

*Lake Restoration Program
2013 Report and 2014 Plan*

Submitted To

Joint Appropriations Subcommittee on Transportation,
Infrastructure, and Capitals
and
Legislative Services Agency

Submitted By

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Executive Summary

The 2013 Iowa Lake Restoration Report and 2014 Plan outlines the need and demand for lake restoration in Iowa; identifies a prioritized group of lakes and the associated costs for restoration; and provides the status of past appropriated legislatively directed funding.

Iowans value water quality and desire safe healthy lakes that provide a full complement of aesthetic, ecological and recreational benefits. A recently completed water-based recreational use survey by Iowa State University found that six of 10 Iowans visit our lakes multiple times each year and spend \$1.6 billion annually in their pursuit of outdoor lake recreation. The most popular activities are fishing, picnicking, wildlife viewing, boating, hiking and biking, and swimming and beach use. The number of household trip visitations to Iowa lakes continues to increase; lake use in 2009 was 27% greater than visitation rates from 2002 through 2005. In addition, visitations at lakes that have completed watershed and lake improvements efforts continue to exceed the state average and their own pre-renovation visitation levels.

Quality Lakes Increase Quality of Life

Lakes with better water quality contribute to a higher quality of life, local economic development and increased property values – ***the Lake Anita Story***

Thanks to a watershed that protects water quality and a recent fish renovation, anglers and campers have made Lake Anita State Park the go-to place between Des Moines and Omaha. Not long ago, yellow bass and grass carp were dominating the game fish and destroying aquatic plants. Without those plants to tie up phosphorus in the water, algae blooms became a problem.

“When I got here in 2002, camping was going down because fishing had become so poor,” said Josh Peach, park manager. In 2003, the DNR drained the lake, killed what fish remained, deepened and strengthened the shoreline, installed underwater fish habitat, and added pea gravel spawning areas to attract bluegills and largemouth bass closer to shore. Park visitors were sparse while the lake took a couple of years to refill. Businesses in the town of Anita, along the park’s northern boundary, could feel that lack of campers and anglers. “What affects us at the park affects the town of Anita,” said Peach. However, once the lake refilled, word spread quickly about the successful restoration. Park use and camping numbers are higher than ever before. Those park visitors stop in town for supplies, gas, bait, dinner and more.

“We get people coming in with the campers. I’m glad we have it here,” said Lee Poeppe, owner of Redwood Steak House in Anita. “Everything is in place here for a great weekend,” said E.D. Broucker with the friends group. Conservation practices within the watershed protect that investment in the community.

People come to Lake Anita from as far away as Waterloo and Omaha. “It’s a fantastic thing for the whole town,” said Lee Poeppe, owner of Redwood Steak House in Anita. “It has grown. It helps the community tremendously.”



Goals of Iowa's Lake Restoration Program are improved water quality; a diverse, balanced aquatic community and sustained public use benefits.

Many of our Iowa Lakes, similar to our nation's lakes, are impaired and suffer from excessive algae growth and sedimentation due to nutrient loading and soil loss. The Iowa Department of Natural Resources (DNR) Lake Restoration Program (LRP) focus is on restoring Iowa's significant publicly-owned lakes. This report provides our plan to restore our Iowa public lakes and improve lake water quality, which will lead to increased lake use and long-term infrastructure protection.



Lake use has **increased 27%** between 2005 and 2009.

Of the four lakes with the highest increase in visitation, three had undergone major restoration efforts - Clear Lake, Lake Macbride and Storm Lake.

Lakes that completed watershed and lake improvements exceed state visitation averages and their own pre-renovation visitation levels.

Lakefront property values have **increased 62%** over the past 10 years, led by West Okoboji Lake at \$14,000 per foot.

Economic Development – Storm Lake

Lake restoration efforts encouraged a \$35 million economic development named “Project AWAYSIS” that created an estimated 690 new jobs and more than \$28 million in spending in Storm Lake and Buena Vista County. “Lake restoration work for Storm Lake and its watershed has been the inspiration for the community to come together and chart its destiny into the future. This community has traditionally had most of its economic base centered on agriculture. Because of lake restoration work, our people determined that we could diversify our economic base by increasing recreational opportunities at Storm Lake,” said Jon Kruse, mayor of Storm Lake.



Buntrock-Salie Photography, taken June 2012

A \$1 million project got Little Storm Lake to become a properly working marsh again that removes sediment and absorbs nutrients from Powell Creek before the water enters the Lake.

Legislative Action

In the 81st General Assembly, with HF 2782, the legislature responded to our need for improving Iowa's lakes by creating the Lake Restoration Plan and Report, known as the Lake Restoration Program. Included in HF2782, Section (26) of The Endowment for Iowa's Health Account is a process and criteria for completing successful lake restoration projects. It directs the DNR to report annually its plans and recommendations for lake restoration funding, as well as progress and results from projects funded by this legislation. This report has been prepared in accordance with these requirements. In addition, it describes some of the important work done by local, state and federal partners. **These partnerships, along with sound scientific information, are the foundation of current and future successful lake restoration projects.**

Funding for the Lake Restoration Program (LRP) is currently appropriated on an annual basis. We anticipate that at the current annual level of \$8.6 million per year over ten years the DNR can complete twenty-eight projects and initiate eight new projects.

Lake Restoration Program

The DNR modeled the Lake Restoration Program after the Federal Clean Lakes Program established in the 1970's.

- In 2005/2006, the DNR reviewed 127 of Iowa's Significant Public Lakes (SPOs) for lake restoration potential.
- Ranking was based on a 5-year Iowa State University (ISU)/DNR assessment of water quality, technical feasibility of restoration, potential economic benefits, use by Iowans, and local support.

For the purpose of Iowa's Lake Restoration Program, the DNR defines "significant, publicly-owned lakes" as those publicly-owned lakes that meet all of the following criteria:

- are maintained principally for public use;
- are multi use systems capable of supporting a viable sport fishery and recreational opportunities;
- have a surface water area of at least 10 acres;
- have a watershed to lake surface area ratio of less than 200:1;
- are not federal flood control impoundments (exception is Rathbun Reservoir due to a watershed to lake surface area ratio that is less than 200:1); and
- are not lakes used solely as water supply reservoirs.

The goal is to invest money on projects with multiple benefits such as improved water quality and increased public use, while taking into account feasibility of restoration. Science based prioritization has been our most effective tool in targeting projects of value to the state.

DNR is currently updating the classification to revise the prioritization and categorization of our significant publically owned lakes for restoration. This assessment will incorporate data available since the initial valuation conducted at inception of the Lake Restoration Program.

Lake Restoration Program - Project Goals

The department recommends funding for lake restoration projects that are designed to achieve the following goals:

- Ensure a cost effective, positive return on investment for the citizens of Iowa.
- Ensure local community commitment to lake and watershed protection.
- Ensure significant improvement in water clarity, safety, and quality of Iowa lakes.
- Provide for a sustainable, healthy, functioning lake system.
- Result in the removal of the lake from the impaired waters list.

Lake Restoration Program - Process and Criteria

The process and criteria to recommend funding for lake restoration projects are:

- The department maintains a list of not more than thirty-five significant publicly owned lakes considered for funding based on the feasibility of each lake for restoration and the use or potential use of the lake, if restored. The list includes lake projects that the department recommends as a priority for funding so long as progress toward completion of the projects remained consistent with the goals of the program.
- The department meets with representatives of communities where prioritized lakes are located to provide an initial lake restoration assessment and to explain the process and criteria for receiving lake restoration funding.
- Communities with lakes not included on the initial list may petition the Director of the department for an explanation of the funding process and criteria and a preliminary assessment of the lake for inclusion in the program and prioritization for restoration.

The Lake Restoration Program updates their 10-year plan on an annual basis to reflect the timeline and potential budget needs for lake restoration efforts at the current thirty-five significant publicly owned lake prioritized for funding (Table 1).

The long-term budget is based on current conceptual plans for restoration and comparison to investment on similar past projects. The emphasis and focus of the Lake Restoration Program over the next ten years is on a current list of thirty-five (35) significant publicly-owned lakes prioritized for funding based on the feasibility of each lake for restoration and the use or potential use of the lake, if restored. Projects need to follow the directives to the department regarding Project Goals, Process and Criteria, and Restoration Plan Guidelines from 2006 State Legislation (HF2782).

Lake Restoration Program - Restoration Plan Guidelines

The department works with communities to develop a joint lake restoration action plan.

- At a minimum, each joint action plan documents the causes, sources, and magnitude of lake impairment, evaluate the feasibility of the lake and watershed restoration options, establish water quality goals and a schedule for attainment, assess the economic benefits of the project, identify the sources and amounts of any leveraged funds, and describe the community's commitment to the project, including local funding.
- The community's commitment to the project may include moneys to fund a lake diagnostic study and watershed assessment, including development of a Water Quality Improvement Plan.

Each joint lake restoration plan complies with the following guidelines:

- Biologic controls will be utilized to the maximum extent, wherever possible.
- If proposed, dredging of the lake will be conducted to a **mean depth of at least ten feet** to gain water quality benefits unless a combination of biologic and structural controls is sufficient to assure water quality targets will be achieved at a shallower average water depth.
- The costs of lake restoration will include the maintenance costs of improvements to the lake.
- Delivery of phosphorous and sediment from the watershed will be controlled and in place before lake restoration begins.
- The department will evaluate the joint action plans and prioritize the plans based on the criteria required by the program.

In-lake, along with watershed management, will meet or exceed the following water quality targets:

- Clarity. A four and one half foot secchi depth will be achieved fifty percent of the time from April 1 through September 30.
- Safety. Beaches will meet water quality standards for recreational use.
- Biota. A diverse, balanced, and sustainable aquatic community will be maintained.
- Sustainability. The water quality benefits of the restoration efforts will be sustained for at least fifty years.

[Note: Appendix A (2006 State Legislation HF2782) provides a summary of directives to the department regarding Project Goals, Process and Criteria, and Restoration Plan Guidelines for the Lake Restoration Program.]

Table 1. Lake Restoration Program – Ten Year Plan

Project Name	County	FY14 Budget	Proposed FY15 Budget	Proposed FY16 Budget	Proposed FY17 Budget	Proposed FY18 Budget	Proposed FY19 Budget	Proposed FY20-FY23 Budget	Ten-year Budget
Carter Lake*	Pottawattamie	\$50,000							\$50,000
Clear Lake*	Cerro Gordo	\$100,000							\$100,000
<i>Lake Icaria</i>	Adams	\$100,000							\$100,000
<i>Little River L.</i>	Decatur	\$60,000							\$60,000
<i>Lost Island Lake</i>	Palo Alto	\$50,000							\$50,000
Prairie Rose L.	Shelby	\$550,000							\$550,000
Central Park L.*	Jones	\$340,000	\$300,000	\$240,000					\$880,000
Five Island L.	Palo Alto	\$400,000	\$150,000	\$100,000					\$650,000
Hickory Grove L.*	Story	\$130,000	\$400,000	\$570,000					\$1,100,000
Kent Park L.	Johnson	\$150,000	\$150,000	\$150,000					\$450,000
L. of the Hills	Scott	\$150,000	\$150,000	\$150,000					\$450,000
<i>Mariposa Lake</i>	Jasper	\$200,000	\$200,000	\$200,000					\$600,000
Silver Lake	Palo Alto	\$200,000	\$100,000	\$100,000					\$400,000
Union Grove L.*	Tama	\$420,000	\$600,000	\$500,000					\$1,520,000
Hannan Lake	Benton		\$200,000	\$200,000	\$100,000				\$500,000
Storm Lake*	Buena Vista	\$1,000,000	\$850,000	\$850,000	\$850,000				\$3,550,000
Pleasant Creek L.	Linn	\$200,000	\$600,000	\$840,000	\$1,270,000	\$600,000			\$3,510,000
Arbor Lake	Poweshiek				\$200,000	\$200,000	\$200,000		\$600,000
Blue Lake	Monona	\$400,000	\$800,000	\$800,000	\$1,100,000	\$700,000	\$300,000		\$4,100,000
Easter Lake	Polk	\$500,000	\$500,000	\$750,000	\$1,500,000	\$1,250,000	\$1,000,000		\$5,500,000
Lake Geode*	Henry	\$100,000	\$100,000	\$100,000	\$400,000	\$950,000	\$850,000		\$2,500,000
Lake Keomah	Mahaska	\$50,000	\$100,000	\$100,000	\$150,000	\$500,000	\$600,000		\$1,500,000
George Wyth L.	Black Hawk						\$150,000	\$150,000	\$300,000
Lake Manawa	Pottawattamie	\$1,500,000	\$1,500,000	\$1,500,000	\$1,300,000	\$1,300,000	\$1,300,000	\$2,400,000	\$10,800,000
Big Creek*	Polk	\$200,000					\$100,000	\$3,500,000	\$3,800,000
Black Hawk L.*	Sac	\$300,000	\$300,000	\$300,000	\$630,000	\$2,000,000	\$3,000,000	\$7,500,000	\$14,030,000
<i>Badger Creek L.*</i>	Madison		\$250,000					\$6,750,000	\$7,000,000
Silver Lake	Delaware							\$2,000,000	\$2,000,000
IA Great Lakes	Dickinson	\$350,000	\$400,000	\$300,000	\$250,000	\$250,000	\$250,000	\$1,000,000	\$2,800,000
Lake Assessment		\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$400,000	\$1,000,000
Minors		\$250,000	\$200,000	\$150,000	\$150,000	\$150,000	\$150,000	\$600,000	\$1,650,000
Shallow Lakes		\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$400,000	\$1,000,000
Proj. Mgmt./Eng.		\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$2,000,000	\$5,000,000
<i>North South Twin L.*</i>	Calhoun	\$150,000						\$1,450,000	\$1,600,000
<i>Swan Lake</i>	Carroll							\$1,000,000	\$1,000,000
<i>Silver Lake*</i>	Dickinson		\$50,000					\$1,250,000	\$1,300,000
Rock Creek L.	Jasper							\$2,700,000	\$2,700,000
<i>Lake Miami</i>	Monroe							\$1,000,000	\$1,000,000
Diamond Lake	Poweshiek							\$300,000	\$300,000
Total		\$8,600,000	\$8,600,000	\$8,600,000	\$8,600,000	\$8,600,000	\$8,600,000	\$34,400,000	\$86,000,000

Project schedule at \$8.6 million annual funding level over FY14 - FY23

- Twenty-eight projects completed FY14-FY23
- Eight projects initiated

Projects in Bold: Initial significant publicly-owned lakes prioritized for funding based on the feasibility of each lake for restoration and the use or potential use of the lake, if restored.

Projects Italicized: Significant publicly-owned lakes added to the priority list after communities have successfully petitioned the director of the department or were prioritized by the department based on the feasibility of restoration and the use or potential use of the lake, if restored.

Projects *: Significant-publicly owned lakes with completed or pending Water Quality Improvement Plans

Additional groups that have expressed interest for lake restoration : Beaver L. (Dallas), Beeds L. (Franklin), Lacey Keosauqua L. (Van Buren), Lake Hendricks (Howard), Upper/Lower Pine (Hardin), Windmill Lake (Taylor)

To Fix the Lake, Start on Land

Lake restoration starts in the watershed and relies on strong local involvement and landowner participation. Successful lake restoration projects, like at Prairie Rose Lake near Harlan, involve many partners, have **strong local involvement** and landowner participation.



With assistance from local landowners, the Shelby County SWCD conducted a watershed assessment followed by a joint Iowa Department of Agriculture and Land Stewardship / DNR Watershed Improvement Section grant to accomplish targeted soil conservation work in the watershed.

Lake Restoration Program – Status

The intent of the program is to develop and administer lake restoration projects that achieve the following goals: ensure a cost-effective investment for the State of Iowa; foster a community commitment to lake and watershed protection; and provide significant improvement to the quality of Iowa lakes.

Major water quality improvement initiatives are completed or near completion at twenty-one lakes. Current program activities are in progress at an additional twenty-one lakes throughout the state and in the initial community outreach, evaluation or planning stage at thirteen lakes (Figure 1).

Timelines for many of these projects usually fall within a three-year period. However, dredging or major construction projects may take even longer. Contractors face substantial costs to mobilize and set up lake dredging operations and this critical work needs multiple year commitments to secure contractors. As such, the most practical and efficient way to complete these undertakings are as continuous projects. The Lake Restoration Program has matured to the point where a number of multi-step projects are nearing the implementation phase. Table 2 highlights major work activities planned for the remainder of FY2014 into FY2015/16.

*Iowa has completed lake restoration work at **21 locations**, with **21 projects** underway and **13 projects** in the planning stages.*

Figure 1. DNR Lake Restoration Program Status

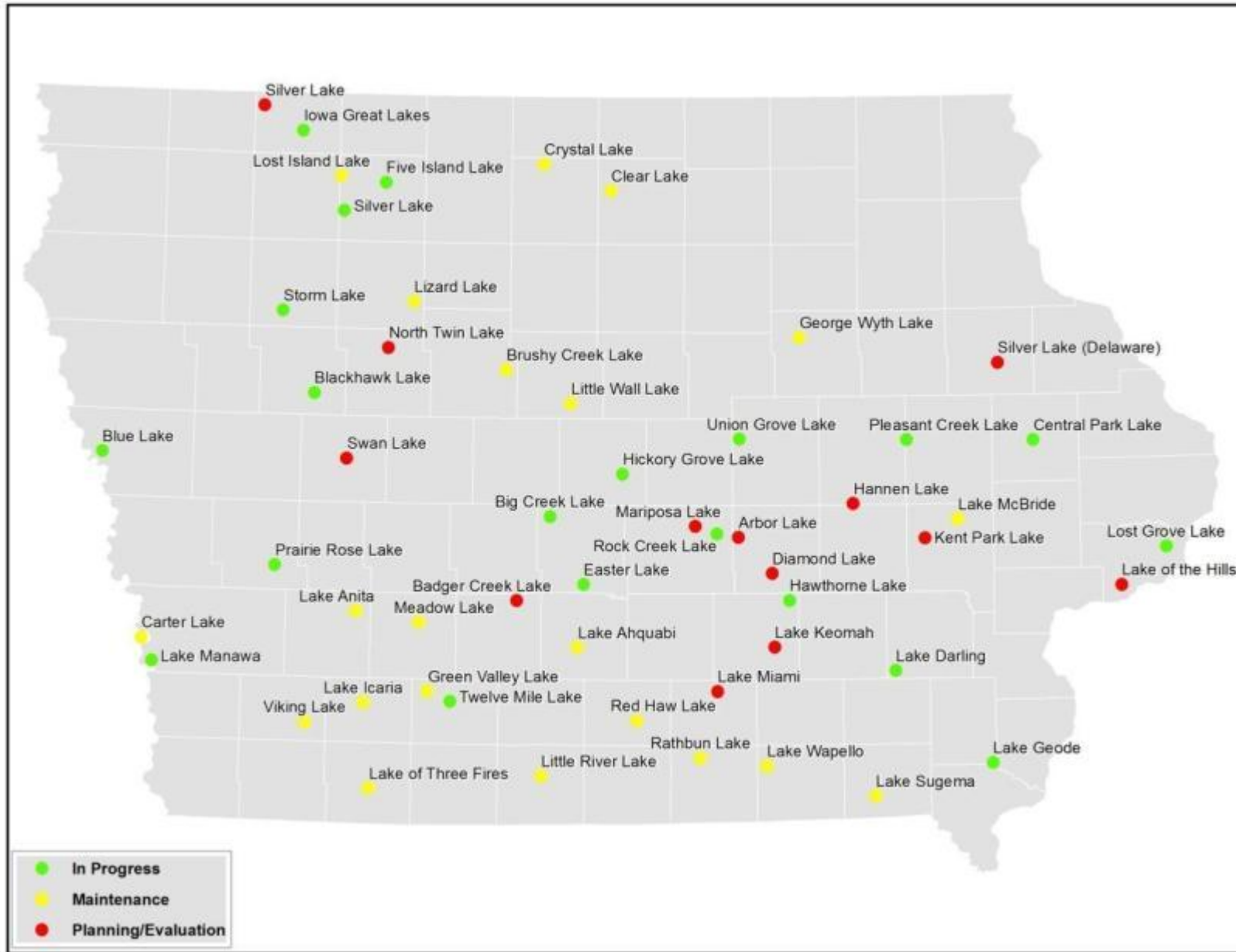


Table 2. Work schedule for select multi-year lake restoration projects

Project Name	County	Projected Timeline	Description
Blackhawk Lake	Sac	2010 - 2020	Diagnostic / Feasibility (DF) study and TMDL reports completed fall 2010. Public meetings led to development of an implementation plan. Watershed work and fish renovation completed in 2012. Funds are available to provide cost share to producers to implement conservation practices such as strip till, no till, cover crops, streambank stabilization and nutrient management
Carter Lake	Pottawattamie	2008 - 2014	Partnership includes the States of Iowa and Nebraska and the cities of Omaha and Carter Lake; Phase 1 - watershed improvement projects, lake alum treatment and fish renovation completed in 2010. Phase 2 – dredging, shoreline improvements and wetland enhancement completed early 2013. Partners developed and are implementing an aquatic plant management plan.
Clear Lake	Cerro Gordo	2000 - 2014	Dredging completed fall of 2009; targeted removal of 2.4 million cubic yards of sediment; continued work in the watershed; Ventura Marsh restoration – partnership with Army COE, construction phase was completed fall 2012. Current efforts have focused on shoreline stabilization and development of a CREP site on the north side of the lakes watershed.
Easter Lake	Polk	2011 - 2018	Diagnostic Study completed fall 2010, including NRCS assessment of Yeader Creek. Public meetings took place during 2012 to inform the public of the project and to form a local citizen group. Water Quality Improvement Plan completed 2012; Implementation of watershed work will start 2014.
Five Island Lake	Palo Alto	1990 – 2015	Continued support of local dredging project. DNR Lakes Program is working with local stakeholders to evaluate watershed/water quality improvement needs to compliment local dredging efforts.
Green Valley Lake	Union	2008 – 2013	Silt removal and silt dike construction completed; final seeding and clean up completed in 2013. Lake has re-filled and fishery is producing catchable sized fish.
Lake Darling	Washington	2008 – 2014	Spillway repair/replace and dam reconstruction is completed; In-lake restoration (shoreline deepening, silt dike construction, shoreline stabilization, beach re-location, boat ramp improvements and fish habitat work was completed late-fall 2013; valve will be closed winter 2014 to allow the lake to begin re-filling; a final phase of work to complete park infrastructure will take place in 2014.
Lake Manawa	Pottawattamie	2009 – 2020	Diagnostic Study is completed and the DNR is exploring the option of utilizing dredge materials for future Iowa DOT highway projects. Project was delayed due to floodwaters and will resume in 2013.
Prairie Rose Lake	Shelby	2011 – 2014	The Shelby County Soil and Water Conservation District completed conservation work in the watershed using a \$510,611 Water Quality / Watershed Protection Project Grant; Completed work includes mechanical sediment removal, shoreline stabilization and fish habitat. Lake has re-filled and the DNR stocked fish in 2013. Construction of the containment site, hydraulic dredging and an additional sediment control pond is planned for 2013/2014.
Storm Lake	Buena Vista	2000 – 2017	Continued support of local dredging project; a five-year project completion plan was developed with local sponsors in 2013. Little Storm Lake restoration is complete and new containment site was built in 2013.

Lake Restoration Program - Funding

The source of FY2014 funding for the Lake Restoration Program was an appropriation from the Rebuild Iowa Infrastructure Fund under HF638 (Figure 2). The LRP received \$8.6 million dollars in FY2014 to meet contracted obligations and budgeted program activities (Tables 3, 4, and 5).

DNR Lake Restoration Program (LRP) Funding as of FY14 (11/30/2013)

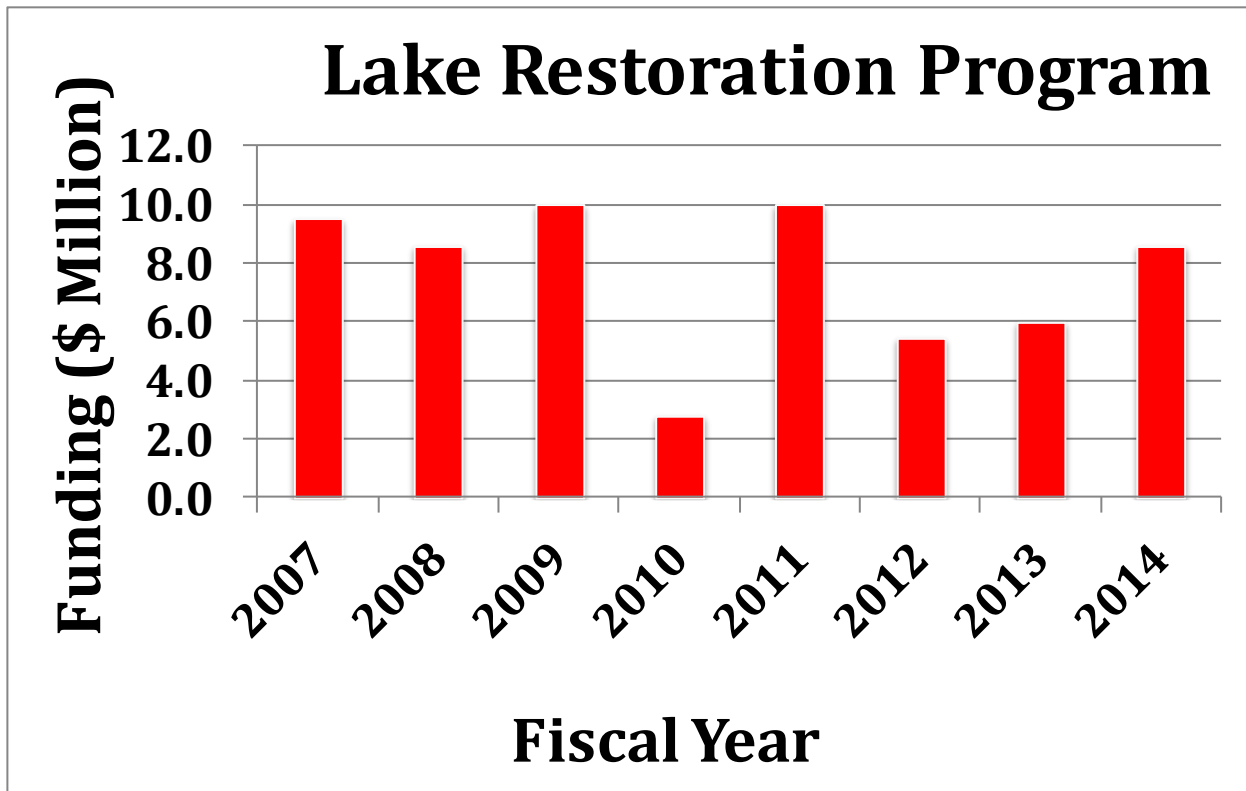
Carry Forward from FY12	\$5,551,142
FY13 Lake Restoration Program Funding	\$6,000,000
Lake Restoration Program Spent FY13 thru FY14 (11/30/2013)	(\$5,742,025)
FY14 Lake Restoration Program Funding	<u>\$8,600,000</u>
Lake Restoration Program Available Balance as of FY14 (11/30/13)	\$14,409,117
Under Contract - Actual Amount Due	(\$7,789,597)
Under Contract by 6/30/13 - Estimated Cost	<u>(\$6,567,280)</u>
LRP Un-obligated Funds as of FY14 (6/30/14)	\$52,240

Funding from FY2007 through FY2014 of \$61.0 million (approximately \$7.6 million per year) has enabled the DNR to improve many Iowa's lakes and proceed with implementing projects at a number of our other priority systems. However, the Lake Restoration Program has matured to the point where a number of multi-step projects are nearing the implementation phase; therefore, we now have more projects ready to start in a given year than we have available dollars. Maintaining flexibility in where the Lake Restoration Program can allocate funding is critical to moving these multiple year projects forward and plan for new projects.

