

Contact: Andy Baumert

2008 ECONOMIC DEVELOPMENT AND TECHNOLOGY TRANSFER REPORT

Actions Requested: Consider recommending the following to the Board:

- 1) Receive the report.
- 2) Direct that this report and copies of complete institutional reports be forwarded to the Secretary of Senate, the Chief Clerk of the House of Representatives, the Legislative Services Agency, and the Office of the Governor and the Director of the Iowa Department of Economic Development pursuant to Iowa Code Chapters 262B.3, HF 809 (2005 Session) and HF 2459 (2006 Session).

Executive Summary:

The Regents universities promote the economy of Iowa primarily by providing higher education to the people of the state. They also strengthen the Iowa economy by conducting academic research—most notably when it results in intellectual property and applications in the marketplace—and by providing expertise and assistance directly to Iowa's people, industry and communities. The University of Iowa (SUI), Iowa State University (ISU) and the University of Northern Iowa (UNI) thus support the economy of Iowa primarily through their core missions, and their economic contributions to the state are fundamentally linked to their overall academic excellence.

This core mission was supported by \$696 million in funding sponsored by federal and corporate sources in FY 2008. This funding provided the basis on which the Regents universities conducted a wide variety of economic development programs that produced the following results in the past year:

- 174 new intellectual property disclosures
- 170 patent applications
- 97 new patents
- 88 new license and option agreements on intellectual property
- 405 total license and option agreements yielding income
- \$33.1 million in royalty and fee income
- \$89 million in revenue generated by Iowa companies as a direct result of university technologies
- 2918 Iowans employed at 139 companies at the SUI, ISU and UNI research parks and incubators
- 13,040 businesses and individuals located in all 99 Iowa counties received technical services and training through the economic development and technology transfer programs at the three universities

Selected 2008 Economic Development and Technology Transfer Highlights

- Companies that have been served through ISU's Institute for Physical Research and Technology Company Assistance Program report a positive annual impact of \$14 million in sales, investments and reduced operating cost.
- An average of \$1.2 million in new commercial and equity investment was generated in each of the 12 UNI MyEntreNet regions in 2008.
- The 1,962 employees of SUI Research Park companies live in 91 communities in 29 counties with an annual payroll of more than \$100 million, generating \$5.7 million in state income taxes.
- ISU Extension's Center for Industrial Research and Service provided service to companies in 93 counties in 2008. The 667 companies served reported \$62 million in new investments, \$12 million in costs saved and \$122 million in sales gained or retained as a result of CIRAS assistance.
- UNI's three incubator programs and MyEntreNet helped start or expand 79 ventures, creating 321 jobs.

- The Small Business Development Center provided 12,295 counseling hours to 4,357 individuals in 99 counties.
- The SUI College of Engineering took the lead in establishing the Iowa Alliance for Wind Innovation and Novel Development to assist the Iowa Department of Economic Development in its efforts to recruit wind energy companies to the state.
- ISU is ranked 2nd in the United States in the number of licenses and options executed per \$10 million of research expenditures.

Engagement

Many organizational units at the Regents universities are engaged with Iowa's people, industry and communities for the promotion of the state's economic development. Key economic development efforts include: research, intellectual property development and technology transfer, business incubation and acceleration, direct technical assistance to local and regional economic development groups, technical assistance and counseling to businesses, market research for Iowa companies and attracting and retaining businesses in the state. More than 13,000 businesses and individuals in Iowa received these services in 2008. These activities are also highly coordinated with the economic development efforts of the Governor, the Iowa General Assembly and state agencies including the Iowa Department of Economic Development.

The full annual reports from the universities are available at the Board of Regents website and will be provided to the General Assembly, the Governor's Office, the Legislative Services Agency and the Iowa Department of Economic Development.

State Funding for Economic Development and Technology Transfer

State funding in FY2008 was provided in three primary economic development program areas:

1. Ongoing Economic Development and Technology Transfer Programs: \$3.63 million

In FY 2008, the state provided \$3.63 million for several ongoing programs which include the research parks at SUI and ISU, the Institute for Physical Research and Technology, the Small Business Development Centers, the Institute for Decision Making, the Metal Casting Center and the Center for Advanced Drug Development. State appropriations for these programs are still well below levels provided several years ago. In FY 2001, state appropriations for these programs were \$7.63 million. These programs were responsible for providing technical services and training to more than 13,000 individual businesses and communities in every county in Iowa in 2008.

2. Grow Iowa Values Fund (GIVF): \$5,000,000

In FY 2005, the General Assembly authorized an annual appropriation of \$5 million under the GIVF to the Regents universities for purposes of supporting the human and physical infrastructure needed to effectively develop and transfer technology discoveries. In August 2008, the Board of Regents approved the FY 2008 proposals by the universities to use \$4.8 million of the GIVF appropriation to strengthen the technology transfer capabilities at each campus and to fund development projects involving several existing companies and start ups. However, since that time, the Governor has announced a 20% cut in the current year's GIVF appropriation in order to provide funds for flood recovery programs. The Board office will work with the universities to determine how the funding reduction will be implemented for current year projects. The universities and companies involved in the projects have identified \$5.13 million in matching funds for the projects. Examples of projects included:

- \$129,968 to ISU to develop in conjunction with a Muscatine company technology converting carbohydrate-based feed stocks produced in Iowa into hexanediol, an industrial chemical with a current market of over \$300 million
- \$85,000 to ISU to develop and commercialize bio-based resins for manufacture of Pella windows

- \$184,407 to ISU for commercialization of a unique atomization process for producing titanium alloy powder; the researchers will form a startup company called Iowa Powder Atomization Technologies which they state will be able to produce the powders for 50-60% below current market prices
- Fit out of new incubator space needed at SUI to create and expand new businesses directly related to commercializing intellectual property
- Gap funding for early stage technologies or startups based on SUI intellectual property
- \$320,000 at UNI to expand business incubation space, recruit additional spinoff and student businesses and expand intellectual property disclosures and licensing agreements
- \$200,000 to further expand UNI's MyEntreNet program
- \$200,000 to UNI's National Ag-Based Lubricants Center to expand biodiesel testing, participate in national standard setting activities, research new formulations and characteristics of bio-based lubricants and fuels

Private College Grant Program

Of the \$5 million in GIVF funding, \$200,000 was awarded by the Board of Regents at the December 2007 meeting to three independent universities and colleges for economic development and technology transfer projects. The three projects include \$218,940 in matching funds.

Drake University received \$71,207 for the second year of a project to enhance technology and product commercialization through the College of Pharmacy DELTA RX Institute. The project is designed to develop entrepreneurial skills among students, practitioners and faculty, including how to develop new formulas and how to find markets for commercialization.

Luther College received \$32,237 for a project to document DNA content variation in Iowa prairie plants to provide basic data for researchers trying to develop the most productive and efficient plantings to produce biomass for alternative fuel production. More than 20 Iowa companies currently supply native plants and seeds in the state.

Clarke College received \$97,164 for a project to develop a web-based HIV analysis laboratory and a software product to be licensed. The library and software will enable researchers to more efficiently mine HIV databases and develop statistical analyses necessary for better treatment options. The project includes as collaborators the universities of Iowa, Wisconsin and Stanford.

The Board will receive new proposals from private colleges at the December meeting. The 20% cut in GIVF funding for flood recovery-related programs will mean \$160,000 is available for these new projects.

3. Battelle Economic Development Appropriations:

The Iowa General Assembly authorized \$20 million in FY 2007 funding to the Regents universities for economic development activities in three key platform areas of biosciences, advanced manufacturing and information technology. Of the total, \$5 million was designated to be used for endowed chairs and faculty salaries, \$6.8 million for related physical infrastructure and \$8.2 million for general support of projects in the key platform areas. The Board of Regents approved the universities' proposals in September of 2006. The universities provide regular progress reports on the Battelle-funded projects at Regents board meetings. No new Battelle funding has been provided by the Iowa legislature since the 2006 Session.

Nearly all of the projects include matching funding, either from businesses, the universities or federal agencies, even though matching funding for platform projects is not required by the legislation. The platform funding provided funding for 23 projects with research participation or investment by more than 40 companies and entrepreneurs to create new products and technology services. The aggregate amount of industry/university/federal matching funding for all three universities was \$49.5 million, resulting in a better than 5 to 1 matching ratio with the \$8.2 million in Battelle platform funding provided. The \$6.8 million of infrastructure proposals are highly integrated to supply key infrastructure support for the research and

commercialization efforts proposed in the platform projects. The \$5 million in endowment and faculty salary funding will attract or retain several top quality faculty members whose research in the targeted platform areas has the highest potential for commercialization.

Many of the projects funded are multi-year initiatives at various stages of development or completion. Highlights of progress made during 2008 include:

- a new 35,000 sf BioVentures Center at SUI and a 45,000 sf speculative wing scheduled for completion in November 2008
- endowed SUI professor Greg Hageman retained through a Battelle-funded initiative recently obtained a \$15 million NIH grant and is affiliated with a spin-off company
- Spin-out company, Exemplar Genetics, Inc., established through SUI in conjunction with TransOva Genetics to produce pig cell lines with a cystic fibrosis genetic profile
- Battelle endowed chair funds matched with a \$1 million gift to the ISU Foundation to hire, as a faculty member, Dr. Peter Nara, vaccine development researcher and entrepreneur
- a new gas clean-up system has been designed and installed to permit additional research in gasification of biomass for fuel production at ISU
- five companies have located at ISU's CyberInnovation Institute Technical Collaboration Facility, including: Deere and Company; Clear Sighted, a developer of intelligent tutoring systems; Kung Pow Studios, a custom animation company; Mack Enterprises, a video and sound editing company; Visual Medical Solutions, a company developing technology to allow visualization and interaction with 3-D images of patients' complex internal systems
- an agreement with an oil well drilling company to field test in oil drilling equipment an ag-based biolubricant developed at UNI
- public release of an abrasive blasting simulator developed at UNI and an agreement with the National Association of Corrosion Engineers to begin development of a co-branded training course

Weather Disaster Services

In addition to ongoing economic development and technology transfer efforts, the Regents universities assisted many businesses damaged by the tornados and floods of 2008. UNI estimated that more than 1,200 small firms in rural communities in northeast Iowa were affected. UNI's Business and Community Services set up a tent in Parkersburg to provide a central point for businesses seeking consulting, planning and recovery assistance. UNI estimated that 700 small businesses in northeast Iowa received these services.

ISU's Center for Industrial Research and Service surveyed manufacturers in all zip codes reported to have severe weather damage. Of the 841 companies that responded, half had been affected by floods and tornados. Of those affected, one-third had direct damage to buildings and machinery. CIRAS estimated damages and lost income would exceed \$100 million.

Table 1: Intellectual Property, Technology Transfer, and External Support FY2006-2008

Indicators	FY 2006				FY 2007				FY 2008			
	ISU	SUI	UNI	Regents Totals	ISU	SUI	UNI	Regents Totals	ISU	SUI	UNI	Regents Totals
1. Number of disclosures of intellectual property	120	89	11	220	114	87	26	227	87	68	16	174
2. Number of patent applications filed	52	178	5	235	41	130	4	175	53	109	8	170
3. Number of patents awarded	19	56	5	80	26	119	7	152	27	65	5	97
4. Number of license and option agreements executed on institutional intellectual property in total	14	43	2	59	113	34	2	149	62	22	4	88
5. Number of license and option agreements executed on institutional intellectual property in Iowa					62	3	2	67	13	4	4	21
6. Number of license and option agreements yielding income	299	92	11	402	268	151	11	430	250	143	12	405
7. Revenue to Iowa companies as a result of licensed technology ¹	\$38 million	\$0.89 million	\$5.9 million	\$44.79 million	\$83 million	\$1.5 million	\$4.56 million	\$89.06 million	\$84 million	\$1.23 million	\$3.8 million	\$89 million
8. Number of startup companies formed, in total (through licensing activities)					2	1		3	2	2		4
9. Number of startup companies formed, in Iowa (through licensing activities)					2	1		3	2	2		4
10. Number of start up companies formed through MyEntrepreneur							51	51			59	59
11. Number of companies in research park/incubators					61	50	15	126	71	51	17	139

Indicators	FY 2006				FY 2007				FY 2008			
	ISU	SUI	UNI	Regents Totals	ISU	SUI	UNI	Regents Totals	ISU	SUI	UNI	Regents Totals
12. Number of new companies in research parks and incubators					16	3	10	29	12	7	9	28
13. Number of employees in companies in research parks and incubators					636	1780	39	2455	923	1962	33	2918
14. Royalties and license fee income	\$8 million	\$16 million	\$32 thousand	\$24.3 million	\$8.1 million	\$17.4 million	\$62 thousand	\$25.56 million	\$9.5 million	\$23.6 million	\$47,000	\$33.1 million
15. Total sponsored funding (\$ million)	\$279 million	\$366 million	\$19.9 million	\$666 million	\$272 million	\$382.2 million	\$23.2 million	\$683.4 million	\$274 million	\$386 million	\$36 million	\$696 million
16. Corporate-sponsored funding for research and economic development ² in total (\$ million)	\$28.6 million	\$31.9 million	\$1.76 million	\$62.2 million	\$14.2 million	\$41.8 million	\$1.7 million	\$56.7 million	\$24.4 million	\$36.3 million	\$1.5 million	\$62.2 million
17. Corporate-sponsored funding for research and economic development ² in Iowa (\$ million)					\$8.1 million	\$1.6 million	\$1.7 million	\$11.4 million	\$13 million	\$3 million	\$1.5 million	\$17.5 million

¹Aggregate sales reported by Iowa companies of products and services based on licensed inventions.

²Excludes corporate philanthropy

IOWA STATE UNIVERSITY

**IOWA STATE UNIVERSITY
OF SCIENCE & TECHNOLOGY**

**FY2008 Board of Regents, State of Iowa, Annual
Economic Development and Technology
Transfer Report**

**PRESENTED BY TED OKIISHI, INTERIM VICE PRESIDENT
FOR RESEARCH & ECONOMIC DEVELOPMENT**

October 1, 2008

**FY 2008 Board of Regents, State of Iowa, Annual Economic Development and
Technology Transfer Report**

1. Please briefly describe the relationship of your institution's economic development activities to the enhancement of economic growth in the state. The description should cover, but not necessarily be limited to the following:

- a. the relationship between institutional activities and creation of jobs and wealth in Iowa
- b. Institutional activities and services which indirectly promote economic development, such as training provided to staff of local economic development agencies

1.A Enhancement of Economic Growth through Job Creation and Retention, Investments, Sales, and Cost Savings

Iowa State University engages in several activities that have direct impact on both the creation as well as the retention of jobs in Iowa. The ISU Research Park is a technology community that encourages commercialization of university research. Likewise, the Innovations Development Facility, part of the Plant Sciences Institute, incubates new companies. In addition, the IPRT (Institute for Physical Research and Technology) Company Assistance Program, ISU Extension's Center for Industrial Research and Service (CIRAS), the Small Business Development Center (SBDC) and the ISU Pappajohn Center for Entrepreneurship interact with companies across Iowa to solve production and management problems. These interactions lead to the resolution of problems related to product development and business management. As a consequence of the improved production resulting from these interactions, businesses have been able to retain and often expand their work force rather than lay off workers due to the expected down turn in business if no solution to the problems had been found. Some examples of the impact that ISU units have had this past year are as follows:

- The ISU Research Park has been very successful in initiating as well as nurturing numerous new businesses. Ten new companies and affiliates have joined the Park in FY08, bringing the historical total to 178 companies, research centers and affiliates. Currently, there are 66 companies, research centers and affiliates located in the Park, employing 911 people.
- Two new faculty start-up companies have located in the Innovations Development Facility, which is an on-campus business incubator in the Roy J. Carver Co-Laboratory, under direction of the Plant Sciences Institute. A total of 13 companies have signed lease agreements for business incubator space since the facility opened in September 2003.
- A five-year summary of project evaluation data was analyzed in June 2008 and clearly shows that Iowa companies with technical problems and research and development needs continue to find important technical help through the services of IPRT Company Assistance. Companies report positive impacts affecting their companies' sales, investments, and operating costs. The estimated annual average impact over the period is approximately \$14M per year, and it is

estimated that 33 jobs on average are created or retained each year. The average satisfaction rating given by clients during this five year period is 4.4 (1-5 scale with "1" being "is not satisfied" and "5" being "very satisfied"), and the average survey return rate is 55%.

- Three ISU proprietary biodiesel catalysts technologies developed by Victor S.-Y. Lin, director of IPRT's Center for Catalysis (CCAT) and a professor of chemistry at Iowa State University, have been successfully transferred to an Iowa-based startup company, Catilin, Inc. These unique recyclable solid catalysts enabled Catilin to attract a \$3 million investment from a California-based venture capital firm, Mohr Davidow Ventures. Even though the company was founded just over a year ago (in May 2007), it has already built a pilot plant for biodiesel production with one million gallon annual production capacity at the Biomass Energy Conversion (BECON) facility of Iowa Energy Center in Nevada, Iowa, using the unique CCAT solid catalyst technologies. Currently, there are 9 full-time employees in Catilin, including three of Lin's former graduate students and postdoctoral research associates. Several major news media, such as the New York Times, the Des Moines Register, The Tribune and other magazines, have covered the cutting-edge technologies of Catilin since it was established.
- Extension's CIRAS (Center for Industrial Research and Service) has a mission to improve the quality of life in Iowa by enhancing the performance of business and industry through research, education, and technical assistance. Cumulatively, over the past three fiscal years, CIRAS and its partners have reported impact from companies totaling over \$480 million dollars (new investments \$211M, costs saved or avoided \$29M, sales gained or retained \$247M) with 4,826 jobs added or retained as a result of the technical assistance, education, or research they received.

In FY08, businesses from 93 counties in the state received assistance on projects or attended educational workshops from CIRAS staff or partners. 667 companies reported \$62 million in new investments, \$12 million in costs saved or avoided, and \$122 million in sales gained or retained (\$196 million total). Company executives stated that 2,226 jobs were added or retained as a result of the technical assistance and education they received from CIRAS and its partners. In addition to direct project and workshop assistance to companies, CIRAS staff also provided educational information to over 10,000 individuals in FY08.

- Extension's CIRAS administers the USDA Biobased product testing and evaluation award on behalf of ISU. A component of this initiative involved ISU working with USDA, the Midwest Governors' Association, and Iowa legislators to help open new markets for biobased product businesses. CIRAS has located over 14,000 products produced by 2,100 U.S. businesses as part of the USDA BioPreferred program. Over 100 Iowa companies are included in the database. The information gathered on biobased products will be used by the Midwest Governors' Association to help expand markets for biobased products in the Midwest. The group, composed of 12 Midwest governors and the premier of Manitoba, is developing a procurement implementation plan for biobased products. Iowa is in the forefront in the Midwest, having already developed a state-based biobased product procurement effort designed around the national

BioPreferred program. In 2008 Governor Culver signed into law legislation that gives preferential procurement to biobased products.

- Over 550 participants were trained in FY08 by attending conferences and workshops offered by Extension's CIRAS, in partnership with Engineering Continuing Education, the Electrical and Computer Engineering department, Alliant Energy, MidAmerican Energy, CIPCO and the Iowa Energy Center. Geotechnical engineers, geologists, plant engineers and safety personnel attended the ASCE (American Society of Civil Engineers) transportation, structural engineering, and geotechnical conferences. Attendees were able to obtain professional development hours towards retention of their Iowa engineering licenses. Energy efficiency workshops, held across Iowa, provided education on lighting, industrial refrigeration, and steam systems. Energy short courses educated participants on the production, transmission, and distribution of electricity.
- During FY08, the Small Business Development Center (SBDC) provided business assistance to companies, involving 2,129 clients and 12,295 counseling hours in 99 counties. They also conducted 334 training workshops in which 4,357 individuals participated.
- The ISU SBDC, along with the ISU Pappajohn Center for Entrepreneurship, provided 5,157 hours of counseling assistance to start-up and existing companies; served 134 clients with one-on-one counseling; educated more than 400 attendees through workshops; provided advice to several hundred clients via telephone and email; and advised 50 technology companies in the areas of licensing, equity based financing, business development, etc.
- In a report published by James J. Chrisman, Ph.D. in Management and Information Systems at Mississippi State University, data was collected from survey respondents for *Economic Impact of Small Business Development Centers (SBDC's)*. In that report, based on several years of data, it was shown that for every \$1.00 in SBDC funding in FY06, the amount of tax dollars returned to the State of Iowa and the federal government by SBDC clients was \$2.02. There were also 334 jobs retained, 545 jobs created, \$7.1 million in sales retained and \$37.5 million in sales increased.
- New technologies originating at ISU and licensed to Iowa companies have resulted in over \$84 million in sales by those companies in calendar year 2007. Total sales of ISURF-licensed technologies were \$468 million, not including germplasm.
- The Office of Intellectual Property and Technology Transfer began supporting SBIR (Small Business Innovation Research) and STTR (Small Business Technology Transfer) outreach efforts in FY06. Since then, SBIR and STTR funding in Iowa has rebounded following a decrease in FY05 after federal support for an earlier assistance program at ISU ended. An emphasis placed on outreach and training activities, including a monthly newsletter, proposal writing workshops and providing proposal preparation support has led to an increasing number of companies receiving funding. Twenty Iowa companies were assisted in the preparation of 21 SBIR or STTR proposals during FY08 including seven

Iowa State faculty or staff related start-up companies. In FY08 21 Iowa companies won 21 new SBIR and STTR awards worth nearly \$6.8 million. The Departments of Agriculture, Defense and Energy, as well as the National Institutes of Health, the National Aeronautics and Space Administration and the National Science Foundation, are funding this year's Iowa SBIR/STTR award winners. The funded projects reflect Iowa's strengths in biotechnology, information systems, materials development and agriculture. Over \$2 million in support was awarded from NIH for diverse projects that range from the development of novel cancer treatments to imaging systems to tools to facilitate life sciences research to medical monitoring devices. An additional \$2.1 million was received from the Department of Defense for Navy and Air Force projects to enhance training, improve fluid dynamics research and develop materials for applications in electronics.

- The ISU Grow Iowa Values Fund program has a competitive research component that pairs ISU faculty members with Iowa industries to create economic benefit for the companies. A survey of seven companies that participated in projects that were completed in June 2007 documented 42 jobs created or retained and a \$5.3M sales impact due to the research projects conducted in partnership between ISU and the companies.

1.B Training Opportunities for Staff of Local Economic Development Agencies and Other Activities that Indirectly Promote Economic Development

- Many units on campus provide training opportunities for staff of economic development groups across the State. Some of these are done through visits to campus and some are done by ISU units going out to the agency or respective community. For example, the Office of the Vice President for Research and Economic Development has sponsored several Economic Development Open Houses during the past five years, in which many economic development groups across the State have participated in a conference, including tours of campus facilities.
- In response to the floods and tornados, ISU Extension's Center for Industrial Research and Service (CIRAS) reached out to Iowa industry in an effort to gather data regarding the resulting challenges for Iowa industries. CIRAS staff surveyed companies to identify industry obstacles to exceeding pre-disaster production levels. The information learned is being conveyed to local, state, and federal economic development agencies, organizations, and people providing support and resources.

The survey was directed at 1,400 manufacturers with 56,000 employees located in ZIP codes that had been reported to have been flooded or hit by tornados. Eight-hundred and forty-one companies spoke with the surveyors. Half of these companies stated they were impacted by floods or tornados. Of those impacted, one-third had direct damage to their buildings or machinery. Two-thirds were indirectly affected.

Workforce was the number one issue affecting companies. Workers were unable to get to work because of flooding in their own homes, washed-out roads or

bridges, etc. This created a variety of problems for manufacturers, including delays in order delivery, short-term lost sales, lost customers, and added costs when penalty clauses were included in orders.

Road transportation was the second most reported issue. Beyond hindering employees getting to work, closed roads also prevented or slowed incoming supplies and outgoing finished products and increased transportation costs as alternate, longer routes had to be located.

Other issues reported by companies included loss of customers, delays in getting supplies, loss or restriction in utilities, damage to buildings, machinery and offices, communication problems, rail transportation bottlenecks, and limited access to money.

The monetary impact of the disasters on companies surveyed varied significantly. Company estimates ranged from zero to millions of dollars. It is difficult to accurately assess the total impact of the flooding and tornados on manufacturing. Many companies could not be reached during the survey period. Only 46% of the companies that provided detailed information would provide cost estimates. Companies either did not know the extent of damage or they did not want to provide company sensitive information (true of many of the larger manufacturers). Also, parts of the state that were not flooded were not surveyed. Many manufacturers in these regions, especially in southeast Iowa, were indirectly affected by the floods. Despite the uncertainty in the data, it is reasonable to expect damages and lost income to exceed \$100,000,000.

2. Please provide the following information for FY 2008: (If your institution utilizes additional metrics specific to your institution's specialized areas of research or service, please include them here)

Note: Unless noted, the data provided below are FY08 data. In some categories, the AUTM (Association of University Technology Managers) ranking is shown. AUTM is a national association that conducts annual surveys. Their most recent data published was based on FY06 numbers and included 161 U.S. university participants.

- a. Number of disclosures of intellectual property 87 (AUTM Ranking—tied at 21st)
- b. Number of patent applications filed 53 (AUTM Ranking—56th)
- a. Number of patents awarded 27 (AUTM Ranking—43rd)
- b. Number of license and option agreements executed on institutional intellectual property, in total and in Iowa 62 total, 13 in Iowa (AUTM Ranking, in total—4th)
- c. Number of license and option agreements yielding income 250 (AUTM Ranking—5th)
- d. Revenue to Iowa companies as a result of licensed technology \$84 million
- e. Number of startup companies formed, in total and in Iowa (through licensing activities) 2 total, 2 in Iowa (AUTM Ranking—tied at 51st)

- f. Number of companies in research parks and incubators ISU Research Park: 50 private and 16 university-related; Plant Sciences Institute Innovations Development Facility (IDF): 5 (all university-related)
- g. Number of new companies in research parks and incubators ISU Research Park: 8 private and 2 university-related; Plant Sciences Institute IDF: 2 (both university-related)
- h. Number of employees in companies in research parks and incubators ISU Research Park: 571 private and 340 university-related; Plant Sciences Institute IDF: 12 (all university-related)
- i. Royalties and license fee income \$9.5 million (AUTM Ranking—35th)
- j. Total sponsored funding \$274 million of which \$167 million is for research
- k. Corporate sponsored funding for research and economic development, in total and in Iowa \$24.4 million total, \$13 million in Iowa
- l. Iowa special appropriations for economic development in the following categories:
 - i. Annual state appropriations for ongoing programs (such as research parks, SBDC, IPRT, IDM, Metal Casting Center) \$2.8 million—includes \$914,207 SBDC (includes state-wide programs), \$153,520 ISU Research Park & \$1.7 million IPRT
 - ii. Grow Iowa Values Fund appropriations \$1.925 million
 - iii. Battelle appropriations No new funding in FY08
- m. Research expenditures (including state appropriations and external funding) \$217 million—Note that this is an FY07 number, most recent number available
- n. Licenses and options executed per \$10 million research expenditures 6 (AUTM Ranking—2nd)—Note that this is an FY06 figure, most recent number available
- o. Sales of licensed products by Iowa-based companies \$84 million--Note that this is a CY07 figure, most recent number available.
- p. Number of employees for current Research Park tenants and incubator, as well as former tenants that are still in existence in basic form world-wide 2,784
- q. Number of interactions ISU had in FY08 with communities and businesses across the State of Iowa 7,522, an increase over the previous year of about 900 (see last paragraph in section 3.C for more detail)

3. Please describe the ways in which your institution is engaged in the following activities (For example, what is the nature of the outreach and service activities? Which units provide it? What kinds of people and organizations benefit?)

- a. Direct and hands-on technical assistance to businesses and entrepreneurs
- b. Direct economic development assistance to Iowa communities
- c. Economic development services provided by research parks, incubators or similar service units

3.A Direct and Hands-on Technical Assistance to Businesses and Entrepreneurs: ISU System for Innovation

Iowa State University is charged with advancing economic development and technology transfer activities that promote growth and benefit all citizens. While creation of

knowledge remains the basic responsibility of a research university, the way we share knowledge determines our success. ISU shares knowledge and expertise with students (learning and teaching), communities (engagement), and business and industry (technology transfer and economic development). ISU ranks as one of the most successful universities nationwide in several categories of technology transfer and economic development. The activities of the colleges, institutes and centers are coordinated through the Economic Development Council that advises the Vice President for Research and Economic Development. The Vice President and this Council continuously communicate with economic development entities within the State such as the Iowa Department of Economic Development, the Iowa Business Council, the Greater Des Moines Partnership and other local and regional agencies.

The Iowa State University "System for Innovation" was developed to focus on the transfer of university technologies into commercial applications in start-up or existing companies. Functions of the ISU System for Innovation include:

- **Business Development & Assistance and Entrepreneurial Activities:** Efforts related to start-up companies, including business assistance services & SBIR/STTR applications.
- **Technical Assistance & Technology Development:** Solving technical problems, assisting in product development and process improvement projects for existing businesses. This includes the current efforts of no-cost technical assistance and cost-sharing projects.
- **Industry Relations:** Facilitation of a multitude of interactions between ISU and its industry partners, including the management of research relationships and interactions with economic development groups, legislative groups, and other third parties.
- **Community Development:** To disseminate and develop programming, facilitating community organizations, fostering community planning, and coordinating with community and regional economic development networks and organizations.
- **Technology Transfer and Licensing:** The transfer of patented intellectual property to business and industry through license agreements.
- **Physical Space:** Physical space for business incubation is available in the ISU Research Park, Plant Sciences Institute, and Center for Crops Utilization Research.
- **Research and Instrumentation Facilities:** Iowa State University maintains more than 20 central research facilities that also serve communities and businesses on a fee-for-service basis.

3.B Direct Economic Development Assistance to Iowa Communities

- Since 2005, the Center for Industrial Research and Service (CIRAS) has partnered with the ISU Department of Economics to conduct five regional economic studies throughout Iowa. The studies provide economic developers with an overview of their regional economy and the forces affecting it, assess the regional industrial structure, identify key regional industries, and promote the use of research-based criteria for justifying public economic development spending. The regional studies help to enhance the link between local economic development needs and Iowa State University research, extension, and

continuing education professionals. The studies have been funded in part from a grant to CIRAS from the Economic Development Administration.

The fourth study, "Understanding the Greater Jasper County Labor Region, and its Workforce and Industrial Characteristics," was completed in July 2007. Through this study, CIRAS assisted Newton in identifying their regional economy by defining the workforce/trade region. This data assisted the region in winning the Central Iowa Regional Innovation Grant (RIG) and establishing the first in the nation RIG's region. The purpose of the grant is to encourage strategic planning that will greatly enhance and complement the current approach to National Emergency Grants. RIG's are proactive, actively engaging all key players, leveraging collective assets, investing in innovative strategies focused on infrastructure, talent development and investment in the region. The RIG's are funded by the Employment and Training Administration within the Department of Labor to assist state workforce agencies and local Workforce Investment boards in the development of a comprehensive, integrated, strategic regional plan, with a focus on current or future unanticipated economic events. CIRAS continues to work with the Greater Jasper County Labor Region to assist with data driven decision making in addressing economic development and workforce development issues in the region. (Note: Other examples are provided elsewhere in this report.)

3.C ISU's Key Units Engaged in Economic Development

Iowa State University, as part of the higher education system in the State, is charged with advancing technology transfer and economic development activities that promote growth and benefit all citizens. The University evolves these goals by contributing to workforce development, creating intellectual property, advancing ideas to the stage of market readiness, supporting creation of new companies, offering assistance to existing companies, and attracting new companies to the State. The University's economic development/technology transfer support system includes the following units that are coordinated through the Economic Development Council:

- **Institute for Physical Research and Technology (IPRT):** Through IPRT's Company Assistance Program, Iowa companies can leverage the expertise of the IPRT research centers and other ISU capabilities in order to solve technical problems, create new products and processes, and increase productivity and quality. IPRT Company Assistance provides help through both short-term, no-cost technical assistance, and its R&D cost-sharing program. IPRT assists early-stage technology commercialization and actively collaborates with Iowa companies on technology transfer projects. Materials and process problems can be addressed, and IPRT experts can also assist Iowa companies with inspection and measurement challenges. IPRT plays an integral role in the process of technology transfer targeted at new business creation. Many successful businesses have emerged from IPRT technologies, including Mechdyne of Marshalltown and PowerFilm, Inc. of Ames.
- **Pappajohn Center for Entrepreneurship and the Small Business Development Center (SBDC):** These units work with researchers to define the technologists' role in the company, evaluate markets, assist in the creation of a business plan and help the company develop connections with a network of

business resources including consultants, accountants, attorneys, prospective employees and investors. In a typical year, the Pappajohn Center, working with IPRT, the Plant Sciences Institute, ISURF/OIPTT and other research centers, identifies approximately 25 prospective new technologies. These technologies can take six to 26 months to develop sufficiently to justify the formation of businesses. During this time the researcher receives assistance in moving the technology from the researcher's bench to the marketplace. The Pappajohn Center helps the researcher develop the model for the business and establish the network of resources necessary to implement the plan. These resources can include business assistance, students or capital. The Pappajohn Center/SBDC also continues to provide a referral network and facilitates the recruitment of students including access to internships.

- **Iowa State Innovation System (ISIS):** Near the time a venture is launched, facilities become an issue. ISIS, ISU's technology incubator, provides an ideal first home for companies. ISIS offers connections to the University, affordable space with reception services, office equipment (copiers, fax machines, and computers), conference rooms, and other amenities at a very reasonable rate. The Pappajohn Center, described above, provides mentoring to the companies as well as the opportunity for companies to utilize students as interns and researchers. ISIS will generally attract five new companies each year. Companies typically spend one to three years in the Incubator moving from product development to product sales. Once sales are established, companies grow out of the Incubator. Some companies remain within the Research Park and continue to receive development assistance, while others move on to commercial space elsewhere but can still receive business development services from the ISU Pappajohn Center and ISU SBDC. As companies mature, the University provides opportunities for collaboration between researchers at the University and in the companies. Students provide cost-effective labor and are potential employees. The Research Park provides expansion space, often financing the space and improvements.
- **Iowa State University Research Park:** The Iowa State University Research Park is a 230-acre development with nearly 325,000 square feet of building space and is located south of the Iowa State University campus. The ISU Research Park is more than just land and buildings; it is a technology community that encourages commercialization of University research.
- **Extension's Center for Industrial Research and Service (CIRAS):** CIRAS provides education, research, and technical assistance to Iowa industry through partnerships with Iowa's universities and community colleges, government agencies, and business associations. Account managers throughout the state meet with clients to assess needs and provide links to resources that companies can use to increase their competitiveness. Solutions are offered through a combination of direct assistance from center staff, university faculty, partner organizations, and outside consultants. CIRAS staff has expertise in biorenewables, engineering, management practices, government procurement, productivity, growth services, and quality systems. The center is supported in part by the DoC/NIST Manufacturing Extension Partnership, the DoD/DLA

Procurement Technical Assistance Program, the DoC/EDA University Center Program, and the USDA BioPreferred program.

- **ISU Research Foundation (ISURF) and the Office of Intellectual Property and Technology Transfer (OIPTT):** ISURF owns and ISURF and OIPTT jointly manage, market and license the intellectual property for Iowa State University. ISURF/OIPTT works with faculty members in regard to the reporting and protection of innovations, including patenting inventions. It markets the innovations to find commercial partners interested in licensing. It also funds projects within the University that have potential for broadening the intellectual property protection or providing value for its commercial potential. ISURF also provides assistance to Iowa companies, including ISU faculty start-ups with SBIR and STTR applications.
- **Innovations Development Facility (IDF):** This is a business incubator operated by the Plant Sciences Institute to promote the commercialization of plant biotechnology. IDF encourages ISU faculty, staff, and students to commercialize their research in the plant sciences and promotes the development of start-up companies among aspiring entrepreneurs. IDF is housed in the Roy J. Carver Co-Laboratory and consists of six well-equipped laboratory modules. The facility offers an environment to transition research from a university to a business setting. The IDF facility is a productive research location where scientists from academe and industry can work together to advance the mission of the Plant Sciences Institute and to promote economic development in Iowa.
- **ISU Extension Community and Economic Development** provides assistance in land use and community planning, community economic analysis, nonprofit management, community design, local government management and leadership development. Major partners in the provision of these services and educational programs have included the Iowa Department of Economic Development; the University of Iowa Nonprofit Resource Center; the Iowa Department of Transportation; the U.S. Department of Housing and Urban Development; the Office of the Iowa Secretary of State; Hometown Perry, Iowa; and the U. S. Department of Agriculture.

For example, Mount Pleasant asked ISU Extension (through Iowa State University Institute for Design Research and Outreach, IDRO), for assistance in planning for the impact of a new bypass, creating a new community graphic identity, redeveloping the town square and the surrounding area, and redesigning and updating the Old Threshers grounds. IDRO prepared a work plan, and Mount Pleasant funded the \$50,000 project, which included community involvement activities, a graphic identity, an Urban Design Studio report, an interchange development report, a park master plan, and CommunityViz, a suite of Geographic Information Systems planning software.

- **ISU Extension to Families** provides leadership for Iowa families and communities in meeting workforce development needs associated with dependent adult and child care, food safety, financial management, and nutrition and health issues. ISU Extension to Families also delivers the Horizons program in Iowa to help communities take charge and build stronger leaders to address poverty, economic decline, and the exodus of young adults. Twenty rural

communities completed the 18-month community leadership program in June 2008. As a result: 20 communities set up volunteer programs to mitigate local poverty issues, 10 communities noted new leaders becoming elected officials, 11 communities formed not-for-profits to assist with funding poverty reduction efforts, 15 communities highlighted work within their communities to pool resources and improve community built capital, and 20 communities wrote grants and secured new resources. Fifteen additional communities are to begin the next round of the program in September 2008. This program is funded by the Northwest Area Foundation.

- **ISU Extension to Agriculture and Natural Resources (ANR)** provides educational leadership to integrate Iowa's rich natural resources, productive people, and viable communities with its strong agricultural industry to grow the economic base of Iowa agriculture. ANR Extension plans and delivers extension education activities through seven teams of faculty, field specialists, and staff with expertise in crop production and protection, farm business management, horticulture, beef production management, pork production management, dairy production management, and natural resources and stewardship. For example, the Iowa Beef Center created a coalition among beef producers, DNR, and NRCS to facilitate improved communications and connect producers with available resources and advice regarding Environmental Protection Agency permit regulations. Since the coalition was formed seven years ago, permits have been awarded to 130 beef feedlots for their strategic land and water stewardship efforts; most producers substantially increased herd sizes, applying efficiencies of scale; and producers are better managing available manure nutrients.
- The Office of the Vice President for Research and Economic Development (OVPR/ED) works closely with all of the above units, including the Office of the Vice President for Extension and Outreach, in promoting the University's mission related to technology transfer and economic development.
 - The Economic Development Council (chaired by the VPR/ED) coordinates ISU technology transfer and economic development activities. Members meet monthly to discuss problems, update each other on activities, assess the state and national environment for technology transfer, and propose policy and procedures to encourage technology transfer and economic development activities at ISU. This council, formed in 1993, is comprised of representatives from all units on campus that have a primary role in economic development and technology transfer as well as representatives from each of the seven colleges.
 - An Economic Development Team within the OVPR/ED meets regularly to coordinate activities in this area. Members of this team include the VPR/ED, the Director of Industry Relations, the Director of Industry Initiatives, the Director of the Office of Sponsored Programs Administration, the Executive Director and Associate Director of the ISU Research Foundation/Office of Intellectual Property and Technology Transfer, the Director of the ISU Research Park and Pappajohn Center for Entrepreneurship, the Director of the Institute for Physical Research

and Technology, the Director of the Center for Industrial Research and Service and the ISU Foundation Vice President for Development.

- o An opportunity response team (ORT) was formed to focus on the bioeconomy initiative and fostering relationships with industry in this area. Members include the Director of the Office of Biorenewables Programs; the Deputy Director of the Office of Biorenewables Programs; the Director of Industry Relations; and the Director of Development, ISU Foundation.

The above units are the key units that focus attention on economic development and technology transfer at ISU; however, significant additional related activity also occurs across campus in individual academic departments, centers and institutes, and colleges.

A recent survey of all ISU units was conducted to capture an estimate of the number of interactions ISU has had with communities and businesses across the State of Iowa. In FY08, the number of interactions reported was 7,522. This activity occurred in all 99 counties--see the attached map (Appendix A). For more detail on these interactions, including cities/towns, names of companies/communities served, names of units providing assistance and types of assistance, please see attached Excel sheet (Appendix B). In addition, there were many state-wide and regional events reported that were not county specific.

4. Please briefly describe two or three examples of major economic development collaborative projects with such other entities as Regent universities, Iowa community colleges, the Iowa Department of Economic Development, Iowa Workforce Development, or other state agencies.

Major Economic Development Collaborative Projects

Grow Iowa Values Fund -- This legislation is providing the universities and private colleges financial resources to expand technology transfer and commercialization efforts. We are in the fourth year of GIVF funding, in addition to providing core support for infrastructure in the Research Park, Pappajohn Center, IPRT Company Assistance, and the VPR/ED office. Each year projects are funded that pair ISU researchers and Iowa companies. More information appears later in this report.

Battelle Initiative -- ISU, the University of Iowa and the University of Northern Iowa have worked closely with the Iowa Department of Economic Development, the Board of Regents, State of Iowa; legislators and business leaders through the Biosciences Alliance of Iowa organization to implement the Battelle initiative. Proposed projects that focus on the biosciences, information technology and advanced manufacturing have been funded. More information appears later in this report.

Iowa Power Fund -- In fall 2007, the State of Iowa established the Office of Energy Independence (OEI) "to help create an economically viable and environmentally sound energy future". The goal was to fund \$100 million over 4 years through the Power Fund program to support research and development, knowledge transfer, technology innovation and educate the public about technologies and different approaches, in an

effort to improve the state of Iowa's competitiveness and help it achieve its goal of energy independence.

To seek funds from the Power Fund, investigators have to submit a 5-page pre-proposal with a full budget to the Due Diligence Committee, which screens and reviews all proposals. If invited to do so, investigators will then submit a full proposal and make a brief 15 minute presentation to the Due Diligence Committee and the Board. The Due Diligence Committee then forwards all recommendations to the Power Fund Board for its final review and decision. If selected for funding, the Board can then recommend a technical and/or market impact review if they feel it is necessary. Awardees negotiate the final details of the contract and budget with the Board.

For its first deadline, which was on February 1, 2008, the Power Fund had received 78 proposals. The total request was \$45,617,528, with matching funds that totaled \$262,024,556. ISU had submitted 12 proposals for the February 1 deadline and since then has submitted another five. So far, 5 pre-proposals were invited to submit full proposals, and of these, two have made it to the final stage. These two proposals are headed by Dr. Song-Chang Kong in the area of biofuels and Dr. Vikram Dalal in solar energy. ISU is working with the Power Fund to negotiate the final contract on one of these.

State-wide committees – Many people from ISU serve on committees that promote economic development programs such as the Battelle Initiative, the Iowa Power Fund, etc.

5. Please provide the following information about Grow Iowa Values Fund projects for FY 2008:
- a. Identify and briefly describe each project or initiative which received GIVF funding in FY 2008 including information on outcomes or progress made
 - b. Identify metrics which were used to measure outcomes for each project and report progress on each metric for FY 2008
 - c. Provide a description of the sources of the matching institutional dollars for each GIVF-funded project

The ISU Grow Iowa Values Fund (GIVF) program has a competitive research component that pairs ISU faculty members with Iowa industries to create economic benefit for the companies. A survey of seven companies that participated in projects that were completed in June 2007 documented 42 jobs created or retained and a \$5.3M sales impact due to the research projects conducted in partnership between ISU and the companies.

Attached are two additional reports that provide information on past projects funded through the GIVF (see Appendix C and Appendix D).

In addition, the following projects were identified this past spring for FY09 funding; however, these projects are on hold until further information is received on the status of GIVF funds.

FY09 Projects Recommended for Funding

PI	Title	Amount Requested
Victor Lin	Catalytic production of 1,6-Hexanediol	\$125,968
Mike Kessler	Pultruded Window Frames from Agricultural Oils	\$ 85,000
Jesse Goff	Test Glycosides of 1,25-Dihydroxyvitamin D for Anti-cancer Activity in vitro and in vivo	\$135,000
Michael Olsen	Development of the Next Generation of Vortex Flow Meters for Engine Applications	\$112,570
David Grewell	Protein Polymer Product Development	\$ 84,357
Gary Munkvold	Low-Temperature Plasma Treatments for Improving Seed Performance	\$ 27,012
Nikki Pohl	Automated Synthesis of Custom-order Carbohydrates for Biologists and Pharmaceutical Scientists	\$ 71,481
Iver Anderson	(IPAT): Titanium Atomizer Prototype Design	\$184,407
Tim Ellis	A Novel and Cost-Effective H ₂ S Absorption Technology Using Rubber Particles from Scrap Tires	\$ 35,287
Atul Kelkar	Tar Sand to Diesel – Capturing Energy from Waste	\$154,639

6. Please provide the following information about Battelle-funded projects for FY 2008:
 a. Identify and briefly describe each project or initiative which received Battelle funding in FY 2008 including information on outcomes or progress made
 b. Identify metrics which were used to measure outcomes for each project and report progress on each metric for FY 2008

The following executive summary (prepared in July 2008) provides an overview of the Battelle funding awarded to ISU. For more detailed information on specific projects, including some updates, see the attached report (Appendix E).

IOWA STATE UNIVERSITY
BATTELLE UPDATE: July 01, 2007 – December 31, 2007

EXECUTIVE SUMMARY

Platform	Expenditures	Total Allocation	Project Allocation	Project Obligated	Infrastructure Allocation	Infra-structure Obligation
Advanced Food & Feed	\$ 12,489	\$ 857,572	\$ 507,572	\$ 350,000	\$ -	\$ -
Advanced Manufacturing	\$ -	\$ 100,000	\$100,000	\$ -	\$ -	\$ -
Animal Systems	\$ 361,120	\$ 626,000	\$ 579,000	\$ -	\$ 47,000	\$ -
Bioeconomy	\$1,373,663	\$2,315,196	\$1,054,666	\$ -	\$ 1,008,000	\$ 252,530
Biosecurity	\$ 428,158	\$ 793,470	\$ 388,000	\$ 62,000	\$ 191,470	\$ 152,000
Information Technology	\$1,009,445	\$1,718,800	\$ 650,000	\$ -	\$ 1,068,800	\$ -
Total	\$3,197,368	\$	\$	\$	\$ 2,315,270	\$ 404,530

Endowed Chairs

ISU received \$2 million in funding to be used for matching dollars for endowed chairs. April 2007, the ISU Foundation received \$1M in private funds from Dr. Eugene and Linda Lloyd to create the W. Eugene Lloyd Chair in Toxicology in the College of Veterinary Medicine. This endowment was matched with \$500,000 from Battelle funds. A national search was done for this position and Dr. Peter Nara was hired and started at ISU in summer 2008.

Advanced Food & Feed

The Nutrition and Wellness Research Center renovation was completed in April 2007. The NWRC has been managed by an Interim Director since fall 2008. Plans are now underway to open the search to hire a full time Director – a search committee has been named and approved by the deans of the College of Human Sciences and Agriculture and Life Sciences. Substantial progress has been made in the operations of the NWRC, including hiring of staff to manage accounts and provide communication, and to direct clinical trials. Several companies have begun using the facility through contracting research projects, and several others have been contacted about using the center. There is high interest among the food industry in the work provided by the NWRC and we anticipate solid growth in the future. The Department of Food Science and Human Nutrition has hired three new nutrition faculty members who will bring research expertise to the NWRC – these faculty members will start in August, November and January. These new faculty will participate in research at the NWRC and will add to the growth of the center.

Advanced Manufacturing

We continue to partner with John Deere to provide lean training to some of their suppliers. We have been funded by EDA to investigate biobased product supply chains. We are working with the Economics Department at ISU to review the Battelle report and the Monitor report. We are nearing completion of the agricultural equipment supply chain proposal. We have created a Supply Chain Advisory Committee from members of the CIRAS Advisory Council to provide advice to us as we proceed. We still have almost all of the funds available from central ISU for the supply chain work that was awarded a year or two ago; We have not spent this yet because we want to make certain we are all on the same page with the IDED Advanced Manufacturing Group

Animal Systems

The first project uses the pig as an animal model to predict bone disorder predisposition in pigs and humans. In this work, 214 genes affecting skeletal development and mineral metabolism were chosen and a total 435 SNPs were detected in 146 genes and these SNPs were deposited to dbSNP of NCBI for public use. Five Sequenom's genotyping multiplexes were developed involving 172 SNPs. The genes *APOE*, *BMP8*, *CALCR*, *COL1A2*, *COL9A1*, *DKFZ*, *FBN1* and *VDBP* were very highly significantly ($P < 0.001$) associated with body conformation traits. The genes *ALOX5*, *BMP8*, *CALCR*, *OPG*, *OXTR* and *WNT16* were very highly significantly ($P < 0.001$) associated with FL structures, and *APOE*, *CALCR*, *COL1A2*, *GNRHR*, *IHH*, *MTHFR* and *WNT16* were highly significantly ($P < 0.01$) associated with overall leg action. At present several genes are being re-sequenced for SNP mining and determining the causative SNPs. Planning of *in vitro* functional studies on bone marrow culture system is being conducted for important genes.

The second project supported research in large animal based 1) neurologic and 2) ophthalmologic diseases. 1) A PhD student has joined a Master's student and begun research on native enzyme purification to generate a crystal structure. Engineered proteins have been evaluated *in vitro* and in mice. A patent application has been filed, and a grant submission is underway with Shire HGT, a biopharmaceutical firm. A PhD student has begun work on canine and feline models of human diseases and a small seed grant has been funded to generate preliminary data. 2) Work has begun on developing a whole genome scan mapping technique to use in this population. Additionally this model has been found to segregate a novel developmental disorder of transitory congenital hypothyroidism.

Infrastructure funds have allowed for the improvement of facilities in the Kildee Hall Animal Facilities to allow expanded housing of canine and feline models. Specifically a biosecurity airlock foyer has been constructed, unsealed concrete floors have been epoxy sealed, and walls repainted. Caging for dog housing in the facility has been installed, and dogs have been on sight in the new facilities since August of 2007.

Biosecurity

Project 1: The focus of this research was to expand our knowledge and applications of methanobactin, an ISU discovery, and evaluate the antimicrobials in grape seed extract. Our first 100 L fermentation produced methanobactin at significantly lower concentrations than bench scale (10 L). Modifications and improvements are underway. We now have six different wine varieties and dried pomace (skin and seed). The antimicrobial properties of grape skin extract will be evaluated on the Bioscreen using five strain cocktails of *Escherichia coli* O157:H7 and *Listeria*. Furthermore, the phenolic

profiles and resveratrol concentrations for each skin extract and wine will be determined via the Infrastructure analytical HPLC. We expect to demonstrate superior health benefits and antimicrobial properties for Iowa grapes.

The Biosafety Level II research laboratory construction began September 2007. Most of the electrical and plumbing is close to completion. We reported last time that all the requested equipment has been purchased. The solvent hood and bioguard hoods installations are still in progress. Research lab benches will be fitted with working surfaces. If sufficient funds remain upon completion of the lab renovation, a customized anaerobic hood will be purchased and installed; the wiring and space will be ready for the equipment. IPRT/Industry grants continue to use the discovery initiative equipment scattered throughout the third floor of the Food Sciences Building.

Project 2: We began to address Livestock traceability key barriers to electronic certification, such as reluctance of some auction markets to learn a new system by developing an off-line software program that is easier for sale barns to use. A Team of economists, transportation/logistics experts, and business specialists have begun a SWOT (strengths weakness, opportunities, threats) analysis of the business entities involved in this project to provide input to the business plan. Methods to incorporate the ILTP into the Iowa Department of Agriculture and the U.S. National Animal Identification Systems (NAIS) plans are still being discussed with IA Department of Agriculture. Additionally, GVL is working with USDA to develop their system consistent with the national program. Online version directed at the veterinary practice to comply with requirements of 'Green' and 'Gold' Preconditioning requirements is in final test and will be moved to production servers by early January 2008.

Bioeconomy

Project and Infrastructure funds are being used to support eight research projects (tasks) in addition to platform related infrastructure purchases made by the Colleges of Agriculture & Life Sciences, Liberal Arts & Sciences, and Engineering.

Task 1. To remove contaminants from the raw syngas, a new gas cleanup system has been designed and is nearly completely installed. The new gas clean-up system includes a new pair of primary cyclones, a pair of secondary mini-cyclones, a hot gas filter, a tar condenser, an impinger train, a vacuum pump, a pair of toxin filters, and an oxygen filter. Work has also been completed to upgrade the gasifier. This work includes replacing the primary cyclone on the gasifier with two new high efficiency cyclones. Recent tests of the new cyclones show that the char removal is now ~99% percent efficient, a 20% increase in char removal efficiency. A new impinger train and chiller were also installed. The data acquisition hardware was upgraded to expand data monitoring and hardware control capacity.

Task 2. Mass-Transfer Balance. Various electrolytes were added to our bench-scale gas-liquid mass transfer reactor to enhance the CO-water mass transfer rate. The addition of nanoparticle to this system enhanced both the CO-water mass transfer coefficient and the CO-water interfacial area. A micro fermentation reactor (~500 ml) was also designed and constructed to investigate the influence of MCM41 nanoparticles with and without functional groups on H₂ yield. Preliminary results revealed *R. rubrum* cells

could be cultivated in this reactor and ~10% of H₂ was produced in this reactor when pure CO was sparged at a gas flow rate of 15 ml/min.

Task 3. A continuous syngas fermentation facility for the production of bio-plastic (polyhydroxy alkanoate) and bio-fuel (hydrogen) has been designed and constructed in Black Engineering. The new facility now includes two major components; a fermentation unit and a clean laboratory. A fermentation unit consists of five laboratory-scale (14L) fermenters able to run in parallel or in series depending on needs to optimize syngas utilization. The first fermenter is designed to test biofiltration system to remove dioxygen and potentially toxic compounds from syngas. Initial biofiltration system involves the screening aerobic carbon monoxide oxidizing bacteria. Syngas filtered through this biofiltration system is currently being fed into remaining four bioreactors for *Rhodospirillum rubrum* cultivation for the production of bio-plastic and molecular hydrogen.

Task 4. The goal of this task is to examine an alternative route to ethanol production that avoids the high energy and water costs of distillation. An important milestone for this work is to genetically engineer *E. coli* to efficiently produce acetaldehyde and hydrogen. In prior work, *Escherichia coli* was engineered to co-produce acetaldehyde and hydrogen from glucose. Work conducted during this update period was aimed at improving acetaldehyde production by identifying and eliminating unwanted by-products. A second milestone of this project is to genetically engineer *R. rubrum* for production of acetaldehyde from syngas. The pyruvate decarboxylase (*pdc*) gene *Zymomonas mobilis* was cloned into *R. rubrum* and expression of the PDC enzyme was verified by in vitro assays. In this period, we continued work to genetically modify *R. rubrum* to prevent anaerobic acetaldehyde metabolism.

Task 5. This task has focused on understanding and manipulating the metabolism of *Rhodospirillum rubrum* so as to make this organism more suitable as a platform for the fermentation-based conversion of syngas to biorenewable chemicals and biofuels. We have targeted the metabolism of two classes of biorenewable chemicals and fuels: 1) polyhydroxyalkanoate (PHA) as a bioplastic; and 2) monoacyl esters as a biofuel. PHAs are natural products of *R. rubrum* metabolism, which are produced when this organism is grown under a low-carbon nutrition status. Monoacyl esters are not normally produced by *R. rubrum*, however, such molecules are produced by many other organisms, including plants, algae, some bacteria, and insects and other animals. Since the last report, we have continued to assess the genetically engineered strains of *R. rubrum* that over-express each of the above listed PHA-genes. Specifically, we have conducted a very detailed analysis of the expression of each transgene and its effect on PHA production. Based upon the above results, we are now conducting similar experiments with these strains using "real" syngas mixtures generated via gasification.

Task 6. Work on task 6 focuses on generating bio-oil under well characterized operating conditions and characterizing physically and chemically the oil properties that influencing bio-oil stability. The original goal of building a new pyrolysis unit has been expanded with the recent receipt of \$500,000 from the U.S. DOE which will allow us to also purchase new feedstock preparation equipment and design and build more sophisticated bio-oil collection equipment. The new fast pyrolysis reactor, char removal system, and bio-oil collection equipment have been designed, built, and installed. The new reactor system will be operational as soon as the new feeder system and control system are installed and functional. For the purpose of better characterizing bio-oil, a new laboratory is being set-up. At present, capabilities (i.e. instrumentations and technical

personnel) of characterizing biomass, bio-oil and bio-char, physically and chemically have been developed. Two recently purchased instruments include a pentapycnometer (from Quantachrome) for analyzing biomass and bio-char densities and a gas absorption surface analyzer (from Quantachrome) for analyzing the pore size distribution and surface area of bio-char.

Task 7. Previous research has shown the rate of oxidation of fatty acids is greatly accelerated when they are spread as a monolayer on silica. We found that the best yield from methyl linoleate of products that might have commercial value was achieved at ~50 C after 24 h. We found that this could be minimized in silica by treatment with small amounts of the metal chelator, citric acid. The production of hydroperoxides was greatly increased, scission products were reduced and desirable products were increased. We plan to test other chelators and also to see if it is possible to recycle the silica in a mini reactor. When biodiesel is burned in diesel engines there often is a slow buildup of material on the fuel injection port. We have explored this problem by evaporating biodiesel and its components at various temperatures in a thermal gravimetric analyzer (TGA) and a muffle furnace.

Task 8. The specially-designed high throughput reactor system consisting of 8 reactors has been received and installed in our laboratory. The system is now completely operational allowing us to greatly expand our reaction testing capability. There were two bio-oil upgrading research directions that we began pursuing as part of Task 8. These areas were stabilizing bio-oil through esterification of the bio-oil acids with added alcohols, which is necessary for further processing of the bio-oil, and condensed phase processing of the bio-oil to convert it to an improved feedstock for processing to fuels in a standard petroleum refinery. Both of these project areas have now been funded by a partnership between ConocoPhillips and Archer Daniels Midland. Therefore, our focus for Task 8 has turned to additional novel approaches for bio-oil upgrading. The first new area to be explored is the simultaneous esterification/hydrogenation of bio-oil. If successful, this approach would obviate the need to add additional alcohol for esterifying the bio-oil acids as alcohol would be produced in situ through hydrogenation of the aldehydes and ketones present in the bio-oil.

Information Solutions

To help foster the cross-disciplinary research needed to address today's complex challenges, the CyberInnovation Institute (CII) announced openings for five postdoctoral positions. These full-time, two-year post-docs will work with faculty teams to address research in one or more of the following areas: high-performance computing, data mining, information integration, semantic web, visualization, Information assurance/network modeling, and Information infrastructure and sensor network applications. The post-docs will work closely with faculty and students on cross-disciplinary research projects to develop the advanced cyberinfrastructure and new research opportunities in bioinformatics, materials informatics, security informatics, and computational fluid dynamics. CII announced a joint industry/university project funded by the Grow Iowa Values Fund entitled: "Multi-Touch Technology: Applications to Homeland Security and ISU Research." The resulting library "Sparsh" facilitates the creation of multi-touch applications on a variety of hardware and software platforms. On April 3-4, the CII co-sponsored the second annual "Emerging Technologies Conference" (ETC 2008) in Ames. This conference features the research progress of CII member centers, with particular emphasis on the Virtual Reality Applications Center and its graduate program in Human Computer Interaction.

By encouraging partnerships, CII nurtures new synergies among faculty, students, industry leaders, and entrepreneurs to create an entrepreneurial culture that fosters connections and opportunities. This vision means creating a space that encourages collaboration and community. To date, five companies have located at the CyberInnovation Technical Collaboration Facility, building on CII's commitment to economic development in the state of Iowa. Our industry partners now include: Deere and Company and four Entrepreneurial teams - ClearSighted, which designs and develops intelligent tutoring systems software to change the ways that future computer-based learning is done; Kung Pow Studios, a custom animation company; Mack Enterprises, a video and sound editing company; Visual Medical Solutions LLC, a company that is developing technology that lets medical personnel easily visualize and interact with 3-dimensional images of patients' complex internal systems, helping them plan and prepare for specific operations.

Infrastructure note:

Within the College of Agriculture and Life Sciences, some of the infrastructure funds have been reallocated from BioSecurity to Bioeconomy.

<p>7. Optional: If desired, please include observations regarding:</p> <ul style="list-style-type: none">a. Availability of startup and venture capital for technology entrepreneursb. Suggestions for new programs or activities that could further enhance the impact of university technology transfer and service on creation of jobs and wealth in Iowa.
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7.A Iowa continues to suffer from a lack of investment capital for start up and rapidly growing technology/innovation based firms.

- The Values Funds to the universities have provided a valuable source of funding for proof of concept/early stage development funding for the innovations that will become the next generation of businesses.
- There has been an increase in the number of Angel/Seed funds throughout the state. Available capital and experience varies widely and there is little coordination between the funds. The seed funds have typically brought more individual investors into play.
- The funding provided by Wellmark through the Pappajohn Center's has been a very valuable tool for early stage investment.
- There are very few true venture capital firms located in the state of Iowa actively investing funds at this point in time.
- Each fund has a particular focus, the investment profile further limiting choices and resulting in very little competition.
- Most venture firms invest with other venture firms, one as lead with the others in secondary positions to spread risk and assure the ability to continue to fund the needs of the company--this is a major problem in Iowa.

- Firms must look outside the state for significant investments of \$5 million plus.
- Really good businesses with really good management teams will attract money; a major problem is the development of an experienced/skilled management team.
- Microenterprise--businesses with less than 5 employees--account for 86 percent of business firms in Iowa, according to the Association for Enterprise Opportunity. A 2007 survey conducted by the Iowa Bankers Association in collaboration with the Community Vitality Center and Leopold Center identified a gap in capital for small entrepreneurial firms seeking less than \$50,000 in Capital. In 2008, the Community Vitality Center (CVC)--which is administered by ISU Extension--received part of a \$1 million grant by Northwest Area Foundation and the Greater Des Moines Community Foundation to implement a business plan for organizing a statewide tax exempt nonprofit microloan intermediary as part of a 3-year Iowa Microenterprise Assistance Project (IMAP). The SBA has also approved a \$750,000 revolving microloan fund for the new entity, called the "Iowa Foundation for Microenterprise and Community Vitality." In addition, \$475,000 was appropriated for IDED to implement a Community Microenterprise Development Grant program and statewide microenterprise advisory committee to encourage collaboration and coordinate statewide efforts.

7.B. Restoration of funds for economic development and technology transfer activities due to budget cuts in the past several years would greatly enhance the University's efforts in this area. The following is a summary of what benefits would occur if funds were restored in the units affected by budget cuts.

- **Small Business Development Centers:** The legislature restored for fiscal 2009 \$160,000 of previous funding lost in 2002. Although SBDC funding has still not reached the level of \$1,211,869 it was in 2001, the additional monies are particularly timely given the additional demands placed upon SBDC services by the flooding and tornadoes of 2008. The SBDC is working with the SBA and with Iowa's congressional delegation to obtain additional federal funds for flood recovery assistance. Thus far, the SBA has awarded the Iowa SBDC an additional \$458,000 for that purpose. Congress' response is pending. SBA funds, including the newly awarded emergency funds, have a match requirement. Any reduction in current levels of state funding for the SBDC will jeopardize the SBDC's ability to match dedicated disaster recovery funds that have been, or may be, awarded by the federal government, thereby inhibiting the SBDC from providing necessary technical assistance to Iowa businesses affected by the flooding and tornadoes. The SBDC estimates that over the next three years, even after receiving this additional \$458,000 from the SBA, it will be \$1.3 million short of meeting anticipated additional demand for SBDC services on account of the 2008 disasters.
- **Iowa State University Research Park:** The restoration of approximately \$230,000 in funding to the Iowa State University Research Park would provide direct benefit to Iowa State University efforts to establish and support new technology ventures. New funds would be utilized to support the costs of providing incubator space and the support services required by new and early

stage companies. The additional funds will increase the capacity for business incubation resulting in more new companies created and higher quality support for the young companies.

- **Institute for Physical Research and Technology (IPRT):** In recent years the IPRT economic development programs suffered a loss of over \$2,500,000 in budget cuts. Ironically, these cuts came at a time when the need for IPRT's expertise by Iowa industries was rapidly growing. Although much of the program has survived the cuts, it now serves only a fraction of the Iowa companies it once served and the current personnel are overextended. Each year since the budget cuts, both the technology commercialization unit and the technical assistance units have had many unmet requests for assistance to Iowa companies. Over 75% of the Iowa manufacturers that IPRT serves have less than 100 employees.

The materials assistance unit of the IPRT economic development program provides short-term no cost technical assistance to Iowa manufacturers and is often the first interaction that manufacturers have with the University. Restoration of funding would allow for growth of materials assistance, enhancing their delivery of services. They seek to offer a wider scope of services directly meeting the needs of Iowa manufacturers. Results of recent surveys of Iowa manufacturers by IPRT and CIRAS indicate that materials and quality issues associated with metallurgical processing, material selection, fabrication, and especially coatings for wear and corrosion protection are top priorities. If funding becomes available, they will hire staff with coating expertise.

The technology commercialization unit has administered cost-sharing, contract research projects and since 1993 has leveraged tax dollars slightly better than 4 to 1. The staff is frustrated — they are working with Iowa's small to medium-sized manufacturers and identifying research and development needs that can be addressed by university teams of faculty scientists and engineers. These small companies have very limited R&D dollars and facilities, and now, this unit does not have the funds needed to leverage Iowa companies' limited resources. These are projects with obvious economic impact—introduction of new products, addressing manufacturing processes, and improving quality—all areas that impact Iowa's global competitiveness in the manufacturing sector.

A unique feature of the economic development program in IPRT is the active participation of scientists from internationally renowned ISU centers such as the Center for Nondestructive Evaluation, the Virtual Reality Applications Center and the Center for Catalysis. Also, these centers have excellent track records of spinning off new Iowa businesses in the areas in which they excel. Both the traditional IPRT economic development units and the new emerging centers such as the Center for Building Energy Research are dedicated to enhancing the state's competitiveness. Restoring the budget cuts to IPRT units would have a rapid and quantifiable impact on Iowa's manufacturing sector. An investment now will result in continuing benefits to Iowa's companies, important opportunities to retain our brightest students, and new industries based on discoveries in ISU's world-class centers.

- **Center for Industrial Research and Service:** CIRAS has successfully leveraged its state budget to bring in additional federal grants to expand technical

assistance and education programs and economic development studies to support Iowa businesses. In FY08, CIRAS brought in \$2.30 for each \$1 of state funds provided. Approximately one-fourth of these external funds were distributed to other units on campus.

CIRAS has lost about \$500,000 from their annual budget this past decade. These funds were used as match on the Department of Commerce/NIST Manufacturing Extension Partnership award and the Department of Defense Procurement Technical Assistance Program award. This loss of state funds reduces the extent of CIRAS assistance and limits the amount of additional funds that might be brought into Iowa via new business assistance grants.

Based on past data, it is expected that for every \$100,000 of additional state funds that are made available, CIRAS would be able to leverage the funds and hire two new business professionals to provide services in the areas of biorenewables, engineering, supply chain management, import/export services, government procurement, productivity, growth services, or quality systems. These two staff would help create a minimum of 40 new jobs and \$4,000,000 of new sales, cost savings, and investment impact in Iowa companies.

APPENDIX A – ISU

APPENDIX B – ISU

1944-1945

Appendix B

Iowa Companies and Communities Served by ISU During FY08

NOTE: Due to confidentiality reasons, names of businesses served by the Iowa Small Business Development Center (Iowa SBDC) are not shown below.
 NOTE: BAC=Business assistance to companies; BCOM=Business assistance to communities; TAC=Technical assistance to companies; TCOM=Technical assistance to communities; FAC=Facilitation (i.e., coordinating conferences); OCOM=Other community assistance; PWD=Professional and workforce development; TT=Technology transfer (i.e., licensing and developing ISU technologies); ISUE=ISU Extension

County	City/Town	Name of Company or Community Served	Name of ISU Unit Providing Assistance	Type of Assistance (coding required)
Adair	Adair	Connect-A-Dock	ISUE	BAC
Adair	Adair	Little Bomber Preschool	Environment Rating Scale Assessment Project -- HD FS	BAC
Adair	Adair	Little Bomber Preschool	Iowa SBDC	BAC
Adair	Bridgewater	BF Pre-Kindergarten	Environment Rating Scale Assessment Project -- HD FS	BAC
Adair	Fontanelle		Iowa SBDC	BAC
Adair	Fontanelle		Interior Design	TAC
Adair	Greenfield	Adair County Extension Office	Adair County Extension	OCOM
Adair	Greenfield	Adair County Home Care	Adair County Extension	PWD
Adair	Greenfield	Commercial pesticide applicator training	Adair County Extension	PWD
Adair	Greenfield	Dry manure applicators training	Adair County Extension	FAC
Adair	Greenfield	Empowering Adair County Foundation	Adair County Extension	FAC
Adair	Greenfield	FACT Empowerment Area	Adair County Extension	OCOM
Adair	Greenfield	Family Rewards	Adair County Extension	OCOM
Adair	Greenfield	Greenfield Chamber/Main Street	Adair County Extension	OCOM
Adair	Greenfield	Greenfield Development Corporation	ReCAP	BCOM
Adair	Greenfield	Greenfield Horizons	Extension	BCOM
Adair	Greenfield	Horizons Job Group	Adair County Extension	FAC
Adair	Greenfield	Horizons Visioning	Adair County Extension	BCOM
Adair	Greenfield	Little Lambs Preschool	Environment Rating Scale Assessment Project -- HD FS	
Adair	Greenfield	Nodaway	Environment Rating Scale Assessment Project -- HD FS	OCOM
Adair	Greenfield	Nodaway Valley Community School	Adair County Extension	OCOM
Adair	Greenfield	Nodaway Valley High School	Seed Science Center	OCOM
Adair	Greenfield	YMCA Preschool	Adair County Extension	OCOM
Adair	Greenfield		Iowa SBDC	BAC
Adair	Greenfield		Iowa SBDC	BAC
Adair	Greenfield		Iowa SBDC	BAC

Adams Creston Iowa SBDC BAC
 Adams Nodaway Iowa SBDC BAC
 Adams Prescott Iowa SBDC BAC
 Adams Corning Community Economic Development PWD
 Adams Prescott Community Economic Development PWD
 Adams Community Economic Development BCOM, TCOM
 Adams Community Economic Development PWD
 Adams 26

Adams County Auditor's Office

Allamakee County
 Allamakee County
 Lansing
 Lansing
 Lansing
 Lansing
 New Albin
 New Albin
 Postville
 Postville
 Postville
 Postville
 Waterville
 Waterville
 Waukon
 Waukon
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 Waukon
 Waukon

Northwest Iowa Food & Farm Coalition
 Northeast Iowa Food & Fitness Initiative
 Distance Education Students
 Lansing Housing Products, Inc.
 Lean: Principles (101) with Lansing Housing
 Products inc and Modernfold
 Distance Education Students
 Trinity Fabricators Inc
 Agriprocessors
 City of Postville
 Upper Exploireland Reg. Plan. Comm.

Distance Education Students
 Kitchen Krafts
 Allamakee County
 Allamakee County Economic Development
 Allamakee County Engineers Office
 Grown Locally Coop
 HORIZONS
 Jet's Meat Processing
 Jet's Meat Processing

Lisa Murphy (Family Child Care Provider)
 Quillin's
 Waukon Chamber of Commerce
 Waukon Horizons

City of Harpers Ferry - City Clerk
 City of Postville
 Postville Council
 Postville Planning & Zoning

ISU Extension Allamakee County BCOM
 ISU Extension Allamakee County BCOM
 Brenton Center PWD
 IPRT Company Assistance-Materials TAC
 ISUE TAC
 Iowa SBDC BAC
 Brenton Center PWD
 ISUE BAC
 Meat Science Extension PWD
 CTRE/SUDAS TAC
 CTRE/SUDAS TAC
 TCOM
 Brenton Center PWD
 ISUE TAC
 CTRE/Natl CP Tech Center PWD
 ISU Extension Allamakee County BCOM
 CTRE/SUDAS TAC
 Extension BAC
 ISU Extension Allamakee County FAC
 Meat Science Extension PWD
 North Central Regional Center for Rural Development BAC & TAC

Adams
 Count

Environment Rating Scale Assessment Project -- HD FS

Meat Science Extension PWD
 ISU Extension Allamakee County FAC
 Extension BCOM
 TCOM
 TCOM
 LTAP
 Community Economic Development PWD
 Community Economic Development BCOM
 Community Economic Development PWD
 Community Economic Development PWD

Appanoose	Exline	Exline County Store	Extension	PWD
Appanoose	Moravia	Hawkeye Box and Pallet	ISUE	BAC
Appanoose	Moravia	J & K Litehouse	Extension	PWD
Appanoose	Moravia		Iowa SBDC	BAC
Appanoose	Moulton	Moulton-Udell Preschool	Human Development and Family Studies	PWD
Appanoose	Moulton		Iowa SBDC	BAC
Appanoose	Mystic	Triple J Enterprises	ISUE	BAC
Appanoose	Mystic	Young's Salvage & Trucking	ISUE	BAC
Appanoose	Mystic		Iowa SBDC	BAC
Appanoose	Centerville	Appanoose Economic Development Group	Extension	BCOM
Appanoose	Centerville	Centerville Municipal Airport	Community Economic Development	PWD
Appanoose	Centerville	Centerville Public School	Extension	PWD
Appanoose	Centerville	Centerville School	Extension	OCOM
Appanoose	Centerville	City of Centerville	Community Economic Development	PWD
Appanoose	Centerville	Indian Hills Community College	Extension	PWD
Appanoose	Centerville	Indian Hills Community College	Extension	OCOM
Appanoose	Centerville	Kentucky Fried Chicken	Extension	PWD
Appanoose	Centerville	Southeast Iowa Rural Water Association	Extension	TAC
Appanoose	Centerville		Extension	TCOM
Appanoose	Moravia	Moravia School system	Extension	PWD
Appanoose		Appanoose Board of Adj. Mem.	Community Economic Development	PWD
Appanoose		Appanoose Co. Zoning Admin.	Community Economic Development	PWD
Appanoose		Appanoose County Auditor's Office	Community Economic Development	OCOM
Appanoose			Community Economic Development	PWD

Appanoose Count 55

Audubon	Audubon	Audubon	Audubon County Extension CEED	FAC
Audubon	Audubon	Audubon County	CTRE/SUDAS	TAC
Audubon	Audubon	Audubon High School	Extension	PWD
Audubon	Audubon	City of Audubon	CTRE/SUDAS	TAC
Audubon	Audubon	Distance Education Students	Brenton Center	PWD
Audubon	Audubon	Judy's Restaurant	Extension	PWD
Audubon	Audubon	Road Safety Audits for Local Governments Wrkshps	LTAP	BCOM
Audubon	Audubon		LTAP	TCOM
Audubon	Audubon	Local economic development person	ReCAP	TCOM
Audubon	NA	Audubon County Zoning Administrator	Community Economic Development	BCOM
Audubon	Audubon	Audubon County Auditor's Office	Community Economic Development	PWD
Audubon	Audubon		Community Economic Development	TCOM, OCOM
Audubon	Audubon		Community Economic Development	PWD

Audubon Count 13

Benton	Atkins	City of Belle Plaine	LA, IDRO	TCOM
Benton	Belle Plaine	Distance Education Students	Brenton Center	BCOM
Benton	Mt. Auburn	Financial Management Event in Wapello County	ISUE	PWD
Benton	Newhall	Newhall Locker	NCRCD w/ CIRAS and ISU Meat Lab	BAC
Benton	Newhall	Newhall Locker	NCRCD w/ CIRAS and ISU Meat Lab	BAC
Benton	Newhall	Newhall Locker	Meat Science Extension	BAC
Benton	Newhall	Newhall Locker	Meat Science Extension	PWD
Benton	Shellsburg	Energy Doctor of Eastern Iowa	ISUE	BAC
Benton	Shellsburg		Iowa SBDC	BAC
Benton	Shellsburg		Iowa SBDC	BAC
Benton	Urbana		Iowa SBDC	BAC
Benton	Urbana		Iowa SBDC	BAC
Benton	Urbana		Iowa SBDC	BAC
Benton	Urbana		Iowa SBDC	BAC
Benton	Van Horne		College of Engineering / ABE (PLTW)	TCOM
Benton	Vinton	Benton Community School District	CCUR	OCOM
Benton	Vinton	AlphaGen Materials Technology, Inc.	CCUR	FAC
Benton	Vinton	AlphaGen Materials Technology, Inc.	CCUR	FAC
Benton	Vinton	Big Timber Sawmill	Natural Resource Ecology and Management	TAC
Benton	Vinton	Cedar Valley Ranch	Extension	PWD
Benton	Vinton	Facilitation Event in Benton County	ISUE	FAC
Benton	Vinton	Vinnovations	Benton County Extension CEED	BCOM
Benton	Vinton	Vinton	Benton County Extension CEED	BCOM
Benton	Vinton	Vinton Shellsburg Community School District	Benton County Extension CEED	OCOM
Benton	Vinton	Windsor Manor	Extension	PWD
Benton	Vinton		Iowa SBDC	BAC
Benton	Walford	City of Walford	Community Economic Development	PWD
Benton	Walford		Iowa SBDC	BAC
Benton	Walford		Iowa SBDC	BAC
Benton	Atkins	City of Atkins - City Clerk	Community Economic Development	PWD
Benton	Belle Plaine	City of Belle Plaine	Community Economic Development	PWD, BCOM
Benton	Newhall	City of Newhall	Community Economic Development	PWD
Benton	Shellsburg	City of Shellsburg	Community Economic Development	PWD
Benton	Urbana	City of Urbana	Community Economic Development	PWD
Benton	Van Horne	City of Van Horne - City Clerk	Community Economic Development	PWD
Benton	Vinton	Vinton Board of Adjustment	Community Economic Development	PWD
Benton	Vinton	Vinton City Attorney	Community Economic Development	PWD
Benton	Vinton	Vinton City Coordinator	Community Economic Development	PWD
Benton	Vinton	Vinton P & Z Board Member	Community Economic Development	PWD
Benton		Benton County Auditor's Office	Community Economic Development	PWD

Black Hawk	Black Hawk County	County's School Superintendents	ISU Extension Black Hawk County	OCOM
Black Hawk	Cedar Falls	Advanced Technical Services Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	Cedar Falls Construction Co. Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	Cedar Falls Developmental Service	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls	Cedar Falls Schools	Extension	PWD
Black Hawk	Cedar Falls	Center for Energy & Environmental Education	Iowa Energy Center	TAC
Black Hawk	Cedar Falls	Christy Dams (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	TAC
Black Hawk	Cedar Falls	City of Cedar Falls	CTRE/SUDAS	BCOM
Black Hawk	Cedar Falls	Community Foundation	Community Vitality Center	BAC
Black Hawk	Cedar Falls	Dynamic Imaging Group	ISUE	BAC
Black Hawk	Cedar Falls	Granite By Design	ISUE	TAC
Black Hawk	Cedar Falls	Iowa Laser Technology Inc	ISUE	TAC
Black Hawk	Cedar Falls	Iowa Metal Spinners, Inc.	IPRT Company Assistance-NDE	TAC
Black Hawk	Cedar Falls	Iowa Northland Regional Council of Governments	College of Engineering	BCOM
Black Hawk	Cedar Falls	Iowa Therapeutic Recreation Association	CED	PWD
Black Hawk	Cedar Falls	John Deere	Engineering Distance Education	PWD
Black Hawk	Cedar Falls	K Cunningham Construction Co Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	KWS Inc.	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls	Lockard Construction	ISUE	BAC
Black Hawk	Cedar Falls	Pegasus Enterprises	ISUE	BAC
Black Hawk	Cedar Falls	Power Pavers Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	ProCAD Designs	Engineering Distance Education	PWD
Black Hawk	Cedar Falls	Standard Distribution	ISUE	BAC
Black Hawk	Cedar Falls	Vieth Construction Corp	CTRE/Natl CP Tech-Geotechnical	PWD
Black Hawk	Cedar Falls	Vieth Construction Corp.	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls	Viking Pump	Engineering Distance Education	PWD
Black Hawk	Cedar Falls	Viking Pump, Inc.	IPRT Company Assistance-Materials	TAC
Black Hawk	Cedar Falls	VJ Engineering	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Weichers Construction, Inc.	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC

Black Hawk	Black Hawk County	County's School Superintendents	ISU Extension Black Hawk County	OCOM
Black Hawk	Cedar Falls	Advanced Technical Services Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	Cedar Falls Construction Co. Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	Cedar Falls Developmental Service	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls	Cedar Falls Schools	Extension	PWD
Black Hawk	Cedar Falls	Center for Energy & Environmental Education	Iowa Energy Center	TAC
Black Hawk	Cedar Falls	Christy Dams (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	TAC
Black Hawk	Cedar Falls	City of Cedar Falls	CTRE/SUDAS	BCOM
Black Hawk	Cedar Falls	Community Foundation	Community Vitality Center	BAC
Black Hawk	Cedar Falls	Dynamic Imaging Group	ISUE	BAC
Black Hawk	Cedar Falls	Granite By Design	ISUE	TAC
Black Hawk	Cedar Falls	Iowa Laser Technology Inc	ISUE	TAC
Black Hawk	Cedar Falls	Iowa Metal Spinners, Inc.	IPRT Company Assistance-NDE	TAC
Black Hawk	Cedar Falls	Iowa Northland Regional Council of Governments	College of Engineering	BCOM
Black Hawk	Cedar Falls	Iowa Therapeutic Recreation Association	CED	PWD
Black Hawk	Cedar Falls	John Deere	Engineering Distance Education	PWD
Black Hawk	Cedar Falls	K Cunningham Construction Co Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	KWS Inc.	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls	Lockard Construction	ISUE	BAC
Black Hawk	Cedar Falls	Pegasus Enterprises	ISUE	BAC
Black Hawk	Cedar Falls	Power Pavers Inc.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	ProCAD Designs	Engineering Distance Education	PWD
Black Hawk	Cedar Falls	Standard Distribution	ISUE	BAC
Black Hawk	Cedar Falls	Vieth Construction Corp	CTRE/Natl CP Tech-Geotechnical	PWD
Black Hawk	Cedar Falls	Vieth Construction Corp.	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls	Viking Pump	Engineering Distance Education	PWD
Black Hawk	Cedar Falls	Viking Pump, Inc.	IPRT Company Assistance-Materials	TAC
Black Hawk	Cedar Falls	VJ Engineering	CTRE/Natl CP Tech Center	PWD
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Wayne Engineering Corp	ISUE	TAC
Black Hawk	Cedar Falls	Weichers Construction, Inc.	CTRE/SUDAS	TAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC
Black Hawk	Cedar Falls		Iowa SBDC	BAC

Black Hawk	Waterloo	Accurate Gear and Machine Inc	ISUE	TAC
Black Hawk	Waterloo	Ament Engineering	CTRE/SUDAS	TAC
Black Hawk	Waterloo	Ament, Inc.	CTRE/SUDAS	TAC
Black Hawk	Waterloo	Applebee's-Waverly	Extension	PWD
Black Hawk	Waterloo	Bertch Cabinet Manufacturing	Extension	TAC
Black Hawk	Waterloo	Cedar Valley Catholic Schools	Extension	PWD
Black Hawk	Waterloo	Cedar Valley Corp.	CTRE/Natl CP Tech Center	PWD
Black Hawk	Waterloo	Cedar Valley Corporation	CTRE/SUDAS	TAC
Black Hawk	Waterloo	Cedar Valley's Promise	ISU Extension Black Hawk County	OCOM
Black Hawk	Waterloo	Chromavantage	ISUE	BAC
Black Hawk	Waterloo	City of Waterloo	CTRE/SUDAS	TAC
Black Hawk	Waterloo	City of Waterloo	CTRE/Natl CP Tech Center	PWD
Black Hawk	Waterloo	City of Waterloo	CTRE/ Natl CP Tech-Geotechnical	PWD
Black Hawk	Waterloo	City of Waterloo	CTRE/Natl CP Tech Center	PWD
Black Hawk	Waterloo	Culver's Restaurant	Extension	PWD
Black Hawk	Waterloo	D&S Clark Holdings	ISUE	BAC
Black Hawk	Waterloo	Distance Education Students	Brenton Center	PWD
Black Hawk	Waterloo	Earth Tech	CTRE/Natl CP Tech Center	PWD
Black Hawk	Waterloo	Earth Tech	CTRE/Natl CP Tech Center	PWD
Black Hawk	Waterloo	Earth Tech, Inc.	CTRE/SUDAS	TAC
Black Hawk	Waterloo	Ei Centro Latinoamericano	ISU Extension Black Hawk County	OCOM
Black Hawk	Waterloo	Emergency Management Team	ISU Extension Black Hawk County	OCOM
Black Hawk	Waterloo	Friendship Village	Extension	PWD
Black Hawk	Waterloo	General Sheet Metal Works Inc	ISUE	BAC
Black Hawk	Waterloo	Hurst & Sons Contractors, Inc.	CTRE/SUDAS	TAC
Black Hawk	Waterloo	Hydrite	Engineering Distance Education	PWD
Black Hawk	Waterloo	IA Northland Reg. Council of Govts	CTRE/SUDAS	TAC
Black Hawk	Waterloo	IA Northland Reg. Trans. Authority	CTRE/SUDAS	TAC
Black Hawk	Waterloo	Iowa DOT	CTRE/Natl CP Tech Center	PWD
Black Hawk	Waterloo	John Deere	Engineering Distance Education	PWD
Black Hawk	Waterloo	John Deere - Waterloo Works - Foundry Operations	ISUE	TAC
Black Hawk	Waterloo	John Deere Dubuque Works	CNDE	TAC
Black Hawk	Waterloo	John Deere Engine Works	ISUE	TAC
Black Hawk	Waterloo	Kess and Associates, Inc.	CTRE/SUDAS	TAC
Black Hawk	Waterloo	O'Neal Steel Inc	ISUE	TAC
Black Hawk	Waterloo	On-line student	Ag & Biosystems Engineering/BRT	PWD
Black Hawk	Waterloo	Operation Threshold	ISU Extension Black Hawk County	OCOM
Black Hawk	Waterloo	Opportunity Works Community Service Network	ISU Extension Black Hawk County	FAC
Black Hawk	Waterloo	Popeye's Chicken	Extension	PWD
Black Hawk	Waterloo	Power Engineering and Manufacturing, Ltd.	IPRT Company Assistance-NDE	TAC
Black Hawk	Waterloo	Power Engineering and Manufacturing, Ltd.	IPRT Company Assistance-NDE	TAC

Bremer
Bremer
60

Bremer County PZ
Community Economic Development
Community Economic Development
59

Bremer
Bremer
60

Bremer
Bremer
60

**Bremer
Count**

Buchanan	Aurora	Aurora	ISU Extension Buchanan County	OCOM
Buchanan	Fairbank	Fairbank Locker	Meat Science Extension	PWD
Buchanan	Fairbank	Golden Hour Enterprises, Inc.	ISUE	BAC
Buchanan	Fairbank		Iowa SBDC	BAC
Buchanan	Hazleton		ISU Extension Buchanan County	OCOM
Buchanan	Independence	-Des Moines		TCOM
Buchanan	Independence	Crawford Engineering & Surveying, Inc.	CTRE/Natl CP Tech Center	PWD
Buchanan	Independence	Geater Machining and Mfg Co	ISUE	TAC
Buchanan	Independence	Independence Community School District	College of Engineering / ABE (PLTW)	OCOM
Buchanan	Independence	Independence School District	Extension	PWD
Buchanan	Independence	Plasmer	Seed Science Center	TAC
Buchanan	Independence		Iowa SBDC	BAC
Buchanan	Independence		Iowa SBDC	BAC
Buchanan	Independence		Iowa SBDC	BAC
Buchanan	Independence		Iowa SBDC	BAC
Buchanan	Independence		Iowa SBDC	BAC
Buchanan	Independence		Iowa SBDC	BAC
Buchanan	Jesup	Heartland Acres Agribition Center	ISU Extension Buchanan County	BAC
Buchanan	Jesup		Iowa SBDC	BAC
Buchanan	Lamont		Iowa SBDC	BAC
Buchanan	Lamont	Grace United Methodist Church	Extension	OCOM
Buchanan	Rowley	Marks Locker	ISU Extension Buchanan County	OCOM
Buchanan	Rowley		Meat Science Extension	PWD
Buchanan	Stanley	Hub City Brewing Company	Iowa SBDC	BAC
Buchanan	Winthrop	City of Winthrop	ISU Extension Fayette County	TAC
Buchanan	Aurora	Distance Education Students	LA, IDRO	BCOM
Buchanan	Independence	Distance Education Students	Brenton Center	PWD
Buchanan	Fairbank	City of Fairbank	Brenton Center	PWD
Buchanan	Hazleton	City of Hazleton - City Clerk	Community Economic Development	PWD
Buchanan	Independence	Blount Excavating LLC	Community Economic Development	PWD
Buchanan	Independence	City of Independence	CTRE/SUDAS	TAC
Buchanan	Jesup	City of Independence	Community Economic Development	PWD
Buchanan	Jesup	City of Jesup	CTRE/SUDAS	TAC
Buchanan	Jesup	City of Jesup - City Clerk/Treasurer	Community Economic Development	PWD
Buchanan	Jesup	City of Jesup	Community Economic Development	PWD
Buchanan	Winthrop	City of Winthrop	Community Economic Development	PWD
Buchanan		Buchanan County Auditor's Office	Community Economic Development	BCOM
Buchanan			Community Economic Development	PWD
Buchanan			Community Economic Development	PWD

Buena Vista	Alta	Alta	ISU Extension to Families and Communities	BAC, BCOM
Buena Vista	Alta	Alta Businesses	Extension	OCOM
Buena Vista	Alta	Alta Horizons	Extension	BCOM
Buena Vista	Alta		Iowa SBDC	BAC
Buena Vista	county wide	Health care providers	ISU Extension - Buena Vista County	OCOM
Buena Vista	Marathon	Distance Education Students	Brenton Center	PWD
Buena Vista	Marathon		Iowa SBDC	BAC
Buena Vista	Newell	4-H Booster Club	Allee Research Farm, ISU	OCOM
Buena Vista	Newell	BV County Regional Hospital	Allee Research Farm, ISU	FAC
Buena Vista	Newell	BV Special Swine 4-H program	Allee Research Farm, ISU	OCOM
Buena Vista	Newell	Corn Grower's Association	Allee Research Farm, ISU	FAC
Buena Vista	Newell	DFS Animal Nutrition	ISUE	TAC
Buena Vista	Newell	Distance Education Students	Brenton Center	PWD
Buena Vista	Newell	Newell Historic Society	Allee Research Farm, ISU	OCOM, FAC
Buena Vista	Newell	Newell/Fonda School to work program	Allee Research Farm, ISU	OCOM
Buena Vista	Newell	Practical Farmers of Iowa	Allee Research Farm, ISU	PWD
Buena Vista	Rembrandt		Iowa SBDC	BAC

Buena Vista	Sioux Rapids	Jennifer Rentsch (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	OCOM
Buena Vista	Sioux Rapids	Sioux Central High School	Agricultural Education and Studies	
Buena Vista	Sioux Rapids	Sioux Central school	Biotech Outreach Education Center	TAC
Buena Vista	Storm Lake	Ag Partners	ABE/Safety Training Instruction and Research	TAC
Buena Vista	Storm Lake	Ag Partners	ABE/Safety Training Instruction and Research	BCOM
Buena Vista	Storm Lake	Business Leaders/HR Reps in Storm Lake	ISU Extension to Communities	PWD
Buena Vista	Storm Lake	BV Regional Medical Center	Extension	TAC
Buena Vista	Storm Lake	City of Storm Lake	CTRE/SUDAS	PWD
Buena Vista	Storm Lake	City of Storm Lake	CTRE/Natl CP Tech Center	PWD
Buena Vista	Storm Lake	Iowa DOT--Dist 3	CTRE/ Natl CP Tech-Geotechnical	PWD
Buena Vista	Storm Lake	Kuehl & Payer Ltd.	CTRE/Natl CP Tech Center	PWD
Buena Vista	Storm Lake	Kuehl and Payer LTD	CTRE/SUDAS	TAC
Buena Vista	Storm Lake	Kuehl and Payer, Ltd.	Engineering Distance Education	PWD
Buena Vista	Storm Lake	Local Banks	ISU Extension to Communities	BCOM
Buena Vista	Storm Lake	Raccoon Valley Biodiesel LLC	ISUE	BAC
Buena Vista	Storm Lake	Sara Lee Foods	Meat Science Extension	PWD
Buena Vista	Storm Lake	Storm Lake Chamber of Commerce	College of Engineering	BCOM
Buena Vista	Storm Lake	Storm Lake City, Schools and Business	ISU Extension - Buena Vista County	FAC
Buena Vista	Storm Lake	Storm Lake City, Schools and Business	ISU Extension to Families	OCOM
Buena Vista	Storm Lake	Storm Lake community leaders, school district	Extension	OCOM
Buena Vista	Storm Lake	Storm Lake community leaders, school district	Extension	OCOM
Buena Vista	Storm Lake	Work Zone Safety Workshops	Continuing and Distance Education	PWD

Carroll	Taco John's - Carroll	Extension	PWD
Carroll	Wamke Construction Co, Inc.	CTRE/SUDAS	TAC
Carroll		Iowa SBDC	BAC
Carroll		Iowa SBDC	BAC
Carroll		Iowa SBDC	BAC
Carroll		Iowa SBDC	BAC
Carroll		ISUE	TAC
Carroll		ISUE	TCOM
Carroll		Community Vitality Center	TCOM
Carroll County	Carroll County Cattlemen's Association	Community Vitality Center	FAC
Carroll County	Community Marketing Cooperative	Community Vitality Center	BCOM
Carroll County	Regional Entrepreneur Association	Community Vitality Center	BAC
Carroll	Distance Education Students	Brenton Center	PWD
Coon Rapids			
Coon Rapids	Jen Derner (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Coon Rapids	Thomas Rest Haven	Extension	PWD
Coon Rapids		Iowa SBDC	BAC
Glidden	Glidden Ralston School District	Extension	PWD
Manning	Distance Education Students	Brenton Center	PWD
Manning			
Manning	Hope Blum (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Ralston	Puck Custom Enterprises	Agricultural Management Lab, ABE	TAC, TT
Ralston	Renewable Energy Group	IPMP/RIMOS	TCOM
Ralston	West Central Coop	BEI	BAC, FAC, TAC
Ralston	West Central Coop	CCUR	TT, TAC
Ralston	West Central Cooperative	CCUR	TT, TAC
Ralston	West Central Cooperative	CCAT	TAC, TT
Ralston	West Central Cooperative	ISUE	TAC
Ralston	West Central Cooperative	ISUE	TAC
Ralston	West Central Cooperative	Ag & Biosystems Engineering	PWD
Ralston	West Central Cooperative	Ag & Biosystems Engineering	PWD
Ralston	West Central Cooperative	Seed Science Center	PWD
Ralston	West Central Cooperative	NREM/CCUR	TAC
Ralston	West Central Cooperative	Biomedical Sciences	PC
Ralston	-Carroll Co.		TCOM
Carroll	City of Carroll - Clerk-Finance Director	Community Economic Development	PWD
Carroll	Region XII COG	Community Economic Development	PWD, TAC
Carroll County	Carroll County Auditor's Office	Community Economic Development	PWD
Carroll County	Carroll County Zoning	Community Economic Development	PWD
Carroll		Community Economic Development	PWD
Carroll		60	
Cass	Anita Meat Processing	Meat Science Extension	PWD

Carroll
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Cass	Anita	CAM School	Biotech Outreach Education Center	BAC
Cass	Anita	Allen House Assisted Living	Iowa SBDC Extension	PWD
Cass	Atlantic	Atlantic High School	Armstrong Research Farm, ISU	OCOM
Cass	Atlantic	Atlantic Locker	NCRCRD w/ CIRAS and ISU Meat Lab	BAC
Cass	Atlantic	Atlantic Locker	NCRCRD w/ CIRAS and ISU Meat Lab	BAC
Cass	Atlantic	Atlantic Locker	Meat Science Extension	BAC
Cass	Atlantic	Atlantic Locker	Meat Science Extension	PWD
Cass	Atlantic	Atlantic Machine and Fabrication	ISUE	BAC
Cass	Atlantic	Cass County	CTRE/SUDAS	TAC
Cass	Atlantic	City of Atlantic	CTRE/Natl CP Tech Center	PWD
Cass	Atlantic	Distance Education Students	Brenton Center	PWD
Cass	Atlantic	Henningsen Construction	CTRE/Natl CP Tech-Geotechnical	PWD
Cass	Atlantic	Iowa DOT	CTRE/Natl CP Tech Center	PWD
Cass	Atlantic	Iowa DOT	CTRE/SUDAS	TAC
Cass	Atlantic	Jack and Jill Preschool	Environment Rating Scale Assessment Project -- HD FS	
Cass	Atlantic	Mahle, Inc.	CIRAS	BAC
Cass	Atlantic	Minsa	CCUR	TAC
Cass	Atlantic	Minsa	CCUR	TAC
Cass	Atlantic	Plastics Professionals	CIRAS	BAC
Cass	Atlantic	Snyder & Assoc.	CTRE/Natl CP Tech Center	PWD
Cass	Atlantic	Southwest Iowa Concrete Polishing Co.	CTRE/Natl CP Tech Center	PWD
Cass	Atlantic	Southwest Iowa Planning Commission	CTRE/SUDAS	TAC
Cass	Atlantic	Southwest Iowa Planning Council	College of Engineering	BCOM
Cass	Atlantic	SW Iowa Economic Developers Event in Cass County	ISUE	TAC
Cass	Atlantic	The Plastic Professionals	CCUR	FAC
Cass	Atlantic	The Plastic Professionals	CCUR	FAC
Cass	Atlantic		Iowa SBDC	BAC
Cass	Atlantic		Iowa SBDC	BAC
Cass	Atlantic		Iowa SBDC	BAC
Cass	Atlantic		Iowa SBDC	BAC
Cass	Atlantic		Iowa SBDC	BAC
Cass	Atlantic		Iowa SBDC	BAC
Cass	Atlantic		CTRE/SUDAS	TCOM
Cass	Atlantic	Snyder & Associates, Inc.	TAC	TAC
Cass	Cumberland		Iowa SBDC	BAC
Cass	Cumberland		Iowa SBDC	BAC
Cass	Griswold	Griswold Comm School	Armstrong Research Farm, ISU	OCOM
Cass	Lewis	NCAT (Iowa Office)	Armstrong Research Farm, ISU	FAC
Cass	Lewis	SW IA Food and Farm Initiative	Armstrong Research Farm, ISU	FAC
Cass	Lewis	TCSFCF Coop	Armstrong Research Farm, ISU	TAC

Cass	Lewis	Distance Education Students	Iowa SBDC	BAC
Cass	Mame	Distance Education Students	Brenton Center	PWD
Cass	Wiota	Atlantic, Lewis, Griswold	Brenton Center	PWD
Cass		Cass County Memorial Hospital	Program Builder Presentation by Tim Borich	BCOM
Cass		Cass-Atlantic Development Corporation	CEED-Cass County Extension	OCOM
Cass		County Wide	CEED-Cass County Extension	FAC
Cass			Extension	OCOM
Cass	Griswold		Community Economic Development	OCOM, PWD
Cass	Lewis	City of Lewis - City Clerk	Community Economic Development	PWD
Cass		Cass County Auditor's Office	Community Economic Development	PWD
Cass			Community Economic Development	TCOM, BCOM
Cass		Cass County	Community Economic Development	PWD

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Cass
Count

Cedar	Clarence	Clarence economic development committee	Cedar County Extension	BCOM
Cedar	Clarence	IMPA	Meat Science Extension	PWD
Cedar	Clarence	Penny's Sausage	Meat Science Extension	PWD
Cedar	Durant	Durant Locker	Meat Science Extension	PWD
Cedar	Durant	Distance Education Students	Brenton Center	PWD
Cedar	Durant	Penny's Sausage	Meat Science Extension	PWD
Cedar	Durant	Schumacher Company, LC	IPRT Company Assistance-Materials	TAC
Cedar	Mechanicsville		Iowa SBDC	BAC
Cedar	Mechanicsville		Iowa SBDC	BAC
Cedar	Tipton	Cedar County Secondary Roads	CTRE/Natl CP Tech Center	PWD
Cedar	Tipton	Dairy Queen - Tipton	Extension	PWD
Cedar	Tipton	Tipton Locker	Meat Science Extension	PWD
Cedar	West Branch	Hoover Library Association	Johnson County Extension	PWD
Cedar	West Branch		Iowa SBDC	BAC
Cedar	West Branch		Iowa SBDC	BAC
Cedar	Bennett	Cedar County	CTRE/Natl CP Tech Center	PWD
Cedar	Clarence	City of Tipton	Community Economic Development	PWD
Cedar	Mechanicsville	City of Clarence - City Clerk	Community Economic Development	PWD
Cedar	Stanwood	City of Mechanicsville - Clerk / Finance Officer	Community Economic Development	PWD
Cedar	Stanwood	City of Stanwood	Community Economic Development	PWD
Cedar	Stanwood	City of Stanwood - City Clerk	Community Economic Development	PWD
Cedar	Tipton		Community Economic Development	TCOM
Cedar		Cedar County Auditor's Office	Community Economic Development	TCOM
Cedar				PWD

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Cedar
Count

Cerro Gordo	Cerro Gordo	Mayors	ISU Extension Cerro Gordo County	FAC
Cerro Gordo	Clear Lake	Apple Valley Assisted Living	Extension	PWD

Crawford	Denison	Ash Grove Cement Co.	CTRE/Natl CP Tech Center	PWD
Crawford	Denison	City of Denison	CTRE/Natl CP Tech Center	PWD
Crawford	Denison	Crawford Co.	CTRE/Natl CP Tech Center	PWD
Crawford	Denison	Crawford County Memorial Hospital	Extension	PWD
Crawford	Denison	Distance Education Students	Brenton Center	TAC
Crawford	Denison	Farmland Foods	NWRC Sensory Evaluation Unit	PWD
Crawford	Denison	Farmland Foods	Meat Science Extension	TAC
Crawford	Denison	Sundquist Engineering	CTRE/SUDAS	PWD
Crawford	Denison	Sundquist Engineering	CTRE/Natl CP Tech Center	PWD
Crawford	Denison	Ten Point Construction	CTRE/Natl CP Tech Center	TAC
Crawford	Denison	Ten Point Construction Co., Inc.	CTRE/SUDAS	TAC
Crawford	Denison		IPMP/RIMOS	TCOM
Crawford	Denison		Iowa SBDC	BAC
Crawford	Denison		Iowa SBDC	BAC
Crawford	Denison		Iowa SBDC	BAC
Crawford	Denison	Countywide Economic Development Group	TCOM	
Crawford	Denison	City of Dow City	BCOM	
Crawford	Dow City		PWD	
Crawford	Dow City		BAC	

Crawford	Kiron	Kathy Miller (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	PWD
Crawford	Manilla	Manilla Maron Nursing Home	Extension	PWD
Crawford	Vail	Distance Education Students	Brenton Center	PWD
Crawford	Westside	Distance Education Students	Brenton Center	PWD
Crawford				TCOM
Crawford	Denison	City of Denison	Community Economic Development	PWD
Crawford	Ricketts	City of Ricketts	Community Economic Development	PWD
Crawford	Schleswig	City of Schleswig	Community Economic Development	PWD
Crawford	Vail	City of Vail - City Clerk	Community Economic Development	PWD
Crawford		Crawford County Auditor's office	Community Economic Development	PWD
Crawford			Community Economic Development	TAC

Crawford 33

Count

Dallas	Adel	-Jackson Co.	31	TCOM
Dallas	Adel	Dallas County	CTRE/SUDAS	TAC
Dallas	Adel	Dallas County Environmental	Extension	PWD
Dallas	Adel	Dallas County Road Dept.	CTRE/Natl CP Tech Center	PWD
Dallas	Adel	Distance Education Students	Brenton Center	PWD
Dallas	Adel	Iowa Spring Manufacturing Inc	ISUE	TAC
Dallas	Adel	Lenhart Plumbing	CTRE/SUDAS	TAC
Dallas	Adel	Stine Seeds	BEI	BAC, FAC, TAC
Dallas	Adel	Stine Seeds	BEI	BAC, FAC, TAC

Dallas	Adel	Stine Seeds	BEI	BAC, FAC, TAC, TT
Dallas	Adel	West Central Mental Health Center	Extension	PWD
Dallas	Adel		Iowa SBDC	BAC
Dallas	Adel		Iowa SBDC	BAC
Dallas	Adel			TCOM
Dallas	Dallas Center	Dallas Christian School	Biotech Outreach Education Center	PWD
Dallas	Dallas Center	Distance Education Students	Brenton Center	TCOM
Dallas	Dallas Center			TAC
Dallas	De Soto	City of De Soto	CTRE/SUDAS	TCOM
Dallas	De Soto			TAC
Dallas	Dexter	City of Dexter	CTRE/SUDAS	TAC
Dallas	Dexter		CTRE - Traffic Operations/RIMOS	BCOM
Dallas	Granger	Michaelis Construction, Inc.	Iowa SBDC	BAC
Dallas	Linden	City of Perry	CTRE/SUDAS	TAC
Dallas	Perry	City of Perry	CTRE/SUDAS	TAC
Dallas	Perry	Dallas County Hospital	CTRE/Natl CP Tech Center	PWD
Dallas	Perry	Distance Education Students	Extension	PWD
Dallas	Perry	Distance Education Students	Brenton Center	PWD
Dallas	Perry	Iowa Fruit and Vegetable Growers	Horticulture Research Station, ISU	FAC
Dallas	Perry	Percival Scientific Inc	ISUE	TAC
Dallas	Perry	Percival Scientific Inc	ISUE	BAC
Dallas	Perry	Perry Community Schools	Extension	PWD
Dallas	Perry	Perry High School,	Biotech Outreach Education Center	
Dallas	Perry	Springvalley Retirement	Extension	PWD
Dallas	Perry	The Loft	Extension	PWD
Dallas	Perry	Wiese Industries Inc	ISUE	TAC
Dallas	Perry			TCOM
Dallas	Perry		Iowa SBDC	BAC
Dallas	Perry		Iowa SBDC	BAC
Dallas	Perry			TCOM
Dallas	Perry		Extension	TAC
Dallas	Redfield	Mount Olivet Lutheran Church	Meat Science Extension	PWD
Dallas	Van Meter	Redfield Lockr	CTRE/SUDAS	TAC
Dallas	Van Meter	Cunningham-Reis Company	Brenton Center	PWD
Dallas	Van Meter	Distance Education Students	Iowa SBDC	BAC
Dallas	Van Meter		CTRE/SUDAS	TAC
Dallas	Waukeee	A.J. Garrett & Assoc.	CTRE/SUDAS	TAC
Dallas	Waukeee	City of Waukeee	CTRE/SUDAS	TAC
Dallas	Waukeee	City of Waukeee	CTRE/Natl CP Tech Center	PWD
Dallas	Waukeee	City of Waukeee	CTRE/Natl CP Tech Center	PWD
Dallas	Waukeee	Distance Education Students	Brenton Center	PWD
Dallas	Waukeee	ecfirst.com	ISUE	BAC
Dallas	Waukeee	Hubbell Realty	Engineering Distance Education	PWD

Delaware	Edgewood	Elkader Planning & Zoning	Community Economic Development	PWD
Delaware	Edgewood	Kendrick Forest Products	ISUE	TAC
Delaware	Edgewood		Iowa SBDC	BAC
Delaware	Edgewood		Iowa SBDC	BAC
Delaware	Manchester	City of Manchester	CTRE/SUDAS	TAC
Delaware	Manchester	Delaware County	ISU Extension Delaware County	OCOM
Delaware	Manchester	Delaware County	ISU Extension Delaware County	PWD
Delaware	Manchester	Distance Education Students	Brenton Center	PWD
Delaware	Manchester	Exide Technologies	ISUE	TAC
Delaware	Manchester	Manchester	ISU Extension Delaware County	BAC
Delaware	Manchester	Tekippe Engineering	CTRE/Natl CP Tech Center	PWD
Delaware	Manchester	Tekippe Engineering, P.C.	CTRE/SUDAS	TAC
Delaware	Manchester		Iowa SBDC	BAC
Delaware	Manchester		TCOM	TAC
Delaware	Manchester	Gibbs Engineering and Surveying	CTRE/SUDAS	TAC
Delaware	Masonville	Winthrop Locker	Meat Science Extension	PWD
Delaware	Colesburg	City of Colesburg	Community Economic Development	PWD
Delaware	Delhi	City of Delhi	Community Economic Development	PWD
Delaware	Earville	City of Earville	Community Economic Development	PWD
Delaware	Hopkinton	City of Hopkinton - City Clerk	Community Economic Development	PWD
Delaware	Ryan	City of Ryan	Community Economic Development	PWD
Delaware		Delaware County Auditor's Office	Community Economic Development	PWD
Delaware		Manchester-Delaware County P & Z	Community Economic Development	PWD
Delaware		Delaware County	Community Economic Development	PWD
Des Moines	Burlington	a variety of local small businesses	Des Moines County Extension	BAC
Des Moines	Burlington	a variety of minority-owned businesses	Des Moines County Extension	BAC
Des Moines	Burlington	Area Education Agency 16	Louisa County Extension	FAC
Des Moines	Burlington	AUNT BEA'S RESTAURANT	Extension	PWD
Des Moines	Burlington	Burlington Community School District	College of Engineering / ABE (PLTW)	OCOM
Des Moines	Burlington	BURLINGTON COMMUNITY SCHOOLS	Extension	PWD
Des Moines	Burlington	Burlington YM/YWCA	Louisa County Extension	OCOM
Des Moines	Burlington	Case New Holland	IPRT Company Assistance-Technology Commercialization	FAC
Des Moines	Burlington	Case New Holland	Agricultural & Biosystems Engineering	TAC
Des Moines	Burlington	Case New Holland	Agricultural & Biosystems Engineering	TAC
Des Moines	Burlington	Catfish Bend Conference Center	Des Moines County Extension	BCOM
Des Moines	Burlington	CHILDRENS CHRISTIAN ACADEMY	Extension	PWD
Des Moines	Burlington	City of Burlington	CTRE/SUDAS	TAC
Des Moines	Burlington	COMFORT SUITES MOTEL	Extension	PWD
Des Moines	Burlington	DAIRY QUEEN	Extension	PWD

