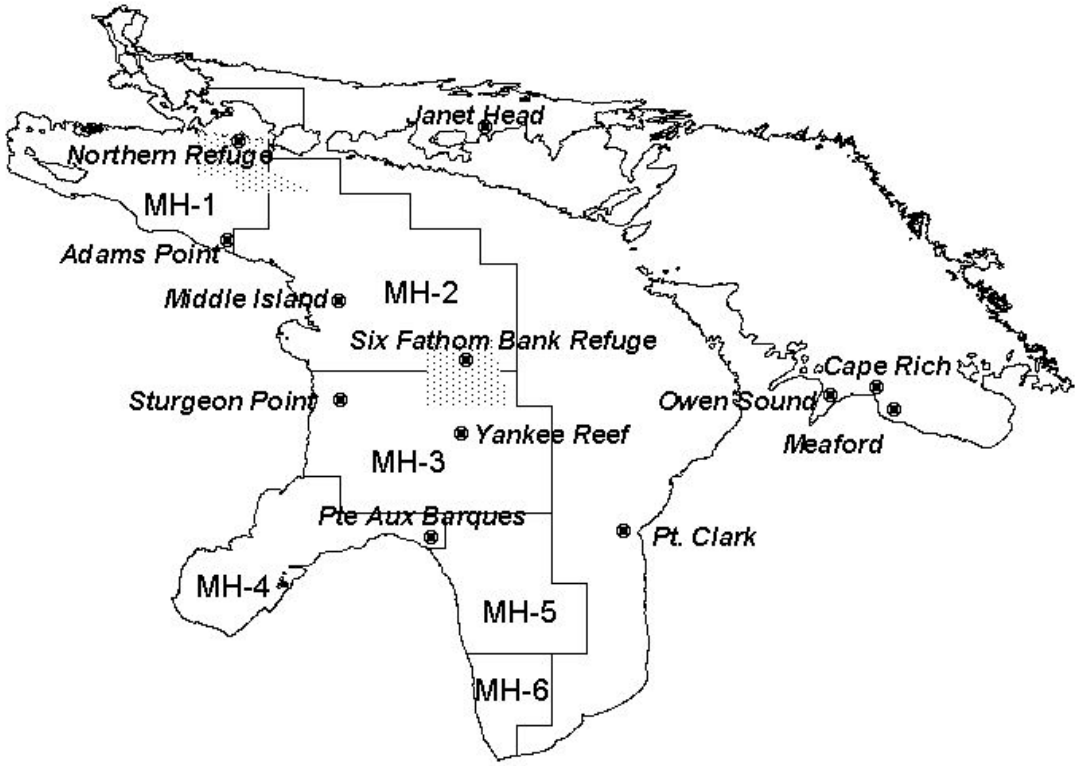
STUDY PLAN FOR COORDINATED EVALUATION OF STRAIN PERFORMANCE, EARLY LIFE STAGE STOCKING, AND MOVEMENT OF LAKE TROUT IN LAKE HURON

3RD Edition



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INTRODUCTION

In 1985 studies were initiated in U.S. waters of Lake Huron to evaluate comparative plantings of several strains of lake trout. The experimental lots of trout were reared in federal (U.S. Fish and Wildlife Service) hatcheries, marked with coded-wire tags (CWT) for later analysis of differential performance, and stocked at specified locations. By stocking various strains and comparing their performance, it was hoped that a strain(s) could be identified which performs better than others, both in terms of establishing spawning populations on historically important reefs and surviving the presence of sea lamprey.

Two locations were chosen for the experiments, a mid-lake reef complex called Six Fathom Bank and a nearshore site along the south shore of Drummond Island in northern Lake Huron (Figure 1). Both sites contain extensive areas of habitat suitable for lake trout reproduction. To eliminate bias associated with harvest, the sites had to be relatively free of fish extraction. The remoteness of Six Fathom Bank (approximately 35 miles from the nearest shore access) provided such protection. To provide similar protection for the fish, Drummond Island was designated as a Refuge closed to all harvest. As the lake trout population has grown and expanded at Six Fathom Bank additional protection was warranted. In 1997 the State of Michigan and Ontario Ministry of Natural Resources designated the site as the first international lake trout refuge in the Great Lakes.

While fish for the two sites were marked and reared similarly, the objectives of the two experiments were different. The Northern Refuge lies in the region of Lake Huron experiencing the greatest degree of sea lamprey induced mortality. A strain of lake trout from the Finger Lakes region of New York state (Seneca Lake strain), having demonstrated a superior ability to withstand sea lamprey attacks (Royce 1950; Schneider 1985; Schneider et al. 1983), was chosen as a test strain. The Lake Superior strain of lake trout that has been the mainstay of the hatchery programs was chosen as the reference strain for this study. These strains are being stocked to test their ability to withstand sea lamprey attacks, or to mature prior to reaching a size when fully vulnerable to attacks, better enabling them to successfully reproduce. Additionally, this comparison will allow better evaluation of sea lamprey control measures applied to the St. Marys River.

Although lake trout were extirpated from the area, Six Fathom Bank was a historical spawning reef that continues to provide what is believed to be suitable spawning habitat. Strain comparison studies in this area of the lake were conducted to compare several lake trout genotypes in terms of growth, survival, and reproductive success relative to the ability of different strains to re-establish reproducing resident populations on a historic spawning reef.

In addition to the two strain comparison studies in U.S. waters, similar studies have been initiated in Canadian waters of the lake and have similar objectives. Studies utilizing CWTs have also been initiated to examine movement and dispersal patterns of hatchery lake trout and to evaluate attempts to improve quality and post-stocking survival (Figure 1). All these studies have the common goal of enhancing the lake trout rehabilitation program in Lake Huron to meet Fish Community Objectives established by the Lake Huron Committee (DesJardine et al. 1995).

This document is an attempt to establish clearly defined objectives, strategies, responsibilities, and time lines for efficacious execution of the studies. The first version of this document was completed in 1995 and

updated in 1999. As a living document, as new studies are added to the program, or significant changes are made in the protocol of any individual component of this document, subsequent editions will be produced. This third edition represents an update on CWT studies being conducted lakewide in Lake Huron.

SIX FATHOM BANK - CWT

It was the recommendation of the Lake Huron Technical Committee (LHTC) that three strains of lake trout (60,000 of each strain) be coded-wire tagged and stocked at specified locations on Six Fathom Bank annually through 1998. Recommended strains, as previously developed by the federal hatchery system, included the Lewis Lake, Seneca Lake, and Superior strains. Stocking coordinates were selected and provided to the federal hatchery system.

Study Objectives: To compare growth, sea lamprey wounding rates, survival, age composition, movement/distribution, and reproductive success of three strains of lake trout, which could result in selection of a preferred strain for the rehabilitation effort in this area of Lake Huron.