The majority of lake restoration projects involve construction phases of watershed or in-lake implementation. A typical construction project might include the following phases: project scoping, engineering design, work bid letting, contract development, construction, and inspection. All processes must adhere to the standards and requirements of doing business as a public agency. Certain projects may require easements or land acquisition before construction can begin and/or require approvals and permits such as an archeological investigation for historic properties, an environmental review for threatened or endangered species, COE 404 permit, and DNR floodplains / sovereign lands permit.

Project planning involves working with representatives of the local community to develop a joint restoration plan. For planning purposes, it is necessary that a proper assessment of the lake and watershed is available to provide restoration alternatives to meet given water quality goals. In order to achieve lake restoration goals it is critical that the DNR form effective watershed partnerships. This includes partnerships at the local and administrative levels of government. Local, state and federal programs offer a multitude of programs for financial assistance to landowners for soil conservation and other water quality protection practices. **Building community support and development of partnerships is a long-term commitment from the Lake Restoration Program and is the foundation to the program's success.**

Figure 2. DNR Lake Restoration Program Funding History



The Lake Restoration Program cooperates in a variety of cost-share partnerships with local, state and federal entities to accomplish the water quality improvement initiatives described in this report. On average, there is a 35% cost-share match to Lake Restoration Program funds, which is critical to accomplishing the work detailed in this report and past summaries of LRP activities. Local groups include associations; such as the IGL - Iowa Great Lakes, LIPA - Lost Island Preservation Association, RRWA - Rathbun Rural Water Association, LPA - Lake Preservation Association (Storm Lake), CLPS - Carter Lake Preservation Society and the LPHC - Lake and Park Holding Corporation (Union Grove) to name a few. The DNR 319 Water Quality Improvement Section, DNR Wildlife, DNR Parks along with the Iowa Department of Agriculture and Land Stewardship – Division of Soil Conservation have worked together to implement watershed BMPs. Non-profit groups; such as DU - Ducks Unlimited, PH - Pheasants Forever and the TNC - The Nature Conservancy have also provided funding for projects. A significant number of Iowa lakes are owned and/or managed by local entities such as County Conservation Boards or Cities. Local agencies have been very active in developing restoration plans and providing resources to these efforts.

Table 3. DNR Lake Restoration Program (LRP) Funding as of FY14 (11/30/2013)

Carry Forward from FY12			\$5,551,142			
FY13 Lake Restoration Program Funding			\$6,000,000			
Total Available Funding at Start of FY13			\$11,551,142			
Project Name	Project Description	County	LRP Spent	Fed	Other	Total Spent
Administration	Engineering/Project Management		\$813,111			\$813,111
Black Hawk Lake	Watershed/Fish Renovation/Shoreline		\$430,151			\$430,151
Carter Lake	Engineering/Project Implementation		\$996,162			\$996,162
Clear Lake	Shoreline/Containment Site		\$93,513			\$93,513
Easter Lake	Water Quality Improvement Plan		\$23,655		\$5,707	\$29,362
Feasibility Studies	Restoration Action Plans/Monitoring		\$107,358			\$107,358
Five Island Lake	Dredging		\$103,144			\$103,144
Green Valley Lake	Sediment Removal		\$56,787			\$56,787
Hawthorn Lake	Watershed Improvement		\$16,298			\$16,298
Hickory Grove Lake	Feasibility Study		\$17,629			\$17,629
IA Great Lakes	Watershed Protection		\$154,020			\$154,020
Lake Anita	East Pond Renovation		\$41,100			\$41,100
Lake Darling	Restoration/Dredging		\$384,956		\$8,728	\$393,684
Lake Icaria	Wetland Repair		\$253,233		\$170,525	\$423,758
Lake of Three Fires	Shoreline		\$30,316			\$30,316
Little River Lake	In-lake Restoration		\$476,140			\$476,140
Lost Grove Lake	Road Risers		\$65,948			\$65,948
Lost Island Lake	Fish Barrier/Water Control Structures		\$85,390			\$85,390
Minor Projects	Minor Projects		\$49,662			\$49,662
Prairie Rose	Watershed/In-lake Restoration		\$269,031			\$269,031
Rock Creek Lake	Water Control Structure		\$12,578			\$12,578
Shallow Lakes	Water Quality Improvement		\$45,981			\$45,981
Storm Lake	Dredging		\$1,215,862			\$1,215,862
			\$5,742,025	\$0	\$184,960	\$5,926,985
Carry Forward from FY13			\$5,809,117			
FY14 Lake Restoration Program Funding			\$8,600,000			
Current Balance as of November 30, 2013			\$14,409,117			

Table 4. Lake Restoration Program Funds Under Contract as of FY14 (11/30/2013)

Project Name	Project Description	County	LRP Contracted	Fed	Other	Under Contract
Administration	Engineering/Project Management		\$335,000			\$335,000
Big Creek Lake	Watershed improvement	Polk	\$47,300			\$47,300
Black Hawk Lake	Watershed/Fish Renovation/Shoreline	Sac	\$55,629			\$55,629
Carter Lake	Engineering/Project Implementation	Pottawattamie	\$260,997			\$260,997
Central Park Lake	Watershed improvement	Jones	\$56,122			\$56,122
Clear Lake	Shoreline/Containment Site	Cerro Gordo	\$38,600			\$38,600
Easter Lake	Water Quality Improvement Plan	Polk	\$40,000			\$40,000
Feasibility Studies	Restoration Action Plans/Monitoring		\$162,401		\$53,024	\$215,425
Five Island Lake	Dredging	Palo Alto	\$400,000			\$400,000
Hawthorn Lake	Watershed Improvement	Mahaska	\$11,596			\$11,596
Hickory Grove Lake	Feasibility Study	Story	\$70,000			\$70,000
IA Great Lakes	Watershed Protection	Dickinson	\$242,211		\$387,918	\$630,129
Lake Darling	Restoration/Dredging	Washington	\$1,944,100		\$2,767,163	\$4,711,263
Lost Island Lake	Fish Barrier/Water Control Structures	Palo Alto	\$203,502			\$203,502
Prairie Rose Lake	Watershed/In-lake Restoration	Shelby	\$2,028,085			\$2,028,085
Red Haw Lake	Sediment Basins	Lucas	\$99,585			\$99,585
Rock Creek Lake	Water Control Structure	Jasper	\$16,709			\$16,709
Storm Lake	Dredging	Buena Vista	\$1,567,907			\$1,567,907
Twin Lakes	Feasibility Study	Calhoun	\$209,854			\$209,854
			\$7,789,597	\$0	\$3,208,105	\$10,997,702

Table 5. Lake Restoration Program Funds Under Contract by end of FY14

Project Name	Project Description	County	LRP Obligated	Fed	Other	Under Contract by 6/30/14
Big Creek Lake	BMPs on Public Ground	Polk	\$320,000			\$320,000
Black Hawk Lake	Vegetation harvester/Containment Site	Sac	\$550,000		\$10,000	\$560,000
Blue Lake	Fish Barrier/Water Control Structures	Monona	\$400,000			\$400,000
Hawthorn Lake	Watershed Improvement	Mahaska	\$80,000		\$80,000	\$160,000
IA Great Lakes	Marble/Hottes	Dickinson	\$225,000		\$225,000	\$450,000
Lake Geode	Sediment control ponds	Henry	\$65,000		\$65,000	\$130,000
Lake Manawa	Dredging	Pottawattamie	\$3,850,000			\$3,850,000
Lake Miami	Spillway modification	Monroe	\$40,000			\$40,000
Little Wall Lake	Watershed improvement	Hamilton	\$50,000			\$50,000
Lost Grove Lake	Road Risers	Scott	\$19,200		\$4,800	\$24,000
Prairie Rose	Grade Stabilization Structure	Shelby	\$85,000			\$85,000
Silver Lake	Survey and design of new outlet	Palo Alto	\$5,000		\$20,000	\$25,000
Twelve Mile Lake	Sediment control ponds/Wetland	Union	\$378,080		\$158,080	\$536,160
Union Grove	Upper arm silt/Shoreline/Spillway	Tama	\$500,000		\$300,000	\$800,000
			\$6,567,280	\$0	\$862,880	\$7,430,160
Lake Restoration Program Available Balance as of FY14 (11/30/13)			\$14,409,117			
Under Contract (Actual Amount Due)			\$7,789,597			
Under Contract by 6/30/14 (Estimated Cost)			\$6,567,280			
LRP Un-obligated Funds as of FY14 close (6/30/14)			\$52,240			

2013 Report and 2014 Plan

Lake Restoration Program (LRP) Highlighted Projects

Iowa Great Lakes (Dickinson County)

The DNR recognize the Iowa Great Lakes (IGL) as a significant public resource and continues to support efforts to maintain and improve lake water quality in the region. The IGL are major recreational lakes for Iowa residents and visitors from adjacent states. In 2013, fisheries staff participation in the planning of an Iowa Great Lakes Water Quality Summit, held in conjunction with Iowa DNR Director's visit on August 21st and 22nd, is one example continued DNR efforts in the Great Lakes region. Fisheries staff presented on several topics at the summit and the meeting was considered a success by many of the participants.

Summary of DNR Lake Restoration Program funded projects at the Iowa Great Lakes (2010 – 2014)

<i>Project Description</i>	<i>Project Cost</i>	<i>Lake Restoration Program Cost-share</i>
Center Lake Urban BMPs	\$469,999	\$47,944
Watershed Conservation Practices	\$308,789	\$160,000
Okoboji View - Beddell Tract	\$578,000	\$250,000
Okoboji View – Chapman-Sebby/Peace Tract	\$680,000	\$25,000
Okoboji View Restoration	\$578,960	\$201,688
Marble/Hottes Restoration	\$450,000	\$350,000
Total Cost	\$3,065,748	\$1,034,632 (34%)

Work in the Iowa Great Lakes Watershed

The Iowa DNR Lake Restoration Program is supporting the Dickinson SWCD watershed Improvement Review Board (WIRB) Center Lake Low Impact Development \$469,999 grant for the installation of urban conservation practices that will be installed in the Center Lake Watershed. These urban conservation practices, involving bio-retention cells, pervious paving systems, and other Low Impact Development Practices will result in beneficial impact to the water quality of Center Lake. The Lake Restoration Program will contribute an estimated \$47,944 dollars over the life of the project. Remaining funding is EPA 319 Grant - \$374,111 and City of Spirit Lake - \$47,944.

The DNR is working with the Department of Agriculture and Land Stewardship to implement conservation strategies, in cooperation with the local County Soil and Water Conservation District that support the common efforts of installing \$308,789 in watershed management practices, the DNR has identified \$160,000 in funding support for the following projects (\$148,789 local cost-share):

Urban Practices

- Improve storm water intakes for filtering storm water before it reaches the lake and improve lake shoreline to prevent further erosion.
- Construct a bio-cell as a water control structure to filter or settle sediment from running water before the water enters East Okoboji Lake.
- Construct two subdivision bio-cells that will capture and filter storm water runoff.
- Low Impact Development within the Center Lake watershed

Wetland Restoration

- Implement a wetland and prairie restoration on the North Shore of West Okoboji that will reduce the amount of sediment reaching the lake.

Water and Sediment Control Basins

- Construct three sediment control basins to manage sediment run off (six have already been completed).

Sandpiper Cove/Okoboji View Watershed Project – West Okoboji Lake

For years, this portion of the West Okoboji Lake watershed has been considered an area of primary concern for maintaining water quality in West Okoboji Lake. It drains into Sand Piper Cove on West Okoboji Lake, an area known for chronic blue-green algae problems and flooding. In 2008, a watershed assessment was completed for the Iowa Great Lakes watershed under an EPA 319 grant and this subwatershed identified as a high priority for restoration.



Sediment loading to West Okoboji Lake at Sandpiper Cove from the Okoboji View watershed following a rainstorm in 1993.

Water and sediment delivery to West Okoboji Lake during a rainfall event in 2011 from the Okoboji View Watershed.

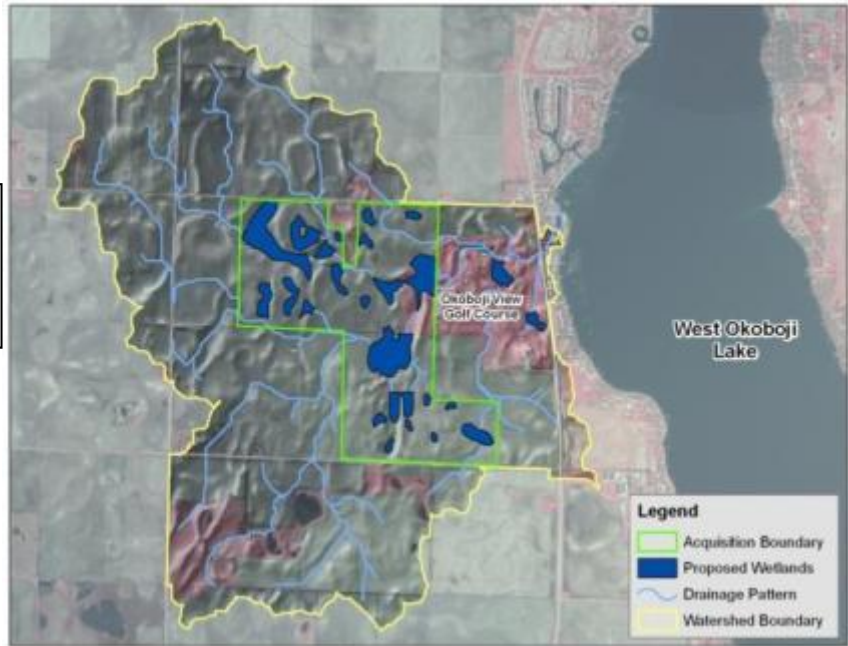


Acquisition of property within the West Okoboji watershed has allowed for significant opportunities for wetland restoration. For example, in 2010 the Natural Resource Commission approved the acquisition of a 90-acre tract of land offered by the Iowa Natural Heritage Foundation for \$478,000 (\$250K LRP, \$150K NAWCA and \$78K REAP Open Spaces). The tract was appraised at \$578,000 (INHF received a \$100,000 grant from the Dickinson County Water Quality Commission). This is part of a larger 230-acre tract acquired by the INHF in March 2010. After restoration, the land will contain 54 acres of native prairie plantings and 35 acres of restored wetlands. Also in 2010, the INHF also acquired a 120-acre parcel and facilitated transfer to public ownership. The Lake Restoration Program continues to budget and work with local partners to pursue opportunities for targeted watershed improvement. For example, The Chapman-Sebby/Peace tract was another critical acquisition toward a successful improvement to the Okoboji View drainage. The 120-acre tract was purchased for \$680,000 by INHF using the following funding sources

(USFWS Waterfowl Production Area Program - \$448,000; North American Wetlands Conservation Act grant program - \$82,000; Dickinson County Water Quality Commission - \$75,000; INHF - \$50,000 and the Lake Restoration Program - \$25,000.

A multi-partner \$578,960 initiative to address a watershed with the largest sediment delivery loads to the Iowa Great Lakes is nearly completed. Approximately 75 acres of wetlands have been constructed or restored on 350 acres of public land and a private golf course. These critical structures will reduce an estimated 420 tons of sediment flowing into West Okoboji Lake during a typical 2-inch rainfall event.

Map showing the Okoboji View Watershed, public land boundary, and proposed wetland locations.



Wetland dike installed on Okoboji View Golf course.

East and West Hottes Lake/Marble Lake/Grovers Lake Complex (Dickinson County) - Located within the 1,700-acre Kettleston Hogsback wildlife complex in northern Dickinson County, these 4 basins are of extreme importance to fish and wildlife as well as water quality in the Iowa Great Lakes. Historically, these basins contained a diversity of high quality aquatic plants that supported a wide array of sport fish, waterfowl, water birds, furbearers, reptiles, amphibians, and other wildlife. Excessive

numbers of carp and chronic high water levels have resulted in the loss of many of these plants and the animals that depend on them.

Mable/West Hottes Lakes – Big Spirit Lake Watershed

Mable Lake (160 acres) and West Hottes (225 acres) drain to Big Spirit Lake. In fact, nearly 20% of the water entering Big Spirit Lake comes through these lakes. Over the past two decades, water quality and habitat have degraded substantially in these two lakes increasing nutrient loading to Big Spirit Lake. Excess drainage, nutrients and common carp populations are responsible for this degraded state.

A number of partners joined to plan and implement a \$450,000 restoration project for Marble and Hottes Lakes (\$350,000 from LRP). Project partners, including the Big Spirit Lake Association, DNR, DU, Dickinson County, and others provided funding and technical guidance to develop a comprehensive feasibility study to identify ways to return ecological health to this critical habitat. Final design incorporated water control structures and pumps that allow for the temporary draining of the basins and fish barriers that allow for the passage of game fish but preclude the passage of carp.



West Hottes and Marble Lake Watershed boundary

Degraded water quality in West Hottes Lake and Marble Lake are evident from aerial photographs. Yellow arrows indicate the location of proposed common carp barriers. Red boxes indicate the proposed locations of pumping stations and intake lines (white lines). Engineering and design of water level control structures, common carp barriers, and pumping stations was recently completed. Fundraising and education campaigns are underway. Construction of these important components will begin in 2014 followed by a drawdown of both lakes to remove common carp populations and restore aquatic plant life.

Lake Darling (Washington County)

Lake Darling is a 267-acre man-made lake, constructed within a 1,400-acre state park, with a watershed to lake ratio of 47:1. Initially impounded in 1950, it has historically been a fair fishery plagued by severe in-lake siltation and poor water quality. Sedimentation has reduced the lakes original 305 surface acres to 267 acres. During the last five years, extensive watershed soil conservation work on state and private land has reduced sediment delivery to the lake by 60%. Iowa State University Center for Agriculture and Rural Development estimated that visitation to Lake Darling supports \$5,372,088 in direct spending and 66 jobs to the local economy. Additional research indicates that improvements just in lake water quality should result in increase visitation resulting in an additional economic benefit to the region.

- The Management Plan includes all in-lake improvements to be done while the lake is drained and sustaining those improvements over the next 50 years. The Plan and its affects will benefit not only Lake Darling State Park but also the local community and economy.

Lake Darling Restoration Project Costs

Watershed BMPs on public land	
Ponds, terraces, risers, wetland	\$396,961 (DNR 319/LRP)
Phase 1 Lake Improvement	
Dam reconstruction with water level increase	\$1,895,137 (LRP)
Phase 2 Dredging / Jetty Repair / Shoreline / Boat Ramp / Park Improvements	
Sediment removal (300,000 yd3)	
In-lake silt dam construction	
Handicap Fishing Pier	
Fishing Trail	
Shoreline Armoring	
Replace Main Boat Ramp	
Campground Boat Ramp/Parking Lot	
Lodge Parking	
Lights for Parking Lot at Beach	
Boat Ramp Pit Toilet	
Main Road Re-pavement	
Campground Grading and Utilities	
Subtotal Phase 2	\$5,494,927
Total	\$7.79 million

Phase 2 Funding Sources: Parks & Institutional Roads, Lake Restoration, Fish and Wildlife Trust Fund, Sheldon Shoreline Access Foundation, Washington Co. River Boat Foundation, Izzak Walton League, Friends of Lake Darling, REAP Land Management, REAP Open Spaces

Other recent work at Lake Darling State Park

New state park lodge (local fund raising from the Friends of Lake Darling)	\$1,000,000
Campground electrical system upgrades	\$600,000
New shower house	\$200,000
New campground sewer system	\$700,000
Total	\$2,500,000

Phase 1 – Dam and Spillway Renovation (Winter 2010 – Spring 2012)

- Acting on the recommendations of the completed engineering report, the DNR is repairing the dam and addressing spillway leakage.
- The NRC approved C.J. Moyna & Sons, Elkader, IA as the lowest bidder (\$1,785,000) for the Lake Darling dam & spillway repair on November 11, 2010. Spillway construction starting spring of 2011 and was completed summer of 2012. In addition, the new spillway will increase the lake level by 2 feet and bring surface area back to 305 acres and closer to a 40:1 watershed to lake ratio.

Phase 2 - In-Lake Construction, Shoreline armoring, Boat Ramp and Paving

- Sediment Retention Basins / Sediment Removal
- Universally Accessible Fishing Pier
- The DNR Fisheries Bureau and Engineering Bureau, is constructing new boat ramp and parking area. DNR will construct the ramp and parking lot on the shoreline before the entrance of the existing campground and will replace the current campground boat ramp. Phase 2 will also include re-location of existing swimming beach and shoreline deepening and stabilization.



2013 Construction at Lake Darling, shown clockwise: Shoreline stabilization, sediment removal from the lakebed and new main boat ramp.

The Lake Darling Restoration is progressing well. Dam construction is complete. All of the fishing jetties have been raised and repaired. Shoreline work and lake deepening is also complete. The plan will be to impound water once the beach work is complete and begin stocking fish in spring of 2014.

- Work began on the Dredging, Shoreline Armoring, and Paving Project in late August (JB Holland, \$5.5 million). Construction is now shut down for the 2013 season. To date, the value of the completed work is about \$2.3 million, not quite half of the \$5.5 million contract.

Thanks to the dry fall, all of the shoreline shaping was completed, along with the parking lot grading and some of the fishing trail. The main park road has been paved from the campground, past the lodge, and almost to the main boat ramp area. In addition, 80% of the Lodge parking lot has been paved along with the underwater sections of both boat ramps. JB Holland wanted to get more paved before winter, but because their paving sub-contractor was double booked, they were limited in what they could pave. The last couple rain events coupled with cold weather coming early shut down paving in November.

The dry summer and fall created perfect conditions for dredging the lakebed. JB Holland did not capitalize on this until later in the fall, but have definitely made up the time. Contractors started dredging around the beginning of November finished with the original planned quantity of 160,000 CY and additional 17,000 CY in December 2013.

The shoreline armoring is complete. The riprap from the Ollie quarry came in looking very clean and uniform. JB Holland is scheduled to finish the beach construction in January. Since the underwater sections of the boat ramps have already been placed, the beach construction will be the final in-lake item. We estimate that we can begin impounding water before the April 15th deadline.

The revised construction schedule proposed by JB Holland shows a completion date of the critical portions of the contract to be May 26th of next year, and completion of everything by June 25th. The spring weather will dictate timeline for completion, and the schedule will again be revised once works begins next year.

Prairie Rose Lake (Shelby County)

Prairie Rose Lake is a 173-acre constructed lake with a watershed to lake ratio of 24/1. Problems at the lake center on low fish populations, historic lake siltation and poor water quality. Lake improvements in recent years include; jetties and fish structure (1998), sediment basin and shoreline riprap (2001) and sediment basins (2004). Local efforts have accomplished significant work in the watershed and identified additional work for completion. DNR Fisheries and Parks staffs have been meeting with NRCS, IDALS, and others about remaining watershed work and lake restoration plans, based in part, on findings from the diagnostic/feasibility study completed by Iowa State University in 2008.

- Shelby County SWCD conducted a watershed assessment followed by a joint Iowa Department of Agriculture and Land Stewardship / DNR Watershed Improvement Section grant to accomplish targeted soil conservation work in the watershed. The Shelby County Soil and Water Conservation District was awarded a \$510,611 Water Quality /Watershed Protection Project Grant in 2008. Through the Prairie Rose Water Quality Project, there was over 225,000 feet (40 mi.) of terraces, grassed waterways and nutrient management plans added to the watershed reducing sediment and nutrient delivery to the lake by 60%.

