

# DRIFTLESS AREA RESTORATION EFFORT



## Aquatic Conservation Plan

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## Acronyms Used in Document

### Driftless Area Restoration Effort Aquatic Conservation Strategy

<b>ANS</b>	<b>Aquatic Nuisance Species</b>
<b>BALM</b>	<b>Basin Alliance of the Lower Mississippi</b>
<b>CSF</b>	<b>Congressional Sportsmen's Foundation</b>
<b>CRP</b>	<b>Conservation Reserve Program</b>
<b>DAI</b>	<b>Driftless Area Initiative</b>
<b>DALCI</b>	<b>Driftless Area Land Conservation Initiative</b>
<b>DARE</b>	<b>Driftless Area Restoration Effort</b>
<b>DNR</b>	<b>Department of Natural Resources</b>
<b>EPA</b>	<b>Environmental Protection Agency</b>
<b>EQIP</b>	<b>Environmental Quality Incentives Program</b>
<b>FSA</b>	<b>Farm Service Agency</b>
<b>GRP</b>	<b>Grassland Reserve Program</b>
<b>HUC</b>	<b>Hydrological Unit Code</b>
<b>LCD</b>	<b>Land Conservation Department (Wisconsin)</b>
<b>NFHAP</b>	<b>National Fish Habitat Action Plan</b>
<b>NFWF</b>	<b>National Fish and Wildlife Foundation</b>
<b>NGO</b>	<b>Non governmental organization</b>
<b>NRCS</b>	<b>Natural Resource Conservation Service</b>
<b>RC&amp;D</b>	<b>Resource Conservation Council and Development</b>
<b>SGCN</b>	<b>Species of greatest conservation need</b>
<b>SVCV</b>	<b>Spring Viraemia Carp Virus</b>
<b>SWCD</b>	<b>Soil and Water Conservation District</b>
<b>TUDARE</b>	<b>Trout Unlimited Driftless Area Restoration Effort</b>
<b>TNC</b>	<b>The Nature Conservancy</b>
<b>UMR</b>	<b>Upper Mississippi River</b>
<b>UMESC</b>	<b>Upper Midwest Environmental Science Center</b>
<b>USDA</b>	<b>U.S. Department of Agriculture</b>
<b>USACOE</b>	<b>U.S. Army Corps of Engineers</b>
<b>USFWS</b>	<b>U.S. Fish and Wildlife Service</b>
<b>USGS</b>	<b>U.S. Geological Survey</b>
<b>VHS</b>	<b>Viral Hemorrhagic Septicemia</b>
<b>WHIP</b>	<b>Wildlife Habitat Incentives Program</b>

## **Introduction**

The following document is a regional Driftless Area conservation strategy that addresses the causes of habitat loss, fragmentation and alteration of lotic systems and outlines objectives and strategies to more effectively and efficiently improve riparian and stream habitat for fish and other aquatic organisms. This conservation plan will serve as a living document and will be updated every 3 years with new assessment information, strategies, species information, and progress measures.

The Driftless Area Restoration Effort (DARE) fish habitat partnership embarked on a long-term effort to increase the quantity and quality of habitat in cold, cool and warm water streams for fish and other aquatic life. Conserving and restoring lotic systems within the Driftless Area continues to take great commitment and involvement by regional, state, local, non- governmental organizations (NGOs), the agricultural community, and private partners.

The DARE continues to recognize the benefits of working together towards a common goal of conserving and increasing biodiversity, health, and productivity within the geographically defined area. Early discussions helped shape the direction of the newly formed fish habitat partnership. Drawing upon existing area relationships, the DARE was able to:

- Build off of past and existing cooperative on-the-ground efforts
- Foster new public-private partnerships and strengthen existing ones
- Promote collaboration and coordination in project planning
- Implement and evaluate stream conservation actions
- Focus financial resources to high priority areas
- Leverage new and existing funds from federal, state, county, non-profit, foundation, and private sources.

## **Mission**

*The DARE partnership is working together to protect, restore and enhance cold, cool, and warmwater streams for fish and other aquatic communities in the Driftless Area region for future generations.*

## **Vision**

Work more collaboratively with conservation partners and private landowners to better manage the region's uplands, streams and their floodplains. The partnership will help plan and coordinate strategic efforts at the landscape level to improve water and habitat quality resulting in increases in healthy fish populations, overall biodiversity and quality of life.

## **Principal Goals**

**GOAL--** Reduce sediment and nutrients inputs to Driftless Area rivers and streams.

**GOAL--** Conserve, restore and expand habitats that will increase the natural abundance, diversity, and health of fish and other aquatic life.

**GOAL--** Increase the quantity and quality of angling and other recreational opportunities.

**GOAL--** Increase awareness about Driftless Area resources and the importance of aquatic conservation and restoration through outreach and education.

## **Key Priorities**

**Priority:** Improve riparian and in-stream habitat on cold, cool and warmwater streams.

**Priority:** Protect, maintain and expand self-sustaining brook trout, brown trout and smallmouth bass populations.

**Priority:** Improve riparian and in-stream habitat for priority non-game species.

**Priority:** Monitor and evaluate conservation actions.

**Priority:** Increase angling and other recreational opportunities.

**Priority:** Raise awareness about upland and aquatic conservation through outreach and education.

## **National Program**

The National Fish Habitat Action Initiative (NFHI) was established to address the declines of our nation's aquatic resources. Approved for implementation by the Association of Fish and Wildlife Agencies on March 24, 2006 in Columbus, Ohio, the National Fish Habitat Partnership (NFHP) formerly Action Plan (NFHAP), attempts to harness the energies, expertise, and existing partnerships of state, federal and local government, and conservation organizations. The Program is non-regulatory, partnership driven, science-based, action oriented, and focuses resources and funding where they will make measurable differences on the landscape (National Fish Habitat Action Plan 2007).

Since the inception of the national program, five general goals have been constructed to provide guidance to fish habitat partnerships: 1) Protect and maintain intact and healthy aquatic systems; 2) Prevent further degradation of fish and aquatic habitats that have been adversely affected; 3) Reverse the declines in the quality of aquatic habitats to improve the overall health of fish and other aquatic organisms; 4) Increase the quality and quantity of fish sustained by our Nation's waters; and 5) Increase self-sustaining aquatic systems that support a broad natural diversity of fish and other aquatic species. The full action plan can be found at <http://fishhabitat.org>.

The NFHP is centered on the establishment of partnerships and the implementation of restoration efforts at multiple geographic scales. Guidance approved by the NFHP Board, the body that oversees and coordinates implementation of the program, suggests that establishment of fish habitat partnerships should form around keystone species, aquatic systems or geographic areas and address issues of national significance (National Fish Habitat Action Plan 2007).

## Partnership Purpose and Need

The DARE fish habitat partnership was formed in late fall of 2005 to jointly address the issues of habitat degradation, loss, and alteration of cold, cool and warmwater streams and rivers. Partners agree there is an elevated need for the coordinated conservation and management of aquatic resources throughout the Driftless Area. The river and stream ecosystems in the Driftless Area contain diverse assemblages of fish, mussels, amphibians, reptiles, and aquatic invertebrates. A history of poor and inconsistent land and water management practices have contributed to current levels of excessive sediment and nutrient loads to many streams resulting in broad declines in fish populations and overall diversity of aquatic life. Driftless Area streams and rivers transport high sediment loads to the Upper Mississippi River, contributing significantly to the degradation of backwater habitat in the Upper Mississippi River and to the expanding hypoxia problems in the Gulf of Mexico.

