Spring Brook Watershed

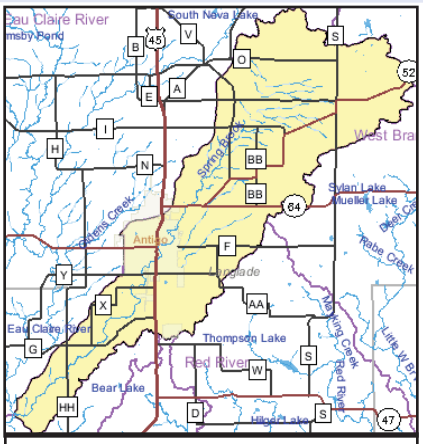
2010 Water Quality Management Plan Update

Central Wisconsin Basin, Wisconsin

August, 2010

The Spring Brook Watershed, 69.8 square miles in size in Marathon and Langlade Counties (Map 1), has 99.5 stream miles , 65.9 lake acres, and 977.95 wetland acres. This groundwater fed region is rich in springs and natural coldwater fisheries.

Portions of the watershed have changed over time due to land uses that have modified the regional hydrology and hydrography. The watershed is a mix of agriculture (62%) and forest (25%) as the dominant land uses.



Map 1: Spring Brook Watershed

Watershed Details

Population and Land Use

Agriculture is important to the area economy, as agriculture comprises over 60 percent of the overall land use in the watershed (Figure 1). There are about 51 active farmers in the watershed and about 30 landowners that rent their land to farmers. The number of farms in both Langlade and Marathon counties has decreased steadily since 1980, however, the average farm size has increased. Over the last 20 years, total farmland acreage has decreased by about 7 percent in Langlade County and by 14 percent in Marathon County. There is currently one confined area feeding operation (CAFO) in the watershed. Following an incident in 2005, where manure was spread from this farm on frozen soil and subsequently was washed into Spring Brook, an adequate manure storage facility was installed. Approximately 80% of the manure from this farm is spread onto lands within the Spring Brook Watershed.

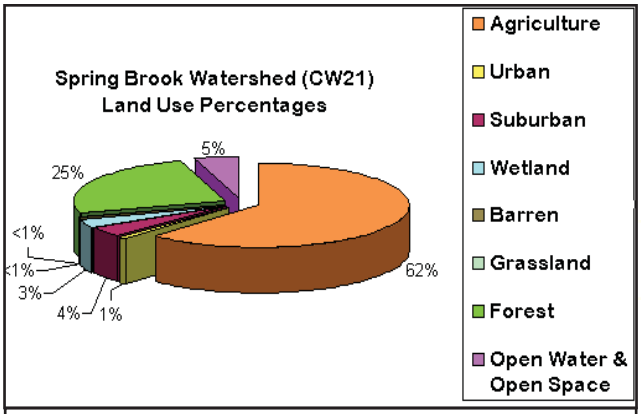


Figure 1. Land Use Spring Brook Watershed

Hydrology

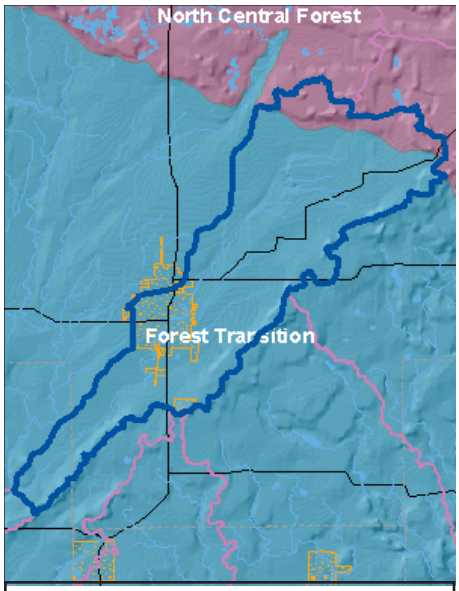
Spring Brook flows in a generally southwesterly direction to its confluence with the Eau Claire River in Marathon County. The watershed is divided into three sub-watersheds, with Spring Brook being the only source of surface water. Maintaining high water quality is very

Plan Contents

important since the entire creek is classified as an Exceptional Resource Waters (ERW) and a Class I trout water.

