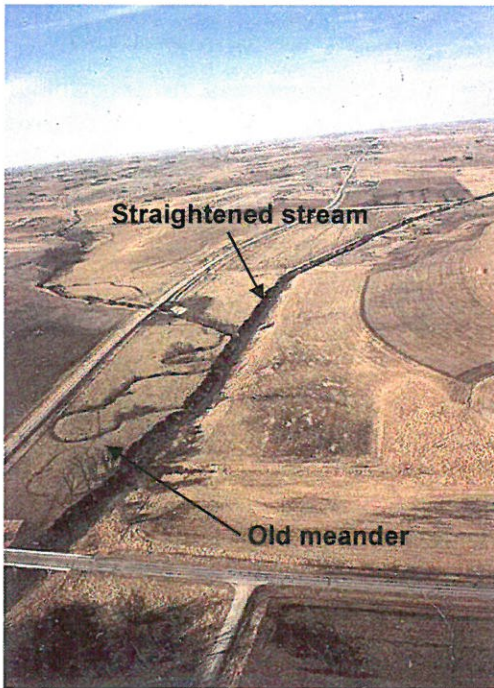
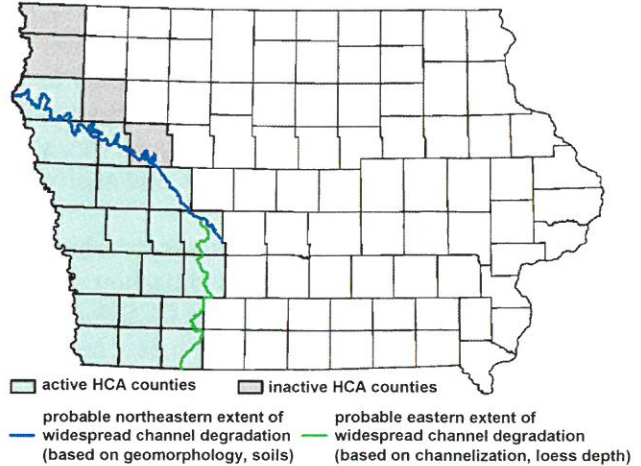


HUNGRY CANYONS ALLIANCE

The Problem

The Hungry Canyons Alliance (HCA) was formed locally to research and implement solutions to the problem of stream channel erosion and degradation in a 19 county area of the deep loess soils region of western Iowa. Channelization of streams and land use changes during the first half of the 1900's caused stream channels to erode, causing an estimated \$1.1 billion in damages to public and private infrastructure (bridges, culverts, utility lines, etc.), loss of farmland, and increased sediment loads. A 2013 survey of county infrastructure in western Iowa revealed that a total of 415 bridges, culverts, and flumes were still endangered due to stream channel degradation. Golden Hills RC&D in Oakland, Iowa helped to form and currently provides office space and administrative assistance to the HCA.



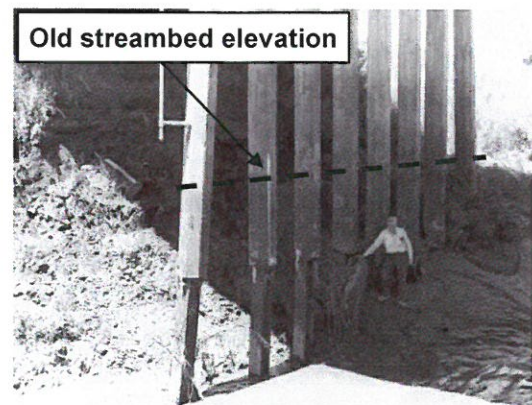
Straightened versus meandering stream.
(Walnut Creek, Pottawattamie County).