## Land Use and Ownership

Land use in the Driftless is primarily agricultural with cash grain operations and livestock most dominant. Corn, soybean, hay and alfalfa are the common row crops (NRCS 2008a-o) planted here.



Deciduous and mixed forest constitutes the second highest percentage of land use in the Driftless.



### **DARE background**

The DARE fish habitat partnership was initiated as Trout Unlimited's Home Rivers Initiative-TUDARE in 2003. To date, TUDARE is Trout Unlimited's largest Home Rivers Initiative undertaken. In 2005, Trout Unlimited released a published report entitled, "*The Driftless Area: A Landscape of Opportunities*". The report described natural resource challenges facing the Driftless Area and the wide range of opportunities to improve land use and restore degraded stream habitat across the region. This report served as a **call to action**. The U.S. Fish and Wildlife Service recognized the similarities between TUDARE goals and NFHAP goals and worked with Trout Unlimited and NFHAP officials to add DARE (formerly MDARE) as a pilot fish habitat partnership during the early development of the NFHAP program. DARE was announced as a pilot partnership in November 2005 and recognized as a full partnership in October 2007.



Approximately 96% of the Driftless Area landscape is in private ownership. The remaining 4% is primarily county, state, federal, tribal, major private, NGO, and other. Because the land base in the Driftless is over 95% privately owned, the future state of the region critically depends on what the landowners choose to do with their lands. Landowners who have taken it upon themselves to conserve and enhance habitat on their lands for fish and wildlife deserve a considerable amount of credit. Many have taken the initiative to help protect environmentally sensitive lands, reduce soil erosion, protect ground and surface waters, and improve habitats for wildlife, plants, and aquatic species. Landowners in the Driftless Area, with assistance from local conservation entities, continue to voluntarily enroll in conservation programs under the U.S. Department of Agriculture's (USDA) Farm Bill Program or through county level programs.

## **Driftless Area Partners**

Diverse partners are essential to the success of this long-term initiative to improve aquatic resources in the Driftless Area. State and federal agencies having jurisdiction and fishery responsibilities in the Driftless Area include the Department of Natural Resources from Minnesota, Iowa, Wisconsin, and Illinois and the U.S. Fish and Wildlife Service. Agencies such as the Natural Resource Conservation Service (NRCS), Resource Conservation and Development Councils (RC&Ds), Soil and Water Conservation Districts (SWCDs), Wisconsin County Land Conservation Departments (LCDs) and other local conservation groups help provide technical and financial assistance to private landowners willing to conserve natural resources on their lands. They also play an important role in the facilitation of planning and implementation of land and water conservation and stream restoration efforts.

Trout Unlimited, dedicated to protecting and conserving coldwater fisheries and their watersheds, is coordinating the Driftless Area Restoration Effort fish habitat partnership. Trout Unlimited plays an important leadership role, having a long history and vested interest in enhancing habitat in coldwater streams for trout in the Driftless Area.

The Nature Conservancy (TNC), world renowned for protecting ecologically important lands and waters, is coordinating with partners to protect and enhance habitat for freshwater biodiversity in target watersheds within the Driftless Area identified in the "Conservation Priorities for Freshwater Biodiversity in the Upper Mississippi River Basin" (TNC 2003).

The U.S. Geological Survey Upper Midwest Environmental Technical Center (UMESC) is known for its GIS capabilities and scientific expertise, undertaking large-scale terrestrial and aquatic projects throughout the Upper Mississippi River basin and is providing invaluable scientific support for the Fishers and Farmers and DARE partnerships.

The above entities, and other conservation organizations not mentioned, understand the importance of protecting and maintaining the high biodiversity in the Driftless Area and have similar goals to improve habitat for fish and other aquatic and semi-aquatic communities. Conservation partners have worked together in the Driftless Area for decades, and for a few, like the former Soil Conservation Service, since the 1930s. While respecting the unique goals and objectives of each partner entity and watershed group, the partnership can collaborate where possible on priorities and actions outlined in a conservation strategy that is consistent with the goals of the NFHP and implement on-the-ground conservation actions that in part, contribute to the strategies developed by the National Science and Data team.

## DARE Management Structure

### ***Steering Committee Structure***

The steering committee is the decision making body of the partnership led by a coordinator from Trout Unlimited. The coordinator's official title is "DARE Project Manager." The steering committee provides overall leadership, guidance, resources, support to the partnership, and a forum to discuss conservation issues. Decisions are made with partner entities.

**Partnership Ad hoc Teams.**--The partnership operates through the help of teams, which serve for a variety of functions including administrative, management, and programmatic issues. The partnership has six standing ad hoc teams:

- Planning & Prioritization Team
- Wild and Rare Team
- Data, Monitoring and Assessment Team
- Outreach and Learning Team
- Economic Assessment Team

**Planning and Prioritization Team.**--The Planning and Prioritization team will develop a regional strategy for stream restoration efforts in the Driftless Area to improve upland health, fish habitat and fish populations. The team will draft a plan to help strategically place dollars on-the-ground where measurable differences can be made. The team will prioritize streams for protection and restoration based on assessments, specified criteria from state natural resource agencies and county level entities operating in the Driftless Area region.

**Wild and Rare Ad Hoc Team.**--The Wild and Rare Committee was organized by DARE to bring together professionals to formulate ideas on how to incorporate habitat for amphibians, reptiles, birds, etc. along with stream restoration projects. This team will develop a guide for professionals and landowners that include standard designs and discussions of appropriate use and monitoring.

Representatives include WI, MN & IA DNR Endangered Resource staff, U.S. Geological Survey, U.S. Fish and Wildlife, Natural Resources Conservation Service, The Nature Conservancy, Driftless Area Initiative, Trout Unlimited, University Wisconsin-La Crosse, and a private herpetologist.

The group meets on a "as needed" basis. General tasks are to develop and occasionally update a riparian stream restoration handbook for professionals. The guide includes technical designs for nongame habitat.

**Data, Monitoring and Assessment Team.**--The team assists with resource assessments and aids in restoration planning and target setting as necessary. Assessment data and documents are made accessible for partner entities and the public on the <http://www.Midwestfishhabitats.org> or <http://www.darestoration.com> websites. GIS coverages are updated as necessary depending on availability of staffing.

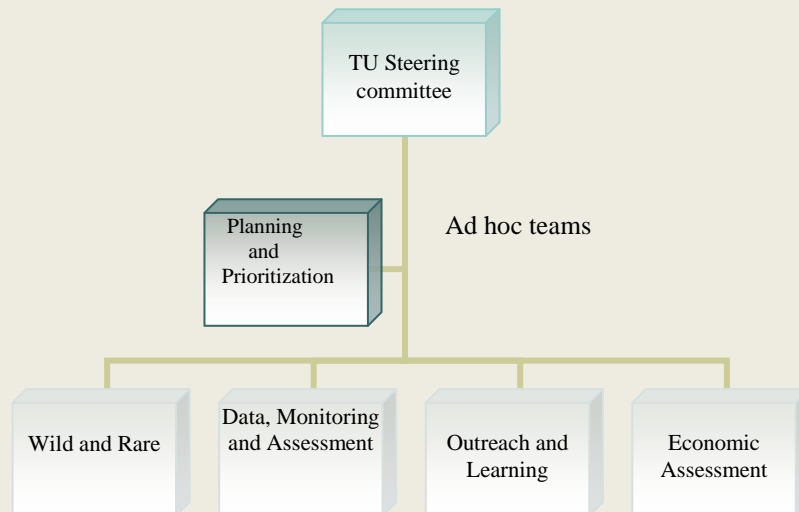
The team also identifies habitat and biological indicators that demonstrate the effectiveness of individual projects in relation to clearly defined project goals. The team works with partners to identify directional habitat and priority fish species outcomes by comparing pre-defined baseline data with post construction data from individual NFHP projects. The team is to work with the

National Science and Data Committee as needed. A project tracking database is to be developed and updated annually.

