F-80-R-7, Michigan
Study 230515 **New Study: 2005-06**

Name of Study: Evaluation of the relative growth and survival of Assinica, Nipigon, and Iron River-strain brook trout stocked into small inland lakes

A. Problem: The Michigan Department of Natural Resources (MDNR) Fisheries Division annually stocks approximately 250,000 brook trout into inland lakes and streams in Michigan's Upper Peninsula (MDNR fish stocking records 2003). Assinica, Nipigon, and Iron River (IR) brook trout are the three genetic strains currently reared and stocked from state hatcheries. There are few quantitative evaluations of the post-stocking performance (growth and survival) of these strains.

Overall genetic diversity of Michigan's Assinica broodstock is low and they are quite susceptible to furunculosis infections. Low levels of genetic diversity are associated with lower adaptability to environmental conditions and with lower survival (Kapuscinski and Jacobson 1987). Michigan fisheries managers wish to evaluate the performance of the Nipigon strain as a possible alternative to the Assinica strain for stocking into lakes. Broodstock for the IR strain were developed from wild fish collected from the Iron River in Iron County, MI. This strain grows more slowly in the hatchery than the Assinica strain. Limited evaluations of the performance of IR trout compared to the Assinica strain suggest that growth rates of IR after stocking may be very slow. However, these evaluations may be misleading because IR fish that are larger at planting are more likely to be harvested by anglers. Fish that were smaller at planting were thus more likely to be captured during late summer electrofishing because they did not grow to the minimum size limit during the year they were stocked. Some managers believe that IR trout may grow too slowly to produce significant angler fisheries in some stocked waters. MDNR's broodstock committee and fisheries managers have recommended better evaluations of IR trout to determine if this perception has merit.

In summary, additional evaluations of brook trout strains reared and stocked by MDNR Fisheries Division are needed. Data from such evaluations will be used to help guide decisions on broodstock maintenance and stocking strategies.

B. Objective: To determine the relative growth and survival of Assinica, Nipigon, and Iron River brook trout stocked into small inland lakes.

C. Justification: Brook trout are stocked extensively into waters of the Upper Peninsula of Michigan to supplement populations and to provide additional sport fishing opportunities. Brook trout angling supplies significant recreational opportunities for both resident and nonresident anglers. Stocking programs are most effective if stocked fish exhibit good survival and growth after planting. More recreational opportunities are produced when the "most fit" genetic strains of fish are stocked. Fisheries Division's internal broodstock committee has recommended further evaluation of post-stocking survival and growth of brook trout strains presently stocked. Hatchery and fisheries managers are concerned about the low genetic diversity and disease susceptibility of Assinica trout. The Nipigon strain trout may provide a viable alternative to the Assinica strain for inland lake plantings, but this strain has not been evaluated in Michigan lakes, to date. More quantitative data on post-stocking growth and survival of IR trout is needed to help determine if this stock is likely to achieve management objectives (reasonably high growth and survival). Very few IR fish were sampled during past evaluations of post-stocking growth and survival and samples may have been biased by effects of size-selective angler harvest. This proposed study will provide unbiased estimates of growth and survival and larger sample sizes because study lakes are closed to angling.

D. Expected Results and Benefits: Results of this study will show the relative post-stocking growth and survival of the three strains of brook trout presently reared in Michigan hatcheries. Results will provide information to guide decisions on brook trout broodstock maintenance. Better information on brook trout strain performance is needed to maximize economic and social values provided by stocking.

E. Background: MDNR Fisheries Division annually stocks approximately 250,000 brook trout into inland lakes and streams in Michigan's Upper Peninsula (MDNR fish stocking records 2003). By comparison, about 112,000 rainbow trout were stocked into inland waters of the Upper Peninsula. Brook trout angling is a highly-valued recreational pursuit for both resident and non-resident anglers of Michigan's Upper Peninsula. In 2003, approximately forty percent of all brook trout stocked were planted into about 90 lakes. Nearly 75% of the lakes stocked with brook trout are less than 50 acres in area.

Fisheries Division has stocked a variety of brook trout strains in the past. These strains included the Assinica, Iron River, Maine, Michigan domestic, Nipigon, OwHi, Rome, Saint Croix, and Temiscamie. Various hybrid crosses of brook trout strains such as Assinica x Maine and Temiscamie x Maine have also been reared and stocked. Presently, only the Assinica, Nipigon, and IR strains are reared in Michigan hatcheries.

Michigan first obtained Assinica strain brook trout from New York in an attempt to improve upon the generally poor survival and growth of domesticated brook trout strains available in the 1970's (Gowing 1974). They have been stocked extensively since 1981. Assinica brook trout stocked into small lakes in Michigan have been shown to grow well and they more frequently survive to older ages than some other domestic strains (Gowing 1986, Alexander et al. 1991). Overall genetic diversity of Michigan's Assinica broodstock is low and they are quite susceptible to furunculosis infections. The broodstock committee has recommended evaluation of potential alternative strains.

