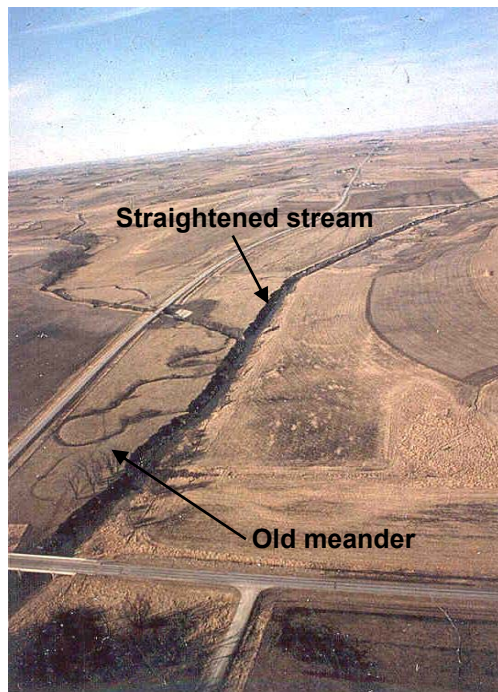
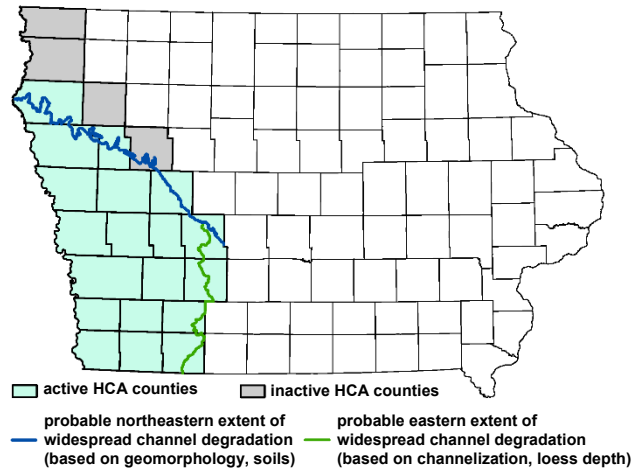


# HUNGRY CANYONS ALLIANCE – Dec 2019 Update

## 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.



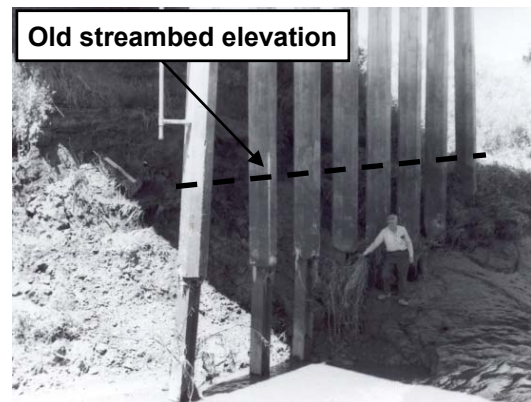
Straightened versus meandering stream.  
(Walnut Creek, Pottawattamie County).

## 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 pilings 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 \$25.5 million in state and federal appropriations and the technical assistance needed to complete 399 GCS in 19 counties in western Iowa. Another 18 GCS are in progress. These GCS will protect an estimated \$99.1 million in property value. It is estimated that 780.2 acres of land, equivalent to 23.4 million tons of sediment, will be protected from erosion by construction of the 417 GCS. HCA grade control structures, with an average cost of \$66,786,



Bridge endangered by exhumation of pilings.

protect approximately \$237,620 in property per GCS. **For every \$1 invested in HCA grade control structures, on average more than \$4.25 of property value and 0.9 tons of sediment are protected from streambed degradation.** During FY 2019, the HCA approved 11 GCS for cost share and completed construction on another nine.

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 130 structures, and approved another one, for a total cost share of \$885,124.

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.**

Spring and summer flooding in 2019 has triggered EWP funding for approximately 83 sites in western Iowa totaling about \$15 million of repair work. The HCA has assisted the NRCS and local sponsors in identifying sites for EWP assistance and estimating repair costs. The repair work will occur in spring and summer 2020.

## 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.