Principal Null Hypothesis: *There is no significant difference in the contribution of the respective genotypes being stocked to the genetic variation of lake-produced YOY lake trout at Six Fathom Bank.*

Methods: A variety of sampling techniques will be employed to recover data necessary for analysis of study results.

SPRING/SUMMER GILLNETTING will be conducted using standardized protocol allowing use of the site as a primary index station for lakewide trend analysis. Three gangs of nets tied together will be set cross contour (14 to 40 m) on the northern, central and southern reefs at Six Fathom Bank. A gang of nets consists of 300-ft panels of 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5 and 6.0 inch mesh stretched measure multi-filament nylon (210/2 twine; 6 ft high). Beginning and ending depths for each mesh size fished will be obtained from the ship's sounder as each gang of net is set. Water temperature profiles from surface to lake bottom will be recorded using an electronic bathythermograph at each location at the time of sampling. Sampling will take place during the last two weeks in June before thermocline becomes established and affects the distribution of lake trout. Catch per unit effort (CPUE) will be standardized to 1000 feet of net. Biological data, including length, weight, age, sex, maturity, stomach analysis, and sea lamprey wounding will be collected from all lake trout, along with information available through recovery of CWTs. All lake trout will be sacrificed for tag recovery and data collection. Mean length at age for fish captured during the sampling period will be used to monitor growth rates. The following information will be provided by this phase of the assessment program:

- relative abundance (CPUE)
- age class composition
- growth (mean length at age)
- survival
- food habits
- sea lamprey wounding rates (AI-AIII)

- maturity schedule
- distribution (among habitat types, depth)
- origin (hatchery/wild)

SPRING/SUMMER ASSESSMENT activities on and near the reef complex will use various methodologies for collection of juvenile and young-of-the-year (YOY) lake trout. Beam trawls (3 meter) will be fished across the tops of the northern, central, and southern reefs in the Six Fathom Bank Refuge to estimate the densities of wild lake trout from the sac fry to the fingerling stage. Special rock-hopping (13 meter) bottom trawls will be fished in deep waters (>150 ft) adjacent to all three reefs at Six Fathom Bank to estimate the densities of wild yearling lake trout. Sampling will take place during the last two weeks in June and July when sac fry have gone through swim-up and are more available to the trawl. Trawl catches will provide density estimates of wild age-0 lake trout on offshore spawning reefs. Catches of age-0 lake trout will be adjusted to number caught per hectare swept (Bronte et al. 1995). In addition to the collection of young lake trout, composition of forage species and predator-prey interactions will be analyzed. Stomachs of all predators, including lake trout, will be analyzed. All YOY lake trout will be preserved according to established procedures (Marsden et al. 1989) allowing for genetic analysis. Genetic analysis of naturally produced lake trout will be necessary to determine the strain of origin, which will provide critical information necessary for measurement of comparative performance of the strains being tested.

In addition to the biological data on the fish inhabiting the reef complex, the spring and summer cruises will be employed to collect physical data on the reef itself. Specifically, habitat found to be most heavily frequented by spawning lake trout the previous fall will be extensively examined.

FALL SPAWNING ASSESSMENT will be conducted on the reef complex for further analysis of strain differences. Four-hundred foot gangs of gillnets consisting of 100-foot panels of 4.5, 5.0, 5.5 and 6.0 inch stretch mesh multi-filament nylon will be used. Three gangs of nets will be fished at selected sites (established coordinates) annually. Effort will consist of overnight sets. All lake trout will be sacrificed for recovery of tags and data collection. The following information will be provided by this phase of the assessment program:

- relative abundance of the respective strains
- age composition of spawners by strain
- spawner abundance (CPUE)
- spawning habitat/temperature selection by strain
- sea lamprey wounding rates
- incidence of unmarked/unclipped (presumably wild) spawners
- sex composition and maturity.

DISPERSAL PATTERNS of fish stocked on Six Fathom Bank will be analyzed by comparing spring and fall CWT recoveries from near-shore and off-shore assessment sites, and sport and commercial recoveries. As part of the overall analysis of dispersal patterns, two approaches will be applied: 1) The incidence of CWT fish in assessment catch at Six Fathom Bank and near-shore sites (pooled) will be compared statistically with Chi-square or other non-parametric analyses to determine the degree of dispersal from the stocking site. 2) Analysis

of CWTs recovered from fish at Six Fathom Bank, the near-shore sport and commercial fishery, and assessment catch will allow for comparison of strain dispersal patterns. For the purposes of analysis two null hypotheses will be tested:

> ***Null Hypothesis 1:*** *There is no significant difference in the incidence of CWT fish in the catch at Six Fathom Bank and the near-shore sites.*
>
> ***Null Hypothesis 2:*** *There is no significant difference between strains in the proportion of lake trout caught at the near-shore sites.*

Responsibilities: Due to the remote location of the reef complex, safety of operation requires that a work platform capable of accommodating Great Lakes weather changes be employed. The *R/V Grayling* will be employed for the spring and summer cruises, as has been the case for the last several years. Fall spawning surveys on the reef will be conducted by the U.S. Fish and Wildlife Service - Alpena FRO from the *M/V Togue*. Recovery of CWTs, data analysis, and reporting will be accomplished collaboratively by USGS-GLSC and the Alpena FRO. The nearshore spawning assessments, creel census and CWT collection programs necessary for evaluation of the dispersal patterns of Six Fathom Bank fish, will be conducted by Michigan Department of Natural Resources (MDNR) with assistance from USFWS (Alpena FRO). Alpena FRO will extract and read CWTs recovered from the MDNR assessment, sport and commercial fisheries.

Time Line: Stocking five consecutive year classes of the same strains from the same facility should be considered the baseline for strain comparison using CWTs. At the end of the fifth year, re-evaluation of the plan is recommended. While lake trout representing the 1985-1997 year classes, inclusively, have been stocked on Six Fathom Bank, these plants have been from three different hatcheries and consisted of, both, fall fingerling (1985 year class) and yearling (1986-1997 year classes) fish. Additionally, the strains used for these plants have not been consistent. The Superior strain has been stocked each of the years identified. The second strain used prior to 1992 (1991 year class) was the Jenny Lake strain. Genetic analysis of that strain demonstrated that a lack of variability, produced by a "bottleneck" of some sort, made it less desirable than the Lewis Lake strain for the Great Lakes program (Leary et al. 1983). In 1992 (1991 year class), stocking of the Lewis Lake strain was established as the Wyoming strain of choice at the Six Fathom Bank Refuge. In 1990 (1989 year class) the transition was made from the Seneca Lake strain to the Lake Ontario feral strain (Ontario) due to a lack of the former in the federal hatchery system. Seneca Lake strain fish were not re-established in the program until the 1993 year class. Although genetically the Ontario and Seneca Lake strain are very similar, there appear to be differences that do not allow for direct comparison. Therefore, stocking of the 1993 year class should be considered the "first" of the five consecutive. The 1997 year class stocked in the spring of 1998 was the final year class of CWT marked lake trout for this study.

