Wisconsin Lake Superior Basin Brook Trout Plan

A Joint Plan Between

Wisconsin Department of Natural Resources

&

U.S. Fish and Wildlife Service

May 2005

Executive Summary

Brook trout (*Salvelinus fontinalis*) were once common in most of the basin's available cold-water habitat, including tributaries and along rocky coastlines, until their populations declined in the 1880's due to over-exploitation and habitat loss. Today's remaining populations are typically only able to sustain themselves in headwater reaches and seldom utilize the lakeshore habitat, where they could grow more quickly and reach larger sizes. For purposes of this plan, we will use a working definition of "coaster" brook trout as brook trout that inhabit the lake shore waters for at least part of their lives.

This plan describes the life history, threats, and management of brook trout in Wisconsin's portion of the Lake Superior basin and it's tributaries, and suggests a goal, objectives and tactics to protect and rehabilitate depleted populations. It was jointly written by the Wisconsin Department of Natural Resources and the U.S. Fish and Wildlife Service.

The plan goal is: To protect and improve self-sustaining brook trout populations and their habitat in Wisconsin's Lake Superior Basin and attempt to establish several populations that exhibit life history diversity (both stream resident and migratory 'coaster' life history types). Objectives, problems and tactics are described for topic areas of: 1. Stream habitat and watershed health, 2. Harvest, 3. Rehabilitation stocking, 4. Genetics management, 5. Life history and management, 6. Species interactions, and 7. Outreach. Brook trout population assessments and/or rehabilitation experiments are already underway for priority populations in the basin (Appendix C). As we learn more from these assessments and experiments, detailed management plans will be developed and adapted to address the needs of each priority population.

The success of this plan will depend on a long-term commitment to manage watersheds to protect and restore tributary habitat-forming processes, and will likely involve partnerships between management agencies and citizens to achieve the goal.

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Introduction

The recent resurgence of interest in native species rehabilitation along with the great strides made in lake trout re-colonization on Lake Superior has spurred the renewed enthusiasm for improving brook trout populations (especially the larger lake-living life history termed 'coaster') within the Lake Superior Basin. The Lake Superior Technical Committee of the Great Lake Fishery Commission produced 'A Brook Trout Rehabilitation Plan for Lake Superior' (Newman et al. 2003). This document was created as a guidance tool for brook trout rehabilitation initiatives undertaken by management agencies situated around Lake Superior. (A short outline of the plans lake-wide goal, objectives and suggested actions can be found in Appendix A) The completion of this lake-wide plan has spurred a fresh brook trout initiative in Wisconsin with the objective of developing a management plan specific to its tributaries and near-shore Lake Superior waters.

A brook trout task force made up of invited experts and interested parties from a number of agencies as well as public groups was assembled in late June of 2000 to present and discuss relevant background data. The task force also suggested a list of actions to be considered in the development of the Wisconsin strategy. A full listing of the task force recommendations can be found in Appendix B.

A first draft of Wisconsin's Lake Superior Brook Trout Plan was mailed out for public review and comment in October 2000 and comments were received back by March of 2001. A second draft of the Plan was completed in October of 2002. In the spring of 2003 the Wisconsin Department of Natural Resources (Wisconsin DNR) and the U.S. Fish and Wildlife Service (Service) decided to develop this joint plan. The purpose of the Plan was to describe the present state of knowledge regarding the fisheries history, past management initiatives, restoration potential, and to outline a new management strategy for the protection and enhancement of Wisconsin's Lake Superior Basin brook trout.

This plan stems from our current knowledge and experience in managing the tributary fishery and that many questions remain regarding brook trout biology and their adaptive potential within Wisconsin's Lake Superior watershed. Historical background information was reconstructed from a number of sources including late 1800 through early 1900 newspaper accounts (researched by Wisconsin DNR biologist Dennis Pratt), along with the professional fisheries management experience of both Service and Wisconsin DNR biologists. Strategies will need to be adjusted as new information becomes available. In that light, this plan represents a vision for the protection and rehabilitation of the brook trout stocks of the Wisconsin basin of Lake Superior.

Brook trout rehabilitation efforts are currently underway on five priority streams (Appendix C).

Geographic/Management Scope of the Plan

This plan geographically covers the Wisconsin waters of Lake Superior, and all of Wisconsin's Lake Superior Basin tributaries. Physical characteristics and fish stocking data for all Lake Superior Tributaries are listed in Appendix D. It's important to note that there are natural barriers that block upstream fish movement and some populations are located large distances from prime coastal habitat. Brook trout inhabiting streams above barriers may provide smolts that have access to Lake Superior. Major natural barriers include from west to east: Big Manitou Falls (Black River in the Nemadji River Basin) and Amnicon Falls (Amnicon River), in Douglas County; Siskiwit Falls (Siskiwit River) in Bayfield County; White River Falls (under White River Dam), Copper Falls (Bad River) and Brownstone Falls (Tyler Forks River), Marengo Lake outlet (Marengo River), Potato River Falls (Potato river) all in the Bad River basin of Bayfield, Ashland and Iron Counties; and Superior Falls on the Montreal River in Iron County.

Agency Goals

Wisconsin Department of Natural Resources

Wisconsin Statute 23.09 (Conservation) grants the Department the authority to conduct fishery management activities. Specific language follows.

23.09 Conservation
(1) Purposes. *The purpose of this section is to provide an adequate and flexible system for the protection, development and use of forests, fish and game, lakes, streams, plant life, flowers and other outdoor resources in this state.*
(2) Departmental rules; studies; surveys; services; powers; long-range planning. *The Wisconsin DNR may promulgate such rules, inaugurate such studies, investigations and surveys, and establish such services, as it deems necessary to carry out the provisions and purposes of this section. The Wisconsin DNR shall establish long-range plans, projects and priorities for conservation.*
29.041 Wisconsin DNR to regulate hunting and fishing in interstate waters. *The Wisconsin DNR may regulate hunting and fishing on and in all interstate boundary waters, and outlying waters.*

The Department also receives instruction form the Natural Resources (NR) board through Wisconsin Administrative Code. Specific language follows.

NR 1.04 Great Lakes fishery management. *The board endorses a flexible management system for the protection, development and utilization of the waters and fish populations of the Great Lakes for the maximum public benefit.*

NR 1.04(1) *Management of the Great Lakes is of intrastate, interstate, federal and international interest; therefore, cooperation with managing agencies shall be sought in developing management objectives and measures for fish stocks of common concern.*

NR 1.04(2) *The Great Lakes fisheries are to be considered part of a diverse community. The Wisconsin DNR shall promote efforts to maintain and enhance the quality of this community and its environment.*

NR 1.04(3) *Management of the fishery resources shall be based on a sound understanding of the dynamics of interacting fish stocks. The Wisconsin DNR shall conduct research and resource base, inventories, and collect harvest and utilization statistics on which to base sound management decisions.*

NR 1.04(4) *The fishery resources of the Great Lakes, though renewable, experiences dynamic changes and are limited. The resources will be managed in accordance with sound biological principles to attain optimum sustainable utilization. Management measures may include but are not limited to seasons, bag and quota limits, limitations on the type and amount of fishing gear, limitation as to participation in the fisheries and* *allocation of allowable harvest among various users and the establishment of restricted areas.*

U.S. Fish and Wildlife Service

The Service operates under many Federal laws and authorities, including the Fish and Wildlife Act of 1956, Fish and Wildlife Coordination Act, Nonindigenous Aquatic Nuisance Species Prevention and Control Act of 1990, Endangered Species Act of 1973, Great Lakes Fishery Act of 1954, and the Great Lakes Fish and Wildlife Restoration Act. The Great Lakes Fish and Wildlife Restoration Act established six goals for the Service including two goals that apply directly to the conservation of brook trout in Lake Superior waters:

1. Restoring and maintaining self-sustaining fishery resource populations; and
2. Protecting, maintaining, and, where degraded and destroyed, restoring fish and wildlife habitat, including the enhancement and creation of wetlands that result in a net gain in the amount of those habitats.

The Service's Fisheries Program has played an important role in conserving and managing nationally significant fish and other aquatic resources since 1871. The Fisheries Program stresses partnerships with States, Tribes, other governments, private organizations, public institutions and interested citizens in larger efforts - often crossing interjurisdictional boundaries - to conserve these important resources. The Fisheries Program worked with partners to prepare a strategic vision, *Conserving America's Fisheries*, which was released in December, 2002. This document includes three principles:

- Protecting the health of aquatic habitats;
- Restoring fish and other aquatic resources; and
- Providing opportunities to enjoy the benefits of healthy aquatic systems.

Common and/or Joint Plans of both agencies

Various signed agreements and plans guide the management of Wisconsin's Lake Superior brook trout populations.

1. The Wisconsin DNR and the Service signed a joint *Strategic Plan for Management of Great Lakes Fisheries* (GLFC 1997). It represents a commitment to cooperative management on the Great Lakes by all state, federal, tribal and provincial agencies involved in the management of Great Lakes Fisheries. This Plan recommends a variety of strategies and procedures to ensure that all agencies are in accord with lake-wide strategies in managing fish community objectives.
2. A subcommittee of the Lake Superior Technical Committee developed a *Brook Trout Rehabilitation Plan for Lake Superior* (Newman et al. 2003). The plan describes the

objectives for rehabilitation and identified issues and strategies to rehabilitate brook trout populations in Lake Superior. The rehabilitation goal for brook trout in Lake Superior is to maintain widely distributed, self-sustaining populations in as many of the original, native habitats a is practical.

3. The Lake Superior Committee updated the *Fish Community Objectives for Lake Superior* (Horns et al. 2003). It describes the goals and objectives for fisheries management on Lake Superior and has the same objective as stated in the Rehabilitation Plan.
4. In March of 1999, the Lake Superior Technical Committee (LSTC) was charged to serve as a link with the Aquatics Committee of the Binational Program for Lake Superior. The LSTC and the Aquatics Committee work cooperatively to describe and manage the aquatic community of Lake Superior.

What is a "Coaster" Brook Trout?

This is the fundamental question that will define the scope of this plan and direct successful rehabilitation and management activities. Brook trout that grow to a larger size in coastal waters of Lake Superior likely resulted from a combination of environmental and genetic factors. Possibilities include:

- A genetically inherited anadromous life history strategy, in which fish spend most of their adult lives in the lake but migrate into tributary streams to spawn.
- Environmentally based patterns of habitat use, in which fish exhibit growth and behavioral traits characteristic of the waters they inhabit.

Within their native range, brook trout are known to express a broad spectrum of reproductive life histories and behaviors. Current knowledge/thought for brook trout in Lake Superior suggests that most brook trout in Lake Superior are probably capable of expressing the migratory life history trait under the appropriate conditions. In Wisconsin, coaster brook trout may be a stream source brook trout that enter the lake environment, grow faster than their river dwelling siblings, and return to reproduce (life history variant). Lake spawning populations are known to exist elsewhere in Lake Superior although no historical evidence exists in Wisconsin waters.

In October 2003 a workshop involving contributors to this plan and other recognized experts was convened to synthesize available data. In addition, in August 2004, research on multiple aspects of brook trout ecology were presented at the American Fisheries Society-sponsored symposium titled, *Coaster Brook Trout Management, Biology and Rehabilitation*. Rather than attempt an incomplete compilation of the scientific information in this document at this time, future versions of the plan will incorporate emerging knowledge.

For purposes of this plan, we will use a working definition for "coaster" as brook trout that inhabit the coastal waters of Lake Superior for at least part of their lives. Although this definition is fairly broad and could include stocked brook trout, it is understood and expressed elsewhere in this plan that the goal of this effort is to establish self-sustaining populations of coaster brook trout in Wisconsin waters of Lake Superior that are as genetically similar to those historically present as practicable. The advantage of keeping this definition general at this point is that it accommodates the uncertainty of the genetic heritage of Wisconsin coasters and allows for parallel rehabilitation experiments. Should it prove that natural reproduction is not feasible, it also allows for the maintenance of coaster populations through stocking from suitable brood stocks.

This plan includes several experimental rehabilitation activities intended to help answer the question of "what is a coaster brook trout?" These experimental activities are documented in more detail in later chapters of the plan.