Ecological Landscapes

The Spring Brook watershed is located in the Forest Transition Ecological Landscape, which lies along the northern border of Wisconsin's Tension Zone, through the central and western part of the state (Map 2). The central portion of the Forest Transition lies primarily on a glacial till plain, deposited by glaciation between 25,000 and 790,000 years ago. The eastern and western portions are on moraines of the Wisconsin glaciation. This zone supports both agricultural landscapes and northern forests. The growing season in this part of the state is long enough that agriculture is viable, although climatic conditions are not as favorable as in southern Wisconsin. Soils are diverse, ranging from sandy loam to loam or shallow silt loam, and from poorly drained to well drained.



Map 2 Ecological Landscapes

The historic vegetation of the Forest Transition landscape was primarily northern hardwood forest and conifer swamps. These northern hardwoods were dominated by sugar maple and hemlock, and contained some yellow birch, red pine and white pine. Currently, over 60% of this Ecological Landscape is non-forested. Forested areas now consist primarily of northern hardwoods and aspen, with smaller amounts of oak and lowland hardwoods. The eastern portion of the Ecological Landscape differs from the rest of the area in that it remains primarily forested, and includes some ecologically significant areas. Throughout the Ecological Landscape, small areas of conifer swamp are found near the headwaters of streams, and associated with lakes in kettle depressions on moraines. Ground flora show characteristics found in those of both northern and southern Wisconsin, as this Ecological Landscape lies along the Tension Zone.

Watershed History Note

The Spring Brook Watershed includes the City of Antigo, the name of which comes from the Chippewa Indian name for the river that flows through the area, "Nequi-Antigo-sebi" meaning "spring river" or "evergreen". The city was founded in 1878 by Civil War veterans Francis Deleglise and George Eckart.

The log cabin in which Deleglise lived is preserved and on display at the Langlade County Museum. A street in Antigo also bears his name. The city gained its charter in 1883.

In the early part of the 1900s, Antigo was best known for its saw mills. At the turn of the millennium, the city's economy had a balance of industry and agriculture. High on the list were potatoes, dairy products, fur, shoes, fertilizer, steel and aluminum products, along with the lumber and wood product industries established in the earlier years. Also at that time, Langlade County's Courthouse was built in Antigo and was later placed on the National Register of Historical Places as an example of Classical Revival architecture.


Langlade County Courthouse, Courtesy of http://www.wisconsincentral.net/CultureBldgsHomesB.html

Watershed Condition

Priorities

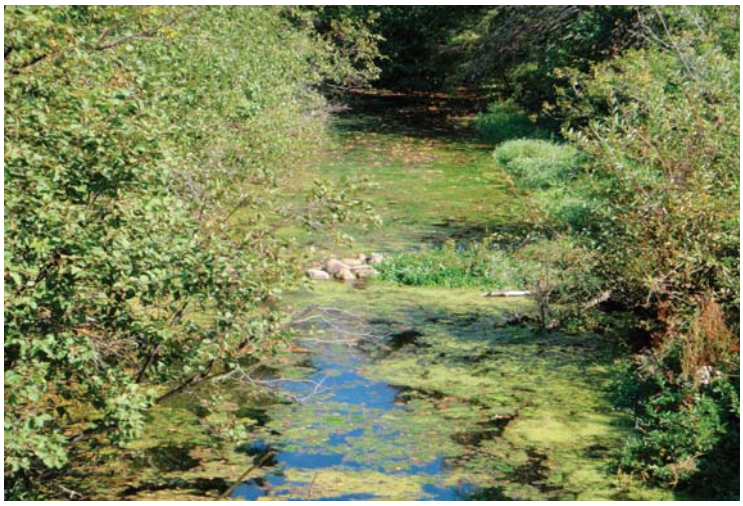
- Preserving coldwater fisheries and spawning areas of the watershed, primarily Spring Brook.
- Identify, restore and protect remaining wetlands in the watershed.
- Evaluate and restore impaired waters in the watershed if they exist.
- Restore and maintain quality trout waters in the stretch of stream known to be degraded.