Most Nipigon strain brook trout have been stocked annually into the Gratiot and Little Carp Rivers since 1999 in hopes of establishing significant Coaster brook trout populations. This strain has also been stocked into a small number of inland lakes. Initial evaluations of stream plantings indicate that very few Nipigon return to spawn in the streams where they were stocked. No evaluations of Nipigon have been conducted in Michigan lakes, to date. Some fisheries managers have advocated evaluations of paired plantings of Nipigon and Assinica trout to determine if they might be a suitable substitute for Assinica plantings into lakes.

IR strain brook trout were developed from wild brook trout collected from the Iron River, Iron County, Michigan in 1994. This stock was developed in hopes that progeny of the wild stock would grow and survive better in rivers than other brook strains stocked at the time. However, IR fish are also occasionally stocked into lakes. First-season survival of IR brook trout planted in the North Branch of Stutts Creek was much higher than for Assinica trout, but this may have occurred because most did not grow to legal size the year they were stocked (Bassett 2000). Limited growth data for fin-clipped IR fish stocked into the Middle Branch of Stutts Creek from 1998 through 2000 suggested that their growth rates were extremely slow (C. Bassett, U.S. Forest Service, personal communication). However, sample sizes of IR fish were small and may have been biased due to selective harvest of larger fish by anglers. More quantitative evaluations of growth and survival rates are needed.

Excess (to yearling production needs) fall fingerling Assinica, Nipigon, and IR strain brook trout reared at the Marquette State Fish Hatchery were fin clipped and stocked into two research lakes within the Hunt Creek Fisheries Research Area in October 2004. Each strain was given a unique

fin clip. Seven hundred of each strain were stocked into East Fish Lake for a total stocking rate of 131 trout per acre. East Fish Lake is an oligotrophic lake that is 16 acres in area, with an average depth of 20 feet and maximum depth of 40 feet. Adequate oxygen for trout exists even in the deepest water throughout the year. Gill nets were used to remove residual trout from previous studies before brook trout were stocked. Nets were fished until daily catch rates were zero for two consecutive days. The remaining 1,300 trout were stocked into Fuller Pond for a total stocking rate of 87/acre. Stocking rates varied slightly between strains because fewer Assinica and IR strain fish than expected were present on the transport truck. Fuller Pond is a 15-acre flowage with an average depth of 1.5 feet and a maximum depth of 7 feet. It is formed by an earthen dam built on the site of an old beaver dam. A small creek with a discharge of 1.5 ft^3/s flows into the pond and produces strong thermal stratification during hot weather. Adequate oxygen exists for trout throughout the year at all depths. Most brown trout present in the pond were removed with gill nets before brook trout were stocked. Both research lakes have been closed to angling since 1966.

F. Procedure: Annual estimates of growth rates for each strain will be made from 2005 through 2008. Trout will be collected each fall via netting and electrofishing. All trout collected will be tagged so that individual growth rates can be determined after subsequent recaptures. In 2005, catch per unit effort (CPE) will be used as a measure of the relative abundance of each strain. Trout captured in fall 2005 will be tagged with Floy T-bar anchor tags. PIT tags may be inserted during subsequent annual collections if they are affordable. Otherwise, Floy tags will be used for the duration of the study. Tags will serve as an identifiable mark for population estimates and will allow estimation of individual growth rates. Recaptures of previously tagged fish will provide data needed to estimate fall populations and annual survival rates. In fall 2008, gill nets and electrofishing gear will be used to capture and remove as many trout as possible. All trout collected throughout the study will be measured and weighed.

Job 1. Collect and tag trout each fall using nets and electrofishing gear.

Job 2. Estimate growth and survival rates for each strain.

Job 3. Write annual performance report.

Job 4. Write research manuscript (MDNR Fisheries Division Research or Technical report)

Job 5. Publish report through the Fisheries Division's editing and finishing process for Research and Technical reports.

Job 6. Write final

G. Schedule:

Year		Work planned
2005-06	Job 1.	Collect and tag brook trout.
	Job 2.	Estimate growth and survival.
	Job 3.	Write annual performance report
2006-07	Job 1.	Collect and tag brook trout.
	Job 2.	Estimate growth and survival.
	Job 3.	Write annual performance report

2007-08	Job 1.	Collect and tag brook trout.
	Job 2.	Estimate growth and survival.
	Job 3.	Write annual performance report
2008-09	Job 1.	Collect and tag brook trout.
	Job 2.	Estimate growth and survival.
	Job 3.	Write annual performance report
	Job 4.	Write research manuscript
2009-10	Job 5.	Publish report
	Job 6.	Write final report

H. Geographical Location: Hunt Creek Fisheries Research Station, Lewiston, Michigan.

I. Personnel: Andrew J. Nuhfer and Todd C. Wills, Fisheries Research Biologists; and Thomas Adams, Fisheries Technician, Hunt Creek Fisheries Research Station. Research Administrative personnel, and contract editor.

Literature Cited:

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