Background

1. Stream Habitat and Watershed Health

Brook trout habitat varies greatly across the Lake Superior Basin. The basin's contrasting geology, the way precipitation is stored or shed to it's tributaries, forest cover, impassable waterfalls and the type of coastline provide varying brook trout habitats. Brook trout populations developed many strategies to exploit and sustain themselves in the range of available habitat conditions. Changes in stream habitat and watershed health over the last 150 years have dramatically affected brook trout populations.

Basin's Landscape Geology Creates Varied Habitat

A simplified portrait of the footprint created by the last series of glacial movements across the basin's landscape shows four major areas. (Figure 1)

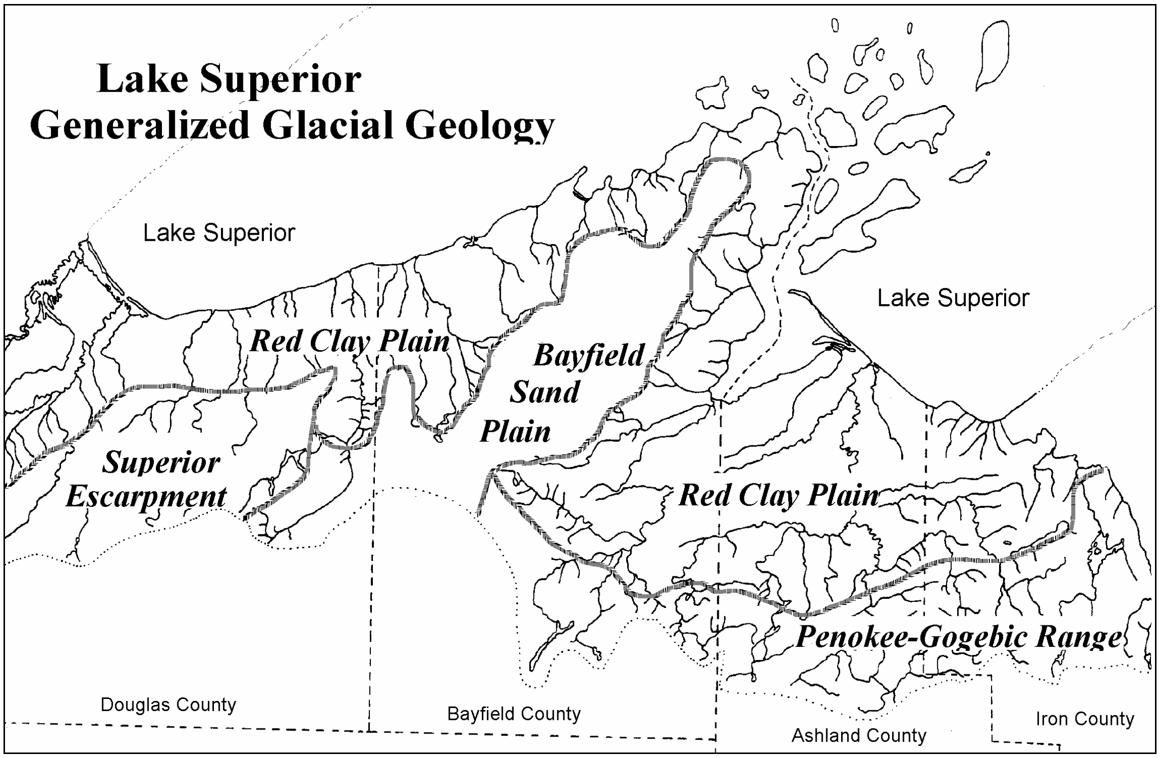

Figure 1 General Lake Superior Basin Geology

A broad zone of clay (Red Clay Plain) with a fairly steep upper slope parallels the Lake Superior shoreline. A region of deep sand sweeps in a southwest to northeast fashion across the basin, from the headwaters of the Brule up the central portion of the Bayfield peninsula (Bayfield Sand Plain). Two bedrock escarpments reach the surface in the east and west along the basin's southern border (Superior Escarpment and the Penokee-Gogebic Range) (Clayton 1984).

Most of the trout streams in the eastern and western portions (Ashland, Iron and Douglas counties) of the basin generally begin immediately north of the two escarpments. They collect a small quantity of groundwater from a comparatively thin layer of glacial till lying on bedrock and then snake through deeply incised valleys of the Red Clay Plain before reaching the Lake Superior shoreline. These shallow aquifer streams are typically surface water dominated with groundwater only able to sustain temperatures suitable for brook trout in upstream reaches. Several of these rivers have cut through the red clay layer reaching the underlying bedrock where waterfalls, like Copper Falls on the Bad River and Big Manitou Falls on the Black River, form barriers to separate upstream brook trout populations from the coastal areas of Lake Superior.

The central portion of Wisconsin's Lake Superior Basin (Bayfield County streams) contains some of the most unique trout streams in the entire Lake Superior Basin. These deep aquifer streams gather most of their groundwater flow at the interface between the Bayfield Sand Plain and the Red Clay Plain. They flow down deeply incised valleys through the Red Clay Plain to Lake Superior. These streams historically contained high quality brook trout habitat. They have great quantities of groundwater supplied to them from the deep sand aquifer (deepest unconsolidated material in the state of Wisconsin) providing them a good trout temperature regime for most, if not all, of their stream length. Recently a United States Geological Survey hydrologist estimated that rain falling on the Bayfield Sand Plain might take ninety years to flow through the aquifer and out into one of these streams (Faith Fitzpatrick, USGS, pers. com.). This type of groundwater recharge provides the Bayfield Peninsula streams with extremely stable base flow. A few of these streams have also scoured channels down to the underlying bedrock, in some cases, creating impassable barriers to upstream trout movement. (E.g. - White River Falls underneath the White River dam).

Graveyard Creek in Iron County and the Bois Brule in Douglas County lie in slightly unique geological basins. The Graveyard's headwaters begin in a small isolated sand plain and flow down a low gradient sandy basin to Lake Superior. The Bois Brule by nature of its glacial history (at one time it was a spillway outlet from Glacial Lake Superior) has a very flat headwater section that cuts through the sand plain for 15 miles before it drops down over the clay plain in its downstream 25 miles (Bean and Thompson 1944).

The impervious nature of the red clay that forms the base for most of the basin's streams causes the land to shed surface water quickly to the watercourses. In steep portions of the red clay plain, surface drainage moves off the landscape so quickly that it has been termed "urban-like" by some.

Forested Landscape Creates Healthy Watershed Environment

The pre-settlement forest that developed since the last glacier retreated, dramatically slowed the rate water was shed off the impervious red clay landscape to the tributaries (Curtis 1959). The forest reduced the water volume available for runoff by intercepting precipitation and transpiring some of it back to the atmosphere. Less snow accumulated on forested lands than on treeless ground, and snow lingered from one to five weeks longer in spring than in today's more sun exposed open landscape. The snow on a forested watershed melting over a longer period of time both delayed the timing of the snowmelt and reduced the peaks of spring high flows.

The mature forest floor developed a deep layer of organic material (the duff layer) made up of rotting needles, leaves, branches and fallen trees. There was more biological activity in forested soil than in open land, so the earth was more porous and more water percolated down through it to become groundwater. The duff layer additionally sponged up water to be released more slowly to both the soil and the trees.

Fallen trees and branches created tiny micro-environments that held water from quickly running off the mineral soil and significantly increased the length of the path that surface water must take to reach the stream. Surface drainages were filled with this fallen wood effectively reducing the speed water would pass through them, and in doing so slowed erosion rates during rainfall or snowmelt events.

The forested watershed reduced the flashiness of the basin's streams and also shaded the escarpment streams, which resulted in cooler temperature regimes. This forested watershed and the basin's natural groundwater supply created the ideal environmental setting for development of good stream habitat conditions where brook trout could thrive.

Forest Protected Watershed Creates Excellent Stream Brook Trout Habitat

The heavily forested landscape buffered watersheds by metering snowmelt and rainfall. The plentiful amounts of wood (a key feature in pre-European settlement streams) lying in stream channels created a mosaic of water velocity patterns. The wood created a forced pool-riffle and step-pool channel morphology (obstruction-controlled) where most pools, bars and channel spanning steps are forced by large logs and trees obstructing flow. (Montgomery and Buffington 1997)

Figure 2 shows a well-wooded section of stream, which is a very rare occurrence today. The wood captured gravel and stabilized substrates. The gravel typically used by brook trout was held in place throughout the upstream half of most streams creating secure spawning and egg incubation sites. It is probable that this wood also created greater numbers of individual spawning sites per stream reach as substrate patterns became more complex. As a result, brook trout exhibited high hatching success and higher numbers emerged from the spawning gravel. Low velocity areas behind the wood in the channel captured silt, leaves and branches, the organic fuel of the system. This wood also provided attachment sites for aquatic insects that processed these vegetative nutrients and lengthened the nutrient cycle providing increased quantities of food needed to support large populations of brook trout. Wood also provided an abundance of high quality feeding sites where low water velocity areas, very near feeding lanes, created an environment critical to the survival of newly emerged trout fry. Brook trout have the smallest emergent fry size of the salmonids found in today's streams - only about three quarters of an inch (DuBois, Wisconsin DNR, pers. com.). The delayed spring snow melt (typically postponed by a couple of weeks in the old growth forested watershed) allowed brook trout fry the opportunity to grow to a larger size before they had to contend with this annual high water event.

The larger fry size and great quantities of wood creating low velocity holding habitat in the channel, allowed many more of them to survive through these spring flood events. Water velocity flowing around this wood additionally carved out holding holes, and provided good cover for juvenile and adult brook trout. These early stream habitat conditions provided for the abundant brook trout populations that European settlers described when they reached the area in the middle 1850's.

The earliest anglers also described another habitat feature, deep lower reach pools, not usually seen in our present-day streams. They described using boats to fish the deep-water stretches in downstream reaches of some of the Bayfield Peninsula streams. The lower Sioux River and Fish Creek were popularly fished this way. These deep-water sections likely resulted from watershed stability where reduced volumes of stream bank material (silt and sand) eroded from upper stream reaches, thereby allowing lower stream reaches to scour deep holes providing important living space for larger brook trout. Fitzpatrick (1998) noted that the modern channel of lower Fish Creek is wider and uplifted because of the excessive sand loading.

Beaver likely affected Brook Trout Abundance

Beaver dams can negatively affect brook trout by blocking fish ascending to upstream spawning locations, restricting water flow, warming water temperatures and covering spawning and rearing habitat with silt. Beaver impoundment's can also drown out evergreens growing along the bank, which further sets back riparian forest succession and large wood recruitment to the stream. Controlling beaver populations negatively affecting brook trout is an essential fish management activity.

Logging Impacts

The first episode damaging stream habitat was the cutting and removal of in-channel wood so streams could be used for log driving. Logs could be cheaply driven down the streams to Lake Superior where they were gathered and towed to sawmills. Log driving began in downstream reaches first and gradually moved toward headwater sections of streams. Splash dams were constructed on upper tributaries and water held behind them was released in synchrony from multiple dams, creating the flushing flows needed to drive logs down to the lake. Log drives occurred annually until all the easily accessible large pine was cut from each watershed. Only the smallest sections of the coldwater tributaries were spared. Physical stream bank damage caused by scour from the catastrophic volumes of water used to drive logs and by the logs abrading the banks quickly destroyed stream habitat that had taken centuries to create. This resulted in channels with increased width and decreased water depths. Log removal increased in-channel water velocities, reduced the stability of the spawning substrates, and eliminated much of the high quality stream habitat that brook trout had once thrived in. This type of activity shifted the stream channel back toward that of a young post-glacial stream. The initial logging events that destroyed critical stream habitat, along with concurrent brook trout over-harvest dramatically reduced brook trout sustainability.

Nearly all the remaining trees were removed from the watershed by the 1930's. Rail and road grades became an ever more common feature on the landscape. Grades damage the watershed by combining drainages and accelerating surface runoff. The litter of the forest-clearing era caught fire and burned repeatedly during the first third of the twentieth century (Holbrook, 1943). The important forest duff layer was burned away and the soil's capacity to hold, store, and slowly dissipate precipitation was lost. Attempts at farming the open landscape and ditching fields also increased runoff.