Goals

- Maintain quality of Outstanding and Exceptional Waters
- Maintain trout waters, particularly naturally reproducing class I and class II trout streams.
- Work with landowners and managers to reduce runoff and point sources of agricultural / urban pollutant sources, particularly suspended solids and phosphorus.
- Identify, restore and protect quality in-stream habitat for fish and other aquatic life, including macroinvertebrates.

Overall Condition

Overall, the watershed is in relatively good condition. However, pockets of land use change and in-stream habitat and water quality conditions indicate resource management work is needed in specific areas. While nonpoint source program measures have been implemented, continued work to reduce nonpoint source problems now and in the future.



Springbrook above STH-64, showing excessive algae and duckweed growth. Photo by Jim Klosiewski, WDNR.

Point and Nonpoint Sources

Prior to building the city of Antigo's Waste Water Treatment Plant (WWTP), Spring Brook was classified as a non-trout water below the city. Since that time, water quality in Spring Brook has improved dramatically, allowing for the reestablishment of trout in the 12 mile reach below Antigo (Class I). However, a 2.5-mile stretch of the creek near Antigo is still non-trout water. Warmer waters due to Antigo Lake and urban runoff prevent establishment of trout in this stretch. Biotic index sampling conducted in 1987 showed very poor, very poor and good water quality conditions in Spring Brook. Spring Brook also experiences excessive growths of filamentous algae and aquatic plants downstream of Antigo WWTP, indicating nutrient problems. Monitoring in 2009 and 2010 indicated nutrient levels are elevated below the WWTP when compared to background levels upstream. This is believed to accentuate the excessive algae and macrophyte growth found downstream of the discharge. Extreme diurnal dissolved oxygen swings have been recorded downstream, all the way to the Eau Claire River. In the 1990s, the watershed was ranked per Wisconsin's DNR Nonpoint Source Priority Watershed selection criteria. Based on surface and groundwater data and land use characteristics, the overall ranking is high, establishing a high priority for future grant eligibility through the DNR Nonpoint Source Program. In 1997, a nonpoint source control plan was approved for the Spring Brook Watershed; the plan completion date was December 2008.

Stream and River Condition

Originating approximately three miles northeast of the City of Antigo, Spring Brook is 19 miles long and flows southwesterly through Antigo before joining the Eau Claire River in northeast Marathon County. The stream is intermittent in the headwaters and spring-fed in the Antigo Flats area. There are no perennial feeder streams associated with Spring Brook.

Spring Brook is classified as a Class I trout stream for 17 of its 19 miles. Trout waters are located between CTH V and one-half mile below North Avenue, and from CTH X to the confluence with the Eau Claire River. These stretches of the stream are also listed in NR 102 as Exceptional Resource Waters (ERW). The segment of stream flowing through the City of Antigo, from one-half mile below North Avenue to CTH X lacks quality habitat, experiences warmer water temperatures, and exhibits poor dissolved oxygen conditions. This stretch of stream is currently classified as a warmwater sport and forage fishery with forage minnows being the dominant fish.

Stretches of Spring Brook, especially downstream of the City of Antigo, are overrun with infestations of reed canary grass and, to a lesser degree, Japanese knotweed and purple loosestrife. Spring Brook is not reaching is highest potential use due to pollution from nonpoint sources including eroding croplands, fertilizer, herbicide, and pesticide use in the watershed, improperly managed livestock operations, lack of water due to drought, and possibly cumulative impacts of all the high capacity irrigation wells on the agricultural land surrounding the City of Antigo.