**Outreach and Learning Team.**--The Outreach Team generates public and congressional support for fish habitat conservation in the Driftless Area. The team utilizes its outreach strategy to increase public awareness of Driftless Area resources and support of restoration and enhancement efforts. The Outreach team keeps Driftless Area congressional members informed about partnership activities through local media events, NFHP project fact sheets, e-newsletters, reports, and helps promote understanding of partnership progress and accomplishments to the NFHP Board.

Team members also organize an annual forum for sharing management policies and issues, monitoring and research results related to coldwater streams, restoration techniques, etc., among professionals, landowners, and academia working or interested in the Driftless Area.

**Economic Assessment Team.**--The Economic Assessment Team will conduct a regional assessment of potential economic impacts from expanding fish habitat restoration efforts and the associated projected increase in angling. The team will work with a contracting firm, to develop and analyze a mail/on-line survey. The scheduled 2015 survey will be compared to the 2007 survey. Trends in demographics, species preference, angler days, and money expended at local Driftless Area business will all be analyzed.



## Geographic Scope

The Driftless Area is a 24,000 sq-mile area that lies in the heart of the Upper Mississippi River basin (Figure 1). The Driftless Area encompasses portions of southeast Minnesota, southwest Wisconsin, northeast Iowa, and northwest Illinois. It is bounded on the north by Hastings, Minnesota, on the west by St. Charles, Minnesota, on the east by Madison, Wisconsin, and on the south by Clinton, Iowa.



Figure 1. Geographic boundary of the Driftless Area Restoration Effort.

The surrounding Upper Mississippi River basin (UMRB) in Iowa, Missouri, Minnesota, Wisconsin and Illinois is a geographic area currently addressed by the Fishers and Farmers of the UMRB partnership. Elevation and gradient of rivers and streams in the Driftless tend to be higher than the predominant lowland prairie streams of the rest of the basin. The DARE partnership is focused on the moderate to higher gradient rivers and streams.

## Driftless Area Setting

The most recent glacial period known as the Wisconsin glacier began about 110,000 years ago during the Pleistocene epoch and receded from northwest Wisconsin approximately 10,000 years ago. As glaciers advance, melt and recede, debris containing a mixture of vegetation, rock and dirt known as "drift" is usually left behind. The resulting lack of drift from this most recent glacier period led to the current name, "Driftless Area." However, thousands of years of weathering and erosion from previous glacial periods have formed a rugged landscape with steep, narrow river valleys and ridges, and forested hilltops. The high topographic relief of the Driftless Area is underlain with soluble bedrock such as limestone and dolomite. This carbonate rock erodes as groundwater seeps or flows through conduits forming cracks, crevices, tunnels, caves, and sinkholes making the area highly vulnerable to erosion and groundwater contamination.

The Driftless Area is dotted with over 600 springs, supplying a high concentration of coldwater streams that interweave across the landscape. Over 3,600 miles of coldwater streams flow throughout the Driftless Area. The beautiful karst landscape is also blanketed with sinkholes, caves and disappearing streams. Sinkholes are often located in rural areas amidst row crops, pastures, or wooded areas. A couple of the region's caves have been placed on the national register of natural landmarks by the Department of Interior's National Park Service. Coldwater Ice cave, located in Winneshiek County near Blufton, Iowa has over 17 miles of passages and extends over the border into southern Minnesota. Cave of the Mounds, near Blue Mounds in Dane County, Wisconsin is decorated with a variety of cave formations called speleotherms and contains an array of



colorful mineral deposits. There are ongoing studies to better understand disappearing streams or losing streams which can sometimes vanish into sinkholes, flow through caves, and reappear as springs miles away. These are just a few geologic examples from the Driftless Area box of gems.

Few natural lakes exist in this area, however several man-made impoundments are found, dammed primarily for hydroelectricity, flood control or for recreational purposes.

### ***Diverse plant and animal communities***

The Driftless Area is recognized as a nationally important area for biodiversity, possessing some very rare species of plants and wildlife (Chaplin et al. 2000). The Driftless also possess an unusual geological feature, which provides a home to a wide array of plants and animals. Algific (cold producing) talus (loose rock) slopes, a unique habitat type associated with sinkholes, is found only in the 4-state Driftless Area and no other place in the world (USFWS 2006). This sensitive microclimate supports and enables the persistence of "glacial relicts," including globally rare terrestrial snails such as the Endangered **lowa pleistocene snail** (*Discus macclintocki*); found in Iowa and Illinois and no other place in the world (USFWS 2006).



The threatened northern monkshood plant (*Aconitum noveboracense*) of the buttercup family also resides in these cool, moist habitats and is found only in the Driftless Area, Ohio, and New York (USFWS 1983). The Driftless Area National Wildlife Refuge was established in 1989 to protect the habitat and the remaining colonies of the Iowa Pleistocene snail and Northern monkshood.

## Angler-Economic Impacts to the Driftless

The Driftless Area attracts a variety of outdoor enthusiasts. Fishing, birding, caving, canoeing, camping, hunting, hiking, and biking can all be enjoyed here. Some of the best fishing opportunities can be found here in the 4-state Driftless, renowned for its trout and smallmouth bass fishery. Brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and smallmouth bass (*Micropterus dolomieu*), are the popular game species here. Recreational angling produces a significant economic impact in the United States including Driftless Area states. According to a study conducted by the Congressional Sportsmen's Foundation (CSF) in 2002, direct spending on angling alone in the United States, totaled \$42 billion by 30 million active anglers (CSF 2006). Direct spending in the Driftless Area was a surprising \$647 million by approximately 155,000 anglers, according to a recreational fishing economic impact study conducted by Northstar Economics (2008) in 2007. The associated "ripple effect" to the local economy was an impressive \$1.1 billion dollars annually (Northstar Economics 2008).

## Priority Habitats

Cold, cool and warmwater systems and associated karst habitats are all part of the Driftless Area's unique character and are priority habitats identified by the partnership (Table 1). These habitats are defined in **Appendix A**. Conservation actions will continue to focus on maintaining self-sustaining fish populations, reconnecting fragmented habitats to improve access to spawning, rearing and overwintering grounds, and slowing and reversing trends in habitat degradation to improve health of streams so that they support diverse communities of fish, herptiles, invertebrates, mussels, and plants.

Table 1. Priority DARE habitats.

<b><i>Priority habitats</i></b>
Coldwater streams
Cool and warmwater streams
Karst habitats
Algific talus slopes, associated sinkholes and buffers
Springs

Note: Priority habitats were identified at a 2007 partner's meeting

## Priority Fish Species

Priority fish species identified for cold, cool and warmwater systems were divided into three categories: 1) fish species of management concern (recreational species); 2) rare, declining or vulnerable species specified in state wildlife action plans and; 3) declining species of agency concern not listed in wildlife action plans.