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Des Moines	Louisa County tour	Great River Ethanol	Louisa County Extension	FAC
Des Moines	into Burlington	Distance Education Students	Brenton Center	PWD
Des Moines	Mediapolis	Mediapolis High School	Louisa County Extension	OCOM
Des Moines	Mediapolis	Mediapolis High School Fine Arts Boosters	Louisa County Extension	OCOM
Des Moines	Mediapolis	PRAIRIE RIDGE NURSING HOME	Extension	PWD
Des Moines	Mediapolis		Iowa SBDC	BAC
Des Moines	Mediapolis		Iowa SBDC	BAC
Des Moines	Mediapolis		Iowa SBDC	BAC
Des Moines	Mediapolis		Iowa SBDC	BAC
Des Moines	Mediapolis		Brenton Center	PWD
Des Moines	Middletown	Distance Education Students	Extension	PWD
Des Moines	West Burlington	GREAT RIVER MEDICAL CENTER - KLEIN	Extension	PWD
Des Moines	West Burlington	IVY BAKE SHOPPE	ISUE	BAC
Des Moines	West Burlington	T and T Technologies, Inc.		TCOM
Des Moines	West Burlington		Iowa SBDC	BAC
Des Moines	West Burlington		Iowa SBDC	BAC
Des Moines	West Burlington		Iowa SBDC	BAC
Des Moines	West Burlington		Iowa SBDC	BAC
Des Moines	West Burlington		Iowa SBDC	BAC
Des Moines	West Burlington		Iowa SBDC	BAC
Des Moines	West Burlington		LTAP	TCOM
Des Moines	West Burlington	Des Moines Asphalt	CTRE/Natl CP Tech Center	PWD
Des Moines				TCOM
Des Moines				TCOM
Des Moines	Burlington	River Park Place	Community Economic Development	PWD
Des Moines	Burlington	SE Iowa Regional Airport	Community Economic Development	PWD, BCOM
Des Moines	Mediapolis	City of Mediapolis - City Clerk	Community Economic Development	PWD
Des Moines	Mediapolis	City of Mediapolis	Community Economic Development	PWD
Des Moines	West Burlington	City of West Burlington - City Clerk	Community Economic Development	PWD
Des Moines	West Burlington	City of West Burlington - Finance Officer	Community Economic Development	PWD
Des Moines	West Burlington	Des Moines County Auditor's Office	Community Economic Development	PWD
Des Moines			125	
Dickinson	Arnolds Park	Coach's Corner Sports Bar	Extension	TCOM
Dickinson	Arnolds Park		Iowa SBDC	PWD
Dickinson	Arnolds Park		Iowa SBDC	BAC
Dickinson	Countywide	Cleanwater Alliance	County Director	BAC
Dickinson	Countywide	Dickinson County Trails Board	County Director	FAC
Dickinson				FAC

Des
Moines
Count

Dickinson	Dickinson County	CTRE/Natl CP Tech Center	PWD
Dickinson	Arnolds Park P & Z	Community Economic Development	PWD
Dickinson	City of Lake Park	Community Economic Development	BCOM
Dickinson	Lake Park City Admin.	Community Economic Development	PWD
Dickinson	Lake Park City Council	Community Economic Development	PWD
Dickinson	Lake Park Mayor	Community Economic Development	PWD
Dickinson	Lake Park P & Z Board	Community Economic Development	PWD
Dickinson	City of Milford	Community Economic Development	BCOM
Dickinson	City of Milford P & Z	Community Economic Development	PWD
Dickinson	City of Wahpeton	Community Economic Development	PWD
Dickinson	Dickinson Co. Supervisor	Community Economic Development	PWD
Dickinson	Dickinson Co. Zon. Admin.	Community Economic Development	PWD
Dickinson	Dickinson County	Community Economic Development	PWD
Dickinson	Dickinson County Auditor's Office	Community Economic Development	PWD

Dickinson

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Dubuque	Asbury	Iowa SBDC	BAC
Dubuque	Bernard	CTRE/SUDAS	TAC
Dubuque	Bernard	Iowa SBDC	BAC
Dubuque	Cascade	County Extension	BCOM
Dubuque	Cascade	CTRE/Natl CP Tech Center	PWD
Dubuque	Cascade	Brenton Center	PWD
Dubuque	Cascade	CTRE/SUDAS	TAC
Dubuque	Cascade	Iowa SBDC	BAC
Dubuque	Cascade	Iowa SBDC	BAC
Dubuque	Cascade	Iowa SBDC	BAC
Dubuque	Dubuque	CTRE/SUDAS	TAC
Dubuque	Dubuque	CTRE/Natl CP Tech Center	PWD
Dubuque	Dubuque	ISUE	BAC
Dubuque	Dubuque	IPRT Company Assistance-NDE	TAC
Dubuque	Dubuque	Brenton Center	PWD
Dubuque	Dubuque	IPRT Company Assistance-NDE	TAC
Dubuque	Dubuque	CTRE/SUDAS	TAC
Dubuque	Dubuque	CTRE/SUDAS	TAC
Dubuque	Dubuque	ISUE	BAC
Dubuque	Dubuque	CCUR	FAC
Dubuque	Dubuque	CCUR	FAC
Dubuque	Dubuque	CTRE/SUDAS	TAC
Dubuque	Dubuque	ITSDS	TAC
Dubuque	Dubuque	LA, CRP, IDRO	PWD
Dubuque	Dubuque	Engineering Distance Education	PWD

Arnolds Park	Dickinson County	
Lake Park	Arnolds Park P & Z	
Lake Park	City of Lake Park	
Lake Park	Lake Park City Admin.	
Lake Park	Lake Park City Council	
Lake Park	Lake Park Mayor	
Lake Park	Lake Park P & Z Board	
Milford	City of Milford	
Milford	City of Milford P & Z	
Milford	City of Wahpeton	
	Dickinson Co. Supervisor	
	Dickinson Co. Zon. Admin.	
	Dickinson County	
	Dickinson County Auditor's Office	

Webber Surveying, LLC	
Cascade Sale Barn	
City of Cascade	
Distance Education Students	
Eastern Iowa Excavating	

City of Dubuque	
City of Dubuque	
Country Charm Carpet Cleaning and Upholstery	
Deere & Company, Inc.-Dubuque	
Distance Education Students	
Don Hedeman - Individual	
Drew Cook and Son's Excavating Inc	
Dubuque County	
Dubuque Sash and Door Mfg	
Earth Foam	
Earth Foam	
East Central Intergovernmental Assoc.	
East Central Intergovernmental Assoc.	
East Central Intergovernmental Association	
Entegege	

Dubuque	Finley/DCY Childcare Center	Human Development and Family Studies	PWD
Dubuque	Flynn Company Inc.	CTRE/Natl CP Tech Center	PWD
Dubuque	Flynn Company, Inc.	CTRE/SUDAS	TAC
Dubuque	Flynn Ready Mix Concrete Co.	CTRE/Natl CP Tech Center	PWD
Dubuque	Frazier Construction Administration, Inc.	ISUE	BAC
Dubuque	Fuerste Law Firm	CTRE/SUDAS	TAC
Dubuque	Haun's Specialty Meats	Meat Science Extension	PWD
Dubuque	Hy-Vee Foods	Extension	PWD
Dubuque	IHOP	Extension	PWD
Dubuque	IIV Engineers & Survey	CTRE/SUDAS	TAC
Dubuque	Iowa Law Enforcement Academy	Extension	OCOM
Dubuque	J & R Supply Inc	CTRE/SUDAS	TAC
Dubuque	Jeid-Wen Fiber of Iowa	IPRT Company Assistance-Technology Commercialization	TAC
Dubuque	John Deere	Engineering Distance Education	PWD
Dubuque	John Deere Dubuque Works	IPRT Company Assistance-NDE	TAC
Dubuque	Kids of the Kingdom	Human Development and Family Studies	PWD
Dubuque	Mercy Child Development Center	Human Development and Family Studies	PWD
Dubuque	MidAmerican Energy Company	Iowa Energy Center	FAC
Dubuque	MSA Professional Services, Inc.	CTRE/SUDAS	TAC
Dubuque	Naughty Dog	Extension	PWD
Dubuque	Noah's Ark Preschool	Human Development and Family Studies	PWD
Dubuque	Operation: New View Community Action	Human Development and Family Studies	PWD
Dubuque	Agency/Head Start	ISUE	BAC
Dubuque	Performance Fabrication Inc.	CTRE/SUDAS	TAC
Dubuque	Portzen Construction, Inc.	Human Development and Family Studies	PWD
Dubuque	Resurrection Children's Center	Extension	PWD
Dubuque	Road Ranger	Human Development and Family Studies	PWD
Dubuque	St Mary's Children's Center	Human Development and Family Studies	PWD
Dubuque	St. Columbkille Children's Center	Human Development and Family Studies	PWD
Dubuque	St. Joseph the Worker Early Childhood Center	Human Development and Family Studies	PWD
Dubuque	Sunset Parkplace	Extension	PWD
Dubuque	Training Within Industry Event in Dubuque County:	ISUE	TAC
Dubuque	TWI Overview	CTRE/SUDAS	TAC
Dubuque	Tshiggrie Excavating Co.	CRP	PWD
Dubuque	Upper Midwest APA Conference	Human Development and Family Studies	PWD
Dubuque	Y Creative Learning Center @ Dubuque	Iowa SBDC	BAC
Dubuque	Community Y	Iowa SBDC	BAC
Dubuque		Iowa SBDC	BAC
Dubuque		Iowa SBDC	BAC

Dubuque	Worthington	Connolly Concrete and Excavating, Inc.	CTRE/SUDAS	TAC
Dubuque	Cascade	City of Cascade	Community Economic Development	PWD
Dubuque	Dubuque	City of Dubuque	Community Economic Development	PWD
Dubuque	Dubuque	Dubuque City Council	Community Economic Development	PWD
Dubuque	Dubuque	Dubuque Zoning Bd of Adjust	Community Economic Development	PWD
Dubuque	Dubuque	ECIA, Urban/Regional Planner	Community Economic Development	PWD
Dubuque	Dubuque	MSA Professional Services	Community Economic Development	PWD
Dubuque	Dubuque	MSA Professional Services, Inc. - Vice President	Community Economic Development	PWD
Dubuque	Dubuque	Zoning Board Member	Community Economic Development	PWD
Dubuque	Dyersville	City of Dyersville	Community Economic Development	PWD
Dubuque	Farley	City of Farley	Community Economic Development	PWD
Dubuque	Sageville	City of Sageville, Council	Community Economic Development	PWD
Dubuque	Sageville	City of Sageville, Mayor	Community Economic Development	PWD
Dubuque	Sherrill	City of Sherrill - City Clerk	Community Economic Development	PWD
Dubuque	Sherrill	Zoning Board Member	Community Economic Development	PWD
Dubuque	Worthington	City of Worthington. - City Clerk/Treasurer	Community Economic Development	PWD
Dubuque		County Supervisor	Community Economic Development	PWD
Dubuque		Dubuque County Auditor's Office	Community Economic Development	PWD
Dubuque		Dubuque County Zoning	Community Economic Development	PWD
Dubuque		Dubuque Long Term Planning Comm.	Community Economic Development	PWD
Dubuque			Community Economic Development	PWD

Dubuque 168

Count

FAC, BCOM

Emmet	Armstrong	TG Industries Inc	ISUE	BAC
Emmet	Estherville	Dakota Pack	Meat Science Extension	PWD
Emmet	Estherville	Aero Race Wheels Inc	ISUE	TAC
Emmet	Estherville	Emmet County	College of Engineering	BCOM
Emmet	Estherville	Iowa Lakes CC	Iowa Energy Center	BCOM
Emmet	Estherville	Iowa Wind Power Association	College of Engineering	TAC
Emmet	Estherville	Jacobson Westergard & Assoc.	CTRE/Natl CP Tech Center	PWD
Emmet	Estherville	Jacobson-Westergard and Associates	CTRE/SUDAS	TAC
Emmet	Estherville	Tug Helmers Construction, Inc.	CTRE/SUDAS	TAC
Emmet	Estherville	Valley Contracting, Inc.	CTRE/SUDAS	TAC
Emmet	Estherville		Iowa SBDC	BAC
Emmet	Estherville		Iowa SBDC	BAC
Emmet	Emmet County		CTRE/Natl CP Tech Center	PWD
Emmet	Distance Education Students		Brenton Center	PWD
Emmet	Distance Education Students		Brenton Center	PWD
Emmet	Emmet County Auditor's Office		Community Economic Development	PWD
Emmet	Estherville Board of Adjustment		Community Economic Development	PWD
Emmet			Community Economic Development	PWD

Grundy	Beamon	Grundy County Economic Development	Iowa Energy Center	FAC
Grundy	Conrad	Conrad American	IGQI/ABE/CCUR	TAC
Grundy	Conrad	Conrad American	IGQI/ABE/CCUR	TAC
Grundy	Dike		Iowa SBDC	BAC
Grundy	Grundy Center	Dows Property Group	VAAP-EXT	BAC
Grundy	Grundy Center	Dows Property Group	VAAP-EXT	BAC
Grundy	Grundy Center	Grundy Center Community Schools	College of Engineering / ABE (PLTW)	OCOM
Grundy	Grundy Center	Heavy Equipment Mfg.	CTRE/Natl CP Tech Center	PWD
Grundy	Grundy Center	New Farm Family Project	ISU Extension Grundy County	FAC
Grundy	Grundy Center		Iowa SBDC	BAC
Grundy	Grundy Center			TCOM
Grundy	Grundy Center,			
Grundy	Conrad, Beaman,			
Grundy	Reinbeck, Stout,			
Grundy	Fern, Dike,			
Grundy	Wellsburg, Morrison	Barn Quilts of Grundy County	ISU Extension Grundy County	FAC
Grundy	Grundy County	North Iowa Food and Farm Partnership	ISU Extension Grundy County	BAC
Grundy	Reinbeck	Gladbrook Rienbeck Schools	Extension	PWD
Grundy	Reinbeck	Peterson Contractors	CTRE/ Natl CP Tech-Geotechnical	PWD
Grundy	Reinbeck	Total Source Molders	ISUE	TAC
Grundy	Wellsburg	Source Verified Foods	Meat Science Extension	PWD
Grundy	Wellsburg	Triple T Country Meats	Meat Science Extension	PWD
Grundy	Conrad	Conrad Administrator/Clerk	Community Economic Development	PWD
Grundy	Conrad	Conrad Board of Adjustment	Community Economic Development	PWD
Grundy	Conrad	Conrad Planning & Zoning Comm.	Community Economic Development	PWD
Grundy	Reinbeck	City of Reinbeck	Community Economic Development	PWD
Grundy	Stout	City of Stout	Community Economic Development	PWD
Grundy		Grundy County Auditor's Office	Community Economic Development	PWD

Grundy
Count

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Guthrie	Bayard	Farnhamville Coop- Bayard Branch	IGQI/ABE/CCUR	TAC
Guthrie	Bayard	Farnhamville Coop- Bayard Branch	IGQI/ABE/CCUR	TAC
Guthrie	Bayard	Shack's	Extension	PWD
Guthrie	Casey	Gus Construction Co., Inc.	CTRE/SUDAS	TAC
Guthrie	Guthrie Center	-Fayette	LTAP	TCOM
Guthrie	Guthrie Center	Distance Education Students	Brenton Center	PWD
Guthrie	Guthrie Center	New Homestead Care Center	IDRO	BCOM
Guthrie	Guthrie Center		Iowa SBDC	BAC
Guthrie	Menlo	Central Valley Preschool	Environment Rating Scale Assessment Project -- HD FS	OCOM
Guthrie	Menlo	West Central Community School	Adair County Extension	

Hardin	Hubbard	Distance Education Students	Brenton Center	PWD
Hardin	Hubbard	Child Care Providers	Iowa SBDC	BAC
Hardin	Iowa Falls	City of Iowa Falls	Extension	PWD
Hardin	Iowa Falls	City of Iowa Falls	Hardin County Extension	4
Hardin	Iowa Falls	County Endowment Foundation	CTRE/SUDAS	TAC
Hardin	Iowa Falls	Distance Education Students	Community Vitality Center	BCOM
Hardin	Iowa Falls	Hawkeye Renewables	Brenton Center	PWD
Hardin	Iowa Falls	Hawkeye Renewables	BEI	BAC, FAC, TAC
Hardin	Iowa Falls	Hawkeye Renewables	BEI	BAC, FAC, TAC
Hardin	Iowa Falls	Home Care Aides-Hospital Staff	Extension	BAC, FAC, TAC
Hardin	Iowa Falls	Iowa Falls Area Development Corporation	Hardin County Extension	PWD
Hardin	Iowa Falls	McDowell & Sons	CTRE/SUDAS	2
Hardin	Iowa Falls	Taco John's - Iowa Falls	Extension	TAC
Hardin	Iowa Falls		Iowa SBDC	PWD
Hardin	Iowa Falls		Iowa SBDC	BAC
Hardin	Iowa Falls		Iowa SBDC	BAC
Hardin	Iowa Falls		Iowa SBDC	TCOM
Radcliffe	Radcliffe	Distance Education Students	Brenton Center	PWD
Union	Union	Distance Education Students	Brenton Center	PWD
Union	Union	Member, P & Z Committee	CTRE - Traffic Operations/RIMOS	BCOM
Ackley	Ackley	City of Ackley	Community Economic Development	TCOM
Ackley	Ackley	City of Eldora - City Clerk	Community Economic Development	PWD
Eldora	Eldora	City of Eldora Board of Adj.	Community Economic Development	PWD
Eldora	Eldora	City of Hubbard - city clerk/treasurer	Community Economic Development	PWD
Hubbard	Hubbard	City of Hubbard	Community Economic Development	PWD
Iowa Falls	Iowa Falls	City of Iowa Falls	Community Economic Development	PWD
Union	Union	City of Union	Community Economic Development	PWD
		Hardin County Auditor's Office	Community Economic Development	PWD
		Hardin County Zoning Adm.	Community Economic Development	PWD
			Community Economic Development	PWD
			Community Economic Development	FAC
				44
Harrison	Dunlap	Cogdill Farm Supply	ISU/Harrison County Extension	TAC
Harrison	Dunlap	Dunlap Nursing & Rehab Center	Extension	PWD
Harrison	Logan	AgriLand Farm Service	ISU/Harrison County Extension	TAC
Harrison	Logan	Farm Service Co.	ISU/Harrison County Extension	TAC
Harrison	Logan	Harrison County Extension Office	Interior Design	TAC
Harrison	Logan	HCDC	ISU/Harrison County Extension	FAC
Harrison	Logan		Iowa SBDC	BAC
Harrison	Logan		Iowa SBDC	BAC

Harrison	Logan	Distance Education Students	Brenton Center	TCOM
Harrison	Missouri Valley	Saw Mill Hollow Organic Farms	ISU/Harrison County Extension	PWD
Harrison	Missouri Valley	TJ Future Lawns	ISU/Harrison County Extension	BAC
Harrison	Missouri Valley	United Western Coop	ISU/Harrison County Extension	TAC
Harrison	Missouri Valley		ISU/Harrison County Extension	TAC
Harrison	Modale		ISU/Harrison County Extension	TCOM
Harrison	Mondamin		lowa SBDC	BAC
Harrison	Persia		lowa SBDC	BAC
Harrison	Pisgah	City of Pisgah	lowa SBDC	BAC
Harrison	Woodbine	City of Woodbine	CTRE/Natl CP Tech Center	PWD
Harrison	Woodbine	Distance Education Students	LA, IDRO	BCOM
Harrison	Woodbine	NPP	Brenton Center	PWD
Harrison	Woodbine (via Horizons program)	Woodbine (via Horizons program)	ISU/Harrison County Extension	TAC
Harrison	Woodbine Horizons	Woodbine Horizons	ISU/Harrison County Extension	BCOM
Harrison			Extension	BCOM
Harrison	County Wide		lowa SBDC	BAC
Harrison	City of Dunlap		lowa SBDC	BAC
Harrison	City of Logan		Extension	FAC
Harrison	City of Logan - Deputy Clerk		Extension	OCOM
Harrison	City of Missouri Valley		Community Economic Development	PWD
Harrison	Missouri Valley Council Mem		Community Economic Development	PWD
Harrison	Missouri Valley Council Mem		Community Economic Development	PWD
Harrison	City of Woodbine		Community Economic Development	PWD
Harrison	City of Woodbine - City Clerk/Administrator		Community Economic Development	PWD, BCOM
Harrison	City of Woodbine P & Z Bd. Mbr.		Community Economic Development	PWD
Harrison	City of Woodbine, Mayor		Community Economic Development	PWD
Harrison	Harrison County Auditor's Office		Community Economic Development	PWD
Harrison			Community Economic Development	PWD
Harrison			Community Economic Development	BCOM, PWD
Harrison			36	
Henry	Mount Pleasant	Anna's Pantry	Extension	BAC
Henry	Mount Pleasant	Batey Sawmill Ltd.	Natural Resource Ecology and Management	TAC
Henry	Mount Pleasant	Diversity--Exito Norte, Citizenship	Extension-Communities	OCOM
Henry	Mount Pleasant	Hearth and Home Technologies	IPRT Company Assistance-Technology Commercialization	TAC
Henry	Mount Pleasant	HENRY COUNTY HEALTH CENTER	Extension	PWD
Henry	Mount Pleasant	JET STOP	Extension	PWD
Henry	Mount Pleasant	Lomont Molding Inc	ISUE	TAC
Henry	Mount Pleasant	Lomont Molding Inc	ISUE	BAC
Henry	Mount Pleasant	MetroGroup Corp.	Engineering Distance Education	PWD

Harrison
Count

Henry Count	Environment Rating Scale Assessment Project -- HD FS
Henry	Brenton Center
Henry	Iowa SBDC
Henry	Natural Resource Ecology and Management
Henry	Brenton Center
Henry	Iowa SBDC
Henry	LTAP
Henry	Community Economic Development
Henry	Extension-Communities-LINCS
Henry	Community Economic Development
Henry	Community Economic Development
Henry	Extension
Henry	Community Economic Development
Henry	Community Economic Development
Henry	Community Economic Development
Henry	Community Economic Development
Henry	Community Economic Development
Henry	CTRE - Traffic Operations/RIMOS

Henry Count	Heather Simpson (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS
Henry	Distance Education Students	Brenton Center
Henry	Geode Forestry Inc	Iowa SBDC
Henry	Distance Education Students	Natural Resource Ecology and Management
Henry	City of Mount Pleasant	Brenton Center
Henry	Mount Pleasant	Iowa SBDC
Henry	Mount Pleasant Bldg. & Zoning Admin.	LTAP
Henry	Mount Pleasant P & Z Member	Community Economic Development
Henry	Mt. Pleasant Foods	Extension-Communities-LINCS
Henry	City of New London	Community Economic Development
Henry	City of Salem - Salem City Clerk	Community Economic Development
Henry	City of Wayland	Community Economic Development
Henry	Henry County Auditor	Community Economic Development
Henry	Engineering	Community Economic Development
Henry	Engineering	CTRE - Traffic Operations/RIMOS

Henry Count	Environment Rating Scale Assessment Project -- HD FS
Henry	Distance Education Students
Henry	Geode Forestry Inc
Henry	Distance Education Students
Henry	City of Mount Pleasant
Henry	Mount Pleasant
Henry	Mount Pleasant Bldg. & Zoning Admin.
Henry	Mount Pleasant P & Z Member
Henry	Mt. Pleasant Foods
Henry	City of New London
Henry	City of Salem - Salem City Clerk
Henry	City of Wayland
Henry	Henry County Auditor
Henry	Engineering
Henry	Engineering

Howard	Lime Springs	Mehmet Tiling, Inc.	CTRE/SUDAS	TAC
Howard	Protivin	Polashak's Locker Service	Meat Science Extension	PWD
Howard	Protovin	Protovin Locker	North Central Regional Center for Rural Development	BAC
Howard	Cresco	City of Cresco	Community Economic Development	PWD
Howard	Cresco	City of Cresco	Community Economic Development	BCOM
Howard	Cresco	City of Cresco - City Administrator/Clerk	Community Economic Development	PWD
Howard	Lime Springs	City of Lime Springs	Community Economic Development	PWD

Howard
Count

Humboldt	Bode	Distance Education Students	Brenton Center	PWD
Humboldt	Bode	City of Badger - City Clerk	Iowa SBDC	BAC
Humboldt	Dakota City	Distance Education Students	Community Economic Development	PWD
Humboldt	Dakota City	SimmService	Iowa SBDC	BAC
Humboldt	Gilmore City	Barn Quilts of Humboldt County	Brenton Center	PWD
Humboldt	Hardy	Blacktop Service Company	ISUE	BAC
Humboldt	Humboldt	Businesses owned and operated by women	Iowa SBDC	BAC
Humboldt	Humboldt	Chantland Company	Humboldt County ISU Extension	5. Facilitation
Humboldt	Humboldt	Dodgen Industries Inc	CTRE/SUDAS	TAC
Humboldt	Humboldt	Dodgen Industries Inc	Extension	PWD
Humboldt	Humboldt	general public - elderly & disabled	IPRT Company Assistance-Materials	TAC
Humboldt	Humboldt	Hanisch Manufacturing Inc	ISUE	BAC
Humboldt	Humboldt	Humboldt Concrete Products	ISUE	OCOM
Humboldt	Humboldt	Humboldt County Community Foundation	BAC	BAC
Humboldt	Humboldt	Humboldt County Gardeners, producers	TAC	TAC
Humboldt	Humboldt	Humboldt Sheltered Workshop staff	5. Facilitation	5. Facilitation
Humboldt	Humboldt	Jet Co Inc	Extension	PWD
Humboldt	Humboldt	Lighten Up Iowa-Public Health, Many businesses	Extension	TAC
Humboldt	Humboldt	Mid Iowa Community Development Conference	Humboldt County ISU Extension	PWD
Humboldt	Humboldt	Regional Economic & Leadership Forum	Humboldt County ISU Extension	5. Facilitation
Humboldt	Humboldt		Iowa SBDC	BAC
Humboldt	Humboldt		Iowa SBDC	BAC
Humboldt	Humboldt		Iowa SBDC	BAC
Humboldt	Humboldt		Iowa SBDC	BAC
Humboldt	Humboldt		Iowa SBDC	BAC
Humboldt	Humboldt		Iowa SBDC	BAC
Humboldt	Humboldt		Iowa SBDC	BAC
Humboldt	Humboldt		Iowa SBDC	BAC

Humboldt	Distance Education Students	Iowa SBDC	BAC
Humboldt		Brenton Center	PWD
Livermore		Iowa SBDC	BAC
Livermore		Iowa SBDC	BAC
Livermore		Iowa SBDC	BAC
Renwick		CTRE/Natl CP Tech Center	PWD
Humboldt	Humboldt County	Extension	PWD
Humboldt	Dairy Queen - Humboldt	Community Economic Development	PWD
Humboldt	City of Dakota City	Community Economic Development	PWD
Humboldt	Gilmore City/Humboldt Council Member	Community Economic Development	PWD
Humboldt	Gilmore City	Community Economic Development	PWD
Humboldt	City of Humboldt	Community Economic Development	PWD
Humboldt	Humboldt County E-911	LA, CRP, IDRO	PWD
Humboldt	Humboldt County Auditor's Office	Community Economic Development	PWD
Humboldt	Humboldt County Zoning	Community Economic Development	PWD
Humboldt			FAC

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Humboldt 47
Count

Ida	Beach Bum	Extension	PWD
Ida	Connie Leuschen (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	PWD
Ida	Distance Education Students	Brenton Center	BAC
Ida	Food Locker Service	ISUE	TAC
Ida	Food Locker Service	ISUE	BAC
Ida	Food Locker Service	ISUE	BAC
Ida	Food Locker Service	North Central Regional Center for Rural Development	BAC
Ida	Food Locker Service	Meat Science Extension	BAC
Ida	Food Locker Service	Meat Science Extension	PWD
Ida	Maple River Energy LLC	ISUE	TAC
Ida	V-T Industries	Extension	PWD
Ida	Battle Creek- Ida Grove Community School	Iowa SBDC	BAC
Ida	Byron Originals, Inc.	Extension	PWD
Ida	Godbersen Smith Construction Co.	IPRT Company Assistance-Materials	TAC
Ida	Godbersen Smith Construction Co.	CTRE/SUDAS	TAC
Ida	GOMACO Corp	CTRE/Natl CP Tech Center	PWD
Ida	GOMACO Corp	ISUE	TAC
Ida	GOMACO Corporation	ISUE	TAC
Ida	Little Panda Express	CTRE/Natl CP Tech Center	PWD
Ida	Midwest Industries Inc	Extension	PWD
Ida		ISUE	TAC
Ida		Iowa SBDC	BAC
Ida	Ida County Community Betterment Foundation	Ida County Extension Education Director	TCOM
Ida			BCOM

Johnson	Coralville	Access Now	lowa SBDC	lowa SBDC	BAC
Johnson	Coralville		lowa SBDC	lowa SBDC	BAC
Johnson	Coralville		lowa SBDC	lowa SBDC	BAC
Johnson	Coralville		lowa SBDC	lowa SBDC	BAC
Johnson	Coralville Hills		lowa SBDC	lowa SBDC	BAC
Johnson	lowa City		ISUE	lowa SBDC	BAC
Johnson	lowa City	Apple Tree Children's Center	Environment Rating Scale Assessment Project -- HD FS	Extension	PWD
Johnson	lowa City	Applebee's	Johnson County Extension	Extension	PWD
Johnson	lowa City	Bailey Leadership Initiative	Johnson County Extension	Extension	PWD
Johnson	lowa City	Bickford Cottage Assisted Living	Johnson County Extension	Extension	PWD
Johnson	lowa City	Big Brothers Big Sisters of Johnson County	OIPTT	OIPTT	FAC
Johnson	lowa City	Bio::Neos	CCAT	CCAT	TT
Johnson	lowa City	BIOWA	CTRE/SUDAS	CTRE/SUDAS	TAC
Johnson	lowa City	Bockenstedt Excavating Inc.	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Brain Injury Association of Iowa	OIPTT	OIPTT	FAC
Johnson	lowa City	Breakthrough to Literacy	OIPTT	OIPTT	BAC
Johnson	lowa City	C&M Sims, Inc.	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Center for Independent Living	CTRE/SUDAS	CTRE/SUDAS	TAC
Johnson	lowa City	City of Iowa City	CTRE/Natl CP Tech Center	CTRE/Natl CP Tech Center	PWD
Johnson	lowa City	City of Iowa City	CTRE/Natl CP Tech Center	CTRE/Natl CP Tech Center	PWD
Johnson	lowa City	City of Iowa City	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Community Corrections Improvement	CTRE/Natl CP Tech Center	CTRE/Natl CP Tech Center	PWD
Johnson	lowa City	Continental Cement	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Continental Cement Company	CTRE/Natl CP Tech Center	CTRE/Natl CP Tech Center	PWD
Johnson	lowa City	Distance Education Students	Brenton Center	Brenton Center	PWD
Johnson	lowa City	Englert Theatre	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Friends of the Animal Center Foundation	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Goldfinch Diagnostics	OIPTT	OIPTT	FAC
Johnson	lowa City	Goldfinch Diagnostics	OIPTT	OIPTT	FAC
Johnson	lowa City	InnoMatix	OIPTT	OIPTT	FAC
Johnson	lowa City	lowa City	CTRE/Natl CP Tech Center	CTRE/Natl CP Tech Center	PWD
Johnson	lowa City	lowa City Free Medical Clinic	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	lowa Cultural Corridor Alliance	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	lowa DNR	OIPTT	OIPTT	FAC
Johnson	lowa City	lowa Shares	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Islamic Center	Johnson County Extension	Johnson County Extension	PWD
Johnson	lowa City	Johnson Council of Governments	CTRE/SUDAS	CTRE/SUDAS	TAC
Johnson	lowa City	Johnson County - Secondary Roads Dept.	CTRE/SUDAS	CTRE/SUDAS	TAC
Johnson	lowa City	Johnson County Child Care Association	Extension	Extension	PWD
Johnson	lowa City	Johnson County Public Health	Johnson County Extension	Johnson County Extension	PWD

Johnson	Iowa City	Johnson County Sec Roads	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	Landmark Surveying & Engineering, Inc.	CTRE/SUDAS	TAC
Johnson	Iowa City	Lepic-Kroeger	OIPTT	BAC
Johnson	Iowa City	LL Pelling	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	Loren W Leach Professional Engineer	CTRE/SUDAS	TAC
Johnson	Iowa City	Louise Rhode (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Johnson	Iowa City	Maxwell Construction	CTRE/SUDAS	TAC
Johnson	Iowa City	Metro Pavers Inc.	CTRE/SUDAS	TAC
Johnson	Iowa City	Metro Pavers Inc.	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	Microtonics	OIPTT	BAC
Johnson	Iowa City	Midwest Forestry & Biofuels	CCAT	TAC
Johnson	Iowa City	Miller Hybrids	OIPTT	FAC
Johnson	Iowa City	MMS Consultants Inc.	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	MMS Consultants, Inc.	CTRE/SUDAS	TAC
Johnson	Iowa City	MMS Consultants, Inc.	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	Neumann Brothers	CTRE/SUDAS	TAC
Johnson	Iowa City	New Pioneer	Extension	PWD
Johnson	Iowa City	Porcinogen	OIPTT	BAC
Johnson	Iowa City	Regal Construction Services	CTRE/SUDAS	TAC
Johnson	Iowa City	Sealane Consulting	OIPTT	FAC
Johnson	Iowa City	Shive Hattery Inc.	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	Shive-Hattery, Inc.	CTRE/SUDAS	TAC
Johnson	Iowa City	Speedie Jeanie Cleaning Service	ISUE	BAC
Johnson	Iowa City	Streb Construction Co. Inc.	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	The Thomas Group	OIPTT	FAC
Johnson	Iowa City	Treebrook Preschool	Environment Rating Scale Assessment Project -- HD FS	
Johnson	Iowa City	United Action for Youth	Johnson County Extension	PWD
Johnson	Iowa City	University of Iowa	Johnson County Extension	PWD
Johnson	Iowa City	University of Iowa	Iowa Energy Center	TAC
Johnson	Iowa City	University of Iowa	CTRE/Natl CP Tech Center	PWD
Johnson	Iowa City	University of Iowa IOWA Centers for Enterprise	OIPTT	FAC
Johnson	Iowa City	University of Iowa Small Business Development Center		
Johnson	Iowa City	University of Iowa Technology Innovation Center	OIPTT	FAC
Johnson	Iowa City	West Bank	OIPTT	FAC
Johnson	Iowa City	Women's Resource and Action Center	Johnson County Extension	PWD
Johnson	Iowa City	Work Zone Safety Workshops	Continuing and Distance Education	PWD
Johnson	Iowa City	Work Zone Safety Workshops	Continuing and Distance Education	PWD
Johnson	Iowa City		IPMP/RIMOS	TCOM
Johnson	Iowa City		Iowa SBDC	BAC

Johnson Count	Johnson	Elderly/Disabled in these two counties	Political Science	OCOM
334	Jones	Anamosa	329	PWD
	Jones	A & L Turf Builders	County Extension	PWD
	Jones	Ag Advantage FS	County Extension	OCOM
	Jones	Anamosa Community School District	College of Engineering / ABE (PLTW)	BAC
	Jones	Anamosa Eureka Journal	County Extension	OCOM
	Jones	Anamosa School	County Extension	OCOM
	Jones	Anamosa State Penitentiary	County Extension	PWD
	Jones	Blade pest Control	County Extension	BCOM
	Jones	City of Anamosa	County Extension	TAC
	Jones	City of Anamosa	CTRE/SUDAS	PWD
	Jones	City of Anamosa	CTRE/Natl CP Tech Center	FAC
	Jones	County Child Care Resource Coalition	County Extension	OCOM
	Jones	County Resource Coalition	County Extension	PWD
	Jones	Crop Production Services	County Extension	PWD
	Jones	Culvers Lawns & Landscapes	County Extension	PWD
	Jones	Distance Education Students	Brenton Center	PWD
	Jones	Emerald Green Lawn Care	County Extension	FAC
	Jones	Facilitation Event in Jones County	ISUE	PWD
	Jones	Feldmanns Yard N Gardens	County Extension	PWD
	Jones	Gehl Lawn	County Extension	PWD
	Jones	Hermesen Custom Work	County Extension	PWD
	Jones	Innovative Ag Services	County Extension	PWD
	Jones	Irish Green Lawn Care	County Extension	PWD
	Jones	Jones County	CTRE/Natl CP Tech Center	PWD
	Jones	Jones County Board of Supervisors	County Extension	OCOM
	Jones	Jones County Bow Hunters	County Extension	OCOM
	Jones	Jones County Career Expo	County Extension	FAC
	Jones	Jones County Emergency Management	County Extension	OCOM
	Jones	Jones County Empowerment Board	County Extension	FAC
	Jones	Jones County Endowment Fund	County Extension	BCOM
	Jones	Jones County Farm Bureau	County Extension	BAC
	Jones	Jones County Leadership Program	County Extension	FAC
	Jones	Jones County Master Gardeners	County Extension	BCOM
	Jones	Jones Regional Medical Center	County Extension	PWD
	Jones	K Farm Supply	Extension	PWD
	Jones	Lawns R Us	County Extension	PWD
	Jones	Limestone Bluffs RC & D	County Extension	PWD
	Jones	Minger Mowing & Landscapes	County Extension	BCOM
	Jones	ORBIS Corporation	County Extension	PWD
	Jones	ORBIS Corporation	CCUR	FAC
	Jones	ORBIS Corporation	CCUR	FAC

Jones	Anamosa	River Bend Buy Fresh, Buy Local	County Extension	BCOM
Jones	Anamosa	SilverCrest	Extension	PWD
Jones	Anamosa	Thomas Enterprises, Inc.	ISUE	BAC
Jones	Anamosa	Trees Forever	County Extension	OCOM
Jones	Anamosa	USDA, FSA, NRCS	County Extension	BCOM
Jones	Anamosa	Wapsi Valley Archaeology, Inc.	ISUE	BAC
Jones	Anamosa		Iowa SBDC	BAC
Jones	Anamosa		Iowa SBDC	BAC
Jones	Anamosa		TCOM	BCOM
Jones	Center Junction	Jones County Conservation District	County Extension	PWD
Jones	Center Junction	Lindley Locker	Meat Science Extension	PWD
Jones	Monticello	Applebee's	Extension	PWD
Jones	Monticello	City of Anamosa	County Extension	BCOM
Jones	Monticello	Dan's Auto Parts Inc	ISUE	BAC
Jones	Monticello	Great Jones County Fair	County Extension	BAC
Jones	Monticello	Jones County Cattleman Board	County Extension	BCOM
Jones	Monticello	Jones County Dairy Promotion	County Extension	BCOM
Jones	Monticello	Jones County Economic Development	County Extension	BCOM
Jones	Monticello	Monticello Express	County Extension	BAC
Jones	Monticello	Monticello School	County Extension	OCOM
Jones	Monticello	Tri County Bank & Trust	County Extension	BAC
Jones	Olin	City of Olin	County Extension	BAC
Jones	Olin	Olin	County Extension	OCOM
Jones	Olin	Olin Horizons	Extension	BCOM
Jones	Olin	Olin School	County Extension	OCOM
Jones	Olin	River Valley Cooperative	County Extension	BAC
Jones	Olin		Iowa SBDC	BAC
Jones	Oxford Junction	City of Oxford Junction	County Extension	BCOM
Jones	Oxford Junction	Oxford Junction	Extension	OCOM
Jones	Oxford Junction	Oxford Junction Horizons	Extension	BCOM
Jones	Oxford Junction	Wapsi Bottoms Whitetails Unlimited	County Extension	OCOM
Jones	Wyoming	City of Wyoming	County Extension	BCOM
Jones	Wyoming	Midland School	County Extension	OCOM
Jones	Wyoming	Midland Times	County Extension	BAC
Jones	Wyoming	Sheriff's Office	ITSDS	OCOM
Jones	Anamosa	City of Anamosa - City Clerk	Community Economic Development	PWD
Jones	Monticello	City of Monticello - City Clerk/Treasurer	Community Economic Development	PWD
Jones	Olin	City of Olin	Community Economic Development	FAC
Jones	Oxford Junction	City of Oxford Junction	Community Economic Development	FAC, PWD
Jones	Wyoming	City of Wyoming - City Clerk	Community Economic Development	PWD
Jones	Wyoming	Wyoming Board of Adjustment	Community Economic Development	PWD

Jones	Wyoming	Wyoming City Clerk	Community Economic Development	PWD
Jones		Jones County	CTRE/Natl CP Tech Center	PWD
Jones		Jones County Auditor's Office	Community Economic Development	PWD
Jones			Community Economic Development	PWD
85			84	
Keokuk	Delta	Kent Feed	Keokuk County Extension	fac
Keokuk	Harper	Gretter Elevator	Keokuk County Extension	fac
Keokuk	Hedrick		Iowa SBDC	BAC
Keokuk	Keota	Kathy Duwa (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	OCOM
Keokuk	Keota	Keota Community High School	Agricultural Education and Studies	OCOM
Keokuk	Keota	Keoto Jr/Sr High School	Natural Resource Ecology and Management	ocom
Keokuk	Keota	Vision Ag	Keokuk County Extension	TAC
Keokuk	Keota	Vittetoe, Inc.	IPRT Company Assistance-Materials	PWD
Keokuk	Keswick	Veracity Sales	Extension	TAC
Keokuk	Sigourney	City of Sigourney	CTRE/SUDAS	PWD
Keokuk	Sigourney	City of Sigourney	CTRE/Natl CP Tech Center	fac
Keokuk	Sigourney	Farm Bureau - Keokuk County	Keokuk County Extension	fac
Keokuk	Sigourney	IPTV-Sigourney TV	Keokuk County Extension	fac
Keokuk	Sigourney	Keokuk County	CTRE/Natl CP Tech Center	PWD
Keokuk	Sigourney	Keokuk County Health Center	Keokuk County Extension	fac
Keokuk	Sigourney	Keokuk County Tobacco Coalition	Keokuk County Extension	fac
Keokuk	Sigourney	Midwest One Bank	Keokuk County Extension	fac
Keokuk	Sigourney	Multiple Insurance Companies - SHIPP	Keokuk County Extension	fac
Keokuk	Sigourney	Whitetail Unlimited	Keokuk County Extension	fac
Keokuk	Sigourney		Iowa SBDC	BAC
Keokuk	Sigourney			TCOM
Keokuk	Sigourney	Keokuk County Hospital	Extension	TCOM
Keokuk	Thornburg		Iowa SBDC	PWD
Keokuk	What Cheer	Local economic development group	ReCAP/Community Vitality Center/ISU Extension	BAC
Keokuk	What Cheer	Print Shop - Florist -What Cheer Business Club	Keokuk County Extension	BCOM
Keokuk	What Cheer		Iowa SBDC	fac
Keokuk	Hedrick	City of Hedrick	Community Economic Development	BAC
Keokuk	Keota	City of Keota	Community Economic Development	BCOM
Keokuk	Keswick	City of Keswick	Community Economic Development	BCOM
Keokuk	Ollie	City of Ollie	Community Economic Development	BCOM
Keokuk	Sigourney	City of Sigourney	Community Economic Development	BCOM, PWD
Keokuk	Sigourney	City of What Cheer	Community Economic Development	PWD
Keokuk	What Cheer	Keokuk County Auditor's Office	Community Economic Development	BCOM
Keokuk			Community Economic Development	PWD

Jones
Count

Kossuth	Fenton	City of Fenton	Community Economic Development	OCOM
Kossuth	Fenton	City of Fenton - City Clerk	Community Economic Development	PWD
Kossuth	Swea City	City of Swea City	Community Economic Development	PWD
Kossuth	Titonka	City of Titonka	Community Economic Development	OCOM
Kossuth		Kossuth County Auditor's Office	Community Economic Development	PWD
Kossuth			Community Economic Development	FAC
44				
Lee	Donnellson	Crop Quest	Lee County Extension	TAC, FAC
Lee	Donnellson	Donnellson Elevator	Lee County Extension	TAC, FAC, BAC
Lee	Donnellson	DONNELSON HEALTH CENTER	Extension	PWD
Lee	Donnellson	Susie Rettig (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Lee	Donnellson		Iowa SBDC	BAC
Lee	Donnellson		Iowa SBDC	BAC
Lee	Donnellson		Extension	TCOM
Lee	Fort Madison	COMMUNITY ACTION OF SE IOWA	Extension	PWD
Lee	Fort Madison	Cryotech De-icing Technology	ISUE	FAC
Lee	Fort Madison	Fort Madison Chamber of Commerce	Lee County Extension	BCOM, BAC, TCOM,
Lee	Fort Madison			FAC
Lee	Fort Madison	Fort Madison Daily Democrat	Lee County Extension	TAC, OCOM, TT, BCOM
Lee	Fort Madison	Fort Madison Hospital	Lee County Extension	FAC, OCOM
Lee	Fort Madison	Fort Madison Public School District	Lee County Extension	OCOM
Lee	Fort Madison	FT MADISON HOSPITAL	Extension	PWD
Lee	Fort Madison	FT MADISON SCHOOLS	Extension	PWD
Lee	Fort Madison	Gaylord Construction, Inc.	CTRE/SUDAS	TAC
Lee	Fort Madison	Industrial Tooling and Fabrication	IPRT Company Assistance-NDE	TAC
Lee	Fort Madison	Industrial Tooling and Fabrication	College of Engineering	TAC
Lee	Fort Madison	Industrial Tooling and Fabrication	Lee County Extension	BAC, TAC, FAC
Lee	Fort Madison	Iowa Prison Industries	Lee County Extension	PWD
Lee	Fort Madison	Kensington	Extension	PWD
Lee	Fort Madison	KENTUCKY FRIED CHICKEN	Extension	TAC, FAC
Lee	Fort Madison	Matt's Bedding Plants	Lee County Extension	PWD
Lee	Fort Madison	MC DONALDS	Extension	PWD
Lee	Fort Madison	PIZZA HUT	Extension	PWD
Lee	Fort Madison	YMCA	Lee County Extension	OCOM, FAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC

Kossuth
Count

Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	TCOM
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Iowa SBDC	BAC
Lee	Fort Madison		Lee County Extension	TCOM, BCOM
Lee	Fort Madison		Lee County Extension	TCOM, BCOM
Lee	Franklin		LTAP	TCOM
Lee	Houghton		Lee County Extension	TAC, FAC, BAC
Lee				TAC, BCOM, TCOM,
Lee				FAC
Lee	Keokuk	Alliant Energy	Lee County Extension	TCOM, BCOM
Lee	Keokuk	City of Fort Madison	Lee County Extension	TCOM, BCOM
Lee	Keokuk	City of Keokuk	Lee County Extension	TAC
Lee	Keokuk	City of Keokuk	CTRE/SUDAS	BAC
Lee	Keokuk	Freedom Wood Pellets, LLC	ISUE	PWD
Lee	Keokuk	HOLY TRINITY CATHOLIC SCHOOLS	Extension	PWD
Lee	Keokuk	HY VEE	Extension	BAC, BCOM, FAC
Lee	Keokuk	Keokuk Area Convention and Tourism Bureau	Lee County Extension	BAC, BCOM, TCOM,
Lee				FAC
Lee	Keokuk	Keokuk Chamber of Commerce	Lee County Extension	TAC, TCOM, FAC,
Lee				OCOM
Lee	Keokuk	Keokuk Daily Gate City	Lee County Extension	FAC, OCOM
Lee	Keokuk	Keokuk Hospital		
Lee	Keokuk	Keokuk Housing Authority	Lee County Extension	BCOM, FAC, OCOM
Lee	Keokuk	Keokuk Main Street Program	Lee County Extension	BCOM, TCOM
Lee	Keokuk	Keokuk Public Works	Lee County Extension	TCOM, TAC
Lee	Keokuk	Keokuk Steel Casting Co	ISUE	BAC
Lee	Keokuk	Lee County Economic Development Corporation	College of Engineering	BCOM
Lee	Keokuk	Poepping, Stone, Bach Associates, Inc	CTRE/SUDAS	TAC
Lee	Keokuk	PSBA / City of Keokuk	CTRE/SUDAS	TAC
Lee	Keokuk	Richard Klusack Company	ISUE	BAC
Lee	Keokuk	RIVER HILLS VILLAGE ASSISTED LIVING	Extension	PWD
Lee	Keokuk	Roquette America Inc.	Lee County Extension	FAC
Lee	Keokuk	SALVATION ARMY	Extension	PWD
Lee	Keokuk	TC Energy	VAAP-EXT	BAC
Lee	Keokuk	TC Energy	VAAP-EXT	BAC
Lee	Keokuk	Tri-City Energy, LLC	ISUE	BAC
Lee	Keokuk	WENDYS	Extension	PWD
Lee	Keokuk		Iowa SBDC	BAC

Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Keokuk	Iowa SBDC	BAC
Lee	Lee County	Lee County Extension	TAC, FAC, BAC
Lee	Lee County	Lee County Extension	TAC, FAC
Lee	Lee County	Lee County Extension	FAC
Lee	Lee County	Lee County Extension	PWD, TAC
Lee	Lee County	Lee County Extension	OCOM
Lee	Lee County	Lee County Extension	TAC, FAC
Lee	Lee County	Lee County Extension	BCOM, TCOM, FAC
Lee	Lee County	Lee County Extension	BCOM, FAC
Lee	Lee County	Lee County Extension	FAC, BAC, TAC
Lee	Lee County	Lee County Extension	FAC, OCOM
Lee	Lee County	Lee County Extension	FAC, TAC
Lee	Lee County	Lee County Extension	TAC, FAC
Lee	Lee County	Lee County Extension	TAC, FAC
Lee	Lee County	Lee County Extension	OCOM
Lee	Lee County	Lee County Extension	TAC, FAC
Lee	Lee County	Lee County Extension	TAC, BA, FAC
Lee	Lee County	Lee County Extension	FAC, OCOM
Lee	Lee County	Lee County Extension	TAC
Lee	Lee County	Lee County Extension	BCOM, TAC, TCOM,
Lee	Lee Co	Lee County Extension	FAC
Lee	Lee Co	Lee County Extension	BCOM, OCOM, FAC
Lee	Montrose	Lee County Extension	TCOM, BCOM
Lee	Montrose	ISUE	FAC
Lee	Montrose	ISUE	BAC
Lee	Montrose	Lee County Extension	BAC, TAC, FAC
Lee	Montrose	ISUE	BAC
Lee	Montrose	Extension	PWVD
Lee	Montrose	Lee County Extension	OCOM
Lee	Montrose	Lee County Extension	BAC, BCOM
Lee	Montrose	Iowa SBDC	BAC
Lee	Montrose		
Lee	Lee County	Agri-Need (three locations)	
Lee	Lee County	Farm Service Agency	
Lee	Lee County	Farmers Markets Groups	
Lee	Lee County	Iowa Department of Agriculture Land Stewardship	
Lee	Lee County	Iowa Emergency Management	
Lee	Lee County	Iowa Woodland owners	
Lee	Lee County	Lee County Board of Supervisors	
Lee	Lee County	Lee County Economic Development	
Lee	Lee County	Lee County Fairboard	
Lee	Lee County	Lee County Farm Bureau	
Lee	Lee County	Monsanto Corporation	
Lee	Lee County	Natural Resource and Conservation Service	
Lee	Lee County	Agriculture Commodity Groups	
Lee	Lee County	FEMA	
Lee	Lee County	Integrated Energy Investment Company	
Lee	Lee County	Kathy's Pumpkin Patch Ag Tourism	
Lee	Lee County	Lee County Health Department	
Lee	Lee County	Rathbun Rural Water Association	
Lee	Lee Co	Lee County Conservation	
Lee	Lee Co	Lee County Emergency Management	
Lee	Montrose	City of Montrose	
Lee	Montrose	Integrated Energy Company	
Lee	Montrose	Integrated Energy Company	
Lee	Montrose	Iowa Corrections	
Lee	Montrose	Lee County Economic Development Group, Inc.	
Lee	Montrose	MONTROSE HEALTH CENTER	
Lee	Montrose	Montrose Senior Housing	
Lee	Montrose	The Welding Shop	
Lee	Montrose		

Lee	Saint Paul	ST PAULS EARLY CHILDHOOD CENTER	Extension	PWD
Lee	Tri-County	Iowa DNR Forestry	Lee County Extension	TAC, BCOM, TCOM,
Lee	Tri-County	Southeastern Community College	Lee County Extension	FAC
Lee	Tri-County			OCOM, FAC
Lee	Tri-State Area	KOKX Broadcasting Company	Lee County Extension	TAC, OCOM, TT, BCOM
Lee	West Point	City of West Point	Lee County Extension	TCOM, BCOM
Lee	West Point	WEST POINT CARE CENTER	Extension	PWD
Lee	Lee County	Lee County	CTRE/Natl CP Tech Center	PWD
Lee	Lee Engineers & Surveyors	Lee Engineers & Surveyors	CTRE/Natl CP Tech Center	PWD
Lee	Central Lee Community School System	Central Lee Community School System	Lee County Extension	OCOM, FAC
Lee	Hoeing's Landscape	Hoeing's Landscape	Lee County Extension	BAC, TAC
Lee	A and E Waste Management	A and E Waste Management	Lee County Extension	TAC, BAC
Lee	Keokuk Public School System	Keokuk Public School System	Lee County Extension	OCOM, FAC
Lee	YMCA	YMCA	Lee County Extension	OCOM, FAC
Lee	Montrose	Montrose	Community Economic Development	PWD
Lee	Montrose Clerk/Treasurer	Montrose Clerk/Treasurer	Community Economic Development	PWD
Lee	Montrose Council Member	Montrose Council Member	Community Economic Development	PWD
Lee	Sigourney		LTAP	TCOM
Lee	St. Paul	MN/DOT Aeronautics	Community Economic Development	PWD
Lee	West Point	Merschaman Seeds	Lee County Extension	TAC, FAC, BAC
Lee	West Point	City of West Point	Community Economic Development	PWD
Lee	Lee County Auditor's Office	Lee County Auditor's Office	Community Economic Development	PWD
Lee				TCOM, TAC, OCOM
131			129	
Linn	218 corridor	Linn and Johnson Counties	Linn County Extension	PWD
Linn	Alburnett	City of Alburnett	CTRE/SUDAS	TAC
Linn	Cedar Rapids	4 Seasons Farmers Market	Extension	PWD
Linn	Cedar Rapids	AB Transport Inc.	ISUE	BAC
Linn	Cedar Rapids	Abbe, Inc.	Johnson County Extension	PWD
Linn	Cedar Rapids	ADM	CCUR	FAC
Linn	Cedar Rapids	ADM	BEI	BAC, FAC, TAC
Linn	Cedar Rapids	ADM	CCUR	FAC
Linn	Cedar Rapids	ADM	NWRC	TAC
Linn	Cedar Rapids	Advanced Traffic Control	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Alliant Energy	BEI	BAC, FAC, TAC
Linn	Cedar Rapids	Alliant Energy	CED, IDRO	OCOM
Linn	Cedar Rapids	Alliant Energy	CSET	FAC
Linn	Cedar Rapids	Alliant Energy	College of Engineering	BCOM
Linn	Cedar Rapids	Arment, Inc.	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Anderson-Bogert Eng. & Surveyors	CTRE/Natl CP Tech Center	PWD

Linn	Cedar Rapids	Anderson-Bogert Engineers	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Apache Hose and Belting Co Inc	ISUE	BAC
Linn	Cedar Rapids	Applebee's	Extension	PWD
Linn	Cedar Rapids	Arnold Olson Associates	Johnson County Extension	PWD
Linn	Cedar Rapids	Big Brothers Big Sisters of Cedar Rapids & East	Johnson County Extension	PWD
Linn	Cedar Rapids	Central Iowa	Extension	PWD
Linn	Cedar Rapids	Brothers Catering Co	Johnson County Extension	PWD
Linn	Cedar Rapids	Catherine McAuley Center	Extension	TCOM
Linn	Cedar Rapids	Cedar Rapids	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Cedar Rapids	lowa Energy Center	TAC
Linn	Cedar Rapids	Cedar Rapids Art Center	Biotech Outreach Education Center	PWD
Linn	Cedar Rapids	Cedar Rapids Jefferson High School	Extension	TAC
Linn	Cedar Rapids	Cedar Rapids Residence Inn	CTRE/SUDAS	PWD
Linn	Cedar Rapids	Cedar Rapids Water Dept	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Cedar Rapids-Kirkwood Community College	Veterinary Pathology	OCOM
Linn	Cedar Rapids	Emergency Shelter	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Chamness Technology	Extension	PWD
Linn	Cedar Rapids	Chili's Grill & Bar of Cedar Rapids	CTRE/SUDAS	TAC
Linn	Cedar Rapids	City of Cedar Rapids	CTRE/SUDAS	PWD
Linn	Cedar Rapids	City of Cedar Rapids	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	City of Cedar Rapids	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	City of Cedar Rapids	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	City Wide Construction	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Clipper Wind Turbine	ABE/Safety Training Instruction and Research	TAC
Linn	Cedar Rapids	Clipper Wind Turbine	ABE/Safety Training Instruction and Research	TAC
Linn	Cedar Rapids	Clipper Windpower, Inc.	IPRT Company Assistance-NDE	TAC
Linn	Cedar Rapids	Clipper Windpower, Inc.	IPRT Company Assistance-NDE	TAC
Linn	Cedar Rapids	Construction Materials, Inc.	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Construction Materials, Inc.	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	Construction Materials, Inc.	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	Creative Host	Extension	PWD
Linn	Cedar Rapids	CV Rockwell Collins	Extension	PWD
Linn	Cedar Rapids	Dave Schmitt Construction Co., Inc.	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Design Engineers, P.C.	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Dickey's Barbeque Pit	Extension	PWD
Linn	Cedar Rapids	Distance Education Students	Brenton Center	PWD
Linn	Cedar Rapids	East Central IA Council of Governments	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Economic development groups	ReCAP	BCOM
Linn	Cedar Rapids	Element 1 Systems	OIPTT	BAC
Linn	Cedar Rapids	Energy Workshops Event in Linn County	ISUE	TAC
Linn	Cedar Rapids	Engineering Alliance Inc	CTRE/SUDAS	TAC
Linn	Cedar Rapids	F & E Paving Co.	CTRE/SUDAS	TAC

Linn	Cedar Rapids	Fumigation Service & Supply	Seed Science Center	PWD
Linn	Cedar Rapids	Genencor	CCUR	TT, TAC, FAC
Linn	Cedar Rapids	Genencor	CCUR	TT, TAC, FAC
Linn	Cedar Rapids	General Mills, Inc.	IPRT Company Assistance-Technology Commercialization	TAC
Linn	Cedar Rapids	Hamburger Mary's	Extension	PWD
Linn	Cedar Rapids	Happle's Organics	Meat Science Extension	BAC
Linn	Cedar Rapids	Horizons	Extension	PWD
Linn	Cedar Rapids	Howard R. Green Co.	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	Howard R. Green Company	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Howard R. Green Company	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	HR Green	CTRE/ Natl CP Tech-Geotechnical	PWD
Linn	Cedar Rapids	Hy-Vee	NWRC - Gut Health Symposium	FAC
Linn	Cedar Rapids	IDOT-Cedar Rapids Field Office	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	Indian Creek Nature Center	Iowa Energy Center	TAC
Linn	Cedar Rapids	Institute of Electrical & Electronics Engineers	Iowa Energy Center	TAC
Linn	Cedar Rapids	Intersource	ISUE	BAC
Linn	Cedar Rapids	Iowa Academy of Science Conference(Cedar Rapids)	Biotech Outreach Education Center	TAC
Linn	Cedar Rapids	Iowa DOT	CTRE/SUDAS	FAC
Linn	Cedar Rapids	iPrism	CSET	BAC
Linn	Cedar Rapids	J-Tec Associates	OIPPT	BAC
Linn	Cedar Rapids	Justice Electric	ISUE	PWD
Linn	Cedar Rapids	Linn County	CTRE/Natl CP Tech Center	TAC
Linn	Cedar Rapids	Linn County Regional Plan. Commission	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Metropolitan Planning Organization	ITSDS	TAC
Linn	Cedar Rapids	Mike Hessman, Cedar Rapids, AFE Chapter	Iowa Energy Center	FAC
Linn	Cedar Rapids	Museum & Cultural Center, Cedar Rapids, IA	Biotech Outreach Education Center	TAC
Linn	Cedar Rapids	Nexerciser Inc.	ISUE	PWD
Linn	Cedar Rapids	On-line student	Ag & Biosystems Engineering/BRT	PWD
Linn	Cedar Rapids	On-line student	Ag & Biosystems Engineering/BRT	PWD
Linn	Cedar Rapids	Penford Products Company	CCUR	TAC
Linn	Cedar Rapids	Penford Products Company	CCUR	TAC
Linn	Cedar Rapids	Pickwick Manufacturing Svcs	ISUE	TAC
Linn	Cedar Rapids	Plains Justice	Johnson County Extension	PWD
Linn	Cedar Rapids	Prairie Woods	Johnson County Extension	PWD
Linn	Cedar Rapids	Rockwell Collins	Engineering Distance Education	PWD
Linn	Cedar Rapids	Rockwell Collins Inc - Cedar Rapids	ISUE	BAC
Linn	Cedar Rapids	Schnoor-Bonifazi Engineering & Surveying	CTRE/SUDAS	TAC
Linn	Cedar Rapids	Security Coverage, Inc.	OIPPT	FAC
Linn	Cedar Rapids	Shive Hattery Inc.	CTRE/Natl CP Tech Center	PWD
Linn	Cedar Rapids	Shive-Hattery, Inc.	CTRE/SUDAS	TAC

Linn	Central City	City of Central City -	Community Economic Development	PWD
Linn	Ely	City of Ely	Community Economic Development	BCOM
Linn	Ely	City of Ely P & Z	Community Economic Development	PWD
Linn	Fairfax	City of Fairfax, P&Z Board	Community Economic Development	PWD
Linn	Hiawatha	City of Hiawatha	Community Economic Development	PWD
Linn	Hiawatha	City of Hiawatha Water Department	Community Economic Development	PWD
Linn	Lisbon	City of Lisbon	Community Economic Development	PWD
Linn	Marion	City of Marion	Community Economic Development	PWD
Linn	Marion	City of Marion	Community Economic Development	PWD
Linn	Palo	City of Palo - City Adm.	Community Economic Development	TCOM
Linn	Springville	City of Springville	Community Economic Development	PWD
Linn		Linn County Auditor's Office	Community Economic Development	PWD
Linn		Linn County, Planning & Zoning Comm.	Community Economic Development	PWD
Linn			Community Economic Development	BCOM, OCOM
Linn			Community Economic Development	TCOM
361				
Louisa	Columbus	Columbus High School		PWD
Louisa	Columbus Junction	Civic Society	Louisa County Extension	OCOM
Louisa	Columbus Junction	CJ Community Club	Louisa County Extension	FAC
Louisa	Columbus Junction	COLUMBUS JCT COMMUNITY SCHOOLS	Extension	PWD
Louisa	Columbus Junction	Columbus School District	Louisa County Extension-University Professor	PWD
Louisa	Columbus Junction	Community Health Center	Louisa County Extension	OCOM
Louisa	Columbus Junction	Distance Education Students	Brenton Center	PWD
Louisa	Columbus Junction	IA Quality Agriculture Guild	Southeast Research Farm, ISU	FAC
Louisa	Columbus Junction	Latino Food Businesses/Meat Producers	Professional Development/Latino Food Sys.	FAC
Louisa	Columbus Junction	Louisa Fair Board	Louisa County Extension	OCOM
Louisa	Columbus Junction	Tri Rivers Foundation	Louisa County Extension	FAC
Louisa	Columbus Junction		Iowa SBDC	BAC
Louisa	Cotter	Dairy Investment Group/Eastern Iowa REC	Louisa County Extension	BAC
Louisa	Entire County	Conservation Board	Louisa County Extension	OCOM
Louisa	Entire County	Emergency Management Agency	Louisa County Extension	BCOM
Louisa	Entire County	Louisa Inter-Agency	Louisa County Extension	FAC
Louisa	Morning Sun	American Legion	Louisa County Extension	OCOM
Louisa	Morning Sun	Boy Scout Troop 69	Louisa County Extension	OCOM
Louisa	Morning Sun	Community Betterment	Louisa County Extension	FAC
Louisa	Morning Sun	Lioness	Louisa County Extension	OCOM
Louisa	Morning Sun	Lions/4th of July Committee	Louisa County Extension	OCOM
Louisa	Morning Sun	Mellinger Memorial Library	Louisa County Extension	OCOM
Louisa	Morning Sun	Morning Sun Development	Louisa County Extension	BCOM
Louisa	Morning Sun	Morning Sun Horizons	Louisa County Extension	BCOM
Louisa	Morning Sun		Extension	BCOM

Louisa	Morning Sun	Morning Sun Market	Horizons - Louisa County Extension	BAC
Louisa	Morning Sun	United Methodist Church	Louisa County Extension	OCOM
Louisa	Oakville	1000 Friends of Iowa	Louisa County Extension	BCOM
Louisa	Oakville	Community Foundation of Great River Bend	Louisa County Extension	FAC
Louisa	Oakville		Louisa SBDC	BAC
Louisa	Wapello	Entire County -- Master Gardeners	Louisa County Extension/Master Gardener	PWD
Louisa	Wapello	Grimm Brothers Plastics Corp	ISUE	TAC
Louisa	Wapello	Kiwanis	Louisa County Extension	FAC
Louisa	Wapello	Louisa 4-H Foundation	Louisa County Extension	FAC
Louisa	Wapello	Louisa County	CTRE/Natl CP Tech Center	PWD
Louisa	Wapello	Southeastern Community College	Louisa County Extension/SCC	PWD
Louisa	Wapello	Superior Tooling Inc.	ISUE	BAC
Louisa	Wapello	Wapello Community Club	Louisa County Extension	FAC
Louisa	Wapello	WAPELLO COMMUNITY SCHOOLS	Extension	PWD
Louisa	Wapello	Wapello High School	Louisa County Extension	OCOM
Louisa	Wapello	Wapello PTO	Louisa County Extension	OCOM
Louisa	Wapello		Iowa SBDC	BAC
Louisa	Wapello		Iowa SBDC	BAC
Louisa	Wapello		Iowa SBDC	BAC
Louisa	Wapello		Iowa SBDC	BAC
Louisa	Wapello		Iowa SBDC	BAC
Louisa	Wapello		Iowa SBDC	BAC
Louisa	Morning Sun	City of Morning Sun	Community Economic Development	TCOM
Louisa	Morning Sun	City of Morning Sun - City Clerk	Community Economic Development	PWD, FAC, BCOM
Louisa	Wapello	City of Wapello - City Clerk	Community Economic Development	PWD
Louisa	Wapello	Louisa County	CTRE/Natl CP Tech Center	PWD
Louisa	50			
Lucas	Chariton	Chariton - Horizons Project	Families	OCOM
Lucas	Chariton	Chariton Comm School	McNay Research Farm, ISU	OCOM
Lucas	Chariton	Chariton Horizons	Extension	BCOM
Lucas	Chariton	Chariton Valley Beef	ISUE	BAC
Lucas	Chariton	City of Chariton	CTRE/SUDAS	TAC
Lucas	Chariton	Facilitation Event in Lucas County	ISUE	FAC
Lucas	Chariton		Iowa SBDC	BAC
Lucas	Chariton		Iowa SBDC	BAC
Lucas	Chariton			TCOM
Lucas	Chariton	Chariton High School	Agricultural Education and Studies	OCOM
Lucas	Chariton	City of Chariton	Community Economic Development	PWD
Lucas	Chariton	City of Chariton	Community Economic Development	FAC
Lucas	Chariton	City of Chariton - City Clerk	Community Economic Development	PWD
Lucas	Chariton	Lucas County	CTRE/Natl CP Tech Center	PWD

Madison	Winterset High School	Biotech Outreach Education Center	TCOM
Madison	Winterset	Iowa SBDC	BAC
Madison	Winterset	Iowa SBDC	BAC
Madison	Winterset	Biotech Outreach Education Center	PWD
Madison	Winterset	Community Economic Development	PWD
Madison	Winterset	Community Economic Development	PWD
Madison	Winterset	Community Economic Development	PWD
Madison	Winterset	Community Economic Development	PWD
Madison	Winterset	Community Economic Development	PWD, TT
Madison	Winterset	Community Economic Development	PWD, TT

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**Madison
Count**

Mahaska	Barnes City	Iowa SBDC	BAC
Mahaska	Fremont	Human Development and Family Studies	PWD
Mahaska	Fremont	Iowa SBDC	BAC
Mahaska	Leighton	Meat Science Extension	BAC
Mahaska	Leighton	Meat Science Extension	PWD
Mahaska	Leighton	LA, CRP, IDRO	PWD
Mahaska	New Sharon	Iowa SBDC	BAC
Mahaska	New Sharon	Iowa SBDC	BAC
Mahaska	New Sharon	Extension	PWD
Mahaska	Oskaloosa	IPRT Company Assistance-Materials	TAC
Mahaska	Oskaloosa	Human Development and Family Studies	PWD
Mahaska	Oskaloosa	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	CTRE/Natl CP Tech Center	PWD
Mahaska	Oskaloosa	CTRE/Natl CP Tech Center	PWD
Mahaska	Oskaloosa	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	Brenton Center	PWD
Mahaska	Oskaloosa	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	CTRE/Natl CP Tech Center	PWD
Mahaska	Oskaloosa	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	Extension	PWD
Mahaska	Oskaloosa	CTRE/Natl CP Tech Center	PWD
Mahaska	Oskaloosa	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	CTRE/Natl CP Tech Center	PWD
Mahaska	Oskaloosa	ISU Extension Mahaska County	FAC
Mahaska	Oskaloosa	ISU Extension Mahaska County	FAC
Mahaska	Oskaloosa	Communities	OCOM
Mahaska	Oskaloosa	CTRE/Natl CP Tech Center	PWD
Mahaska	Oskaloosa	Extension	PWD

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**Madison
Count**

Winterset	Winterset High School	Biotech Outreach Education Center	TCOM
Winterset	Winterset	Iowa SBDC	BAC
Winterset	Winterset	Iowa SBDC	BAC
Winterset	Winterset	Biotech Outreach Education Center	PWD
Winterset	Winterset	Community Economic Development	PWD
Winterset	Winterset	Community Economic Development	PWD
Winterset	Winterset	Community Economic Development	PWD
Winterset	Winterset	Community Economic Development	PWD
Winterset	Winterset	Community Economic Development	PWD, TT
Winterset	Winterset	Community Economic Development	PWD, TT

Mahaska	Oskaloosa	Musco Sports Lighting	Engineering Distance Education	PWD
Mahaska	Oskaloosa	Oskaloosa Community Schools	Extension	PWD
Mahaska	Oskaloosa	Partners Construction Services	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	Peek-a-Boo Child Care Center	Human Development and Family Studies	PWD
Mahaska	Oskaloosa	Spaghetti's - Oskaloosa	Extension	PWD
Mahaska	Oskaloosa	Spaghetti's - Oskaloosa2	Extension	PWD
Mahaska	Oskaloosa	Subsurface Construction, Inc.	CTRE/SUDAS	TAC
Mahaska	Oskaloosa	Taco John's - Oskaloosa	Extension	PWD
Mahaska	Oskaloosa		Iowa SBDC	BAC
Mahaska	Oskaloosa		Iowa SBDC	BAC
Mahaska	Oskaloosa		Iowa SBDC	BAC
Mahaska	Oskaloosa		Iowa SBDC	BAC
Mahaska	Oskaloosa		TCOM	TCOM
Mahaska	Rose Hill	Distance Education Students	Brenton Center	PWD
Mahaska	University Park	Kids' Corner Child Care Center	Human Development and Family Studies	PWD
Mahaska				TCOM
Mahaska	New Sharon	City of New Sharon	Community Economic Development	PWD
Mahaska	Oskaloosa	Papa Murphy's	Extension	PWD
Mahaska		Mahaska County	CTRE/Natl CP Tech Center	PWD
Mahaska		Mahaska County Auditor's Office	Community Economic Development	PWD
Mahaska			Community Economic Development	PWD
Mahaska				BCOM, OCOM

Mahaska 50
Count

Marion	Bussey	Southern Iowa Asphalt, Inc.	CTRE/SUDAS	TAC
Marion	Hamilton	Distance Education Students	Brenton Center	PWD
Marion	Hamilton		Iowa SBDC	BAC
Marion	Knoxville	-Monona Co.		TCOM
Marion	Knoxville	Abie C. Davis P.E. & L.S.	CTRE/SUDAS	TAC
Marion	Knoxville	Bruening Rock Products	CTRE/SUDAS	TAC
Marion	Knoxville	City of Knoxville	CTRE/SUDAS	TAC
Marion	Knoxville	City of Knoxville	CTRE/Natl CP Tech Center	PWD
Marion	Knoxville	Davis Excavation	CTRE/SUDAS	TAC
Marion	Knoxville	Distance Education Students	Brenton Center	PWD
Marion	Knoxville	Kieth Davis	CTRE/SUDAS	TAC
Marion	Knoxville	Knoxville Federated Garden Club	Natural Resource Ecology and Management	OCOM
Marion	Knoxville	Marion Co. Secondary Roads	CTRE/Natl CP Tech Center	PWD
Marion	Knoxville	Marion County	CTRE/SUDAS	TAC
Marion	Knoxville	Marion County Road Dept.	CTRE/Natl CP Tech Center	PWD
Marion	Knoxville	Park Lane Village	Extension	PWD
Marion	Knoxville	VA Central Iowa - Knoxville	Extension	PWD
Marion	Knoxville	Verista Imaging	IPRT Company Assistance-Materials	TAC
Marion	Knoxville	Verista Imaging Inc	ISUE	TAC

Marion	Knoxville	Iowa SBDC	BAC
Marion	Knoxville	Iowa SBDC	BAC
Marion	Knoxville	LTAP	TCOM
Marion	Knoxville	Extension	TCOM
Marion	Pella	CTRE/SUDAS	PWD
Marion	Pella	Extension	TAC
Marion	Pella	Environment Rating Scale Assessment Project -- HD FS	FAC
Marion	Pella	OIPTT	TAC
Marion	Pella	CTRE/SUDAS	PWD
Marion	Pella	Meat Science Extension	TAC
Marion	Pella	CTRE/SUDAS	PWD
Marion	Pella	Extension	PWD
Marion	Pella	IPRT Company Assistance-Technology Commercialization	TAC
Marion	Pella	Extension	PWD
Marion	Pella	CTRE/SUDAS	TAC
Marion	Pella	Ag & Biosystems Engineering	BAC
Marion	Pella	Ag & Biosystems Engineering	BAC
Marion	Pella	MPC	TAC
Marion	Pella	Engineering Distance Education	PWD
Marion	Pella	Natural Resource Ecology and Management	TAC
Marion	Pella	CTRE/SUDAS	TAC
Marion	Pella	ISUE	TAC
Marion	Pella	ISUE	TAC
Marion	Pella	ISUE	BAC
Marion	Pella	ISUE	TAC
Marion	Pella	ISUE	TAC
Marion	Pella	ISUE	TAC
Marion	Pella	ISUE	BAC
Marion	Pella	CTRE/SUDAS	TAC
Marion	Pella	ISUE	TAC
Marion	Pella	ISUE	BAC
Marion	Pella	Extension	PWD
Marion	Pella	Ag & Biosystems Engineering and CIRAS	TAC
Marion	Pella	Ag & Biosystems Engineering and CIRAS	TAC
Marion	Pella	ISUE	TAC
Marion	Pella	ISUE	TAC
Marion	Pella	BEI	BAC, FAC, TAC
Marion	Pella	Ag & Biosystems Engineering	BAC
Marion	Pella	ABE/Safety Training Instruction and Research	TAC
Marion	Pella	Iowa Energy Center	BCOM
Marion	Central College		
Marion	City of Pella		
Marion	Creation Station Christian Preschool		
Marion	Fleener Manufacturing		
Marion	Hooyer Construction, Inc.		
Marion	In't Velds Meat Market		
Marion	Larry Peterson		
Marion	Papa Murphy's - Pella		
Marion	Pella		
Marion	Pella Christian School		
Marion	Pella Concrete Contractors Inc.		
Marion	Pella Corp.		
Marion	Pella Corp.		
Marion	Pella Corporation		
Marion	Pella Corporation		
Marion	Pella Corporation		
Marion	Pella Machine Inc		
Marion	Pella Machine Inc		
Marion	Pella Machine Inc		
Marion	Pella Supply and Metal Fabrication		
Marion	Pella Supply and Metal Fabrication		
Marion	Pella Supply and Metal Fabrication		
Marion	Pella Supply and Metal Fabrication		
Marion	TK Concrete, Inc.		
Marion	Ulrich Meat Market		
Marion	Ulrich Meat Market		
Marion	Unicorn's		
Marion	Van Gorp		
Marion	Van Gorp		
Marion	Van Gorp Corp		
Marion	Van Gorp Corp		
Marion	Vermeer		
Marion	Vermeer		
Marion	Vermeer		
Marion	Vermeer		

Marshall	Marshalltown	Chamber of Commerce	Marshall County ISU Extension	BCOM
Marshall	Marshalltown	Child Care Providers	Extension	PWD
Marshall	Marshalltown	City of Marshalltown	CTRE/SUDAS	TAC
Marshall	Marshalltown	City of Marshalltown	CTRE/Natl CP Tech Center	PWD
Marshall	Marshalltown	Clapsaddle-Garber Associates, Inc.	CTRE/SUDAS	TAC
Marshall	Marshalltown	Clapsaddle-Garber Associates, Inc.	CTRE/Natl CP Tech Center	PWD
Marshall	Marshalltown	Culver's of Marshalltown	Extension	PWD
Marshall	Marshalltown	Distance Education Students	Brenton Center	PWD
Marshall	Marshalltown	Emerson Process Management	Engineering Distance Education	PWD
Marshall	Marshalltown	Fakespace Systems, Inc.	ISUE	TAC
Marshall	Marshalltown	Family Development Professionals	Marshall County ISU Extension-ISU Ext. Families	PWD
Marshall	Marshalltown	Family support workers from community action agencies in Iowa		
Marshall	Marshalltown	Fisher Controls	Extension	PWD
Marshall	Marshalltown	Fisher Controls	CNDE	TAC
Marshall	Marshalltown	Fisher Controls International, Inc.	College of Engineering	BCOM
Marshall	Marshalltown	Glenwood Place	IPRT Company Assistance-NDE	TAC
Marshall	Marshalltown	Hardee's	Extension	PWD
Marshall	Marshalltown	Interface Sealing	Extension	PWD
Marshall	Marshalltown	Interface Sealing	Ag & Biosystems Engineering and CIRAS	TAC
Marshall	Marshalltown	InterFace Sealing Solutions	Ag & Biosystems Engineering and CIRAS	TAC
Marshall	Marshalltown	Iowa DOT	ISUE	TAC
Marshall	Marshalltown	JBS Swift and Company	CTRE/Natl CP Tech Center	PWD
Marshall	Marshalltown	Karla Haigh (Family Child Care Provider)	NWRC Sensory Evaluation Unit	TAC
Marshall	Marshalltown	Lennox Manufacturing	Environment Rating Scale Assessment Project -- HD FS	TAC
Marshall	Marshalltown	Lennox Manufacturing	ISUE	TAC
Marshall	Marshalltown	Lighten Up Iowa-Public Health, Many businesses	ISUE	TAC
Marshall	Marshalltown		Extension	PWD
Marshall	Marshalltown	Marshall County Economic Development Corporation	College of Engineering	BCOM
Marshall	Marshalltown	Marshall County Empowerment	Human Development and Family Studies	PWD
Marshall	Marshalltown	Marshall County Engineer	CTRE/SUDAS	TAC
Marshall	Marshalltown	Marshalltown High School	Biotech Outreach Education Center	PWD
Marshall	Marshalltown	Mycogen Seed	Seed Science Center	PWD
Marshall	Marshalltown	Ottile Seed	Seed Science Center	PWD
Marshall	Marshalltown	Regional Six Planning Commission	CTRE/SUDAS	TAC
Marshall	Marshalltown	TSP Inc.	CTRE/SUDAS	TAC
Marshall	Marshalltown	Weiker Construction Company, Inc.	CTRE/SUDAS	TAC
Marshall	Marshalltown		Iowa SBDC	BAC
Marshall	Marshalltown		Iowa SBDC	BAC
Marshall	Marshalltown		Iowa SBDC	BAC
Marshall	Marshalltown		Iowa SBDC	BAC

Mills	Malvern	Feed Energy	Iowa SBDC	BAC
Mills	Pacific Junction	Feed Energy	ABE/Safety Training Instruction and Research	TAC
Mills	Pacific Junction	Feed Energy	ABE/Safety Training Instruction and Research	TAC
Mills	Pacific Junction	Feed Energy Company--Des Moines based	Fremont Co. Extension	FAC, BAC
Mills	Pacific Junction			TCOM
Mills		County Wide	Extension	OCOM
Mills		Glenwood/ Mills County Econ. Dev. Bd.	Shery Ford/ Mills Co. Ext.	FAC
Mills		Health Conference	Shery Ford/ Mills Co. Ext.	OCOM
Mills		Mills County Extension Office	Interior Design	TAC
Mills	Emerson	City of Emerson - City Clerk	Community Economic Development	PWD
Mills	Glenwood	City of Glenwood	Community Economic Development	TAC
Mills	Glenwood	Entrepreneurship Team	Shery Ford/ Mills Co. Ext.	OCOM
Mills	Glenwood	IDED Downtown Assessment	Shery Ford/ Mills Co. Ext.	OCOM
Mills	Hastings	City of Hastings - City Clerk	Community Economic Development	PWD
Mills	Malvern	Community Event	Shery Ford/ Mills Co. Ext.	OCOM
Mills	Silver City	City of Silver City	Community Economic Development	PWD
Mills		Mills County Auditor's Office	Community Economic Development	PWD
Mills			Community Economic Development	BCOM, FAC
Mills		Mills County	Community Economic Development	PWD

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Mills
Count

Mitchell	Osage	Chasity Huber	EHS Project - HD FS	PWD
Mitchell	Osage	City of Osage	CTRE/Natl CP Tech Center	PWD
Mitchell	Osage	Distance Education Students	Brenton Center	TAC
Mitchell	Osage	Fox River Mills Inc	ISUE	TAC
Mitchell	Osage	Fox River Mills Inc	ISUE	TAC
Mitchell	Osage	Fox River Mills Inc	ISUE	TAC
Mitchell	Osage	S & S Locker	Meat Science Extension	PWD
Mitchell	Osage	S & S Locker	Meat Science Extension	BAC
Mitchell	Osage		Iowa SBDC	BAC
Mitchell	Osage		Iowa SBDC	BAC
Mitchell	Osage		Iowa SBDC	BAC
Mitchell	Osage		Iowa SBDC	BAC
Mitchell	Osage		Iowa SBDC	BAC
Mitchell	Osage		Iowa SBDC	BAC
Mitchell	Osage		Iowa SBDC	BAC
Mitchell	Riceville	County Line Locker	Meat Science Extension	BAC
Mitchell	Riceville	County Line Locker	Meat Science Extension	PWD
Mitchell	Riceville	Homeland Energy Solutions	ISUE	BAC
Mitchell	Riceville	Riceville Family Care and Therapy Center	Extension	PWD
Mitchell	Riceville	Riceville Refrigerated Lockers	NCRCRD w/ CIRAS and ISU Meat Lab	BAC
Mitchell	Riceville	Riceville Refrigerated Lockers	NCRCRD w/ CIRAS and ISU Meat Lab	BAC

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Monona Count 34

Albia Lumber Company
 Chariton Valley Council of Governments
 Monroe County

County Engineer
 Monroe County
 Sheriff's Office
 City of Albia
 Albia
 Albia
 Albia Community School District
 Monroe Co. Zoning Admin.
 Monroe County Auditors Office

Albia
 Albia
 Albia
 Albia

Red Oak
 Red Oak
 Red Oak

Red Oak
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 Red Oak
 Red Oak
 Red Oak
 Red Oak
 Stanton
 Stanton
 Villisca
 Grant

Community Economic Development
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Natural Resource Ecology and Management
 College of Engineering
 CTRE/SUDAS
 Iowa SBDC
 Iowa SBDC

LTAP
 LTAP
 LTAP
 ITSDS
 CTRE/Natl CP Tech Center
 ITSDS
 Community Economic Development
 Communities
 Communities
 Families
 Community Economic Development
 Community Economic Development
 Community Economic Development

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Monroe Count 19

Extension
 ISSUE
 CTRE/SUDAS

IPRT Company Assistance-Technology Commercialization
 Montgomery County Extension
 Montgomery County Extension
 Montgomery County Extension
 Montgomery County Extension
 CTRE/SUDAS
 College of Engineering
 Iowa SBDC
 Iowa SBDC
 Iowa SBDC
 Iowa SBDC
 Agricultural Management Lab, ABE
 Extension
 Community Economic Development

BCOM, PWD

TAC
 BCOM
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 PWD
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 BCOM, TCOM

Montgomery
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PWD
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FAC
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 TAC, TT
 OCOM
 PWD

Montgomery Red Oak
 Montgomery Stanton
 Montgomery Villisca
 Montgomery County Auditor's Office
 Montgomery
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City of Red Oak
 City of Stanton
 City of Villisca
 Montgomery County Auditor's Office
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FAC, TAC, PWD
 BCOM, PWD
 PWD
 PWD
 TCOM, TAC, BCOM

Montgomery County

Muscatine Fruitland
 Muscatine Allsteel
 Muscatine City of Muscatine
 Muscatine City of Muscatine
 Muscatine Distance Education Students
 Muscatine Grain Processing Corp.
 Muscatine Grain Processing Corp.
 Muscatine Grain Processing Corporation
 Muscatine Grain Processing Corporation
 Muscatine Grain Processing Corporation
 Muscatine Grain Processing Corporation
 Muscatine Grain Processing Corporation
 Muscatine Grain Processing Corporation
 Muscatine Grain Processing Corporation
 Muscatine Grain Processing Corporation
 Muscatine Greater Muscatine Chamber of Commerce and Industry
 Muscatine Heartland Renewable Energy
 Muscatine HNI Technologies, Inc
 Muscatine HNI Technologies, Inc
 Muscatine HNI, Inc.
 Muscatine HNI, Inc.
 Muscatine Leadership Muscatine
 Muscatine Martin & Whitacre Surveyors & Engineers, Inc.
 Muscatine McKee Button Company
 Muscatine McKee Button Company
 Muscatine McKee Surfaces
 Muscatine McKee Surfaces
 Muscatine McKee Surfaces
 Muscatine McKee Surfaces
 Muscatine McKee Surfaces
 Muscatine McKee Surfaces
 Muscatine Muscatine
 Muscatine Muscatine Chamber of Commerce

CTRE/SUDAS
 Engineering Distance Education
 CTRE/SUDAS
 CTRE/Natl CP Tech Center
 Brenton Center
 NWRC
 NWRC
 CCUR
 CCUR
 NWRC - Gut Health Symposium
 NWRC/FSHN
 BEI
 BEI
 CCUR
 CCAT
 OIPTT
 Muscatine Island Research Farm, ISU
 IPRT Company Assistance-NDE
 IPRT Company Assistance-NDE
 CCUR
 CCUR
 Muscatine County Extension
 CTRE/SUDAS
 IPRT Company Assistance-NDE
 IPRT Company Assistance-Technology Commercialization
 CCUR
 ISUE
 ISUE
 ISUE
 ISUE
 CCUR
 Muscatine County Extension
 ReCAP

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Community Economic Development
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Community Economic Development
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Community Economic Development
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Palo Alto	Emmetsburg	Skyjack Corporation	College of Engineering	BAC
Palo Alto	Emmetsburg	Skyjack Inc.	ISUE	TAC
Palo Alto	Emmetsburg		Iowa SBDC	BAC
Palo Alto	Emmetsburg			TCOM
Palo Alto	Emmetsburg			TCOM
Palo Alto	Graettinger	Shaver Manufacturing Co Inc	ISUE	TAC
Palo Alto	Graettinger			TCOM
Palo Alto	Mallard			TCOM
Palo Alto	Ruthven	Distance Education Students	Brenton Center	PWD
Palo Alto	Ruthven	Farmers Corrugated Solutions	ISUE	TAC
Palo Alto	Ruthven	Ruthven Meat Processing	Meat Science Extension	PWD
Palo Alto	Ruthven	Ruthven Meat Processing	Meat Science Extension	BAC
Palo Alto	Ruthven	Ruthven Meat Processing	Meat Science Extension	PWD
Palo Alto	Ruthven		Iowa SBDC	BAC
Palo Alto	Ruthven			TCOM
Palo Alto	West Bend	-Poweshiek Co.		TCOM
Palo Alto	West Bend	Skogland Meats & Lockers	Meat Science Extension	PWD
Palo Alto	West Bend		Iowa SBDC	BAC
Palo Alto	West Bend		Iowa SBDC	BAC
Palo Alto	West Bend			TCOM
Palo Alto	Emmetsburg	Palo County Auditor's Office	Community Economic Development	PWD
Palo Alto	Ruthven	City of Ruthven	Community Economic Development	PWD
Palo Alto		Palo Alto Co. Board of Supervisors	CTRE/Natl CP Tech Center	PWD
Palo Alto		Palo Alto County	CTRE/Natl CP Tech Center	PWD
Palo Alto			Community Economic Development	FAC

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Palo Alto
Count

Plymouth	Lemars	City of Le Mars	CTRE/SUDAS	TAC
Plymouth	Akron		Iowa SBDC	BAC
Plymouth	Akron		Iowa SBDC	BAC
Plymouth	Hinton		Iowa SBDC	BAC
Plymouth	Kingsley	Idlewild Components	ISUE	BAC
Plymouth	Kingsley		Iowa SBDC	BAC
Plymouth	Kingsley		Iowa SBDC	BAC
Plymouth	Le Mars			TCOM
Plymouth	Le Mars	-Story Co.	Extension	PWD
Plymouth	Le Mars	American Bank	CTRE/Natl CP Tech Center	PWD
Plymouth	Le Mars	City of Le Mars	Extension	PWD
Plymouth	Le Mars	Community of Le Mars	Brenton Center	PWD
Plymouth	Le Mars	Distance Education Students	ISUE	BAC
Plymouth	Le Mars	Drico Products Inc.	Extension	BAC
Plymouth	Le Mars	Family Child Care Home		

Polk	Altoona	Court Yard Estates of Altoona	Extension	PWD
Polk	Altoona	Culver's of Altoona	Extension	PWD
Polk	Altoona	Distance Education Students	Brenton Center	PWD
Polk	Altoona	Grandma Max's	Extension	PWD
Polk	Altoona	Kelly Ethell (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Polk	Altoona	Kids Connection Preschool	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Altoona	Prairie Meadows	Extension	PWD
Polk	Altoona	small IA food processors and produce handlers	FSHN-Wilson	PWD
Polk	Altoona	small IA food processors and produce handlers	FSHN-Wilson	PWD
Polk	Altoona	Windsor Windows and Doors	Engineering Distance Education	PWD
Polk	Altoona	Ziegler Inc.	CTRE/Natl CP Tech Center	PWD
Polk	Altoona		lowa SBDC	BAC
Polk	Altoona		lowa SBDC	BAC
Polk	Altoona		lowa SBDC	BAC
Polk	Altoona		lowa SBDC	BAC
Polk	Altoona		lowa SBDC	BAC
Polk	Altoona		lowa SBDC	BAC
Polk	Altoona		lowa SBDC	BAC
Polk	Altoona		lowa SBDC	BAC
Polk	Ankeny	Ankeny Economic Development Corporation	College of Engineering	TCOM
Polk	Ankeny	Ankeny Public Library	Extension	BCOM
Polk	Ankeny	Ankeny School District	lowa Energy Center	OCOM
Polk	Ankeny	Ankeny School system	Biotech Outreach Education Center	OCOM
Polk	Ankeny	Apple Tree	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Ankeny	Apple Tree Children's Center	Human Development and Family Studies	PWD
Polk	Ankeny	Applebee's of Ankeny	Extension	TAC
Polk	Ankeny	ASHRAE Technical Session	lowa Energy Center	PWD
Polk	Ankeny	BASF Admixtures	CTRE/Natl CP Tech Center	PWD
Polk	Ankeny	BASF Plant Sciences	Seed Science Center	BAC
Polk	Ankeny	Bill Lofquist	ISUE	TAC
Polk	Ankeny	Carpenter Erosion Control	CTRE/SUDAS	PWD
Polk	Ankeny	Chili's Grill & Bar of Ankeny	Extension	BCOM
Polk	Ankeny	City of Ankeny	CRP	BCOM
Polk	Ankeny	City of Ankeny	College of Engineering	TAC
Polk	Ankeny	City of Ankeny	CTRE/SUDAS	BCOM
Polk	Ankeny	City of Ankeny	CTRE/Natl CP Tech Center	TAC
Polk	Ankeny	City of Ankeny	CTRE/Natl CP Tech Center	PWD
Polk	Ankeny	City of Ankeny	CTRE/Natl CP Tech Center	PWD
Polk	Ankeny	City of Colfax - Snyder	CTRE/SUDAS	TAC
Polk	Ankeny	Construction Products Inc.	Engineering Distance Education	PWD

Polk	Ankeny	Courtyard by Marriott - Ankeny	Extension	PWD
Polk	Ankeny	CPMI	CTRE/SUDAS	TAC
Polk	Ankeny	Creative Composites	CCUR	FAC
Polk	Ankeny	Creative Composites	Ag & Biosystems Engineering	BAC
Polk	Ankeny	Creative Composites	CCUR	FAC
Polk	Ankeny	Creative Composites	Ag & Biosystems Engineering	BAC
Polk	Ankeny	Culver's of Ankeny	Extension	PWD
Polk	Ankeny	Des Moines Area Community College	Human Development and Family Studies	PWD
Polk	Ankeny	Dice	Engineering Distance Education	PWD
Polk	Ankeny	Distance Education Students	Brenton Center	PWD
Polk	Ankeny	DMACC Business Office employees tour	Iowa Energy Center	TAC
Polk	Ankeny	DMACC HVAC-R students	Iowa Energy Center	OCOM
Polk	Ankeny	FBL Financial Group	Engineering Distance Education	PWD
Polk	Ankeny	Grain Life Technologies, LLC	IGQI/ABE/CCUR/Vaap	FAC
Polk	Ankeny	Grain Life Technologies, LLC	IGQI/ABE/CCUR/Vaap	FAC
Polk	Ankeny	GSF Inc	IGQI/ABE/CCUR	TAC
Polk	Ankeny	GSF Inc	IGQI/ABE/CCUR	TAC
Polk	Ankeny	Halbrook Excavating Inc.	CTRE/SUDAS	TAC
Polk	Ankeny	Huber Grading & Land Development	CTRE/SUDAS	TAC
Polk	Ankeny	IA Division of Criminal Investigation Crime Lab	Midwest Forensics Resource Center, IPRT	OCOM
Polk	Ankeny	Iowa Association of Municipal Utilities	LA, CRP, IDRO	PWD
Polk	Ankeny	Iowa Association of Municipal Utilities	Iowa Energy Center	TAC
Polk	Ankeny	Iowa Association of Municipal Utilities	Engineering Distance Education	PWD
Polk	Ankeny	Iowa Concrete Paving Assn.	CTRE/Natl CP Tech Center	PWD
Polk	Ankeny	Iowa Concrete Paving Assoc	CTRE/SUDAS	TAC
Polk	Ankeny	Iowa Dept of Ag & Land Stewardship	LA, CRP, IDRO	PWD
Polk	Ankeny	Iowa Municipal Waste Applicators Association	Agricultural & Biosystems Engineering	PWD
Polk	Ankeny	Iowa Municipal Waste Applicators Association	Agricultural & Biosystems Engineering	PWD
Polk	Ankeny	Iowa Ready Mixed Concrete Assn.	CTRE/Natl CP Tech Center	PWD
Polk	Ankeny	Iowa Ready Mixed Concrete Association	CTRE/SUDAS	TAC
Polk	Ankeny	John Deere	Engineering Distance Education	PWD
Polk	Ankeny	John Deere Des Moines Works	IPRT Company Assistance-NDE	TAC
Polk	Ankeny	John Deere Des Moines Works	Engineering Distance Education	PWD
Polk	Ankeny	LaFarge North America	CTRE/Natl CP Tech Center	PWD
Polk	Ankeny	McClure Engineering Co.	CTRE/SUDAS	TAC
Polk	Ankeny	Midwest Dairy Association	Extension	PWD
Polk	Ankeny	Midwestern Culvert Ltd.	CTRE/SUDAS	TAC
Polk	Ankeny	Mill Pond Assisted Living	Extension	PWD
Polk	Ankeny	Monsanto Company	Engineering Distance Education	PWD
Polk	Ankeny	New Horizons Adult Day Center	Extension	PWD
Polk	Ankeny	Nilles Surveying, Inc.	CTRE/SUDAS	TAC
Polk	Ankeny	Nitro Ice Cream	Extension	PWD

Polk	Ankeny	Northstar Power Systems Co	ISUE	TAC
Polk	Ankeny	Okoboji Grill - Ankeny	Extension	PWD
Polk	Ankeny	Palmer's Deli - Ankeny	Extension	PWD
Polk	Ankeny	PDI Manufacturing	Iowa Energy Center	TAC
Polk	Ankeny	Proliant	CCUR	TAC
Polk	Ankeny	Prostruct	CCUR	TAC
Polk	Ankeny	Quality Automation Graphics	CTRE/SUDAS	TAC
Polk	Ankeny		Engineering Distance Education	PWD
Polk	Ankeny	Sharon Fiscus (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	BAC
Polk	Ankeny	Smart Solutions	College of Engineering	PWD
Polk	Ankeny	Snyder & Assoc.	CTRE/ Natl CP Tech-Geotechnical	PWD
Polk	Ankeny	SNYDER & ASSOC. INC	CTRE/Natl CP Tech Center	TAC
Polk	Ankeny	Snyder & Associates, Inc.	CTRE/SUDAS	PWD
Polk	Ankeny	Snyder & Associates, Inc.	CTRE/Natl CP Tech Center	FAC
Polk	Ankeny	Tones	College of Engineering	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Ankeny		Iowa SBDC	BAC
Polk	Avon	D. H. Blattner & Sons, INC.	CTRE/SUDAS	TCOM
Polk	Bondurant	Bondurant Christian Preschool		TAC
Polk	Bondurant	City of Bondurant	CTRE/SUDAS	PWD
Polk	Bondurant	Court Yard Estates - Bondurant	Extension	PWD
Polk	Bondurant	Distance Education Students	Brenton Center	BAC
Polk	Bondurant		Iowa SBDC	BAC
Polk	Bondurant		Iowa SBDC	BAC

Polk	Boudurant	Army Corps of Engineers	Iowa SBDC	BAC
Polk	Camp Dodge	Grain Life Technologies	Natural Resource Ecology and Management	TCOM
Polk	Central Iowa	Grain Life Technologies	VAAP-EXT	BAC
Polk	Central Iowa	Aerospace Geartech	VAAP-EXT	BAC
Polk	Clive	Apple Tree Children's Center	IPRT Company Assistance-NDE	TAC
Polk	Clive		Human Development and Family Studies	PWD
Polk	Clive	Apple Tree Children's Center	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Clive	Cheddar's - Clive	Extension	TAC
Polk	Clive	City of Clive	CTRE/SUDAS	PWD
Polk	Clive	City of Clive	CTRE/Natl CP Tech Center	PWD
Polk	Clive	City of Clive	Community Economic Development	PWD
Polk	Clive	Distance Education Students	Brenton Center	PWD
Polk	Clive	Dupey Equipment Co	Meat Science Extension	PWD
Polk	Clive	Entrees Made Easy	Extension	PWD
Polk	Clive	Fawn Engineering Corp	ISUE	TAC
Polk	Clive	Fawn Engineering Corp	ISUE	TAC
Polk	Clive	Fawn Engineering Corp	ISUE	TAC
Polk	Clive	Fawn Engineering Corp	ISUE	TAC
Polk	Clive	Heavenly Ham	Extension	PWD
Polk	Clive	Iowa Pork Producers Association	CARD	BAC
Polk	Clive	Iowa Signal and Electric	CTRE/SUDAS	TAC
Polk	Clive	National Pork Board	NWRC Sensory Evaluation Unit	TAC
Polk	Clive	National Pork Board	Engineering Distance Education	PWD
Polk	Clive	Nick's Bar & Grill	Extension	PWD
Polk	Clive	On-line student	Ag & Biosystems Engineering/BRT	PWD
Polk	Clive	Outback Steakhouse - Clive	Extension	PWD
Polk	Clive	Planning Department	CTRE - Traffic Operations/RIMOS	TCOM
Polk	Clive	Prairie Eco Pak	ISUE	BAC
Polk	Clive	Rhiners Plumbing Co, Inc.	CTRE/SUDAS	TAC
Polk	Clive	Roisum Elite	Extension	PWD
Polk	Clive	Russell Construction	ISUE	BAC
Polk	Clive	Silvercrest at the Woodlands	Extension	PWD
Polk	Clive	Spectrum Prosthetics and Orthotics, Inc.	ISUE	BAC
Polk	Clive	Van Hauen & Associates	CTRE/SUDAS	TAC
Polk	Clive	Woodlands Creek Senior Living	Extension	PWD
Polk	Clive		IPMP/RIMOS	TCOM
Polk	Clive		Iowa SBDC	BAC
Polk	Clive		Iowa SBDC	BAC
Polk	Clive		Iowa SBDC	BAC
Polk	Clive		Iowa SBDC	BAC
Polk	Clive		Iowa SBDC	BAC

Polk	Clive		lowa SBDC	BAC
Polk	Clive		lowa SBDC	BAC
Polk	Clive		lowa SBDC	BAC
Polk	Clive		lowa SBDC	BAC
Polk	Clive		CTRE/SUDAS	TAC
Polk	Clive	Palmer Plumbing LLC	CTRE/SUDAS	TAC
Polk	Clive	Ryan Companies US, Inc.	CTRE/SUDAS	TAC
Polk	Clive	Universal Concrete		TAC
Polk	Des Moines	lowa Soyfoods Council/Iowa Soybean Association	FSHN_Wilson	FAC/TAC
Polk	Des Moines	lowa Soyfoods Council/Iowa Soybean Association	FSHN-Wilson	FAC/TAC
Polk	Des Moines	Pine Ridge Farms	Meat Science Extension	PWD
Polk	Des Moines	210 Communications	ISUE	BAC
Polk	Des Moines	3801 Grand Assisted Living	Extension	PWD
Polk	Des Moines	3M	CTRE - Traffic Operations/RIMOS	TAC
Polk	Des Moines	A. Leo Pelds Engineering	CTRE/SUDAS	TAC
Polk	Des Moines	AARP	ITSDS	OCOM
Polk	Des Moines	Academy Roofing and Sheet Metal Company	ISUE	BAC
Polk	Des Moines	ACG of Iowa	CTRE/SUDAS	TAC
Polk	Des Moines	Aliber Child Development Center (YWCA)	Human Development and Family Studies	PWD
Polk	Des Moines	Alliant Energy	BEI	BAC, FAC, TAC
Polk	Des Moines	Andrew J. Parsons	CTRE/SUDAS	TAC
Polk	Des Moines	Applebee's	Extension	PWD
Polk	Des Moines	Applebee's	Extension	PWD
Polk	Des Moines	Architects Smith Metzger	CTRE/SUDAS	TAC
Polk	Des Moines	Assoc Gen Contractors of IA	CTRE/SUDAS	TAC
Polk	Des Moines	Associated Engineering Co. of IA	CTRE/SUDAS	TAC
Polk	Des Moines	Association of Iowa Fairs	County Extension	FAC
Polk	Des Moines	Baker Electric	CTRE/SUDAS	TAC
Polk	Des Moines	Baker Group	CTRE/SUDAS	TAC
Polk	Des Moines	Barbara Ann's Dairy Queen	Extension	PWD
Polk	Des Moines	Barker Lemar & Associates	CTRE/SUDAS	TAC
Polk	Des Moines	Bernie Lorenz Recovery	Extension	PWD
Polk	Des Moines	Best Restaurant in Town	Extension	PWD
Polk	Des Moines	Biaggi's	Extension	PWD
Polk	Des Moines	Bid Preparation Assistance Event in Polk County	ISUE	BAC
Polk	Des Moines	Bidwell Riverside Child Development Center	Human Development and Family Studies	PWD
Polk	Des Moines	Blank Children's Hospital	ITSDS	OCOM
Polk	Des Moines	Bonanza Family Restaurant Des Moines	Extension	PWD
Polk	Des Moines	Border's Bookstore	Extension	PWD
Polk	Des Moines	Bowen Contractors	CTRE/SUDAS	TAC

Polk	Des Moines	Bratney Companies	Seed Science Center	PWD
Polk	Des Moines	Breiholz Construction Company	CTRE/SUDAS	TAC
Polk	Des Moines	Brian Clark and Associates	CTRE/SUDAS	TAC
Polk	Des Moines	Brody Middle School, Des Moines	Biotech Outreach Education Center	TAC
Polk	Des Moines	Brooks, Borg, Skiles	CTRE/SUDAS	TAC
Polk	Des Moines	Brothers Construction LTD	CTRE/SUDAS	PWD
Polk	Des Moines	Burger King - Des Moines	Extension	PWD
Polk	Des Moines	Buzzard Billy's	Extension	PWD
Polk	Des Moines	C. V. Gilkeson & Associates	ISUE	BAC
Polk	Des Moines	Calmar Telematics	CTRE - Traffic Operations/RIMOS	TAC/FAC
Polk	Des Moines	Calvin Community Assisted Living	Extension	PWD
Polk	Des Moines	Canteen	Extension	PWD
Polk	Des Moines	Capital City Boiler and Machine Works	ISUE	BAC
Polk	Des Moines	Capital Sitework and Design, Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Capitol Park Early Learning Center	Human Development and Family Studies	PWD
Polk	Des Moines	CCR and ORCA Event in Polk County	ISUE	BAC
Polk	Des Moines	CCR and ORCA Event in Polk County	ISUE	BAC
Polk	Des Moines	CCR and ORCA Event in Polk County	ISUE	BAC
Polk	Des Moines	CEC	CTRE/SUDAS	TAC
Polk	Des Moines	Central Iowa Heating Company	CTRE/SUDAS	TAC
Polk	Des Moines	Central Iowa Shelter and Services	Extension	PWD
Polk	Des Moines	Centro	Extension	PWD
Polk	Des Moines	Cerebral Infotech, LLC	ISUE	BAC
Polk	Des Moines	CH2M Hill	CTRE/ Natl CP Tech-Geotechnical	PWD
Polk	Des Moines	CH2M Hill, Inc	CTRE/SUDAS	TAC
Polk	Des Moines	Chicago Speakeasy, LTD	Extension	PWD
Polk	Des Moines	Christopher's, Inc.	Extension	PWD
Polk	Des Moines	Churches United Shelter	Extension	PWD
Polk	Des Moines	Cindy Dunkerson (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Polk	Des Moines	City Hall, Traffic Engineering	CTRE/SUDAS	TAC
Polk	Des Moines	City of Des Moines	Natural Resource Ecology and Management	BCOM
Polk	Des Moines	City of Des Moines	Natural Resource Ecology and Management	BCOM
Polk	Des Moines	City of Des Moines	CTRE/SUDAS	TAC
Polk	Des Moines	City of Des Moines	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	City of Des Moines	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	City of Des Moines, Traffic Div. Engineering	CTRE/SUDAS	TAC
Polk	Des Moines	City of Des Moines-WWTP	CTRE/SUDAS	TAC
Polk	Des Moines	Civil Engineering Consultants	CTRE/SUDAS	TAC
Polk	Des Moines	CMT	CTRE/SUDAS	TAC
Polk	Des Moines	Cold Stone Creamery	Extension	PWD
Polk	Des Moines	Comfort Suites	Extension	PWD