Prairie Rose Restoration Plan	Cost
Water Quality/Watershed Protection Grant	\$510,611
Containment site purchase	\$340,000
Phase 1: Begin to drain lake July 11, 2011	2012 and 2013
Two road risers and two wetland rock chutes	\$393,866
Spillway modification/M47 Structure/Gate Valve	\$185,242
Containment site construction	\$629,154
Mechanical dredging/Shoreline/Fish habitat	\$524,197
Fish renovation/archeological assessment	\$30,000
Phase 2: 2014	2014
Hydraulic dredging	\$1,480,000
Sediment pond construction (estimated)	\$85,000
Total	\$4,178,070

- DNR, in partnership with Pheasants Forever, acquired a 77-acre dredge spoil containment site in 2010, an important component to the in-lake restoration work. Archeological survey is being done on state lands that will be disturbed by construction and engineering plans are being developed for in-lake construction to begin late in 2011 including shoreline stabilization, wetland dredging, spillway modification, gate valve repair, and fish habitat.
- Rock chute wetlands and road risers were constructed on public land on the four main drainages of the lake during fall 2011/spring 2012. Prairie Rose Lake was dewatered back in July 2011 to allow construction work to begin in the basin. Stabilizing the eroding shoreline and removal of 60,000 cubic

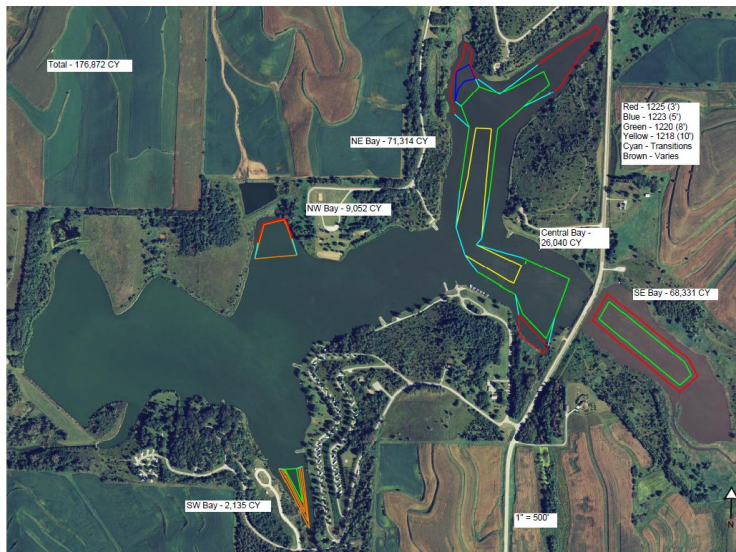
yards of sediment was completed during the winter of 2011-12. The spillway modification to prevent rough fish re-entering the lake from below is now in place. Additional fish habitat and shoreline access has been added to the lake basin utilizing \$150,000 of DNR Trust Fund dollars.

- In September 2012, the gate was shut and Prairie Rose Lake began to re-fill following the treatment of the watershed to remove undesirable fish species (e.g. common carp). By June of 2013, the lake had refilled and fish stocking by the DNR commenced. Largemouth bass, bluegill, and channel catfish have been stocked into the lake.
- Construction of the dredge spoil containment site began in the fall and was nearly complete by the end of 2013. The containment site designed to hold 180,000 cu-yd of sediment is now 65% complete.



Dredge spoil containment site construction at Prairie Rose Lake, 2013.

- Phase 2 hydraulic dredging plans were completed and put out for bids in 2013. The low bid of \$1.4 million was accepted by NRC and the project will move forward in 2014. Removing accumulated sediment from the upper portions of Prairie Rose Lake will have water quality and recreation benefits in this popular state park lake.



Hydraulic dredging locations and quantities planned for 2014.

- The NRC accepted a donation of a permanent easement for storage of water for retention of silt adjacent to Prairie Rose State Park above the campground arm of the lake. The DNR will construct the pond at this location in 2014.

- The development of the fish population appears to be on track. Two-hundred adult largemouth bass stocked in the spring subsequently spawned. The 2-inch fish from Fairport were marked in a way to provide the DNR with a chance to estimate percent contribution. Samples were collected for future analysis. Electro fishing catch rates for the young-of-year bass were greater than 300 fish per hour.

Lake Restoration Program (LRP) – Projects In Progress

Big Creek Lake (Polk County)

Big Creek State Park/Lake is a major recreational destination for the citizens of Iowa. Over 350,000 visitors travel to the 864-acre Big Creek each year and they annually generate over \$19 million in spending. Improving the lakes water quality through watershed improvements is critical to maintaining and even increasing recreational use levels.

Big Creek Lake is currently listed on the EPA 303d list for bacteria and historically has been listed for sediments and nutrients. A comprehensive review of the watershed indicates that the watershed annually delivers approximately 6,379 tons of sediment and 8,280 pounds of phosphorus to the lake. We must significantly reduce these numbers to preserve the lake's water quality and extend the lifespan of the lake. Additionally, we must also reduce waste products from humans and animals within the watershed that adversely affect water quality. During the past year, Blue-green algae blooms put Big Creek Lake in the news headlines multiple times this year. In addition, water quality samples revealed high E. coli levels in the tributaries and at the beach.

- A 2007 development grant provided analyses of the Big Creek watershed. In addition, a 2008 gully analysis and 2009 land use analysis provided a better understanding of critical areas in the watershed. Watershed assessment identified several gullies with severe erosion on State property. DNR Engineering is structures for two of the most critical areas. The locations of structures are in the process of being forwarded on to the COE for approved. Bid letting for construction should take place in early 2014.
- The Iowa DNR Watershed Improvement Section completed a Water Quality Improvement Plan in September 2010 and in March 2010 contracted with the Iowa Department of Agriculture and Land Stewardship to provide Polk SWCD and Boone SWCD with funding to complete a Watershed Management Plan. The EPA approved the Big Creek Watershed Project for \$292,834 over the five-year duration of the project. There is now watershed coordinator and outreach coordinator working on Big Creek Watershed and a Big Creek Citizens Advisory Committee has been formed.
- A public and landowner outreach event (Big Creek Appreciation Day) was held at Big Creek Lake in June 2013 to encourage more involvement. Approximately 250 people attended this event.
- Numerous watershed improvement projects are being implemented on private lands in the watershed. A 400 ft streambank stabilization project is in the construction phase and nearly 500 acres were planted with a cover crop during the fall 2013. These projects are being cost-shared by the Big Creek Lake Watershed Project, which is helping to generate more interest among watershed landowners. Arc View coverage of updated and new septic systems within the watershed was also updated in 2013.

Big Creek Watershed landowners Steve and Rob Hansen worked with the Big Creek Lake Watershed Project Cost-Share Program to stabilize 115 feet of streambank on Little Creek directly above the lake. Little Creek runs through their property where they have spent countless hours planting hundreds of trees to turn a former pasture into a beautiful wildlife area that they will be able to enjoy for years to come. Adjoining the timber is a beautifully managed CRP planting where numerous native grasses and forbes can be found.



Steve and Rob worked for over a year with watershed coordinators and NRCS staff to plan their multi-phase stabilization project on a severely eroding section of their creek. Phase I was completed this fall and is stopping 109 tons of sediment from entering Big Creek Lake each year along with 185 pounds of phosphorous. Phase II is planned to be completed in 2014 and will stabilize another 220 feet of streambank. The Big Creek Lake Watershed Project and Partners appreciate the conservation efforts of this father and son and look forward to assisting them in the future.

Blackhawk Lake (Sac County)

Blackhawk Lake is the southern most natural lake in Iowa located in Sac County, Iowa, near the town of Lake View. This 922-acre lake has a watershed of 14,097 acres. Data from the Iowa Department of Natural Resources indicate that the lake currently has an average depth of 5.2 feet. Water clarity is predominantly in the range of 0.5 – 1.5 feet, with phosphorus levels consistently 100-200 ppb. Very poor lake transparency due to turbidity and frequent algae blooms due to high phosphorus levels are common in the past few years. In addition, the state beach portion of the lake on the 30 Acres Campground shore was closed once in 2004 and 2007, both due to high E. coli.

- Local leadership in cooperation with the DNR and ISU Extension formed a local steering committee (Watershed Action Group). This group includes members of the community and watershed, as well as members from various state and local agencies (e.g. ISU Extension, ISU Agronomist, Sac SWCD, Carroll NRCS, Sac Board of Supervisors, watershed residents/landowners/farmers, Iowa DNR, City of Lake View, Sac NRCS, City of Breda City Clerk, and Carroll SWCD). This committee locally raised \$42,000 to help fund the Diagnostic / Feasibility Study; the goal of the study was to provide restoration alternatives to the DNR and local community; DNR contracted with Iowa State University (ISU) for the D/F study, which they completed in fall of 2010.
- IDALS provided planning assistance to help accurately identify existing problems and issues critical to achieve desired resource management objectives and to help local leaders inventory, assess, and develop strategies to address watershed problems.

- DNR provided funding to the SWCD to take information gathered in the Watershed Assessment, Diagnostic Study and Water Quality Improvement to development of a Watershed Management Plan. This allowed the local group the ability to apply for project implementation dollars for work in the watershed. The SWCD received funding through a DNR 319 Watershed Improvement Implementation Grant. The grant is funding a watershed coordinator for the Black Hawk Lake Project and implementation of BMPs.
- NRCS approved \$330,673 of National Water Quality Initiative (NWQI) funding for the Black Hawk Lake watershed. Funds will be used to provide cost share to seven producers to implement conservation practices such as strip till, no till, cover crops, streambank stabilization and nutrient management. Last year \$287,000 was provided to producers in the watershed through NWQI.

Renovation of the fishery

- The DNR held a public meeting August 2012 in Lake View, IA to discuss the plans to renovate the fishery in Black Hawk Lake. The major focus of the lake restoration project has been targeted at improving the watershed. However, the internal recycling of nutrients and re-suspension of sediments via rough fish activity still contribute significantly to the water quality issues in Black Hawk Lake. Taking advantage of historically low water levels the DNR implemented a fishery renovation to eradicate rough fish species, help improve water quality, and reclaim the lake in order to establish quality sport fishery.
- Promiscuous fishing was opened up after the public meeting. Commercial harvesters came in, and over the course of about 5 weeks, removed around 130,000 pounds of fish. During this time, we conducted fish salvage. Most of the fish went to Black Hawk Pits, which was renovated early, to provide some local recreational fishing while Black Hawk Lake is turning around over the next couple of years. Some fish were also taken to Arrowhead Lake. These fish were mostly largemouth bass and channel catfish.
- DNR implemented a chemical renovation of Black Hawk Lake in November 2012. 3,720 gallons (124 barrels) of rotenone were applied in less than 4 hours on the day of the application. Upon examining the shoreline the following days, just about all of the dead the fish that washed to shore were gizzard shad, common carp, bigmouth buffalo, bullhead, and channel catfish. Aside from the channel catfish, there were very few sportfish.
- The week after the renovation, we conducted fish pick-up. It took a day and a half to complete the clean up. DNR Fisheries estimated that somewhere between 120,000 to 140,000 pounds of fish were picked up. The vast majority of the shoreline was covered by workers pitch forking fish into UTVs, which dumped the fish into a tractor bucket, and the fish were then loaded into a dump truck and dump trailer. Unusually warm weather and high winds caused thousands of pounds of fish to surface and wash ashore after the initial fish pick up and another effort to pick up fish, estimated at 100,000 pounds, was made on December 5th.

Total Pounds of Fish Tissue Removed from Black Hawk Lake (estimated): 354,000 (estimated Pounds of Phosphorus Removed via Fish Removal: 8,071; estimated Pounds of Nitrogen Removed via Fish Removal: 37,170)

Fish Stocking

April: 300,000 bluegill, 2 inch

May: 2,200,000 walleye, fry; 230 gallons of fathead minnows; 3,500 largemouth bass, 5 inch; 2,300 walleye, 8 inch; and 400 muskellunge, 13 inch

July: 153,342 yellow perch, 1.5 inch

September: 5,100 channel catfish, 7 inch

DNR Fisheries has been sampled Black Hawk Lake in the fall and found there to be good survival of the stocked fish and the fish had put on substantial growth as expected.

Newly stocked Muskie in near the north stone pier. Photo taken on June 4th, 2013.



Fish House

In anticipation of a booming fishery following the renovation of Black Hawk Lake, local DNR staff wanted to improve the amenities and access for anglers. DNR has initiated a project request for construction of a fish house, similar to the one at Aquhuabi, in the Town Bay area of Black Hawk Lake. An engineering consultant has completed design for the structure. However, the cost estimates provided were higher than what was budgeted and therefore the DNR has put the project on hold. The estimated cost for the project is around \$250,000.



Outlet Fish Barrier

A fish barrier was needed on the outlet of Black Hawk Lake to block undesirable fish species from reentering the system following the fish renovation of 2012. The Black Hawk LPA hired a local fabricator to design, manufacture, and install the barrier and funded the project with their money and a Sac County Endowment Fund Grant. The cost of project was approximately \$21,000. The fish barrier provides a complete enclosure of the spillway for protection under high water events and features 10 rotating gates that can easily be cleaned of debris to allow for unobstructed flow of water.

Cottonwood Point Armoring

Cottonwood Point is a significant natural feature on Black Hawk Lake and is now only a few feet wide in some areas due to erosion. Shoreline armoring to protect this area was completed February 2013.



The contractor completed armoring of Cottonwood Point in mid-February. The low water and frozen lakebed provided a prime opportunity to armor shoreline that is typically inaccessible with heavy equipment. They armored around 2,300 feet of shoreline with native fieldstone for under \$100,000.

Future Dredging

The Lake restoration Program is currently investigating the utility of the old Merehoff spoil site. A site visit has been made by the engineering staff and a survey will be conducted to determine how much additional sediment the spoil site can take, and if it can be modified to take more. An archeological survey of the inlet of Black Hawk Lake identified for dredging is scheduled for the winter of 2013-14 to determine if there are any cultural or historical artifacts in the area.

Inlet Fish Barrier/Water Control Structure/ Vegetation Management

DNR fisheries and wildlife staff met with Ducks Unlimited to discuss the concept of a new fish barrier and water control structure at the inlet bridge of Black Hawk Lake. Ducks Unlimited completed initial survey work in March 2013. This project would hinder rough fish movement (if they were ever reintroduced) into their prime spawning habitat during high flow events. The current barrier is undersized and fish can find their way around it during high water events. The water control structure would allow managers to dewater the inlet portion of the lake to reestablish aquatic vegetation, and if need be, remove carp. Water quality testing has shown that nutrients leaving the inlet than what is being received indicating the need for better management capabilities in this part of the lake. Funding still needs to be secured for actual construction of the project, but Ducks Unlimited has completed the engineering and design work. It is estimated that this project would cost around \$380,000.

In October 2013, members of the DNR met with the City of Lake View, Lake View Community Club, and Black Hawk LPA to discuss the potential need and purchase of a vegetation harvester to manage aquatic vegetation response from increased water clarity. The proposed plan is for the DNR Lakes Restoration Program to purchase a vegetation harvester with local support from the City of Lake View, the Black Hawk LPA, Lake View Community Club and Sac County. An aquatic vegetation management plan will be developed by local fisheries staff, with input from the City of Lake View and the Black Hawk LPA, over the winter to serve as a guide for the aquatic vegetation harvester and other necessary vegetation management.

Blue Lake (Monona County)

Blue Lake is a Missouri River oxbow lake located in western Monona County three miles west of Onawa and three miles east of the Missouri River. The lake was an active channel of the Missouri River in 1804 when the Lewis and Clark expedition went through the area. The lake shoreline is now part of Lewis and Clark State Park. Excessive growth of algae, a lack of clarity caused by this algal growth, and non-algal turbidity are the impairments at Blue Lake. These problems combine to reduce the recreational use of the lake.

- DNR completed a Water Quality Improvement Plan for Blue Lake in 2008 and held a public meeting to discuss the findings of the study. DNR held a public meeting in 2009 to present the lake assessment and restoration process and develop a local technical advisory team of conservation agencies and local stakeholders to help guide the project. The group met periodically during the year. Objectives of the project are to reduce nutrient and sediment inputs from the watershed, reduce re-suspension/recycling of in-lake nutrient and sediments, eliminate rough fish introductions and evaluate lake and water table interactions.
- A public meeting was held in March of 2011 to discuss potential restoration efforts with the community. Lake Restoration contracted with MSA Professional Services to conduct a diagnostic-feasibility study on the lake. Extensive data collection was conducted by local DNR staff throughout 2010. The final report from MSA on the diagnostic-feasibility study was completed in November of 2011. The report proposes that construction of a storm water settling basin, reconstruct water control structures to minimize common carp introductions, dredging and removal of common carp will achieve water quality goals for the lake.
- A Technical Advisory Team meeting was held in 2013 to discuss the report and develop a restoration and implementation plan. The lake aeration system was upgraded in 2013 with a new motor and blower to prevent fish winterkills.



DNR is developing a request for proposals to determine the feasibility of and methods for a fish barrier system and water level management capabilities between Blue Lake and Camp Nebowa Bay (Site #1) Blue Lake and West Blue (Site #2) and Blue Lake and South Blue (Site #3) and the potential of enhancing Nebowa Bay to improve water quality inflows from McCandless-Cleghorn Ditch to Blue Lake.

Carter Lake (Pottawattamie County)

Carter Lake is a natural lake that is uniquely located in both Iowa and Nebraska. Carter Lake is an old oxbow of the Missouri River that was isolated from the river main channel in 1877. The lake is approximately 300 surface acres at conservation pool elevation 970.0 feet, with a watershed area of 2,675 acres (watershed area to lake area ratio of 8/1). The lake is approximately 75% in Nebraska and 25% in Iowa. Park areas in Nebraska and the City of Carter Lake in Iowa dominate land use adjacent to the lake. Problems at the lake have centered on poor water quality, chronic low water levels and

nuisance algae bloom. Impairments include nutrients/algae, indicator bacteria, and fish contaminants (PCBs).

- Carter Lake is a highly productive lake with a history of poor water clarity, high nutrient concentrations, frequent algal blooms, and periodically high bacteria. Given the nature of the problems at Carter Lake, corrective measures focused on the reduction of phosphorus, which is the driving force behind algal production. The goals pertain to protecting aquatic life and public uses of the lake such as recreation, fish consumption, and aesthetics.
- Restoration of Carter Lake involves the cooperation of Iowa, Nebraska and the cities of Omaha and Carter Lake. A local Iowa group, the Carter Lake Preservation Society (CLPS), has been very active in moving this project forward. In 2006, the cities of Carter Lake, Iowa and Omaha, Nebraska, requested assistance from environmental agencies in addressing water quality problems at Carter Lake. The Carter Lake Environmental Assessment and Rehabilitation (CLEAR) Council, with assistance from numerous local and state agencies, developed a conceptual plan to address water quality concerns. The community led steering committee finalized the Carter Lake Water Quality Management Plan in the spring of 2008.
- Fall 2008, the Metro Area Planning Agency (MAPA), with support of project partners, selected Tetra Tech, Inc. for the purpose of preliminary design and engineering of critical components of the Water Quality Management Plan for Carter Lake. Their work will focus on the restoration alternatives of water-budget/seepage management, dredging, and storm water/in-lake alum treatment. By winter of 2009 project partners will have enough information on probable cost, effectiveness and permitting issues to determine how to best move forward with implementation.

Project funding partners

Iowa Department of Natural Resources – Lake Restoration Program	\$2,494,624
Iowa Department of Natural Resources – Section 319	\$381,744
Iowa Water Quality Review Board	\$175,000
Nebraska Department of Environmental Quality - Section 319	\$1,120,000
Nebraska Game and Parks Commission	\$2,105,837
Nebraska Environmental Trust	\$400,000
City of Omaha	\$500,000
City of Carter Lake (in-kind)	\$250,000

- Metropolitan Area Planning Agency (MAPA) hired a project coordinator to work with both the local Watershed Council and agencies. One of their primary responsibilities was to finalize plans on a first group of watershed improvement projects and have these projects ready to bid for final design/construction by fall of 2010.
- Project partners made significant progress at Carter Lake in 2010 with a spring alum treatment followed up by a complete fish renovation in the fall. Nebraska and Iowa, following the community accepted restoration plan guidelines established a no-wake zone on 100 acres of the lake in 2010 to lessen the impacts of recreational boating.
- The Carter Lake fish renovation was a joint project involving Nebraska Game and Parks, the City of Carter Lake, and Omaha.
 - Applied 2665 gallons of rotenone on September 26, 2010
 - Physically removed 89.6 tons of fish (Approximately 600 lbs/ac)
 - Each worker handled ~ 10,000 lbs of fish twice (pitched in & out the boat) in 3 days



Almost immediately, visitors to Carter Lake saw drastically improved water clarity. Water quality data collected during the summer of 2010 showed that toxic algae blooms have declined, phosphorous and nitrogen concentrations are lower, and water clarity has increased.

- Extremely clear conditions persisted again during the summer of 2013 allowing tremendous amounts of aquatic plants to fill the water column. Lifelong residents of Carter Lake commented that they had never seen the bottom the Carter Lake before. Due to the clarity and resulting response in plant growth a BMP for aquatic plants was drafted in consultation with the local communities to establish guidelines for future plant management efforts.
- As part of the 2012 vegetation management plan the TAT authorized the chemical (herbicide) treatment of vegetation around public access points, canals, private docks, and ski club area. State agencies treated the public access areas. Local homeowners contracted a private aquatic pesticide applicator to treat vegetation around privately owned docks, canals, and ski club area. The TAT discussed various options, but ultimately decided to chemically treat a limited number of acres of open water areas to open up boating lanes. A permit to apply aquatic herbicide and a contractor were secured by the City of Carter Lake to chemically treat 100 acres of open water area with the herbicide “Reward”.

City of Carter Lake employee operated vegetation harvester on the lake in 2013.



- The lakes re-charge system was completed and activated in 2012. This system provided well water to Carter Lake during the dry summer assisting in vegetation management, dredging operations and recreational use of the lake.
- To address future aquatic plant management needs at Carter Lake, both Iowa and Nebraska have agreed on purchase of an aquatic vegetation harvester; future operation and maintenance will be provided by the cities of Carter Lake and Omaha.



DNR Fisheries samples abundant crappie population in Carter Lake, 2013.

Central Park Lake (Jones County)

Central Park Lake is a 24 acre lake with a 365 acre watershed. In 2012, the DNR worked with Jones CCB to acquire a 77-acre parcel (Pearson Tract) directly above the lake that was in CRP. The purpose of acquisition of the tract was to provide an area for protection and enhancement of Central Park Lake. The area will be managed to improve water quality in Central Park Lake. The Conservation Board's management plan for the area includes the construction of wetlands and ponds to serve as catch basins for runoff, open space for storage of dredge material from the lake, mixed prairie planting throughout the entire area, tree and shrub plantings and walking trails for access to the area and environmental education programs.

The NW wetland on the Pearson Tract is engineered and will be constructed next spring. Funding for these projects is from WIRB, Jones County Supervisors, DNR Lake Restoration and the Jones County Conservation Board. The large western pond (~6 acres) on the Pearson Tract will be engineered this winter and constructed next fall. The south pond on the Pearson Property is engineered and will be built the same time. Funding for these projects was from the Fish Habitat Program, Twin River Pheasants Forever, DNR Lake Restoration, WIRB and the Jones County Conservation Board.

New Septic systems (tanks and fields) were installed at the dump station, shower building, campground and rangers residence in 2013. These areas have erosion control devices installed and were covered with straw. Next spring they will be leveled and planted turf grass or native grasses. The lagoon area has been reclaimed (sewage pumped, sludge and 6-12 inches of soil removed). The earthen berms surrounding it were pushed into the lagoon to create a shallow wetland.

Clear Lake (Cerro Gordo County)

Clear Lake is a 3,625-acre natural lake in Northwest Iowa. It has a watershed to lake area ratio of 2.3/1. In 2001, ISU completed a lake/watershed diagnostic/feasibility study. They presented a number of lake restoration options; specifically dredging of Little Clear Lake and restoration of Ventura Marsh.

- The DNR and local sponsors purchased a 208-acre dredge spoil site with approximately \$660,000 of LRP funds and an additional \$660,000 local match. Contractors completed the \$886,000 containment site in spring of 2008. The estimated cost of dredging was \$8 million dollars (2.3 million cubic yards at \$3.50/cu. yd.). DNR had a January 2008 bid letting for the hydraulic dredging of the Little Lake portion of Clear Lake and awarded the low bidder, L.W. Mattensen of Burlington, Iowa, the \$6,453,000 contract (75% LRP and 25% local-match funding).
- Dredging commenced in late spring of 2008 and completed by late summer of 2009. Contractors removed a total of 2.4 million cubic yards.

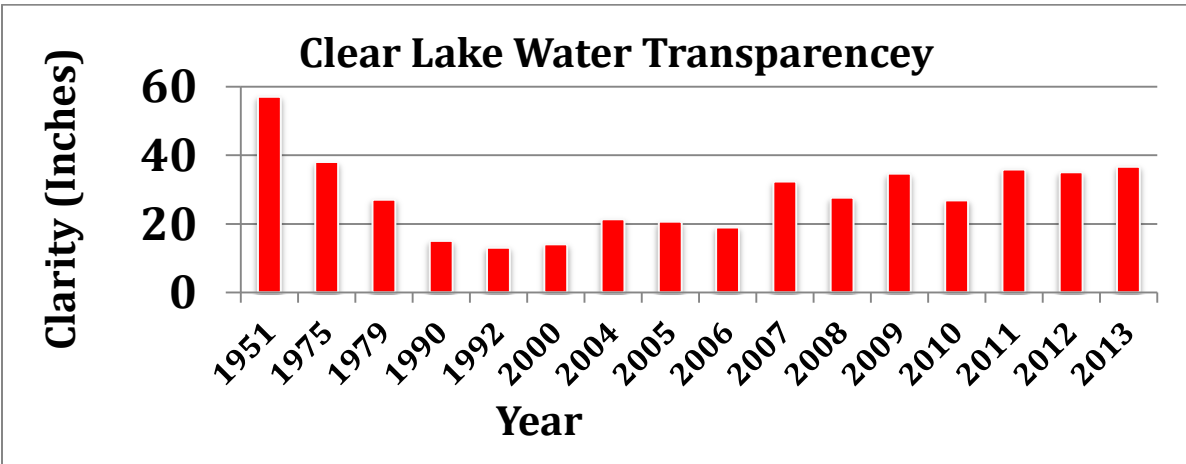


In 2013, the DNR lowered the dikes on 7300 feet of the dredge containment site. Trees were also removed from the north end and pushed into piles. The Wildlife staff will burn the trees during the winter months. A second project, to lower the remaining dikes, is under contract and will be built 2014. Total cost is \$64,830. The long-term plan for the containment site is seeding down to native prairie and management as a wildlife area.



1,500 feet of publically owned shoreline was protected with native stone rip rap in 2011. This work took place on the ice along the shorelines of McIntosh Woods State Park. One hundred twenty five feet of this project was along the State Dock area on North Shore Drive. An additional 750 feet of native riprap was completed for the State Dock area in 2013.

