This is to certify that the
thesis entitled

Natural Rivers Program
Management Team Interview and Resource Value
Assessment

presented by

Steven Larry Sutton

has been accepted towards fulfillment
of the requirements for the

M.S. degree in Fisheries and Wildlife

William W. Taylor
Major Professor's Signature

13 May 2009
Date

Natural Rivers Program
Management Team Interview and Resource Value Assessment

By

Steven Larry Sutton

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Fisheries and Wildlife

2009

ABSTRACT

NATURAL RIVERS PROGRAM
MANAGEMENT TEAM INTERVIEW AND RESOURCE VALUE ASSESSMENT

By

Steven Larry Sutton

The Natural Rivers Program has been in effect in Michigan since 1970 and currently protects 16 river systems and 2,091 miles of river state-wide. The primary goals of this project were to assess the level of Department knowledge and support for the Natural Rivers Program, prioritize future Program projects, and determine if the effectiveness of a Natural River designation could be monitored and evaluated by reviewing existing data on selected natural resource values of a designated river in Michigan.

Face-to-face interviews were administered to 14 key decision-makers who are members of the Department of Natural Resources Management Team. Results suggested a moderate level of Program knowledge with a strong level of Program support from the majority of Management Team members. Results also prioritized future projects for the Natural Rivers Program.

Three selected resource values from the Betsie River were reviewed for their ability to provide a measure of the effectiveness of a Natural River designation. Resource values of water quality, the fishery, and the condition of the riparian area were selected for review. As a result of this review, a resource monitoring and assessment plan will be developed for the Natural Rivers Program that utilizes resource partners and professionals, and includes ecological, social, and economic measures.

ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. William W. Taylor, for the opportunity to pursue a Master of Science degree in Fisheries and Wildlife Management and for his encouragement, motivation, and friendship along the way. I also appreciate my committee members, Dr. Kurt Newman, Dr. Tom Coon, Dr. Aaron McCright, and Dr. Dana Infante for their knowledge, assistance, and mentoring.

I wish to thank Dr. Kelley Smith, Chief of Fisheries Division, Department of Natural Resources for his encouragement, support, and especially for allowing me the flexibility to pursue this project. I am also grateful to all of the Management Team members for their participation in the interview portion of this research project. I also want to acknowledge co-workers at the DNR and DEQ, Mark Tonello, Lisa Dygert, and Sylvia Heaton, for sharing their knowledge with me.

Most of all, I want to thank my wife Cheryl and crew (Amanda, Colter, and Sam) for their patience, support, and understanding throughout this entire process...now let's go boating!

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

In the late 1960s, the Department of Natural Resources (Department) and Michigan legislature recognized that the state's rivers and streams were some of Michigan's most important natural resources. They also recognized the beauty and quality of the state's rivers were fragile and being threatened (MNRC Policy 2703). In response to the threat, on December 3, 1970, Governor William Milliken signed into law Michigan's Natural River Act, Public Act 231 of 1970, which is now known as Part 305, Natural Rivers, of Public Act 451 of 1994 (Appendix A). The new statute became effective on April 1, 1971. The Natural River Act (Act) authorized the Department to develop a state-wide system of designated Natural Rivers for the purpose of preserving or enhancing a designated river's identified natural values. The Natural River system was defined in the Act as "all of those rivers or portions of rivers designated under this Act" (Section 30501).

At the time the Act passed, the legislature did not name which rivers were to be included within the Natural River system. Instead, they provided a broad list of values which a river must possess in order to be included in the Natural River system. These values were to be preserved, protected, or enhanced through designation. The eleven values that are named in the Act are: water conservation, free flowing condition, fish, wildlife, boating, scenic, aesthetic, floodplain, ecologic, historic, and recreational uses (Section 30502). Although the values listed in the statute are central to the goal of each river designation, only the value of "free flowing condition" is specifically defined within the Act. Free flowing is defined as "existing or flowing in a natural condition without impoundment, diversion, straightening, riprapping, or other modification" (Section

30501). Additional Program guidance was developed by the Department's Office of Planning Services in 1971 to further define the values and their objectives within the Act (MDNR 1971). They were:

1. General – To preserve and protect the ecologic, aesthetic, and historic values and enhance the many recreational values of the river and adjacent lands.

2. Water quality – To maintain or improve water quality consistent with the designated classification of the river and adhere to the concept of non-degradation of water quality.

3. Free flowing condition – To maintain existing free flowing conditions where they presently exist for the purpose of preserving this part of the natural environment of the river.

4. Fish and wildlife resources – To maintain, protect, and enhance desirable fish and wildlife populations and plant communities.

5. River environments – To protect riverbanks, the floodplain, and other adjacent river areas essential to the perpetuation of the total environment of the river.

By passing the Natural River Act, Michigan was following the lead of the federal Wild and Scenic Rivers Act, which had been signed into law by President Lyndon Johnson in October, 1968. The federal act authorized the creation of a nation-wide system of rivers to be protected in their free flowing condition (Wild and Scenic Rivers Act 1968). The federal act emphasized protecting rivers against dam construction or other federally-funded water control projects that would reduce their free flowing condition or other resource values. The federal act also identified several "Outstandingly Remarkable Values" to be protected, which included scenic, recreational, geologic, fish

and wildlife, historic, cultural, or "other similar values", which are to be preserved for current and future generations. None of the federally listed values, including other similar values, are defined in the federal act. According to the Interagency Wild and Scenic Rivers Council, the federal act does not further define Outstandingly Remarkable Values. Furthermore, agency resource professionals are directed to "develop and interpret criteria in evaluating river values based on professional judgment on a regional, physiographic, or geologic comparative basis" (Interagency Wild & Scenic Rivers Council 2009).

In the 39 years since the passage of Michigan's Natural River Act, 16 rivers or segments of rivers totaling 2,091 miles, including mainstream and tributaries, have been designated as Natural Rivers (Appendix B). There are roughly 36,500 total river miles in Michigan. The first river designated into the Program was the Jordan River in 1972, and the most recent additions were the Upper Manistee and Pine rivers designated in 2003 (Table 1).