Polk	Des Moines	Commonwealth Electric	CTRE/SUDAS	TAC
Polk	Des Moines	Community Housing Development Corporation	Architecture	TAC, BCOM
Polk	Des Moines	Community Support Advocates	Extension	PWD
Polk	Des Moines	Compass Group (Eurest)	Extension	PWD
Polk	Des Moines	Compressor Controls Corporation	Engineering Distance Education	PWD
Polk	Des Moines	Consolidated Management Co.	Extension	PWD
Polk	Des Moines	Consolidated Mgmt. Company	Extension	PWD
Polk	Des Moines	Construction Materials, Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Contractors Steel	CTRE/SUDAS	TAC
Polk	Des Moines	Court Avenue Restaurant	Extension	PWD
Polk	Des Moines	Craig Smith	CTRE/SUDAS	TAC
Polk	Des Moines	Cramer & Assoc., Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Creative Host Services	Extension	PWD
Polk	Des Moines	Creative Visions	ISUE	BAC
Polk	Des Moines	Crose-Gardner Associates	CTRE/SUDAS	TAC
Polk	Des Moines	CSI Precast	CTRE/SUDAS	TAC
Polk	Des Moines	Culver's of Des Moines	Extension	PWD
Polk	Des Moines	Cummings Turbines	ABE/Safety Training Instruction and Research	TAC
Polk	Des Moines	Cummings Turbines	ABE/Safety Training Instruction and Research	TAC
Polk	Des Moines	Customer-Ease	OIPTT	BAC
Polk	Des Moines	Dairy Queen - Army Post	Extension	PWD
Polk	Des Moines	Dairy Queen - Des Moines	Extension	PWD
Polk	Des Moines	Dairy Queen - DSM	Extension	PWD
Polk	Des Moines	Dale M. Smith Technical Services	CTRE/SUDAS	TAC
Polk	Des Moines	David Bovee	CTRE/SUDAS	TAC
Polk	Des Moines	Dee Zee	Ag & Biosystems Engineering and CIRAS	TAC
Polk	Des Moines	Dee Zee	Ag & Biosystems Engineering and CIRAS	TAC
Polk	Des Moines	Dee Zee Inc	ISUE	TAC
Polk	Des Moines	Dee Zee Inc	ISUE	TAC
Polk	Des Moines	DeJaye Electronics, Inc.	OIPTT	BAC
Polk	Des Moines	Dejeay Enterprises, LLC	OIPTT	BAC
Polk	Des Moines	Des Moines Asphalt	ISUE	PWD
Polk	Des Moines	Des Moines Business Women	CTRE/ Natl CP Tech-Geotechnical	FAC
Polk	Des Moines	Des Moines Feed Co.	Iowa Energy Center	PWD
Polk	Des Moines	Des Moines Marriott Hotel	Seed Science Center	PWD
Polk	Des Moines	Des Moines Mayors Task Force	Extension	PWD
Polk	Des Moines	Des Moines Public Schools	Iowa Energy Center	TAC
Polk	Des Moines	Des Moines School	Extension	PWD
Polk	Des Moines	Des Moines Water Works	Biotech Outreach Education Center	TAC
Polk	Des Moines	Diamond Vogel Paint	CTRE/SUDAS	TAC
Polk	Des Moines	Distance Education Students	CTRE - Traffic Operations/RIMOS	PWD
Polk	Des Moines	Drake Diner	Brenton Center	PWD
			Extension	PWD

Polk	Des Moines	Dunbar/Jones PLC	CTRE/SUDAS	TAC
Polk	Des Moines	Earth Tech	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Earth Tech, Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Easter Seals	Extension	OCOM
Polk	Des Moines	EFCO	Ag & Biosystems Engineering and CIRAS	TAC
Polk	Des Moines	EFCO	Ag & Biosystems Engineering and CIRAS	TAC
Polk	Des Moines	Elder Corp.	CTRE/SUDAS	TAC
Polk	Des Moines	Embassy Suites Hotel	Extension	PWD
Polk	Des Moines	EMC Insurance Companies	Engineering Distance Education	PWD
Polk	Des Moines	Emerging Growth Group	OIP/TT	BAC
Polk	Des Moines	Energy Awareness Week	Iowa Energy Center	TAC
Polk	Des Moines	Engineering Resource Group, Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Ennis Paint	CTRE - Traffic Operations/RIMOS	TAC/FAC
Polk	Des Moines	Environmental Solutions of Iowa	CTRE/SUDAS	TAC
Polk	Des Moines	Evelyn Davis Early Learning Academy	Environment Rating Scale Assessment Project -- HD FS	
Polk	Des Moines	EZ Liner	CTRE - Traffic Operations/RIMOS	TAC
Polk	Des Moines	Facilitation Event in Polk County	ISUE	FAC
Polk	Des Moines	Facilitation Event in Polk County	ISUE	FAC
Polk	Des Moines	Facilitation Event in Polk County	ISUE	FAC
Polk	Des Moines	Facilitation Event in Polk County	ISUE	FAC
Polk	Des Moines	Facilitation Event in Polk County	ISUE	FAC
Polk	Des Moines	Facilitation Event in Polk County	ISUE	FAC
Polk	Des Moines	Facilitation Event in Polk County	ISUE	FAC
Polk	Des Moines	Falling Weight Deflectometer User Group	Continuing and Distance Education	PWD
Polk	Des Moines	Farm Bureau	ITSDS	TAC
Polk	Des Moines	Feasibility Studies Event in Polk County	ISUE	BAC
Polk	Des Moines	Federal Highway Administration	CTRE - Traffic Operations/RIMOS	TCOM
Polk	Des Moines	Federal Home Loan Bank	Engineering Distance Education	PWD
Polk	Des Moines	Feed Energy	ABE/Safety Training Instruction and Research	TAC
Polk	Des Moines	Feed Energy	ABE/Safety Training Instruction and Research	TAC
Polk	Des Moines	Feed Energy Company	ISUE	TAC
Polk	Des Moines	Feed Energy/FEC Solution	FSHN - Tong Wang	TAC, TT
Polk	Des Moines	Feed Energy/FEC Solution	FSHN - Tong Wang	TAC, TT
Polk	Des Moines	FEH Assoc., Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Firestone Agricultural Tire Co	ISUE	TAC
Polk	Des Moines	Flint Trading	CTRE - Traffic Operations/RIMOS	TAC/FAC
Polk	Des Moines	Food Bank of Iowa	Extension	PWD
Polk	Des Moines	Foth-Engineering Alliance	CTRE/SUDAS	TAC
Polk	Des Moines	Genus Landscape Architects	CTRE/SUDAS	TAC
Polk	Des Moines	Geotechnical Services Inc.	CTRE/ Natl CP Tech-Geotechnical	PWD
Polk	Des Moines	Geotechnical Services, Inc.	CTRE/SUDAS	TAC

Polk	Des Moines	Golden Dragon Research	Ctr Integr An Genomics/Depart of Ani Sci	startup - BAC
Polk	Des Moines	Graham Construction	CTRE/SUDAS	TAC
Polk	Des Moines	Grandview College Bookstore	Extension	PWD
Polk	Des Moines	Grandview Park Baptist School	Human Development and Family Studies	PWD
Polk	Des Moines	Great American	Extension	PWD
Polk	Des Moines	Greater Des Moines Community Foundation	North Central Regional Center for Rural Development	BCOM
Polk	Des Moines	Greater Des Moines Partnership	College of Engineering	BCOM
Polk	Des Moines	Greater Iowa Asphalt Conference	Continuing and Distance Education	PWD
Polk	Des Moines	Hallett Materials	CTRE/SUDAS	TAC
Polk	Des Moines	HALLETT MATERIALS	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Hart/Meyer, Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	HDR	CTRE/SUDAS	TAC
Polk	Des Moines	Herbert, Lewis, Kruse & Blunch Architects	CTRE/SUDAS	TAC
Polk	Des Moines	House of Mercy Child Development Center	Human Development and Family Studies	PWD
Polk	Des Moines	Howard R. Green Co.	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Howard R. Green Company	CTRE/SUDAS	TAC
Polk	Des Moines	Howe Elementary School (Des Moines)	Biotech Outreach Education Center	TAC
Polk	Des Moines	Howe Head Start	Environment Rating Scale Assessment Project -- HD FS	
Polk	Des Moines	Hoyt Middle school (Des Moines)	Biotech Outreach Education Center	TAC
Polk	Des Moines	Hydro-Klean, Inc.	CTRE/SUDAS	FAC
Polk	Des Moines	IBA meeting /tour/presentation	Biotech Outreach Education Center	TAC
Polk	Des Moines	IDED, Kermin, Proliant	NWRC - Gut Health Symposium	BAC
Polk	Des Moines	IDNR, Wallace State Office Building	CTRE/SUDAS	PWD
Polk	Des Moines	Impact Business Printing	ISUE	TAC
Polk	Des Moines	ING	Engineering Distance Education	PWD
Polk	Des Moines	ING Insurance Company	ISUE	TAC
Polk	Des Moines	ING of Iowa	Extension	PWD
Polk	Des Moines	Iowa Association of Counties- County Zoning	CRP	BCOM, TCOM
Polk	Des Moines	Officials		
Polk	Des Moines	Iowa Association of Insurance Adjustors	Agricultural & Biosystems Engineering	PWD
Polk	Des Moines	Iowa Association of Insurance Adjustors	Agricultural & Biosystems Engineering	PWD
Polk	Des Moines	Iowa Biotechnology Association	CCUR	FAC
Polk	Des Moines	Iowa Biotechnology Association	CCUR	FAC
Polk	Des Moines	Iowa Department of Economic Development	LA, CRP, IDRO	PWD
Polk	Des Moines	Iowa Department of Economic Development	BEI	BCOM
Polk	Des Moines	Iowa Department of Health	Ag & Biosystems Engineering	OCOM
Polk	Des Moines	Iowa Department of Health	Ag & Biosystems Engineering	OCOM
Polk	Des Moines	Iowa Department of Natural Resources	Ag & Biosystems Engineering	OCOM
Polk	Des Moines	Iowa Department of Natural Resources	Natural Resource Ecology and Management	TCOM
Polk	Des Moines	Iowa Department of Natural Resources	Ag & Biosystems Engineering	OCOM
Polk	Des Moines	Iowa Department of Natural Resources	Natural Resource Ecology and Management	TCOM

Polk	Des Moines	Iowa Department of Natural Resources	CTRE/SUDAS	TAC
Polk	Des Moines	Iowa Dept. of Public Health	LA, CRP, IDRO	PWD
Polk	Des Moines	Iowa Dept. of Public Health	Extension	PWD
Polk	Des Moines	Iowa DOT	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Iowa Farm Bureau	CCUR	FAC
Polk	Des Moines	Iowa Farm Bureau	CCUR	FAC
Polk	Des Moines	Iowa Farm Bureau	BEI	BAC, FAC, TAC
Polk	Des Moines	Iowa Farm Bureau	CSET	FAC
Polk	Des Moines	Iowa Farm Bureau Federation	Iowa Pork Industry Center (Mabry)	TT
Polk	Des Moines	Iowa Farm Bureau Federation	Iowa Pork Industry Center (Mabry)	TT
Polk	Des Moines	Iowa FFA Association	County Extension	OCOM
Polk	Des Moines	Iowa Interactive	Engineering Distance Education	PWD
Polk	Des Moines	Iowa League of Cities	Community Economic Development	PWD
Polk	Des Moines	Iowa Limstone Producers Assoc.	CTRE/SUDAS	TAC
Polk	Des Moines	Iowa Nursery Landscape Association	Horticulture	FAC
Polk	Des Moines	Iowa Pork Producer Association	Ctr Integr An Genomics/Dept of Ani Sci	TAC
Polk	Des Moines	Iowa Pork Producers Assoc.	Ag & Biosystems Engineering	OCOM
Polk	Des Moines	Iowa Pork Producers Assoc.	Ag & Biosystems Engineering	OCOM
Polk	Des Moines	Iowa Renewable Fuels Association	CCUR	FAC
Polk	Des Moines	Iowa Renewable Fuels Association	CCUR	FAC
Polk	Des Moines	Iowa State Fair	County Extension	OCOM
Polk	Des Moines	Iowa State Fair	CTRE/SUDAS	TAC
Polk	Des Moines	Iowa Wine and Grape Grower Association	Horticulture Research Station, ISU	FAC
Polk	Des Moines	JB Morris Early Learning Center	Environment Rating Scale Assessment Project -- HD FS	TAC
Polk	Des Moines	Jenco Construction Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Jensen Construction Company	CTRE/SUDAS	TAC
Polk	Des Moines	Jimmy's Pizza	Extension	PWD
Polk	Des Moines	JMT Trucking	CTRE/SUDAS	TAC
Polk	Des Moines	JMT TRUCKING CO	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Johnny's Italian Steakhouse	Extension	PWD
Polk	Des Moines	KDS-LL	ISUE	BAC
Polk	Des Moines	Kemin Food Ingredients	CCUR	TAC, FAC
Polk	Des Moines	Kemin Food Ingredients	CCUR	TAC, FAC
Polk	Des Moines	Keystone Electrical	Ag & Biosystems Engineering and CIRAS	TAC
Polk	Des Moines	Keystone Electrical	Ag & Biosystems Engineering and CIRAS	TAC
Polk	Des Moines	Keystone Electrical Mfg Co	ISUE	TAC
Polk	Des Moines	Keystone Electrical Mfg Co	ISUE	TAC
Polk	Des Moines	Kirkham Michael Associates	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Kirkham Michael Associates	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	KJWW Engineering Consultants	CTRE/SUDAS	TAC
Polk	Des Moines	Kurtz Hardware Company	ISUE	BAC

Polk	Des Moines	L.A. Company	CTRE/SUDAS	TAC
Polk	Des Moines	Lean: Principles (101) Event in Polk County	ISUE	TAC
Polk	Des Moines	Lean: Principles (101) Event in Polk County	ISUE	TAC
Polk	Des Moines	Lean: Principles (101) Event in Polk County	ISUE	TAC
Polk	Des Moines	Legacy Business Group, Inc.	ISUE	BAC
Polk	Des Moines	Legislators - Ag Committee - NH3	Iowa Energy Center	BCOM
Polk	Des Moines	Lemar Industries	ISUE	TAC
Polk	Des Moines	Lister Ind.	CTRE/SUDAS	TAC
Polk	Des Moines	Logan Contractors Supply Inc.	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Logan Contractors Supply, Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Maid-Rite Corporation	Extension	PWD
Polk	Des Moines	Market Research Event in Polk County	ISUE	BAC
Polk	Des Moines	Martin Marietta Aggregates	CTRE/SUDAS	TAC
Polk	Des Moines	Martin Marietta Materials	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Master Builders of Iowa	ABE/Safety Training Instruction and Research	TAC
Polk	Des Moines	Master Builders of Iowa	ABE/Safety Training Instruction and Research	TAC
Polk	Des Moines	Master Builders of Iowa	CTRE/SUDAS	TAC
Polk	Des Moines	McAninch Corporation	CTRE/SUDAS	TAC
Polk	Des Moines	McAninch Corporation	CTRE/ Natl CP Tech-Geotechnical	PWD
Polk	Des Moines	McCombs Middle School (Des Moines)	Biotech Outreach Education Center	TAC
Polk	Des Moines	McCombs Middle school, Des Moines	Biotech Outreach Education Center	TAC
Polk	Des Moines	McKenna Truck Center	ISUE	PWD
Polk	Des Moines	McKinley Head Start	Environment Rating Scale Assessment Project -- HD FS	BAC
Polk	Des Moines	Mercy Child Development Center	Human Development and Family Studies	PWD
Polk	Des Moines	Meredith Corp	ISUE	TAC
Polk	Des Moines	Meridith Middle School (Des Moines)	Biotech Outreach Education Center	TAC
Polk	Des Moines	Mid-American Engergy	CTRE - Traffic Operations/RIMOS	PWD
Polk	Des Moines	Midwest Concrete Consortium	Continuing and Distance Education	FAC
Polk	Des Moines	Mike Helack, Ds Moines Business Club	Iowa Energy Center	TAC
Polk	Des Moines	Miller the Driller	CTRE/SUDAS	PWD
Polk	Des Moines	Monsanto Company	Seed Science Center	PWD
Polk	Des Moines	Moujton Head Start	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Des Moines	Mr. Bibb's Burger Express	Extension	TAC
Polk	Des Moines	Municipal Supply Supply, Inc.	CTRE/SUDAS	BAC
Polk	Des Moines	MYA Group	ISUE	TAC
Polk	Des Moines	National Pork Board	Ctr Integr An Genomics/Depart of Ani Sci	PWD
Polk	Des Moines	National Pork Board	Meat Science Extension	TAC
Polk	Des Moines	Neumann Brothers	CTRE/SUDAS	TAC
Polk	Des Moines	Newsham Choice Genetics	Ctr Integr An Genomics/Depart of Ani Sci	BAC
Polk	Des Moines	NRCS	CTRE/SUDAS	TAC

Polk	Des Moines	Nuckolls Concrete Services	CTRE/SUDAS	TAC
Polk	Des Moines	NUCKOLLS CONCRETE SERVICES INC	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	Okoboji Grill - Des Moines	Extension	PWD
Polk	Des Moines	On the Border	Extension	PWD
Polk	Des Moines	On-line student	Ag & Biosystems Engineering/BRT	PWD
Polk	Des Moines	Palmer's Deli	Extension	PWD
Polk	Des Moines	PDI	College of Engineering	FAC
Polk	Des Moines	Perficut lawn and landscape	Natural Resource Ecology and Management	TAC
Polk	Des Moines	Perspective Consulting Partners, LLC	ISUE	BAC
Polk	Des Moines	Pine Ridge Farms	ISUE	TAC
Polk	Des Moines	Point Builders, Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	Polk County	Extension	TAC
Polk	Des Moines	Polk County Jail	Extension	PWD
Polk	Des Moines	Polk County Sheriff's Office	Extension	PWD
Polk	Des Moines	Polk County United Way	ReCAP	BCOM
Polk	Des Moines	Polk County Youth Services	Extension	PWD
Polk	Des Moines	Potters Industries	CTRE - Traffic Operations/RIMOS	TAC
Polk	Des Moines	Principal Financial Group	Engineering Distance Education	PWD
Polk	Des Moines	Priority Excavating LLC	CTRE/SUDAS	TAC
Polk	Des Moines	Promise IT Solutions	ISUE	BAC
Polk	Des Moines	Public Works	IPMP/RIMOS	TCOM
Polk	Des Moines	Quality Inn & Suites	Extension	PWD
Polk	Des Moines	Quick Supply Co.	CTRE/SUDAS	TAC
Polk	Des Moines	R.E. Van Gundy	CTRE/SUDAS	TAC
Polk	Des Moines	RCI, Inc.	Ag & Biosystems Engineering	TAC
Polk	Des Moines	RCI, Inc.	Ag & Biosystems Engineering	TAC
Polk	Des Moines	RDG Bussard Dikis Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	RDG Crose Gardner Shukert, Inc	CTRE/SUDAS	TAC
Polk	Des Moines	Regional aquaculture associations and state agencies	North Central Regional Aquaculture Center	FAC
Polk	Des Moines	Regional aquaculture associations and state agencies	North Central Regional Aquaculture Center	FAC
Polk	Des Moines	Reilly Construction Co. Inc.	CTRE/SUDAS	TAC
Polk	Des Moines	REL LLC - Des Moines	Extension	PWD
Polk	Des Moines	Renaissance Savery Hotel	Extension	PWD
Polk	Des Moines	ResCare	Extension	PWD
Polk	Des Moines	Rising Sun Learning Center	Human Development and Family Studies	PWD
Polk	Des Moines	Rist & Associates training	Iowa Energy Center	FAC
Polk	Des Moines	River Woods Head Start	Environment Rating Scale Assessment Project -- HD FS	TAC
Polk	Des Moines	Rohm & Haas	CTRE - Traffic Operations/RIMOS	TAC
Polk	Des Moines	Roto Rooter	Ag & Biosystems Engineering and CIRAS	TAC

Polk	Des Moines	Roto Rooter	Ag & Biosystems Engineering and CIRAS	TAC
Polk	Des Moines	Saint Theresa School (Des Moines)	Biotech Outreach Education Center	BAC
Polk	Des Moines	Salem Associates, Inc.	ISUE	TAC
Polk	Des Moines	Schildberg Construction Co, Inc.	CTRE/SUDAS	PWD
Polk	Des Moines	Science Center of Iowa	Extension	
Polk	Des Moines	Science Center of Iowa Preschool	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Des Moines	Science Center Preschool	Human Development and Family Studies	TAC
Polk	Des Moines	Seneca Companies	CTRE/SUDAS	TAC
Polk	Des Moines	Shuck Britson Consulting Engineers	CTRE/SUDAS	TAC
Polk	Des Moines	Siegwerk USA Inc.	ISUE	PWD
Polk	Des Moines	Skip's Inc.	Extension	PWD
Polk	Des Moines	SONshine Christian Preschool Daycare	Human Development and Family Studies	PWD
Polk	Des Moines	Spaghettis - Des Moines	Extension	PWD
Polk	Des Moines	Splash Seafood Bar & Grill	Extension	PWD
Polk	Des Moines	St. Augustin class (Des Moines)	Biotech Outreach Education Center	TAC
Polk	Des Moines	Standard Bearing Company	IPRT Company Assistance-Materials	TAC
Polk	Des Moines	Stanley Consultants, Inc.	CTRE/SUDAS	PWD
Polk	Des Moines	Stanley Consultants, Inc.	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	STAR EQUIPMENT LTD	CTRE/Natl CP Tech Center	PWD
Polk	Des Moines	State of Iowa	Engineering Distance Education	TAC
Polk	Des Moines	Steam System Training	ISUE	
Polk	Des Moines	Stilwell Middle School, Des Moines,	Biotech Outreach Education Center	PWD
Polk	Des Moines	Stork Townsend	Meat Science Extension	
Polk	Des Moines	Studebaker Head Start	Environment Rating Scale Assessment Project -- HD FS	FAC
Polk	Des Moines	Successful Farming Magazine	Ag Engineering/Agronomy Farm, ISU	PWD
Polk	Des Moines	Suites 800 Locust	Extension	BAC
Polk	Des Moines	SuperFlow Technologies Group	ISUE	PWD
Polk	Des Moines	Swan Packing Inc	Meat Science Extension	PWD
Polk	Des Moines	Taco Bell/QSR	Extension	PWD
Polk	Des Moines	Taco John's - Des Moines	Extension	PWD
Polk	Des Moines	Taco John's of Iowa	Extension	PWD
Polk	Des Moines	Tanya Kitchen (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	TAC
Polk	Des Moines	Taylor Ball	CTRE/SUDAS	TAC
Polk	Des Moines	TEAM Services	CTRE/SUDAS	
Polk	Des Moines	Teddy Bear Town	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Des Moines	Teen Challenge of the Midlands	Johnson County Extension	TAC
Polk	Des Moines	Terracon	CTRE/SUDAS	TAC
Polk	Des Moines	The Building Inspectors	CTRE/SUDAS	

Polk	Des Moines	The Gardens at Luther Park	Extension	PWD
Polk	Des Moines	The Harvest Restaurant	Extension	PWD
Polk	Des Moines	The Rose of Des Moines	Extension	PWD
Polk	Des Moines	The Rose of East Des Moines	Extension	PWD
Polk	Des Moines	The Underground Company	CTRE/SUDAS	TAC
Polk	Des Moines	The Weitz Company LLC	ISUE	BAC
Polk	Des Moines	The Weitz Company, LLC	CTRE/SUDAS	TAC
Polk	Des Moines	Townsend Engineering Co	ISUE	TAC
Polk	Des Moines	Traffic and Trans Division	CTRE - Traffic Operations/RIMOS	TCOM
Polk	Des Moines	Trans-Lux Fair-Play	ISUE	TAC
Polk	Des Moines	Trans-Lux Fair-Play	ISUE	TAC
Polk	Des Moines	Trans-Lux Fair-Play	ISUE	TAC
Polk	Des Moines	Trans-Lux Fair-Play	ISUE	TAC
Polk	Des Moines	Triple "F"	OIPTT	BAC
Polk	Des Moines	Trostel's Greenbrier - DSM	Extension	PWD
Polk	Des Moines	Urban Conservation Advisory Committee	Natural Resource Ecology and Management	OCOM
Polk	Des Moines	URS	CTRE/SUDAS	TAC
Polk	Des Moines	Utility Equipment Co.	CTRE/SUDAS	TAC
Polk	Des Moines	Van Hauen & Associates, Inc	CTRE/SUDAS	TAC
Polk	Des Moines	VentureNet Iowa	OIPTT	FAC
Polk	Des Moines	Vodaci Technologies	ISUE	BAC
Polk	Des Moines	Walnut Creek Alternative High School Des Moines	Biotech Outreach Education Center	
Polk	Des Moines	Walnut Creek Alternative High School Des Moines	Biotech Outreach Education Center	
Polk	Des Moines	Weitz Industrial Service Group	Seed Science Center	PWD
Polk	Des Moines	Wellmark Blue Cross and Blue Sheild	Engineering Distance Education	PWD
Polk	Des Moines	Wells Fargo	Engineering Distance Education	PWD
Polk	Des Moines	Wellspring	ISUE	BAC
Polk	Des Moines	Wendy Armburg (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Polk	Des Moines	Wesley Central Assisted Living	Extension	PWD
Polk	Des Moines	Wesley Retirement Community	Extension	OCOM
Polk	Des Moines	Westminster Preschool	Environment Rating Scale Assessment Project -- HD FS	
Polk	Des Moines	White Rabbit Group	ISUE	BAC
Polk	Des Moines	Wing Zone	Extension	PWD
Polk	Des Moines	Wonder Years Academy	Human Development and Family Studies	PWD
Polk	Des Moines	World Food Prize	Interior Design	BCOM, FAC
Polk	Des Moines	Xochipilla Children's Center	Environment Rating Scale Assessment Project -- HD FS	

Polk	Johnston	Distance Education Students	Brenton Center	PWD
Polk	Johnston	Diteq Diamond Tools	CTRE/Natl CP Tech Center	PWD
Polk	Johnston	DMACC	Engineering Distance Education	PWD
Polk	Johnston	Dupont Pioneer	CCUR	FAC
Polk	Johnston	Dupont Pioneer	CCUR	FAC
Polk	Johnston	Engineering Alliance, Inc.	CTRE/SUDAS	TAC
Polk	Johnston	Hansen Company	CTRE/SUDAS	TAC
Polk	Johnston	Henning Construction	CTRE/SUDAS	TAC
Polk	Johnston	Hockmuth Concrete Services, Inc.	CTRE/SUDAS	TAC
Polk	Johnston	Iowa Army National Guard	CTRE/SUDAS	TAC
Polk	Johnston	Iowa Corn	CCUR	FAC
Polk	Johnston	Iowa Corn	CCUR	FAC
Polk	Johnston	Iowa Corn Growers Association	CARD	BAC
Polk	Johnston	Iowa Renewable Fuels Assoc.	CSET	FAC
Polk	Johnston	ISU/Pioneer Corporation (DuPont)	Veterinary Pathology	FAC
Polk	Johnston	ISU/Pioneer Corporation (DuPont)	Veterinary Pathology	TT
Polk	Johnston	ISU/Pioneer Corporation (DuPont)	Veterinary Pathology	FAC
Polk	Johnston	ISU/Pioneer Corporation (DuPont)	Veterinary Pathology	TT
Polk	Johnston	ITS, Inc.	Engineering Distance Education	PWD
Polk	Johnston	John Deere Wind Energy	Engineering Distance Education	PWD
Polk	Johnston	Johnston Public Works	CTRE/SUDAS	TAC
Polk	Johnston	Johnston Schools	Extension	PWD
Polk	Johnston	Lawson Elem. (Johnston)	Biotech Outreach Education Center	
Polk	Johnston	Manatt's Inc.	CTRE/Natl CP Tech Center	PWD
Polk	Johnston	Manatts INC-Metro Div	CTRE/Natl CP Tech Center	PWD
Polk	Johnston	Martina Place Assisted Living (Bishop Durham)	Extension	PWD
Polk	Johnston	McClure Engineering Co.	CTRE/SUDAS	TAC
Polk	Johnston	McClure Engineering Co.	CTRE/Natl CP Tech Center	PWD
Polk	Johnston	Metro Food & Drink	Extension	PWD
Polk	Johnston	National Maintenance Training Center - Iowa Army	IPRT Company Assistance-NDE	TAC
Polk	Johnston	National Guard	GEAT	
Polk	Johnston	National Weather Service - Des Moines office	GEAT	6
Polk	Johnston	National Weather Service - Des Moines office	Extension	PWD
Polk	Johnston	Okoboji Grill - Johnston	NWRC Sensory Evaluation Unit	TAC
Polk	Johnston	Pioneer	ABE/Safety Training Instruction and Research	TAC
Polk	Johnston	Pioneer	Engineering Distance Education	PWD
Polk	Johnston	Pioneer	ABE/Safety Training Instruction and Research	TAC
Polk	Johnston	Pioneer Hi-Bred International	Seed Science Center	PWD
Polk	Johnston	Pioneer Hi-Bred International Inc - Johnston	ISUE	TAC
Polk	Johnston	Pioneer Hi-Bred International, Inc.	IPRT Company Assistance-Technology Commercialization	TAC

Polk	Pleasant Hill	Rising Sun Learning Center	Environment Rating Scale Assessment Project -- HD FS	TAC
Polk	Pleasant Hill	Sandy Deahl	CTRE/SUDAS	PWD
Polk	Pleasant Hill	SE Polk Community Schools	Extension	
Polk	Pleasant Hill	Shining Starrs	Environment Rating Scale Assessment Project -- HD FS	TCOM
Polk	Pleasant Hill	Southeast Polk School	Biotech Outreach Education Center	TAC
Polk	Pleasant Hill	City of Polk City	IPMP/RIMOS	TAC
Polk	Polk City	Distance Education Students	CTRE/SUDAS	PWD
Polk	Polk City	Polk City Development Corporation	Brenton Center	PWD
Polk	Polk City		CEC	BCOM
Polk	Polk City		Iowa SBDC	BAC
Polk	Runnells	Distance Education Students	Brenton Center	PWD
Polk	Urbandale	Allender Butzke Engineers	CTRE/SUDAS	TAC
Polk	Urbandale	Allender Butzke Engineers	CTRE/Natl CP Tech Center	PWD
Polk	Urbandale	Apple Tree Children's Center	Human Development and Family Studies	PWD
Polk	Urbandale	Apple Tree Children's Center	Environment Rating Scale Assessment Project -- HD FS	TAC
Polk	Urbandale	Arterra Group, LTD	CTRE/SUDAS	PWD
Polk	Urbandale	Ball Construction Services	Engineering Distance Education	TAC
Polk	Urbandale	Becker Construction	CTRE/SUDAS	PWD
Polk	Urbandale	Bickford Cottage - Urbandale	Extension	TAC
Polk	Urbandale	Bishop Engineering	CTRE/SUDAS	PWD
Polk	Urbandale	Bizstarts, LLC	ISUE	BAC
Polk	Urbandale	Brocon Services	CTRE/SUDAS	TAC
Polk	Urbandale	C & L Companies	IPRT Company Assistance-Materials	TAC
Polk	Urbandale	C & L Companies	IPRT Company Assistance-Materials	TAC
Polk	Urbandale	Central IA Regional Trans Plan Alliance	CTRE/SUDAS	TAC
Polk	Urbandale	City of Urbandale	CTRE/SUDAS	TAC
Polk	Urbandale	City of Urbandale	CTRE/Natl CP Tech Center	PWD
Polk	Urbandale	City of Urbandale-Water Dept.	CTRE/SUDAS	TAC
Polk	Urbandale	Concrete Technologies Inc.	CTRE/Natl CP Tech Center	PWD
Polk	Urbandale	Concrete Technologies, Inc.	CTRE/SUDAS	TAC
Polk	Urbandale	Culver's of Urbandale	Extension	PWD
Polk	Urbandale	Deerfield Retirement Community	Extension	PWD
Polk	Urbandale	Des Moines Metro Planning Org.	CTRE/SUDAS	TAC
Polk	Urbandale	Dice	Engineering Distance Education	PWD
Polk	Urbandale	Distance Education Students	Brenton Center	PWD
Polk	Urbandale	Engineering Resource Group	Engineering Distance Education	PWD
Polk	Urbandale	Fogarty Enterprises, LLC	Extension	PWD
Polk	Urbandale	Geotech Engineering & Observation	CTRE/Natl CP Tech Center	PWD
Polk	Urbandale	Henriksen Contracting, LLC	CTRE/Natl CP Tech Center	PWD

Polk	Urbandale	Hirsh Industries Inc	ISUE	BAC
Polk	Urbandale	Hobbs Building Systems, LLC	IPRT Company Assistance-Technology Commercialization	TAC
Polk	Urbandale	Illahee Hills	Extension	PWD
Polk	Urbandale	Iowa Association of Regional Councils	College of Engineering	BCOM
Polk	Urbandale	Iowa Machine Shed	Extension	PWD
Polk	Urbandale	Iowa Restaurant Association	Extension	PWD
Polk	Urbandale	John Deere	Engineering Distance Education	PWD
Polk	Urbandale	John Deere Ag Solutions	Ag & Biosystems Engineering	TAC
Polk	Urbandale	John Deere Ag Solutions	Ag & Biosystems Engineering	TAC
Polk	Urbandale	Kay Strahorn (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Urbandale	Kirkham Michael Associates	CTRE/Natl CP Tech Center	TAC
Polk	Urbandale	Kirkham Michael Consulting Engineers	CTRE/SUDAS	TAC
Polk	Urbandale	Larson & Larson Construction	CTRE/SUDAS	PWD
Polk	Urbandale	Living History Farms	Extension	BAC
Polk	Urbandale	Medplast, Inc	ISUE	BAC
Polk	Urbandale	MEPJobs.com	ISUE	TAC
Polk	Urbandale	Missman, Stanley & Assoc. P.C.	CTRE/SUDAS	TAC
Polk	Urbandale	Oakview Construction	CTRE/SUDAS	TAC
Polk	Urbandale	Olivet Christian Preschool	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Urbandale	On-line student	Ag & Biosystems Engineering/BRT	PWD
Polk	Urbandale	ProCAD Designs	Engineering Distance Education	TAC
Polk	Urbandale	Quality Manufacturing Corp.	ISUE	BAC
Polk	Urbandale	Rochon Corporation of Iowa, Inc.	ISUE	TAC
Polk	Urbandale	Russell Construction Company	CTRE/SUDAS	PWD
Polk	Urbandale	Senior Suites	Extension	TAC
Polk	Urbandale	SSI Development, LLC	ISUE	PWD
Polk	Urbandale	St. Pius X School, Urbandale	Biotech Outreach Education Center	TAC
Polk	Urbandale	Tiny Treasures Lutheran Preschool	Environment Rating Scale Assessment Project -- HD FS	PWD
Polk	Urbandale	Traditions - 3	Human Development and Family Studies	BAC
Polk	Urbandale	Triple 'F' Inc.	ISUE	PWD
Polk	Urbandale	Urban Grill	Extension	PWD
Polk	Urbandale	Urbandale Schools	Extension	PWD
Polk	Urbandale	Urbandale Water Dept	CTRE/SUDAS	TAC
Polk	Urbandale	Urbandale/Des Moines/Clive/W. Des Moines		
Polk	Urbandale	Chambers of Commerce	ReCAP	BCOM
Polk	Urbandale	Validus	ISUE	TAC
Polk	Urbandale	Woody's Smoke Shack	Extension	PWD
Polk	Urbandale			TCOM

Polk	West Des Moines	Bartlett & West Engineers, Inc	CTRE/SUDAS	TAC
Polk	West Des Moines	Beyond the Grain	Extension	PWD
Polk	West Des Moines	Bickford Cottage - W. Des Moines	Extension	PWD
Polk	West Des Moines	Bravo Cucina Italiano	Extension	PWD
Polk	West Des Moines	Brown Engineering	CTRE/SUDAS	TAC
Polk	West Des Moines	Calhoun-Burns & Associates	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	Calhoun-Burns & Associates, Inc.	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	CALHOUN-BURNS ASSOC. INC	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	Calhoun-Burns Associates	CTRE/SUDAS	TAC
Polk	West Des Moines	Care Initiatives	Extension	PWD
Polk	West Des Moines	Career Management Associates	ISUE	BAC
Polk	West Des Moines	City of	ITSDS	TAC
Polk	West Des Moines	City of West Des Moines	CTRE/SUDAS	TAC
Polk	West Des Moines	City of West Des Moines	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	City of West Des Moines	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	Clark Deitz	CTRE/SUDAS	TAC
Polk	West Des Moines	Cooper Crawford & Associates, LLC	CTRE/SUDAS	TAC
Polk	West Des Moines	Corell Contractors	CTRE/SUDAS	TAC
Polk	West Des Moines	Corell Recycling	CTRE/SUDAS	TAC
Polk	West Des Moines	CRETEX MIDWEST	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	Culver's of West Des Moines	Extension	PWD
Polk	West Des Moines	Culver's of West Des Moines #2	Extension	PWD
Polk	West Des Moines	Distance Education Students	Brenton Center	PWD
Polk	West Des Moines	Doc's Bar & Grill	Extension	PWD
Polk	West Des Moines	DuBois Engineering	Seed Science Center	TAC
Polk	West Des Moines	Ed Miner	CTRE/SUDAS	TAC
Polk	West Des Moines	EmbarkIt, Inc.	ISUE	BAC
Polk	West Des Moines	Farm Bureau Mutual Insurance Company	CARD	BAC
Polk	West Des Moines	FBL Financial Group	Engineering Distance Education	PWD
Polk	West Des Moines	Fleming's Steakhouse	Extension	PWD
Polk	West Des Moines	Fountain West Health Center	Extension	PWD
Polk	West Des Moines	Fuddrucker's	Extension	PWD
Polk	West Des Moines	Goodrich Corp	ISUE	BAC
Polk	West Des Moines	Goodrich Engine Components	Engineering Distance Education	PWD
Polk	West Des Moines	Guide One	Engineering Distance Education	PWD
Polk	West Des Moines	Heritage Court Assisted Living	Extension	PWD
Polk	West Des Moines	HOLMES MURPHY AND ASSOCIATES INC	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	Hooter's	Extension	PWD
Polk	West Des Moines	Hy-Vee	Engineering Distance Education	PWD
Polk	West Des Moines	Iowa Concrete Products	CTRE/SUDAS	TAC
Polk	West Des Moines	Iowa Farm Bureau	College of Engineering	BCOM
Polk	West Des Moines	Iowa Foundation for Medical Care	Engineering Distance Education	PWD

Polk	West Des Moines	Joseph's Steakhouse	Extension	PWD
Polk	West Des Moines	Krishna Engr.	CTRE/SUDAS	TAC
Polk	West Des Moines	Kum & Go	Extension	PWD
Polk	West Des Moines	Macaroni Grill	Extension	PWD
Polk	West Des Moines	MaggieMoos Ice Cream & Treatery	Extension	PWD
Polk	West Des Moines	McAinch Corporation	CTRE/SUDAS	TAC
Polk	West Des Moines	Midwest L & I Inc.	CTRE/SUDAS	TAC
Polk	West Des Moines	MPS Engineers	ISUE	BAC
Polk	West Des Moines	Net Integrated Consulting	ISUE	BAC
Polk	West Des Moines	Public Works	CTRE - Traffic Operations/RIMOS	TCOM
Polk	West Des Moines	Regency Land Development	CTRE/SUDAS	TAC
Polk	West Des Moines	Savage-Ver Ploeg & Associates	CTRE/SUDAS	TAC
Polk	West Des Moines	Savannah Homes, Inc.	CTRE/SUDAS	TAC
Polk	West Des Moines	Shive-Hattery, Inc.	CTRE/SUDAS	TAC
Polk	West Des Moines	St. Francis of Assisi	Extension	PWD
Polk	West Des Moines	St. Francis of Assisi Preschool	Human Development and Family Studies	PWD
Polk	West Des Moines	St. Timothy's Preschool	Environment Rating Scale Assessment Project -- HD FS	
Polk	West Des Moines	Statistics & Control Inc.	OIPPT	BAC
Polk	West Des Moines	Taco Bell	Extension	PWD
Polk	West Des Moines	TGI Friday's	Extension	PWD
Polk	West Des Moines	The Children's Place	Environment Rating Scale Assessment Project -- HD FS	
Polk	West Des Moines	The Wine Experience	Extension	PWD
Polk	West Des Moines	Tokens Family Fun Center	Extension	PWD
Polk	West Des Moines	Traditions - 1	Human Development and Family Studies	PWD
Polk	West Des Moines	Treat of America Food Services	Extension	PWD
Polk	West Des Moines	Valley High School	Seed Science Center	OCCOM
Polk	West Des Moines	Valley Southwoods Class (West Des Moines)	Biotech Outreach Education Center	
Polk	West Des Moines	Valley West Pub and Grill	Extension	PWD
Polk	West Des Moines	Veenstra & Kimm Engineers	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	Veenstra & Kimm, Inc.	CTRE/SUDAS	TAC
Polk	West Des Moines	Veenstra and Kimm Inc.	CTRE/Natl CP Tech Center	PWD
Polk	West Des Moines	WDM Water Works	CTRE/SUDAS	TAC
Polk	West Des Moines	West Des Moines Christian Church Preschool	Environment Rating Scale Assessment Project -- HD FS	
Polk	West Des Moines	West Des Moines Comm. Schools	Extension	PWD
Polk	West Des Moines	West Des Moines Marriott	Extension	PWD
Polk	West Des Moines	West Des Moines Methodist Parent's Morning and Preschool	Environment Rating Scale Assessment Project -- HD FS	
Polk	West Des Moines	West Des Moines Water Works	CTRE/SUDAS	TAC
Polk	West Des Moines	When Pigs Fly	Extension	PWD

Polk	Bondurant	City of Bondurant	Community Economic Development	PWD
Polk	Clive			TCOM
Polk	Des Moines	Ankeny Airport	Community Economic Development	PWD
Polk	Des Moines	Center for Transp. Res. & Educ.	Community Economic Development	PWD
Polk	Des Moines	City of Des Moines - City Clerk	Community Economic Development	PWD
Polk	Des Moines	Des Moines Intl. Airport	Community Economic Development	PWD
Polk	Des Moines	Iowa League of Cities - Mgr of Special Projects	Community Economic Development	PWD
Polk	Des Moines	Iowa Secretary of State	Community Economic Development	PWD
Polk	Des Moines	Roadside Vegetation Managers	Community Economic Development	TCOM
Polk	Des Moines			TCOM
Polk	Des Moines	City of Des Moines	Community Economic Development	PWD
Polk	Elkhart	City of Elkhart	Community Economic Development	PWD
Polk	Grimes			TCOM
Polk	Johnston	City of Johnston BOA	Community Economic Development	PWD
Polk	Pleasant Hill	City of Pleasant Hill	Community Economic Development	PWD
Polk	Pleasant Hill	MSA Professional Services Inc.	Community Economic Development	PWD
Polk	Pleasant Hill	City of Pleasant Hill	Community Economic Development	PWD
Polk	Polk City	City of Polk City	Community Economic Development	PWD
Polk	Urbandale	City of Urbandale - City Clerk	Community Economic Development	PWD
Polk	Urbandale			TCOM
Polk	Urbandale			TCOM
Polk	Urbandale			PWD
Polk	West Des Moines	City of West Des Moines - Deputy City Clerk	Community Economic Development	PWD
Polk	West Des Moines	City of West Des Moines - Director of Administrative Services	Community Economic Development	PWD
Polk	Windsor Heights			PWD
Polk	Windsor Heights	City of Windsor Heights	Community Economic Development	PWD
Polk		Polk Co. Zoning Comm.	Community Economic Development	PWD
Polk		Polk County	Community Economic Development	FAC
Polk				BCOM, FAC, TT
Polk				TCOM
Polk				BCOM
Polk				BCOM
Polk		Polk County Auditor's Office	Community Economic Development	PWD
Polk		Polk County Election Office	Community Economic Development	PWD
Polk		Polk County	Community Economic Development	PWD
Polk	1047		1026	
Pottawattamie	Avoca	AHST High School	Extension	PWD
Pottawattamie	Avoca	Avoca Nursing and Rehab Center	Extension	PWD
Pottawattamie	Avoca	Parkway Café	Extension	PWD
Pottawattamie	Avoca			TCOM

Polk
Count

Pottawattamie Carson	lowa SBDC	BAC
Pottawattamie Carson	lowa SBDC	BAC
Pottawattamie Council Bluffs	ISUE	BAC
Pottawattamie Council Bluffs	Local CEED's and Communities FS	BAC, BCOM
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	ISUE	TAC
Pottawattamie Council Bluffs	Families	PWD
Pottawattamie Council Bluffs	ISU Engineering	TT
Pottawattamie Council Bluffs	Communities and West Pott Co Ext.	PWD
Pottawattamie Council Bluffs	Midwest Forensics Resource Center, IPRT	OCOM
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	Biotech Outreach Education Center	TAC
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	ISUE	TAC
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	IPRT Company Assistance-Materials	TAC
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	EHS Project -- HD FS	TAC
Pottawattamie Council Bluffs	Natural Resource Ecology and Management	PWD
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	BAC
Pottawattamie Council Bluffs	OIPTT	PWD
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	CTRE/Natl CP Tech-Geotechnical	PWD
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	CIRAS	TAC
Pottawattamie Council Bluffs	ISUE	TAC
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	CTRE/Natl CP Tech-Geotechnical	PWD
Pottawattamie Council Bluffs	CTRE/SUDAS	TAC
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	ISUE	BAC
Pottawattamie Council Bluffs	CTRE/Natl CP Tech Center	PWD
Pottawattamie Council Bluffs	Contract Research Event in Pottawattamie County	
Pottawattamie Council Bluffs	Council Bluffs Chamber of Commerce	
Pottawattamie Council Bluffs	Council Bluffs Chamber of Commerce	
Pottawattamie Council Bluffs	Council Bluffs Nonprofits	
Pottawattamie Council Bluffs	Council Bluffs Police Department Crime Lab	
Pottawattamie Council Bluffs	Council Bluffs Public Works	
Pottawattamie Council Bluffs	Council Bluffs School	
Pottawattamie Council Bluffs	Council Bluffs Water Works	
Pottawattamie Council Bluffs	Council Bluffs Winnelson	
Pottawattamie Council Bluffs	Energy Workshops Event in Pottawattamie County	
Pottawattamie Council Bluffs	Griffin Pipe Products	
Pottawattamie Council Bluffs	Griffin Pipe Products Company	
Pottawattamie Council Bluffs	Henningsen Const., Inc.	
Pottawattamie Council Bluffs	HGM Associates	
Pottawattamie Council Bluffs	HGM Associates, Inc.	
Pottawattamie Council Bluffs	Hilltop Child Care Center	
Pottawattamie Council Bluffs	Hues Tree Service	
Pottawattamie Council Bluffs	IA Dept of Ag and Land Stewardship	
Pottawattamie Council Bluffs	inHisName	
Pottawattamie Council Bluffs	Iowa DOT	
Pottawattamie Council Bluffs	Iowa DOT--Dist 4	
Pottawattamie Council Bluffs	MFT Construction	
Pottawattamie Council Bluffs	NRCS	
Pottawattamie Council Bluffs	Omaha Standard	
Pottawattamie Council Bluffs	Operations/Production Management Event in	
Pottawattamie Council Bluffs	Pottawattamie County	
Pottawattamie Council Bluffs	Pottawattamie Co/West Pott SWCD	
Pottawattamie Council Bluffs	Pottawattamie County	
Pottawattamie Council Bluffs	Pottawattamie County Engineers	
Pottawattamie Council Bluffs	Pottawattamie County Engineers	
Pottawattamie Council Bluffs	Quality Services of Iowa, Inc.	
Pottawattamie Council Bluffs	Ready Mixed Conc Inc	

Pottawattamie	Treynor	-Council Bluffs	Iowa SBDC	BAC
Pottawattamie	Underwood	County Wide	Iowa SBDC	BAC
Pottawattamie	Underwood	East Pott Extension Office	Iowa SBDC	BAC
Pottawattamie	Underwood	City of Carson - City Clerk	Iowa SBDC	BAC
Pottawattamie	Walnut	Carter Lake/Pott. Co. Ping. Bd.	Iowa SBDC	BAC
Pottawattamie	Walnut	City of Council Bluffs	Iowa SBDC	BAC
Pottawattamie		Habitat for Humanity	LTAP	TCOM
Pottawattamie		City of Crescent - City Clerk	Extension	OCOM
Pottawattamie		City of Minden	Interior Design	TAC
Pottawattamie	Oakland	City of Oakland	Community Economic Development	PWD
Pottawattamie	Ottumwa	City of Treynor - City Clerk	Community Economic Development	PWD
Pottawattamie	Treynor	City of Treynor, Board of Adj.	Community Economic Development	BCOM, PWD
Pottawattamie	Treynor	City of Treynor, City Council	Community Economic Development	PWD
Pottawattamie	Treynor	City of Treynor, Zoning Comm.	Community Economic Development	PWD
Pottawattamie	Underwood	City of Underwood	Community Economic Development	PWD
Pottawattamie		Pottawattamie County Auditor's Office	Community Economic Development	PWD
Pottawattamie		Pottawattamie County Planning	Community Economic Development	PWD
Pottawattamie			Community Economic Development	BCOM, TCOM
Pottawattamie			148	
Poweshiek	Grinnell	Jeld-Wen	Ag & Biosystems Engineering and CIRAS	TAC
Poweshiek	Grinnell	Jeld-Wen	Ag & Biosystems Engineering and CIRAS	TAC
Poweshiek	Brooklyn	BGM Community Schools	Extension	PWD
Poweshiek	Brooklyn	Brooklyn 80	Extension	PWD
Poweshiek	Brooklyn	City of Brooklyn	CTRE/SUDAS	TAC
Poweshiek	Brooklyn	Creative Composites	ISUE	TAC
Poweshiek	Brooklyn	Manatts Inc.	CTRE/Natl CP Tech Center	PWD
Poweshiek	Brooklyn	Manatt's, Inc.	CTRE/SUDAS	TAC
Poweshiek	Brooklyn		Iowa SBDC	BAC
Poweshiek	Grinnell	Brenda O'Halloran (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	TAC
Poweshiek	Grinnell	City of Grinnell	CTRE/SUDAS	PWD
Poweshiek	Grinnell	Dairy Queen - Grinnell	Extension	

Pottawattamie

Count

Count

Sac	Sac City	Beer Bread Co	ISUE	BAC
Sac	Sac City	chamber main street	ISUE	BAC
Sac	Sac City	City of Sac City	LA, IDRO	BCOM
Sac	Sac City	City of Sac City	ceed	BCOM
Sac	Sac City	Distance Education Students	Brenton Center	PWD
Sac	Sac City	Elaine Wycoff (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	OCOM
Sac	Sac City	Horizons	Ceed, families	TAC
Sac	Sac City	Pugh Machining	ISUE	BAC, FAC
Sac	Sac City	Sac Area Entrepreneurs	ISUE	BCOM
Sac	Sac City	Sac City Horizons	Extension	TCOM
Sac	Sac City		lowa SBDC	BAC
Sac	Sac City			TCOM
Sac	Sac City	Kid's World	Environment Rating Scale Assessment Project -- HD FS	PWD
Sac	Schaller	Fiesen USA	Engineering Distance Education	
Sac	Schaller	Schaller-Creston Transitional Kindergarten and Preschool	Environment Rating Scale Assessment Project -- HD FS	PWD
Sac	Wall Lake	Hallett Materials	CTRE/Natl CP Tech Center	TCOM
Sac	West Burlington			TCOM
Sac	Auburn	City of Auburn	Community Economic Development	FAC, TAC, BCOM
Sac	Early	City of Early	Community Economic Development	BCOM
Sac	Lake View	City of Lake View	Community Economic Development	BCOM
Sac	Odebolt	City of Odebolt	Community Economic Development	BCOM
Sac	Sac City	City of Sac City	Community Economic Development	BCOM
Sac	Wall Lake	City of Wall Lake	Community Economic Development	BCOM
Sac		Sac City-Sac Co-Zoning Admin	Community Economic Development	PWD
Sac		Sac County Auditor's Office	Community Economic Development	PWD
Sac			Community Economic Development	PWD
Sac		Sac County	Community Economic Development	PWD
52				48
Scott	Bettendorf	Alcoa	Engineering Distance Education	PWD
Scott	Bettendorf	AmeriCold	Meat Science Extension	BAC
Scott	Bettendorf	Christina Heald (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	TAC
Scott	Bettendorf	City of Bettendorf	CTRE/SUDAS	PWD
Scott	Bettendorf	City of Bettendorf	CTRE/Natl CP Tech Center	PWD
Scott	Bettendorf	City of Bettendorf	CTRE/Natl CP Tech Center	PWD
Scott	Bettendorf	Community Foundation	Community Vitality Center	BCOM

Sac
Count

Scott	Davenport	Davenport Community Schools	Youth	OCOM
Scott	Davenport	Davenport Police Department	Midwest Forensics Resource Center, IPRT	PWD
Scott	Davenport	Distance Education Students	Brenton Center	PWD
Scott	Davenport	Eastern Iowa Orthotics & Prosthetics, L.L.C.	ISUE	BAC
Scott	Davenport	ESCP Corporation	ISUE	BAC
Scott	Davenport	Facilitation Event in Scott County	ISUE	FAC
Scott	Davenport	Foley Construction	CTRE/SUDAS	TAC
Scott	Davenport	Friendly House Early Learning Program	Environment Rating Scale Assessment Project -- HD FS	PWD
Scott	Davenport	Gierke Robinson Co.	CTRE/Natl CP Tech Center	TAC
Scott	Davenport	Graet, Anhalt, Schloemer & Associates, Inc.	CTRE/SUDAS	PWD
Scott	Davenport	Granite City Restaurant & Brewery	Extension	TAC
Scott	Davenport	Hansaloy Corp	ISUE	TAC
Scott	Davenport	Hansaloy Corporation	IPRT Company Assistance-NDE	TAC
Scott	Davenport	IA American Water Co.	CTRE/SUDAS	TAC
Scott	Davenport	Iowa DOT	CTRE/Natl CP Tech Center	PWD
Scott	Davenport	Iowa DOT-Dist 6	CTRE/Natl CP Tech-Geotechnical	PWD
Scott	Davenport	John Deere	BEI	BAC, FAC, TAC, TT
Scott	Davenport	Lafarge North America	ISUE	TAC
Scott	Davenport	McClure Engineering Co. PC	CTRE/Natl CP Tech Center	PWD
Scott	Davenport	Michael Masterson, CPA	OIPTT	FAC
Scott	Davenport	MMS Thermal Processing, LLC	IPRT Company Assistance-Technology Commercialization	FAC
Scott	Davenport	MRA	ReCAP	BAC
Scott	Davenport	MSA Professional Services, Inc.	CTRE/SUDAS	TAC
Scott	Davenport	Murray's Enterprises	OIPTT	FAC
Scott	Davenport	N.J. Miller, Inc.	CTRE/SUDAS	FAC
Scott	Davenport	New Composite Partners	OIPTT	FAC
Scott	Davenport	New Ventures, Inc.	OIPTT	FAC
Scott	Davenport	PCT Engineered Systems	Engineering Distance Education	PWD
Scott	Davenport	Police Department	ITSDS	OCOM
Scott	Davenport	Relay Staffing	ISUE	BAC
Scott	Davenport	Rockwell Automation	BEI	BAC, FAC, TAC
Scott	Davenport	S. J. Smith Welding Supply	ISUE	BAC
Scott	Davenport	Scott County	Families and Youth	OCOM
Scott	Davenport	Scott County	CTRE/SUDAS	TAC
Scott	Davenport	Scott County Community Gardens	Horiculture	OCOM
Scott	Davenport	Skip-A-Long Child Development Services	Environment Rating Scale Assessment Project -- HD FS	FAC
Scott	Davenport	St. Ambrose University	OIPTT	TAC
Scott	Davenport	Tab Construction	CTRE/SUDAS	TAC
Scott	Davenport	Treiber Construction Company Inc.	CTRE/SUDAS	TAC

Scott	Davenport	John Deere	Iowa SBDC	BAC
Scott	Davenport		Iowa SBDC	BAC
Scott	Davenport		Iowa SBDC	BAC
Scott	Davenport			TCOM
Scott	Davenport			BAC, FAC, TAC, TT
Scott	Davenport			BAC
Scott	Donahue			BAC
Scott	Eldridge	Distance Education Students	Brenton Center	PWD
Scott	Eldridge	Propex Concrete Systems	CTRE/Natl CP Tech Center	PWD
Scott	Eldridge	Propex Concrete Systems	CTRE/Natl CP Tech Center	PWD
Scott	Eldridge		Iowa SBDC	BAC
Scott	Eldridge		Iowa SBDC	BAC
Scott	Eldridge		Iowa SBDC	BAC
Scott	Eldridge		Iowa SBDC	BAC
Scott	Eldridge		Iowa SBDC	BAC
Scott	Eldridge		Iowa SBDC	BAC
Scott	Le Claire			TCOM
Scott	LeClaire			BAC
Scott	LeClaire			BAC
Scott	LeClaire			BAC
Scott	LeClaire			BAC
Scott	Long Grove			TAC
Scott	Princeton	City of Long Grove	CTRE/SUDAS	TAC
Scott	Walcott	Johnson Manufacturing Company	IPRT Company Assistance-NDE	TAC
Scott	Walcott		Iowa SBDC	BAC
Scott	Bettendorf	City of Bettendorf	Community Economic Development	PWD
Scott	Blue Grass	City of Blue Grass - City Clerk/Financial Officer	Community Economic Development	PWD
Scott	Davenport	City of Davenport	Community Economic Development	PWD, BCOM
Scott	Davenport	Scott County	Agriculture	FAC
Scott	LeClaire	City of LeClaire	Community Economic Development	PWD
Scott	Long Grove	Long Grove Planning & Zoning	Community Economic Development	PWD
Scott	Long Grove	Planning & Zoning Comm.	Community Economic Development	PWD
Scott	Riverdale	City of Riverdale	Community Economic Development	PWD
Scott	Walcott	City of Walcott - City Clerk	Community Economic Development	PWD
Scott	155			150
Shelby	Defiance	Clean Air Filter Co	ISUE	BAC
Shelby	Defiance		Iowa SBDC	BAC
Shelby	Defiance		Iowa SBDC	BAC
Shelby	Earling		Iowa SBDC	BAC
Shelby	Elk Horn		Iowa SBDC	BAC
Shelby	Harlan	4-H Leader Training	4-H/Youth Development	OCOM
Shelby	Harlan	City of Harlan	LA, IDRO	BCOM
Shelby	Harlan	City of Harlan	CTRE/SUDAS	TAC
Shelby	Harlan	City of Harlan	CTRE/Natl CP Tech Center	PWD
Shelby	Harlan	Conductix	ISUE	TAC

Scott
Count

Shelby	Harlan	Conductix	ISUE	TAC
Shelby	Harlan	Elm Crest	Extension	PWD
Shelby	Harlan	Jacobs Corp	ISUE	TAC
Shelby	Harlan	Jacobs Corp	ISUE	TAC
Shelby	Harlan	Jacobs Corp	ISUE	TAC
Shelby	Harlan	Jacobs Corporation	IPRT Company Assistance-Materials	TAC
Shelby	Harlan	Jacobs Corporation	IPRT Company Assistance-Materials	TAC
Shelby	Harlan	Jacobs Corporation	IPRT Company Assistance-Materials	TAC
Shelby	Harlan	Jacobs Corporation	IPRT Company Assistance-NDE	TAC
Shelby	Harlan	Jim's Wholesale Meats	Meat Science Extension	PWD
Shelby	Harlan	Jim's Wholesale Meats	Meat Science Extension	BAC
Shelby	Harlan	Molded Products Inc	ISUE	TAC
Shelby	Harlan	Shelby County	CTRE/SUDAS	TAC
Shelby	Harlan	Shelby County Chamber of Commerce	Shelby County Extension	OCOM
Shelby	Harlan	Shelby County Cookers	Meat Science Extension	PWD
Shelby	Harlan	Shelby County Cookers	Meat Science Extension	PWD
Shelby	Harlan	Shelby County DevelopSource	Extension to Communities	BCOM
Shelby	Harlan	Shelby County Fair Board	Shelby County Extension	FAC
Shelby	Harlan	West Central Community Action Agency	Extension to Families	PWD
Shelby	Harlan		Iowa SBDC	BAC
Shelby	Harlan		Iowa SBDC	BAC
Shelby	Harlan		Iowa SBDC	BAC
Shelby	Harlan		Iowa SBDC	BAC
Shelby	Harlan		Iowa SBDC	BAC
Shelby	Harlan		Iowa SBDC	BAC
Shelby	Harlan		Iowa SBDC	BAC
Shelby	Irwin		LTAP	TCOM
Shelby	Kirkman		Iowa SBDC	BAC
Shelby	Panama		Iowa SBDC	BAC
Shelby	Panama		Brenton Center	PWD
Shelby	Shelby	Distance Education Students	ISUE	TAC
Shelby	Shelby	Operations/Production Management Event in Shelby County	Iowa SBDC	BAC
Shelby	Shelby		Iowa SBDC	BAC
Shelby	Shelby		Iowa SBDC	BAC
Shelby	Shelby		Iowa SBDC	BAC
Shelby	Shelby	City of Shelby	Community Economic Development	PWD
Shelby	Westphalia	Distance Education Students	Brenton Center	PWD
Shelby	Westphalia	County Wide	Extension	OCOM
Shelby	Harlan	City of Harlan	Community Economic Development	BCOM
Shelby	Harlan	Shelby County Auditor's Office	Community Economic Development	PWD
Shelby			48	
Sioux	Alton			TCOM

Sioux	Boyden	SIG International	Meat Science Extension	PWD
Sioux	Boyden	DEMCO	Extension	PWD
Sioux	Boyden	Democ	ISUE	TAC
Sioux	Boyden	Democ	ISUE	TAC
Sioux	Boyden	Democ	ISUE	TAC
Sioux	Boyden	Democ	ISUE	TAC
Sioux	Boyden	Democ	ISUE	TAC
Sioux	Hawarden	Family Child Care Home	Extension	BAC
Sioux	Hawarden	Family Child Care Home	Extension	BAC
Sioux	Hawarden	For-Most Inc.	IPRT Company Assistance-Technology Commercialization	TAC
Sioux	Hawarden	Rolling Hills Feedlot	Agricultural Management Lab, ABE	TAC, TT
Sioux	Hospers	Family Child Care Home	Extension	BAC
Sioux	Hospers	Premium Iowa Pork	ISUE	TAC
Sioux	Hospers	Premium Iowa Pork	VAAP-EXT	BAC
Sioux	Hospers	Premium Iowa Pork	VAAP-EXT	BAC
Sioux	Hospers	Premium Iowa Pork, LLC	Meat Science Extension	PWD
Sioux	Hospers	Premium Iowa Pork, LLC	Meat Science Extension	BAC
Sioux	Hull	Patrick Cudahy, Inc	Meat Science Extension	PWD
Sioux	Hull	the Foreign Candy Company	Extension	PWD
Sioux	Hull		Iowa SBDC	BAC
Sioux	Hull		Iowa SBDC	BAC
Sioux	Ireton	Jill Schouten (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	BAC
Sioux	Ireton		Iowa SBDC	BAC
Sioux	Maurice		Iowa SBDC	BAC
Sioux	Orange City	Advance Brands	Meat Science Extension	PWD
Sioux	Orange City	Advance Brands	Extension	PWD
Sioux	Orange City	Diamond Vogel Paints	Extension	TAC
Sioux	Orange City	entire county	ISUE	OCOM
Sioux	Orange City	entire county	Sioux County Extension	FAC
Sioux	Orange City	EZ-Liner Industries	Sioux County Extension	FAC
Sioux	Orange City	Family Child Care Home	OIPTT	FAC
Sioux	Orange City	Family Child Care Home	Extension	BAC
Sioux	Orange City	Landsmeer Ridge Retirement Community	Extension	BAC
Sioux	Orange City	Quatro Composites	Extension	PWD
Sioux	Orange City	Quatro Composites	IPRT Company Assistance-NDE	TAC
Sioux	Orange City	Silent Drive, Inc.	IPRT Company Assistance-NDE	TAC
Sioux	Orange City	Sioux County Jail	IPRT Company Assistance-Materials	TAC
Sioux	Orange City		Extension	PWD
Sioux	Orange City	Van Beek Natural Science LLC	IPRT Company Assistance-Technology Commercialization	TAC
Sioux	Orange City	Van Beek Natural Science, LLC	ISUE	TAC

Story	Ames	Applebee's of Ames	Extension	PWD
Story	Ames	Armstrong Co., Inc.	CTRE/SUDAS	TAC
Story	Ames	ASCE/ICEA Surveying Conference	Continuing and Distance Education	PWD
Story	Ames	Aspen House	IDRO	BCOM
Story	Ames	Asphalt Paving Assoc of Ia	CTRE/SUDAS	TAC
Story	Ames	Ball Corporation	IPRT Company Assistance-Materials	TAC
Story	Ames	Ball Corporation	IPRT Company Assistance-NDE	TAC
Story	Ames	BASF Plant Sciences	CCUR	TAC
Story	Ames	BASF Plant Sciences	CCUR	TAC
Story	Ames	Becker Underwood	Seed Science Center	PWD
Story	Ames	Becker Underwood Inc	ISUE	TAC
Story	Ames	Becker Underwood Inc	ISUE	TAC
Story	Ames	Biobased Products Economic Indicators Forum	ISUE	FAC
Story	Ames	BioCrystals	OIPPT	BAC
Story	Ames	Biodiesel Event in Story County	ISUE	FAC
Story	Ames	Biodiesel Event in Story County	ISUE	FAC
Story	Ames	Bioeconomy Conference	CCUR	FAC
Story	Ames	Bioeconomy Conference	CCUR	FAC
Story	Ames	BioRefinery Safety	ISUE	FAC
Story	Ames	Blue Sky	Art & Design	TAC
Story	Ames	Bolton and Menk, Inc.	CTRE/SUDAS	TAC
Story	Ames	Border's	Extension	PWD
Story	Ames	Bridge Inspection Refresher Course	Continuing and Distance Education	PWD
Story	Ames	Bridges to Excellence	Continuing and Distance Education	PWD
Story	Ames	Burger King of Ames	Extension	PWD
Story	Ames	Burger King of Ames	Extension	PWD
Story	Ames	Caremoli	NWRC	TAC
Story	Ames	Caremoli	ABE/Safety Training Instruction and Research	TAC
Story	Ames	Caremoli	ABE/Safety Training Instruction and Research	TAC
Story	Ames	Caremoli	NWRC	TAC
Story	Ames	Caremoli USA Inc.	CCUR	TAC
Story	Ames	Caremoli USA Inc.	CCUR	TAC
Story	Ames	Carriage House Foods	Meat Science Extension	PWD
Story	Ames	CATILIN	CCAT	TAC, TT
Story	Ames	Cellencor	OIPPT	BAC
Story	Ames	Cellencor Corporation	CCUR	TAC
Story	Ames	Cellencor Corporation	CCUR	TAC
Story	Ames	Cellencor, Inc.	NREM/IPRT/BECON	TAC
Story	Ames	Center for Industrial Research and Service (CIRAS)	Interior Design	OCOM
Story	Ames	Howe Hall, ISU		
Story	Ames	Central Iowa Transportation Center	CTRE/SUDAS	TAC
Story	Ames	CIRAS	ISUE	TAC

Story	Ames	City of Ames	BEI		BAC, FAC, TAC
Story	Ames	City of Ames	BEI		BAC, FAC, TAC
Story	Ames	City of Ames		Natural Resource Ecology and Management	BCOM
Story	Ames	City of Ames		Natural Resource Ecology and Management	TCOM
Story	Ames	City of Ames		Natural Resource Ecology and Management	PWD
Story	Ames	City of Ames		Natural Resource Ecology and Management	TCOM
Story	Ames	City of Ames		Natural Resource Ecology and Management	BCOM
Story	Ames	City of Ames		Natural Resource Ecology and Management	TCOM
Story	Ames	City of Ames		Natural Resource Ecology and Management	PWD
Story	Ames	City of Ames		Natural Resource Ecology and Management	TCOM
Story	Ames	City of Ames		Natural Resource Ecology and Management	TAC
Story	Ames	City of Ames		CTRE/SUDAS	PWD
Story	Ames	City of Ames		CTRE/Natl CP Tech Center	PWD
Story	Ames	City of Ames		CTRE/Natl CP Tech Center	PWD
Story	Ames	City of Ames		Landscape Architecture	BCOM
Story	Ames	City of Ames Public Works Department			TAC
Story	Ames	City of Ames Street Dept.			TAC
Story	Ames	City of Ames Utility Maintenance Dept.			TAC
Story	Ames	City of Ames Water and Pollution Control Dept.			TAC
Story	Ames	Clapsaddle-Garber Associates, Inc.			TAC
Story	Ames	College of Ag and Natural Resources Foundation			BCOM, FAC
Story	Ames	Colorbiotics		Interior Design	TAC
Story	Ames	Colorbiotics		ISUE	TAC
Story	Ames	Colorbiotics		ISUE	TAC
Story	Ames	Con-Struct, Inc		CTRE/SUDAS	TAC
Story	Ames	Council for Agricultural Science and Technolgy		Ag & Biosystems Engineering	OCOM
Story	Ames	Council for Agricultural Science and Technolgy		Ag & Biosystems Engineering	OCOM
Story	Ames	Countermeasure Design for Bridge Scour and Stream			PWD
Story	Ames	County Engineers Association		Continuing and Distance Education	PWD
Story	Ames	CTRE		Continuing and Distance Education	TAC
Story	Ames	Culver's of Ames		CTRE/SUDAS	PWD
Story	Ames	Culver's of Ames		Extension	PWD
Story	Ames	Cyclone Society for Human Resource Management		ReCAP	OCOM
Story	Ames	Dairy Queen - Ames		Extension	PWD
Story	Ames	Distance Education Students		Brenton Center	PWD
Story	Ames	Dublin Bay		Extension	PWD
Story	Ames	Edwards Elementary-Science Night, Ames		Biotech Outreach Education Center	BAC
Story	Ames	Endometric		OIPTT	TAC
Story	Ames	Energy Workshops Event in Story County		ISUE	TAC
Story	Ames	Energy Workshops Event in Story County		ISUE	TAC
Story	Ames	Eng Cont Ed - ASCE Iowa Section Annual Meeting		ISUE	PWD
Story	Ames	Eng Cont Ed - ASCE Structural Engineering Conference		ISUE	PWD

Story	Ames	Eng Cont Ed - ASCE Transportation Conference	ISUE	PWD
Story	Ames	Eng Cont Ed - Control Systems Cyber Security Short Course 2008	ISUE	PWD
Story	Ames	Eng Cont Ed - Electric Substation Short Course 2008	ISUE	PWD
Story	Ames	Eng Cont Ed - Midwestern Protective Relay Short Course 2008	ISUE	PWD
Story	Ames	Eng Cont Ed - SCADA, Substation and Feeder Automation, in Electric Utilities Short Course	ISUE	PWD
Story	Ames	Engineering Plus, Inc.	CTRE/SUDAS	TAC
Story	Ames	EnoGen	CCUR	TAC
Story	Ames	EnoGen	CCUR	TAC
Story	Ames	ETREMA	MPC	TAC
Story	Ames	ETREMA Products, Inc.	IPRT Company Assistance-Materials	TAC
Story	Ames	ETREMA Products, Inc.	IPRT Company Assistance-NDE	TAC
Story	Ames	Farm to Folk	NCRCRD	OCOM
Story	Ames	Feasibility Studies Event in Story County	ISUE	BAC
Story	Ames	FHWA	CTRE/Natl CP Tech Center	PWD
Story	Ames	FHWA	CTRE/Natl CP Tech Center	PWD
Story	Ames	FHWA	CTRE/Natl CP Tech Center	PWD
Story	Ames	FHWA-Iowa Division	CTRE/SUDAS	TAC
Story	Ames	FOX Engineering	CTRE/Natl CP Tech Center	PWD
Story	Ames	FOX Engineering	CTRE/Natl CP Tech Center	PWD
Story	Ames	FOX ENGINEERING	CTRE/Natl CP Tech Center	PWD
Story	Ames	Fox Engineering Associates	CTRE/SUDAS	TAC
Story	Ames	Frontline BioEnergy	BEI	BAC, FAC, TAC, TT
Story	Ames	Frontline Bioenergy	CSET	FAC
Story	Ames	Frontline BioEnergy, LLC	OIPPT	BAC
Story	Ames	Frontline BioEnergy, LLC	CCAT	TT
Story	Ames	Glendandy Marketing, Inc.	ISUE	BAC
Story	Ames	Gumby's Pizza	Extension	TT
Story	Ames	Hall JL Engineering Services PC	MPC	BAC
Story	Ames	Harold Pike Construction	CTRE/SUDAS	PWD
Story	Ames	Hawkeye Ethanol	CCAT	TAC
Story	Ames	Hawkeye Renewable	CSET	TAC
Story	Ames	Heartland Senior Services	GEAT	FAC
Story	Ames	Heartland Senior Services	GEAT	FAC
Story	Ames	Helping Hands	Engineering Distance Education	6
Story	Ames	Hickory Park, Inc.	CTRE/SUDAS	PWD
Story	Ames	Hoover Mentoring Workshop	Continuing and Distance Education	TAC
Story	Ames	HWS Consulting Group	CTRE/SUDAS	PWD
Story	Ames	ICS Advanced Technologies	Engineering Distance Education	TAC
Story	Ames			PWD

Story	Ames	IDOT Methods	CTRE/SUDAS	TAC
Story	Ames	IDOT Traffic and Safety	CTRE/SUDAS	TAC
Story	Ames	Immunobiotics Iowa 1 (IBI2)	Biomedical Sciences	BAC, TAC, FAC TT
Story	Ames	Innovative Energy Solutions Inc	OIP TT	FAC
Story	Ames	Innovative Energy Solutions Inc	OIP TT	BAC
Story	Ames	Installation Company, L.L.C.	ISUE	BAC
Story	Ames	Integrated Sensor Technologies, Inc.	IPRT Company Assistance-Technology Commercialization	TAC
Story	Ames	Iowa Better Concrete Conference	Continuing and Distance Education	PWD
Story	Ames	Iowa County Engineers Conference	Continuing and Distance Education	PWD
Story	Ames	Iowa Department of Trans.	CTRE - Traffic Operations/RIMOS	TCOM
Story	Ames	Iowa Department of Transportation	IPRT Company Assistance-Materials	TCOM
Story	Ames	Iowa DOT	CTRE/Natl CP Tech Center	PWD
Story	Ames	Iowa DOT	CTRE/Natl CP Tech Center	PWD
Story	Ames	IOWA DOT	CTRE/Natl CP Tech Center	PWD
Story	Ames	Iowa DOT	CTRE/SUDAS	TAC
Story	Ames	Iowa DOT--Construction	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa DOT--Design	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa DOT--Dist 1	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa DOT--Local Systems	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa DOT--Materials	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa DOT--Research	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa DOT--Specifications	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa DOT--Statewide Ops	CTRE/ Natl CP Tech-Geotechnical	PWD
Story	Ames	Iowa Energy Center	CSET	FAC
Story	Ames	Iowa Energy Industry Workshop Workforce	Continuing and Distance Education	PWD
Story	Ames	Iowa Maintenance Training EXPO/Snow Roads	Continuing and Distance Education	PWD
Story	Ames	Iowa Nursery Research Corp.	Horticulture	TAC
Story	Ames	Iowa Science Olympiad, Ames Middle School	Kinesiology	OCOM - Coordinator for the Iowa Science Olympiad -- The Science of Fitness
Story	Ames	Iowa State University	Veterinary Pathology	TT
Story	Ames	Iowa State University	LA, CRP, IDRO	PWD, BCOM
Story	Ames	Iowa State University	CTRE/SUDAS	TAC
Story	Ames	Iowa State University	Veterinary Pathology	TT
Story	Ames	Iowa Turf Grass Institute	Horticulture Research Station, ISU	FAC
Story	Ames	ISU CCEE Dept.	CTRE/SUDAS	TAC
Story	Ames	ISU Chapter of Mechanical Contractors of America	Iowa Energy Center	TAC

Story	Ames	Parenting, education professionals throughout central and south central Iowa, and the U.S.			PWD
Story	Ames	Parenting education professionals throughout central and south central Iowa, and the U.S. -- Greder	Extension		PWD
Story	Ames	Parks and Recreation Department, City of Ames	GeAT		4
Story	Ames	PHD Technologies, LLC.	NWRC Sensory Evaluation Unit		TAC
Story	Ames	PhD. Technologies	IPRT Company Assistance-Technology Commercialization		TAC
Story	Ames	Photo Energy Technology, Inc.	MPC		TAC
Story	Ames	Photo Energy Technology, Inc.	MPC		TAC
Story	Ames	Pile Wave Equation Workshop	Continuing and Distance Education		PWD
Story	Ames	PK Biosciences	OIPTT		BAC
Story	Ames	PK Biosciences Corporation	Biomedical Sciences		TT
Story	Ames	PowerFilm Inc	ISUE		BAC
Story	Ames	PowerFilm Inc	ISUE		TAC
Story	Ames	PowerFilm Inc	ISUE		BAC
Story	Ames	PowerFilm Inc	ISUE		BAC
Story	Ames	Prairie Rivers/City of Ames	CSET		FAC
Story	Ames	Professional Developers of Iowa	CED		PWD
Story	Ames	Professional Developers of Iowa	College of Engineering		FAC
Story	Ames	Quality Attributes	OIPTT		BAC
Story	Ames	Quality Attributes Software, Inc.	ISUE		BAC
Story	Ames	REG	FSHN - Tong Wang		TAC
Story	Ames	REG	FSHN - Tong Wang		TAC
Story	Ames	Renewable Energy Group	CCUR		TAC
Story	Ames	Renewable Energy Group	CSET		FAC
Story	Ames	Renewable Energy Group	CCUR		TAC
Story	Ames	Renewable Energy Group, Inc.	IPRT Company Assistance-Technology Commercialization		TAC
Story	Ames	Rognes Corporation	CTRE/SUDAS		TAC
Story	Ames	Sauer Danfoss	Ag & Biosystems Engineering and CIRAS		TAC
Story	Ames	Sauer Danfoss	Ag & Biosystems Engineering and CIRAS		TAC
Story	Ames	Sauer Danfoss Company	IPRT Company Assistance-NDE		TAC
Story	Ames	Sauer Danfoss Company	IPRT Company Assistance-NDE		TAC
Story	Ames	Sauer Danfoss Company	IPRT Company Assistance-NDE		TAC
Story	Ames	Sauer Danfoss Company	IPRT Company Assistance-NDE		TAC
Story	Ames	Sauer Danfoss Company	IPRT Company Assistance-NDE		TAC
Story	Ames	Sauer Danfoss Company	IPRT Company Assistance-NDE		TAC
Story	Ames	Sauer Danfoss Company	Engineering Distance Education		PWD
Story	Ames	Sauer-Danfoss	ISUE		TAC
Story	Ames	Sauer-Danfoss Co	Biotech Outreach Education Center		
Story	Ames	Sawyer Elementary Science night, Ames			

Story	Ames	Science Olimpiad	GEAT	OCOM
Story	Ames	Silvercrest Assisted Living	Extension	PWD
Story	Ames	Sirrah	OIPTT	FAC
Story	Ames	Sloan BioBased Products Industry Center	ISUE	FAC
Story	Ames	Snap!	Extension	PWD
Story	Ames	Soils Design Section	CTRE/SUDAS	TAC
Story	Ames	Splash	OIPTT	BAC
Story	Ames	Splash	IPRT Company Assistance-Technology Commercialization	TAC
Story	Ames	Splash	IPRT Company Assistance-Technology Commercialization	TAC
Story	Ames	Starch Design	OIPTT	BAC
Story	Ames	State 4-H Youth Conference 2007	Center for Transportation Research and Education (CTRE)	OCOM
Story	Ames	State 4-H Youth Conference 2008	CTRE and National Concrete Pavement Technology Center	OCOM
Story	Ames	StineSeeds	BBMB/PSI	TAC,FAC,TT
Story	Ames	Stomping Grounds	Extension	PWD
Story	Ames	Story Construction	CTRE/SUDAS	TAC
Story	Ames	Strategic Planning Event in Story County	ISUE	BAC
Story	Ames	Successful Management -Ames	LTAP	TCOM
Story	Ames	The Flying Burrito	Extension	PWD
Story	Ames	The Rose of Ames	Extension	PWD
Story	Ames	Thielen Student Health Center	Arts & Design, Fred Malven, IDRO	BCOM
Story	Ames	Thompson Electric Company	Engineering Distance Education	PWD
Story	Ames	Tom Frederickson Wandling Eng	CTRE/SUDAS	TAC
Story	Ames	Transportation Career Fair	Continuing and Distance Education	PWD
Story	Ames	Trileaf Corp.	CTRE/SUDAS	TAC
Story	Ames	USDA BioPreferred Program	ISUE	TAC
Story	Ames	Wandling Engineering	CTRE/SUDAS	TAC
Story	Ames	Water and Pollution Control Department, City of Ames	GeAT	4
Story	Ames	Weitz Golf Int.	Engineering Distance Education	PWD
Story	Ames	WHKS & Co.	CTRE/SUDAS	TAC
Story	Ames	Woodruff Design	Engineering Distance Education	PWD
Story	Ames	Work Zone Safety Workshops	Continuing and Distance Education	PWD
Story	Ames	Work Zone Safety Workshops	Continuing and Distance Education	PWD
Story	Ames	Work Zone Safety Workshops	Continuing and Distance Education	PWD
Story	Ames	Work Zone Safety Workshops	Continuing and Distance Education	PWD
Story	Ames	Work Zone Safety Workshops	LTAP	TCOM
Story	Ames	Work Zone Safety Workshops	LTAP	TCOM
Story	Ames	Work Zone Safety Workshops	LTAP	BCOM
Story	Ames	Work Zone Safety Workshops	LTAP	TCOM

Story	Cambridge	Swine Genetics International	lowa Pork Industry Center (Mabry)	TT
Story	Cambridge	Swine Genetics International	lowa Pork Industry Center (Mabry)	TT
Story	Cambridge		lowa SBDC	BAC
Story	Gilbert	Distance Education Students	Brenton Center	PWD
Story	Gilbert	Gilbert CSD	Extension	PWD
Story	Gilbert	Gilbert Elementary School	GEAT	6
Story	Gilbert	Gilbert Elementary School	GEAT	6
Story	Gilbert	Gilbert Middle School	GEAT	BCOM
Story	Gilbert	Gilbert Middle School	GEAT	BAC
Story	Gilbert		CTRE - Traffic Operations/RIMOS	BAC
Story	Gilbert	Gilbert Community School District	lowa SBDC	OCOM
Story	Huxley	Ballard Community Schools	Extension	PWD
Story	Huxley	BASF Plant Sciences	Extension	PWD
Story	Huxley	City of Huxley	Seed Science Center	TAC
Story	Huxley	Dairy Queen - Huxley	CTRE/SUDAS	PWD
Story	Huxley	Distance Education Students	Extension	PWD
Story	Huxley	EnviroESI	Brenton Center	FAC
Story	Huxley	Kreg Tool Co	OIPPT	TAC
Story	Huxley	Kreg Tool Company	ISUE	TAC
Story	Huxley	Syngenta	IPRT Company Assistance-Materials	BAC, FAC, TAC
Story	Huxley		BEI	BAC
Story	Huxley		lowa SBDC	BAC
Story	Huxley		lowa SBDC	BAC
Story	Huxley		lowa SBDC	BAC
Story	Huxley		lowa SBDC	BAC
Story	Huxley		lowa SBDC	TCOM
Story	Kelley	Distance Education Students	Brenton Center	PWD
Story	Kelley	Mg Biologics	Biomedical Sciences	BAC
Story	Kelley	Mg Biologics	Biomedical Sciences	TAC
Story	Kelley		lowa SBDC	BAC
Story	Maxwell	Collins Maxwell Baxter School	Biotech Outreach Education Center	BAC
Story	Maxwell		lowa SBDC	TCOM
Story	Nevada	-Boone		BCOM
Story	Nevada	Aginimoto	lowa Energy Center	BCOM
Story	Nevada	Alliant Energy	lowa Energy Center	BCOM
Story	Nevada	ALMACO	ISUE	TAC
Story	Nevada	ALMACO	ISUE	TAC
Story	Nevada	ALMACO	Ag & Biosystems Engineering and CIRAS	TAC
Story	Nevada	ALMACO	Ag & Biosystems Engineering and CIRAS	TAC
Story	Nevada	ALMACO	Seed Science Center	PWD
Story	Nevada	Ames Christian School	lowa Energy Center	BCOM

Story	Nevada	Bratney Companies	Iowa Energy Center	TAC
Story	Nevada	Burke Corporation	IPRT Company Assistance-NDE	TAC
Story	Nevada	Catlin Inc.	Iowa Energy Center	TAC
Story	Nevada	Cellencor	Iowa Energy Center	TAC
Story	Nevada	Cindy Sloan (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	TAC
Story	Nevada	City of Nevada	CTRE/SUDAS	TAC
Story	Nevada	City of Nevada - Water Dept	CTRE/SUDAS	TAC
Story	Nevada	Couser Cattle Company	Agricultural Management Lab, ABE	TAC, TT
Story	Nevada	Des Moines Engineers, Robert Sieh	Iowa Energy Center	BCOM
Story	Nevada	Distance Education Students	Brenton Center	PWD
Story	Nevada	Drying Solutions Inc.	Iowa Energy Center	TAC
Story	Nevada	Elisworth Community College	Iowa Energy Center	BCOM
Story	Nevada	Frontline Bioenergy	Iowa Energy Center	BCOM
Story	Nevada	Heartland Renewable Energy	Iowa Energy Center	TAC
Story	Nevada	Iowa Association of Electric Cooperatives	Iowa Energy Center	TAC
Story	Nevada	Iowa Central Community College	Iowa Energy Center	BCOM
Story	Nevada	Iowa Farm Bureau	Iowa Energy Center	BCOM
Story	Nevada	Iowa Institute of Cooperatives	Iowa Energy Center	FAC
Story	Nevada	Iowa Soybean Association	Iowa Energy Center	BCOM
Story	Nevada	Iowa Soybean Association	Iowa Energy Center	BCOM
Story	Nevada	Iowa Western Community College	Iowa Energy Center	BCOM
Story	Nevada	IRFA	CTRE/SUDAS	TAC
Story	Nevada	Jensen Turf Inc.	Iowa Energy Center	TAC
Story	Nevada	Kemin Industries	BEI	BAC, FAC, TAC
Story	Nevada	Lincolnway Energy	ISUE	TAC
Story	Nevada	Mid-America Manufacturing Inc	ISUE	TAC
Story	Nevada	Mid-America Manufacturing Inc	IPRT Company Assistance-Materials	TAC
Story	Nevada	Mid-America Manufacturing, Inc.	IPRT Company Assistance-Materials	TAC
Story	Nevada	Midwest Cylinder Head	Extension	PWD
Story	Nevada	Nevada Comm. School District	Natural Resource Ecology and Management	OCOM
Story	Nevada	Nevada Community	Iowa Energy Center	BCOM
Story	Nevada	Nevada Economic Development	Iowa Energy Center	BCOM
Story	Nevada	NRCS Humboldt	Iowa Energy Center	TAC
Story	Nevada	Paragon International Inc	ISUE	PWD
Story	Nevada	Purfoods LLC / Mom's Meals Ltd	Meat Science Extension	PWD
Story	Nevada	Purfoods/Mom's Meals	Meat Science Extension	PWD
Story	Nevada	Shawnee Garcia (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	PWD
Story	Nevada	Story County Auditor's Office	LA, CRP, IDRO	TAC
Story	Nevada	Story County Planning and Zoning	CTRE/SUDAS	TCOM
Story	Nevada			

Story	Nevada	Iowa SBDC	BAC
Story	Nevada	Story County Extension	TCOM
Story	Nevada	CRP, IDRO	7
Story	Roland	CTRE/SUDAS	BCOM, TCOM
Story	Roland	Brenton Center	TAC
Story	Roland	ISUE	PWD
Story	Roland	CTRE - Traffic Operations/RIMOS	TAC
Story	Roland	Iowa SBDC	BCOM
Story	Roland	Iowa SBDC	BAC
Story	Roland	LTAP	BAC
Story	Sioux City	CTRE/Natl CP Tech Center	BCOM
Story	Slater	CTRE/SUDAS	PWD
Story	Slater	Brenton Center	TAC
Story	Slater	CTRE - Traffic Operations/RIMOS	PWD
Story	Slater	Iowa SBDC	BCOM
Story	Slater	Iowa SBDC	BAC
Story	Slater	ABE/Safety Training Instruction and Research	BAC
Story	Slater	ABE/Safety Training Instruction and Research	TAC
Story	Slater	Extension	TAC
Story	Slater	College of Engineering	PWD
Story	Slater	Brenton Center	BAC
Story	Slater	Seed Science Center	PWD
Story	Slater	VAAP-EXT	BAC
Story	Slater	VAAP-EXT	BAC
Story	Slater	ISUE	BAC
Story	Slater	Agricultural Education and Studies	OCOM
Story	Slater	Extension	PWD
Story	Slater	Environment Rating Scale Assessment Project -- HD FS	TCOM
Story	Slater	ITSDS	TCOM
Story	Slater	ITSDS	TAC
Story	Slater	ITSDS	TCOM
Story	Slater	ITSDS	TAC
Story	Slater	Luella Kalvik's Preschool	
Story	Slater	Iowa Maintenance Training EXPO -Ames	
Story	Slater	Iowa Streets & Roads Conf. - Ames	
Story	Slater	Planning and Zoning Department	
Story	Slater	Snow Roadeo (Truck, Motor Grader, Loader) -Ames	
Story	Slater	Story County Empowerment	

OCOM - leadership for local health coalition (Story County Healthy Lifestyle Taskforce) that provides programming & service to the surrounding communities

Story	Story County Healthy Lifestyle Taskforce	Kinesiology	
Story	Viewing Iowa's Bio-Fuels/IA Streets & Roads Conf.	LTAP	TCOM
Story		LTAP	BCOM
Story			BCOM
Story			TCOM
Story	AGMRC	Community Economic Development	PWD
Story	City of Ames	Community Economic Development	OCOM, FAC, TCOM, PWD
Story	ISU Dining Services	Extension	TAC
Story	Practical Farmers of Iowa	Extension	TAC
Story	School Foodservice Personnel Short Courses	Extension	TAC
Story	School Foodservice Personnel Short Courses	Extension	FAC
Story	School Nutrition Association	Extension	FAC
Story	City of Collins - City Clerk	Community Economic Development	PWD
Story	City of Gilbert	Community Economic Development	PWD
Story	City of Huxley - City Clerk	Community Economic Development	PWD
Story	City of Maxwell - city clerk	Community Economic Development	PWD
Story	City of Maxwell	Community Economic Development	PWD
Story	City of Nevada	Community Economic Development	PWD
Story	City of Roland	Community Economic Development	PWD
Story	City of Story City	Community Economic Development	PWD
Story	Story County	Community Economic Development	PWD
Story	Story County Auditor's Office	Community Economic Development	PWD
Story		Community Economic Development	OCOM, PWD
Story		Community Economic Development	PWD
Story		Community Economic Development	FAC, OCOM
Story		Community Economic Development	BCOM
505		Community Economic Development	PWD
Tama			BAC
Tama			BAC
Tama	GMG school		
Tama	Mary Millard (Family Child Care Provider)		

Story Count

Taylor	Clearfield	Clearfield Community School	Taylor County Extension	OCOM
Taylor	Clearfield	Distance Education Students	Brenton Center	PWD
Taylor	Clearfield	Kerns Farms	Iowa Pork Industry Center (Mabry)	TT
Taylor	Clearfield	Kerns Farms	Iowa Pork Industry Center (Mabry)	TT
Taylor	Lenox	CCR and ORCA Event in Taylor County	ISUE	BAC
Taylor	Lenox	Cox Manufacturing Corporation (Dalton)	Taylor County Extension	FAC
Taylor	Lenox	Lenox Community School	Taylor County Extension	OCOM
Taylor	Lenox	Lenox Development Corporation	ISUE	BAC
Taylor	Lenox	Lenox Economic Development Corporation	Taylor County Extension	BCOM
Taylor	Lenox	Precious People Preschool	Taylor County Extension	OCOM
Taylor	NA	Local economic development group	ReCAP	BCOM
Taylor	Bedford	City of Bedford	Community Economic Development	PWD
Taylor	Lenox	City of Lenox	Community Economic Development	PWD
Taylor		Taylor County Auditor's Office	Community Economic Development	PWD
Taylor			Community Economic Development	FAC, BCOM

Taylor
Count

30

Union	Afton	Five counties in SW IA - SW PBS (3&4's)	Human Development and Family Studies	PWD
Union	Afton		Iowa SBDC	BAC
Union	Afton		Iowa SBDC	BAC
Union	All of county	All of Union County for rain garden education and implementation	county Extension and Hort FS	FAC
Union	Creston	Bunn-O-Matic Corporation	IPRT Company Assistance-Materials	TAC
Union	Creston	City of Creston	CTRE/SUDAS	TAC
Union	Creston	City of Creston	CTRE/Natl CP Tech Center	PWD
Union	Creston	Creston	Extension at county and area level	TCOM
Union	Creston	Creston High School Environmental and Spatial Technology Program	county Extension	OCOM
Union	Creston	Distance Education Students	Brenton Center	PWD
Union	Creston	Fansteel Wellman Dynamics Corp	ISUE	TAC
Union	Creston	Fansteel Wellman Dynamics Corp	ISUE	TAC
Union	Creston	Fansteel Wellman Dynamics Corp	ISUE	TAC
Union	Creston	Fansteel Wellman Dynamics Corp	ISUE	TAC
Union	Creston	Fansteel/Wellman Dynamics	IPRT Company Assistance-Technology Commercialization	TAC
Union	Creston	Five counties in SW IA - SW PBS (3&4's)	Human Development and Family Studies	PWD
Union	Creston	Food service employees	Extension	OCOM
Union	Creston	Iowa Tool and Mfg, Inc.	ISUE	BAC
Union	Creston	Jeanann's Catering	Extension	PWD
Union	Creston	Southern IA Council of Governments	CTRE/SUDAS	TAC
Union	Creston	Southwestern Corn. College, Creston	Biotech Outreach Education Center	

Union
Count

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Van Buren	Birmingham	Birmingham Early Childhood Center	Human Development and Family Studies	PWD
Van Buren	Birmingham	Empowerment	Van Buren County Extension	TCOM
Van Buren	Birmingham		Iowa SBDC	BAC
Van Buren	Birmingham		Iowa SBDC	BAC
Van Buren	Bonaparte	Shooting sports	Van Buren County Extension	TCOM
Van Buren	Bonaparte	Horizons	Iowa SBDC	BAC
Van Buren	Douds	Women in Agriculture	Van Buren County Extension	PWD
Van Buren	Douds	Distance Education Students	Brenton Center	Fac
Van Buren	Farmington	Harmony Community Schools	Van Buren County Extension	PWD
Van Buren	Farmington	Master Gardeners	Van Buren County Extension	OCOM
Van Buren	Farmington	Health Care Professionals	Van Buren County Extension	FAC
Van Buren	Keosauqua	Johnston Catering	Van Buren County Extension	OCOM
Van Buren	Keosauqua	Kaiser Wines	Van Buren County Extension	BAC
Van Buren	Keosauqua	Keosauqua Horizons	Extension	FAC
Van Buren	Keosauqua	Van Buren County	CTRE/SUDAS	BCOM
Van Buren	Keosauqua	Whispering Pines	Van Buren County Extension	TAC
Van Buren	Milton	Mid-States Engineering	Van Buren County Extension	FAC
Van Buren	Milton	Mid-States Engineering and Mfg	ISUE	TAC
Van Buren	Milton	Mid-States Engineering and Mfg	ISUE	BAC
Van Buren	Stockport	Horizons	Van Buren County Extension	PWD
Van Buren	Stockport	JET STOP	Iowa SBDC	BAC
Van Buren	Keosauqua	City of Keosauqua	Extension	PWD
Van Buren	Keosauqua	Horizons	Community Economic Development	FAC, PWD
Van Buren	Keosauqua	Van Buren Hospital	Van Buren County Extension	PWD
Van Buren	Moulton	Moulton Udell Schools	Van Buren County Extension	OCOM
Van Buren		Van Buren County Auditor's Office	Extension	PWD
Van Buren			Community Economic Development	PWD
Van Buren			Community Economic Development	FAC, BCOM, TAC
30			29	

Van
Buren
Count

30

Villisca
Count

1

Villisca		Community Economic Development	Community Economic Development	FAC, TAC
1			1	
Wapello	Agency		Iowa SBDC	BAC
Wapello	Eddyville	Ajinomoto	CCUR	FAC
Wapello	Eddyville	Ajinomoto	CCUR	FAC
Wapello	Eddyville	C & J Bulldozing	CTRE/SUDAS	TAC

Wapello	Ottumwa	Wigglesville	Extension	PWD
Wapello	Ottumwa, Eddyville, Eldon, Blakesburg School Districts	Wapello Co. Platting Admin Wapello Co. Supervisor Wapello County Auditor's Office	Families Community Economic Development Community Economic Development Community Economic Development Community Economic Development	OCOM PWD PWD PWD BCOM, PWD
90			89	
Warren	Carlisle	City of Carlisle	CTRE/SUDAS	TAC
Warren	Carlisle	Distance Education Students	Brenton Center	PWD
Warren	Carlisle	G&K Services	Extension	PWD
Warren	Carlisle	Sandstone Mgmt. LTD.	CTRE/SUDAS	TAC
Warren	Carlisle	The Commons	Extension	PWD
Warren	Cumming	City of Cumming	LA, CRP, IDRO	TCOM
Warren	Cumming	City of Cumming	CTRE/SUDAS	BCOM
Warren	Cumming	Jacquelyn Kopsa (Family Child Care Provider)		TAC
Warren	Cumming	John Bellizi	Environment Rating Scale Assessment Project - HD FS	TAC
Warren	Cumming	City of Hartford	CTRE/SUDAS	BAC
Warren	Hartford	Triple R. Paving, Inc.	Iowa SBDC	TAC
Warren	Hartford	Cemen Tech Inc	CTRE/SUDAS	TAC
Warren	Indianola	City of Indianola	ISUE	TAC
Warren	Indianola	Distance Education Students	CTRE/SUDAS	TAC
Warren	Indianola	Herberger Construction Co., Inc.	Brenton Center	PWD
Warren	Indianola	Indianola Child Care	CTRE/SUDAS	TAC
Warren	Indianola	Indianola Community High School	Human Development and Family Studies	PWD
Warren	Indianola	Indianola Community Schools	Agricultural Education and Studies	OCOM
Warren	Indianola	Sternquist Construction	Extension	PWD
Warren	Indianola	Sternquist Construction Inc.	CTRE/SUDAS	TAC
Warren	Indianola	Vanderpool Construction Inc.	CTRE/Natl CP Tech Center	PWD
Warren	Indianola	Warren County Environmental	CTRE/SUDAS	TAC
Warren	Indianola	Windsor Manor Assisted Living	Extension	PWD
Warren	Indianola		IPMP/RIMOS	TCOM
Warren	Indianola		Iowa SBDC	BAC
Warren	Indianola		Iowa SBDC	BAC
Warren	Indianola		Iowa SBDC	BAC
Warren	Indianola		Iowa SBDC	BAC
Warren	Indianola		Iowa SBDC	BAC

Wapello
Count

Warren	Lacona	Distance Education Students	Brenton Center	PWD
Warren	Martensdale			TCOM
Warren	Milo	Milo Locker	Meat Science Extension	PWD
Warren	Milo	Distance Education Students	Brenton Center	PWD
Warren	Milo	Milo Locker	NCRCRD w/ CIRAS and ISU Meat Lab	BAC
Warren	Milo	Milo Locker	NCRCRD w/ CIRAS and ISU Meat Lab	BAC
Warren	Milo	Milo Locker	Meat Science Extension	BAC
Warren	New Virginia	AEC Enterprises	Seed Science Center	PWD
Warren	New Virginia			TCOM
Warren	Norwalk	Apple Tree - Norwalk	Human Development and Family Studies	PWD
Warren	Norwalk	City of Norwalk	CTRE/SUDAS	TAC
Warren	Norwalk	Distance Education Students	Brenton Center	PWD
Warren	Norwalk	Kelly Cortum, Inc.	CTRE/SUDAS	TAC
Warren	Norwalk		Iowa SBDC	BAC
Warren	Norwalk		Iowa SBDC	BAC
Warren	Norwalk		Iowa SBDC	BAC
Warren	Norwalk		Iowa SBDC	BAC
Warren	Prole			TCOM
Warren	Warren			BCOM
Warren	Carlisle	City of Carlisle	LTAP	PWD
Warren	Cumming	City of Cumming	Community Economic Development	PWD
Warren	Indianola	City of Indianola	Community Economic Development	PWD
Warren	Indianola	City of Indianola Comm. Devel.	Community Economic Development	PWD
Warren	Indianola	City of Indianola P & Z	Community Economic Development	PWD
Warren	Norwalk	City of Norwalk - City Clerk	Community Economic Development	PWD
Warren	Norwalk	City of Norwalk	Community Economic Development	PWD
Warren	Warren County	Warren County	CTRE/Natl CP Tech Center	PWD
Warren	Warren County Auditor's Office	Warren County Auditor's Office	Community Economic Development	PWD
Warren			Community Economic Development	PWD
Warren				56
Washington	Ainsworth	Distance Education Students	Brenton Center	PWD
Washington	Ainsworth		Iowa SBDC	BAC
Washington	Ainsworth		Iowa SBDC	BAC
Washington	Crawfordsville	Riksch BioFuels LLC	ISUE	FAC
Washington	Crawfordsville	Riksch BioFuels LLC	ISUE	FAC
Washington	Kalona	CIVCO	Extension	PWD
Washington	Kalona	Farmers Hen House	Meat Science Extension	PWD
Washington	Kalona	Jessica Vlovchik (Family Child Care Provider)	Environment Rating Scale Assessment Project - HD FS	BAC
Washington	Kalona	Metatron Zone Management	ISUE	TAC
Washington	Kalona	OEC Inc	CTRE/SUDAS	

Warren
Count

Washington	Riverside Variance Comm.	Community Economic Development	PWD
Washington	City of Riverside	Community Economic Development	PWD
Washington	City of Riverside, City Attorney	Community Economic Development	PWD
Washington	City of Washington - City Clerk	Community Economic Development	PWD
Washington	Washington Airport Community	Community Economic Development	PWD
Washington	Barn Quilters	Washington County Extension	OCOM
Washington	Chamber of Commerce-New Citizens	Washington County Extension	OCOM
Washington	Washington Economic Development	Washington County Extension	BCOM
Washington	City of Wellman	Community Economic Development	PWD
Washington	Washington Co Engineer's Office	Community Economic Development	PWD
Washington	Washington County	CTRE/Natl CP Tech Center	PWD
Washington	Washington County Auditor's Office	Community Economic Development	PWD
Washington		Community Economic Development	BCOM

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**Washington
on Count**

Wayne	Allerton	Families	OCOM
Wayne	Allerton Horizons	Extension	BCOM
Wayne	Corydon - Horizons Project	Families	OCOM
Wayne	Corydon Horizons	Extension	BCOM
Wayne	Distance Education Students	Brenton Center	PWD
Wayne	Shiwers, Inc.	Ag & Biosystems Engineering	TAC
Wayne	Shiwers, Inc.	Ag & Biosystems Engineering	TAC
Wayne	Wayne Comm School	McNay Research Farm, ISU	OCOM
Wayne	Wayne Community School	Extension	PWD
Wayne	Wayne County	CTRE/SUDAS	TAC
Wayne		Iowa SBDC	BAC
Wayne	Humeston - Horizons Project	Families	OCOM
Wayne	Humeston Horizons	Extension	BCOM
Wayne		Iowa SBDC	BAC
Wayne	Seymour - Horizons Project	Families	OCOM
Wayne	Seymour Horizons	Extension	BCOM
Wayne	Wayne County Housing Trust Fund	Extension	OCOM
Wayne	City of Allerton	Community Economic Development	FAC
Wayne	City of Corydon	Community Economic Development	FAC
Wayne	City of Humeston	Community Economic Development	FAC, PWD
Wayne	City of Seymour	Community Economic Development	FAC
Wayne	Wayne County Auditor's Office	Community Economic Development	PWD
Wayne		Community Economic Development	PWD

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**Wayne
Count**

Webster	Nels Pederson Co., Inc.	CTRE/SUDAS	TAC
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Webster	Badger	Habitat Workshop	Iowa SBDC	BAC
Webster	Barnum	REAP Mtg.	Iowa SBDC	BAC
Webster	County	Wind Farm Development	Extension Office & Nat Resources	FAC
Webster	County	Early Childhood Development	Extension Office	BAC
Webster	County	Horizon III	Extension Office & Families	OCOM
Webster	Dayton		Extension Office	OCOM
Webster	Dayton		Iowa SBDC	BAC
Webster	Dayton		Iowa SBDC	BAC
Webster	Dayton		Iowa SBDC	BAC
Webster	Dayton		Iowa SBDC	BAC
Webster	Dayton		CTRE/SUDAS	TAC
Webster	Fort Dodge	Allers Architects	Extension	PWD
Webster	Fort Dodge	Applebee's - Ft. Dodge	ISUE	BAC
Webster	Fort Dodge	Arnold Consulting	Extension	PWD
Webster	Fort Dodge	Bickford Cottage - Fort Dodge	Agricultural & Biosystems Engineering	TAC
Webster	Fort Dodge	Brokaw Farm Supply	Agricultural & Biosystems Engineering	TAC
Webster	Fort Dodge	Brokaw Farm Supply	CTRE/SUDAS	TAC
Webster	Fort Dodge	Brown Supply		
Webster	Fort Dodge	C & S Products	IPRT Company Assistance-Technology Commercialization	FAC
Webster	Fort Dodge	C and S Products Co	ISUE	TAC
Webster	Fort Dodge	Child Care Providers	Extension	PWD
Webster	Fort Dodge	City of Fort Dodge	CTRE/SUDAS	TAC
Webster	Fort Dodge	Decker Trucking	Extension	PWD
Webster	Fort Dodge	Distance Education Students	Brenton Center	PWD
Webster	Fort Dodge	Ferguson Enterprises	CTRE/SUDAS	TAC
Webster	Fort Dodge	Fort Dodge Animal Health	IPRT Company Assistance-Technology Commercialization	TAC
Webster	Fort Dodge	Fort Dodge Animal Health	Veterinary Diagnostic and Production Medicine	TT
Webster	Fort Dodge	Fort Dodge Animal Health	Veterinary Pathology, VMPM, IPRT	TAC
Webster	Fort Dodge	Fort Dodge Asphalt	CTRE/SUDAS	TAC
Webster	Fort Dodge	Fort Dodge Correctional Facility	Extension	PWD
Webster	Fort Dodge	Fort Dodge Homebuilders	Iowa Energy Center	TAC
Webster	Fort Dodge	Fort Dodge Labs	Veterinary Microbiology and Preventive Medicine	TAC
Webster	Fort Dodge	Fort Dodge Rotary/ Community Visit	Extension Office & President's Office	FAC
Webster	Fort Dodge	Fort Dodge Schools	Extension	PWD
Webster	Fort Dodge	Home Care Aides-Head Start Staff	Extension	PWD
Webster	Fort Dodge	Hovey Construction	CTRE/SUDAS	TAC
Webster	Fort Dodge	Josepheson	ABE/Safety Training Instruction and Research	TAC
Webster	Fort Dodge	Josepheson	ABE/Safety Training Instruction and Research	TAC
Webster	Fort Dodge	Josephson Manufacturing Co	ISUE	TAC

