

# Restoring Aquatic Organism Passage at Road-Stream Crossings

## 2006 Accomplishment Report



Eastern Region  
USDA Forest Service

## From the Regional Forester

We entered our second century of service in 2006 and began a new approach to forest management in the Eastern Region. During this past year, we began implementing our new Vision, “Courageous Conservation.” This Vision continues our legacy of restoration and creates a framework for a sustainable future. In keeping with this vision, the Eastern Region has continued to aggressively pursue collaborative partners to restore and maintain watershed health. As part of this effort, we are actively engaged in restoring aquatic organism passage at road-stream crossings. Passage projects provide immediate benefits to all aquatic organisms by restoring habitat which enhances the long term viability of many species. In Fiscal Year (FY) 2006, nearly 80 projects were implemented, which opened access to more than 70 miles of quality habitat. Congressional earmarks for fish passage and transportation bill “Safe, Accountable, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)” funds supported this effort, with agency funds, partnerships, and leveraging accounting for the rest.

After reading through this report, my hope is that you will have a better understanding of how our work is aligned with the goals of Courageous Conservation. Partners will play an increasingly important role in our new Vision.

### **Courageous Conservation**

*A sustainable future, a legacy of restoration*

- ❖ **Protect ecosystems across boundaries**
- ❖ **Connect citizens to the land**
- ❖ **Walk the talk for sustainability**
- ❖ **Revolutionize effectiveness and efficiency**
- ❖ **Be an employer of choice**



Randy Moore  
Regional Forester

A handwritten signature in black ink that reads "Randy Moore". The signature is written in a cursive, flowing style.

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## **Introduction**

The Eastern Region is pleased to share the work accomplished in Fiscal Year 2006 (FY06). There are 14 national forests and one national tallgrass prairie within the Eastern Region with public lands in 13 of the northeastern 20 states. We have more than 962,000 acres of lakes (43 percent of the NFS total) and over 15,000 miles of streams - 64 percent of which are trout waters. Over 1,350 miles of these streams support anadromous fishes. Pacific salmon species and steelheads occur on the three national forests in Michigan, while the national forests in New Hampshire and Vermont are engaged in restoring historic Atlantic salmon and shad runs. The Region is host to over 300 species of fish, 68 species of crayfish and numerous freshwater mussels with 110 of those species considered threatened, endangered or sensitive.

The Region supports approximately 28,000 miles of roads, with an estimated 50,000 road stream crossings. These crossings are of particular concern in our efforts to improve aquatic passage and restore stream channel function.

For many years the Eastern Region has been actively engaged in protecting our water resources through wetland restoration; aquatic passage restoration, including inventory and assessment; road and trail relocation out of riparian areas; restoration of channel flow; and restoration of stream morphology.

The purpose of this Accomplishment Report is to highlight the work completed in FY06 for the restoration of aquatic passage at road stream crossings.

## **Program Accomplishment**

The FY06 program includes obligation of \$97 thousand of Congressional Earmark funding for the replacement of structures causing barriers to aquatic passage at 3 road-stream crossings, with improvements to 5 miles of habitat (See Table 1).

SAFETEA-LU funded an additional \$2.1 million of project work. These funds cover four design projects and four construction projects, with estimated improvements to 65 miles of habitat (See Table 2). Projects funded by SAFETEA-LU were on designated Forest Highways (FH) in cooperation with local road agencies.

Eastern Region forests also implemented 67 projects utilizing appropriated funds with direct benefits to aquatic passage, reduction of sedimentation, restoration of stream channel morphology, and wetland function. In addition, the Region initiated a partnership with Northern Research Station to inventory over 500 structures across the region and assess those structures for aquatic passage needs.

**Table 1. FY06 Aquatic Organism Passage Projects Funded by Congressional Earmark**

<b>Forest</b>	<b>Project Name</b>	<b>Habitat Affected</b>	<b>Focus Species (See Table 3)</b>
Superior	Kadunce River Watershed Stream Crossing Project	5 miles	CBT, WT, NBL

**Table 2. FY06 Aquatic Organism Passage Projects Funded by SAFETEA-LU**

<b>Forest</b>	<b>Project Name</b>	<b>Habitat Affected</b>	<b>Focus Species (See Table 3)</b>
Hoosier	Bridge replacement-FH23-Taylor Br (C)	3.5 miles	No TES
Hiawatha	Indian River Wild and Scenic at Doe Lake (C)	11 miles	BKT, WT, HED, OD, BE, LN, BT
Hiawatha	County Road 442 at Johnson Cr (D)	4 miles	BKT, WT, HED, OD, BE, LN, BT
Hiawatha	County Road 437 at Murphy Creek (D)	30 miles	BKT, WT, HED, OD, BE, LN, BT
Hiawatha	Dick Road at Pine Creek (D)	4 miles	BKT, WT, HED, OD, BE, LN, BT
Mark Twain	Sutton Bluff (D)	3 miles	No TES
Superior	County State Aid Highway 2 - 3 stream crossings (C)	5 miles	CHS
Wayne	Gallia County Box Culverts - 3 (C)	4.7 miles	ESD
	<b>TOTALS</b>	<b>65.2 miles</b>	