The headwaters area of Spring Brook watershed has no perennial streams and is instead made up of a network of intermittent drainage ditches. Spring snow melt and rain are efficiently drained from agriculture fields via these ditches to Skinner Dam, which was built in the 1930s to reduce impacts of flooding to the City of Antigo. Floodwaters from spring storm events and snow melt carry sediment and fertilizer from the headwaters area, impacting the rest of Spring Brook. Potato farming and dairy farming are the dominant agricultural uses in this area.

Springbrook Creek below the dam. This picture shows excessive iron bacteria, most likely caused by low flows due to drought and low discharge through the dam. Low flows with higher concentrations of groundwater (versus surface water) results in high iron concentations, which precipitate out when exposed to oxygen at the water's surface.

Between Skinner Dam and the City of Antigo, in-stream habitat is severely impacted due to heavy runoff deposits of silt due primarily to agricultural practices. In some cases in this area, Spring Brook has been altered to the point that it no longer flows in its original channel. The fairgrounds racetrack discharges fine clay sediment to the stream during spring runoff and summer rain events. Below the WWTP in Antigo, Spring Brook has exhibited higher phosphorus levels than immediately above the treatment plant. Further below the City of Antigo, Spring Brook is wide and shallow in areas due to historic and the present day practice of allowing livestock free access to the stream.

A reconnaissance field visit by DNR Water Resources and Remediation and Redevelopment (R&R) Program personnel in the fall of 2009 found free petroleum product entering Spring Brook adjacent to the old coal gas plant just downstream from U.S. Highway 45. In the city of Anitgo, clean-up of contaminated soils is being addressed through the R&R Program.

Lake Health

Antigo Lake

Antigo Lake, the only lake in the watershed is 32 acres in size and is comprised of a series of four interconnected impoundments. Maximum depth is 16 feet, and the average depth is 7 feet. The drainage area of Antigo Lake is approximately 34.3 square miles. The lake supports a limited fishery. Fish species found in order of abundance during a summer 2008 electrofishing survey were: bluegill, black crappie, largemouth bass, white sucker, yellow perch, pumpkinseed, common shiner, northern pike, and golden shiner. Brook trout in limited numbers are likely present at least part of the year. A spot check of dissolved oxygen conditions in the lake during algal blooms show super saturated levels above 20 mg/L at the water's surface and under 3 mg/L only a few feet below the surface. These dissolved oxygen levels reveal that the summer algal blooms are having adverse chemical effects on the lake, which in turn affects the lake's fish popu-

lation. Antigo Lake acts as a sediment settling basin for agricultural and urban runoff. Curly-leaf pondweed and rusty crayfish have been found in Antigo Lake. Curly-leaf pondweed and cattails are managed within Antigo Lake. Antigo Lake offers a diverse recreational resource including boating and fishing, but has a history of water quality problems including algae blooms, and excess levels of sediment, nutrients and organic matter which limit its use.

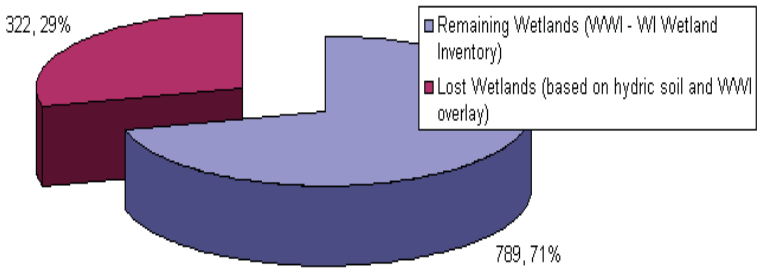


Figure 2: Wetlands Lost, Spring Brook Watershed

Wetland Health

Wetlands were once more common in the watershed, but now occur primarily in riparian areas. Most wetlands have been drained and are now in agricultural or other uses. Wetlands of the watershed include the following types:

Table 1: Wetland Types in the Spring Brook Watershed

Wetland Type	Acres	Percent of Acres	Reed Canary Grass Acres	Percent Type infested
Aquatic Bed	3.51	0.4%	0	0
Emergent (Marshes and Meadows)	130.53	16.6%	71	40
Shrub	302.14	38.3%	108	46.8
Forested	333.62	42.3%	48	20.7
Other	18.25	2.3%	3	1.4
Total	788.0561	100.0%	231	100%

Wetland Status

Roughly 1% of the current land uses in the watershed are wetlands. Only 71% of the original wetlands are estimated to exist. Of these wetlands, the majority are forested or shrub wetlands (See Table 1 above).

Wetland Condition

Little is known about the condition of the remaining wetlands but estimates of reed canary grass infestations, an opportunistic aquatic invasive wetland plant, into different wetland types has been estimated based on satellite imagery. This information shows that reed canary grass dominates 46% of the existing shrub wetlands and 40% of the remaining emergent wetlands. Reed Canary Grass domination inhibits successful establishment of native wetland species.

Wetland Restorability

Of the 2682 acres of estimated lost wetlands in the watershed, approximately 99% are considered potentially restorable based on modeled data, including soil types, land use and land cover (Chris Smith, DNR, 2009).

Groundwater

Groundwater is the main source of drinking water in the watershed. Groundwater quality is generally considered good, however it can be susceptible to contamination by human activity. The water is held in thick, permeable layers of soil and rock. The sand-gravel aquifer is the principal aquifer of the Spring Brook Watershed, with a few wells reaching the deeper Precambrian basement complex.

Wells that reach the deeper complex are generally located where the sand and gravel aquifer is very thin or absent, or otherwise, used as sumps. A sampling of private wells in the watershed found some with elevated nitrate levels. Elevated nitrate has been linked to agricultural practices, septage spreading, and faulty septic systems.

Waters of Note

Outstanding and Exceptional Waters
The Spring Brook wasterhed does not contain any outstanding waterbodies; however, Spring Brook is designated an exceptional resource water for three of its segments.

Official Name	Local Name	WBIC	ORW/ERW	Start Mile	End Mile
Spring Brook	Spring Brook Creek	1440800	ERW	0	10.27
Spring Brook	Spring Brook Creek	1440800	ERW	12.65	14.59
Spring Brook	Spring Brook Creek	1440800	ERW	14.59	19.36

Trout Waters
The following stream segments are classified as trout waters in this watershed.

Official Name	Local Name	WBIC	Start Mile	End Mile	Trout Class
Spring Brook	Spring Brook Creek	1440800	0	10.27	CLASS I
Spring Brook	Spring Brook Creek	1440800	12.65	14.59	CLASS I
Spring Brook	Spring Brook Creek	1440800	14.59	19.36	CLASS I

Impaired Waters
There are two impaired segments of Spring Brook. Collectivly, these segments run from mile 10.27 to 14.59 - the stretch in the middle of the stream - where there have been hydrologic modifications, excess nutrients, and historic contaminant deposits that have resulted in low dissolved oxygen readings and aquatic toxicity. The quality of the upstream portion is designated an exceptional resource water and Class I stream but it has been degraded.

Watershed Actions

Grants and Plans

Two DNR lakes grants are on record for this watershed. The first in 1998, the second in 2001.

Lakes Grant Large Scale Lake Planning Antigo Lake (Kellog Pond) 04/01/1998 Complete

Antigo Lake District: Antigo Lake District Water Quality Management Plan: The Antigo Lake District collected samples of stormwater outfalls under normal and storm water runoff conditions. They will created maps of stormwater inlets, outlets, and associated drainage areas. Their final plan included a section on the recommended preventative, remedial, and rehabilitation measures to minimize stormwater impacts, as well as a section focusing strictly on the future growth areas within the district. The WDNR was provided both a paper copy and an electronic copy of the final report and results were disseminated to the public by a summary reporting mailing, a public meeting, fact sheet distributions, and through various public media.