All of these events combined to dramatically increase surface runoff rates to the point that large precipitation events reached the stream channels with such volume and velocity that streams had to carve out larger channels to handle these much increased water volumes. The upstream reaches with little rock or cobble to protect stream bottoms began carving deep ‘culvert like’ channels with high stream banks that contain all but the most extreme floods. The great volume of wood, now gone, could no longer buffer this down-cutting. Substrates were destabilized and easily washed downstream, channels were straightened, and the majority of the remaining wood was flushed from the channel. Each subsequent rainfall event likely eliminated additional downstream brook trout spawning habitat.

Current Conditions and Management Activities

Today, most brook trout reproduction occurs in headwater reaches. The smaller stable gravel substrate where brook trout formerly spawned has been transported downstream and deposited in unstable locations at the head end of the low gradient sections of the stream mid section. The loss of in-stream wood and the lack of recruitment of new wood have severely reduced fry survival rates by removing nearly all of their former protection from high water velocities. Stream channel structure is very simple today compared to the complex wood-modified stable original river channels (Figures 2 and 3). In addition, large amounts of sand are continually added to the stream and moved down the watercourses.

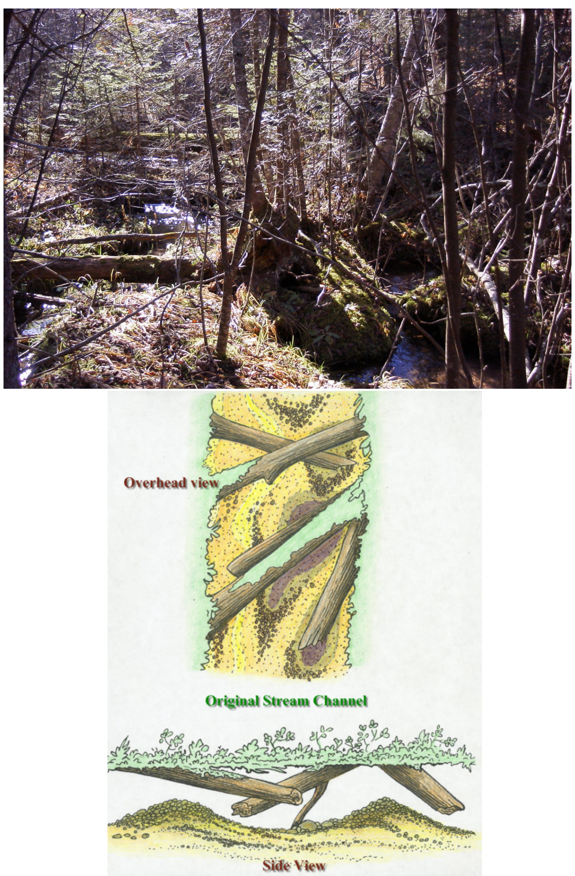

Figure 2. Historic complex channel.

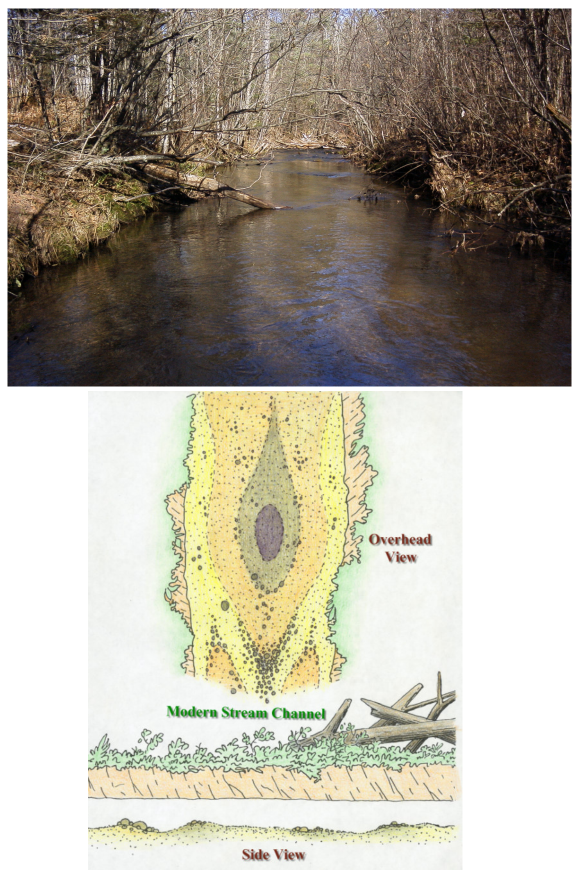

Figure 3. Today’s simple channel.

A hydrogeomorphic study of Fish Creek estimated that although peak runoff conditions are improved, from the watersheds worst conditions in the 1930's, flood magnitudes are still twice the pre-settlement rates and more than two and a half times the sandy sediment is still being transported down the stream channel (Fitzpatrick 1998). The large quantity of sand added to the stream channel during each flood event moves slowly through the stream filling in most potential hole habitat, covering and embedding spawning gravels, and creating desert-like conditions limiting aquatic insect production (Basset 1987, Alexander 1986, Rose and Graczyk 1996). Sand is not readily flushed from the larger capacity channels created by catastrophic runoff events. Channel morphologies shift away from a pool-riffle structure toward a dune-riffle channel type (Montgomery and Buffington 1997). The holes that were originally abundant in lower stream reaches have become filled with shifting sand.

The combined human induced watershed changes, altered channel structure, loss of natural in-channel wood, and great quantities of sand deposition, have combined to impair brook trout sustainability in the Wisconsin tributaries.

A number of activities presently protect and attempt to restore watersheds in Wisconsin's Lake Superior basin cold-water streams. The Whittlesey Creek Priority Watershed Project's primary goal was 'to protect and improve fish habitat'. The Brule River State Forest is a state acquisition project that targets protection of the Bois Brule River. The South Shore Fish and Wildlife Area was created to protect riparian areas of streams through state acquisition, and combined previously separate acquisition projects on the Flag, Cranberry, Pikes, Sioux and Fish Creek watersheds, all major central basin coldwater streams.

A few attempts have been made to repair in-stream habitat. The Wisconsin Trout Stamp program has funded activities on the Bois Brule, Flag, Bark, Sioux and Pikes Creek. Additionally, funds from a water regulation violation on the north fork of Fish Creek were used in a follow up project to that case. The Whittlesey Creek Priority Watershed project resulted in the installation of several bank erosion control devices. Most in-stream habitat devices are intended to confine the river channel to create fish holding holes, uncover or expose spawning gravel, and/or prevent bank erosion. Most projects, however, have failed to produce the intended result, with many being destroyed by subsequent flood events. The successful projects are those located in the least violent stream reaches. Most of the devices built in the upper watercourse of the Bois Brule watershed have functioned as intended, as they're located in a stable section of that watershed

Presently a beaver control program operates in the basin with the objective of removing tributary populations of beaver from at least the main coldwater tributaries. The US Department of Agriculture's Animal Damage Control Program is contracted to do the work. Targeted watersheds include Fish, Whittlesey, Sioux, Onion, Pikes, Bark, and Cranberry, Flag and Bois Brule rivers. Beaver control agents remove all problem beaver and dams from these tributaries. The objectives include maintaining fish access to spawning areas and protection of in-stream habitat conditions and riparian cover.

Wisconsin DNR staff assists local governments (towns and counties and watershed groups) in land use planning efforts that protect coldwater tributary watersheds. Presently the counties and some townships are developing land use management plans. Additionally, a public-private partnership group, the Sioux River Watershed Council, is developing a watershed plan for the Sioux and Onion Rivers in Bayfield County.

These most recent fishery efforts have generally shifted from stocking and limiting angler harvest to riparian forest protection and beaver control, and to the more recent initiatives targeted at understanding and improving stream habitat and watershed health with the goal of restoring watershed-induced habitat forming processes.

2. Harvest

Brook Trout Abundant at the Time of European Settlement (1850's through 1870's)

Newspaper accounts during the initial European settlement period described abundant brook trout populations occupying the basin's coldwater streams. Anglers caught great numbers of fish in streams they called brook trout or speckled trout. The tributaries in the central portion of the basin from the Bois Brule in the west to Fish Creek in the east (Figure 4) were especially productive. These brook trout harvested by anglers averaged about ten or eleven inches with large fish reported to be about seventeen inches (based on newspaper reported catches compiled by Dennis Pratt, Wisconsin DNR). Additionally, anglers caught large brook trout that they called rock trout (termed coasters today) along the sandstone coastline of the Bayfield Peninsula in early to mid summer and seasonally in the nearby streams. Newspaper accounts report the average size of a harvested rock trout was about a pound with some reaching about four pounds.

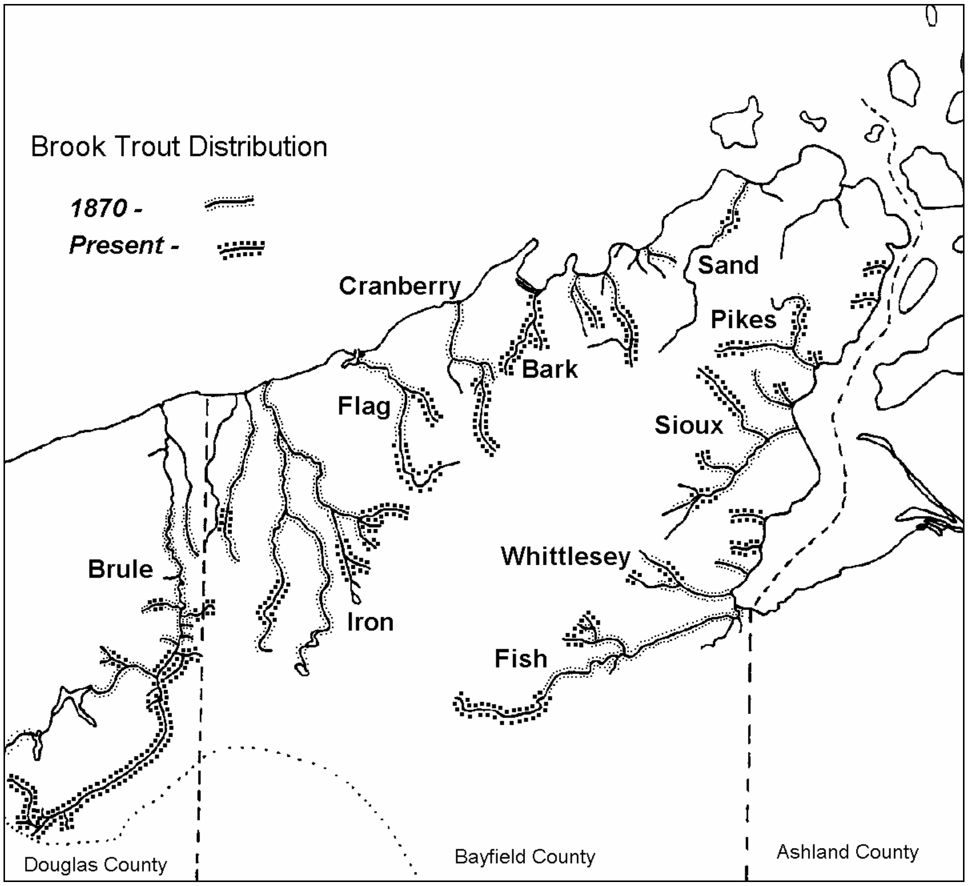

Figure 4. Present and Historic Brook Trout Range – Central Basin Streams

Brook Trout Populations Decline Rapidly in the 1880's

Reports in the local newspapers chronicle a rapid decline of the fishery in the 1880's. Railroad access to the Wisconsin shoreline in 1877 allowed non-local anglers easy access to the Chequamegon Bay/Bayfield Peninsula streams. The alluring angling for rock trout declined rapidly along the rocky coastline and in the more easily accessed lower river stretches. A sequential decline of angling success is observed from a chronology of newspaper reports. Angling success generally declined in a progression from easily reached streams to more remote streams and from lower stream reaches to upper stream reaches. Bois Brule angling success declined later because it's brook trout population was located far from the Lake Superior shoreline and from population centers of Ashland and Bayfield to the east and Superior to the west (railroad did not reach the Brule valley until 1884). Commercial harvest accelerated the decline, as brook trout along the coastline were considered fair game when caught incidental to commercial whitefish harvest. Illegal winter stream harvest was noted occasionally. Freshly caught brook trout were common menu items at hotels.