A thorough evaluation of the differential strain performance of those five year classes would require that the study be carried out until the last of the year classes is fully mature at age 8 (in 2005). At that point, obvious trends, or lack of, would be apparent and allow for recommendations regarding the future direction of the hatchery broodstock program.

Evaluation of seasonal nearshore/offshore movement of Six Fathom Bank trout should continue for the duration of the study phase (through 2005).

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NORTHERN REFUGE - CWT

It is the recommendation of the LHTC that two strains of lake trout (60,000 of each strain) be marked with CWTs and stocked at specified locations in the Northern Refuge annually. Recommended strains, as previously developed by the federal hatchery system, are to include the Seneca Lake/Lake Ontario, and Superior strains. Stocking coordinates were selected and provided to the federal hatchery system. If changes in stocking coordinates are required they will be provided to the federal hatchery system by the Lake Huron Committee at least 30 days prior to the anticipated stocking date.

Study Objectives: 1) To document trends in sea lamprey wounding and monitor effects of St. Marys River control efforts on lake trout stocks. 2) To compare vulnerability and survivability of two strains of lake trout to sea lamprey predation in northern Lake Huron where sea lamprey populations are largest. 3) To compare growth, sea lamprey wounding rates, survival, age composition, movement/distribution, and reproductive success of the two strains.

Principal Null Hypothesis: *There is no significant difference in survivability and vulnerability of the two strains to sea lamprey predation.*

Methods: A variety of sampling techniques will be employed to recover data necessary for analysis of study results.

SPRING GILLNETTING with 5,400 ft. gangs of net will be conducted at three locations within the refuge in May of each year. Each gang will consist of 54 one-hundred foot panels of 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5 and 6.0 inch stretch mesh multi-filament nylon gill nets. Each net is 6 ft. high and twine diameter is 210/2 (0.23mm) in the 2.0 to 4.5 inch mesh gill nets and #69 (0.28 mm) in the 5.0 to 6.0 inch mesh gill nets. These nets have plastic floats for buoyancy and 3/lb leads to keep them on the bottom. Each 100 ft. panel is numbered from 1 to 54 by writing that number on the first two floats at each end of a net. A 100 ft. panel of each mesh size is placed into a single net box and six net boxes are set during the spring. Individual 100 ft. panels are randomly arranged in each net box by drawing a piece of paper with the mesh size written on it from a coffee can. This procedure is repeated for each box of nets. The boxes of nets are set in the lake in no specific order. The number of each 100 ft. panel is recorded as they are set and the depth of water at the beginning and end of each 100 ft. panel. Typically fishing is conducted in water 70 to 160 ft. deep. All gangs are lifted after one night in the water. The purpose of this survey is to target both juvenile and adult lake trout. Catch per unit effort (CPUE) is standardized to 1000 feet of net. Biological data, including length, weight, age, sex, maturity, stomach analysis, fin clips, and sea lamprey wounding will be collected from all lake trout, along with information available through recovery of CWT. Mean length at age for fish captured during the May sampling period will be used to measure growth rates. All adipose clipped lake trout will be sacrificed for tag recovery and

data collection. The following information will be provided from this phase of the assessment:

- relative abundance (CPUE)
- age class composition
- growth (mean length at age)
- survival
- food habits
- sea lamprey wounding rates
- maturity schedule
- distribution (among habitat types, depth)
- origin (hatchery\wild)

FALL INDEX GILL NETTING will be conducted at 13 sites within the refuge during October of each year. Single 800 ft. gangs of 4.5, 5.0, 5.5 and 6.0 inch mesh gillnets are set in waters of 3 to 50 ft. deep at ten sites during this survey. The 800 ft. gang contains two 100 ft. panels of each mesh size randomly arranged in a net box as described for the spring assessment surveys. These nets are all 6 ft. high and have a twine diameter of #69 and have no floats or leads. Float line and lead line is used on these nets. There is one float at each end of each 100 ft. panel with a number from 76 to 100 written on it. The net number and water depth at the beginning and end of each 100 ft. panel is recorded when the gangs are set. The purpose of the shallow water sets is to target adult, spawning-size lake trout.

In addition to the shallow sets, a single 2,000 ft. gang of 2.0, 2.5, 3.0, 3.5 and 4.0 stretched mesh gill nets is set at three sites in waters of 90 to 150 ft. during the October survey. The 2,000 ft. gang contains four 100 ft. panels of each mesh size randomly arranged in each box. These nets are the same as those used in the spring survey and are 6 ft. high, have a twine diameter of 210/2 (0.23 mm), and have floats and leads. The number of each 100 ft. panel is recorded as the nets are set, as is the water depth at the beginning and end of each panel. The purpose of these deep sets are to target immature, juvenile lake trout that are spatially segregated from the adult spawning-size fish during October.

The following information will be provided by this phase of the assessment:

- relative abundance of the two strains
- age composition of spawners (by strain)
- sea lamprey wounding rates
- spawner abundance (CPUE)
- spawning time (by strain)
- origin (hatchery\wild)
- sex composition and maturity

All lake trout captured in both the spring and fall surveys will be sacrificed for tag recovery and data collection. Length, weight, fin clip, sex, stage of sexual maturity, and sea lamprey marking is recorded for each fish. In addition, 10 stomachs from each of five size classes of each predator species; i.e. lake trout, burbot, chinook salmon, and walleye. The size classes are <200 mm, 200-399 mm, 400-599 mm, 600-799 mm, and >799 mm. Snouts are removed from all adipose clipped fish and placed in numbered plastic bags. A scale sample is collected from each fish species, except for unclipped lake trout >800 mm long and walleyes >500 mm long. Otoliths are collected from lake trout >800 mm and the first dorsal spine from walleyes >500

mm long.

Responsibilities: Spring and fall assessment, as described above, will be conducted by Intertribal Fisheries and Assessment Program (ITFAP) personnel. Trout heads containing a CWT will be forwarded to the Alpena FRO for extraction and data recovery. Recovered data will be forwarded to USGS-GLSC for database storage, consolidation, and reporting.

Time Line: This study has no clear end point. A primary objective of the strain evaluation study is to compare the success of two strains of lake trout (test and reference) in response to sea lamprey predation. It is the recommendation of this committee that this study continue until further evaluation warrants the definition of a single strain to be used in the Refuge study area.