- The recently dredged west end of Clear Lake has continued to show improved water quality when compared to pre-dredged conditions. The recent monitoring data indicates that water clarity is returning to what was seen in the mid 1970's. The west-end sampling site has shown better water quality than the other two sites on Clear Lake now that dredging has been completed. Prior to dredging, the west end site showed poorer water quality than the other two sites. Overall, the water quality of Clear Lake has shown substantial improvement over the past ten years that watershed and lake improvements have been implemented. Water quality remains excellent following previous restoration activities.



**Section 206 U.S. Army Corps of Engineers
Aquatic Ecosystem Restoration Project for Ventura Marsh**

- Construction is completed on a Section 206 U.S. Army Corps of Engineers Aquatic Ecosystem Restoration Project for Ventura Marsh, which flows into the west end of Clear Lake. In its present degraded state, the marsh serves as a major source of nutrients contributing to water quality problems in the lake and is a major reproduction area for common carp. The Army Corp of Engineers (COE) budgeted \$3.2 million for the Ventura Marsh restoration project. Ventura Marsh state land and in-kind credits of \$1,331,200 and approximately \$884,062 in LRP dollars will fund the DNR's portion of the marsh restoration project.
- The goal was to work with the COE to restore Ventura Marsh and gain water level management capabilities. This will allow for fish removal and revegetation of the marsh.
- The old stop log structure was removed and replaced with a new structure in 2011. The stop log structure will be used to control water levels from the marsh crest elevation down to Clear Lake's water level. For water level manipulations below Clear Lake's level, the pumping station will need to be used. A flow path was dredged in 2011 to allow the deeper portions of the marsh basin to drain towards the pumping station. This will allow nearly a complete drawdown.
- Planned work in 2013/2014 was the construction of a catch basin and a water flow path in the southwest corner of the marsh. This feature will treat water entering the marsh from two large tile sources and allow for longer retention of water entering the marsh before it gets to Clear Lake. The implemented project established two sediment basins to treat major tile inlets in the southwest corner of Ventura Marsh.
- Rotenone was applied to the dredged trench on September 13th to kill the carp reproduction that occurred in the marsh. The treatment was effective in the area of the Ventura Grade, but live carp were likely present in other portions of the basin and watershed for the marsh.
- On September 16th stoplogs were removed and Clear Lake and water was allowed to flow west into Ventura Marsh. The water level stabilized with the current lake level by September 19th. This gave adequate levels in the marsh to allow for waterfowl hunting opportunities.
- Late September an additional foot of water was pumped into Ventura Marsh from Clear Lake to increase volume and make access easier for fall waterfowl hunting. The marsh is still 15-20 inches from crest, but no more pumping will occur in 2013. Lake levels have dropped to 9 inches below crest on October 29th. This is much better than the 31.5 inches below crest in 2012. The aeration systems will be started after freeze up and run as normal.

Vegetation establishment was very successful and water was returned to Ventura Marsh in September 2013



Anticipated Benefits

The total cost of all above activities is approximately \$17.0 million. Of this amount, local and federal match represent 40% of the funds necessary to complete these restoration efforts. Restoration efforts and improvements in water quality have the potential to double the annual economic return that Clear Lake generates to the local economy. The Center for Agriculture and Rural Development at ISU has projected a significant benefit to cost ratio from lake and watershed restoration at Clear Lake. Restoration of Ventura Marsh will improve the water quality of Clear Lake and help keep the Carp population under control. Local groups and DNR Section 319 continue to pursue watershed projects that have the potential to decrease sediment delivery to Clear Lake.

Easter Lake (Polk County)

Easter Lake is a 178-acre constructed lake with a watershed to lake ratio of 36/1. Constructed in 1967, Easter Lake began as a lake in an agriculture/suburban watershed that over the years has shifted to a highly developed urban area. Construction activities and storm water issues have contributed greatly to more than a 20% reduction in lake volume. The Polk CCB owns and manages this area and they continue to work in partnership to accomplish lake and watershed improvements.

- In response to the lake's water quality problems, project partners completed research to identify pollutant sources, locate priority areas, and develop a plan of action to provide guidance and outline goals for the restoration project. Project partners have incorporated multiple funding sources into future lake and watershed improvements, as well as a new trail system that will further connect local residents to the natural amenities of Easter Lake and Ewing Parks. Initial projects and programs will be aimed at reducing pollution entering the lake through major stream stabilizations and financial incentives for watershed residents to implement rainscaping practices.
- A Technical Advisory Team met multiple times from 2007 through 2012 to discuss plans for Easter Lake and the watershed. Representatives from the Polk County Conservation Board, City of Des Moines – Parks and Recreation / Public Works, DNR – Environmental Services Division / Fisheries /



Watershed Improvement Section, Iowa Department of Agriculture and Land Stewardship, Iowa State University, and the Natural Resources Conservation Service have attended these meetings.

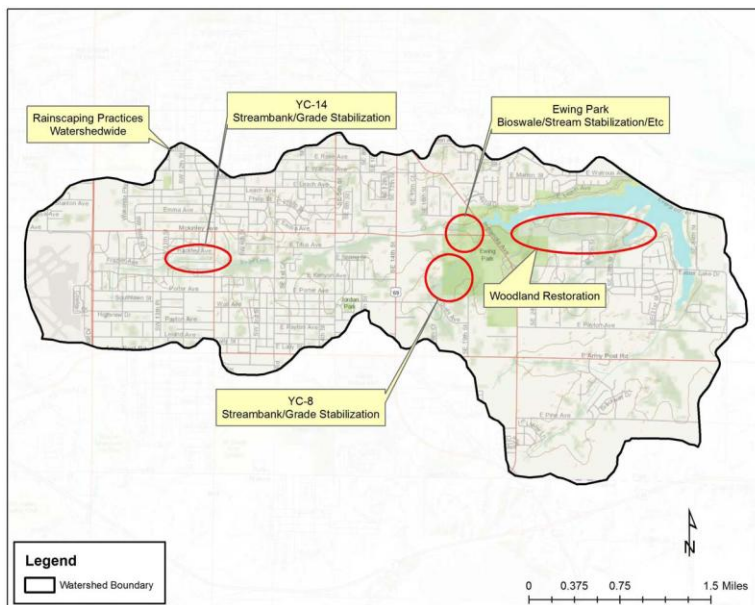
- EA Engineering was hired to complete a water quality improvement plan for Easter Lake. This plan incorporated findings from previous watershed and in-lake research projects.
- A local steering committee was formed from watershed landowners who attended past public meetings. This committee provided local input and feedback to EA during the development of the water quality improvement plan.

A Water Quality Improvement plan was completed by EA Engineering in the fall of 2012 and a public meeting was held to inform the public of the proposed improvement and gather feedback

- The Polk County SWCD working with the Technical Advisory Team recently applied for and received \$699,727 in DNR 319 funding. These dollars will allow for implementation of Phase I in the plan. The total Phase 1 budget is \$1,912,950. This includes cost-share of \$599,788 from the City of Des

Moines and in addition resources from the NRCS, Polk CCB and the DNR Lake Restoration Program. The Technical Advisory Team hired watershed coordinators in 2013 to help lead Phase I of the project and work with watershed landowners.

- The Easter Lake Watershed Project has two coordinators to oversee project goals and assist the public. These coordinators will provide the necessary link between watershed residents and project partners working together to improve Easter Lake. Rainscaping practices (bioswales, rain gardens, native landscaping) in the watershed and Phase I construction on Yeader Creek are slated to begin in 2014.
- On November 6, 2012, voters supported the Polk County Water and Land Legacy Bond (PCWLL) in historic fashion passing the measure by 72%. This large margin of victory clearly shows that there is bipartisan support for critical water quality, wildlife, trails, and recreation projects.
- The Conservation Board has a set of signature projects ready to go including critical water quality work at Easter Lake and in the Four Mile Creek Watershed as well as other trail connectors and infrastructure projects throughout the county. These projects have received valuable public feedback and support.
- A legislative kick-off event was held in the fall of 2013 to discuss the proposed project with state legislators and local officials.



Five Island Lake (Palo Alto County)

Five Island Lake is a 973-acre natural lake located on the north side of the town of Emmetsburg, Iowa in Palo Alto County. In 1989, following years of diminished recreational opportunities and poor water quality conditions due to low lake levels, a group of concerned citizens formed the Five Island Lake Board. They established two major goals for the project: Increase the lake water depth; and, improve the lake water quality.

1994 Diagnostic Feasibility Study: Included goals for dredging and shoreline stabilization

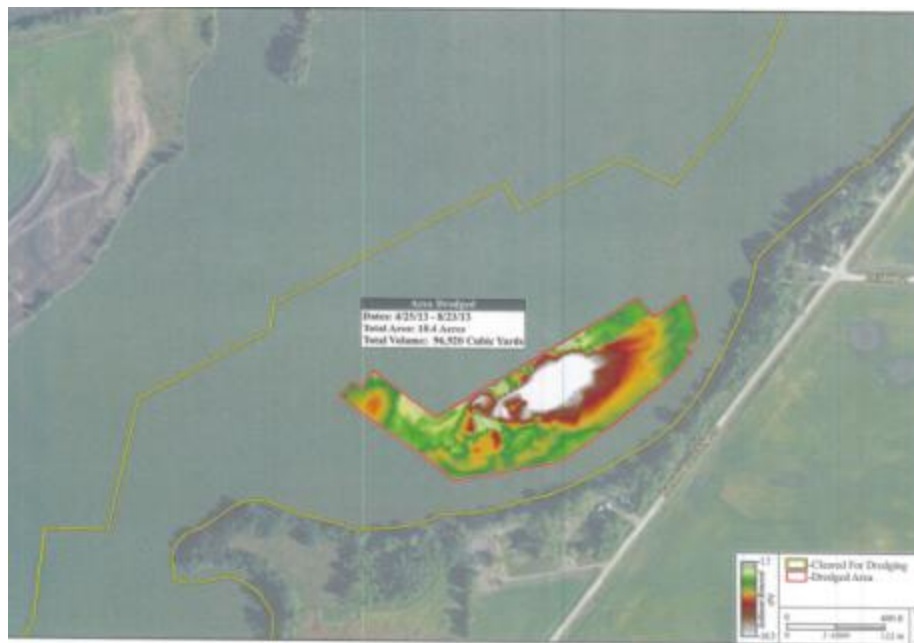
- Since the early 90's, the Lake Board has stabilized almost 10.5 miles of lake shoreline, dredged over 6.5 million cubic yards of silt, and has worked in the watershed to reduce nutrients and sediment from entering the lake.
- Funding for this project since 2000 has required a combination of 1:1 state and local matching grants (total of \$3.0 million).

Year	Cubic Yards
1991-1993	1,390,000
1994-1999	3,028,000
2002-2011	1,926,296
2013	205,221
Total	6,549,517

Five Island Lake, based on the 1994 DF Study map, had a mean depth of 4.6 feet. Over the 1994 - 2013 dredge seasons, an additional 3,199 acre-feet was dredged, which increased the mean depth to 7.9 feet. The current plan is to dredge approximately 328,000 cu. yds. over the next two years (2014-2015) in

order to complete deepening in the areas approved for dredging and achieve a mean depth greater than 8 feet. The planned work from 2014-2015 will be accomplished using FY13/FY14 funds. The City did explore the option of a private contractor being hired to complete final dredging and among responses received a low quote of \$3.92 / cu. yd. to remove sediment from the lake. The City and DNR believe the most viable and less expensive option going forward will be to continue the dredging using City equipment, personnel and containment site along with DNR funding.

- The City of Emmetsburg ran into both equipment and personnel issues in 2012, which limited their ability to have an effective dredge season. In 2013, the City dredged 205,221 cubic yards.



Region dredged during the 2013 open water season. Bear Creek Archeology survey estimated that as of August 2013 the City had dredged 96,920 cubic yards from a 10.4-acre area.

2006 TMDL: Impaired water for algae and turbidity

- Large source of turbidity is from internal re-suspension of sediment. A TP load reduction of 17% is needed to achieve water quality goals and protect the designated uses.
- TMDL supports that dredging is a critical component to improving and maintaining water quality improvements. However, partners recognize that water quality still does not meet expectations and a plan needs to be developed to address the watershed and any other in-lake issues.

Recent Activities

- The Palo Alto SWCD received an IDALS-DSC development grant for assessment of Five Island Lake and its watershed. This was completed in 2007.
- Summer 2008 tour with the DNR Director Leopold, State Senator Kibbe, local stakeholders and the DNR Lake Restoration Program reviewed progress and the need for continued watershed work to compliment local dredging efforts
- On November, 2011 the DNR met w/ the City of Emmetsburg, Palo Alto SWCD, Palo Alto CCB, IDALS and members of the Lake Board to discuss current status of project and potential future work
- In addition to wrapping up the dredging portion of their project, the Lake Board is evaluating the need for additional work in the watershed and in-lake management strategies to achieve the desired water quality goals.
- The City of Emmetsburg and Palo Alto SWCD submitted a Watershed Management Planning Grant application to the DNR April 2012. The grant was not approved; however, the city and county are still interested in exploring funding opportunities for watershed initiatives.

Green Valley Lake (Union County)

Green Valley Lake is a 390-acre lake constructed in 1950. It has a watershed to lake ratio of 11:1. The DNR implemented a limited lake restoration project through the State and U.S. EPA's Clean Lakes Program in the mid 1980s, however additional watershed and in-lake work was needed. Project partners initiated current restoration efforts at Green Valley Lake in 2006.

The local district soil group and NRCS completed a watershed assessment and developed a four-year plan to make needed watershed improvements. Cost share funding allowed local landowners to accomplish soil and water quality improvement projects on their property. Iowa State University completed a Diagnostic Feasibility study in 2008 and presented a variety of restoration alternatives (i.e. spillway modification, fish restoration and dredging of coves) for consideration. A technical workgroup that included DNR staff, NRCS and SWCD staff, the City of Creston, Southern Iowa Rural Water, Green Valley Chemical and CIPCO coordinated project activities.

DNR Parks has worked in parallel with lake improvements efforts to complete a facelift to the park. Including, adding full hook-up sites, removing a number of campsites to increase the size of each site, redesigning all the camping pads, a new electrical system upgrading from 30 amps to 50 amps, each site will have a new picnic tables and fire grills and a new shower building was installed. DNR Parks added new pit latrines at the campground, the cabins and the north picnic area and built a third camping cabin. Green Valley also has a new playground that was donated in part by the family of Greg Haley, who was the park manager when he passed away in January 2009, and built by volunteers. In addition, the park was connected to the City of Creston by a paved bike trail in 2009 that allows park visitors easy access to the amenities in town.

- The local NRCS District Conservationist has implemented a four-year, \$409,000, watershed improvement plan and completed approved soil and water quality improvement projects.
- Recent fish population estimates had supported the presence of high numbers of yellow bass and common carp, species both considered detrimental to sport fish populations, with common carp having the additional negative impact of contributing to poor water quality conditions. The DNR renovated the fishery in September 2008 and has since restocked the lake with bluegill, largemouth bass, channel catfish, crappie and walleye.
- The concrete spillway had starting to develop some structural problems and its design allowed common carp to enter the lake during high outflow periods. Iowa Bridge & Culvert LC completed a redesigned spillway in May 2009 at a cost of \$510,435. DNR awarded a \$348,767 contract to CL Carroll Company Inc. for in-lake fish habitat and protecting of the existing shoreline. Fish Habitat Stamp funds in cooperation with Federal Dingell-Johnson, Marine Fuel Tax and Lake Restoration Program funds paid for this aspect of the project.
- The Natural Resource Commission approved the acquisition of a parcel of land with LRP funding. The land is located 2.5 miles north of Creston, and adjacent to the northeast corner of Green Valley State Park. The Betty E. Gater Estate offered this 67.58-acre parcel for \$338,000. This site is serving as a storage area for sediments removed from the Green Valley Lake during the lake restoration process and will be re-shaped and seeded down spring 2012.
- Taylor Construction & Excavation signed a contract in the fall of 2009 for removal of approximately 250,000 yards of sediment targeted from both existing sediment retention basins and in-lake areas. In addition, a new sediment dike was installed at a location below an area identified in the diagnostic study as a subwatershed area contributing significant sediment and nutrient loading and critical areas of shoreline were stabilized.
- The campground at Green Valley State Park opened in 2013 after being closed for nearly two years for renovations. The campground features full hook-up sites, each site has been enlarged and camping pads redesigned, a new electrical system now provides up to 50 amp service, and a new

picnic table and fire grill at each site. The campground has a new shower building and pit latrines were added at the campground, the cabins and the north picnic area.

- Green Valley fishery and water quality looks very good. The fishery has an unusual number of “keeper” sized fish of all species including >9” Bluegill, >10” Crappie, Bass up to 18”, good Channel Catfish and Walleye up to 20”.

Hawthorn Lake (Mahaska County)

The Mahaska County SWCD applied for, received a watershed assessment grant from IDALS, and completed the assessment during the winter of 2007. They then held a kick-off meeting in May of 2010, with 34 landowners, stakeholders, staff, commissioners, news media, etc. in attendance. Partners discussed shoreline work, structures on public property, signage, private land progress, and reviewed goals.

The Mahaska SWCD applied for and received a WIRB grant of \$360,900 toward Lake Restoration activities. In addition, a total of \$208,618 in Publicly Owned Lakes (POL) funds has been available to the project. Lake Restoration Program utilized funds of \$450,000 for in-lake shoreline stabilization, deepening, and watershed improvement on state lands.

- To-date landowners have completed a grade stabilization structure with sediment loading reduction of 157 (t/y). 3,238’ of terraces on private property have been installed reducing sediment loading by 104 (t/y), and 2,109’ of waterways reducing sediment loading by 32 (t/y) on private property.
- DNR awarded a \$384,854 contract to Cornerstone Excavating, Inc. of Washington Iowa for in-lake restoration work at Hawthorn Lake (\$147,824 Fish and Wildlife Habitat Funds, \$132,033 Lake Restoration Program, \$100,000 Mahaska County SWCD WIRB grant). The project, completed April 2011, consists of the placement of in-lake habitat, shoreline armoring and deepening, and jetty construction/repair.



The DNR has designed nine sediment control ponds for watershed improvement on public ground. Phase I: Five of the nine structures on public property were let for bid on January 19, 2012 and are now completed. We are currently under permit review for the remaining four sites and the plan is for 2014 construction.

The fishery in this 170-acre lake collapsed in 2004 after gizzard shad were introduced in 2002. The DNR lowered the water level to a 20-acre pool while the in-lake restoration work was completed in the winter of 2010 and a nonselective fish renovation was completed in March of 2011 to eradicate the carp and gizzard shad populations. Bluegills were restocked on the east arm of the lake, the last week of April 2011. Channel catfish were restocked on May 18, 2011, and 18,000 (½-inch) Largemouth bass were restocked on Monday June 20, 2011. On September 6, 2011, DNR performed a survey of these

stockings and found growth to be good. The bass are running between 6-8 inches and the bluegills are about 4-5 inches.

The Hawthorn Lake fishery has redeveloped quickly following completion of the 2010 restoration project. Largemouth bass abundance is high and largemouth bass up to 16 inches are common. Angling pressure continues to build as the quality of these fish improves. Bluegill angling is improving with 8-inch bluegill presently available. Channel catfish abundance is excellent and size quality is well-developed. Channel catfish in excess of 22 inches are present. Muskellunge were restocked in 2012 and will be stocked again in May 2014. Five new sediment control structures completed on state property were also stocked with largemouth bass and bluegill in 2013.

- The DNR Lake Restoration Program, DNR Wildlife Bureau and Mahaska County Conservation Board worked cooperatively to eradicate early secondary succession woody vegetation from targeted areas on the Hawthorn Wildlife area. Lake Restoration provided up to \$15,000 for removal of these trees, which will allow for the stabilization and restoration of native grasses, providing overall better watershed protection while improving wildlife habitat.

Hickory Grove Lake (Story County)

The Hickory Grove Watershed is located in Story County, Iowa. The 83-acre lake has a drainage area of 4,026 acres and landuse distribution of 84.7% row crop, 9.8% grass, 1.6% forest, 2.2% water, 0.9% barren and 0.7% artificial. Iowans consider Hickory Grove Lake an important recreational resource; however, the lake is experiencing event driven water quality problems that negatively affect this resource. In general, the Hickory Grove watershed has few elevation changes and much of the agricultural land is under tile drainage management. Storm related surface runoff has led to gully erosion, debris and nitrogen spikes immediately after these events.

The eastern end of the lake is now sediment filled, limiting boat access. The fishery is healthy; however, carp have destroyed most vegetation and DNR is considering a lake fishery renovation. The lake has a designated use of primary contact recreation and is listed on the 2008 303(d) Impaired Waters Listing for elevated bacteria concentrations.

- Watershed Technical Advisory Team has met from the summer of 2008 - 2012 to discuss water quality improvement efforts at the lake. The NRCS received Development grant was in 2008 to determine critical areas in the watershed with significant quantities of sediment and nutrient delivery to the lake and completed a land use assessment in 2009.
- The Story SWCD has listed the Hickory Grove Lake Watershed as an Environmental Quality Incentives Program (EQIP) priority watershed. The EQIP is a voluntary program that provides financial and technical assistance to agricultural producers to help plan and implement conservation practices.



Spring 2011, ISU received a DNR Planning Grant for development of a Watershed Management Plan for Hickory Grove Lake. In October 2011, Dr. Michelle Soupir, from Iowa State University, named Aaron Andrews, from the Iowa Learning Farms (ILF) as the Watershed Project Coordinator. Aaron has made one-on-one contact with the majority of the watershed landowners and continued communication with these landowners is recommended.

- ISU is finished with the Watershed Management Plan, which outlines recommended improvement strategies for bacteria levels, lake drawdown, sediment removal and fishery renovation over the next three years.

- The Watershed Technical Advisory Team met again fall 2013 to discuss future funding options and to develop a strategy for restoration based on the Watershed Management Plan recommendations. A small working group is set to meet again early 2014 to develop a strategy for the CCB to apply for funding opportunities to start implementing practices in the Hickory Grove watershed.

Lake Anita (Cass County)

Maintenance activities at the 159-acre Lake Anita over this past year included expansion of the sediment retention basin above the east arm of the lake. The box culvert at the road was raised four feet and 8,000 yrd³ of material was removed all in an effort to increase the trapping efficiency reducing the sediment and nutrient delivery to the lake. This project will benefit the lake for the next 30 years.



Sediment removal and new box culvert at Lake Anita east silt pond in 2013.

What started out to be a project to take advantage of drought conditions and clean out a nonfunctioning sediment retention pond at Lake Anita ended up with a total rebuild. NRCS engineers provided us with a design to raise the water level four feet by modifying the box culvert. In addition to raising the water level, 8,000 cu-yd of dirt was removed from the upper end to act as a sediment trap. Combined this will extend the life of this sediment pond by an estimated 30 years and allow for water level control (management capabilities) of the east pond. Cost of the project was \$41,000 and funded through Lake Restoration.

Lake Geode (Henry County)

Lake Geode, located in Henry and Des Moines Counties, is a 174-acre lake encompassed by a 1,640-acre state park. The entire Lake Geode Watershed consists of approximately 10,327 acres. The watershed encompasses drainage from Cedar Creek and the lake outlets to the Skunk River. This scenic lake was constructed in 1950 and has excellent fishing. DNR estimates that Lake Geode State Park attracts approximately 180,000 annual visitors who camp, hike, fish, and boat within the park.

The goals of the Lake Geode Watershed Project are to reduce bacteria, sediment and phosphorus from loading into Lake Geode. Project partners plan to achieve these goals through a combination of best management practices that will target identified source contributors from state and private land. The following agencies are working in partnership to achieve this goal, Iowa Department of Natural Resources (DNR), Iowa Department of Agriculture and Land Stewardship – Division of Soil Conservation (IDALS-DSC), Natural Resources Conservation Service (NRCS) , Henry Soil and Water Conservation District and Des Moines Soil and Water Conservation District.

Goal 1: Address bacteria impairment of Lake Geode in an effort to remove it from the 303(d) list

Goal 2: Reduce total phosphorus and sediment delivery from agricultural and non-agricultural sources by 6,351 lbs/year and 2,499 tons/year, respectively.

A variety of structures and management practices will be required to reduce both TP and bacteria contributions to the watershed. The district hired a watershed coordinator and he is meeting with watershed landowners to establish targeted watershed improvement measures. Funding has been secured through a number of partners (e.g. DNR Lake Restoration and Watershed Improvement Section / Iowa Department of Agriculture and Land Management) to implement these practices. DNR staff will help develop a Lake Geode Management Plan that will outline in-lake restoration options, with implementation of these options will only take place after sufficient sediment/phosphorus watershed reduction.

The Natural Resources Conservation Service, Iowa Department of Agriculture and Land Stewardship and the Iowa Department of Natural Resources have been working together to install Best Management Practices (BMP's) on state property. The Lake Geode Watershed Coordinator continues to make progress in the watershed. For example, terrace projects have been completed and septic systems are being investigated in terms of leakage/upgrading.

- Recently, five grade stabilization structures (i.e., ponds) and four sediment basins were built within park boundaries. These structures “catch” surface water run-off. Temporarily impounding water allows harmful sediment, adhered nutrients, and bacteria to settle to the bottom of the ponds or traps. Each site has been selected by the partnering agencies to control gully erosion within the park. Each site that has been selected was identified through a gully assessment that was conducted during the early stages of the project.
- An additional benefit of the ponds built as part of the Lake Geode Restoration Project, is that all were built to depths adequate to support their own fish communities. In fact, in fall 2012 four of the five ponds had filled to levels to allow an initial stocking of bluegills. These fish were spawned and raised at the DNR's Fairport Fish Hatchery. Fisheries staff stocked bluegills at a rate of 1000 per acre. In June 2013, the ponds will receive stockings of largemouth bass (70 per acre) and channel catfish (100 per acre). These ponds will provide recreational fishing opportunity once the fish grow to catchable sizes in 2-3 years (approximately 2014-2015).