Angling success declined rapidly in close association with the combination of excessive harvest and in-stream habitat changes caused by the first log driving activities; however, initial attempts to reverse the decline focused only on regulating harvest. Sport clubs popped up in most cities prompting citizens to turn in violators of the trout law and requesting that something be done to curtail commercial brook trout harvest.

Angling regulations had been in place since 1858, when the length of the open season was reduced to eight months, and more restrictive regulations have been enacted over time. The season length was reduced to five months in 1878 and the first bag limit restriction was set at ten pounds in 1905. Bag limits were changed to 45 in 1909, 35 in 1917, 25 in 1923, 15 in 1929, and 10 in 1949. The first size limit was set in 1905 at 6 inches and increased to 7 in 1915. It was returned to 6 in 1950 where it remained for nearly the next forty years. It's unlikely that any of these regulations were strict enough to provide protection from over-harvest.

More recent attempts have been made to protect and improve brook trout fishing. Lake Superior tributary brook trout harvest is presently limited to a daily bag of five in combination with other trout and salmon, with a minimum size limit of eight inches. Regulations in Lake Superior restrict the harvest to one brook trout with a minimum size limit set at 20 inches.

3. Rehabilitation Stocking

Early requests for stocking declining brook trout streams went unfilled. The declining trend of brook trout fishing, seen all across the brook trout range because of the increasing human population continued across Wisconsin's Lake Superior basin. The first brook trout stocking likely took place in the late 1880's when a private landowner on Pike's Creek built a small hatchery to supply that stream. The first officially recorded stocking was done in 1890 when a resident resort owner placed brook trout in the Sioux River. More than 23 million brook trout were stocked in the basin during the next 100 years, including fry, fingerlings, advanced growth fingerlings and yearlings in nearly every stream known to originally hold brook trout. (Table 1).

Table 1. Lake Superior Basin Brook Trout Stocking.

	Fry	Fingerling	Yearling	Adult	Egg	Unknown	Total
1890	10000						10000
1891	40000						40000
1892	0						0
1893	0						0
1894	10000						10000
1895	0						0
1896	8000			500			8500
1897	0						0
1898	109500						109500
1899	126000						126000
1900	52500						52500
1901	96000						96000
1902	168000						168000
1903	130000						130000

	Fry	Fingerling	Yearling	Adult	Egg	Unknown	Total
1904	212500						212500
1905							Missing
1906							Missing
1907	114000						114000
1908	124000						124000
1909	160670						160670
1910	428694						428694
1911	561080						561080
1912	469078						469078
1913	938370						938370
1914	916944						916944
1915							Missing
1916	459000						459000
1917	631200						631200
1918	732450						732450
1919	32000					380000	412000
1920	39600					432600	472200
1921	391800	1200					393000
1922		505710					505710
1923		305350					305350
1924							Missing
1925		347100					347100
1926		431946					431946
1927		333750					333750
1928		339009					339009
1929		368574	2800				371374
1930		607479	6105				613584
1931		452507	200				452707
1932		415710	3400				419110
1933		523626		555		18200	542381
1934		710761	282	1382		106166	818591
1935		996700	12650				1009350
1936		393405	5328			179605	578338
1937		636690				15430	652120
1938		662395	13490	35		19724	695644
1939		633748	29885	543		22900	687076
1940		535110	7900				543010
1941		350171	14570	1028		4000	369769
1942		351770	3710	2527		7950	365957
1943		121800	10730			2650	135180
1944		140775	18283			4000	163058
1945		109700	10508	6620		3000	129828
1946		132540	31190				163730
1947		89450	47710	18			137178
1948		124100	53530				177630
1949		105900	53450				159350
1950		157725	61845				219570
1951		94532	47707		132354		274593
1952		132165	53484				185649
1953		114660	44536				159196

	Fry	Fingerling	Yearling	Adult	Egg	Unknown	Total
1954		6900	47735				54635
1955			49670				49670
1956		750	37554				38304
1957			44000				44000
1958			35771				35771
1959			38760				38760
1960		159505	43300				202805
1961			33800				33800
1962	50000	7000	35850				92850
1963		85906	29500				115406
1964		44207	29000				73207
1965		9500	37050				46550
1966		30146	39446	1290			70882
1967		13400	59639				73039
1968		2000	64054	1525			67579
1969		85700	97907	109			183716
1970			31570	300			31870
1971			41400	270			41670
1972		36000	38485				74485
1973		7100	14650				21750
1974		12000	34034				46034
1975		3000	43900			2500	49400
1976		10000	16964				26964
1977		82100	50527				132627
1978		30400	150319	1000		2500	184219
1979		8000	131167	100			139267
1980		71000	68100	100			139200
1981		1000	91360	200		3175	95735
1982		1000	53290	100			54390
1983		11000	60000				71000
1984		1000	42620	3170			46790
1985			82600	100			82700
1986			128970	150			129120
1987		87500	6450	100			94050
1988			9400	3000			12400
1989		84650	13752				98402
1990			10400				10400
1991		40000	17800				57800
1992			9900	286			10186
1993			24486				24486
1994			25900				25900
1995			30900				30900
1996		41109	6999				48108
1997			3000				3000
1998			3500				3500
1999		7000	6000	2640			15640
2000		2000	9250				11250
2001		2000	1500				3500
2002		2400	430				2830

Most brook trout stocking in the Wisconsin basin involved cultured strains developed from undocumented sources. A few of the earliest were not originally from Wisconsin, while the rest were originally from other Wisconsin basins. Cultured brook trout stocking in streams was much reduced by the late 1990's.

A more recent stocking initiative to recreate a coastal brook trout fishery began in about 1960. Since that time, about 2 million brook trout have been stocked in Lake Superior proper (Table 2). Returns to the creel were fairly decent until about 1972. During that time yearling stocking produced returns of fifteen to nineteen percent. Since 1972 brook trout stocking results have been very poor. A similar evaluation in 1979 reported a return of only four tenths of a percent, or about four surviving to creel per thousand stocked. Although there were great hopes that harvest regulations and stocking would revitalize the brook trout fishery, once the initial decline had occurred, the fishery continued to slowly deteriorate to the present state.

Table 2. Brook Trout Stocking in Lake Superior.

	Fry	Fingerling	Yearling	Adult	Egg	Unknown	Total
1960		159505					159505
1961							0
1962							0
1963		67906					67906
1964		43707					43707
1965			5050				5050
1966		30146	17446				47592
1967		11400	21178				32578
1968			36554	1525			38079
1969		27700	66798				94498
1970			17070				17070
1971			24600				24600
1972		33000	25135				58135
1973							0
1974			21390				21390
1975			32500				32500
1976		8000	860				8860
1977		81100	32777				113877
1978		29400	134369	1000			164769
1979		7000	115580	100			122680
1980		70000	56050	100			126150
1981			79510	200			79710
1982			42490	100			42590
1983		10000	49200				59200
1984			31320	3170			34490

	Fry	Fingerling	Yearling	Adult	Egg	Unknown	Total
1985			71000	100			71100
1986			118570	150			118720
1987		87500		100			87600
1988				3000			3000
1989		84650	3000				87650
1990							0
1991		40000	7900				47900
1992				286			286
1993			4086				4086
1994							0
1995							0
1996		41109	2999				44108
1997							0
1998							0
1999				2640			2640

4. Genetics Management

Genetic adaptation to local environments differs among brook trout populations. Individual populations depend on adequate levels of genetic variation to adjust to fluctuating environments and sustain a healthy stock size. Restocking efforts are most likely to succeed when source fish come from the rivers to be stocked or rivers nearby that may share some of the same environmental conditions.

Historically, genetic considerations have not been a prominent component of brook trout management in the basin. The brook trout inhabiting the Wisconsin portion of the Lake Superior basin have never been used as a brood source for any stocking experiment. Various brook trout strains were stocked between 1890 and the present, beginning with various domestic hatchery strains and shifting to longer-living strains like the Assinica, and more recently the Lake Nipigon strain originating from Lake Nipigon in Ontario. The Lake Nipigon strain was introduced to Wisconsin waters in an attempt to reestablish a self-sustaining coaster fishery. They were stocked from 1982 to 1987 and again in 1993 to 1996 in both the lake and streams, with very poor results. Suggested reasons for their poor survival and lack of reproductive success include: domestication of the strain, stocked at the wrong sizes, stocked in the wrong places, the shoal spawning strain could not adapt to stream spawning, not adapted to successfully reproducing in Wisconsin tributary conditions, poor reproductive habitat, and competitive interactions with naturalized salmonids. Curry and Noakes (1995) noted that brook trout might be selecting different spawning site characteristics in different regions based on glacial geology.

Brook trout populations in some streams may be in such low numbers today that they lack enough spawning fish to enable them to recover from sustained periods of drought (especially the escarpment streams) or flood. Very small populations are vulnerable to inbreeding and genetic losses that reduce their adaptability to the varying habitat limiting conditions found in the current stream environment.

Emerging work on genetic issues will help set direction relevant to this evolving plan.

5. Life History and Management

Aspects of brook trout life history are previously discussed in the "What is a Coaster Brook Trout?" section. Brook trout, the only salmonid native to Wisconsin's Lake Superior basin coldwater tributaries, historically occupied most of the available coldwater tributary habitat. Additionally, brook trout seasonally occupied the rocky near shore habitat of the Bayfield peninsula and some of the adjacent Apostle Islands. Only about fifteen percent (approximately 40 miles) of Wisconsin's mainland shore is comprised of this broken sandstone. The remaining 85 percent is either sand beach or red clay bluff. Most of the streams in close association with the rocky shoreline habitat likely had a few larger rock trout 'coasters' associated with them. It appears that the deep lower river habitat once present in the tributaries was an important staging area for these shoreline brook trout. It's speculated that as shoreline waters warmed in August, the coastal brook trout sought the cooler river water.

Both stream resident and migratory brook trout were reported to ascend the middle to upper stream reaches to spawn each fall. No historical record has been found describing lake spawning brook trout or a lake concentration of coasters caught during the spawning period in the Wisconsin basin. The larger Bayfield Peninsula streams (Fish Creek, Sioux and Sand Rivers) that were in close contact with the rocky sandstone coastline were seasonally (spring and fall) noted for containing these large coasters. Additionally, the Bois Brule had a small run of large brook trout ascending that stream each autumn (St. John 1846). Streams with less abundant populations separated from the Lake Superior shoreline habitat by long distances and/or by natural barriers were not reported to contain the larger lake run fish (e.g. escarpment streams).

Today, individual populations within the watershed are very small in comparison to the time that written accounts first documented the natural resources of the region (mid 1850's through 1870's). Brook trout are still present and sustaining themselves in limited portions of most tributaries. The larger stream reaches tend to have few brook trout, while brook trout still sustain themselves in the smaller channel reaches less impacted by peak flood events. Figure 4 displays some of the differences in the brook trout range of the major central basin streams noted in earlier period newspapers and their current self-sustaining range today. Presently, in excess of 80 self-sustaining stocks subsist in portions of accessible tributaries. Streams where upstream movement is not blocked by waterfalls or impassable manmade barriers are catalogued in Appendix D. The range of the brook trout within the basin and their size structure and abundance within this range has been greatly reduced. Very few naturally produced brook trout inhabit Wisconsin's Lake Superior coastline today.

It is clear that today harvest is less than in historic times. Newspaper reports from Ashland indicated that the harvest from Fish Creek alone was 3,000 to 6,000 per year, averaging 10-11 inches with some up to four pounds. By comparison, today's brook trout harvest in the Fish Creek watershed is estimated to be less than 100 brook trout (Wisconsin DNR- creel census files) and the large fish that seasonally ascended Fish Creek from Chequamegon Bay are rarely seen today. The Sand River also historically had one of the more famous fisheries where most of the population was sustained by groundwater-input in the lower portion of the basin. Damage from this stream's first log drive quickly degraded needed habitat and this fishery quickly declined and has since not recovered.

Most central basin streams are inhabited by self-sustaining non-native salmonids. Abundances are also limited by the same watershed-related factors which limit brook trout, but to a lesser extent.