Brook trout, brown trout and smallmouth bass were selected as focal species because they were species of management concern (policy relevance) and traditional funding of restoration efforts have typically targeted these sportfish in the Driftless Area. The three species also have technical merit, respond to specific management or conservation actions quickly, and are cost efficient as it relates to time and effort expended in monitoring and evaluation. Fish monitoring protocols and reporting metrics across the 4-state area are similar, lending to the ease of common evaluation measures.

Stream enhancement and restoration efforts typically improve habitat for the associated fish community including sculpin, daces, chubs, redhorses, and darters. Several state species of greatest conservation need (SGCN) were selected as priority fish species.

Table 2. DARE priority fish species.

<b>Coldwater streams</b>	<b>Cool and Warm water streams</b>
Brook trout	Smallmouth bass
Brown trout	Black redhorse
Sculpin(Mottled/Slimy)	Blacknose dace
American brook lamprey	Longnose dace
	Ozark minnow



## Priority Non-game Wildlife

Targeted riparian corridor protection, restoration, and enhancement efforts on Driftless Area streams can also extend benefits to non game wildlife such as frogs, salamanders, turtles, snakes, mussels, bird and insects. Installing basking logs for turtles, hibernacula for snakes, backwater and riparian wetlands for frogs while restoring stream habitat can reconnect fragmented habitats and increase local biodiversity. Some of the heptiles, mussels and birds that benefit from such riparian efforts are included in Table 3.



E. softshell turtle



Blanding's turtle

**Table 3.** DARE priority non-game rare and sensitive herptile, mussels, and bird species.

<b>Amphibians</b>	<b>Reptiles</b>	<b>Mussels</b>	<b>Birds</b>
Pickerel frog	Wood turtle	Slippershell	Wood duck
Boreal chorus frog	Blanding's turtle	Black sandshell	Bank swallow
Northern cricket frog	Eastern snapping turtle	Ellipse	Northern rough winged-swallow
Spring peeper	Common garter snake		Tree swallow
Blue spotted salamander	Western fox snake		Spotted sandpiper
Four-toed salamander			



## Current Habitat Conditions

Habitat condition assessments were completed for three DARE priority fish species in 2011 by Downstream Strategies, a GIS-consulting firm. The assessments were completed in conjunction with six other Midwest fish habitat partnerships and funded through a Multistate Conservation Grant. Landscape-based natural habitat variables (non human-influenced) such as drainage area, slope, elevation, baseflow, etc., and stressor variables (human-influenced) such as row crops, cattle density, dams, impaired waters, road crossings, etc. were used to predict the probability of presence/absence of brook trout, brown trout and smallmouth bass at the 1:100k catchment level. Those natural quality and human-influenced variables were then used to characterize habitat quality and anthropogenic stress for the three species.

### *Natural habitat quality*

Forty-three predictor variables were used to help develop the brook trout, brown trout and smallmouth bass models. The five most influential variables for each of the species are found in Table 4.

**Table 4.** The top five natural habitat variables influencing the predicted probability of presence for brook trout, brown trout and smallmouth bass.

<b>Brook trout</b>	<b>Brown Trout</b>	<b>Smallmouth Bass</b>
Mean annual air temp	Network drainage area	Network drainage area
Mean annual precipitation	Network carbonate bedrock geology cover	Mean annual air temp
Network drainage area	Mean annual air temp	Mean annual precipitation
Network mean baseflow index	Mean annual precipitation	Minimum catchment elevation
Slope of the catchment flowline	Network mean baseflow index	Network sandstone bedrock geology cover

**Source:** Downstream Strategies DARE Fish Habitat Model summaries 2012.

### *Anthropogenic Stressors*

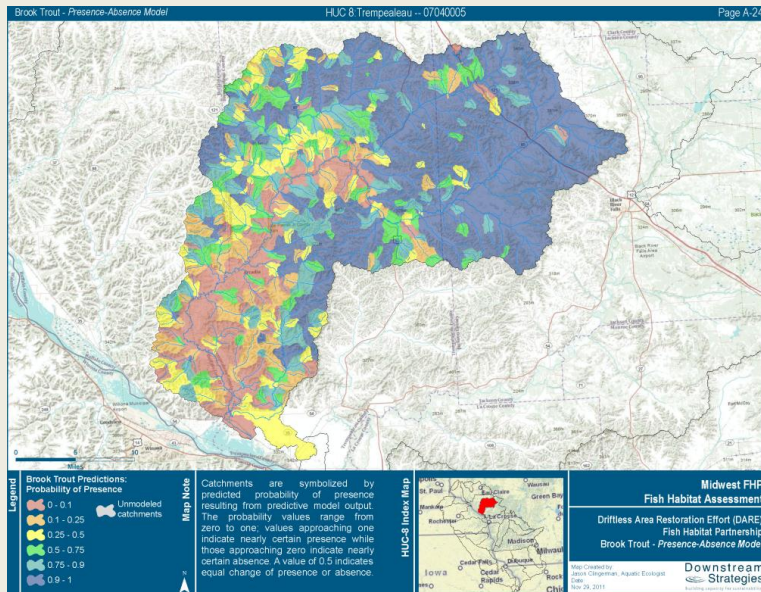
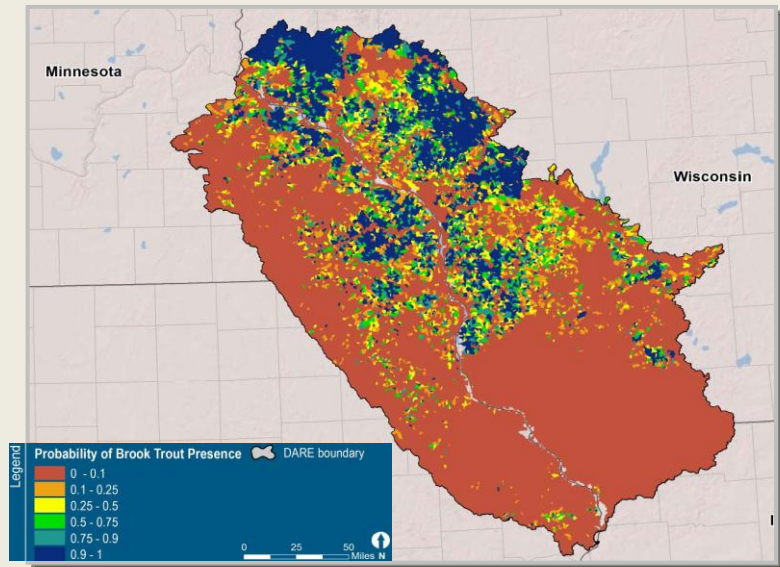
Forest, grassland, cattle density, and pasture were among the top stressors influencing the probability of presence of the trout and smallmouth bass models (Table 5). It is important to note that a riparian health coverage, current/past restoration projects, karst feature, and water quality data were not included in the assessment due to time constraints and lack of support staff to pull information together into common databases.

**Table 5.** The top five anthropogenic variables influencing the predicted probability of presence for brook trout, brown trout and smallmouth bass.

