STATE WILDLIFE GRANT

FINAL PERFORMANCE REPORT
PROJECT NUMBER: T-33 D-1

NATURAL LAND INSTITUTE

PROJECT TITLE: Raccoon Creek Restoration and Reconnection

LOCATION: Within the Nygren Wetland Preserve, 2810 W. Rockton Road, Rockton, Illinois, Section 22, T. 46 N, R 1 E, 3 PM, Winnebago County, Illinois.

PROPOSED OBJECTIVES: The objective of the project was to return healthy populations of fish and mussels to Raccoon Creek by reconnecting the creek to the Pecatonica and Rock rivers and the existing oxbow lake and riparian wetlands along the creek to allow access to spawning and nursery areas in the Nygren Wetland Preserve. This was to be accomplished by removing culverts from the creek, and by installing a fish passage structure at the outlet of the oxbow lake to allow movement of fish into and out of the lake.

PROJECT BACKGROUND: The Rock and Pecatonica rivers are popular with sport fishermen. The Rock River in this location is considered the best walleye fishery in the state. Muskies are also taken from this part of the river. Fishing access is provided at the Rockton dam and from nearby forest preserves.

Raccoon Creek is a tributary to the Pecatonica River just upstream from its confluence with the Rock River. It is a high quality, "biologically significant" stream in its upper reaches, but the lower mile of the creek was ditched in the 1960s and cut off from the natural oxbow lake and wetlands located in the floodplain. The ditching caused serious bank erosion and excessive sedimentation in the creek, loss of aquatic habitat for fish, mussels and aquatic insects, down cutting of the stream bed and lowering of the water table in the adjoining riparian wetlands.

Historically, buffalo, walleye and northern pike used the creek to reach the oxbow lakes and riparian wetlands to spawn and raise young. All of the land adjoining the lower segment of the creek was acquired in 2000 by the Natural Land Institute (NLI) to restore the original forests, prairies and wetlands on the site. An intensive biological and hydrological study of the creek was completed in 2002 to document the baseline condition of the stream before restoration activities began. The survey found that the ditched segment of the creek was almost devoid of fish and mussels, while the natural stretches upstream supported many aquatic species, including a healthy population of the state threatened Iowa darter, *Etheostoma exile*.

In 2002 the IDNR awarded NLI a $150,000 grant to restore the creek to its original channel. The grant was matched by funds from the USFWS, the Grand Victoria Foundation and the Illinois Department of Commerce and Economic Opportunity.

Engineering plans were completed, permits obtained and 2/3rd of the creek restored to its original meandering channel in 2004-05. The lower 1/3rd of the creek was restored in 2006. Restoration of the creek to its original channel stopped the bank erosion and sedimentation, reversed down cutting of the stream bed, raised the water table in the riparian wetlands and restored habitat for many species of fish, mussels, and other wildlife. A post-restoration fish survey was completed by the IDNR on September 26, 2007. The survey found a 100% increase in the number of fish species using the stream, and the total number of fish captured increased from 48 before the restoration to 480 after restoration. (Appendix 1)

However, populations of sport fish, such as Northern pike, Rock bass and Largemouth bass remained low. Access by sport fish between the Rock and Pecatonica rivers and the riparian wetlands and oxbow lake were blocked by culverts on the creek put in place to provide a farm crossing and by a small culvert and fill at the outlet of the oxbow lake that blocked water from flowing out of the lake into the creek.

It was expected that the restoration and reconnection of Raccoon Creek to the wetlands and oxbow lake in the Nygren Wetland Preserve would result in the repopulation of the creek with many fish and mussel species listed in the Illinois Comprehensive Wildlife Conservation Plan & Strategy, including the state threatened Iowa darter, Creek heelsplitter, Northern pike, muskie, walleye, smallmouth bass, Central mudminnow, Blacknose dace, softshell and snapping turtles. It was also expected to increase the number of sport fish found in the Rock and Pecatonica rivers. The restoration of Raccoon Creek was also designed to help to implement three Priority Conservation Strategies from the Plan: 1. Protect, restore and enhance riparian and land-water transition vegetation; 2. Protect, restore and enhance in-stream habitats and processes, and; 3. Restore populations of imperiled and extripated aquatic fishes and mussels.

APPROACH: Phase 1 of the creek restoration was completed during the spring of 2005; Phase 2 of the restoration will be done during the winter and spring of 2006. Removal of the culverts and construction of the fish passage structure will be done as the final phase of the restoration project, once engineering plans are completed and permits are secured.

ACCOMPLISHMENTS

Publicity: The State Wildlife Grant was awarded on June 21, 2006, but the Grant Agreement was not finally approved until April 10, 2007. A news release was sent to local media on April 17, 2007 and a notification of award letter was sent to state and federal representatives on May 1, 2007. An article about the grant award was published in the Summer/Fall 2007 edition of NLI's newsletter.

Engineering plans: A Request for Proposals was sent to engineering companies in the area on September 25, 2006 after the original grant was approved, anticipating an October 2006 start date for the project. Three proposals were received from qualified firms. After a six month delay in final approval of the grant agreement by IDNR, V3 Companies of Illinois, LTD was selected as the engineering consultant for the project and

a contract was signed on April 24, 2007 for Professional Engineering Design, Permitting and Construction Observation Services. An extension of the grant period was requested on November 9, 2007 because the engineering and permitting was not completed in time for the construction season. The final engineering plans were completed and sent to the IDNR for review

Permitting: Applications for Corps of Engineers, IEPA permits were submitted on October 6, 2008. A nationwide permit was issued by the Corps on October 15, 2008. The engineering plans and wetland mitigation plan were submitted to the IDNR on November 21, 2008. The DNR requested additional information about avoiding nearby archeological sites on January 6, 2009 and completed the CERP review on January 8, 2009, clearing the way for construction of the project. The delay in submitting and securing the agency permits and approvals required another extension of the deadline for the project to December 31, 2009.

The Fish Passage Structure had already been permitted as part of the creek restoration and has complied with all state and federal requirements. Removal of the existing creek crossing and construction of a new crossing required a U.S. Army Corps of Engineers Sec. 404 Permit, Illinois EPA 401 Water Quality Certification, state and federal endangered species review, state and federal wetlands mitigation and floodplain compliance, and a review of the effect of the project on archeological resources. A Phase 1 archeological survey had already been completed for the project, but approval of the Illinois Historic Preservation Officer was needed for the modified structures.

Construction: The request for bids to construct the fish passage structure and creek crossing were sent to potential contractors on February 24, 2009. A contract to install the fish passage structure was awarded to Cooling Land Concepts LLC on May 18, 2009, and a contract to remove the culverts and construct the creek crossing was awarded to Sjostrom and Sons, Inc. on July 28, 2009. The width of the creek crossing structure was reduced from two railroad flatbeds to one, which required a modification of the engineering plans.