River	Classification	Year Designated
Jordan	Wild/Scenic	1972
Betsie	Wild/Scenic	1973
Two Hearted	Wilderness	1973
Rogue	Country/Scenic	1973
White	Country/Scenic	1975
Boardman	Country/Scenic & Wild/Scenic	1976
Huron	Country/Scenic	1977
Pere Marquette	Wild/Scenic	1978
Flat	Country/Scenic	1979
Rifle	Wild/Scenic	1980
Lower Kalamazoo	Wild/Scenic	1981
Pigeon	Wild/Scenic	1982
Au Sable	Wild/ Scenic	1987
Fox	Wild/Scenic	1988
Pine	Wild/Scenic	2003
Upper Manistee	Wild/Scenic	2003

Table 1. Designated Rivers Including their Designation Dates and Designation Classification

Designated Natural Rivers are located throughout the state; however, the majority of currently designated rivers are located in the northwest Lower Peninsula. Natural Rivers are chosen for designation because of their outstanding natural resource values as listed in the Act, geographic distribution throughout the state, and level of local support for river protection and Natural River designation. Although geographic distribution was a goal of designation, natural resource values have been most important in deciding designation priorities.

The goal of designation under Michigan's Act is to preserve or enhance the listed values for which a river is designated (Section 30502) and to protect a river by reducing human impacts, such as loss of vegetation and development, from within the 400 foot-wide Natural River district along a designated river. The Act authorized the Department to utilize three methods to preserve and protect a river's natural values. They are:

1. Acquisition of lands or interest (easements) in lands (Section 30504);
2. To enter into lease agreements with property owners (Section 30505);
3. To develop zoning standards designed to protect riparian vegetation, limit or prohibit certain uses, such as commercial, industrial, or mineral extraction, and regulate the location of structures relative to the water's edge (Section 30507).

The administration of local zoning standards or state administrative rules designed to control land uses within the Natural River district are the only methods to date that have been utilized to implement the Natural Rivers Program in Michigan. Acquisition of easements, leases, or other rights in land have not yet been used.

The Act defined the size of the Natural River district that could be controlled through designation to be no more than 400 feet wide as measured from the water's edge

(Section 30509). Within the 400 foot-wide Natural River district, the Act limits the width of the buffer within which vegetation cutting can be controlled to be no greater than 100 feet wide, also measured from the water's edge (Figure 1).

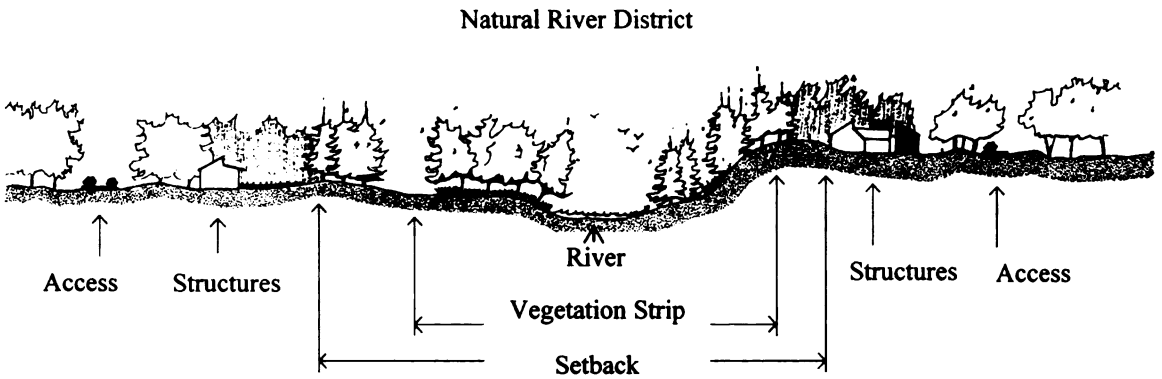


Figure 1 Natural River District Cross Section

It is within the 400 foot-wide Natural River district that all other Natural River protection or development standards also apply (Table 2). In addition to the vegetated buffer, other land use standards within the Natural River district include a minimum lot width and parcel size to control the density of development. Minimum setbacks from the water's edge are required for all structures to reduce impacts to the river and to protect the scenic quality of the river and condition of the vegetated buffer. A septic system setback from the water's edge is also required to reduce nutrient inputs to the river. Types of uses (residential, commercial, etc.) within the district are also limited or prohibited in order to prevent inappropriate land uses near a designated river.

All distances are measured in feet	District Width	Building Setback	Minimum Lot Width	Vegetated Buffer Width	Septic System Setback
Upper Peninsula					
Fox	400	100	330	100	150
Two Hearted	400	100	330	100	100
Northern Lower Peninsula					
Au Sable	400	200/100	200	75/50	150
Betsie	400	200/100	200	50	150
Boardman	400	150/100	200	75/50	100
Jordan	400	200/100	150	100/25	200
Pere Marquette	400	150/100	200	75/50	150
Pigeon	400	200/150	200	100/75	150
Pine	400	150/100	200	100/50	100
Upper Manistee	400	100	200	75	100
Southern Lower Peninsula					
Flat	300	100	100	25	100
Huron	400	125/50	150	50	125
Lower Kalamazoo	300	200	150	50	100
Rogue	300	150/100	200	50/25	150
Rifle	400	150/100	200	75/50	150
White	400	150	200	50	100

Table 2 Summary of Natural Rivers Program Development Standards

When compared to the entire watershed or landscape-scale variables, such as climate, geology, or topography, the relatively narrow zone of influence within the Natural River district will not account for all impacts to a river system that may result from land use changes within a watershed (Zorn and Wiley 2006; Allan 2004). Landscape scale alterations such as urban development or agricultural uses can threaten or influence habitat, water quality, and biota within a river system (Allan 2004; Townsend 2003; Fausch et al. 2002) and may "overwhelm" riparian vegetation (Roth 1996).

However, Gregory et al. (1991) stated, "The importance of riparian zones far exceeds their minor proportion of the land base because of their prominent location

within the landscape and the intricate linkages between terrestrial and aquatic ecosystems" (p.545). The riparian area, floodplains, and riparian vegetation have been found to be important for protecting in-stream communities of macroinvertebrates and natural processes, such as providing inputs of organic matter, including dissolved organic carbon in leaf litter (Findlay et al. 2001), controlling the amount of water entering a stream as runoff (Strayer 2003), and reducing instream nutrient concentrations (Baker et al. 2001).

