Current projects for Fisheries Research Unit of Minnesota Department of Natural Resources

MAJOR RESOURCE ISSUES IN THE DIVISION OF FISHERIES

Status of Fish Populations

To effectively manage fish populations, it's important to know how many fish are in a given lake, what sizes they are, and how many die each year of natural causes, from harvest and from hooking mortality. It's also important to know how fast fish grow in a given lake, how many young fish are being produced, and what they are eating.

With this information, fisheries managers can determine if a lake needs to be stocked, if new regulations might help produce larger fish, and the effects of a regulation change on forage populations and growth rates.

Current Research in This Area

611 – **Gill net catch/effort as a measure of northern pike relative abundance.**
A study of the relationship between pike gill-net catch per unit effort and the pike population in the lake. By knowing the true population in a lake, managers can make more informed management decisions. Started 1997. To be completed summer 2003.

615 – **A comparative study of muskellunge waters for trophy potential.**
A study to determine which muskellunge waters has the potential to produce trophy fish using trap net catch and angler diary information. Started 1996. Final report available.

616 – **Estimating black crappie populations and exploitation rate from lake surveys.**
A study to determine how lake survey trap net data can be used to establish black crappie population size and structure. Started in 1996. To be completed summer 2003.

638 – **Growth, recruitment, and mortality of crappies.**
This study will examine differences between black and white crappie mortality rates, and investigate the amount of hybridization between these two species. Started 2001. To be completed in 2004.

640*--**Real time mortality estimation by acoustic telemetry.**
University contract to develop estimates of walleye natural mortality. Information is needed in assessment models to improve on their output for walleye on Mille Lacs Lake. Started 2003. To be completed in 2005.

661 – **Bioenergetics modeling of predator species in Lake Superior.**
A study to estimate prey consumption by predators and to compare population estimates with estimates of prey species. Will aid in determining what number of predators should be stocked. Started 2000. To be completed in 2004.

666 – **Growth potential for large brown trout in southeast Minnesota streams.**

This study will evaluate the influence of temperature, prey availability, and environment on the growth of brown trout. The goal is to determine which streams have the capability of producing larger brown trout. Started 2002. To be completed in 2004.

Fish Stocking

When done well, stocking can work wonders. Many Minnesota lakes would today offer little or no walleye fishing were it not for regular stockings, particularly bass/panfish lakes. Stocking has helped restore the native lake trout population on Lake Superior. Stocking has created new trout fishing opportunities in Arrowhead Region lakes. Fisheries researchers help determine which species should be stocked, how many, and at what life stage fish should be stocked. After stocking, researchers examine how many fish survived, and if the stocking created a successful fishery. Researchers also try to determine the cost per fish returned to the angler. In addition, researchers look at what effects the stocked fish may have on natural reproduction and survival of the naturally reproduced fish, and what effects adding a new predator species may have on the other species in the lake.

Current Research in This Area

603 – **Induced winterkill as a management tool for reclaiming walleye rearing ponds.**

This study will examine the use of reverse aeration to kill "carry over" fish in wetlands used for rearing walleye. If this technique works, it could increase statewide fingerling production, and would decrease the need for chemical reclamation of rearing ponds. Started winter of 2002. To be completed in 2007.

606 – **Landscape factors affecting water quality in wetland ponds.**

This study will examine the effects of land use around wetlands used for rearing walleye, and its effect on the production of walleye.
Started 2002. To be completed in 2005.

624 – **Re-establishment of walleye in Lake Thirteen.**

This study will examine the effects of fry stocking on re-establishing a walleye population in the face of a large yellow perch population, and the effects on the yellow perch after a successful stocking. Started 1998. Final report due summer 2003.

630 – **Contribution of fry stocking to the walleye recovery of in Red Lakes.**

This study is to monitor Red Lake to determine how stocking walleye will speed the recovery of the crashed population. Started 1999. To be completed in 2005.

634*--**To evaluate the restoration of fishery productivity to Red Lakes.**

A University contracted study to develop indicators of recovery of the walleye population. Contract is jointly funded with the Red Lake Band.
Started 2001. To be completed in 2004.

635 – **Evaluation of walleye stocking in 80-400 hectare (200-1,000 acre) lakes.**

A study to evaluate the success of stocking walleye fry, fryling, and fingerlings in more than 50 lakes throughout Minnesota. Started 2002. To be completed in 2009.

646 – **Effects of walleye rearing in prairie wetlands in western Minnesota.**
A joint study with the Division of Wildlife to evaluate the effects of walleye rearing on wetlands. This study includes two university contracts Started 2000. Final report due in late 2003.

649B – **Evaluation of stocking strategies used in Minnesota.**
A study to evaluate relationship between our past and current stocking strategies using our historical stocking database. This is an outgrowth of the Accelerated Walleye Stocking Program. Started 2000. To be completed in 2005.