The existing creek crossing and culverts were removed and concrete footings placed on the sides of the creek to hold a new, open span bridge consisting of an old, modified railroad flatbed car (Figures 2 & 3). Erosion control measures were taken during grading and excavation to prevent sedimentation in the creek. A fish passage structure was installed at the outlet of the oxbow lake in September according to the engineering specifications.(Figure 1). The structure included a drop-box that can be used to control the water levels in the ox-bow lake for management purposes. Erosion control measures were put in place during grading and excavation of the structure. All disturbed earth was seeded with a cover crop of field oats and Virginia wild rye and of native wetland species provided by NLI. Construction activities were overseen by the consulting engineer and the Project Manager, Andy Bacon. Copies of the final engineer's reports are attached (Appendix 2 and 3).

EVALUATION: The results will be measured by re-sampling the fish and mussel populations to compare with the baseline surveys done in 2002 and 2007. Karen Rivera, Fisheries Biologist with the IDNR will conduct a follow-up sampling of the fish found in the creek within the project area in the fall of 2010. A basin survey will be completed in 2012 to evaluate the results of the reconnection project. Observations of sport fish migrating into the ox-bow lake and up the creek channel during the spring spawning season are being made by NLI staff and volunteers.

The project was plagued by delays in approval of the grant agreement, engineering and permitting, forcing a two-year extension in the grant period. Once all the plans and approvals were in place, the project was completed on schedule and within budget. The only modification in the project was to reduce the width of the creek crossing and footings. This was done to eliminate unnecessary costs, but it also reduced the area of riparian wetland affected by the project.

The response of fish populations to the restoration of Raccoon Creek to its original, meandering channel has exceeded the expectations for the first phase of the project (Appendix 1). It is expected that removal of the culverts in the creek and construction of the fish passage on the ox-bow lake will also enhance the populations of sport fish and mussels in the creek, and allow for the reintroduction of endangered and extripated fish species to the restored stream, fulfilling the third objective of the State Wildlife Action Plan: *Restore populations of imperiled and extripated aquatic fishes and mussels.*

SUPPORT DOCUMENTATION:

The following documents are attached. Copies of grant documents, permits, contracts, engineering plans, publicity and notification letters have been provided to the IDNR.

Appendix 1 – Fish Survey Results, Raccoon Creek Re-meandering Project.
Appendix 2 – Final Construction Observation Report: Bridge Crossing.
Appendix 3 – Final Construction Observation Report: Fish Passage Structure.
Figure 1 – Fish passage structure at outlet to ox-bow lake in Nygren Wetland.
Figure 2 – Crane putting railroad flatbed car on footings on Raccoon Creek
Figure 3 – Open span bridge and footings replacing culverts in Raccoon Creek

FINANCIAL REPORT

Proposed Budget	Federal	Match	Total
Contractual			
Engineering Design & Permit Fees	$ 6,350	$ 6,350	$ 12,700
Engineering Observation Fees	$ 4,220	$ 4,220	$ 8,440
Remove & Replace Creek Crossing	$37,650	$37,650	$ 75,300
Construct Fish Passage Structure	$ 4,700	$ 4,700	$ 9,400
Contingency @ 12%	$ 5,080	$ 5,080	$ 10,160
	$58,000	$58,000	$116,000

Actual Expenditures	Federal	Match	Total
Contractual			
Engineering Design & Permit Fees	$11,519	$11,731	$ 23,250
Engineering Observation Fees	$ 2,125	$ 2,125	$ 4,250
Remove & Replace Creek Crossing	$39,670	$39,670	$ 79,340
Construct Fish Passage Structure	$ 4,686	$ 4,686	$ 9,372
	$58,000	$58,212	$116,212

See Exhibit A for detailed Income and Expenses report.

CONTACT INFORMATION:

Natural Land Institute
Jerry Paulson, Executive Director
320 S. Third Street
Rockford, Illinois 61104
815-964-6666
paulsonjerry@aol.com

Appendix 1

FISH SURVEY RESULTS
RACCOON CREEK RE-MEANDERING PROJECT
MARCH 2009
NATURAL LAND INSTITUTE, ILLINOIS

(photo credit David Olson)

Submitted to:

NATURAL LAND INSTITUTE
320 S. THIRD STREET
ROCKFORD, IL 61104

By:

Living Waters
CONSULTANTS

MAKING A DIFFERENCE FOR STREAMS, RIVERS AND LAKES
Stream and Lake Restoration • Fluvial Geomorphology
Watershed Management • Stormwater Engineering

February 11, 2009

Jerry Paulson
Natural Land Institute
320 S. Third Street
Rockford, IL 61104

RE: RACCOON CREEK RE-MEANDERING FISH SURVEY RESULTS

Dear Mr. Paulson:

Thank you for the opportunity to submit this Fish Survey Results for the Raccoon Creek Re-Meandering Project. Phase 1 and Phase 2 Raccoon Creek Re-Meandering Design and Permitting and Phase 1 Construction Observation was completed by the team of V3 Consultants and Living Waters Consultants. Phase 2 Construction Observation was completed by V3 Consultants. Post-Project fish surveys described in this Report were completed by Living Waters Consultants with the Illinois DNR and Illinois EPA. We hope this information will be used to better understand the benefits of Re-Meandering.

Introduction

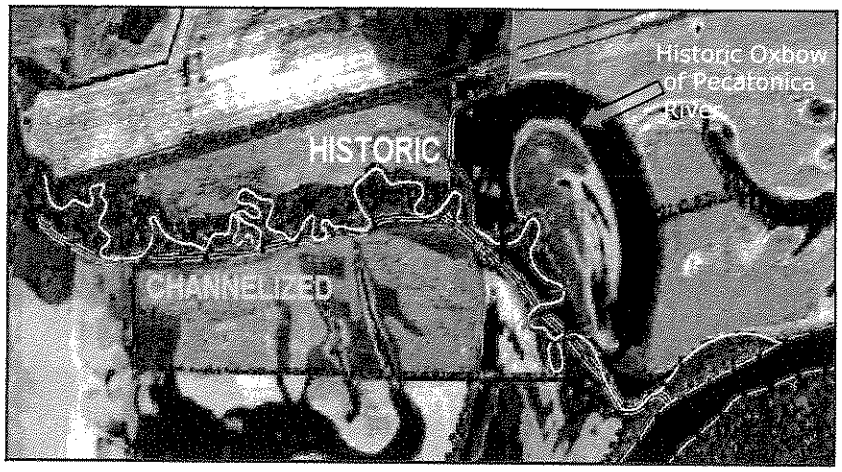
The Raccoon Creek Re-Meandering Project Site is located along the lower reach of Raccoon Creek at the Carl & Myrna Nygren Wetland Preserve in Rockton, Illinois. The 700-acre Project Site is located near the confluence with the Pecatonica River. The Nygren Wetland Preserve was donated to the Natural Land Institute in the 1990s. Since then, the Natural Land Institute (NLI) has been conducting ongoing wetland, prairie and stream restoration.