Protecting the riparian area and its vegetation is important to the biological function and stability of river systems by providing bank stabilization through root systems, inputs of large woody debris, in-stream habitat, organic material, stream shading and reduction of stream temperatures, and reducing stormwater runoff and sediment transport (Lammert and Allan 1999; Roth 1996; Osborne and Kovacic 1993; Karr and Schlosser 1978), which in turn, can influence fish communities (Naiman and Latterell 2005). Headwater streams and their riparian areas are considered especially important to protect, as they provide the initial sources of stream energy, water, nutrients, sediment, and organic matter to a river system (Gomi et al. 2002; Vanotte et al. 1980). By protecting riparian vegetation, the scenic, aesthetic, and wildlife habitat values associated with natural riparian corridors are also protected (Lovell and Sullivan 2005). Orth and White (1999) claimed it is essential to understand the relationship between riparian areas and stream habitat and to manage and protect them, because an altered riparian area can negatively impact stream habitat.

In addition to the importance of the riparian area, a Natural River designation protects a river's free flowing condition by prohibiting dams and harmful streambank

stabilization projects. Protecting the free flowing condition of a river, or its natural flow regime, can influence the ecologic integrity of the entire river system by affecting water quality and quantity, energy sources, physical habitat, and biotic interactions (Poff et al. 1997).

Program Administration

Currently, the majority of Program staff time is spent on the review and issuance of Natural River zoning permits, monitoring of public and private lands for compliance with the Natural River management plans and administrative rules, working with local units of government to achieve consistent administration of the Program, and coordinated review of other agency projects or permit applications for Program compliance.

However, no specific long-term monitoring or assessment of the natural resource values associated with Natural River designation has been developed or compiled for designated Natural Rivers. Further, the level of Department understanding and support for Natural Rivers Program monitoring, new designations, and other priorities is not known and will be important to assess prior to initiating additional monitoring, outreach, or designation of additional rivers into the Natural River System.

Goals and Objectives

Therefore, the goals of this study were to assess the level of Department knowledge and support for the Natural Rivers Program, prioritize future Program projects, and determine if the effectiveness of a Natural River designation could be monitored and evaluated by reviewing existing data on selected natural resource values of a designated river in Michigan.

My first objective was to conduct an interview of the Department's Management Team (MT) members to assess their program knowledge, support, and priorities, including monitoring, for the Natural Rivers Program. My second objective was to review and evaluate existing data from three selected values of water quality, the fishery, and the condition of the riparian area of the Betsie River to determine if the metrics associated with these values could be used to evaluate and monitor the effectiveness of a Natural River designation.

Taylor et al. (1995) identified project or program evaluation as an important step in the Eight Steps of Project Management process. The eight steps include: goal setting; resource analysis; diagnosis of problems and potentials; plan development; project organization (people, budget, equipment); plan implementation; evaluation of program or project progress; and maintenance of the plan. This research will provide guidance to current Program staff in the development of a program monitoring and assessment plan that will enable future evaluation of the Natural Rivers Program.

METHODS

Management Team Interview

The goal of the interview was to measure the perceptions of the Department's Management Team members regarding the Natural Rivers Program. The interview method was to meet one-on-one with MT members and interview them regarding their knowledge, support, and priorities for the future of the Natural Rivers Program, including Program monitoring. The assessment consisted of a total of ten questions, with questions for each category of interest: program knowledge, program support, resource monitoring, and future priorities (Appendix C).

The interview consisted of a mix of Likert scale and open-ended questions, with an opportunity for follow-up questions by the interviewer or the respondent. All Likert responses were self-reported by the respondents and each interview was recorded for transcription following the interview. Most interview sessions lasted approximately one hour and took place in the privacy of the respondent's office. Two Management Team members were interviewed by telephone and received the interview information through electronic mail prior to the interview.

The Human Research Protection Program deemed this project as exempt, in accordance with federal regulation for projects exempt from the Institutional Review Board review (Appendix D). Each respondent was provided with a research participant and consent form to read and sign prior to participating in this research (Appendix E).

For this study, the respondents included 14 members from two of the Department's Management Teams: nine members from the Executive Division and five members from Fisheries Division. The Executive Division MT members interviewed included the Director, Resource Deputy Director, Chief of Staff, Office of Communications Chief, and the five resource managing Division Chiefs representing: Fisheries; Wildlife; Forest, Mineral, and Fire Management; Parks and Recreation; and Land and Facilities. The Fisheries Division MT members included three of the four Great Lakes Basin Coordinators (Superior, Michigan, Erie), the Fish Production and Tribal Coordination Manager, and the Fisheries Research Manager (Figure 2).

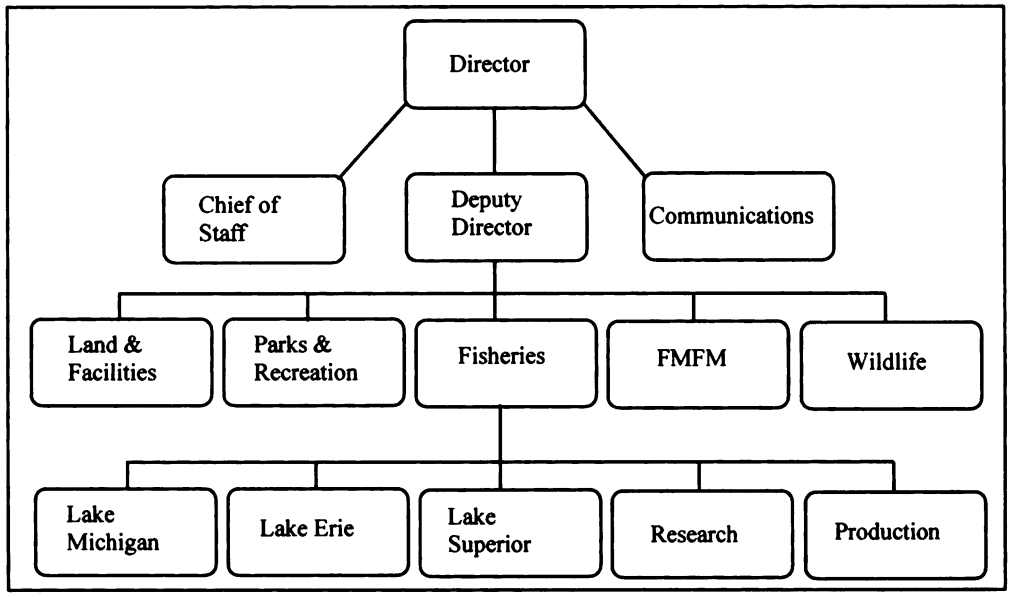


Figure 2. Organizational Chart for the Management Team Interview

The objective of the agency interviews was to assess the MT members' knowledge and understanding of the Natural Rivers Program, their support for the Program, and their priorities for the future of the Program, including monitoring. The purpose of the first objective was to establish the level of knowledge and understanding that MT members had regarding the program. The results of this objective would help determine what additional information and education would be needed to improve the level of agency Program knowledge.