Contact: Mark Ebener, ITFAP (906)632-0043

MOVEMENT STUDY - CWT

Calculation of Total Allowable Catch (TAC) in northern Lake Huron has suggested that there is substantial south to north movement of stocked lake trout from MH-2 to MH-1. Such movement significantly complicates mortality and TAC estimates. In an effort to quantify movement patterns, the LHTC requested four lots of CWT fish (60 K each) from the federal hatchery system. In the spring of 1992 lots of 60,000 lake trout (1991 year class) were stocked at Adams Point, Middle Island, Sturgeon Point, and Point Aux Barques (Figure 1). Stocking coordinates were selected and provided to the federal hatchery system. Three additional year classes of similarly marked fish were stocked in alternate years at those locations as replicates of the 1992 study fish. Stocking of the 1997 year class in the spring of 1998 was the fourth and final replicate for this original study. Additional replicates of this study will be stocked beginning in 2002 (2001 year class) and will include a new site in the southern main basin of Lake Huron in Ontario waters (Pt. Clark). A sixth site may be added in northern MH-1 to better quantify movement in this region of the lake.

Study Objectives: 1) to determine the extent of immigration to MH-1 from MH-2 and beyond. 2) To better define movement for improved delineation of management units. 3) To better define seasonal inshore/offshore movement patterns of hatchery lake trout.

Principal Null Hypothesis: *For lake trout marked with coded-wire tags and stocked at the four index locations, there is no difference in north and south movement of fish stocked at each site where movement is distance over time.*

Methods: Extend study initiated with 1991 year class, whereby 60 K lots were marked with CWTs and stocked in previously selected nearshore sites. The Lewis Lake strain will be used for the study to maintain continuity of the data set and all lots will be reared at the same hatchery. Distribution and movement patterns of these specially marked fish will be monitored through recovery of tags from assessment sampling and sport and commercial harvest in U.S. and Canadian waters.

Spring assessment conducted by MDNR at four of the five index stations will be expanded, beginning in 1995, to sample north and south of the stations, as well as at the standard coordinates. This expanded coverage will enhance recoveries and provide better definition for the degree of

movement.

Recovery of CWT from spring and fall surveys at the index stations and from the sport and commercial fishery will provide the best information for statistical analysis of movement patterns. Information will be compiled on the degree (distance) and direction of movement from the stocking site for each lot. In addition, as the lots of CWT fish age, a comparison of movement behavior between ages will be evaluated.

Responsibilities: Ongoing interagency assessment activities (MDNR, ITFAP, OMNR, USGS, USFWS), and creel surveys will provide the bulk of the CWT returns. The MDNR Alpena Great Lakes Research Station will employ a seasonal "head-hunter" position through the duration of this study to provide coverage at principal fishing ports for recovery of CWTs, and to collect heads from drop-off stations along the Michigan shore. Alpena FRO will provide assistance to MDNR for enhanced coverage at major fishing ports, especially during tournaments. A significant number of tag returns are provided by Ontario Ministry of Natural Resources, primarily from the commercial fishery. These tag return data will be provided to BRD-GLSC for database entry. Routine screening of commercially harvested lake trout in the tribal fishery, conducted by ITFAP staff, will provide access and recovery of CWTs in the northern region of the lake. The Alpena FRO will receive lake trout heads carrying CWTs from assessment, sport, and commercial harvest for recovery, analysis, and data entry. Data analysis and reporting for this study will be conducted by the Alpena FRO with assistance from the Alpena DNR office.

Time Line: A total of four alternate year classes of fish were marked and released for this study (1991, 1993, 1995 and 1997). Additional cohorts will be added to the study beginning with the 2002 stocking and add a new location in the southern main basin near Point Clark in Ontario waters. This movement study is expected to be modified when/if a pulse stocking program is tested in Lake Huron. Distribution and movement patterns should be monitored for ten (10) years or until the last year class is no longer present in the catch.

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FISH QUALITY STUDY - CWT

The federal hatchery system has altered its program to improve the quality of lake trout stocked in the upper Great Lakes. To improve the quality of the product fewer fish are being held in the hatcheries, and they are being fed optimum rations throughout the hatchery cycle. As a result of the change 35 percent fewer yearling fish are available for stocking in each of the lakes. It is hoped that improved quality will result in significantly better survival, and consequently in no net loss to lakewide abundance. The proposal was made to Lake Huron Technical Committee in July 1994 and the endorsed recommendation passed on to the Lake Huron Committee where it was approved. To evaluate the change, the Technical Committee has designed a study to compare the new hatchery product with the historical "standard". The study is part of the movement study previously discussed.

Study Objectives: 1) To compare the post-stocking performance of the new, enhanced quality (larger) fish with the historical "standard" produced in the federal hatchery system.

Principal Null Hypothesis: *There is no net loss of fish to the fishery;*

that is, we should expect that survival of the enhanced quality (larger) fish will be at least 35 % greater than the standard quality (smaller) fish.

Methods: Beginning with the 1995 year class, modify the movement study to incorporate the stocking of two 30,000 fish lots at each of the four movement study sites. One lot will be reared and stocked at the current standard of quality and size (approximately 20 fish/lb), and the second lot will be reared under more optimal hatchery conditions and consequently stocked at a larger size (approximately 10 fish/lb). All lots will be reared at the same hatchery and marked with coded-wire tags for purposes of analysis. Prior to release the LaCrosse Fish Health Center (USFWS) will conduct a fish health/condition assessment of each lot according to procedures developed by Goede and Barton (1990). Data collected through this assessment will provide baseline information on stocked fish, and allow statistical comparison of the two treatments at release. Monitoring of post-stocking performance will be accomplished through recovery of tags from interagency assessment sampling and sport and commercial harvest in U.S. and Canadian waters.

The expanded assessment (MDNR), at and adjacent to the index stations, previously mentioned in the movement study will provide enhanced data recovery for this study as well.

Relative abundance of the two treatments in the returns will be used as an indicator of survival. Other means of comparing short-term relative performance of the treatment groups will include growth rates, movement patterns, and sea lamprey wounding rates. Overall evaluation of the efficacy of the program change will be addressed by comparing relative abundance of the treatment groups in the assessment catch. In light of current mortality constraints being imposed on the Lewis Lake strain by sea lamprey, it is doubtful that an adequate sample size of experimental fish older than age 5 would be available for assessment.

Responsibilities: Ongoing interagency assessment activities (MDNR, ITFAP, OMNR, BRD, USFWS), and creel surveys will provide the bulk of the CWT returns. The MDNR Alpena Great Lakes Research Station will employ a seasonal "head-hunter" position through the duration of this study to provide coverage at principal fishing ports for recovery of CWTs, and to collect heads from drop-off stations along the Michigan shore. Alpena FRO will provide assistance to MDNR for enhanced coverage at major fishing ports, especially during tournaments, as long as budget and staffing at the two offices allows. A significant number of tag returns are provided by Ontario Ministry of Natural Resources, primarily from the commercial fishery. These tag return data will be provided to USGS-GLSC for database entry. Routine screening of commercially harvested lake trout in the tribal fishery, conducted by ITFAP staff, will provide access and recovery of CWTs in the northern region of the lake. The Alpena FRO will receive lake trout heads carrying CWTs from assessment, sport and commercial harvest. Data analysis and reporting for this study will be conducted by the Alpena FRO.