The Raccoon Creek watershed area at the Project Site is approximately 59.4 square miles. The Illinois Department of Natural Resources has classified Raccoon Creek as a Biologically Significant Stream. This classification is based in part on diverse aquatic life and the presence of threatened and endangered species within the watershed. According to the Illinois DNR and the Illinois Natural History Survey, state endangered Iowa Darter (Etheostoma exile), Bald Eagle (Haliaeetus leucocephalus), Northern Harrier (Circus cyaneus), and Sandhill Crane (Grus canadensis) occur in the watershed. However, due to past degradation including channelization as described below, the fish community was impaired at the Project Site.

Conditions Before Re-Meandering

According to the Sugar-Pecatonica Watershed Critical Trends Assessment Program (CTAP) Report by the Illinois DNR, the Raccoon Creek watershed formed in a very broad, flat glacially-carved valley which has significant deposits of sand, silt and clay. The stream channel valley soils consist of highly erodible Cahokia alluvium. Historic conditions of erodible soils, low stream gradient, and wet prairie and wetland vegetation contributed to

high sinuosity and meandering. Significant channel migration likely occurred across the valley of lower Raccoon Creek. During the 1970's, the meandering Raccoon Creek was channelized into an excavated ditch located south of the meandering stream. The historic meandering channel remained intact following channelization, and was not filled.



Above: Aerial photo depicts high sinuosity of historic meandering Raccoon Creek (channel in yellow) compared with the channelized ditch (depicted in blue). Channelization reduced the stream length from approximately 12,000 linear feet to 5,500 linear feet. (Note remnant oxbow of the Pecatonica River located northeast of the Project Site.)

Since the 1970s channelization, significant instability had occurred along the channelized ditch. For instance, moderate to severe bank erosion, significant sediment deposits on the channel bottom, and lack of desirable aquatic habitat were apparent. Typical eroding bank slopes ranged 0.25:1 (H:V) to 1:1 (H:V). Severe downcutting had occurred along the channelized ditch. Due in part to downcutting and channelization, the remnant meanders of Raccoon Creek were essentially dry except during significant flood events. Even though T/E fish species such as Iowa Darter occur upstream in Raccoon Creek, the fish population at the channelized site was significantly degraded.

Photos: Channelized (pre-restoration) conditions included moderate to severe bank erosion, typical 1.5-ft thick sand deposits, downcutting, uniform velocity distribution and water depths, lack of deep pool habitat, lack of in-stream vegetation, and other habitat impacts.

Based on field surveys, the historic meander channel was relatively narrow in width compared with the channelized ditch. The meander channel bankfull width was typically 35 to 40 feet wide, whereas the ditch bankfull width was 75 feet or more. Channelization had increased stream slope from approximately 0.00024 ft/ft to 0.00053 ft/ft. This is a 220% increase in gradient. The increased gradient increases bank shear stress, potential bank erosion, as well as downcutting pressure. The stream channel length was reduced to 45% of the original length, from 12,000 linear feet to less than 5,500 linear feet.

Photo: An example historic meander north of the channelized stream. Field analysis indicates that the historic meandering channel had significantly better aquatic habitat than the channelized ditch. One of the primary goals of the restoration project was to divert flows back into the historic meandering stream channel.

The historic meander bankfull width likely allowed for improved sediment transport, higher percentages of coarse aggregate (gravel and cobble) stream substrates, depth and velocity diversity, deeper pools, and more desirable aquatic habitat. During flood flows above bankfull flow, low entrenchment allowed the broad floodplain to rapidly widen, reducing flood flow velocities and severe scouring. The historic channel likely included significant streamside wetlands with desirable in-stream aquatic habitat for fish, mussels, aquatic macroinvertebrates and wildlife. In contrast, the channelized ditch had a relatively uniform, shallow depth, thick sand deposits, and significantly higher shear stress during super-bankfull flood flows. Pollutants including sediment likely impacted not only the channelized ditch but also downstream waters including Pecatonica River. Invasive Common Carp were abundant in the ditch. Carp are undesirable because they increase turbidity and nutrients, and degrade aquatic habitat.

Significant changes in riparian vegetation had occurred since agricultural use of the area. According to early historic records such as the 1835 General Land Office maps, "wet prairie" vegetation dominated the project area. However, due to subsequent channelization, tile drainage and/or other activities, invasive woody vegetation including Silver Maple became increasingly dominant within the riparian corridor. Although a forested canopy can provide desirable ecological functions in certain areas, in the case of Raccoon Creek, Silver Maple encroachment was an artifact of fire suppression and drainage and was not indicative of desirable riparian vegetation. Ongoing management by NLI includes reduction of the forested canopy to enhance riparian and in-stream habitat. For instance, native emergent wetland, wet prairie, and submergent aquatic macrophytic vegetation require a reduced shade canopy and increased sunlight penetration to the riparian area.

Conditions After Re-Meandering and Stream Enhancement

The Raccoon Creek Restoration Project included re-establishing flows through the historic meander channel at the Project Site. Re-meandering was accomplished in part by diverting stream flow from the existing channelized ditch into the historic meander channel through construction of eight stabilized in-stream diversion berms. Installation of the diversion berms occurred in two phases. The upstream installation and re-meandering (Phase 1) was completed in 2004. The downstream installation and re-meandering (Phase 2) was completed in August 2006. The diversion structures were composed of clay soils and stabilized with erosion blanket, cobble and bankrun coarse aggregate, native plant seed, native plant plugs, and native shrub live stakes. In addition to diverting the flow into the historic stream course, the structures provided backwater pools along the channelized sections, which over time can become vegetated backwater habitat.

Re-meandering increased the length of the restored channel from 5,500 linear feet to approximately 12,000 linear feet in length, a 220% increase. Other stream restoration measures included bank re-grading, installation of rock vortex weirs, brushlayers, and installation of native vegetation. Ongoing riparian management activities include conversion from existing woody vegetation dominated by Silver Maple into desirable herbaceous wet prairie and emergent wetland vegetation. Removal of invasive Silver Maple trees will increase sunlight levels, allowing herbaceous vegetation to stabilize the riparian corridor, potentially allowing in-stream aquatic macrophytes to become established. Such macrophytes are likely important to restore fish species diversity, as described below.