The second objective was to determine the level of agency support that exists for the program. Results from this objective would help establish areas of focus for additional internal efforts in order to develop greater agency-wide buy-in and support for the Program. The third objective was to identify what priorities the MT members felt would be most important for the Program to address in the future. Results from this objective would help establish Program work plans and priorities for the future. Resource monitoring was specifically addressed to assess if there was MT support for the

development of resource monitoring, in addition to current compliance monitoring. Results would establish the priority level of Program monitoring for the next 12 months.

Program Knowledge

Respondents were asked to rate themselves regarding familiarity with and understanding of the Natural Rivers Program. Program familiarity was defined simply as awareness of the Program. Program Understanding was defined as knowledge of how the Program functioned administratively day-to-day. In response to questions regarding program familiarity and understanding, all respondents indicated they had some level of familiarity with the program, as well as an understanding of how the program functioned day-to-day. Seventy-one percent of MT members rated themselves as at least moderately familiar with the program, and 58% rated themselves with at least a moderate amount of understanding of how the Program functioned. Only one MT respondent reported having no understanding of how the program functioned (Figures 3 and 4).

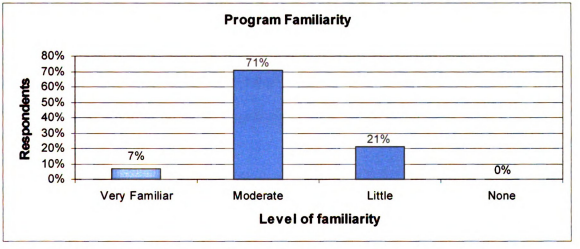


Figure 3. Management Team Response for Program Familiarity

Using a bivariate correlation, responses for familiarity and understanding were compared with a result of (Pearson's r= 0.636). The correlation between the amount of

familiarity and the degree of understanding was strong enough to be statistically significant, even with the small sample size. The majority of respondents rated themselves with a relatively equal amount of familiarity and understanding of the Program.

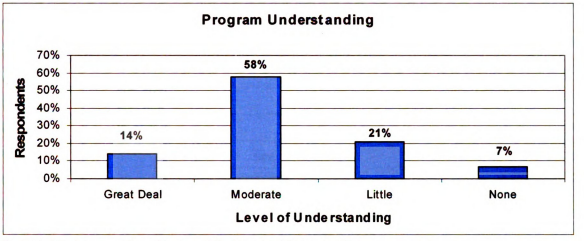


Figure 4. Management Team Response for Program Understanding

Ninety-three percent of MT members stated they had participated in some type of recreational experience, such as hiking along or canoeing and fishing on a Natural River. Seventy-two percent reported having had a work-related Natural River experience with the Program. Those respondents who rated themselves as only a little familiar with the Program (21%) reported no work-related experience with the Program.

Program Support

Respondents were also asked to report their support for the program. Eighty-six percent of respondents rated themselves as strongly supportive of the program, regardless of potential impacts that Natural River designation may have on other Department programs (Figure 5). The remaining 14% of respondents expressed moderate support for the Program, with one citing the "need for developing greater public awareness and support in order to gain [their] strong support." One strong supporter stated "their

support could change, however, depending on whether or not staff personalities or Department cultural issues, such as working in silos (Divisions), could be mitigated," indicating that a holistic management approach where all Division input is considered would be preferred over single Division or Program control.

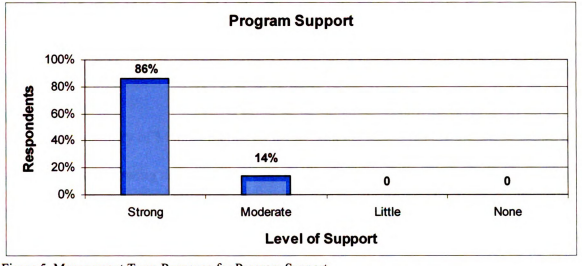


Figure 5. Management Team Response for Program Support

Forty percent of strong supporters of the program specifically added that Natural River standards had less of an impact on other Department programs than many perceive. They mentioned the perceived loss of timber harvest or wildlife management opportunities as examples. Another strong supporter commented that, "it is better to protect the intact, rather than try to fix what is broken," when talking about river and resource protection.

Program familiarity and understanding both were positively correlated with Program support. The correlation between familiarity and support was r=(0.522) and was statistically significant. The correlation between understanding and support was less significant, but was still a positive correlation at r=(0.290). Respondents with even a

little or moderate amount of understanding or familiarity with the Program were still rating themselves as strong supporters of the Program.

In an additional measure of Program support, 64% of respondents thought the Program could improve in its administration of ecosystem management principals specifically by working more within the Department's Statewide Council and eco-team process. Statewide Council would provide an opportunity for other Divisions to consider and comment on Natural Rivers Program issues.

Values

The majority of Management Team respondents identified the values of ecologic, scenic, and free flowing as being most important when thinking about the character of a Natural River. Recreation, fish, and the floodplain were other highly ranked values (Figure 6).

Seventy-one percent felt that the ecologic value was most important because it represented a functioning river system, floodplain, and riparian area that would support good water quality, and appropriate and diverse populations of fish and wildlife. One MT member stated, "If we do a good job protecting the riparian area and its ecologic function, then we will have good fish and wildlife populations." Others mentioned "it is a synthesis of many values" and a "self-sustaining system over time." When considering their reply, one respondent commented that "the statute was very progressive for its time in considering all the values that it incorporates, including ecologic."