The escarpment stream populations are also generally much diminished although limited data currently exists. They typically have much less stable base flow than central basin streams and local angler's report that brook trout populations are currently much diminished. It's suspected that the warmer than normal summer temperatures of the 1990s may be causing the more recent declines.

Thorough information on the distribution and population status of brook trout, both stream-resident and coaster life histories, is lacking. New information on results of rehabilitation and life history experiments and effects of new regulations will assist efforts in reaching rehabilitation objectives.

6. Species Interactions

Competition occurs when two organisms require the same resource that is in limited supply. Krueger et al.(1991) provides a good review of impacts of non-native salmonids across North America.

Non-native species were distributed in the watershed beginning with rainbow trout in the 1890's, and later with brown trout and Pacific salmon. By the early 1940's, most stocking efforts shifted away from brook trout to these more successful new species. The newcomers appeared to be more suited to the deteriorating stream conditions and eventually established self-sustaining populations. Compared to brook trout, some of the introduced species choose higher velocity spawning sites and deposit more eggs. The fry emerge from the spawning gravel earlier and grow to a larger size sooner allowing them a better chance of survival. Competition for food and space could be a problem; however competitive interactions between brook trout and other salmonids is unknown.

7. Outreach

Public understanding of the brook trout resource and impediments to protection, distribution, stock status, and the relationship between healthy watershed land use and brook trout and rehabilitation is necessary for success. Much of this information has been communcated through public presentations, reports, newsletters, web pages, and similar outlets. Continued outreach is needed to communicate rehabilitation goals, expectations, opportunities and impediments.

Brook Trout Management Plan

Rationale

It is essential that we understand brook trout resource requirements and the impact human activities have had on the watershed, stream habitat and this native fauna. Simple supplementation programs have not been very successful in the past and may not succeed on their own today. Much of the error in past actions may have involved responding to symptoms of resource loss, while failing to address the root problems brook trout face.

We recommend gathering current information on each stock, protecting healthy stocks, and identification of limiting factors and potential threats. Through this process agencies should ascertain factors limiting stocks and develop and initiate actions to overcome them. While this information is being gathered we will continue to research major brook trout biology questions. The success of this plan will depend on a long term commitment to manage watersheds to protect and restore the tributary habitat-forming processes, and will likely involve partnerships between both public agencies and private citizens to achieve the goal.

Goal

To protect and improve the self-sustaining brook trout populations and their habitat in Wisconsin's Lake Superior Basin, and attempt to rehabilitate or establish several populations that exhibit life history diversity (both stream resident and migratory 'coaster' life history types).

Objectives

1. Stream Habitat and Watershed Health. To develop watershed-based ecosystem approaches that will protect and restore watershed function that in turn rehabilitates dysfunctional channel form and function, and damaged stream habitat.

Problem: Land use and subsequent changes in cover types within Lake Superior basin watersheds have reduced stream habitat quality, which limits brook trout sustainability.

> **1.1.Tactic**: Investigate and quantify the physical and biological changes between pre- and post-disturbance watershed condition and stream channel habitat, and describe the impact of that change on brook trout.

1.1.1. Identify and quantify existing stream and lake habitat critical to brook trout.
1.1.2. Delineate watersheds draining to and areas riparian to critical brook trout reaches.
1.1.3. Compile existing land-use data in GIS format for Wisconsin's Lake Superior basin. Conduct additional land use surveys, as needed, to develop a complete description of land use in watersheds with brook trout.
1.1.4. Define historical land use pattern changes (Land Sat photos, aerial photography and GIS etc.) in direct surface watersheds as to percent of land cover in open, impervious and young age forest (less than 15 years of age) versus older forest cover.

1.2.Tactic: Inventory watersheds and stream habitats critical to brook trout and implement steps necessary to ameliorate such threats as peak flood flows and sedimentation.

1.2.1. Conduct stream habitat assessment in five (5) watersheds on the Bayfield Peninsula – Whittlesey Creek, Sioux River, Raspberry River, Bark River, and Cranberry River – and develop recommendations for improving stream and watershed health.
1.2.2. Test the addition of large wood to the stream channel to constrict channel flow, reduce erosive forces and reduce sediment transport by installing in-stream devices (where practical) to speed habitat rehabilitation processes .
1.2.3. Suggest Best Management Practices for forest harvest, agricultural, road construction and maintenance and riparian zones.
1.2.4. Restore woodlands and wetlands in the watershed to reduce peak flood flows and moderate a watershed's surface water runoff rates.

1.3.Tactic: Develop partnerships with local, state, tribal, and federal agencies and non-government organizations to restore watershed function and riparian habitat to reverse detrimental effects of beaver and/or other animals not currently in balance with the ecosystem.

1.3.1. Control beaver populations to protect riparian and stream habitat, and allow brook trout access to critical stream reaches.
1.3.2. Support the highly effective U.S. Department of Agriculture's beaver trapping program.
1.3.3. Continue DNR fall monitoring program for beaver in the Lake Superior Basin.

2. Harvest. To review, develop and implement regulations that protect and enhance Wisconsin's Lake Superior basin self-sustaining brook trout populations.

Problem: Brook trout populations are reduced due to habitat limitations. Brook trout mature early, die young and deposit few eggs. The small fry must contend with the spring snowmelt period. They are severely limited by environmental events and vulnerable to harvest before they are able to reproduce. Reduced numbers of spawners may be limiting abundance.

2.1 Tactic: Review existing brook trout regulations and implement/propose conservative or no harvest regulations on populations identified for rehabilitation.

- **2.1.1** Investigate the effect of current regulations and how they function to either protect or add to the population limitations of each stock.
- **2.1.2** Continue zero bag limit regulations for experimental streams (Graveyard, Whittlesey and Bark) and investigate how they function to either protect or add to the population limitations of each stock.
- **2.1.3** Promote enforcement of existing regulations.

3. <u>Rehabilitation Stocking.</u> To conduct a set of experiments that attempt to establish the coaster life history through stocking.

Problem: Brook trout populations are severely reduced in the basin and stocking may contribute to rehabilitation.

3.1 Tactic: Summarize stocking history for each stock.

3.2 Tactic: Continue development of the U.S. Fish and Wildlife Service/ Wisconsin DNR Whittlesey Creek experiment to establish a self-sustaining brook trout population that exhibits a migrating life history by stocking, enacting protective regulations and implementing habitat improvements.

3.3 Tactic: Continue to support the Red Cliff Tribal Fisheries Department in development of various experiments on reservation streams. Continue evaluation of experiments trying to restore a migrating coaster population by stocking various life stages and stocking locations.

3.4 Tactic: Develop hatchery capacity for propagating fish obtained from naturally reproducing broodstocks in the watersheds.

3.5 Tactic: Develop stocking plans that identify measurable objectives, fish community effects, genetic and fish health considerations, stocking methods, etc. before experimental stocking takes place.

<u>4. Genetics Management.</u> To minimize loss of genetic integrity from management actions.

Problem: We lack genetics information on Lake Superior Basin brook trout populations. As a result, management actions such as stocking may contribute to reduced fitness in existing populations.

4.1 Tactic: Describe existing brook trout genetics from priority populations with management plans.

4.2 Tactic: Develop stocking plans that identify measurable objectives, fish community effects, genetic and fish health considerations, stocking methods, etc. before any experimental stocking takes place.

5. Life History and Management. To describe the life history of Lake Superior basin brook trout through assessments and implementation of rehabilitation experiments.

Problem: Current information regarding distribution and status is lacking.

5.1 Tactic: Select priority populations and develop detailed management plans for each of these stocks (Appendix C).

5.2 Tactic: Support efforts to develop a detailed management plan for brook trout populations within the boundaries of the Apostle Islands National Lakeshore.

5.3 Tactic: Continue to monitor the catch of brook trout in the creel and summarize data on the effects of new regulations on a 3-year basis.

Problem: Brook trout exhibiting life history diversity (lake life history, migratory behavior) is lacking in Wisconsin.

5.4 Tactic: Continue monitoring brook trout in three streams to determine if they will express a lake life history component through habitat management.

5.5 Tactic: Continue to monitor brook trout in streams being stocked to determine if a migratory run is established.

6. Species Interactions. To investigate and understand Lake Superior basin brook trout interactions with introduced salmonids.

Problem: Competitive interactions with naturalized salmonids may be limiting brook trout survival, growth and reproduction.

6.1 Tactic: Investigate and describe salmonid/brook trout interactions in priority populations with management plans.

7. Outreach. To communicate rehabilitation goals, expectations, opportunities and impediments.

Problem: Public misunderstanding of rehabilitation potential, timelines and needed actions have lead to unrealistic expectations.

7.1 Tactic: Improve public understanding of the relationship between land use, watershed health and brook trout self-sustainability through development and distribution of educational materials.

7.2 Tactic: Hold public meetings on this Plan

7.3 Tactic: Periodically meet with partners to report on significant results of the various experiments.

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Appendix A -- A summary of actions suggested in 'A Brook Trout Rehabilitation Plan For Lake Superior' Paraphrased

Task: Set a lake-wide goal and list individual objectives.

The rehabilitation goal for brook trout in Lake Superior is to maintain widely distributed, self-sustaining populations in as many of the original, native habitats as is practical.

Individual objectives for this goal are as follows:

- Populations will be geographically widespread; inhabiting the areas that historically held viable populations, given that tributary and Lake Habitat conditions in these areas are still suitable, or that they can be restored.
- Brook trout populations will be self-sustaining and capable of co-existing with populations of naturalized salmonines in the existing fish community.
- Populations will be comprised of 6 or more age groups (ages 0-5), including at least 2 spawning year classes of females, and spawning populations will exhibit densities sufficient to ensure viable gene pools.
- Populations will exhibit genetic profiles consistent with those of populations currently existing in the Lake Superior basin.
- Fully rehabilitated native or reintroduced stocks will be capable of supporting managed fisheries.

List of Suggested Individual Actions

Biologically based science must be used to manage brook trout populations. Actions need to be initiated first where brook trout populations still exist and then at reintroduction sites.

- Research unknowns
    - Investigate brook trout biology and life history characteristics
    - Describe genetics of brook trout that utilize Lake Superior and those that remain in tributaries for their entire lives
    - Survey and quantify the reach scale, watershed scale, and lake scale habitat requirements of brook trout populations
    - Develop a historical reconstruction of the pre-disturbance watershed condition
    - Describe species interactions

- Control harvest to prevent over-exploitation
    - Regulations may have to be set differently for lake and stream populations
    - Regulations should protect females until they have spawned at least twice
- Protect and restore riverine and lake habitat that support the remaining brook trout populations
- Rehabilitate degraded habitats
    - Essential habitat in Lake Superior and it's tributaries will be protected, and where necessary, rehabilitated
- Determine suitable reintroduction sites
- Reintroduce and establish reproducing populations of genetically appropriate stocks in suitable areas
    - Develop appropriate brood stocks (three strains available today)
    - Weigh the potential threat of stocking any type of salmonid on brook trout rehabilitation
    - Mark all stocked brook trout
    - Only Lake Superior origin strains should be used and strain selection should be based on proximity of source, or performance and behavioral traits
    - Determine appropriate life stages and optimal densities to stock
- Monitor progress of lake-wide brook trout rehabilitation success
- Implement habitat rehabilitation initiatives on other cold-water tributary watersheds where habitat conditions are currently unsuitable for coaster reintroduction
- Develop informational and educational materials as needed to aid in accomplishing actions

Appendix B -- Final Report of the Brook Trout Task Force, June 2000

RECOMMENDED ACTIONS

Following the development of the questions and answers, the Task Force met and developed a list of recommendations for consideration by the Wisconsin DNR in the development of a Lake Superior brook trout strategy.