Time Line: Two alternate year classes of lake trout will be stocked for analysis of this study (1995 and 1997). Monitoring of these experimental lots will continue for a minimum of ten years, or until they are no longer present in the catch.

Contact: Jerry McClain, USFWS, (989) 356-5102 ext. 18

MICHIPICOTEN/SLATE ISLAND STRAIN COMPARISON STUDY - CWT

A strain comparison study was initiated by OMNR in Owen Sound in 1994. In 1996 stocking was moved to the nearby Cape Rich location due to constraints in the assessment budget (Figure 1). This study, using coded-wire tagging, was initiated to compare the relative performance of two lake trout genotypes. The last year of stocking for this study was 1998.

Study Objectives: 1) To determine if differences exist between two strains of stocked lake trout in terms of survival, contribution to the fishery, and reproductive success.

Principal Null Hypothesis: *There is no significant difference in the performance, in terms of survival, contribution to the fishery, and reproductive success, of Michipicoten and Slate Island strains of lake trout stocked in southwestern Georgian Bay.*

Methods: Annual spring releases of 100,000 lake trout yearlings of each strain were coded-wire tagged in lots of 10,000 fish and stocked in Owen Sound or at Cape Rich. At the Owen Sound location, paired stocking over three different water depths was conducted in 1994 and 1995 to test for differential performance relative to stocking habitat. Annually three lots (30,000) of each strain were stocked at the surface over a 16 foot depth, four lots (40,000) of each over a 50 foot depth, and three lots (30,000) of each over a 98 foot depth. In 1996, 1997, and 1998 all fish were released over the same depth (approximately 30 feet) at Cape Rich. Assessment netting for this study utilizes the standard OMNR Lake Huron graded mesh monofilament gill nets. In addition to the recovery of data from assessment netting, data are anticipated from sport and commercial catches.

Responsibilities: OMNR Upper Great Lakes Management Unit – Lake Huron is responsible for data recovery, analysis, and report preparation.

Time Line: The experiment had a five year stocking protocol with annual releases occurring from 1994 through 1998. The Cape Rich assessment site is a long-term OMNR project with annual summer gill netting planned to continue indefinitely. Data collection and analysis will continue as long as the tagged fish occur in the various fisheries.

Contact: Steve Gile (519) 371-5791

Big Sound/Iroquois Bay Strain Comparison Study - CWT

A strain comparison study was initiated in 2001 at Janet Head on Manitoulin Island in the central North Channel of Lake Huron (Figure 1). This study, using coded-wire tagging was initiated to compare the relative performance of two lake trout genotypes. Stocking is planned to continue for five years until 2005.

Study Objectives: 1) To determine if differences exist between two strains of stocked lake trout in terms of survival, contribution to the fishery, and reproductive success.

Principal Null Hypothesis: *There is no significant difference in the performance, in terms of survival, contribution to the fishery, and*

reproductive success, of Big Sound (Parry Sound) and Iroquois Bay strains of lake trout stocked in the central North Channel.

Methods: Annual spring releases of 100,000 lake trout yearlings of each strain are stocked at Janet Head. For each strain, 50,000 fish are coded-wire tagged in lots of 10,000 and adipose fin clipped. The balance of the fish are marked with the standard fin clip of the year for lake trout. Tag returns are anticipated from recreational and commercial catches. Directed assessment netting is not planned at present.

Responsibilities: OMNR Upper Great Lakes Management Unit – Lake Huron is responsible for data recovery, analysis, and report preparation.

Time Line: The experiment has a five year stocking protocol with annual releases planned to occur from 2001 through 2005. Data collection and analysis will continue as long as returns of tagged fish occur.

Contact: Steve Gile (519) 371-5791

Big Sound/Seneca Lake Strain Comparison Study –CWT

A strain comparison study was initiated in 1999 near Cape Rich off the port of Meaford in southwestern Georgian Bay (Figure 1). This study, using coded-wire tagging was initiated to compare the relative performance of two lake trout genotypes. Stocking is planned to continue for five years until 2003.

Study Objectives: 1) To determine if differences exist between two strains of stocked lake trout in terms of survival, contribution to the fishery, and reproductive success.

Principal Null Hypothesis: *There is no significant difference in the performance, in terms of survival, contribution to the fishery, and reproductive success, of Big Sound (Parry Sound) and Seneca Lake strains of lake trout stocked in southwestern Georgian Bay.*

Methods: Annual spring releases of 100,000 lake trout yearlings of each strain are stocked near Cape Rich. For each strain, 50,000 fish are coded-wire tagged in lots of 10,000 and adipose fin clipped. The balance of the fish are marked with the standard fin clip of the year for lake trout. Standard assessment index netting is conducted at Cape Rich annually in mid-summer. Standard OMNR Lake Huron graded mesh monofilament gill nets are used (mesh sizes ranging from 38 to 127 mm). In addition to recovery of data from assessment netting, data are anticipated from recreational and commercial catches.

Responsibilities: OMNR Upper Great Lakes Management Unit – Lake Huron is responsible for data recovery, analysis, and report preparation.

Time Line: The experiment has a five year stocking protocol with annual releases planned to occur from 1999 through 2003. The Cape Rich assessment site is a long-term OMNR project with annual summer gill netting planned to continue indefinitely. Data collection and analysis will continue as long as returns of tagged fish occur.

Contact: Steve Gile (519) 371-5791

PULSE STOCKING

Constant stocking policies have basically failed to produce significant amounts of natural reproduction in Lake Huron for any number of reasons (Eshenroder et al. 1995; Johnson et al. 1995; Sitar 1996). There also is mounting scientific evidence of diminishing returns associated with constant stocking practices, and that supplemental stocking on naturally reproducing populations suppresses abundance of the wild portion of the stock.

Natural reproduction and subsequent recruitment of Great Lakes fishes is not a steady-state condition. Nearly all species of fish that reproduce naturally in the Great Lakes experience some degree of significant variation in year class strength (Scott 1951; Fry and Watt 1957; Christie 1963; Lawler 1965). Shiners, lake herring, whitefish, chubs, walleyes, yellow perch, coho salmon, chinook salmon, lake trout, and even sea lampreys experience variable reproductive success from year to year or over a series of years due to biotic and abiotic factors.

The creation of unusually large year classes affects a specie's subsequent population size, survival, growth, and reproduction for many years into the future. Unusually large year classes of lake whitefish were produced in Lakes Huron and Michigan in 1943 and this year class produced amazing annual harvests after it became recruited to the commercial fishery (Hile and Buettner 1959; Cucin and Regier 1966; Henderson et al. 1983; Reckahn 1995). Large year classes of lake whitefish produced in 1972 and 1977 in Lake Michigan also produced record annual commercial yields and substantially increased population size of whitefish in the lake (Ebener and Copes 1985; Scheerer and Taylor 1985). The 1977 year class of bloaters produced in Lake Huron dramatically aided in recovery of the species (Ebener et al. 1995). Bloaters became the most abundant prey fish in the coldwater fish community of Lake Huron after producing large year classes again in 1983, 1984, and 1988 (Argyle 1995).