Winneshiek	Decorah	Erdman Engineering, P.C.	CTRE/SUDAS	TAC
Winneshiek	Decorah	Fred Carlson Co., Inc.	CTRE/SUDAS	TAC
Winneshiek	Decorah	JB Holland	CTRE/Natl CP Tech-Geotechnical	PWD
Winneshiek	Decorah	JB Holland Construction, Inc.	CTRE/SUDAS	TAC
Winneshiek	Decorah	Knife River	CTRE/Natl CP Tech-Geotechnical	PWD
Winneshiek	Decorah	Knife River Midwest, LLC.	CTRE/Natl CP Tech Center	PWD
Winneshiek	Decorah	Lynch BBQ Company	Meat Science Extension	PWD
Winneshiek	Decorah	NE IA Community Action Head Start	Human Development and Family Studies	PWD
Winneshiek	Decorah	Platinum Equity	Engineering Distance Education	PWD
Winneshiek	Decorah	Vision Signal & Signing, Inc.	CTRE/SUDAS	TAC
Winneshiek	Decorah	Wicks Construction Inc.	CTRE/SUDAS	TAC
Winneshiek	Decorah	Wicks Construction Inc.	CTRE/Natl CP Tech Center	PWD
Winneshiek	Decorah	Winneshiek County	CTRE/SUDAS	TAC
Winneshiek	Decorah	Winneshiek County Board of Supervisors	ISU Extension Winneshiek County	BCOM
Winneshiek	Decorah	Winneshiek County Economic Dev. Board	ISU Extension Winneshiek County	BCOM
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Decorah		Iowa SBDC	BAC
Winneshiek	Ossian	Doug Egeland Tiling	CTRE/SUDAS	TCOM
Winneshiek	Ossian	Reilly Construction	CTRE/Natl CP Tech-Geotechnical	TAC
Winneshiek	Ridgeway		Iowa SBDC	PWD
Winneshiek	Spillville	City of Spillville	North Central Regional Center for Rural Development	BAC
Winneshiek	Spillville			TCOM
Winneshiek	Spillville	Financial Management Event in Winneshiek County	ISUE	BAC
Winneshiek	Spillville	Spillville Locker	North Central Regional Center for Rural Development	BAC & TAC
Winneshiek	Spillville	Spillville Locker	Meat Science Extension	PWD
Winneshiek	Winneshiek County	Northeast Iowa Food & Farm Coalition	ISU Extension Winneshiek County	BCOM
Winneshiek	Winneshiek County	Northeast Iowa Food & Fitness Initiative	ISU Extension Winneshiek County	BCOM
Winneshiek	Calmar	City planners & engineers	LA	TCOM
Winneshiek	Decorah	City of Decorah	Community Economic Development	PWD
Winneshiek	Decorah	City of Decorah - City Clerk, Treasurer	Community Economic Development	PWD
Winneshiek	Decorah	Northeast Iowa Food & Fitness Initiative	LA	TCOM
Winneshiek	Winneshiek	Winneshiek Co. P & Z	Community Economic Development	PWD
Winneshiek	Winneshiek	Winneshiek County	CTRE/Natl CP Tech Center	PWD
Winneshiek	Winneshiek	Winneshiek County Auditor's Office	Community Economic Development	PWD

Woodbury	Sioux City	American Popcorn	FSHN - Tong Wang	TAC
Woodbury	Sioux City	American Popcorn	FSHN - Tong Wang	TAC
Woodbury	Sioux City	Angelhouse Day Care	Extension	BAC
Woodbury	Sioux City	Apple Tree Day Care	Extension	BAC
Woodbury	Sioux City	Bacon Creek Construction and Design Inc.	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Barkley Asphalt Inc.	CTRE/SUDAS	TAC
Woodbury	Sioux City	Bierschbach Equipment & Supply	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Boss Hog BBQ	Extension	PWD
Woodbury	Sioux City	Brian Catus Local Sys. Eng	CTRE/SUDAS	TAC
Woodbury	Sioux City	Brower Construction Co.	CTRE/SUDAS	TAC
Woodbury	Sioux City	Buell Winter Mousel & Assoc	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Buell Winter Mousel & Associates, P.C.	CTRE/SUDAS	TAC
Woodbury	Sioux City	Building Bloicks Child Care	Extension	BAC
Woodbury	Sioux City	Call Utilities, LLC	CTRE/SUDAS	TAC
Woodbury	Sioux City	Cannon Technologies	Engineering Distance Education	PWD
Woodbury	Sioux City	Carion Hotel	Extension	PWD
Woodbury	Sioux City	Carlos O'Kelly's	Extension	PWD
Woodbury	Sioux City	CBM Food Service	Extension	PWD
Woodbury	Sioux City	Certified Testing Services, Inc.	CTRE/SUDAS	TAC
Woodbury	Sioux City	Certified Testing Services, Inc.	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Chick- Fil-A	Extension	PWD
Woodbury	Sioux City	Chili's Grill & Bar of Sioux City	Extension	PWD
Woodbury	Sioux City	Cindy Cottrell (Family Child Care Provider)	EHS Project -- HD FS	PWD
Woodbury	Sioux City	City of Sioux Center	CTRE/Natl CP Tech Center	BCOM
Woodbury	Sioux City	City of Sioux city	College of Engineering	TAC
Woodbury	Sioux City	City of Sioux City	CTRE/SUDAS	PWD
Woodbury	Sioux City	City of Sioux City	CTRE/Natl CP Tech Center	BAC
Woodbury	Sioux City	Comm. Action Agency of Siouxland	Extension	TAC
Woodbury	Sioux City	Concrete Specialty, Inc.	CTRE/SUDAS	PWD
Woodbury	Sioux City	Cuiver's	Extension	PWD
Woodbury	Sioux City	Curly's Food	Meat Science Extension	PWD
Woodbury	Sioux City	Dairy Queen	Extension	PWD
Woodbury	Sioux City	Dewild Grant Reckert & Assoc.	CTRE/SUDAS	TAC
Woodbury	Sioux City	DGR	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Distance Education Students	Brenton Center	PWD
Woodbury	Sioux City	Dotzler Engineering	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Dotzler Engineering Enterprises, PC	CTRE/SUDAS	TAC
Woodbury	Sioux City	Energy Awareness Week	Iowa Energy Center	TAC
Woodbury	Sioux City	Even Start Family Literacy Program-Sioux City	Environment Rating Scale Assessment Project -- HD FS	TAC
Woodbury	Sioux City	Feed Energy	ABE/Safety Training Instruction and Research	TAC
Woodbury	Sioux City	Feed Energy	ABE/Safety Training Instruction and Research	TAC

Woodbury	Sioux City	FEH Associates, Inc.	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Godfather's Pizza	Extension	PWD
Woodbury	Sioux City	Handke Enterprises	CTRE/SUDAS	TAC
Woodbury	Sioux City	Headstart-	Extension	BAC
Woodbury	Sioux City	Holy Spirit Retirement Home	Extension	PWD
Woodbury	Sioux City	Howard R. Green Co.	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Howard R. Green Company	CTRE/SUDAS	TAC
Woodbury	Sioux City	Iowa DOT	CTRE/SUDAS	TAC
Woodbury	Sioux City	Iowa DOT-Dist. 3	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Iowa Workforce Development	Extension	PWD
Woodbury	Sioux City	Knife River Midwest	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Kraco Contractors Inc.	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Lessard Contracting, Inc.	CTRE/SUDAS	TAC
Woodbury	Sioux City	Local economic development community	ReCAP	BCOM
Woodbury	Sioux City	Loess Hills Prairie Seminar Group	Western Research Farm, ISU	FAC
Woodbury	Sioux City	Mary Elizabeth Day Care	Extension	BAC
Woodbury	Sioux City	Mercy Medical Center	Extension	PWD
Woodbury	Sioux City	Mid-Step Services	Extension	PWD
Woodbury	Sioux City	Missouri Valley Steel Company	ABE/Safety Training Instruction and Research	TAC
Woodbury	Sioux City	Missouri Valley Steel Company	ABE/Safety Training Instruction and Research	TAC
Woodbury	Sioux City	Misty Harbor-	ABE/Safety Training Instruction and Research	TAC
Woodbury	Sioux City	Misty Harbor	Extension	BAC
Woodbury	Sioux City	Morningside Lutheran	Extension	PWD
Woodbury	Sioux City	Negron's Mexican Food	OIPTT	FAC
Woodbury	Sioux City	Nutra-Flow		
Woodbury	Sioux City	Nutra-Flow	IPRT Company Assistance-Technology Commercialization	TAC
Woodbury	Sioux City	NWIP	Meat Science Extension	PWD
Woodbury	Sioux City	Olsson Associates	CTRE/SUDAS	TAC
Woodbury	Sioux City	Olsson Associates	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Prime Living	Extension	PWD
Woodbury	Sioux City	Red Robin	Extension	PWD
Woodbury	Sioux City	Rose Engineering	CTRE/SUDAS	TAC
Woodbury	Sioux City	Rose Engineering	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	S E H	CTRE/SUDAS	TAC
Woodbury	Sioux City	Sacred Heart School	Extension	PWD
Woodbury	Sioux City	Schroder Engineering	CTRE/SUDAS	TAC
Woodbury	Sioux City	Schroder Engineering	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	SIMPICO	LA, CRP, IDRO	PWD
Woodbury	Sioux City	Sioux City	CTRE/Natl CP Tech Center	PWD
Woodbury	Sioux City	Sioux city Downtown Partners	College of Engineering	BCOM
Woodbury	Sioux City	Sioux City Engineering	CTRE/SUDAS	TAC

Woodbury	Sioux City	Sioux City Planning Department	Landscape Architecture	BCOM
Woodbury	Sioux City	Sioux City Police Department	Midwest Forensics Resource Center, IPRT	PWD
Woodbury	Sioux City	Sioux Rubber & Urethane	ISUE	TAC
Woodbury	Sioux City	Sioux Steel	BEI	BAC, FAC, TAC
Woodbury	Sioux City	Siouxland District Health	Engineering Distance Education	PWD
Woodbury	Sioux City	Siouxland District Health Department	Extension	PWD
Woodbury	Sioux City	Siouxland Industrial Roundtable - Hyperion Oil	ISUE	BAC
Woodbury	Sioux City	Refinery Proposal Presentation	ISUE	FAC
Woodbury	Sioux City	Siouxland Industrial Roundtable - Project Lead the Way	OIPPT	FAC
Woodbury	Siouxland Initiative	Siouxland Initiative	IPRT Company Assistance-Technology Commercialization	FAC
Woodbury	Siouxland Initiative	Siouxland Initiative	College of Engineering	BCOM
Woodbury	Siouxland Interstate Metro Plan, Council	Siouxland Interstate Metro Plan, Council	CTRE/SUDAS	TAC
Woodbury	Siouxland Reg. Trans. Planning Assoc.	Siouxland Reg. Trans. Planning Assoc.	CTRE/SUDAS	TAC
Woodbury	Soup Kitchens and Food Bank	Soup Kitchens and Food Bank	CRP	BCOM
Woodbury	Standard Ready Mix Concrete	Standard Ready Mix Concrete	CTRE/Natl CP Tech Center	PWD
Woodbury	Stella Standford Day Care	Stella Standford Day Care	Extension	BAC
Woodbury	Story Time Daycare and Preschool	Story Time Daycare and Preschool	Extension	BAC
Woodbury	Storytime Day Care	Storytime Day Care	EHS Project -- HD FS	PWD
Woodbury	Taco Bell	Taco Bell	Extension	PWD
Woodbury	Taco John's	Taco John's	Extension	PWD
Woodbury	Terracon, Inc.	Terracon, Inc.	CTRE/Natl CP Tech Center	PWD
Woodbury	The Haakinson & Beaty Co., Inc.	The Haakinson & Beaty Co., Inc.	CTRE/SUDAS	TAC
Woodbury	Utility Equipment Company	Utility Equipment Company	CTRE/SUDAS	TAC
Woodbury	Veenstra & Kimm, Inc.	Veenstra & Kimm, Inc.	CTRE/Natl CP Tech Center	PWD
Woodbury	Verschoor Meats	Verschoor Meats	Meat Science Extension	PWD
Woodbury	WA Klinger LLC	WA Klinger LLC	CTRE/Natl CP Tech Center	PWD
Woodbury	Wendys	Wendys	Extension	PWD
Woodbury	Western Iowa Tech Community College SBDC	Western Iowa Tech Community College SBDC	OIPPT	BAC
Woodbury	Western Iowa Tech Community College SBDC	Western Iowa Tech Community College SBDC	OIPPT	FAC
Woodbury	Wilson Trailer Company	Wilson Trailer Company	IPRT Company Assistance-Materials	TAC
Woodbury	Woodbury County	Woodbury County	College of Engineering	BCOM
Woodbury	Woodbury County	Woodbury County	CTRE/SUDAS	TAC
Woodbury	Work Zone Safety Workshops	Work Zone Safety Workshops	Continuing and Distance Education	PWD
Woodbury			LTAP	BCOM
Woodbury			Iowa SBDC	BAC
Woodbury			Iowa SBDC	BAC
Woodbury			Iowa SBDC	BAC
Woodbury			Iowa SBDC	BAC
Woodbury			Iowa SBDC	BAC

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Woodbury County Auditors Office
Woodbury County Conservation Board

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Worth	Hanlontown	Hanlontown Community Betterment Group	ISU Extension Worth County	OCOM
Worth	Hanlontown	POET biorefining	ABE/Safety Training Instruction and Research	TAC
Worth	Hanlontown			TCOM
Worth	Joice	Brian Nettleton Excavating Inc.	CTRE/SUDAS	TAC
Worth	Kensett		Iowa SBDC	BAC
Worth	Manly	Central Springs Community Schools	ISU Extension Worth County	OCOM
Worth	Manly	Manly Ethanol Terminal	ISU Extension Worth County	FAC
Worth	Manly	Manly Police Department	ISU Extension Worth County	OCOM
Worth	Manly		Iowa SBDC	BAC
Worth	Manly		Iowa SBDC	BAC
Worth	Northwood	Northwood Foods	Meat Science Extension	PWD
Worth	Northwood	ACT Manufacturing	ISU Extension CIRAS	BAC
Worth	Northwood	Advanced Component Technologies	ISUE	TAC
Worth	Northwood	Advanced Component Technologies	ISUE	TAC
Worth	Northwood	Advanced Component Technologies	ISUE	TAC
Worth	Northwood	CCR and ORCA Event in Worth County	ISUE	BAC
Worth	Northwood	City of Northwood	ISU Extension Worth County	BCOM
Worth	Northwood	Northwood Chamber of Commerce	ISU Extension Worth County	OCOM
Worth	Northwood	Northwood Economic Development Board	ISU Extension Worth County	BAC
Worth	Northwood	Northwood Foods	ISU Extension CIRAS	BAC
Worth	Northwood	Northwood Police Department	ISU Extension CIRAS	OCOM
Worth	Northwood	Northwood Sesqui Centennial Committee	ISU Extension Worth County	OCOM
Worth	Northwood	Northwood-Kensett Schools	ISU Extension Worth County	OCOM
Worth	Northwood	Top of Iowa Welcome Center	ISU Worth County Extension	BCOM
Worth	Northwood	True Value, Northwood	ISU Extension CIRAS	BAC
Worth	Northwood	Viking Industrial Development Board	ISU Extension Community	BCOM
Worth	Northwood	WIN-WORTH BETCO Economic Development	ISU Extension CIRAS	Bac
Worth	Northwood	Worth County Assessor	ISU Extension Community	BCOM
Worth	Northwood	Worth County Auditor	ISU Extension Community	BCOM
Worth	Northwood	Worth County Fair Beautification Committee	ISU Extension Community	BCOM
Worth	Northwood	Worth County Public Health	ISU Extension Landscape Design	TCOM
Worth	Northwood	Worth County Sheriffs Office	ISU Extension Worth County	OCOM
Worth	Northwood	Worth County Supervisors	ISU Extension Worth County	OCOM
Worth	Northwood		Iowa SBDC	BCOM
Worth	Northwood		Iowa SBDC	BAC
Worth	Northwood	Spirit Lake		TCOM

BCOM, FAC
PWD
PWD
PWD

Worth	Kensett	City of Kensett	Community Economic Development	PWD
Worth	Manly	City of Manly - City Clerk	Community Economic Development	PWD
Worth	Manly	Manly Worth BOA	Community Economic Development	PWD
Worth	Manly	Manly Worth City Clerk	Community Economic Development	PWD
Worth	Manly	Manly Worth Council	Community Economic Development	PWD
Worth	Manly	Manly Worth P & Z Admin.	Community Economic Development	PWD
Worth	Manly	Senior Mealsite Meals	Extension	TAC
Worth	Northwood	ADA Enterprises	ISU Extension CIRAS	BAC
Worth	Northwood	Fallgatters Market	ISU Extension CIRAS	BAC
Worth		Worth County	LA	TCOM
Worth		Worth County Auditor's Office	Community Economic Development	PWD
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Wright	Belmond	Distance Education Students	Brenton Center	PWD
Wright	Belmond	Syngenta Seeds, Inc - Belmond	ISUE	TAC
Wright	Belmond		Iowa SBDC	BAC
Wright	Belmond		Iowa SBDC	BAC
Wright	Clarion	City of Clarion	CTRE/SUDAS	TAC
Wright	Clarion	Clarion Goldfield School	Biotech Outreach Education Center	
Wright	Clarion	general public - low income population	Extension	OCOM
Wright	Clarion	Hagie Manufacturing Co	ISUE	TAC
Wright	Clarion	Monsanto Company	Seed Science Center	PWD
Wright	Clarion	Wendi Harrah (Family Child Care Provider)	Environment Rating Scale Assessment Project -- HD FS	
Wright	Clarion	Wright County Gardeners, producers	Extension	PWD
Wright	Clarion	Wright County Vending and Food Stands	Extension	PWD
Wright	Clarion		LTAP	TCOM
Wright	Clarion		Iowa SBDC	BAC
Wright	Clarion		Iowa SBDC	BAC
Wright	Clarion		Iowa SBDC	BAC
Wright	Clarion			TCOM
Wright	Dows	Weidemann, Inc.	CTRE/ Natl CP Tech-Geotechnical	PWD
Wright	Eagle Grove	Distance Education Students	Brenton Center	PWD
Wright	Eagle Grove	Lewright Meats	Meat Science Extension	PWD
Wright	Eagle Grove	Lewright Meats Inc	ISUE	BAC
Wright	Eagle Grove	Sparboe Farms	Meat Science Extension	PWD
Wright	Eagle Grove		Iowa SBDC	BAC
Wright	Eagle Grove	Wright County Fair Board	IDRO, LA	TCOM
Wright	Clarion	City of Clarion	Community Economic Development	FAC, PWD
Wright	Clarion	City of Clarion - assistant deputy clerk	Community Economic Development	PWD
Wright	Dows	City of Dows	Community Economic Development	PWD
Wright			Community Economic Development	FAC, BCOM

Worth
Count

PWD
TCOM
PWD
PWD

Community Economic Development
Community Economic Development
Community Economic Development
Community Economic Development

31

7301

7351

City of Goldfield - City Clerk / Treasurer
City of Rowan
Wright Co. P & Z Admin.
Wright County Auditor's Office

Goldfield
Rowan

Wright
Wright
Wright
Wright

32

7522

7522

Wright
Count
Grand
Count
Grand
Count

APPENDIX C – ISU

Executive Summary

Please remember that the projects funded in FY08 have a duration of 18-24 months and are still ongoing at this time. In addition, projects are not required to submit on-going reports after the project is completed, so the projects that ended in FY06 are reported on using the final report collected in FY07.

To date GIVF funds have supported 59 projects, which have generated 69 investments in research and development by Iowa industry and the creation of 11 new companies. In addition ISU is seeing a growing pipeline of both opportunities for industry collaboration and formation of start up companies.

1. Number of research and development agreements executed with Iowa companies as part of GIVF projects funded:

FY06	Number of projects initiated:	19
	Number of Iowa company partners:	19
	Funding Allocated:	\$1,325,000
FY07	Number of projects initiated:	16
	Number of Iowa company partners:	24
	Funding Allocated	\$1,325,000
FY08	Number of projects initiated:	14
	Number of Iowa company partners:	12
	Funding Allocated	\$1,325,000
FY09	Number of projects initiated:	10 (proposed)*
	Number of Iowa company partners:	14 (proposed)
	Funding Proposed	\$1,020,000 (approximate)

* A small discretionary pool of funds is reserved by the VPRED office at ISU to be used for appropriate projects that arise throughout the year (most projects are chosen through an annual RFP process during the spring). This usually results in an additional 1-3 projects.

2. Company matched resources: Company sponsored funding provided by companies as a part of GIVF projects funded:

Note: 5 projects were completed at the end of FY07, with an additional 16 projects concluding at the end of FY08. It is very difficult to collect the match information from the companies, so we are providing both the committed match and the recorded match. We are confident that our companies are meeting and/or exceeding their commitment to the in-kind cost share and are working on improving our ability to collect this information.

FY06	Cash Committed & Received:	\$ -
	In-kind support committed:	\$1,085,595.00
	In-kind support documented:	\$ 807,378.94
FY07	Cash Committed & Received:	\$ 73,000.00
	In-kind support committed:	\$ 625,700.00

In-kind support documented:	\$ 576,797.42
FY08* Cash Committed & Received:	\$ 475,777.00
In-kind support committed:	\$ 580,297.00
In-kind support documented:	\$ 330,759.20
FY09 Cash Committed:	\$ 135,287 (proposed)
In-kind support committed:	\$ 335,600 (proposed)

*These projects are still in progress

3. University matched resources: Involvement of university/college centers and institutes: description of laboratory equipment used and services provided measured by hours used, samples run or dollar amount of services provided.

One component of the university match is that uncollected indirect cost revenues. We do collect any indirect costs (clearer) from either the funding that comes from the State, or from the cash matches provided by companies. 100% of the funds are put toward project costs.

Uncollected Indirect costs:

FY06:	\$ 486,937.13
FY07	\$ 666,770.42
FY08	\$ 165,814.32

Other University match:

FY06 In-kind reported:	\$ 115,093.60
FY07 In-kind reported:	\$ 243,597.06
FY08 In-kind reported:	\$ 330,759.20

Total University Match

FY06	\$ 602,030.73
FY07	\$ 910,367.48
FY08	\$ 496,573.52

Involvement of University Centers and Equipment

Please see Appendix A below. We do not normally collect this information. This report contains partial information for FY08 and will be collected biannually for every active project from this point forward.

4. Number of license or option agreements executed with Iowa companies.

FY06-FY07: There have been 6 option and/or license agreements signed/in negotiation with Iowa companies, related to technologies developed using GIVF funding. Of these, 2 were signed during the project, one was signed after the project was completed and 3 are in negotiation.

FY08: Zero, but the projects are still on-going, so this is to be expected.

5. Number of new companies formed and jobs created as a part of GIVF projects.*

FY06-FY07	New companies:	6
	Number of paid jobs:	**
	Existing startups supported:	7
FY08:	New companies:	3 with the possibility of a fourth
	Number of paid jobs:	**
	Additional startups supported:	3
FY09:	New companies:	2 (proposed)
	Number of paid jobs:	**
	Existing startups supported:	4 (proposed)

* The GIVF program does not take full credit for starting the companies. The GIVF program IS a CRITICAL component that enables these companies to get started, but is not the sole source. In addition, almost every GIVF project supports the salary of a graduate student and partial salary of the researcher. These jobs have not been included in this total

** Past efforts by the VPRED office to collect employment figures and other measures of economic growth have not been successful (companies do not return the surveys). CIRAS, the Center for Industrial Research & Service, has agreed to assist the VPRED office in this data collection. CIRAS has a long reputation for gathering this information. However, we were not able to establish this partnership in time to meet the deadline for this report. The information will be forthcoming as soon as possible.

6. Revenue to companies as a result of technology licenses executed with Iowa companies as part of the GIVF projects:

FY06 – FY07: \$446,000, related to the 3 signed agreements above and as reported to ISURF.

FY08: N/A

7. Infrastructure

For FY06- FY08, \$600,000 was allocated toward supporting the economic development infrastructure (a partial restoration of the budget cuts made in the early 2000's), with the following annual allocation and match information:

- ISU Research Park \$200,000
- ISU Pappajohn Ctr \$200,000
- IPRT Company Assistance \$100,000
- VPR Office \$100,000
- Post Doc Entrepreneur Prg \$150,000 (proposed for FY09)

FY06	
Expenditures	\$ 600,000.00
Unrecovered Indirects (Match)	\$ 497,898.93
Other University Match	\$ 267,883.13
Third Party Match	\$ 207,283.95

FY07

Expenditures	\$ 600,000.00
Unrecovered Indirects	\$ 340,229.21
Other University Match	\$ 124,262.94
Third Party Match	\$ 400,000.00

FY08

Expenditures	\$ 318,845.97
Unrecovered Indirects	\$ 155,990.42
Other University Match	\$ 18,958.56
Third Party Match	\$ 220,000.00

8. Additional Measures of Project Success*

FY06

External funding leveraged	\$ 3,868,138
Number of publications/presentations	52
Number of invention disclosures	10
Number of honors/awards	7

FY07

External funding leveraged	\$ 969,380 (plus five awards with no amount reported)
Number of publications/presentations	67
Number of invention disclosures	11
Number of honors/awards	6

FY08 (projects are ongoing)

External funding leveraged	\$ 356,882
Number of publications/presentations	18
Number of invention disclosures	10
Number of honors/awards	-

*This information is reported as of the final (or interim) report submitted.

9. Additional Information

These GIVF funds represent ISU's only flexible funding available to assist start-up companies and to encourage Iowa companies to partner with Iowa State in research and development. In some cases research and development leads to patents and licenses in others it results in better products and processes. In both cases it helps Iowa Companies succeed. We are currently working with CIRAS to develop a survey process that will provide data on the actual improvements in success the GIVF funded projects have generated. Examples include a company that initiated a GIVF project in FY06. This did not lead to a patentable product, but to software improvements. At the beginning of the project, the company had "a few" leads. The improvements made during the project led to 26 companies in seven countries securing 200 licenses (as of June 30, 2007 – one year ago) and an additional 70 companies undergoing product evaluation. A second example is that the technology further developed in an FY07 GIVF project won an R&D 100 award. The nature of this technology is such that it can not be patented, but the know-how could lead to major cost-savings in ethanol plants in Iowa and around the world.

The GIVF funds have allowed ISU to increase our prospecting system. ISU personnel have actively used the GIVF funds as a carrot to encourage industry to locate in Iowa, collaborate with faculty and for faculty considering the creation of a new business.

APPENDIX A: Involvement of University Centers/Institutes and Equipment for projects awarded in FY08*

Centers/Institutes

- Nutrition and Wellness Research Center
- Center for Crops Utilization Research
- CyberInnovation Institute
- Bioeconomy Institute
- Virtual Reality Applications Center
- Institute for Physical Research and Technology
- Center for Sustainable Environmental Technologies
- Biorenewable Resources and Technology Graduate Program
-

Equipment

- Five hundred samples were processed for determining the amount of virus present. The processing is done at ISU and costs about \$20 per sample for a total contribution of \$10,000
- Blood glucose analyzer, 100 samples, 25 hours
- Fitz® Mill Model DAS 06 (the Fitzpatrick Co., Elmhurst, IL):60:60
- Roskamp Roller Mill Model K (Roskamp Mfg., Inc., Waterloo, IA):60:60
- Leistritz ZSE 27 twin-screw extruder (American Leistritz Extruder Corp., Somerville, NJ):20:10
- C. W. Brabender single-screw extruder (South Hackensack, NJ):20:20
- Beckman Coulter Avanti™ J-20 XPI centrifuge (Fullerton, CA):30:50
- KICE Model 6DT4 laboratory aspirator unit (KICE Metal Products Co. Inc., Wichita, KS):8:5
- LAB-LINE® Incubator-Shaker, model 3525 (Lab-Line Instruments Inc., Melrose Park, IL):1200:50
- Tomy Autoclave SS-325E (Tomy Seiko Co., Ltd., Tokyo, Japan):50:50
- Waters high-pressure liquid chromatography (HPLC):8:50
- IEC Centra® MP4 centrifuge (International Equipment Co., Needham Heights, MA):30:50
- Isotemp 220 water bath (Fisher Scientific, Pittsburgh, PA):400:50
- stir motors (Fisher Scientific, Dubuque, IA):400:50
- pH meter IQ 150 (IQ Scientific Instruments Inc., Carlsbad, CA):100:50
- Other miscellaneous equipments used occasionally include other mills, Ro-tap Testing Sieve Shaker, blender etc.
- Flow cytometer (12 hr/month),
- electron microscope (12 hr/month),
- NMR instrumentation (2 hr/month),
- Protein Facility – circular dichroism spectrometer (2 hrs/month),
- high and low speed centrifuges (15 hr/month),
- fermentation facility (once 4 hrs),
- luminex cytometer (8/month), cryogenic atomizer (12 hrs/month),
- lab animal facilities – Innovive rodent housing unit (3 months continual housing),

- CO₂ incubator (almost daily),
- tissue culture hoods 95 hrs/week),
- ELISA reader (spectrophotometer) (4 hrs/month), protein purification (8 hrs),
- column chromatography (8 hrs),
- fraction collectors,
- pH meter (4 hrs/month),
- Metler balances (4 hours/month), Mettler?
- Equipment: Optical Parametric Amplifier (OPA)
 - Description: This is laser equipment to be used as part of a spray diagnostic system employing a technique called ballistic-photon imaging. It is designed to make measurements in sprays that are optically dense and will be utilized to characterize fuel sprays for next generation combustion systems.
 - Hours Used: Part of optical system still under construction
 - Samples Processed: Used for development work and not for pay on demand sample testing

*This request was sent out after the original call for updates and only about 1/2 of the projects responded. Several projects are related to software and therefore have no equipment to report.

APPENDIX D – ISU

Appendix D
IOWA STATE UNIVERSITY GROW IOWA VALUES FUND UPDATE

JULY 2008

**FY06 FUNDED PROJECTS
FINAL REPORTS**

Principal Investigator	Project Title	FY06 Award Amount	FY07 Award Amount	ISU Cost Share	Industry Cost Share
Johnny Wong*	Quality Assessment Tools for Colonoscopy	\$75,405.00	n/a	47,187.79	71,685.23
Victor Lin*	Enhancing the Soy Biorefinery	\$138,274.53	n/a	126,201.42	-
Arun Somani*	Model-based Reasoning for Software: Advanced Algorithmic Techniques and Prototype Implementation	\$96,343.12	n/a	43,692.43	35,000.00
Atul Kelkar*	Pneumatic Continuously Variable Natural Frequency and Damping Isolator for Active Suspensions	\$73,917.22	n/a	42,986.15	48,400.00
Matthew Erdman*	Viral replicon particle discovery research for development of improved vaccines for swine	\$103,118.42	n/a	47,436.47	73,550.00
Surya Mallapragada	Protein Micropatterning on Microsensors to Quantify Cell Cytotoxicity of Adherent and Non-adherent Cells	\$14,824.59	\$ 7,943.86	9,559.53	20,000
Byron Brehm-Stecher	Applied Nanotechnology for Label-free Detection of Pathogen-Specific Nucleic Acids	\$69,392.00	\$ 32,088	50,100.06	60,000.00
Martha James	Development of Novel Digestion-Resistant Starches from Corn to Combat Human Disease	\$78,000.00	\$ 21,800	77,812.58	-
David Grewell	Retooling Ethanol Industries: Integrating Ultrasonics into Dry Corn Milling to Enhance Ethanol Yield	\$43,496.00	\$ 37,023	34,070.51	7,000
Infrastructure	ISU Research Park, ISU Pappajohn Center, IPRT Company Assistance, VPRED Office	\$600,000.00	n/a	675,782.06	207,283.95
Short Term Projects*	Metabolic Technologies, Infiscape, CombiSep, Glycon, Industrial Hardfacing, iSeek	\$500,000.00	n/a	94,468.35	512,743.71

* The final reports for these projects were collected in July 2007 and have not been updated for the purpose of this report.

Quality Assessment Tools for Colonoscopy

Principal Investigator: Johnny Wong

Co-PIs: Wallapak Tavanapong

Industry Partners (company names only): EndoMetric, LLC

Project Goal: To enhance and integrate our proof-of-concept software for objectively measuring the quality of colonoscopy and to test its value in a high volume, world-class colonoscopy practice in preparation for commercialization.

Executive Summary:

Please provide a 300-500 word summary of the final results of the project (text only, 2500 character maximum), including the commercialization status.

We have met and exceeded the milestones outlined in the original proposal.

I. Progress on Software Development

- Arthemis 3.0 (or EndoMetric-Manual--Software for annotating colonoscopy videos): We completed the implementation of the software. Dr. de Groen (domain expert) has used the software to annotate colonoscopy videos.

- Avidense version 2.0 (software that analyzes quality measurements from captured videos generated during colonoscopy): We completed the development of the proof-of-concept analysis software that produces a total of six quality metrics (one extra metric in addition to what we originally proposed) for videos captured from Olympus endoscopes. These metrics are (1) location of maximal intubation; (2) duration of informative frame video segment during withdrawal excluding both biopsy and therapeutic operations; (3) duration of operational episodes; (4) direction of movement and speed estimate of the endoscope during withdrawal; (5) an estimated score of quality of colon mucosa inspection; and (6) number of images with the appendiceal orifice clearly seen. The software has been installed at Mayo Clinic Rochester in September of 2006 and show promising results.

II. Progress on Commercialization

- Increased Visibility. We have demonstrated EndoMetric-Manual at Digestive Disease Week 2006 in May in Los Angeles. Our invention on the automatic quality measurement system also received the 2006 American College of Gastroenterology (ACG) Governors Award for Excellence in Clinical Research. News articles on the award appeared locally and nationally. Oncology Times, IEEE Intelligent Systems, and Gastroenterology & Endoscopy News have articles on our work. Our work has created a significant visibility for the university and the state of Iowa.

- Protection of Key Intellectual Property. Mayo Medical Venture (MMV) has filed patent applications to cover related inventions on behalf of ISU, Mayo, and UTA. The application includes 13 inventions.

- Formation of EndoMetric, LLC, an Iowa-based startup company to commercialize our technology. We have incorporated the company and developed the business plan with the help of the ISU Pappajohn Business center. Our business plan was one of the thirty plans selected to compete in the next stage of the 2007 Pappajohn Iowa Business Plan Competition.

- External collaboration. We conducted feedback sessions with endoscopy staffs at UI and IDDC and received verbal agreements to have the two places as test sites.

External Funding:

Please list all of the applications for external funding that you have applied for using the results from this GIVF project, including the status (awarded, denied, pending).

- Automated Reporting System for Colonoscopy. Mayo Clinic Rochester. 01/15/2007 - 12/31/2007. \$50,000. Status: Awarded.

- Enhancement of a Quality Control System for Colonoscopy. Iowa State University Research Foundation. 03/01/07 - 02/28/08. \$25,000. Status: Awarded.

- Evaluation of a Quality Assessment System for Colonoscopy at Iowa Digestive Disease Center (IDDC). Iowa State University Technology Commercialization Acceleration Program. 01/01/2007-06/30/2007. \$10,000. Status: Awarded.

- Evaluation of Quality Assessment Tools for Colonoscopy. Grow Iowa Values Fund. Iowa State University. 07/01/2007-06/30/2008. \$100,397. Status: Pending.

- Computer-Aided Quality Control for Colonoscopy, National Institutes of Health, STTR. 01/01/2008-06/30/2008. \$100,000. Status: Pending.

•III-CXT: Objective Quality Control System for Colonoscopy. National Science Foundation. 06/01/07-05/31/10. \$861,546. Status: Rejected; reason: regarded as an application of techniques developed as part of our current NSF grant.

Intellectual Property

Please list any invention disclosures (ISURF number and one-sentence description) related to the project that existed PRIOR to the start of the project:

ISURF # 03305: Intelligent Multimedia Processing and Analysis for Colorectal Tumors (IMPACT)

Please indicate if you intend to file future invention disclosures related to this project (one-sentence description):

We have other new algorithms to be filed.

Publications and Presentations

Please list all publications and presentations (published or pending) that included the results of this research:

- P. C. De Groen, W. Tavanapong, J. Oh, J. Wong. Computer-aided Quality Control for Colonoscopy: Automatic Documentation of Cecal Intubation. Digestive Disease Week 2007. ASGE Poster Session Endoscopic Technology Endoscopy: New Image Technology, May 15-24, 2007, Washington DC, USA.
- D. Liu, Y. Cao, W. Tavanapong, J. Wong, J. Oh, and P. C. de Groen. Mining Colonoscopy Videos to Measure Quality of Colonoscopic Procedures. In Proc. of IASTED Int'l Conf. on Biomedical Engineering (BioMed), pages 409-414, Innsbruck, Austria, February 2007. (Oral presentation)
- Y. Cao, D. Liu, W. Tavanapong, J. Wong, J. Oh, and P. C. de Groen. Automatic Classification of Images with Appendiceal Orifice in Colonoscopy Videos. In Proc. of IEEE Engineering in Medicine and Biology Conference, pages 2349-2352, New York City, New York, August 2006. (Oral presentation).
- Danyu Liu, Yu Cao, Ki-Hwan Kim, Sean Stanek, Bancha Dounggratanaex-chai, Kungen Lin, Wallapak Tavanapong, Johnny Wong, JungHwan Oh, and Piet C. de Groen. Arthemis: Annotation Software in an Integrated Capturing and Analysis System for Colonoscopy. In preparation for 2nd round review of Computer Methods and Programs in Biomedicine.

Honors and Awards

Please list all honors/awards/special press/etc. related to this project.

Award

- Objective Quality Control for Colonoscopy: Automated Extraction of Endoscopic Metrics from Video Files. 2006 American College of Gastroenterology Governors Award for Excellence in Clinical Research for "The Best Scientific Paper," Oct. 21, 2006.

Articles written by others discussing our work

- New Technology Aims to Improve Colonoscopy by Automatically & Objectively Analyzing Efficacy, Oncology Times, Volume 1, Jan 10, pages 24-25.
- Danna Voth. Toward More Intelligent Healthcare, IEEE Intelligent Systems, March/April 2007, pages 5-7.
- Best of ACG. Gastroenterology & Hepatology Volume 3, issue 1, Jan 2007, pages 41-48.
- Steve Frandzel. New Digital Recording System Measures Colonoscopy Performance Metrics. Gastroenterology & Endoscopy News. Volume 58, issue 3, March 2007.

Enhancing the Soy Biorefinery

Principal Investigator: Victor S.-Y. Lin
Co-PIs: George A. Kraus, John G. Verkade
Industry Partners (company names only): Catilin, Inc.

Project Goal: The objectives of this project are to lower the costs of production of biodiesel by refining and engineering a system to deploy new catalyst technologies for converting soy oil or other oil-containing feedstocks to biodiesel, and to refine a process to convert glycerin into 1,3-propanediol (PDO).

Executive Summary:

Please provide a 300-500 word summary of the final results of the project (text only, 2500 character maximum), including the commercialization status.

The goal of this project is to increase the efficiency, expand the product line, and enhance the profitability of biodiesel industry. We are happy to report that we have made some significant progress in taking soy biorefining to the next stage - furthering the value-added utilization of the soybean. Specifically, we have accomplished the following specific goals that we proposed a year ago:

1. Revolutionize the way biodiesel is produced.

We have developed two types of novel solid catalysts that are low cost, heterogeneous, and recyclable, eliminating the "wash and neutralization step" of biodiesel production, which, in turn, significantly lowers the cost of manufacturing biodiesel. We have filed two patent applications on these new catalysts through ISURF. We have received \$3,000,000 from a California-based venture capital firm, Mohr Davidow Ventures, to establish a new start-up company, Catilin, Inc. (www.catilin.com), for the commercialization of these new catalyst technologies.

2. Convert glycerin into value-added chemicals.

We have evaluated the ionic hydrogenation reaction to convert glycerin into 1,3-propanediol. A porous silicon (PSi) material was developed to be a reagent to convert glycerin into 1,3-propanediol. Preliminary results obtained by the Kraus and Lin group show that reduction of glycerol on a gram scale using the PSi produces only 1,3-propanediol in a 55% yield. A patent application was filed through ISURF.

Accomplished Milestones:

Several deliverables generated from this project on the soy biorefinery are:

- Establishment of Catilin, Inc. for the commercialization of our biodiesel catalyst technology.
- New synthetic laboratory at the Innovations Development Facility (IDF) of the Plant Science Institute (Carver Co-Lab) for the scale up synthesis of the biodiesel catalysts
- Collaboration with the Biomass Energy Conversion Center (BECON) for the construction of a biodiesel production pilot plant using our new solid catalyst technology.

Jobs created from this project so far:

- Four full time employees at Catilin for biodiesel catalyst development and commercialization.

External Funding:

Please list all of the applications for external funding that you have applied for using the results from this GIVF project, including the status (awarded, denied, pending).

"Start-up company for commercialization of new solid biodiesel catalysts" \$3,000,000 Mohr Davidow Ventures (awarded)

"Diols from Polyols" \$1,200,000 U.S. DOE/USDA Biomass Research and Development Initiative (denied)

Intellectual Property

Please list any invention disclosures (ISURF number and one-sentence description) related to the project that existed PRIOR to the start of the project:

ISURF # 2979 Mesoporous Solid Acid Catalyst for Conversion of Soybean Oil to Biodiesel and Elimination of Fatty Acids

Please list any invention disclosures (ISURF number and one-sentence description) that were made as a result of the project:

ISURF # 3196 Selective Reduction of Polyols by Porous Silicon (Conversion of Glycerin to PDO)

ISURF # 3280 A new Porous Silica & Calcium Oxide Composite-based Catalyst for Conversion of Vegetable Oils to Biodiesel

ISURF # 03503 Cement Kiln Dust-based Transesterification Catalyst for Conversion of Vegetable Oils to Biodiesel

Publications and Presentations

Please list all publications and presentations (published or pending) that included the results of this research:

1. "Nanoporous Solid Catalysts for Efficient Biodiesel Production" Victor S.-Y. Lin, Thailand-U.S.A. OSTC/NSTDA/MOST/ATPAC Annual Workshop, Biodiesel Symposium: Heterogeneous Catalysis, Columbus, Ohio, August 28-29, 2006 (Invited Talk).
2. "Environmentally Friendly Nanoporous Oxide Catalysts for Biodiesel Synthesis" Victor S.-Y. Lin, Green Chemistry for Fuel Synthesis and Processing Symposium, 232nd ACS National Meeting, San Francisco, CA, September 10-14, 2006 (Invited Talk).
3. "Gatekeeping Effect: Multi-functionalized Mesoporous Silica Nanomaterials for Catalysis and Biotechnological Applications" Victor S.-Y. Lin, Department of Chemistry, University of North Carolina at Chapel Hill, Chapel Hill, NC, September 19, 2006 (Chemistry Seminar).
4. "Gatekeeping Effect: Multi-functionalized Mesoporous Silica Nanomaterials for Catalysis and Biotechnological Applications" Victor S.-Y. Lin, Department of Chemistry, Duke University, Durham, NC, September 20, 2006 (Chemistry Seminar).
5. "Gatekeeping Effect: Multifunctional Mesoporous Silica Materials for Catalysis and Biomedical Applications" Victor S.-Y. Lin, 4th COE 21 International Symposium on Human-Friendly Materials Based on Chemistry, University of Tokyo, Tokyo, Japan, October 10-11, 2006 (Invited Keynote Talk).
6. "Environmentally Friendly Nanoporous Oxide Catalysts for Biodiesel Synthesis" Victor S.-Y. Lin, 9th Annual Chinese-American Frontiers of Science (CAFOS) Symposium, Irvine, California, October 26-28, 2006 (Invited Talk).
6. "Gatekeeping Effect: Multi-functionalized Mesoporous Silica Nanomaterials for Catalysis and Biotechnological Applications" Victor S.-Y. Lin, Department of Chemistry, Michigan State University, East Lansing, Michigan, November 6, 2006 (Chemistry Seminar).
7. "Multifunctional Mesoporous Silica Nanoparticles for Catalysis, Sensor, and Intracellular Controlled Release Applications" Victor S.-Y. Lin, CSR-Catalytic Systems, ExxonMobil Research and Engineering Co., Annandale, New Jersey, December 7, 2006 (Invited Talk).
8. "Gatekeeping Effect: Multifunctional Mesoporous Silica Nanoparticles for Selective Catalysis and Conversion of Bio-based Feedstocks to Biodiesel" Victor S.-Y. Lin, North East Zeolite/Mesoporous Catalytic Materials Symposium (NECZA Symposium), Philadelphia, Pennsylvania, December 8, 2006 (Invited Talk).
9. "Multifunctional mesoporous nanoparticle-based catalysts and controlled release delivery systems for bioenergy applications" Victor S.-Y. Lin, Sustainability of Energy, Food, and Water Symposium, 233rd ACS National Meeting, Chicago, IL, March 25-29, 2007 (Invited Talk).
10. "Functional Mesoporous Metal oxides for Bio-mimetic Cooperative Catalysis and Biodiesel Synthesis" Victor S.-Y. Lin, The Catalysis Club of Philadelphia 2007 Spring Symposium, Holiday Inn Select - Claymont, DE, May 14, 2007 (Invited Speaker).

11. "Multifunctional Mesoporous Silica Nanoparticles for Selective Catalysis and Conversion of Bio-based Feedstocks to Biodiesel and Value-added Chemicals" Victor S.-Y. Lin, the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences Catalysis Program Contractors' Meeting, Wintergreen, VA, May 23-26, 2007 (Invited Speaker).

Honors and Awards

Please list all honors/awards/special press/etc. related to this project.

Our biodiesel research breakthrough was featured on a public television program (PBS) of "Farmers' Almanac TV." The episode was broadcast on Friday, June 8, on Iowa Public Television (IPTV).

The New York Times published a story about our new biodiesel catalyst technology and the technology transfer from Iowa State University to Catilin, Inc. on July 1, 2007.

Model-based Reasoning for Software: Advanced Algorithmic Techniques and Prototype Implementation

Principal Investigator: Arun Somani

Industry Partners (company names only): EnSoft Corp.

Project Goal: Work with EnSoft to develop the next generation of SimDiff, a tool for differencing control software models.

Executive Summary:

Please provide a 300-500 word summary of the final results of the project (text only, 2500 character maximum), including the commercialization status.

EnSoft, an ISU based software tools company at the ISU Research Park, has developed an innovative tool for users of Simulink software. Simulink is a software modeling tool widely used for developing control systems. EnSoft's tool, SimDiff, analyzes Simulink software models and presents the results in an easy-to-comprehend visual form. An animated demo of the SimDiff tool is available at (<http://www.ensoftcorp.com/>). Initially, SimDiff was developed with partial funding from Rockwell. Initial, objective was to automate auditing of software design models of flight control systems. After its initial development, the scope broadened and eventually SimDiff released by EnSoft in 2005 as a model differencing tool with applications in avionics, automotive, and many other industries that develop complex control software as a critical component of their products.

This project involved research to assist EnSoft in developing the next generation of the SimDiff tool. The work involved developing innovative algorithmic techniques and their prototype implementation. The proposed work was split between work performed at ISU by ISU faculty and students, and some work to be performed at EnSoft.

The SimDiff tool has huge potential for commercialization because of the vast proliferation of software enabled control. Control software is everywhere – in thermostats, watches, cell phones, microwave ovens, cars, tractors, pacemakers, airplanes, spacecrafts, and so on. Control software continues to be harnessed to achieve more functionality and efficiency. Just as imaging technologies allow doctors to look inside the human body to target health treatment, so also the objective of the SimDiff tool and the underlying analysis technology is allow engineers to look inside the highly complex control software so they can target their work and perform more efficiently. Currently, SimDiff is the only tool available in the market to analyze control software models.

Within 18 months of its introduction, close to 200 copies of SimDiff have been licensed by 26 companies in 7 countries including USA, Austria, Germany, England, Italy, Romania, and Japan; and 70 other companies are conducting trials of SimDiff, the vast majority of which are included in the Global Fortune 500. Executives from major car manufacturers in Japan now visit EnSoft to discuss company-wide adoption of SimDiff and the possibility of developing other tools for accelerating designs of new cars.

External Funding:

Please list all of the applications for external funding that you have applied for using the results from this GIVF project, including the status (awarded, denied, pending).

Two proposals were submitted one to NSF and another to the Advanced Technology Program (ATP) within National Institute of Standards and Technology (NIST). The NSF proposal was not funded. The ATP proposal is currently under review.

Intellectual Property

Please indicate if you intend to file future invention disclosures related to this project (one-sentence description):

While working on this project, we made significant advances in a related area of online software maintenance. We have had preliminary discussions with ISURF and the possibility of filing a patent application is being explored.

Publications and Presentations

Please list all publications and presentations (published or pending) that included the results of this research:

1. Jason Stanek, S.C. Kothari, T.N. Nguyen, Online Software Maintenance for Mission-Critical Systems, 22nd IEEE International Conference on Software Maintenance (ICSM 06), pp. 93-103, Philadelphia, October 2006. (published)

2. Jason Stanek, S.C. Kothari, Software Differencing with a Suffix Tree based Graph Alignment Technique, submitted in May 2007 to the CASCON conference.

3. Jason Stanek, S.C. Kothari, A Graph Alignment Algorithm for Incremental Validation of Simulink Models, submitted in June 2007 to the Automated Software Engineering conference.

Pneumatic Continuously Variable Natural Frequency and Damping Isolator for Active Suspensions

Principal Investigator: Atul Kelkar

Industry Partners (company names only): Vibroacoustic Solutions, Inc.

Project Goal: Advancing the state-of-the-art in vibration isolation technology and accelerating the technology transfer to commercial market for an innovative vibration isolation concept based on active/semi-active purely pneumatic isolation system.

Executive Summary:

Please provide a 300-500 word summary of the final results of the project (text only, 2500 character maximum), including the commercialization status.

The research and development activity from this Grow Iowa Values Funds project has resulted into a joint Intellectual Property disclosure (# 03492) between VSI and ISU entitled - "Vibration Isolation System - LCPID (Low Cost Pneumatic Isolation Device)". ISU and VSI were engaged right from beginning with potential end user, namely Link Manufacturing, Sioux City, IA, who are major suppliers of truck cab suspensions to U.S. market. The development of LCPID was focused on addressing the unmet need of the market in the vibration isolation in truck cab/seat suspensions. VSI's intellectual property on Continuously Varying Natural Frequency and Damping (CVNFD) technology combined with the over-the-road field testing conducted by VSI and the performance targets given by Link led to the design of a new "low-cost" purely pneumatic isolation device. This project involved an extensive laboratory testing (simulations and experiments) for several versions of LCPID design including head-to-head comparison with existing truck cab suspension. The orders of magnitude difference in the performance of LCPID lab prototype witnessed by Link rapidly accelerated the project to the field testing. The field tests validated the lab results. Currently, Link is conducting cost analysis and addressing packaging and maintenance issues. The mechanical fatigue issues in LCPID design has led P.I. to further develop the isolation concept which has led to another IP disclosure through ISURF. The follow-on GIVF project if funded will focus on lab testing and commercial prototyping of this new design.

The LCPID technology has numerous other applications including suspension for operator seats in ag and construction equipment, driver seats for trucks and off-road vehicles, wheelchairs for handicaps, and vehicle suspensions. VSI has strong ties with Sear Seating and Mid-American Energy, who are actively looking for suspension solutions for seats and cabs. VSI's suspension division is working with Link for potential commercialization of LCPID in cab, seat, or sleeper bunk applications. VSI is also working with Mid American who is looking for retrofitting a fleet of over 800 trucks with the new suspension designs. Link Mfg. is expecting to introduce their new line of cab suspensions in 2008 with a low cost purely pneumatic revolutionary technology. VSI is planning to introduce LCPID technology in the market either in cab, seat, and sleeper bunk suspensions within next two years.

External Funding:

Please list all of the applications for external funding that you have applied for using the results from this GIVF project, including the status (awarded, denied, pending).

Proposal: "Fundamental Investigation of Active Pneumatic Isolation Concept", Agency: NSF, Amount: \$280,596 (not funded).

Intellectual Property

Please list any invention disclosures (ISURF number and one-sentence description) related to the project that existed PRIOR to the start of the project:

Please list any invention disclosures (ISURF number and one-sentence description) that were made as a result of the project:

ISURF# 03492: "Vibration Isolation System - LCPID (Low Cost Pneumatic Isolation Device)"

Please indicate if you intend to file future invention disclosures related to this project (one-sentence description):

The further enhancements to vibration isolation technology emerging from this project are in the process of new Intellectual Property disclosures.

Publications and Presentations

Please list all publications and presentations (published or pending) that included the results of this research:
Presentation to Link Manufacturing - (Sept. 06) "LCPID - Low end version of CVNFD".

(Due to Patent Disclosure on file no public presentations and/or publications were actively pursued.)

Honors and Awards

Please list all honors/awards/special press/etc. related to this project.

None.

(In spite of repeated request from ISU publicity department to showcase LCPID technology through press release due to the Patent Disclosure (# 03492) on file no press and or award activity was actively pursued.)

Viral replicon particle discovery research for development of improved vaccines for swine

Principal Investigator: Matthew M Erdman

Co-PIs: Maynard Hogberg

Industry Partners (company names only): Sirrah LLC, AlphaVax Inc

Project Goal: To prove the efficacy of RS and RP vaccines in swine and position Sirrah, LLC as a credible choice for an exclusive field of use license for economically important diseases of swine.

Executive Summary:

Please provide a 300-500 word summary of the final results of the project (text only, 2500 character maximum), including the commercialization status.

This project represents the first time pigs have ever been vaccinated with replicon subunit (RS) or replicon particle (RP) technology. In order to evaluate the effectiveness of these vaccines in pigs we analyzed the antibody response of pigs vaccinated with RP and RS vaccines expressing the hemagglutinin protein of a human strain of influenza virus. The vaccinated pigs had an average antibody titer nearly 1000 times the level needed for protection from disease while the non-vaccinate controls remained antibody negative. These results indicate that RS and RP vaccines can successfully immunize pigs and induce high antibody titers. This proof of concept work supports further development and evaluation of RS and RP vaccines for economically important diseases of pigs including swine influenza virus (SIV), porcine reproductive and respiratory syndrome virus (PRRSV), and porcine circovirus 2 (PCV2).

This project has provided the positive results needed to allow an Iowa startup company to commercialize RS and RP vaccines for swine. Sirrah LLC was founded by Dr. Hank Harris (ISU professor Animal Science) in 2005. The Sirrah management team includes Dr. Harris (Founder and CTO), Dr. Erdman (Director R&D), Stuart Oxer (CFO), and Margaret Pahl (Legal Counsel) and has contributed nearly \$205K to the company. Sirrah is operating in the ISU Research Park and has 6 full time employees, including 2 PhDs, and will expand to 10 employees in the coming months.

Based on the results of the project, Sirrah licensed key technology from ISURF and AlphaVax Inc, a human vaccine company in Research Triangle Park, NC. Convinced of the efficacy in swine, AlphaVax exclusively licensed RS and RP technology usage in pigs to Sirrah and has assisted in technology transfer from NC to IA. Sirrah completed exclusive licensure of ISURF # 03284 describing the protective antigenic determinants of PRRSV and the basis for Sirrah's first product. Sirrah has started taking orders for RS vaccines and hopes to deliver product in July/August of 2007. These vaccines will be sold under vet-client-patient relationship (CFR107) which allows veterinarians to provide vaccines to animals under their care and prior to USDA licensure. Initial sales are to swine producers located only in Iowa, the top pig producing state in the US. To date Sirrah has sold 32,600 doses of RS vaccine at \$5 per dose totaling \$136,000. Sirrah is concurrently pursuing USDA licensure for RP vaccines to be completed by 2010.

External Funding:

Please list all of the applications for external funding that you have applied for using the results from this GIVF project, including the status (awarded, denied, pending).

GIVF 2007, \$136,000 (pending)

USDA SBIR Phase 1, \$80,000 (funded)

IDED EVA, \$100,000 (funded)

USDA Formula Funds, \$20,000 (funded)

ILHAC, \$25,000 (funded)

NPB, \$133,000 (funded)

Intellectual Property

Please list any invention disclosures (ISURF number and one-sentence description) related to the project that existed PRIOR to the start of the project:

ISURF # 03284, Identification of Protective Antigenic Determinants of Porcine Reproductive and Respiratory Syndrome Virus and Uses Thereof.

Please list any invention disclosures (ISURF number and one-sentence description) that were made as a result of the project:

ISURF # 03388, Farm Specific Animal Vaccines not Requiring Isolation of the Specific Infections Agent
(partial relation to this project)

Please indicate if you intend to file future invention disclosures related to this project (one-sentence description):

Future disclosures are planned that directly describe use of RS and RP technology for other significant diseases of swine including Porcine Circovirus 2, Haemophilus parasuis and Mycoplasma.

Publications and Presentations

Please list all publications and presentations (published or pending) that included the results of this research:

1. Viral replicon particles: a new technology for swine vaccines. Journal submission pending.
2. Immunogenicity of a virus like replicon particle expressing the influenza hemagglutinin protein in pigs. Ames, IA (2007).
3. Vaccines: Present and Future. Proc AASV, Orlando, FL. (2007).
4. Sirrah LLC: Innovative vaccines to improve animal health and productivity. VNI, Des Moines, IA (2006).
5. New vaccine technologies: review and research update. Swine Dis Conf, Ames, IA (2006).
6. Replicon particle co-expression of PRRSV GP5 and M proteins. Proc Int PRRS Symp, Chicago, IL (2006).
7. Immunization of swine with replicon particles: proof of concept. Proc Int PRRS Symp, Chicago, IL (2006).

Honors and Awards

Please list all honors/awards/special press/etc. related to this project.

2nd place Pappajohn business plan competition. Business plan includes the supporting results provided by this GIVF project.

Title: Nanotechnology for Label-Free Detection of Pathogen-Specific Nucleic Acids

PI: Byron Brehm-Stecher

Companies: BioForce Nanosciences

Publications/presentations based on project:

Invited Oral Presentations:

- **Brehm-Stecher, B.F.** "Peptide Nucleic Acids: Food Safety Applications, Carnegie Mellon University, Pittsburgh, PA, March 24, 2006
- **Brehm-Stecher, B.F.** "Recent Developments in Whole-cell Diagnostics for the Detection of Foodborne Pathogens", Institute for Food Research, Norwich, England, April 12th, 2006
- **Brehm-Stecher, B.F.** "Whole Cell Methods for Rapid Detection of Foodborne Pathogens", University of Wisconsin-Madison Food Research Institute, Madison, WI, May 9th, 2006
- **Brehm-Stecher, B.F.** "Rapid Detection and Control of Foodborne Pathogens", National Center for Food Safety and Technology, Summit-Argo, IL, August 1, 2006
- **Brehm-Stecher, B.F.** "Whole Cell Methods for Detecting Foodborne Pathogens on Surfaces", symposium on "Structure, Interactions and Reactivity at Microbial Surfaces", 232nd American Chemical Society National Meeting, San Francisco, CA, September 10-14, 2006.
- **Brehm-Stecher, B.F.** "Rapid Molecular Detection of Foodborne Pathogens", Food Safety Consortium Annual Meeting, Fayetteville, AR, October 1-3, 2006.
- **Brehm-Stecher, B.F.** "Rapid Detection of Foodborne Pathogens". NATO Advanced Research Workshop: Food Safety and Security: Global Holistic Approaches for the Future and Environmental Impacts, Galati, Romania, September 4-6, 2007.
- **Book Chapter:**
Brehm-Stecher, B.F. 2007. "New Technologies for Imaging Individual Microbial Cells" in *Imaging Cellular & Molecular Biological Function*, F. Frischknecht and S. Shorte, (eds.) Springer-Verlag, Berlin.
- **Manuscript in Preparation:** **Brehm-Stecher, B.F., S. Nettikadan, K. Radke, and E. Henderson.** AFM-deposited ultramicroarrays for DNA and rRNA-based detection of *Salmonella*.

• **Educational Outreach:**

In Spring, 2008, BioForce hosted Dr. Brehm-Stecher's FS HN 627X class, an experimental graduate class on rapid detection in food microbiology. In their evaluations of the class, students commented that they valued this opportunity to tour an operational biotechnology company, to view hands-on some of the technology covered in class, and to obtain feedback from working scientists on what it is like to work in Iowa's biotech sector.

Invention Disclosures:

- **Brehm-Stecher, B.F., Nettikadan, S., and J.C. Johnson.** Biomimetic antimicrobials as ligands for microbial recognition and capture, ISURF # 03605.

External Funding Applied For (indicate received/denied/pending):

- **Narasimhan, B., A. L. Pometto III, S. Mallapragada, and M. Misra.** 2008-2013. NSF Engineering Research Center for Food Safety and Security. NSF \$18,500,000. Role played: participant, "Sampling and Manipulation of Complex Food Matrices for Effective Extraction of Pathogens" and "Rapid Sensing" research thrust platforms. Not funded.
 - **Nanotechnology Sensors for Plant and Animal Biosecurity, Battelle Infrastructures and Platform Grants Program,** \$265,787. Not funded
-

Progress report (300 word maximum):

The original intent of this work was to create AFM-deposited, self-assembling peptide nucleic acid (PNA) ultramicroarrays capable of capturing pathogen-specific nucleic acids, with subsequent detection via either non-specific fluorescent staining and simple imaging or via AFM-detectable differences in spot heights between negative controls and treatments after hybridization. Although we were able to bind PNA probes to chip surfaces, their capture efficiencies for target nucleic acids were low. Subsequently, litigation between the Copenhagen Inventor's Group (original inventors of PNA) and our commercial PNA source (Applied Biosystems) resulted in a lapse in the availability of PNAs. We therefore changed our tact to include a focus on DNA-based probes arrayed onto chip surfaces. Using BioForce Nanosciences' NanoEnabler ultramicroarrayer, we were able to array *Salmonella*-specific DNA probes to the surface of silica chips and were able to demonstrate specific capture of a short, complementary synthetic DNA target. Once proof of principle was shown in this model system, we were able to demonstrate capture and fluorescence-based detection of purified *Salmonella* rRNA, with rRNA from non-target cells serving as negative controls. A concentration curve demonstrated that we were able to detect as little as 10 picograms per microliter (an estimated ~10-100 cells) of *Salmonella* rRNA via the array-based system. Key to our success was use of a pre-hybridization rRNA fragmentation step. Access of rRNA to the chip surface and binding kinetics was found to be dependent on fragment size, with large molecules of intact rRNA showed poor binding characteristics. Despite the initial setback of limited PNA availability, we have accomplished all goals of this grant, with the exception of height-based detection of rRNA via AFM. We will continue to work with BioForce Nanosciences to accomplish this goal, using colloidal gold to amplify height differences for array spots occupied by captured *Salmonella* rRNA. We anticipate submission of this work for publication in 2008.

Title: Protein Micropatterning on Microsensors to Quantify Cell Cytotoxicity of Adherent and Non-adherent Cells

PI: Surya Mallapragada

Companies: Cellular Engineering Technologies

External funding applied for (indicate received/denied/pending): NIH STTR proposal submitted April 2007 by Cellular Engineering Technologies - declined

Progress report (300 word maximum): We have optimized our silanization techniques to attach proteins to the indium-tin oxide (ITO) electrode substrates. Using this technique, we have shown that CD34 antibodies can be attached to the ITO electrode substrates covalently, and verified this by atomic force microscopy. In addition, we have cultured CD34+ cells on these substrates and shown good attachment. Our collaborators at Cellular Engineering technologies investigated selective cell adhesion on these substrates.

Title: Development of Novel Digestion-Resistant Starches from Corn to Combat Human Disease

PIs: Martha James, Alan Myers

Company: Starch Design

Invention disclosures, patent applications:

U.S. Provisional Patent Serial No. 61/030,836 filed February 22, 2008, SHORT CHAIN AMYLOPECTIN STARCH, METHOD FOR MAKING AND USE THEREOF.

Publications/presentations based on project:

- Poster: October, 2007, Annual Intl. Meeting of the American Assoc. of Cereal Chemists,
- Invited oral presentation, October, 2007, Starch Round Table Meeting, San Antonio, TX;
- Invited oral presentation, October, 2007, Swedish Univ. of Ag. Sciences, Uppsala, Sweden;
- Poster presentations: March, 2008, Midwest Meeting of the American Association of Plant Biologists,
 - Claire Moallic, Alan Myers, and Martha James; Modification of Amylopectin Chain Length in Transgenic Maize Plants Results in Novel Starches with Altered Hydrolysis Properties.
 - Alex Meyer, Josh Rivenbark, Claire Moallic, Alan Myers, and Martha James; Use of FACE as a tool to screen for rapidly degradable starch.
- Invited talk: June, 2008. Corn Utilization Technology Conference, Kansas City, MO. Martha James. Targeted Design of Qualitative and Quantitative Changes in Maize Endosperm Starch.

Awards received:

- Outstanding Poster Award, given by the Corn Refiners Association (CRA/AACC International Outstanding Poster Award) to author Claire Moallic for the poster presented
- October, 2007 at the Annual International Meeting of the American Association of Cereal Chemists, San Antonio, TX, entitled "Modification of Amylopectin Chain Length in Transgenic Maize Plants Results in Novel Starches with Altered Hydrolysis Properties".

External funding applied for utilizing project results (indicate received/denied/pending):

- USDA special grant to the ISU CDFIN - Award: \$30,000
 - USDA CSREES sub-award to Iowa State University - Sub-award: \$105,000
 - Grow Iowa Values Fund - Award: \$70,000
-

Progress report (300 word maximum):

Progress in this final period included additional characterization of the functional properties of two types of cornstarch predicted to be more slowly digestible (i.e., degraded to glucose) in the human system. The prototype starch was made by genetically engineering plants for increased expression of a starch debranching enzyme, which resulted in production of a long-chain amylopectin starch (LCAPS1). A derivative starch termed LCAPS3 was made by crossing LCAPS1 plants with *dull1* mutant plants. This combined genetic engineering/breeding approach was predicted to produce a more digestion-resistant type of starch.

Starch hydrolysis analyses were performed using a combination of two digestive enzymes, α -amylase and amyloglucosidase. These *in vitro* tests confirmed LCAPS1 was digested more slowly than normal starch over a two-hour digestion period. LCAPS1 digestion ranged from 40% of normal starch after just 10 minutes incubation to 80% of normal starch after an hour or more. LCAPS3 digestion, however, was slower, approximately 40% to 50% that of normal starch throughout the two-hours. These analyses indicate that LCAPS3 is more likely than LCAPS1 to be a slow energy release form of starch.

Another means of assessing starch digestibility, measurement of the temperature required to gelatinize the starch, was applied to LCAPS1 and LCAPS3 samples. This analysis showed that both modified starches have

higher gelatinization temperatures compared to wild type, and the onset, peak, and end gelatinization temperatures for LCAPS3 are significantly higher. Thus, more heat energy is required to dissolve the structure of LCAPS3 starch.

A previous human feeding trial designed to test the digestibility of an LCAPS1 containing food product was unsuccessful. That trial fed participants a starch based pudding, and no difference was seen in the glycemic index of the LCAPS1 pudding versus the wild type pudding. In this research period preparation was in progress for a second round of human feeding trials, which will use an alternative to cooked food product. Foods such as muffins, breads, and polenta that include varying amounts of cornstarch (LCAPS1, LCAPS3, or the control) are being produced and evaluated in the laboratory. Based on these results, a food product will be selected for planned feeding trials in the fall of 2008.

Finally, Starch Design, LLC is a small biotechnology company that was organized in 2007 to commercialize these and other new starches. The company is in the process of reorganizing as a class C corporation, and has nearly finalized negotiations with ISURF to license intellectual property. Starch Design has begun informal negotiations with two multi-national agricultural biotechnology companies and one multi-national starch company regarding this technology.

Title: Retooling Ethanol Industries: Integrating Ultrasonics into Dry Corn Milling to Enhance Ethanol Yield

PI: David Grewell Co-PIs: Samir Kumar Khanal and J (Hans) van Leeuwen

Companies: Branson Electronic, Lincolnway Energy, Quad County Processors

Publications/presentations based on project:

- Samir Khanal, Melissa Montalbo, J. (Hans) van Leeuwen, Gowrishankar Srinivasan and David Grewell, Ultrasound Enhanced Glucose Release from Corn in Ethanol Plants, *Journal of Environmental Science and Technology*, Vol. 6, No. 6, 2007, pg. 35-42.
- Saoharit Nitayavardhana, Sudip Kumar Rakshit, J (Hans) van Leeuwen, David Grewell, Samir Kumar Khanal Ultrasound Pretreatment of Cassava Chip Slurry to Enhance Sugar Release for Subsequent Ethanol Production, Submitted to *Biotechnology and Bioengineering*
- Melissa Montalbo-Lomboy, Lawrence Johnson, Samir Kumar Khanal, J. (Hans) van Leeuwen, David Grewell, *Sonication of Sugary-2 Corn: A Potential Pretreatment to Enhance*, Submitted to *Bioresource Technology*, April 2008.
- David Grewell, Samir Khanal, Melissa Montalbo, J. (Hans) van Leeuwen *Ultrasonic Enhancement of Bio-renewable Fuels Production*, June 2008 RWTH University, Aachen, Germany, **Invited Lecture**
- David Grewell, *Ultrasonics and its application in environment, energy and biotechnology*, Asian Institute of Technology Thailand 2006, **Invited Lecture**
- David Grewell, *Ultrasonic Enhancement of Bio-renewable Fuels Production*, 2006 Emerson Electric, Frankfurt, Germany, **Invited Lecture**
- David Grewell, *High Power Ultrasonics: Equipment, Key Concepts and Applications*, Conference Innovative Treatment Technologies for Water, Wastewater, Sludge and Contaminated Waters, Conference May 2007, Cairo, Egypt, **Invited Lecture**

Conference Papers:

- Samir Kumar Khanal, Melissa Montalbo, J (Hans) van Leeuwen, Gowrishankar Srinivasan, David Grewell, Enhanced Glucose Release from Corn in Ethanol Plants by Ultrasonic Pretreatment, International Conference on "21st century challenges to sustainable agri-food systems, Biotechnology, Environment Nutrition, Trade and Policy" 15th- 17th March 2007 in Bangalore, India.
- Samir Kumar Khanal, Melissa Montalbo, J (Hans) van Leeuwen, Gowrishankar Srinivasan, David Grewell, Ultrasonic Enhanced Liquifaction and Saccharification of Corn for Bio-Fuels, ASABE Annual International Meeting, 17-20 June 2007, Minneapolis, Minnesota.
- Melissa Montalbo-Lomboy, Lawrence Johnson and David Grewell, Ultrasonication of Sugary-2 Corn: Enhanced Sugar Yield, ASABE Annual International Meeting (AIM), Rhode Island, June 29-July 2, 2008.

Awards received: Ethicon Endo-surgery, Inc. Graduate Research Award, Melissa Montalbo-Lomboy, 2008.

External funding applied for utilizing project results (indicate received/denied/pending):

Status	Title	Funding	Source	PI, Co-PI's
Funded	Exploratory Research with High Power Ultrasonics in Bio-Renewables	\$25,000	BBC	D. Grewell
Funded	Bio-fuels Unit Operations Course Development	\$295,138	USDA	D. Grewell, T. Brumm, C. Hurburgh
Denied	Spectroscopic Analysis during Lignocellulose Degradation by Ultrasonic and Ammonia Treatments	\$2,130,000	DOE	R. S. Houk, Dr. Edward Yeun, Dr. Tae Hyun Kim, Dr. Nicola Pohl, Dr. Klaus Schmidt-Rohr
Denied	Ultrasonic Pretreatment of Lignocellulosic Biomass:	\$793,761	USDA	D. Grewell, Mike Ladisch,

	Achieving Positive Net Energy Balances and Reducing Overall Processing Costs			Nathan Moiser, Tae Hyun Kim
Denied	Ultrasonic Enhancement of Chemical Pathways for Esterification	\$468,957	NSF	D. Grewell, J. Verkade
Denied	Development of Courses and Training Modules for Biofuels Plants-Phase I	\$149,803	NSF	D. Grewell, T. Brumm, C. Hurburgh
Denied	CAREER:Ultrasonic Enhancement of biofuels	\$517,839	NSF	D. Grewell, T. Brumm, C. Hurburgh
Denied	Retooling Ethanol Industries: \$517,839 Integrating Ultrasonics into Dry Corn Milling to Enhance Ethanol Yield	\$317,681	USDA	S. Khanal, D. Grewell, J. van Leuwen, A. Pometto
Denied	<i>Development of Courses and Training Modules for Biofuels Plants</i>	\$348,426	NSF	D. Grewell, T. Brumm, C. Hurburgh

Progress report

This work evaluated the use of high power ultrasonic energy to treat corn slurry in dry corn milling ethanol plants to enhance liquefaction and saccharification for ethanol production. Corn slurry samples obtained before and after jet cooking were subjected to ultrasonic pretreatment for 20 and 40 seconds at amplitudes of vibration ranging from 64 to 107 μm_{pp} (peak to peak amplitude in μm). The resulting samples were then exposed to enzymes (alpha-amylase and glucoamylase) to convert cornstarch into glucose. A comparison of scanning electron micrographs of raw and sonicated samples showed the development of micropores and the disruption of cell walls in corn mash. The corn particle size declined nearly 20-fold following ultrasonic treatment at high power settings. The glucose release rate from sonicated samples increased as much as 3-fold compared to the control group. The efficiency of ultrasound exceeded 100% in terms of energy gain from the sugar released over the ultrasonic energy supplied. Enzymatic activity was enhanced when the corn slurry was sonicated with simultaneous addition of enzymes. This finding suggests that the ultrasonic energy did not degrade or denature the enzymes during the pretreatment. In addition, it was seen that ultrasonic energy could gelatinize starch at relatively low temperatures (30-50 C) much faster compared to heating. It is believed that this also promoted hydrolysis of the polysaccharides. Continuous flow studies suggested that single ultrasonic systems (5 kW) could treat 5-10 gallons of corn slurry per second. Based on conservative assumptions, ultrasonication could be implemented on ethanol plants resulting in a pay-back period of less than a year. This work has resulted in over \$300,000 of external funding and equipment donation as well as further studies investigating ultrasonication in various bio-fuels, such as bio-diesel and itanonic acid chemistries.

GROW IOWA VALUES FUND FINAL REPORT
Short Term Projects – FY06

Progress Reports:

Company: Metabolic Technologies
Contact: Ronald Whillhelm
Award: \$150,000
Status: Final Report

Initial studies have begun to investigate the bioactivity of several compounds found in the Argentinean plant in the Solanum family. Equipment purchased is intended to speed the process of isolation, identification and testing of compounds from this plant. With the funds we have purchased equipment for the extraction/drying necessary for initial purification of bio-compounds, chromatographic equipment for further purification of bio-compounds, cell culture equipment to test large numbers of compounds for bioactivity and general laboratory upgrades to efficiently conduct studies related to this project. Good progress has been made on isolation of compounds from the Solanum plant with several fractions having bioactivity in cell culture. Ongoing work is planned to further purify these compounds and eventually test them in animals.

Company: Infiscape
Contact: Allen Bierbaum
Award: \$100,000
Status: Final Report

The funds provided by the Grow Iowa Value Funds have allowed Infiscape to expand this year and pursue several new market opportunities. When we applied for the GIV Funds we examined growth strategies to address the needs of our core market by creating general-purpose software products for immersive visualization. Our analysis identified two areas that looked promising: 1) immersive design and review for architecture and commercial design, and 2) immersive extensions to existing engineering software packages. After the initial application we identified an addition new market, digital planetariums that we could approach as part of this effort.

During the past year, we have used the GIV Funds to pay the equivalent of 2 full-time employees to go after these markets.

In the architectural market, we have successfully completed a beta version of software product that allows architects and designers to connect a standard desktop design tool (3DSMax) to an immersive virtual environment. This product has been shown at two conferences and has been well-received. We are currently working with a Fortune 500 company that is interested in the product and we hope to have a commitment from them to purchase a license within the next 3 months.

We have made significant progress in the engineering software market. All of our current developments in this area are still confidential, but we plan to announce a significant new product line early this year.

Digital planetariums have proven to be another very good market for us. During the last year we have worked with the Denver Museum of Nature and Science to help them bridge the gap between traditional use of immersive virtual environment technologies and that of digital planetariums. They are now running several VR applications on their system and we are partnering with them to develop software tools for this market.

None of these developments would have been possible without the GIV Funds. Although we have not fully achieved the growth rate we hoped, the GIV Funds have allowed us to dramatically increase our internal product development efforts and add new staff members. We will continue on this path and we will be expanding again in the near future.

Company: Combisep
Contact: Ronald Whilhelm
Award: \$75,000
Status: Final Report

The objective of this project is to develop a high speed, high throughput amino acid analyzer based on the CombiSep's 96-capillary array electrophoresis system with UV absorption detection. The technology developed would eventually enable the screening of amino acid content of individual corn seeds across a large population. The amino acid analyzer project has been demonstrated and accomplished. The prototype system was delivered and installed into the BASF-Ames facility. BASF personnel were trained to use the system. The separation protocol was developed according to the BASF specifications. The corn samples are oxidized, followed by hydrolysis using microwave digestion. The protein content is thus converted to the individual amino acids. Amino acids are labeled with a fluorescent dye to enable detection. Up to 96 samples can then be analyzed simultaneously. A new design for temperature control during the capillary electrophoresis process has been implemented. In addition, data analysis software specifically designed for amino acid analysis has been developed for quantification. Individual amino acid calibrations have been performed to enable more reliable quantification. The reproducibility and reliability of the amino acid separation has been evaluated and results satisfactory for performing general population screening of relative amino acid content have been obtained.

Company: iSeek
Contact: Don Flugrad
Award: \$50,000
Status: Final Report

Project description: CMNet/iSeek – A grant of \$50,000 was awarded to CMNET, Incorporated to provide resources necessary for "Programming for compatibility with Unigraphics and Dassault CAD software."

CMNET, Incorporated is a software research and development company that has developed a shape-based search engine, CADSEEK, which allows a user to find components of similar shape in large, distributed Computer-Aided Design (CAD) databases. This provides the tool needed by engineers working for manufacturing companies to find parts that can be re-used for new applications. When parts can be re-used, significant savings are realized.

The anticipated results expected from this project include:

1. Accelerated penetration into the market.
2. Hiring of two additional programmers.
3. Accelerated hiring of salespeople.

CMNET, Inc. signed a multi-year contract with Deere, Inc. in June 2006 to implement CADSEEK across their global enterprise. The company has also entered sales negotiations with a number of other companies that use Unigraphics and Dassault CAD software including Vermeer, General Electric and Spirit AeroSystems. Approximately 100 other potential customers are currently in the sales pipeline. The company hired a senior software developer in mid 2006 to coordinate the effort to seamlessly interface CADSEEK with Unigraphics and Dassault CAD packages. In addition, a consultant was retained to optimize and automate the classification of coded parts to efficiently handle files from a variety of CAD packages. Finally, the company hired an Executive Vice President of Sales and Business Development in October of 2005. He is currently handling the bulk of the sales work, but will hire additional sales personnel during the coming months.

The work accomplished on this project has helped position CMNET, Inc. at the forefront of this emerging technology field. With only a handful of companies selling shape-based software, CMNET is poised to become the recognized authority in this important market.

Company: Glycon Technologies

Contact:

Award: \$100,000

Status: Final Report

Eggshell Membrane Separation

Consistent with our milestones, we have designed and fabricated a technology to separate the eggshell membrane from the eggshell on a large scale. The separation technology advanced from a pilot stage to full production, proving the ability to separate in excess of 3 million eggshells a day. The technology was designed and fabricated with replication and mobility in mind for future implementation in numerous egg-breaking facilities.

Further development transpired with the hiring of a lab staff for product development. The lab team has successfully hydrolyzed and isolated numerous proteins contained within the eggshell membrane. BiOva is in the final stages of a commercialization plan for the distribution of numerous products, including proteins, amino acids and eggshell calcium.

Company: Industrial Hardfacing

Contact: Kim Bentley (IPRT Company Assistance)

Award: \$25,000

Status: Final

The hardfacing of augers is a long manual operation with an inefficient deposition of materials. This project resulted in the automation of the hardfacing process, driven by computer software and based on 4-axis CNC and *Rapid Prototyping* technology. Results of the project include:

- Reduction in Process time
 - FROM: 6-12 hours TO: 1-2 hours
- Unattended operation
 - FROM: Manual Laborer TO: Technical operator
- Quality
 - FROM: as much as 0.5" TO: as much as 0.03" deviation from nominal

FY07 FUNDED PROJECTS
FINAL REPORTS

Principal Investigator	Project Title	FY06 Allocation	FY07 Award Amount/expenditures	FY08 Carryover Amount	ISU Cost Share	Industry Cost Share
Mary Holz-Claus	Corn-Biomass Composite Fuel Pellets: An Industry-University Partnership	n/a	\$ 49,380	n/a	23,208.60	68,335.71
Hans Van Leeuwen	Ultrasonication in Soy Processing for Enhanced Protein and Sugar Yields and Subsequent Nisin Production	n/a	\$ 81,977	n/a	37,516.65	None reported
Vikram Dalal	Collaborative Research on High Performance Stable Amorphous Silicon- Germanium Solar Cells	n/a	\$ 63,406	n/a	29,452.08	43,784.00
Manjit Misra#	Commercialization of a Continuous In-Line Flow Meter	n/a	\$ 44,695.27	25,000	21,006.77	73,871.52
Larry Johnson	Commercializing New Fractionated Soy Proteins to Improve Human Health and Food Quality	n/a	\$ 167,717	n/a	164,936.95	20,000.00
Jay-Lin Jane	Development of Resistance and Low-Caloric Maltodextrins from Cornstarch	n/a	\$ 96,273	n/a	40,930.89	175,000.00
David Grewell*	Ultrasonic Assisted Exfoliation of Bio-Renewable Polymer Nanocomposites with Micro-Cellular Structures	24,399	\$ 48,282	n/a	24,946.38	16,306.63
Richard Larock	Commercialization of a Corn/Soy Oil-Based Composite Hog Feeder	57,409.41	\$ 38,590.59	n/a	47,118.63	10,000
Robert Brown#	Gasification Technologies in Support of Biorefineries	n/a	\$ 94,569.21	37,704.79	104,345.78	87,130.00
Jacek Koziel	Purification & Quality Enhancement of Fuel Ethanol to Produce Alcoholic Beverages with Ozonation & Activated Carbon	n/a	\$ 81,848	n/a	56,250.09	68,400.00
Hans van Leeuwen*	Converting Low Value Thin Stillage from Dry Milling Ethanol Plants into High Value Fungal Biomass	52,129.00	\$ 29,874	n/a	57,091.17	24,800.00
Pamela White#	Designing corn lines with dietary fiber to produce ethnic foods with enhanced health benefits	n/a	\$ 61,908.75	6,051.25	98,291.21	---
Suzanne Hendrich	Flaxseed lignans for health	n/a	\$ 66,960	n/a	31,471.20	28,466.42
Ruth MacDonald#	Role of complex carbohydrates from soybeans in inflammatory bowel disease	n/a	\$ 44,000	21,000	50,258.81	---
Anumantha Kanthasamy	Development of Novel Gene Therapy Approach for Parkinson's disease by Targeting	n/a	\$ 50,000	n/a	88,859.41	---

	a Cleavage Site of a Proapoptotic Kinase					
Don Reynolds	Concept paper for Biosafety Level 3 (BSL3) facilities at Vet Med	n/a	\$ 38,000	n/a	17,860.00	---
Infrastructure						
Pappajohn Ctr / Research Park		n/a	\$ 400,000	n/a	189,656.37	400,000
IPRT		n/a	\$ 100,000	n/a	178,496.13	---
VPRED		n/a	\$ 100,000	n/a	96,339.65	---
TOTAL						

*These projects were awarded in FY07 but partially funded from FY06 funds

#These projects were given a no-cost extension and will be completed in FY09. The full cost-share will be reported in FY09. The reports for these projects are interim.

Title: Corn-biomass Composite Fuel Pellets: An Industry-University Partnership

PI: Mary Holz-Clause

Co-PI: Douglas Stokke, Daniel Burden

Companies: Iowa Area Development Group; Ag Pellet Energy, Inc; Corn Belt Power ; Pine Lake Ethanol; LDJ Manufacturing

Project Goal: Fine-tune the extruder-die configuration and extrusion parameters for a 100% ethanol-manufacturing co-product pellet that is "commercially firm," i.e., for packaging, shipping, storage and auger-handling.

Progress report (300 word maximum):

The project has been completed. Testing with wood and cob material showed that these formulations produced an inferior product. This resulted in fine-tuning the extruder-die configuration and extrusion parameters for a 100% ethanol-manufacturing co-product pellet that is "commercially firm," i.e., for packaging, shipping, storage and auger-handling. Emissions and combustion testing by Twin-Ports Testing Inc., Superior, WI., demonstrated significantly higher BTU production, lower emissions, and lower ash (residual) production; than corn kernels, wood pellets or composite DDG-wood-dust pellets (competing and potentially competing fuels). A USDA Rural Development Pass-Through-Loan-Guarantee application was submitted by IADG to assist the ongoing expansion of the fuel-stove production facility in Pella, IA. A patent application regarding the architecture of the extrusion die has been applied for by LDJ, Landers Machine, and Gary Wobler under the name of Ag Pellet Energy. Additionally, a filing for patent-protection currently is underway on a 100% DDG Pellet and Processing System for both fuel and feed applications. Ag Pellet Energy and Landers Machine have introduced this concept to the ethanol industry and are forming a new company, Ag Fuel & Feed, which will be based in Iowa. The "100% DDG Pellet and Processing System" is designed to be located at or near ethanol plants. Marketing the technology as a system for sale to ethanol plants was initially proposed by the ISU Extension Value-added Agriculture Project. Ag Pellet Energy is now focusing on their "100% DDG Pellet" to serve both the fuel and feed markets; with the fuel market changing from home and light-industrial application to large-scale power co-generation systems. In March, 2007, a test-burn was conducted at the Wisdom Station power plant, Spencer, Iowa, owned and operated by Corn Belt Power Cooperative, Humboldt, Iowa. The test burn consisted of mixing 10% of Ag Pellet Energy's DDG Pellets with 90% coal at the power plant. Although the plant did not achieve full generation output with the fuel blend, a reduction in emissions (percent opacity, which is the measurement of visual emissions coming out of the stack) was obtained. Cattle feeding tests were conducted under contract with Dr. Dan Loy, Iowa State University, regarding the analysis of the palletized distillers' grains and examining systems for feeding and delivering them to cattle with positive results. Additional contract research with Dr. Loy is looking at market analysis for this product. LDJ Industries, Pella, has experienced an ash build-up problem with their automatic-feed burner system in their residential light-industrial stove units. Based on testing lab data, this problem was unforeseen and deemed unlikely. However, they currently are considering a redesign of their burner system as well as simply abandoning the DDG-pellet product for the residential light-industrial stove application.

Title: Ultrasonication in Soy Processing for Enhanced Protein and Sugar Yields and Subsequent Nisin Production

PI: Hans Van Leeuwen (for Samir Khanal)

Companies: Cargill; ADM; P&G; Branson Ultrasonics

Project Goal: Evaluate the potential of this low/negative value byproduct stream, soybean whey, as an alternative, inexpensive substrate to grow lactic acid bacteria (LAB) specifically *Lactococcus lactis subsp. lactis* and produce nisin.

Publications/presentations based on project:

- Ultrasonication in soy processing for enhanced protein and sugar yields and subsequent bacterial nisin production. ASABE Annual International Meeting (AIM), Jun 17-20, 2007, Minneapolis, MN.
- Karki, B. Khanal, S. K., Jung, S. and van Leeuwen, J (2008) Ultrasound enhanced glucose separation from protein in soy flakes. *Biotechnology and Bioengineering*, submitted
- Karki, B., Mitra, D., Grewell, D., Van Leeuwen, J. and Khanal, S. K. (2007) Ultrasonication in soy processing for enhanced protein and sugar yields and subsequent bacterial nisin production. ASABE Annual International Meeting of Am. Assoc. Agric. Biosystems Eng., Jun 17-20, Minneapolis, MN.
- Mitra, D., Khanal, S.K., Pometto, A.L.III, and van Leeuwen, J (Hans) (2008) Value-added soybean processing: A preliminary study on the utilization of soybean whey as a substrate for lactic acid bacterial fermentation and subsequent nisin-like bacteriocin production. *J. Food Biotech.*, submitted

Invention disclosures:

- ISURF # 03396 *Producing high value nisin from soy whey* Khanal, van Leeuwen, Pometto and Lamsal
- Ultrasonication in soy processing for enhanced protein and sugar yields and subsequent nisin production [US Provisional Patent No. 60/914,502].

External funding applied for (indicate received/denied/pending):

- Value-added soybean processing: utilization of soybean whey, as an alternative, cheaper substrate to produce nisin with lactic acid bacterial fermentation, GIVF with various companies' assistance - denied
- Various negotiations with industry - pending

Progress report (300 word maximum):

Soybean whey is an industrial by-product formed during the extraction of soy protein isolates (SPI) from defatted soy flakes. Nisin is the only bacteriocin approved by Food and Drug Administration (FDA) and it is seeing increasing usage as a natural food preservative. The objective of this study is to evaluate the potential of this low/negative value byproduct stream, soybean whey, as an alternative, inexpensive substrate to grow lactic acid bacteria (LAB) specifically *Lactococcus lactis subsp. lactis* and produce nisin. This project aims to add value to a waste stream with high organic strength by producing an important product. It will result in local production of a popular but expensive food preservative.

Our preliminary studies proved soybean whey an excellent growth medium for LAB fermentation and nisin production. We achieved a biomass yield of 2.18 g/L and nisin yield of 619 mg/L without pH control. The goal of the proposed research is to scale-up nisin production from soybean processing wastewater computer-controlled fermentors for development of commercialization protocols. Furthermore, fungal bioremediation of any residual suspended carbon load after nisin recovery will also be examined to reduce the COD levels before discharge to the environment. The research team has developed excellent partnerships with the Kerry Group, a leader in the global food industry who will be providing the soybean whey, Kemin Industries, with an interest in the nisin product, and West Central, with an interest in the high-quality protein. We envision that this collaboration will lead to industry funding.

Title: Collaborative Research on High Performance Stable Amorphous Silicon- Germanium Solar Cells

PI: Vikram Dalal

Company: Thin Film Technologies

Project Goal:

Progress Report:

Task 1: Improve collection of carriers in a-Si cells on plastic so as to improve cell efficiency, in collaboration with Powerfilm Inc. and transfer technology to production at Powerfilm.

This task was successfully completed.

Using a multi-layer back reflector of Al followed by doped Zinc oxide, we were able to increase absorption of light into the solar cell, and hence current, by 11% compared to the standard Powerfilm process. This process has been transferred to Powerfilm. They have built a new sputtering system for depositing Al followed by doped zinc oxide.

Beyond this process, we have also shown that etching zinc oxide using a wet chemical etch also leads to significant increases in current, about 20% compared to standard process. However, this process is not amenable to mass production, and in future projects, we will utilize a different etching scheme, based on plasma etching (which can be implemented into production), to achieve a similar result.

Task 2. Demonstrate that lower bandgap a-Si can be produced using variations in plasma processing, and then fabricate proof of concept solar cells.

This task was also completed. We succeeded in reducing the bandgap of a-Si, and hence, increasing absorption of red light, by utilizing a novel low pressure plasma process using a Helium diluted plasma. The bandgap reduced to about 1.67 eV compared to normal 1.75 eV. This is a significant reduction which would help in future production of more efficient tandem junction solar cells. We also succeeded in making proof of concept a-Si solar cells in this new material. Thus, this task was also successfully completed.

Task 3. Demonstrate that lower gap a-(Si,Ge) cells can be made using VHF process similar to what Powerfilm uses.

This task was also successfully completed. Using 45 MHz plasma discharge, we succeeded in making a-(Si,Ge) alloy of bandgaps in the range of 1.6 eV. Such a lowering of bandgap is significant for making tandem junction solar cells on plastic substrates. We achieved very high ratios of photo/dark conductivity ($\sim 10^5$), a measure of the high quality of the film. We also succeeded in making solar cells in this material. The quantum efficiency data showed that the response in the infrared region significantly improved when Ge was added to Si. The fill factors remained reasonable, ~60% range. More work needs to be done on this alloy to improve its electronic properties to achieve high efficiencies.

Summary

All three tasks were successfully completed. One major outcome was that part of the technology was transferred to Powerfilm for improving their products. Even better avenues for improving the performance were identified but need more research.

Title: Commercialization of a Continuous In-Line Flow Meter

PI: Manjit K. Misra Co-PIs: Yuh-Yuan Shyy

Companies: Almaco; Remington Hybrid Seed Company

Invention disclosures: ISURF patent pending prior to the start of the project

Progress report (300 words maximum):

Discussions were held with Remington seed plant in Williams, Iowa for field testing of the flow meter. A trip was made to the seed plant and four potential locations were identified for installing the flow meter. Of these four, a long and inclined spout that feeds large flats to the sizer was selected as the best location. However, this tower is rated at 300 bushels per hour capacity. We therefore conducted research to further increase the capacity of the flow meter and making it suitable for installation in an inclined spout.

Two modifications were made to the flow meter: 1) The inner tube was modified by increasing the angle of the inclined plates from 45 to 60 degrees and 2) A set of ring springs were provided to enable the flow meter to be installed in an inclined spout. The modified flow meter was first tested with static weights in the laboratory. The flow meter generated weaker signals and took a little longer to settle down in the beginning. However, after the system was warmed up, the data had no significant difference when compared with the original design. The flow meter was then installed at the Seed Conditioning Tower and a maximum flow rate of 300 bu/hr was obtained which is suitable for testing at the seed plant. However, a problem was observed at this high flow rate, i.e. when the PVC tube and plastic plates rubbed with seeds (either corn or soybean), it built up significant amounts of static electricity and generated sparks. Bonding or ground cables had little effect on static electricity buildup and the discharge was intense enough to damage the load cell circuit. We will therefore design an all steel flow meter for testing it at high capacity.

Title: Commercializing New Fractionated Soy Proteins to Improve Human Health and Food Quality

PI: Lawrence A. Johnson

CoPI(s): Nicolas A. Deak

Companies: SafeSoy Technologies; Crown Iron Works

Publications/presentations based on project:

Deak, N.A., Z.M. Nazareth, and L.A. Johnson. 2007. Scalping B-Conglycinin from Soybean Meal. Institute of Food Technologists Annual Meeting and Food Expo, Chicago, IL. July 28-Aug. 1.

Nazareth, Z.M., N.A. Deak, and L.A. Johnson Functional Properties of Soy Protein Isolates Made from Gas-supported Screw-pressed Soybean Meal. *J. Am. Oil Chem. Soc.* (submitted).

Invention disclosures:

ISURF filed for US patent on April 13, 2007.

External Funding:

SafeSoy - \$50,000

Progress report (300 words maximum):

Five of our six objectives have been completed. We have completed all of the original planned functionality and compositional testing as well as gelling that was added because our market analysis indicated that gelling is a property that companies are especially interested in and willing to pay premiums. Our industry partners, SafeSoy Technologies (Elsworth, IA) and Crown Iron Works, identified a high value market in Japan for our fractionated proteins in fish cakes, which was verified by TechnoSigma, a Japanese consulting firm hired by Crown. We demonstrated that our glycinin-rich products have superior gelling properties and may be especially well-suited for this application. We completed pilot-plant trials to prepare large quantities of our fractionated soy protein products and are evaluating them in Japanese-style fish cakes (surimi). We developed protocols for evaluating protein performance in fish cakes and sensory analysis of flavors of our products. Preliminary data suggest our glycinin fraction has outstanding performance in fish cakes, but this needs to be verified. We have shown that treating soy protein with small amounts of hydrogen peroxide in lieu of the industry practice of jet cooking gives much superior gelling performance while achieving adequate microbial kill. We have completed sensory testing (flavor and aroma). Using gas-supported screw-pressed meal produced by SafeSoy gave standard soy protein isolates with slightly more beany flavor, which becomes accentuated in our fractionated proteins. A strategy has been identified to deal with this. SafeSoy continues to engage other soy protein manufacturers to partner with them, the latest being Proliant (Ankeny, IA) who is interested in a superior gelling soy protein isolate. SafeSoy and Crown filed a law suit against Specialty Protein Products for theft of trade secrets around our preferred feedstock to prepare fractionated soy proteins, which has delayed SafeSoy from developing markets for our products.

Title: Development of resistant and low-calorie maltodextrins from cornstarch

PI: Jay-lin Jane

Companies: GPC

Publications/presentations based on project:

A. H. Lin and J. Jane, "Structure analysis of resistant maltodextrin using NMR." Presented at American Association of Cereal Chemists Annual Meeting, Oct. 7-10, 2007.

Invention disclosures:

One invention disclosure on "Resistant and low-calorie maltodextrins from cornstarch" was filed at the ISU Research Foundation.

External funding applied for utilizing project results (indicate received/denied/pending):

A research grant of \$25,000 from Grain Processing Corporation has been approved to support a product development project on the basis of the results obtained from this research.

Progress report (300 words maximum):

A novel technology was developed to produce resistant maltodextrins from normal cornstarch. A series of resistant maltodextrins were produced by using different reaction conditions and reagents. One example of the product consisted of 52.4% resistant starch and about 3% slow-digestible starch as measured by *in vitro* enzymatic analysis. The product displayed a tan color, gave lightly caramel flavor, and had a bland taste. The resistant maltodextrin was 78.7% water soluble at 35% weight/volume dispersion. Average molecular weight of the product was 7.2×10^3 Dalton, equivalent to 44.5 anhydroglucose units. Glycosidic linkages of the resistant maltodextrins were elucidated using ^{13}C -nmr. The product was made into a beverage and used for a human feeding study. Twenty healthy free-living adult men, 18-45 years of age, were recruited to participate in the human feeding study. Results of the human feeding study showed that after ingesting the resistant maltodextrin product, the average blood glucose concentration of the human subjects was 62.9% of that obtained after ingesting a regular maltodextrin product (Maltrin M180) as the reference of 100%. The blood glucose concentration profile recorded from 0 to 240 minutes after ingesting the resistant maltodextrin product also showed a slow glucose-release peak up to 90 minutes, indicating the product consisting of slow-digestible maltodextrin. The slow-digestible characteristic of the product is highly desirable as a health food ingredient. Because of these desirable properties of the product, the industry partner is in the process of conducting further studies of the product for potential commercial applications.

Title: Ultrasonic Assisted Exfoliation of Bio-Renewable Polymer Nanocomposites with Micro-Cellular Structures

PI: David Grewell **CoPIs:** Michael Kessler, Howard Van Auken

Companies: Creative Composites; Vermeer; Texel; Zein Protein Products; Branson Ultrasonics

Project Goal: Develop protein-based (corn and soy) plastics reinforced with nanoclays, for cost reduction and mechanical property enhancement.

Publications/presentations based on project:

- Maria Vlad, Gowrishankar Srinivasan, David Grewell, Improvement of the mechanical properties of soy protein isolate based plastics through formulation and processing, *International Polymer Processing Journal*, Vol 12, Issue 5, Nov 2007, pp489-496.
- David Grewell, Gowrishankar Srinivasan, Maria Baboi, Michael R. Kessler, William Graves, Matt Helgeson, Plant Based Plastics and Applications, ICIPC (Research Institute for Plastics and Rubber) International Colloquium, February 27 - 29, 2008, Medellin, Colombia, **Invited Lecture.**
- David Grewell, Blends of Zein and soy plastics, Materials Discovery and Design: Conference by the NSF -CoSMIC-Intl Materials Institute and the Indo-US Science and Technology Foundation. October 29-31 2007, Indian Institute of Science, Bangalore India.
- Michael R. Kessler, Richard Larock, David Grewell "Structural Composites from Agricultural Oils and Proteins" International Conference on Natural Polymers, Bio-Polymers, Bio-Materials, their Composites, Blends, IPNs, and Gels: Macro to Nano Scales (ICNP - 2007). November 19-21, 2007, Kottayam; Kerala, India. **Invited Lecture.**
- David Grewell, Michael Kessler, and William Graves, "Protein-based Plastics and Applications" *Bioplastics Magazine*, Issue 02/2007 (June), 34-35.
- DDGS Plastic Composites, 66th Annual Technical Conference for the Society of Plastic Engineers Proceedings (2008), Society of Plastic Engineers, Brookfield, CT
- David Grewell, Gowrishankar Srinivasan, Maria Baboi, Michael R. Kessler, William Graves, Matt Helgeson, Plant Based Plastics and Applications, SAMPE 2008 Fall Technical Conference, September 8-11, 2008, Memphis, TN. (peer reviewed). Invited Lecture
- David Grewell, Gowrishankar Srinivasan, Maria Baboi, Michael R. Kessler, William Graves, Matt Helgeson, Plant Based Plastics and Applications, Iowa State University, Bioplastics/Biocomposites Workshop, Ames, IA 2008
- Matthew S. Helgeson, William R. Graves, David Grewell, Gowrishankar Srinivasan, Initial Evaluation Of Zein-Based Bioplastics For Horticulture, *66th Annual Technical Conference for the Society of Plastic Engineers Proceedings* (2008), Society of Plastic Engineers, Brookfield, CT
- David Grewell, Ultrasonic Enhancement of Bio-renewable Fuels, June 2008 RWTH University, Aachen, Germany, Invited Lecture
- Julius Vogel, David Grewell, Impact Study Of Substituting Non Degradable Plastics By Biodegradable Composites (DDGs And Zein) And The Potential Of Nanoclays As Reinforcement, 66th Annual Technical Conference for the Society of Plastic Engineers Proceedings (2008), Society of Plastic Engineers, Brookfield, CT
- David Grewell, Gowrishankar Srinivasan, Maria Baboi, Michael R. Kessler, William Graves, Matt Helgeson, Plant Based Plastics and Applications, ICIPC (Research Institute for Plastics and Rubber) International Colloquium, February 27 - 29, 2008, Medellin, Colombia, Invited Lecture.
- Maria Vlad, Gowrishankar Srinivasan, David Grewell, Improvement of the mechanical properties of soy protein isolate based plastics, 65th Annual Technical Conference for the Society of Plastic Engineers Proceedings (2007), Society of Plastic Engineers, Brookfield, CT
- Gowrishankar Srinivasan, Michael Kessler, David Grewell, Casting of Zein Protein Polymers, 65th Annual Technical Conference for the Society of Plastic Engineers Proceedings (2007), Society of Plastic Engineers, Brookfield, CT
- David Grewell, Mike Kessler, Maria Vlad, Gowrishankar Srinivasan, Enhancing Plastic from Naturally Occurring Proteins, SPG Media Group PLC, Brunel House, London W2 1LA, UK, 2006.
- Maria Vlad, Greg Harmon, David Grewell, Avraham Benatar, Weldability of Bio-Renewable Ultrasonic Exfoliated Nanocomposites, 64th Annual Technical Conference for the Society of Plastic Engineers Proceedings (2006), Society of Plastic Engineers, Brookfield, CT

Awards received: Featured in:

- o Bioplastics Magazine (February 2007)
- o Ceramic Industry (September 2007)

External funding applied for utilizing project results (indicate received/denied/pending):

Status	Title	Funding	Source	PI, Co-PI's
Funded	<i>Feasibility Study Of The Use Of DDGs Plastic Composites For Structural Components In Window Framing</i>	\$39,745	Pella	D. Grewell
Funded	<i>Scale-up and Technology Transfer of Protein Based Plastic Products</i>	\$140,000	DOE-Soyworks	D. Grewell,
Funded	<i>Biobased Product Testing and Evaluation</i>	\$72,127	USDA	D. Grewell
Funded	<i>Solar Decathlon</i>	\$250,000	DOE	M. Mikesch, D. Grewell, etal
Funded	<i>Degradable pots for plants</i>	\$14,000	Horticultural Research Institute	W. Graves, David Grewell
Funded	<i>Protein Polymer Product Development</i>	\$217,357	GIVF	D, Grewell, etal
Rejected	<i>Soy Protein Plastics Formulation Development to Reduce Water Solubility</i>	\$60,000	United Soy Board	D. Grewell, etal
Rejected	<i>Protein plastics and application development</i>	\$416,875	USDA	D. Grewell, etal
Rejected	<i>Ultrasonic Assisted Exfoliation of Bio-Renewable Polymer Nanocomposites</i>	\$274,436	NSF	D. Grewell, etal
Rejected	<i>Development and Air Barrier Characterization of Novel Rubber Nanocomposites from</i>	\$148,842	NineSigma	M. Kessler, D. Grewell
Rejected	<i>Bio-degradable Bio-renewable Soy Protein-Based Nanocomposites for Packaging</i>	\$49,902	NineSigma	D. Grewell, etal

Progress report (300 word maximum):

This was an 18 month research project that had the goal of developing protein-based (corn and soy) plastics reinforced with nanoclays, for cost reduction and mechanical property enhancement. Applications for these materials range from packaging materials to automotive body panels. High powered ultrasonication will be used to overcome the obstacle of fully exfoliating and dispersing the nanoclay platelets in the polymer matrix. We demonstrated several applications and worked with Iowa Companies to test their performance. For example, Creative Composites of Brooklyn, IA, tested lubrication sticks that were formulated from 100% bio-based ingredients. The results were promising and the company plans further product testing. In addition, planting pots design, fabricated and currently being tested. These pots rapidly decompose in the soil and release natural nutrition into the soil that promote plant growth. Vermeer Manufacturing Co. of Pella IA is currently testing corn protein based hay bale wrapping.

In addition, to product development, this project resulted in the publication of one journal article 8 peer reviewed conference paper, 7 international presentations and 3 domestic presentations. This project also resulted in nearly \$750,000 of funded research.

Title: Commercialization of a Corn/Soy Oil-Based Composite Hog Feeder

PI: Distinguished Professor Richard C. Larock

Companies: R3 Composites

Project Goal: Development of a vegetable oil-based biocomposite hog feeder

Publications based on project:

- Lu, Y.; Larock, R. C. "Fabrication, Morphology and Properties of Soybean Oil-Based Composites Reinforced with Continuous Glass Fibers", *Macromol. Mater. Eng.* 2007, 292, 1085-1094.
- Henna, P. H.; Larock, R. C. "Rubbery Thermosets Prepared by Ring Opening Metathesis Copolymerization of a Functionalized Castor Oil and Cyclooctene", *Macromol. Mater. Eng.* 2007, 292, 1201-1209.
- Valverde, M.; Andjelkovic, D.; Kundu, P. P.; Larock R. C. "Conjugated Low-Saturation Soybean Oil Thermosets: Free-Radical Copolymerization with Dicyclopentadiene and Divinylbenzene", *J. Appl. Polym. Sci.* 2008, 107, 423-430.
- Pfister, D. P.; Baker, J. R.; Henna, P. H.; Lu, Y.; Larock, R. C. "Preparation and Properties of Tung Oil-Based Composites Using Spent Germ as a Natural Filler", *J. Appl. Polym. Sci.* 2007, submitted.
- Valverde, M.; Larock, R. C. "Free Radical Synthesis of Rubbers Made Entirely from Highly Unsaturated Vegetable Oils and Derivatives", *PMSE Preprints* 2007, 97, 76-77.
- Larock, R. C. "Novel Bioplastics and Composites from Natural Oils", *Polymer Preprints* 2007, 48, 859.

Presentations based on project:

- Larock, R. C. "Novel Bioplastics and Composites from Natural Oils", 234th American Chemical Society national meeting, Division of Polymer Chemistry, Polymers from Renewable Resources, Boston, Massachusetts, August 21, 2007.
- Valverde, M.; Larock, R. C. "Free Radical Synthesis of Rubbers Made Entirely From Highly Unsaturated Vegetable Oils and Derivatives", 234th American Chemical Society national meeting, Boston, Massachusetts, August 21, 2007.
- Larock, R. C. "Adventures in Biopolymers, Iodine Cyclizations, and Palladium Annulation and Migration Chemistry," University of Missouri, Kansas City, September 13, 2007.
- Larock, R. C. "Novel New Bioplastics and Biocomposites for the Transportation Industry," SERMACS 2007 - Advanced Materials in Transportation Symposium, Greenville, South Carolina, October 25, 2007.
- Larock, R. C. "Adventures in Biopolymers, Iodine Cyclizations, and Palladium Annulation and Migration Chemistry," Università della Calabria, Cosenza, Italy, November 20, 2007.
- Larock, R. C. "Adventures in Biopolymers, Iodine Cyclizations, and Palladium Annulation and Migration Chemistry," University of Rome, La Sapienza, Italy, November 23, 2007.
- Larock R. C. "Novel Bioplastics, Rubbers, Composites, Coatings and Adhesives from Natural Oils", Cargill Inc., Minneapolis, Minnesota, December 3, 2007.

Awards received: Distinguished Professor for Richard C. Larock

Invention disclosures:

- Larock, R. C.; Lu, Y. S.; Li, F. "Bio-based Thermoset Plastic Composite Materials and Methods of Making Same", U.S. patent application 60/839,918 (2007).
- Larock, R. C.; Andjelkovic, D. "Bio-based Thermoset Plastic Materials", U.S. patent application, submitted (2007).
- Larock, R. C.; Lu, Y. S. "Novel Hybrid Latexes from Vegetable Oil-based Waterborne Polyurethanes and Acrylics via Emulsion Polymerization", ISURF Disclosure (2007).
- Larock, R. C.; Henna, P. H. "Ring Opening Metathesis Polymerization of Vegetable Oils", ISURF Disclosure (2007).

External funding applied for utilizing project results (indicate received/denied/pending):

- "Biorenewable Composites Reinforced with Under-used Co-products from Ethanol Production", Recycling and Reuse Technology Transfer Center, University of Northern Iowa, 7/1/07-6/30/09, funded.
- "Novel Renewable Bio-based Rubber Composites from Plant Oils and Agricultural Co-products", Iowa State University, Plant Sciences Institute, 7/1/07-6/30/09, funded.
- "Bio-based Pressure Sensitive Adhesives", Avery Dennison, 7/1/2007-6/30/2008, funded.
- "Pultruded Window Frames from Agricultural Oils", Institute for Physical Research and Technology, Iowa State University, Grow Iowa Values Fund seed grant with Pella Corp., funded.
- "Development and Commercialization of Soy/Corn/Linseed Oil Bioplastics", Consortium for Plant Biotechnology Research, pending.
- "Practical Waterborne Agricultural Oil-based Coatings", Consortium for Plant Biotechnology Research, pending.
- Iowa Biotechnology Consortium - USDA, "Development of Bioplastic Composites Using Ag Co-product Fillers," 9/1/06-8/31/07, funded.