The scenic value of a designated river was also considered important as respondents felt "they would not want to encounter many man-made structures or mowed lawns to the water's edge" while on a designated river and "would expect a naturally vegetated river bank and floodplain." A Management Team member reported, "The

scenic value was important because everyone likes to be in a beautiful area." Sixty-four percent rated the scenic value as one of their top three values, second only to ecologic.

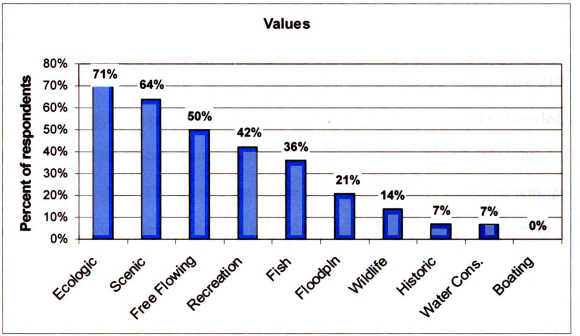


Figure 6. Management Team Response for Program Values

A respondent who rated recreation high felt it was important because "recreation can provide an opportunity to talk with other river users about the Natural River designation and point out why the river is special." Fifty percent also thought some of the values could be combined together or would be integrated when protecting broader values, such as ecologic or scenic.

Free flowing was identified by fifty percent of MT members as important. They felt the natural function of a river would be protected if there were no additional dams built and encouraged removal of any unnecessary dams. They also felt that river dependent recreational values would be protected through preserving the free flowing value of a river. As one MT member stated, "Nature should rule the system, not man-made structures like dams and seawalls."

When discussing values, respondents focused on one of two categories; system function vs. system services. Seventy-one percent focused on a naturally functioning ecosystem as being important, while 29% discussed public access, river dependent recreational activities, and the "human engagement with the resource." Also, those 21% who self reported little or no understanding of the Program had a great deal of knowledge and understanding of ecosystem processes and function and how they related to the Natural River values. This level of knowledge and understanding of ecological principals and Natural River values may be what led to their high level of Program support even with little Program knowledge.

Priorities

Respondents were also asked to prioritize a list of potential Natural River projects for the next twelve months of the program. A list of potential projects was provided to serve as a starting point for the discussion and additional projects ideas could be included by the respondents (Appendix F). Updating existing outreach and education documents was chosen by 64% of MT members as a priority for the Program. Fifty-seven percent identified updating existing rules and management plans as another priority (Figure 7). Development of Program monitoring was also high on the priority list and was chosen by 50% of the MT. Respondents, however, were concerned with current staffing levels and budget constraints as a limiting factor when considering projects like increased monitoring or new designations. Raising the public's awareness about the Program and its accomplishments was also seen as important. One MT member felt, "No matter what

priority project is chosen, it should be done in a manner to raise public awareness about the Program."

Providing greater assistance to local units of government and developing new designations were mentioned 28% of the time. The Program is responsible for oversight and assistance to local units of government who choose to administer the Program within their jurisdiction. Greater oversight would help to maintain statewide Program consistency. New designations were also seen as requiring a great deal of staff time, but would be a higher priority once the existing Program documents were up-to-date. Updated Program materials were considered important to the success of additional designated rivers.

Partnering with local units or stakeholder groups was identified as critical in an effort to develop long-term, grass roots support for the Program. "Development of local support and local leadership during designation is critical for the Program," stated more than one MT member. Others felt that creating greater Program visibility and local buy-in would be necessary for any successful new designations.

Several members mentioned development of an economic study though a university partnership to be essential. The study would highlight the benefits of designation to help convince both the legislature and local units of the positive aspects of the Program. An economic study could provide evidence of the economic benefit that designation can have on a region or community. This would include promotion of the Program from a statewide benefit perspective.

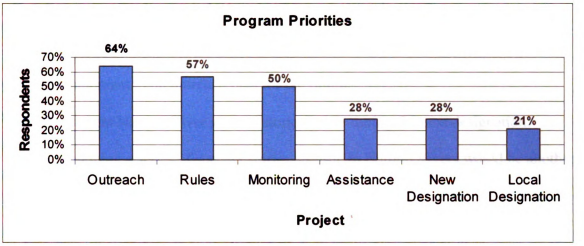


Figure 7. Management Team Response for Program Priorities

Several additional projects that were not on the list (Appendix F) were mentioned by individual Management Team members and are listed below. Several are good projects and could be included within Program priorities in the near future.

- Prioritization of the next rivers to be designated as Natural Rivers. This project would begin to develop the next phase of Natural River designations and could potentially define the complete Natural River system for Michigan.
- Integrate the Program into the Statewide Council and eco-team process. By working within statewide council, greater Department recognition and buy-in could be developed.
- Develop greater partnering with local support groups on designated rivers. The idea was to empower local groups to provide additional on the ground work for the benefit of each river, including monitoring.
- Foster sponsors for increased outreach and education products. This project would utilize partners to develop and distribute outreach and educational products that promote the Natural Rivers Program.

- Monitor our outreach and education efforts and products. This project would review the effectiveness of our current outreach effort and recommend development of an outreach plan for the future.
- Document Natural River success stories to use during the next designation. Developing a series of success stories specific to Natural Rivers would be another promotional tool that would be useful for outreach and during additional river designations.
- Purchase of additional public access on Natural Rivers. This project would identify additional public access needs on Natural Rivers and potential funding sources.

Monitoring

All 14 respondents agreed that resource monitoring and compliance monitoring are important and should be a priority for the Program. A Management Team member stated, "Monitoring may tell us if we are really getting at what we want to achieve, and if not, what needs to be modified." Another member added, "We go through a lot of political capital during a designation, and it's important to point to a Michigan river and provide evidence that we've made a difference." Several members recommended the use of partners as a potential method to develop Program monitoring. Potential partners were identified as Michigan State University faculty and/or students, Michigan Natural Features Inventory staff, Fisheries Division field staff or other Division field staff. Several MT members felt that many grant opportunities exist for resource monitoring. Continuation of compliance monitoring remained the highest priority.