The Solution

A proven, affordable solution to this problem is to build grade control structures in streams. Grade control structures (GCS) at regular intervals help streams stabilize by changing their longitudinal profile from an erosive steep incline to a stable stair-step pattern. Streambed stabilization is the key to preventing further erosion and protecting infrastructure. GCS design is largely dependent on drainage area. Small drainage areas can often be controlled with reinforced concrete box (RCB) or corrugated metal pipe (CMP) culverts with drop inlets and/or flume outlets. Large drainage areas are often controlled with weirs constructed with steel sheet pile driven into the streambed, with a riprap and concrete grout slope immediately downstream, a loose riprap stilling basin downstream of the weir slope, and loose riprap covered banks. Both RCB/CMP and weir designs allow the stream elevation to drop in a controlled setting, restore lost stream grade, prevent further degradation, and reduce streambed slope upstream. This creates a calm backwater condition where silt can settle out, decreasing sediment loads and turbidity and increasing water quality. Sediment re-deposited upstream then helps support formerly exposed bridge piling and stabilize eroded streambanks.

The Savings

The HCA provides state and federal money available to the 19 counties through a cost share program for grade control structures (GCS). County governments provide a minimum of 20% match for each GCS. Since 1992, the program has provided \$24.6 million in state and federal appropriations and the technical assistance needed to complete 383 GCS in 19 counties in western Iowa. Another 18 GCS are in progress. These GCS will protect an estimated \$95.9 million in property value. It is estimated that 739.6 acres of land, equivalent to 22.4 million tons of sediment, will be protected from erosion by construction of the 401 GCS. HCA grade control structures, with an average cost of \$67,332,



Bridge endangered by exhumation of pilings.

protect approximately \$239,114 in property per GCS. **For every \$1 invested in HCA grade control structures, on average more than \$4.22 of property value and 0.91 tons of sediment are protected from streambed degradation.** During FY 2017, the HCA approved 8 GCS for cost share and completed construction on another ten.

A second HCA program provides funding to landowners where grade control is necessary to stabilize active gully erosion. This program is funded with the interest earned from state appropriations. This program has built 127 structures, and approved another one, for a total cost share of \$869,964.

The HCA has quarterly meetings at which issues concerning stream erosion and streambed stabilization are discussed. Tours show firsthand which aspects of past GCS designs have worked and which haven't while also highlighting new techniques which can be used to enhance future GCS performance. Regular attendees include county engineers, county supervisors, NRCS & DNR employees, SWCD commissioners, engineering consultants, contractors, and landowners.

Over 1,500 GCS of all types have been constructed in 19 western Iowa counties by county governments, the HCA, NRCS, NRCS-EWP, SWCD, Iowa DOT, cities, utility (water, gas, telephone, electric, etc.) companies, railroad companies, Army Corps of Engineers, Iowa DNR, and landowners. This is the greatest concentration of GCS anywhere in the world due to the loess soils, highly altered unstable stream system, high drainage density, and high road density. With so many GCS located in one area, western Iowa has been referred to as a "laboratory" for GCS design. And because western Iowa is still experiencing streambed degradation, the HCA is one of the unheralded leaders in innovative GCS research, design, and construction.



Top: 4 foot high sheet pile weir with a 1:20 grouted riprap slope in Crawford County. Bottom: RCB flume with 25 feet of fall in Fremont County.

Matching Federal Funding for Flood Recovery

Heavy precipitation in May 2007 and June 2008 resulted in widespread stream channel damage and destroyed county road infrastructure. However, in the investigations that followed, FEMA, NRCS, and county road departments all reported that GCS directly reduced infrastructure and channel damage costs and the number of FEMA program claims, and infrastructure protected by GCS suffered no damage. Although some GCS suffered minor damage, these damages were minimal compared to the potential total loss of infrastructure that could have resulted without the GCS.

Federal NRCS-EWP funding became available after the disaster declarations; so in order to complete as many projects as possible and reduce the counties' burden to 15% match, the HCA provided 10% match (using state cost share) for all EWP projects which provided grade control or were directly associated with existing GCS projects. A total of 72 GCS projects were completed between September 2008 and January 2011 at a cost of **\$12.83 million. The EWP program provided \$9.50 million in cost share, the HCA \$1.28 million, and the sponsor counties \$2.05 million.** This influx of funding for construction came at the perfect time to also help stimulate western Iowa's economy during the 2008–2012 Great Recession.