<u>Habitat work</u>

The Task Force adopted the following recommendations related to habitat:

- Support research to identify criteria for identifying suitable habitat for coaster brook trout.
- Survey streams to identify and quantify suitable existing habitat.
- Compile existing land-use data in GIS format for Wisconsin's Lake Superior watershed.
- Conduct additional land use surveys, as needed, to develop a complete description of land use in the watershed.
- Form a citizen Task Force and, using the information described in the foregoing points, prioritize streams for habitat work (protection and restoration) and brook trout restoration. Complete this work by 2003.
- Work with interested outside groups (Conservation Congress, sportsman's clubs, Trout Unlimited, etc.) to conduct in-stream habitat improvement projects.
- Hold a conference involving the Wisconsin DNR, the Wisconsin Coastal Management Program, UW Extension, the Department of Transportation, county governments, municipalities, and others to raise awareness of the importance of managing runoff to minimize peak in-stream flow.
- Produce a video, magazine article, brochure, or other medium for communicating the importance of land use for managing peak in-stream flow and, thereby, allowing the restoration of suitable brook trout habitat.

<u>Experiments</u>

The Task Force endorsed a number of experimental approaches to coaster brook trout management. In making these recommendations, the Task Force stressed the need to identify criteria for judging success or failure of each experiment and to establish assessment plans prior to initiation of the experiments.

- Graveyard Creek – Test whether removal of a logjam can allow restoration of a coaster population. Close this tributary to all brook trout harvest for ten years, remove the log jam at the mouth of the creek, maintain stream flow, and remove all competing salmonids utilizing all available methods and promulgating regulation changes if needed.

- Apostle Islands shoal areas –Attempt to re-establish a shoal spawning population by stocking for 5 years. This should be undertaken only if it is established that native brook trout utilized these areas for spawning.
- Streams to be named – Attempt to establish a trophy fishery by designating several streams for protective regulations (e.g., 15" minimum size). Stocking could be considered in these streams.
- Sucker Creek – Test restoration techniques, including stocking, protective regulations, habitat improvements, and exotic species removal.
- Raspberry Creek/Bay - Test restoration techniques, including stocking, protective regulations, habitat improvements, and exotic species removal.
- Tributary to be named - Undertake a watershed restoration demonstration project.
- Brule River – Continue ongoing brook trout work. This includes habitat improvement work and modest protective regulations in upstream areas.
- Bark River (or unspecified alternate) – Test whether habitat is limiting expansion of a resident population. For four years, stock fingerlings spawned from a brood stock developed from the resident population. Establish protective regulations. Evaluate for four years after stocking is terminated. Concurrently, undertake watershed work, to the extent possible.

Other recommendations

The Task Force also made the following recommendations by consensus:

- Use the habitat survey data developed as described above to identify streams appropriate for adoption of protective regulations
- Institute a public education campaign to help anglers correctly identify brook trout and understand the potential value of protective regulations
- Improve enforcement of fishing laws
- Make the adoption of any protective regulations in Lake Superior itself contingent upon the results of restoration efforts in streams.
- Periodically review the splake stocking program, as suggested by the lake wide plan.
- Conduct or support an in-stream comparison of existing coaster groups (Tobin Harbor, Siskiwit River, Lake Nipigon), in Wisconsin or elsewhere as possible in the future.

Other suggestions with partial support

The following ideas were not endorsed by consensus of the Task Force, but were approved by a majority.

- Whittlesey Creek – Test restoration techniques in a degraded ground water fed stream. Implement protective regulations and stock eggs and/or fry.
- Pikes Creek – Test the effect of steelhead in Pikes Creek by blocking migration of that species.
- All tributaries - Shorten the general open season for brook trout.

Appendix C – Priority Locations and Activities for Brook Trout and Habitat Rehabilitation

The priority locations for brook trout rehabilitation initiatives are listed from west to east. These locations were selected based on current management activities by agencies.

1. Brule River
2. Bark River
3. Raspberry River
4. Whittlesey Creek
5. Graveyard Creek

Activities common to all locations include:

- Describe brook trout population dynamics.
- Control beaver populations to protect riparian and stream habitat, and allow brook trout access to critical stream reaches.
- Describe existing brook trout genetics.
- Establish regulations that provide greater protection of brook trout while in Lake Superior.

Specific objectives and activities for each of the 5 priority locations

1. Brule River

Objective: Increase brook trout abundance enough to reconnect the stream population with its lake shore habitat.

Activities, progress and needs:

- Improving stream habitat by adding spawning gravel with the help of the Brule River Sportsmen Club
    - Underway
- Re-exposing historic spawning sites that were buried under beaver impoundments
    - Underway
- Test the addition of large wood to the stream channel to constrict channel flow, reduce erosive forces and reduce sediment transport by installing in-stream devices (where practical) to speed habitat rehabilitation processes .
    - Underway
- Establish more restrictive angling regulations and summarize data on the effects of new regulations.
    - Restrictive regulations established
    - Analysis underway

2. Bark River

Objective: Increase brook trout abundance enough to reconnect the stream population with its lake shore habitat.

Activities, progress and needs:

- Re-exposing historic spawning sites that were buried under beaver impoundments
    - Underway
- Test the addition of large wood to the stream channel to constrict channel flow, reduce erosive forces and reduce sediment transport by installing in-stream devices (where practical) to speed habitat rehabilitation processes .
    - Underway
- Establish more restrictive angling regulations and summarize data on the effects of new regulations.
    - Restrictive regulations established
    - Analysis underway
- Improve fish passage through perched culverts
    - Barrier culvert removed

3. Raspberry River

Objective: Rehabilitate brook trout and their habitat.

Activities, progress and needs:

- Develop general understanding of channel condition and target areas for restoration, reclamation and remediation using bioengineering techniques.
    - Report completed by Inter-Fluve, Inc.
- Stock all life stages of Nipigon strain brook trout in Buffalo and Raspberry Bays.
    - Underway
- Stock marked surplus broodstock in reservation nearshore areas of Lake Superior to provide for a put-take fishery and possible rehabilitation of historic spawning areas.
    - Underway
- Stock Raspberry River with brook trout once streams have been restored and suitable brook trout habitat is available to restore populations.
- Develop methods to evaluate success of Red Cliff's brook trout stocking efforts in waters of the Red Cliff Tribal Reservation.

4. Whittlesey Creek

Objective: Establish a self-sustaining brook trout population in the Whittlesey Creek watershed that exhibits a migrating life history.

Activities, progress and needs:

- Repeat in 2001, the comprehensive fish survey conducted by Wisconsin DNR in 1977.
    - Completed
- Establish index stations in the stream and along the lake shoreline and survey these on a regular schedule beginning in 2001.
    - Underway
- Stock Whittlesey Creek for seven years using strains of brook trout from the Lake Superior basin with a known lake life history.
    - Underway, initiated in 2003
- During and post stocking conduct the comprehensive fish survey to monitor changes in the fish community of Whittlesey Creek throughout the experiment.
    - Underway
- Establish regulations that protect brook trout from harvest while in the stream.
    - Restrictive regulations established
- Develop general understanding of channel condition and target areas for restoration, reclamation and remediation using bioengineering techniques.
    - Report completed by Inter-Fluve, Inc.
- Initiate sediment input and transport study.
    - Funding options under investigation.

5. Graveyard Creek

Objective: Increase brook trout abundance enough to reconnect the stream population with its lake shore habitat.

Activities, progress and needs

- Remove log jam barrier at mouth to allow migration to and from Lake Superior
    - Completed
- Rehabilitate spawning habitat
    - Placed gravel substrate on one ground water upwelling
- Establish more restrictive angling regulations and summarize data on the effects of new regulations.
    - Restrictive regulations established
    - Analysis underway

Objectives and activities for additional tributaries

Cranberry River

Objective: Increase brook trout abundance sufficient to reconnect the stream population with its lake shore habitat.

Activities, progress and needs:

- Describe brook trout population dynamics above and below perturbed areas.
    - University of Eau Claire study underway
- Develop general understanding of channel condition and target areas for restoration, reclamation and remediation using bioengineering techniques.
    - Report completed by Inter-Fluve, Inc.

Flag River

Objective: Increase brook trout abundance enough to reconnect the stream population with its lake shore habitat.

Activities, progress and needs:

- Re-exposing historic spawning sites that were buried under beaver impoundments Underway

Red Cliff Creek

Objective: Rehabilitate brook trout and their habitat.

Activities, progress and needs:

- Use bioengineering techniques to reduce sediment
- Stock marked surplus broodstock in reservation nearshore areas of Lake Superior to provide for a put-take fishery and possible rehabilitation of historic spawning areas.
    - Underway
- Stock Red Cliff Creek with brook trout once streams have been restored and suitable brook trout habitat is available to restore populations.
- Develop methods to evaluate success of Red Cliff's brook trout stocking efforts in waters of the Red Cliff Tribal Reservation.

Apostle Islands

Objective: Document extant brook trout population presence, distribution, and habitat use within Lake Superior and streams within the Apostle Islands.

Activities, progress and needs:

- In 2004, survey selected areas in the park to determine whether coaster brook trout are present and characterize habitat where coasters are captured.
    - Underway
- Establish more restrictive angling regulations, monitor the catch of brook trout in the creel, and summarize data on the effects of new regulations on a 3-year basis.
    - Restrictive regulations established

    - Analysis underway

Sioux River

Objective: Increase brook trout abundance enough to reconnect the stream population with its lake shore habitat.

Activities, progress and needs:

- Develop general understanding of channel condition and target areas for restoration, reclamation and remediation using bioengineering techniques.
    - Report completed by Inter-Fluve, Inc.
- Re-exposing historic spawning sites that were buried under beaver impoundments
    - Underway
- Test the addition of large wood to the stream channel to constrict channel flow, reduce erosive forces and reduce sediment transport by installing in-stream devices (where practical) to speed habitat rehabilitation processes .
    - Underway
- Improve fish passage through perched culverts
    - Barrier culvert removed

North Fish Creek

Objective: Increase brook trout abundance enough to reconnect the stream population with its lake shore habitat.

Activities, progress and needs:

- Use bioengineering techniques to reduce sediment
    - Underway

Appendix D Physical Characteristics and Fish Stocking Data for Lake Superior Tributaries in Wisconsin															
		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	Watershed	Name	Total Stream Length	Coaster Impediments	Distance from stream mouth to Superior shoreline	Eggs	Period	Fry	Period	Fgls	Period	Ylgs	Period	Adlts	Period
Douglas	St. Louis River	**Red River**	5	DI	16.6					36,268	1930-53				
Douglas	St. Louis River	**Balsam Creek**	13	WF	21.3			46,200	1904-21	158,940	1922-54	4,800	1954-59		
Douglas	St. Louis River	**Unnamed Tributary to Big Balsam**	1.2		34.5										
Douglas	St. Louis River	**Little Balsam Creek**	4.6		30.7			30,600	1907-21	92,428	1922-53				
Douglas	St. Louis River	**Empire Creek**	4.3		28.7			31,600	1907-21	103,380	1922-53				
Douglas	St. Louis River	**Unnamed Tributary to Big Balsam**	2.6		27.6										
Douglas	St. Louis River	**Miller Creek**	5.1		26.1					21,500	1928-44				
Douglas	St. Louis River	**Rock Creek**	3.7		22.4			41,900	1904-21	66,580	1928-47	200	1935		
Douglas	St. Louis River	**Black River**	27.6	WF	26.9			7,200	1916	20,896	1928-39				
Douglas	St. Louis River	**Copper Creek**	8.9	WF	23.5			10,500	1904-07	32,213	1928-52				
Douglas	St. Louis River	**Unnamed Trib. to Copper Creek**	1.1	WF	24					1,750	1928				
Douglas	Amnicon River	**Little Amnicon River**	6.6	WF	18			15,200	1908-21	43,815	1928-43	22,662	1943-95		
Douglas	Amnicon River	**Cranberry Creek (Wascott Creek)**	3.9	WF	30.5										
Douglas	Amnicon River	**Silver Creek**	8.5	WF	16.6			7,200	1916	35,075	1925-43	700	1930		
Douglas	Amnicon River	**Unnamed Tributary to Silver Creek**	1.5	WF	21.8										
Douglas	Poplar River	**Poplar River**	20	WF	15.3			69,800	1900-17	35,764	1927-49	27,639	1930-02		
Douglas	Pearson Creek	**Anderson Creek**	2.4	WF	7.2										
Douglas	Bois Brule River	**Bois Brule River**	44		0	80,000	1951	307,800	1891-62	794,016	1922-69	294,512	1929-79	4,951	1933-71
Douglas	Bois Brule River	**Unnamed Tributary to Bois Brule**	0.6		5.2										
Douglas	Bois Brule River	**Percival Creek**	0.7		13.1										
Douglas	Bois Brule River	**Casey Creek**	4.1		18										
Douglas	Bois Brule River	**Unnamed Tributary to Bois Brule**	0.5		18.3										
Douglas	Bois Brule River	**Unnamed Tributary to Bois Brule**	2.6		19.8										
Douglas	Bois Brule River	**Nebagamon Creek**	6.4		25.8			24,200	1916-19	35,001	1923-43				
Douglas	Bois Brule River	**Blueberry Creek**	3.1		27.4			20,600	1900-19	65,115	1923-53	3,965	1948-54		
Douglas	Bois Brule River	**Tributary to Blueberry Creek**	1.2		29.3										
Douglas	Bois Brule River	**Trib. to Bois Brule (Cutler Creek)**	0.3		28			10,800	1916-17	3,310	1930				
Douglas	Bois Brule River	**Trib. to Bois Brule (Gitchee Gumee)**	0.7		28.1										
Douglas	Bois Brule River	**Angel Creek**	0.7		39.6										
Douglas	Bois Brule River	**Wilson Creek**	2.6		40.7	52,354	1951			37,479	1925-51	11,102	1948-69		
Douglas	Bois Brule River	**West Fork Bois Brule River**	2		40.3										