Progress report (300 word maximum):

We have developed a commercially viable vegetable oil resin and corresponding biocomposites for use in a hog feeder or other commercial possibilities. The composition of the soybean /corn oil-based resin, the ratio of resin to glass fibers, the cure kinetics and the processing conditions have all been carefully investigated. We have successfully obtained very hard composites from several different bio-based resins reinforced with 45-55 wt % glass fibers. The bio-based resins contain at least 50 wt % of soybean, corn or linseed oils. The mechanical properties of the biocomposites meet the requirements for a viable hog feeder and other commercial applications. We have dramatically shortened the cure time of the composites from 24-48 hr to just a few minutes with no reduction in the thermal and mechanical properties. These times are suitable for a commercial molding process.

We have also developed high performance vegetable oil-based resins by ring opening metathesis copolymerization. The composition of the resins, the cure time and temperature, the amount of catalyst, and the properties of these resins have been investigated. The Young's modulus and tensile strength reach 650 MPa and 21 MPa, respectively. Glass fiber reinforced biocomposites have also been prepared by a composite molding process. These biocomposites show excellent mechanical properties. The tensile strength and Young's modulus of the composites reinforced with 40 wt % glass fiber reach 150 MPa and 1545 MPa, respectively.

Although R3 Composites failed to deliver the services promised, Bulk Molding Compounds, Inc., a major international bulk molding company, has now offered their equipment for molding our bio-based hog feeder and other applications. Furthermore, we are now working closely with Pella Corp. on the production of biobased pultruded window frames using this technology.

Title: Gasification Technologies in Support of Biorefineries

PI: Robert C. Brown, Francine Battaglia, Theodore J. Heindel

Companies: Frontline Bioenergy; Chippewa Valley Ethanol Company

Project Goal:

Publications/presentations based on project:

- Battaglia, F., Deza, M., Franka, N.P., and Heindel, T.J., "Computational and Experimental Studies of Fluidized Beds for Biomass Gasification", 2007 American Physical Society, Division of Fluid Dynamics, November 18-20, Salt Lake City, UT, 2007.
- Deza, M., Battaglia, F., and Heindel, T.J., "Computational Modeling of Biomass in a Fluidized Bed Gasifier," Proceedings of the 2007 ASME International Mechanical Engineering Congress and Exposition, November 10-16, Seattle, WA, ASME Press, Paper IMECE2007-43097, 2007.
- Franka, N.P., Heindel, T.J., and Battaglia, F., "Visualizing Cold-Flow Fluidized Beds with X-rays," Proceedings of the 2007 ASME International Mechanical Engineering Congress and Exposition, November 10-16, Seattle, WA, ASME Press, Paper IMECE2007-43073, 2007.
- Franka, N.P., "Visualizing Fluidized Beds with X-rays," M.S. Thesis, Iowa State University, Ames, IA, May 2008.
- Heindel, T.J., and Battaglia, F., "Gasification Technologies in Support of Biorefineries – Progress Report," Submitted to John Reardon, Frontline BioEnergy, June 18, 2008.
- Deza, M., Franka, N.P., Battaglia, F., and Heindel, T.J., "Numerical Modeling of Biomass in a Fluidized Bed," *Chemical Engineering Science*, In Review, 2008.
- Franka, N.P., and Heindel, T.J., "Local Time-Averaged Gas Holdup in a Fluidized Bed with Side Air Injection using X-ray Computed Tomography," *Powder Technology*, In Review, 2008.
- Deza, M., Battaglia, F., and Heindel, T.J., "A Validation Study for the Hydrodynamics of Biomass in a Fluidized Bed," To be presented at the 2008 ASME Fluids Engineering Division Summer Meeting, August 10-14, 2008, Jacksonville, FL, Paper FEDSM2008-55158, ASME Press, New York, 2008.
- Franka, N.P., Drake, J.B., and Heindel, T.J., "Minimum Fluidization Velocity and Gas Holdup in Fluidized Beds with Side Port Air Injection," To be presented at the 2008 ASME Fluids Engineering Division Summer Meeting, August 10-14, 2008, Jacksonville, FL, Paper FEDSM2008-55100, ASME Press, New York, 2008.

External funding applied for utilizing project results (indicate received/denied/pending):

- "Collaborative Research: GOALI: Biomass Particle Hydrodynamics in Fluidized Bed Gasifiers," Theodore J. Heindel and John P. Reardon (ISU) and Francine Battaglia (Virginia Tech), Submitted to the National Science Foundation. Pending.
 - "Characterizing Biomass Fluidization to Improve Biomass Gasification," Theodore J. Heindel, Submitted to the Iowa Energy Center. Denied
 - "Biomass Gasification to Improve Producer Gas Quality for Power Production," Theodore J. Heindel (ISU) and Francine Battaglia (Virginia Tech), Submitted to USDA (RD-RBP-BIOMASS-2007: Biomass Research and Development Initiative. Pending
 - "Advanced Diagnostics Using High-Resolution 3D X-ray Imaging to Characterize Fluidized Bed Hydrodynamics," Theodore J. Heindel, Submitted to DOE, June 10, 2008. Pending
-

Progress report (300 word maximum):

X-ray computed tomography (CT) and radiography imaging were completed in a 10.2 cm diameter fluidized bed without and with side air injection, which simulates the immediate volatilization of biomass in a fluidized bed gasifier. Bed materials of 500-600 μ m glass beads, ground walnut shell, and ground corn cob were used in the study. Complete details and all data are available in the M.S. Thesis of Nathan Franka (listed above), which was completed in May 2008. Significant findings from this study include:

- Comparing the three materials, CT imaging was more effective in glass bead beds while radiographic imaging was more useful in ground walnut or corncob beds.
- Fluidization was generally uniform without side air injection for the three materials studied, and the uniformity increased with superficial gas velocity.
- With the introduction of side air injection, a distinctive plume was observed along the reactor wall above the side injection port. The plume gradually expanded toward the center of the bed as height increased; the expansion was found to increase with increasing side air injection flow rate. As the superficial gas velocity increased, fluidization became more uniform and the effect of side air injection on fluidization hydrodynamics was less pronounced.

Modeling the fluidized bed hydrodynamics in a similar 10.2 cm diameter fluidized bed is on-going. During the past period, we focused on 2D and 3D modeling using MFIIX, without and with side air injection, in a 10.2 cm diameter glass bead bed. The findings showed that 2D simulations were reasonable for the lower side air injection velocities, but that nonuniform fluidization predictions that resulted for the higher side air injection velocities did not accurately predict the experimental results. In contrast, the 3D simulations compared very well for all cases simulated to date.

Over the next period, we will be comparing 2D and 3D simulations for biomass particles and compare the simulations to our imaging data. We will also be evaluating producer gas emissions during the next period.

Title: Purification and Quality Enhancement of Fuel Ethanol to Produce Industrial Alcohols with Ozonation and Activated Carbon

PI: Jacek Koziel

Companies: MellO3z; Lincolnway Energy; Quad County Corn Processors; Fischer Law Firm

Project Goal:

Publications/presentations based on project:

1. Onuki, S., L. Cai, J.A. Koziel, H. van Leeuwen. 2008. Purification and quality enhancement of fuel ethanol to produce industrial alcohols with ozonation and activated carbon: method developments for quantification of impurities and their removal mechanisms. Submitted for presentation at the 2007 American Society of Agricultural and Biological Engineers Annual International Meeting, Providence, RI, June 2008.
2. Onuki, S., J.A. Koziel, C. Tebben, H. van Leeuwen. 2008. Ethanol production, purification, and analysis techniques: a review. Submitted for presentation at the 2007 American Society of Agricultural and Biological Engineers Annual International Meeting, Providence, RI, June 2008.
3. Onuki, S. 2008. Purification and quality enhancement of fuel ethanol to produce alcoholic beverages with ozonation and activated carbon. M.S. thesis, May 2008. Iowa State University.
4. Onuki, S., J.A. Koziel, C. Tebben, H. van Leeuwen, W.S. Jenks, L.S. Cai, D. Grewell. 2008. Ethanol production, purification, and analysis techniques: a review. To be submitted to Bioresource Engineering.
5. Onuki, S., J.A. Koziel, H. van Leeuwen, W.S. Jenks, L.S. Cai, D. Grewell. 2008. Analytical method development of fermentation volatile by-products in industrial ethanol with solid-phase microextraction and gas chromatography. To be submitted to the Journal of Agricultural and Food Chemistry.
6. Onuki, S., J.A. Koziel, H. van Leeuwen, W.S. Jenks, L.S. Cai, D. Grewell. 2008. Ethanol purification with ozonation, activated carbon adsorption, and gas stripping. To be submitted to the Journal of Agricultural and Food Chemistry.
7. Onuki, S., L. Cai, J.A. Koziel, H. van Leeuwen. 2008. Purification and quality enhancement of fuel ethanol to produce industrial alcohols with ozonation and activated carbon: method developments for quantification of impurities and their removal mechanisms. ASABE paper # 084664 presented at the 2008 American Society of Agricultural and Biological Engineers Annual International Meeting, Providence, RI, June 2008.
8. Onuki, S., J.A. Koziel, C. Tebben, H. van Leeuwen. 2008. Ethanol production, purification, and analysis techniques: a review. ASABE paper # 085136 presented at the 2008 American Society of Agricultural and Biological Engineers Annual International Meeting, Providence, RI, June 2008.
9. Koziel, J.A. S. Onuki, L. Cai. Purification and quality enhancement of fuel ethanol to produce alcoholic beverages with ozonation and activated carbon. Presentation to the Grow Iowa Value Program, ISU Research Park, Ames, IA, June, 2008.
10. Koziel, J.A., S. Onuki, L. Cai, J.H. van Leeuwen. 2008. Purification of ethanol with ozone and activated carbon, and method development to evaluate quality of ethanol. Presentation for the Grain Processing Corporation, Muscatine, IA, March 2008.

Progress report: We developed a novel process for ethanol purification utilizing ozonation, granular activated carbon (GAC) adsorption, and gas stripping. This process is capable of purifying fuel grade ethanol to industrial, pharmaceutical, and beverage grades. This process addresses many of the disadvantages of traditional distillation. The approximate cost of treatment is <\$0.005/gallon.

The following was accomplished since the last report:

- M.S. thesis based on this research was defended and deposited with ISU.
- Two national-conference presentations based on this work were made.
- Three manuscripts for peer-review have been in various stages of preparation with the goal of submitting them by August 15, 2008.

- Research proposal to the GIVP program titled "Purification and quality enhancement of ethanol by inexpensive means" was submitted by Jenks and Koziel.
- Research proposal to the ISU-Sloan Biobased Products Industry Center Seed Grants Program titled "Optimization of ethanol purification and process-based cost analysis of ozonation, granular activated carbon and gas stripping as an alternative to distillation" (by Koziel, van Leeuwen, Jenks) was submitted.
- Presentation of results was made to the GIVF on June 3, 2008.
- Presentation of results was made to the GPC in Muscatine, IA, May 2008.

Title: Converting Dry-Grind Ethanol Plant Low Value Thin Stillage into High-Value Fungal Biomass

PI: J.(Hans) van Leeuwen

Companies: Lincolnway Energy; GPC; Northern Filter Media

Project Goal:

Publications/presentations based on project:

- Use of microfungi for wastewater treatment and production of high value fungal by-products: A review. *Critical Reviews in Environmental Science and Biotechnology*. (by invitation, in press).
- Thin stillage treatment from dry grind ethanol plants with fungi. ASABE Annual International Meeting (AIM), Jun 17-20, Minneapolis, MN.
- Sindhuja, S., Khanal, S. K., Pometto, A. L. and Van Leeuwen, J. (2008) Ozone as a selective disinfectant for nonaseptic fungal cultivation on corn-processing wastewater. *Bioresource Technology* BITE 4698 BRT 07-26
- Jasti, N., Khanal, S. K., Pometto, A.L. and van Leeuwen, J. (2008) Converting corn wet milling effluent into high-value fungal biomass in an attached growth bioreactor *Biotech and Bioeng* 08-128.R1
- Jasti, N., Khanal, S. K., Pometto, A.L. and van Leeuwen, J. (2007) The effect of various operational parameters on attached fungal growth in food wastewater treatment. *Biotech and Bioeng* (accepted)
- Rasmussen, M., Kambam, Y., Khanal, S. K., Pometto, A. L. and Van Leeuwen, J. (2007) Thin stillage treatment from dry grind ethanol plants with fungi. ASABE Annual International Meeting of Am. Assoc. Agric. Biosystems Engs., Jun 17-20, Minneapolis, MN.
- Van Leeuwen, J., Rasmussen, M., Shrestha, P., Vincent, M., Kambam, Y., Townsend, R., Khanal, S. K., Pometto, A. L. III. (2007) Water usage and water reclamation on ethanol plants Am. Wat. Wks Assoc Annual Conference in Minnesota, September 20/21, Duluth, MN.
- Van Leeuwen, J., Rasmussen, M., Shrestha, P., Vincent, M., Kambam, Y., Townsend, R., Khanal, S. K., Pometto, A. L. III. (2007) Conversion of byproduct streams into animal feeds, Growing the Bioeconomy Conference, November 5/6, Ames, IA.

Invention disclosures:

- ISURF # 03387 "Purification of Thin Stillage from Dry Corn Milling with Fungi" patent pending
- A second disclosure was submitted December 21.

External funding applied for (indicate received/denied/pending):

- Developing an alternative methodology for stillage treatment and resource recovery based on fungal cultivation, GIVF with Poet assistance - denied
- Biomass Research and Development Initiative USDA/DoE \$800,000 with \$200,000 co-funding from Poet - pending
- Developing an alternative methodology for Poet's BPX and BFRAC stillage treatment and resource recovery based on fungal cultivation, Poet \$300 to \$400k - pending
- Enhancing Feed Value of Dry-Grind Ethanol Coproducts: Fungal Protein for Nonruminants,
- GIVF with various companies' assistance - denied

Awards received:

- Grand Prize for University Research, American Academy of Environmental Engineers
- Mary Rasmussen: Distillers Grains Research Scholarship from Beam Global Spirits & Wine along with Distillers Grains Technology Council;
- R&D 100 award 2008

Invention disclosures:

ISURF # 03387 "Purification of Thin Stillage from Dry Corn Milling with Fungi" Patent pending.

Progress report (300 word maximum):

Bioreactors were operated to treat thin stillage, the centrate of the distillation leftovers from a dry-grind ethanol plant, Lincolnway Energy with fungi. The aerated reactors were inoculated with spores of *Rhizopus oligosporus*.

Tests were conducted with an airlift reactor, in which the diffused air itself causes the water and fungi to rise in a draft tube inside the reactor with continuous water recycle in the annulus between the reactor wall and the draft tube. This was done in order to satisfy the oxygen requirements more rapidly. This caused the fungi to grow to large densities within two days and also to grow into pellets, which are denser and readily harvested with mesh screens. Another reactor was developed and built with external recirculation to avoid problems of fungal biomass attachment. Mycelial growth was visible within two days after inoculation. The total organic concentration of the thin stillage, characterized as chemical oxygen demand (COD) of 94 g/L, was lowered by 60 to 80%. Continuous operation could achieve up to 93% COD removal. Total suspended solids in the samples decreased from 30 to less than 0.1 g/L. Water from thin stillage could be recovered without evaporation. The fungal biomass has a protein content of 38% and contains high levels of lysine and methionine, making the fungal biomass suitable for monogastrics.

The results were used to show that substituting the current process of evaporating thin stillage with the fungal process would save 18c/gal ethanol produced and another 2c on water and enzyme recycling. Another 7.5c income per gallon could be expected from the fungal biomass as animal feed. Allowing for capital amortization and operational cost, the net savings and income would be about 18c/gal ethanol with a payback on investment of 6 to 8 months.

Title: Designing corn lines with dietary fiber to produce ethnic foods with enhanced health benefits.

PIs: Pam White

Companies: Genetic Enterprises International.

Project Goal:

External funding applied for utilizing project results (indicate received/denied/pending):

- Hendrich, S., P.J. White, and L.M. Pollak, Screening System for Digestion-Resistant Starch. USDA Special Grants Program. Center for Designing Foods to Improve Nutrition, ISU. \$30,000 funded through 2008.
- Hendrich, S., P.J. White, and L.M. Pollak, Screening System for Digestion-Resistant Starch: Effects on Human Fecal Microbes and Short-chain Fatty Acid Production, ISU Plant Sciences Institute. \$50,000 for two years.
- White, P.J. and L.M. Pollak, Improving the Nutritional Quality of Corn Starch, ISU Plant Sciences Institute. \$45,026 through 2008.
- White, P.J., T. Boylston and N. Yao. 2008. Yogurt nutritionally enhanced with *Bifidobacteria* and α -glucan. Midwest Dairy Association. \$36,955 for one year.

Publications/presentations based on project:

- Rohlfing*, K., and P.J. White. 2008. Resistant Starch Levels in Exotic Corn Crosses and Impact on Starch Gelatinization Characteristics. Proceedings of the Corn Utilization and Technology Conference XIII.

Progress report (300 word maximum):

Aim #1. Develop specialty corn lines with high resistant starch (RS) that can thrive in the U.S. Corn Belt.

Specialty corn lines with properties ideal for use in native Hispanic foods were previously planted and crossed with corn lines containing high amounts of resistant starch (RS) as a dietary fiber. These lines include corn types with different numbers of mutant amylose-extender (*ae*) and floury-1 (*fl1*) alleles. In spring 2008, our commercial partner, Dr. Alix Paez, Genetic Enterprises International (GEI), continued to develop these lines and to increase corn yields. The lines will be self pollinated during summer 2008 to create lines with more fixed starch properties, and harvested in fall 2008, with enough material for evaluation as noted in aim #3.

Aim #2. Characterize the new lines for basic composition and potential RS

The RS % in the original starches were: # 1, *aeaeae*, 54.6%; # 2, *fl1 fl1 fl1*, 1.1%; # 3, *aeae fl1*, 5.1%; and # 4, *fl1 fl1 ae*, 1.9%. In general, # 3 starch seemed to have inherited some pasting, thermal and structural characteristics from both # 1 and # 2, but was distinctly different from # 4. The appropriate dosage of *ae* with *fl1* will be further pursued to optimize structure-function relationships for food applications.

Aim #3. Evaluate the functional and sensory properties of flours from the new corn lines.

We have begun establishing procedures for dry milling the new corn lines in the Center for Crops Utilization Research (CCUR) pilot plant. The resulting flours will be tested in several food products, including tortillas.

Title: Flaxseed lignans for heart health

PI: Suzanne Hendrich

Companies: ADM

Project Goal:

Centers/Institutes involved in this project
Nutrition and Wellness Research Center

Description of major laboratory equipment used for this project including an estimate of the number of hours used, number of samples processed, or dollar amount for services provided
LC/MS/MS, 200 samples, 150 hours @ \$126/h = \$18,900

Progress report (300 word maximum): The human feeding study of a flaxseed lignan supplement began with the first cohort of 24 individuals in December 2007, after 4 months of subject recruitment and screening. An additional cohort of 21 subjects completed the trial in April 2008. To date 41 subjects have completed the trial, with another cohort of 24-30 to begin in July 2008. An additional cohort is planned to begin in August 2008, with the trial completed by December 2008 with at least 90 subjects completed. Subjects' blood lipids, glucose, and blood biomarkers of treatment compliance, as well as blood pressure and dietary records are under analysis.

Title: Role of complex carbohydrates in inflammatory bowel disease

PI: Ruth MacDonald

Companies: n/a

Project Goal:

External funding applied for (indicate received/denied/pending): USDA-NWRC grant in collaboration with Proliant Inc. received.

Progress report (300 word maximum): The goal of the project is to develop a suitable animal model and tissue markers to investigate the role of dietary carbohydrates in colon cell physiology. Through a series of 3 experiments, we have established a mouse model that mimics human inflammatory bowel disease. The model was used to determine the ability of a commercial animal feed ingredient, provided by Proliant Inc, to reduce the inflammatory response in the colon. Mice were fed the test ingredient after administration of the inflammation-inducing protocol. Blood and tissue were collected and analyzed for selected inflammatory markers. These assays have been completed and the data are being statistically analyzed. Based on this work, we submitted a new proposal to the USDA through the Nutrition and Wellness Research Center, which was awarded funding. This new project will investigate the same ingredient given prior to the inflammatory insult. Proliant is providing a match for that project. We will begin the new project in the next few weeks. Our long-term goal is to develop a model that will allow us to study a variety of dietary supplements, foods and food ingredients that may be protective of the colon. We anticipate that this model will be suitable for pre-clinical trials of these novel components such that we can work with companies that are developing products for humans. Given the substantial interest in gut health by food and supplement companies, this is a timely and important research area.

Title: Development of a Novel Gene Therapy Approach for Parkinson's Disease by Targeting a Cleavage Site of a Proapoptotic Kinase

PI: Anumantha G Kanthasamy, Ph.D.

Companies: PK Biosciences; NewLink Genetics

Project Goal: Develop a gene therapy approach for Parkinson's disease by targeting the cleavage site of a proapoptotic kinase PKC δ

External funding applied for (indicate received/denied/pending): Applied for NIH SBIR grant, pending
Invention disclosures: We have formed a small startup company called PK Biosciences. This will foster our efforts to commercialize this and other novel technologies.

External funding applied for (indicate received/denied/pending): NIH SBIR grant submitted. NIH has informed that the proposal will be funded soon.

Progress report (300 word maximum):

The overall objective of our project is to develop a gene therapy approach for Parkinson's disease by targeting the cleavage site of a proapoptotic kinase PKC δ . As reported in our previous biannual report, we first developed lentiviruses coding for the PKC δ cleavage motif triplet peptides QDAM₃, DMQD₃ and DMQA₃, and tested their transfection efficiency in cell culture and animal models of Parkinson's disease. We found that lentiviral vector-mediated expression of the peptide sequences worked well in cell culture models, but the expression was very low when injected in animal models. To overcome this problem, we tested Adeno Vector AAV2-1CMVeGFP from the Gene Transfer Vector Core (GTVG) facility (University of Iowa). This adenoviral-mediated delivery into the mouse SN also did not yield sufficient expression. Next, we cloned DMQD₃ and DMQA₃ into BamHI and MluI sites in the PLVPT-tTR-KRAB vector obtained from Addgene.org. This inducible vector has been previously used for long-term expression of recombinant proteins in the CNS in a tetracycline-regulatable manner without producing toxicity. We have produced the viruses coding for the LacZ, DMQD₃, DMQA₃ and QDAM₃ in HEK 293-FT cells. We tested their efficiency in cell culture models before proceeding to animal models. This vector showed a low level expression in 293 cells, but not enough expression in dopaminergic neuronal cell model. We are now testing whether higher concentrations of virus will increase the efficiency of the vector. We have also started a collaborative arrangement with Prof. Tusanya Ikezu at the University of Nebraska Medical Center to adopt AAV1/2 hybrid viral vector in our studies. Recently, Dr. Ikezu's group has used this vector in an animal model of Alzheimer's disease. We already tested the AAV1/2 GEP in cell culture models and animal models. The preliminary results are quite promising, and we are in the process of obtaining appropriate plasmids from the Gene Therapy Program at the University of Pennsylvania for cloning QDAM₃, DMQD₃ and DMQA₃ in the AAV1/2 vector. After the completion of cloning, we will test in animal models to determine efficacy of this hybrid vector based gene therapy.

Title: Modular BL3 Facility

PI: Don Reynolds

Companies: Tech Space

External funding applied for (indicate amount & received/denied/pending):

Kellogg Foundation - \$1 million / Denied

Progress report (300 word maximum): To date, funds have been expended on the planning of the BL3 modular laboratory. This planning has resulted in various sites being considered for the BL3 at the VMRI and at the Vet Med complex. It was revealed that VMRI is at capacity with regard to utilities and adding more facilities is not possible without major expansion of infrastructure. However, due to the City of Ames needing to expand its electrical infrastructure the project can now be sited at the VMRI. The planning has now been completed and approvals from the University and the Board of Regents have been sought and obtained. The project is being bid and it is anticipated that construction will begin in the fall of 2008 with completion in the following spring.

FY08 FUNDED PROJECTS

INTERIM REPORT: Update period January 01, 2008 – June 30, 2008

Principal Investigator	Project Title	FY08 Award Amount	FY07 Allocation	ISU Cost Share	Industry Cost Share
Arun Somani**	Differential Testing for Control Systems Software	\$ 61,534.50	34,669.50	38,558.72	---
Johnny Wong	Evaluation of Quality Assessment Tools for Colonoscopy	\$ 100,397	n/a	26,856.67	---
Brad Bosworth	Replicon particles: a novel approach for more effective porcine reproductive and respiratory syndrome virus (PRRSV) vaccines	\$ 82,437	n/a	23,183.17	18,000
Jay-Lin Jane	Resistant and slowly digestible starch from cornstarch through ingredient processing	\$ 66,960	n/a	155.61	---
Jay-Lin Jane**	Enzyme Hydrolysis of Uncooked Dry-grind Corn for Ethanol Production	\$ 75,120.34	74,439.66	92,777.12	---
Suzanne Hendrich	Human Feeding Study of a Novel Dietary Fiber	\$ 18,954	n/a	8116.53	19,000
Toni Wang**	Oil Recovery from Corn Fermentation By-Products	\$ 107,100	6,400	24,146.58	63,227.67
Mike Wannemuehler	Generation X Vaccines: Combining Novel Antigens and Single Dose Delivery Technologies	\$ 150,444	n/a	107,382.19	---
Halil Ceylan	Ethanol Plant By-Product Uses for Pavement Geo-Materials Stabilization	\$ 93,775	n/a	6,797.76	55,000
Eliot Winer**	Commercialization of 3D Interactive Digital Medical Software for Surgical Planning and Training	\$ 50,133	59,400	11,637.72	81,853.30
Terry Meyer	Laser-Based Diagnostics of Next Generation Combustion Systems	\$ 86,814	n/a	12,569.41	---
Stephen Gilbert	Multi-touch Technology: Applications to Homeland Security and ISU Research	\$ 100,000	n/a	13,519.62	11,275.03
Guru Rao	Development of Novel Digestion-Resistant Starches from Corn to Combat Human Disease	\$ 70,000	n/a	12,437.05	
Marian Kohut*	Effectiveness of EpiCor in improving immune function, inflammation, and performance after intense exercise	\$ 92,777	n/a	21,691.86	
Charlie* Hurburgh	Automated phenotyping of biomass crops – part 1	\$ 51,450	n/a	---	---
Lie Tang*	Automated phenotyping of biomass crops – part 2	\$ 52,180	n/a	---	---

Infrastructure					
Pappajohn Ctr/ Research Park		\$ 400,000	n/a		
IPRT		\$ 100,000	n/a		
VPRED		\$ 100,000	n/a		

* These projects were initiated in the 4th quarter of FY08, no update is reported.

**These projects were initiated in FY08 but partially funded using FY07 funds.

Title: Differential Testing for Control Systems Software

PI: Arun Somani

Companies: EnSoft

Publications/presentations based on project: We are working on a paper based on the performance evaluation of graph algorithms using a new measure for graph differencing that we have discovered as a part of our research. We expect to submit the paper in January.

Awards received: Dr. Kothari and EnSoft received the first prize of \$25,000 from Pappajohn Business Plan Competition. The prize was awarded in October 2007 at the Iowa Venture Network Conference in Des Moines.

External funding applied for utilizing project results(indicate received/denied/pending): We are working on an NSF proposal to be submitted on January 17, 2008

Progress report (300-word maximum):

Due to a family emergency, no update is provided for this period.

Title: Evaluation of Quality Assessment Tools for Colonoscopy
PI: Johnny Wong and Wallapak Tavanapong
Companies: Endometrics

Publications/presentations based on project:

- Presentation at the eighth annual Iowa Venture Capital & Entrepreneur Conference held on Wednesday, Oct. 11, in Des Moines.
- S. Stanek, W. Tavanapong, J. Wong, J. Oh, and P. C. de Groen. Automatic Real-Time Capture and Segmentation of Endoscopy Video. PACS and Imaging Informatics. SPIE Medical Imaging. February, 2008.
- Y. Wang, W. Tavanapong, J. Wong, J. Oh, and P. C. de Groen. Edge Cross-Section Features for Detection of Appendiceal Orifice Appearance in Colonoscopy Videos. Accepted to appear in Proc. of International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Vancouver, British Columbia, Canada, August, 2008.
- J. Oh, S. Hwang, Y. Cao, W. Tavanapong, D. Liu, J. Wong, and P. C. de Groen. Measuring Objective Quality of Colonoscopy. Accepted to appear in IEEE Transactions on Biomedical Engineering.

Awards received:

- Second prize winner for the annual statewide John Pappajohn Business Plan Competition

Invention disclosures: The technology was previously patented

Description of major laboratory equipment used for this project including an estimate of the number of hours used, number of samples processed, or dollar amount for services provided

- There are no major laboratory equipments used in our project. We use regular personal computers to develop our algorithms.

External funding applied for (indicate received/denied/pending):

- STTR Phase I: Video Analysis Techniques for Computer-Aided Quality Control for Colonoscopy. National Science Foundation. Award No. 0740596. Tavanapong (PI) with Johnny Wong (Co-PI). 01/01/2008-12/31/2008. \$149,882. Status: Received
- Improving Colonoscopy Quality through Automated Monitoring. Subcontract to Mayo Clinic Rochester. NIH NIDDK PA-07-070. 4/1/09-3/31/2012. \$317,169. Status: Pending
- The proposal submitted for Iowa Demonstration fund from Iowa Department of Economic Development was denied. We have been improving the proposal and will resubmit it again by this July 14.

Progress report (300 word maximum):

1. EndoMetric signed an exclusive license of the image analysis technology with Mayo Foundation for Medical Education and Research (representing ISU, UTA, and Mayo).
2. Improvement of algorithms for classification of whether the endoscopist performs local or global inspection. The algorithms are needed to compute the mucosa coverage metric of a procedure. However, more research and testing are needed.
3. Improvement of software for automated capturing of endoscopic procedures. The current accuracy is over 99% for classification of in-patient frames instead of the previous 90%. The automated capturing must not miss any procedures, but at the same time it must minimize the number of out-patient images included in resulting videos.
4. Evaluation of manual annotation software. Six endoscopists at Mayo Clinic Rochester used the manual annotation software and they are satisfied with functionality and ease of use of the software.
5. Implementation of EM-Central---Web-based software for easy viewing of information about captured videos, quality measurements, and machine and software status.
6. We iteratively integrated and tested various improvements at the test bed at Mayo Clinic Rochester. We expanded our test bed to eight endoscopic rooms instead of the original two rooms.
7. We drafted the testing agreement for IDDC and have prepared two machines: client and server to be used for future installation. We are still waiting for IDDC approval to install the machines.
8. We have been working with colleagues at the University of Iowa in order to establish the test bed there. Due to the recent flood, we will have to wait until they are able to resume further collaboration.

Title: Replicon particles: a novel approach for more effective porcine reproductive and respiratory syndrome virus (PRRSV) vaccines

PI: Brad Bosworth

Companies: Sirrah

Description of major laboratory equipment used for this project including an estimate of the number of hours used, number of samples processed, or dollar amount for services provided

Five hundred samples were processed for determining the amount of virus present. The processing is done at Iowa State University and costs about 20 dollars per sample for a total contribution \$10,000.

Summary of GIVE PRRS Study

The study was designed to evaluate a PRRS replicon particle (PRRS-RP) vaccine for its ability to protect against live virus challenge. The experimental group received the PRRS-RP vaccine, and the control group received a non-PRRS-RP vaccine. Vaccine was administered on Days 0 and 35 of the study. Challenge with a homologous strain of PRRS virus was on Day 63.

Prior to challenge, all pigs that received PRRS-RP vaccine had a specific immune response to the viral proteins of interest, while none of the control vaccinates had a measurable response. The relative strength of the response increased after the second vaccination, indicating a successful prime-boost immunization protocol.

Following challenge, pigs that received PRRS-RP vaccine had significantly higher levels of neutralizing antibody than controls. PCR analysis of post-challenge serum did not show statistical differences between groups. Live virus titration and commercial IDEXX ELISA titers were slightly lower in the PRRS-RP group, but the difference was not statistically significant.

Based on the results of the study, the PRRS-RP vaccine induced a specific immune response, but did not provide measurable protection against challenge. Potential explanations for these results include: vaccine formulation, vaccine dosage, and challenge virus strain. Future studies will examine the aspects in greater detail.

Title: Oil Recovery from Corn Fermentation By-Products

Title: Resistant and slowly digestible starch from cornstarch through ingredient processing

PI: Jay-lin Jane

Companies:

Progress report (300 words maximum):

Digestibility of high-amylose maize starches isolated from different lines, including GEMS 0067 lines and existing high-amylose maize lines (H99ae, OH43 ae, B89ae, and B84ae), were analyzed using the Englyst method. The starch samples were cooked and then hydrolyzed using porcine pancreatic α -amylase. Results showed that rapidly digestible-starch contents (hydrolyzed within the first 20 min incubation with the enzyme) of the GEMS 0067 line starches were 64.7% - 66.2% and that of the existing line starches were 75.0% - 79.5%, slowly digestible-starch contents (hydrolyzed between 20 min and 120 min incubation with the enzyme) were 0.9% - 3.2% and 1.9% - 4.0%, respectively, and resistant-starch contents (can't be hydrolyzed after 120 min incubation) were 30.9% - 34.3% and 18.6% - 20.9%, respectively. Resistant starch residues of the GEMS 0067 starch remaining after enzyme hydrolysis displayed granular structures and maintained crystalline structure as revealed by x-ray diffraction studies. After the starch samples were extracted with methanol, the resistant starch contents of all the starch samples decreased to 60-80% of the original contents, indicating effects of lipids on the resistance of starch to enzyme hydrolysis. The resistant starch contents of the high-amylose maize starches appeared to vary with processing and drying conditions of the corn. Further studies are conducted to understand the mechanism of resistant and slowly-digestible starch formation.

Title: Enzyme hydrolysis of uncooked dry-grind corn for ethanol production

PI: Jay-lin Jane

Progress report (300 words maximum):

A method for preparing fermentation-broth samples (Ferm sample) was developed to effectively stop enzyme and yeast activities while maintaining intact structures of starch granules that remained in the fermentation broth. The Ferm samples were collected at different fermentation time and were analyzed for the contents of residual starch, total soluble sugars, free glucose, and ethanol to evaluate the efficiency of fermentation. The remaining starch residue in the Ferm sample after 72 h fermentation is known as resistant starch (RS). Characterization of the RS at the end of fermentation was conducted to identify the nature and structure of the RS. Intact amylopectin molecules were revealed in the residues using gel permeation chromatography (GPC), indicating that the starch remaining in the residues was inaccessible starch. The RS was also observed embedded in yellow-color particles when viewed under a light microscope with iodine-staining, and Maltese cross of the RS was observed under a polarized-light microscope, which confirmed the presence of starch granules. All these results showed the presence of the Type I RS, surrounded by corn proteins, mainly zein. Unlike the RS residues of the conventional fermentation process using cooked corn as the substrate, there was no amylose-lipid complex and retrograded amylose present in the residues of the Ferm samples. Reaction patterns of selected alpha-amylases were studied to identify desirable enzymes for granular starch hydrolysis. Reaction rates and affinities of enzyme hydrolysis of granular starch were determined. Oligosaccharide products of the enzymes were identified using thin-layer chromatography (TLC). Scanning electron micrographs (SEM) of the enzyme hydrolyzed starch granules showed holes through the granules. The results reflected that alpha-amylases hydrolyzed starch in the granule and generated holes and channels into the internal region of the granule.

Title: Human feeding study of a novel dietary fiber

PI: Suzanne Hendrich

Please list all Centers/Institutes involved in this project
Nutrition and Wellness Research Center

Description of major laboratory equipment used for this project including an estimate of the number of hours used, number of samples processed, or dollar amount for services provided
Blood glucose analyzer, 500 samples, 25 hours.

Progress report (300 word maximum): The human feeding study of a novel dietary fiber was completed Dec. 16, 2007. The trial consisted of 3 feeding periods of 14 days each, with a randomized crossover design, 12 subjects, 4 on each treatment (control, wheat bran, test fiber) during each feeding interval. All subjects completed the trial. Mean daily fecal weights, gut transit time, gastrointestinal symptoms, blood glucose response, 3-day food records and fecal calcium compared with dietary calcium are under study. Breakfast bars containing 15 g of dietary fiber were formulated and prepared, as well as a low fiber control. One bar of each type was consumed daily during each feeding period. When g wet fecal weight change/g dietary fiber added compared with the control breakfast bar was contrasted between corn and wheat bran, the two treatments did not differ significantly in their effect. Dietary fiber intakes of subjects were significantly increased by the addition of high fiber breakfast bars to their daily diets, with no adverse effects on gastrointestinal function. The lack of effects of either dietary fiber source on blood glucose after a 50 g glucose challenge is consistent with the literature, but such fibers may exert other diabetes preventive effects that deserve further study. This trial supports the ability of corn bran to function as a dietary fiber similar to wheat bran.

Title: Oil Recovery from Corn Fermentation By-Products

PI: Tong Wang, Lawrence Johnson, and Anthony Pometto

Companies:

Publications/presentations based on project:

May, 2008, AOCS annual mtg (Abs submitted and accepted)

External funding applied for (indicate received/denied/pending):

09 GIVF, not approved. Parts of the new proposal to be submitted to Iowa and National Corn Growers' Associations, and certain selected ethanol fermentation companies.

Please list all Centers/Institutes involved in this project

Department of Food Science and Human Nutrition, Center for Crops Utilization Research (CCUR), Iowa State University

Description of major laboratory equipment used for this project including an estimate of the number of hours used, number of samples processed, or dollar amount for services provided

Equipment: No. of hours: number of samples

- Fitz[®] Mill Model DAS 06 (the Fitzpatrick Co., Elmhurst, IL):60:60
- Roskamp Roller Mill Model K (Roskamp Mfg., Inc., Waterloo, IA):60:60
- Leistritz ZSE 27 twin-screw extruder (American Leistritz Extruder Corp., Somerville, NJ):20:10
- C. W. Brabender single-screw extruder (South Hackensack, NJ):20:20
- Beckman Coulter Avanti[™] J-20 XPI centrifuge (Fullerton, CA):30:50
- KICE Model 6DT4 laboratory aspirator unit (KICE Metal Products Co. Inc., Wichita, KS):8:5
- LAB-LINE[®] Incubator-Shaker, model 3525 (Lab-Line Instruments Inc., Melrose Park, IL):1200:50
- Tomy Autoclave SS-325E (Tomy Seiko Co., Ltd., Tokyo, Japan):50:50
- Waters high-pressure liquid chromatography (HPLC):8:50
- IEC Centra[®] MP4 centrifuge (International Equipment Co., Needham Heights, MA):30:50
- Isotemp 220 water bath (Fisher Scientific, Pittsburgh, PA):400:50
- stir motors (Fisher Scientific, Dubuque, IA):400:50
- pH meter IQ 150 (IQ Scientific Instruments Inc., Carlsbad, CA):100:50
- Other miscellaneous equipments used occasionally include other mills, Ro-tap Testing Sieve Shaker, blender etc.

Progress report (300 word maximum):

The majority of fuel ethanol in the US is produced by dry grind corn ethanol fermentation process. The corn oil that is contained in the by-product, distillers' dried grains with solubles (DDGS), can be recovered as a biofuel feedstock, and the removal of oil will also improve feed quality of DDGS. The most desirable way to remove oil is at the centrifugation step for liquid and solid separation after fermentation. The more oil is in the liquid, the more oil can be recovered. Therefore, we tested corn grinding and preparation method on oil distribution between liquid and solid phases. Six treatments, which were grinding with three different particle sizes, flaking, flaking-then-grinding, flaking-then-extrusion, were used to break up the corn kernel before fermentation and their effects on oil distribution between solid and liquid phases were examined by using a bench top simulation of the industrial decantor. Total oil contents were measured in the supernatant and solids after the centrifugation. Two types of oils with different extractabilities, (i.e., centrifugable oil and solvent-extractable oil), were also determined. Data from laboratory simulation of industrial decanting method demonstrated that dry matter yield and oil partition in thin stillage were highly positively correlated. Although some treatments led to more oil distributed in the liquid, such treatments also had high solid content in the liquid which is not desirable. Further investigations into the extractability of oil showed that flaking slightly

reduced the bound oil. The flaked then extruded corn meal released the highest level of free oil, about 25% compared to 7%, the average free oil from the rest of the treatments. The freed oil from flaking became non-extractable after flaked corn was further ground by Fitz Mill. Fitz Mill grinding alone had limited effect on oil partition. This research offers more insights on how to increase the oil partition into fermentation liquid during corn dry grind ethanol process. New flaking and extrusion method are being investigated to maximize oil recovery during fermentation.

Title: Generation X Vaccines: Combining Novel Antigens and Single Dose Delivery Technologies

PI: Michael Wannemuehler, Balaji Narasimhan, Chris Minion

Companies:

Awards received: R03 grant from NIAID NIH. B. Narasimhan was elected a Fellow of the American Institute for Medical and Biological Engineering. B. Narasimhan also received the ISU award for Mid-Career Achievement for Research.

External funding applied for (indicate received/denied/pending):

- Novel polymer-based single dose vaccine: Use of rPA for anthrax immunity. M.J. Wannemuehler, B. Narasimhan, and T. Merkel (FDA), submitted to NIAID (National Institutes of Health), November, 2007. \$142,000 (FUNDED)
- Nanoparticle vaccines exploiting diverse polymer chemistry for pneumonic plague. B. Narasimhan, M. J. Wannemuehler, R. Mandel, and R. Flick, submitted to Midwest Research Center for Excellence (MRCE) at Washington University, St. Louis, January, 2008. \$142,625 (NOT FUNDED).
- Impact of Polymer Adjuvant Chemistry on Adaptive Immune Mechanisms. B. Narasimhan, M. J. Wannemuehler, B. Bellaire, submitted to NIAID – NIH, July, 2008. \$2,764,345 (PENDING).
- Ability of carbohydrate modification to enhance vaccine efficacy. B. Narasimhan, M. J. Wannemuehler, N. Pohl, submitted to the Gates Foundation, May, 2008, \$100,000 (PENDING).

Description of major laboratory equipment used for this project including an estimate of the number of hours used, number of samples processed, or dollar amount for services provided

- Flow cytometer (12 hr/month),
- electron microscope (12 hr/month),
- NMR instrumentation (2 hr/month),
- Protein Facility – circular dichroism spectrometer (2 hrs/month),
- high and low speed centrifuges (15 hr/month),
- fermentation facility (once 4 hrs),
- luminex cytometer (8/month), cryogenic atomizer (12 hrs/month),
- lab animal facilities – Innovive rodent housing unit (3 months continual housing),
- CO₂ incubator (almost daily),
- tissue culture hoods 95 hrs/week),
- ELISA reader (spectrophotometer) (4 hrs/month), protein purification (8 hrs),
- column chromatography (8 hrs),
- fraction collectors,
- pH meter (4 hrs/month),
- Metler balances (4 hours/month),

Progress report (300 word maximum):

The goals of this project are to develop a novel vaccination strategy using polyanhydride-based bioerodible polymers and α Gal-modification of the vaccine candidate. This goal of the project is to develop a vaccine regimen that will induce protective immunity following immunization with a single dose vaccine that will improve patient compliance. The project focuses on the use of a recombinant protein (rF1-V) derived from *Yersinia pestis*, the causative agent of plague. During the past six months of this project, Dr. Minion has continued to produce and purify the rF1-V protein from recombinant *E. coli*. This protein has been used by Drs. Narasimhan and Wannemuehler to perform protein stability studies and immunization studies. The F1-V protein has been shown to be very stable (maintains physico-chemical structure) when mixed with the solutions used to prepare the polyanhydride nanospheres. In addition, the rF1-V also remained stable following release from eroding nanospheres indicating that it maintained its ability to induce an immune response. Adjuvanticity studies have also been performed and we have demonstrated the ability of the polymer adjuvants to enhance

the immune response of a suboptimal dose of the rF1-V protein. We have evaluated the induction of the immune response in two separate strains of mice (BALB/c and C57BL/6) to demonstrate that the response were not strain specific. Our colleagues at BioProtection Systems, Drs. Mandel and Flick, have perfected the chemical process of α Gal-modification to a test protein and we are currently in the process of modifying the F1-V protein. In all, we have used the initial 12 months of the project to develop the necessary reagents (rF1-V), establish the conditions for α Gal-modifications, established the stability of rF1-V following encapsulation and establish the in vivo conditions for assessing the ability of this novel vaccination strategy to enhance protective immunity.

Title: Ethanol Plant By-Product Uses for Pavement Geo-Materials Stabilization

PIs: Halil Ceylan and Kasthurirangan Gopalakrishnan

Publications/presentations based on project:

Several articles appeared regarding this research project on the ethanol production, biomass and bioenergy related magazines, journals, radio interviews, etc. Some of these articles published online are listed below:

<http://www.biobasednews.com/list2.php?storyid=15194>

<http://www.sciencedaily.com/releases/2007/10/071016101452.htm>

http://www.innovations-report.com/html/reports/materials_science/report-93049.html

<http://www.radioiowa.com/gestalt/go.cfm?objectid=C7FF5469-A0A9-38C3-5ECD3AF26E777854>

http://www.treehugger.com/files/2007/10/building_better.php

External funding applied for utilizing project results (indicate received/denied/pending):

A joint proposal is being submitted to the Iowa Power Fund by Robert C. Brown and others on the utilization of ethanol by products (lignin) for soil stabilization and dust control purposes.

Progress report (300 words maximum):

This research aims to investigate the utilization of ethanol by-product (lignin) in pavement base/subbase/soil stabilization. Currently, there are no standard methods for evaluating the stability of lignin-soil mixtures in the laboratory. Previous studies have shown that there are several variables which may affect the strength characteristics of these mixtures. As per the original research plan, the research efforts during January – June 2008 period mainly focused on obtaining test materials and engineering property characterization of test materials. Potential lignin samples have been obtained by contacting the industry (Grain Processing Corporation of Muscatine) and Iowa State University's biofuel research labs. The research team consulted the Iowa Department of Transportation engineers to identify potential soil types which will benefit from lignin treatment both from structural and economic perspectives. On June 17th, 2008, the research team collected soil materials from a new construction site near highway US 20 in Calhoun County, Iowa. So far, the research team has characterized the engineering properties of soil materials through national standard laboratory specifications including Grain size distribution (AASHTO T 27), Atterberg's limit (AASHTO T 89/90) and Moisture/density relationship (AASHTO T 99). In the near future, the lignin-soil/ aggregate mixtures will be prepared and examined for the effect of lignin addition on the strength and overall engineering characteristics of the lignin-soil mixtures.

Title: Commercialization of 3D Interactive Digital Medical Software for Surgical Planning and Training

PI: Eliot Winer

Publications/presentations based on project:

- Foo J.L., Lobe T., and Winer E., "A Virtual Reality Environment for Patient Data Visualization and Endoscopic Surgical Planning", *Journal of Laparoendoscopic & Advanced Surgical Procedures*, accepted for publication, June 2008.
- Koehring, A., Foo, J.L., Miyano, G., Lobe, T., and Winer, E.H., "A Framework for Interactive Visualization of Digital Medical Images", *Journal of Laparoendoscopic & Advanced Surgical Procedures*, Accepted for publication, March 2008.
- Foo, J.L., Miyano, G., Lobe, T., and Winer, E., "A Framework for Interactive Examination of Automatic Segmented Tumors in a Virtual Environment," Proceedings of the 16th Medicine Meets Virtual Reality (MMVR) Conference, January 29, 2008, Long Beach, CA, vol. 132, pp. 120-122.
- Grow Iowa Values Fund 2008 (denied)

Please list all Centers/Institutes involved in this project

- Virtual Reality Applications Center (VRAC)
 - Institute for Physical Research and Technology (IPRT)
 - CyberInnovation Institute (CII)
-

Progress report (300 word maximum):

All of the project budget is a subaward to Visual Medical Solutions, LLC. (VMS). Here are the milestones completed by VMS in the past six months:

- Near completion of second beta version of software (i.e. "BodyViz")
 - Testing to commence in the next six months with users
- Sales and licensing meetings were held with Stryker Medical for sale and use of BodyViz in conjunction with their surgical tools.
 - Software demonstrated at American Association of Orthopedic Surgeons meeting in March of 2008 at request of Stryker Medical.
 - * Met with focus group of surgeons to specifically test and evaluate BodyViz. Outcome of meeting was very positive.
- Sales and licensing meetings held with Mechdyne Corporation. Mechdyne interested in becoming reseller of BodyViz software.
- FDA 510K approval application nearing completion
 - Completed indications for use, device description, and technological characteristics for software
- VMS working on plan to develop sales, marketing, and support channels for BodyViz later this year.

Title: Multi-touch Technology: Applications to homeland security and ISU Research

PI: Stephen Gilbert

Please list all Centers/Institutes involved in this project

- o VRAC (under IPRT)
- o CyberInnovation Institute

Progress report (300 word maximum):

In the first semester of this project (Spring 08), we have accomplished Phase I (Evaluation & Analysis of current multitouch systems), though we continue that work periodically because of the cutting edge nature of multitouch development; there are many entrants into the hardware market.

We have also made significant work on Phase II: Build Prototype. ISU has created an open-source multitouch API called Sparsh-UI (<http://code.google.com/p/sparsh-ui/>) which Priority 5, our business partner, has used as part of their underlying TACCS system. There are two key aspects of our work on Sparsh-UI: the interface and interaction design (touch gestures, etc), and the underlying software architecture.

Interface and Interaction Design: Multitouch-based software applications require a rethinking of traditional user-interface standards, and Priority 5 faces resulting interface challenges with its TACCS system. Our teams have collaborated on creating specifications of the needs of a functional TACCS system and have prototyped design solutions in the form of "miniTACCS," a mockup of the TACCS system done at ISU that contains none of the classified data at Priority 5.

Software Architecture: Initial versions of Sparsh-UI required Java, but Priority 5 and other users required a C++ version, which has been completed recently. This architecture will support TACCS more effectively.

We have experienced significant delays due to the difficulty of getting off-the-shelf multitouch hardware that functions well because of the experimental nature of the technologies. Our goal from the start was for the ISU team to have identical hardware as Priority 5, but the vendor has been not consistently reliable. We have only recently achieved this goal.

We will continue refining our prototypes and working together to address Priority 5's needs related to TACCS as well as expanding Sparsh-UI to attract other partners.

Title: Laser-Based Diagnostics of Next Generation Combustion Systems

PI: Terry Meyer

Please list all Centers/Institutes involved in this project

- Bioeconomy Institute
- Center for Sustainable Environmental Technologies
- Biorenewable Resources and Technology Graduate Program

Description of major laboratory equipment used for this project including an estimate of the number of hours used, number of samples processed, or dollar amount for services provided

Equipment: Optical Parametric Amplifier (OPA)

Description: This is laser equipment to be used as part of a spray diagnostic system employing a technique called ballistic-photon imaging. It is designed to make measurements in sprays that are optically dense and will be utilized to characterize fuel sprays for next generation combustion systems.

Hours Used: Part of optical system still under construction

Samples Processed: Used for development work and not for pay on demand sample testing

Publications/presentations based on project:

1. Mechanical Engineering Magazine, Too Hot to Handle, March 1, 2008
2. ScienceDaily, Engineer Develops Laser Technologies to Analyze Combustion, Biofuels, December 14, 2007
3. Laser Focus World, Laser Technology Used to Analyze Combustion in Biofuels, December 6, 2007
4. EnergyDaily, Laser Technologies Used to Analyze Combustion of Biofuels, December 6, 2007

Awards received:

1. Elected General Co-Chair, Optical Society of America's Conference on Laser Applications to Chemical, Security, and Environmental Analysis, March 2008

External funding applied for (indicate received/denied/pending):

1. Studies of Injection and Ignition for Gas-Turbine Afterburners, Air Force Research Laboratory, \$65000, 1 Year, Received
2. Combustion of Emulsified Pyrolysis Oil with Petroleum-Based Fuels, Conoco-Phillips, \$268792, 2 years, Pending
3. A Systems Approach to Bio-Oil Stabilization: Laser diagnostics for Vapor Filtration and Bio-Oil Recovery, Department of Energy, \$249560 (Meyer's portion), 2 Years, Pending

Progress report (300 word maximum):

We are building up the facilities and instrumentation that will allow us to develop advanced laser-based sensors for analyzing combustion systems that burn alternative fuels. The end product will be improved combustion sensors and improved combustor designs given detailed knowledge of alternative fuel sprays, fuel-air mixing, and energy release. Below is an update on early tasks required for this work.

Task 1. Install laser systems for achieving narrowband, tunable radiation.

In order to study the complex properties of combustion operating with alternative fuels, it is important to utilize laser systems that can target specific parameters. Parameters of interest in this work include the temperature of the burning mixture, the quantity and mixing state of the fuel spray, and the quantity of pollutants such as nitric oxide and soot. A laser tuned to specific colors of light that can target parameters has

been acquired and is being used to develop state-of-the-art high-speed diagnostic techniques. This task, scheduled for completion in Q3 of 2008 is currently complete.

Task 2. Acquire detection hardware, including photodetectors and imaging systems.

A number of detection systems are being acquired to enable multi-parameter imaging in the combustion zone. This task, scheduled to begin in Q2 of 2008 is currently in progress.

Task 3. Assemble and characterize measurement system for studying multiple combustion parameters.

With the completion of Task 1, testing has already begun on detection of soot in a biofuel combustor using a borrowed camera (until a camera from Task 2 arrives). Imaging of soot properties in the combustion zone of this biofuel combustor is currently underway to understand the difference with operation using conventional fuel oil. This task, scheduled to begin in Q3 of 2008 is currently underway and ahead of schedule. Additional technologies for testing other combustion parameters will be explored in the coming months.

Title: Development of Novel Digestion-Resistant Starches from Corn to Combat Human Disease

PIs: Martha James, Alan Myers

Company: Starch Design

Please see the report on page 16. A combined report was created for both awards.

Title: Effectiveness of EpiCor in improving immune function, inflammation, and performance after intense exercise

PI: Marian Kohut ; Rick Sharp

Company: Embria Health

This project received IRB approval on June 17th, 2008. Five subjects have been enrolled since that time and each of the subjects have completed initial forms and participated in the preliminary testing. Because this project has only had IRB approval for ~1 week, it is in the earliest stages and there is not much to report at this time.

APPENDIX E – ISU

FULL REPORT

BATTELLE FUNDING: PROGRESS REPORT

Update Period: January 01, 2008 - June 30, 2008
 Title: Large Animal Genomics Models for Animal and Human Health
 Platform: Animal Systems
 Platform Chair: Max F. Rothschild
 Platform Expenditures: \$302,698.54
 Platform Funding: \$626,000
 Project Allocated: \$579,000
 Project Obligated: \$ -
 Inf. Allocated: \$47,000
 Inf. Obligated: \$ -

PROJECT 1 (Rothschild)

Publications/presentations based on project:

- Onteru, S.K., B. Fan, B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M.F. Rothschild. SNP discovery in genes affecting leg health traits in pigs. 2007. Proc. International Symposium on Animal genomics for Animal Health, Paris, France, Oct. 23-25.
- B. Fan., Onteru, S. K., B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M. F. Rothschild. 2008. Association Of Genes Affecting Skeletal Design And Feet And Leg Soundness In Pigs. Plant and Animal Genome XVI Conference, San Diego, California, Jan. 12-16. (accepted)
- Onteru, S. K., B. Fan, B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M. F. Rothschild. 2008. Association of candidate genes to leg and body conformation traits in pigs. ASAS/ADSA Midwest Meeting, Des Moines, IA, Mar. 17-19. (submitted)
- Onteru, S. K., B. Fan, B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M. F. Rothschild. 2008. Determination of genes associated with leg and body conformation traits in pigs. Animal Industry Reports (submitted)
- Onteru, S.K., B. Fan, M.F. Rothschild. 2008. SNP detection and comparative linkage mapping of 66 bone-related genes in the pig. Cytogenetic and Genome Research (accepted).
- Fan, B., S. K. Onteru, B. Mote, T. Serenius, K. J. Stalder, M. F. Rothschild. 2008. Large-scale association study for structural soundness and leg locomotion traits in the pig. Genetic Selection and Evolution (submitted).
- Fan, B., S. K. Onteru, B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M. F. Rothschild. 2008. Association of gene markers affecting the principal components of skeletal design and feet and leg soundness in pigs. Proceedings Joint ADSA-ASAS annual meeting, Indianapolis, Indiana, July 7-11.
- Onteru, S. K., B. Fan, B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M. F. Rothschild. 2008. Association of candidate genes to leg and body conformation traits in pigs. Proceedings ASAS/ADSA Midwest Meeting, Des Moines, IA, Mar. 17-19.
- Fan, B., S. K. Onteru, B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M. F. Rothschild. 2008. Association of genes affecting skeletal design and feet and leg soundness in pigs. Proceedings Plant and Animal Genome XVI Conference, San Diego, California, Jan. 12-16.
- Onteru, S.K., B. Mote, T. Serenius, M. Nikkilae, K. J. Stalder, M.F. Rothschild. SNP discovery in genes affecting leg health traits in pigs. 2007. Proceedings, International Symposium on Animal genomics for Animal Health, Paris, France, Oct. 23-25.

External funding applied for (indicate received/denied/pending):

Received

Association of genetic markers with structural soundness and sow longevity (M Rothschild, K Stalder)	National Pork Board	\$86,000
Association of genetic markers with structural soundness and sow longevity year 2 (M Rothschild, K Stalder)	National Pork Board	\$118,669

Progress Report (300 word maximum):

This grant uses the pig as an animal model to predict bone disorder predisposition in pigs and humans. In this work, 214 genes affecting skeletal development and mineral metabolism were chosen and a total 435 SNPs were detected in 146 genes and these SNPs were deposited to dbSNP of NCBI (Accession numbers: ss86352080-ss86352515). Five Sequenom's genotyping multiplexes were developed involving 172 SNPs. We excluded SNPs with no calls, monomorphism, mistaken inheritance, MAF less than 5% and a call rate less than 85%, 119 SNPs from 95 genes were successfully genotyped for 2066 commercial pigs which were scored for 17 traits describing various leg and feet and conformation conditions. Association analyses between SNPs and individual scoring traits, and principal components (PCs) were completed using SAS package. The genes *APOE*, *BMP8*, *CALCR*, *COL1A2*, *COL9A1*, *DKFZ*, *FBN1* and *VDBP* were very highly significantly ($P < 0.001$) associated with body conformation traits. The genes *ALOX5*, *BMP8*, *CALCR*, *OPG*, *OXTR* and *WNT16* were very highly significantly ($P < 0.001$) associated with FL structures, and *APOE*, *CALCR*, *COL1A2*, *GNRHR*, *IHH*, *MTHFR* and *WNT16* were highly significantly ($P < 0.01$) associated with overall leg action. Haplotype analyses were performed with the Haploview for *CALCR* and *COL1A2* on SSC9. The association analyses between different copy numbers of specific haplotypes and traits were executed using SAS. The genes *CALCR* and *COL1A2* had strong linkage disequilibrium, and the haplotype -ACGACC- was highly significantly ($P < 0.01$) associated with overall leg action and several important FL soundness traits. At present several genes are being re-sequenced for SNP mining and determining the causative SNPs. Planning of *in vitro* functional studies on bone marrow culture system is being conducted for important genes.

Platform leader Rothschild has met with new groups concerning expanded commercial activities in Iowa and two companies are starting up.

PROJECT 2 (Ellinwood)

Publications/presentations based on use of infrastructure:

- Presented at the 10th International Symposium on Mucopolysaccharide and Related Diseases: Intrathecal and Intravenous rIDU treatment of MPS I dogs from birth
- A recombinant N-acetyl-alpha-D-glucosaminidase (Naglu)-Apolipoprotein E ligand domain fusion: Paradoxically similar cellular internalization properties to native Naglu
- Delivery of a recombinant Naglu fusion enzyme to the central nervous system after a systemic AAV2-8 vector injection in the MPS I IIIB mouse model
- Presented at the 4th International Conference: Advances in canine and feline genomics and inherited diseases
- Canine Facto VII deficiency: Propagation of inadvertent inherited genetic diseases within canine research breeding colonies.
- Atypical transitory congenital hypothyroidism in a feline colony

Invention disclosures utilizing infrastructure purchases:

A provisional patent application filed April 23, 2008, with the US Patent and Trademark Office (PHOSPHORYLATED RECOMBINANT N-ACETYL-alpha-D-GLUCOSAMINIDASE (NaGlu) AND USES THEREOF)

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

- The National MPS Society, "Development of Pharmacoperon Based Therapy for the Treatment of MPS IIIIB", Letter of intent invited for full application. \$60,000. Application denied.
 - Lauren's Hope Foundation, "Combined Hepatopoietic Stem Cell And Gene Therapy for the Treatment of MPS IIIIB", Awarded, \$35,000.
 - Fondazione Cariplo, "Novel Efficacious and Safe Gene/Cell Therapy Approaches for the Treatment of Type I Mucopolysaccharidosis, Pending, \$117,240.
-

Progress Report (350 word maximum):

Work supported research in large animal based 1) neurologic and 2) ophthalmologic diseases. A progress review follows:

Neurologic Conditions Goals

- Develop a chaparonin base therapy for MPS IIIIB. A PhD student has joined a Master's student and begun research on native enzyme purification to generate a crystal structure.
- Develop an enzyme fusion capable of crossing the blood brain barrier. Engineered proteins have been evaluated in vitro and in mice. A patent application has been filed, and a grant submission is underway with Shire HGT, a biopharmaceutical firm.
- Develop canine and feline mesenchymal stem cells to treat canine and feline models of human genetic diseases. An additional aspect to this aim involves the development of a gene therapy and bone marrow transplantation therapy for lysosomal storage diseases. A PhD student has begun work on this and a small seed grant has been funded to generate preliminary data.

Ophthalmologic Conditions

Further characterize and maintain a feline congenital glaucoma model. This model is maintained to characterize this spontaneous and unique model for leading cause of blindness. Work has begun on developing a whole genome scan mapping technique to use in this population. Additionally this model has been found to segregate a novel developmental disorder of transitory congenital hypothyroidism.

PROJECT 3 (Greenlee)

Progress Report (350 word maximum):

In January we began to expend funds from this account. We hired a post-doc (Molly Murphy, D.V.M., Ph.D.) to begin work on this project. Animals that are intended for this study are at the National Animal Disease Center (a collaborator on this project) have been are still at pre-clinical stages of disease. Dr. Murphy has now been trained to perform the appropriate assays, and has begun to collect data. In addition, we have purchased an imaging system (with funds from another grant) that will also be used by Dr. Murphy to augment her studies.

Data collected by Dr. Murphy will be used as preliminary data in a proposal to be submitted to NIH (Characterizing retinal pathology associated with transmissible spongiform encephalopathies). Target submission date will be Feb 2009.

PROJECT 2 INFRASTRUCTURE (Ellinwood)

Publications/presentations based on use of infrastructure:

- Presented at the 10th International Symposium on Mucopolysaccharide and Related Diseases: Intrathecal and Intravenous rhIDU treatment of MPS I dogs from birth
- A recombinant N-acetyl-alpha-D-glucosaminidase (Naglu)-Apolipoprotein E ligand domain fusion: Paradoxically similar cellular internalization properties to native Naglu
- Delivery of a recombinant Naglu fusion enzyme to the central nervous system after a systemic AAV2-8 vector injection in the MPS I IIIB mouse model
- Presented at the 4th International Conference: Advances in canine and feline genomics and inherited diseases
- Canine Facto VII deficiency: Propagation of inadvertent inherited genetic diseases within canine research breeding colonies.
- Atypical transitory congenital hypothyroidism in a feline colony

Invention disclosures utilizing infrastructure purchases:

A provisional patent application filed April 23, 2008, with the US Patent and Trademark Office (PHOSPHORYLATED RECOMBINANT N-ACETYL-alpha-D-GLUCOSAMINIDASE (NaGlu) AND USES THEREOF)

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

The National MPS Society, "Development of Pharmacoperon Based Therapy fro the Treatment of MPS IIIB", Letter of intent invited for full application. \$60,000. Application denied.

Progress Report (300 word maximum):

No direct progress has been made in the utilization of the infrastructure funds during this period. Remaining funds will be utilized for sealing concrete floors in animal rooms in Kildee Hall (Department home to Animal Science).

Previously, infrastructure funds have allowed for the improvement of facilities in the Kildee Hall Animal Facilities to allow expanded housing of canine and feline models. Specifically a biosecurity airlock foyer has been constructed, and unsealed concrete floors in a large animal room and the new foyer have been epoxy sealed and walls repainted. Caging for dog housing in the facility have been installed, and dogs have been on sight in the new facilities since August of 2007. The work came in under estimates, and bids will be sought to utilize further resources to further the infrastructure of the Kildee Hall Animal Facilities.

BATTELLE FUNDING: PROGRESS REPORT

Update Period: January 01, 2008 – June 30, 2008
Title: Advanced Food & Feed: Advanced Carbohydrates for Health
Platform: Advanced Food and Feed
Platform Expenditures: \$ 10,036.82
Platform Co-Chairs: Ruth MacDonald and Michael Budnick
Platform Funding: \$857,572*
Project Allocated: \$507,572
Project Obligated: \$350,000**
Inf. Allocated: \$ -
Inf. Obligated: \$ -

*In addition to the Battelle funds, \$330,000 from ISU's FY07GIVF funding was used to support research projects associated with this platform.

** This funding is reserved as a start-up package for the Director of the Nutrition & Wellness Research Center (to be hired)

PROJECT 1 – NWRC

Progress Report:

These funds are being used to support the activities of the Nutrition and Wellness Research Center. The NWRC has been managed by an Interim Director since fall 2008. Plans are now underway to open the search to hire a full time Director – a search committee has been named and approved by the deans of the College of Human Sciences and Agriculture and Life Sciences. Substantial progress has been made in the operations of the NWRC, including hiring of staff to manage accounts and provide communication, and to direct clinical trials. Several companies have begun using the facility through contracting research projects, and several others have been contacted about using the center. There is high interest among the food industry in the work provided by the NWRC and we anticipate solid growth in the future. The Department of Food Science and Human Nutrition has hired three new nutrition faculty who will bring research expertise to the NWRC – these faculty will start in August, November and January. These new faculty will participate in research at the NWRC and will add to the growth of the center.

PROJECT 2 (MacDonald)

Project Goal: To determine the role of dietary carbohydrates in reducing the symptoms of inflammatory bowel disease.

Progress report (300 word maximum):

To date we have established a protocol for inflammatory bowel disease (IBD) in mice that provides a suitable model for the human disease. We have tested the model by quantifying several biochemical parameters in the colon that we plan to use for future work. These include interleukin 1B and 12, CCL5, NF κ B, TNF α and myeloperoxidase. We have defined these assays and shown that the model causes substantial upregulation in each. The next phase will involve feeding trials using the mouse model in which we will test dietary factors as mediators of these parameters. Our goal is to complete these studies by May 2010.

BATTELLE FUNDING: PROGRESS REPORT

Update Period: July 01, 2006 – December 31, 2006
Title: Thermochemical Technologies for the Bioeconomy
Platform: BioEconomy
Platform Chair): Robert Brown
Platform Expenditures: \$ 1,058,662.23
Platform Funding: \$ 2,164,666
Project Allocated: \$ 1,054,666
Project Obligated: \$ -
Inf. Allocated: \$ 1,008,000
Inf. Obligated: \$ 102,000*

*Allocated to the College of Agriculture, account pending

NOTE: The following report is a combined platform/infrastructure report.

Publications/presentations based on use of infrastructure:

- David C. Chipman, Young S. Do, Dong-Won Choi, Samuel T. Jones, Alan DiSpirito and Robert C. Brown. 2007. Syngas Fermentation Research Facility at Iowa State University. Biobased Industry Outlook Conference. Poster presentation.
- Zhu, H., Shanks, B.H., and Heindel, T.J., "Enhancing CO-Water Mass Transfer with MCM41 Nanoparticles and Electrolytes," To be presented at the AIChE 2008 Annual Meeting, November 16-21, 2008 Philadelphia, PA, Abstract # 124029.
- Zhu, H., Shanks, B.H., and Heindel, T.J., "Enhancing CO-Water Mass Transfer by Functionalized MCM41 Nanoparticles," *Industrial & Engineering Chemistry Research*, In Review, 2008
- David C. Chipman, Dongwon Choi, Samuel T. Jones, and Robert C. Brown., Optimization of PHA Production in *Rhodospirillum rubrum* Cultured on Carbon Monoxide from Synthesis Gas, 30th Symposium on Biotechnology for Fuels and Chemicals, May 4-7, 2008, Astor Crown Plaza Hotel, New Orleans, LA (Poster)
-

Invention disclosures utilizing infrastructure purchases:

IPDR entitled "Ethanol production by combined fermentation and chemical synthesis." was filed with ISURF.

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

- Funding received: Conoco-Phillips. \$150,000 (3/07-12/07)
- Funding received: Conoco-Phillips and ADM \$200,000 (1/08-12/08)
- Funding received: Annotation of novel enzymatic functions in methanogens : Amount: \$1.25M
Funding Agency: DOE-GTL : Dates: October, 2007-October, 2010
- Funding pending: CPBR
- Funding Received: Department of Energy under award number: DE-FG36-07Go87003.
- Funding Received: Project Title: Fast Pyrolysis Process Development Unit for Validating Bench Scale Data
Duration: October 2007- September 30, 2008)
Amount of funds awarded by DOE: \$500,000
Cost share from ISU: \$125, 132
- Funding received: Catalytic Upgrading of Bio-Oil, ConocoPhillips, \$162,974 (5/07-12/08)
- Funding Received: Condensed Phase Catalysis with Bio-Oil Species, ConocoPhillips, \$70,000 (1/08-12/08)
- Title of project: Engineering Research Center on Biorenewable Chemicals
Funding Agency: National Science Foundation
Date submitted: December, 2007

Status: Pending

- Department of Energy under award number: DE-FG36-07Go87003.
Project Title: Fast Pyrolysis Process Development Unit for Validating Bench Scale Data
PI: Robert C. Brown
Status: received
Duration: October 2007- September 30, 2008)
Amount of funds awarded by DOE: \$500,000
Cost share from ISU: \$125, 132
- "A Systems Approach to Bio-Oil Stabilization," Department of Energy, \$1,500,000 (10/08-9/10) - pending
- Equipment Donation, Parr Instruments, \$29,000

Infrastructure Purchased During this Reporting Period:

- Multiple Reactor System

Infrastructure Purchases made previously:

- Pyrolyzer Fabrication (partially complete)
- Mercury Porosimeter
- MicroGC
- Plumbing & Flow Control System
- Spectrophotometer
- Fermentation System
- Room Modification
- Electrical Modification
- High Pressure Pumps, Filtration System, and HPLC.

RESEARCH PROJECTS

Task 1: Thermochemical Products: Syngas production and clean-up

Task Objective:

The objective of this task is to produce syngas with properties that maximize growth and production of chemoautotrophic microorganisms.

Summary of Progress to Date:

Raw syngas from the gasification of biomass feedstocks contains many condensable liquid compounds that may inhibit growth and even kill in cases the *Rhodospirillum Rubrum* cells being used to convert carbon monoxide to hydrogen. To remove these and other compounds from the raw syngas, a new gas clean-up system has been designed and is nearly completely installed. The new gas clean-up system includes a new pair of primary cyclones, a pair of secondary mini-cyclones, a hot gas filter, a tar condenser, an impinger train, a vacuum pump, a pair of toxin filters, and a oxygen filter. This gas clean-up system is capable of providing 10 L/min of cleaned syngas to the bioreactor containing *Rhodospirillum Rubrum*.

In preparation for evaluating the merits of perspective of feed stock such as: corn stover, switchgrass, corn fiber, and distillers' dried grains work has been completed to upgrade the gasifier. This work includes replacing the primary cyclone on the gasifier with two new high efficiency cyclones. Recent tests of the new cyclones show that the char removal is now ~99% percent efficient, a 20% increase in char removal efficiency. A new impinger train and chiller were also installed. The new impinger train and chiller, used to remove condensable vapors in the producer gas, improved vapor removal efficiency and allow for longer test durations before the impinger train is saturated. This improves our ability to run tests over a longer period of time and evaluate the gasifier operation at steady state conditions. The data acquisition hardware was upgraded to expand data monitoring and hardware control capacity. This expansion also included the installation of a new data acquisition software package. These improvements have facilitated improved data collection and mass balance closure for the gasification unit.

Task 2. Thermochemical Products: Enhancing gas-liquid mass transfer

Progress Report (300 word maximum):

Various electrolytes were added to our bench-scale gas-liquid mass transfer reactor to enhance the CO-water mass transfer rate. Among of them, copper sulfate showed the strongest enhancement by a factor of ~4.7. The enhancement in the CO-water mass transfer coefficient resulted from the increase in CO-water interfacial area due to the suppression of bubbles coalescence by the added electrolytes. This was different from the CO-water mass transfer enhancement when nanoparticles were added to the solution. The addition of nanoparticle to this system enhanced both the CO-water mass transfer coefficient and the CO-water interfacial area.

The toxicity of MCM41 nanoparticles to *Rhodospirillum Rubrum* cells was measured. *R. rubrum* could be cultivated in the fermentation media with MCM41 nanoparticles. But the addition of MCM41 nanoparticles inhibited cell growth by ~30%.

A micro fermentation reactor (~500 ml) was also designed and constructed to investigate the influence of MCM41 nanoparticles with and without functional groups on H₂ yield. Preliminary results revealed *R. rubrum* cells could be cultivated in this reactor and ~10% of H₂ was produced in this reactor when pure CO was sparged at a gas flow rate of 15 ml/min.

In the next six months, MCM41 nanoparticles with and without functional groups will be added to this fermentation reactor to investigate the influence of these nanoparticles on H₂ yield.

Task 3: Syngas fermentation pilot facility

Progress Report (300 word maximum):

A continuous syngas fermentation facility for the production of bio-plastic (polyhydroxy alkanate) and bio-fuel (hydrogen) has been designed and constructed in Black Engineering. The new facility now includes two major components; a fermentation unit and a clean laboratory. A fermentation unit consists of five laboratory-scale (14L) fermenters able to run in parallel or in series depending on needs to optimize syngas utilization. The first fermenter is designed to test biofiltration system to remove dioxygen and potentially toxic compounds from syngas. Initial biofiltration system involves the screening aerobic carbon monoxide oxidizing bacteria. Syngas filtered through this biofiltration system is currently being fed into remaining four bioreactors for *Rhodospirillum rubrum* cultivation for the production of bio-plastic and molecular hydrogen. Initial studies show S²⁻ concentration control is critical to achieve higher cell density in cells cultured in the dark on syngas.

Current experiment involves the manipulation of culture conditions for optimal production of polyhydroxyalkanoate (PHA) and molecular hydrogen. As expected disruption of nitrogen-carbon balance by limiting ammonium, by increasing acetate, or by limiting yeast extract, enhanced PHA production. By disrupting the nitrogen to carbon balance increases in PHA productivity of more than 250% have been obtained. The results have been presented at the 30th Symposium on Biotechnology for Fuels and Chemicals.

Task 4: Thermochemical Products: Ethanol production by combined fermentation and chemical synthesis

Progress Report (350 word maximum):

The goal of this task is to examine an alternative route to ethanol production that avoids the high energy and water costs of distillation. An important milestone for this work is to genetically engineer *E. coli* to efficiently produce acetaldehyde and hydrogen. In prior work, *Escherichia coli* was engineered to co-produce acetaldehyde and hydrogen from glucose. Work conducted during this update period was aimed at improving acetaldehyde production by identifying and eliminating unwanted by-products. Previously, HPLC analysis identified formate, succinate, acetic acid and ethanol as the major unwanted by-products. To eliminate acetate production, we deleted the *ack* and *pta* genes. To eliminate lactate, the *ldhA* gene was deleted. To eliminate ethanol the *adh* gene was deleted. The quadruple mutant (*ack*, *pta*, *ldh* and *adh*) produced 5.4 mM acetaldehyde. Hydrogen measurements are in progress. A second milestone of this project is to genetically engineer *R. rubrum* for

production of acetaldehyde from syngas. The pyruvate decarboxylase (*pdh*) gene *Zymomonas mobilis* was cloned into *R. rubrum* and expression of the PDC enzyme was verified by in vitro assays. Under aerobic growth conditions, PDC expression increased acetaldehyde formation about 2,000%. However, during growth on syngas under anaerobic conditions, no increase in acetaldehyde production was detected. This indicates that *R. rubrum* metabolizes acetaldehyde in the absence of oxygen. In this period, we continued work to genetically modify *R. rubrum* to prevent anaerobic acetaldehyde metabolism.

Task 5 - Thermochemical Products: Establish functional genomics of *Rhodospirillum rubrum* metabolism

Progress Report (300 word maximum):

This task has focused on understanding and manipulating the metabolism of *Rhodospirillum rubrum* so as to make this organism more suitable as a platform for the fermentation-based conversion of syn-gas to biorenewable chemicals and biofuels. These manipulations are taking advantage of the genomics platform that is afforded by the fact that this organism's genome is completely sequenced. We have targeted the metabolism of two classes of biorenewable chemicals and fuels: 1) polyhydroxyalkanoate (PHA) as a bioplastic; and 2) monoacyl esters as a biofuel. PHAs are natural products of *R. rubrum* metabolism, which are produced when this organism is grown under a low-carbon nutrition status. Monoacyl esters are not normally produced by *R. rubrum*, however, such molecules are produced by many other organisms, including plants, algae, some bacteria, and insects and other animals.

For PHA metabolism, we have identified and are characterizing six *R. rubrum* genes that appear to be involved in PHA production. These are labeled: *phaA*, Rru_A0274; *phaB*, Rru_A0273; *phaC*, Rru_A0275; *phaC*-like1, Rru_A2413; *phaC*-like2, Rru_A1816; and *phaj*, Rru_A2964

Since the last report, we have continued to assess the genetically engineered strains of *R. rubrum* that over-express each of the above listed PHA-genes. Specifically, we have conducted a very detailed analysis of the expression of each transgene and its effect on PHA production. These experiments were conducted using an "artificial syn-gas" mixture, and they provide us with a basic understanding of how the engineered strains are behaving in generating PHA in an artificial, but scientifically controlled system. These results are now being prepared for publication in a scientific journal, and will be the subject of a patent application.

Based upon the above results, we are now conducting similar experiments with these strains using "real" syn-gas mixtures generated via gasification. We anticipate that these studies will provide invaluable data on how to best use the engineered strains for generating biorenewable plastics via a syn-gas fermentation platform.

Finally, in the last six months we have isolated a gene from plants, which should be capable of generating monoacyl esters, a product that has direct use as biodiesel. This gene is currently being expressed in *R. rubrum*, and we anticipate that we will be able to test the resulting strain for its ability to generate biodiesel from syn-gas. The results of these experiments are anticipated within the next reporting period.

Task 6 -Thermochemical Products: Developing stable bio-oils from fast pyrolysis

Summary of Progress to Date:

Work on task 6 focuses on generating bio-oil under well characterized operating conditions and characterizing physically and chemically the oil properties that influencing bio-oil stability.

The original goal of building a new pyrolysis unit has been expanded with the recent receipt of \$500,000 from the U.S. DOE which will allow us to also purchase new feedstock preparation equipment and design and build more sophisticated bio-oil collection equipment. The new fast pyrolysis reactor, char removal system, and bio-oil collection equipment have been designed, built, and installed. The new reactor system will be operational as soon as the new feeder system and control system are installed and functional. Currently, the biomass feeder is being built by Acrison, Inc. with an expected delivery date of August, 2008. Likewise we are awaiting delivery

of the control system which is being designed and built by Rockwell Automation, Inc. Once these two systems are in place the new pyrolyzer should be complete and operational. In addition, work is being completed on a new biomass preprocessing facility which will include two new large biomass grinders and a high throughput biomass dryer to support the production of bio-oil through fast pyrolysis.

For the purpose of better characterizing bio-oil, a new laboratory is being set-up. At present, capabilities (i.e. instrumentations and technical personnel) of characterizing biomass, bio-oil and bio-char, physically and chemically have been developed. Two recently purchased instruments include a pentapycnometer (from Quantachrome) for analyzing biomass and bio-char densities and a gas absorption surface analyzer (from Quantachrome) for analyzing the pore size distribution and surface area of bio-char.

Task 7: Oleochemicals: Identifying physical and chemical attributes for improved biobased lubricants and fuels

Progress Report (300 word maximum):

Previous research has shown the rate of oxidation of fatty acids is greatly accelerated when they are spread as a monolayer on silica. We found that the best yield from methyl linoleate of products that might have commercial value was achieved at ~50 C after 24 h. The addition of transition metals to the silica has been reported recently to accelerate the formation of undesirable scission products. We found that this could be minimized in silica by treatment with small amounts of the metal chelator, citric acid. The production of hydroperoxides was greatly increased, scission products were reduced and desirable products were increased. We plan to test other chelators and also to see if it is possible to recycle the silica in a mini reactor.

When biodiesel is burned in diesel engines there often is a slow buildup of material on the fuel injection port. We have explored this problem by evaporating biodiesel and its components at various temperatures in a thermal gravimetric analyzer (TGA) and a muffle furnace. There is considerable variation in the suggested temperatures of the diesel injection ports. Our first experiments were done at 300C. After 15 min at this temperature, biodiesel and pure methyl esters left residues with very small amounts of methyl ester. A series of long-chain hydrocarbons (C₂₄ to C₃₃) was found along with the antioxidant BHT. Traces of phenols were often found. More recently we have experimented with placing samples in a muffle furnace at 150C for 30 to 60 min. At this temperature there were large amounts of methyl esters in the residue. At 200C in the furnace, the residue pattern was similar to those at 300C.

Task 8: Bio-Oil Upgrading

Progress Report (350 word maximum):

The specially-designed high throughput reactor system consisting of 8 reactors has been received and installed in our laboratory. The system is now completely operational allowing us to greatly expand our reaction testing capability. There were two bio-oil upgrading research directions that we began pursuing as part of Task 8. These areas were stabilizing bio-oil through esterification of the bio-oil acids with added alcohols, which is necessary for further processing of the bio-oil, and condensed phase processing of the bio-oil to convert it to an improved feedstock for processing to fuels in a standard petroleum refinery. Both of these project areas have now been funded by a partnership between ConocoPhillips and Archer Daniels Midland. Therefore, our focus for Task 8 has turned to additional novel approaches for bio-oil upgrading. The first new area to be explored is the simultaneous esterification/hydrogenation of bio-oil. If successful, this approach would obviate the need to add additional alcohol for esterifying the bio-oil acids as alcohol would be produced in situ through hydrogenation of the aldehydes and ketones present in the bio-oil. This project will start in September when a visiting scholar from China comes to our lab. We are also pursuing support of this project from the U.S. Department of Energy through a proposal submission. The second area being explored is the aqueous reforming of bio-oil. A postdoctoral scholar joined our group in June and has begun work in this area. She will be taking bio-oil samples to the University of Wisconsin in July for preliminary screening on whether the aqueous reforming process will work with bio-oil.

STARTUP FUNDS

Title: Raman Startup Funds

Publications/presentations based on use of infrastructure:

- Mathematical Models of Batch SSF Processes: Dimensionless Groups for Characterizing Process Regime. D Raj Raman & Robert P Anex, presented at the Institute of Biological Engineering 2008 Annual Conference in Raleigh NC.

Progress Report:

Battelle Funds provided to Associate Professor D Raj Raman as startup funds were used to support the following activities:

- Summer Salary allowed him to develop a model and present it at a national meeting (title above).
- Summer salary allowed authoring a paper entitled Mathematical Models of Batch SSF Processes: Dimensionless Groups for Characterizing Process Regime, which defines a novel method of characterizing SSF (simultaneous saccharification and fermentation) that can be used by scientists developing high-throughput fermentation screening methods for lignocellulosic biomass.
- Funding for Jasjeet Kaur (MS Student, Agricultural & Biosystems Engineering Department) that allowed her to continue to develop an optical system for real-time measurement of carbon-dioxide production from multiple (eight) fermentation reactors. When completed, this system should be able to provide rapid screening of a wide variety of biomass feedstocks, pretreatments, and enzyme cocktails, and combinations thereof.

INFRASTRUCTURE FUNDS PROVIDED TO COLLEGES

College of Engineering

Previously:

Dr. Chris Williams has upgraded a servo-pneumatic testing machine for testing materials associated with bio-energy research. Research will be under contract within the next 6-12 months. A substantial amount of exposure is being received by the research team associated with utilizing bio-energy co-products in asphalt materials and this equipment will further expand their research capabilities and thus research exposure.

Dr. Terry Meyer purchased components for building a quadruple pulse laser system that will help develop technologies for alternative fuel processing and utilization.

Dr. Santosh Pandey has purchased a Leica Microscope with High-resolution Digital Camera & Vibration Isolation Table. This equipment will be used for testing characteristics of living cells and microorganisms under various stimuli. The electrically-active bio-nanoelectronic platform combines the versatility of nanoscale circuits with the flexibility of polymeric substrates to study biological processes. Our portable assay would allow label-free detection of a specific biological specimen and nanoscale probing of its characteristics. The electronic detection scheme would provide real-time information over a long time interval, which is not possible with optical or fluorescence-based assays. Combined with high-performance computing features and embedded systems, the microscope system can provide real-time monitoring of biological processes.. He also purchased a two-section glove box from MBraun Inc. for research in organic and bio-electronics of material which are sensitive to air and humidity.

Dr. Jaeyoun Kim purchased an optical table, its support, and a pneumatic controller. The heavy, very flat optical table stabilized by pneumatic floating will serve as the platform in various high-precision optical experiments. He will purchase lasers, optomechanical stages, and detectors. The equipment will be essential for the development of high-performance optical sensing, communication, and computing systems including surface plasmon resonance sensors and nanoscale optical waveguides.

College of Liberal Arts and Sciences

Equipment Purchased/Renovations Made: Photonmax 512B System

Emily Smith (Startup package)

Publications/presentations based on use of infrastructure:

- “General Fluorescence Resonance Energy Transfer Assay for the Study of Cell Membrane Protein Clustering” Pittsburgh Conference, New Orleans, LA, March 2008.
- “Fluorescence Studies of Cell Membrane Organization” American Chemical Society National Meeting, New Orleans, LA, April 2008.
- “General Fluorescence Resonance Energy Transfer Assay for the Study of Cell Membrane Protein Clustering” University of St. Thomas, St. Paul, MN, November 30, 2007.
- “General Fluorescence Resonance Energy Transfer Assay for the Study of Cell Membrane Protein Clustering” Emily A. Smith, Deepak Dibya, Suzanne Sander, Nuha Salem. Midwestern Universities Analytical Chemistry Conference, Urbana, IL, November 1-3, 2007.
- “General Fluorescence Resonance Energy Transfer Assay for the Study of Cell Membrane Protein Clustering” 34th Federation of Analytical Chemistry and Spectroscopy Societies, Memphis, TN, October 2007.

Awards received related to infrastructure purchases:

Society of Analytical Chemists of Pittsburgh Starter Award (2007)

Invention disclosures utilizing infrastructure purchases:

None

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

Current Support

I.S.U. Plant Sciences Institute and U.S. Department of Energy, Ames Laboratory, “High-Throughput Raman Imaging Studies of Plant Tissue Arrays for Measuring Cell Wall Content and Degradation” 7/1/2007-6/30/09, \$60,000

Roy J. Carver Charitable Trust, “Novel Fluorescence Resonance Energy Transfer Studies of Cell Membrane Dynamics: Unraveling Integrin Cluster Mediated Signaling Pathways” 11/1/2007-10/30/1009, \$239,000

Expired Support

Society of Analytical Chemists of Pittsburgh 2007 Starter Grant Award, “Development of Raman and Fluorescence Imaging Methods for the Study of Cellular Processes and Biological Materials in Diverse Applications” 5/1/07-4/30/08, \$20,000

Pending Support

NSF CAREER, “Development of Novel Methods to Measure Cell Membrane Protein Clustering *in vivo*: Unraveling the Relationship between Clustering, Ligand Binding and Cell Signaling” 2009-2014, \$798,068

U.S. Department of Energy, “Chemical Analysis of Nanodomains” 2008-2011, \$2,005,000, (PI: E. Smith; co-PIs: J. Petrich, N. Fang, E. S. Yeung)

USDA, U.S. Department of Energy, “Diagnostic DNA Markers for High Ethanol and Biomass Yield in Maize and Other Energy Grasses” 2008-2011, \$250,000, (PI: T. Lubberstedt; co-PI: E. Smith)

Midwest Forensic Resources Center "Detection of Exogenous Compounds in Latent Prints Using Raman Spectroscopy: A Practical Tool to Assist Forensic Investigators" 8/2008-4/2009, \$53,208

U.S. Department of Energy Midscale Instrumentation "Development of a Sub-Diffraction Limited Microscope with Molecular Resolution and Time-Resolved Capabilities" 2009-2012, \$1,950,369, (PI: E.Smith, Co-PIs: J. Petrich, V. Lin)

U.S. Department of Energy, "Nanostructure of Plant Cell Walls" 2009-2014, \$21,581,962 (PI: R. Jernigan, co-PIs: N. Fang, M. Hargrove, V. Honavar, M. Hong, H. Horner, B. Nikolau, J. Petrich, N. Pohl, K. Rajan, S. Sivasankar, E. Smith, D. Vaknin, J. Verkade, E. Yu, O. Zabolina)

Denied Support

Petroleum Research Fund Type G Grant "Raman Spectroscopy Studies of Bifunctionalized Mesoporous Silica Nanosphere Catalytic Systems", \$50,000

National Institutes of Health 2007 Director's New Innovator Award "Unraveling and Inhibiting Advanced Glycation End Products (AGE) *in vivo*" Program (DP2), \$1,500,000

Midwest Forensics Resource Center Competitive Research Program "Raman Imaging for the Detection of Latent Fingerprints on Traditionally Hard to Visualize Surfaces and the Measurement of Endogenous Compounds in Fingerprint Residue", \$57,106

Arnold and Mabel Beckman Foundation "A Novel Method for Studying Cell Membrane Proteins: Combining Surface Chemistry, Model Lipid Bilayers and Raman Microscopy" 2007-2010, \$300,000

Searle Scholars Program "Elucidating Cell Membrane Protein Dynamics with Fluorescence and Raman Imaging", 2008-2011, \$240,000

Camille Dreyfus Teacher Scholar Award "Development of Raman and Fluorescence Imaging Methods for the Study of Cellular Processes, Catalysis, and Lignocellulosic Materials", 2008-2013, \$75,000

Equipment Purchased/Rennoations Made:

ISU # 446552 Microscope Inverted w/Epifluor Kit \$42,317.25

ISU # 446605 Cabinet Safety Biological Cabinet \$6,171

ISU # 446642 Sorvall Primo Centrifuge Benchtop \$6,584.95

ISU # 447012 Camera Pixis Digital CCD System \$32,063

ISU # 447031 High Power NIR Laser \$16,486

ISU # 447032 Holospec Imaging Spectrograph \$16,645

ISU # 447042 Microscope Inverted 4-Position \$19,383.80

ISU # 447270 Photon Max CD Camera Detector \$22,998.70

Progress Report (300 word maximum): We are developing imaging instrumentation and methods, and subsequently applying these techniques in a diverse set of applications, including the study of cellular processes that are initiated at the cell membrane, lignocellulosic biomass, and catalytic systems. Two goals of this work are elucidating how properties of the cell membrane influence cell signaling events across the membrane, and developing methods to study reactions utilizing chemical and biological catalysts. The analysis techniques that we use include fluorescence and Raman scattering. Raman imaging is a particularly attractive imaging mode since it provides spatially-correlated chemical content data without the need to destroy or modify the sample under study. Fluorescence imaging can provide kinetic and thermodynamic information

concerning biological interactions, and can also provide spatial data below the diffraction limit. The lab has built two imaging instruments, one capable of Raman scattering measurements and one suitable for several fluorescence techniques. The Raman instrument has been used to measure the efficiency of converting a variety of plant materials to ethanol, and to measure chemical catalysis in nanoporous materials. This work serves as a foundation for developing biofuels and improving the efficiency of catalytic reactions. The fluorescence instrument has been used to study cell membrane receptor signaling events, receptor clustering, receptor conformational changes in two diverse classes of cell membrane proteins: integrins and receptor for advanced glycation end products.

Publications/presentations based on use of infrastructure:

"General Fluorescence Resonance Energy Transfer Assay for the Study of Cell Membrane Protein Clustering" University of St. Thomas, St. Paul, MN, November 30, 2007.

"General Fluorescence Resonance Energy Transfer Assay for the Study of Cell Membrane Protein Clustering" Emily A. Smith, Deepak Dibya, Suzanne Sander, Nuha Salem. Midwestern Universities Analytical Chemistry Conference, Urbana, IL, November 1-3, 2007.

"General Fluorescence Resonance Energy Transfer Assay for the Study of Cell Membrane Protein Clustering" 34th Federation of Analytical Chemistry and Spectroscopy Societies, Memphis, TN, October 2007.

Awards received related to infrastructure purchases:

Society of Analytical Chemists of Pittsburgh Starter Award (2007)

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

Funded

Plant Sciences Institute
Arrays for Measuring Cell
7/1/2007-6/30/09

"High-Throughput Raman Imaging Studies of Plant Tissue Wall Content and Degradation"
\$60,000 (total direct costs)

Society of Analytical Chemists of
Methods for the Study of Cellular Processes and
5/1/07 4/30/08

"Development of Raman and Fluorescence Imaging Pittsburgh Biological Materials in Diverse Applications"
"Single-Molecule Immunoassay and DNA"
\$20,000 (total direct costs)

Roy J. Carver Charitable Trust
10/30/1009

"Novel Fluorescence Resonance Energy Transfer 11/1/2007-Studies of Cell Membrane Dynamics: Unraveling Integrin Cluster Mediated Signaling Pathways"
\$239,000 (total direct costs)

Pending

U.S. Department of Energy
2007-2010 (current project)

"Chemical Analysis of Nanodomains"
\$750,000 (per year)
(Co-PIs: V. Lin, J. Petrich, N. Pohl, R. S. Houk, E. S. Yeung, M. Pruski)

Arnold and Mabel Beckman Foundation

"A Novel Method for Studying Cell Membrane 2007-2010 Proteins: Combining Surface Chemistry, Model Lipid Bilayers and Raman Microscopy"

	\$300,000 (total direct costs)
Searle Scholars Program	“Elucidating Cell Membrane Protein Dynamics 2008-2011 with Fluorescence and Raman Imaging” \$240,000 (total direct costs)
U.S. Department of Agriculture, U.S. Department of Energy (co-PI: Thomas Lubberstedt) 2008-2011	“Diagnostic DNA Markers for High Ethanol and Biomass Yield in Maize and Other Energy Grasses” \$250,000 (total direct costs per year)
Camille Dreyfus Teacher Scholar Award	“Development of Raman and Fluorescence Imaging 2008-2013 Methods for the Study of Cellular Processes, Catalysis, and Lignocellulosic Materials” \$75,000 (total direct costs)
<u>Denied</u> Petroleum Research Fund Type G Grant	“Raman Spectroscopy Studies of Bifunctionalized Mesoporous Silica Nanosphere Catalytic Systems” \$50,000
National Institutes of Health 2007 Director’s New Innovator Award Program (DP2)	“Unraveling and Inhibiting Advanced Glycation End Products (AGE) <i>in vivo</i> ” \$1,500,000
Midwest Forensics Resource Center Competitive Research Program	“Raman Imaging for the Detection of Latent Fingerprints on Traditionally Hard to Visualize Surfaces and the Measurement of Endogenous Compounds in Fingerprint Residue” \$57,106

Progress Report (300 word maximum):

We are developing imaging instrumentation and methods, and subsequently applying these techniques in a diverse set of applications, including the study of cellular processes that are initiated at the cell membrane, lignocellulosic biomass, and catalytic systems. Two goals of this work are elucidating how properties of the cell membrane influence cell signaling events across the membrane, and developing methods to study reactions utilizing chemical and biological catalysts. The analysis techniques that we use include fluorescence and Raman scattering. Raman imaging is a particularly attractive imaging mode since it provides spatially-correlated chemical content data without the need to destroy or modify the sample under study. Fluorescence imaging can provide kinetic and thermodynamic information concerning biological interactions, and can also provide spatial data below the diffraction limit.

The lab has built two imaging instruments, one capable of Raman microspectroscopy and Raman imaging measurements and one suitable for several fluorescence techniques. The Raman instrument uses fiber bundle image compression to obtain complete spectra from several areas of the sample surface simultaneously. The second instrument is a fluorescence microscope that is set-up for fluorescence resonance energy transfer, single molecule fluorescence, and fluorescence immunohistochemistry measurements, and is used with either total internal reflection or wide-field excitation. The Photonmax 512B can be used in either instrument set-up. These instruments are used in several diverse projects that have been initiated in the laboratory, including the study of: cell membrane receptor signaling events, receptor clustering, receptor conformational changes, and chemical transformations catalyzed by enzymes.

College of Agriculture

No expenditures have been made on the existing allocations (faculty startup) or the new allocations toward the New Century Farm.

BATTELLE FUNDING: PROGRESS REPORT

Update Period: July 01, 2006 – December 31, 2006
Title:
Platform: BioSecurity
Platform Chair: Manjit Misra
Platform Expenditures: \$376,826.29
Platform Funding: \$944,200
Project Allocated: \$450,000
Project Obligated: \$ -
Inf. Allocated: \$ 271,000
Inf. Obligated: \$ 223,200*

* The infrastructure obligation is for the BL3 facility currently in the planning stages for the College of Vet Med (\$62,000) and for the College of Agriculture (\$161,000)

TASK 1 (Natural Antimicrobials) PROJECT FUNDS:

Publications/presentations based on use of infrastructure:

Lantz, A., Brehm-Stecher, B.F., and D.W. Armstrong. Combined Capillary Electrophoresis and DNA-FISH for Rapid Molecular Identification of *Salmonella* Typhimurium in Mixed Culture. Invited manuscript for special issue of Electrophoresis (under review).

B.F. Brehm-Stecher. 2007. "New Technologies for Imaging Individual Microbial Cells". In *Imaging Cellular & Molecular Biological Function*, F. Frischknecht and S. Shorte, (eds.) Springer-Verlag, Berlin.

B.F. Brehm-Stecher "Methods for Whole Cell Detection of Microorganisms" in *Structure, Interaction and Reactivity at Microbial Surfaces*, T. Camesano and C. Mello (eds.), American Chemical Society, Washington, D.C. (in press).

Awards received related to infrastructure purchases:

None

Invention disclosures utilizing infrastructure purchases:

None

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

Funded

Ahn, D. U., E. J. Lee, and A. L. Pometto III. 2007-08. Production of Ovotransferrin from Egg White for Antimicrobial Applications. Midwest Poultry Research Program. \$44,421

Brehm-Stecher. 2007-2008. Antimicrobial Activities of Essential Oils Part II: Formulation Testing, Blend Optimization, Expanded Pathogen Testing, Activity Enhancement and Alternative Delivery Strategies. Industry/IPRT. \$36,893.

Brehm-Stecher. 2007-2008. Testing the Antimicrobial Effects of QSI-Nano Metal Nanoparticles: Basic Research and Applications. Industry. \$50,944.

Brehm-Stecher. 2007-2008. Simultaneous Concentration and Visual Identification of *Salmonella* and *Listeria* in Mexican-Style Soft Cheeses. Midwest Dairy Association. \$31,068.

Brehm-Stecher. 2007-2008. Rapid Cytometric Detection of *Salmonella*, *Campylobacter*, *Yersinia* and *Listeria monocytogenes* in Pork Products – Assay Refinement, Extension and Technology Transfer. Food Safety Consortium. \$17,794.

Brehm-Stecher. 2007-2010. Biomimetic Polymer-Based Antimicrobial Systems: Development and Applications. Industry. \$117,300.

Mendonca, A, and A. L. Pometto III. 2007. Antimicrobial Efficacy of a Novel Antimicrobial Skin Cleanser against Foodborne Enteric Pathogens on a Model Skin Surface. IPRT (\$12,057) and Northern Filtration Media (\$12,065)

Pending

Brehm-Stecher. 2007-2008. Midwest Regional Center of Excellence for Biodefense and Emerging Infectious Diseases Research. Biomimetic Antimicrobial Systems for Biothreat and Emerging Pathogen Mitigation. \$97,289.

Brehm-Stecher. 2008-2011. USDA-NRI. Rapid Separation, Concentration & Visual Molecular Identification of Foodborne Pathogens on Fresh Produce. \$328,343.

Narasimhan, B., A. L. Pometto III, S. Mallapragada, and M. Misra. 2008-2013. NSF Engineering Research Center for Food Safety and Security. NSF \$18.5 Million.

Munkvold, G., A.L. Pometto III, Kim, T., and Shetty, K. 2008-2011. Corn biomass quality for biofuel production; impacts of fungal pathogens and approaches for quality enhancement. Department of Energy. RD-RBP-BIOMASS-2007. \$1,101,301.

Progress Report (350 word maximum):

The focus of this research was to expand our knowledge and applications of methanobactin, an ISU discovery, and evaluate the antimicrobials in grape seed extract. Our first 100 L fermentation produced methanobactin at significantly lower concentrations than bench scale (10 L). To increase the residence time for methane for methanobactin production, we need to further modify the 100-L fermentor by employing a down-draft marine agitator blade. For methanobactin recovery we had some start up difficulties with the organic solvent spray drier; we have received some new parts from the manufacturer. Our second pilot scale run will be late January. For the grape seed extract objectives, we decided to produce some Iowa grape extract. Working with the ISU organic grape extension farm in Gilbert, IA and with Dr. Paul Domoto in Horticulture, we now have six different wine varieties and dried pomace (skin and seed). Wine has been racked and shortly the dried grape skins will be separated from the seeds. The antimicrobial properties of grape skin extract will be evaluated on the Bioscreen using five strain cocktails of *Escherichia coli* O157:H7 and *Listeria*. Furthermore, the phenolic profiles and resveratrol concentrations for each skin extract and wine will be determined via the Infrastructure analytical HPLC. We expect to demonstrate superior health benefits and antimicrobial properties for Iowa grapes. Finally, Dr. Kalidas Shetty, Professor at University of Massachusetts, was an IFSS visiting professor this summer. His students worked with Dr. Colonna to evaluate the antimicrobial properties of his enhanced plant extracts using the Bioscreen, and the above food pathogen cocktails.

TASK 1 (Natural Antimicrobials) INFRASTRUCTURE FUNDS

Equipment Purchased/Renovations Made:

Progress Report (300 word maximum):

The Biosafety Level II research laboratory construction began September 2007. Most of the electrical and plumbing is close to completion. We reported last time that all the requested equipment has been purchased. The solvent hood and bioguard hoods installations are still in progress. Research lab benches will be fitted with working surfaces. If sufficient funds remain upon completion of the lab renovation, a customized anaerobic hood will be purchased and installed; the wiring and space will be ready for the equipment. IPRT/Industry grants continue to use the discovery initiative equipment scattered throughout the third floor of the Food Sciences Building (see funded grants).

TASK 2 (Livestock Traceability) PROJECT FUNDS

Progress Report (300 word maximum):

- Began to address key barriers to electronic certification, such as reluctance of some auction markets to learn a new system by developing an off-line software program that is easier for sale barns to use.
- A Team of economists, transportation/logistics experts, and business specialists have begun a SWOT (strengths weakness, opportunities, threats) analysis of the business entities involved in this project to provide input to the business plan.
- Methods to incorporate the ILTP into the Iowa Department of Agriculture and the U.S. National Animal Identification Systems (NAIS) plans are still being discussed with IA Department of Agriculture. Additionally, GVL is working with USDA to develop their system consistent with the national program.
- Online version directed at the veterinary practice to comply with requirements of 'Green' and 'Gold' Preconditioning requirements is in final test and will be moved to production servers by early January 2008.
- Future funding for next phase is open - sources have not been solidified.

INFRASTRUCTURE ALLOCATED TO COLLEGES

College of Agriculture

The field building renovations were complete as previously reported.

A previous allocation to the College of Agriculture for equipment supporting the biosecurity platform was determined to not fit the definition of infrastructure and funds have been redirected to the Bioeconomy platform and allocated toward purchases related to the New Century Farm

College of Vet Med

A small allocation has been made to the College of Vet Med to assist in building the BL3 facility. Construction should occur within the next year.

BATTELLE FUNDING: PROGRESS REPORT

Update Period: July 01, 2006 – December 31, 2006
Title:
Platform: Information Solutions
Platform Chair): Jim Oliver
Platform Expenditures: \$ 663,545.83
Platform Funding: \$1,718,000
Project Allocated: \$650,000
Project Obligated: \$ -
Inf. Allocated: \$1,068,800
Inf. Obligated: \$ -

PROJECT FUNDS

External funding applied for (indicate received/denied/pending):

- "Multi-Touch Technology: Applications to Homeland Security and ISU Research," Grow Iowa Values Fund, \$100,000, Jan 1, 2008, December 31, 2008. Partners: Priority5 (Allen Bierbaum), ISU (Stephen Gilbert) awarded
 - "Center for Information Protection: NSF IU/CRC Industry Memberships," Doug Jacobson, PI, \$150,000. awarded
 - "Bio-inspired Fault-tolerant, Adaptive, Decentralized, and Stable Decision-making and Control for Dynamic and Concurrent Coalitions of Vehicle-Human Teams," James Oliver, PI, with ISU Co-PI's Soon-Jo Chung, Arun Somani, Stephen Gilbert, and MIT Co-PIs Jean-Jacques Slotine and David W. Miller. \$6,891,646, Office of Naval Research, pending.
 - "An Interdisciplinary Methodology to Measure the Social and Emotional Aspects of Communication in Health Care," Debra Satterfield, PI, with Co-PI's Sung Kang and Nora Ladajahasen, \$108,498, National Institutes of Health, pending.
 - "EFRI: Development, Validation, and Use of Sense of "Self" in Robots," Alex Stoytchev, PI, with Co-PI's Nicola Elia, Akhilesh Tyagi, Umesh Vaidya, James Bloedel, and Srikanta Tirthapura, \$1,948,294, National Science Foundation, pending.
 - "A Distributed Peer to Peer Investigation Tool Kit," Doug Jacobson, PI, \$558,110, National Institute of Justice, pending.
 - "Combinatorial and High Throughput Discovery of High Temperature Piezoelectro Ceramics," Air Force Office of Scientific Research, \$82,431, June 15, 2008 to October 30, 2008, Krishna Rajan
 - "Center for Information Protection: NSF IU/CRC Industry Memberships," National Science Foundation, \$60,000, Doug Jacobson
 - CyberInnovation Institute Industry Memberships, Deere & Company, \$50,000.00, January 1, 2008 to December 31, 2008, James Oliver
 - "NETS-NBD: Network Coding-Based Protection," National Science Foundation, \$103,700, Ahmed Kamal, PI, with Co-PI Aditya Ramamoorthy, pending
 - "CPA-ACR: Parallel Algorithms and Software for Large Scale Microarray Data Analysis and Gene Network Interference," National Science Foundation, \$494,853, Srinivas Aluru, pending
 - "Theoretical Foundations and Design of Self-Healing and Fast-Recovery Strategies for Network Infrastructure Protection," US Department of Defense, \$429,587, Lei Ying, pending
-

Progress Report (350 word maximum):

To help foster the cross-disciplinary research needed to address today's complex challenges, CII announced openings for five postdoctoral positions. These full-time, two-year post-docs will work with faculty teams to address research in one or more of the following areas:

1. High-performance computing
2. Data Mining, information integration, semantic web

3. Visualization
4. Information assurance/network modeling
5. Information infrastructure and sensor network applications

The post-docs will work closely with faculty and students on cross-disciplinary research projects to develop the advanced cyberinfrastructure and new research opportunities in bioinformatics, materials informatics, security informatics, and computational fluid dynamics (among others). The CII post-docs are expected to begin as early as August 15, 2008.

Last reporting period, CII announced a joint industry/university project funded by the Grow Iowa Values Fund entitled: "Multi-Touch Technology: Applications to Homeland Security and ISU Research." This spring, the CII helped the PI's negotiate an agreement with ISU's Office of Intellectual Property and Technology Transfer to enable the results of the project to be distributed via open source. The resulting library "Sparsh" facilitates the creation of multi-touch applications on a variety of hardware and software platforms. Details can be found at: <http://code.google.com/p/sparsh-ui/>

On April 3-4, the CII co-sponsored the second annual "Emerging Technologies Conference" (ETC 2008) in Ames. This conference features the research progress of CII member centers, with particular emphasis on the Virtual Reality Applications Center and its graduate program in Human Computer Interaction. ETC2008 kicked off on the evening of April 3 with "IgniteIT" a networking opportunity for Iowa's information technology community to spark imaginations, connect people, create new technology opportunities in Iowa and have fun in the process. More than 200 regional IT professionals attended IgniteIT, which was hosted at the CII Technical Collaboration Facility in ISU's Research Park. On Friday April 4th, ETC2008's was anchored by a keynote address entitled "HCI: Help Create Ideas— Exploring Innovation Leadership" presented by Michael Schrage, an affiliate of MIT's Sloan School, widely published columnist, consultant for the United States government, and author of two critically acclaimed books focused on the social implications of technology. ETC2008 was open to the public and its technology demonstrations attracted over 300 attendees.