Fifty percent of MT members were concerned that limited staff and budgets would prevent the Program from developing or implementing a resource monitoring plan and re-emphasized the need to utilize partners and share existing data to develop a workable monitoring strategy. At a minimum, the collection of baseline data for each river was seen as important, as was development of a monitoring plan. Respondents recommended several resource metrics they felt would be useful for monitoring, which included use of DEQ's Procedure 51, water quality sampling, survey of the condition of the riparian zone, fish surveys, use of GIS as a monitoring tool, and the identification of a featured wildlife species. Procedure 51 is a qualitative biological and habitat survey protocol for wadable streams in Michigan.

In addition, 65% also mentioned the importance of measuring public acceptance through local interest group or local government support, local promotion of the Program, property value studies, or research of local attitudes as all being important measures of Program success. A Management Team member stated, "Evidence of success comes from support or encouragement from locals for Natural River designation." Measuring public support for the Program will be an important priority in the monitoring of Program success.

In addition to measuring public support, when asked about ecosystem management, 64% of respondents thought the Program could improve in its administration of ecosystem management principals and integration within the Department, specifically by working more within the Department's Statewide Council and eco-team process. Ecosystem management is a Department priority which includes social and economic values when considering ecological management decisions. There

was a positive correlation of r=(0.344) between those who supported developing a social measure of Program success and respondents who felt the Program could improve in its ecosystem management approach. This indicated that MT members are consistent in their position on including a social measure within the administration of the Program.

In consideration of monitoring and the values that MT members identified in the previous section as important, our monitoring plan should consider those highly rated values as priorities to measure and report on their condition.

Interview Summary

The assessment indicated that the Natural Rivers Program is a well recognized program among the Department's Management Team members, with 78% of respondents reporting at least moderate familiarity with the Program. Seventy-two percent of the team members had a moderate level of Program understanding. Eighty-six percent of respondents also indicated a high level of support for the Program within the Department. Department Management Team support in the future will be important when initiating additional river designations and other controversial projects.

In addition, 64% of respondents stated that a greater level of Program understanding, support, and buy-in could be achieved by utilizing the Statewide Council and eco-team process for future planning, rule making, and Natural River designations. Management Team members specifically identified the Statewide Council as the most appropriate forum for addressing Natural River issues on a Department-wide basis due to the council's implementation of a holistic, ecosystem-based strategy for resource management.

Future Program priorities focused on updating existing documents such as management plans, administrative rules, and outreach or educational material. The next most common priority was resource monitoring and increased local assistance. Management team members were also supportive of designating additional rivers following the completion of Program updates and the prioritization of a list of proposed rivers. Sixty-five percent of the MT identified including a social metric in the measurement of program monitoring or success.

Resource Value Assessment

For the evaluation of resource values, water conservation, the fishery, and ecologic were selected as the three values from the Act to be reviewed and evaluated to determine if these metrics could be used to monitor the effectiveness of Natural River designation.

Study Area – the Betsie River

The Betsie River was chosen for this study because it has been a designated Natural River since July of 1973 and included a significant amount of privately owned river frontage. Sixty-eight percent of the river corridor is privately owned, and roughly 75% of the entire watershed is in private ownership. A high percentage of privately owned river frontage was desirable to provide an indication of how effective the Betsie River development standards have been at protecting the river. The length of time that the Betsie has been a designated Natural River was also important to provide a long-term assessment of the Program.

The Betsie River watershed is located in Grand Traverse, Benzie, and Manistee counties in the northwest Lower Peninsula of Michigan (Figure 8). A series of small

lakes and several tributary streams make up the headwaters of the Betsie River that empty into Green Lake near Interlochen before becoming the Betsie River at the Green Lake outfall (Tonello 2004). From there, the Betsie River flows into Grass Lake and then flows in a westerly direction for roughly 52 miles before it enters into Betsie Lake. Betsie Lake then empties into Lake Michigan near Frankfort (Betsie River Plan 1973).

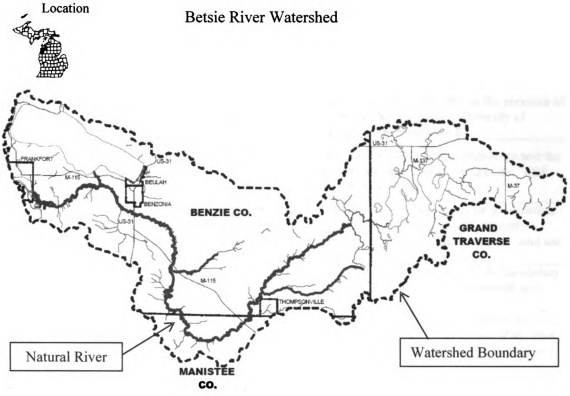


Figure 8. Betsie River Watershed and Natural River Boundary

The Natural River designation of the Betsie River begins at the Grass Lake outfall in Grand Traverse County and continues downstream to the river's mouth at Betsie Lake

in Benzie County. Designation also includes the Little Betsie River and Dair Creek, the system's two largest cold-water tributaries to the mainstream.

Resource Values

The first step in my data collection was to define the 11 resource values found within the Act and to identify measurable metrics for each value (Table 3). From these 11, the resources values of water conservation, fish, and ecologic were selected to assess.

Value	Definition	Metric
Free flowing	Defined in the Act: without impoundment, diversion, straightening, riprapping, or other modification	Presence or occurrence of dams, riprapping, or other streambank modifications (Number of dams, miles of modified shoreline, etc.)
Water conservation	Protection and enhancement of water quality and quantity.	Results of water chemistry testing, habitat assessments, and use of Procedure 51. USGS gauge or other flow data.
Fish	Protection and enhancement of fish communities and their habitat	Data that considers relative abundance, species diversity index, IBI, or the presence of selected or theme species. Diversity of habitat. Use of Procedure 51.
Wildlife	Protection and enhancement of wildlife species and their habitat within the riparian corridor	Data that consider relative abundance and the presence of important or key species. T&E species occurrence.
Ecologic	Variety of biological relationships, interactions, and functions that support fish, wildlife, transfer of energy, and water conservation principles	Various measures depending on the function or relationship of interest, IBI, natural recruitment of LWD. Riparian zone, land use measures. Use of Procedure 51.
Floodplain	Area as defined by FEMA 100 year floodplain area	Inventory and measurement of the floodplain considering gain or loss of floodplain area.
Historic	Historic and cultural attributes	Targeted historic or cultural features are protected or enhanced. Inventory at the time of designation. Aboriginal or other historic sites.
Recreation – Boating	Tradition recreational uses and historic commercial boating operations	DNR permits, inventories, public access use, recreation plans, creel census for effort, user satisfaction.
Scenic - Aesthetic	Protection of important scenic visual condition of the corridor	GIS or on the ground survey of the riparian corridor condition

Table 3. Natural River Values Defined with Metrics

Water Conservation

From the value of water conservation, water quality was identified as the measurable metric, and within water quality, the characteristic of total phosphorus (TP)

was reviewed. An increase in TP can occur as the result of human activity such as waste water discharge, agricultural activity, lawn fertilization, and soil erosion. Excessive levels of TP can cause eutrophication in river systems and result in the loss of in-stream nutrient balances (Osborne and Kovac 1993).