		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	Watershed	Name	Total Stream Length	Coaster Impediments	Distance from stream mouth to Superior shoreline	Eggs	Period	Fry	Period	Fgls	Period	Ylgs	Period	Adlts	Period
Douglas	Bois Brule River	**East Fork Bois Brule River**	1.1		40.3			10,000	1891						
Douglas	Bois Brule River	**Beaupre Springs**	0.5		41					10,750	1946-56	500	1979		
Douglas	Bois Brule River	**Jerseth Creek**	1		37.9										
Douglas	Bois Brule River	**Stones Bridge Tributary**	0.5		33.7										
Douglas	Bois Brule River	**McDougal Springs**	0.5		31.8										
Douglas	Bois Brule River	**Cedar Island Spring Ponds**	1.2		29.8										
Douglas	Bois Brule River	**Little Bois Brule River**	2.8		22.2			29,900	1898-21	226,794	1922-69	41,788	1938-69		
Douglas	Bois Brule River	**Sandy Run**	1.7		22.6			9,600	1908-19	55,273	1923-42	5,686	1939		
Douglas	Bois Brule River	**Unnamed Tributary to Bois Brule**	1		19.8										
Douglas	Bois Brule River	**Rocky Run**	1.5		19			26,400	1916-19	12,300	1922-39				
Douglas	Bois Brule River	**Trask Creek**	7.2	I	8.8										
Douglas	Bois Brule River	**Unnamed Tributary to Bois Brule**	2.6		?										
Bayfield	Fish Creek (Oulu Creek)	**Fish Creek (Oulu Creek)**	13.9	I	10.1										
Bayfield	Reefer Creek	**Reefer Creek**	11.4	I	9.1					114,456	1922-53				
Bayfield	Iron River	**Iron River**	19.7	WF	0			117,200	1898-21	83,933	1922-35	1,400	1935-55		
Bayfield	Iron River	**Muskeg Creek**	9.5	WF	11.6			55,550	1899-21	35,142	1926-35				
Bayfield	Iron River	**Dahl Creek**	2.6	WF	21.2			3,600	1916	38,052	1926-53			150	1942
Bayfield	Iron River	**East Fork Iron River**	12.6	WF	4.2			42,700	1898-20	56,110	1922-53	12,498	1946-68	620	1945
Bayfield	Iron River	**Hill Creek**	2.8	WF	14			20,700	1902-17	32,298	1922-46				
Bayfield	Iron River	**DeChamps Creek**	2.7	WF	17.9			32,750	1903-21	66,783	1927-53	500	1940		
Bayfield	Iron River	**Unnamed Tributary to DeChamps**	0.4	WF	19.8										
Bayfield	Iron River	**Townsend Creek**	1.1	WF	17.9					87,985	1926-54	9,700	1940-69	150	1942
Bayfield	Iron River	**Schacte Creek**	4	WF	14.7			7,200	1916	121,462	1926-53	14,295	1940-68	300	1942
Bayfield	Iron River	**Middle Creek**	2.7	WF	16.4			23,600	1908-18	800	1928	16,578	1935-36		
Bayfield	Iron River	**Trib. to the East Fork Iron**	1.5	WF	19.9										
Bayfield	Flag River	**Flag River**	12.9		0			51,300	1898-20	465,914	1926-53	43,401	1941-95		
Bayfield	Flag River	**East Fork Flag River**	3.8		5			7,500	1898	102,584	1930-50	100	1942		
Bayfield	East Fork Cranberry River	**East Fork Cranberry River**	7.2		6.4										
Bayfield	East Fork Cranberry River	**Cranberry River**	6.6		0			83,900	1902-19	317,088	1922-53	45,643	1940-95	1,000	1945
Bayfield	East Fork Cranberry River	**Lenawee Creek**	3.1		10.8										
Bayfield	East Fork Cranberry River	**Trib. to East Fork Cranberry**	2.7		8.1										

		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	Watershed	Name	Total Stream Length	Coaster Impediments	Distance from stream mouth to Superior shoreline	Eggs	Period	Fry	Period	Fgls	Period	Ylgs	Period	Adlts	Period
Bayfield	Bark River	**Bark River**	5.6		0			54,400	1907-20	309,645	1922-53	8,499	1940-95		
Bayfield	Bark River	**Trib. to Bark (First Trib)**	1.1		2.2										
Bayfield	Bark River	**Trib. to Bark (Powerline Trib)**	0.9		4.1										
Bayfield	Lost Creek	**Lost Creek No. 1**	3.4		0			21,600	1918-20	98,243	1922-53	380	1940-42		
Bayfield	Lost Creek	**Lost Creek No. 2**	4.3		0.3										
Bayfield	Unnamed Tributary	**West of Cornicopia (Spring Creek)**	1		0			46,200	1916-21	91,097	1925-43				
Bayfield	Siskiwit River	**Siskiwit River**	9.3	WF	0			90,300	1898-21	229,518	1922-74	24,577	1940-95	300	1941
Bayfield	Siskiwit River	**Trib. to Siskiwit (Spring Pond)**		WF	6.9										
Bayfield	Unnamed Tributary	**Trib. 1 mile southeast of Corny**	1.5		0										
Bayfield	Squaw Creek	**Squaw Creek**	2		0					73,348	1927-53	430	1940-47		
Bayfield	Squaw Creek	**Unnamed Tributary to Squaw**	1.1		0.1			2,000	1908	12,300	1936				
Bayfield	Saxine Creek	**Saxine Creek**	2.4		0										
Bayfield	Saxine Creek	**Unnamed Tributary to Saxine**	2.3		0.4										
Bayfield	Sand River	**Sand River**	13.4		0			68,600	1902-21	219,490	1922-46	43,667	1940-68	1,043	1939-45
Bayfield	Trib. to Sand Bay	**Unnamed Tributary to Sand Bay**			0										
Bayfield	Raspberry River	**Raspberry River**	5.6		0			3,600	1920	33,400	1922-33				
Bayfield	Raspberry River	**Unnamed Tributary to Raspberry**	1.4		1.4										
Bayfield	Chicago Creek	**Chicago Creek**	1.9		0										
Bayfield	Brickyard Creek	**Brickyard Creek**	2.6		0			3,600	1920	12,350	1928-36				
Bayfield	Pikes Creek	**Pikes Creek**	7.7		0			1,356,200	1902-21	317,150	1922-46	4,675	1941-95	1,302	1896-41
Bayfield	Pikes Creek	**Birch Run Creek**	0.8		0.1			76,000	1902-20						
Bayfield	Pikes Creek	**North Pikes Creek**	5		1.9					57,260	1922-36	2,500	1994-95		
Bayfield	Onion River	**Onion River**	4		0			104,100	1898-21	143,118	1922-49	8,054	1940-95	436	1934-41
Bayfield	Onion River	**Unnamed Tributary to Onion**	2.5		0.7			39,600	1920	18,000	1925				
Bayfield	Sioux River	**Sioux River**	12		0			195,800	1890-20	206,714	1922-42	7,305	1941-95	505	1934
Bayfield	Sioux River	**Little Sioux River**	6		2.4			20,800	1907-16	127,040	1922-53	2,046	1940-46	153	1934-41
Bayfield	Sioux River	**Four Mile Creek**	4.7		6.6			145,100	1898-21	176,988	1922-52	10,700	1940-95	200	1941
Bayfield	Sioux River	**Unnamed Tributary to Sioux**	1.6		10.7										
Bayfield	Sioux River	**Unnamed Tributary to Sioux**	2.7		12.1										
Bayfield	Thompson Creek	**Thompson Creek**	3.4		0					13,750	1932-42	2,000	1993-95		
Bayfield	Thompson Creek	**Unnamed Tributary to Thompson**	0.7		1.7										

		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	Watershed	Name	Total Stream Length	Coaster Impediments	Distance from stream mouth to Superior shoreline	Eggs	Period	Fry	Period	Fgls	Period	Ylgs	Period	Adlts	Period
Bayfield	Bono Creek	**Bono Creek**	3.3		0										
Bayfield	Boyd Creek	**Boyd Creek**	3.6		0										
Bayfield	Whittlesey Creek	**Whittlesey Creek**	5.2		0			26,000	1903-21	133,739	1928-50	4,327	1941-95	14	1941
Bayfield	Whittlesey Creek	**North Fork Whittlesey Creek**	2.8		2.7			13,200	1907-17						
Bayfield	Whittlesey Creek	**Little Whittlesey Creek**	1.4		0.1			7,200	1908-17						
Bayfield	Fish Creek (Eileen Creek)	**Fish Creek (Eileen Creek)**	0.9		0			71,700	1900-21	129,686	1929-40	7,000	1993-95	18	1947
Bayfield	Fish Creek (Eileen Creek)	**North Fork Fish Creek**	18.8		1.4										
Bayfield	Fish Creek (Eileen Creek)	**Pine Creek**	3.4		8.8			58,400	1900-21	144,945	1927-53	23,220	1941-65	1,035	1938-45
Bayfield	Fish Creek (Eileen Creek)	**Little Pine Creek**	1.3		11			29,300	1903-17	14,755	1938-42				
Bayfield	Fish Creek (Eileen Creek)	**Unnamed Tributary to Pine Creek**	1.4		11.3										
Bayfield	Fish Creek (Eileen Creek)	**Tributary to North Fish (Ino)**	2.1		15.8										
Bayfield	Fish Creek (Eileen Creek)	**Unnamed Tributary to North Fish**	1.1		9.4					1,980	1932				
Bayfield	Fish Creek (Eileen Creek)	**Slaughterhouse Creek**	1		0.7			3,000	1907						
Ashland	Bad River	**Bad River**	70.2	DI/WF	0			7,200	1916	88,030	1921-34	25,968	1948-73		
Ashland	Bad River	**White River**	21.4		5.5										
Bayfield	Bad River	**White River**	33.9		5.5			14,800	1908-17	176,120	1925-74	16,500	1955-73		
Bayfield	White River	**Bolen Creek**	1.4		54.2					27,534	1927-49				
Bayfield	White River	**Kern Creek**	1.2		54.6										
Bayfield	White River	**East Fork White River**	2.3		58			10,000	1904						
Bayfield	White River	**West Fork White River**	3		58.7			26,000	1916-21	31,040	1923-36				
Bayfield	White River	**South Fork White River**	2.3		58.7			22,800	1916-21	72,760	1927-42				
Bayfield	White River	**Unnamed Tributary to White**	0.5		51										
Bayfield	White River	**Trib. to Unamed Trib. to White**	0.5		51.4										
Bayfield	White River	**Hanson Creek**	3.7		49.6					47,250	1931				
Bayfield	White River	**Johnson Creek**	2.5		46.3			14,400	1916-20	81,346	1922-90	1,100	1973		
Bayfield	White River	**Long Lake Branch**	16		40.3			24,800	1903-21	166,722	1922-49				
Bayfield	White River	**Trib. to Long Lake (Johnson Spgs.)**	0.3		52.2										
Bayfield	White River	**Tributary to Long Lake Branch**	1.4		51.8										
Bayfield	White River	**Jader Creek**	3		48.9					54,290	1920-42				
Bayfield	White River	**Tributary to Long Lake Branch**	0.6		45.9										
Bayfield	White River	**Tributary to Long Lake Branch**	1.4		45.4										