Brook trout	Brown Trout	Smallmouth Bass
Network forest cover	Network forest cover	Network density of cattle
Network density of cattle	Network pasture cover	Network forest cover
Network grassland cover	Network grassland cover	Network grassland cover
Network impervious cover	Local forest cover	Network surface water use
Local forest cover	Network density of cattle	Local forest cover

**Brook trout model**

Based on the habitat condition analysis, predicted probability of presence for brook trout is highest in the northern part (blue) of the Driftless where there is lower stress on the landscape and more favorable natural habitat. The lowest probability of presence of brook trout is in the southern portion (red) of the Driftless Area where there is higher stress on the landscape and less favorable natural habitat conditions.



Predicted probability of presence maps were developed at the catchment level for each HUC 8. Habitat condition assessment summary and mapbooks can be found at <http://www.Midwestfishhabitats.org>

### **Brown trout model**

Predicted probability of brown trout presence was higher in the mid and lower portions of HUC 8 watersheds including the Lower Wisconsin, Kickapoo, Pecatonica, Root and Turkey River watersheds. Brown trout predicted presence is lowest in southwest Wisconsin in the Grant-Platte watersheds where habitat is more favorable for smallmouth bass.

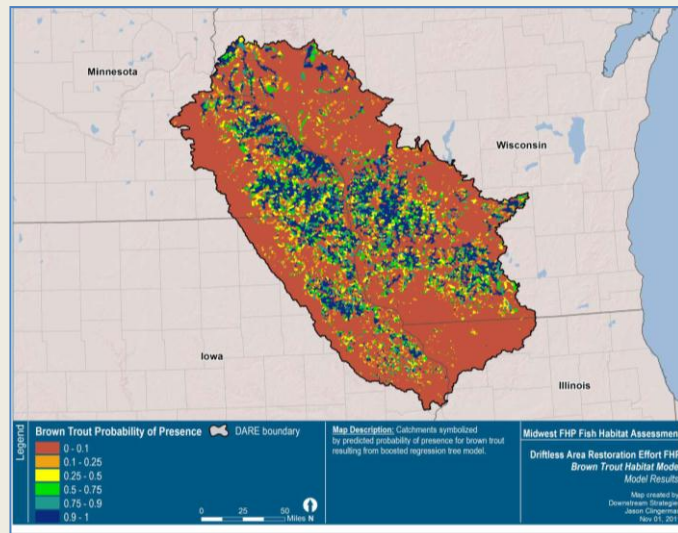


Figure 4. Predicted probability of presence of brown trout.

### **Smallmouth bass model**

Predicted probability of smallmouth bass presence was higher in larger tributaries such as the Apple, Turkey, Maquoketa, Upper Iowa, Root and Lower Wisconsin rivers, where drainage area contributed the most influence to the model (Figure 5; Downstream Strategies 2012).

Though cattle density, forest cover and grassland cover were the top three stressors influencing the presence of smallmouth bass, their relative influence in the model was small (10%), suggesting that the natural quality variables in the model had a much greater influence (61.3%) on the presence-absence of the species.

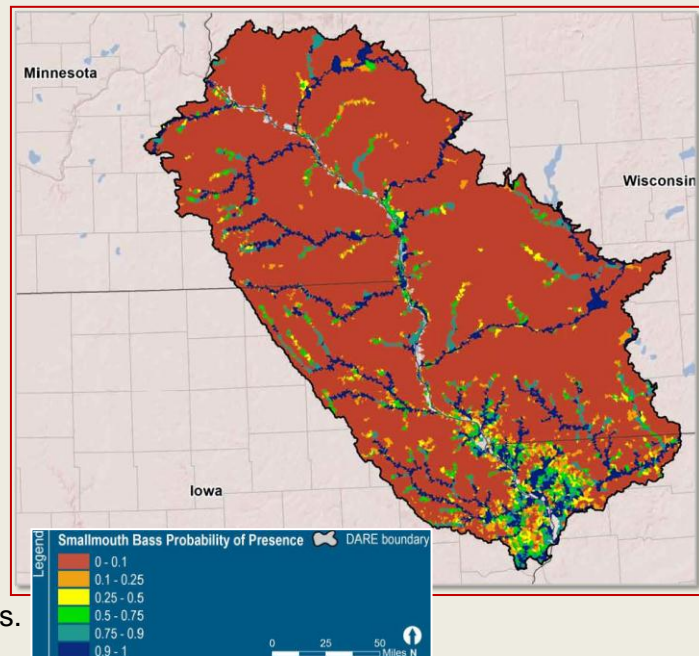


Figure 5. Predicted probability of presence of smallmouth bass.

## **Impacts to Fish Habitat**

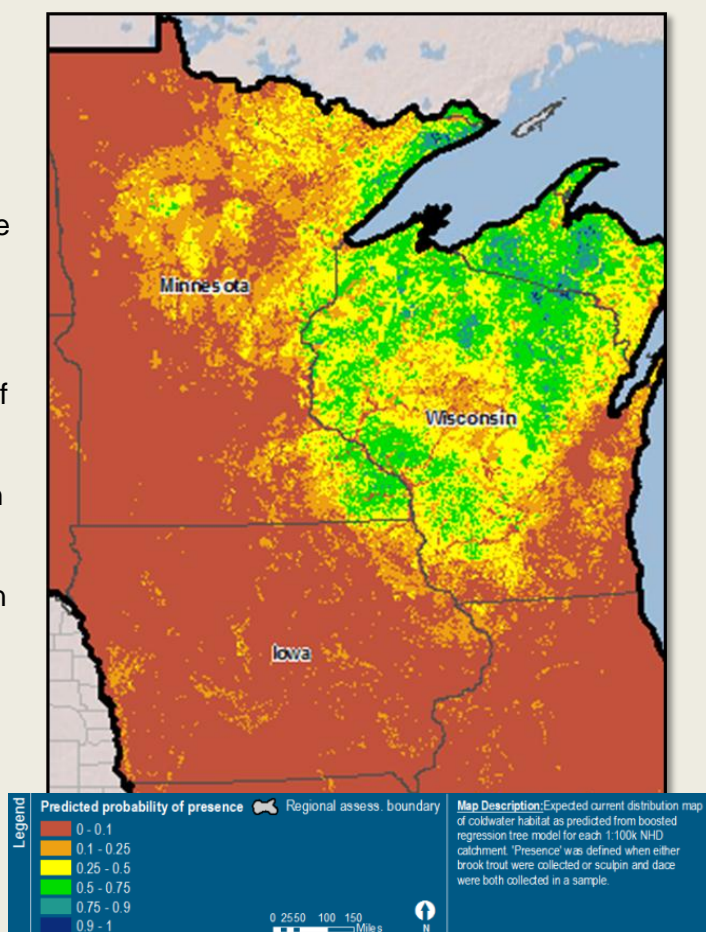
Conversion of native prairie and savanna, clearing of timber and draining of wetlands for agriculture has forever changed the Driftless Area landscape. Agricultural development and other continued human disturbances on the landscape have led to widespread streambank erosion, invasive riparian vegetation growth, and disconnection of stream channels from their floodplains causing excessive sediment and nutrient inputs to streams. This has resulted in poor water quality, shallower and wider stream reaches with higher summer stream temperatures, and more frequent flooding. Sediment has covered gravel cobble substrates needed for feeding and spawning, has slowed the growth of and contributed to poor survival of trout and other fish and invertebrate species.