- A project request was submitted to build six additional sediment control ponds. Each location is required to have a threatened and endangered species, cultural resources and an Indiana bat habitat check all completed prior to construction being started. Construction of a second round of structures is under permit review and scheduled for 2014 construction. A project request for a riprap project to address eroding shoreline around the boat ramp and adjacent shoreline areas was submitted and approved. Future in-lake work may include removal of sediment from the upper end of the lake, additional riprap, and placement of fish habitat.

Caleb Waters, Geode Watershed Coordinator, Josh Sieren, Soil Conservationist, and Ulf Konig, Park Manager install snow fence in hopes to deter geese away from beach area.

Based on the original assessment, Lake Geode has two impairments. The two impairments include high bacteria levels and pH levels. It was decided that geese could be a contributor of bacteria levels at the Geode beach. In the past, the geese have been found loafing on the beach causing a potential bacteria concern by their fecal matter. Partners of the watershed project have been brainstorming ideas how to deter geese from the beach. During 2012, the partners of the watershed agreed to implement a Goose Management Plan that involves ethical practices to detour geese from the beach at Lake Geode. The Goose Management Plan outlines multiple practices that will be implemented by the watershed coordinator and park staff. The first step to detouring geese from the beach is to use pyrotechnics or

screamer guns to scare the geese away from the beach area. This practice can be implemented anytime other than the nesting season. Second is to install wood-lathe snow fence during the public off-season.

Lake Icaria (Adams County)

Lake Icaria's clarity used to be measured in inches; it is now measured in feet. Before, you could only see down six inches in the murky waters of this southwestern 647-acre Iowa lake. Now, following work in the watershed and in the lake, you can watch your toes wiggle when standing in waist-deep water. Landowners set out in 1996 to improve the lake as part of the Adams County Three Lakes Project. In the past decade, landowners have changed how they farm to improve water quality.

Following work in the watershed, the DNR moved ahead with restoration efforts in the lake in 2004. At Lake Icaria, in-lake work has helped protect 10,000 feet of shoreline from erosion. Anglers will notice four new fishing jetties, repaired jetties and a repaired main boat ramp, as well as a renovated fishery and restocked lake. The DNR also placed 12 underwater rock mounds to attract fish for anglers. Since Lake Icaria completely refilled in the spring of 2007, the water is remarkably clearer – generally, a person can see three feet down in the water, sometimes up to six feet. With an improved lake, anglers, campers and other park visitors are taking notice. Starting in 2008, fishing and park visitations have improved.



In-lake work has helped protect 10,000 feet of shoreline from erosion. Anglers will notice four new fishing jetties, repaired jetties and a repaired main boat ramp, as well as a renovated fishery and restocked lake.

- The DNR Lake Restoration Program cooperated with the Adams SWCD by providing funding resources to repair and improve the main tributary wetland that was originally constructed in 2004. In 2013, the DNR contracted with Murphy Heavy Contracting Corp. to repair the wetland at a cost of \$386,028 (WIRB grant to the SWCD paid \$170,525 and the Lake Restoration Program paid \$215,503). Construction was completed September 2013.

The DNR and Adams County SWCD worked together to repair and improve the main tributary wetland during the 2013 construction season.



- In addition, Adams CCB applied for a fish habitat grant for four sediment control ponds above Lake Icaria. The DNR and Adams CCB coordinated planning for these structures during the winter of

2012/2013 and the ACCB constructed these ponds during the summer of 2013 at a cost of \$67,221 (Fish Habitat Grant \$34,871, SWCD \$22,500 and Lake Restoration \$9,850).

- In 2014, the DNR will also repair the existing rip rap shoreline along the point that surrounds the Primitive Campground at Lake Icaria with more rip rap.

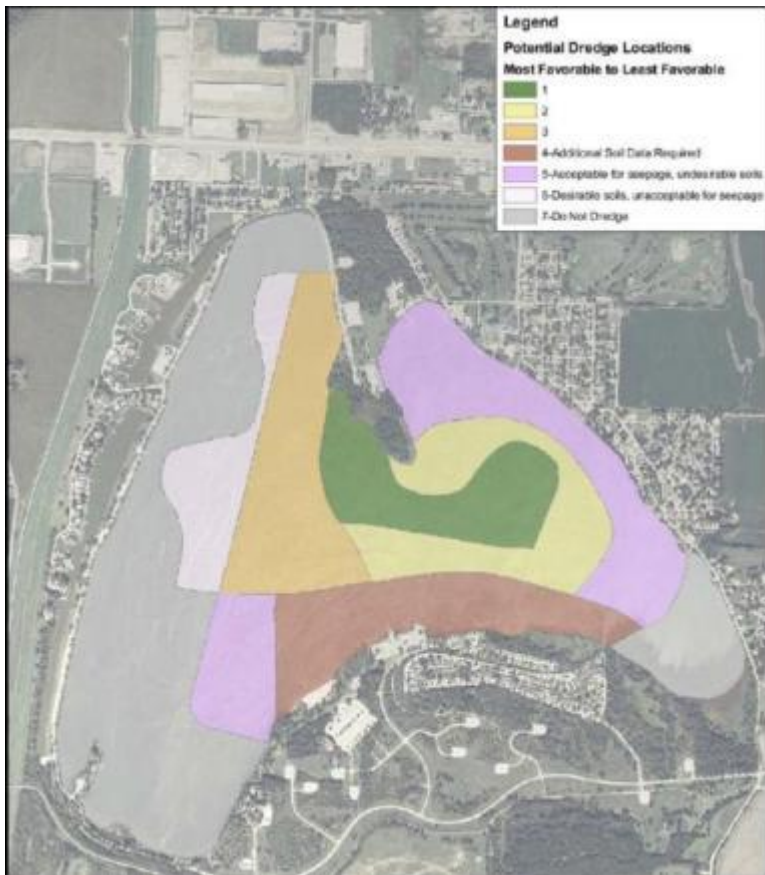


One of four sediment control ponds above Lake Icaria built by Adams CCB with assistance from the Lake Restoration Program and a Fish Habitat Grant.

Lake Manawa (Pottawattamie County)

Lake Manawa is a 715-acre natural lake with a watershed to lake ratio of 4/1. Mosquito Creek supplies additional water to the lake. Past lake dredging work in the 1960s deepened significant portions of the lake. However, maximum lake depth does not exceed 13 feet with large expanses of 6 to 7 feet deep water. The Iowa Department of Transportation approached the DNR to explore the possibility of dredging the lake for sand to use for highway construction. However, there is concern about whether they can remove sand materials from Lake Manawa while still maintaining the hydraulic seal between the lake and the fluctuating Missouri River.

- The Iowa DOT and DNR have met periodically between of 2007 and present to discuss opportunities to obtain highway building materials from Lake Manawa sediments.
- The DNR hired Tetra Tech to conduct a diagnostic and feasibility study and review the option of dredging as a potential lake restoration activity. Tetra Tech also completed a Jurisdictional Wetland Delineation for Lake Manawa Pilot Dredge Spoil Site and finalized a dredging plan that will reduce the risk involved both in providing the materials to the specifications required and in the ability to control additional seepage from areas along the lake bottom. The project remains a viable opportunity for both DNR and the Iowa Department of Transportation (IDOT).
- The DNR continues to meet with groups such as the “Friends of Lake Manawa” to solicit support and to assist in moving the lake/watershed restoration project along.
- In advance of dredging, Tetra Tech has prepared a Phase I Archaeological Investigation as part of the Diagnostic and Feasibility Study of Lake Manawa.
- One of the primary goals of Lake Manawa’s restoration would include an increase in mean depth from the current 6.1 feet to approximately 10.0 feet and an increase in water clarity to 4.5 feet, at least 50% of the time as measured from April through September. Achieving a mean depth of 10.0 feet will require removal of 4.7 million cubic yards of material. A secondary goal would be to obtain deeper sand that may then be used for Iowa Department of Transportation (IDOT) road projects and/or other local construction activities.
- DNR plans to post a Request for Proposals in early 2014 for a vendor to provide design/oversight services related to dredging approximately 340,000 cubic yards of material from Lake Manawa and store the material on state land adjacent to the lake.



Dredge locations ranked by suitability of soils and potential for seepage in Lake Manawa.

Little River Lake (Decatur County)

Little River Lake was created in 1985 as a multipurpose PL-566 structure to reduce flood damage, provide drinking water for the City of Leon and Decatur City, provide an established fishery, and to provide recreational opportunities for Decatur County and neighboring areas. Little River Lake is a 788-acre lake with a 17:1 watershed to lake ratio. For the first 15 years, the lake produced tremendous quantities of quality fish. However, common carp, an inadequately protected watershed, and unprotected shoreline problems have reduced water clarity, suppressed sport-fish abundance and growth, recreation opportunities, and increased water treatment costs. The lake had no shoreline protection in placed at its initial impoundment construction. Shoreline erosion, silt loading, and a common carp population have all adversely affected water clarity. Fish quality and angling activity have steadily declined since 2000 to a point where the lake offered few sport-fish or angling opportunities today.

The Decatur County Soil District and the NRCS have completed a watershed assessment and have developed a four-year plan to make needed watershed improvements. Cost share funding was made available for local landowners to accomplish soil and water quality improvement projects on their property.

- Decatur County, Southern Iowa Rural Water Association, Decatur County Conservation Board, Decatur County Soil and Water Conservation District, the City of Leon, and the Iowa Department of Natural Resources began planning water quality improvement efforts in 2008. Since that time, the group has met to plan and implement water quality improvement practices for the watershed.
- The Decatur County Soil & Water Conservation District and NRCS personnel assessed the watershed's problems, quantified soil erosion, and identified best management practices, (BMPs). The Watershed Improvement Review Board (WIRB) awarded the Decatur SWCD a \$423,900 grant to cost-share improvement costs with landowners. The group also received a letter of support from

the DNR Lake Restoration Program to consider Little River Lake for future funding for in-lake improvement projects. Pending adequate implementation of watershed soil conservation practices, Lake Restoration funding will address in-lake improvements such as shoreline stabilization, rough fish management and silt basin improvements.

- The restoration process during 2011 involved implementation of remaining targeted watershed practices with available WIRB funding. Re-assessment of the watershed will guide planners to any remaining areas of the watershed to address before potential work in-lake.
- The local NRCS District Conservationist has implemented \$384,419 of WIRB funding, \$214,359 of EQIP funds, \$192,471 of Public Owned Lakes funding, \$100,865 of State cost share funding, \$14,793 REAP funding, and \$316,439 of landowner commitments totaling \$1.2 million to improve the watershed and complete approved soil and water quality improvement projects. To-date less than \$20,000 of WIRB funding remains available. Landowners in the watershed receive bonus points when competing for countywide funding from the Soil District and NRCS.
- Recent fish population estimates had indicated a dense common carp population. Their feeding for bottom organisms suspends fine clay sediments causing poor water clarity. The DNR renovated the fishery in October 2011 and in 2012 restocked the lake with walleye, largemouth bass, bluegills, crappies, and channel catfish. Fish population surveys conducted during 2012 has found excellent growth and survival of all stocked species.
- The elevation of the dike and outflow chute of the wetland above Little River Lake was raised two feet to allow additional storage capacity. The additional area is expected to restore wetland's sediment and nutrient trapping efficiency. Expansion of the wetland area above Little River Lake (completed spring 2012 at a cost of \$207,340 paid for by Lake Restoration) doubled the area, improved sediment trapping capabilities above the lake and allowed for water level management of the wetland.
- In 2011, the DNR awarded a \$1.1 million contract to TK Concrete of Pella for shoreline deepening, shoreline stabilization, and in-lake fish habitat. The Lake Restoration Program funds paid for \$880,000 million for shoreline improvements and Fish Habitat Stamp funds in cooperation with Federal Dingell-Johnson, Marine Fuel Tax funds paid for \$220,000 in fish habitat improvements. Construction was complete spring 2013, the DNR renovated the fishery and re-stocked gamefish, and the lake has now re-filled.
- The DNR is also working with the NRCS to design/construct fifteen basins on public land by fall 2014 for \$228,825 (75% LRP / 25% Local cost-share).



Shoreline stabilization of regions with significant erosion

This level of clarity has not been seen since the lake's initial impoundment in the late 1980's. ***Post restoration water clarity measurements at Little River Lake routinely exceed 36 inches and have been over 80 inches.*** The largemouth bass population has a very strong 2012 year class. Night electro-fishing catches can easily exceed 1000 per hour. Growth for bass increased from that found in 2012 and all sizes have good body condition. Bluegills of all sizes are present ranging from 1 inch to 8.5 inches with a lot above 7.0 inches. It produced a moderated size fish for the 2012/2013 ice fishing season and

following spring. The 2012 walleye stocking survived well. Night fall electro-fishing catches were 125 per hour. None of the 2013 stocked fry or 2-inch fingerlings were found.

Lizard Lake (Pocahontas County)

Lizard Lake was a highly degraded 285-acre shallow natural lake. Rough fish (buffalo, bullhead and carp) dominated the lake population. The lake contained very little area of aquatic vegetation and exhibited poor water quality. A local lake group has promoted lake restoration and they continue to meet with DNR staff to discuss their concerns. In June 2006, IDALS and the local Soil and Water Conservation District awarded a Development Grant to evaluate the watershed of Lizard Lake. The Iowa State University Limnology Laboratory conducted a Diagnostic Feasibility study for Lizard Lake. This 2008 study, completed by Dr. John Downing, states that Lizard Lake is one of the most eutrophic lakes studied in Iowa. As part of potential restoration alternatives, ISU presented "shallow lakes management" as an option for improving the lake's water quality, fish population structure and wildlife potential. During 2008 and 2009, DNR staff has met several times with local partners and stakeholders to discuss shallow lake management options for Lizard Lake. Many stakeholders recognized the benefits of shallow lake management and expressed a preference for that type of management. Other stakeholders, while preferring dredging, realize that high dredging costs make that option unattainable and therefore support shallow lake management. Other stakeholders preferred to continue supporting dredging as the only alternative.

With strong support from most local constituents, the DNR hired Ducks Unlimited to conduct survey work during winter 2009 and plans to construct a water control structure and fish barrier. Construction of a new water control structure, fish barrier, and improved draw down channels was completed in 2011. DNR drained the lake to eliminate high populations of common carp and other problems fish, allow for the consolidation of loose bottom sediments, and promote the growth of aquatic plants. These plants will help keep water in the lake clean by holding down bottom sediments, reducing wave energy, using up nutrients otherwise available for growing algae, and provide habitat for the small invertebrates that eat algae. Aquatic plants will also provide excellent habitat for sport fish and a multitude of game and nongame wildlife species that depend on clean-water lakes for survival.



- Lizard Lake was drawn down during the winter/spring of 2011 as planned. The draw down went very well and the wildlife biologist was able to achieve a complete draw down. Cooperating weather conditions allowed vegetation to flourish in the exposed lakebed.
- Construction activities on and around Lizard Lake were completed as planned. A new outlet and water control structure was installed to replace the antiquated one. A private firm was contracted to survey the outlet structure to assure local citizens that the new outlet structure was installed at the same elevation as the old one.
- A velocity tube fish barrier was installed just downstream of the outlet structure at Lizard Lake. This fish barrier is the first of its kind as it allows debris to flow through the structure, but does not allow fish to pass through it because it is installed at a steep enough grade.

In 2012, Lizard Lake went through its second year of a draw down since the project's inception. Good stands of perennial emergent vegetation were established. We attempted to hold three feet of water in the basin throughout the summer and then bring the lake up to crest by fall. The drought kept us from achieving that goal. DNR did attempt to stock yellow perch into the lake when there was several feet of water; however, the lake basin dried up after they were stocked.

Although we were not able to hold water in the lake, it was there long enough to inhibit emergent plant growth in the deeper portions of the lake, which created open pockets of water. Black Hawk fish management staff met with the Pocahontas CCB in March 2013 to discuss plans for Lizard Lake for the 2013 season. 50,000 yellow perch were stocked into Lizard Lake on July 2nd. Many locals were present for the stocking and a good article on the stocking was published in the local paper. All of the stop logs are currently in place to hold as much water as possible going into the 2014 season. Also in 2013, the DNR acquired 120 acres of land in the watershed of Lizard Lake. This land will be protected in perpetuity and help to improve water quality in Lizard Lake. The land also provides more shoreline access for the public and connects two existing pieces of public property.

Fifty thousand little yellow perch, all about 1.5 inches in length, were stocked in Lizard Lake on July 2nd 2013. They should grow rapidly and be a perfect prize for anglers next winter. Northern pike will be stocked in 2014.



Lost Grove Lake (Scott County)

The Iowa Department of Natural Resources has nearly completed work to construct Lost Grove Lake, Scott County. The project is an investment in Iowa's infrastructure; promoting long-term economic growth; is a watershed/water quality project; and will provide flood protection and soil conservation benefits. The Lost Grove Lake recreation site was selected in 1987. Land acquisition from willing sellers began in 1988 and completed in 2003. The state purchased a total of 1,701 acres of land as the site for this 400 surface acre lake. This recreation project has strong local support from groups such as; the Quad City Conservation Alliance, Pheasants Forever, the Izzak Walton League, Scott County Soil and Watershed Conservation District and the Quad City Bass Club. In addition, the Scott County Soil and Watershed District completed a watershed assessment and implemented water quality projects that have included filter strips, grass waterways, sediment basins and EQIP nutrient and pest management enrollments.

The lake site is located 10 miles north of Davenport, Iowa and will provide needed public fishing opportunities for the areas 400,000 residents. The lake and surrounding public land will also support outdoor activities such as hunting, wildlife viewing, boating and hiking. While a campground is not proposed at this time, local or county support could incorporate development of a campground site in the future.



- The Lost Grove Lake and Recreation Area project will provide 60 to 75 jobs during the construction phase. Iowa State University Center for Agriculture and Rural Development (CARD) research indicates that a lake of this size that exhibits good water quality will annually provide over 350,000 visits, create approximately \$20 million in local spending and will result in supporting 175 jobs.
- Project activities include dam construction, shoreline stabilization, boating and shore access, fish habitat enhancement and site access roads. Prior land acquisition, watershed improvements, utility relocation, dam design and road modification funding expenditures have totaled \$4.495 million (Federal Sport Fish Restoration \$2.610M, DNR Fish and Wildlife Trust Fund \$1.00M, State Marine Fuel Tax Fund \$885,000).
- This project will provide a high quality recreational lake while at the same time providing immediate economic stimulus to the region and when completed will provide long-term economic benefits to the State of Iowa.
- Langman Construction, Inc. was awarded the Fish Habitat, Riprap, and Shoreline Access phase of the project. The bid was for \$1.17 million. Construction commenced the week of July 25 and was completed on October 7, 2011.
- J.B. Holland Construction was the lowest bidder (\$4,341,437) on the Lost Grove Lake dam construction project. The NRC approved the bid on June 10, 2010. Dam construction began in July 2010 and was completed summer 2012. Given Lost Grove Lake's small watershed to lake area ratio, the lake is expected to take 2-3 years to reach full pool.
- Scott County Secondary Roads designed two road culvert risers on Utica Ridge Road (see green dots on map). These risers will temporarily impound water to allow settling of sediment and nutrients, and thus, preserve the water quality of Lost Grove Lake. Arensdorf Excavating & Trucking, Inc., Anamosa, IA received the bid for \$90,089.84. The project was completed in December 2012.
- The boat ramp, parking lot, and pit-vault toilet construction phase of the project was bid in February 2013 and work on the \$920,000 project began in late July.
 - Main Boat Ramp (triple lane) 95% complete.
 - Ramp and parking lot have been graded.
 - The concrete for the ramp and parking lot has been completed.
 - The access road has been built and a portion has been graveled.
 - Armoring around the ramp as well as finish work remains.
 - Slippage of the main dam required rip rap and grouting of a 3' x 4' trench at base of ramp
 - Middle Boat Ramp (double lane)-75% complete.
 - Ramp and parking lot have been graded.
 - Concrete forms are currently being installed.
 - The access trails to the boat slip and parallel fishing structure have been built.

- West Boat Ramp (single lane)-50% complete.
 - Crews are currently constructing the access road and grading the ramp.
 - Road culverts are being installed where drainage problems are likely.

The construction deadline is March 15, 2014. The lake is re-filling and fish stocking is underway.

Lost Island Lake (Palo Alto County)

Lost Island Lake /Barringer Slough / Blue-wing Marsh Complex

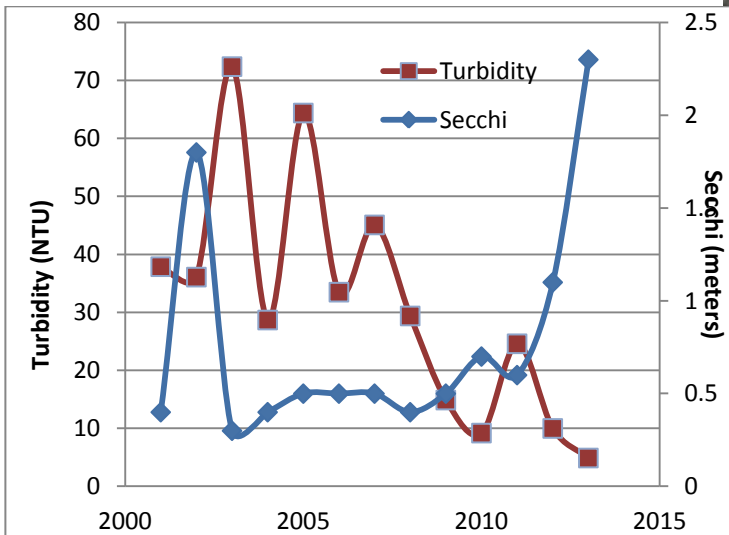
This is an aggressive and comprehensive plan to improve water quality in the > 2,200-acre complex, which includes the 1,162-acre lake. The plan includes reducing existing carp numbers, preventing remaining rough fish from entering most spawning areas, conducting beneficial drawdowns on associated wetland areas (780-acre Barringer Slough, 150-acre Blue-wing Marsh) and eliminating rough fish. Resulting germination of aquatic plants and consolidation of bottom sediments will restore proper wetland function and improve the water quality at Lost Island Lake.

- The project includes an innovative plan to allow for the removal of up to 75% of the exiting carp biomass, an aggressive stocking of predatory fish and new construction or rehabilitation of four water control structures and five fish barriers throughout the complex.
- During summer 2008, DNR-Fisheries used mark – recapture techniques to estimate in-lake carp numbers and biomass and initiated an intensive commercial fishing contract, which resulted in the harvesting of approximately 427,000 lbs of carp and 353,000 lbs of buffalo in 2010. The result has been a 90% reduction in population and 80% reduction in the biomass of rough fish.
- At present, a commercial hauler is aggressively removing rough fish from Lost Island Lake and the DNR is stocking large numbers of predatory fish into the system. Harvesting efforts will target of additional 34,000 lbs of carp and 60,000 lbs buffalo by spring 2012.
- DNR awarded Ducks Unlimited, Inc. a contract to design effective water control and fish barrier structures. The survey and design work began during summer/fall 2009. Local excitement regarding the project is high. Nearly 70 local stakeholders attended a December 2009 public meeting and voiced strong approval for the design work.
- The NRC approved Lake Restoration Funding toward the \$834,263 bid from Landwehr Construction, St. Cloud, MN for the project. The Watershed Improvement Review Board awarded the Palo Alto County Conservation Board \$180,000 to cover part of the cost (two water level control/fish barrier systems); construction began in the fall of 2010 and was completed summer of 2012. The \$1.3 million project is a partnership between the Iowa Department of Natural Resources, Palo Alto County, Ducks Unlimited, and the Lost Island Protective Association.
- Various basins within the complex have been dewatered to eliminate rough fish, create favorable conditions for re-vegetation. Weather permitting; all basins should be at full pool during fall 2013 thereby providing excellent habitat for wildlife species and much-improved recreational opportunities for lowans. Some additional minor work will be completed at several of the structures to ensure the entire system works efficiently and there are still plans to install an electric fish barrier at the Barrier Marsh site.
- Over 1.27 million pounds of common carp and buffalo have been removed from Lost Island Lake since 2008 reducing the common carp density from nearly 400 lbs/acre to 66 lbs/acre. The lake has shown substantial increases in water quality and habitat.



The final infrastructure component of the Lost Island Lake restoration project (at Barrier Marsh) was completed fall 2013. An electric fish barrier was added to the water control structure that will prevent breeding common carp from reaching Blue-wing Marsh wetlands in the Lost Island Lake’s watershed while allowing debris to pass during high water events.

Above: Orange dot indicates approximate location of barrier structure.
Right: Construction of a control building and security fence at the site of an electric fish barrier in the Lost Island Lake watershed.



Water quality trends in Lost Island Lake. Water transparency (secchi) has increased and turbidity has decreased.

The Barringer Slough and Blue Wing Marsh complexes did not fill completely this summer because of dry weather conditions. Smith Root Inc. has designed and engineered a fish barrier and construction is complete. This electric barrier, at a cost of \$234,720, is the final major component to be completed for the Lost Island Lake Restoration Project. Common carp population estimates continued in 2013. The common carp population continues to remain below the biomass target of 100 lbs/acre (66 lbs/acre). Water quality, habitat, and the sport fishery continue to respond.

Meadow Lake (Adair County)

Meadow Lake is a 34-acre public owned lake located six miles north of Greenfield in Adair County. Constructed in 1963, the lake sits within a larger 320-acre fish and wildlife area owned and managed by the Iowa Department of Natural Resources to provide fishing, hunting, and other outdoor recreation activities for the public. Overall, Meadow Lake has provided good fishing for largemouth bass, bluegill, crappie, and channel catfish for over 40 years. The DNR listed Meadow Lake as impaired water in 2004 for algae and added impairment for turbidity in 2008. The presence of aesthetically objectionable blooms of algae and poor water transparency impair the primary contact recreational uses at the lake. The DNR lowered the water level in Meadow Lake starting late summer of 2008 to facilitate a significant fish habitat and shoreline stabilization project, which included 740 feet of shoreline stabilization, rock reefs (2), pea gravel spawning beds (3) and a rock field. This project will enhance the fish habitat in Meadow and have water quality benefits. The shoreline stabilization work addressed all the actively eroding shoreline in the lake. The total cost of this project was \$65,000 including \$22,200 for stabilizing eroding shoreline. Three sources contributed to this project the state of Iowa Fish and Wildlife Trust Fund (\$15,250), Sportfish Restoration (\$45,750), and the Jensen-Butler Conservation Foundation (\$4,000).