INFRASTRUCTURE FUNDS

Publications/presentations based on project:

- On August 9th, the The CyberInnovation Institute (CII) hosted a corporate retreat for Wells Fargo Home Mortgage. Attended by more than 50, the morning session was devoted to CII's leadership describing near-future term technology developments that could impact the finance industry. Several promising relationships were developed as a result.
- CII Director James Oliver was invited to present informational seminars describing the CII and its benefits to the Departments of Aerospace Engineering, and the Department of Electrical and Computer Engineering at ISU.
- Through fall 2007, CII representatives Oliver, Hanovar, Jacobson, and Kothari visited companies including Principal Financial, Wells Fargo, Pella, Deere and Rockwell to describe CII capabilities and benefits of membership.

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

- "Combinatorial and High Throughput Discovery of High Temperature Piezoelectro Ceramics," Air Force Office of Scientific Research, \$82,431, June 15, 2008 to October 30, 2008, Krishna Rajan
 - "Center for Information Protection: NSF IU/CRC Industry Memberships," National Science Foundation, \$60,000, Doug Jacobson
 - CyberInnovation Institute Industry Memberships, Deere & Company, \$50,000.00, January 1, 2008 to December 31, 2008, James Oliver
 - "NETS-NBD: Network Coding-Based Protection," National Science Foundation, \$103,700, Ahmed Kamal, PI, with Co-PI Aditya Ramamoorthy, pending
 - "CPA-ACR: Parallel Algorithms and Software for Large Scale Microarray Data Analysis and Gene Network Interference," National Science Foundation, \$494,853, Srinivas Aluru, pending
 - "Theoretical Foundations and Design of Self-Healing and Fast-Recovery Strategies for Network Infrastructure Protection," US Department of Defense, \$429,587, Lei Ying, pending
-

Progress Report (300 word maximum):

By encouraging partnerships, CII nurtures new synergies among faculty, students, industry leaders, and entrepreneurs to create an entrepreneurial culture that fosters connections and opportunities. This vision means creating a space that encourages collaboration and community. To date, five companies have located at the CyberInnovation Technical Collaboration Facility, building on CII's commitment to economic development in the state of Iowa. Our industry partners now include:

- Members: Deere and Company
- Entrepreneurial teams:
 - Clearsighted, which designs and develops intelligent tutoring systems software to change the ways that future computer-based learning is done.
 - Kung Pow Studios, a custom animation company.
 - Mack Enterprises, a video and sound editing company
 - Visual Medical Solutions LLC, a company that is developing technology that lets medical personnel easily visualize and interact with 3-dimensional images of patients' complex internal systems, helping them plan and prepare for specific operations.

These partnerships build on CII's commitment to economic development in the state of Iowa. Start-up companies can share resources (from the copy machine to student interns) and network with other startups as well as bigger IT companies. Overall these resources ease the start-up process by providing a space to collaborate on the challenges in commercializing new technologies.

As an educational resource, CII's ISEAGE works with high schools and local industry leaders to sponsor programs to engage high school and undergraduate students in IT. In February, 40 students participated in the Cyber Defense competition, defending their computer network from professional "hackers," and in April, students from 220 high schools from across Iowa participated in the first IT-Olympics.

To reflect the new and ongoing activity at CII, we have rewritten portions of its website, including the home page. These updates are important to our outreach and educational mission. Visit the site as these changes continue to take place:
www.cyberi.iastate.edu

INFRASTRUCTURE PROVIDED TO COLLEGES

College of Liberal Arts and Sciences

No new update was provided; previous activity includes

- **Equipment Purchased/Rennoations Made:** Twelve Dual Opteron Compute Nodes

Publications:

"Direct Dynamics Trajectory Study of $F^- + CH_3OOH$ Reactive Collisions. An Important Non-IRC Reaction Path", J.G. López, G. Vayner, U. Lourderaj, S.V. Addepalli, S. Kato, W.A. deJong, T.L. Windus, and W.L. Hase, *J. Am. Chem. Soc.*, 2007, 129, 9976-9985

"Tackling Component Interoperability in Quantum Chemistry Software", F.Peng, M.S. Wu, M. Sosonkina, T.L. Windus, J. Bentz, M.S. Gordon, J. Kenny, C. Janssen, *Proc. of HPC-GECO/CompFrame 2007*, 2007, 101-110

Presentations:

"Monte Carlo simulation of cluster nucleation using quantum mechanical potentials", L.D. Crosby, S.M. Kathmann, and T.L. Windus, 234th ACS National Meeting, Boston, MA, August 19-23, 2007.

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

Received:

- Co-PI on "Simulation of Electronic Non-Adiabatic Dynamics for Reactions with Organic Macromolecules Liquids and Surfaces" funded by NSF-OISE (\$110K per year to Windus)
- Co-PI on "Enabling Petascale Applications in the Chemical Sciences" funded by NSF-OCI (approx. \$60K per year to Windus)

Pending:

- Co-PI on "Mid-Range Instrumentation: Computer Hardware for Computational Science and Engineering", DOE-BES (\$939K)
 - Co-PI on "Nanostructured Organic-Inorganic Hybrid Long-Range Charge Separation System for Photocatalysis and Photovoltaic Applications", DOE-BES (\$3M)
 - Co-PI on "Ames Laboratory Chemical Physics Program", DOE-BES (\$3M)
-

Progress Report (300 word maximum):

During this year, we have had several significant research accomplishments associated with our overall work in combining quantum mechanics with methods traditionally used with classical molecular mechanics. One of these methods is the use of semi-classical trajectories for reactions such as $F^- + CH_3OOH$ collisions. This research, in addition to the chemical insights gained through using quantum mechanics, also represents an example of our collaborative research with leaders in the field. In another major research effort, we have been using dynamic nucleation theory Monte Carlo to examine small water clusters using ab initio methods - their reaction rates, energy distributions and properties. In our quest to reduce the number of quantum mechanical evaluations, we have developed a method to scale configurational probability distributions obtained at high temperatures to lower temperatures without any additional evaluations. These results will be submitted for publication early in the next year.

In addition, we have made significant inroads into the computational science of component development and data definitions. On the component front, we have been tackling the complex issue of developing components for interoperability of integral codes between three computational chemistry codes, NWChem, GAMESS and MPQC. While the final work is still in progress, the interfaces have been defined and a significant portion of the interfaces have been implemented. For data definitions, we have made an extensive description of the Gaussian basis sets and the portal that accesses the basis sets (the Basis Set Exchange). This is a world-wide resource to the quantum chemistry community that is highly used and the work has already been well cited.

Teresa Windus (Startup package)

Publications:

"Components for Integral Evaluation in Quantum Chemistry", J.P. Kenny, C.L. Janssen, E.F. Valeev, and T.L. Windus, *J. Comp. Chem.*, 2008, 29, 562-577

"Implementation of Dynamical Nucleation Theory with Quantum Potentials", L.D. Crosby, S.M. Kathmann, T.L. Windus, *J. Comp. Chem.*, accepted

"High performance computations using dynamical nucleation theory", T.L. Windus, S.M. Kathmann, L.D. Crosby, *J. Phys.: Conf. Ser.*, accepted

Presentations:

"Large Scale Monte Carlo Simulations of Cluster Nucleation Using Quantum Mechanical Potentials", T.L. Windus, S.M. Kathmann, L.D. Crosby, Invited, SciDAC 2008, July 2008

"Monte Carlo Simulations of Cluster Nucleation Using Quantum Mechanical Potentials", T.L. Windus, Invited, University of North Texas, February 2008

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

Only new projects or updated information within the update period are listed here.

Pending:

- Co-PI on "Ames Laboratory Chemical Physics Program", DOE-BES (\$3M)

- Co-PI on "PRAC: Computational Chemistry at the Petascale", NSF (\$31,800 + 620 Million CPU hours)
- Co-PI on "CDI-Type II: Unraveling the Mysteries of Flash NanoPrecipitation – A Cyber-Enabled Multidisciplinary Approach", NSF (\$1,200,000)

Denied:

- Co-PI on "Mid-Range Instrumentation: Computer Hardware for Computational Science and Engineering", DOE-BES (\$939K)
- Co-PI on "Nanostructured Organic-Inorganic Hybrid Long-Range Charge Separation System for Photocatalysis and Photovoltaic Applications", DOE-BES (\$3M)
- Co-PI on "Project/Proposal Title: MRI Proposal for the Development of Next Generation Blue Gene Architectures for High Performance Multi-Scale Computing Applications in Science and Engineering", NSF (\$1,493,416)

Progress Report (300 word maximum):

In one major research effort, we have been using dynamic nucleation theory Monte Carlo to examine small water clusters, small nitric acid clusters and small sulfuric acid clusters using ab initio methods – their reaction rates, energy distributions and properties. In our quest to reduce the number of quantum mechanical evaluations, we have continued developed of a method to scale configurational probability distributions obtained at high temperatures to lower temperatures without any additional evaluations. These results are currently being reviewed for an article in the Journal of Physical Chemistry A. In addition, we have had two papers accepted on the overall methodology and parallel algorithms used in the research.

In addition, we have continued to make significant inroads into the computational science of component development. On the component front, we have been tackled the complex issue of developing components for interoperability of integral codes between three computational chemistry codes, NWChem, GAMESS and MPQC. While the final testing is still in progress, the interfaces have been defined and the interfaces have been implemented. We have also continued to develop new components for combined quantum and molecular mechanics computations.

Finally, we have started extremely accurate computations of oxygen atom with ethylene to study the dynamics of the nonadiabatic crossings on the reactive surfaces. These calculations will represent the most accurate computations of these surfaces and will lead to new insights on the actual mechanisms of the crossings.

College of Engineering:

- **Principle Investigator : Aaron Clapp**

Publications/presentations based on project:

A.R. Clapp, E.R. Goldman, H.T. Uyeda, E.L. Chang, J.L. Whitley, I.L. Medintz, "Monitoring of Enzymatic Proteolysis Using Self-Assembled Quantum Dot-Protein Substrate Sensors," *J. Sensors*, in press.

I.L. Medintz, H. Mattoussi, and A.R. Clapp, "Potential Clinical Applications of Quantum Dots," *Int. J. Nanomed.*, 3, 1-17 (2008)

External funding applied for (indicate received/denied/pending):

- \$31,000 for Equipment for Aaron Clapp, CBE Department
- Denied: Ames Lab seed grant, NIH R01

- Pending/future: NIH R21, NSF CAREER
-

Equipment Purchased/Renovations Made: On PO I7-50307-00, purchased Fluoromax-4; Research spectrofluorometer with 150w ozone free Xe source and power supply.

Also, on PO I7-49358-00, used \$6,653 of the Battelle funding towards the purchase of a unilab antechamber.

Progress Report (300 word maximum):

These funds were used as part of a startup package where the equipment has been in place for approximately 1.5 years.

The Fluoromax-4 is a highly sensitive fluorescence fluorometer which we use to formally characterize fluorescent nanoparticles synthesized in our laboratory. It is a workhorse piece of equipment and invaluable to our research. Recently, it has been used to study protein-protein interactions using fluorescence resonance energy transfer (FRET) where quantum dots donate energy to nearby fluorescent dyes. The emission spectrum provides quantitative distance and orientation information about the associating biomolecules. This is a capability that is greatly enhanced through the use of this instrument.

The mini antechamber is an integral part of the Unilab glovebox system which allows us to safely handle air-sensitive precursor materials such as diethyl zinc. The antechamber is absolutely necessary for transferring materials into and out of the glovebox system. We use the glovebox daily in our work.

- **Principal Investigator(s):** JimAlleman

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

This equipment has provided all faculty the opportunity to benefit from this donation. In FY08, 128 proposals were submitted and 82 funded for a total of \$9,056,980 for CCEE/CTRE staff.

Equipment Purchased/Renovations Made:

Dual Core Intel Xeon 5050 Server for the CCEE Department. New server provides the capability of larger memory storage and real-time computer access for an entire research group.

Progress Report (300 word maximum):

- 1) Five professors within the department (more than 20% of our total faculty) are using the system for archival and backup data storage as well as for routine IT applications tied to individual research and departmental operations. In addition, our department's staff communications specialist also uses the system primarily for large-scale photo and video archiving and retrieval (i.e., see item # 4 below).
- 2) One of these professors (i.e., Charles Jahren) is in charge of the CCEE department's 'distance education' (DE) initiative, and according uses the server as the department's DE-related course file storage repository. A related highlight point on this account is that our department's DE activities represent one of the most rapidly evolving college-level DE operations, with rapidly expanding course offering and enrollment changes, and the use of this server plays a strategically critical role with local hosting of course materials.
- 3) Yet another professor using this system (i.e., David White), uses the server for high-level storage of data tied to his world-class initiative in geo-construction engineering. In this case, Dr. White is also studying the parallel use of this server as a repository for real-time data acquisition via on-site sensors tied to intelligent compaction technologies coupled with in-field geotechnical equipment.

- 4) This server is also used as the primary storage site for all departmental photographs and videos taken during routine student, faculty, and staff events. This information is then used for both developing both print and web-based materials.
-

• **Principal Investigator(s): Jaeyoun Kim**

Publications/presentations based on use of infrastructure:

[1] Jiwon Lee and Jaeyoun Kim, "Numerical Investigation of Quasi-Coplanar Plasmonic Waveguide-based Photonic Components," *Optics Express*, v. 16, pp.9691-9700, 2008.

[2] Jaeyoun Kim, "Surface plasmon-polariton waveguiding characteristics of metal/dielectric quasi-coplanar structures," *Optics Letters*, v. 32, pp.3405-3407, 2007.

[3] Yu Liu and Jaeyoun Kim, "Ultracompact Plasmonic Waveguide Bend Based on Nanoscale Cavity Resonance," *Integrated Photonics and Nanophotonics Research and Applications, IWD2*, Boston, MA, 2008

[4] Jiwon Lee and Jaeyoun Kim, "A Quasi-Coplanar Plasmonic Waveguide for Ultracompact Photonic Integrated Circuits," *Conference on Lasers and Electro-Optics, QTuD6*, San Jose, CA, 2008

Awards received related to infrastructure purchases: N/A

Invention disclosures utilizing infrastructure purchases: N/A

External funding applied for utilizing infrastructure purchases (indicate received/denied/pending):

An Implantable Optical Glucose Sensor (to NSF, pending)

Equipment Purchased/Renovations Made:

- 1) WS-400B 6NPP-Lite Processor Singer Wafer Spin with vacuum pump and SPIN2000-PC interface software from Laurel Technologies (\$5,390)
- 2) FEMTO 40KHZ Plasma System including Leybold D1.5B Vacuum Pump, Food Grade Vacuum hose from Diener Electronic (\$11,185)
- 3) ST-UT2-46_8 Table Assy, Support System, and ACMP-02 Compressor Assy from Newport Corp (\$8,45672)
- 4) Leica Microscope with Camera and Vibration Isolation Table from north Central Instruments (Paid \$4,071.75, \$20,267.85, and \$4,243.50)
- 5) GB-08 Labmaster 130 (2500/1000) with single purification and analyzer from M Braun Inc (\$31,416.90)
- 6) 4DOF WAM Basic Turn-Key System with modular 3 DOF Wrist and Barrethand Robot from Barrett Technology (\$54,968.28)

Progress Report (300 word maximum):

The research focuses on a novel plasmonic waveguide structure for future applications in photonic integrated systems. Plasmon waveguides are attractive for their ability to confine electromagnetic waves on subwavelength scale, which is not possible in purely optical waveguides. Numerous plasmonic waveguiding structures have been demonstrated. Many of them require, however, extremely small feature size or high aspect ratio which makes their implementation prohibitively difficult. We invented a new plasmonic waveguiding structure called "quasi-coplanar plasmon waveguide (QCPW)."

The results of 2D numerical studies reveal that QCPW has many desirable characteristics: (1) The fabrication QCPW involves only standard lithographic and deposition processes. (2) It supports a wide range of wavelength, especially the important "telecommunication bandwidth". (3) The size of propagating modes is far below wavelength scale. (4) The tolerance of the modal characteristics to the fabrication imperfection is good. These 2D results are published and presented [2,4].

Since the QCPW structure is partially open in lateral directions, its performance in "perturbed 3D operations", such as propagation through waveguide bends or couplers, needs to be confirmed with 3D simulations. The results show that: (1) 2D mode analysis and 3D propagation simulation results match well each other. (2) The coupling between QCPW becomes negligible when the waveguides are separated by more than 500 nm, (3) The bending loss becomes negligible when the bend radius becomes greater than 8 microns. (4) The QCPW supports a new type of mode called the half-mode. It is useful for implementing plasmonic interferometers. (5) By covering part of the QCPW structure with metal films, we can increase the transmission through an ultracompact waveguide bends by a factor of 2. These results are published and presented in 2008 [1,3].

In the 2nd half of 2008, we will seek the mechanism for bending efficiency improvement.

A two-section glove box from MBraun Inc. for research in organic and bioelectronics of material, have also been purchased, which are sensitive to air and humidity.

The Barrett WAM is a state of the art robot arm with 7 degrees of freedom in the arm and an additional 7 degrees of freedom in the hand. It is highly dexterous and has human-like grace and dexterity. Two WAM arms were purchased and they will be used to construct an upper-torso humanoid robot. The robot will be used to conduct cutting edge research in autonomous and developmental robotics.

Previous information:

- Andrew Hillier. \$120,000 is currently encumbered on this fund. It is match support for the Keck Grant. Dr. Andy Hillier has placed a purchase order to AJA International, Inc. for an ATC Series Combinatorial/Conventional Sputtering System. The W. M. Keck Foundation established the W. M. Keck Laboratory for High Throughput Atom-Scale Analysis to drive the frontiers of combinatorial science and atom-scale materials research. This lab provides sample preparation and characterization facilities in support of the research activities performed by members of the Institute for Combinatorial Discovery as well as researchers throughout Iowa State University and the public. The laboratory provides unique materials preparation and characterization facilities that support a range of research and educational projects.
- Dr. James Alleman purchased a Dual Core Intel Xeon 5050 Server for the Civil Construction and Environmental Engineering Department. The new server provides the capability of larger memory storage and real-time computer access for the entire research group.
- Dr. Song-Chang Kong purchased time on the Lighting Cluster (high performance computing). This computer time will allow him to perform combustion process modeling which is vital to his effort to find better ways to burn bio-renewable fuels in engines cleanly, efficiently and effectively. If we want to increase use of bio-renewable fuels to lessen our dependence on petroleum based engine fuels, this kind of research must occur.
- Dr. Krishna Rajan spent \$81,000 of the Battelle funds to purchase a Nano Test Platform and NTX Controller with High Temperature option and High temperature extension. The equipment was purchased from Micro Materials Limited. The total cost of the equipment was \$188,905. The benefits of the equipment are various including the ability to collaborate with several other faculty members at ISU and support industrial sponsored projects in the areas of mechanics of materials and high temperature behavior of materials.
- Dr. Richard LeSar spent \$80,000 of the Battelle funds to purchase a portion of the large computer system. This equipment is essential for Dr. LeSar's work on computational materials science, providing the ability to model a wide range of materials behavior. Results of this work enable the ability to collaborate with other ISU researchers and to develop strong and active ties with industry and governmental research efforts.

BATTELLE FUNDING: PROGRESS REPORT

Update Period: July 01, 2006 – December 31, 2006
Title:
Platform: Advanced Manufacturing
Platform Chair): Ron Cox
Platform Expenditures: \$ -
Platform Funding: \$100,000
 Project Allocated: \$100,000
 Project Obligated: \$ -
 Inf. Allocated: \$ -
 Inf. Obligated: \$ -

Progress Report:

We continue to partner with John Deere to provide lean training to some of their suppliers. This is funded by Deere and CIRAS as part of our NIST/MEP grant. We have been funded by EDA to investigate biobased product supply chains. This work will begin this summer. We are working with the Economics Department at ISU to review the Battelle report and the Monitor report. We are looking at a simplified approach to analyzing clusters/supply chains to rank Iowa clusters and to determine what are the top 2 or 3 we should be focusing on. We are ranking these based on recent growth rate, importance to the Iowa economy, wages, and the extent of the supply chain. We hope to have this completed by the 10th or 11th. (We anticipate that ag equipment will end up in this short list.). We are nearing completion of the ag equipment supply chain proposal and plan to proceed with this effort, unless the analysis (item 3) steers us somewhere else. I will add some verbiage on the lean institute. I do not want to complete a detailed analysis of an institute. I would rather spend funds to implement lean/six sigma/TOC projects with suppliers and then survey OEMs and suppliers on what works and does not with the approach. Based on what we learn, we will offer our opinion on how this might be structured. Does that work? We have created a Supply Chain Advisory Committee from members of the CIRAS Advisory Council to provide advice to us as we proceed. We still have almost all of the funds available from central ISU for the supply chain work that was awarded a year or two ago; We have not spent this yet because I want to make certain we are all on the same page with the IDED Advanced Manufacturing Group

BATTELLE FUNDING: PROGRESS REPORT

Update Period: January 01, 2008 – June 30, 2008
Purpose: Endowed Chairs
Purpose Funding: \$2,000,000
Purpose Expenditures: \$ 500,000
Purpose Obligations: \$1,500,000

Progress Report:

The previously reported W. Eugene Lloyd Chair in Toxicology in the College of Veterinary Medicine has been awarded to Dr. Peter Nara. Dr. Peter Nara is currently co-founder, president and CEO of Biological Mimetics, Inc., a Maryland-based company that commercializes pharmaceutical products. Nara is also a former section chief of the Vaccine Resistant Diseases section at the National Cancer Institute, U.S. National Institutes of Health, in Washington, D.C.

In December 2007, \$500,000 was committed to match a \$1 million gift from the estate of Charles Schafer to establish the Charles Schafer Chair in Biorenewable Energy Science and Technology in the College of Engineering. Negotiations are underway with a faculty member at an institution in Texas, with a target date to announce the appointment by the end of this calendar year.

In July 2008, the College of Veterinary Medicine received a \$1 million pledge from a donor who has requested anonymity to establish a yet-to-be-named Chair in Biomedical Sciences. This chair will also be matched by \$500,000 from the state appropriated Battelle funds. The College has identified a recipient for this chair and is currently in negotiations with that individual. No target date for an award has been established, but it is also likely to occur by calendar year end.

Discussions continue with other prospective donors regarding the remaining \$500,000 in matching dollars.

UNIVERSITY OF IOWA

The University of Iowa
2008 Annual Economic Development Report
Submitted to
The Board of Regents

The Battelle Reports related to the biosciences, advanced manufacturing and information technology and the resulting Battelle and Grow Iowa Values Funding (GIVF) have proven critical to the development of a strong UI infrastructure to promote economic development consistent with our mission and the goals of the State of Iowa. This funding allowed us to reorganize our Technology Transfer and Economic Development programs through the formation in 2005 of the IOWA Centers for Enterprise. This virtual organization now functions as integrated programs providing infrastructure and service to enhance technology transfer and commercialization of UI technologies, new company formation, support of Iowa companies and workforce development. Six individual units at UI currently comprise this virtual Center:

- The University of Iowa Research Park (formerly Oakdale Research Park) (UIRP)
- The Technology Innovation Center (TIC)
- The University of Iowa Research Foundation (UIRF)
- The John Pappajohn Entrepreneurial Center (JPEC)
- The University of Iowa Small Business Development Center (SBDC)
- The Office of Corporate Partnerships (OCP)

The individual and collective accomplishments of these units are highlighted as part of this report to illustrate how we have responded to the state's expectations for enhancing economic development.

1. Impact of UI Economic Development Activities on the Economic Growth in Iowa.

a. Job creation and wealth in Iowa.

University of Iowa Research Park (UIRP) and Technology Innovation Center (TIC)

The combined activities of these units support established corporations by providing access to key University research infrastructure including internet access and access to libraries, animal housing and research facilities, core facilities to support chemistry, biology, computation, and instrumentation, and access to faculty collaborators and to students as interns or employees. Nineteen established companies have located at the UIRP since 1993, and nearly 100 companies have been admitted to the TIC since 1984. On June 30, 2008, 10 established companies and five University anchor laboratories were located at the UIRP, and 15 tenants were in the TIC.

A milestone will be achieved in FY09 with the completion in November of the UI BioVentures Center at the Research Park. This state-of-the-art biosciences incubator facility will allow the University to provide laboratory facilities to support technology based companies emerging from the commercialization of faculty research as well as other start-up companies drawn to the area by the substantial R&D assets of the University. This 35,000 square-foot business incubator contains 20 wet laboratories and 16 offices for lease to new life science and biotechnology business ventures. GIVF funding was critical in enabling the design and construction of this facility, which now allows us to capitalize on University assets. This new facility will occupy one wing of a building that will also contain 45,000 square-feet of leasable space for commercial tenants operated by a private developer in our region. It should prove attractive to start-up companies as they grow, mature and “graduate” from the BioVentures Center and Technology Innovation Center yet still desire close proximity to University assets.

In FY 2008, the 51 active Iowa companies affiliated with UI Research Park and Technology Innovation Center¹, reported 1,597 employees earning an average salary of \$58,000. The five UI anchor laboratories on the Research Park reported another 365 employees, for a total workforce of 1,962 employees. The 1,962 employees of companies and labs affiliated with the UI research park and business incubator reported living in 91 communities in 29 Iowa counties, a regional labor shed covering almost one-third of the State. (See Figure 1.) The annual payroll exceeds \$100 million resulting in an estimated \$5.7 million in State income taxes in 2007. The affiliated companies and labs also reported employing 115 UI students, and 175 employees had earned doctoral degrees.

In FY08, TIC reported five new tenants (UIQI², JL MediTech, Bio::Neos, Terpenoid Therapeutics and QI²) while five firms (Soligence, Corridor Media Group, Actual Safety, KemPharm and Applied Fullerene) “graduated” from the incubator. The UIRP reported three new corporate tenants (Noel-Levitz, Optherion and Cargill Animal Nutrition) and construction was initiated for a new University Hygienic Laboratory facility. This facility is due to open in FY 2010.

¹ This includes active companies at the Technology Innovation Center and/or at the UI Research Park, and graduate companies located in Iowa.

Over the past three years, 19 companies were formed, resulting in 55 jobs created, as a part of GIVF projects. The table below summarizes this information.

Table 1. Number of new companies formed FY06-FY08 and jobs created as a part of GIVF projects funded.

Company	# of Employees	GIVF Gap Funded
Optherion*	5	Y
Terpenoid Therapeutics*	1	Y
iOptics	0	Y
Reppenix	1	Y
Exemplar	5	Y
OMR Sensors	3	Y
ASL Analytical*	3	Y
QI2*	3	Y
Advanced Infoneering*	5	N
JL Meditech*	2	N
Componica*	2	N
Cellular Engineering Technologies*	5	N
Actual Safety, Inc.*	3	N
Soligence Corporation*	1	N
KemPharm	2	N
The Thomas Group*	1	N
UIQI2*	4	N
Bio::Neos*	3	Y
NGI/Vivakor*	6	N

*Indicates company is in the TIC and/or UIRP.

Note: Non-Gap funded companies received support from UIRP and/or TIC.

Note also that Optherion, Reppenix, and UIQI2 benefited from Battelle funds.

- b. Institutional activities and services which indirectly promote economic development, such as training provided to staff of local economic development agencies.**

University of Iowa Research Park and Technology Innovation Center

A variety of educational and training programs are offered for UIRP/TIC tenants and faculty investigators including SBIR/STTR Phase I/Phase II grant writing workshops, UI Career

Services and student internship programs, a seminar on working with the news media, and others.

The University of Iowa Research Foundation

The University of Iowa Research Foundation (UIRF) - a 501(c)3 corporation - commercializes University of Iowa developed technologies and inventions through licensing and new venture formation. UIRF collaborates regularly with other economic development organizations and individuals, including, the IDED Technology Commercialization Committee, the Iowa City Area Development Group (ICAD), the Southeast Iowa Venture Fund (SIVF) and Iowa entrepreneurs and investors.

The John Pappajohn Entrepreneurial Center (JPEC)

Formed in 1996, JPEC is an innovator in delivering interdisciplinary courses and specialized life-long learning programs to meet the unique needs of aspiring entrepreneurs and leaders. JPEC offers a wide variety of academic programs, continuing education and technology commercialization support that benefit Iowa companies. Included in indirect support are teacher training for youth entrepreneurship, conferences and speaker series, and programs, seminars and workshops. These are detailed in Appendix A of this report.

College of Engineering

The UI College of Engineering is a leader in the Project Lead the Way Iowa program. Project Lead the Way is a program that seeks to make learning in the sciences, technology, engineering and mathematics (STEM) an attractive process for young people. The program has grown to 23 middle schools and 65 high schools in Iowa. The College hosted its second year of Summer Training Institutes for Project Lead the Way with 23 teachers participating in Principles of Engineering and 8 teachers participating in Biotechnical Engineering. The College also increased the number of students (371 applications) requesting college credit for Project Lead the Way courses completed by participating high schools.

The College also provided joint scholarships with ISU College of Engineering to winning recipients in the regional Future City Competition, MATHCOUNTS state competition, the Eastern Iowa Science and Technology Fair, and the Invent Iowa Invention Convention.

IOWA Centers for Enterprise Senior Staff Board and Related Affiliations

IOWA Centers senior staff participated in Iowa economic development organizations in a variety of important ways in FY08. These include:

STATEWIDE:

- Iowa Department of Economic Development (IDED)
 - Board, Bioscience Alliance of Iowa (BAI)
 - Board, Iowa Information Technology Council (ITC)
- Iowa Biotechnology Association, Board of Directors
- Technology Association of Iowa, Board of Directors
- Professional Developers of Iowa, Member
- Iowa Rural Development Council, Member
- Iowa Careers Consortium Advisory Board, Member
- Prolog Ventures, Iowa Deal Flow Committee
- Iowa Venture Capital and Entrepreneur Conference, Planning Committee
- Iowa First Capital Fund, Advisory Board

LOCAL AND REGIONAL:

- Priority One, Board of Directors
- Iowa City Area Development Group, Board of Directors
- Iowa City Area Chamber of Commerce, Member

2. Please provide the following information for FY 2008: (If your institution utilizes additional metrics specific to your institution's specialized areas of research or service, please include them here.)

The metrics listed in Table 2 are for FY08 unless indicated otherwise.

Table 2. Metrics describing UI economic development activity FY08

a. Number of disclosures of intellectual property	68
b. Number of patent applications filed	
• U.S. Applications	71
• National Applications	21
• Patent Cooperation	17
• Total Applications	109
c. Number of patents issued	65
d. Number of license and option agreements executed on institutional intellectual property	22
• In Iowa	4
e. Number of license and option agreement yielding income	143
f. Revenue to Iowa companies as a result of licensed technology	\$1.23 million
g. Number of startup companies formed	2
• In Iowa	2
h. Number of companies in research parks and incubators	51
i. Number of new companies in research parks and incubators	7

j. Number of employees in companies in research parks and incubators	1962
k. Royalties and license fee income	\$23.6 million
l. Total sponsored funding	\$386.2 million
m. Corporate sponsored funding for research and economic development <ul style="list-style-type: none"> • In total • In Iowa 	\$36.3 million \$3.0 million
n. Iowa special appropriations for economic development in the following categories <ul style="list-style-type: none"> • Annual state appropriations for ongoing programs (such as research parks, SBDE, IPRT, IDM, Metal Casting Center) • Grow Iowa Values Fund appropriations • Battelle appropriations (FY06; Spent in ensuing years) 	\$259,206 \$1,925,000 \$8,410,000
o. Estimated jobs created by SBDC clients	125

3. Please describe the ways in which your institution is engaged in the following activities (For example, what is the nature of the outreach and service activities? Which units provide it? What kinds of people and organizations benefit?)

a. Direct and hands-on technical assistance to businesses and entrepreneurs

The University of Iowa Research Foundation

The UIRF works directly with UI faculty, entrepreneurs, and investors in selecting, evaluating and developing new companies. This includes:

- IP analysis for viability of proposed company products
- IP protection strategies and execution; UIRF fronts the cost of IP protection
- Due diligence on the viability of UI spinout companies
- Business model development for UI spinout companies
- Provide *Entrepreneurs-in-Residence* for high new priority UI companies
- Provide gap funding for highest priority projects
- Facilitation of financial investment in the company
- Licensing to UI spinout companies
- Extensive mentoring and education of faculty in new company formation

UIRF also formed a *New Ventures Formation Group* to screen and evaluate UI technology pre-company concepts in order to most effectively select and move forward new companies. This group meets monthly and includes private sector entrepreneurs, venture investors, intellectual property attorneys, and economic development professionals and University representatives from the Tippie College of Business and Carver College of Medicine.

UIRF launched its Entrepreneur-in-Residence (EIR) and New Ventures Formation Group programs in FY07 and got major traction in FY08. EIRs included:

- EIR Randy Weiss, *Startup Midwest Seed Fund* (entrepreneur, investor)
- EIR Rich Lineback, formerly at *Pearson*, (entrepreneur)
- EIR Bob Karr, formerly at *Pfizer*, (CEO, entrepreneur)

As a direct result of this work and since February, 2008, UIRF vetted ~16 company concepts, and of those, 6 are moving forward. These included formation of Terpenoid Therapeutics, a cancer drug discovery startup company, and Exemplar Genetics, a unique joint venture between UI and Trans Ova Genetics of Sioux Center focused on developing animal models for serious human conditions. Potential companies are moving forward related to immunomodulation for therapeutics, biofilm technology for treating antibiotic resistance, technology related to bone loss and injury prevention, and magnetic materials for batteries, fuel cells and photovoltaics.

John Pappajohn Entrepreneurial Center

The John Pappajohn Entrepreneurial Center (JPEC) provides one-on-one counseling to technology based entrepreneurial companies. JPEC also uses undergraduate and MBA student teams to conduct product assessments, strategic marketing assessments, and other components of an entrepreneurial business plan. Some 30 consulting projects were conducted in FY08. In addition, JPEC supports the efforts of the UIRF to vet and spin out companies based on faculty technology by providing strategic business advice and participating in business development assessments. Several programs related to hands-on technical assistance are described below. For a description of the rich array of JPEC programs aimed at supporting Iowa entrepreneurship, please see Appendix A.

- **Iowa Venture Capital and Entrepreneurship Conference** JPEC is a major sponsor and organizer of the Iowa Venture Capital and Entrepreneurship Conference, in partnership with IDED, the other Pappajohn Centers and Equity Dynamics.
- **FastTrac Entrepreneurial Training Program** JPEC has partnered with the Iowa Community College system and UNI to deliver statewide the nationally acclaimed FastTrac® entrepreneurial training programs of the Ewing Marion Kauffman Foundation of Kansas City. The initiative prepares aspiring entrepreneurs to launch new ventures and existing companies to grow their businesses. Since the inception of the partnership in fall 1997, over 3,000 Iowans have completed the entrepreneurial training programs.
- **Entrepreneurial Ventures Group** JPEC conducts each year a seminars series, the Entrepreneurial Ventures Group, aimed at aspiring entrepreneurs that attracts students, faculty and members of the community at-large.

- **Wellmark Venture Capital Fund JPEC** is the regional administrator of the \$5M Wellmark Venture Capital Fund that supports the creation and growth of new businesses throughout the state. JPEC screens applicants, performs due diligence, evaluates business concepts, and assists applicants with their business plans. JPEC partners with area angel investors, equity fund managers, lenders, the Iowa Department of Economic Development, and the Small Business Administration to help business owners secure additional venture funding.

Small Business Development Center

The Small Business Development Center (SBDC) offers one-stop assistance to current and prospective small business owners by providing high quality, one-on-one counseling that is tailored to the needs of individual clients. The SBDC conducts research, counsels, and trains business owners in management, financing, and operating small businesses, and provides comprehensive information services and access to experts in a variety of fields. Educational programs are offered on topics that include taxes, accounting systems, and business planning. It also offers a wide range of training seminars concerning business skills and issues, and assists small businesses in securing Small Business Administration backed loans. In FY08, the SBDC served 233 clients, assisted 29 business startups, and assisted clients in obtaining \$2.3 million in SBA loans.

Office of Corporate Partnerships

The Office of Corporate Partnerships serves as a primary contact for corporations, state industry trade associations and economic developers interested in collaborating with UI. This office works closely with IDED and state industry trade organizations in marketing the resources of the State of Iowa. In FY 2008, the office arranged 42 visits to Iowa companies and to local, regional and state economic development groups, and with help from UI's college liaisons, identified technical assistance for companies seeking UI expertise.

b. Direct economic development assistance to Iowa communities

John Pappajohn Entrepreneurial Center

- **Secondary Teacher Training** The Jacobson Institute for Youth Entrepreneurship and JPEC partner with state, regional and local educational agencies to offer entrepreneurship training to educators around the state of Iowa.
- **Be Your Own Boss Entrepreneurship Summit** – The Jacobson Institute for Youth Entrepreneurship, UI JPEC, UI Office of Corporate Partnerships, UI I-Envision

Student Organization, Community Vitality Center of Ames and the Iowa Workplace Learning Connection, jointly sponsor this one-day entrepreneurial conference open to Iowa high school students participating in the Jacobson Institute's Statewide Business Plan Competition.

- **Community College Partnerships** – JPEC has designed a distance education program which will allow students of several community colleges (Iowa Western Community College, Western Iowa Tech Community College, Indian Hills Community College, and Iowa Lakes Community College) to earn a Certificate in Entrepreneurial Studies as part of their degree programs. The partnerships with these community colleges will also allow JPEC to bring entrepreneurship education and business support to rural Iowa and will help Iowans from around the state more easily access the business and economic development resources of the UI.
- **Okoboji Entrepreneurial Institute** – JPEC conducts an annual institute at UI's Lakeside Laboratories at Lake Okoboji that provides hands-on experiential learning for 40 undergraduates from UI, ISU, UNI, Buena Vista College and Iowa Lakes Community College about what it takes to launch an entrepreneurial enterprise. This year, one of the start-ups evolving from the institute went on to win prizes in state and national business plan competitions and is seeking venture investment for the company.

University of Iowa Research Foundation

- **SIVF (Southeast Iowa Venture Fund)**: Public and private sector individuals in the southeast Iowa counties of Des Moines, Lee, Henry and Louisa are creating a joint economic development program. York continued to talk with this group and provide feedback on plans and programs for the purposes of creating a new venture capital fund.

c. Economic development services provided by the research parks, incubators or similar service units

The University of Iowa Research Park and Technology Innovation Center

Corporate tenants of the Park benefit from sustained relationships with UI in the form of access to specialized research facilities, library access, faculty consultation, research collaboration and access to students as interns and employees. UI resources also provide smaller companies with assistance with business planning, identifying professional service providers, introductions to local and state government agencies and the regional business community, help in identifying potential sources of investment and other funding and communications. For more information about these programs see Section 1a. For a list of

companies and developers associated with the Research Park and Technology Innovation Center please see Appendix B.

Research Park Magnet Laboratories

In addition to the core university facilities, four specialized UI laboratories reside within the Research Park that provide services on a fee-for-service basis to Park tenants, other Universities and private industry. These units provide Iowa with unique capabilities that IDED and local economic development entities have utilized in recruitment of outside companies to the Park, the region and the state. These facilities include:

1. Center for Advanced Drug Development (CADD)

The Center for Advanced Drug Development (CADD) is a division of the University of Iowa College of Pharmacy that offers contract analytical and quality assurance services to the pharmaceutical and biotechnology industry. CADD is U.S. Food and Drug Administration (FDA) registered and current Good Manufacturing Practices (cGMP) compliant and works closely with the Division of Pharmaceutical Service (DPS), housed on the central University campus. The focus of both CADD and DPS is the manufacture and control of clinical supplies of new drugs entering initial Phase I clinical trials. They are particularly attractive to smaller pharmaceutical/biotechnology companies that have new drugs moving into the clinic but have not developed their own manufacturing capabilities.

CADD and DPS have an extensive recurrent client base of mainly smaller biotechnology companies, manufacturers of pharmaceutical excipients, and a growing pool of U.S. and foreign pharmaceutical firms. CADD and DPS are particularly well positioned to work directly with discoveries from Iowa university research laboratories, thereby providing an opportunity to hasten technology transfer and shorten the time to market. The presence of these FDA registered facilities along with the Center for Biocatalysis and Bioprocessing makes UI unique among US universities in its ability to provide this type of infrastructure for pharmaceutical and biological products.

2. Center for Biocatalysis and Bioprocessing (CBB)

The Center for Biocatalysis and Bioprocessing is a research and education center reporting to the Vice President for Research that links university scientists from 6 different colleges who have focus on biocatalysis and bioprocessing. The Center also performs contract production for the fermentation and bioprocessing of products for the food, alternative energy, pharmaceutical and biotechnology industries and is capable of working from small molecules to complex proteins, including such products as alcohols, vaccines, antibiotics, anticancer drugs, polymers, biochemicals, enzymes, pharmaceutical intermediates and derivatives of bioactive compounds. It can produce products under Good Laboratory Practices (GLP) conditions at a scale of up to a 1000 liter fermentor, and under U.S. Food and Drug Administration current Good Manufacturing Practices (cGMP) conditions (products produced under cGMP conditions can be used in human clinical trials) at a scale of up to 300

liters. The CBB is central to the University's efforts to attract industrial fermentation companies to Iowa; the IOWA Centers and CBB have worked in close concert with IDED and other Iowa economic development agencies to recruit companies to Iowa.

3. National Advanced Driving Simulator (NADS)

Using the world's most advanced driving simulator, the NADS-1, researchers at the University of Iowa's National Advanced Driving Simulator (NADS) have defined the state-of-the-art in driving simulation, vehicle performance and cognitive systems engineering. This national shared-use facility has working collaborations with federal and state governments, industry and the military. It is available for use by any group interested in utilizing driving simulation as a tool to advance productivity, promote vehicle safety and foster innovation. Selected projects include studies of cell phone distraction in driving, younger driver risk, affect of pharmaceutical products on driver function, electronic stability control, crash avoidance, development of software for an agricultural equipment driving simulator, and customer satisfaction of ride quality during tractor driving tasks. Collaborators include the federal government, automotive companies and earth moving and agricultural equipment companies, including Deere.

4. University Hygienic Laboratory (UHL)

The University Hygienic Laboratory (UHL) has provided health and environmental laboratory services to the State of Iowa for more than 100 years. The UHL performs 175 different clinical laboratory tests in maternal screening, newborn screening, virology, serology, microbiology, molecular biology, blood lead screening and biological and chemical terrorism response. UHL uses state of art chemical, biologic and enzymatic analytical methods. These laboratories also serve as important training facilities and can perform fee for service analyses for companies at the UIRP and throughout Iowa.

4. Collaboration for economic development. Please briefly describe two or three examples of major economic development collaborative efforts with other entities such as Regent universities, Iowa community colleges, the Iowa Department of Economic Development, Iowa Workforce Development, other state agencies, other non-governmental organizations in the state.

Start-up Company to Commercialize Animal Models of Human Disease

UI, Trans Ova Genetics of Sioux Center and the IDED have collaborated to support a start-up company that will develop animal models of human disease, an important tool for the research community in its effort to discover and develop new cures for diseases. The effort began with the work of UI's Michael Welsh, MD, an investigator who has studied the development of cystic fibrosis (CF) for more than 15 years. Dr. Welsh developed an animal

model for this disease as a part of his investigation. The collaboration with Trans Ova Genetics will allow a mechanism for translation for broader use as a research tool. A \$400K Battelle award also supported a part of this development. (See Section 6 of this report.) A new company was formed, Exemplar Genetics, in which Trans Ova owns a minority share and Dr. Welsh serves as a scientific advisor. The IDED is supporting the further development of the business via a recent \$1M grant that IDED announced will be awarded to UI to support three related projects: 1) development of a small pig facility to support the work, 2) development of a molecular biology laboratory to support the work, and 3) further R&D into the CF model and perhaps one additional animal model of human disease. Dr. Welsh developed intellectual property that is being licensed to Exemplar by the UIRF as a part of this overall effort.

UI-ISU Medical/Materials Science Collaboration

The University of Iowa and Iowa State University collaborated to develop bio-materials to address a large unmet medical need. The project combines the UI orthopedic surgery expertise of Todd McKinley, MD and James Martin, PhD with the ISU materials science expertise of Surya Mallapragda, PhD, Mufit Akine and Zhiquan Lin, PhD. The team will develop and test materials required to prevent post-traumatic osteoarthritis.

IAWind

The University of Iowa, and particularly the College of Engineering, took the lead in establishing the Iowa Alliance for Wind Innovation and Novel Development (IAWind), a virtual organization established to promote the wind energy industry in Iowa. This collaboration includes:

- The Regents Universities
- Iowa Community Colleges
- State Agencies (IDED, DNR, Office of Energy Independence)
- Federal Agencies (NSF, DOE)
- Iowa Wind Industries
- Community Partners (Iowa Energy Center, Iowa Wind Energy Association)

The organization comprises components related to policy, research, training and education, and testing facilities. The impetus for this organization arose as the College of Engineering was assisting the Iowa Department of Economic Development in its efforts to recruit wind energy companies to the State, and the need to identify and integrate the state's wind energy assets became obvious. For more information: <http://www.iawind.org>.

Shared DNA Sequencing Instrumentation

UI and ISU biological scientists have recognized the need for partnering to facilitate the purchase of major scientific equipment that benefits both programs for human health and plant science. They worked jointly to acquire parallel DNA sequencers--instruments capable of deciphering DNA sequences at the rate of millions to billions of bases in a single run. These two instruments, one housed at UI and the other at ISU, have unique advantages and provide benefit for a large number of researchers engaged in biotechnology related science. Together, the two instruments place UI and ISU at the state-of-the-art in DNA sequencing technology, which will allow them to be more competitive in seeking federal funding and in supporting economic development efforts related to biotechnology.

5. Please provide the following information about Grow Iowa Values Fund projects for FY 2008:

- a. Identify and briefly describe each project or initiative which received GIVF funding in FY 2008 including information on outcomes and progress made**
- b. Identify metrics which were used to measure outcomes for each project and report progress on each metric for FY 2008.**
- c. Provide a description of the sources of the matching institutional dollars for each GIVF-funded project**

GIVF Program Summary	Description of Program	FY08 - Expenditures From FY07 GIVF and FY08 GIVF	Match Funds (source)	Progress through June 30, 2008 ROI DATA
<u>VP for Research</u>	<p>These funds have been instrumental in enabling UI to expand the very small economic development infrastructure in the TIC by developing the IOWA Centers for Enterprise and enabling integration with UIRF and JPEC and SBDC.</p> <p>Funds were used to support salaries for key administrative personnel, investing in facilities at the research park and providing critical start up funding for key faculty whose research is anchored in biotechnology.</p>	<p>FY 2008 \$1,202,667</p>	<p>1. VPR Discretionary Fund \$76,334 2. Ryan Companies - Private company in-kind contribution \$525,000</p>	<p>AVP, UIRF, JPEC, SBDC co-located on central campus allowing greater integration of programs and increased productivity.</p> <p>UIRF moved from Research Park to central campus resulting in greater access for faculty customers.</p> <p>Increased collaboration with IDED in support of IDED programs in recruitment of companies to Iowa.</p> <p>Increased outreach to state promoting UI engagement in economic development.</p>
<u>Office of Corporate Partnerships</u>	<p>These funds provided salary and administrative support for the Office of Corporate Partnerships (OCP) and the UI Research Park.</p> <p>Funds were used for salaries and fringe benefits of the Office of Corporate Partnerships (OCP), operating expenses, travel, marketing materials, memberships and other expenses of the OCP.</p>	<p>FY 2008 \$478,930</p>	<p>1. VPR Discretionary Fund \$29,466 2. Ryan Companies - Private company in-kind contribution \$210,000</p>	<p>Relationships with 42 Iowa companies established or advanced.</p> <p>Outreach to state and biotech industry accomplished via exhibits at Iowa State Fair and at the Iowa pavilion at the Biotechnology Industry Organization (BIO) annual meeting.</p> <p>Initial UI Research Park, Bio Ventures Center marketing plan completed.</p> <p>Website overhauled.</p> <p>Operations focus shifted to support UI Research Park and Bio Ventures Center, where greatest impact can occur.</p>
<u>Technology Innovation Center and University of Iowa Research</u>	<p>These funds were used primarily to design and build a 35,000 sf Bio Ventures Center. The building will be owned by the developer and operated by the University as a life sciences business incubator. Total cost of the building when constructed will be approximately \$8 million. Construction is scheduled to be completed in November 2008, with occupancy soon thereafter. In addition the</p>	<p>FY 2008 \$2,359,287</p>	<p>1. UI Research Park contribution \$33,416 2. Ryan</p>	<p>Bio Ventures Center (BVC) construction 65% complete; scheduled for completion 11/08.</p> <p>When completed, BVC will have 20 wet</p>

<p><u>Park</u></p>	<p>developer is constructing a three story 45,000 sq speculative wing that will house more established life science and other technology-based companies.</p> <p>Funds were used for design and construction of the BioVentures Center and contractual services support for advancing the development of the Research Park.</p>		<p>Companies – Private company in-kind contribution \$1,146,227</p>	<p>labs and 16 office/dry labs available for life sciences start-up companies.</p> <p>Five companies (Vertex, Cellular Engineering Technologies, Terpenoid Therapeutics, ASL Analytical, and Exemplar Genetics) slated to occupy 8 wet labs and 9 dry labs/offices in BYC when it opens—almost 50% of leasable space.</p> <p>Collaboration with Ryan Companies (the developer) provides 45K sf of “accelerator” space at no cost to UI when fully occupied.</p>
<p><u>John Pappajohn Entrepreneurial Center</u></p>	<p>These funds were used by the John Pappajohn Entrepreneurial Center to support the development, implementation, and expansion of entrepreneurship programs and support new venture formation and small firm growth.</p>	<p>FY 2008 \$180,160</p>	<p>Entrepreneurial Center in-kind contribution \$90,079</p>	<p>Conducted 31 consulting projects resulting in estimated 46 jobs created.</p> <p>59 people participated in FastTrac® Entrepreneurial Training programs in Iowa City resulting in an estimated 10 business start-ups and 88 jobs created.</p> <p>13 applications processed for Wellmark VC Funds resulting in 3 companies funded.</p> <p>51 student teams enrolled in Bedell Learning Lab since 2004 (27 in FY08) resulting in 11 new business start-ups.</p>
<p><u>I-GROW—Subramanian</u></p>	<p>GIVF I-GROW funds were used as part of a faculty start up package that allowed the University to attract Dr. Venkiteswaren (Mani) Subramanian to serve as director of the UI Center for Biocatalysis and Bioprocessing (CBB). Prior to coming to UI, Dr. Subramanian was Global R&D Director of Biotechnology, Bioprocessing, and Bioinformatics for Dow Chemical Company. He brings 24 years of industrial experience and an entrepreneurial approach to the University. This start-up package was essential to attract this highly entrepreneurial faculty member to the University of Iowa.</p>	<p>FY 2008 \$546,562</p>	<p>1. Biosciences Initiative Fund \$235,358 2. VPR Discretionary account \$113,051</p>	<p>CBB achieved \$2.75M in revenues in FY08. This is a nearly 5-fold increase compared to FY05.</p> <p>CBB supported work of other GIVF/Battelle projects: Weiss lab, Ophtherton, ASL Analytical, O'Doniso lab.</p>

<p><u>University of Iowa Research Foundation (UIRF)</u></p>	<p>GIVF funds were used to engage Venture Advisors and Entrepreneurs-in-Residence (EIRs) to assist the UIRF in building viable spin-out companies and to evaluate UI technologies for company formation potential as well as overall commercial potential. UIRF matching funding was used to add extensive business development resources to these efforts, develop new methods of quickly vetting people and opportunities, pay for crucial market intelligence resources, cover new related IP expenses, and to manage the overall effort. These activities are summarized below:</p> <ol style="list-style-type: none"> 1. UIRF launched its Entrepreneur-in-Residence (EIR) and venture advisor program in FY07 and got major traction in FY08. 2. UIRF developed a rigorous, staged "go/no go" due diligence and decision process that is followed by presentation to industry experts and venture investors that ultimately and ideally culminates in financial investment in the company. 3. UIRF also developed substantial know-how and methods around determining the type of management resources needed for a given company stage of development. 4. UIRF launched an advanced technology marketing program that included preparing new marketing materials for ten of the top technologies and then marketing those technologies at BIO 2008. Feedback was invaluable in making plans for further development of these technologies. 5. UIRF also launched a web-based marketing effort that will go substantially beyond the passive listing that most universities use, and this is in progress. 	<p>FY 2008 \$813,296</p>	<p>UI Research Foundation in-kind contribution \$429,713</p>	<p>CBB served 54 clients in FY08, including 6 in Iowa and 3 in the UIRP.</p> <p>CBB supported IOWA Centers and IDEED in recruiting bioscience companies to Iowa; hosted at least 3 companies, and provided support for others.</p> <p>With assistance of EIRs, reviewed more than 200 technologies for top business development candidates.</p> <p>Vetted 16 company concepts and identified top company candidates (6 emerged).</p> <p>EIR Bob Carr engaged as CEO for spin-out Terpenoid Therapeutics.</p> <p>EIR Dave Dorheim engaged to take lead in moving Ledy patent portfolio forward as a business.</p> <p>Evaluated over 300 UI technologies, patents or portfolios of patents for IP strength and commercial potential so that resources could easily be directed to top priorities, and new company concepts could be identified.</p> <p>Ten top biotech technologies marketed aggressively at BIO 2008; meetings with 50+ companies.</p>
<p><u>Arnold Seed Grant</u></p>	<p>ASL Analytical (ASL) is developing instrumentation for monitoring chemical signatures in harsh environments, such as glucose monitoring and industrial monitoring.</p> <p>In FY08: ASL Analytical (ASL) made significant progress along a number of critical fronts. Progress included: 1) advancing its noninvasive hypoglycemic nocturnal alarm, 2) initiating development of a continuous, real-time bioreactor monitor for the biopharmaceutical industry, 3) evaluating customized prototype</p>	<p>FY 2008 \$33,976</p>	<p>UI Chemistry in-kind Grant contribution \$16,988</p>	<p>Series A funding obtained.</p> <p>\$1M STTR award obtained.</p> <p>ASL occupies temporary space at UI Research Park.</p> <p>ASL will occupy space in BioVentures</p>

	<p>instrumentation for non-laboratory sensor applications, and 4) designing novel optoelectronics based on unique semiconductor materials.</p>			<p>Center when it opens in 11/08. New hires: 1 full-time Ph.D. Chemist, 1 part-time accountant, .45FTE senior scientist. Beginning 7/08 1 post-doctoral position. Phase I SBIR award obtained. Business relationship established with VisionQuest.</p>
<p><u>Abramoff Seed Grant</u></p>	<p>Developing software and hardware products for inexpensive, automated and remote screening of the human eye for prevalent diseases such as diabetic retinopathy. In FY08: The latest data indicates that computerized screening is approaching the level and quality that can be achieved by human screening, a key factor in switching to an entirely automated approach. Numerous discussions were held this past year for both software and camera partners, and extensive academic collaborations continue. A product development effort was established with VisionQuest, a research and development company, via a Phase I SBIR. Development of a software "requirements definition document," part of the process in developing commercial-grade software, is underway. Evaluating business models for moving forward with a marketable product.</p>	<p>FY 2008 \$11,932</p>	<p>UI Ophthalmology Grant in-kind contribution \$5,966</p>	
<p><u>Leddy Seed Grant</u></p>	<p>An extensive technology and patent portfolio with innovations that relate to batteries, fuel cells, hydrogen production, and acetone sensing. In FY08: UJRF engaged an external technology assessor (Dave Dorheim) to perform an extensive assessment to determine market opportunity, business strategy, and IP protection strategy moving forward on UI Chemistry professor Johna Leddy's magnetic materials technology inventions. The assessment revealed significant opportunity related to both rechargeable and disposable batteries, with the possible application of this technology to numerous other industry sectors. The assessment also revealed the need to focus on IP protection to fully cover desired products, and the need to perform validation studies on the some of the results. UJRF engaged Dave Dorheim as an Entrepreneur-In-Residence to raise money to perform these studies, and to begin developing the business plan and engaging commercial partners. UJRF will manage the IP strategy, and expects that these collective efforts will gain traction in the second half of CY2008.</p>	<p>FY 2008 \$50,000</p>	<p>UI Chemistry Grant in-kind contribution \$25,000</p>	<p>Entrepreneur-in-Residence engaged to take a lead in moving business forward. This portfolio is broad and deep, and has significant commercial potential.</p>

<p>Otherion</p>	<p>Supplemental funding to substantial Battelle funds supporting this effort. (GIVF funding in FY06 and FY07 also supported this project.)</p>	<p>FY 2008 \$19,791</p>	<p>UI Ophthalmology in-kind contribution \$9,895</p>	<p>See description of progress under Question 6, related to Battelle funding.</p>
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6. Please provide the following information about Battelle-funded projects for FY 2008:

- a. Identify and briefly describe each project or initiative which received Battelle funding in FY 2008, including information on outcomes or progress made.
- b. Identify metrics which were used to measure outcomes for each project and report progress on each metric for FY 2008.

Battelle Program Summary	Description of Program	Funding Amount	Allocation to Projects	Expenditures (July 1, 2006 – June 30, 2008)	Progress through June 30, 2008
	To create a joint venture partnership between The University of Iowa, regional economic development leaders and the private sector to expand and develop a new Technology Incubation Center on the UI Research Park		New TIC: \$1,419,397	\$50,792	Metric: Construct a 35,000 sf life sciences incubator, and begin operations in support of start-up companies. Progress: Construction of the new 35,000 sf BioVentures Center began Fall 2007 and is approximately 65% complete. Scheduled to be completed November 2008 with occupancy shortly thereafter. Shell of 45,000 sf speculative wing to be completed as new tenants define fit-out needs. With construction and fit-out of combined 80,000 building we will surpass the original metric for this project.
Infrastructure		\$2,720,000	Myriad Purchase: \$1,300,000	\$1,300,000	Metric: Purchase and renovate an accelerator-scale building for support of UI economic development infrastructure. Progress: Building at Myriad Plaza on the University of Iowa Research Park was purchased. This building allowed the University to provide space for a California based start-up company.
			Myriad Fit-out: \$603	\$603	The purchased Myriad building was renovated to accommodate the California based start-up company. (See description under "Core Platforms" for other renovation expenditures.)

Battelle Program	Description of Program	Funding Amount	Allocation to Projects	Funding Spent To Date	Progress through June 30, 2008
<p>Endowment</p>	<p>Description: To create an endowed professor-and/or entrepreneur-in-residence program to attract world-class, entrepreneurial talent in the core platform areas.</p>	<p>\$2,000,000</p>	<p>Long term Investment Pool \$2,000,000</p>	<p>\$2,000,000</p>	<p>Metric: Hire or retain two world-class scientists with high potential to produce innovations from their research that can be commercialized. Progress: One endowed professor (\$100K/year for three years) position was filled allowing us to retain Dr. Greg Hageman, one of our most prolific and entrepreneurial professors (July 1, 2007). Without this endowed professorship, we would have lost him to a University on the East coast. This professor recently obtained a \$15M NIH grant and is affiliated with Optherion, a UI spin-out company that also recently closed on a \$37M venture capital investment. Funding was \$50K from interest income and \$50K match from the academic department. A second endowed professor (\$100K/yr for three years) position was filled allowing UI to recruit a world class researcher. Dr. Bernd Fritsch was appointed chair of The Department of Biological Sciences and Iowa Entrepreneurial Endowed Professor, effective July 1, 2008. He is internationally known for his research in neurology of the inner ear and joins a world class research group at the UI Cochlear Implant Clinical Research Center. He brings with him an SBIR award for development of neuronal tracers. Funding was \$50K from interest income and \$50K match from the university.</p>

Battelle Program Summary	Description of Program	Funding Amount	Allocation to Projects	Expenditures (July 1, 2006 – June 30, 2008)	Progress through June 30, 2008
	Description: To provide financial assistance in the form of grants to accelerate the transformation of new and ongoing research and development initiatives in the core platform areas into commercial opportunities.	\$3,690,000	Myriad Fit-out: \$1,019,060	\$1,019,060	<p>Metric: Purchase and renovate an accelerator-scale building for support of UI economic development infrastructure.</p> <p>Progress: Renovation of space in Myriad Building completed. NGI moved into this space in early 2007. Upon vacating this space for space in a new building, the UI Center for Advanced Drug Development will occupy the Myriad Building space, or, alternatively, the space will be used for a life sciences company or UI life sciences research unit.</p> <p>Metric for each of the core platforms:</p> <ul style="list-style-type: none"> • Advance the science in a UI core research strength area that has potential for commercialization. (Emphasis is on capacity building.) • When merited, spin-out a company based on innovations from the science. • Support the spin-out toward viability and sustainability. <p>See following pages for details of progress.</p>
Core Platforms			8 Core Platforms: \$2,670,940	\$1,966,504	

Progress through June 30, 2008				
Core Platform PI Details	Title of Battelle Proposal	Battelle Funds Awarded	Expenditures (July 1, 2006 – June 30, 2008)	Platform
Abdel-Malek Team	Commercialization of Santos, a Human Simulation Environment	\$370,000	\$279,177	IT, AM
				<ul style="list-style-type: none"> • Several releases of pre-beta software versions have been installed at our industry partners' facilities and all are being used. • Architecture development for the beta version of the Santos™ environment has continued.

<ul style="list-style-type: none"> • Software integration has centered on integration of functionality developed for several Virtual Soldier Research (VSR) program's corporate and government partners within the pre-Beta version of the Santos™ environment. Key new components include a dynamics controller, motion capture playback controller, advanced inverse kinematics motion control, joint manipulation, forward kinematics motion control and avatar customization. • Market research for Santos, Inc – a spin-out company founded by the inventors – has focused on product lifecycle management. • Market penetration strategies identified include corporate research partnerships, federal government research partnerships, corporate software licensing opportunities, and federal government licensing opportunities. • Technology licensing discussions with UIRF are in progress. • An initial business plan for Santos, Inc. has been completed. • Santos, Inc. applied for an STTR award from the Office of Naval Research (it was awarded in August 2008) to develop a software utility to lighten battlefield load and optimize mission performance for Marine squads. • An entrepreneur-in-residence has assisted in evaluating the business opportunity. 					
<ul style="list-style-type: none"> • Established assays for TNFa and Luc reporter expression in virus-infected HeLa cells. • Produced and characterized a TNFa gene-targeted reporter cell line. • Ten primary porcine fibroblasts with high cloning potential were established. • Initial AAV transduction studies were conducted. • Dual reporter targeted cell line is under construction. • Invention disclosure filed with UIRF, released to inventors and patent application pending. • Developing business model for <i>RepGenix</i>. • Discussing business opportunities with potential partners. • Preparing a STTR grant application in collaboration with <i>RepGenix</i> to fund production of targeted transgenic cells. 	Bio-genetics-transgenic cell lines	\$233,561	\$400,000	Designing Transgenic Cells for Biomedical Applications	Leno Team
<ul style="list-style-type: none"> • Identified three peptides to use as first candidate drugs. • Submitted an NIH grant to support the preclinical studies. • Identified suitable space to house the synthesizer and operate under 	Bio-imaging & drug	\$215,693	\$400,000	Development of Peptides for Diagnosis and	O'Dorizio Team

	Therapy of Cancer			discovery	<p>cGMP conditions and purchased state-of-art peptide synthesizer that should be suitable for cGMP peptide manufacturing .</p> <p>Completed procedures to establish lab as a cGMP peptide lab; established cGMP procedures for synthesis of first peptide.</p> <ul style="list-style-type: none"> Hired peptide chemist who is expert in synthesis and purification of small peptides. Recruited new faculty member into Carver College of Medicine with expertise in radiolabeling of peptides. Obtained grant from Carver Foundation to label a peptide for use in PET imaging; currently conducting preclinical animal imaging experiments and designing the clinical protocol for PET imaging of neuroendocrine tumors in humans. Finalizing the Exploratory Investigational New Drug (IND) application for PET imaging using cGMP grade peptide synthesized and purified in O'Dorisio laboratory. Working closely with the UI Center for Advanced Drug Development (CADD) to verify molecular identity and purity of first peptide. The peptide will then be packaged under cGMP conditions ready for radiolabeling at a clinical site. Obtained R21 grant from National Cancer Institute to conduct an imaging trial in children and young adults with recurrent solid tumors. Protocol now awaiting final approval by UI Institutional Review Board.
Shields	Iowa Neuro-Musculoskeletal Therapeutic Training System: Impact on Commercialization in Iowa	\$130,000	\$82,187	Bio-therapeutic/medical device	<ul style="list-style-type: none"> Developed the computer drawings (CAD) of a hinged-type knee brace that will attach to the leg below and above the knee. This has been manufactured and is operational. Designed a brake power controller in the inventor software. Included in this design is a controller circuit that uses modern surface mount components. Designed all algorithms. Deployed the software LABVIEW to carry out the algorithms in this prototype system. The software is fully operational but will require continued updates. Identified 2 Iowa companies interested in manufacturing the final product: SENSR (Elkader, IA) and EASY STAND (Sheldon, IA). With assistance of the UIRF, developed plan for company called "Therapeutics Unlimited." Preparing 4 SBIR and STTR proposals to be submitted to the NIH.

<p>Van Beek Team</p>	<p>Iowa Imaging-Based Multi-center Trials Organization</p>	<p>\$400,000</p>	<p>\$240,663</p>	<p>IT; Bio-imaging</p>	<ul style="list-style-type: none"> • A main objective is to create a comprehensive medical image and data archive with a web interface enabling multi-center clinical trials to easily access and transfer data. • Established a solid database that can be used for clinical trials. • Developing security, data transfer and web application. • Hired 1 FTE (two people; both IT programmers) to work with VIDA Diagnostics (North Liberty, IA) to explore pros and cons of commercially available or free software versus an in-house developed archiving/reporting database. • Established additional partnership with Compleware in North Liberty. • Established spin-out company, QI2, Inc. • Established dedicated office space at Technology Innovation Center, close to VIDA Diagnostics. • Produced cell line with appropriate Cystic Fibrosis (CF) genetic profile to use these cells to generate a "knock out" CF pig. • Introduced the most common human CF mutation into pig cells that were then used to clone the first ever "knock in" pigs • First CF mutation pigs born March 2008. They have already developed the intestinal, pancreatic and liver disease that is often seen in human infants with CF. We are optimistic they will develop the lung disease that is the cause of most mortality and morbidity in CF. • With Trans Ova Genetics (Sioux Center, IA) established spin-out company, Exemplar Genetics, Inc. • \$1M IDEED grant approved for UI to 1) further develop the CRF animal model and perhaps other models of human disease, 2) establish a pig facility in Johnson County that will support such R&D, and 3) establish a molecular biology lab at the UI Bio Ventures Center that will also support such R&D. The pig facility and molecular biology lab will be used by Exemplar. • Exemplar has applied for an SBIR award from the National Institutes of Health. • Exemplar has 5 prospective employees located in Iowa City and Sioux Center, including a company president, director of R&D, production manager and two animal technicians. Additional personnel are projected to be added soon.
<p>Welsh</p>	<p>Porcine Models of Human Disease</p>	<p>\$400,000</p>	<p>\$400,000</p>	<p>Bio-genetics-animal models</p>	

Griffith Team	Development of AD5-Trail as a Cancer Therapeutic	\$400,000	\$377,003	Bio-genetics-cancer therapy	<ul style="list-style-type: none"> Commenced testing on the next lot of clinical vector. This testing will be performed by AppTec. Have completed human testing in 1st three dose levels (9 pts.) Contracted several companies about further developmental and licensing. Discussions with one major pharmaceutical company are continuing regarding the combination of the AD5-Trial vector with one of its anticancer agents. Two grant applications were submitted to the Department of Defense to find potential clinical trials.
Weiss Team	Design and Testing of Novel Toll-like Receptor 4-Directed Immunomodulators	\$170,940	\$138,220	Bio- drug delivery, genomics	<ul style="list-style-type: none"> Using leveraged NIH funds, prepared for animal experiments that will soon follow by completing the following: prepared and purified needed amounts of wild-type and variant endotoxin:MD-2 complexes, tested <i>in vitro</i> for quality control characterization and prepared chemically cross-linked complexes. Testing in <i>in vivo</i> mouse model showed dramatic protective effects when administered before airway exposure of mice to virulent <i>Yersinia pestis</i>. Another Experiment showed partial protective effects against pneumonic tularemia, another biodefense target. Results show promise for blunting of epidemic outbreaks. <i>In vivo</i> mouse model testing against influenza infection is forthcoming. <p>Note: This project is still at an early stage of basic research.</p>

7. Optional: If desired, please include observations regarding:

- a. **Emerging trends in university economic development and technology transfer;**
- b. **Availability of startup and venture capital for technology entrepreneurs; and**
- c. **Suggestions for new programs or activities that could further enhance the impact of university technology transfer and service on creation of jobs and wealth in Iowa.**

a. Emerging Trends- There has been a clear focus among major research universities to enhance their infrastructure necessary to more effectively move important research findings towards commercialization for the benefit of society as well as to maximize economic value. More venture and angel investors are engaging with university tech transfer groups. National conferences held by early stage investors and conferences held by university tech transfer groups are merging. Experienced business and new venture development professionals are becoming common place in university tech transfer organizations, and university tech transfer conferences are presenting relevant business and new venture sessions. Successful university research parks have vibrant laboratory-based business incubators that provide both facilities and active business support programs for their start-up companies. Most successful university business incubators are constructed debt free, or very close to it. Graduate space for incubator companies – sometimes called accelerator space – is becoming a mainstream program to support companies as they graduate from life science and IT incubators.

b. Available Capital- There is an excess of capital for good business concepts. Iowa entrepreneurs/companies that have difficulty raising money tend to lack the criteria that venture investors seek, such as addressing a large market opportunity, and/or having an experienced management team. This situation is gradually improving in Iowa. UIRF is regularly sought out by top tier national venture capital firms to evaluate opportunities in our portfolio, and 3 companies were formed with such groups in the past 18 months.

c. New Programs- The top priority is finding people with highly specific high-tech market sector experience and new high-tech company formation experience. This is particularly true in research related to discovery and development of pharmaceuticals and other new therapies for human health as well as for medical devices, both areas of significant strength at the University of Iowa. This environment requires intense vetting of disclosed technologies to maximize success and minimize expenditures on technologies with lower prospects for economic value.

Appendix A

The John Pappajohn Entrepreneurial Center

Youth Outreach - Jacobson Institute for Youth Entrepreneurship

The Jacobson Institute for Youth Entrepreneurship is a comprehensive program that enriches K-12 students' lives through classroom and practical educational experiences. Created in 2007 through a generous gift from the Richard O. Jacobson Foundation, the Institute is built on three key components – teacher education, development of innovation curricula, and outreach opportunities. The Jacobson Institute provides opportunities for both instruction and practice in entrepreneurship and gives educators the tools they need to teach the “entrepreneurial mindset” – that is, to encourage creativity, innovation, critical thinking, and problem solving, and to prepare students for success in the worlds of business and entrepreneurship.

The Jacobson Institute believes that building entrepreneurial spirit in today's youth is a critical component for sustaining the country's long-term economic health. By strengthening their ability to think creatively and providing the tools for understanding the entrepreneurial process, youth are more inclined to consider business ownership as a career. The University of Iowa's youth entrepreneurship initiatives began in fall 2000 as part of the John Pappajohn Entrepreneurial Center's (JPEC) plan to support entrepreneurial engagement at all ages.

Teacher Training

The Jacobson Institute for Youth Entrepreneurship and JPEC work directly with middle school and high school teachers by training them to incorporate entrepreneurship into their classrooms and providing them with ongoing support and curriculum resources throughout the school year. The two-day entrepreneurship seminar provides in-depth training on topics including opportunity recognition, innovation and creativity, market research and analysis, entrepreneurial finance, and business planning.

Designed to simulate an entrepreneurial-based classroom, the training provides educators with hands-on learning experiences enabling them to leave the training fully equipped to implement entrepreneurial education in their respective classrooms. Coupled with ongoing support from the Jacobson Institute, participants stay abreast of additional training opportunities and are directly connected to the latest entrepreneurial resources.

Open to all teachers interested in or currently teaching entrepreneurial concepts, this program is being taught in various disciplines including, careers, business, science, mathematics, marketing, art, family and consumer sciences, and agriculture.

YouthBizCentral Online Curriculum

Educators incorporating entrepreneurship into their classrooms have access to a customized, innovative, internet-based entrepreneurship curriculum. In addition to downloading PowerPoint presentations, lesson plans, and activities on key entrepreneurial topics, teachers

develop a fully customized business planning template geared to meet the specific needs of their classroom. Through completion of the business planning process, students using the YouthBizCentral curriculum learn firsthand the skills necessary for starting and running a successful business.

Through support from the Carver Trust of Muscatine, IA, the Jacobson Institute is currently developing discipline-based modules for math, science and agriculture to better meet the entrepreneurship education needs of these classrooms. Furthermore, teachers nationwide will have the opportunity to enroll in graduate level online entrepreneurship courses offered by the Jacobson Institute in partnership with JPEC.

Outreach

JPEC is committed to providing entrepreneurial education, consulting services, and lectures to the community at large in order to contribute to the growth of existing and emerging businesses. Through the following programs, JPEC impacts the economic development of the region and the state of Iowa.

Conferences & Speaker Series

The John R. Hughes Lecture Series, sponsored by Hills Bank & Trust, Inc., the Sandage Entrepreneurial Speaker Series, sponsored by the Sandage Charitable Trust, and the Community Lectures, a component of the Entrepreneur-in-Residence program, sponsored by the Iowa State Bank & Trust Company, bring successful entrepreneurs to campus to share their experiences with UI students and community members. The Iowa Venture Capital and Entrepreneur Conference and Collegiate Entrepreneurs Iowa Conference provide seminars and networking opportunities for aspiring entrepreneurs, business owners, investors, and students.

Academic Program

• Enrollment

- Summer 2007: 8 Classes/Sections, 104 Undergraduates, 25 Graduate Students
- Fall 2007: 28 Classes/Sections, 1364 Undergraduates, 8 Graduate Students
- Spring 2008: 30 Classes/Sections, 1647 Undergraduates, 31 Graduate Students

• I-Envision Student Organization

- Number of members 75
- National / Regional Conferences Attended 4

• Business & Entrepreneurship Learning Community

- Number of participants/members 50
- Service Learning Projects Completed 16

Client Consulting Services

Wellmark Venture Capital Fund

- Applications processed 13
- Companies funded 3

• Applications in process	3
Consulting Projects	
• Number of projects	31
• Industries include: <i>Biotech, manufacturing, medical, information technology, Ag services, retail</i>	
• Estimated Job Creation	46
FastTrac® Entrepreneurial Training Program	
Statewide (including Iowa City):	
• Classes	10
• Total participants	202
Iowa City area class:	
• Classes	2
• Total participants	59
• Estimated Job Creation	88
• Estimated New Business Starts	10
Recent Graduates	
• Estimated Job Creation	27
• Estimated New Business Starts	18
Assorted Other Clients	
Various consulting projects and clients not directly involved in the programs above.	
• Estimated New Business Starts	30
Bedell Entrepreneurship Learning Lab	
Enrollment Since Inception in May 2004	
• Number of student teams (including 27 in the past year)	51
• Number of student participants	43
Impact	
• Total students impacted	103
• Estimated Job Creation	11
• Estimated New Business Starts	11
Business Plan Competitions	
• Pappajohn New Venture Business Plan Competition	
J&J Solutions (John Slump & Jared Garfield)	\$5,000
Dream Day Registry (Stephanie Hall)	\$2,500
The Grocery (Blake Peterson)	Regional Finalist

- **Volding Business Plan Competition**

Dream Day Registry	\$2,000
Drew Holdings, Inc. (Nathan Drew)	\$1,500
J&J Solutions	\$1,500
Build-A-Bowl (Tracey Ites)	\$1,500
Slanty Shanty Records, LLC (Corey Gingerich)	\$1,000
Entrepreneurial Connections (Jim Guarino)	\$1,000
The Grocery	\$1,000
Olmecca Studios (Erik Ramirez)	\$1,000

- **Pappajohn Iowa Business Plan Competition (2007)**

TMT Manufacturing	3 rd Place
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- **National Business Plan Competitions**
 - J&J Solutions (Jared Garfield & John Slump)
 - Northwest Venture Championship, Boise State University
 - 2nd Place, Elevator Pitch Competition
 - Finalist, Undergraduate Track
 - New World Ventures Business Plan Competition, University of Nebraska
 - 3rd Place, Undergraduate Division
 - Venture Adventure Business Plan Competition, Colorado State University
 - 3rd Place, Undergraduate Division

- **Hubert E. Storer Engineering Student Entrepreneurial Startup Awards, College of Engineering**

Entrepreneurial Connections (Jim Guarino)	\$10,000
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Date	Event	# of Attendees
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Programs, Seminars and Workshops

8/5-8/10/2007	Okoboji Entrepreneurial Institute	9
9/24/2007	Fall FastTrac® Class - Washington	11
9/26/2007	Fall FastTrac® Class - Iowa City	15
9/27/2007	Entrepreneurial Ventures Group (EVG): <i>Manny Villafana, Kips Bay Medical, Inc.</i>	120
9/28/2007	Entrepreneur-in-Residence (E-in-R): Manny Villafana	3
9/28/2007	E-in-R: Tom Bedell	6
9/28/2007	E-in-R: Merle Volding	6
10/10/2007	Iowa Venture Capital & Entrepreneur Conference	124
10/19/2007	Sandage Speaker Series: <i>Wendy Gady, Pohaku, Inc.</i>	80
10/25/2007	Overcoming Call Reluctance Workshop	18
10/30/2007	Quickbooks I Workshop	14
11/6/2007	I-Envision Guest Speaker: Discerning Eye	90
11/7/2007	Sales, Use & Local Option Taxes Workshop	4
11/7/2007	Franchise Business Ownership Workshop	4
11/7/2007	EVG: <i>Thomas Argentieri, Wyeth Pharmaceuticals</i>	71
11/9/2007	Quickbooks II Workshop	8
11/9/2007	Sandage Speaker Series: <i>Bob Reed, DataComm International & Donald Kutyna, US Air Force</i>	120
11/9/2007	E-in-R: Tom Bedell	4
11/9/2007	Okoboji Meeting with Students	15
11/14/2007	Business Expenses & Deductions Workshop	4
11/14/2007	Celebrating Entrepreneurship: A Panel Discussion	24
11/28/2007	Small Business Tax Workshop	5
12/5/2007	Small Business Tax Workshop	0
12/7/2007	1/2 Day Entrepreneurship Boot Camp	67
2/1/2008	BELL Round table lunch	25
2/20/2008	Okoboji Informational Meeting	35
2/21/2008	EVG: <i>Peter Donnelly, IOWA Centers for Enterprise</i>	75
2/21/2008	Spring FastTrac® Class	33
2/22/2008	Sandage: <i>Monica Nassif, Caldrea Company</i>	69
2/22/2008	E-in-R: Monica Nassif	6
2/27/2008	SBA Presentation (SBDC)	30
2/29/2008	BELL Round table lunch	25
3/4/2008	ISB&T Community Lecture: <i>Don Schoen, MediNotes, Corp.</i>	206
3/7/2008	Statewide Pappajohn New Venture Business Plan Competition	15
3/26/2008	SIFE Regional Competition	11
3/27/2008	EVG: <i>Tom Detmer, CenterStone Technologies</i>	115
3/28/2008	BELL Round table lunch	25
4/4/2008	Collegiate Entrepreneurs Iowa Conference at The University of Iowa	335
4/4/2008	SBIR/STTR Lecture	35
4/7/2008	Sales, Use & Local Option Taxes Workshop	11
4/11/2008	E-in-R: Scott Heiferman	7
4/14/2008	Business Expenses & Deductions Workshop	8
4/21/2008	Reporting Sole Proprietor Income Workshop	5
4/25/2008	1/2 Day Entrepreneurship Boot Camp	50

4/28/2008	Payroll & Employment Tax Workshop	6
5/1/2008	UI Volding Business Plan Competition	21
5/1/2008	Franchise Business Ownership Workshop	8
5/8/2008	Business Succession Planning Workshop	35
5/13-5/15/2008	SIFE National Competition (Chicago)	5
	TOTAL PARTICIPANTS	2,018

Appendix B

Name of Business or Other Entity Served	City and County where this Project is in Place		University Unit that interacted with business or other entity	Activity
	City	County		
Actual Safety, INC.	Coralville	Johnson	Technology Innovation Center	BUSINESS INCUBATOR TENANTS
Applied Fullerene	Coralville	Johnson	Technology Innovation Center	
ASL Analytical	Coralville	Johnson	Technology Innovation Center	
Bio::Neos, Inc.	Coralville	Johnson	Technology Innovation Center	
Cellular Engineering Tech.	Coralville	Johnson	Technology Innovation Center	
Componica, LLC	Coralville	Johnson	Technology Innovation Center	
Corridor Business Journal	Coralville	Johnson	Technology Innovation Center	
Digital Artefacts, LLC	Coralville	Johnson	Technology Innovation Center	
IAGEN, LLC	Coralville	Johnson	Technology Innovation Center	
Innomatix, LLC	Coralville	Johnson	Technology Innovation Center	
J. L. MediTech	Coralville	Johnson	Technology Innovation Center	
K2 Technologies	Coralville	Johnson	Technology Innovation Center	
KemPharm, Inc.	Coralville	Johnson	Technology Innovation Center	
Pharmacom Corporation	Coralville	Johnson	Technology Innovation Center	
Ramaanchar Technologies, Inc.	Coralville	Johnson	Technology Innovation Center	
Soligence Corporation	Coralville	Johnson	Technology Innovation Center	
Terpenoid Therapeutics, Inc.	Coralville	Johnson	Technology Innovation Center	
The Thomas Group	Coralville	Johnson	Technology Innovation Center	

UIQ12	Coralville Coralville Coralville	Johnson Johnson Johnson	Technology Innovation Center Technology Innovation Center Technology Innovation Center	RESEARCH PARK TENANTS
Innovative Software Engineering LMS North America Stanley Environmental, Inc. Vangent, Inc. Integrated DNA Technologies, Inc. Pearson Educational Measurement Vivakor, Inc. Noel-Levitz Cargill International Optheron, Inc.	Coralville Coralville Coralville Coralville Coralville Coralville/Iowa City Coralville Coralville Coralville/Cedar Rapids Coralville	Johnson Johnson Johnson Johnson Johnson Johnson Johnson Johnson Johnson Johnson	UI Research Park/TIC Graduate UI Research Park/TIC Graduate UI Research Park UI Research Park UI Research Park/TIC Graduate UI Research Park UI Research Park UI Research Park UI Research Park UI Research Park	RESEARCH PARK TENANTS
AISST, Inc. Garvin Consulting Services	Coralville North Liberty	Johnson Johnson	Technology Innovation Center Technology Innovation Center	OTHER BUSINESS INCUBATOR GRADUATES ACTIVE IN IOWA
Ecolotree, Inc. Accredo Therapeutics Corcoran Communications,	Lowden, North Liberty Iowa City Iowa City	Cedar, Johnson Johnson Johnson	Technology Innovation Center Technology Innovation Center Technology Innovation Center	

				DEVELOPERS
Inc.	Iowa City	Johnson	Technology Innovation Center	
Buckle Down Publishing, Inc.	North Liberty	Johnson	Technology Innovation Center	
Bio-Research Products, Inc.	Cedar Rapids	Linn	Technology Innovation Center	
afile Systems, Inc.	Cedar Rapids	Linn	Technology Innovation Center	
CompuTerra, Inc.	Iowa City	Johnson	Technology Innovation Center	
Entrepreneurial Learning Systems	Des Moines	Polk	Technology Innovation Center	
Caviforce Technologies, Inc.	Coralville	Johnson	Technology Innovation Center	
Sebesta Blomberg & Assoc., Inc.	Coralville	Johnson	Technology Innovation Center	
HomeSafe	Coralville	Johnson	Technology Innovation Center	
Integrated DNA Technologies, Inc.	Coralville	Johnson	UI Research Park/TIC	
The Patient Education Institute	Coralville/Iowa City	Johnson	UI Research Park/TIC	
Police Law Institute	Coralville/North Liberty	Johnson	UI Research Park/TIC	
Myriad Developers, Inc.	Cedar Rapids	Linn	UI Research Park	
TMD, L.L.C.	Solon	Johnson	UI Research Park	
Midwest Development & Invest. Corp.	Fairfield	Jefferson	UI Research Park	
Liberty Growth	Iowa City	Johnson	UI Research Park	
Hunter Companies	Cedar Rapids	Linn	UI Research Park	
S & S Developers	Iowa City	Johnson	UI Research Park	
Andersen Construction	North Liberty	Johnson	UI Research Park	
Kevin Hanick	Iowa City	Johnson	UI Research Park	

<p>Ryan Companies, US NAI Iowa Realty Weitz Companies Southgate Development</p>	<p>Cedar Rapids Des Moines/Cedar Rapids Des Moines Iowa City</p>	<p>Linn Polk/Linn Polk Johnson</p>	<p>UI Research Park UI Research Park UI Research Park UI Research Park</p>	<p>PROSPECTIVE TENANTS</p>
<p>Pharmaceutical Firm Iowa Lions Eye Bank Almac Sciences Stem Cell Sciences Kinseth Hospitality Specialized Education Service Provider Simpson Biotech Exemplar QI2 Drug Development Start-up Medical Device Start-up Drug Development Start-up Animation Start-up Educational Services Start-up Consumer Device Start-up</p>	<p>Champaign-Urbana Iowa City Craigavon City London North Liberty Iowa Taiwan Iowa City Iowa City Fairfield Iowa City San Diego Los Angeles Coralville Cedar Rapids</p>	<p>Illinois Johnson UK UK Johnson Iowa Taiwan Johnson Johnson Jefferson Johnson California California Johnson Linn</p>	<p>UI Research Park UI Research Park UI Research Park UI Research Park UI Research Park UI Research Park UI Research Park Technology Innovation Center Technology Innovation Center Technology Innovation Center Technology Innovation Center Technology Innovation Center Technology Innovation Center Technology Innovation Center Technology Innovation Center</p>	<p>PROSPECTIVE TENANTS</p>

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UNIVERSITY OF NORTHERN IOWA



**University of Northern Iowa
Annual Economic Development and Technology Transfer Report
FY 2008**

Section 1. UNI's Economic Development Activities to Enhance Economic Growth in Iowa

UNI has distinguished its economic development efforts by being highly successful in several specialized areas. Targeted areas in which the University has realized significant growth and achievement include: community and economic development; market research; environmental research and service; metal casting; biobased lubricants; executive development; new Iowans; and entrepreneurship. UNI offers a variety of programs, housed within the Business and Community Services (BCS) division, which emphasize hands-on assistance to meet the needs of both businesses and communities. BCS employees are literally at the front doors of clients in all 99 counties, utilizing the resources of the University to address the needs of those they serve. We are also able to bring these needs back to our university community – the faculty, staff and students – all of which play critical roles in providing practical assistance. Outcomes achieved in key economic development and tech transfer programs during FY 2008 are highlighted below:

- Provided service in all 99 counties to more than 3,500 business and community clients.
- Involved 191 faculty members and 2,520 students in delivery of these services.
- Leveraged each \$1 invested by the state with \$6 in federal or private support.

Entrepreneurship and Business Incubation

- UNI's 3 incubator/accelerator programs and MyEntreNet helped start or expand 79 ventures, creating 321 jobs.
- MyEntreNet now boasts more than 2,000 rural and 700 urban, actively engaged users.
- More than 500 entrepreneurs attended 35 webinars.
- Disaster recovery assistance was provided to approximately 700 northeast Iowa small businesses via MyEntreNet and a resource tent placed in Parkersburg.
- 11 student businesses were tenants in the John Pappajohn Entrepreneurial Center's Student Business Incubator and 25 additional student entrepreneurs were virtual tenants.
- One of the UNI John Pappajohn Center's student incubator tenants has been selected as a finalist in the Global Student Business Competition.

Technology Transfer

- UNI faculty and staff submitted 16 new intellectual property disclosures.
- A total of 5 patents were received and 8 new patents were filed.
- 4 new license agreements were approved and 2 more are in negotiations.
- Support from GIVF and Battelle funds enabled 17 research projects, with substantial commercial potential, to either be launched or completed.
- All but one of the GIVF research projects have submitted disclosures and are moving toward commercialization.



Waste Reduction and Environmental Assistance

- Environmental technical assistance and on-site reviews were provided to 335 small businesses.
- 140 military personnel were provided with painting / coating training to improve transfer efficiency.
- Recycling and reuse project funding was provided to 47 companies and organizations.
- Energy efficiency and environmental education assistance was provided to 298 educational institutions, farmers, and food vendors in 146 different communities and 63 counties.

Local Economic Development

- Community clients report creating approximately 1,500 jobs as a result of local economic development technical assistance.
- IDM created a base set of 25 metrics to assist regional groups with measuring progress.
- A Rural Innovation Grant launched a major assessment of workforce and education assets in the Cedar Valley region.
- A methodology for estimating job vacancies in Iowa industrial sectors was developed.
- IDM's project with Iowa Valley Community College has resulted in new programs to meet future employment needs in the region.
- A new planning process for community sustainability was launched.

Bioeconomy

- New testing labs for biobased lubricants were completed and 188 fee-based tests were provided.
- Biofuel testing services are being provided to the Iowa Department of Agriculture.
- Product development of biofuels byproduct (glycerin)-based lubricants is being researched.
- ISO 17025 lab certification was obtained by NABL.
- Initiated a research program to determine the feasibility of using prairie hay on CRP land as biomass for electricity generation.

Metal Casting – Advanced Manufacturing

- New biobased binder systems have been developed; patent applications were prepared and license agreements are being negotiated.
- Technical assistance, research and training was provided to 30 foundries.

Market Research

- 25 diverse market research projects were conducted for 14 different clients.
- Market research clients report an average employment increase of 16%, due in part to the information provided by UNI.
- Five technology transfer projects at UNI were provided with market research assistance.



Section 2. Technology Transfer and Intellectual Property

FY 2008

	UNI
a. Number of disclosures of intellectual property	16
b. Number of patent applications filed	8
c. Number of patents awarded	5
d. Number of license and option agreements executed on institutional intellectual property (all Iowa)	4
e. Number of license and option agreements yielding income	12
f. Revenue to Iowa companies as a result of licensed technologies	\$3,800,000
g. Number of start up companies formed, in total and in Iowa	59/59
h. Number of companies in research parks and incubators	17
i. Number of <u>new</u> companies in research parks and incubators	9
j. Number of employees in companies in research parks and incubators	33
k. Royalties/license fee income	\$47,359
l. Total sponsored funding	\$36,181,460
m. Corporate-sponsored funding for research and economic development and revenue generation (excludes corporate philanthropy all in Iowa)	\$1,528,554
n. i. Annual appropriations for economic development	\$578,608
ii. Grow Iowa values appropriation 950,000	\$950,000

Section 3. Overview of UNI's Economic Development Programs

UNI outreach services for community and economic development activities are outlined in a table format on the following six pages. The format provides a brief overview of each program, its purpose, who is served and outcomes. Together, the programs served approximately 3,500 communities and/or businesses in the past year.

Economic Development Report to the Board of Regents



Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2008 Results	Cumulative Results
National Ag-Based Lubricants (NABL) Center	Biobased lubricants research, testing services, performance standards and certification	Companies and individuals developing or using biobased lubricants	<ul style="list-style-type: none"> ✓ Increased laboratory resources to better serve biolubricants users and industry. ✓ Provided fee-based testing services. ✓ Installed diesel engine testing equipment to investigate soy-based engine lubricants. ✓ Developed oil well drilling lubricant using biofuels processing byproducts. ✓ Expanded research to mitigate degradation through bacterial growth control. 	<ul style="list-style-type: none"> ✓ Over 40 soy lubricants, greases, metalworking fluids and specialty lubricants developed to date. ✓ A national testing and certification center, leading the nation's biobased lubricants industry.
Institute for Decision Making (IDM)	Hands-on community and economic development guidance and research	Economic development organizations, chambers, communities and others	<ul style="list-style-type: none"> ✓ Hands-on community and economic development assistance and research provided to 45 community partners and 6 regional development groups. ✓ Developed regional metrics to track progress. ✓ Partnered with Iowa Workforce Development to provide innovative workforce initiatives. 	<ul style="list-style-type: none"> ✓ Served 627 communities, counties and groups in nearly all of Iowa's counties to date. ✓ Community clients report 1,500 – 2,000 new jobs annually as a result of IDM assistance.
Iowa Waste Reduction Center (IWRC)	Free, confidential, non-regulatory environmental assistance for small businesses	Small businesses throughout Iowa	<ul style="list-style-type: none"> ✓ Environmental technical assistance and on-site reviews were provided to 335 small businesses. 	<ul style="list-style-type: none"> ✓ Provided 4,155 on-site reviews to Iowa small businesses.

Economic Development Report to the Board of Regents



Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2008 Results	Cumulative Results
<p>John Pappajohn Entrepreneurial Center (JPEC)</p>	<p>Research, entrepreneurship education, technology transfer, and capital investment programs</p>	<p>All students interested in entrepreneurship, UNI faculty and staff entrepreneurs, new ventures and rapidly growing small companies</p>	<ul style="list-style-type: none"> ✓ One UNI student entrepreneur selected as regional winner to advance to the Global Student Entrepreneur Awards competition. ✓ 1189 businesses and individuals were assisted or attended workshops. ✓ 68 K-12 students and teachers provided one-day entrepreneurial training and activities. ✓ 13 student businesses were provided space and services in the student business incubator. ✓ 25 student businesses were provided services as part of the student business (virtual) incubator program. 	<ul style="list-style-type: none"> ✓ Student business incubator entrepreneur and local business owner (UNI alumnus) formed a partnership to start a new air taxi business from the Waterloo airport. ✓ The JPEC has assisted 133 student businesses with technical expertise and/or incubation. ✓ The Cedar Valley Venture Fund, managed by JPEC, has invested in 5 new ventures.

Economic Development Report to the Board of Regents



Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2008 Results	Cumulative Results
<p>UNI Regional Business Center/ Small Business Development Center (RBC/SBDC)</p>	<p>Rural/ Urban Entrepreneurship development system, online entrepreneurship resources, business consulting, business training, business incubation</p>	<p>Small and medium sized businesses, entrepreneurs, service providers to entrepreneurs, community leaders</p>	<ul style="list-style-type: none"> ✓ MyEntreNet network launched in Adams and O'Brien Counties. ✓ New <i>urban</i> MyEntreNet network introduced in Black Hawk County. ✓ Disaster recovery efforts launched in Parkersburg and the Cedar Valley ✓ RBC Incubator graduated 2 companies. ✓ 1,721 entrepreneurs served statewide, 70 new business starts or expansions, 304 new full-time rural jobs. ✓ \$13 million in new commercial investment leveraged statewide. ✓ 336 community leaders trained in Entrepreneurship Economic Development. ✓ 307 clients served by UNI SBDC with technical assistance or training. 	<ul style="list-style-type: none"> ✓ MyEntreNet network in 14 rural Iowa counties; 2,000 active in online community. ✓ Urban MyEntreNet network approach formalized. ✓ RBC incubator has graduated 35 companies, creating 60 new FTE jobs, \$2 million in commercial investment in Cedar Valley.
<p>Iowa Center for Immigrant Leadership and Integration (ICILI)</p>	<p>Helping Iowa communities and businesses accommodate the needs of newcomers</p>	<p>Communities, faith-based organizations and businesses</p>	<ul style="list-style-type: none"> ✓ Created a new handbook entitled <i>New Americans, New Iowans</i>. ✓ Created a manual for effectively using interpreters in health care settings. ✓ Worked with 30 companies, health care providers, social service providers and communities to better meet the needs of newcomers. 	<ul style="list-style-type: none"> ✓ Assistance in accommodating the needs of newcomers has been provided to more than 200 Iowa companies and organization. ✓ More than 25,000 copies of four different guides/manuals (and untold electronic copies) have been distributed throughout Iowa.



Economic Development Report to the Board of Regents

Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2008 Results	Cumulative Results
Tallgrass Prairie Center (TPC)	Research, techniques, education and source-identified seed for restoration and preservation of native vegetation	Iowa counties, state and federal agencies, commercial native seed producers, the community, students educators, students and others	<ul style="list-style-type: none"> ✓ Roadside vegetation research for restoring right-of-ways was provided to the Iowa Department of Transportation and native seeds distributed to 50 counties in Iowa. ✓ Initiated applied research project to determine prairie species mix for optimal biomass electrical generation. ✓ Published seed production manual. ✓ Completed roadside research projects. 	<ul style="list-style-type: none"> ✓ More than 14,000 acres of roadway right-of-way have been restored to native vegetation. ✓ Increased public knowledge regarding prairie ✓ Provided information for Iowa DOT to change seeding regulations.
Center for Energy and Environmental Education (CEEE)	Innovative educational and technical advice related to energy, environment and community-based agriculture	Iowa classrooms, teachers, farmers, businesses, state agencies and citizens	<ul style="list-style-type: none"> ✓ Energy efficiency, environmental education assistance, and local economic development assistance was provided to 298 educational institutions, farmers, and food vendors in 146 different communities and 63 counties. ✓ Education programs reached nearly 10,000 K-12 students, and 1,000 K-12 teachers. ✓ Buy Fresh, Buy Local participating restaurants and institutional buyers in the Black Hawk county area spent \$2.2 million on locally grown foods, a growth of 250%. 	<ul style="list-style-type: none"> ✓ Since 1998, energy and environmental education programs in 72 counties have reached over 80,000 K-12 students, and 4,580 K-12 teachers. ✓ Since 1998, Buy Fresh/Buy Local program has facilitated purchase of \$5.8 million worth of meat and produce from hundreds of area farmers by food vending institutions.
Executive Development Center (EDC)	Management and professional training workshops and certificate programs	Iowa businesses and organizations	<ul style="list-style-type: none"> ✓ Specialized business management training provided in 86 workshops to 816 business professionals from 60 businesses during the past year. 	<ul style="list-style-type: none"> ✓ Since 1998, has provided training in 1,140 workshops to 18,985 business professionals.

Economic Development Report to the Board of Regents



Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2008 Results	Cumulative Results
Recycling and Reuse Technology Transfer Center (RR TTC)	Recycling and by-products research, education and outreach	Iowa businesses, the recycling industry and Iowa citizens.	<ul style="list-style-type: none"> ✓ Research project funding and outreach services related to recycling and reuse were provided to 47 companies and organizations. 	<ul style="list-style-type: none"> ✓ 42 RR TTC funded research projects. Over 170 reports and publications available. ✓ Outreach and services provided to more than 8,185 individuals, including business/industry, K-12 students and teachers, and Iowa citizens.
Metal Castings Center (MCC) and Center for Advanced Biobased Foundry Binders (CABB)	Metal casting technologies, applied research, testing and training	Iowa casting users, foundries and foundry suppliers	<ul style="list-style-type: none"> ✓ Maintained active contracts with 24 companies, provided outreach projects to 2 Iowa foundries and technical assistance to 30 additional foundries. ✓ Conducted DOE-sponsored research into bio-based foundry binders – 2 patents submitted. ✓ Sponsored commercialization of bio-based foundry binders ✓ Collaborated with University of Iowa and Iowa State on DOD-sponsored research. 	<ul style="list-style-type: none"> ✓ Over 50 industry funded research projects have been completed to date.
Strategic Marketing Services (SMS)	Market research and analysis	Businesses, entrepreneurs and non-profit organizations	<ul style="list-style-type: none"> ✓ Market research and analysis services were provided to 14 Iowa companies. 	<ul style="list-style-type: none"> ✓ Since 1990, market research and analysis services have been provided to 269 Iowa companies.

Economic Development Report to the Board of Regents



Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2008 Results	Cumulative Results
Sustainable Tourism and Environment Program (STEP)	Sustainable tourism planning and policy assistance	Businesses, government and non-government organizations, special interest and community groups	<ul style="list-style-type: none"> ✓ Tourism training and technical assistance was provided to 5 county tourism groups and 1 multi-county regional sustainable tourism project. 	<ul style="list-style-type: none"> ✓ Market research feasibility and economic impact studies have been provided to more than 40 counties or communities.
Materials Innovation Service (MIS)	Mechanical, physical and chemical tests of metals, polymers and cementitious materials	Iowa manufacturers and suppliers	<ul style="list-style-type: none"> ✓ Technical assistance provided to 69 individuals and testing contracts from five companies. 	<ul style="list-style-type: none"> ✓ More than 2,410 hours of testing provided since the beginning of the program.
Geoinformatics Training, Research, Education and Extension Center (GeoTREE)	Geospatial technologies, education, research, and outreach activities for federal, state, local and tribal agencies	Federal, state, local and tribal (FSLT) government agencies (NASA)	<ul style="list-style-type: none"> ✓ 3 educational workshops held at UNI in new computer teaching lab with more than 100 people in attendance. ✓ Worked in conjunction with DNR and Public Health to apply geospatial data to solve problems. ✓ Provided geospatial mapping and data related to natural disasters. 	<ul style="list-style-type: none"> ✓ GeoTREE has provided 12 training and educational workshops for about 309 federal, state, local and tribal government staff members.

Section 4: Grow Iowa Values Funding Project

Pursuant to its FY 2008 Grow Iowa Values Fund proposal, the University of Northern Iowa used its expertise to expand and stimulate economic growth across the state in these areas:

- Technology Transfer and Business Incubation
- Rural Entrepreneurship
- Market Research
- Regional Development
- Bioeconomy - National Ag-Based Lubricants Center

GIVF Project 1: Technology Transfer and Business Incubation

Summary

UNI researchers, with growing support from a variety of public and private sources, made substantial progress in several areas of applied research. Notable among these are biobased industrial products, advanced manufacturing methods and equipment, and biohazard security. As anticipated, the total number of disclosures declined from 26 in 2007 to 16 in 2008. In large part this reflected researchers' increasing concentration on developing more practical applications of discoveries reported previously, for example, in moving their projects from proof-of-concept stage to patentability. Further evidence of this effort is the significant increase in patent filings (8 applications pending and more to be filed soon) and patents awarded (5). Finally, UNI researchers' willingness and ability to work closely with industrial and commercial partners and meet the needs of the marketplace yielded a "harvest" in licensure of 4 of the 5 new patents, plus licensure negotiations on two of the pending patents. Business incubation also increased substantially in our first year in the BCS Building. Both the Student Business Incubator and the Innovation Incubator have increased tenancy and are producing real, immediate benefits for the entrepreneurs that they serve in this supportive environment.

Outcomes/Metrics: The following are specific accomplishments and outcomes of Technology Transfer and Business Incubation projects:

Area 1: Technology Transfer

Highlights from the UNI Technology Transfer Team and staff include the following:

- 16 new disclosures from a variety of colleges across campus were submitted
- Three of the four GIVF-funded, applied research projects submitted disclosures
- Eight US patent applications were filed during the fiscal year, with five US patents and multiple foreign patents awarded to innovators across campus
- Four patents were licensed, with two others in negotiation

Area 2: Business Incubation

Highlights from UNI's GIVF business incubation efforts include the following:

- Ten students have started six early-stage companies in the Student Business Incubator (located in the Business & Community Services Building), and another 20 are currently receiving virtual incubation services

- One student entrepreneur is among the 25 finalists, internationally, for the Global Student Entrepreneurship Awards
- Four technology companies have become tenants in the Innovation Incubator; these companies' specialties range from software development to manufacturing efficiency to financial analysis
- The Regional Business Center incubator, located in downtown Waterloo, remains full

GIVF Project 2: Rural Entrepreneurship

Summary

Progress was made on many fronts in FY 2008: statewide service providers began collaborating in MyEntreNet regions to serve rural business; a record number of entrepreneurs are taking advantage of the online resources at MyEntreNet; a new statewide conference for small business owners called EntreFest! was launched, and existing MyEntreNet regions began to see the results of their work over the past two years in terms of new jobs and commercial investment. Two new MyEntreNet regions were competitively selected, bringing the number of rural counties engaged in MyEntreNet across the state to 14. Finally, the UNI Regional Business Center has been actively engaged in regional disaster recovery efforts throughout NE Iowa. *(Please see Appendix A for a description of the Regional Business Center / SBDC's involvement in disaster recovery efforts).*

Outcomes/Metrics:

- An average of \$1,204,828 new commercial and equity investment was generated in each MyEntreNet region during FY 2008
- Improved entrepreneur and rural community confidence in small business development was demonstrated through increased investment into new business creation in rural regions. The amount of commercial and equity investment in rural counties more than doubled in FY 2008 over FY 2007.
- Rural community confidence extended to job creation as well, as rural entrepreneurs added more than 300 new full time jobs to the rural economy, nearly double the job creation of FY 2007.
- With eleven of the fourteen counties reporting, more than 2,000 rural Iowa entrepreneurs and community leaders received services through MyEntreNet, starting or expanding 70 new companies and creating 306 new full time rural jobs; these firms leveraged more than \$13 million in new commercial or equity investment in their respective rural regions.

Area 1: Expand MyEntreNet

Growth of Entrepreneurial Activity in MyEntreNet Regions

Since the 2003 launch, regions served by MyEntreNet have experienced consistent growth in numbers of entrepreneurs drawn into system services, as well as improved community culture to support entrepreneurial development as exhibited by increased commercial investment and job creation coupled with low rates of business closure. Less than 11% of businesses tracked since 2003 have closed in MyEntreNet regions. The chart below illustrates the growth realized across all MyEntreNet regions in FY 2008:

	Total # Served	Start Up/Exp	New Jobs	Commercial Investment
FY 2007	912	45	167	\$6,139,116
FY 2008	2,057	70	306	\$13,253,100

Regional EntreBash! networking events have been introduced this past year throughout the state, creating a forum for service providers and entrepreneurs to socialize, network and innovate. These events mark the beginning of a long-term relationship between innovators and statewide service providers, both online and in their communities. Attendees to all EntreBash! events are given an Entrepreneurship Master Calendar outlining the collective technical assistance, training, classes, networking and customized services available to them for a six month period. The Master Calendar is adjusted to reflect the specific needs of the region, based upon the resources and expertise of the participating service providers. The Iowa Small Business Development Center System (IA SBDC), Iowa State Extension, community colleges, private colleges, Iowans for Social and Economic Development (ISED) and the Small Business Administration (SBA) are some of the providers who have been involved in Master Calendar development this past year.

Two new MyEntreNet Regions Selected

In accordance with our mandate to continue expanding MyEntreNet statewide, we offered a competitive RFP early in FY 2008 and selected two new counties in January of 2008. O'Brien County in NW Iowa (population 15,102) and Adams County in SW Iowa (population 4,482) represent some of the smallest counties we've worked in to date, but their enthusiasm and community commitment to this form of economic development has been greater than many urban regions.

Urban MyEntreNet System Developed

In January of 2008, the Cities of Cedar Falls and Waterloo, in conjunction with the Greater Cedar Valley Alliance in Black Hawk County, engaged the UNI MyEntreNet team to implement an urban entrepreneurship development system, modeled after the success of rural MyEntreNet programs in rural Iowa. This urban entrepreneurship system offers great opportunity to address the unique development needs of culturally diverse neighborhoods in urban areas.

EntreFest: A statewide conference for small business in Iowa

In February of 2008, the first annual statewide conference for small business owners called EntreFest!, was held in Cedar Falls drawing 230 attendees from 47 counties throughout Iowa. The success of this conference is credited in part, to the new collaborative spirit generated among nearly 20 public and private providers of services and capital in Iowa. GIVF funds supported the budget for this event and UNI MyEntreNet staff led the planning team. The planning committee consists of an impressive roster of service providers and others engaged in entrepreneurship across Iowa. EntreFest! 2009 is scheduled for March 5th and 6th in Coralville, Iowa.

Area 2: Develop new online Webinar technology to integrate into MyEntreNet

The MyEntreNet online community has grown dramatically this past year. More than 2,000 rural entrepreneurs have registered into MyEntreNet's online community resources, and the free, live weekly Webinars have drawn hundreds of attendees online to learn and participate on topics of interest to rural business. A complete overhaul of the MyEntreNet website is underway this summer, with a statewide launch planned for fall; the new site will have several fresh and exciting features including a Disaster Recovery/ Help Iowa Biz section where Iowa business owners can trade, barter, donate or share services during the recovery process.

Webinars

More than 500 entrepreneurs attended 35 Webinars in FY 2008. Beginning in February of 2008, MyEntreNet Webinars were increased from bi-monthly to weekly and incorporated into a weekly newsletter, sent via email, to online users. Weekly Webinar Topics included Preparing Your Business for a Recession,

Opportunities of Changing Demographics, Creative Financing, Increasing Your Business Through eBay, QuickBooks Overview and Marketing on a Shoestring. Webinars were led by more 20 different individuals, representing the SBDC system, SBA, IDED, and private industry.

GIVF Project 3: Market Research

Summary

The purpose of devoting GIVF investment towards market research projects for start-up businesses, existing businesses and tourism/quality-of-life ventures, is to help expand and stimulate economic growth across Iowa. Quality market intelligence significantly increases the opportunity for success. Strategic Marketing Services (SMS) allocated FY 2008 GIVF support towards three primary areas: 1) Market Research Projects, 2) Market Research Plans and Assessments, and 3) Marketing and Education.