Recovery of lake trout populations in Lake Superior appears to have occurred as larger than average year classes were recruited to the spawning population. This is especially evident at sites such as Gull Island Shoal, Isle Royale and Stannard Rock where recovery is well documented.

Several important points are evident from the lake trout abundance data at Gull Island Shoal, Isle Royale, and Stannard Rock;

⇒ recovery of lake trout populations takes decades and occurs in stanzas related to production of large year classes,

⇒ declines in abundance should be expected, but should not last longer than 3 to 6 years.

⇒ lake trout recruitment, like that of other species, is also affected by abiotic and biotic factors, not just abundance of female spawners.

Inter-agency plans developed to aid in establishing naturally reproducing populations of lake trout in the Great Lakes have focused on stocking a given density of fish each year at specific sites throughout the lakes (Hansen 1996; Ebener 1998). For the most part these stocking practices have failed to produce measurable amount of wild recruits except in Lake Superior. Measurable numbers of naturally produced adult lake trout are found in Lake Superior (Swanson and Swedberg 1980; Krueger et al. 1986; Peck 1986; Curtis 1990; Hansen et al. 1995; Schram et al. 1995), and reproduction has been so successful that stocking of hatchery-reared lake trout has been ceased throughout most areas of the lake. Very little

reproduction by lake trout occurs in the other Great Lakes (Cornelius et al. 1995; Elrod et al. 1995; Holey et al. 1995) except for portions of Lake Huron (Anderson and Collins 1995; Eshenroder et al. 1995; Johnson and VanAmberg 1995; OMNR 1997).

One consequence of these constant stocking policies has been the decline in survival of hatchery-reared fish. Relative survival of age-7 hatchery-reared lake trout in Lake Superior declined six-fold from the 1963 to 1982 year class (Hansen et al. 1994) and these declines were related to predation by wild adult lake trout and commercial gill net effort (Hansen et al. 1996). In Lake Michigan survival of age-6 lake trout declined nearly 5 fold from the 1977-1981 year classes to the 1987 year class (Fabrizio et al. 1997). Elrod et al. (1993) reported that survival of hatchery-reared lake trout declined in Lake Ontario. This decline in survival in Lake Ontario occurred during the first year hatchery fish spent in the lake, and survival was negatively and significantly correlated with abundance indices of large lake trout.

There is evidence that stocking hatchery-reared salmonines will suppress abundance of wild fish. Recommendations from Ontario's Lake Trout Synthesis suggest that stocking for rehabilitative purposes should be permitted as an appropriate management tool, but that supplemental stocking of lake trout should not be permitted (Olver et al. 1991). Ontario has found many adverse affects result from stocking hatchery-reared lake trout in lakes with naturally reproducing populations (Evans et al. 1991; Olver et al. 1991; Evans and Willox 1991), and include:

⇒ reduced survival of wild juveniles due to competition with, or predation by, hatchery fish
⇒ reductions in the number of wild fish in the population as fishing pressure increases, and
⇒ eventual replacement of wild stocks by less fit domestic stocks due to excessive stocking (Dunlop and Brady 1998).

Dunlop and Brady (1998) reported few negative consequences resulting from cessation of stocking lake trout and brook trout in two small inland Ontario lakes. In Rosseau Lake the catch and catch rate of lake trout increased after stocking was ceased, and strong year classes of wild fish were produced. In Meach Lake two successive strong year classes of brook trout were produced after stocking was ceased.

Constantly stocking equal numbers of hatchery-reared lake trout at the same site each year appears to have very broad negative affects. The affects include:

1. Declines in survival of stocked fish.
2. Suppression of natural recruitment.
3. Reduced fitness of extant populations.
4. Reductions in growth rate.
5. No net gain in population abundance by continual stocking.

Declines in survival of hatchery-reared fish always occur with constant policies and the declines in survival occur immediately after stocking. It is possible that density effects on survival of hatchery-reared lake trout might well extend beyond the effect of adults eating newly stocked fish. Constant high stocking levels may build up high densities of all ages of lake trout and perhaps survival of older ages, 2-5, could be affected by high densities of adults and fish their own age.

Yankee Reef

It is the recommendation of the LHTC that an alternate strategy of "Pulse Stocking" be evaluated at Yankee Reef (Figure 1).

Initiation of stocking at Six Fathom Bank in 1985, although a "scaled down" pulse stocking, resulted in significant increases in stock abundance at that site, development of large spawning stocks, and measurable recruitment of "swim-up fry". The 1998 plant of yearling lake trout at the Six Fathom Bank reef complex was the final year of a multi-year coded-wire-tagging study for evaluation of multiple genotypes at that site. With the expiration of that study, fish (180,000) were available for initiation of this "pulse stocking" experiment at Yankee Reef without affecting stocking levels at other lakewide sites in U.S. waters of Lake Huron. To produce a significant stocking density at Yankee Reef, an additional 180,000 fish will be made available by reducing numbers at other Lake Huron sites slightly. A single previous stocking of fall fingerling lake trout at Yankee Reef in 1992 has survived well and is now present in sizeable numbers as observed in assessment fisheries at that site.

Study Objectives: 1) To "flood" an area of low stock abundance with significant numbers of hatchery lake trout to determine whether the effects of sea lamprey and fishing mortality can be overcome, resulting in an abundant population of adult lake trout. 2) To increase survival of hatchery-reared lake trout in the wild by reducing the potential for predation of newly stocked fish by adult lake trout, and by reducing intraspecific competition between newly stocked lake trout and extant population. 3) To reduce effects of stocked lake trout on naturally reproducing populations (Six Fathom Bank).

Methods: Beginning with the 1998 year class stocked in the spring of 1999, as many as 360,000 yearling lake trout will be stocked on Yankee Reef in central Lake Huron as part of the annual stocking program. Lake trout stocked at this site will be Seneca Lake strain to the extent possible.

Spring assessment gill netting and beam trawling will be employed to monitor population trends and subsequent recruitment potential of the lake trout stocks at Yankee Reef and will be conducted in conjunction with similar surveys at Six Fathom Bank. Fall spawning surveys will be initiated at Yankee Reef to monitor trends in spawning stock abundance and will be conducted in conjunction with similar surveys at Six Fathom Bank.

Up to 200,000 of the lake trout stocked for this experimental strategy will receive coded-wire tags (CWT) for evaluation purposes. The remaining 160,000 fish will receive the lakewide fin clip for that year class as defined by the established rotation.

