

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-35-R-24

Study No.: 665

Title: Investigation of causes of declines in
Au Sable River brown trout populations

Period Covered: April 1, 1998 to September 30, 1999

Study Objective: To continue to conduct annual trout population surveys at index stations on the Au Sable River. These data will be used to determine effects of changes in channel habitats and water quality on the abundance of larger trout in the river. They will also be used to evaluate the effectiveness of instream structure rehabilitation efforts in the Mainstem and North Branch Au Sable River.

Summary: We estimated trout populations in two reaches in each of the Mainstem Au Sable River and its North and South branches. Scale samples collected from subsamples of trout were read to determine trout ages and used to derive age-specific population estimates in all reaches. We used electronic thermometers to collect water temperature data in all three branches of the Au Sable River where trout populations were estimated. A survey of water quality data for the Au Sable River watershed suggests that present nutrient levels, particularly phosphorus, are roughly 2-3 times lower than they were 20-30 years ago (Zorn and Sendek *In press*). Future work will help: 1) determine if such changes have occurred on other Michigan trout streams; and 2) describe how lower nutrient levels relate to changes in trout abundance. Data were also obtained that describe when and where instream structure rehabilitation occurred in the Au Sable River system.

Job 1. Title: Estimate trout populations and age scales

Findings: Watershed Management Unit personnel conducted mark-and-recapture estimates of trout populations in six river reaches distributed among three branches of the Au Sable River during late summer and early fall 1998. Management Unit personnel determined the ages of trout from scale samples collected from subsamples of trout. I used these data to compute both size- and age-specific trout population estimates for each river reach. Estimated numbers of fish per hectare by age for fall 1998 are reported for brown trout (Table 1) and brook trout (Table 2).

Over 1200 instream structures were repaired or replaced in the Mainstem and North Branch Au Sable River between 1994 and 1998. Data were obtained that describe when different river reaches were worked on (Table 3). These efforts may have also affected instream habitats in the electrofishing stations on these streams.

Job 2. Title: Monitor water temperatures and summarize data

Findings: We have used electronic thermometers to record hourly water temperatures at a minimum of one location in each of the three branches of the Au Sable River since 1989. Thermometers

were deployed at or near river reaches where we estimate trout populations. Data were recovered from electronic thermometers each spring and fall. Data were summarized in formats to facilitate analyses such as effects of temperature on incubation time or growth rates of trout.

Literature Cited:

Zorn, T.G., and S.P. Sendek. 1999. Au Sable River assessment draft. Michigan Department of Natural Resources, Fisheries Division, Special Report. Ann Arbor.

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Table 1.—Estimated^a number (± 2 SE) of brown trout per hectare by age for fall 1998 populations in the Mainstem, North Branch, and South Branch Au Sable River.

| River branch River reach | Age | | | | | | |
|-----------------------------|----------------------|---------------------|---------------------|--------------------|--------------------|------------------|------------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Mainstem | | | | | | | |
| Stephan Bridge | 962 (± 89) | 514 (± 54) | 165 (± 44) | 54 (± 23) | 45 (± 18) | 3 (± 5) | 0 |
| Wa Wa Sum | 460 (± 242) | 275 (± 30) | 75 (± 12) | 21 (± 10) | 10 (± 5) | 0 | 0 |
| North Branch | | | | | | | |
| Eamons Landing | 294 (± 43) | 93 (± 20) | 20 (± 6) | 2 (± 2) | 0 | 0 | 0 |
| Dam – 4 | 653 (± 63) | 86 (± 16) | 34 (± 11) | 2 (± 1) | 2 (± 0) | | |
| South Branch | | | | | | | |
| Chase Bridge | 697 (± 254) | 87 (± 25) | 41 (± 21) | 20 (± 11) | 11 (± 7) | 7 (± 5) | 2 (± 4) |
| Smith Bridge | 257 (± 99) | 99 (± 47) | 14 (± 11) | 2 (± 3) | 3 (± 0) | 0 | 0 |

^a Petersen (Bailey modification) single-census mark-and-recapture population estimate.

Table 2.—Estimated^a number (± 2 SE) of brook trout per hectare by age for fall 1998 populations in the Mainstem, North Branch, and South Branch Au Sable River.

| River branch River reach | Age | | | |
|-----------------------------|----------------------|----------------------|--------------------|------------------|
| | 0 | 1 | 2 | 3 |
| Mainstem | | | | |
| Stephan Bridge | 1216 (± 98) | 280 (± 37) | 20 (± 10) | 0 |
| Wa Wa Sum | 948 (± 100) | 440 (± 54) | 76 (± 32) | 0 |
| North Branch | | | | |
| Eamons Landing | 1229 (± 93) | 335 (± 43) | 21 (± 14) | 0 |
| Dam – 4 | 1912 (± 93) | 250 (± 37) | 43 (± 26) | 0 |
| South Branch | | | | |
| Chase Bridge | 932 (± 262) | 452 (± 215) | 24 (± 26) | 3 (± 2) |
| Smith Bridge | 998 (± 142) | 286 (± 75) | 9 (± 7) | 0 |

^a Petersen (Bailey modification) single-census mark-and-recapture population estimate.

Table 3.—Years and locations of instream structure rehabilitation on the Au Sable River. Data from B. Benjamin, Huron Pines Resource Conservation and Development Council, Inc.

| Year | Number of structures rehabilitated | River reach affected | Electrofishing stations potentially affected |
|------------------------------------|------------------------------------|---|--|
| Mainstem Au Sable River | | | |
| 1994 | 100 | Grayling to Louie's Landing | Wa Wa Sum |
| 1995 | 221 | Louie's Landing to Stephan Bridge | Stephan Bridge |
| 1996 | 458 | Stephan Bridge to Wakeley Bridge | Stephan Bridge |
| North Branch Au Sable River | | | |
| 1997 | 203 | Dam 4 to Kellogg's Bridge | Dam 4 |
| 1998 | 300 | Kellogg's Bridge to mouth & from Twin Bridges halfway down to Lovells | |
| 1999 | not done yet | Lovells Bridge (Co. Rd. 612) to Dam 4 | Eamons Landing, Dam 4 |