Specific accomplishments during this project timeline:

- Improved competitive intelligence for Iowa companies
- Provided initial market screening and identified potential competitors for Iowa businesses and UNI faculty and staff research
- Developed and executed targeted efforts towards promoting market research and educating Iowa companies about its benefits

Outcomes/Metrics: The following are specific outcomes and accomplishments of the Market Research project:

Area 1: Market Research Projects

Market research projects were split equally between the Iowa-based client and GIVF investment, with maximum GIVF support of \$10,000 per project.

Projects Completed as of June 30, 2008 including results of GIVF assistance:

- Development Resources – building expansion complete; jobs are being added
- Hub City Brewing Company – demand has doubled; focus moved to production
- The Building Inspectors – beginning implementation
- Anti-Leukemia Drug Therapy – still in proof-of-concept stage
- Springboard Technologies – (former Maytag employees) serving Whirlpool and attracting new clients
- Northern Filter – entering market

Area 2: Market Research Plans and Assessments

SMS staff conducts consultations with potential clients (Iowa companies and entrepreneurs) about their businesses and proposes a Market Research Plan / Strategic Plan, which will be an assessment of their situation and a plan to address it, along with associated costs. GIVF investment for these projects is matched either by the client or directly by Strategic Marketing Services.

Projects Completed as of June 30, 2008:

- Heavy Equipment
- Maintainer Corporation
- UNI Technology Transfer projects

Area 3: Marketing and Education

In order to ensure that the best possible candidates for GIVF-supported projects are recruited, efforts were targeted towards educating Iowa businesses about the benefits of market research and marketing these services, statewide.

Results as of June 30, 2008:

- Contributed three guest editorials discussing GIVF-funded projects
- Issued four statewide news releases
- Completed one direct mailing to Iowa businesses and business associations
- Continuous development of a comprehensive marketing plan
- Partnered with statewide economic development organizations and SBDCs to promote services at statewide conference for small businesses

GIVF Project 4: Capacity Building to Help Regions Succeed

Summary

During FY 2008, the Institute for Decision Making (IDM) continued implementing regional development assistance programs that build capacity, both regionally and locally, in an effort to ensure long-term sustainability of Iowa's regional economies. During the past year, IDM has focused its primary regional efforts in three ways:

1. Developing practical sustainability of two rural regions ready to move to the next level (Area 1)
2. Assisting other regions and their local-level collaborating partners (Area 1)
3. Preparing for collaborative, focused efforts to build upon previous work regarding layoff aversion and regional responses to mass layoffs (Area 2)

Specific Accomplishments during this project:

IDM solicited reports from a cross-section of economic development organizations (collaborative partners) involved in regions. During FY 2008, each partner averaged ten business leads attributable to regional activity, with each lead having a one in six chance of a follow-up business visit. Taking these same organizations' responses, regional activity accounted for 25 total leads in 2007 and 69 total leads in 2008. In a typical region, the average investment by each collaborative partner organization was roughly \$19,000 (31% monetary, 69% in-kind), an increase of about \$2,000 over FY 2007 investments, but showing a shift from monetary to in-kind support. In two of these regions, IDM's services shifted from the development of marketing and operating protocols to implementing them. IDM received a total of five testimonial letters from regional groups in FY 2008.

Outcomes/Metrics: The following are specific outcomes and accomplishments for the Capacity Building to Help Regions Succeed Project, reported by region:

Area 1: Sustainability of regional work and strengthening collaborative partners – hands-on capacity building:

Northeast Iowa Business Network (NIBN):

Counties of Allamakee, Chickasaw, Clayton, Delaware, Fayette, Howard, and Winneshiek

- Provided multi-faceted, integrated marketing implementation with the following targets and strategies: World Dairy Expo in Madison, WI, business round table, ethnic businesses, direct marketing, website development, workforce marketing and entrepreneurship.

Off-Shore Iowa (OSI):

Communities of Oelwein, Osceola, Mt. Pleasant, and Harlan (in Fayette, Clarke, Henry, and Shelby counties, respectively):

- Provided technical assistance and service with focus on the following: administration, leveraging local match for grants, website and materials, construction, direct marketing, advertising and research
- Served as the designated point of contact and administrative agent for this virtual region's marketing efforts, including hosting and maintaining the OSI website
- Coordinated community input for website and facilitated review and approval of all marketing materials by OSI participants
- Facilitated by IDM staff, the 10,000 square foot Oelwein Tech Center building broke ground; construction of a similar building in Harlan to support OSI efforts is currently in the planning stages
- Coordinated ongoing direct mail program to about 1,800 high-cost MSAs; developed targeted, personalized direct mail campaign to companies identified by IDM to be candidates for off-shoring.
- Advertising schedule and ad design for business publications finalized and placements made
- Thorough research produced two potential conferences with opportunities for OSI developers' to promote the region; also updated laborshed analyses to demonstrate availability of people and skills

Western Iowa Advantage Region (WIAD):

Counties of Adair, Audubon, Carroll, Crawford, Greene, Guthrie, Sac, and Ida with Region XII Council of Governments serving as fiscal and administrative agent

- Advancing the region through technical assistance/feedback and collaboration with IWD staff and WIAD members on job vacancy survey, which has become the model survey for the State.

Ida County Economic Development Corporation (ICEDC) within this region

- Provided technical implementation assistance for action items in their updated plan to more fully participate in WIAD and provided technical assistance on development issues leading to their capacity to update their plan on their own

Midwest Partnership Corporation (MWP)

- Counties of Adair, Green and Guthrie, within this WIAD region and also within the Southwest Iowa Marketing Coalition region
- Reviewed accomplishments relative to goals and facilitated an update to their 3-year plan

MIDAS Council of Governments:

Serving Mid Iowa Growth Partnership Region; counties of Calhoun, Hamilton, Hardin, Humboldt, Kossuth, Palo Alto, Pocahontas, Webster, Wright

- Assisted MIDAS in setting strategic priorities, including regional efforts and the Mid Iowa Growth Partnership, for which MIDAS is administrative agent

Black Hawk County Government:

Cedar Valley Region

- Pilot Project – Engaged in design and facilitation of state-of-the-art capacity-building for thinking, organizing, monitoring, collaborating, and acting to best prepare for rapid and significant change in our world and in our communities; this includes the individualized needs of local economies, as well as global workforce competition

Decatur County Development Corporation:

South Central Iowa Area Partnership (SCIAP) Region

- Provided focused assistance, continuing to leverage USDA-RCDI grant to improve the effectiveness and efficiency of new staff and to provide needed technical assistance to both volunteers and staff

Area 2: Layoff Aversion and Regional Response to Mass Layoffs:

IDM advanced the development of services and resources to help regions prepare for crisis events and to, for example, utilize tools which can quickly document the available workforce as a marketable asset. During FY 2008, IDM staff:

- Reviewed original work completed in early 2000s
- Researched relevant existing tools and materials that have been developed by other states; primarily websites and support materials, but no existing programs met the needs identified for this program
- Conducted literature review of academic journals to determine what relevant scholarly research has been completed in recent years
- Had initial and follow-up discussions with IDED and IWD staffs about the project. Both agencies are having internal discussions about how to augment their services to communities, based on the increase in closings and mass layoffs in Iowa.
- Assisted IWD staff and other partners in the development of a grant proposal to the U.S. Department of Labor's Employment and Training Administration to undertake a number of demonstration projects which would target dislocated workers and impacted communities (grant was awarded)
- Began the development of resource tools for use by economic developers and communities. The first document's working title is "Plant Closures – Early Warning Indicators for Community Leaders".

GIVF Project 5: Bioeconomy - National Ag-based Lubricants (NABL) Center**Summary**

The National Ag-Based Lubricants (NABL) Center has successfully commercialized over 40 biolubricant products, to date. The recent proliferation of biofuels production facilities throughout the State provides unprecedented opportunities to leverage the expertise connected with NABL's biolubricants research in support of the State's developing bioeconomy. Through concerted efforts in several key areas, the NABL Center has been able to expand its scope, while continuing its tradition of quality in biolubricants research and development. NABL has been a leader in Iowa's biobased industry for more than 17 years. As the value of a profitable, diverse, and well-accepted biobased industry driving economic growth within the State has been evidenced during the last five years, the presence and credibility of Centers like NABL becomes crucial to address the increasing efforts of petroleum interests to decrease support for biobased products and biofuels.

Outcomes/Metrics: The following are specific outcomes and accomplishments of the National Ag-Based Lubricants Center project:

Area 1: Biofuels and Biolubricants Testing Services:

NABL is applying 17 years' of biobased product expertise to support Iowa's biofuels industry, by offering fee-based biodiesel and ethanol testing services, in addition to biolubricants testing services

Progress as of June 30, 2008:

- NABL laboratories provided testing services including 48 fee-based tests to industry clients, between July 1 and December 31, 2007, including one biolubricants company and one ethanol producer.
- Between January 1 and June 30, 2008, NABL provided 140 tests for industry clients
- NABL opened discussions with the Iowa Department of Agriculture and Land Stewardship (IDALS) Department of Weights and Measures regarding availability/need for biodiesel testing services within the State, and subsequently completed a test run by performing biodiesel tests on five trial samples of diesel fuel provided by the department
- NABL tested biodiesel samples for an individual-scale fuel producer, to gauge the value of rigorous ASTM methodologies for small scale production processes

Area 2: Biofuels and Biolubricants Research:

NABL has devoted 17 years to overcoming the inherent shortcomings of vegetable-based oils for use in biolubricants. As biofuels begin to face these same questions, NABL will investigate whether the antioxidants and pour point depressants used successfully in NABL's biolubricants research can address these same issues in biofuels, new biolubricants, or biobased engine oil additive applications.

Progress as of June 30, 2008:

- NABL scientists and staff arranged and held two on-site meetings with senior representatives of two major lubricants industry companies, to plan for collaborative research projects, discuss collaboration on research investigating the use of lubricant and fuel additives in biodiesel fuel to address low temperature issues and to use biobased lubricants and conventional lubricants additive technologies to provide energy efficiency improvements, resulting in reduced operating costs.
- NABL laboratories completed baseline research investigating the oxidative stability index modifications possible through esterifying various biobased oils. Biodiesel (esters) were manufactured by processing samples of biobased oils, including emu oil, ostrich oil, high oleic acid content canola oil, high oleic soybean oil, etc. Both methyl and ethyl esters were produced. Subsequent oxidative stability index testing was conducted to provide broad information on this process.

Area 3: Lab Upgrades and Certifications:

In order to maintain the required credibility as a national testing center, NABL must achieve appropriate certifications and accreditations. To do so, NABL will continue to pursue further ISO certifications and participate in ASTM Lab cross-check programs. In addition, as the State's preeminent lubricants testing laboratory, the NABL Center has begun to offer the following ASTM D6751 biodiesel tests:

- | | |
|-------------------------------------|---|
| 1. D93 - Flash point (closed cup) | 8. D2709 - Water and sediment, |
| 2. D445 - Kinematic viscosity, 40 C | 9. D4530 - Carbon residue, |
| 3. D 874 - Sulfated ash | 10. D6584 - Free glycerin, |
| 4. D130 - Copper strip corrosion | 11. D6584 - Total glycerin, |
| 5. D2500 - Cloud point | 12. D1160 - Distillation temperature, |
| 6. D664 - Acid number | atmospheric equivalent temperature, 90% |
| 7. D4951 - Phosphorus content test | recovered |

Progress as of June 30, 2008:

- NABL laboratories are offering the full spectrum of ASTM D6751 biodiesel testing services
- Equipment was added and training completed to expand NABL laboratories' biofuel testing capabilities to include the following ASTM D6751 tests for biodiesel fuels (B100):

- D2709 – Water and sediment
- D4530 – Carbon residue
- D6584 – Free glycerin
- D6584 – Total glycerin
- D1160 – Distillation temperature
- Equipment was installed and technical training was completed for the lab's new GC-FID. GC-FID is designed to analyze large molecules, such as triglycerides, diglycerides, monoglycerides and sterols involved in biodiesel production. Glycerides in biodiesel may cause injector fouling and valve deposits.
- NABL laboratories participated in five ASTM Laboratory Crosscheck Programs for hydraulic fluid, three Laboratory Crosscheck Programs for lubricating grease, and one for biodiesel. NABL's results were submitted for 39 laboratory tests performed on the hydraulic fluid sample, and for 32 tests performed on the lubricating greases. NABL's results met ASTM standards for all tests.
- ISO Procedures Manual, Quality Manual, Standard Operating Procedures (SOP's), and related materials were composed. ISO pre-assessment audit was completed by outside auditors and NABL staff members. Deficiencies identified in pre-assessment audit were addressed. NABL staff performed the internal audit. The final, official audit for NABL to achieve ISO 17025 accreditation was conducted, culminating two years' worth of NABL staff effort. The NABL Center received its official ISO 17025 certificate on May 13, 2008.

Grow Iowa Values Fund – Supplemental Report

Disaster Recovery Efforts by BCS Programs

On May 25th, an EF5 tornado ravaged the town of Parkersburg, Iowa, completely destroying one-third of the community. Six residents lost their lives and hundreds of homes and businesses were demolished in one breathtaking instant. Thirty-two small businesses along Highway 57 were reduced to rubble, another 35 suffered serious damage and the remaining few small companies without physical damage found their market displaced and their distribution channels dismantled.

Less than two weeks later, Parkersburg and other communities along Iowa's waterways were struck by widespread flooding. In Greene, the entire downtown district was flooded on June 9th and every one of the two dozen downtown businesses there found themselves under water. In Waverly, parts of buildings crumbled under the rush of water and debris as it cascaded downstream, with over 80 small companies flooded along the river and in the downtown district. In Parkersburg and New Hartford, struggling business owners still reeling from the devastation of the tornado now found themselves battling a second disaster. All across Northeast Iowa- in Elkader, El Dorado, Greene, Waverly, Janesville, Independence, Allison and many other small rural communities - local economies have been thrown into disarray as a result of this unprecedented series of natural disasters.

Regional Business Center / SBDC

By our best estimates, more than 1,200 small firms in rural communities throughout NE Iowa have been adversely affected by the tornado and subsequent flooding in the past six weeks. The University of Northern Iowa's Regional Business Center/SBDC is familiar with many of the communities and businesses affected by the flooding; the magnitude of this devastation has overwhelmed us. The RBC has been inundated by phone calls and emails from community leaders and entrepreneurs across the state, requesting our assistance to help these small companies re-assess, re-build and potentially re-open. We know, from personal conversations with business counselors serving victims of the Greensburg, Kansas tornado of 2007 and the great flood of 2006 in South Dakota, that we must first be patient while these business owners recover from shock; we must then be prepared to serve them with customized, high-quality consulting assistance as they make critical decisions about the future of their business.

We opted to provide support in several important ways: We began with a series of town meetings in rural communities for small business owners to gather, share their experiences and learn about the resources and services available to support them. In less than two weeks, we were able to gather over 300 impacted business owners in communities throughout NE Iowa, including Parkersburg, Waverly and Greene.

In Parkersburg we were confronted with the sad realization that their tragedy had been eclipsed by the subsequent flooding. We made a strategic decision to realign a small portion of the RBC budget and GIVF funding to offer a strong public statement of help in that community. Working with a local lender and the Iowa SBDC system, we set up a large canvas tent in the middle of the devastated area along Highway 57 in Iowa State Bank's undamaged parking lot, put some large banner signs out and invited business owners to stop in to visit with a certified disaster recovery SBDC consultant anytime, any day when the flags were out.

We asked a retired SBDC director from the NIACC SBDC to help us with the Parkersburg recovery effort and placed him for several days each week along the highway in that tent. It was hot, windy, messy and not very professional but they came, sometimes just to talk, sometimes with FEMA or SBA paperwork in hand. Five businesses along the corridor have reopened and half a dozen others continue to work with us on rebuilding. It was a good decision and one we hope will be supported by the BOR.

We have placed a request with Winnebago Industries to allow us use of a Winnebago recreational vehicle this fall and winter to put an SBDC consultant on the road in Greene, New Hartford, Allison, El Dorado, and other flood affected communities, providing 1:1 consulting and planning assistance along the same lines as our tent recovery efforts in Parkersburg.

Initially, most flood-affected business owners were without Internet, but as the first week passed, we found increasing numbers of emails in our inboxes from flooded business owners wondering what to do next. We decided to suspend our regular Webinars for several weeks and replace them with daily interactive Webinars over the lunch hour concerning disaster relief. These online discussions featured multiple presentations by FEMA and SBA and served as a forum for affected business owners to share concerns, ask questions or post information. They were discontinued July 9th 2008.



As we move forward, we know that this disaster recovery will be a long and involved process for thousands of Iowa business owners. We have a burgeoning relationship with many of these rural entrepreneurs and are hopeful that we can continue to use the relationships and communications linkages built through MyEntreNet to keep these business owners engaged and linked to the resources and services they need to recover in rural Iowa.

Institute for Decision Making

- Having an established relationship with Parkersburg Economic Development (PED), the Institute for Decision Making (IDM) has been providing guidance on economic development recovery, planning and execution, in the wake of the tornado which devastated the Parkersburg community. IDM has devoted substantial short-term staff support to provide capacity-building facilitation for PED (a member of the Cedar Valley Region; counties of Black Hawk, Bremer, Buchanan, Butler, Chickasaw, and Grundy) as they set immediate and long-term priorities for recovery. IDM has also provided technical assistance for action, supplementary expertise for the development organization, and referrals for consultants within the region who possess the needed experience/expertise to benefit the PED.

Section 5: Battelle Projects

The University of Northern Iowa was awarded \$3.18 million to develop research capacity related to key economic development clusters identified in the Battelle Reports. UNI invested these funds in key research programs that have the greatest potential to contribute to economic development in the state of Iowa. By supporting a portfolio of near, mid and long-term projects, UNI, with State of Iowa support, has created a pipeline of research that will create opportunities for technology transfer for many years to come.

Since 2006, UNI has accelerated the research agendas of 13 projects in biosciences, information solutions and advanced manufacturing. The Battelle funding not only made it possible for new products developed at UNI to become commercialized, but it has also provided enhanced research opportunities for graduate and undergraduate students, and will thus contribute to an advanced workforce.

The Battelle Report, *Iowa's Bioscience Pathway for Development*, outlined the following three actions for building research capacity at the Regents Universities in Iowa.

- 1. Undertake key recruitment, capacity building, and required investments to ensure rapid progress in the Battelle platforms.**
\$983,732 expended through 6/30/08

UNI has allocated \$1 million in Battelle funds to provide salary support for faculty members engaged in research projects with the potential for commercialization. Since 2006, faculty members received support to work on 12 projects. Seven of these projects were in the Biosciences. These funds supported 6 new faculty members whose primary research focused on creating new products related to the bioeconomy and advanced manufacturing. These funds were used to accelerate the establishment of their research programs of these key contributors to technology transfer. Funds were used to support new faculty on some of the research grants identified in Section 3, as well as for the following research:

- A "phase 2" orthotic insert for lower leg amputees.
 - A patentable neural network-based and other data-mining algorithms for mining Enterprise Resource Planning (ERP) databases.
 - The integration of UNI grapevine identification data with the international plant germplasm database.
 - Nanoscience basic and applied research
- 2. Invest in strategic technology development infrastructure to strengthen and accelerate the scientific and commercialization work of the core platforms.**
\$1,079,156 expended through 6/30/08

UNI received \$1.36 million to renovate and equip research laboratories used in the Battelle projects. In April of 2007, \$133,797.00 purchased fixed equipment from Wynn O. Jones for the appurtenant rooms in Physics, McCollum Science Hall and the Greenhouse. That equipment has been received, installed and is paid out at 100%.

Appurtenant infrastructure components (bricks and mortar) include but are not limited to: New Research Greenhouse, New Greenhouse Research Lab and cooler – Biology Research Rooms 107, 109 & 109A – Chemistry Research Rooms 111 & 260 – Physics Research Rooms 001, 202 & 302

Overall construction progress is complete for the Physics contract and for the McCollum/Greenhouse contract. The work has been reviewed for correctness and acceptability. Lists have been generated detailing corrective measures necessary to comply with the contract documents. The contract requires that the University hold 5% of the total amount until final acceptance. Final Acceptance can occur when all of the contractual obligations have been met by the contractor.

**3. Institute a grant program to support research in the core platforms.
\$518,439 expended through 6/30/08**

UNI held an internal competition to select applied research projects with the greatest potential technology transfer and commercialization. With input from the Technology and Commercialization Resources Organization, 8 projects were funded. Eleven UNI undergraduate and 9 graduate students have participated in these research projects thus far.

Progress of Battelle Projects

So far these projects have leveraged an additional \$427,000 from industry and government sources. The following industry partners are collaborators on Battelle research projects:

Department of Energy
Golden Grain Energy
Renewable Energy Group
Environmental Lubricants
Manufacturing
Montana Polysaccharides
American Metalcasting Services
Recon Robotics
Rockwell Collins
Doerfer Corporation

Team Technologies
TeraGrid
FastServers Inc.
S.S. Steiner, Inc.
Bio:Neos
Pharmacon
TDS Automation

DisTEK
Iowa Energy Center

Some of the Battelle projects have already resulted in new products or services, including: a new biolubricant, two new biobased foundry binders, a software application for protein structure prediction, a virtual reality sand blasting training device, a new material for improved hydrogen storage and a commercial computing grid.

The following projects are currently underway:

Bioeconomy

Ethanol & Biodiesel Byproducts as Base Oils for Biobased Industrial Lubricants. The intent of this research is to determine whether corn oil and glycerin, byproducts of ethanol and biodiesel production, respectively, have potential for use in the development of biolubricants. NABL secured 1:1 matching funds from the US Department of Energy to leverage the State's Battelle funding for this research. Tribological and performance testing were conducted to evaluate each of the samples collected within each category of byproduct, including byproduct corn oil, glycerin, and methyl esters. These byproduct samples were obtained from Renewable Energy Group (REG) of Ralston, Iowa, and Golden Grains Energy, of Mason City, Iowa.

After identifying the relative benefits of each byproduct tested, NABL scientists were able to compare the byproduct strengths with qualities needed for many common lubricant products. After looking at several possibilities, NABL settled on the development of a product to be used in the drilling of petroleum oil wells, common throughout the southern United States, and elsewhere.

Several companies involved in the oil well drilling industry have been contacted, and one has agreed to partner with NABL to develop a product competitive with the petroleum oil-based formulation currently in use by the industry. After a visit by three NABL staff members to an actual oil well drilling site in Texas, and subsequent discussions with the company, a non-disclosure agreement has been signed. The next steps include product field testing.

Development and Commercialization of a Foundry Binder System Based on Polysaccharide Bio-feed stock. The overarching goal of the UNI Metal Casting Center's research in foundry binder systems is to find bio-based substitutes for the current petroleum based binder systems that hold sand in the shape of a mold in which to cast molten metal. The specific binder system is the phenolic urethane system, which currently holds about 80% of the foundry binder market. This system is composed of three parts:

- Part I: the phenol-formaldehyde resin
- Part II: the isocyanate resin
- Part III: the tertiary amine catalyst, which could be in either gaseous or liquid form

Battelle research completed thus far indicates the best prospect for commercialization is a Part I replacement consisting of corn syrup with a solvent package involving an alcohol (such as methanol, ethanol, or isopropanol). This new system utilizes Iowa grown corn syrup and has shown great promise in both replacing petrochemical materials as well as reducing hazardous air emissions of the ferrous and non ferrous casting process. This material has exhibited improved

physical properties to conventional polymers based on petrochemical feed stocks and has shown to be superior in environmental characteristics. The material is also very cost competitive with conventional materials. In December of 2007 the center applied for a provisional patent to protect the intellectual property.

Concerns with the availability of corn products for industrial applications have spurred additional research for a second new polymer technology that utilizes an under-utilized but abundant naturally-occurring organic product. This technology has matched and exceeded the performance level of conventional binders at substantially reduced levels of environmental impact.

The market for the technology is estimated at 1-1/2 billion dollars on a worldwide basis. Efforts during the last reporting period have included initial negotiations with several companies in the effort to license the intellectual property. The Center has been working closely with American Colloid Corp, ACC who has expressed interest in an exclusive license for the manufacture and marketing of the binder technology. To date they have funded the UNI Research Foundation for \$20,000 for rights to hold worldwide exclusivity until after field trials have been completed.

Biodefense and Biosecurity

Robotics-Deployed Detection of Biological Agents. Following reconsideration of the market potential, intellectual property value, prototype design and proof-of-concept constraints and following consultations with local engineers, Michael Walter altered his research focus to a more productive and profitable development of a sensor, rather than on narrow robotics deployment of the original proposal. More specifically, Walter is developing a prototype anthrax detection sensor based upon phage affinity reagent PAR-QCM based sensing capabilities. The prototype will be used to achieve proof of concept for the sensor with live anthrax agent (at approved BSL3 facilities).

Phase I of this project aims to produce a design and bid for building a prototype that can be bench-tested with both safe and lethal anthrax spore strains, which will complete our proof of concept level studies. TDS Automation (a Doerfer company in Waverly, Iowa) is now designing the air-sampling, fluid-handling 'manifold' that will collect air samples, suspend particulates from samples in liquid buffer and route the buffer-suspended particles through bubble removal devices and into 'test chambers' where the samples will be tested for the presence of airborne spores or bacteria of bio-agents. A current design schematic is attached (see Figure 1). The completed manifold prototype will consist of a plastic block containing various buffer and waste reservoirs, samplers, filters, check valves, chambers and pumps designed to handle small amounts of sample fluids. The most cost-effective initial bench-tests will employ off-the-shelf QCM sensors, hardware, software, controls and communications links in the Walter lab at UNI.

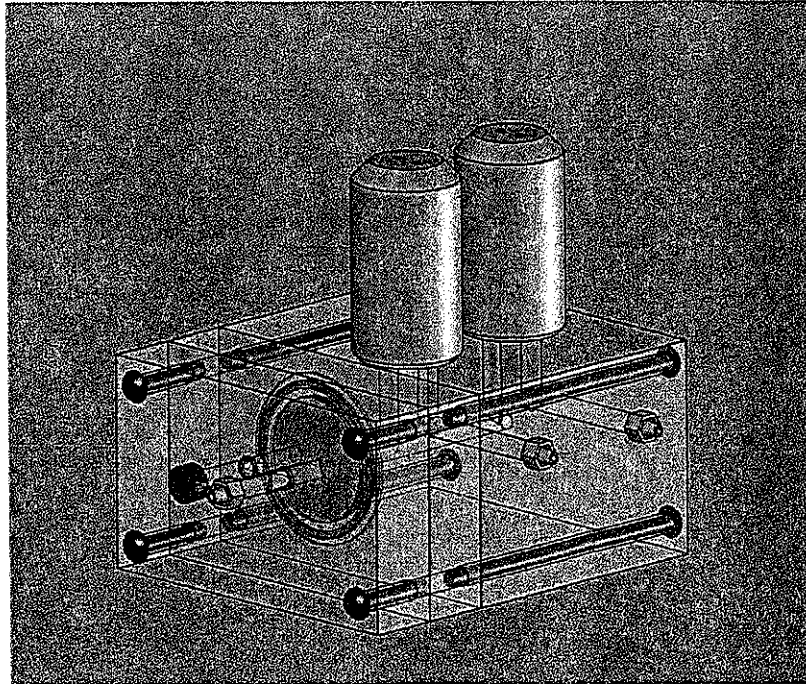


Figure 1

Phase II of the project includes miniaturization of the detector prototype (Prototype II), which will be used in further testing with lethal Ames strains of anthrax at an appropriate BSL3 facility.

Post Genomic Medicine

Commercialization of protein structure prediction technology. The research goal was to develop and commercialize an automated method for the determination of protein structure from the sequence of amino acids. The technology has been developed and incorporated into a program called UNI-FOLD software. The main strength of UNI-FOLD is its sensitivity and selectivity in recognizing the relationships between remotely-related amino acid sequences. A patent is currently being sought for this software. A description of UNI-FOLD and its benchmarking results has been published in a journal article in *Bioinformatics*.

Although UNI-FOLD outperforms all other methods in the Lindahl benchmark for fold recognition sensitivity and ranks #1 in the SALIGN benchmark for the alignment accuracy (as benchmarked in the *Bioinformatics* article), UNI's research team is currently developing additional computational techniques to further improve sensitivity and selectivity in recognizing the relationships between remotely related amino acid sequences. If these tests are encouraging, phase two research funding will be sought from NSF or NIH.

Advanced Food and Feed

Identifying drought tolerance genes in the reproductive structures of barley. Tilahun Abebe and colleagues plan to discover genes for drought tolerance in barley flowers that can be used to develop new Iowa crops resistant to drought in the sensitive reproductive stage. The project has two main objectives 1) determine gene expression at the transcription (mRNA) level in drought-

stressed tissues using the Affymetrix Barley1 GeneChip, and 2) analyze gene expression in drought-stressed tissues at the proteome (protein) level using two-dimensional protein gel electrophoresis (2-D protein gel).

To identify a drought-inducible gene, UNI researchers drought-stressed barley plants (*Hordeum vulgare* cv. Morex) for 4 days at early grain-filling stage by withholding water. Ribonucleic acid (RNA) was isolated from the awn, husk and the young seeds and hybridized to the Barley1 GeneChip (Affymetrix, Inc.). Total protein was extracted and resolved on two-dimensional gel electrophoresis and proteins accumulated during stress were analyzed by mass spectrometry. Both studies have identified several drought-inducible genes. The major classes include proteins that prevent aggregation of macromolecules and sequester ions during drought (LEA proteins, such as dehydrins and *HVA1*), proteins that prevent protein degradation and maintain proper folding (heat-shock proteins), transcription factors, antioxidant genes, disease resistance genes (since drought causes physical damages similar to diseases), genes involved in metabolism, and genes involved in maintenance of tissue water level.

Next steps are to verify expression of selected genes using real-time polymerase chain reaction (real-time PCR). This will take place over the summer and into the fall semester.

Faculty/Student Collaboration on Commercializable Research. Two UNI faculty proposed to work with students to discover plant genes that would be used to develop plant-made pharmaceuticals and fungus resistant crops.

Fungus resistant crops

Dr. Jurgenson and his research team have isolated *F. verticillioides* resistant variants of the native grass Tall Dropseed (*Sporobolus compositus* (Poir.) Merr.). In these experiments seedlings of this grass have been challenged with massive numbers of infectious spores of the plant pathogenic fungus. About 1-2% survive, apparently unscathed. Our researchers have been able to grow these plants and get them to flower. Since this project has been going only for a year, there has not yet been a large amount of seed from these resistant plants. Researchers have finally been able to get seeds produced by some of the resistant plants (12 resistant plants were isolated). Seeds from these plants were collected and stored in the freezer for 6 weeks to induce germination.

Second generation Tall dropseed plants were grown with the seed collected from the mature plants that had survived exposure to *Fusarium verticillioides*. These "resistant" plants were exposed to *F. verticillioides* again to determine if the resistance is inherited (See Figure 2). This process is slow as the generation time is 8 months in our growth chambers.



Figure 2

Subtractive hybridization techniques of expressed genes are currently being used to allow us to determine the genes that may be responsible for making these plants resistant. This will be done by subtracting out all of the genes that the non-resistant plants have in common with the resistant plants. Cloning of the uniquely expressed genes of the resistant plants and sequencing will give us clues as to the nature of the disease resistance mechanism.

Next steps will include genetic analysis to locate the gene(s) involved in the genome. Ultimately, our research team wants to know if this gene will protect corn from infection by *Fusarium verticillioides*. To learn the answer to this question, the gene will be inserted into the genome of corn so that it is expressed. Protection will be observed by challenging these modified corn seedlings with infectious fungi.

Plant-made pharmaceuticals

The proposed project aims at genetically engineering the hop plant (*Humulus lupulus* L.) for increased production of pharmaceutically valuable compounds. Battelle funds were used to initiate and optimize hop tissue culture and in vitro propagation.

The largest bottleneck for the genetic transformation of hop is the genotype specificity and inefficiency of existing transformation protocols. Two factors play key roles, together limiting transformation efficiency. First, regeneration through direct shoot organogenesis is inefficient. Second, only 0.5-10% of regenerants seem to be transgenic (Horlemann et al., 2003; Batista et al., 2008). Therefore, successful hop transformation requires large numbers of explants, is time consuming and labor intensive (Schwekendiek et al., 2007).

We developed a fast and efficient shoot regeneration procedure for the "US Tettang" cultivar, starting from green organogenic nodule cultures. Compared to earlier reports (Horlemann et al., 2003), we have increased our in vitro regeneration efficiency 40-fold. This increased regeneration frequency could help overcome current limitations in biotechnological applications for hop. It also eliminates bi-weekly tissue transfers and thereby reduces labor and contamination

problems. UNI's procedure, which works through de novo shoot induction via the callus route, seems to have high potential for the generation of virus-free hop material. It will also be useful for the production of large numbers of genetically transformed plants, for example in the arena of pathogen resistance, for improving flavor, or for the development of medicinal hops.

Based on our improved regeneration procedure, we expect being able to increase overall transformation efficiencies from 1.5% to 60% using *Agrobacterium*, and up to 300% using the gene gun. The next step requires experiments to test this prediction. These experiments are currently underway this summer.

Information Solutions

Commercial Computing Grids. The research goal is to create a High Performance Computing grid to provide academia and industry with accessible, secure, and scalable computing infrastructure. This statewide resource will provide a computing fabric needed to support new economic development in financial services, engineering and biotechnology in Iowa.

Attention on the Corporate Clusters project has turned from hardware components to software support. Parallel and distributed scientific software libraries have been incorporated into the cluster environment, making it a "complete" cluster environment. The integration of software into the cluster was supported by corporate donations from Wolfram, WebMo, Totalview Technologies, and the Supercomputing Conference Education Program (sponsored by IEEE and ACM).

The most notable achievement of the activities to date has been combining the available resources of the UNI Battelle effort with those of Earlham College (Richmond, IN) in a cross-institutional collaboration and computational environment. Our combined efforts with Earlham resulted in being awarded the "Campus Technologies Innovators Award, 2008" for our efforts; to be awarded in Boston, MA this upcoming July.

The next steps of the project will remain focused on identifying funding avenues to support the long-term aspects of this work.

Faculty/Student Collaboration on Commercializable Research. A faculty team proposed to work with students to develop a novel system for automatically reading utilities meters using wireless mesh networks. Automatic Meter Reading (AMR) is an electronics system that provides remote meter reading of usage rate of electricity, gas, water and other related information. The primary goal of this project was to build an IEEE 802.15.4-compliant wireless mesh network based AMR system that is more cost-efficient and able to implement real-time data collection. This utility data collection system will utilize the two-way communication between AMR nodes to forward the readings back to a collection center or AMR server and therefore minimize the use of other infrastructures.

The CC2430ZDK IEEE802.15.4/Zigbee development kits and IAR Embedded Workbench have been used to develop the experimental models. The CC2430EM module has been tested and

studied. We have designed a routing protocol for a small-scaled mesh network with 10-20 nodes. A four-node communication model has been successfully tested.

The implementation of the AMR node prototypes are in process. We expect to implement a mesh network consists of at least 5 AMR nodes in this summer. Two types of meters will be adopted for the test network. The typical conventional electromechanical watt-hour meters are retrofitted utilizing IR sensors. The pulsed instantaneous power output of the newer type kilowatt hour meters is sent to the CC2430 I/O port 1 for analog to digital conversion and further process. Each test bench is also built with several loads, such as electrical heater and light bulbs, for test purposes.

The communication protocol has been developed and tested using CC2430ZDK IEEE802.15.4/Zigbee development kits and IAR Embedded Workbench. The radio modules have the capability to join and start a network once they are powered on without external intervention. The coordinator node is responsible for collecting data from other nodes and sends the collected data to the connected PC via serial communication port. The majority of efforts are being spent on the integration of the electric meters with the CC2430 modules. The user friendly interface for displaying the data and related operation is also under development.

The next step will consist of prototype performance analysis. We may need to adjust the system based on the test results. We will also seek external research grant funds from NSF and/or Department of Energy to support implementation and testing the system in larger scale.

Advanced Manufacturing

Commercialization of Leading Edge Paint Removal Technologies. The Iowa Waste Reduction Center (IWRC) staff have developed a VirtualBlast system based on their existing VirtualPaint™ virtual reality training tool. The VirtualPaint Blasting patent was filed this past semester. The public release of the abrasive blasting simulator took place at the Corrosion 2008 Convention in New Orleans, LA.

Preliminary market research was completed this Spring to determine potential market segments and avenues to pursue. IWRC staff made a verbal agreement with the National Association of Corrosion Engineers (NACE) to begin development of a co-branded training course featuring VirtualBlast.

Faculty/Student Collaboration on Commercializable Research. Three faculty teams will work with students to enhance the properties of materials used for novel nanoscale devices and miniaturization of components; to prove the utility of a novel laser interferometer for non-contact measurement of nanoscale surface vibrations; and to compare the performance of bio-based with petroleum-based cutting fluids during machining.

Development of a Comprehensive Nanoscience Laboratory for Basic and Applied Research.

UNI nanoscience research focuses on the areas of nanoscale protective thin films, hydrogen storage, layered compounds, and solar cell materials. There are currently eight students taking part in the research for the summer, while five worked on various projects during the spring semester. Students have given presentations relating to this work at one regional conference at Argonne National Laboratory, the national American Physics Society March Meeting, as well as several local presentations at UNI.

The laboratory has expanded its infrastructure with the acquisition of several new pieces of equipment totaling more than \$100,000 from funds gained outside of the initial Battelle grant. Some of these instruments will serve in university courses as well, but are all directly related to research in basic and applied nanoscience.

For brevity, a list of significant findings is outlined below.

1. Using nanoscale gold films as an ideal model for oxide protection of steel, it has been found that the surface mobility of gold atoms is extremely high even at temperatures less than one fourth the melting point of gold. Furthermore, the interface between bare and coated materials serves as an initiation point for the formation of nanoscale clusters and nanocrystal formation.
2. We have developed a material which appears to be promising for hydrogen storage. Tests are currently underway, and initial results show that the material should be competitive with the current state of the art products. A patent application is in development for this material.
3. We are currently developing techniques for using the scanning probe microscopy to modify the surface of materials at the nanoscale. Two methods have been developed to remove or add material to the surface of a layered compound. We are attempting to develop a more controlled methodology so that the technique could be used for device integration.
4. We have successfully created nanoscale quantum dots of PbSe that might be used in solar cell applications. We are currently in the process of developing a systematic process for controlling the size and shape of these nanoparticles to optimize their properties and for testing in devices. As these are infra-red related materials, they should be suitable for development of co-generative processes to increase the efficiency of traditional coal plants or other heat related sources of energy.
5. We are developing a variety of nano-textured silicon surfaces to be used as growth templates. This technique uses self-assembly so that the surfaces form readily on their own accord. These surfaces are chemically inert and electrically insulating, and so should be well suited as growth sites for devices that can be isolated from the remainder of the silicon material.

Performance of biobased versus petroleum based cutting fluids during machining. Tool life and surface roughness are two important measurements to study the bio-based cutting fluids. A fixture was designed and fabricated in the Production Lab in order to measure workpiece surface roughness without interrupting turning operation setup. With the initial machining parameters such as cutting speed, feed rate, and depth cut defined in the previous stage, 4140 steel and carbide insert (insert code: CNMG432 K313) were applied in numerical trial experimental runs under dry cutting conditions to estimate tool life. Copper coolant tubes and accessories were fabricated and installed in the CNC lathe. Following the manufacturing suggestion and literature

review, petroleum based cutting fluid (5% of Castrol Clearedge 6550) has been used to test the CNC lathe coolant system.

Experimentation is now in progress. Partial results have been obtained thus far. Further experiments will be carried out during the summer months.

The use of a novel miniature laser interferometer for two commercial applications. Researchers have demonstrated the ability to detect very minute vibrations of solid surfaces by laser interferometry. Specifically, they can detect, with no contact with the surface, the amplitude of vibrations to better than ± 5 nanometer. Nanoscale detection of surface vibrations has possible applications in early detection of miniature cracks and other surface defects. Patenting is in process for this technology.

Researchers have also been able to excite and measure the resonance frequencies of a very small volume of fluid. The data yields the surface tension with no contact with the fluid. Our test measurements on pure water and a number of other fluids and mixtures are quite promising. A patent disclosure has been submitted to the UNI Intellectual Property Committee. Patenting is in process.

Section 6. Collaboration for Economic Development

Examples of UNI's collaboration with state government, federal agencies and other Regent universities are outlined by category below:

Energy, Environment and the Bioeconomy

- The **Center for Energy and Environmental Education (CEEE)** worked in a collaborative relationship with eight solid waste agencies. The goals of the project were to:
 1. Educate K-12 teachers about solid and hazardous wastes
 2. Provide classroom-ready lesson plans to educators, who in turn teach mini-units to an average of 35 students per teacher.
 3. Develop relationships between solid waste agencies and educators so that educators have an on-going, local partner to help them teach about environmental issues
- **CEEE Local Food Program** has evolved into the Northern Iowa Food and Farm Partnership spreading the leadership and ownership of the Buy Fresh Buy Local Initiative.
- **CEEE**, the Center for the Health Effects of Environmental Contamination (CHEEC), at University of Iowa and the Leopold Center at Iowa State University are collaborating on an initiative connecting food, health and agriculture.
- **The Iowa Waste Reduction Center (IWRC)** collaborated with the Iowa Department of Natural Resources and the Iowa Department of Economic Development to provide five Construction and Demolition workshops. A total of 355 attendees came from the following five locations: Council Bluffs, Ames, Storm Lake, Cedar Falls, and Ottumwa. Attendees included contractors, engineers, architects, professors, industrial hygienists, public school officials, city inspectors, planning officials, and water superintendents from 26 Iowa cities. Continuing Education Units were presented to 92 real estate agents/appraisers and 48 building code officials/home inspectors.
- **The National Ag-Based Lubricants (NABL) Center** continues to work with professors and scientists at Iowa State University in a long-term collaboration toward the development of improved vegetable oil stability, through modification of existing crop oils as well as identifying traits desired in new cultivars. One long-term goal of this project is to isolate fractions of vegetable oils with potential in engine crankcase lubricants.
- **Materials Innovation Service (MIS)** program coordinator has been assisting a faculty research group testing the viability of using bio-based coolants in manufacturing. This project has the potential to lead to increased use of bio-based coolants in manufacturing.

Public Health

- **The GeoTREE Center** collaborated with the Iowa Department of Natural Resources and the Department of Transportation to develop a unique web portal to disseminate LiDAR data for the entire State of Iowa.
- **The GeoTREE Center** is also collaborating with Iowa Public Health, Iowa State University, and Black Hawk County officials to identify the habitats for West Nile Virus (WNV) carrying mosquitoes. Using geospatial technologies, a risk map is being created to combat the spread of WNV.
- Additionally, **GeoTREE** is working with Homeland Security in tornado and flood affected areas, following this summer's natural disasters in Iowa.
- **The Iowa Center for Immigrant Leadership and Integration (ICILI)** worked with the Iowa Center on Health Disparities and the Iowa Department of Public Health to develop advertising materials encouraging more African Americans to be tested for colorectal cancer.
- **The ICILI** worked with the Iowa Center on Health Disparities and the Iowa Department of Public Health to conduct research among Latino and African refugees in Iowa about their oral health practices.

Economic Development and Workforce

- **The Institute for Decision Making (IDM)** collaborated with Iowa Workforce Development, UNI's Center for Social and Behavioral Research (CSBR) and Dr. Mark Ecker from UNI's Department of Mathematics to develop a methodology for estimating job vacancies in Iowa industrial sectors.
- **The Regional Business Center (RBC)** launched an urban entrepreneurship development network in the Cedar Valley during FY 2008. Iowa State University Extension, UNI SBDC, UNI Regional Business Center, Institute for Social and Economic Development, Main Street Waterloo/Cedar Falls, Community Main Street, Hawkeye Community College and the UNI John Pappajohn Entrepreneurial Center participated in multiple trainings and compiled a quarterly Master Calendar which was then distributed throughout the Cedar Valley.
- **Strategic Marketing Services (SMS)** is working with the Iowa Power Fund and Office of Energy Independence to conduct a comprehensive statewide residential energy survey. The purpose of the survey will be to gather broad-based statewide data on Iowans' knowledge, beliefs, attitudes, levels of concern, use, affordability, and behaviors as they relate to energy issues and create a mechanism to measure changes in knowledge, beliefs, attitudes, and behaviors over time.

- The **Tallgrass Prairie Center (TPC)** has developed a relationship with Cedar Falls Utilities involving a project to determine maximum energy production from prairie biomass mixture. CF will burn the biomass produced in their stoker furnace. Initially there will be test burns to evaluate the materials. The June 2008 flood has delayed the project by one year.

Advanced Manufacturing

- **Metal Casting Center (MCC)**, Northern Illinois University, Quad Cities Manufacturing Laboratory and Rock Island Arsenal are currently working to develop a center for excellence in titanium casting technologies. Projects include the development of advanced technology to replace heavy conventional castings with high performance titanium castings. The resulting technology that is developed will be available to Rock Island Arsenal and also licensable by commercial companies throughout the Midwest.
- The **MCC** has an ongoing research partnership with professors at Iowa State University, the University of Iowa and the Steel Founders Society of America. This collaborative research program investigates advanced manufacturing methods for high performance steel castings. This program is in support of several key defense systems for the United States Military Service.

Section 7: Client and Project Summary

See attached spreadsheet of UNI's clients served in 2008

APPENDIX A - UNI

7. Client and Project Summary
 University of Northern Iowa
 Service to Iowa
 Fiscal Year 2008

Key to Acronyms

CEEE - Center for Energy and Environmental Education Center
 EDC - Executive Development Center
 GeoTREE - GeoInformatics Training, Research, Education, and
 ICILJ - Iowa Center for Immigrant Leadership and Integration
 IDM - Institute for Decision Making
 IWRC - Iowa Waste Reduction Center
 JPPEC - John Pappajohn Entrepreneurial Center
 MCC - Metal Casting Center

NABL - National Ag-Based Industrial Lubricants
 RBC/SBDC - Regional Business Center/Small Business Development Center
 RRTTC - Recycling and Reuse Technology Transfer Center
 MIS - Materials Innovation Services
 SMS - Strategic Marketing Services
 STEP - Sustainable Tourism and the Environment Program
 TPC - Tallgrass Prairie Center
 IRVM - Integrated Roadside Vegetation Management

Community or Business	County	State	Industry	Counseling Provided	Program
Farmers & food service staff	Benton	IA	Farm and food	marketing assistance	CEEE
Hannan Park Field Days	Benton	IA	Benton Co. Park	EE Outreach-Activities	CEEE
Black Hawk School	Black Hawk	IA	K-12 school	EE Outreach-Tour	CEEE
Bunger School	Black Hawk	IA	K-12 school	EE Outreach-Activities	CEEE
Bunger School	Black Hawk	IA	K-12 school	EE Outreach-Activities	CEEE
Bunger School	Black Hawk	IA	K-12 school	EE Outreach-Tour	CEEE
Cedar Falls Rotary	Black Hawk	IA	Service Org.	EE Outreach-Presentation	CEEE
Cedar Falls Utility Energy Fair	Black Hawk	IA	Municipal Utility	EE Outreach-Activities & Exhibits	CEEE
Cedar Valley Arboretum	Black Hawk	IA	Educational non-profit	EE Outreach-Activities	CEEE
Central Middle School	Black Hawk	IA	K-12 school	EE Outreach-Tour	CEEE
CF United Church of Christ	Black Hawk	IA	Church	EE Outreach-Activities	CEEE
CRU Energy Fair - Cedar Falls	Black Hawk	IA	Utility	Energy Education	CEEE
Crossroads TEAG display	Black Hawk	IA	Shopping Mall	EE Outreach-Exhibit	CEEE
Energy Fun in the Sun	Black Hawk	IA	College/university	EE Outreach-Activities	CEEE
Farmers and food service staff	Black Hawk	IA	Farm and food	marketing assistance	CEEE
Hartman Reserve Nature Center	Black Hawk	IA	Co. conservation	REAP Conservation Education Program	CEEE
Hartman Reserve Nature Center	Black Hawk	IA	Co. conservation	REAP Conservation Education Program	CEEE
Heartland Habitat for Humanity	Black Hawk	IA	Service non-profit	EE Outreach-Presentation	CEEE
Hoover School	Black Hawk	IA	K-12 school	EE Outreach-Activities	CEEE
ICEC Env. Ed. Summit	Black Hawk	IA	Educational non-profit	Organized and hosted event	CEEE
Iowa Academy of Science	Black Hawk	IA	Non-profit	REAP Conservation Education Program	CEEE
Iowa Farmers Union conference	Black Hawk	IA	Educational non-profit	Hosted event	CEEE
John Deere Env. Fair	Black Hawk	IA	Manufacturing Corp.	EE Outreach-Exhibit	CEEE
Logan School	Black Hawk	IA	K-12 school	EE Outreach-Tour	CEEE
Public Health Dept	Black Hawk	IA	Health	scientific consulting	CEEE
Speak Out for Agriculture, SOFA	Black Hawk	IA	Educational non-profit	EE Tour and Activities	CEEE
UNI Earth Day	Black Hawk	IA	College/university	EE Outreach-Display	CEEE
UNI Interior Design Club	Black Hawk	IA	College/university	EE Outreach-Tour	CEEE
UNI JSS race	Black Hawk	IA	K-12 school	EE Outreach-Activities	CEEE
UNI Spring Break Camp	Black Hawk	IA	College/university	EE Outreach-Activities	CEEE

7. Client and Project Summary
 University of Northern Iowa
 Service to Iowa
 Fiscal Year 2008

Community or Business	County	State	Industry	Counseling Provided	Program
UNI-CUE students	Black Hawk	IA	College/university	EE Outreach-Activities	CEEE
Waterloo Building Trades	Black Hawk	IA	Professional Org.	EE Outreach-Tour	CEEE
Waterloo Home Show	Black Hawk	IA	Promotional company	EE Outreach-Display	CEEE
Waterloo Optimists Club	Black Hawk	IA	Service Org.	EE Outreach-Presentation	CEEE
Waterloo Public Schools-Orange	Black Hawk	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Art Educators of Iowa Conf.	Boone	IA	Educational Association	EE Outreach-Exhibit	CEEE
Farmers and food service staff	Bremer	IA	Food and farm	marketing assistance	CEEE
Green Bike Tour	Bremer	IA	Educational non-profit	Hosted & participated in event	CEEE
Master Conservationists	Bremer	IA	ISU Extension	EE Outreach-Presentation	CEEE
Waverly Light & Power	Bremer	IA	Municipal utility	EE Outreach-Activities	CEEE
Waverly-Irving Elementary	Bremer	IA	K-12 school	EE Outreach-Activities	CEEE
Farmers & food service staff	Buchanan	IA	Food and farm	marketing assistance	CEEE
Fontana Park Field Days	Buchanan	IA	ISU Extension	EE Outreach-Activities	CEEE
Farmers and food service staff	Butler	IA	Food and farm	marketing assistance	CEEE
Manson Northwest HS - Webster	Calhoun	IA	High School	Electric Vehicle Education	CEEE
Pomeroy HS - Palmer	Calhoun	IA	High School	Electric Vehicle Education	CEEE
Agren	Carroll	IA	Consulting	REAP Conservation Education Program	CEEE
Clear Lake JSS race	Cerro Gordo	IA	K-12 school	EE Outreach-Activities	CEEE
Mason City Home Show	Cerro Gordo	IA	Promotional company	EE Outreach-Presentation	CEEE
North Iowa Fair	Cerro Gordo	IA	County Fair	EE Outreach-Activities	CEEE
Radish Festival	Clinton	IA	Publications Co.	EE Outreach-Activities	CEEE
Waukeee HS - Waukeee	Dallas	IA	High School	Electric Vehicle Education	CEEE
Davis County Community School	Davis	IA	School	Energy Education	CEEE
Conservation Foundation of Dickinson Co.	Dickinson	IA	Private, non-profit	REAP Conservation Education Program	CEEE
Iowa Lakes R, C& D	Dickinson	IA	Public, non-profit	REAP Conservation Education Program	CEEE
Dubuque County Historical Society	Dubuque	IA	Museums	REAP Conservation Education Program	CEEE
Dubuque Lutheran School	Dubuque	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Dubuque Public Schools-Cascade Elem	Dubuque	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Dubuque Public Schools-Lincoln Elem	Dubuque	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Dubuque Public Schools-Roosevelt MS	Dubuque	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Dubuque Public Schools-WA MS	Dubuque	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Dubuque READ	Dubuque	IA	Elementary Schools	Environmental books	CEEE
Dubuque READ	Dubuque	IA	Middle Schools	Environmental books	CEEE
Public Health Dept	Dubuque	IA	Health	scientific consulting	CEEE
Western Dubuque Public Schools-Cascad	Dubuque	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Western Dubuque Public Schools-Drexler	Dubuque	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Charles City School District	Floyd	IA	School	Energy Education	CEEE
Fossil Prairie Park Field Days	Floyd	IA	Boy Scouts of America	EE Outreach-Activities	CEEE
Farmers & food service staff	Grundy	IA	Food and farm	marketing assistance	CEEE

7. Client and Project Summary
 University of Northern Iowa
 Service to Iowa
 Fiscal Year 2008

Community or Business	County	State	Industry	Counseling Provided	Program
Iowa DNR	Guthrie	IA	Natural Resources	REAP Conservation Education Program	CEEE
West Hancock School	Hancock	IA	School	Energy Education	CEEE
WACO Community School District	Henry	IA	School	Energy Education	CEEE
Ida County Conservation	Ida	IA	County Conservation	REAP Conservation Education Program	CEEE
Andrew School District	Jackson	IA	School	Energy Education	CEEE
Maquoketa Community School District	Jackson	IA	School	Energy Education	CEEE
Preston Community School	Jackson	IA	School	Energy Education	CEEE
Lynville-Sully Comm. School District	Jasper	IA	School	Energy Education	CEEE
GSA Go Green Camporee	Johnson	IA	Educational non-profit	EE Outreach-Activities	CEEE
ICEC Winter Solstice	Johnson	IA	Educational non-profit	EE Outreach-Exhibit	CEEE
ICEC Winter Solstice	Johnson	IA	Educational non-profit	EE Outreach-Presentation	CEEE
Iowa Council for the Social Studies	Johnson	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Council for the Social Studies	Johnson	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Council for the Social Studies	Johnson	IA	Middle Schools	Environmental books	CEEE
Iowa Council for the Social Studies	Johnson	IA	High Schools	Environmental books	CEEE
Iowa Council for the Social Studies	Johnson	IA	High Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Library Asso	Johnson	IA	Libraries	Environmental books	CEEE
I-Renew Expo	Johnson	IA	Educational non-profit	EE Outreach-Activities & Exhibits	CEEE
Carpenter Elementary	Jones	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Algona Schools	Kossuth	IA	School	Energy Education	CEEE
Iowa Lakes Community College	Kossuth	IA	School	Energy Education	CEEE
Fort Madison Community School	Lee	IA	School	Energy Education	CEEE
Cedar Rapids Community Schools	Linn	IA	School	Energy Education	CEEE
COSC Residential Workshop	Linn	IA	Educational non-profit	EE Outreach-Exhibit	CEEE
Grant Wood AEA	Linn	IA	Iowa Area Ed. Assocn.	EE Outreach-Tour	CEEE
Iowa Science Teachers Conf.	Linn	IA	Educational Association	EE Outreach-Presentation & Exhibits	CEEE
Kennedy - Cedar Rapids	Linn	IA	High School	Electric Vehicle Education	CEEE
Linn County Extension	Linn	IA	ISU Extension	EE Outreach-Presentation	CEEE
Prarie -Cedar Rapids	Linn	IA	High School	Electric Vehicle Education	CEEE
Cedar Rapids Public Schools-LaSalle	Linn	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Academy of Science-Teachers Sect	Linn	IA	Elementary Schools	Environmental books	CEEE
Iowa Academy of Science-Teachers Sect	Linn	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Academy of Science-Teachers Sect	Linn	IA	High Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Conservation Education Coalition	Linn	IA	Private, non-profit	REAP Conservation Education Program	CEEE
Linn co. Conservation	Linn	IA	County Conservation	REAP Conservation Education Program	CEEE
Trees Forever	Linn	IA	Private, non-profit	REAP Conservation Education Program	CEEE
Knoxville School District	Marion	IA	School	Energy Education	CEEE
Marshall Co. Conservation	Marshall	IA	County Conservation	Solid & haz waste instruc teacher training	CEEE
Marshalltown Community Schools	Marshall	IA	School	Energy Education	CEEE

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Marshalltown Public Schools-Miller	Marshall	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Marshalltown TAG JSS race	Marshall	IA	K-12 school	EE Outreach-Activities	CEEE
Public Health Dept	Marshall	IA	Health	scientific consulting	CEEE
Riceville HS - Riceville	Mitchell	IA	High School	Electric Vehicle Education	CEEE
Loess Hills Alliance	Monona	IA	Private, non-profit	REAP Conservation Education Program	CEEE
NW Area Education Agency	Monona	IA	Education	REAP Conservation Education Program	CEEE
Muscatine HS - Muscatine	Muscatine	IA	High School	Electric Vehicle Education	CEEE
AIA Iowa Conference	Polk	IA	Educational non-profit	EE Outreach-Presentation	CEEE
Blank Park Zoo	Polk	IA	Zoo	REAP Conservation Education Program	CEEE
Blues for Greens Event	Polk	IA	Educational non-profit	EE Outreach-Display	CEEE
Des Moines Public School District	Polk	IA	School	Energy Education	CEEE
Ia Assoc for the Ed of Young Children Conf	Polk	IA	Pre-K	Solid & haz waste instruc teacher training	CEEE
Ia Assoc for the Ed of Young Children Conf	Polk	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Ia Assoc for the Ed of Young Children Conf	Polk	IA	Pre-K	Environmental books	CEEE
IEPC Award Ceremony	Polk	IA	State government	EE Outreach	CEEE
Iowa Assoc. for Energy Eff. Conf.	Polk	IA	Educational non-profit	EE Outreach-Exhibit	CEEE
Iowa DNR	Polk	IA	Natural Resources	REAP Conservation Education Program	CEEE
Iowa DNR-CLEAR	Polk	IA	Natural Resources	REAP Conservation Education Program	CEEE
Iowa Env. Council Conf.	Polk	IA	Edn. & Public Policy non-profit	EE Outreach-Exhibit	CEEE
Iowa Farmer's Union Conference	Polk	IA	Educational non-profit	EE Outreach-Exhibit	CEEE
Iowa Math Conference	Polk	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Math Conference	Polk	IA	High Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Math Conference	Polk	IA	Coe College	Solid & haz waste instruc teacher training	CEEE
Iowa Natural Heritage Foundation	Polk	IA	Private, non-profit	REAP Conservation Education Program	CEEE
Iowa Natural Heritage Foundation	Polk	IA	Private, non-profit	Board member	CEEE
Iowa Public TV	Polk	IA	Private, non-profit	REAP Conservation Education Program	CEEE
Iowa State Fair	Polk	IA	ISU Extension	EE Outreach-Activities	CEEE
Iowa Talented & Gifted Conf.	Polk	IA	Educational Association	EE Outreach-Exhibit	CEEE
Iowa Talented and Gifted Conference	Polk	IA	Middle Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Talented and Gifted Conference	Polk	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Keep Iowa Beautiful	Polk	IA	Private, non-profit	REAP Conservation Education Program	CEEE
Metro Arts Alliance	Polk	IA	Arts/Museums	REAP Conservation Education Program	CEEE
Polk Co Conservation	Polk	IA	County Conservation	REAP Conservation Education Program	CEEE
Polk Co Conservation	Polk	IA	County Conservation	REAP Conservation Education Program	CEEE
Practical farmers of Iowa	Polk	IA	Farm	sustainable agriculture	CEEE
St. Anthony School	Polk	IA	School	Energy Education	CEEE
Urbandale Community School District	Polk	IA	School	Energy Education	CEEE
Waukee Community School District	Polk	IA	School	Energy Education	CEEE
Ia Assoc for the Ed of Young Children Conf	Polk	IA	Elementary Schools	Environmental books	CEEE

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Pottawattamie County Conservation	Pottawattamie	IA	County Conservation	REAP Conservation Education Program	CEEE
BGM Field day, Brooklyn	Poweshiek	IA	K-12 school	EE Outreach-Activities	CEEE
Davenport Public Schools-West High	Scott	IA	High Schools	Solid & haz waste instruc teacher training	CEEE
Pleasant Valley School	Scott	IA	School	Energy Education	CEEE
Davenport Public Schools-Adams El	Scott	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Davenport Public Schools-Harrison El	Scott	IA	Elementary Schools	Solid & haz waste instruc teacher training	CEEE
Iowa Industrial Tech. Conf.	Story	IA	Educational Association	EE Outreach-Presentation & Exhibits	CEEE
Iowa 4-H Foundation (ISU)	Story	IA	College and Universities	REAP Conservation Education Program	CEEE
Practical Farmers of Iowa	Story	IA	College and Universities	REAP Conservation Education Program	CEEE
Farmers and food service staff	Tama	IA	Private, non-profit	marketing assistance	CEEE
Indianola School District	Warren	IA	Food and farm	Energy Education	CEEE
Renewables on Parade	Washington	IA	School	EE Outreach-Activities & Exhibits	CEEE
Fort Dodge Community Schools	Webster	IA	Educational non-profit	Energy Education	CEEE
Iowa Central CC - Fort Dodge	Webster	IA	School	Electric Vehicle Education	CEEE
Decorah Community Schools-Carrie Lee	Winnesiek	IA	Community College	Solid & haz waste instruc teacher training	CEEE
Luther College	Winnesiek	IA	Elementary Schools	REAP Conservation Education Program	CEEE
St Benedict School	Winnishiek	IA	College and Universities	Energy Education	CEEE
Lawton-Bronson School District	Woodbury	IA	School	Energy Education	CEEE
Sioux City Community School District	Woodbury	IA	School	Energy Education	CEEE
Westwood Community School	Woodbury	IA	School	Energy Education	CEEE
Advanced Heat Treat - Waterloo	Woodbury	IA	School	Energy Education	CEEE
Allen Health System - Waterloo	Black Hawk	IA	Manufacturing	Training	EDC
American Color Imaging - Cedar Falls	Black Hawk	IA	Health Care	Training	EDC
Bossard - Cedar Falls	Black Hawk	IA	Service	Training	EDC
Cedar Falls Schools	Black Hawk	IA	Manufacturing	Training	EDC
Cedar Falls Utilities - Cedar Falls	Black Hawk	IA	Education	Training	EDC
Cedar Valley Medical Specialists	Black Hawk	IA	Service	Training	EDC
City of Cedar Falls - Cedar Falls	Black Hawk	IA	Medical	Training	EDC
ConAgra Grocery Products - Waterloo	Black Hawk	IA	Government	Training	EDC
CUCCC - Cedar Falls	Black Hawk	IA	Manufacturing	Training	EDC
Eagle Ottawa- Waterloo	Black Hawk	IA	Service	Training	EDC
Exceptional Persons, Inc. - Waterloo	Black Hawk	IA	Manufacturing	Training	EDC
Grainger Parts - Waterloo	Black Hawk	IA	Service	Training	EDC
Hampton Inn - Waterloo	Black Hawk	IA	Service	Training	EDC
Iowa Laser Technology	Black Hawk	IA	Service	Training	EDC
John Deere Waterloo Works - Waterloo	Black Hawk	IA	Manufacturing	Training	EDC
Kay Park Industries - Janesville	Black Hawk	IA	Manufacturing	Training	EDC
KWWL TV - Waterloo	Black Hawk	IA	Manufacturing	Training	EDC
Manatts - Elk Run Heights	Black Hawk	IA	Service	Training	EDC

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Martin Bros. - Cedar Falls	Black Hawk	IA	Retail	Training	EDC
MidAmerican Energy - Waterloo	Black Hawk	IA	Utility	Training	EDC
Mudd Group - Cedar Falls	Black Hawk	IA	Service	Training	EDC
Next Generation Wireless - Cedar Falls	Black Hawk	IA	Service	Training	EDC
North Star Community Services	Black Hawk	IA	Service	Training	EDC
Omega Cabinets - Waterloo	Black Hawk	IA	Manufacturing	Training	EDC
PIPAC	Black Hawk	IA	Insurance	Training	EDC
Professional Ofc Services - Waterloo	Black Hawk	IA	Printing	Training	EDC
Rabo AgriFinance - Cedar Falls	Black Hawk	IA	Financial	Training	EDC
Shoff Consulting Engineers - Cedar Falls	Black Hawk	IA	Service	Training	EDC
UNI Physics Dept. - Cedar Falls	Black Hawk	IA	Education	Training	EDC
United Concrete - Elk Run Heights	Black Hawk	IA	Service	Training	EDC
Veridian Credit Union - Waterloo	Black Hawk	IA	Financial	Training	EDC
VGM Financial	Black Hawk	IA	Financial	Training	EDC
Viking Pump, Inc - Cedar Falls	Black Hawk	IA	Manufacturing	Training	EDC
Wheaton Franciscan Healthcare-Waterloo	Black Hawk	IA	Service	Training	EDC
CUNA Mutual - Waverly	Bremer	IA	Service	Training	EDC
GMT Corporation - Waverly	Bremer	IA	Manufacturing	Training	EDC
Nestle USA Beverage Div. - Waverly	Bremer	IA	Manufacturing	Training	EDC
Schumacher Elevator - Denver	Bremer	IA	Manufacturing	Training	EDC
TDS Automation - Waverly	Bremer	IA	Manufacturing	Training	EDC
Buchanan Cty. Health Ctr - Independence	Buchanan	IA	Health Care	Training	EDC
DuTrac Community Credit Union	Dubuque	IA	Financial	Training	EDC
Cambrex Charles City - Charles City	Franklin	IA	Manufacturing	Training	EDC
Lincoln Savings Bank - Reinbeck	Grundy	IA	Financial	Training	EDC
Hardin County Savings Bank - Eldora	Hardin	IA	Financial	Training	EDC
ACT - Iowa City	Johnson	IA	Service	Training	EDC
J&P Cycles - Anamosa	Jones	IA	Retail	Training	EDC
City of Cedar Rapids	Linn	IA	City Government	Training	EDC
Duane Arnold Energy Center - Palo	Linn	IA	Energy	Training	EDC
Foundation2Youth Shelter -Cedar Rapids	Linn	IA	Service	Training	EDC
Gazette Communications - Cedar Rapids	Linn	IA	Publishing	Training	EDC
Intermec Technologies - Cedar Rapids	Linn	IA	Manufacturing	Training	EDC
Linn Area Credit Union - Cedar Rapids	Linn	IA	Financial	Training	EDC
Midland Forge - Cedar Rapids	Linn	IA	Manufacturing	Training	EDC
Rockwell Collins - Cedar Rapids	Linn	IA	Manufacturing	Training	EDC
United Fire & Casualty Co - Cedar Rapids	Linn	IA	Service	Training	EDC
Worley Warehousing - Cedar Rapids	Linn	IA	Service	Training	EDC
Emerson Process Mgmt - Marshalltown	Marshall	IA	Manufacturing	Training	EDC

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Lennox Industries - Marshalltown	Marshall	IA	Manufacturing		Training		EDC
Ruan Transportation - Des Moines	Polk	IA	Transportation		Training		EDC
American Red Cross - Ames	Story	IA	Service		Training		EDC
Black Hawk County	Black Hawk	IA	County Government		Education & Research activities in Geospatial technologies		GeoTREE
City of Cedar Falls	Black Hawk	IA	City Government		Education & Research activities in Geospatial technologies		GeoTREE
City of Evansdale	Black Hawk	IA	City Government		Education & Research activities in Geospatial technologies		GeoTREE
City of Waterloo	Black Hawk	IA	City Government		Education & Research activities in Geospatial technologies		GeoTREE
Natural Resources Conservation Services	Black Hawk	IA	US Government Agency		Education & Research activities in Geospatial technologies		GeoTREE
ITREES	Linn	IA	City Government		Education & Research activities in Geospatial technologies		GeoTREE
Homeland Security	Statewide	IA	US Government Agency		Education & Research activities in Geospatial technologies		GeoTREE
Iowa Department of Natural Resources	Statewide	IA	State Government		Education & Research activities in Geospatial technologies		GeoTREE
Iowa Department of Natural Resources	Statewide	IA	State Government		Education & Research activities in Geospatial technologies		GeoTREE
Iowa Department of Transportation	Statewide	IA	State Government		Education & Research activities in Geospatial technologies		GeoTREE
US Fish and Wildlife Service and NASA	Statewide	IA	US Government Agency		Education & Research activities in Geospatial technologies		GeoTREE
American Foundry Society	Black Hawk	IA	Business		Training		ICILI
Black Hawk County Health Department	Black Hawk	IA	Public Health		Consulting		ICILI
Career Connections	Black Hawk	IA	Workforce Development		Immigration Training		ICILI
Cedar Valley Society for Human Resource Management	Black Hawk	IA	Business		Training		ICILI
Waterloo Fire Department	Black Hawk	IA	Community Services		Training		ICILI
Community Memorial Hospital? Summer	Bremer	IA	Health Care		Training		ICILI
Upper Des Moines Opportunity (UDMO)	Buena Vista	IA	Social Services		Consulting and Training		ICILI
Mercy Medical Center	Cerro Gordo	IA	Health Care		Consulting and Training		ICILI
Upper Des Moines Opportunity (UDMO)	Clay	IA	Social Services		Consulting and Training		ICILI
Upper Des Moines Opportunity (UDMO)	Dickinson	IA	Social Services		Consulting and Training		ICILI
Upper Des Moines Opportunity (UDMO)	Emmet	IA	Social Services		Consulting and Training		ICILI
Upper Des Moines Opportunity (UDMO)	Hamilton	IA	Social Services		Consulting and Training		ICILI
Upper Des Moines Opportunity (UDMO)	Humboldt	IA	Social Services		Consulting and Training		ICILI

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Community or Business	County	State	Industry	Counseling Provided	Program
Upper Des Moines Opportunity (UDMO)	Lyon	IA	Social Services	Consulting and Training	ICILI
Upper Des Moines Opportunity (UDMO)	O'Brien	IA	Social Services	Consulting and Training	ICILI
Upper Des Moines Opportunity (UDMO)	Osceola	IA	Social Services	Consulting and Training	ICILI
Upper Des Moines Opportunity (UDMO)	Palo Alto	IA	Social Services	Consulting and Training	ICILI
Upper Des Moines Opportunity (UDMO)	Plymouth	IA	Social Services	Consulting and Training	ICILI
Upper Des Moines Opportunity (UDMO)	Pochahontas	IA	Social Services	Consulting and Training	ICILI
Child Care Resources and Referral of Central Iowa	Polk	IA	Social Services	Training	ICILI
Des Moines University	Polk	IA	Education	Consulting and Training	ICILI
FutureNet: Iowa Network for Adolescent Preg. Prevention	Polk	IA	Social Services	Training	ICILI
Iowa Department of Public Health	Polk	IA	Public Health	Consulting and Training	ICILI
Iowa Department of Public Safety	Polk	IA	Iowa State Patrol	Cultural Competency Training	ICILI
Iowa Farm Bureau Federation	Polk	IA	Business	Training	ICILI
Western Iowa Business Network	Pottawattamie	IA	Business	Training	ICILI
Upper Des Moines Opportunity (UDMO)	Stoux	IA	Social Services	Consulting and Training	ICILI
Upper Des Moines Opportunity (UDMO)	Webster	IA	Social Services	Consulting and Training	ICILI
Upper Des Moines Opportunity (UDMO)	Wright	IA	Social Services	Consulting and Training	ICILI
Mid West Partnership	Adair	IA	Economic Development	Economic Development Planning	IDM
Northeast Iowa Business Network	Allamakee	IA	Economic Development	Economic Development Assistance	IDM
Black Hawk County Board of Supervisors	Black Hawk	IA	County Government	Strategic Planning	IDM
Cedar Falls, City of	Black Hawk	IA	City Government	Economic Development Assistance	IDM
Goodwill Industries	Black Hawk	IA	Non-Profit Organization	Economic Development Planning	IDM
Greater Cedar Valley Alliance	Black Hawk	IA	Economic Development	Economic Development Assistance	IDM
Waterloo, City of	Black Hawk	IA	City Government	Economic Development Planning	IDM
Buchanan County Economic Development Commission	Buchanan	IA	Economic Development	Economic Development Assistance	IDM
Carroll Area Development Corporation	Carroll	IA	Economic Development	Economic Development Assistance	IDM
Clear Lake Chamber	Cerro Gordo	IA	Chamber of Commerce	Strategic Planning	IDM
Clear Lake Economic Development	Cerro Gordo	IA	Economic Development	Economic Development Planning	IDM
Clarke County Development Corporation	Clarke	IA	Economic Development	Marketing Assistance	IDM
Off-Shore Iowa	Clarke	IA	Economic Development	Marketing Assistance	IDM
Spencer, City of/Iowa Lakes Corridor	Clay	IA	Economic Development	Strategic Planning	IDM
Elkader, City of	Clayton	IA	City Government	Marketing Assistance	IDM
Northeast Iowa Business Network	Clayton	IA	Economic Development	Economic Development Assistance	IDM
Clinton Reginal Development Corporation	Clinton	IA	Economic Development	Economic Development Assistance	IDM
Dallas Center, City of	Dallas	IA	City Government	Targeting and Economic Development Planning	IDM
Greater Dallas County Economic Development	Dallas	IA	Economic Development	Economic Development Planning	IDM

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Waukee, City of	Davis	IA	City Government	Organizational Management & Planning	IDM
Delaware County EDC	Delaware	IA	Economic Development	Economic Development Assistance	IDM
Northeast Iowa Business Network	Delaware	IA	Economic Development	Economic Development Assistance	IDM
Burlington Chamber of Commerce	Des Moines	IA	Economic Development	Economic Development Assistance	IDM
Grow Greater Burlington, Inc	Des Moines	IA	Economic Development	Economic Development Assistance	IDM
Spirit Lake, City of	Dickinson	IA	City Government	Visioning and Planning	IDM
Fayette County Economic Development	Fayette	IA	Economic Development	Economic Development Assistance	IDM
Northeast Iowa Business Network	Fayette	IA	Economic Development	Economic Development Assistance	IDM
Oelwein Chamber & Area Development	Fayette	IA	Economic Development	Economic Development Assistance	IDM
Off-Shore Iowa	Fayette	IA	Economic Development	Marketing Assistance	IDM
Charles City, City of	Floyd	IA	City Government	Economic Development Planning	IDM
Mid West Partnership	Greene	IA	Economic Development	Economic Development Planning	IDM
Mid West Partnership	Guthrie	IA	Economic Development	Economic Development Planning	IDM
Webster City Area Development	Hamilton	IA	Economic Development	Organizational Management	IDM
Hancock County Economic Development Corp	Hancock	IA	Economic Development	Economic Development Planning	IDM
Iowa Falls Area Development Group, Inc.	Hardin	IA	Economic Development	Economic Development Assistance	IDM
Mt. Pleasant Area Development Commission	Henry	IA	Economic Development	Economic Development Planning	IDM
Off-Shore Iowa	Henry	IA	Economic Development	Marketing Assistance	IDM
Howard County Economic Development Corp.	Howard	IA	Economic Development	Economic Development Assistance	IDM
Fairfield, City of	Jefferson	IA	City Government	Sustainability Planning	IDM
Iowa City Area Development Group	Johnson	IA	Economic Development	Economic Development Assistance	IDM
Jones County Development Commission	Jones	IA	Economic Development	Economic Development Planning	IDM
Kossuth/Palo Alto County Economic Development Corp	Kossuth	IA	Economic Development	Economic Development Planning	IDM
Fort Madison Development Corporation	Lee	IA	Economic Development	Economic Development Planning	IDM
Lee County Economic Development Group, Inc.	Lee	IA	Economic Development	Economic Development Assistance	IDM
Marion County Economic Development	Marion	IA	Economic Development	Economic Development Planning	IDM
Kossuth/Palo Alto County Economic Development Corp	Palo Alto	IA	Economic Development	Economic Development Planning	IDM
Council Bluffs Chamber of Commerce	Poweshiek	IA	Economic Development	Economic Development Assistance	IDM
Grinnell Tourism Group	Poweshiek	IA	Economic Development	Marketing Plan	IDM
Off-Shore Iowa	Shelby	IA	Economic Development	Marketing Assistance	IDM
Shelby County DevelopmentSource	Shelby	IA	Economic Development	Marketing Assistance	IDM
Orange City Development Corporation	Sioux	IA	Economic Development	Economic Development Assistance	IDM
Traer Economic Development Corporation	Tama	IA	Economic Development	Visioning and Planning	IDM
Union County Development Association	Union	IA	Economic Development	Economic Impacts	IDM
Northeast Iowa Business Network	Winneshtiek	IA	Economic Development	Economic Development Assistance	IDM
Clarion Partnership for Growth, Inc.	Wright	IA	Economic Development	Economic Development Planning	IDM

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Adair	Adair	IA	Manufacturing (20-39)	Air Assistance	IWRC
Corning	Adams	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Postville	Allamakee	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Waukon	Allamakee	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Waukon	Allamakee	IA	Manufacturing (20-39)	Air Assistance	IWRC
Audubon	Audubon	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Keystone	Benton	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Cedar Falls	Black Hawk	IA	Manufacturing (20-39)	Air Assistance	IWRC
Cedar Falls	Black Hawk	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Cedar Falls	Black Hawk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Dunkerton	Black Hawk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Evansdale	Black Hawk	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Evansdale	Black Hawk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Hudson	Black Hawk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Waterloo	Black Hawk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Waterloo	Black Hawk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Waterloo	Black Hawk	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance	IWRC
Waterloo	Black Hawk	IA	Transportation and Public Utilities (40-49)	On-Site Assistance	IWRC
Waterloo	Black Hawk	IA	Services (70-89)	On-Site Assistance	IWRC
Waterloo	Black Hawk	IA	Manufacturing (20-39)	Air Assistance	IWRC
Boone	Boone	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Boone	Boone	IA	Manufacturing (20-39)	Air Assistance	IWRC
Boone	Boone	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Readlyn	Bremer	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC
Sumner	Bremer	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Waverly	Bremer	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Independence	Buchanan	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Independence	Buchanan	IA	Manufacturing (20-39)	Air Assistance	IWRC
Independence	Buchanan	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Independence	Buchanan	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Jesup	Buchanan	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Rowley	Buchanan	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Winthrop	Buchanan	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Newell	Buena Vista	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance	IWRC
Newell	Buena Vista	IA	Manufacturing (20-39)	Air Assistance	IWRC
Rembrandt	Buena Vista	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance	IWRC
Allison	Butler	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Allison	Butler	IA	Services (70-89)	Air Assistance	IWRC
Aplington	Butler	IA	Mining (10-14)	Air Assistance	IWRC
Aplington	Butler	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC

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Bristow	Butler	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Clarksville	Butler	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Greene	Butler	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Parkersburg	Butler	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Rockwell City	Calhoun	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Arcadia	Carroll	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Breda	Carroll	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Carroll	Carroll	IA	Transportation and Public Utilities (40-49)	Air Assistance			IWRC
Dedham	Carroll	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Glidden	Carroll	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Lidderdale	Carroll	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Manning	Carroll	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Atlantic	Cass	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Durant	Cedar	IA	Manufacturing (20-39)	Air Assistance			IWRC
Tipton	Cedar	IA	Manufacturing (20-39)	Air Assistance			IWRC
Tipton	Cedar	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Clear Lake	Cerro Gordo	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Clear Lake	Cerro Gordo	IA	Transportation and Public Utilities (40-49)	Air Assistance			IWRC
Thornton	Cerro Gordo	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Cherokee	Cherokee	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Cherokee	Cherokee	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Cherokee	Cherokee	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Cherokee	Cherokee	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance			IWRC
Larrabee	Cherokee	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Marcus	Cherokee	IA	Construction (15-17)	Air Assistance			IWRC
Marcus	Cherokee	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Lawler	Chickasaw	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
New Hampton	Chickasaw	IA	Manufacturing (20-39)	Air Assistance			IWRC
New Hampton	Chickasaw	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
New Hampton	Chickasaw	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Osceola	Clarke	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Osceola	Clarke	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Royal	Clay	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Spencer	Clay	IA	Manufacturing (20-39)	Air Assistance			IWRC
Edgewood	Clayton	IA	Manufacturing (20-39)	Air Assistance			IWRC
Edgewood	Clayton	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Elkader	Clayton	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Monona	Clayton	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Monona	Clayton	IA	Wholesale Trade (50-51)	Air Assistance			IWRC

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Saint Olaf	Clayton	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Andover	Clinton	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Clinton	Clinton	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
De Witt	Clinton	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Welton	Clinton	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Charter Oak	Crawford	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Denison	Crawford	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Denison	Crawford	IA	Manufacturing (20-39)	Air Assistance	IWRC
Schleswig	Crawford	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Perry	Dallas	IA	Manufacturing (20-39)	Air Assistance	IWRC
Bloomfield	Davis	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Bloomfield	Davis	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC
Pulaski	Davis	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Lamoni	Decatur	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC
Leon	Decatur	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Delhi	Delaware	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Earlville	Delaware	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Earlville	Delaware	IA	Manufacturing (20-39)	Air Assistance	IWRC
Hopkinton	Delaware	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Manchester	Delaware	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance	IWRC
Ryan	Delaware	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Mediapolis	Des Moines	IA	Manufacturing (20-39)	Air Assistance	IWRC
Sperry	Des Moines	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Dubuque	Dubuque	IA	Services (70-89)	On-Site Assistance	IWRC
Dubuque	Dubuque	IA	Services (70-89)	On-Site Assistance	IWRC
Dubuque	Dubuque	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Dubuque	Dubuque	IA	Manufacturing (20-39)	Air Assistance	IWRC
Dubuque	Dubuque	IA	Retail Trade (52-59)	Air Assistance	IWRC
Dubuque	Dubuque	IA	Services (70-89)	Air Assistance	IWRC
Dubuque	Dubuque	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Dubuque	Dubuque	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Dyersville	Dubuque	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Dyersville	Dubuque	IA	Manufacturing (20-39)	Air Assistance	IWRC
Epworth	Dubuque	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Farley	Dubuque	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Luxemburg	Dubuque	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Peosta	Dubuque	IA	Manufacturing (20-39)	Air Assistance	IWRC
Worthington	Dubuque	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Elgin	Fayette	IA	Wholesale Trade (50-51)	Air Assistance	IWRC

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Maynard		Fayette	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Oelwein		Fayette	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Oran		Fayette	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Marble Rock		Floyd	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Hampton		Franklin	IA	Manufacturing (20-39)	Air Assistance			IWRC
Hampton		Franklin	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Hampton		Franklin	IA	Services (70-89)	Air Assistance			IWRC
Latimer		Franklin	IA	Wholesale Trade (50-51)	On-Site Assistance			IWRC
Dana		Greene	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Jefferson		Greene	IA	Services (70-89)	Air Assistance			IWRC
Jefferson		Greene	IA	Manufacturing (20-39)	Air Assistance			IWRC
Beaman		Grundy	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Conrad		Grundy	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Dike		Grundy	IA	Transportation and Public Utilities (40-49)	Air Assistance			IWRC
Dike		Grundy	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Reinbeck		Grundy	IA	Manufacturing (20-39)	Air Assistance			IWRC
Wellsburg		Grundy	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Bayard		Guthrie	IA	Mining (10-14)	On-Site Assistance			IWRC
Bayard		Guthrie	IA	Mining (10-14)	Air Assistance			IWRC
Blairsburg		Hamilton	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Webster City		Hamilton	IA	Manufacturing (20-39)	Air Assistance			IWRC
Webster City		Hamilton	IA	Manufacturing (20-39)	On-Site Assistance			IWRC
Garner		Hancock	IA	Manufacturing (20-39)	Air Assistance			IWRC
Woden		Hancock	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Ackley		Hardin	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Alden		Hardin	IA	Mining (10-14)	Air Assistance			IWRC
Hubbard		Hardin	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Iowa Falls		Hardin	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance			IWRC
Iowa Falls		Hardin	IA	Services (70-89)	On-Site Assistance			IWRC
New Providence		Hardin	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Radcliffe		Hardin	IA	Transportation and Public Utilities (40-49)	Air Assistance			IWRC
Logan		Harrison	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Mount Pleasant		Henry	IA	Services (70-89)	On-Site Assistance			IWRC
Cresco		Howard	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Elma		Howard	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Lime Springs		Howard	IA	Wholesale Trade (50-51)	Air Assistance			IWRC
Protivin		Howard	IA	Manufacturing (20-39)	Air Assistance			IWRC
Riceville		Howard	IA	Manufacturing (20-39)	Air Assistance			IWRC
Bode		Humboldt	IA	Wholesale Trade (50-51)	Air Assistance			IWRC

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Gilmore City	Humboldt	IA	Manufacturing (20-39)	Air Assistance	IWRC
Humboldt	Humboldt	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance	IWRC
Ottosen	Humboldt	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Holstein	Ida	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Ida Grove	Ida	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Ida Grove	Ida	IA	Manufacturing (20-39)	Air Assistance	IWRC
Ida Grove	Ida	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Ladora	Iowa	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC
Ladora	Iowa	IA	Nonclassified Establishments (99-99)	Air Assistance	IWRC
North English	Iowa	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
La Motte	Jackson	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Maquoketa	Jackson	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Miles	Jackson	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Preston	Jackson	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Killduff	Jasper	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Lynnville	Jasper	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Monroe	Jasper	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Newton	Jasper	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Newton	Jasper	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC
Prairie City	Jasper	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Sully	Jasper	IA	Transportation and Public Utilities (40-49)	On-Site Assistance	IWRC
Fairfield	Jefferson	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Fairfield	Jefferson	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Iowa City	Johnson	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Solon	Johnson	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Monticello	Jones	IA	Manufacturing (20-39)	Air Assistance	IWRC
Monticello	Jones	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance	IWRC
Monticello	Jones	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Monticello	Jones	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Keota	Keokuk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Sigourney	Keokuk	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Algona	Kossuth	IA	Construction (15-17)	Air Assistance	IWRC
Burt	Kossuth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Fort Madison	Lee	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC
Fort Madison	Lee	IA	Transportation and Public Utilities (40-49)	On-Site Assistance	IWRC
Houghton	Lee	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Cedar Rapids	Linn	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Cedar Rapids	Linn	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Letts	Louisa	IA	Wholesale Trade (50-51)	Air Assistance	IWRC

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Community or Business	County	State	Industry	Counseling Provided	Program
Chariton	Lucas	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Doon	Lyon	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Inwood	Lyon	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Lester	Lyon	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Truro	Madison	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Winterset	Madison	IA	Manufacturing (20-39)	Air Assistance	IWRC
Winterset	Madison	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Leighton	Mahaska	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Oskaloosa	Mahaska	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Oskaloosa	Mahaska	IA	Manufacturing (20-39)	Air Assistance	IWRC
Oskaloosa	Mahaska	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Knoxville	Marion	IA	Transportation and Public Utilities (40-49)	On-Site Assistance	IWRC
Knoxville	Marion	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC
Knoxville	Marion	IA	Transportation and Public Utilities (40-49)	On-Site Assistance	IWRC
Pella	Marion	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Pella	Marion	IA	Manufacturing (20-39)	Air Assistance	IWRC
Pleasantville	Marion	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Albion	Marshall	IA	Manufacturing (20-39)	Air Assistance	IWRC
Marshalltown	Marshall	IA	Manufacturing (20-39)	Air Assistance	IWRC
Marshalltown	Marshall	IA	Services (70-89)	On-Site Assistance	IWRC
Melbourne	Marshall	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
State Center	Marshall	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC
Little Cedar	Mitchell	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Osage	Mitchell	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Osage	Mitchell	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC
Saint Ansgar	Mitchell	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Saint Ansgar	Mitchell	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Onawa	Monona	IA	Services (70-89)	Air Assistance	IWRC
Albia	Monroe	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Albia	Monroe	IA	Manufacturing (20-39)	Air Assistance	IWRC
Red Oak	Montgomery	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Moscow	Muscatine	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Muscatine	Muscatine	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Muscatine	Muscatine	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Muscatine	Muscatine	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Wilton	Muscatine	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Archer	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Calumet	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Hartley	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC

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Paullina	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Pringhar	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Sheldon	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Sheldon	O'Brien	IA	Manufacturing (20-39)	Air Assistance	IWRC
Sutherland	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Ocheyedan	O'Brien	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Ocheyedan	O'Brien	IA	Services (70-89)	On-Site Assistance	IWRC
Clarinda	Page	IA	Manufacturing (20-39)	Air Assistance	IWRC
Shenandoah	Page	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Emmetsburg	Palo Alto	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Ruthven	Palo Alto	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Akron	Plymouth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Brunsville	Plymouth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Kingsley	Plymouth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Le Mars	Plymouth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Le Mars	Plymouth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Remsen	Pocahontas	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Palmer	Polk	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Ankeny	Polk	IA	Services (70-89)	Air Assistance	IWRC
Ankeny	Polk	IA	Services (70-89)	On-Site Assistance	IWRC
Ankeny	Polk	IA	Services (70-89)	On-Site Assistance	IWRC
Ankeny	Polk	IA	Services (70-89)	On-Site Assistance	IWRC
Des Moines	Polk	IA	Manufacturing (20-39)	Air Assistance	IWRC
Council Bluffs	Pottawattamie	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC
Council Bluffs	Pottawattamie	IA	Manufacturing (20-39)	Air Assistance	IWRC
Council Bluffs	Pottawattamie	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC
Council Bluffs	Pottawattamie	IA	Services (70-89)	Air Assistance	IWRC
Council Bluffs	Pottawattamie	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Grinnell	Poweshiek	IA	Manufacturing (20-39)	Air Assistance	IWRC
Grinnell	Poweshiek	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Mount Ayr	Ringgold	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Nemaha	Sac	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Bettendorf	Scott	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Bettendorf	Scott	IA	Services (70-89)	On-Site Assistance	IWRC
Davenport	Scott	IA	Services (70-89)	Air Assistance	IWRC
Davenport	Scott	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Davenport	Scott	IA	Manufacturing (20-39)	Air Assistance	IWRC
Davenport	Scott	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Eldridge	Scott	IA	Services (70-89)	Air Assistance	IWRC

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Earling	Shelby	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Harlan	Shelby	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Irwin	Shelby	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Alton	Sioux	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Granville	Sioux	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Hospers	Sioux	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Hull	Sioux	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Hull	Sioux	IA	Manufacturing (20-39)	Air Assistance	IWRC
Ireton	Sioux	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Orange City	Sioux	IA	Services (70-89)	On-Site Assistance	IWRC
Orange City	Sioux	IA	Manufacturing (20-39)	Air Assistance	IWRC
Rock Valley	Sioux	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Rock Valley	Sioux	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC
Sioux Center	Sioux	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Ames	Story	IA	Retail Trade (52-59)	Air Assistance	IWRC
Ames	Story	IA	Construction (15-17)	Air Assistance	IWRC
Zearing	Story	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Dysart	Tama	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Tama	Tama	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Tama	Tama	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Tama	Tama	IA	Nonclassified Establishments (99-99)	Air Assistance	IWRC
Traer	Tama	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC
Lenox	Taylor	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Lenox	Taylor	IA	Manufacturing (20-39)	Air Assistance	IWRC
Afton	Union	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Creston	Union	IA	Transportation and Public Utilities (40-49)	On-Site Assistance	IWRC
Creston	Union	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Cantril	Van Buren	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Farmington	Van Buren	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Eddyville	Wapello	IA	Manufacturing (20-39)	Air Assistance	IWRC
Ottumwa	Wapello	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC
Indianola	Warren	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Lacona	Warren	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
New Virginia	Warren	IA	Manufacturing (20-39)	Air Assistance	IWRC
Ainsworth	Washington	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Crawfordsville	Washington	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Kalona	Washington	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Riverside	Washington	IA	Wholesale Trade (50-51)	Air Assistance	IWRC
Washington	Washington	IA	Manufacturing (20-39)	On-Site Assistance	IWRC
Washington	Washington	IA	Wholesale Trade (50-51)	On-Site Assistance	IWRC

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Community or Business		County		State	Industry	Counseling Provided		Program
Washington	Washington	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Washington	Washington	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Wellman	Washington	IA	Agriculture, Forestry, and Fishing (01-09)	Air Assistance	IWRC			
Corydon	Wayne	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Seymour	Wayne	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Fort Dodge	Webster	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Fort Dodge	Webster	IA	Mining (10-14)	Air Assistance	IWRC			
Fort Dodge	Webster	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Lake Mills	Winnebago	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Leland	Winnebago	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Calmar	Winneshiek	IA	Construction (15-17)	Air Assistance	IWRC			
Calmar	Winneshiek	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Decorah	Winneshiek	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Decorah	Winneshiek	IA	Manufacturing (20-39)	On-Site Assistance	IWRC			
Spillville	Winneshiek	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Danbury	Woodbury	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Sioux City	Woodbury	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Manly	Worth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Manly	Worth	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Northwood	Worth	IA	Manufacturing (20-39)	Air Assistance	IWRC			
Northwood	Worth	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Clarion	Wright	IA	Wholesale Trade (50-51)	Air Assistance	IWRC			
Dows	Wright	IA	Transportation and Public Utilities (40-49)	Air Assistance	IWRC			
Cedar Falls	Black Hawk	IA	Nonprofit	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Electronic Media	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Restaurant	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Oil Wholesale	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Cleaning Service	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Daycare	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Machining	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Recording Studio	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Restaurant	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Wedding Consultant	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	E-commerce	Existing	JPEC			
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Air Transportation	Start-up	JPEC			
Cedar Falls	Black Hawk	IA	Lawn Care Service	Start-up	JPEC			

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Community or Business	County	State	Industry	Counseling Provided	Program
Cedar Falls	Black Hawk	IA	Franchise	Start-up	JPEC
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Import/Export	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Marketing	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Restaurant	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Organic Farming	Start-up	JPEC
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Accounting	Start-up	JPEC
Cedar Falls	Black Hawk	IA	E-services	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Marketing	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Trucking	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Marketing/Consulting	Start-up	JPEC
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Photography	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Photography	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Trucking	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Health and Education Services	Existing	JPEC
Cedar Falls	Black Hawk	IA	Construction	Existing	JPEC
Cedar Falls	Black Hawk	IA	Electronic Media	Existing	JPEC
Cedar Falls	Black Hawk	IA	Construction	Exit	JPEC
Cedar Falls	Black Hawk	IA	Government Contracting Firm	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Restaurant	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Graphic Design	Existing	JPEC
Cedar Falls	Black Hawk	IA	Housekeeping	Existing	JPEC
Cedar Falls	Black Hawk	IA	Self-Publishing Business	Existing	JPEC
Cedar Falls	Black Hawk	IA	Daycare	Existing	JPEC
Cedar Falls	Black Hawk	IA	Machining	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Restaurant	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Photography	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Digital Media	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Breeding Services	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Landscaping Services	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Landscaping Services	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Nonprofit	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Recreation Services	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Taxidermy	Existing	JPEC
Cedar Falls	Black Hawk	IA	Hairstyling	Start-up	JPEC
Cedar Falls	Black Hawk	IA	Air Transportation	Start-up	JPEC
Cedar Falls	Black Hawk	IA	E-commerce	Start-up	JPEC

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Community or Business		County		State	Industry	Counseling Provided		Program
Cedar Falls		Black Hawk	IA	Retail		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Convenience Store		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Professional Poker		Start-up		JPEC
Cedar Falls		Black Hawk	IA	E-commerce		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Furniture Restoration		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Retail - Book Store		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Retail - Pottery		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Used Car Sales		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Organization Services		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Construction		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Furniture Restoration		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Restaurant		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Restaurant		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Marketing		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Financial Services		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Restaurant		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Business Consultant		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Consulting		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Consulting		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Automotive Services		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Manufacturing		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Arts - ceramics		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Consulting		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Manufacturing		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Retail - recreation		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Art Gallery		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Restaurant and Wedding Planning		Start-up		JPEC
Cedar Falls		Black Hawk	IA	Info Systems		Start-up		JPEC
Evansdale		Black Hawk	IA	Photography		Start-up		JPEC
Ida Grove		Ida	IA	Oil Company		Start-up		JPEC
Cedar Rapids		Linn	IA	Restaurant		Start-up		JPEC
Polk City		Polk	IA	Cleaning Service		Start-up		JPEC
Benton Castings		Benton	IA	Foundry, Metal Casting		Technical Assistance		MCC
John Deere Waterloo Works		Black Hawk	IA	Foundry, Metal Casting		Technical Assistance		MCC
Roskamp		Black Hawk	IA	Foundry, Metal Casting		Consulting		MCC
Viking Pump, Inc - Cedar Falls		Black Hawk	IA	Foundry, Metal Casting		Technical Assistance		MCC
American Colloid Co		Blackhawk	IA	Foundry, Metal Casting		Technical Assistance		MCC
Bentonite Performance Materials		Blackhawk	IA	Foundry, Metal Casting		Technical Assistance		MCC
GMT		Bremer	IA	Foundry, Metal Casting		Technical Assistance		MCC

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Community or Business	County	State	Industry	Counseling Provided	Program
Plastic Professionals	Cass	IA	Foundry, Metal Casting	Consulting	MCC
Progress Foundry	Chickasaw	IA	Foundry, Metal Casting	Technical Assistance	MCC
AY McDonald	Dubuque	IA	Foundry, Metal Casting	Technical Assistance	MCC
University of Iowa	Johnson	IA	Foundry, Metal Casting	Technical Assistance	MCC
Bender Foundry Service	Keokuk	IA	Foundry, Metal Casting	Technical Assistance	MCC
Clow Valve	Mahaska	IA	Foundry, Metal Casting	Technical Assistance	MCC
Sivier Steel Casting	Scott	IA	Foundry, Metal Casting	Technical Assistance	MCC
Iowa State University	Story	IA	Foundry, Metal Casting	Technical Assistance	MCC
Wellman Dynamics / Fansteel	Union	IA	Foundry, Metal Casting	Technical Assistance	MCC
Clear Creek	Black Hawk	IA	Manufacturing	Materials Testing	MIS
Standard Golf	Black Hawk	IA	Manufacturing	Materials Testing	MIS
City Carton Recycling	Johnson	IA	Recycling Products	Materials Testing	MIS
Greystone Manufacturing	Scott	IA	Manufacturing	Materials Testing	MIS
UNI Metal Casting Center - CABB	Black Hawk	IA	Manufacturing	Testing/Research	NABL
UNI Recycling and Reuse Technology Center	Black Hawk		Research/Service	Testing/Research	NABL
Environmental Lubricants Manufacturing - Plainfield	Bremer	IA	Manufacturing	Testing/Research	NABL
Renewable Energy Group	Carroll	IA	Biodiesel	Testing/Research	NABL
Golden Grains Energy, LLC	Cerro Gordo	IA	Ethanol	Testing/Research	NABL
Little Sioux Corn Processing	Cherokee	IA	Ethanol	Testing/Research	NABL
Green World Biofuels	Johnson	IA	Biodiesel	Testing/Research	NABL
Feed Energy Company	Polk	IA	Biofuels Byproducts	Testing/Research	NABL
Iowa State University Center for Sustainable Environmental Technologies (CSET)	Story	IA	Research	Testing/Research	NABL
Iowa State University: Office of Biorenewable Programs (OBP)	Story	IA	Research	Testing/Research	NABL
Adams County Entrepreneurs	Adams	IA	Entrepreneurship Economic Development	EntreBash!	RBC/SBDC
MyEntreNet Task Force	Adams	IA	Entrepreneurship Economic Development	MyEntreNet	RBC/SBDC
MyEntreNet Task Force E Team	Adams	IA	Entrepreneurship Economic Development	MyEntreNet	RBC/SBDC
Entrepreneurs	Allamakee	IA	Retail. Manufacturing/Service/Technology	Market Research Presentation	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	Smart Start	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	Fascinating Facts on Iowa's History	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	End of the Year Wrap-Up for Your Business	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	Networking Offline	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	Smart Start	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	Smart Start	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	MyEntreNet Entrepreneurial Exchange	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	Smart Start	RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail. Manufacturing/Service/Technology	Credit Concerns for your Business	RBC/SBDC

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Community or Business	County		State	Industry	Counseling Provided		Program
	Black Hawk	IA			Quickbooks	RBC/SBDC	
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Quickbooks	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Keeping Ahead of Technology	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Organizational Marketing	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Fast Trac	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Market Penetration	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	The Power of Market Research	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Developing Your Online Presence	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Financial Feasibility	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Chaos Controlled-Where did I put that?	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Keeping Your Business Organized	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Marketing	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Boosting your Business Image	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Public Relations	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	EntreFest	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Creating Extraordinary Customer Services	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Networking & Customer Service	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Succession Planning	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Ebay	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Emergence of a Molecular Economy	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Small Business Accounting	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Quickbooks	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	EntreBash	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Patents and Intellectual Property Issues	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	What you need to start a business	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Fast Trac	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Black Hawk	IA	Retail.Manufacturing/Service/Technology	MyEntreNet	RBC/SBDC		RBC/SBDC
MyEntreNet Task Force	Black Hawk	IA	Entrepreneurship Economic Development	Smart Start	RBC/SBDC		RBC/SBDC
Entrepreneurs	Buchanan	IA	Retail.Manufacturing/Service/Technology	Managing Your Marketing Methods	RBC/SBDC		RBC/SBDC
Entrepreneurs	Buchanan	IA	Retail.Manufacturing/Service/Technology	Where's the Money	RBC/SBDC		RBC/SBDC
Entrepreneurs	Buchanan	IA	Retail.Manufacturing/Service/Technology		RBC/SBDC		RBC/SBDC

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Community or Business		County	State	Industry	Counseling Provided		Program
MyEntreNet Task Force	Decatur	IA	Entrepreneurship Economic Development	MyEntreNet			RBC/SBDC
Entrepreneurs	Delaware	IA	Retail.Manufacturing/Service/Technology	Smart Start			RBC/SBDC
Entrepreneurs	Jasper	IA	Retail.Manufacturing/Service/Technology	Fast Trac			RBC/SBDC
MyEntreNet Task Force	Jasper	IA	Entrepreneurship Economic Development	MyEntreNet			RBC/SBDC
MyEntreNet Task Force- E Team	Jasper	IA	Entrepreneurship Economic Development	MyEntreNet			RBC/SBDC
MyEntreNet Task Force	Marion	IA	Entrepreneurship Economic Development	MyEntreNet			RBC/SBDC
MyEntreNet Task Force	O'Brien	IA	Entrepreneurship Economic Development	MyEntreNet			RBC/SBDC
MyEntreNet Task Force- E Team	O'Brien	IA	Entrepreneurship Economic Development	MyEntreNet			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Preparing Your Business for Recession			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Organizational Marketing			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Importance of Budgets; Credit Reports & Sc			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Marketing			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Social Networking and It's Importance to Y			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Mastering Your Marketing Methods			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Boosting Your Business Image			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Networking & Customer Service			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Keeping Your Business Organized			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	End of the Year Wrap-up for Your Business			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Preparing Your Business for Recession			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Where's The Money?			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Opportunities of Changing Demographics			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Technology Solutions			RBC/SBDC
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Advertising Open Forum			RBC/SBDC

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Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Targeted Monies		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Mastering Market Research		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Identifying the Value of Your Business Nic		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Preventing Employee Theft/ Biz Security		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Marketing Your Biz on a Shoestring		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Making Your Business Noteworthy		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Financial Feasibility		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Patents and Intellectual Property		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Event Planning		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Finding and Hiring Employees		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	USDA- A Source for Business Capital		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Increasing Your Business Through E-Bay		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Successful Business Succession		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Preparing Your Business for Recession		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Creative Financing		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Understanding Credit		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Quickbooks		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Marketing on a Shoestring		RBC/SBDC	
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Public Relations and Peer Marketing		RBC/SBDC	

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Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Market Penetration		RBC/SBDC				
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Entrepreneurship Basics		RBC/SBDC				
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Smart Start		RBC/SBDC				
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Smart Start		RBC/SBDC				
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Smart Start		RBC/SBDC				
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Smart Start		RBC/SBDC				
Webinar	Online- Statewide	IA	Retail.Manufacturing/Service/Technology	Smart Start		RBC/SBDC				
MyEntreNet Task Force	Poweshiek	IA	Entrepreneurship Economic Development	MyEntreNet		RBC/SBDC				
MyEntreNet Task Force- E Team	Poweshiek	IA	Entrepreneurship Economic Development	MyEntreNet		RBC/SBDC				
Entrepreneurs	Tama	IA	Retail.Manufacturing/Service/Technology	Preparing Your Business for an Economic I		RBC/SBDC				
Entrepreneurs	Union	IA	Retail.Manufacturing/Service/Technology	Market Research		RBC/SBDC				
MyEntreNet Task Force	Union	IA	Entrepreneurship Economic Development	MyEntreNet		RBC/SBDC				
MyEntreNet Task Force- E Team	Union	IA	Entrepreneurship Economic Development	MyEntreNet		RBC/SBDC				
Cedar Valley Corp.	Black Hawk	IA	Manufacturing	Lunch & Learn program for employees on area county recycling options		RRTTC				
Columbus High School	Black Hawk	IA	Education	Recycling education presented at Columbus High school to students and teachers.		RRTTC				
University of Northern Iowa	Black Hawk	IA	Education	Coordination and participation in campus "Earth Day" celebration giving opportunity for area businesses and organizations to share their messages with students, faculty and staff. Collection of 2 trucks full of recyclables.		RRTTC				
West High School	Black Hawk	IA	Education	Recycling Education presented to all 1100 students through "A Day in the Life of You"		RRTTC				
Wheaton Franciscan Hospitals	Fayette	IA	Health Care	The RRTTC worked with Mercy hospital to find ways to increase recycling options for the hospital		RRTTC				
Iowa Elementary Schools	Multi-county	IA	Education	Env. Education regarding recycling, water quality and health though Iowa Children's Water Festival.		RRTTC				

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Iowa Citizens, Businesses and Industries	Multi-county	IA	Multiple		Technical Assistance, & Env. Education		RRITC
Washington County elementary children & teachers, businesses and public	Washington	IA	Education		Recycling & Material innovations presented to children, teachers, businesses and public at "Renewables on Parade"		RRITC
Anti-Leukemic - Waterloo	Black Hawk	IA	Medical Research		Market Research		SMS
Cedar Falls Utilities - Cedar Falls	Black Hawk	IA	Utility		Market Research		SMS
Retirement Resource Center - Cedar Falls	Black Hawk	IA	Service		Market Research		SMS
Waterloo Municipal Utility - Waterloo	Black Hawk	IA	Utility		Market Research		SMS
Hub City - Stanley	Buchanan	IA	Food Manufacturing		Market Research		SMS
Butler County Cheese Factory	Butler	IA	Food Manufacturing		Market Research		SMS
Heavy Equipment Mfg. - Grundy Center	Grundy	IA	Manufacturing		Market Research		SMS
Lincoln Savings Bank - Reinbeck	Grundy	IA	Financial		Market Research		SMS
Metal Tech - Iowa Falls	Hardin	IA	Manufacturing		Market Research		SMS
Collis, Inc. - Muscatine	Muscatine	IA	Manufacturing		Market Research		SMS
Northern Filter Media - Muscatine	Muscatine	IA	Manufacturing		Market Research		SMS
Maintainer Corp. - Sheldon	O'Brien	IA	Manufacturing		Market Research		SMS
Building Inspectors - Huxley	Story	IA	Service		Market Research		SMS
Iowa Energy Center - Ames	Story	IA	Service		Market Research		SMS
Calhoun County RC&D	Multi-county	IA	Tourism/Education/Cultural		Feasibility Study		STEP
RAGBRAI - Des Moines Register	Multi-county	IA	Tourism		Evaluation/Economic Impacts		STEP
Iowa Center for the ARTS	Multi-county	IA	Tourism		Economic Impact		STEP
County Roadside Mgrs. Winter Mtg.	Adair	IA	Roadside Vegetation Management		1-Day Training		TPC-IRVM
Seedling Identification Workshop	Adair	IA	Training		1-Day Training		TPC-Outreach
NRCS	Adams	IA	Plant ID		Technical Workshop		TPC
NRCS	Alamakee	IA	Plant ID		Technical Workshop		TPC
Roadside Plantings Bus Tour	Appanoose	IA	Roadside Vegetation Management		IRVM Promotion		TPC-IRVM
County Roadside Managers Winter Mtg.	Audubon	IA	Roadside Vegetation Management		1-Day Training		TPC-IRVM
County Roadside Managers Winter Mtg.	Benton	IA	Roadside Vegetation Management		1-Day Training		TPC-IRVM
Seedling Identification Workshop	Benton	IA	Training		1-Day Training		TPC-Outreach
Wetland Plant ID Workshop	Benton	IA	Roadside Vegetation Management		2-Day Training		TPC-IRVM
Bennington Township	Black Hawk	IA	Prescribed burn		prairie management		TPC
Black Hawk County Conservation	Black Hawk	IA	Conservation Organization		Prairie Biomass Presentation		PC-Prairie Institut
Cedar Falls Rotary	Black Hawk	IA	Prescribed burn		prairie management		TPC
Cedar Falls Rotary	Black Hawk	IA	Non-Profit Service Organization		Seed Collecting at Big Woods		PC-Prairie Institut
City of Cedar Falls	Black Hawk	IA	Prescribed burn		prairie management		TPC
County Roadside Managers Winter Mtg.	Black Hawk	IA	Roadside Vegetation Management		1-Day Training		TPC-IRVM
Hawkeye Comm. College IRVM	Black Hawk	IA	Roadside Vegetation Management		Advisory Committee Meeting		TPC-IRVM