C = Construction

D = Design

**Table 3. Focus Species**

BE = bald eagle	LN = loon
BKT = brook trout	NBL = northern brook lamprey
BNT = brown trout	NP = northern pike
BT = blandings turtle	OD = odonates (various other)
CBT = coaster brook Trout	RBT = rainbow trout
CHS = creek heelsplitter mussel	SMB = smallmouth bass
ESD = eastern sand darter	STH = steelhead
GHR = greater redhorse	WHS = white sucker
HED = hines emerald dragonfly	WT = wood turtle

## **Integration and Leveraging Resources**

Fish diversity in the United States has been declining due to pollution, invasive species, habitat degradation and fragmentation. This decline has had negative impacts on stream ecosystems. Recent studies have shown that culverts at road crossings can fragment habitat, acting as barriers to the upstream movement of fishes, preventing essential spawning migrations, and inhibiting re-colonization of streams after natural or man-made disturbances. With over 50,000 road crossings on eastern National Forest lands, these crossings represent a serious threat to the viability of native fish fauna. Our forests are using models developed for predicting which culverts are likely to be impassable by fish based on measured culvert characteristics and literature reviews of fish swimming and leaping ability. The study has produced three models that evaluate movement of trout, minnows, sculpins, and darters in streams with culverts classified by the model as passable or impassable. The results of this study provided fisheries biologists with tools for evaluating, prioritizing, and implementing road crossing management projects, in addition to increasing our knowledge of fish movement in small streams.

Besides aquatic passage evaluations, forests evaluated potential projects for multiple objectives that included, but were not limited to, reducing risk to human health, emergency repairs to roads, and restoring access. In addition, projects were to address one or more of the Chief's Four Threats (fire and fuels, unwanted terrestrial and aquatic invasive species, unmanaged recreation, and loss of open space). Projects were to consider partnership potential and leverage funds, as well as, enhance, restore, or protect ecological function in watersheds. Finally, projects were to contribute to conservation and recovery of species at risk. The Inventory and Assessment process (Phase I) provided the information to address integration and leveraging of resources both internally and externally.

## **Monitoring**

Monitoring the effects of culverts has major implications. Some techniques can detect passage but may be limited when movement is infrequent, or when it occurs over large spatial scales. Monitoring methods are needed to determine the influence of environmental factors on passage probability and need to evaluate actual reproductive isolation caused by passage limitation, and should document the reestablishment of population connectivity. A combination of genetic, direct passage using antenna arrays and Passive Integrated Transponder (PIT) tags, and population monitoring is currently being researched and evaluated by the Northern Research Station to provide managers with information on successful culvert remediation efforts.

**Before and After Photos  
of  
FY06 Projects**

## Superior National Forest - Kadunce River Watershed Stream Crossing Project

### Project Purpose/Objectives:

The Kadunce River Watershed project includes the reconstruction of 3 stream crossings. The Kadunce River watershed directly supports healthy populations of eastern brook trout and provides habitat for migratory Lake Superior coaster brook trout. Aquatic passage improvements at the 3 locations will enhance over 5 miles of cold water stream habitat. Funding for the project was a combination of Congressional earmark funds and forest appropriated funds. Partnerships have also been established with Trout Unlimited and Minnesota Department of Natural Resources to accomplish additional work within this watershed.



**Before:** Existing circa 1950's steel multi plate structure.



**After:** New bottomless arch structure.



**Before:** Existing 48" perched pipe.



**After:** New timber bridge.

Work Performed:

Work included: 1) the replacement of an existing perched circa 1950's steel multi-plate structure with an open bottom aluminum box culvert set on cast-in-place concrete footings; 2) replacement of dual 30" existing rusted, perched pipes with new buried pipes and 3) replacement of a 48" pipe with a small timber bridge.

Funding included the Congressional earmark for \$97 thousand and \$40 thousand of Forest appropriated funds.

Expected Benefits:

The Kadunce River directly supports healthy populations of eastern brook trout and provides habitat for migratory Lake Superior coaster brook trout. Aquatic passage improvements at the three Kadunce River crossings will enhance access to over 5 miles of cold water stream habitat.