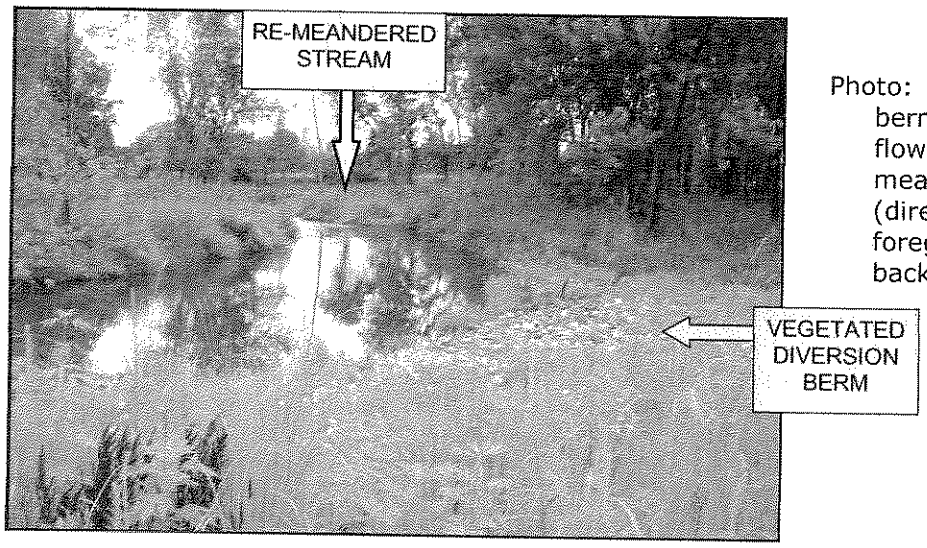
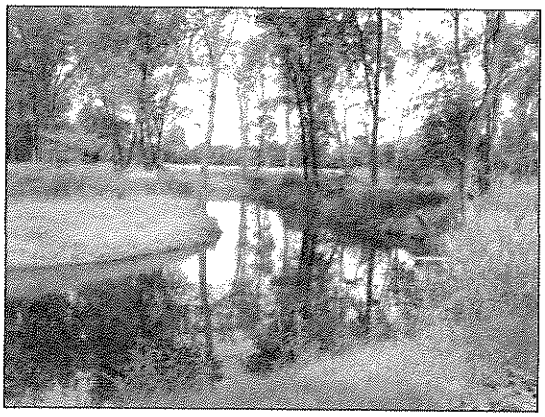
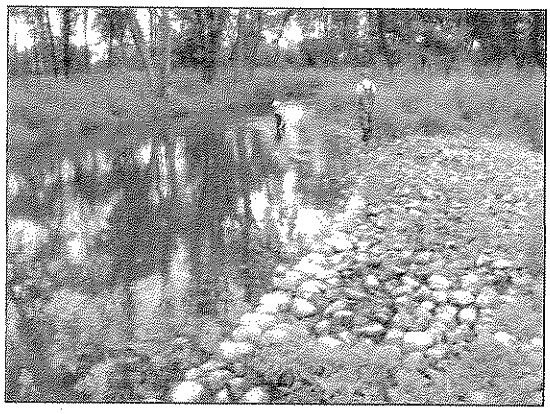


Photo: Phase 1 diversion berm to divert stream flow through the meandering channel (direction of flow is from foreground to background in photo).

Based on historic fish species records from Raccoon Creek, pre-channelized stream habitat likely included vegetated pools, vegetated (macrophytic) backwater areas, sluggish pools, and clear gravel / cobble riffles (Page and Burr 1991). Highly water transparency likely occurred. Moreover, channel substrate would have been relatively stable to allow vegetation to form. These conditions would have facilitated growth of in-stream vegetation. Gravel and cobble deposits were likely more prevalent compared with sand and silt. It is likely that the presence of clear water, in-stream macrophyte growth, and stable channel substrates were important characteristics of historic aquatic habitat. These habitat requirements are typical of species extirpated from the Project Site but extant in other areas of Raccoon Creek including Iowa Darter, Starhead Topminnow, Brook Stickleback, Grass Pickerel, and other species.





Photos: Left photo depicts flow through restored, meandering stream approximately two years after construction. Right photo depicts diversion berm. Note pool depths up to 3-feet or more. Diversion berms indicate outside bend areas, and they enhance scouring, sediment particle size sorting, and pool formation.

During the pre-construction fish survey, it was noted that the channelized ditch stream bottom substrate was 30% silt/mud, 49% sand, 1% boulders, and 20% claypan. This is indicative of poor substrate habitat. In contrast, during the Post-Restoration fish survey, the stream channel substrate was 5% silt/mud, 15% sand, 5% gravel, 10% cobble, and 65% claypan. The abundance of silt, mud and sand was reduced after project completion, and the abundance of gravel and cobble was notably higher. Instream cover included boulders, undercut banks, a few exposed roots, and some aquatic vegetation such as primarily Elodea. Hopefully, future conditions will include further increases in cobble and gravel as well as an increase in in-stream cover.

The re-meandered stream corridor to date has enhanced aquatic habitat, riparian vegetation, fish species diversity (described below), and apparent water quality. Increased diversity in water depth, velocity, and substrate types have been observed. Deep pools (in areas 3 to 4-feet or more) are becoming established. Shallow gravel and cobble-based riffles were installed and naturally forming riffles are becoming established. Fish, mussels and macroinvertebrates over time are expected to become more diverse in the restored environment. A higher floodplain connectivity with the riparian corridor could enhance sediment filtration, improve water quality, and potentially enhance fish habitat.

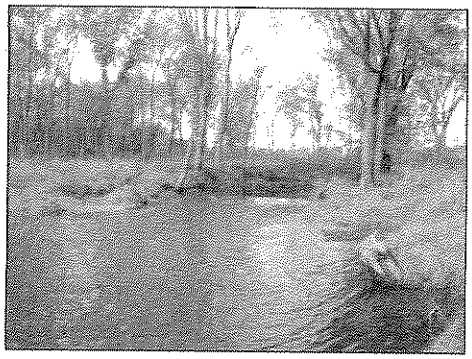


Photo: After restoration, desirable channel substrates such as gravel and cobble which previously were lacking had begun to increase. Moreover, naturally-forming riffles (depicted in photo) began to form.

Project benefits to date include stabilization of eroding banks, aquatic habitat diversity, wetland restoration, improved water quality, and wildlife diversity. These benefits extend not only along Raccoon Creek, but to downstream waters including the Pecatonica River.