Water quality of the Betsie River at the time of Natural River designation was rated as high. The Michigan Water Resources Commission had developed water quality standards and use designations for the Betsie River (DNR 1973) and the river was to be protected for recreation and total body contact such as swimming; for intolerant fish such as cold water species; for industrial water supply; and agricultural and commercial water supply and other uses (DNR 1969).

Existing Department of Environmental Quality (DEQ) water quality data was reviewed from the Michigan Surface Water Information Management System (MiSWIMS) database which also contains the EPA's STORET legacy data. The data set used was for the Lewis Bridge site in Benzie County, Crystal Lake Township, Section 30, sampling station 100067. Water quality data were collected monthly at the Lewis Road site from 1968 through 1993, which was the longest-term and most comprehensive data set available for the Betsie River. Also included were TP data from three additional studies that were sampled by the DEQ for the years 1994, 1998, and 2003 utilizing the DEQ's Procedure 51, which is a qualitative biological and habitat survey protocol for wadable streams in Michigan and includes TP (Reports 97/082, 99/135, 07/107). At the recommendation of DEQ staff, the monthly TP data were averaged into annual concentration levels and then summarized (Figure 9).

The water quality data indicated that for TP during the time period studied at the Lewis Bridge site, the average yearly TP concentrations within the Betsie River were (24 ug/l), which is below the EPA threshold of (30 ug/l) within the Sub-Ecoregion 56 (USEPA 2000). It appears that TP levels in the Betsie River were at an acceptable level in 2003.

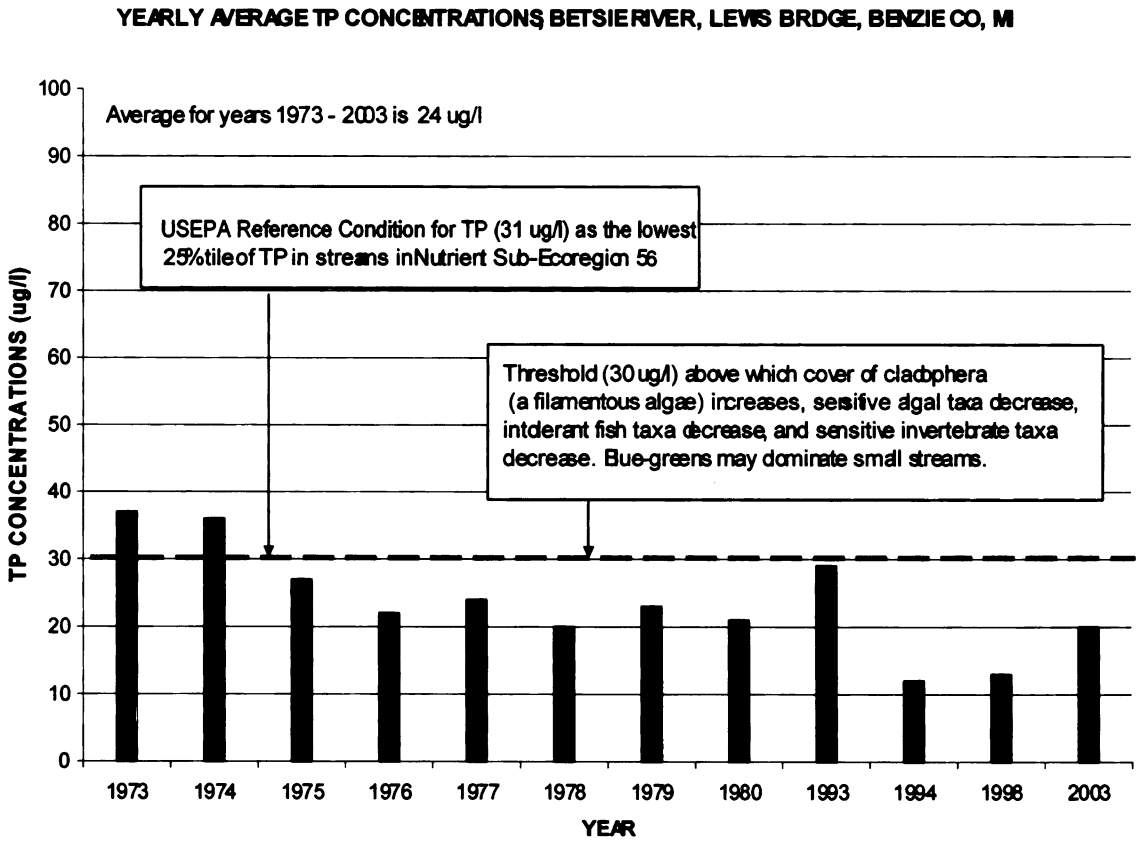


Figure 9. Yearly Average TP Concentrations in the Betsie River

Fish

The condition of the fishery was reviewed as another resource value and a measurable metric for the Betsie River. The rainbow trout, *Oncorhynchus mykiss* was selected as the indicator or key species. The Betsie River is classified as a marginal trout stream because sections of its mainstream and tributaries develop summer water temperatures that are often too warm for most trout species to thrive or survive

(Newcomb and Coon 1997). The high water temperatures are due to the small amount of groundwater the river receives during the summer months (Tonello 2004). However, the Betsie River does support some natural reproduction of both brown *Salmo trutta* and rainbow trout. Chinook *Oncorhynchus tshawytscha,* coho *Oncorhynchus kisutch,* and steelhead *Oncorhyinchus mykiss* are also present in the river (Tonello 2004).