		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	Watershed	Name	Total Stream Length	Coaster Impediments	Distance from stream mouth to Superior shoreline	Eggs	Period	Fry	Period	Fgls	Period	Ylgs	Period	Adlts	Period
Bayfield	White River	**Eighteen Mile Creek**	13.4		44.3			13,100	1903-17	194,020	1922-76				
Bayfield	White River	**Tader Creek**	1.2		50.7										
Bayfield	White River	**Unnamed Trib. to Eighteen Mile**	0.7		54.1										
Bayfield	White River	**Twenty Mile Creek**	9.5		43.5			8,100	1904-17	202,840	1929-53	38,739	1940-68		
Bayfield	White River	**Preemption Creek**	5.6		45.2			3,600	1917	34,375	1932-53				
Bayfield	White River	**Unnamed Trib. to Twenty Mile**	0.8		50.3										
Bayfield	White River	**Unnamed Trib. to Twenty Mile**	0.8		52.1										
Ashland	Bad River	**Marengo River**	20.6		30.2			7,200	1916-21	67,649	1927-31	1,000	1957		
Bayfield	Bad River	**Marengo River**	24.3		30.2			2,000	1919	51,895	1922-02	50,190	1970-95		
Bayfield	Marengo River	**Unnamed Tributary to Marengo**	2.5		46.6										
Bayfield	Marengo River	**Unnamed Tributary to Marengo**	1.4		62.7										
Bayfield	Marengo River	**Unnamed Tributary to Marengo**	1.4		63.3										
Bayfield	Marengo River	**Unnamed Tributary to Marengo**	1.5		63.5										
Bayfield	Marengo River	**Blazer Creek**	2.3		68.1					17,660	1946-53				
Bayfield	Marengo River	**Whiskey Creek**	2.1		67.1					12,500	1940-46				
Ashland	Marengo River	**Whiskey Creek**	1.5		67.1					12,500	1940-46				
Bayfield	Marengo River	**Unnamed Tributary to Whiskey**	1.9		69.4										
Bayfield	Marengo River	**Unnamed Tributary to Marengo**	1.7		60.7										
Bayfield	Bad River	**Morgan Creek**	2.6		56.3										
Ashland	Bad River	**Morgan Creek**	3.4		56.3			4,000	1919	22,550	1922-52	1,500	1954-56		
Bayfield	Bad River	**Hawkins Creek**	3.5		56.6					2,000	1953				
Ashland	Bad River	**Troutmere Creek (Whittlesey)**	1.6		44.5					32,065	1939-53				
Ashland	Bad River	**Brunsweiler River**	22.1	DI	38			25,600	1916-20	189,724	1927-45				
Ashland	Bad River	**Spring Brook**	5.7		48.2			42,000	1904-21	164,114	1922-52	25,245	1941-62	1,000	1945
Ashland	Bad River	**Frames Creek**	1.7		49.1					54,018	1935-50	50	1941		
Ashland	Bad River	**Waboo Creek**	1.1		51.8					80,340	1936-41				
Ashland	Bad River	**McCarthy Creek**	6.9		58.5					26,210	1922-35				
Ashland	Bad River	**Trout Brook**	8.8		39			43,400	1904-21	118,635	1922-48	400	1940		
Ashland	Bad River	**Silver Creek (Ashland Creek)**	7		35.1			37,100	1904-21	120,557	1922-47	18,443	1941-58		
Ashland	Bad River	**Billy Creek**	0.4	DI	32.9			5,000	1904	6,825	1934-36				
Ashland	Bad River	**Krause Creek**	3.2		40.9			3,600	1921	28,019	1923-53				

		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	Watershed	Name	Total Stream Length	Coaster Impediments	Distance from stream mouth to Superior shoreline	Eggs	Period	Fry	Period	Fgls	Period	Ylgs	Period	Adlts	Period
Ashland	Bad River	**Hardscrabble Creek**	1.8		53.2										
Ashland	Bad River	**Iron River**	6.8		56					83,512	1922-42	11,807	1948-68		
Ashland	Bad River	**Brush Creek**	5.7		60.2					38,050	1935-52				
Ashland	Bad River	**Squaw Creek**	3.4		56.4					5,280	1949-52				
Ashland	Bad River	**Knab Creek**	1.9		62.5										
Ashland	Bad River	**Minnie Creek**	2.3		65.9			18,400	1916-20	29,315	1942-53				
Iron	Bad River	**Minnie Creek**	2.8		65.9							1,000	1970-73		
Iron	Bad River	**Mineral Creek**	2.5		68.2					2,250	1935				
Ashland	Bad River	**Minnow Creek**	4.9		65.7			3,600	1920	14,376	1922-34				
Ashland	Bad River	**Happy Creek**	3.4		53.3			18,400	1916-21	98,345	1926-53	2,000	1940-46		
Ashland	Bad River	**Tafelski Creek**	0.6		49.2					1,665	1941-42				
Ashland	Bad River	**Devils Creek**	5.9		47			18,000	1916-20	274,513	1921-99	53,747	1940-00	1,000	1945
Ashland	Bad River	**City Creek**	2		48.7					4,420	1935-42	6,800	1966-84		
Ashland	Bad River	**Ballou Creek**	2.4	DI/WF	53					25,525	1938-42				
Ashland	Bad River	**Montreal Creek**	6.1		47.3			3,600	1920	189,744	1921-53	58,705	1940-94	1,000	1945
Iron	Bad River	**Montreal Creek**	1.4		47.3										
Ashland	Bad River	**Gully Creek (Opergard)**	2.4		50.8					2,975	1941-42				
Ashland	Bad River	**Tyler Forks**	6.6	WF	39.6			13,300	1904-20	95,058	1921-99	50,326	1959-01		
Iron	Bad River	**Tyler Forks**	25.4		39.6					71,028	1922-65	171,992	1950-00		
Ashland	Tyler Forks	**Scott-Taylor Creek**	1.6		40.3			3,600	1921	8,664	1923-29				
Ashland	Tyler Forks	**Gehrman Creek**	0.5		42					4,435	1941-53				
Ashland	Tyler Forks	**Camp Four Creek**	1.9		44.3					84,314	1926-36	915	1940-1953		
Ashland	Tyler Forks	**Feldcher Creek**	1		45.3					1,755	1941-42				
Iron	Tyler Forks	**Javorsky Creek**	3.7		56					3,400	1950-53				
Iron	Tyler Forks	**Dunn Creek**	1.5		58.1										
Iron	Tyler Forks	**Bull Gus Creek**	2.4		63.8										
Iron	Tyler Forks	**Spring Creek**	1.9		69.5			14,800	1908-17	16,250	1929-53				
Iron	Tyler Forks	**Shine Creek**	4.9		75.3										
Iron	Tyler Forks	**LeClaire Creek**	2.4		77.6										
Iron	Tyler Forks	**Mead Creek**	2.5		61.7										
Iron	Tyler Forks	**Mud Creek**	3.3		62.2			9,000	1916-21	11,075	1922-36	5,741	1950-53		

		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	Watershed	Name	Total Stream Length	Coaster Impediments	Distance from stream mouth to Superior shoreline	Eggs	Period	Fry	Period	Fgls	Period	Ylgs	Period	Adlts	Period
Iron	Tyler Forks	**Erickson Creek**	4.1		56.9			3,600	1917	7,850	1950-53	2,750	1970-80		
Iron	Tyler Forks	**Rouse Creek**	1.3		58.2										
Iron	Tyler Forks	**Vogue Creek**	3.3		49.6							1,200	1970-81		
Ashland	Bad River	**Potato River**	11		27.5			10,800	1916	8,760	1931				
Iron	Bad River	**Potato River**	25.5		27.5			34,400	1898-19	124,668	1922-65	78,471	1950-71		
Ashland	Bad River	**Winks Creek**	1.9		33.1										
Iron	Potato River	**Barr Creek**	3.3		38.3					5,400	1950-53				
Iron	Potato River	**Coil Creek**	3.5		39.2										
Iron	Potato River	**Tributary to Coil Creek**	1		40.4										
Iron	Potato River	**Apple Creek**	4.5		55.7			7,200	1920-21	52,275	1922-65	10,900	1939-62		
Iron	Potato River	**Norman Creek**	2.8		56.1			4,300	1966-73	12,840	1936-53				
Iron	Potato River	**Turntable Creek**	5		58.7					12,470	1950-53				
Iron	Potato River	**Alder Creek**	13.3		52					19,664	1936-47	1,000	1939		
Iron	Potato River	**Sixteen Creek**	2.3		54.5										
Iron	Potato River	**Cemetery Creek**	1.9		57.6					4,200	1950-53				
Iron	Potato River	**Sullivan Creek**	4.3		48.4					25,180	1936-53	7,800	1969-95		
Iron	Potato River	**Chase's Creek**	3.3		44.3										
Iron	Potato River	**Lawrence Creek**	10		40.7					27,005	1950-73				
Iron	Potato River	**Freiberg Creek**	3.3		43.4					3,050	1950-53				
Ashland	Bad River	**Vaughn Creek**	20		30			7,200	1916-17	6,000	1967-69	3,200	1970-77		
Iron	Bad River	**Vaughn Creek**	7.6		30			31,400	1916-21	15,435	1922-36	2,400	1972-77		
Iron	Bell Creek	**Bell Creek**	1.7		0										
Iron	Graveyard Creek	**Graveyard Creek**	5.5		0					600	1973				
Iron	Graveyard Creek	**West Branch Graveyard Creek**	2.4		0.8										
Iron	Sturgeon Branch Creek	**Sturgeon Branch**	2.5		0										
Iron	Carpenter Creek	**Carpenter Creek**	3		0										
Iron	Oronto Creek	**Oronto Creek**	5.6		0							8,175	1975-81		
Iron	Oronto Creek	**Spoon Creek**	3.9		1.6										
Iron	Oronto Creek	**Parker Creek**	6		0					500	1973				
Iron	Montreal River	**Montreal River**	19		0			35,000	1904-20	96,150	1931-35				
Iron	Montreal River	**Boomer Creek**	9.4		8.3			7,200	1917-21	14,210	1927-62	46,674	1950-97		

		As of July 23 2004				Historical Brook Trout Stocking Summary (Number stocked by size and time range stocked									
County	**Watershed**	**Name**	**Total Stream Length**	**Coaster Impediments**	**Distance from stream mouth to Superior shoreline**	**Eggs**	**Period**	**Fry**	**Period**	**Fgls**	**Period**	**Ylgs**	**Period**	**Adlts**	**Period**
Iron	Montreal River	**Fourche Creek**	4.5		12.2			18,400	1908-21	40,175	1922-62	9,750	1954-95		
Iron	Montreal River	**Flood Creek**	4.1		12.9					33,605	1936-84	25,130	1957-85		
Iron	Montreal River	**West Branch Montreal River**	18.5		12.9			23,400	1904-20	3,400	1922	24,190	1950-62		
Iron	Montreal River	**Linnunpuro Creek**	3.2		24.4										
Iron	Montreal River	**Kaarris Creek**	2.5		16.6										
Iron	Montreal River	**East Branch Montreal River**	28.6		16.6							5,838	1952-53		
Iron	Montreal River	**Kaminski Creek**	2.2		18.9										
Iron	Montreal River	**Layman's Creek**	8.7		34.9					79,400	1920-53	17,085	1955-62		
Iron	Montreal River	**Sandrock Creek**	0.8		38										
Iron	Montreal River	**Sandhill Creek**	1.2		39.7					3,925	1936				
Ashland	Unnamed Oak Island Trib.	**Unnamed Oak Island Trib. (North)**	0.6		0										
Ashland	Unnamed Oak Island Trib.	**Unnamed Oak Island Trib. (South)**	1.1		0										
N = natural reproduction		T=temperature; C=culvert; LBF-low baseflow; D=Dupont													
X = stocked		WF=waterfall; DI=distance; I=intermittent section				0		41,800		160,505		81,993		0	