Fish Survey Results

Fish surveys were conducted at the Phase 1 Project Site before and after Re-Meandering. These surveys were used to assess the benefits of Re-Meandering for the fish population of Raccoon Creek. The surveys with IDNR personnel included Karen Rivera and others. A pre-restoration fish survey was performed near the upstream portion of the Project Site on August 5, 2002 to establish baseline conditions prior to Re-Meandering. An electric seine was used to sample a stream reach 526 feet long for a total sample time of 27 minutes, 35 seconds. The water was muddy and there were lots of downed trees, making sampling difficult. Sampling efficiency was classified as intermediate. The average width of the water at the time was 27 feet with an average depth of 1.5 feet. The Phase 1 Post-Restoration fish survey occurred September 26, 2007. An electric seine was used to sample a 967 foot reach of the Phase 1 re-meandered stream for a total sample time of 56 minutes. The average width of the water was approximately 30 feet. Sampling efficiency was good. The current was a bit fast due to the flooding in the summer of 2007, but the water was clear with good visibility. The average depth was 1.5 feet. Two riffles and 2 long runs were sampled. Block nets were placed at both the upper and lower reaches of each wadeable station.

Raccoon Creek is a Biologically Significant Stream with high potential fish species diversity. Fishes found in Raccoon Creek on the state's list of "Species in Greatest Need of Conservation." According to the Illinois DNR and the Illinois Natural History Survey, the state endangered Iowa Darter (Etheostoma exile) has been captured on the mainstem and tributaries upstream of the project site between 1976 through as recently as 1999. Brassy Minnow, American Brook Lamprey (Lampetra appendix), Brook Stickleback (Culaea inconstans), Starhead Topminnow (Fundulus dispar), Grass Pickerel (Esox americanus), Central Mudminnow (Umbra limi), Shorthead Redhorse (Moxostoma macrolepidotum), Silver Redhorse (Moxostoma anisurum), Rosyface Shiner (Notropis rubellus), Stonecat (Noturus flavus), and Banded Darter (Etheostoma zonale) have been captured in Raccoon Creek. The upper reach of the East Branch of Raccoon Creek in Wisconsin has been the subject of a study by the Wisconsin DNR for the reintroduction of native Brook Trout (Byla 2001). However, none of these species were captured in the channelized stream prior to restoration.

Photo: Phase 1 Post-Restoration fish surveys were a collaborative effort with Illinois DNR, Illinois EPA, and others (photo credit David Olson).

A list of fish species is provided in Attachment 1. Only eleven (11) species were captured in the Pre-Restoration fish survey. In comparison, over twenty-two (22) fish species were captured in the Post-Restoration Survey. This is a 100% increase in the number of fish species after stream re-meandering. Thus over eleven (11) fish species were not captured prior to stream restoration. The total number of fish captured increased 1000% from 48 before restoration to 480 after restoration.

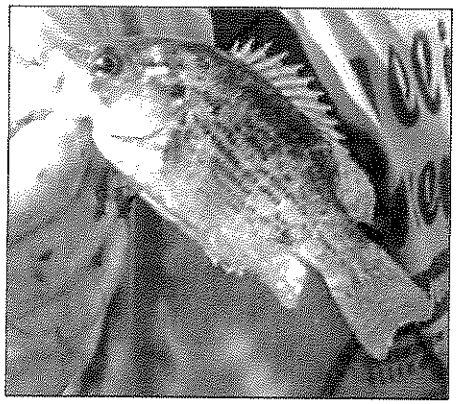


Photo: Rock Bass are indicative of good water quality. They will not inhabit degraded areas. Rock Bass were only captured in Raccoon Creek at the Project Site after re-meandering had occurred. The number of fish species captured increased after restoration from 11 to 22.

Three (3) species indicative of good water quality and habitat were not captured before stream restoration. These species include Rock Bass, Stonecat, and River Carpsucker. Desirable gamefish such as Northern Pike and Largemouth Bass were only captured after stream restoration. The number of desirable species such as Grass Pickerel increased 1500% after stream restoration. Blackstripe topminnow, a species preferring backwater wetland habitat and quiet pools was only found after stream restoration. Two desirable Redhorse species were only found after stream restoration. The number of darters which occupy riffle habitat increased 450%.

The Index of Biotic Integrity (IBI) score, a widely used indicator of stream quality, was calculated using IDNR protocol. The IBI score ranges form 0 for a very poor stream, to 60 for a high-quality, relatively undisturbed stream. The Pre-Restoration IBI score at Raccoon Creek was 31 whereas the Post-Restoration IBI score was 41. This is a 32% increase in the IBI level. This raised the Biological Stream Classification for Raccoon Creek from a C class stream to a B class stream.

Photo: Iowa Darter, a state T/E species, occurs in Raccoon Creek but was extirpated at the Project Site. Perhaps as habitat restoration progresses this species may re-occupy the Project Site.

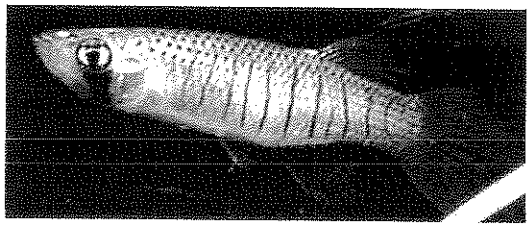


Photo: Starhead topminnow, a rare species preferring sluggish, vegetated stream and wetland habitat, may be re-introduced at the Project Site.

It is possible that stream health of Raccoon Creek at the Re-Meandering Project area as measured by IBI scores may continue to improve as channel recovery continues, native vegetation becomes established, and stability improves. In the future, desirable fish species such as Iowa Darter, Starhead Topminnow, Brook Stickleback, and Brassy Minnow may once again re-occupy the Project Site. To date, significant progress in stream quality as measured by the health of the fish community has occurred at the Project Site.

It has been a pleasure to work with the Natural Land Institute and with V3 Consultants for this important project. Please contact me if you have any questions or would like further information.

Best Regards,

Ted Gray, P.E., CFM, CPESC
Eco-Hydrologist & Director
Living Waters Consultants, Inc.