## Challenges in a Changing Climate

The inseparable linkage between the karst landscape, cold and coolwater systems and the glacial relics that dwell within the region makes the Driftless Area particularly vulnerable to climate driven changes. Incorporating strategies such as protecting and restoring contiguous blocks of unfragmented habitat and reducing non climate change factors such as land use changes, invasive species, urbanization, etc. will be vital to protecting Driftless Area treasures. It is essential that we work with our Driftless Area partners to reduce specific stressors that predictive models/tools indicate will be the key limiting factors in overall adaption strategies for fhp priority species.

Based on the Intergovernmental Panel on Climate Change's (IPCC) fourth assessment global climate model (GCM) ensemble - high A2 emission scenario (IPCC 2007), predicted temperature and precipitation values for the year 2050 shows a region-wide mean annual increase in both temperature and precipitation. Climate change models incorporating temperature and precipitation may aid area managers in their decisions of where to focus future protection and restoration efforts for brook and brown trout.

Downstream Strategies conducted a Midwestern regional climate change vulnerability assessment in 2013. A regional coldwater guild (brook trout, sculpin, dace) model was developed using predicted temperature and precipitation converted datasets from the IPCC GCM high A2 emission scenario. The model predicted the future percent change in probability of presence at the catchment level. Compared to the previously shown predicted probability of presence maps for brook trout (under current day landscape conditions), the noticeable changes will be the decline in the native coldwater communities potentially in northeast Iowa and in the tier of watersheds in southern Wisconsin like the Grant/Platte, Lower Wisconsin, and Pecatonica and Sugar watersheds where brown trout and smallmouth bass have the strongholds.



## Objectives and Conservation Actions

The objectives and actions outlined below describe how the partnership is working towards its principal goals and objectives, while consistent with the goals and strategies of the national plan. DARE conservation actions primarily address NFHP strategies #1: identify and protect intact healthy waters; #2: restore natural variability in river and stream flows and #3: reconnect fragmented habitats through removal/modification of barriers.

### ASSESSMENTS, DATA GAPS AND PRIORTIES

**1.1 Objective.** Assess baseline fish habitat conditions for cold, cool and warmwater systems in the Driftless Area and fill data gaps by 2016.

#### Actions

- Conduct habitat condition assessments for priority fish species.
- Develop a methodology to assess current day riparian conditions on cold water streams.
- Develop a web based decision support tool based on completed habitat condition assessments to aid managers and practitioners in setting priorities.
- Refine assessments by incorporating climate change factors, water quality, karst features, past restoration projects, etc.
- Fill data gaps as staff and funding resources become available. Develop Driftless databases to include: stream restoration projects from 2008-2014, karst features, water quality, and invasive species.

**1.2 Objective.** Identify priority coldwater streams for enhancement and restoration.

#### Actions

- 1.0 Select priority streams based on habitat condition assessments and criteria developed by state natural resource agencies, and other partner priorities.
- 2.0 Update past stream restoration GIS coverages for the Driftless.
- 3.0 Update Class I, II and III trout stream GIS coverages.
- 4.0 Collaborate with partners to find streams/subwatersheds to jointly contribute resources to stop the cause of degradation and restore the ecological health of the system.

## PROTECT AND RESTORE BROOK TROUT, BROWN TROUT AND SMALLMOUTH BASS

**2.1 Objective.** Protect, maintain (no net loss) and improve habitat conditions for Class I (self-sustaining) and Class II brook trout streams.

### Upland, riparian, in-stream actions

- 1.0 Work with producers and other private landowners to implement Best Management Practices (BMPs) to reduce soil erosion and excessive nutrient loads to streams.
- 2.0 Develop Best Management Practices (BMPs) to support habitat resilience amidst a changing climate.
- 3.0 Assist landowners to enroll in Department of Agriculture Farm Bill Program (ie EQIP, WHIP, CREP, WRP, etc. ) and other local conservation programs.
- 4.0 Work with NRCS and partners in watersheds having high potential for water quality improvements and habitat restoration.
- 5.0 Restore/re-establish native riparian vegetation consistent with the local ecology and landscape in critical catchments identified on priority streams.
  - Promote use of buffer programs through Farm Bill, state, and local programs.
  - Encourage an approximate buffer width to allow infiltration of nutrients and reduce erosion.
  - Encourage development of a riparian management plan to include; 1) maintenance, control and evaluation of native vegetation 2) control and prevention in the spread of invasive plant and insect species.
  - Promote rotational grazing in grazed areas to help protect streambanks and keep woody growth under control.
  - Reduce number of cattle per acre to help reduce grazing impacts.
  - Encourage installation of cattle crossings to control access to streams and protect banks from being trampled.
- 6.0 Prevent and control the spread of terrestrial and aquatic invasive species in streams/subwatersheds containing trout.
- 7.0 Implement direct stream channel restoration and enhancement techniques in critical catchments to reduce bank erosion, restore geomorphology, and improve in-stream habitat diversity for trout.
  - Incorporate techniques and practices used by state natural resource agencies, NRCS, and experienced consultants.
- 8.0 Restore stream hydrology and connectivity by removing and modifying barriers to fish passage as appropriate.

**2.2 Objective.** Protect, maintain and improve habitat conditions for Class I and Class II brown trout streams identified by natural resource agencies.

Upland, riparian, in-stream actions

- 1.0 Work with producers and other private landowners to implement Best Management Practices (BMPs) to reduce soil erosion and excessive nutrient loads to streams.
- 2.0 Develop Best Management Practices (BMPs) to support habitat resilience amidst a changing climate.
- 3.0 Assist landowners to enroll in Department of Agriculture Farm Bill Program (ie EQIP, CREP, WHIP, WRP, etc.) and other local conservation programs.
- 4.0 Work with NRCS and partners in watersheds having high potential for water quality improvements and habitat restoration.
- 5.0 Restore/re-establish native riparian vegetation consistent with the local ecology and landscape in critical catchments identified on priority streams.
  - Promote use of buffer programs through Farm Bill, state, and local programs.
  - Encourage an approximate buffer width to allow infiltration of nutrients and reduce erosion.
  - Encourage development of a riparian management plan to include; 1) maintenance, control and evaluation of native vegetation 2) control and prevention in the spread of invasive plant and insect species.
  - Promote rotational grazing in grazed areas to help protect streambanks and keep woody growth under control.
  - Reduce number of cattle per acre to help reduce grazing impacts.
  - Encourage installation of cattle crossings to control access to streams and protect banks from being trampled.
- Prevent and control the spread of terrestrial and aquatic invasive species in streams/subwatersheds containing trout.
- Implement direct stream channel restoration and enhancement techniques in critical catchments to reduce bank erosion, restore geomorphology, and improve in-stream habitat diversity for trout.
  - Incorporate techniques and practices used by state natural resource agencies, NRCS, and experienced consultants.
- Restore stream hydrology and connectivity by removing and modifying barriers to fish passage as appropriate.

**2.3 Objective.** Restore and expand access to 500 mainstem and tributary miles of stream and river habitat for smallmouth bass by 2017 in the Turkey, Maquoketa and Wapsipinicon river watersheds.

Actions

- 1.0 Work with partners to identify barriers for removal in watersheds (HUC8) with high probability of presence for smallmouth bass and high quality smallmouth bass rivers identified by state natural resource agencies.
- 2.0 Increase connectivity on target cool and warmwater rivers by modifying or removing dams, increasing access to tributary streams needed by smallmouth bass for spawning and rearing habitat.