## **Hoosier National Forest - Bridge Replacement-FH 23-Taylor Branch**

### Project Purpose/Objectives:

The purpose of the project is to replace the existing undersized, dual perched culverts with a new concrete box culvert on FH 23. The new structure is designed to allow for adequate aquatic passage and correct safety issues relative to alignment and load restrictions.



**Before:** Existing Culverts

### Work Performed:

Design of the new concrete box culvert is complete. The project is currently being reviewed under the State process. Contract award is expected in late FY07/early FY08.

### Expected Benefits:

Restore stream connectivity and provide aquatic species passage for the eight known species existing in this stream. Improve public safety.

## Hiawatha National Forest - Indian River Wild and Scenic at Doe Lake Road

### Project Purpose/Objectives:

This project replaced a culvert and repaved approaches to the Indian River on Forest Highway 80. Habitat upstream from the crossing includes three lakes and 11 miles of river channel occupied by a wide variety of coldwater and warmwater fish species. Similarly diverse habitat and fish communities occur downstream from the crossing. Existing culverts at the crossing were undersized and perched resulting in channel aggradation and water impoundment upstream through a 35-acre lake. Seasonally excessive velocities through the pipes and excessive scour downstream were the result. The small culverts were prone beaver activity and debris blockage. Wild and Scenic River considerations favored replacement of the existing crossing with a bridge or other structure that would blend well aesthetically and span normal bankfull channel width.



**Before:** Culverts on Indian River prior to culvert replacement.



**After:** New con span structure

### Work Performed:

Work included: 1) the removal of the old culvert pipes and road fill, 2) the casting of concrete footings and installation of the pre-cast arch structure, 3) the back fill of the structure and 4) reconstructing the roadway with ditches, cross drainage and bituminous surfacing.

### Expected Benefits:

The project has improved aquatic passage to 11 miles of river and 47 acres of lake upstream from the crossing; restored channel morphology upstream and downstream from the crossing; restored lake surface elevation upstream from the crossing; provided for the natural conveyance of debris, and reduced sediment inputs from the road surface.

## **Hiawatha National Forest - County Road 442 at Johnson Creek**

### Project Purpose/Objectives:

The project involves the replacement of multiple, undersized culverts with a larger structure and reconstruction of approaches on FH 76. The current road stream crossing impedes aquatic passage and delivers large amounts of sediment to the stream. The replacement structure and approach work will allow for a natural stream bottom and reduction of sedimentation. Several miles of cold water trout streams will be improved as a result of this project.

### Pictures:

Before and after pictures will be provided upon completion of the work.

### Work Performed:

Design was completed in FY06. Construction is scheduled for FY07 based on the receipt of funds.

### Expected Benefits:

Stop erosion and sedimentation from the road. Restore stream channel continuity and provide for aquatic passage.

## **Hiawatha National Forest - County Road 437 at Murphy Creek**

### Project Purpose/Objectives:

The project involves the replacement of an undersized, perched culvert with a con span bridge on FH 43. The current road stream crossing impedes aquatic passage. The replacement structure and approach work will provide for a natural stream bottom and the reduction of sediment in the stream. Thirty miles of cold water trout streams will be improved as a result of this project.



**Before:** Culvert on Murphy Creek existing conditions.

**After:** Replacement structure similar to Indian River Wild and Scenic at Doe Lake Road (see page 12).

### Work Performed:

Design was completed in FY06. Construction is scheduled for FY07 based on the receipt of funds.

### Expected Benefits:

Restore stream channel continuity and provide for aquatic passage. Reduce sediment load to the stream.

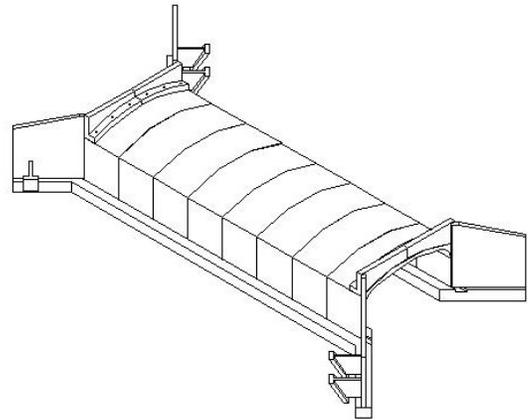
## Hiawatha National Forest - Dick Road at Pine Creek

### Project Purpose/Objectives:

The purpose of this project is to replace an existing perched culvert, that is nearing the end of its useful life, in the Pine River watershed. The existing structure is not aligned appropriately with the stream channel and is narrower than bankfull width resulting in stream bank erosion and aggradation. Aquatic passage is further impeded by continued beaver activity.