Lakes Grant Large Scale Lake Planning Antigo Lake (Kellog Pond) 04/01/2001 Complete

Antigo Lake District: Antigo Lake District - Fairgrounds Runoff Maintenance Plan:
The Antigo Lake District enhanced their stormwater monitoring and management plan by focusing on the county fairgrounds (racetrack) and loading for nearby stormwater collection basins. The project determined stormwater treatment alternatives to reduce sediment loading into Spring Brook and Antigo Lake from the racetrack.

Deliverables included:

1. Detailed data on drainage are of fairgrounds and other contributing basins.

2. Map of all current stormwater systems and summary of their effectiveness.

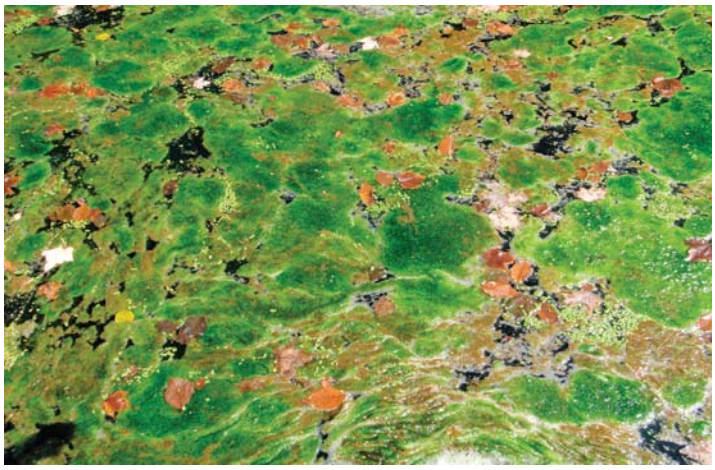
3. A written document outlining recommended measures to solve the sediment loading problem off the fairgrounds including, specific technical designs for recommended method(s), implementation strategy, economic analysis, and cost share programs available. The WDNR was provided with both a paper copy and an electronic copy of the final report. The project results were disseminated to the public by newsletter(s), public meeting(s), and local newspaper articles.

Monitoring

Fisheries projects include a wide variety of "baseline" monitoring and targeted fieldwork to gain specific knowledge related to Wisconsin's fish communities in/on Antigo Lake (Kellog Pond), Spring Brook

Aquatic Invasive Species (AIS) Monitoring
In close cooperation with UW Extension and Wisconsin Sea Grant, education efforts focus on working with resource professionals and citizens statewide to teach boaters, anglers, and other water users how to prevent transporting aquatic invasive species when moving their boats. Additional initiatives include monitoring and control programs.

Spring Brook Impairment Monitoring 2009
Monitoring was proposed to include water chemistry monitoring at four sites during summer, fall, and winter. Biologists proposed deploying sondes for a month period during the summer months and conducting fish IBI surveys at the same sites.



Excess algae, Springbrook Creek at STH-64

Recommendations

Monitoring

- DNR Water Resources and R & R Programs should continue to monitor water quality during the clean-up phase of contaminated soils associated with the old coal gasification plant adjacent to Spring Brook.
- Sediment monitoring should be conducted in Spring Brook, and tested for Polycyclic Aromatic Hydrocarbons, Volatile Organic Compounds and metals.
- Stream sediment and water should be collected for bioassessment toxicity testing above and below the old coal gas plant.