**NONGAME SPECIES**

**3.1 Objective.** Enhance in-stream and riparian habitat for non game species by incorporating practices into 30 percent of planned stream restoration projects by 2015.

Actions

- 1.0 Revise “Driftless Riparian Habitat Guide” and disseminate to TU chapters, conservation agencies and other entities.
  - J. Hastings. 2012. “Nongame Wildlife Habitat Guide: Complementary Opportunities for Stream Restoration Projects”- completed
- 2.0 Discuss incorporation of non game habitat designs at stream project planning meetings.
- 3.0 Increase landowner and public outreach and education efforts related to protecting critical habitat for rare and sensitive species.
- 4.0 Monitor amphibian and reptile response to conservation actions on specified project streams using protocols outlined in the revised Nongame Wildlife Habitat Guide. (<http://www.dare Restoration.com>)

**MONITORING AND EVALUATION**

**4.1 Objective.** Conduct pre/post project fish monitoring and evaluation on 75 percent of project streams to determine if trout response meets intended management objectives by 2015.

Actions

- 1.0 Compare pre-post project overall relative abundance of trout on stream restoration projects (# trout per/mile).
- 2.0 Collect trout length/weight data during fishery surveys to detect changes in reproduction (YOY), recruitment (stock size), and quality size fish.
- 3.0 Compare pre-post barrier project electrofishing catch per/hr for smallmouth bass and black redhorse upstream/downstream of the former barrier.



## RECREATIONAL FISHING

**5.1 Objective.** Increase recreational fishing opportunities and experiences.

### Actions

- 1.0 Maintain current level of public access on public lands and on private lands through conservation/access easements.
- 2.0 Increase angling access to streams from willing private landowners by acquiring easements.
- 3.0 Vary regulations on streams/stream reaches as appropriate to provide diverse experiences for anglers.
- 4.0 Conduct a 2015 web/mail based economic impact survey comparing 2007 angler survey results.

## COMMUNICATION, OUTREACH AND EDUCATION

**6.1 Objective.** Increase general landowner and public awareness about Driftless Area resources and the importance of aquatic conservation, restoration and potential climate related impacts.

### Actions

- 1.0 Encourage local community participation on stream restoration projects where possible, through planned workdays.
- 2.0 Promote responsible fishing and other recreational opportunities at outreach events.
- 3.0 Maintain an up-to-date partnership brochure for dissemination to the public and partners.
- 4.0 Incorporate Driftless Area information about the landscape and its diverse biota while giving presentations at schools or participating in outdoor classrooms and fishing clinics.
- 5.0 Communicate partnership goals, accomplishments and current activities at meetings, workshops, fairs, expos, and conferences.
- 6.0 Place Driftless Area restoration project signage to recognize partners and accomplishments where there is interest.
- 7.0 Give presentations to watershed groups and local events, disseminate fact sheets and watch cards about invasive species such as Japanese knotweed, New Zealand mudsnail, Asian carp, purple loosestrife, etc.
- 8.0 Distribute invasive species factsheets and other materials to area landowners, businesses and general public.

**6.2 Objective.** Exchange information at partnership, regional, and national levels.

Actions

- 1.0 Continue to organize 4-state Driftless Area annual forum for sharing management, monitoring and evaluation results, research related to cold water systems, lessons learned, and a forum to discuss hot topic environmental issues.
  - 2.0 Give greater visibility to partners and individual stream projects through local newspaper articles, press releases, and stream tours.
  - 3.0 Develop TUDARE quarterly newsletter and distribute to internal and external partners.
  - 4.0 Maintain web site focused on partnership activities, assessments and accomplishments.
  - 5.0 Inform and update regional and national USFWS offices, NFHP Board and NFHP communications team on partnership activities and accomplishments.
  - 6.0 Compile project summaries into a project portfolio and share with partners, NFHAP Board, Congress members, and general public.
  - 7.0 Maintain restoration project tracking database that is consistent with needs of the partnership and the USWS reporting requirements (ie. Fisheries Information System).
-

## Collaboration, Coordination and Planning

**C1.1 Objective.** Foster integration across political boundaries of natural resource protection, restoration and planning.

### Actions

- 1.0 Work with watershed groups to collaboratively identify upland conservation and stream corridor restoration areas, seek funding, recruit volunteers, implement practices, and monitor results.
- 2.0 Work with various agricultural groups to explore potential cooperative improvement projects.
- 3.0 Establish sub-regional planning teams modeled on the Western Wisconsin Trout Habitat Project Planning Committee to facilitate long-term planning for target areas.

**C1.2 Objective.** Build the capacity of partner groups to implement Driftless restoration priorities.

### Actions

- 1.0 Facilitate partnerships among DNR Fisheries staff, NRCS, USFWS, County LCDs and SWCD personnel, and TU volunteers to maximize funding, volunteer resources, technical expertise, and project oversight.
- 2.0 Coordinate with the Driftless Area Initiative, Driftless Area Partnership, The Nature Conservancy, River Alliance of Wisconsin, Rivers Council of Minnesota, Prairie Rivers Network, etc., to help build capacity of other watershed groups in the region.

**C1.3 Objective.** Influence federal, state, and local policy to promote protection, restoration, and public access.

### Actions

- 1.0 Support efforts to increase conservation incentives in the Federal Farm Bill.
- 2.0 Support Minnesota efforts to target stream restoration and purchase of riparian easements through the Minnesota Lessard Outdoor Heritage Fund.
- 3.0 Collaborate with the Driftless Area Initiative, NRCS, and others to target special WHIP, EQIP, Grassland Reserve Program (GRP) and Cooperative Conservation Partnership Initiative (CCPI) funding for the Driftless Area.
- 4.0 Coordinate with Driftless Area partners to identify and advocate for state policy and funding initiatives that will help facilitate Driftless restoration.
- 5.0 Solicit coordinated support from the Driftless Area MOU and four NRCS state conservationists to advocate for Driftless Area projects.

**C1.4 Objective.** Increase funding for restoration and utilize existing funding more effectively.

Actions

- 1.0 Use sub-regional planning teams and existing Focus Watershed Workgroups to coordinate the best use of existing funding resources.
- 2.0 Ensure representation of Driftless conservation interests on NRCS State Technical Committees and local workgroups.
- 3.0 Support regional and national advocacy efforts to maintain or increase high levels of funding for Farm Bill conservation programs.
- 4.0 Continue to seek funding from existing grant programs through the NFWF, USFWS, Trout Unlimited, EPA, Patagonia, and local government programs.
- 5.0 Seek new sources of funding from corporate sponsors and other non-traditional sources, such as non-game species funding (i.e. state Wildlife Action Plans for endangered species, Departments of Transportation, etc).

## Filling Data Gaps

As funds become available, the fhp will work towards filling the below data gaps with the goal of having a common database containing consistent information across the 4-state Driftless. The intent is to use these data for inclusion in future assessments, planning efforts and sharing of information in a consistent manner across state lines.

Data gaps to be filled by staff/contractors include:

- Compile 2008-2014 stream restoration project and fish monitoring data into a relational project restoration and monitoring database.
- Assess current riparian vegetative health conditions on coldwater streams for inclusion in future brook and brown trout habitat condition assessments.
- Development of an invasive species database for coldwater streams in the Driftless.
- Development of a 4-state karst feature database consisting of locational information on springs and sinkholes.
- Development of a 4-state water quality database.