- DNR Lake Restoration and the Watershed Improvement Section, with design from NRCS, constructed an in-lake structure in the spring of 2010 at Meadow Lake to achieve sediment and phosphorous reduction from 236 acres of the watershed. In addition, we constructed two wetlands above Meadow Lake by the fall 2010. The larger of the two wetlands will impound 14 acres of water when filled. Removing Meadow Lake from the impaired waters list is the ultimate goal of the project.
- The affects of grass carp on aquatic vegetation by installing exclusion fencing was monitored in both 2012 and 2013. Grass carp removal is ongoing.



Grass carp exclusion fence is installed in Meadow Lake.

Red Haw Lake (Lucas County)

- In 2001, a wetland and three sediment retention ponds were constructed within this watershed to improve and protect water quality.

- Recently IDALS performed a watershed assessment and identified priority gully areas. The DNR has initiated design for construction of six structures within the State park to control sediment and provide additional water quality benefits. DNR developed final design for these grade stabilization and sediment basin structures and the plan is for 2013/2014 construction at a cost of \$126,193.
- As of December 2013, all sites are cleared and the contractor is cutting core trenches and building the ponds.



Rock Creek Lake (Jasper County)

Rock Creek Lake is a 491-acre lake constructed in 1952. The lake has a watershed to lake ratio of 54/1. Iowa State University, in a 2000 Diagnostic/Feasibility Study, indicated that over the last 50 years the lake has lost almost 40% of its lake water volume and 102 lake surface acres. Local efforts have accomplished some work in the watershed; however, local and state partners need a renewed effort to move this project forward. Continued watershed improvement projects have been a difficult “sell” to area landowners.

A fall 2008 technical work group meeting resulted in an outlined approach to meet the necessary reductions in sediment and nutrient delivery to Rock Creek Lake. It focused on dividing the total watershed into larger subwatershed segments, and then designing larger watershed structures that will require a higher government percentage contribution to put these water quality improvement practices in place. Several landowners had expressed interest in this concept; however, due to the inability to implement projects on private ground, the involved agencies did not grant the requested Watershed Project extension and the project contract expired December 31, 2009.

- During fiscal year 2009, landowners completed some small practices such as waterways and small basins in the Rock Creek Watershed as part of the funded Watershed Project. Implementation of these practices resulted in a sediment reduction of 1,439 tons/year and 750 acres protected from June 2008 to September 30, 2009.

- Work on the Rock Creek Watershed Project at this time is limited to five grade stabilization structures in the state park. The project coordinator had selected these sites for the placement of three ponds and two large basins to address critical areas of gully erosion. NRCS completed design and DNR completed construction in 2013/2014.

This challenging watershed will require this and other innovative concepts to significantly reduce sediments and nutrients from reaching Rock Creek Lake and to eventually allow us to move forward with the D/F studies lake restoration measures.



New sediment basin at Rock Creek State Park

Storm Lake (Buena Vista County)

Storm Lake is a shallow natural lake (3rd largest natural lake in Iowa) with a surface acreage of 3,140 acres and a watershed to lake ratio of 5:1. The Diagnostic / Feasibility Study and the Impaired Water's Assessment both indicate that internal loading from re-suspension of bottom sediment is the primary source of nutrient availability and water turbidity, which supports dredging as a critical restoration approach to achieve desired improvement in water quality.

- DNR constructed a dredge spoil site at Storm Lake in 2001 and began dredging activities in 2001/2002. Lake dredging removed 1.32 million cu./yds. of sediment at a total project cost of approximately \$4.0 million during this first year of operation. Funding limitations restricted this initial dredging activity to 180-acres of the lake.
- The Lake Preservation Association (LPA) expressed a strong interest to continue dredging to achieve better water quality and from 2003 to 2013 has, along state partnership, dredged an additional 4,861,659 cubic yards of sediment. The City of Storm Lake leased the original DNR containment site and has since has constructed two containment sites east of Storm Lake.

Funds contributed to the project (2001 – 2012)

State allocation	\$8,942,920
Federal Allocation	\$1,765,000
City of Storm Lake	\$1,378,995 (Annually contributes a portion of Hotel/Motel Tax)
City of Lakeside	\$110,477 (Annually contributes a portion of Local Option Sales Tax)
Buena Vista County	\$680,000
Private Pledges	\$1,385,964

Funds contributed to the project (20012 – FY14 11/30/13))

State allocation \$1,144,054
 Local cost-share \$703,903

Total (2001- FY14 11/30/13) \$16,111,313 (63% State, 26% Local, 11% Federal)

Joint (DNR/Local) Five-year Dredging Plan (FY13-FY17)

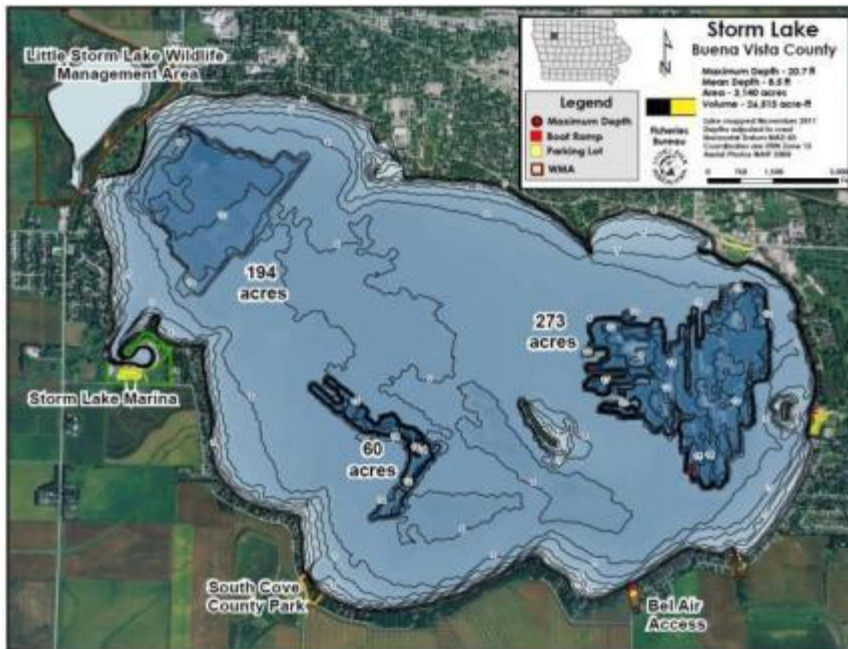
Storm Lake was mapped after the 2009 dredge season. At that point, the mean depth was 8.3 feet. Over the 2010-2011 dredge seasons, an additional 701 acre-feet was dredged, which increased the mean depth to 8.5 feet. From 2012-2013, an additional 328 acre-feet was dredged, which results in a current estimated mean depth of 8.6 feet. The dredge containment capacity, once the new site is completed, will be approximately 2.81M CY (1,742 acre-feet). Given a 3,140-acre lake, we will have the capacity between both containment sites to add 0.6 feet to the mean depth, which will result in Storm Lake having 9.2 feet in mean depth.

Year	Cubic Yards
2002	1,320,000
2003	50,000
2004	699,112
2005	548,389
2006	573,225
2007	527,837
2008	244,450
2009	559,966
2010	579,673
2011	550,604
2012	281,448
2013	246,955
Totals	6,181,659

As of fall 2013

Capacity of old containment site: 160,000 CY

Capacity of new containment site: 2,650,000 CY



Storm Lake mapped November 2011

Iowa State University, under the direction of Dr. John Downing, is completing a study aimed to determine which areas of Storm Lake and to what depths Storm Lake could be dredged in the immediate future to yield the most reduction in sediment resuspension. In addition, this project explored alternative management scenarios that may further improve water clarity in Storm Lake.

DNR fisheries and lake restoration staff met with the City of Storm Lake and Iowa State University in March 2013 to discuss preliminary findings from the ISU study. A meeting was also held in November 2013 to discuss the final findings of that study and a presentation was given by ISU. DNR, City of Storm

Lake, and ISU staff were present at the meeting. The information gathered from this study should help to guide future dredging in order to get the most benefit for water quality. The goal is for the DNR and the City of Storm Lake to continue dredging at locations and to depths that will maximize our potential to reach our water quality goals within constraints of how much dredge spoil we can contain in existing containment sites.

New Containment Site

The Storm Lake Improvement Commission accepted the low bid for the construction of the new spoil site. The low bid was for \$1,210,851.04 and is from Leroy & Son's Inc. from Arcadia. The engineers estimate was \$1,976,745.50. The new spoil site construction is complete except for a few small items and will be ready for use during the 2014 dredge season.

Little Storm Lake Ecosystem Restoration

Little Storm Lake is a 190-acre state-owned marsh that is an extension of Storm Lake (marsh and lake elevation is the same). The Lake Preservation Association (LPA) for Storm Lake applied and received a Watershed Improvement Review Board (WIRB) grant for \$200,000 to reduce the sediment and phosphorous transport from Little Storm Lake in to Storm Lake.

The DNR initially requested that DU provide a feasibility study, conceptual designs and final design/construction plans for construction of a fish barrier structure and water control structure between Little Storm Lake and Storm Lake for the purposes of renovation and rehabilitation. The DNR also entered into a contract amendment that allowed DU to assist the DNR in project bidding, construction administration, project inspection and construction staking, quantity calculations, and development of as-built plans.

This project includes a fish barrier and water control structure between Little Storm Lake and Storm Lake and the construction of a pumping station and associated equipment. Future management involves periodic dewatering of Little Storm Lake during years of favorable climatological conditions. Construction of the fish barrier will aid restoration efforts by preventing rough fish from destroying the vegetation and would decrease recruitment of rough fish by limiting their spawning area. To obtain the greatest chance for success for water quality improvement, the local community and DNR would like to renovate Little Storm Lake through periodic water level drawdown and, if needed, chemical fish renovation. This drawdown will consolidate bottom sediments, improve aquatic vegetation growth, eliminate common carp and other undesirable fish species, and ultimately improve water quality in these areas; the barrier system will prevent reintroduction of undesirable fish species.

Summary of Construction:

Through a competitive bidding process, Lessard Contracting from Sioux City was awarded the construction contract and construction began on January 28, 2011. The \$812,849 construction contract was administered by the DNR. Construction on the Little Storm Lake project was finished in 2012. Wildlife staff dewatered Little Storm Lake in an attempt to re-establish vegetation in the basin. Dewatering was successful and a vegetative response of annual vegetation was achieved. DNR kept Little Storm Lake dewatered throughout the growing season of 2013 in order to establish perennial vegetation, such as cattails and bulrush.

The Little Storm Lake project was tested during the high water events that took place in May. The infrastructure in the Little Storm Lake complex held up to the high flows and performed as designed. Little Storm Lake is currently being managed to promote aquatic vegetation in the basin. Black Hawk fish staff gave a tour and presentation of Little Storm Lake to the Roadside Managers of Iowa. The Roadside Managers held their annual meeting in Storm Lake and the focus of this year's meeting was watersheds.



Buntrock-Salie Photography, taken June 2012

Anticipated Benefits

- This aggressive dredging goal, coupled with watershed improvements and restoration of Little Storm Lake and wetland will result in significant improvements in water quality.
- In addition, lake restoration efforts so far have encouraged a \$35 million economic development named "Project AWAYSIS" that has the potential to create 690 new jobs and over \$28 million in new spending in Storm Lake and Buena Vista County.
- Completion of the Casino Bay Marina with \$3 million dollars of State of Iowa funds which allow better access and a full service boat dealership on the lake.

Union Grove Lake (Tama County)

Union Grove is a 105-acre shallow constructed lake owned by the State of Iowa, with a watershed to lake area ratio of 63/1. It has 6,640 acres in the watershed with the vast majority is in private ownership. In the late 1980s, the state dredged the lake and installed an in-lake silt and nutrient dike on the north end of the lake. The DNR purchased an additional 60-acre parcel on the southwest side of the park and constructed a 10-acre pond. Union Grove Lake was last dredged from 1988 - 1990. Dredging from Union Grove Lake involved removal of 275,000 cubic yards of sediment Accumulated since the lake was built in 1936.

Spillway water seepage had been an on-going problem at Union Grove Lake and past attempts to repair the problem had limited success. DNR hired a geo-tech firm in 2005 to evaluate the problem and contracted a firm in 2006 to repair the structure. The DNR completed the project in July of 2007 and successfully addressed the water seepage issue. Total project cost for the spillway repair was \$178,572, with the Lake Restoration Program as the funding source. The construction firm also made several recommendations for additional future spillway modifications that will preserve the integrity of the system at an estimated cost of \$40,000.

Union Grove Lake is on the Iowa's impaired waters list because of four limitations: pH, bacteria, algae, and turbidity. The Union Grove Lake Watershed Project has been underway since April of 2008. The project aims to reduce the soil and phosphorus reaching the lake, as well as reduce the effects of livestock on streams in the watershed.

As progress continued in the watershed, a 116-acre parcel at the top of the lake went to auction. This strategically important piece of land that filters 40 percent of the watershed was purchased by the Iowa Natural Heritage Foundation and held until the DNR's watershed improvement section, using EPA section 319 funds, and local supporters could purchase the \$695,000 parcel. This acquisition will be seeded with perennial prairie grasses and an existing wetland will be expanded providing permanent water quality protection for the lake.

Local partners, with the DNR have updated the plan to improve the lake and water quality conditions. The Tama SWCD Watershed Project Coordinator worked to revise and approve the Management Plan. In addition, the Tama County Sanitarian completed a report on a septic plan for the lake community.

DNR Lake Restoration has started working with our engineers on initial survey and planning and anticipate implementing shoreline stabilization, renovation of the fishery, modification of the spillway, habitat improvement and dredging from 2014-2016.

The lake will be drawn down, fish eliminated to get rid of carp and yellow bass, and the lake outlet will be modified to prevent rough fish from reentering the lake. An improved Union Grove Lake when paired with the renovated state park will likely see increased visits and use of the area.

The renovated campground features a new shower house and bathroom, nine campsites with electricity, water and sewer connections and two campsites with electricity among the 25 campsites available.

The \$400,000 campground renovation project was completed in 2012. Part of the renovation included adding a new four season modern family cabin with air conditioning.

Lake Restoration Program (LRP) – Projects In Outreach; Evaluation/Planning Stage

Diamond Lake (Poweshiek County)

Preliminary engineering has been done to repair and modify spillway. Possible construction date would be summer of 2014.

George Wyth Lake (Black Hawk County)

George Wyth is a sand borrow-lake with relatively low overall fertility when compared to other Iowa Lakes. George Wyth's historic fishery was moderate to poor, due to relatively low productivity and a lack of aquatic vegetation. Water quality parameters in George Wyth Lake compare favorably to other Iowa lakes, due to a low watershed to lake ratio and relatively small portions of watershed in agricultural production.

- The DNR Watershed Improvement Section completed a Water Quality Improvement Plan for George Wyth Lake in 2008 to address impairment due to high bacteria levels on the beach, with the primary cause for impairment identified as resident geese.
- Fisheries Biologists introduced aquatic macrophytes into George Wyth Lake in the fall of 2009 on an experimental basis. Wild Celery and Narrow-Leaved Pondweed were introduced into two enclosures designed to exclude aquatic herbivores.
- During a vegetation inventory completed on George Wyth Lake in 2010, DNR staff found six species of submersed aquatic plants and two species of floating-leaved aquatic plants. Wild Celery planted during 2009 was found within enclosure structures and narrow-leaved pondweed planted in 2009 was found at multiple locations in the lake. During 2010, about 15% of the lake was covered with aquatic vegetation. George Wyth Lake was practically devoid of vegetation from 1988 – 2009, so biologists are optimistic that an aquatic plant community will improve water quality and fishery resources in the lake. Biologists are uncertain as to what caused the proliferation of vegetation in 2010, but the most likely explanation is that the flood of 2008 delivered sediment, seeds, and plant fragments to George Wyth Lake.
- During 2010, George Wyth Lake experienced high water levels for much of the year due to persistent flood conditions on the nearby Cedar River. High water conditions and an increased abundance of aquatic plants promoted improved water clarity and improved overall water aesthetics at George Wyth Lake during 2010.
- During 2011, biologists identified seven species of submersed aquatic plants and two species of floating-leaved plants. Wild Celery was not found among the plants during 2011 and plant enclosures were removed from the lake. Unfortunately, brittle naiad (an aquatic nuisance species) was found in a small section of the George Wyth during 2011.
- The proliferation of vegetation in George Wyth during 2010-2011 was beneficial to the George Wyth Fishery due to increased fish habitat and improved water quality. Observational information from DNR Parks and Fisheries staff suggest increased recreational use and improved fishery quality during 2011.

- George Wyth Lake experienced reduced lake water levels during 2012 resulting from drought conditions, and the quality and quantity of aquatic vegetation were much reduced from 2010-2011 levels. Fisheries personnel spot treated brittle naiad in an isolated (about 0.5 acre) section of lake to reduce the potential for spreading to additional areas of lake. The lake beach was reopened in the western basin of the lake during 2012. Fisheries personnel will be adding fabricated fish habitat structures to the lake during 2013.
- George Wyth Lake water levels were near “full-pool” for most of 2013 in response to high discharge in the nearby Cedar River (water levels in George Wyth are largely dependent upon groundwater recharge that varies with the water-level height on the Cedar River). Increased water volume led to improved water clarity in George Wyth during 2013. The Iowa DNR Fisheries Bureau teamed with the Iowa DNR Parks Bureau and Cedar Valley Walleye Club to add 45 fish habitat structures into George Wyth Lake during July.



Cedar Valley Walleye Club Members and Iowa DNR Fisheries working together on a fish habitat project at George Wyth Lake in Waterloo.

Kent Park Lake (Johnson County)

A planning meeting is scheduled for early next year to develop a project plan and get a watershed assessment schedules.

Lake of the Hills (Scott County)

Lake of the Hills (LOH) is located in Davenport, Iowa. The main basin of the lake is 54 acres with an approximately 2,000-acre watershed. LOH is the largest lake in a complex of four (Bluegrass Lake, Railroad Lake, and Lambach Lake) that make up the West Lakes. The other three lakes serve as sediment retention ponds but offer recreational fishing.

Lake of the Hills H is often listed on the 319 list for algal turbidity or bacteria and has both gizzard shad and grass carp. There is also a private lake, Lake Canyada that adjoins the complex and suffers from poor water quality. There has been strong interest from the partnering agencies to develop a plan for lake restoration and a great deal of progress has been made on initiating this effort. For example, the Scott CCB entered into an agreement with Pathfinders Resource Conservation and Development to assist in the development of a watershed management plan and grant writing. NRCS has even begun to contact landowners about the possibility of implementing projects to reduce sediment delivery. There is potential for work (e.g., rain gardens, fertilizer application) in housing developments adjacent to the lake complex as well.

Over the course of 2013 the Scott CCB, DNR, and IDALS have worked together to gain a better understanding of the watershed. A RASCAL gully and land cover / management survey was conducted during the spring/summer 2013. Assessment included land use, erosion, tile outlets, and sediment delivery.



Lake Keomah (Mahaska County)

- DNR held a public meeting in fall of 2009 to gauge local support for restoration activities at Lake Keomah. The Mahaska County Soil and Water Conservation District applied for, but did not receive, a watershed assessment grant to evaluate the status of sheet and rill and gully erosion within the watershed in 2008. They completed a sheet and rill assessment in 1991; however, it did not include any assessment in the State Park or in Keomah Village.
- Current activities center on the creation of a “Friends” group for the State Park, laying the groundwork for local support and participation in future restoration activities.
- DNR Watershed Improvement Section completed a Water Quality Improvement Plan in 2012 to address non-support of designated recreational use due to impairment issues of algae and pH.
- DNR Lake Restoration Program has identified Lake Keomah as one of our 35 priority lakes for restoration: however funding limitations will prevent in-lake restoration from moving forward for at least several years. However, following watershed needs identified in the TMDL, there could be projects undertaken to make needed watershed improvements and the LRP will continue to coordinate with project partners regarding this project.

Lake Miami (Monroe County)

Lake Miami is a 122-acre impoundment located on the 776 Miami Wildlife Area, approximately 6 miles northwest of Albia, in Monroe County. The lake, constructed in 1961, is owned by the Iowa Department of Natural Resources. The area is cooperatively managed by the Iowa DNR and through a 28-E agreement by the Monroe County Conservation Board, which operates campground, cabin rental, and a nature center facility on 89 additional acres of adjacent County Park. The lake and park provide facilities for boating, fishing, camping, picnicking, and hiking. Park use, as determined in the recent Center for Agricultural and Rural Development (CARD) study is estimated at approximately 43,000 visits per year. Approximately 160 hours of angling effort per acre are expended annually at Lake Miami. However, the most recent creel surveys suggest angling activity has declined in recent years.

The Iowa Department of Natural Resources (DNR) has identified Lake Miami as impaired and has placed it on the Clean Water Act Section 303(d) list of impaired waters in the state. The identified pollutant is siltation from agricultural non-point sources (NPS) impairing aquatic life in the lake. In addition, Lake

Miami is one of the significant publically owned lakes in Iowa as identified by the Iowa Department of Natural Resources Lake Restoration Program.

From 1971 to 1991 mean Secchi disk readings exceeded 25 inches eight out of 10 times (80%) while since that time mean Secchi readings have exceeded 25 inches only four out of 10 times (40%). These data indicate a substantial decline in Secchi transparencies in this time. According to the Lake Classification Report completed by ISU, Lake Miami ranks in the lower 1/3 for water clarity out of the 131 lakes studied. Possible reasons for the decline in water quality include turbidity from sediment, nutrient delivery from sheet/rill and gully erosion in the watershed, shoreline erosion due to wind and wave action and the re-suspension of these bottom sediments and their associated nutrients from wave action, and re-suspension of sediments by rooting action of Common Carp.



The Monroe County Soil Conservation Commission applied for and was awarded \$17,000 (\$15,000 from Division of Soil Conservation with \$2,000 from Iowa Lake Restoration funding) for an updated watershed assessment of the Lake Miami Watershed. This assessment was completed fall 2012. Current effort from the Monroe SWCD is development of a Water Quality Management Plan with the goal of applying to various sources of funding (e.g. Watershed Improvement Review Board, Publicly-owned Lakes, Water Protection Fund, Watershed Protection Fund and DNR Watershed Improvement 319 funds) and initiate watershed improvement activities.

Preliminary results indicate that while multiple structures have been completed in the Miami watershed, many of these structures have reached the end of their design life and are no longer functioning properly.

An assessment of the fishery indicated that common carp are present in excess of 400 lbs/acre while gamefish biomass is minimal. Angling quality has decline dramatically in recent years, mirroring changes in water

quality. Lake Miami was listed on DNR Fisheries Bureau 5-year capital plan for dredging in 2004; however, the project was removed from the plan due to funding limitations with the intention of returning it to the capital budget at the earliest time possible. DNR Lake Restoration Program has identified Lake Miami as one of our 35 priority lakes for restoration: however funding limitations will prevent in-lake restoration from moving forward for at least several years. However, the LRP will continue to coordinate with project partners regarding this project and the potential for assistance with implementation of watershed improvement practices.

A shoreline survey was conducted at Lake Miami in February of 2013. A total of 10,000 feet of priority shoreline was identified from this survey. Eroded bank height ranged from 2 feet to over 15 feet and recession rates are estimated at between 0.2 and 1.0 feet / year. Total annual sedimentation from shoreline is estimated at 786.97 tons / year. 2001 RUSLE estimates of sediment delivery were 1,120 tons/yr to the lake. However, 2012 estimates are nearly 3 times higher than that at a rate of 3,324.79 tons / year. When combined with the shoreline erosion rate total sediment delivery to the lake is 4,111.77 tons/year or 33.70 ton/acre from the lake basin per year. The Lake Miami Watershed Management Plan is to be completed by April 2013. While more than 45 basins have been constructed in the watershed, many of these have reached the end of their design life and are in need of alteration to meet their desired function. MFT funds appear to be available for a shoreline restoration project in winter

2014/2015. The Monroe County SWCD and IDALS will work with DNR Fisheries to capture WIRB funding to continue this restoration project.

The fish population at Miami was renovated in late October 2013. A total of 11 barrels of rotenone were applied, which was approximately 1/3 of the chemical estimated for this renovation. The change in chemical needs is the result of a 10' drawdown that was accomplished to facilitate archeological surveys to make way for the future shoreline restoration project. Temporary carp exclusion is being purchased for placement by the end of November and will be funded by lake restoration. A permanent carp barrier will be constructed in the Miami spillway in the winter of 2013/2014 to reduce changes of upstream carp migration into this renovated system.

Little Wall Lake (Hamilton County)

A working group has met three times to work with a local group on concerns with lake levels and future lake management. The group is looking into future management of the past used lake dredging project containment site, low dose rotenone treatment to remove grass carp and yellow bass, alternate water sources for lake level enhancement on dry years, and improved public access facilities and opportunities. DNR Engineering is currently looking at options to re-grade the old containment site with the goal of adding 60 acres to lakes watershed.

Mariposa Lake (Jasper County)

- The Mariposa watershed project ran through June 2011. The NRCS completed a waterway project in spring 2009. The Jasper County Conservation Board has completed bank stabilization practices along approximately 900 ft of shoreline using rock riprap and coconut fiber logs and has completed a 3-acre timberstand improvement project. An overgrown area over a gully was cleared to approximately 25% canopy cover to allow grasses to grow and seeded to native grasses and wildflowers.
- Jasper County Conservation installed a 3.9-acre wetland in 2012. The wetland will collect run off from 368 acres of watershed and it will benefit the in-lake water quality by filtering sediment & nutrients.