ATTACHMENT 1
RACCOON CREEK FISH SURVEY DATA

Fish Species Lists

Fish Species Common name	Scientific name	Pre-Project Phase 1 Site 8/5/2002 (Channelized)	Post-Project Phase 1 Site 9/26/2007 (Restored)
Grass pickerel	Esox americanus	1	15
Northern pike	Esox lucius		1
Spotfin shiner	Cyprinella spiloptera	7	94
Fathead minnow	Pimephales promelas		6
Bluntnose minnow	Pimephales notatus	1	179
Bigmouth shiner	Notropis dorsalis		1
Sand shiner	Notropis ludibundus	23	96
River carpsucker	Carpiodes carpio		1
White sucker	Catostomus commersoni	1	3
Shorthead redhorse	Moxostoma macrolepidotum		8
Black redhorse	Moxostoma duquesnei		3
Golden redhorse	Moxostoma erythrurum	2	2
Stonecat	Noturus flavus		1
Blackstripe topminnow	Fundulus notatus		22
Rock bass	Ambloplites rupestris		3
Largemouth bass	Micropterus salmoides		3
Green sunfish	Lepomis cyanellus	6	27
Bluegill	Lepomis macrochirus	3	3
Blackside darter	Percina maculata	2	2
Johnny darter	Etheostoma nigrum	1	7
Banded darter	Etheostoma zonale	1	2
Freshwater drum	Aplodinotus grunniens		1
Total fish		**48**	**480**
Total species		**11**	**22**
Electrode minutes		27.5	56

Index of Biotic Integrity Calculations (IBI)

Index of Biotic Integrity	Pre-Project Phase 1 Site 8/5/2002 (Channelized)	Post-Project Phase 1 Site 9/26/2007 (Restored)
Native fish species	11 (2)	22 (5)
Native minnow species	3 (2)	5 (3)
Native sucker species	2 (3)	5 (6)
Native sunfish species	2 (4)	4 (6)
Benthic invertivore species	4 (3)	8 (6)
Intolerant species	1 (2)	2 (3)
Prop. specialist benthic invertivores	12% (5)	5% (2)
Prop. geneneralist feeders	85% (3)	85% (3)
Prop. mineral-substrate spawners	8% (2)	4% (1)
Prop. tolerant species	27% (5)	18% (6)
Extrapolated IBI	**31**	**41**

(The numbers in parentheses are the IBI scores for each IBI metric.)

Appendix 2

Æenon Consultants, Ltd.

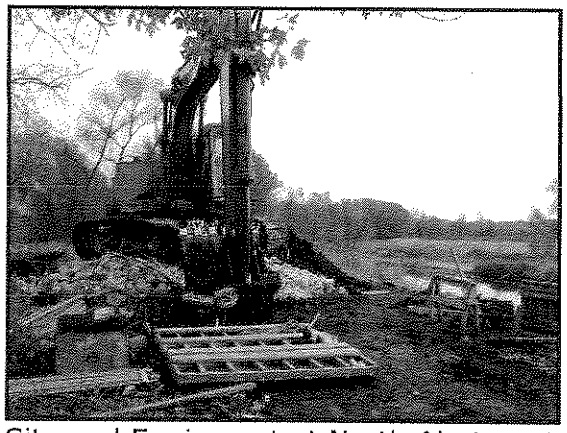
"because there was much water..."

MEMORANDUM

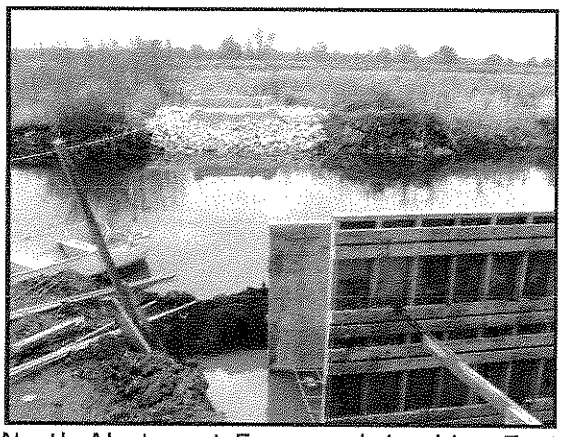
To: Carrie Pintar of V3 Companies for the Natural Land Institute
From: Christian Smith
Re: Nygren Wetland Preserve Phase III Bridge Crossing of Raccoon Creek
Subject: Final Construction Observation Report
Date: February 22, 2010
Project: 03005.RCB

Aenon Consultants, Ltd., in accordance with our agreement to provide construction observation services for the construction of the Railcar bridge crossing of Raccoon Creek on the Nygren Wetland Preserve, visited the site and made observations and follow-up co-ordination with the contractor and your office as indicated below. It should be noted that these improvements are part of the Phase III construction for stream corridor enhancements for improved fish passage and stream restoration.

Christian Smith of our office visited the site on October 20, 2009 after the bridge abutment location was determined and the initial abutment formwork was being installed. The following photographs provide a general sense of the nature of activity being performed relative to initial placement of formwork and reinforcing for the bridge abutments.

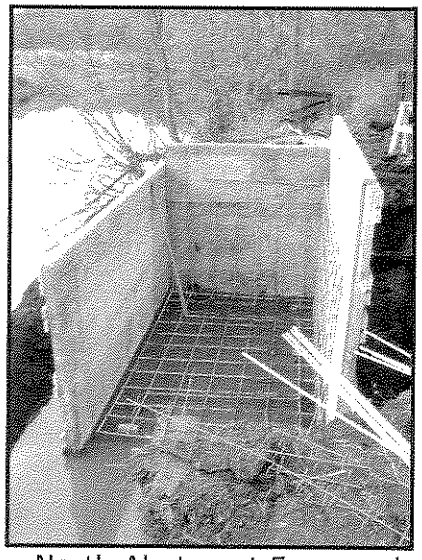


Site and Equipment at North Abutment



North Abutment Formwork Looking East

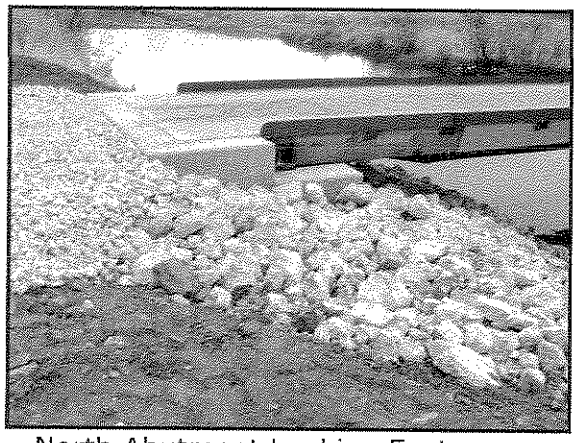
405 King Arthur Court • Suite 14 • Bolingbrook, IL 60440
Phone (630) 759-9190 • Fax (630) 759-9134



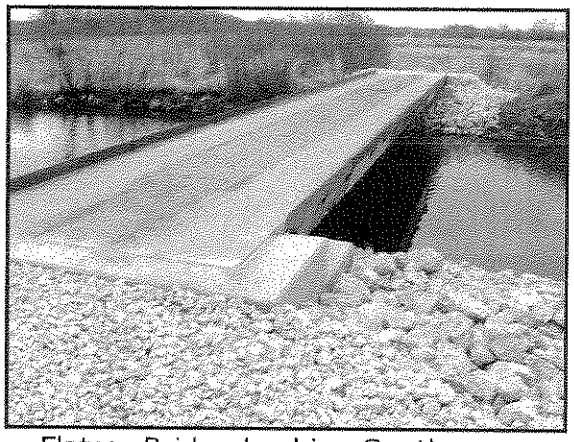
North Abutment Formwork and Reinforcing Bar Initial Placement

After the site visit and co-ordination with Reed Sjostrom of Sjostrom Construction, Reed indicated that they were intending to pump out the formwork and confirm bearing soil strength prior to concrete placement.