Management

- DNR Fisheries Management should look into developing some type of restricted harvest regulation so the quality and trophy brook trout fishing is maintained on Spring Brook.
- DNR Staff should determine the cause of excessive plant growth (Reed Canary Grass) below Antigo and evaluate control options and conduct dissolved oxygen studies.
- DNR Staff should continue to pursue land acquisition or leases along Spring Brook for streambank protection and habitat improvement.
- Spring Brook Watershed should remain a high priority for future grant eligibility under the State Nonpoint Source Pollution Abatement Program.
- Encourage sports clubs (e.g. Trout Unlimited) and agricultural producers to work together to plant cover crops on recently harvested potato fields to keep water and wind from moving the soil away and into Spring Brook.
- Potential impacts of high capacity irrigation wells should be studied to see if their cumulative impact is resulting in lower than normal stream flows.
- Encourage the fairgrounds racetrack managers to install stormwater control measures such as detention ponds.
- Encourage the use of rain gardens and rain barrels in the City of Antigo.
- County Land Conservation Department personnel, NRCS, and DNR staff should continue to encourage farmers to implement soil and water quality conservation practices. These include the installation of grassed waterways and runoff detention ponds in the watershed to reduce flooding potential, erosion, sedimentation, and chemicals from reaching the stream. Stormwater detention basins could be farmed and would help slow runoff to Spring Brook during high runoff events such as spring melt and large rainfall events.
- County Land Conservation Department personnel and DNR staff should continue to encourage farmers to implement Best Management Practices for groundwater water quality. These include nutrient management, manure storage facilities, barnyard runoff management, animal lot relocation, animal waste storage abandonment, manure storage facilities, and wetland restoration.

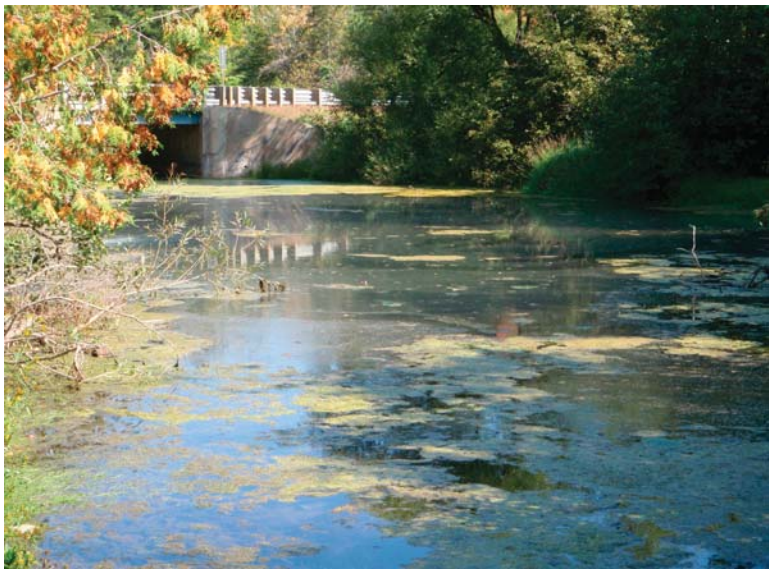
Educational Outreach Needs and Opportunities

- Educate the public concerning AIS and ways to reduce the spread of these via human activities.
- Inform the public of habitat loss and the impacts of those losses upon fish and wildlife populations, water quality, flood control and the quality of life.
- Educate the public concerning shoreline preservation and restoration.
- Educate the public concerning the impacts of stormwater to Antigo Lake and Spring Brook.
- Educate the public on the installation and use of rain gardens and rain barrels.

Contributors

- Jim Klosiewski, Water Quality Biologist
- Bill Klase, UW Extension Basin Educator
- Lisa Helmuth, Water Resources Specialist
- Mandie Lederer, Water Resources Specialist
- Mark Binder, GIS Analyst

Wisconsin Department of Natural Resources
Box 7921, WT/3
Madison, WI 53707-7921



Springbrook Creek

DNR PUB WT- 937

Wisconsin DNR's mission involves preserving, protecting, and restoring natural resources. Watershed Planning provides a strategic review of water condition to enhance awareness, partnership outreach, and the quality of natural resource management.

Spring Brook Watershed