HCA Research

Completed HCA research projects include design of GCS to provide fish passage, use of scrap tires in GCS, aerial stream video and classification of western Iowa streams, factors controlling knickpoint migration, and the use of directional drilling in small watershed GCS projects. Ongoing research projects include experimenting with new bank stabilization techniques and measuring nutrient loads from eroding streambanks to quantify the impact of channel stabilization projects. Partners in these projects include: NRCS, Iowa DOT Highway Research Board, IIHR—Hydroscience and Engineering at the University of Iowa, Natural Resource Ecology and Management Department at Iowa State University, Civil Engineering Department at Iowa State University, Iowa DNR, US Geological Survey, and US Fish and Wildlife Service.

Hungry Canyons Alliance

I. Project Overview

A. Purpose:

- Focus attention on the problems of, and develop solutions related to, stream channel degradation in the deep loess region of western Iowa.

B. Needs:

- 415 bridges, flumes, and major culverts susceptible to significant damage from stream degradation in 2013 (from correspondence with county engineers).

C. Goals:

- Provide financial and technical assistance to construct grade control structures (GCS) in 19 counties in western Iowa.
- Conduct research and provide demonstration for members.

II. Progress Report (1992-2017)

A. HCA Structures as of 12-22-17:

- | | |
|---------------------|-----|
| 1. GCS approved: | 401 |
| 2. GCS completed: | 383 |
| 3. GCS in progress: | 18 |

B. HCA Costs as of 12-22-17:

- | | |
|--|---------------|
| 1. Total costs: | \$ 27,200,325 |
| 2. Total HCA cost share spent: | \$ 18,429,772 |
| 3. Total HCA cost share obligated: | \$ 1,377,101 |
| 4. Cost share per structure: | \$ 49,394 |
| 5. Counties share of total cost spent: | \$ 6,282,561 |
| 6. Counties share of total cost obligated: | \$ 1,110,890 |

C. HCA Benefits as of 12-22-17:

- | | |
|--------------------------------------|---------------|
| 1. Total property protected: | \$ 95,884,690 |
| 2. Property protected per structure: | \$ 239,114 |

For every \$1 invested in Hungry Canyons Alliance grade control structures (GCS), an average of more than \$4.20 in property value and 0.9 tons of sediment are protected.

Match for EWP Program:

Occasionally, western Iowa counties will be declared eligible for federal disaster assistance due to severe rains which cause flooding and stream channel damage, endangering or destroying county infrastructure. The NRCS-EWP program will provide cost share for new GCS and repairs to existing GCS. In order to complete as many EWP projects as possible while the federal money is available to western Iowa, the HCA will provide 10% of the match, reducing the counties match to 15%, for any EWP projects which provided grade control or were directly associated with existing GCS projects. In FY10, the state appropriated \$100,000 to the HCA specifically for this purpose.

D. EWP Structures and Costs as of 12-22-17:

- | | |
|---------------------------------|---------------|
| 1. GCS completed: | 76 |
| 2. Total costs: | \$ 13,137,249 |
| 3. Total HCA cost share spent: | \$ 1,314,188 |
| 4. Total NRCS cost share spent: | \$ 9,731,801 |
| 5. Total counties share spent: | \$ 2,091,260 |

III. Funding Summary (1992-2017)

A. Total Appropriations:

1. Federal:	\$ 11,944,394
2. State:	\$ 12,651,334
3. Total:	\$ 24,595,728
4. County share:	\$ 8,495,124

B. Funds Needed:

Total needed to reach goal of protecting 192 bridges, flumes, and major culverts: \$9.5 million

- Annual appropriations of \$0.9 million (\$0.45 million in state funds, \$0.45 million in federal funds) for 10.6 more years (assuming no disastrous floods)