7. Client and Project Summary
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Community or Business	County	State	Industry	Counseling Provided	Program
Introduction to the Tallgrass Prairie	Black Hawk	IA	Education	4-Day Training	TPC-Outreach
Iowa Assoc. County Conservation Boards	Black Hawk	IA	Conservation Organization	Seedling Identification Presentation	PC-Prairie Institut
Iowa Dept. of Transportation	Black Hawk	IA	State Agency	Forb Enhancement Presentation	PC-Prairie Institut
John Deere PEC	Black Hawk	IA	Prescribed burn	prairie management	TPC
Lost Landscape Teacher Workshop	Black Hawk	IA	Education	2-Day Training	TPC-Outreach
Natural Resource Research and Management Sem	Black Hawk	IA	Education	Presentation	TPC-Outreach
NRCS	Black Hawk	IA	Native Plant Propagation	Technical Workshop	TPC
private	Black Hawk	IA	Native Plant Propagation	Technical Workshop	TPC
private	Black Hawk	IA	Native Plant Propagation	Technical Workshop	TPC
private ownds	Black Hawk	IA	Prescribed burns	Technical Workshop	TPC
Seedling Identification Workshop	Black Hawk	IA	Training	prairie management	TPC-Outreach
UNI	Black Hawk	IA	Native Plant Propagation	1-Day Training	TPC
Waterloo School - McKinstry	Black Hawk	IA	Elementary School	Technical Workshop	TPC
Wetland Plant ID Workshop	Black Hawk	IA	Roadside Vegetation Management	Developed and implemented school prairie	PC-Prairie Institut
Iowa DNR State Preserves Resource Mngr Mtg	Black Hawk/But	IA	Technical	2-Day Training	TPC-IRVM
NRCS	Boone	IA	Plant ID	Field tour	TPC
Introduction to the Tallgrass Prairie	Bremer	IA	Education	Technical Workshop	TPC
NRCS	Bremer	IA	Plant ID	4-Day Training	TPC-Outreach
Wartburg	Bremer	IA	Native Plant Propagation	Technical Workshop	TPC
Wartburg	Bremer	IA	Native Plant Propagation	Technical Workshop	TPC
County Roadside Managers Winter Mtg.	Buchanan	IA	Roadside Vegetation Management	Technical Workshop	TPC
IRVM Roadside Conference	Buchanan	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
IRVM Roadside Conference	Buchanan	IA	Roadside Vegetation Management	Prairie planting techniques Presentation	PC-Prairie Institut
NRCS	Buchanan	IA	Plant ID	Plant Identification Presentation	PC-Prairie Institut
Pre-Conference Planning visit	Buchanan	IA	Roadside Vegetation Management	Technical Workshop	TPC
Roadside Scholarship Meeting	Buchanan	IA	Roadside Vegetation Management	Meeting	TPC-IRVM
Seedling Identification Workshop	Buchanan	IA	Training	Committee Meeting	TPC-IRVM
NRCS	Buena Vista	IA	Plant ID	1-Day Training	TPC-Outreach
NRCS	Buena Vista	IA	Plant ID	Technical Workshop	TPC
Iowa DNR State Preserves Resource Mngr Mtg	Butler/Black Haw	IA	Technical	Technical Workshop	TPC
Meet with County Engineer	Butler	IA	Roadside Vegetation Management	Field tour	TPC
Prairie Walks for School Kids	Butler	IA	Education	IRVM Program Development	TPC-IRVM
NRCS "	Calhoun	IA	Plant ID	Tour	TPC-IRVM
County Roadside GPS/GIS Workshop	Carroll	IA	Roadside Vegetation Management	Technical Workshop	TPC
NRCS	Carroll	IA	Plant ID	2-Day Training	TPC-IRVM
NRCS	Carroll	IA	Plant ID	Technical Workshop	TPC
NRCS	Cass	IA	Plant ID	Technical Workshop	TPC
County Roadside Managers Winter Mtg.	Cerro Gordo	IA	Roadside Vegetation Management	Technical Workshop	TPC-IRVM
County Roadside Managers Winter Mtg.	Chickasaw	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM

7. Client and Project Summary
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Community or Business	County	State	Industry	Counseling Provided	Program
NRCS	Chickasaw	IA	Plant ID	Technical Workshop	TPC
Wetland Plant ID Workshop	Chickasaw	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Clay	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
NRCS	Clay	IA	Plant ID	Technical Workshop	TPC
Lost Landscape Teacher Workshop	Clayton	IA	Education	2-Day Training	TPC-Outreach
Clinton Comm. College	Clinton	IA	Mowing	prairie management	TPC
County Roadside GPS/GIS Workshop	Clinton	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Clinton	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Introduction to the Tallgrass Prairie	Clinton	IA	Education	4-Day Training	TPC-Outreach
Lost Landscape Teacher Workshop	Clinton	IA	Education	2-Day Training	TPC-Outreach
Wetland Plant ID Workshop	Clinton	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
Lost Landscape Teacher Workshop	Crawford	IA	Education	2-Day Training	TPC-Outreach
NRCS	Crawford	IA	Plant ID	Technical Workshop	TPC
County Roadside GPS/GIS Workshop	Dallas	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Dallas	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
NRCS	Dallas	IA	Plant ID	Technical Workshop	TPC
Wetland Plant ID Workshop	Dallas	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside GPS/GIS Workshop	Des Moines	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Des Moines	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Seedling Identification Workshop	Des Moines	IA	Training	1-Day Training	TPC-Outreach
Visit Roadside Mgr and Photo Wildflowers	Des Moines	IA	Roadside Vegetation Management	Program Support	TPC-IRVM
Wetland Plant ID Workshop	Des Moines	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
private owner	Dickinson	IA	Prairie species list	prairie assessment	TPC
Introduction to the Tallgrass Prairie	Dubuque	IA	Education	4-Day Training	TPC-Outreach
Lost Landscape Teacher Workshop	Dubuque	IA	Education	2-Day Training	TPC-Outreach
Lost Landscape Teacher Workshop	Fayette	IA	Education	2-Day Training	TPC-Outreach
County Roadside Managers Winter Mtg.	Fayette	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Introduction to the Tallgrass Prairie	Floyd	IA	Education	4-Day Training	TPC-Outreach
County Roadside Managers Winter Mtg.	Franklin	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Seedling Identification Workshop	Franklin	IA	Training	1-Day Training	TPC-Outreach
USDA-NRCS WRP wetland site visits	Franklin	IA	Technical	Partnership Program	TPC
County Roadside GPS/GIS Workshop	Guthrie	IA	Roadside Vegetation Management *	2-Day Training	TPC-IRVM
NRCS	Guthrie	IA	Plant ID	Technical Workshop	TPC
County Roadside Managers Winter Mtg.	Hardin	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Seedling Identification Workshop	Hardin	IA	Training	1-Day Training	TPC-Outreach
County Roadside GPS/GIS Workshop	Henry	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Henry	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Meet with County Engineer	Howard	IA	Roadside Vegetation Management	IRVM Program Development	TPC-IRVM
County Board of Supervisor Meeting	Iowa	IA	Roadside Vegetation Management	IRVM Program Defense	TPC-IRVM

7. Client and Project Summary
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Community or Business		County	State	Industry	Counseling Provided		Program
County Roadside Managers Winter Mtg.	Iowa	IA	Roadside Vegetation Management	1-Day Training		TPC-IRVM	
Lost Landscape Teacher Workshop	Jackson	IA	Education	2-Day Training		TPC-Outreach	
Preston Elem School	Jackson	IA	Prairie propagation	Classroom activity		TPC	
Preston Elem School	Jackson	IA	Prairie walk	Educational experience		TPC	
County Roadside GPS/GIS Workshop	Jasper	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
Roadside Plantings Bus Tour	Jefferson	IA	Roadside Vegetation Management	IRVM Promotion		TPC-IRVM	
County Roadside GPS/GIS Workshop	Johnson	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
Seedling Identification Workshop	Johnson	IA	Training	1-Day Training		TPC-Outreach	
U of Iowa	Johnson	IA	Native Plant Propagation	Technical Workshop		TPC	
Wetland Plant ID Workshop	Johnson	IA	Roadside Vegetation Management	4-Day Training		TPC-IRVM	
Wetland Plant ID Workshop	Johnson	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
County Roadside Managers Winter Mtg.	Johnson	IA	Roadside Vegetation Management	1-Day Training		TPC-IRVM	
County Roadside Managers Winter Mtg.	Jones	IA	Roadside Vegetation Management	1-Day Training		TPC-IRVM	
Lost Landscape Teacher Workshop	Jones	IA	Roadside Vegetation Management	2-Day Training		TPC-Outreach	
NRCS	Jones	IA	Plant ID	Technical Workshop		TPC	
Wetland Plant ID Workshop	Jones	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
County Roadside Managers Winter Mtg.	Keokuk	IA	Roadside Vegetation Management	1-Day Training		TPC-IRVM	
Photograph Roadside Planting	Keokuk	IA	Roadside Vegetation Management	Program Support		TPC-IRVM	
Wetland Plant ID Workshop	Keokuk	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
NRCS	Lee	IA	Plant ID	Technical Workshop		TPC	
County Roadside Managers Winter Mtg.	Linn	IA	Roadside Vegetation Management	1-Day Training		TPC-IRVM	
Introduction to the Tallgrass Prairie	Linn	IA	Education	4-Day Training		TPC-Outreach	
Lost Landscape Teacher Workshop	Linn	IA	Education	2-Day Training		TPC-Outreach	
Prairie Field Day	Linn	IA	Roadside Vegetation Management	Presentation		TPC-IRVM	
Prairie Harvest Field Day	Linn	IA	Technical	Presentation		TPC	
Prescribed fire field Day	Linn	IA	Roadside Vegetation Management	Presentation		TPC-IRVM	
private	Linn	IA	Native Plant Propagation	Technical Workshop		TPC	
Seedling Identification Workshop	Linn	IA	Training	1-Day Training		TPC-Outreach	
Wetland Plant ID Workshop	Linn	IA	Roadside Vegetation Management	4-Day Training		TPC-IRVM	
Wetland Plant ID Workshop	Linn	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
Lost Landscape Teacher Workshop	Lucas	IA	Education	2-Day Training		TPC-Outreach	
NRCS	Lucas	IA	Plant ID	Technical Workshop		TPC	
NRCS	Madison	IA	Plant ID	Technical Workshop		TPC	
County Roadside GPS/GIS Workshop	Mahaska	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
County Roadside Managers Winter Mtg.	Mahaska	IA	Roadside Vegetation Management	1-Day Training		TPC-IRVM	
Introduction to the Tallgrass Prairie	Mahaska	IA	Education	4-Day Training		TPC-Outreach	
Lost Landscape Teacher Workshop	Mahaska	IA	Education	2-Day Training		TPC-Outreach	
Sedge ID Workshop	Mahaska	IA	Roadside Vegetation Management	2-Day Training		TPC-IRVM	
County Roadside Managers Winter Mtg.	Marion	IA	Roadside Vegetation Management	1-Day Training		TPC-IRVM	

7. Client and Project Summary
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Community or Business	County	State	Industry	Counseling Provided	Program
Introduction to the Tallgrass Prairie	Marion	IA	Education	4-Day Training	TPC-Outreach
Lost Landscape Teacher Workshop	Marion	IA	Education	2-Day Training	TPC-Outreach
Meeting with County Engineer	Mills	IA	Roadside Vegetation Management	IRVM Program Implementation	TPC-IRVM
Lost Landscape Teacher Workshop	Mitchell	IA	Education	2-Day Training	TPC-Outreach
B&B	Monona	IA	Native Plant Propagation	Technical Workshop	TPC
County Roadside Managers Winter Mtg.	Monona	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Leopold Center	Multi-county	IA	Tourism	Market Research	TPC
County Roadside Managers Winter Mtg.	Muscatine	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
NRCS	O'Brien	IA	Plant ID	Technical Workshop	TPC
NRCS	O'Brien	IA	Plant ID	Technical Workshop	TPC
County Roadside GPS/GIS Workshop	O'Brien	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
Wetland Plant ID Workshop	O'Brien	IA	Roadside Vegetation Management	4-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Palo Alto	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Pocahontas	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
NRCS staff	Pocahontas	IA	Plant ID	Technical Workshop	TPC
County Roadside Managers Winter Mtg.	Polk	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Homestead	Polk	IA	Native Plant Propagation	Technical Workshop	TPC
Iowa Natural Heritage Foundation Interns	Polk	IA	Roadside Vegetation Management	Presentation	TPC-IRVM
NRCS	Polk	IA	Plant ID	Technical Workshop	TPC
Seedling Identification Workshop	Polk	IA	Training	1-Day Training	TPC-Outreach
County Roadside Managers Winter Mtg.	Pottawattamie	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Introduction to the Tallgrass Prairie	Pottawattamie	IA	Education	4-Day Training	TPC-Outreach
Visit Roadside Mgr and Photo Wildflowers	Pottawattamie	IA	Roadside Vegetation Management	IRVM Program support	TPC-IRVM
County Roadside GPS/GIS Workshop	Poweshiek	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
Introduction to the Tallgrass Prairie	Poweshiek	IA	Education	4-Day Training	TPC-Outreach
County Roadside GPS/GIS Workshop	Sac	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Sac	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
NRCS	Sac	IA	Plant ID	Technical Workshop	TPC
Roadside Conference Planning	Sac	IA	Roadside Vegetation Management	Meeting	TPC-IRVM
Lost Landscape Teacher Workshop	Scott	IA	Education	2-Day Training	TPC-Outreach
private	Scott	IA	Native Plant Propagation	Technical Workshop	TPC
County Roadside Managers Winter Mtg.	Shelby	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
NRCS	Shelby	IA	Plant ID	Technical Workshop	TPC
County Conservation Employee Conference	Statewide	IA	Roadside Vegetation Management	Information Booth	TPC-IRVM
County Engineer's Conference	Statewide	IA	Roadside Vegetation Management	Distribute Materials and Information	TPC-IRVM
County Weed Commissioner's Convention	Statewide	IA	Roadside Vegetation Management	Technical Presentation	TPC-IRVM
Des Moines Register Article	Statewide	IA	Roadside Vegetation Management	Public Awareness/Education	TPC-IRVM
IRVM Calendar/Poster	Statewide	IA	Roadside Vegetation Management	Education/Promotion Material	TPC-IRVM
Living Roadway Trust Fund	Statewide	IA	Roadside Vegetation Management	Grant writing instruction mailing	TPC-IRVM

7. Client and Project Summary
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Community or Business	County	State	Industry	Counseling Provided	Program
Living Roadway Trust Fund Summer Meeting	Statewide	IA	Roadside Vegetation Management	County Program Support	TPC-IRVM
Native Seed Distribution for Roadsides	Statewide	IA	Roadside Vegetation Management	Write grant, buy and distribute seed	TPC-IRVM
Native Seed Production Manual	Statewide	IA	Technical	Informational	TPC
Prescribed Fire Conference	Statewide	IA	Roadside Vegetation Management	Information Booth	TPC-IRVM
Roadside Digest Newsletter	Statewide	IA	Roadside Vegetation Management	Informational Networking	TPC-IRVM
Roadside Conference	Statewide	IA	Roadside Vegetation Management	2-Day Technical Training	TPC-IRVM
State Capitol Rotunda Natural Resources	Statewide	IA	Roadside Vegetation Management	Information Booth	TPC-IRVM
Stormwater Conference	Statewide	IA	Roadside Vegetation Management	Presentation	TPC-IRVM
TPC Newsletter	Statewide	IA	Programmatic	Informational	TPC
Trees Forever Annual Celebration	Statewide	IA	Roadside Vegetation Management	Information Booth	TPC-IRVM
County Roadside GPS/GIS Workshop	Story	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
County Roadside Managers Winter Mtg.	Story	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Erosion & Sediment Control Workshop	Story	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Introduction to the Tallgrass Prairie	Story	IA	Education	4-Day Training	TPC-Outreach
IPN	Story	IA	Native Plant Propagation	Technical Workshop	TPC
ISU Plant Intro Station	Story	IA	Native Plant Propagation	Technical Workshop	TPC
Living Roadway Trust Fund Grant Review	Story	IA	Roadside Vegetation Management	Advisory Committee Meeting	TPC-IRVM
Lost Landscape Teacher Workshop	Story	IA	Education	2-Day Training	TPC-Outreach
private	Story	IA	Native Plant Propagation	Technical Workshop	TPC
Seedling Identification Workshop	Story	IA	Training	1-Day Training	TPC-Outreach
Visit Roadside Mgr and Photo Wildflowers	Story	IA	Roadside Vegetation Management	Program Support	TPC-IRVM
Wetland Plant ID Workshop	Story	IA	Roadside Vegetation Management	4-Day Training	TPC-IRVM
Wetland Plant ID Workshop	Story	IA	Roadside Vegetation Management	2-Day Training	TPC-IRVM
Seedling Identification Workshop	Tama	IA	Training	1-Day Training	TPC-Outreach
Roadside Plantings Bus Tour	Van Buren	IA	Roadside Vegetation Management	IRVM Promotion	TPC-IRVM
County Roadside Managers Winter Mtg.	Washington	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
NRCS	Webster	IA	Plant ID	Technical Workshop	TPC
County Roadside Managers Winter Mtg.	Webster	IA	Roadside Vegetation Management	1-Day Training	TPC-IRVM
Lost Landscape Teacher Workshop	Winneshieck	IA	Education	2-Day Training	TPC-Outreach
NRCS	Winneshieck	IA	Plant ID	Technical Workshop	TPC
Seedling Identification Workshop	Winneshieck	IA	Training	1-Day Training	TPC-Outreach
Iowa Prairie Conf	Woodbury	IA	conference planning	planning consultant	TPC
USDA-NRCS WRP wetland site visits	Worth	IA	Technical	Partnership Program	TPC

PRIVATE COLLEGES

Agenda Item 4

**A Research-Based Approach to Development of
Pharmaceutical Compounding Products and Practices**

**Drake University
October 2007**

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**BOARD OF REGENTS
STATE OF IOWA**

Executive Summary

Entrepreneurial activity and commercialization of products associated with the pharmacy profession have had a significant impact on the health of the general population and the economy of Iowa. Examples of successful entrepreneurs with connections to Iowa and the Drake pharmacy program include Fred Fitch, developer of a top selling dandruff shampoo in the 1940s; Dick Hartig, CEO of Hartig Drug Stores in Northeast Iowa; Dan Jorndt, retired CEO of Walgreen's. Pharmaceutical compounding is a growing component within the practice of pharmacy and has been estimated to account for 30-40 million prescriptions each year in the United States. A similar market niche is also present for veterinary compounding. Development of entrepreneurial skills and its application to product development in the area of pharmaceutical compounding represent an important opportunity for enhancing the profession and stimulating economic growth in the state.

In December 2006, Drake University received funding for the first year of a two-year proposal from the Grow Iowa Values Fund to enhance technology and product commercialization. The current proposal represents a modified version of the second year activities that were outlined in the original grant. The first year of the grant brought together the activities and initiatives of an entrepreneurial organization (DELTA Rx Institute) and a research organization (DUSCI) to engage faculty and students from pharmacy and other scientific disciplines in the process of research and product development in the area of pharmaceutical compounding.

The proposed project seeks to continue the progress made in the first year and expand the activities to include pharmacy practitioners and their businesses and professional practices. By engaging students, faculty and pharmacy practitioners through research (DUSCI) and entrepreneurial (DELTA) activities, we hope to enhance the experience of the participants, broaden the scope of the project and increase the likelihood of success.

Introduction

Pharmaceutical compounding is the combining, mixing, or altering of ingredients to create a customized medication for an individual patient (or animal) in response to a licensed practitioner's prescription (Food and Drug Administration Modernization Act of 1997). It is a means by which to customize drug options for a particular person, help those with special needs or provide alternative therapies not available from manufacturers. Pharmaceutical compounding is a growing component within the practice of pharmacy. The Pharmacy and Compounding Accreditation Board reports that 30-40 million prescriptions are compounded each year in the US. Veterinary pharmacy is also a growing practice setting, especially in rural states such as Iowa.

Recognizing the growth of compounding pharmacy and its potential to enhance the role of the pharmacist in patient care, the College of Pharmacy and Health Sciences has put forth

significant changes in its physical facilities and curriculum to address these trends. Larry Mayhew, a Drake Pharmacy alumnus, donated \$500,000 to the pharmacy program in 2006 to create a state of the art pharmaceutical compounding lab. (The features of this lab are described below.) Subsequently, the College has made changes to its curriculum with the addition of a compounding course and the incorporation of sterile compounding skills at the basic, intermediate and advanced levels into a series of practicum courses.

The College faculty has recognized that while having the skills to perform these tasks is important, the ability to implement these skills into practice, to bring these products to the market and to effect change in the profession is even more critical. In 2004, the College established the Drake Entrepreneurial Leadership Tools for Advancement (DELTA) Rx Institute. The mission of the Institute is to advance the profession by empowering practitioners, faculty, and students to boldly pursue opportunities for breakthrough achievements. The Institute instills a philosophy of life that embraces innovation and perseveres to effect change. (The activities and initiatives of the Institute are described below.)

At the University level, there have been significant efforts to bring innovation to the education and training practices in the sciences. The Drake Undergraduate Science Collaborative Institute (DUSCI) was created in April 2005 to promote and coordinate undergraduate research endeavors in the sciences and mathematics departments at Drake University. DUSCI provides a structure for interdisciplinary discussions and collaborations among faculty and students, and supports activities and programs that focus on an integral education of undergraduates and faculty development.

The goal of this project is to bring students, practitioners and research faculty together to develop the practices, skills and attitudes necessary for successful development and of innovative pharmaceutical practices and products. Given the favorable marketplace in Iowa for compounded pharmaceuticals (both human and animal) and the innovative educational initiatives developed at Drake in the areas of research and entrepreneurial leadership, this proposal has high potential for success.

Below is a more detailed description of the ongoing initiatives at Drake that relate to this proposal.

Background on Drake Initiatives

Drake Undergraduate Science Collaboration Institute (DUSCI)

The mission of DUSCI is to provide students with an exceptional learning environment that emphasizes research and interdisciplinary collaboration. Students engaged in research and immersed in professional development activities will be better prepared for graduate school or other professional activities, particularly by focusing on their communication and critical thinking skills and by helping them to become conscientious citizens.

Activities promoted and supported by DUSCI include: summer and academic year undergraduate research activities, Drake Science Colloquium Series which features Drake faculty and invited external speakers, Life After Drake Series which brings in successful alumni to celebrate their accomplishments, and Drake University Conference on

Undergraduate Research in the Sciences (DUCURS) which provides a forum to showcase scientific results of faculty/student collaborative research in math and science.

Drake's summer research program in the sciences as coordinated through DUSCI is modeled after the programmatic structure used at REU (Research Experiences for Undergraduates) sites funded by the National Science Foundation (NSF). Typically, this model entails engaging undergraduates in full-time research for 8-10 weeks and provides professional development opportunities. At Drake University, undergraduates have had the opportunity to be engaged in collaborative research projects with faculty from the College of Arts and Sciences and the College of Pharmacy and Health Sciences. During the summer, faculty from chemistry, biology, pharmaceutical sciences, environmental science, neuroscience, psychology, astronomy, mathematics, computer science and physics departments engage students in their research projects through a one-on-one mentor-apprentice relationship.

Students interested in participating in the summer program seek an advisor and submit an application that includes a description of their proposed research project. The application includes a signed letter from the faculty sponsor answering questions about the student and the research proposal.

In 2007, DUSCI organized the second summer undergraduate research program which was supported by a gift from Drake alumnus Dr. William Smith, funds from the Grow Value Iowa Fund and faculty grants. The summer research program provided student and faculty stipends to support eight weeks of full-time research during June and July. Activities supported and organized by DUSCI during in the summer of 2007 included field trip, professional development opportunities, weekly research meetings, and a final research presentation by participants. Professional development activities organized in the last two years include data analysis, grant writing, scientific writing, resume preparation, database searching and safety in the laboratory. Past field trips include visits to the Great Ape Trust, Kemin Industries, and the Des Moines Municipal Observatory.

Below are the student-faculty research projects that were completed in Summer 2007 using funds from the previous grant through the Grow Iowa Values Funds.

Temperature Dependent Gelation of Poloxamer-Lecithin Organogels
Adam Ericksen and Nita Pandit

Compounding a Pediatric Oral Formulation of Methylprednisolone
Amanda Weber, Laura Wolf and Hassan Almoazen

Synthesis of Diene Compounds via Grignard and Wittig Reactions
Daniel Sadowski and Gholam Mirafzal

Aspirin Liquid Formulation
Ben Kacner and Hassan Almoazen

DELTA Rx Institute

Recognizing the need for the spirit of change in pharmacy, Drake University, College of Pharmacy and Health Sciences established the DELTA Rx Institute in 2005. Many of the recent activities and initiatives are listed below. Notably with regard to this proposal, DELTA has worked with Drake's College of Business and Public Administration to develop

a minor in entrepreneurial leadership. The minor and the associated course work will be available to Drake pharmacy and science students and demonstrates that the culture of entrepreneurial leadership that has been developed at Drake is expanding and crosses different colleges and programs.

The following is a list of activities and initiatives coordinated through the DELTA Rx Institute:

- Hosted "Shaping Your Pharmacy Future," a strategic leadership business development course for practicing and student pharmacists in collaboration with the Small Business Development Centers of Iowa and the Institute for the Advancement of Community Pharmacy.
- Sponsored a special session titled, "Entrepreneurial Spirit in the Pharmacy Curriculum," at the American Association of Colleges of Pharmacy Annual Meeting in 2004.
- Co-hosted the Community Pharmacy Management Conference with the Iowa Pharmacy Association in Okoboji, Iowa in 2004 and 2005.
- Launched the DELTA Rx Institute website, www.deltarx.drake.edu, in October of 2005, offering tools, articles, columns, profiles and courses to pharmacy practitioners, students and faculty.
- Sponsored two special sessions about Entrepreneurial Leadership at the American Association of Colleges of Pharmacy Annual Meeting in July 2006.
- Developed new publications circulated to pharmacists in the state of Iowa. The most recent publication entitled "Innovation".
- Through collaboration with the College of Business and Public Administration at Drake, received a \$29,000 grant in September 2006 from National Collegiate Inventors and Innovators Alliance for development of a cross disciplinary program of study: Entrepreneurial Leadership in Pharmacy.
- Received a \$40,000 grant from Community Pharmacists Foundation in September 2006 to promote the DELTA Rx Institute at state, regional, and national levels.
- Sponsored a team of five faculty to attend the USASBE (United States Association for Small Business and Entrepreneurship) meeting. Two groups of Drake faculty presented workshop sessions at the meeting (January 2006).
- Sponsored Drake's Next Top Entrepreneur Competition (February/March 2007).
- Presented two posters at the Iowa Pharmacy Association Annual Meeting describing the Drake's Next Top Entrepreneur Competition and the updates to the DELTA Rx web site (June 2007).
- Presented a special session at the AACP Annual Meeting on developing a minor in entrepreneurial leadership. Session selected to be videotaped and made available on the AACP web site (July 2007).

In the two years since its inception, the DELTA Rx Institute has been successful in attracting funding and generating interest in entrepreneurial leadership at the state and national level. Its partnership with DUSCI on this proposal represents an opportunity to bring together research skills and their application in the marketplace.

Pharmaceutical Compounding Lab

The College of Pharmacy & Health Sciences at Drake University received \$500,000 from Drake alumnus Larry Mayhew to establish a state of the art compounding laboratory. The new lab was completed in April 2007. It accommodates 24 students and is equipped with the following features: autoclave sterilizer, ointment mills, homogenizers, a Janssen capsule machine, a variety of dosage form molds to create suppositories, lollipops and troches and a clean room that includes a gowning area, three horizontal laminar flow hoods, one vertical flow hood and a Baxa Exacta-Mix compounding system for mixing parenteral products. Each work station is equipped with all the necessary glassware for compounding and an electronic balance and heat source. Instructional technology includes three computer stations with internet access and video cameras that can record and display demonstrations occurring in the clean room and at the instructor's bench on two screens through an overhead projection system.

This facility will enable students and practitioners to acquire the proper skills for preparing both sterile, and non-sterile pharmaceutical extemporaneous products. Pharmacists with such skills are in high demand in community pharmacy and hospital pharmacy in the state of Iowa and can add to the economic vitality of the state by offering services and products in high demand.

Project Description

The goal of this project is to bring students, practitioners and research faculty together to develop the practices, skills and attitudes necessary for successful development of innovative pharmaceutical practices and products. Each group brings a unique perspective to the project:

- Researchers – an evidenced based approach
- Practitioners – practical and clinical applications
- Students – unbiased view of perceived barriers and limitations

The three-step process described below is designed to create synergy between the individuals and the organizations DELTA Rx Institute and DUSCI to achieve the goal of this proposal.

Step One -- Recruitment and Membership

The first step in the process is to identify students and practitioners for recruitment into the program and membership into the DELTA Rx Institute and DUSCI.

Student recruitment will entail sending notices through the DUSCI website, College student weekly announcements and postings on campus inviting students to apply for the program. Requirements for entry into the program will be membership in the DELTA Rx Institute and DUSCI. Pharmacy students will also be asked to enroll in the Basic Pharmaceutical Compounding Lab, a two credit hour elective offered in the Spring semester 2008.

Student membership in DUSCI and the DELTA Rx Institute will allow for mentoring relationships to be developed with science faculty and entrepreneurial experts. DUSCI was

created to promote and support undergraduate scientific research at Drake. Each summer, DUSCI hosts eight weeks of active research and workshops for undergraduate students in science. The students in this program will be part of the DUSCI cohort and participate in those activities described earlier. Membership in the DELTA Rx Institute will afford the students opportunities to begin thinking about and participating in entrepreneurial discussions and activities.

Recruitment of practitioners will entail identifying pharmacists who currently have compounding practices or have an interest in developing such a practice. The Director of Experiential Programs in the College of Pharmacy and Health Sciences has developed a database listing the pharmacists in the state and their areas of practice. The Director will provide services and staff hours to aid in the identification and recruitment of practitioners for this program. We will also recruit through announcements posted on the DELTA Rx Institute website. Pharmacists would be invited to apply to the program and to become members of the DELTA Rx Institute.

Step Two – Summer Research and Skills Development

The second step in the process is to develop the research and advanced compounding skills of the students and practitioners.

An advanced pharmaceutical compounding workshop will be offered in June 2008 in the Mayhew Compounding Lab at Drake University. The workshop will focus on developing skills in advanced compounding techniques and in research design. Christie Carlson, a compounding pharmacist at Central Iowa Compounding, will teach the compounding skills portion of the workshop. Nita Pandit, Professor of Pharmaceutics at Drake University, will be responsible for instruction in research design. The workshop will be set up such that a student and a pharmacist will be paired together along with a Drake faculty member. Each student/pharmacist/faculty team (six total teams) will identify a dosage form problem and design a research project focused on that topic. The practitioners will be encouraged to identify a research problem based on their practice experience or, research projects will be provided through consultation with Steve Martin, chief pharmacist at the Veterinary Teaching Hospital at Iowa State University. The role of the Drake faculty member on each team will be to serve as a research mentor to the projects and provide guidance on research technique and design. The research topics will be the basis for the students' summer research project and the continuation of the program into Step Three where mentoring and development of entrepreneurial skills will take place.

Step Three – Entrepreneurial Skills and Business Plan Development

The third step in the process is to develop the entrepreneurial skills and subsequent business plan that centers on the product and development of a new professional practice model.

Upon completion of the advanced compounding workshop and the summer research project, the students and the practitioners will continue with their work in two areas: development of entrepreneurial skills and a business plan. The students will continue work with the practitioner at the practice site in further development of the product and the practice. This

relationship will also continue with respect to a mentoring role between the student and the practitioner.

The mechanism by which the entrepreneurial skills and a business plan will be developed will be through the program Shaping Your Pharmacy Future. This program is a strategic leadership development program series designed to bring business and pharmacy experts together to help students and practitioners fine-tune their business practices and ensure its vitality into the future. It is based on Shaping the Future, a successful ten-year strategic leadership program offered to Iowa CEO's and most recently, veterinarians. Shaping Your Pharmacy Future consists of five web-based online modules (Strategic Planning, Human Resources, Financial Matters, Marketing, and Legal Issues). The modules are offered in presentation format with embedded audio clips, and include various exercises and feedback designed to establish a practice's vision for the future, develop and implement its strategic plan, and set it on a path for financial success. Students and practitioners who complete all five of the modules earn a Certificate in Community Pharmacy Entrepreneurial Leadership.

Upon completion of all modules of the Shaping Program, the students and practitioners will have created the essential pieces of a business plan. Each team will provide a report and presentation to the DELTA Rx Institute on their progress in product and practice development as it related to their business plan.

Budget Justification

Student research stipends are requested for six students. The amount (\$3,000 each) is standard rate for undergraduate research assistants.

Summer salary support is requested for Maria Bohorquez and Nita Pandit. Both are nine-month employees of Drake. The amount requested is equivalent to one month of salary for each.

Teaching and research consultant fees are requested for Christie Carlson and Steve Martin for the advanced compounding workshop. Amounts are based on hourly rates for pharmacists and estimated time of their involvement.

Salary for a part-time staff person to coordinate the summer research activities sponsored through DUSCI, grading the assignments associated with the Shaping Your Pharmacy Future Program and providing general support to the DUSCI and DELTA Rx Institute programs.

Funds for the purchase of consumables associated with the advanced compounding workshop and the research projects are requested.

Project Timeline

December 2007: Recruit students into DUSCI, DELTA and the basic compounding course for the spring 2008 semester.

December 2007 - March 2008: Recruit pharmacy practitioners into DELTA and get their commitment to the summer program.

March 2008 - May 2008: Develop the exercises and activities for the advanced compounding workshop

June 2008: Offer the advanced compounding workshop

Summer 2008: Summer Research Program for students coordinated by DUSCI. Students and pharmacists may begin the modules in the Shaping Your Pharmacy Future Program

Fall 2008: Continuation of product and skills development and student mentoring at the pharmacists' practice sites; continued participation in the Shaping Your Pharmacy Future Program.

November 2008: Completion of the Shaping Your Pharmacy Future Program.

January 2009: Presentation of business plans to DELTA Rx Institute

Commercial Impact

The commercial impact of this proposal will be seen as an expansion of the professional services and pharmaceutical compounding products that can be offered to both patient and veterinary clients throughout the state of Iowa. By increasing the number of pharmacists that have the skills (both technical and entrepreneurial) to provide services and products that are in high demand in Iowa, a significant economic impact will be made. The activities that will be used in this proposal to enhance the commercialization of these services and products is the development of research and entrepreneurial skills in both students and pharmacists and the creation of business plans to bring these efforts to market.

Background Descriptions of Principal Investigators

Robert Soltis, Ph.D.

Dr. Soltis's role on this project is to serve as project director and faculty research mentor. Dr. Soltis is a Professor of Pharmacology and Chair of the Department of Pharmaceutical Sciences at Drake University, College of Pharmacy and Health Sciences. He received his B.S. in pharmacy from Butler University and a Ph.D. in pharmacology from Indiana University. Prior to joining the faculty at Drake University in 1992, he was a Pharmacology Research Associate (PRAT Fellow) at the National Institutes of Health.

His research program focuses on central mechanisms regulating the cardiovascular and neuroendocrine response to stress. He has received funding from the National Institutes of Health, the American Heart Association and the Merck/AACP Research Scholar Program. His area of teaching includes neuropharmacology, toxicology and mechanisms of drug interactions. He has served as a peer reviewer for scientific and education journals as well as a grant reviewer for NIH and American Heart Association. Dr. Soltis served as chair of the Biological Sciences Section of AACP in 2006-07 and is a graduate of the AACP Academic Leadership Fellows Program.

Nita Pandit, Ph.D.

Dr. Pandit's role on this project is to serve as workshop instructor and faculty research mentor. Dr. Pandit is a Professor of Pharmaceutics in the Department of Pharmaceutical Sciences at the Drake University College of Pharmacy & Health Sciences. She obtained her B. Pharm. from Bombay University in India, and her M.S. and Ph.D. in Pharmaceutics from the University of Wisconsin, Madison. She then worked for ten years in pharmaceutical R&D at Boehringer Ingelheim Pharmaceuticals, where she was involved with the discovery and development of new drugs. Dr. Pandit's current research interests are in surface and colloid chemistry, particularly with the characterization and use of Pluronic block

copolymers in drug delivery. In this area, she has worked on collaborative projects with faculty members from the Chemistry and Biology departments at Drake University, and with a Chemical Engineering faculty member from Iowa State University. She is a co-author of several research publications, and a textbook on Pharmaceutical Sciences.

Maria Bohorquez, Ph.D.

Dr. Bohorquez's role on this project is to serve as a faculty research mentor and to administer the DUSCI program. Dr. Bohorquez is an Associate Professor of Chemistry at Drake University. Her credentials include a Ph.D. in physical chemistry from the University of Rio Cuarto, Argentina and extensive experience engaging undergraduates in collaborative research projects with faculty members from the College of Pharmacy and Health Sciences at Drake University. She joined the faculty of the Chemistry Department at Drake University in 1995. She is now an Associate Professor in the Chemistry Department and the first director of DUSCI. As the director of DUSCI she has organized and successfully launched new initiatives such as Drake University Science Colloquium Series and the summer research program in 2006. She has been named a Windsor Professor in Sciences based on her dedication to scientific research, enthusiasm in the classroom, mentorship and support of undergraduate student research. Her experience in undergraduate research and ability to communicate with the sciences departments are fundamental in establishing a solid collaboration with the DELTA Rx Institute in this project.

Christie Carlson, PharmD

Dr. Carlson's role in this project is to serve as a workshop instructor. She will provide instruction on the advanced compounding techniques and practical applications of compounded medications. Dr. Carlson is a staff pharmacist at Central Iowa Compounding. She received her PharmD from Drake University in 2005. Her experience in compounding started as a student intern at Central Iowa Compounding in 2003-2005 and she then transitioned to a pharmacist role after graduating from Drake. She has received specialized training from Professional Compounding Centers of America that includes "Specialized Course in Sterile Products Compounding" in 2005 and "Compounding and Quality Assurance Software Training" in 2006. She will be teaching the Basic Pharmaceutical Compounding Lab at Drake University in Spring 2008.

Steve Martin PharmD, MBA

Dr. Martin's role in this project is to serve as a research consultant on veterinary compounding practices. He will provide research topics and guidance on matters related to veterinary compounding. He has served as chief pharmacist at the Veterinary Teaching Hospital at Iowa State University since 1988. Dr. Martin received his BS in pharmacy and PharmD from University of Iowa and his MBA from University of Dubuque. His training in pharmaceutical compounding includes four semesters of compounding labs at University of Iowa and two training courses in sterile and non-sterile compounding at Professional Compounding Centers of America.

PROPOSED BUDGET**Personnel Costs**

Pharmacy & DUSCI Students for Summer '08 research (6 students @ \$3,000 each)	18,000
Fringes (Students @ .0765)	1,377
PI Summer '07 Salaries for 1 month each (Pandit & Bohorquez)	17,000
Fringes (Pandit & Bohorquez @ .29)	4,930
Teaching Consultant (Carlson)	6,000
Research Consultant (Martin)	1,000
DELTA Rx and DUSCI Staff	10,000
Fringes (Staff @ .29)	2,900
Supplies	10,000
Laboratory Supplies for Summer '08 Workshop and Research Program	

TOTAL**71,207****MATCH**

Administrative Costs (calculated at federally negotiated rate of .44 x salaries/wages)	24,141
Baxa Exacta compounding system for mixing parenteral products; purchased in September 2007 by Drake	22,500
Project Director – one month salary and fringes Advancing Pharmacy through the Development of Entrepreneurial Leadership	12,726
Director and staff hours, Experiential Education Office for identifying recruiting pharmacists into program	1,500
Costs for 6 students and 6 pharmacists to enroll in Shaping your Pharmacy Future (\$895 each)	10,740

TOTAL**71,607**

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Documenting DNA content variation in northern Iowa plants

Executive summary

Variation in chromosome number, and therefore in nuclear DNA content, is common among plants (Levin 2002). Most of the important grasses in Iowa's prairie exhibit variation in ploidy, as do many of the invasive species threatening crops, prairie, wetlands, and forests. Variation in ploidy is associated with differences in plant metabolism, which may be important for the development of prairie grasses as an alternative fuel, and with invasion success. Further, plants of different ploidy are effectively two different species in terms of reproductive compatibility, making it important to take ploidy into consideration when supplementing native populations during restoration and conservation plantings.

This grant request seeks \$32,337.74 from GIVF to acquire equipment and support research on ploidy variation in Iowa's prairie plants and invaders; Luther college will contribute \$32,405.41 to this project. During the two years of this project, we will map ploidy variation in Iowa prairie plants and invasive species, collaborating with Iowa seed producers to ensure that prairie restorations are as beneficial as possible to existing populations, and disseminating information that will be of value to researchers exploring alternative fuel strategies for Iowa.

These three goals of the grant will support important sectors of Iowa's economy as well as increasing basic knowledge of Iowa's prairie ecology. Alternative fuels are a significant and growing portion of the economy, with over a billion gallons of ethanol produced, and significant interest in developing more cost and energy effective sources of fuel such as cellulosic ethanol. More than 500,000 acres of land are set aside in state conservation programs (Iowa Dept. of Ag and Land Stewardship) as well as nearly 2 million acres enrolled in the federal conservation reserve program (Farm Service Agency, US Department of Agriculture, 2007), supporting over 20 Iowa businesses supplying native seed and plants. Finally, invasive plant species cost the US over 36 billion dollars a year, and threaten native plants in Iowa's forests and wetlands.

Project description

Background - Ploidy variation in plants

Many plant species exhibit variation in chromosome number. For instance, switchgrass (*Panicum virgatum*), an important candidate for generating cellulosic ethanol, has populations with 18, 36, 54, 72, and 90 chromosomes, which translates to ploidy levels ranging from 2x to 10x (Great Plains Flora Association (GPFA) 1986). Many important prairie grasses in Iowa show variation in their chromosomal counts, including big blue stem (*Andropogon gerardii*), side oats gramma grass (*Bouteloua curtipendula*), and sand drop seed (*Sporobolus cryptandrus*) (GPFA 1986). Likewise, prairie forbs show variation in ploidy level, particularly in the aster family. For example, conflower (*Echinacea angustifolia*) has both diploid (2x) and tetraploid (4x) forms (Great Plains Flora Association 1986). Finally, Iowa weeds and invasive species frequently have variation in ploidy: Japanese knotweed (*Falopia japonica*) ranges from 4x to 16x, while cypress spurge (*Euphorbia cyparissias*) ranges from 2x to 4x.

This ploidy variation can have important ecological and economic consequences. Plants of different ploidy often vary in growth rates (Garbutt & Bazzaz 1983), cold tolerance (MacGillivray & Grime 1995), timing of flowering (Husband & Sabara 2004), photosynthesis rates (Warner & Edwards 1989), and secondary metabolism (Griesbach & Kamo 1996). These basic differences translate into more effective forage for livestock and wildlife (Gowen *et al.* 2003), differences in invasion success (Pandit *et al.* 2006), and quite possibly to differences in suitability as an alternative fuel. Ploidy variation in itself has important consequences for plant populations, as reproduction between plants of different ploidy levels can lead to odd-ploidy offspring (eg triploid, pentaploid) or aneuploid offspring (eg two copies of chromosome 1, three copies of chromosome 2) which typically are less likely to establish and have poor reproductive success (Ramsey & Schemske 1998). When a native population is present, introducing plants of a differing ploidy may reduce the fitness of native plants.

Ploidy variation and Iowa's economy

Plant ploidy variation can affect Iowa's economy in several ways. First, ploidy variation may affect the suitability of native plants for alternative fuel sources. While ethanol has become an important element in Iowa's agricultural economy, corn is viewed as a relatively inefficient source of carbohydrate for ethanol production. Cellulosic ethanol has been proposed as a more efficient alternative, using switchgrass (Parrish & Fike 2005) or native prairie (Tilman *et al.* 2006; Tilman *et al.* 2007) as feed stocks. Since ploidy variation has been demonstrated to alter metabolic pathways, knowledge of plant ploidy in addition to plant species will be important to research maximizing the efficiency of plantings for cellulosic ethanol.

Second, ploidy variation can alter the effect of restoration plantings on native plant populations. Native prairie fragments often harbor small populations that lose genetic diversity over time, imperiling their long term survival (Wagenius *et al.* 2007).

Supplementing relict populations with seeds from nearby populations can reduce the risk of extinction, provided that the introduced plants match the ploidy of the existing plants. When plants of the same species but different ploidy come into contact, the result can be reduced fitness, particularly for the smaller population (Levin 1975). Thus, extensive plantings of native grasses and forbs for restoration and conservation could inadvertently harm native populations unless care is taken to ensure that the ploidy levels match. By mapping ploidy variation in Iowa prairie plants, restoration plantings can be certain of supplementing native populations rather than competing with them.

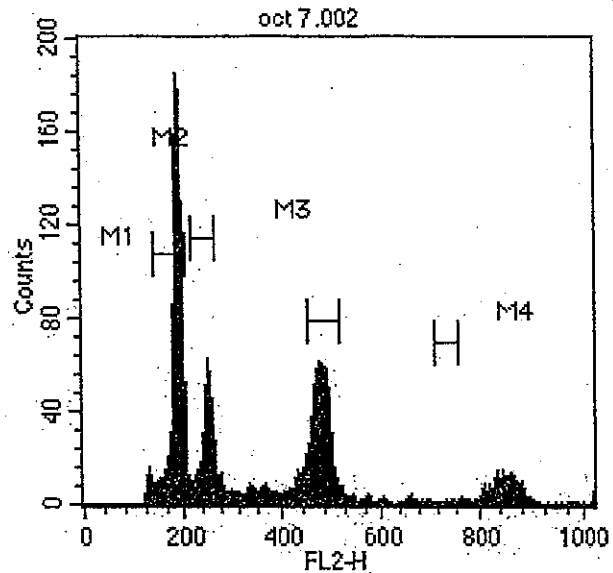
Third, ploidy variation may alter the invasion risk posed by introduced species. Many of the species invading Iowa's forests, prairies, and wetlands show variation in ploidy, including reed canary grass (*Phalaris arunifera*), common reed (*Phragmites australis*), brome grass (*Bromus inermis*), Kentucky blue grass (*Poa pratensis*), and Japanese knotweed (*Fallopia japonica*). Ploidy variation can be important in distinguishing native from invasive populations in some species, and may allow for better predictions of the risk of invasions in others. Mapping ploidy variation in invasive species will contribute to basic research necessary to better allow land managers to allocate resources.

Thus, screening Iowa's prairie populations for ploidy variation is basic research with important economic consequences. This project will collect basic data on variation in this important ecological and agronomic trait. This information will be important for those considering the use of prairies for alternative fuels, as the different ploidy levels may have different chemical properties. The same database will be important for land managers when considering restoration plantings. Mapping ploidy variation in Iowa native plants will therefore maximize the benefit of conservation plantings to native species. At the same time, screening invasive species and weeds will allow weed specialists and land managers to develop a better understanding of the variation present, and to better target eradication efforts. While evidence suggests that ploidy may be an important factor in determining the potential for invasion success, land managers tracking invasive species rarely have ploidy information available.

Project methods

Prior to the 1980s, ploidy variation was detected by counting chromosomes. Establishing chromosome counts remains an essential part of determining plant ploidy, but this is now supplemented by flow cytometry. Flow cytometry is a faster technique, providing DNA content estimates on hundreds of cells rather than the handful that are usually counted for chromosome counts. Further, flow cytometry can make use of readily-available leaf tissue rather than requiring root tips or flower buds, greatly speeding the sampling of individuals.

To determine DNA content via flow cytometry, a portion of a plant of unknown DNA content is chopped with a plant of known content. Because plant cells are filled with water, the chopping will release the cellular contents into the surrounding buffer. Filtering eliminates larger pieces of debris, while the smaller components, including nuclei, are retained for staining with a DNA binding fluorescent stain. Samples are processed in a flow cytometer, which moves the nuclei past a laser. The fluorescence from each nucleus is proportional to the amount of stained DNA present: detectors quantify the fluorescence from each nucleus. The resulting histogram, showing the number of nuclei present with different levels of fluorescence, yields two major peaks, one for the standard, and one for the unknown (see Figure 1) The ratio of the fluorescence values of the two peaks is the ratio of the DNA contents between the two plants. Depending on the plant species being used, one person can process around 12 samples per hour in this way. After acquisition of the cytometer itself, processing samples is inexpensive aside from the time required.



Proposed work

I propose to obtain a flow cytometer for Luther College for use in screening native Iowa prairie plants and invasions for ploidy variation. The cytometer would be obtained in the spring of 2008, and research would begin in the summer of 2008. One research student would work on this project in the summer of 2008, two students would work during the 2008-2009 academic year, and likewise in the summer of 2009 and the subsequent year. The principal investigator will work on this project during the summers of 2008 and 2009, as well as during the subsequent academic years. We propose to screen 30 species from 20 native prairie populations in northern Iowa, with a focus on grasses and asters. In parallel, we will screen 10 invasive species from 30 localities for ploidy variation.

Figure 1: Flow cytometry output, showing peak from standard of known DNA content (first peak from left) and two peaks of the unknown plant (2nd peak from left and central peak). The two peaks of the unknown plant represent the G1 and G2 phases of the cell cycle. The ratio of the standard peak to the G1 peak from the unknown will equal the ratio of DNA contents between the two plants.

Principal investigator background

I earned my PhD in population biology from the University of California, Davis in 2003, and conducted post-doctoral research at Indiana University and the University of British

Columbia. I began my work as assistant professor of Biology at Luther College in the fall of 2007. I have extensive experience with ploidy and plants and flow cytometry. For my doctoral work I examined the distribution of diploid (2x) and tetraploid (4x) snow buttercups (*Ranunculus adoneus*) in the Rocky Mountains, scoring over 3000 plants using flow cytometry in the process (Baack 2004). As a post-doctoral researcher, I examined genome size changes due to hybridization in sunflowers (*Helianthus* spp.; Baack *et al.* 2005). In the past year, I have collaborated with researchers at the National Park Service and at the University of Massachusetts examining the links between ploidy and invasiveness in populations of cattails (*Typha* hybrids between *angustifolia* and *latifolia*) and Japanese knotweed (*Falopia japonica*). Since 2003, I have published eight peer-reviewed publications and have served as a reviewer for 14 different scientific journals.

Institution background

Luther College, founded in 1861, is a Phi Beta Kappa institution acclaimed as one of the outstanding liberal arts colleges in the Midwest. Luther is home to 2,476 students from 38 states and 44 countries, with the majority of our students coming from the Upper Midwest (i.e., Iowa, Minnesota, Wisconsin, and Illinois). Given its size, Luther has a substantial number of science majors, particularly in biology. Approximately one-third of the entering first-year class indicates an interest in the biological sciences, and our introductory biology courses serve over 180 students annually. The average ACT score of our first-year students is 25.4, and 30 percent come from the top 10 percent of their high school classes. An average of 67 students annually have received a degree in biology over the past five years, 60 percent of whom have continued their education in graduate or professional schools. In 2005, the Teagle Foundation recognized Luther as one of 13 "overachieving colleges" in the nation based on our high graduation rates, high percentage of students who go on to earn doctoral degrees, and efficient use of available resources.

The college has recently revised its curriculum in recognition of the importance of undergraduate research. Majors now have increased flexibility to allow students greater opportunities to conduct research, and the number of courses taught by each faculty member has been reduced to allow professors the necessary time to work with undergraduate researchers. In addition, Luther College is currently constructing a twenty million dollar building for the biology and chemistry departments which will increase the lab space available for independent research.

Project budget

Luther College will contribute \$32,670 towards this project, including indirect costs for facilities, necessary supplies, conference travel, salary and benefits for Eric Baack, and student stipends. \$8,500 of the cost of the purchase of the flow cytometer will be made available from the principal investigator's start up budget and biology departmental funds. I seek \$32,338 from GIVF to support the acquisition of the flow cytometer and for one month of salary and benefits for summer research by the project principal investigator.

Item	2008-09 Luther	2008-09 GIVF	2009-2010 Luther	2009-2010 GIVF
Salary & student stipend				
1 month PI salary		5,526.22		5,810.57
Summer student stipend	2,750.00		2,750	
Academic year salary (3%)	1,554.25		1,634.22	
Benefits				
FICA and pension for PI (17.65%)		975.38		1,025.57
FICA for summer research student (7.65%)	210.38		210.38	
Academic year benefits (45%)	699.41		7,35.40	
Permanent Equipment				
BD Facs-scan flow cytometer	8,500.00	19,000		
Supplies	900.00		900.00	
Indirect costs	4423.71		4587.66	
Travel	1,000.00		1,000.00	
Student summer housing	225.00		225.00	
Total	\$20,312.75	\$25,501.60	\$12,092.66	\$6,836.14

Total request from GIVF: \$32,337.74

Total match from Luther College: \$32,405.41

Budget narrative*Salaries*

During the 2008-2009 and 2009-2010 academic years, two students will work on this project. Supervising research students is counted as 1/12 of the biology teaching load at Luther College, and teaching responsibilities consume 75% of faculty hours. I estimate that supervision of this project will be 50% of my total student research supervision. Accordingly, I have allocated 3% of my academic 9-month salary (estimated at \$52,068 from the current pay schedule, assuming a 3% annual increase for 2008-2009, and at \$53,362 for 2009-1010. This is a contribution by Luther College to the project.

I have requested one month of salary for each of the summers of 2009 and 2010, based upon the previous year's academic salary.

One research student will work on this project in each of the summers of 2008 and 2009. Research students receive a stipend of \$2,750 for their 10 weeks of research.

Benefits

The Luther College benefits package is approximately 45% of the base salary: this is part of Luther's contribution during the academic year when I will be supervising students working on this project.

For the summer, I have requested 17.65% in benefits from GIVF, reflecting FICA for salary and 10% contribution to the TIAA-CREF college pension plan.

Luther College will contribute the FICA payments for the research students working each summer (7.65%).

Permanent equipment

The BD FacScan flow cytometer is a basic research instrument widely used for flow cytometry by hospitals and research universities throughout the US. Due to their wide use and durability, used instruments are widely available as a cost-effective means of establishing flow cytometry capability. Estimated costs for used instruments are \$25,000 (Analytical Capital Inc, Minneapolis, MN). The budget request of \$27,500 includes funds for installation and training. Luther College will contribute \$9,500 of the cost of the cytometer, using departmental funds and funds from the PIs startup budget. Most maintenance on FacScan cytometers can be performed by end users (personal communication, Jim Tarara, Mayo Clinic, MN).

Supplies

Luther College will contribute \$900 per year for reagents and supplies for this project. These include chemicals for buffers, filters for separation of cellular components, centrifuge tubes, and toxic waste disposal.

Indirect costs

Luther College will also contribute approximately \$4,500 in facilities in each year. Placing a specific dollar value on lab facilities and equipment is challenging due to their use in multiple projects over many years. Here, we have followed the standard practice of using the negotiated indirect cost calculations for National Institutes of Health (NIH) grants. Based on Luther's facilities and support, NIH calculates the college's contribution at 45% of salary.

For this grant, indirect costs include fume hoods, greenhouse space and support, microcentrifuges, growth chambers, and basic lab supplies such as pipetters and glassware. Luther is currently building a \$20 million dollar building for Biology and Chemistry, which will include facilities designed for this project. A fume hood was added to a lab (cost: \$10,000) to ensure that flow cytometry could take place there. The biology department recently purchased a growth chamber (\$7,000) which will be used for germinating and growing the standards used for DNA content determination.

Travel

Luther College will contribute \$1,000 in each year for student and PI conference travel. Undergraduates will present their work at one of several meetings, including the conference for undergraduate research (CUR) and national professional meetings (Ecological Society, Botanical Society of America).

Housing

Luther College will contribute \$275 in each year of the grant for summer student housing for those students taking part in this project.

Project timeline

As soon as funding is awarded in the spring of 2008, we will acquire a flow cytometer, identify prairie sites for collection and obtain necessary permissions, and recruit an undergraduate research student. During the summer of 2008, the PI and research student will collect material from ten sites for screening, and begin screening. During the 2008-09 academic year, the PI will supervise two research students continuing the project, focusing on those species that were most troublesome during the first summer, as well as expanding the focus to invasive species. This will be repeated for the next ten sites during the next summer and subsequent academic year.

Collaborations

We will collaborate with Ion Exchange Inc, a seed producer for prairie restoration and CRP projects in NE Iowa. Ion Exchange has over 200 species of plants in its accessions, and we propose to screen 30 of these, focusing again on grasses and asters. Identifying mismatches between the ploidy of native populations and possible sources of seeds for restoration will allow greater effectiveness in using conservation plantings to supplement native populations.

In addition, we are developing a collaboration with Dr. Elizabeth Lynch, an ecologist at Luther College, to examine the relationship between ploidy and invasiveness in two wetland species that are invasive in Iowa, the common reed *Phragmites australis* ($2n = 36, 48, 72$ or 96) and reed canary grass, *Phalaris arundinaceae* ($2n = 14, 28,$ or 42). Dr. Lynch has previously worked on the ecology of *Phragmites* in the upper Midwest (Lynch & Saltonstall 2002).

We hope to develop collaborations with the Iowa Dept. of Natural Resources as part of this process, but have not had the opportunity to do so in the two months since moving to Iowa.

Project impact and dissemination

This project focuses on basic research of economic importance. The future for alternative fuels, including cellulosic ethanol, is excellent in Iowa. This project will provide basic data that will aid researchers in developing the most productive and efficient plantings to provide sustainable sources of alternative fuels. Conservation plantings are an important part of Iowa's economy, and Iowa has over 20 providers of seed for conservation plantings. This research will permit seed producers to better match their product to the needs of agencies and farmers interested in supporting native prairie plantings. Finally, invasive plant species cost the nation 35 billion dollars each year (Czarapata 2005). Understanding the factors which make some invaders more successful than others is still in its infancy in ecology, but has the potential to allow much more effective allocation of resources.

Undergraduate researchers will present their research at national meetings, such as the Botanical Society of America or the Ecological Society of America. The completed project will be prepared for publication in a national journal such as *Restoration Ecology*. By collaborating with Ion Exchange, Iowa businesses will benefit from this knowledge as it is gathered. Finally, all results will be shared with the Iowa Departments of Natural Resources and Dept. of Agriculture and Land Stewardship.

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Design and Implementation of a Web-Based HIV Analyses Library
A proposal submitted to the Grow Iowa Values Fund

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1. Executive Summary

Beginning in 2004, the Principal Investigator, Dr. George Towfic, and his co-investigators have worked to develop a Web-Based HIV Analysis Library. Using a sample set of patients' records, they developed prototype mathematical models, Expert Systems and graphical tools that this proposal seeks to improve, expand and integrate to obtain a **full scale model** that simulates all available HIV patients' datasets available at the University of Iowa, University of Wisconsin and Stanford University. The initial work was funded by previous grants and has been published.

At the present, the University of Iowa has about 12,000 individual sera (available since 1998) from 1248 patients (dated back to 1988), totaling approximately 25,000 visits. The University of Wisconsin-Madison has information on over 3000 individuals infected with HIV. Most available datasets, provided by both clinics, are related to CD4 counts and RNA levels with other patients' datasets such as type of regimens, date of clinical trial, patients' weights, Hgb, HCT, Platelet, and WBC. It is essential to secure a unified HIV database to store reliable datasets obtained from both clinics. It is also important to design and implement efficient data mining and statistical analysis to provide better treatment options and to enable researchers in both states to test their research hypotheses and provide valuable data for their graduate students. In addition, the developed tools, algorithms, and statistical analyses can be used nationally and internationally to develop and analyze medical datasets.

The proposed web-based library will provide relevant analysis services for physicians, researchers, and national and international HIV clinics. Examples of suggested analysis tools are:

1. Ontology analysis to provide a conceptual analysis for the obtained laboratory datasets,
2. Gene regulatory network analysis to establish a network connection for intra genes (that impact the HIV progression) and inter genes (HIV genes that are related to other infectious diseases),
3. Error handling analysis to refine the collected clinical datasets and provide error feedbacks to relevant clinics,
4. Machine learning analysis to search for hidden information in the considered clinical datasets using statistical and stochastic algorithms.

In addition to the above analyses, the proposed library will provide analysis of HIV dynamic datasets using computer software and statistical analysis tools available from Stanford University's HIV Drug Resistance Database. These analyses include:

1. correlations between patients' clinical datasets,
2. treatment correlations, and
3. regimens –CD4+ and viral load correlations.

This proposal is the result of a collaborative effort between Clarke College, the University of Iowa, the University of Wisconsin-Madison, and Stanford University. In addition to providing analysis and software development expertise, Clarke College will host the proposed database and provide a secure network to access its datasets. The medical center at the University of Stanford will provide medical and software expertise in the area of drug resistance and clinical and treatment genotype-phenotype correlations. The department of Medical Informatics at Stanford will provide assistance in the area of error handling, ontology and machine learning. HIV physicians from the University of Iowa and the University of Wisconsin-Madison will mentor and coordinate the clinical activities related to this project in both states to provide expertise in establishing a unified HIV library and to ensure the establishment of a reliable database.

We anticipate producing a software product which will be available through licensing agreements. Its use will incorporate network services including: Client-server connection services, security tools and new clinical data input services. Consultation services will also be available.

2. Organizational Background

Clarke College, founded in 1843 is recognized as one of the outstanding Liberal Arts Colleges in the Midwest. The pioneer spirit of its early founders has persisted as the college has moved into the 21st century. The founder's mandate to be "progressive with the times" continues to inspire a faculty and staff of dedicated faculty to offer challenging and growth-producing education to all students. The college offers Bachelor degrees in 26 majors, Master's degrees in Education, Business Administration and Nursing as well as the Doctor of Physical Therapy degree. Clarke's fall 2007 total enrollment of 1230 students includes students from 23 states, Puerto Rico and 5 foreign countries. The average ACT score of the 2007 freshman class is 22, and 42% of incoming freshmen come from the top 25% of their high school class.

Clarke is accredited by The Higher Learning Commission and is a member of the North Central Association. U.S. News & World Report consistently names Clarke College to its top tier of Midwestern colleges in the "Best Comprehensive Colleges-Bachelor's" category. This year, Clarke was one of 10 schools in its category named to the U.S. News "Great Schools, Great Prices" ranking for outstanding quality and value. Clarke has also been named to Peterson's Competitive Colleges, The Templeton Guide: Colleges that Encourage Character and Barron's Best Buys in College Education.

The Computer Science department was the first at a liberal arts college in Iowa and is among the oldest in the Midwest. The pioneering spirit of the college and the department was demonstrated most recently when in 2004 it became the first college in Iowa to establish an undergraduate major in Bioinformatics. In collaboration with the natural sciences and mathematics departments, a total of 12 Ph.D. faculty members are involved in offering courses for this interdisciplinary major. The Isidore Laboratory, a molecular visualization lab for the Bioinformatics programs, was opened that year with support from the Dubuque Racing Association. Several Maytag Innovation Awards have supported ongoing faculty-student research projects related to this initiative.

3. Principle Investigator

Dr. George Towfic is an Associate Professor at Clarke College, Dubuque, Iowa. He taught many graduate and undergraduate courses related to the proposed project both during his time at Clarke College and in other national and international universities. These courses include Bioinformatics, Distributed Systems, Data Communication and Networking, Artificial Intelligence and Expert Systems, and Web Programming.

Dr. Towfic's bioinformatics research has appeared in highly regarded journals including *Bioinformatics*, which is edited by Oxford and Stanford Universities. In addition to his academic research, Dr. Towfic's scholarly achievements include his role as a reviewer for NIH grant proposals, several textbooks, as well as peer reviewed transcripts. He is currently in collaboration with the HIV Medical Clinic at the University of Iowa, HIV Medical Clinic at the University of Wisconsin-Madison, Stanford Medical Center, and Wayne State University to develop data mining tools and algorithms for the analysis of HIV drug resistance. Dr. Towfic has served as Principle Investigator for many research grants and has contributed and chaired national and international research conferences. Encouraged by a positive score from a previous NIH grant proposal, Dr. Towfic is currently applying (in contribution with four national universities) for an NIH grant to establish drug resistance datasets for HIV patients at the University of Iowa and the University of Wisconsin. The tools and algorithms developed in this proposal will be part of the tools that will be implemented in the NIH grant proposal. Dr. Towfic is a member of the Institution of Electrical and Electronics Engineers (IEEE) and the Association for Computing Machinery (ACM).

4. Project Description

The specific aims of this project are:

Aim 1: providing a standardized, rule-based, HIV dynamics analysis interface,

Aim 2: Providing a graphical web-based user friendly decision and regression support system,

Aim 3: design and implementation of online data validation methods and interfaces,

Aim 4: implementing Web-based mathematical and statistical analysis models.

The following analysis tools were developed through joint research between Clarke College, the University of Iowa Medical Center, the University of Wisconsin Hospital and Clinics, Stanford University, Wayne State University, and Oakland University. All the tools described below will need to be upgraded (as shown in the Timeline section) to incorporate more data, analysis models, and graphical and web-based interfaces.

Aim 1: Providing a standardized, rule-based, HIV dynamics analysis interface

To illustrate a preliminary interface for Aim 1, we used a graphical "fuzzy logic" user interface to simulate the following rule [1]:

If the combination contains drug regimens from Group1 {Indinavir, Ritonavir or Saquinavir} and Group2 {Nevirapine or Delavirdine} then do not use the combination [weight=1.0].

In general n different drug regimens can generate 2^n possible combinations. For example, in the above rule, five different drug regimens can generate 32 therapy recommendations of possible drug combinations. A user friendly graphical interface, developed by researchers at Clarke College and University of Wisconsin Madison, will help physicians and clinical researchers to select suitable drug regimens and obtain recommendations on the use of the selected combinations.

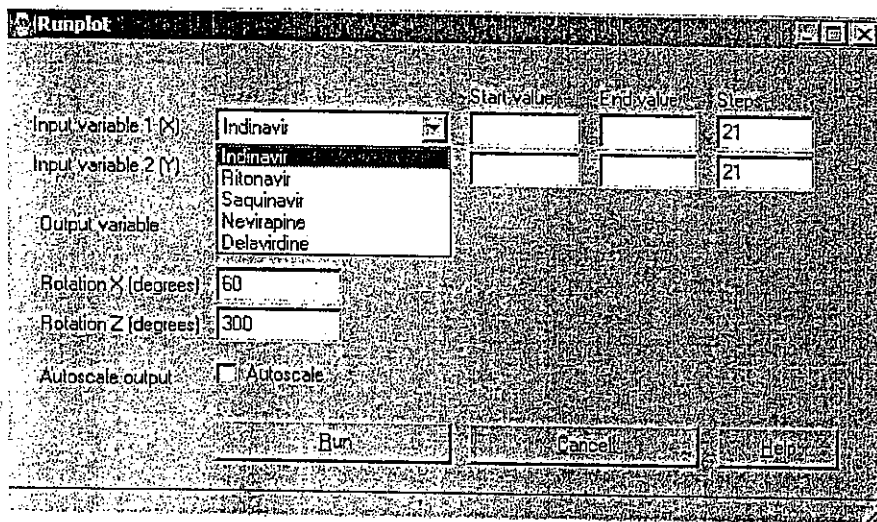


Figure 1. Graphical user interface used to test recommended therapy combinations using different drug regimens

Figure 1 depicts a user option window for the decision support interface where five possible combinations (representing the five drug regimens involved in the above rule) can be selected for each input.

Figure 2 depicts a three-dimensional contour plot showing that if both Indinavir and Nevirapine are taken, then the combination is not recommended (the value of the combination is below the upper level plane). When selecting any two regimens from the same group then the combination is recommended (the combination value is at the upper level plane). Users can explore the system to display the rules with its selected variables. Users can get the system's recommendations by changing the selected variables displayed in Figure 1.

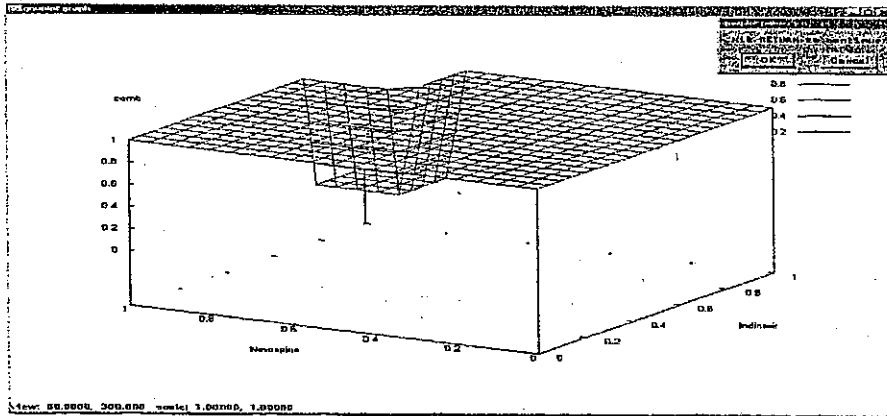


Figure 2 Contour plot showing the relation between two drug regimens according to a proposed therapy combination rule

Aim 2: Providing graphical web-based user friendly decision and regression support system

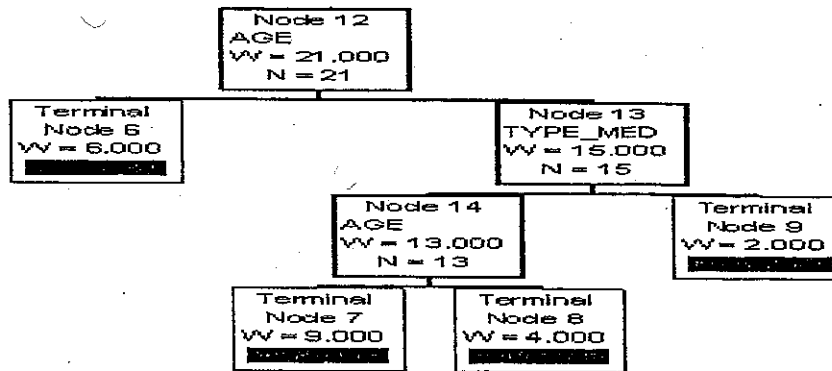
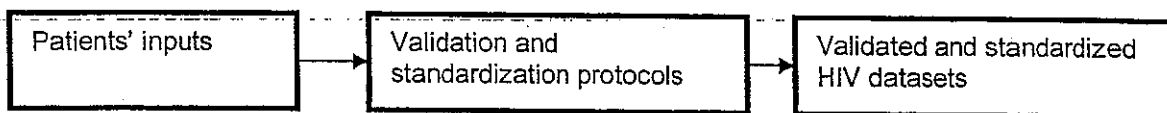


Figure 3. A decision tree that shows the significance of age and type of medication on CD4+ counts

Decision trees [2, 3] are important tools to generate homogenous groups in large datasets. Analysts can use the generated trees to predict with greater accuracy how to manage individual groups. For example, in an HIV database, decision trees can be used to segment groups of patients with a given range of CD4+ and develop correlated groups to help physicians and researchers understand the effect of system inputs on a selected target variable. Figure 3 depicts part of a decision tree generated by the authors of this article [4] using University of Wisconsin Clinics' datasets. The part of the tree shown in Figure 3 illustrates the effect of age, and type of medication on the CD4+ counts (not shown in the figure due to space restriction since the CD4+ node will be node number one at the top of the tree). Each tree node depicts the number of datasets, N , associated with the considered node. This number also represents the weight, W , of the considered node with respect to the target variable (in this case the CD4+ counts). The depicted tree suggests that out of the total 21 datasets (shown in node 12), 13 patients ($N = 13$) show a strong correlation between age (node 14) and type of medications (node 13). It also shows that both age and type of medication affect the target variable (the CD4+ progression). In the tree's "Terminal" nodes (associated with nodes that have no further splits), dark color indicates high significance while light color indicates insignificant percentage of confidence. This can be used to indicate the degree of confidence in the considered correlation. For example, node 7 shows that there is a 40% confidence that the relation claimed by the decision tree, i.e. that there is a correlation between node 14 (age), and node 13 (type of medication), is correct. Physicians or clinical researchers can easily observe correlations between system parameters (by looking at nodes' hierarchy) and estimate their degree of confidence (by looking at terminal nodes' colors).

Aim 3: Design and implementation of online data validation methods and interfaces

The goal of this aim is to enable clinics, physicians, and researchers to enter and validate their HIV data online. The project module responsible for this aim will contain a statistical package that checks the compatibility of the entered data with the overall trend of identical inputs stored in the database. A quality control option inspects every data input to verify that it falls within the range of similar data stored in the database. This module will reduce erroneous datasets due to many sources or errors. Important error sources that will be given special attention in this module are data errors and information therapy errors. One important source of data error, besides data entry errors, is when patients supply inaccurate information, such as incorrect date and amount of dosage regimen. Another source of data error is the information therapy error where a motivated patient, without the aide of a licensed professional or health care organization, reviews prescription-strength information to make a medical decision, using unfiltered sources of information such as the internet. By providing error controlled datasets, supported with specialists' analysis, physicians and patients can obtain a reliable data source. This module will help reduce data errors and information therapy errors in two ways: a. By comparing patients' most recent laboratory data with similar datasets obtained from the proposed HIV dynamics library to discover possible differences between patients' supplied data and data obtained from the proposed library. b. By consulting the "decision support rule-based database" which will be built using module 1 of this project.



The following table depicts a sample ANOVA test obtained from our recent paper [5]. The figure shows comparison between the analytical data obtained from four finite element mesh sizes of 300, 500, 1000, and 1500. The fact that the *F* value between the four groups is approximately 0.001 indicates that there is no statistically significant difference between the CD4+ values calculated using the four mesh sizes.

Table 1: A single factor ANOVA test showing that there is no significant difference between the CD4+ values calculated for 4.3 Log₁₀ viral load baseline using 300, 500, 100, and 1500 finite element mesh.

Groups	Count	Sum	Average	Variance		
300 mesh	33	11697	354.4545	1202.818		
500 mesh	33	11641	352.7576	979.8769		
1000 mesh	33	11654	353.1515	1015.008		
1500 mesh	33	11792	357.3333	790.9792		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	17976.15	3	5992.051	0.00987	0.0547	2.675387
Within Groups	127637.8	128	997.1705			
Total	145614	131				

Aim 4: Implementing Web-based mathematical and statistical analysis models

A fundamental problem in the area of HIV analysis is finding a suitable representation of multivariate data, i.e. random vectors associated with the rapid change in HIV dynamics and the strongly coupled dependency between the T helper cells, the CD8+ lymphocytes and the viral load. For reasons of computational and conceptual simplicity, the representation is often sought as a linear transformation of the original data. In other words, each component of the representation is a linear combination of the original variables. Well-known linear transformation methods include principal component analysis, factor analysis, and projection pursuit.

Independent Component Analysis (ICA) is a recently developed method in which the goal is to find a linear representation of non-Gaussian statistically independent components. Such a representation seems to capture the essential, nonlinear structure of non-Gaussian data. The authors of this proposal have led the way to the use of the ICA method in the area of HIV simulation [5, 6]. Our successfully implemented ICA models can be

extended to offer Web-based simulations whereby a mixture of HIV dynamics related datasets, such as CD4+, CD8+, and viral load, for a particular patient is normalized with respect to broader datasets that can be obtained from the suggested Web-based HIV library. The objective of the ICA algorithm here is to isolate groups of independent patterns embedded in a considered HIV dataset to provide online graphical histograms that show the transient change in time of HIV dynamics with respect to different inputs including CD4+, CD8+, and viral progression. Figure 4 shows an example output that can be obtained using a Web-based, ICA algorithm. The figure depicts that the CD4+ counts decrease sharply during the first 10-15 weeks and start to increase to a higher level after the first 25 months of the HIV infection.

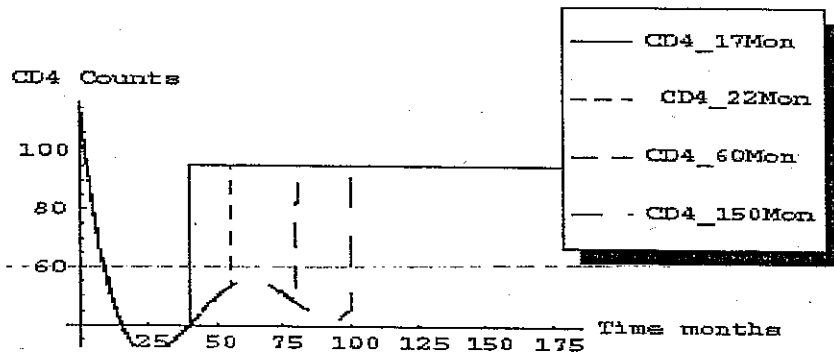


Fig. 4. Laboratory CD4+ data for different time intervals.

Another analysis model developed as a joint effort between Clarke College, University of Iowa, University of Wisconsin, and Stanford University [5] is the HIV simulator tool depicted in Figure 5. The model uses Finite Element analysis and Boltzmann equation to trace the progression of CD4+ lymphocytes, and viral load counts during different drug regimens. Users can enter base CD4+ counts, start time of therapy, and end of therapy time, given in Table 2, to display histograms that depict stored datasets during different times of viral progression.

Table 2. Therapy start and end time selected, using slide bars, in Figure 5.

Therapy start time (days)	Therapy end time (days)
1400	1800
1800	2330
1800	1900
2800	3420
3150	3500

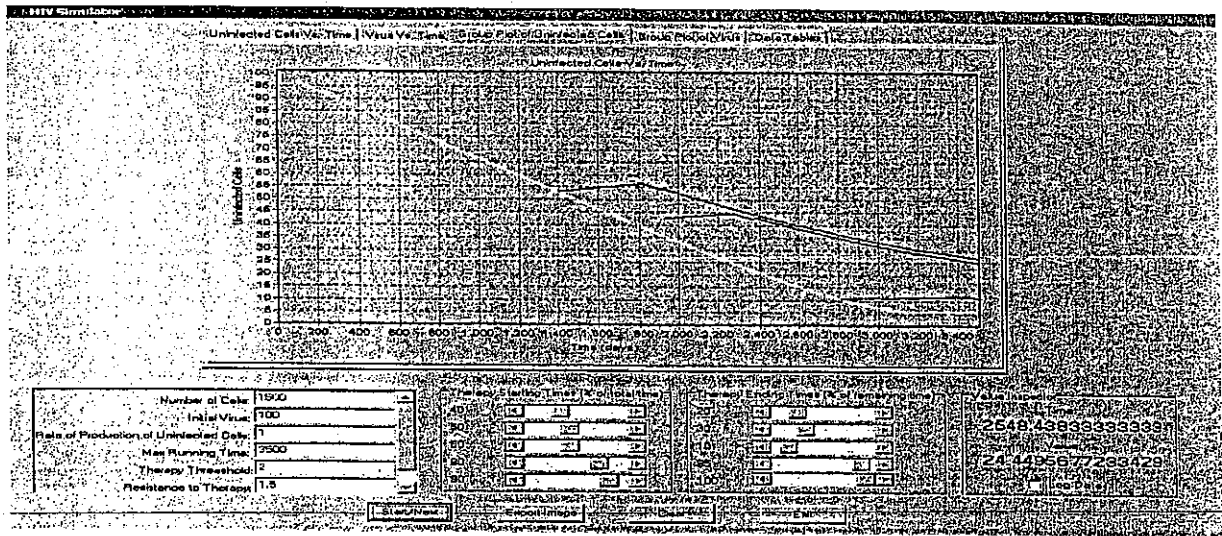


Figure 5. A graphical user interface that shows the change of CD4 + counts, with respect to time, according to therapy start and end time depicted in Table [2].

5. Timeline

This project will be an extension to the Principle Investigator, CO-PI, and CO-Investigator's previous grants and published research work in the area of HIV analysis (as summarized in the Project Description section). Sample patients' records are already available and have been already used to developed prototype mathematical models, Expert Systems, and graphical tools that this proposal seeks to improve, expand, and integrate to obtain a full scale model that simulates all available HIV patients' datasets available at the University of Iowa, University of Wisconsin and Stanford University.

The project was initiated in 2004 and is approximately 47% completed. The timeframe for this project is two months spanned over the summers of 2008 and 2009. The following figure depicts the activities required to complete the project. The estimated duration of individual activities and the percentage of the task which has already been completed are indicated for each.

During the first year, concurrent and overlapping activities shown in Figure 6 under labels 1.1.1-1.1.4 will be implemented. Timeframes depicted at Figure 6 assumes a full time eight hour daily work not including weekends. Existing HIV patients' datasets will be expanded by upgrading the database management system and obtaining more patients' data from the clinics at the University of Iowa, University of Wisconsin, and Stanford University Medical Center. During this first year, an XML web-based database will be designed and implemented. Physicians, researchers and clinics will be the end-user domain for this project. End users will be able to use the proposed XML rules to retrieve selected end-users datasets according to a user-friendly query system which will interact with the MySQL database. Expert Systems, Decision Support Systems, and Graphical User Interfaces, which are responsible for the Ontology and statistical error detection and correction algorithms, will be designed and implemented as part of the proposed XML algorithms. Testing and preparation of a progress report will be an umbrella activity that accompanies each task in the proposed project.

In the second year, more datasets will be added to the systems and most of the time will be spent on integrating the proposed software packages (XML, Ontology, Expert Systems, and Decision Support Systems). Expansion of the developed Ontology and Expert System packages will be another important part of the second year work. Students will participate in national conference and research papers resulting from the developed mathematical and computer models will be published.

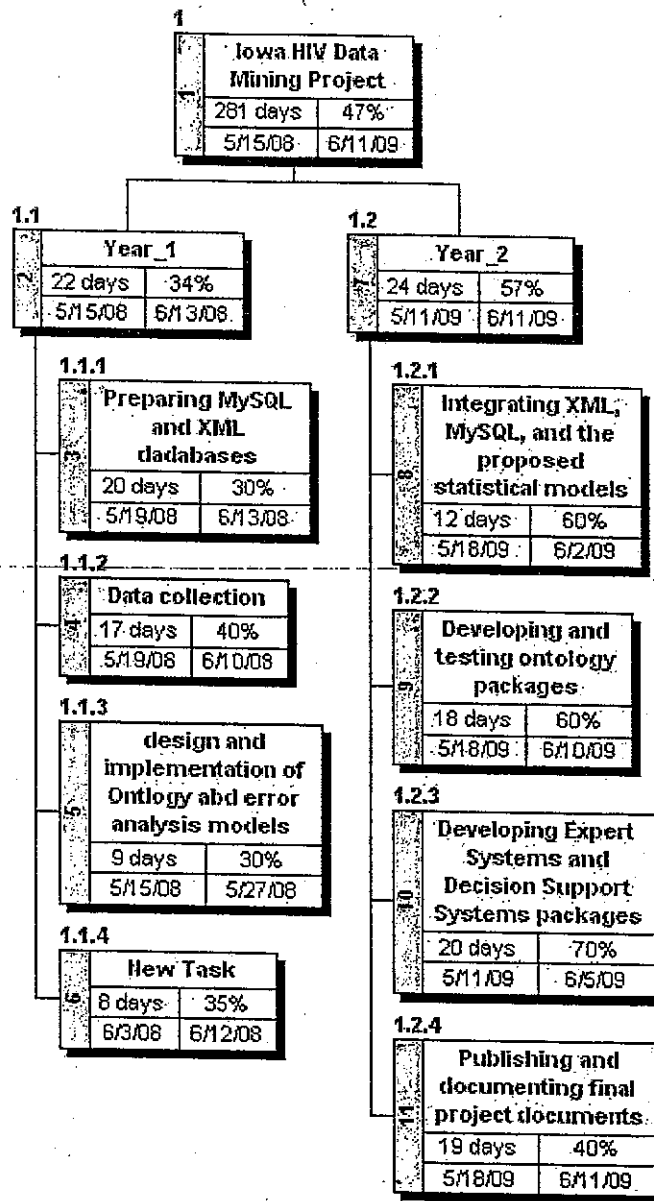


Figure 6. Time-line to complete proposed Web-based HIV Analyses Library

6. Proposed Budget

Funding for this project is requested for salaries, computer and networking hardware, and analysis and computer software. The principle investigator, CO-PI and the CO-Investigator are on a nine months contract with Clarke College. The principle investigator is requesting GIVF 1/9th (0.111) of his salary for a one month full time work load for each the summer of 2008-2009 and 2009-2010 sessions. The CO-PI is and the CO-Investigator are asking GIVF for 0.083 and 0.055 of their salaries for three and two weeks, full time working load, respectively for each of the 2008-2009 and 2009-2010 summer sessions. Two students will be working full time in this project for a total of eight weeks during the two summer sessions of 2008-2009 and 2009-2010. Clarke College is respectively asking GIVF for a stipend of \$2000 for each student during each of the two summer sessions.

Permanent equipment required for the project includes seven computers including three servers, two client nodes which will be located at Clarke College, and two client nodes which will be located at the University of Iowa. Clarke College will provide the three servers and GIVF is respectfully requested for the other four computers. Client nodes at the University of Wisconsin and Stanford University will be provided by those institutions. Clarke College will also provide one security firewall server at its location and GIVF is respectfully requested to fund another firewall node. Networking equipment including two CISCO routers, four switches, and three wireless hubs are required to establish a network connection between the three servers and the four client nodes which are located at Clarke College and the University of Iowa. Clarke College will provide services for one CISCO router and networking cables and GIVF is respectfully requested for funding to purchase another CISCO router, four switches, and three Wireless Hubs.

Clarke College will provide software resources (including operating systems, software licenses, and databases). We request GIVF to respectively fund \$21,511 to develop and purchase other software packages including ontology packages, sequence matching packages, and decision support and machine learning packages.

The complete budget is shown following page 10.

7. Impact and Commercialization

In addition to societal impact of improved medical care, the proposed project has potential commercial value in licensing, networking and consultation services. It will also enhance Iowa's position in the emerging fields of Health Informatics through new jobs and business partnerships. The state of Iowa has clearly positioned itself for a leadership role in this area as the new UI Institute for Biomedical Discovery was announced this fall.

Specific aspects with commercial value include:

- **Licensing Agreements for Databases and Web-based Analysis Tools**
The project will establish the first electronic database to store reliable HIV patients' records (including CD4+ count, CD8+ count and viral loads) in the state of Iowa. The proposed HIV library will provide web-based analysis tools that will be available for sale to clinics, researchers and pharmaceutical companies to validate research hypotheses and to use the analysis tools to understand the effect of available HIV regimens on drug resistance and drug mutations. Also, this integrated electronic database to store patients' records and the developed data mining tools could be adapted to other infectious diseases and illnesses.
- **Network and Consultation Services**
The project will incorporate network services including: remote connection network to the proposed analyses server, security tools and online clinical data input services. Consultation services will also be available for a reasonable cost.

- **Job training and Partnerships**

We believe this project will enhance the job market in the areas of medical analyses, mathematical modeling, computer networks, and Web design. While working in this project, we will collaborate closely with local universities, local pharmaceutical companies, and health institutes to create a research and development trend in the area of medical informatics (in particular HIV analysis) that can accommodate undergraduate and graduate students majoring in Biology, Bioinformatics, Statistics, Mathematics, and Computer Science. This will strengthen the perception of medical informatics in the state of Iowa supporting creation of a job market in this field. Researchers at the state of Iowa will benefit from the collaborative nature of this project to exchange research ideas with their colleagues at the University of Wisconsin and Stanford University.

- **Hands-on training for undergraduate students**

The technology obtained from this project will be available (on-site and through remote servers) to local clinics, researchers, and graduate and undergraduate students in the state of Iowa. The analyses tools, advanced computer facilities, and network interfaces can be used to attract students to study and research in the area of medical informatics. We intend to continue our collaboration with the University of Wisconsin-Madison and Stanford University in addition to Iowa universities and colleges to establish joint research projects and internships that will encourage our students to continue research in the field of medical informatics. This will generate tuition income for Iowa universities and colleges.

A business plan will be developed once the software product is developed to the extent where the commercialization potential is clear. The PI will pursue copyright protection in accordance with the guidelines of the GIVFund.

Budget for Development of a Web-based HIV Analysis Library

	Year1		Year2		Cumulative	
	Matching Funds	GIVF Funding	Matching Funds	GIVF Funding	Matching Funds	GIVF Funding
Salaries						
Principle Investigator	\$0	\$5,661	\$0	\$5,661	\$0	\$11,322
Co-PI	\$0	\$4,233	\$0	\$4,233	\$0	\$8,466
Co-Investigator	\$0	\$2,805	\$0	\$2,805	\$0	\$5,610
2 undergraduate students	\$0	\$4,000	\$0	\$4,000	\$0	\$8,000
Fringe Benefits						
Institutional Rate (20.1% Salaries)	\$0	\$3,507	\$0	\$3,507	\$0	\$7,014
Total Salary and Benefits	\$0	\$20,206	\$0	\$20,206	\$0	\$40,412
Permanent Equipment						
Servers	\$8,546	\$4,890	\$7,500	\$1,526	\$16,046	\$6,416
Network	\$10,334	\$3,872	\$4,034	\$1,500	\$14,368	\$5,372
Firewall	\$4,875	\$2,120	\$2,560	\$0	\$7,435	\$2,120
Storage devices	\$4,555	\$0	\$4,554	\$1,500	\$9,109	\$1,500
Total Equipment	\$28,310	\$10,882	\$18,648	\$4,526	\$46,958	\$15,408
Software						
Data Warehouse and Data mining package	\$3,690	\$1,510	\$598	\$1,010	\$4,288	\$2,520
Decision support package	\$8,654	\$3,980	\$1,245	\$1,276	\$9,899	\$5,256
Ontology analysis package	\$8,899	\$2,490	\$1,989	\$3,000	\$10,888	\$5,490
Windows Vista	\$9,687	\$1,480	\$2,200	\$0	\$11,887	\$1,480
Gene analysis	\$6,890	\$2,678	\$3,000	\$1,000	\$9,890	\$3,678
Sequence matching and analysis package	\$6,670	\$2,587	\$1,000	\$500	\$7,670	\$3,087
Total Software	\$44,490	\$14,725	\$10,032	\$6,786	\$54,522	\$21,511
Travel						
Consultation with collaborators	\$0	\$3,500	\$0	\$4,000	\$0	\$7,500
Presentations	\$1,500	\$500	\$1,500	\$500	\$3,000	\$1,000
Conference	\$0	\$750	\$0	\$750	\$0	\$1,500
Total Travel	\$1,500	\$4,750	\$1,500	\$5,250	\$3,000	\$10,000
Dissemination						
Publication	\$0	\$500	\$0	\$500	\$0	\$1,000
Total Dissemination	\$0	\$500	\$0	\$500	\$0	\$1,000
SUBTOTAL	\$74,300	\$51,063	\$30,180	\$37,268	\$104,480	\$88,331
Indirect Cost (10% Annual Project Cost)	\$7,430	\$5,106	\$3,018	\$3,727	\$10,448	\$8,833
TOTAL FUNDING	\$81,730	\$56,169	\$33,198	\$40,995	\$114,928	\$97,164

References:

1. Pazzani, M. Iyer, R. Shroeder, E. and Tilles, J. 1997 "CTSHIV: A Knowledge-based System in the Management of HIV-infected patients", Proceedings of the International Conference on Intelligent Information Systems.
2. Lynn B. Shenghui G. Bruce, F. Redden, D. Kimerling, M. E. Brook, N. Dunlap, N. and Bailey W. C. 2002 "A Decision Tree for Tuberculosis Contact Investigation", American Journal of Respiratory and Critical Care Medicine Vol 166. pp. 1122-1127.
3. Liu, B. 2000 "Clustering through decision tree construction", IBM T.J. Watson Research Center.
4. Towfic G. Graziano, F. 2005 "Generating a Connected Weighted Graph for the Analysis of HIV Data Using CART 5", Salford Data mining conference, Biomedical section.
5. Graziano F. M., Kettoola, S. Y., Munshower J. M., Stapleton J T, and Towfic, G J, 2007 "Effect of Spatial Distribution of T-Cells and HIV Load on HIV Progression", Accepted Bioinformatics, September 2007.
6. Draghici, S. Graziano, F. Kettoola S., Sethi, I S. Towfic, G J 2003 "Mining HIV Dynamics Using Independent Component Analysis", Bioinformatics 19(8): 981-986.

Attachments:

Curriculum Vitae: George J. Towfic

Support letters for research project from

Jack T. Stapleton, M.D., University of Iowa Hospitals and Clinics
Robert Shafer, M.D., Stanford University School of Medicine
Frank M. Graziano, M.D., University of Wisconsin Medical School
KyungMann Kim, Ph.D., University of Wisconsin Medical School

Name: George J. Towfic
Position Title: Associate Professor
Email: george.towfic@clarke.edu
URL: keller.clarke.edu/~gtowfic
Address: 1550 Clarke Dr., MS# 1792, Dubuque, IA 52001

Education:

B.Sc Mathematics (1973), Basrah Univesity, Basrah-Iraq
Ph.D. Computer Science (1982), Reading University, Reading-England.

A. Professional Experience

1984-1996 Scientific Research Council, Computer Center, Baghdad, Iraq
1984-1996 Adjunct Professor, Computer Science Department, -Baghdad University, Iraq
1996-1998 Associate Professor, Computer Science Department, Near East University, North Cyprus
1998-1999 Visiting Professor, Wayne State University, Computer Science Department, Detroit, Michigan
1999-2000 Assistant Professor, Lawrence Technological University, Computer Science Department, Southfield, Michigan
2000-2006 Assistant Professor, Clarke College, Dubuque, Iowa
2006-present Associate Professor, Clarke College, Dubuque, Iowa

Selected Scholar Activities:

1. Reviewer of four NIH grant proposals.
2. Reviewer of numerous books and peer reviewed papers
3. Technical director of a Virtual Reality Lab, Clarke College, Dubuque, Iowa. This lab is funded by the Dubuque Racing Association (DRA) grant
4. Mentor of the Computer Club at Clarke College, Dubuque, IA (2000-present)
5. Mentor of the Association of Computer Machinery (ACM) club. (2000-present)
6. Director of a joint project with the Dubuque National Mississippi River and Aquarium to design and setup a computer controlled system for the simulation of the Lewis and Clark grizzly bear adventure
7. Founder and mentor of the Clarke College Robotics Club. (2001-present)
8. Mentor of the Computer Science department's library budget (2001-present)
9. Director of the multiprocessor lab at Lawrence Technological University, Southfield, MI (1999)
10. Participated in a joint project to build a medical expert system for the diagnosis and treatment of HIV/AIDS infection. This research was carried out at Wayne State University-CS department, in collaboration with the medical school (1998)
11. Technical director of a collaborative software engineering project between Lawrence Technological
a. University and Blue Cross Blue Shield of Michigan (BCBSM): A reverse engineering data mining analysis library has been proposed to optimize a legacy database used by BCBSM (1999)
12. Letter of appreciation from the Dean of the School of Science, Lawrence Technological University, for the design and maintenance of the computer lab for graduate studies
13. ACM programming contest team coach award for the years 2000-2004

Collaborative Research Projects:

1. Principal Investigator of a Keck grant proposal to establish a graphical user interface to be used in the analysis of infectious diseases including HIV/AIDS.
 2. Principle Investigator of a proposed NIH grant (under review) in collaboration with Stanford University, the University of Wisconsin-Madison Hospital and Clinic, Harvard College of Medicine, and the University of Iowa. Names and project details can be provided upon request
 3. Simulation of HIV dynamics: Joint research in collaboration with the following universities:
 - a. University of Wisconsin-Madison, Department of Medicine
 - b. Wayne State University, Department of Computer Science
 - c. University of Rochester, Department of Computer Science
-

- d. University of Wisconsin-Platteville
4. Principle Investigator for a Maytag grant (2006-2007) in collaboration with the Chemistry department. The aim of the grant is to provide a data mining mathematical and statistical model to investigate possible genetic correlation between HIV/AIDS and Cancer.
 5. Principle Investigator for Maytag grant (2005-2006) to setup an HIV dataset for the Iowa region
 6. Principle Investigator for Maytag grant (2004-2005), in collaboration with the Mathematics Department. The title of the research project is "An Adaptive Microevolutionary Model for the Analysis of HIV Dynamics"
 7. Principle Investigator for a Maytag (2003-2004) grant in collaboration with the Clarke College Department of Biology professor Dr. Christopher Meseke-Wren. The title of the research project is "Independent Component Analysis of Base-Posterior Radiographs of the Occipital Condyles"
 8. Honor award from Lawrence Technological University and Blue Cross Blue Shield (BCBSM)
 9. Intel Cooperation Honor award for contributing in the organization of the "2000 Intel International Science and Engineering Fair," ISEF, held in Detroit, Michigan

Selected Scholarly Applications:

1. Network Design, installation, and maintenance
2. Web implementation for the dynamic book covers design (in contribution with McGRAW-HILL Dubuque, Iowa)
3. Design and implementation of 3-D Finite Element Simulations for thermal analysis with different boundary conditions (radiation, convection, conduction)
4. Design and implementation of 2-D Hydrodynamics computer code for the simulation of fluid flow under compressible and incompressible structures
5. Design and implementation of a Finite element program for simulation of solids in a compression state.
6. Pressure analysis in vessels with different structures
7. Design of a mathematical model that controls the CNC (Computer Numerical Control) machine
8. Design and implementation of Electrostatic Finite Element mesh generation pre-processor algorithm
9. Implementation of Monte Carlo scattering program for the control of ions distribution in gasses
10. Implementation of a Machine scheduling program for the synchronization and allocation of jobs to many numerical control machines
11. Implementation of a Statistical model for the prediction of power load on different power stations under different load conditions
12. Design of an integrated job scheduling database

Teaching Experience

• Undergraduate Classes:

1. Computer Science I and Computer Science II (Lawrence Technological University (LTU) and Clarke College 2000-present)
 2. Artificial Intelligence (Clarke College, Fall 2001, Fall 2003, fall 2006)
 3. Bioinformatics (Clarke College, Spring 2006)
 4. Software Engineering I (Clarke College Fall 2000-Fall 2007)
 5. Software Engineering II (Clarke College Spring 2000, Spring 2006)
 6. Distributed Systems (Clarke College, Spring 2001, Spring 2003)
 7. Computer Architecture (Clarke College, Spring 2000-2006; LTU (MI), Fall 2000; Wayne State University (MI), Summer 1999; Near East University (Cyprus) Fall 1998)
 8. Computer Organization (Clarke College, Fall 2000-2005)
 9. Operating Systems (LTU (MI), Spring 2000; Clarke College, Spring 2000-2006)
 10. Web development (Clarke College Spring 2003-Spring 2006)
 11. Digital Logic (Clarke College, Fall 2003-Fall 2005)
 12. Introduction to Java Programming (Clarke College, Fall 2004-Fall 2005)
 13. Data Communication and Networking (Clarke College, Spring 2000-Spring 2005)
 14. Unix System Programming (LTU (MI), Fall 2000; Clarke College, Spring 2000-2006)
 15. Numerical Analysis (Near East University (Cyprus), Fall 1998)
 16. Methods for the specifications and verifications of communication protocols (Baghdad University, Spring 1996)
 17. Calculus of variations (Baghdad University, Fall 1996)
-

• **Graduate Classes:**

1. Decision Support Systems: Data mining and Data warehousing (Clarke College, Spring 2003)
2. Distributed Systems and Networking (Lawrence Technological University (LTU) (MI), Fall 2000)
3. Advanced Distributed systems (Including Java and CORBA), (LTU (MI), Spring 2000; Wayne State University, Spring 1998)
4. Introduction to distributed systems (Including Network Programming using C) , (Wayne State University, Fall 1998)
5. Methods in Computational Physics (Baghdad University, Fall 1995)
6. Solutions of P.D.E. (Baghdad University, Spring 1995)
7. Architecture of distributed Systems (Baghdad University, Fall 1996)
8. Finite Element and Boundary Elements Methods for the solution of P.D.E (Baghdad University, Spring 1996)
9. Solution of partial differential equations (Near East University, Spring 1997)
10. Advanced operation systems (Near East University (Cyprus), Fall 1997)

B. Publications: (Selected)

1. Frank M. Graziano, Samira Y. Kettoola, Judy M. Munshower, Jack T. Stapleton, and George J. Towfic (2007) "Effect of Spatial Distribution of T-Cells and HIV Load on HIV Progression"; accepted for publication, *Bioinformatics*.
2. Sorin Draghici, Frank Graziano, Samira Kettoola, Ishwar Sethi, and George Towfic (2003): "Mining HIV Dynamics using Independent Components Analysis, *Bioinformatics*, Vol. 19 No. 18 2003, Pages 981-986.
3. George Towfic, Frank Graziano, and Samira Kettoola (2005) "Generating a Connected Weighted Graph for the Analysis of HIV Data Using CART 5", Salford Data mining conference, Biomedical section, March 28, 2005.
4. George Towfic, and S.Y.Kettoola,(2001): "Searching for Ramsey game sets using neural networks": Internationals Conference on Computational Intelligence for Modeling Control and Automation (CICMA'2001). *Proceeding* ISBN: 0 858 89847, Page: 483-494.
5. George Towfic, and S.Y.Kettoola (2001): "Image Decomposition Using Independent Component Analysis": *Computer Graphics and Imaging*, (CGIM 2001) August 13-16, 2001 Honolulu, Ha.
6. Samira Towfic and T.G.Towfic (1998): " Stochastic Neural Network applied to combinatorics Game theory", accepted at Oregon State University, Dept. of Mathematics Conference on Applications of Expert systems in industry (5-11, July.1998).
8. T. G.Towfic and S.Y.Kettoola (1986) : " A unified method for the specification and verification of Protocols", *Journal of Engineering*, Vol. 22.
9. George Towfic (1987) : " A formalized specification of HDLC classes of procedures ", *Journal of Engineering*, Vol . 23.
10. S.Y.Kettoola and T.G.Towfic(1988) : " An adopted procedure using Galerkin Finite Element Method for non-linear heat transfer problems" *Journal of Science* Vol. 25.
11. R.S.Naom and T.G.Towfic (1998) : "Solution of Hydrodynamics problems using Eulerian-Lagrangien coordinates with Flux Corrected technique ", *I.J.S*, Vol. 20 (1998).
12. T.G.Towfic,(1994) : " Stability Analysis of unconditionally stable difference scheme for hydrodynamics equations.", *I.J.S.*, Vol. 35(1998).
13. T.G.Towfic and R.S.Naom, (1994) " An adopted combined implicit-multi grid scheme for the solution of two-dimensional Euler Equations.", *I. J. S*. Vol. 35(1997).
14. T.G.Towfic and R.S.Naom (1995) "The numerical solution of a Caustic field problem by Galerkin Finite Element Method ", *I.J.S*, Vol.36(1997).

C. Selected Research Support

1. Maytag grant award, 2006-2007
2. Maytag grant award, 2005-2006
3. Maytag grant award, 2004-2005
4. Maytag grant award, 2003-2004
5. Dubuque Racing Association (DRA) grant, 2004
6. Research Development Award: Clarke College, Dubuque, IA, 2005
7. Research Development Award: Clarke College, Dubuque, IA, 2003
8. Research Development Award: Clarke College, Dubuque, IA, 2001



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August 14, 2005

George Towfic, Ph.D.
Assistant Professor
Department of Computer Science
Clarke College
Dubuque, IA 52001

Dear George,

I am writing to convey my support for your proposal and also my willingness to collaborate with you in the analysis of HIV markers from geographically diverse clinic populations. Expanding current data sets related to HIV surrogate markers and drug resistance and making these resources widely available is a laudable goal to facilitate future HIV research.

I established the University of Iowa HIV clinic in 1988, and starting with the first patient we established a database that includes demographics, CD4 and HIV RNA data, hepatic enzyme and peripheral blood cell data, and viral hepatitis data from all of the ~ 25,000 visits by the 1248 patients seen in our clinic. In addition, a large proportion of the 800 patients seen since 1998 have consented to allow us to store serum for studies on both HIV and hepatitis viruses, and we have a sample bank of ~ 12,000 individual sera from these subjects in our freezers. We have drug resistance information (either ViroLogic or affymetrix sequence data) on a large number of these patients. Patients are assigned a sequential clinic number, and all data is listed only with this code number decreasing confidentiality concerns.

We look forward to working with you to develop and analyze the proposed geographically diverse HIV database. Please let me know if you would like any additional information.

Sincerely,

Jack T. Stapleton, M.D.
Professor
Director, Division of Infectious Diseases
Director, UIHC Virology Clinic
Director, Helen C. Levitt Center for Viral Pathogenesis

**STANFORD**
SCHOOL OF MEDICINE

Stanford University Medical Center

DIVISION OF INFECTIOUS DISEASES AND
GEOGRAPHIC MEDICINE

May 25, 2005

George Towfic, Ph.D.
Assistant Professor, Department of Computer Science
Clarke College
Dubuque, IA

Frank Graziano, M.D., Ph.D.
Professor of Medicine
University of Wisconsin Hospital and Clinics
Madison, Wisconsin

Dear George and Frank,

I am writing this letter to describe my enthusiasm for your proposal and my willingness to both collaborate and act as a consultant. The Stanford HIV Drug Resistance Database (<http://hivdb.stanford.edu>) is a publicly available online database that represents, stores, and analyzes the diverse forms of data underlying drug resistance knowledge. The database makes these data available to researchers and clinicians in order to inform guidelines for interpreting HIV drug resistance testing and to aid in antiretroviral drug development and drug-resistance surveillance.

A large proportion of the data in the database links genotypic resistance data and treatment history to clinical outcome – most commonly represented by plasma HIV-1 RNA levels and CD4 counts. This is precisely the type of data you are most interested in analyzing, making for an ideal collaboration. In particular, you are developing sophisticated approaches to study viral and CD4 count dynamics that are sorely needed to advance research in this area. Therefore, we hope to advise you on making optimal use of the data on our website for your research.

A second area of potential collaboration surrounds the large patient database from the University of Wisconsin. We already have Human Subjects-Approved collaborations with several clinics in Northern and Southern California to maintain a pooled database linking genotype, treatment, RNA levels, and CD4 counts in an anonymous confidential manner. This database now contains partial data on 4,000 patients and complete data on 2,000 patients. These data will appear on our website in a slightly redacted form (and of course in the absence of any personal identifiers) following publication of one or more peer-reviewed publications. We are very interested in adding the University of Wisconsin data to our database. After validation and analysis, we can add the data to our website with a possible intermediate step of assisting your group with one or more peer-reviewed publications.

We have also developed novel XML schema for validating treatment histories and genotypic resistance data and this could be of immediate use to your project as well as a third area of collaboration.

Sincerely,

Robert Shafer, MD
Assistant Professor of Medicine
Division of Infectious Diseases, S-169
Stanford University Medical Center
Stanford, CA 94305
Email: rshafer@stanford.edu



University of Wisconsin
MEDICAL SCHOOL

May 26, 2005

George Towfic, Ph.D.
Assistant Professor, Department of Computer Sciences
Clarke College
Dubuque, IA

Dear George,

I am writing to give my enthusiastic support for your proposal to implement an HIV analysis and graphical user interface library. This library will support HIV drug resistance datasets by providing user-friendly graphical interfaces, decision support protocols, and HIV expert rules to analyze and interpret datasets related to HIV progression.

The University of Wisconsin Hospital and Clinics HIV Care Program is the largest single clinic devoted to the care of individuals infected with HIV in the State of Wisconsin. We have an extensive database that is directly linked to other treatment facilities. This will allow us to obtain the data - CD counts and viral RNA levels - which you hypothesize, are critical to your proposal. While our database is local and not web-linked, it has been in existence for the past five years. Based upon the above and our ties with HIV treating facilities across the State of Wisconsin, we have access to over 3000 individuals infected with HIV in the state. This data along with the collaboration with Dr. Shafer at Stanford should make for an excellent evaluation of your proposed work.

We at the University of Wisconsin are excited and anxious to go forward and develop this important tool that will be important for treaters in the US and perhaps even more important globally.

Sincerely,

A handwritten signature in black ink, appearing to read 'Frank M. Graziano'.

Frank M. Graziano, M.D., Ph.D.
Professor of Medicine
University of Wisconsin
Hospital and Clinics

Department of Medicine



University of Wisconsin
MEDICAL SCHOOL

Department of Biostatistics
& Medical Informatics

May 27, 2005

George Towfic, Ph.D.
Assistant Professor
Department of Computer Science
Clarke College
Dubuque, IA 52001

Dear Dr. Towfic:

I am writing to give my enthusiastic support for your proposal to implement an independent component analysis for HIV dynamics and graphical user interface library. When accomplished, this library will provide user-friendly graphical interfaces, decision support protocols, and HIV expert rules to analyze and interpret datasets related to HIV progressions.

I have discussed this project with Dr. Graziano and you and I am interested to work with both of you to establish a distributed system that encompasses networking facilities to implement and share proposed HIV graphical user interfaces and analysis tools. I believe that their work will extend the benefits of our web services and will provide invaluable tools that can be used, nationally and internationally, by physicians and clinical researchers, to study, contrast and interpret HIV pathogenesis and treatment. I am excited to extend my support and that of the Department of Biostatistics and Medical Informatics at the University of Wisconsin Medical School.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Kyung-Man Kim'.

Kyung-Man Kim, Ph.D.
Professor and Associate Chair