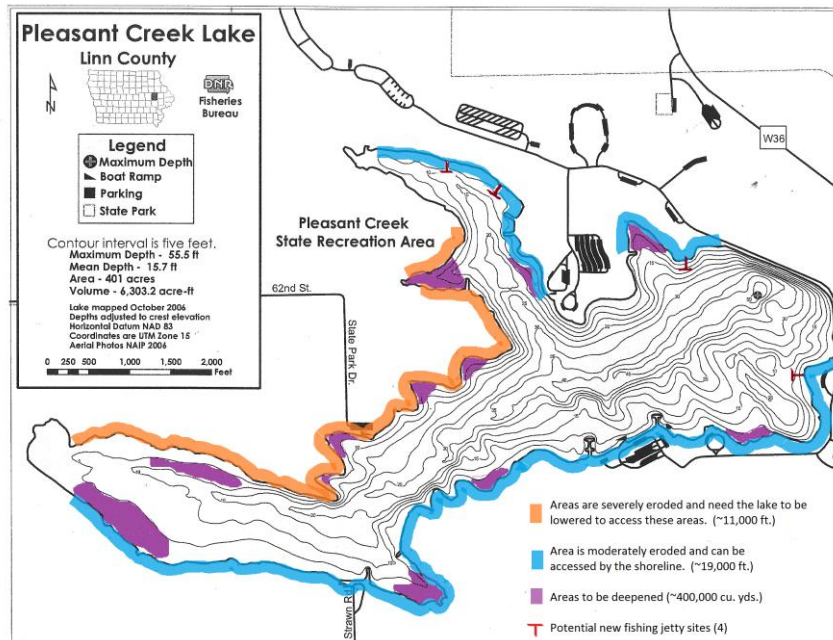
- Lake Restoration staff met with the Jasper CCB in July 2013. The plan is to continue discussions in 2014 and begin collecting information (e.g. testing and mapping of bottom sediments, archeological investigation) and potential of additional work in the watershed on both public and private ground.
- Mariposa Lake was mapped by Iowa DNR Fisheries staff in 2013. Sediment volume will be calculated and dredging costs will be projected.

Jasper County Conservation installed a 3.9-acre wetland in 2012. The wetland will collect run off from 368 acres of watershed and it will benefit the in-lake water quality by filtering sediment & nutrients.

Pleasant Creek Lake (Linn County)

Pleasant Creek is a 401-acre lake owned by the State of Iowa with a watershed to lake ratio is 5:1. The State owns 90% of the 2,035-acre watershed. The other 10% is mainly in timber.

A meeting was held in October 2013 with DNR Parks, Lake Restoration and IDALS regarding developing a management approach and time line for the project. The plan is for DNR Fisheries and Parks to work cooperatively with IDALS in developing a watershed plan to address potential issues. From initial survey, there may be some opportunity to do some gully control structures on park property and review/update land management approaches on state ground. In-lake restoration will include shoreline riprap, shoreline deepening and fishing jetty development. Lake Restoration has funding in FY15-FY18 of their ten-year plan for lake and watershed improvements.



The local power plant utility contributed financially to the acquisition of land for building Pleasant Creek dam and for dam construction. As part of the original financial contribution, they were granted the option to pump water from the lake to serve their power plant operation needs. Recently, the utility has approached the DNR indicating that they no longer have this water need and want to relinquish that right.

Pleasant Creek Dam has a crack around the valve housing and leaking water and the initially proposed fix to seal the pipe prior to turning complete rights of the dam to the DNR may not be acceptable to the DNR because it might limit our future ability to lower the lake for management/repair purposes. DNR Engineering will be investigating the problem further and DNR is in discussions with the utility company on how to resolve repair and transfer of control to the DNR.

Rathbun Reservoir (Appanoose County)

- Rathbun Land and Water has been successful in assisting 400 farmers with BMP application for priority land in 24 targeted sub-watersheds; they helped apply BMP on 16,500 acres (goal: 60,000 acres); these practices will reduce sediment delivery to Rathbun Lake by 25,600 tons per year (goal: 84,000 tons). In addition' these BMPs will reduce phosphorus delivery to Rathbun Lake by 110,400 pounds per year (goal: 360,000 pounds).
- The State and Army COE have been working on in-lake work to protect vital habitats and improve water quality in several bays on the lake by protecting shoreline. Stabilized shoreline loss will reduced erosion and improve water quality. The COE is constructing the Rathbun Lake Habitat

Restoration Project under Section 1135 of the Water Resources Development Act (WRDA) of 1986. Cost-share (75% COE / 25% DNR).

- Phase 1 of the Rathbun Lake Section 1135 project addressed seven sites with rock quantities exceeding 45,000 tons. In addition to water quality improvements, fish habitat was improved for a number of important game fish species. Work was completed spring 2011.
- Phase 2 of the Rathbun Lake Section 1135 project addresses the Honey Creek Resort Point. Honey Creek is a 300 plus acre arm of Rathbun Lake and provides some of the highest quality crappie spawning habitat available in the lake. Protection of the Honey Creek Resort Point will provide water quality benefits that will translate into improved crappie habitat and production, and secondarily will preserve Resort infrastructure from flood damage. Total rock quantities to be placed exceed 40,000 tons. Work was completed by spring 2012.



Final phase of the joint COE/DNR Section 1135 project was to restore an additional 500' of shoreline. This work was completed fall 2012.

Rathbun Section 1135 Final Cost Share			
Total Project Cost		\$6,512,000	
Federal Share (Cash)		\$4,884,000	
DNR Share		\$1,628,000	
DNR Share Breakdown:			
Cash			\$1,548,000
In-Kind South Fork Construction			\$26,000
In-Kind S-13 Wetland Design			\$25,000
In-Kind Lands for S-13			\$29,000

Silver Lake (Delaware County)

Silver Lake is a small, natural lake enlarged by the construction of a dam. It has a 34-acre surface area lake and a lake ratio of 6.4/1. University of Northern Iowa completed a diagnostic feasibility study in 2001 and the DNR completed a Water Quality Improvement Plan analysis in 2001. Lake depth maps and sediment borings indicated excessive lake sedimentation depths ranging from 0.5 to 4 feet. A lake watershed assessment conducted in 2001, documented areas of high phosphorus input in the watershed. The assessment also identified excessive manure application levels as a problem. NRCS continues to work with landowners in the watershed to reduce nutrient and sediment lake inputs.

- In 2001, an engineering firm evaluated dam integrity and leakage issues. The construction firm hired to repair the dam and eliminate dam safety issues completed the work fall of 2007 at a cost of

\$314,950. Lake water overflowed the Silver Lake spillway in April of 2008 following dam repair and wet weather conditions. According to local reports, that marked the first spillway overflow since 1993. Silver Lake has remained near full pool throughout 2008-2011, which indicates that dam repairs completed during 2007 were very effective.

- Submersed aquatic vegetation and water clarity have responded favorably to higher water volume and water levels that are more persistent. Vegetation was largely absent from Silver Lake during the 2006 and 2007 growing seasons and Secchi transparency commonly fell below 24 inches. Aquatic macrophytes (primarily coontail and narrow-leaved pondweed) were abundant during the summer of 2009, 2010, and 2011. Increased vegetation can pose a nuisance to recreational fishing, boating, and lake aesthetics; however, the dense vegetation coverage promotes improved water clarity and reduces the abundance of free-floating algae.
- DNR completed a Water Quality Improvement Plan for Silver Lake in the fall of 2008 and this study highlighted watershed areas responsible for primary phosphorus delivery. The goal is to form local action committees to address watershed inputs. Following watershed improvements that reduce sediment delivery and phosphorus inputs, the community and biologists are hoping to remove phosphorus-rich sediments from Silver Lake to help reduce problems associated with internal phosphorus loading. During 2010, members of the Delhi Community formed a small community-led workgroup. This workgroup held two meetings during the 3rd quarter of 2010 to discuss options for watershed improvement and in-lake water quality improvement. Activity of this group lost momentum during 2011.
- Silver Lake suffered a moderate winterkill during the severe winter of 2010-2011, which effectively eliminated largemouth bass from the system and reduced the bluegill population. DNR Fisheries restocked Largemouth Bass in June 2011 and the bluegill have recovered favorably during the 2011 growing season. Silver Lake had reduced fishing pressure during 2011 because of the recent fish kill, but fishery use is expected to increase substantially during 2012.
- Recovery of the fishery following the severe winterkill of 2010-2011 has proceeded within expectations. Largemouth bass in the 8-10 inch size are now common and the lake contains high numbers of 3-6 inch bluegills and 5-7 inch black crappie with a few larger individuals present. Silver Lake is approximately 6-feet below crest following the drought of 2012 and significant rain will be required to reach full pool. Barring a severe winter during 2012-2013, it is expected that Silver Lake will provide good opportunities for largemouth bass and bluegill during 2013. Watershed improvement work is still needed and a small group of local residents remains dedicated to improving the resource.
- Fish populations in Silver Lake continue to thrive following the winterkill event that occurred during 2010-2011. Largemouth Bass in the 8-10 inch size are now common in Silver Lake with some individuals up to 14 inches. High numbers of 4-7 inch bluegill are present and these fish are expected to provide good winter fishing opportunities during the 2013-2014 ice season. Anglers continually report good catches of bass and bluegill, as well as modest catches of northern pike in the 20-30 inch size range. Observations of much increased fishing pressure were reported by County Conservation Board staff, Iowa DNR staff, and Delhi residents during summer 2013. A new boat ramp is planned for Silver Lake during spring 2014. Silver Lake was about 18-inches below crest during fall 2013 despite a late summer drought and this continues to support that dam repairs made during 2007 have greatly improved water-level stability. Watershed work has not progressed during the past year, but lake activists and DNR continue to seek opportunities for watershed improvements at Silver Lake.

In a letter dated November 10, 2012, the City Council of Delhi, Iowa requested continued support from the DNR Lake Restoration Program to pursue water quality improvement efforts at Silver Lake in Delaware County. An example of the need from our local communities for these types of projects.

Silver Lake (Palo Alto)

The Silver Lake Protective Association was successful in 2012 at acquiring local grant money to pursue survey, design, and engineering of a fish barrier on the existing outlet structure and determining the feasibility of using the existing drawdown structure. That project is complete and a set of drawings and hydraulic analysis were completed this spring.

In August 2013, the lake association met with Fisheries, Wildlife, and Lake Restoration staff. The meeting provided the association with a framework for moving towards a restoration project. A proposal for a diagnostic and feasibility study was prepared by ISU and presented to the Silver Lake Association. The Association has committed approximately \$44,000.

Swan Lake (Carroll County)

Black Hawk fisheries staff has been working closely with the Carroll CCB in efforts to re-establish emergent vegetation around the perimeter of Swan Lake. Siphoning and pumping efforts have taken the lake 4 feet below the crest of the spillway, which was the goal of the draw down project. There was a vegetative response to the draw down, however it was mostly annuals that came in, which was expected. The draw down will occur throughout the 2013 season in order to establish a good stand of perennial vegetation, such as bulrush and cattails.

DNR monitored Swan Lake throughout the summer and observed a very good vegetative response of annual species, such as smartweed and yellow nut sedge. DNR also found bulrush and some cattail in several areas. In addition, we attempted an experimental removal of grass carp with a commercial angler using trammel nets. Through our efforts were removed 40 grass carp from Swan Lake. 300 grass carp were originally stocked in Swan Lake since the renovation in 2004 and none have been stocked since. Due to the success of removing grass carp, we are planning to attempt another removal effort through the ice when the grass carp cannot jump the nets. The Carroll CCB is paying for the services of the commercial angler. The deepest part of Swan Lake is only 6 feet right now. Although we have winter aeration there, we are still going to bring some water back into the lake via well/pipeline. The Carroll CCB is also paying for the cost of pumping in water and running aeration. We plan to take water off Swan Lake next spring, although based on the vegetative response, not as much. We hope to bolster the emergent perennial vegetation next year and have the lake at full pool by the fall/winter of 2013.

Water Level Management

Last year Swan Lake underwent a partial draw down in an attempt to establish emergent perennial vegetation. Although some progress was made, a second year was needed to establish the perennial plants. On June 12th the Godwin Pump was set up to dewater Swan Lake for a second year. The water was already low, but the pump was put in place to manage water levels during rain events. Bulrush and arrowhead have started appearing along the fringe area of the lake. The Godwin Pump was shut down and disassembled for the season on Swan Lake in late August. It was winterized and is now in covered storage. There are no plans for a partial draw down on Swan Lake next year.

Wetland Restoration

The Carroll County Conservation Board was awarded a WIRB grant to construct a 4-acre wetland in the watershed of Swan Lake. Part of the matching funds, which are required for a WIRB grant, were promised by the NRCS, but they backed out at the last minute. Black Hawk fisheries staff worked with the Carroll CCB and Lake Restoration to keep the project on track despite the setback. Lake restoration staff provided \$7,000, which is what was needed to cover what was promised by the NRCS. The Carroll CCB is in the process of acquiring permits and completing engineering and design. Once constructed, the wetland will play a major role in helping to filter out nutrients before water reaches Swan Lake.



Planned construction of a new wetland will increase the detention time of the main inlet to the lake. This would reduce both sediment delivery (slower-moving water will drop out more fine sediment) and soluble nutrient delivery (more time for aquatic vegetation to uptake the nutrients). The wetland is an instrumental part of our Swan Lake Watershed Management Plan and its construction will be critical to improving water quality by reducing the amount of sediment/phosphorus that enters the lake from the watershed.

Twin Lakes - North and South (Calhoun County)

Local DNR fisheries and wildlife biologists met with the Twin Lakes Restoration Association (TLRA) to discuss water quality issues in the lake system. Local DNR staff fielded a number of calls throughout 2011 in regards to water quality issues and potential projects at both lakes. The TLRA invited local biologists to attend a meeting and provide information regarding water quality projects.

- Biologists explained that the best way to start a water quality project is to conduct a comprehensive Diagnostic Feasibility Study on both lake systems. The TLRA has sent a letter to the Director of the DNR requesting that the Twin Lakes System be included in the Lakes Restoration Program budget to fund a DF Study.
- The potential for a successful restoration project on the Twin Lakes System is high. North Twin Lake has an average depth of 8.7 feet, which is relatively deep compared to other natural lakes in the region. Additionally, both North and South Twin Lakes have a relatively small watershed to lake ratios and although the land surrounding the two lakes is primarily in row crop production, the slope of the land is low.

Black Hawk Fish Management staff attended a meeting with the North Twin Lake Restoration Association and Senator Beall in March 2013. The purpose of the meeting was for DNR staff to provide information on what is involved with a Diagnostic Feasibility Study, how the study is conducted, and what to expect if such a study were to be carried out. Senator Beall provided information on legislative and budgetary issues.

- The DNR signed a \$209,854 contract with Iowa State University to carry out a DF Study, which started in October. The DNR intends to utilize the information gathered and analyzed in this Contract to plan and implement lake and watershed improvement efforts on North and South Twin Lakes.
- The Twin Lakes Restoration Association has pledged \$43,000 to help DNR Lakes Restoration fund the DF Study. In September 2013, Black Hawk fish staff and members of the TLRA met with the Calhoun County Board of Supervisors to discuss a partnership. The Board of Supervisors pledged to contribute \$20,000 to lessen the burden of the TLRA's responsibility for providing match money. Black Hawk fish staff and members of the TLRA also met with the Calhoun SWCD

to discuss the same issues. The SWCD pledged to contribute \$1,000 to the DF Study. The largest contribution from the SWCD will most likely come in the form of grant applications and employing a watershed coordinator as the project progresses.

- In November 2013, Iowa State University and the DNR held a public meeting at North Twin Lake to present and discuss the DF Study that will be carried out on North and South Twin Lakes. Approximately 40 people attended.



Map of the Twin Lakes identifying primary (white symbols) and proposed secondary (yellow symbols) monitoring stations.

Special Projects

Lake Delhi (Delaware County)

Lake Delhi, a 450-acre on-stream impoundment located on the Maquoketa River in Delaware County, was not included as one of the top thirty-five priorities or on the initial list of significant public lakes for several reasons. Lake Delhi technically is an on-stream impoundment and has a huge watershed draining into it (220,000 acres). With such a large watershed, lake improvements cannot be sustained for the required 50 years, and the water quality goals cannot be met. The DNR Lake Restoration Program, following the legislative plan, is involved in a number of lake restoration projects around the state and none of the current or past projects has such large watershed-to-surface acreage lake ratios. Lake Delhi's watershed-to-lake ratio is 488/1, and as stated above and based on experience and past restoration work, ratios greater than 100/1 are almost impossible to control. A watershed as large as Lake Delhi's could not be adequately treated to meet the water quality guidelines that permit the program to initiate in-lake restoration.

2010 Flood Event

The Lake Delhi Dam is located southwest of the city of Delhi, Iowa and forms an impoundment on the Maquoketa River. During the flood event of July 23-24, 2010 a portion of the southern earthen embankment of the privately owned dam was breached and eroded by the flood and the concrete spillway's gates were damaged. Floodwaters also infiltrated and seeped through a section of the northern embankment.

When the Delhi Dam breached during high water in July, it created a waterfall from the higher situated bed of Lake Delhi that had been receiving silt for 80 years, to the river below. The force of the falling water ate away at the silt, moving the waterfall gradually upriver and causing tremendous loads of silt to be released downstream. Any areas this head cut passed were highly susceptible to rapid channel

widening during high water, which released sediments even more rapidly. It was estimated that hundreds of thousands of tons of silt had been released into the river downstream creating maintenance problems, recreational problems and threats to aquatic life.

Iowa Governor Chet Culver issued a disaster declaration in October 2010 charging the Iowa Department of Natural Resources to stabilize the Maquoketa River's eroding lakebed. Under direction of the disaster declaration, the DNR Policy and Coordination Bureau submitted a project request to develop and implement an engineering project to stabilize the head cut. The DNR also collaborated with the Lake Delhi Recreation Association with assistance from the Natural Resources Conservation Service to complete the project. The resulting project was construction of two riffle areas. One initiative sought to head off the lakebed erosion at the County Road X29 bridge. To stop the erosion, the project called for removing much of the accumulated silt and adding rock riffles to the bed. Much of the work took place under water. The other work, which took place at the Delhi Dam and cleaned up breach site, used loose rock to shore up the remaining portion of the dam and created a stilling pool upstream of the breach area. The two projects in the Maquoketa River designed to stabilize the former bed of Lake Delhi are now complete.

The DNR, operating under the understanding that they would be re-imbursed for stabilization of the Maquoketa River, paid for the \$666,049 project out of DNR Lake Restoration Program funds with the intent of having the Program re-imbursed. Federal Emergency Management Agency (FEMA) was identified as a potential funding source. However, at this point the DNR has not been able to secure FEMA reimbursement. The DNR has submitted necessary documentation to FEMA and is currently examining the opportunity to appeal if funding is denied.

Feasibility Study for Dam Restoration

The DNR has also entered into a Cooperative Agreement with the Lake Delhi Combined Recreational Facility and Water Quality District to fund a preconstruction dam restoration study as directed under House File 648. The District has entered into this Cooperative Agreement to retain consulting services for analysis of conditions for reconstruction of Lake Delhi Dam; preparation of regulatory documentation for the reconstruction of Lake Delhi Dam; preparation of construction documents for the reconstruction of Lake Delhi Dam; bidding services and engineering services during construction.

Funding for this project was appropriated during the 2011 legislative session per HF 648.

"Of the amount appropriated in this lettered paragraph, \$350,000 shall be allocated to a county with a population between seventeen thousand seven hundred and seventeen thousand eight hundred as determined by the 2010 federal census, for a lake with public access that has the support of a benefited lake district. The allocated moneys shall be used for purposes of completing a preconstruction dam restoration study that would include a geotechnical evaluation, hydrological studies, restoration alternatives and construction specifications. The preconstruction dam study shall be filed with the general assembly upon completion". This project is not typical of our current lake restoration process; however, it was supported through legislative direction. To-date, all available funds have been billed for this project.

Restoration of Lake Delhi Dam

The Iowa legislature appropriated a total of \$5.0 million (\$2.5 M from FY13 and \$2.5M from FY14) from the Rebuild Iowa Infrastructure Fund for the restoration and reconstruction of Lake Delhi dam under SF 2316 of the 84th General Assembly, with administration of funding was given to the DNR. Funding for restoration and reconstruction of the lake and dam is being handled through a grant from the DNR to the Lake Delhi Combined Recreational and Water Quality District (the District) and covers architectural and engineering design costs, including all related survey; acquisition of real estate and property rights; construction management costs; and construction labor and material costs.

As of November 30, 2013, the District has requested \$285,200 of the appropriated \$5.0 million in funding for re-payment of eligible expenses.

Shallow Lakes Management Initiative

Shallow lake management has always been a challenge in Iowa and around the world. Shallow lakes are scattered throughout Northwest Iowa and, in most of these lakes water quality is less than desired. In fact, most of these lakes are turbid, algae-dominated systems with little to no vegetation, and poor sport fisheries comprised mostly of common carp (*Cyprinus carpio*), and black bullheads (*Ameiurus melas*). Successful restorations of deeper lakes have historically focused on reducing nutrient inputs by repairing the watershed and/or removing phosphorus-laden sediments from the lake. Successful shallow lake management strategies require intensive in-lake management strategies that can immediately flip the basin from the turbid-water state to the clean-water state, and long-term watershed protection efforts that help maintain clean water over time.

Shallow lakes differ substantially from deeper lakes in many respects. Shallow lakes usually exist in either of two alternative stable trophic states with or without any change in the nutrient budget of the lake. These lakes can exist as very turbid, algae-dominated systems with little to no vegetation, or as clear water, macrophyte dominated systems. In shallow lakes, the benthivorous and planktivorous fishes along with wind and wave action and in some cases heavy boating traffic can perpetuate the algae dominated system.



Severe blue green algae blooms are capable of producing during warm weather in unhealthy shallow lakes.

By controlling or removing the factors perpetuating the algae dominated turbid system, it is possible to "flip" the system into a clear water macrophyte dominated system. The positive impacts of emergent and submergent vegetation on water quality are due to several factors. Rooted vegetation prevents resuspension of sediments into the water column by solidifying bottom sediments and suppressing wind and wave action. Rooted plants provide habitat for periphyton and zooplankton and fish species commonly found in clear water lakes.

Rooted vegetation also ties up nutrients making them unavailable for algae. Some plants also release allelopathic substances into the water suppressing algae growth. Many of these mechanisms are difficult to assess and vary among water bodies; however, their combined effect stabilizes the clear water trophic state. Both the clear water macrophyte state and the algae dominated state are stable, and it takes a major perturbation to move from one state to another. Three methods that show great promise to cause the shift from the turbid to the clear water state are benthivorous fish control, heavy piscivore stockings (to control both benthivorous and planktivorous fishes), and water level draw downs. The goal of this project is to develop tools that managers can use to shift and maintain shallow lakes in a clear water state.

Many natural Lakes in Northwest Iowa are characterized as these shallow, windswept systems that exhibit poor water quality. Significant watershed changes and the introduction of common carp in the late 1800's have forever made management of these water bodies a challenge. Through work accomplished on the projects listed below, great strides have been made in our understanding of these systems. These ground breaking projects in Iowa will undoubtedly lead to others as the health to these unique water bodies is restored. Success is also being measured in public education and outreach, communities and user groups are coming together to make these projects truly successful demonstration

models for improving not only water quality, but fostering partnerships for the long-term active management required to maintain the health of these lakes.

Good water quality and healthy aquatic plant communities can become evident through shallow lake improvement projects

Iowa DNR's Wildlife and Fisheries Bureaus in cooperation with Ducks Unlimited have established a list of shallow lakes prioritized renovated. The current focus of the Lake Restoration Program is on shallow lakes that support both fishing and wildlife benefits. In addition, there is an emphasis on shallow systems above important natural lakes.



Shallow Lake Projects

Pickerel Lake (Buena Vista County)

Pickerel Lake, located in extreme NE Buena Vista County, is a 170-acre basin that suffered from the same problems as most other shallow lake basins in the upper Midwest; poor water quality due to an intensively cultivated watershed, an overabundance of rough fish, and a lack of beneficial aquatic plants. Even with poor water quality, walleyes have surprisingly been able to reproduce in Pickerel Lake. Project partners initiated intensive in-lake management to enhance water quality, fish and wildlife habitat in Pickerel Lake. In addition, they will continue to work long-term throughout the watershed to ensure that soil, fertilizers, and pesticides stay on the uplands. In-lake actions included installing a new water control structure and fish barrier on the lake's outlet and enhancing existing draw down channels in the lake and downstream of the new water control structure. Once this infrastructure was in place, the DNR temporarily drained the lake to allow for the elimination of problem fish, the consolidation of bottom sediments, and the establishment of beneficial aquatic plants.



Pickerel Lake in drawdown condition (left). The outlet structure replaced at Pickerel Lake now incorporates both the ability to control water levels and a fish barrier to keep rough fish out of the lake.

The new outlet and water control structure at Pickerel Lake (right). Overhanging fingers allow debris to flow over the barriers but keep carp from jumping up into the lake from downstream. Note the barriers on the stop logs can move up and down with the elevation of the logs.



Pickerel Lake was drained in the late winter/early spring of 2011 and now has gone through its second year of a draw down since the project's inception. No boards were put in the stop log structure to hold water in 2012 and good stands of perennial emergent vegetation were established. Some attempts were made to hold water in Pickerel Lake in 2013, but water levels are quite low. Even with low water levels, 42,000 yellow perch were stocked into Pickerel Lake in July 2013 in the hope to get a start on the fishery going into 2014.

Rice Lake (Winnebago County)

Local interest has developed for shallow lakes management on Rice Lake. The fishery has declined and the water quality is currently poor. DNR held public meetings to discuss shallow lakes management with the community. The public meetings held in 2013 had overwhelming support for shallow lakes management



- The lake was drawn down 4 feet in 2013 to facilitate renovation of the fishery and promote aquatic vegetation growth. The original plan was to aerially apply rotenone in November, however weather did not allow for open water treatment and the current plan is for winter through the ice application in 2013-2014.
- Vegetation growth responded well and water levels will be brought up slowly in the spring of 2014. In addition, fish stockings will be initiated in June 2014

Engineers from Ducks Unlimited are working on the design for a new water control structure. The

new structure will allow for better water level management and reduce spring bounces that the current structure creates.

Silver Lake (Worth)

DNR conducted shallow lakes restoration work at Silver Lake starting in 2011 in response to poor water quality. The plan was to replace the current water control structure, dig a channel in the lakebed to aid in draining the basin, and renovate the fishery. The benefits will be improved water quality, establishment of an aquatic plant community, and a restored fishery.