660 – **Recovery of thermally marked lake trout otoliths, evaluate fry stocking.**
668 This study will evaluate a better (cheaper) way to mark stocked lake trout to evaluate the success of our rehabilitation stockings. This study is a follow-up to the study where we developed a way to mark lake trout fry using heated water to mark the growth rings in the otoliths with a dark band. Started 2000 (to be continued as Study 668). Interim report due summer 2003. To be completed in 2008.

New Technologies
Current fish sampling equipment tends to be inaccurate because of the way the equipment works. Variables beyond the control of the manager (i.e., changes in weather) can significantly affect the numbers of fish sampled in a survey.

Researchers continue to work on ways to improve the accuracy of the information, and to develop less expensive techniques to gather data.

Current Research in This Area
617 – **Evaluation of short and long-term marking techniques for muskellunge.**
A study to determine methods for long-term marking of muskellunge to make better population estimates Started 2003. To be completed in 2005.
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639 – **Developing hydroacoustics to assess and map submerged aquatic plants.**
This study will investigate the use of hydroacoustics in evaluating and mapping submerged plants. This project ties in with the issue of cumulative effects in removing aquatic vegetation at a rapid rate. Started 2002. To be completed in 2005.

639B **- Oviduct implantation of radio transmitter in northern pike and muskellunge.**
Radio transmitters will be used in this study to determine where these two species spawn. The transmitter is shed when the eggs are laid. This information can be used to protect spawning / nursery areas. Pilot project started in 2002. To be completed in 2005.

641 – **Light trap sampling of larval and juvenile northern pike.**
A pilot study will determine if light-trap catches of young northern pike can be used as a measure of relative abundance. Pilot project started in 2003.

648 – **Development of a video camera based fisheries assessment tool.**
This study will examine the use of video cameras as an additional tool to use with gill nets and trap nets to sample fish populations. Preliminary work indicates this tool may be a real option to sampling with nets. Started 2002. To be completed in 2005.

664 – **Hydroacoustics methods to estimate trout abundance in lakes.**
This study examines the use of hydroacoustics as an alternative to gill nets to sample lake trout and forage fish populations. Started 2001. To be completed in 2005.

665 – **Modifying Clemson pond levelers to facilitate brook trout passage.**
This study examines devices known as Clemson levelers that are used to let water drain from beaver ponds without being plugged by the beavers. Clemson levelers currently do not allow for fish passage. This study is looking for ways to allow for fish passage while still functioning to allow water to leave the beaver pond. Started 2001. To be completed in 2004.

Regulations
Anglers prefer to catch many large fish. The Division of Fisheries goal is to provide a mix of angling opportunities, including size, numbers, and catch rates of each species to meet the perceived needs of the state's anglers. Each lake cannot provide all species and a catch rate for each of those species that will satisfy most anglers. It is an ongoing area of research to determine what angling regulation can improve the catch rate, fish size, or both while still allowing harvest for the angler to take home a meal of fish.

Current Research in This Area
602 – **Statewide experimental regulations.**
Evaluating regulations for walleye, bass, crappie, and northern pike.
Started 1993. To be completed in 2005.

645 – **Community dynamics in southern Minnesota bass/panfish lakes.**
This study is to evaluate the effect of restrictive bass largemouth harvest regulations on bluegill size. Started 1991. To be completed in 2003.

Habitat Issues and Watersheds
What happens in the watershed directly effects what happens in the lake. Working with landowners in the watershed is the most effective way to prevent problems in the lake such as excessive plant and algal growth, erosion, warmed water, and pollutants. In many cases, identifying the problem, and using demonstration plots to correct the problem are effective in working with landowners to correct the problem.

Habitat is where it all begins. Without habitat you will have less or no fish in a water body. We must find better ways to protect the habitat that is remaining as well as finding more efficient ways to recreate the habitat that we have lost. Cumulative habitat loss is the most insidious problem that is faced today. We must find a way to quantify and to

stop or slow these losses. We cannot stock enough fish to make up for the habitat that we lose on a daily basis.

Current Research in This Areas

604*-- **Temporal and spatial variation in near shore fish species richness.**
This study under a university contract will evaluate variation in the number of fish species and how it relates to lake water quality and vegetation.
Started 2002. To be completed in 2004.

605 – **Evaluate relationships between aquatic plant cover and fish populations.**
This study will attempt to quantify relationships between plant communities and fish communities. Relates to how watershed development can effect plant communities and ultimately fish communities. Also relates to the concept of cumulative impacts.
Started 2002. To be completed in 2004.

623 – **Factors affecting black crappie recruitment.**
Factors effecting black crappie spawning and recruitment are being examined in this study. Management actions that may enhance recruitment will be identified.
Started 1998. To be completed in 2004.

628 – **Relationships between aquatic habitat, and nest site selection.**
This study was to identify nest site characteristics of largemouth bass and black crappie, and to investigate any effects of riparian vegetation on the selection of spawning sites for crappie and bass. Started1999. Final report available.

631 – **Evaluation of stream habitat improvement for walleye spawning in tributaries.**
This study will evaluate the effectiveness of adding rock material for spawning habitat in streams for walleye. Began 1999. To be completed in 2003.