Responsibilities: The USFWS will rear the lake trout to be used in this experiment and will deliver the fish to Yankee Reef via the *M/V Togue*. Any changes in the coordinates for the stocking site will be provided to the USFWS at least 30 days prior to scheduled stocking dates. Spring gill net surveys and beam trawling will be conducted by USGS-BRD aboard their vessels and will be conducted in conjunction with similar surveys at Six Fathom Bank. Staff assistance will be provided by USFWS if requested. Fall spawning surveys will be conducted by USFWS aboard the *M/V Togue*. Data analysis and report preparation will be a collaborative effort between USFWS and USGS-BRD.

Time Line: A total of three year classes (1998-2000) will be stocked for this phase of the experiment. The program will be reevaluated at the end

of the three year period. Spring and fall assessment will be conducted for 8 years following the last stocking.

Contact: Jerry McClain, FWS, (989)356-5102 ext. 18

Limestone Islands/Watcher Islands Alternate 3 Year Stocking Study

This experiment was initiated in 1997 in eastern Georgian Bay. The experiment is intended to investigate the effects of alternating stocking in a cycle of 3 years of annual stocking followed by 3 years without stocking at 2 locations separated by approximately 60 km, the Limestone Islands and the Watcher Islands. Stocking is planned to continue in this pattern for the foreseeable future using the Big Sound strain of lake trout.

Study Objectives: 1) To determine if significant differences exist between lake trout populations established by alternating 3 year on and off stocking versus uninterrupted annual stocking in terms of population structure, survival, abundance, contribution to the fishery, reproductive success, etc.

Principal Null Hypothesis: *There is no significant difference in the population structure, survival, abundance, contribution to the fishery, and reproductive success, of lake trout stocked in an alternating 3 year pattern of stocking followed by no stocking, compared to locations with uninterrupted annual stocking.*

Methods: Annual spring releases of between 277,767 and 530,754 lake trout yearlings of the Big Sound (Parry Sound) strain took place near the Limestone Islands in 1997, 1998 and 1999. A target number of 400,000 fish was planned for stocking annually at the Watcher Islands in 2000, 2001, and 2002. Stocking is planned to continue alternating between the 2 locations on the same basis (400,000 yearlings annually for 3 years). All fish are marked with the standard fin clip of the year for lake trout. Sampling of fish is anticipated from recreational and commercial catches. Directed assessment netting is not planned at present. Characteristics of lake trout from these 2 locations will be compared to locations where uninterrupted annual stocking occurred.

Responsibilities: OMNR Upper Great Lakes Management Unit – Lake Huron is responsible for data recovery, analysis, and report preparation.

Time Line: The experimental stocking is planned to continue for an indefinite period of time. Data collection and analysis will continue as long as returns of these fish occur.

Contact: Steve Gile (519) 371-5791

EARLY LIFE HISTORY EXPERIMENTS

EGG STOCKING

A joint study developed by the Technical Committees for Lakes Huron and Michigan was initiated in 1992. The study calls for the stocking of up to 4.0 million lake trout eggs, using protocol developed by Swanson (1982), on

historical spawning reefs in the two lakes. Egg stocking was alternated between the two lakes, with Lake Huron receiving the eggs in 1993, 1995 and 1997. Beginning in 1998 the artificial turf incubation study was moved to Lake Michigan and will remain there, annually, through 2000. In 2001 the experiment is scheduled to return to Lake Huron. The experimental use of lake trout eggs will be in lieu of any fall fingerling stocking in the lakes unless/until the availability of eggs exceeds the needs of the early life-history work.

Study Objectives: 1) To evaluate the efficacy of stocking lake trout eggs in artificial turf incubators on historically important reefs for the establishment of spawning populations of lake trout.

Principal Null Hypothesis: *The artificial-turf technique is not effective at establishing spawning populations of lake trout on historically important spawning reefs.*

Methods: Using procedures developed by Swanson (1982) and modified by Holey (1993) and McClain (1994), stock up to 4.0 million green or eyed lake trout eggs on Spectacle Reef where suitable habitat exists. Techniques and procedures will be modified annually based on logistical impediments identified the previous year. Eggs will be shipped from the federal hatcheries to sites specified by the ITFAP in late October (green) or early November (eyed). Using staff and volunteer assistance, the eggs will be packaged and transported to the stocking site for deployment. The incubators will be retrieved the following spring in May or June. Upon retrieval, the incubators will be transported to Sault Ste. Marie where they will be disassembled and cleaned for future use. Twenty percent of the incubators will be randomly selected for evaluation of hatching success. Selected incubators will be carefully examined during disassembly, with dead eggs and/or alevin counted and converted to a percentage of the estimated number contained in each incubator. A mean survival will be calculated to represent the overall "swim-up" success of that year's operation.

FALL GILL NETTING will be conducted at 3 sites on the reef during October of each year. Single 800 ft. gangs of 4.5, 5.0, 5.5 and 6.0 inch mesh gillnets will be set across the reef during this survey. The 800 ft. gang contains two 100 ft. panels of each mesh size randomly arranged in a net box as described for the spring assessment surveys at the Northern Refuge. These nets are all 6 ft. high and have a twine diameter of #69 and have no floats or leads. Float line and lead line is used on these nets. There is one float at each end of each 100 ft. panel with a number from 76 to 100 written on it. The net number and water depth at the beginning and end of each 100 ft. panel is recorded when the gangs are set. The purpose of the shallow water sets is to target adult, spawning-size lake trout to determine if spawning is currently occurring on that reef.

In addition to the shallow sets, a single 2,000 ft. gang of 2.0, 2.5, 3.0, 3.5 and 4.0 stretched mesh gill nets will be set in the deeper water off the reef. The 2,000 ft. gang contains four 100 ft. panels of each mesh size randomly arranged in each box. These nets are the same as those used in the spring survey at the Northern Refuge and are 6 ft. high, have a twine diameter of 210/2 (0.23 mm), and have floats and leads. The number of each 100 ft. panel is recorded as the nets are set, as is the water depth at the beginning and end of each panel. The purpose of this deep set is to target juvenile lake trout, burbot and chubs in this region of Lake Huron.

Responsibilities: The ITFAP will be responsible for the scheduling, coordination, and execution of the deployment phase of the project. Retrieval of the artificial turf incubators will be accomplished with the assistance of tribal commercial fishers. The retrieval phase of the project will be conducted in mid-May, in conjunction with spring assessment activities in that region of the lake if possible. Data analysis and report preparation, for the evaluation of this project, will be conducted by ITFAP personnel. Fall spawning surveys will be conducted by ITFAP with assistance from the USFWS-Alpena FRO.

Time Line: At least three year classes (1998, 2000 and 2002) of lake trout will be stocked as eggs at this site using the artificial turf technique. Following deployment of the 2002 year class, determination will be made as to whether the project will be extended at this site or moved to a new site. Spring, summer, and fall assessment activities will continue annually through 2007 to evaluate the efficacy of the program. During the 10-year assessment phase, modifications will be made as needed to improve the efficiency of the gear, and annual updates will be provided. At the end of the 10-year assessment phase a decision will be made regarding the future of the program.