**Before:** Culvert on Murphy Creek existing condition.



**After:** New concrete structure as designed.

### Work Performed:

Due to high bids on the Indian River project (page 12) the forest used appropriated funds for the Pine Creek project. Design was completed in FY06. Construction is scheduled for FY07 based on the receipt of funds.

### Expected Benefits:

The project will reduce sediment from entering the river by improving the road slopes, ditches, and hardening the road surface. Restore stream channel continuity and provide for aquatic passage. The addition of guardrails will enhance public safety.

## Mark Twain National Forest - Sutton Bluff – FH 56

### Project Purpose/Objectives:

The stream channel in the vicinity of the low water crossing (LWC) is relatively shallow and meandering through a broad floodplain, controlled by scattered bluffs. The existing LWC consists of a three box culvert ford, with a perched apron on the downstream side. Velocity increases three fold as the flow passes through the structure, resulting in downstream scour and the change in stream habitat both up and downstream of the structure. Rain events or flash storms contribute to the problem. After such events, Sutton Bluff LWC can become impassable for days. The project consists of designing a structure that will provide flow across the bankfull width, allow for a natural channel bottom to enhance aquatic passage and provide for the safe passage of the public.



**Before:** Low water crossing on the East Fork of the Black River.

**Before:** At high water.

### Work Performed:

Sutton Bluff was the featured field site for the Aquatic Organism Passage (AOP) Design session, sponsored by R9 in conjunction with San Dimas Technology Development Center and hosted by the Mark Twain in May 2006. Field work was conducted during the summer of 2005. The river was surveyed and cross sectioned, hydrologic data and fish data was also collected. Twenty two fish species were noted during mark and recapture, while historic data indicated this stream supported over 30 different species of fish. During the design session the students interpreted the data and structure alternatives were discussed. Currently, this project is in the planning and design phase.

### Expected Benefits:

The new structure will provide for aquatic passage, help restore the natural geomorphology to the stream channel, and provided for public safety.

## **Superior National Forest - County State Aid Highway (CSAH) 2 – 4 stream crossings**

### Project Purpose/Objectives:

The 4 road stream crossings funded with SAFETEA-LU funds are part the 11.4 mile reconstruction of CSAH 2, FH 15, located in Lake County. Work includes the improvement for aquatic passage at the Cloquet River, Langley River, Little Langley River and Dempsey Creek crossings. Each crossing includes concrete box culvert installation, riprap, sodding, turf establishment, erosion control measures, approach grading, etc.

### Pictures:

Before and after pictures will be provided upon completion of the work.

### Work Performed:

The county road contract has been awarded; work is scheduled to start spring 2007.

### Expected Benefits:

Forest fisheries staff collaborated with Lake County engineering to design the crossing improvements to greatly improve the aquatic passage and fish access. The reconstruction work will provide improvement to 5 miles of stream habitat. The crossings improve habitat for the creek heelsplitter mussel (Regional Forester Sensitive Species) and benefits aquatic communities by maintaining proper river functions to create a natural conveyance of water and sediment.

## Wayne National Forest - Gallia County Box Culverts - 3

### Project Purpose/Objectives:

Forest Highway 41 (Gallia County Road 68) provides a key link to the northern portion of the Ironton Ranger District. It traverses the Symmes Creek drainage, arguably the watershed with the most diverse aquatic life on the Forest. There are four existing crossings on FH 41 that are functionally obsolete and structurally deficient. In 2004, the County replaced one small bridge with a concrete box culvert, unknowingly causing an aquatic species barrier where none existed previously. (See the picture below). The forest is working with the County to ensure the construction of the 3 new concrete box culverts meet the needs for aquatic passage.



County Culvert placed in 2004, causing serious aquatic passage problems, where none existed previously.



Structures to be replaced in 2007 are similar to the one replaced in 2004.

### Work Performed:

The contract to replace the 3 existing structures with 3 concrete box culverts is awarded.

### Expected Benefits:

Completion of properly installed structures will ensure the unimpeded passage of the diverse species located in this watershed.

The 2004 project resulted in an awareness of county and state officials to the needs of aquatic species. In FY06 the Forest invited an Ohio DOT, District 10 Design Engineer to attend the AOP Design training course being conducted by the FS and hosted in Missouri. This individual serves as a valuable resource for the state and local road engineers to ensure proper design for aquatic species and will assist with the continued cooperation between the Forest Service, State and County for future projects.