IV. Accomplishments of the Past Year

- Approved cost share for 11 county GCS and 4 small GCS for landowners.
- Completed construction of 10 county GCS and 5 small GCS for landowners.
- Held four successful quarterly meetings, including two tours.
- Helped with the implementation of a WIRB grant for Waubonsie Creek in Mills and Fremont Counties.
- Assisted with the formation of the West and East Nishnabotna River Watershed Management Authorities (WMAs).
- Helped organize the Partnership for River Restoration and Science in the Upper Midwest's (PRRSUM) February 2017 Upper Midwest Stream Restoration Symposium (UMSRS) held in LaCrosse, Wisconsin.
- Helped in the DNR's effort to build a framework for a best practices toolbox which will be used as the basis for a potential statewide stream restoration program.
- Began a research project led by Iowa State University to measure nutrient loads from eroding streambanks in western Iowa with the goal to make a case for funding stream bed and bank stabilization due to the current emphasis on the state's nutrient reduction strategy.
- Gave free advice to three landowners, two cities, and one county road department on cost-effective methods of bank stabilization using only broken concrete; fourteen have been completed.

V. Strategy for the Coming Year

- Continue to protect infrastructure and prevent soil loss by providing state cost share to county governments and private landowners for streambed erosion control projects.
- Continue helping the implementation of the West and East Nishnabotna River Watershed Management Authorities (WMAs) watershed plan.
- Investigate whether the HCA should become an in-lieu fee provider to help local entities complete mitigation projects when required by the USACE to do stream mitigation in order to receive a permit.
- Continue providing education to students and public about the fragility of loess soils and river channel stability and processes.
- Continue cooperation with Iowa DNR Fisheries Division and US Fish and Wildlife Service to modify existing grade control structures to allow fish migration.
- Continue monitoring and building bored headcut basins in the Loess Hills in conjunction with the USDA-NRCS and IDALS. Despite being experimental, the bored headcut basin design was recognized in 2015 by the NRCS as an approved, viable, cost-effective method of controlling deep gully headcuts with small drainage areas in the Loess Hills.
- Continue to provide technical assistance for bank stabilization projects.

Hungry Canyons Projects in Progress as of 12-22-17

Grade Control Projects

<i>Project #</i>	<i>County (or sponsor)</i>	<i>Stream</i>	<i>Total Cost</i>	<i>Requested Share</i>
11-1	Woodbury	Dutch Crk. Trib.	\$ 37,500.00	\$ 30,000.00
11-6	Woodbury	Reynolds Crk. Trib.	\$ 15,500.00	\$ 12,400.00
12-1	Ida	Maple R. Trib.	\$ 120,000.00	\$ 96,000.00
14-1	Ida	Soldier R.	\$ 150,000.00	\$ 120,000.00
14-8	Ida	Maple R. Trib.	\$ 50,000.00	\$ 40,000.00
15-6	Page	W. Tarkio Crk.	\$ 256,800.00	\$ 200,000.00
16-8	Page	Tarkio R.	\$ 488,747.00	\$ 200,000.00
17-1	Woodbury	Wolf Crk.	\$ 40,200.00	\$ 27,215.00
17-2	Sioux City	Perry Crk. Trib.	\$ 64,464.00	\$ 51,571.20
17-3	Fremont	Plum Crk.	\$ 489,886.30	\$ 140,000.00
17-4	Woodbury	Camp Crk. Trib.	\$ 84,608.75	\$ 67,687.00
17-6	Plymouth	Floyd R. Trib.	\$ 22,400.00	\$ 17,920.00
18-1	Guthrie	Lone Grove Crk.	\$ 140,000.00	\$ 112,000.00
18-2	Guthrie	Lone Grove Crk.	\$ 120,000.00	\$ 96,000.00
18-3	Guthrie	Lone Grove Crk.	\$ 60,000.00	\$ 48,000.00
18-4	Montgomery	Indian Crk. Trib.	\$ 49,295.00	\$ 39,436.00
18-5	Montgomery	Walnut Crk. Trib.	\$ 49,295.00	\$ 39,436.00
18-6	Montgomery	Walnut Crk. Trib.	\$ 49,295.00	\$ 39,436.00
Total			\$ 2,287,991.05	\$ 1,377,101.20