Contact: Mark Ebener, ITFAP, (906)632-0043

LARVAL FISH STOCKING

The development of spawning populations of lake trout and the production of offspring in Lake Huron has, with few exceptions, been unsuccessful. There are constraints on both processes: the development of spawning populations can be constrained by exploitation, maturation, location and use of appropriate spawning shoals, and the behavior of naive mature trout; recruitment can be constrained by environmental conditions on the shoals and nursery habitats, and by the phenology of incubation and emergence. In a large lake, the location of appropriate spawning shoals and nursery habitats by lake trout may be more of a roulette game than in small inland lakes. If imprinted mature planted fish can be induced to return to appropriate shoals in sufficient numbers for spawning, this bottleneck may be overcome.

Study Objectives: 1) To evaluate the efficacy of stocking larval lake trout on historically important spawning shoals for improved homing of sexually mature adults to these "natal" shoals.

Principal Null Hypothesis: *Lake trout planted as larvae on historically important spawning shoals will show no more fidelity to the "natal" shoal than lake trout planted as yearlings.*

ONTARIO WATERS

Methods: Up to 1 million pre-swimup lake trout fry will be stocked on an alternate year basis at White Shingle reef, a historically important reef in the Bruce archipelago north of Tobermory, Ontario. The fry will be stocked in May of 1995, 1997, 1999, and 2001. The stocking will be accomplished by gravity feeding the fry through a flexible hose that is dragged along the bottom at depths of 10-17 feet. Approximately 500 fry

will be retained in 10 containers on the reef and retrieved after 1 week to determine post-stocking mortality.

Up to 50,000 lake trout yearlings will be stocked at the same reef in May of 1994, 1996, 1998, and 2000. The yearlings will be fin clipped and marked with a coded-wire tag.

All lake trout used in this study will be the Michipicoten strain from Lake Superior. Eggs and fry will be incubated at ambient lake temperature at the Blue Jay Creek Fish Culture Station.

Assessment of this study will entail various techniques employed from year 4 through year 12.

> ***SUMMER ASSESSMENT*** around the stocking site will consist of 10 overnight sets of multi-mesh gill nets in August of each year. At the present time, the gear is 2250 foot multi-filament gill nets with mesh sizes of 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5 and 5.0 inch. The 1.5 inch panels are 150 feet, with the remaining seven panels being 300 feet each. Transition is currently being made to monofilament nets, with the possible inclusion of trap nets as part of the assessment gear.
>
> ***FALL SPAWNING ASSESSMENT*** will start in the fifth year of the study and continue each successive fall. Current plans call for the use of trap nets set on the spawning shoal to assess the spawning population. The exposed nature of the shoal may preclude the use of trap nets and require reversion to multi-mesh gill nets.

Responsibilities: OMNR's Lake Huron Fisheries Research team will be responsible for coordinating and completing all aspects of this project. The vessel *Atigamayg* will be used to stock lake trout and set assessment gear.

Time Line: Five year classes (1993, 1995, 1997, 1999, 2001) of lake trout will be stocked as either fry or yearlings from 1994 to 2001. Summer and fall assessment activities will continue annually through 2005 to evaluate the relative contribution of the fry and yearlings to the spawning stock at White Shingle shoal.

Contact: Brian Henderson, (519) 371-5810

MICHIGAN WATERS

Methods: Up to 1 million pre-swimup lake trout fry will be stocked at Thunder Bay Shoal north of Alpena or at other sites as determined. In the spring of 1999 and 2000 when the bulk of the available eggs were used for artificial turf incubation experiments in Lake Michigan, some fry were stocked at Spectacle Reef rather than at Thunder Bay Shoal. The number stocked was dependent upon total availability and the extent of the artificial turf experiment in Lake Michigan. The stocking was accomplished by gravity feeding the fry through a flexible hose that is dragged along the bottom at depths of 30-40 feet.

Incubation was retarded to provide pre-swimup fry in April by a combination of chillers and ambient Videan Creek water at the Pendills Creek NFH. Thermal marking was applied to eyed-eggs and/or fry to provide differentiation from hatchery and naturally produced lake trout. Strains used for the study were determined by hatchery availability in the years of stocking.

Assessment of this study will entail various techniques employed from year 4 through year 12.

SPRING/SUMMER ASSESSMENT will be conducted annually at the site of fry stocking using nine hundred foot nets consisting of one-hundred foot panels of 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5 and 6.0 inch stretch mesh multi-filament nylon, fished overnight at varying depths. CPUE will be standardized to 1000 feet of net. Biological data, including length, weight, age, sex, maturity, stomach analysis, and sea lamprey wounding will be collected from all lake trout. Aging of unclipped lake trout will be conducted using scale and otolith samples. Year class strength of unclipped lake trout will be compared with fry stocking histories using statistical methods to explain annual variations. Mean length at age for fish captured during the May - July sampling period will be used to measure growth rates.

FALL SPAWNING ASSESSMENT will start in the fifth year of the study and continue each successive fall. Four-hundred foot gillnets consisting of 100 foot panels of 4.5, 5.0, 5.5 and 6.0 inch stretch mesh multi-filament nylon will be used for this portion of the assessment. Nets will be fished overnight at various locations on the reef, providing representation of a variety of depths and habitat types.

Responsibilities: The Alpena Fishery Resources Office (USFWS) will be responsible for stocking of the fry with the use of the *M/V Togue*. Spring/summer and fall assessment netting will be conducted through collaboration between the MDNR, ITFAP and the Alpena FRO.

Time Line: Two year classes (1998, 1999) of lake trout fry were stocked for this study. Spring/summer and fall assessment activities will continue annually from 2002 through 2007 to evaluate the relative contribution of the fry and yearlings to the spawning stock at Thunder Bay Shoal, Spectacle Reef. Logistical constraints within the federal hatchery system relative to the chilling component of the project do not allow for continuation of this experiment at this time

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CWT DATABASE MANAGEMENT

The Lake Huron lake trout CWT database is currently being maintained by NBS-GLSC. All CWT data should be provided to the center in a timely manner by those recovering and reading the tags (MDNR, OMNR, USFWS). Once the data have been entered (annually) a collated listing of the recovery information will be provided to each of the agencies and interested offices. Dissemination of the information in this manner will allow each office involved in or directing a particular study to analyze their own data and prepare the appropriate reports. It is anticipated that the report will be available for distribution by the winter meeting of the LHTC. This protocol will continue until further notice to the LHTC. The Alpena FRO has worked with the USGS-GLSC to standardize the input data and provide that guidance to all agencies involved in data collection. Previous input inconsistencies resulted in missing data for specific agencies and years that impede effective analysis of data provided by this database. This new standardized format should eliminate many of the previous problems with this database.

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Figure 1. Stocking location (⊛) for CWT studies in U.S. and Canadian waters of Lake Huron.