Silver Lake water control structure was replaced in 2011/2012 and a drawdown was conducted in 2012 for vegetation establishment. Three feet of stop logs were placed in new structure in August 2012 to begin re-filling the lake. The plant community response has been good. There is a good stand of bulrush establishing with several other species of aquatic plants coming as well.

Fish stockings of yellow perch and bluegill occurred in 2013. However, this fall we started getting reports from the public stating they were observing carp in the lake. A DNR electrofishing survey confirmed that carp were present in the system. The Conservation Officer also collected some carp with a mud motor after the electrofishing survey. The only gamefish collected was one perch.





A public meeting will be held and explain the situation. The opinion of the DNR is that a 7-inch rain event in late May either topped the barrier or allowed a few fish to jump the barrier. DNR plans to modify the barrier to address vulnerable spots in the barrier.

The management strategy will be to lower the lake after freeze up and try to winterkill the carp. Some rotenone may need to be added under the ice to get a complete kill. The lake will then be boarded up to near crest to capture all the spring melt and rains we can get. Fish stockings will then need to be initiated again in 2014.

Trumbull Lake (Clay County) - One of Iowa's larger shallow lakes was the focus of a water quality improvement project that was initiated from 2012 drought conditions. The 1,200-acre Trumbull Lake and its 1,000 acres of connected marshes, in Clay County, are nearly dry which is unusual for the shallow lakes system that receives water from a nearly 50,000-acre watershed.

The Iowa Department of Natural Resources presented its plan to improve the lake during a meeting October 2012 in Okoboji.

"Trumbull has an enormous watershed so we need to take advantage of this opportunity that Mother Nature is granting us to recharge the marshes and improve the lake by getting plants to return and eliminate the carp," said Mike Hawkins, fisheries biologist with the Iowa Department of Natural Resources. Hawkins said restoration plans shifted gears when it became apparent that the summer was going to be a drought for the record books. What began as a partial drawdown of 22 inches last spring, ended with, essentially, a dry lake.

"This is a blessing, in a good way," said Bryan Hellyer, wildlife biologist for the DNR. "While things didn't go as planned with the drawdown, we now have an opportunity to reset the lake-marsh system and go from a shallow lake with murky water and no vegetation to one that benefits waterfowl, shorebirds and all kinds of wetland wildlife with emergent and submergent vegetation. That's exciting."

Hawkins said they will dig an existing channel to keep the lake water free as much as possible next spring to allow plants to germinate and grow on the lakebed. "We have a small window of opportunity in May and June to get these plants to germinate so we plan to begin digging the channel soon after this meeting," Hawkins said. The restoration plan includes stocking yellow perch and northern pike in the spring of 2014.

"Trumbull Lake has been in a dismal state for years. It has a history of some boom and bust cycle of fishing, but mostly poor fishing and poor water quality. What this project should do is improve the water quality and make the fishery more consistent," Hawkins said. "If this is your spot to hunt or fish, we understand how this can be disappointing, but if all goes as planned, Trumbull Lake will dramatically change for the better for wildlife and fishing for quite a few years," Hellyer said. In addition, it will be carp-free for the first time since carp were introduced 100 years ago.



Trumbull Lake shoreline photo taken July, 2012

Trumbull Lake was drawn down during the summer and fall of 2012. Following a public meeting in October of 2012, Trumbull Lake was drawn down throughout 2013 and the watershed renovated through low water and rotenone application. The lake remains in drawdown status and will be restocked in 2014.

Virgin Lake (Palo Alto County) - Virgin Lake is a unique 220-acre basin in western Palo Alto County that features a highly diverse shoreline, back bays, peninsulas, and islands. Like other shallow lakes in Iowa and the upper Midwest, it has become unhealthy due to intensive agriculture in its watershed and an overabundance of rough fish. Together, these and other factors have resulted in turbid water in the lake and the subsequent loss of the beneficial aquatic plants needed to sustain clean water and provide habitat for sport fish and aquatic wildlife. Project partners, including DNR and DU plan to improve the lake by riding the lake of problem fish species, restoring aquatic plants, and stocking quality game fish.

The lake was drained fall 2011 and was completely drawn down by early 2012. Aquatic plants germinated over the entire basin. Drought conditions and a very dry lakebed have allowed trees to begin growing. The DNR anticipates that terrestrial plants, such as the smartweed visible in the photo, will die out when the lake fills back up with water.

Limited water has been held in the lake because of dry weather conditions. Restocking of this lake will take place in 2014.



Lake Restoration Program (LRP) – Other Program Activities

Meetings with Local Leaders and Stakeholders

In accordance with Section 26 of House File 2782, the department has met with representatives of communities with lakes on the initial priority list are located to provide an initial lake restoration assessment and to explain the process and criteria for receiving lake restoration funding. The DNR has established local stakeholder groups or held initial technical field staffs planning for a number of planned lake/watershed improvement projects. Including; Badger Creek Lake (Madison Co.), Hannen Lake (Benton Co.), Kent Park Lake, (Johnson Co.), Lake of the Hills (Scott Co.), Lake Keomah (Mahaska Co.), Lake Miami (Monroe Co.), and Mariposa Lake (Jasper Co.).

Lake Restoration Prioritization Process

The Lake Restoration Program initially ranked 127 public lakes for lake restoration priorities in 2006. A group of thirty-five lakes, considered highest priority for restoration, was established and served as a starting point for identifying potential lake restoration projects. Ranking indices used lake water quality data and watershed characteristics to create groups of good, fair, or poor lakes and watersheds. The department used these descriptions to categorize lakes into management action groups.

The initial list of thirty-five significant publicly-owned lakes was prioritized for funding based on the feasibility of each lake for restoration and the use or potential use of the lake, if restored. The list included lake projects under active development that the department recommended be given priority for funding so long as progress toward completion of the projects remained consistent with the goals of the program. An additional twenty lakes, not included on the initial list of thirty-five significant publicly-owned lakes eligible for funding, have since been added to the priority list after communities have successfully petitioned the director of the department or were prioritized by the department based on the feasibility of the lake for restoration and the use or potential use of the lake, if restored.

DNR annually reviews projects to determine which lakes should proceed with lake restoration. Until watershed best management practices protect the lake, restoration work cannot move forward, therefore lakes with well-documented watershed protections are the best candidates for restoration. The other necessary ingredient to begin lake restoration is local commitment. In order to better document how lake restoration will benefit Iowa we will use cost benefit analysis, as well as identifying non-economic benefits to people and our natural resources. Computing and documenting the economic benefits, recreation benefits, health benefits, and natural resource/environmental benefits of lake improvements will be a great asset to the lake restoration process. This information will also go a long way in communicating the need of lake restoration projects to local communities and the legislature.

Inquiries from Stakeholders of Lakes not on the Priority List

Also in accordance with HF2782, "Communities with lakes not included on the initial list may petition the director of the department for a preliminary lake restoration assessment and explanation of the funding process and criteria".

Examples of two local stakeholders groups that contacted the DNR and successfully petitioned to have their lakes added to the priority list of restoration projects are Lake Rathbun (Appanoose Co.) and Lost Island Lake (Palo Alto Co.). Rathbun Reservoir (Appanoose Co.) is an 11,000 acre lake in south-central Iowa that is one our most significant state recreational destinations. It is distinct from several of our other large reservoirs, Saylorville, Coralville and Red Rock in that its watershed to lake ratio is only 37:1 and has great potential to maintain and improve lake water quality with a combination of watershed and lake restoration alternatives. Lost Island Lake (Palo Alto Co.) is a 1,000 ac. natural lake in northwest Iowa that is not meeting its water quality and recreational potential. The Iowa DNR currently owns 23

percent of the watershed and proposes watershed work in parallel with current restoration efforts described in the Lost Island Lake section of this report.

Local, State and Federal Partnerships

In order to achieve lake restoration goals it is critical that the DNR form effective watershed partnerships. This includes partnerships at the local level, but also at administrative levels of government. Local, state and federal programs offer a multitude of programs for financial assistance to landowners for soil conservation and other water quality protection practices. The strategy pursued in the lake restoration program will be to seek out key individuals with expertise at the local level and the program administration level. This expertise will maximize access to financial incentives for landowner participation in watershed improvement and lake restoration projects. Listed below are several examples of potential partners in watershed improvement and lake restoration.

Local:

- Chamber of Commerce, City/Town Mayors and Councils
- Conservation and Recreation Clubs and Organizations
- County Board of Supervisors, County Conservation Board
- DNR Field Offices (Environmental Services, Fisheries, Forestry, Parks, Wildlife)
- IDALS/ Division of Soil Conservation – Project Coordinators
- IOWATER Volunteers / Educators / Interested Citizens
- Lake Associations / Groups / Watershed Organizations / Private Landowners
- NRCS Soil and Water Conservation Districts (SWCD)
- USDA Resource Conservation and Development (RC&D)

State:

- IDALS/ Division of Soil Conservation
- Iowa Department of Transportation
- Iowa Environmental Council
- Iowa Farm Bureau
- Iowa Natural Heritage Foundation

Federal:

- U. S. Environmental Protection Agency / U.S. Fish and Wildlife Service
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers / U.S. Geological Survey

Communication Tools and Strategies

The DNR, in cooperation with Iowa Department of Agriculture Land Stewardship (IDALS), has worked to develop a holistic approach to locally led watershed projects and information to help guide communities through the process of water quality improvement projects.

First Steps for Cleaner Water

<http://www.iowadnr.gov/Environment/WaterQuality/LakeRestoration.aspx>

Community Watershed Improvement Framework for Lakes

<http://www.iowadnr.gov/Environment/WaterQuality/LakeRestoration.aspx>

People will find these brochures useful as handouts at meetings. In addition to brochure type handouts, a number of communication and outreach tools for the public and lake stakeholders will be considered as deemed appropriate, including: display/kiosk, lake restoration tool kit and workshop, newsletters, opinion surveys, web site. For example, the Lakes Program developed a one-page handout that summarizes the Lake Restoration Process. This has proved to be a useful tool in communicate the important aspects of the program to the public.

Appendix A. House File 2782 - Enrolled

PAG LIN

1 1 HOUSE FILE 2782

1 2

1 3 AN ACT

1 4 RELATING TO AND MAKING APPROPRIATIONS TO STATE DEPARTMENTS

1 5 AND AGENCIES FROM THE REBUILD IOWA INFRASTRUCTURE FUND,

1 6 ENVIRONMENT FIRST FUND, TOBACCO SETTLEMENT TRUST FUND,

1 7 VERTICAL INFRASTRUCTURE FUND, THE ENDOWMENT FOR IOWA'S

1 8 HEALTH RESTRICTED CAPITALS FUND, THE TECHNOLOGY REINVEST-

1 9 MENT FUND, THE ENDOWMENT FOR IOWA'S HEALTH ACCOUNT, THE

1 10 PUBLIC TRANSIT INFRASTRUCTURE GRANT FUND, THE IOWA GREAT

1 11 PLACES PROGRAM FUND, AND RELATED MATTERS AND PROVIDING

1 12 IMMEDIATE, RETROACTIVE, AND FUTURE EFFECTIVE DATES.

1 13

1 14 BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF IOWA:

31 13 Sec. 26. NEW SECTION. 456A.33B LAKE RESTORATION PLAN AND

31 14 REPORT.

31 15 1. It is the intent of the general assembly that the

31 16 department of natural resources shall develop annually a lake

31 17 restoration plan and report that shall be submitted to the

31 18 joint appropriations subcommittee on transportation,

31 19 infrastructure, and capitals and the legislative services

31 20 agency by no later than January 1 of each year. The plan and

31 21 report shall include the department's plans and

31 22 recommendations for lake restoration projects to receive

31 23 funding consistent with the process and criteria provided in

31 24 this section, and shall include the department's assessment of

31 25 the progress and results of projects funded with moneys

31 26 appropriated under this section.

31 27 The department shall recommend funding for lake restoration

31 28 projects that are designed to achieve the following goals:

31 29 a. Ensure a cost-effective, positive return on investment

31 30 for the citizens of Iowa.

31 31 b. Ensure local community commitment to lake and watershed

31 32 protection.

31 33 c. Ensure significant improvement in water clarity,

31 34 safety, and quality of Iowa lakes.

31 35 d. Provide for a sustainable, healthy, functioning lake

32 1 system.

32 2 e. Result in the removal of the lake from the impaired

32 3 waters list.

32 4 2. The process and criteria the department shall utilize

32 5 to recommend funding for lake restoration projects shall be as

32 6 follows:

32 7 a. The department shall develop an initial list of not

32 8 more than thirty-five significant public lakes to be

32 9 considered for funding based on the feasibility of each lake

32 10 for restoration and the use or potential use of the lake, if

32 11 restored. The list shall include lake projects under active

32 12 development that the department shall recommend be given

32 13 priority for funding so long as progress toward completion of

32 14 the projects remains consistent with the goals of this

32 15 section.

32 16 b. The department shall meet with representatives of

32 17 communities where lakes on the initial list are located to

32 18 provide an initial lake restoration assessment and to explain

32 19 the process and criteria for receiving lake restoration
32 20 funding. Communities with lakes not included on the initial
32 21 list may petition the director of the department for a
32 22 preliminary lake restoration assessment and explanation of the
32 23 funding process and criteria. The department shall work with
32 24 representatives of each community to develop a joint lake
32 25 restoration action plan. At a minimum, each joint action plan
32 26 shall document the causes, sources, and magnitude of lake
32 27 impairment, evaluate the feasibility of the lake and watershed
32 28 restoration options, establish water quality goals and a
32 29 schedule for attainment, assess the economic benefits of the
32 30 project, identify the sources and amounts of any leveraged
32 31 funds, and describe the community's commitment to the project,
32 32 including local funding. The community's commitment to the
32 33 project may include moneys to fund a lake diagnostic study and
32 34 watershed assessment, including development of a TMDL (total
32 35 maximum daily load).

33 1 c. Each joint lake restoration plan shall comply with the
33 2 following guidelines:

33 3 (1) Biologic controls will be utilized to the maximum
33 4 extent, wherever possible.

33 5 (2) If proposed, dredging of the lake will be conducted to
33 6 a mean depth of at least ten feet to gain water quality
33 7 benefits unless a combination of biologic and structural
33 8 controls is sufficient to assure water quality targets will be
33 9 achieved at a shallower average water depth.

33 10 (3) The costs of lake restoration will include the
33 11 maintenance costs of improvements to the lake.

33 12 (4) Delivery of phosphorous and sediment from the
33 13 watershed will be controlled and in place before lake
33 14 restoration begins. Loads of phosphorous and sediment, in
33 15 conjunction with in-lake management, will meet or exceed the
33 16 following water quality targets:

33 17 (a) Clarity. A four-and-one-half-foot secchi depth will
33 18 be achieved fifty percent of the time from April 1 through
33 19 September 30.

33 20 (b) Safety. Beaches will meet water quality standards for
33 21 recreational use.

33 22 (c) Biota. A diverse, balanced, and sustainable aquatic
33 23 community will be maintained.

33 24 (d) Sustainability. The water quality benefits of the
33 25 restoration efforts will be sustained for at least fifty
33 26 years.

33 27 d. The department shall evaluate the joint action plans
33 28 and prioritize the plans based on the criteria required in
33 29 this section. The department's annual lake restoration plan
33 30 and report shall include the prioritized list and the amounts
33 31 of state and other funding the department recommends for each
33 32 lake restoration project. The department may seek public
33 33 comment on its recommendations prior to submitting the plan

33 34 and report to the general assembly.

Appendix B. Significant, Publicly-owned Lakes - Defined

Bachmann (1980). “Clean Lakes Classification Study of Iowa’s Lakes for Restoration”.

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Introduction

Approximately 175 lakes and reservoirs were considered by the Iowa Conservation Commission (ICC) staff for inclusion into the list of lakes to be surveyed and classified. Many of these 175 lakes are contained in “Iowa Fishing Guide”, a publication of the ICC. Time and money precluded survey and classification of all the lakes; therefore, the list was reduced to include only significant lakes in public ownership.

Significant Lakes – Defined and Explained

Significant publicly-owned lakes were defined as those lakes which are principally maintained for public use containing a minimum surface area of 10 acres and capable of supporting fish stocks of at least 200 pounds per acre. Species diversity in water bodies containing less than 10 acres is habitually low resulting in a fish density with minimal potential for maximum sustained yields via sport or foodfish fisheries. Shallow lakes, which are most characteristic of wetlands and marsh-like habitat that are subject to chronic and extensive fish winterkills, were excluded from the survey. Establishment of productive fish populations is hopeless where massive mortality results from the lowering of life supporting oxygen concentrations under ice cover each winter. Federal-owned on-stream impoundment constructed for floodwater supplies were excluded because of Clean Water Act regulations. Multi-purpose lakes providing domestic water supply as only one of several major management objectives were included in the study. Impoundments containing a watershed to surface area ratio greater than 200:1 acres were omitted from the list since they are mainly on-stream impoundments formed by lowhead dams and emulate riverine habitat rather than lake environment.

Section 305 (b) report (2000)

Section 314 (a) (2) of the federal Clean Water Act of 1987 requires each state to include in its biennial Section 305 (b) report specific information on the water quality conditions and trends of the state’s “significant, publicly-owned lakes,” as well as a description of the state’s lake protection and restoration programs. In Iowa, “significant, publicly-owned lakes” are defined as those publicly-owned lakes that meet all of the following criteria:

- are maintained principally for public use;
- are capable of supporting fish stocks of at least 200 pounds per acre;
- have a surface water area of at least 10 acres;
- have a watershed to lake surface area ratio of less than 200:1;
- are not shallow marsh-like lakes, federal flood control impoundments, or used solely as water supply reservoirs.

As such, the 115 significant, publicly-owned lakes (SPOLs) represent a subset of the Iowa’s approximately 5,400 lakes, ponds, and reservoirs.

Lake Restoration Program (2013)

For the purpose of Iowa’s Lake Restoration Program, “significant, publicly-owned lakes” are defined as those publicly-owned lakes that meet all of the following criteria:

- are maintained principally for public use;
- are multi use systems capable of supporting a viable sport fishery and recreational opportunities;
- have a surface water area of at least 10 acres;
- have a watershed to lake surface area ratio of less than 200:1;
- are not federal flood control impoundments (exception is Rathbun Reservoir due to a watershed to lake surface area ratio that is less than 200:1); and
- are not shallow marsh-like lakes; or lakes used solely as water supply reservoirs.

Appendix C. Significant, Publicly-owned Lakes

Initial list of thirty-five significant publicly-owned lakes eligible for funding based on the feasibility of each lake for restoration and the use or potential use of the lake, if restored. The list included lake projects under active development that the department recommended be given priority for funding so long as progress toward completion of the projects remained consistent with the goals of the program.

LAKE NAME	COUNTY
Arbor Lake	POWESHIEK
Big Creek Lake	POLK
Black Hawk Lake	SAC
Blue Lake	MONONA
Brushy Creek Lake	WEBSTER
Carter Lake	POTTAWATTAMIE
Central Park Lake	JONES
Clear Lake	CERRO GORDO
Crystal Lake	HANCOCK
Diamond Lake	POWESHIEK
Easter Lake	POLK
Five Island Lake	PALO ALTO
George Wyth Lake	BLACK HAWK
Green Valley Lake	UNION
Hannen Lake	BENTON
Hickory Grove Lake	STORY
Kent Park Lake	JOHNSON
Lake Ahquabi	WARREN
Lake Anita	CASS
Lake Darling	WASHINGTON
Lake Geode	HENRY
Lake Keomah	MAHASKA
Lake Macbride	JOHNSON
Lake Manawa	POTTAWATTAMIE
Lake of the Hills	SCOTT
Little Wall Lake	HAMILTON
Lower Gar Lake (IA Great Lakes)	DICKINSON
Pleasant Creek Lake	LINN
Prairie Rose Lake	SHELBY
Red Haw Lake	LUCAS
Rock Creek Lake	JASPER
Silver Lake	DELAWARE
Storm Lake	BUENA VISTA
Union Grove Lake	TAMA
Viking Lake	MONTGOMERY

The following twenty lakes were not included on the initial list of thirty-five significant publicly-owned lakes eligible for funding. They have since been added to the list after communities have successfully petitioned the director of the department or were prioritized by the department based on the feasibility of the lake for restoration and the use or potential use of the lake, if restored.

LAKE NAME	COUNTY
Badger Creek Lake	MADISON
Center Lake	DICKINSON
Hawthorn Lake	MAHASKA
Lake Icaria	ADAMS
Lake Miami	MONROE
Lake Sugema	VAN BUREN
Lake of Three Fires	TAYLOR
Lake Wapello	DAVIS
Little River Lake	DECATUR
Lizard Lake	POCAHONTAS
Lost Grove Lake	SCOTT
Lost Island Lake	PALO ALTO
Mariposa Lake	JASPER
Meadow Lake	ADAIR
North Twin Lake	CALHOUN
Rathbun Reservoir	APPANOOSE
Silver Lake	DICKINSON
Silver Lake	PALO ALTO
Swan Lake	CARROLL
Twelve Mile Creek Lake	UNION

The following lakes are the additional seventy-eight lakes recognized by the Iowa Department of Natural Resources Lake Restoration Program as Significant Publicly-Owned Lakes.

LAKE NAME	COUNTY
Arrowhead Lake	SAC
Arrowhead Pond	POTTAWATTAMIE
Avenue of the Saints Pond	BREMER
Badger Lake	WEBSTER
Beaver Lake	DALLAS
Beeds Lake	FRANKLIN
Belva Deer Lake	KEOKUK
Big Hollow Lake	DES MOINES
Big Spirit Lake	DICKINSON
Bob White Lake	WAYNE
Briggs Woods Lake	HAMILTON
Browns Lake	WOODBURY
Casey Lake (Hickory Hills Lake)	TAMA
Cold Springs Lake	CASS
Crawford Creek Impoundment	IDA
DeSoto Bend	HARRISON
Dog Creek (Lake)	OBRIEN
Don Williams Lake	BOONE
East Lake (Osceola)	CLARKE
East Okoboji Lake	DICKINSON
Eldred Sherwood Lake	HANCOCK
Fogle Lake S.W.A.	RINGGOLD
Green Belt Lake	BLACK HAWK

LAKE NAME	COUNTY
Green Castle Lake	MARSHALL
Greenfield Lake	ADAIR
Hooper Area Pond	WARREN
Indian Lake	VAN BUREN
Ingham Lake	EMMET
Iowa Lake	IOWA
Lacey Keosauqua Park Lake	VAN BUREN
Lake Cornelia	WRIGHT
Lake Hendricks	HOWARD
Lake Meyer	WINNESHIEK
Lake Pahoja	LYON
Lake Smith	KOSSUTH
Little Sioux Park Lake	WOODBURY
Little Spirit Lake	DICKINSON
Littlefield Lake	AUDUBON
Lower Pine Lake	HARDIN
Manteno Park Pond	SHELBY
Meyer Lake	BLACK HAWK
Mill Creek Lake	OBRIEN
Minnewashta Lake	DICKINSON
Mitchell	BLACK HAWK
Moorhead Park Pond	IDA
Mormon Trail Lake	ADAIR
Nelson Park Lake	CRAWFORD
Nine Eagles Lake	DECATUR
Nodaway Lake	ADAIR
Oldham Lake	MONONA
Orient Lake	ADAIR
Otter Creek Lake	TAMA
Ottumwa Lagoon	WAPELLO
Pierce Creek Pond	PAGE
Poll Miller Park Lake	LEE
Roberts Creek Lake	MARION
Rodgers Park Lake	BENTON
Rudd Lake	FLOYD
Silver Lake	WORTH
Slip Bluff Lake	DECATUR
Snyder Bend Lake	WOODBURY
South Prairie Lake	BLACK HAWK
Spring Lake	GREENE
Springbrook Lake	GUTHRIE
Summit Lake	UNION
Thayer Lake	UNION
Three Mile Lake	UNION
Upper Gar Lake	DICKINSON
Upper Pine Lake	HARDIN
Volga Lake	FAYETTE
West Lake (Osceola)	CLARKE
West Okoboji Lake	DICKINSON
White Oak Lake	MAHASKA
Williamson Pond	LUCAS
Willow Lake	HARRISON
Wilson Park Lake	TAYLOR
Windmill Lake	TAYLOR
Yellow Smoke Park Lake	CRAWFORD

Appendix D. Lake Restoration Prioritization Process and Program

Key Concepts and Facts

- Six of ten Iowans visit lakes each year; they will visit these lakes eight times during the year
- Iowans prefer lakes with better water quality
- Statewide our lakes generate \$1.6 billion in annual spending by Iowans
- A lake is a reflection of both watershed and lake management
- Lake restoration starts in the watershed; it relies on strong local involvement and voluntary participation of landowners

Current Prioritization and Program

- Modeled after the Federal Clean Lakes Program established in the 1970s
- DNR provided the 2006 legislature with a priority list of 35 lake candidates
 - Priorities based on a 5-year ISU/DNR assessment of water quality
 - Technical feasibility of restoration
 - Potential economic benefits
 - Use by Iowans, and local interest/involvement
- Projects require a lake and watershed restoration assessment and plan
- Projects require local resources in combination with state and federal funds
- Local groups can petition to have their lake added to the priority list
- Project Status
 - 21 Completed or near completion
 - 21 Active projects in-progress
 - 13 Initial public outreach, evaluation or planning stage
- DNR provides an annual progress report to the legislature that includes a work plan and budget

Water Quality Goals

Stipulated in 2006 State Legislation (HF2782):

- Delivery of phosphorous and sediment from the watershed will be controlled before lake restoration begins
- Shallow lakes management will be considered among options for restoration
- Water quality targets
 - Clarity. 4 ½ foot secchi disc transparency 50% of the time from April – September
 - Biota. A diverse, balanced, and sustainable aquatic community must be maintained
 - Impairment. Water quality impairments must be eliminated
 - Sustainability. The water quality and public use benefits must be sustained for 50 years

Lake Restoration Program Budget

- Funding from FY2007 through FY2014 of \$61.0 million (approximately \$7.6 million per year) has enabled the DNR to improve many Iowa's lakes and proceed with implementing projects at a number of our other priority systems

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