Subsequent to placement of the flatcar on the constructed abutments, Christian Smith of our office visited the site on November 17, 2009. The approach stone and abutment scour protection had been placed and seal protection at the interface of the bridge ends and the concrete abutments had been installed. The following photographs provide a general sense of the nature of the bridge abutments and Railcar installation.

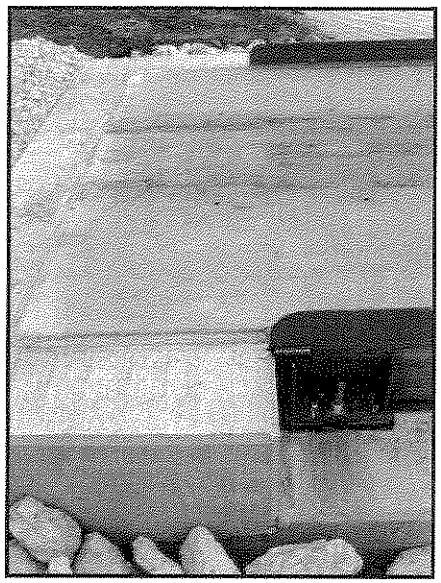


North Abutment Looking East

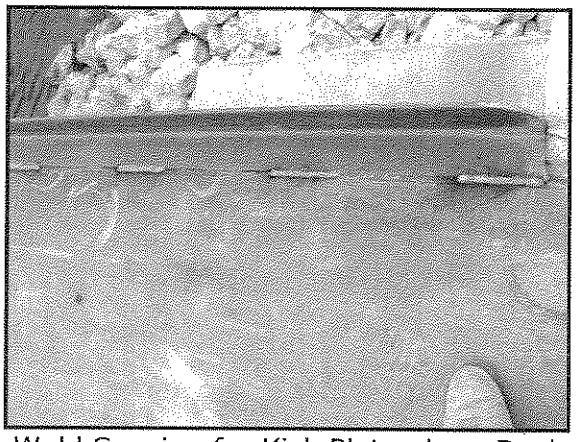


Flatcar Bridge Looking South

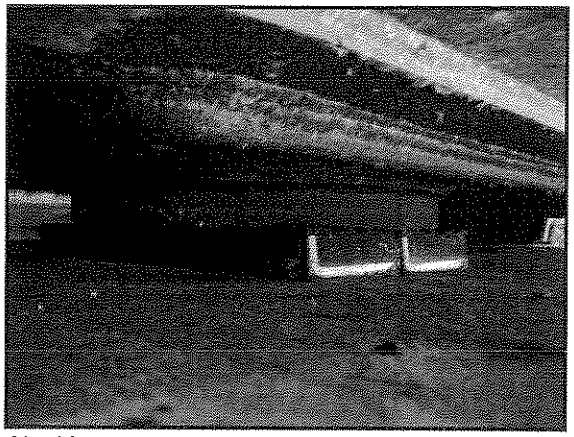
Stone Approach Looking North



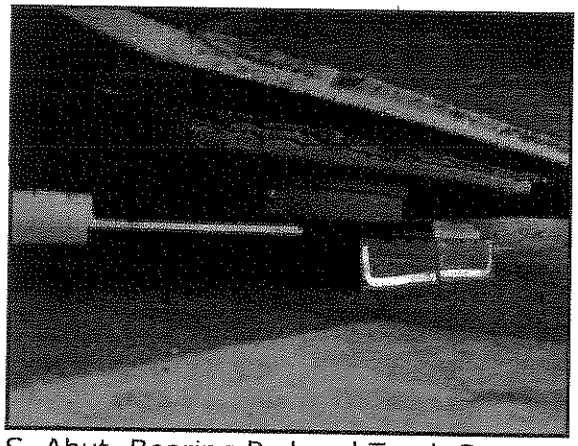
North Abutment and Railcar Joint



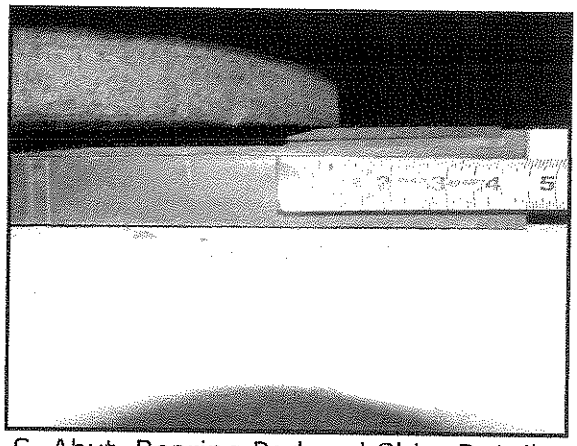
Weld Spacing for Kick Plate along Deck



N. Abut. Bearing Pad and Truck Support



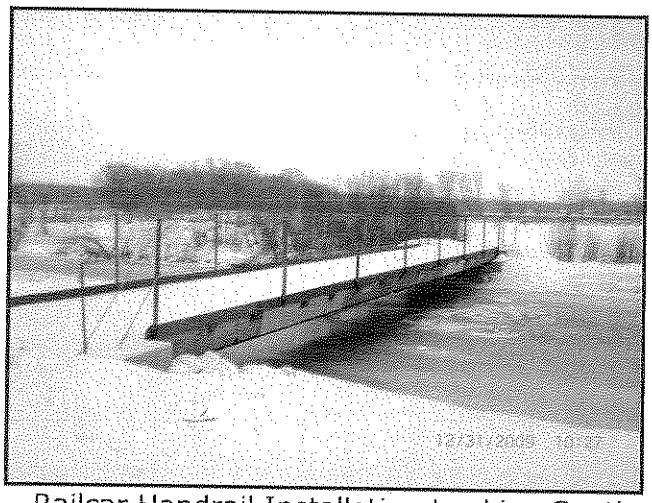
S. Abut. Bearing Pad and Truck Support



S. Abut. Bearing Pad and Shim Detail

After the site visit and co-ordination with Reed Sjostrom of Sjostrom Construction, Reed indicated that they were intending to replace the metal shim under the south abutment truck support ring with an appropriate shim support and bearing pad width(s) to support the entire truck support ring. Subsequent to this co-ordination effort with Sjostrom Construction, it was our understanding that Sjostrom replaced the south abutment shim with a more appropriate shim but had not, as yet, increased the bearing pad width for the entire truck support ring. Reed has indicated that they are waiting for better weather to finish the bearing pad modifications.