636 – **Evaluation of an index of biotic integrity for Minnesota lakes.**
Indexes of biotic integrity will be used in this study to give a snapshot of the health of an aquatic ecosystem. This work is to evaluate a previous model and to refine the model. PCA is already using our previous work in determining water quality.
Started 2001. To be completed in 2005.

637 – **Landscape alteration and abundance of aquatic vegetation.**
This study will attempt to quantify how lakeshore development has altered the amount of aquatic vegetation in the lake, and its subsequent effects on fish populations. Relates to the cumulative effects work that we are attempting. Started 2001. To be completed in 2004.

647 – **The relationship between bluegill population dynamics and aquatic vegetation.**
To determine the effects of aquatic vegetation on bluegill populations. This study relates to the issue of cumulative effects of removing aquatic vegetation at a rapid rate. The issue is where does this removal begin to negatively effect the fish populations.

Started 2002. To be completed in 2006.

657 – **Woody debris as a limiting factor for steelhead parr (young fish).**
This study is to determine how adding woody debris contributes to the success of steelhead fry survival in their first two years in the stream. Started 1998. To be completed in 2006.

667 – **Measuring and classifying large brown trout habitat in southeast Minnesota.**
This study will test the current habitat model, and work to develop a better habitat index and habitat classification for large brown trout. Started 2003. To be completed in 2005.

Genetics
Although fish have been moved around the state for more than 100 years, we have been fortunate to maintain a certain amount of genetic diversity in these stocks. Researchers are working to determine what genetic strains were present in the state, and to be more judicious in future stockings so that we do not further reduce genetic diversity. Work has been done on fish growth and ultimate size to follow up on genetics work that indicated that we had different strains. This has led to the use **of a specific strains** of muskellunge and lake trout for our stocking programs. Similar work needs to be done on other species that are heavily stocked. Work also needs to be done to separate muskellunge and northern pike, and walleye and sauger from each other using blood or scales, for enforcement purposes. Additional work needs to be done on fathead minnows and other imported bait species to determine if they originated in Minnesota so that proper enforcement can be undertaken to prevent the introductions of different genetic material and exotic species.

Current Research in This Area

625* – **Diagnostic genetic markers at the species and subspecies level.**
This ongoing study includes a continuing contract with the University of Minnesota to assist us with genetics work. This includes some forensics work on distinguishing genetically between muskellunge and pike, black and white crappie, lake trout strains, and where fathead minnows in a bait store originated (within or outside Minnesota). Other work involves using genetic markers to follow the stocked walleye in Red Lakes. Started 2001. Ongoing.

Mille Lacs Lake
Due to recent court rulings on Indian treaty rights, it has been necessary to manage Mille Lacs Lake and other waters in the 1837 Ceded Territory for safe harvest levels, and to use restrictive harvest regulations to stay within these designated levels. New methods of estimating walleye populations need to be developed. These methods need to be validated so that the angler gets his share, and to insure that we are not over harvesting the walleye resource.

Current Research in This Area
XXX – **Development of assessment models to estimate walleye populations.**

Started 1996. Continuing, no end date.

XXX – **Tagging walleye to provide a population estimate from the recaptures.**
Started 2002. To be completed in 2005.

607 – **Hooking mortality of walleye caught by Mille Lacs anglers.**
Started 2003. To be completed in 2005.

Human Dimensions
Human dimensions is measuring the social factors that influence how we manage the fishery resource in the state. This can range from surveys to determine how the angling public perceives the problem, to surveying the public on how well we are doing as a management agency. Additional topics might include working with focus groups to find a more effective way of collecting public input, and to better determine what the public really wants.

Current Research in This Area

633*-- **Opinion surveys.**
Ongoing surveys of how anglers perceive fishing in Minnesota. This includes a large survey every five years of the state's anglers as well as smaller surveys in the four years between the large surveys. The bag limit survey is an example of one of the smaller surveys. These surveys are critical in determining the outcomes of fisheries programs. The last three years of this contract are a partnership with the Cooperative Fish and Wildlife Research Unit, and the Divisions of Fisheries and Wildlife. This has reduced the costs for the DNR. Started 2000. Ongoing.

662*-- **Opportunities for quality trout fishing in southeast Minnesota.**
This study with the University of Minnesota had personnel working with the angling constituents in the southeast and the DNR to relate what the anglers wanted with what the resource could produce. This work was attempting to resolve some of the long-standing concerns of the angling groups using human dimensions work along with biology presented by an outside party. Started 2000. To be completed in early 2004.

* University funded research

Cumulative Effects
To identify problems associated with cumulative effects of human activities and development on fish communities in Minnesota lakes, and to identify and develop tools and information that can be used to address these problems. More directly: 1- How can we measure cumulative effects on fish communities? 2- What criteria can be used to determine when to limit these effects? New studies will be developed based on the outcomes of a June 2003 workshop.