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## **Appendix A. Priority Habitat Descriptions.**

### **Coldwater streams**

These waters have relatively constant water temperatures year-round. Coldwater streams can be described as having maximum summer water temperatures typically below 22° C. The watersheds of these streams are usually less than 100 square miles and the streams exhibit mean annual flow rates of less than 50 cubic feet/sec. Fish communities of these coldwater streams contain relatively few species and are dominated by trout and sculpins. The Driftless Area is on the western tail edge for brook trout, the only native salmonid to the region.

### **Coolwater streams**

Coolwater streams are thermal transitions between coldwater and warmwater streams. These streams have flowing waters with maximum summer water temperatures typically between 22 and 25 degrees Celsius (Wisconsin DNR 2006). Watershed areas of these moderate size streams are usually less than 200 square miles (Wisconsin DNR 2005, Minnesota DNR 2006). These streams contain moderately diverse fish faunas with a mix of cold and warmwater species and a few coolwater specialists like Wisconsin's redbreast dace *Clinostomus elongatus* (Wisconsin DNR 2005).

Coolwater streams of Illinois and associated habitats harbor several state agency concern species such as the ozark minnow *Notropis nubilus*, hornyhead chub *Nocomis biguttatus*, largescale stoneroller *Campostoma oligolepis*, and black redhorse *Moxostoma duquesni* (Illinois DNR 2006). Larger coolwater rivers in Illinois include the Galena, Apple and Pecatonica rivers. Historical records indicate that trout streams did not exist in northwest Illinois, however there are springs that supply a number of coldwater streams. There are several streams that are currently stocked with brook trout, rainbow trout *Oncorhynchus mykiss* and brown trout by the Illinois DNR, to provide a varied fishing experience for anglers.

### **Warmwater rivers**

Warmwater rivers are flowing waters with maximum water temperatures typically greater than 25 degrees Celsius. Wisconsin describes their warmwater rivers within the Driftless Area as typically having watershed drainage areas greater than 500 sq miles and mean annual flow rates of more than 200 cubic feet/sec (Wisconsin DNR 2005). Major warmwater rivers of the Driftless include the Upper Iowa, Maquoketa, and Turkey rivers in Iowa; Root, Zumbro, Whitewater, and Vermillion rivers in Minnesota; and lower Chippewa, Black, La Crosse, Kickapoo, Baraboo, Pecatonica, Sugar, and Wisconsin rivers to name a few in Wisconsin. A rich fish fauna dominated by warmwater species in the families Cyprinidae (minnows), Catostomidae (suckers), Ictaluridae (catfish), Centrarchidae (sunfish), and Percidae (perch), occur in these rivers. Natural, periodic flood flows, often driven by spring snow melt and rains, are important to the health of floodplain forests and wetlands, and to the maintenance of self-sustaining populations of wetland-spawning fish, such as walleye and northern pike.

## Appendix B. Priority Areas.

<b>Years</b>	<b>Priority watersheds</b>	<b>State</b>	<b>Species</b>
2007-2012	Rush/Vermillion	Minnesota/Wisconsin	Brook trout/ brown trout
	L. Chippewa-Elk Creek	Wisconsin	Brook trout
	Upper Iowa	Iowa	Brook/brown trout
	Lower Wisconsin- Blue River	Wisconsin	Brown trout
	Lower Wisconsin-Black Earth	Wisconsin	Brown trout
	Lower Wisconsin- Bear Creek		Brook/brown trout
	Pecatonica (East Pecatonica)	Wisconsin	Brook/brown trout
	Root (Middle/Lower)	Minnesota	Brook/brown trout
	Turkey (Little Turkey)	Iowa	Brown trout
2012-2017	Buffalo-Whitewater	Minnesota/Wisconsin	Brook/brown trout
	Trempealeau- Upper/Middle	Wisconsin	Brook trout
	Kickapoo	Wisconsin	Brown/brook trout
	La Crosse	Wisconsin	Brook/brown trout
	Turkey	Iowa	Smallmouth bass
	Wapsipinicon (mainstem/tribs)	Iowa	Smallmouth bass/black redhorse
	Apple/Plum	Illinois	Smallmouth bass

## Appendix C. Driftless Area Restoration Effort Partners.

### **Federal Agencies**

U.S. Fish and Wildlife Service  
Natural Resources Conservation Service  
U.S. Geological Survey  
U.S. Environmental Protection Agency  
National Park Service  
U.S. Forest Service

### **State Agencies**

Illinois Department of Natural Resources  
Iowa Department of Natural Resources  
Minnesota Department of Natural Resources  
Wisconsin Department of Natural Resources  
Minnesota Pollution Control Agency  
Wisconsin Department of Agriculture, Trade and Consumer Protection

### **County Organizations**

Basin Alliance for the Lower Mississippi in Minnesota  
County Land and Water Conservation Departments (Wisconsin)  
Soil and Water Conservation Districts (Minnesota, Illinois & Iowa)

### **Conservation Organizations**

Blufflands Alliance (Consortium of seven land trusts in the Driftless Area)

<b>Alliance Member</b>	<b>State</b>
Jo Daviess Conservation Foundation	Illinois
Natural Land Institute	Illinois
Iowa Natural Heritage Foundation	Iowa
Minnesota Land Trust	Minnesota
Mississippi Valley Conservancy	Wisconsin
West Wisconsin Land Trust	Wisconsin
Gathering Waters Conservancy	Wisconsin

Driftless Area Initiative (Coalition of six Resource Conservation and Development (RC&D) Agencies in the Driftless Area)

<b>RC&amp; D Member</b>	<b>State</b>
Northeast Iowa RC&D	Iowa
Limestone Bluffs RC&D	Iowa
Southwest Badger RC&D	Wisconsin
River Country RC&D	Wisconsin
Blackhawk Hills RC&D	Illinois
Hiawatha Valley RC&D	Minnesota

## Driftless Area Restoration Effort partners

### **Conservation Organizations** continued

Izaak Walton League  
Iowa Hawkeye Fly Fishing Association  
Land Stewardship Project  
Minnesota Environmental Partnership  
Minnesota Farmers Union  
Minnesota Institute for Sustainable Agriculture  
National Fish and Wildlife Foundation  
National Mississippi River Museum & Aquarium  
National Wild Turkey Federation  
Pheasants Forever  
The Prairie Enthusiasts  
The Audubon Society  
The Nature Conservancy  
Trout Unlimited  
Upper Iowa River Watershed Alliance  
Upper Mississippi Fishery Services  
Vernon County Conservation Alliance

### **Tribes**

Ho-Chunk Nation

### **Corporations and Businesses**

Excel Energy  
Patrick Engineering  
Riverland Energy  
T. Thrall, Inc.  
University of Iowa Hygienics Laboratory, IA

### **Universities**

Luther College, IA  
University of Stevens Point, WI  
University of Minnesota  
University Wisconsin -Eau Claire, WI  
University Wisconsin –Stout  
University Wisconsin-Madison  
University Wisconsin- Platteville, WI  
Winona State University, MN

### **Local community**

Local middle and high schools  
Local Boy Scout troops  
Local rod and gun clubs

### **Industry**

Forest City Gear  
Orvis  
Patagonia  
Wahl Clipper Corporation