The photograph below was supplied by Sjostrom Construction and shows the handrail installation.



Railcar Handrail Installation Looking South

Our office will follow-up with Sjostrom regarding the necessary final modifications to the bearing pads and shims for complete support of the Railcar truck support ring.

End of Memorandum

AENON CONSULTANTS, LTD

Christian A. Smith, P.E.
President

405 King Arthur Court • Suite 14 • Bolingbrook, IL 60440
Phone (630) 759-9190 • Fax (630) 759-9134

Appendix 3

MEMORANDUM

DATE:	February 4, 2010
TO:	Jerry Paulson, Natural Land Institute
FROM:	Carrie Pintar
CC:	
RE:	Raccoon Creek Phase III Fish Passage Structure Final Construction Observation Report

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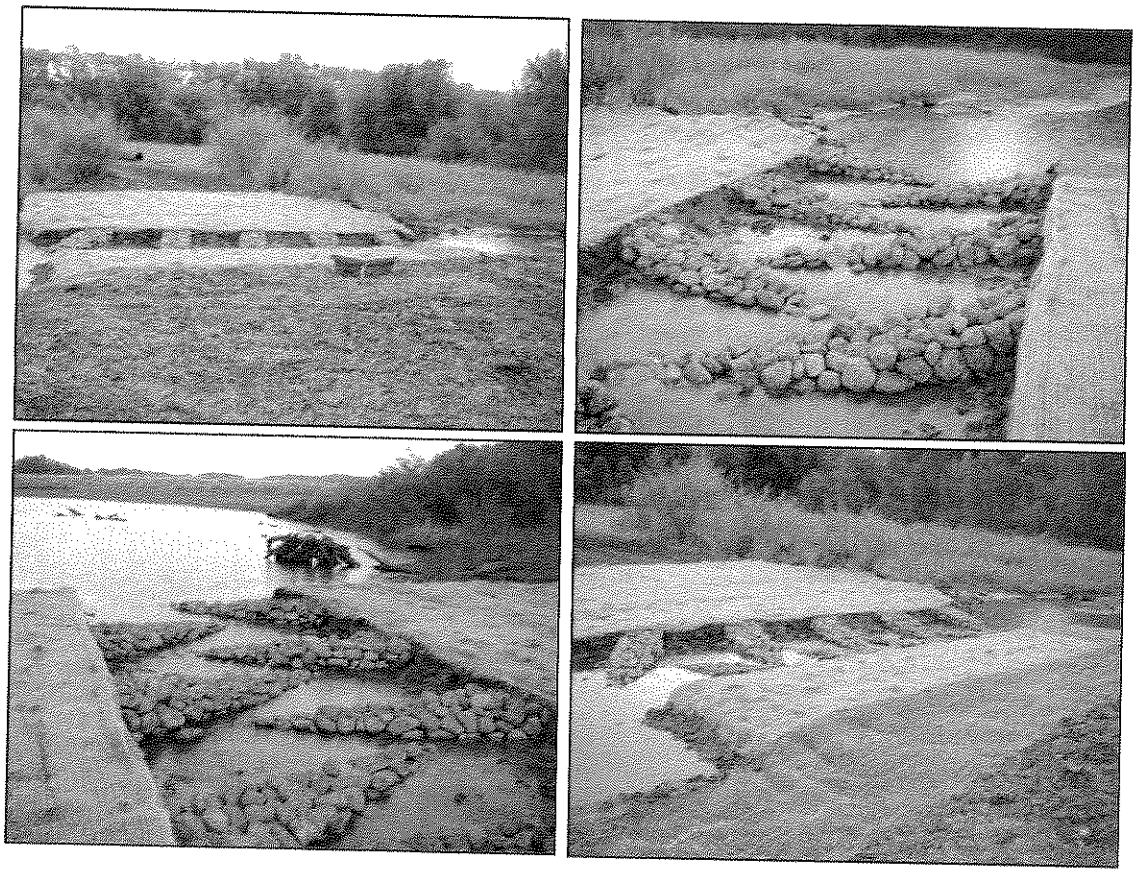
The following information is being provided as the Final Construction Observation Report for the Fish Passage Structure for the Raccoon Creek Phase III Restoration Project. In accordance with the contract between Natural Land Institute (NLI) and V3, contractor coordination, site visits and follow up coordination were performed as a part of this task.

Cooling Landscape Concepts was chosen as the contractor for the Fish Passage portion of the Phase III project. On September 9, 2009, coordination with Cooling (Kip/Chris) took place to clarify the normal water level used in designing the fish passage structure, the dimensions and elevations proposed for the rock riffles and the material proposed for the rock riffles. The normal water level within the oxbow area was a critical elevation for the fish passage structure placement and needed to be verified in the field. V3 (Carrie) recommended to Cooling to verify the normal water elevation via survey measures and then to verify with NLI (Andy) if the elevation measured at that time made sense for what was typically seen in the oxbow area. V3 (Carrie) clarified the dimensions of the rock riffles as well as the material needing to be natural cobble and not rip rap. V3 (Carrie) also provided Cooling with some photos of a similar fish passage structure that the design was based off of.

Further coordination with Cooling (Bill) and NLI (Andy) took place on September 16, 2009 after some initial survey work was completed verifying the fish passage structure area elevations and the design normal water level. It was determined that the normal water level used in the design, which was based off of a water level boundary from a 2-foot aerial topography, was inaccurate of what the true normal water level is in the area. Andy confirmed with Cooling the general location within the oxbow area of where the normal water level took place. This elevation was then used to set the fish passage structure.

Based on correspondence with NLI (Andy), Cooling began installation of the proposed inline water control structure on September 24, 2009 and completed the construction of the fish passage structure on September 29, 2009.

V3 completed a final site visit on October 1, 2009. The following photographs show the installed inline water control structure and constructed fish passage structure.



On November 11, 2009, NLI contacted V3 with some concerns with regards to the fish passage structure and the cobble within the rock riffles shifting and washing downstream. NLI provided some further clarification that approximately 15% of the cobble had been displaced and that this area was being used by wildlife (i.e. deer, raccoons…etc.) and bird watchers as a place to cross the water. It should be noted that the water level was also above the top of the rock riffles at this time.

Since the fish passage structure had only been installed a little over a month, it would be expected that some shifting of the cobbles would take place due to lack of vegetation or sediment build up within the riffles themselves to help with natural stabilization of the structure. V3 (Carrie/Didi) recommended to NLI to monitor the structure through the winter and if the overall stability of the structure is still in question, a wire mesh could be installed to prevent additional displacement of the cobbles. V3 and NLI will coordinate after the spring melt to determine the appropriate coarse of action.

Figure 1

Figure 2

Figure 2