Stream Profile Surveys

<i>Project #</i>	<i>County</i>	<i>Stream</i>	<i>Total Cost</i>	<i>Requested Share</i>
SPS-17-1	Audubon	Troublesome Crk.	\$ 17,500.00	\$ 14,000.00
SPS-18-1	Guthrie	Lone Grove Crk.	\$ 10,000.00	\$ 8,000.00
Total			\$ 27,500.00	\$ 22,000.00

Total State \$ 2,315,491.05 \$ 1,399,101.20

Hungry Canyons Alliance Small Structure projects in progress as of 12-22-17

<i>Project #</i>	<i>Name</i>	<i>County</i>	<i>Location/Notes</i>	<i>Total cost</i>	<i>HCA Cost Share</i>
13-133	John Hanigan	Crawford	Boyer R. Trib.	\$ 186,245.00	\$ 8,500.00
Totals				\$ 186,245.00	\$ 8,500.00

Hungry Canyons Alliance
FY2018 Budget
July 1, 2017 to June 30, 2018

I. Available funds	State	Interest	County	Federal
A. New appropriations	\$ 450,000			\$ -
B. Unobligated state appropriations (pre-FY2018)	\$ 605,842			
C. Unobligated interest (7/1/17)		\$ 99,047		
D. Differed salary already paid to GH (7/1/17)			\$ 9,868	
E. Unobligated county fees & interest (7/1/17)			\$ 144,696	
F. County dues expected for FY17 (7/1/17)			\$ 66,500	
Total available funds	\$ 1,055,842	\$ 99,047	\$ 221,064	\$ -
II. Expenses from state and federal appropriations				
A. NRCS administration				
1. NRCS 5% administration				\$ -
B. Available for projects				
1. HCA county structures	\$ 935,842			\$ -
C. HCA administration				
1. LHDCA administrative expenses from state appropriations (2%)	\$ 9,000			
2. GHRC&D administrative expenses (5% of previous fiscal year approp.)	\$ 22,500	\$ -	\$ 12,500	
3. Staff (salary, benefits)	\$ 13,500	\$ 4,500	\$ 57,000	\$ -
D. Research and education				
1. Research, education, & development (GIS, special projects, stream table, other)	\$ 1,800			
2. Stage-discharge / crest-stage gages	\$ 400			
3. Aerial video reconnaissance - misc.	\$ 2,000			
4. Aerial video development	\$ -			
5. Bank erosion & nutrients research project	\$ 22,800			
6. Road signs	\$ 1,000			
7. Stream profile surveys	\$ 17,000			
8. Experimental bored headcut basins	\$ 20,000			
9. Experimental scrap tire structures	\$ 10,000			
III. Expenses from interest fund				
A. Available for projects				
1. HCA small structures		\$ 25,500		
IV. Expenses from county fees				
A. Administration				
1. Insurance			\$ 700	
2. Supplies/equipment (computer, camera, cell phone, etc.)			\$ 2,000	
3. Postage			\$ 200	
4. Office / field assistants			\$ 500	
5. Meeting expenses & travel			\$ 2,500	
6. Conferences/training			\$ 1,500	
7. Subscriptions, books, media			\$ 100	
8. Miscellaneous (cards, awards, etc.)			\$ 100	
9. HCA shirts			\$ 500	
B. Lobbying				
1. State lobbyist			\$ 7,500	
2. Lobbying trips (DC trip, Des Moines trip)			\$ 600	
C. Services to counties				
1. Services (web page, maps, etc.)			\$ 300	
V. Expenses from federal administration fund				
A. Administration				
1. LHDCA administrative expenses from federal appropriations (1.5%)				\$ -
Subtotal of expenses (no county structures)	\$ 120,000	\$ 30,000	\$ 86,000	\$ -
Total budgeted expenses	\$ 1,055,842	\$ 30,000	\$ 86,000	\$ -

Hungry Canyons Alliance Funding