Population estimates for both brown and rainbow trout from 1990 and 1996 ranged from 6.8 to 64.9 brown trout/acre, and from 4.0 to 624.7 rainbow trout/acre (includes stocked fish). Tonello (2004) stated that other northern Michigan trout streams such as the Boardman, Jordan, and Au Sable often have trout densities greater than 500 fish/acre. Due to its marginal summer water temperatures, the Betsie River has been stocked with brown and rainbow trout for many years.

For review of the condition of the fishery, existing stocking evaluation data from the DNR Fisheries Division Fish Collection System database for the years 1990, 1996, 1998, 2003 through 2008 were used. There were no Status and Trends fixed sites or random site surveys in the DNR, Fisheries Division Fish Collection System for the Betsie River. Data for the total numbers of unmarked juvenile steelhead were reviewed as reported by Tonello from 2008 (Tonello, MDNR, unpublished data). Tonello found an increasing number of wild, unmarked juvenile steelhead (Figure 10) and estimated their presence indicates the river's ability to produce large numbers of fry due to desirable habitat conditions, with the majority being produced in the river's cold-water tributaries (Newcomb 1998) or colder sections of the mainstream. Tonello also estimates that many of the wild steelhead are now surviving to smolt and are returning to the river in much

larger numbers than those of stocked fish. Tonello's early estimates are that roughly 75% of returning fish are wild steelhead.

It appears from the existing data that the Betsie River is showing a significant trend of increased wild steelhead production. Even with the river's higher than desired water temperatures, natural reproduction is occurring and adult fish are returning to spawn (Tonello personal communication 2009). It appears that the Betsie River's many habitat attributes may be able to support natural reproduction of steelhead.

Figure 10. Unmarked Steelhead for the Betsie River, Kurik Road

Riparian Buffer

Ecologic was the third value reviewed. For this research, ecologic was defined as the physical condition of the riparian area or Natural River district (NRD). Utilizing a Geographic Information System (GIS) approach, the metric was to measure and compare the change in land use and land cover over time within the 400 foot-wide Betsie River

NRD. Although there are potentially several metrics that could be selected to measure the Ecologic value of the Betsie River, it was important for this research to assess the condition of the buffer and NRD. As described previously, the Natural River development standards apply within the 400 foot-wide district, therefore a measure of the land use and cover condition within the district could be a direct indication of the success of the designation. Increased development of impervious surfaces within watersheds or the NRD can have negative impacts on hydraulic processes and in turn, the ecological processes within streams. Schoonover et al. (2006) identified five hydraulic variables that can be affected by an increase in impervious surface development and impact instream ecological processes, these include stream flow magnitude, duration, frequency, timing, and rate of discharge.

Land use or land cover change within the buffer could be an indication of the lack of adequate NRD protection. Inadequate protection could occur through a violation of the development standards or improper administration of the development standards at the state or local level. However, some change in land use and land cover is to be expected and is permitted according to the previously mentioned development standards in Table 2.

Land use and land ownership data were compared from 1978 and 2001 for the Betsie River watershed (Figures 11 and 12; Tables 4 and 5). Information used to create the maps was from the 1978 MIRIS land cover data and the IFMAP 2001/GAP Lower Peninsula land cover data with a single cell size of $30m^2$. Both a 100 foot-wide and 400 foot-wide buffer clip was taken from the 1978 and 2001 watershed land use data (Figures 13 and 14; Tables 6 and 7). From these two buffer clips, a third comparison clip was

made to highlight the areas of change within the 400 foot-wide Betsie River Natural River District (Figure 15; Table 8).

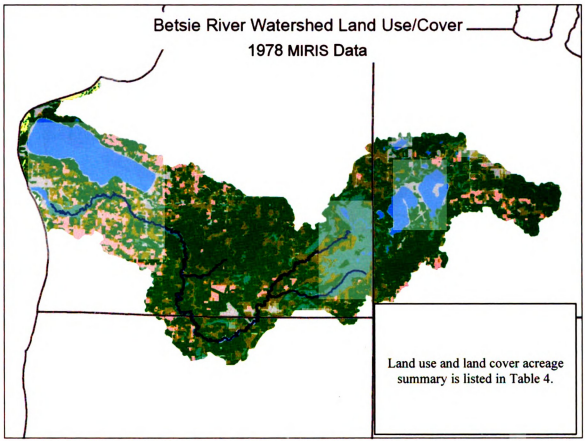


Figure 11. 1978 Betsie River Watershed Land Use, Cover, and Ownership

1978	Acres	Percent
Public Land	39,214.12	25%
Private Land	117,589.16	75%
Total	**156,803**	**100%**
Agriculture	9,390.96	6%
Barren	885.39	0%
Forest Land	79,782.94	51%
Rangeland	29,696.44	19%
Urban	8,747.67	6%
Water	14,889.61	9%
Wetlands	13,410.27	9%
Total	**156,803.28**	**100%**

Table 4. Summary of 1978 Betsie River Watershed Land Use, Cover, and Ownership

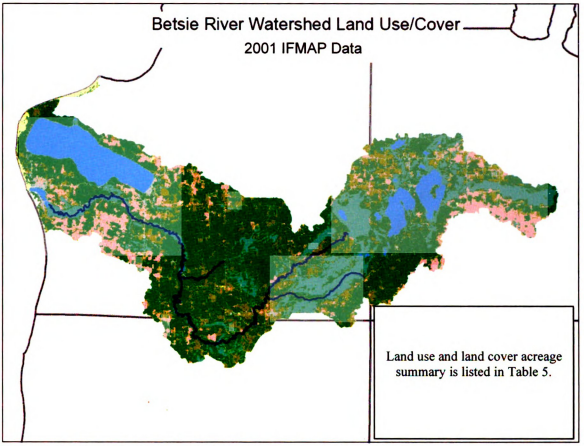


Figure 12. 2001 Betsie River Watershed Land Use, Cover, and Ownership

2001	Acres	Percent
Public Land	39,214.12	25%
Private Land	117,409.59	75%
Total	**156,623.71**	**100%**
Agriculture	11,969.89	8%
Barren	1,209	1%
Forest Land	72,570.41	46%
Rangeland	27,493.25	17%
Urban	5,187.28	3%
Water	14,938.59	10%
Wetlands	23,254.91	15%
Total	**156,623.71**	**100%**

Table 5. Summary of 2001 Betsie River Watershed Land Use, Cover, and Ownership

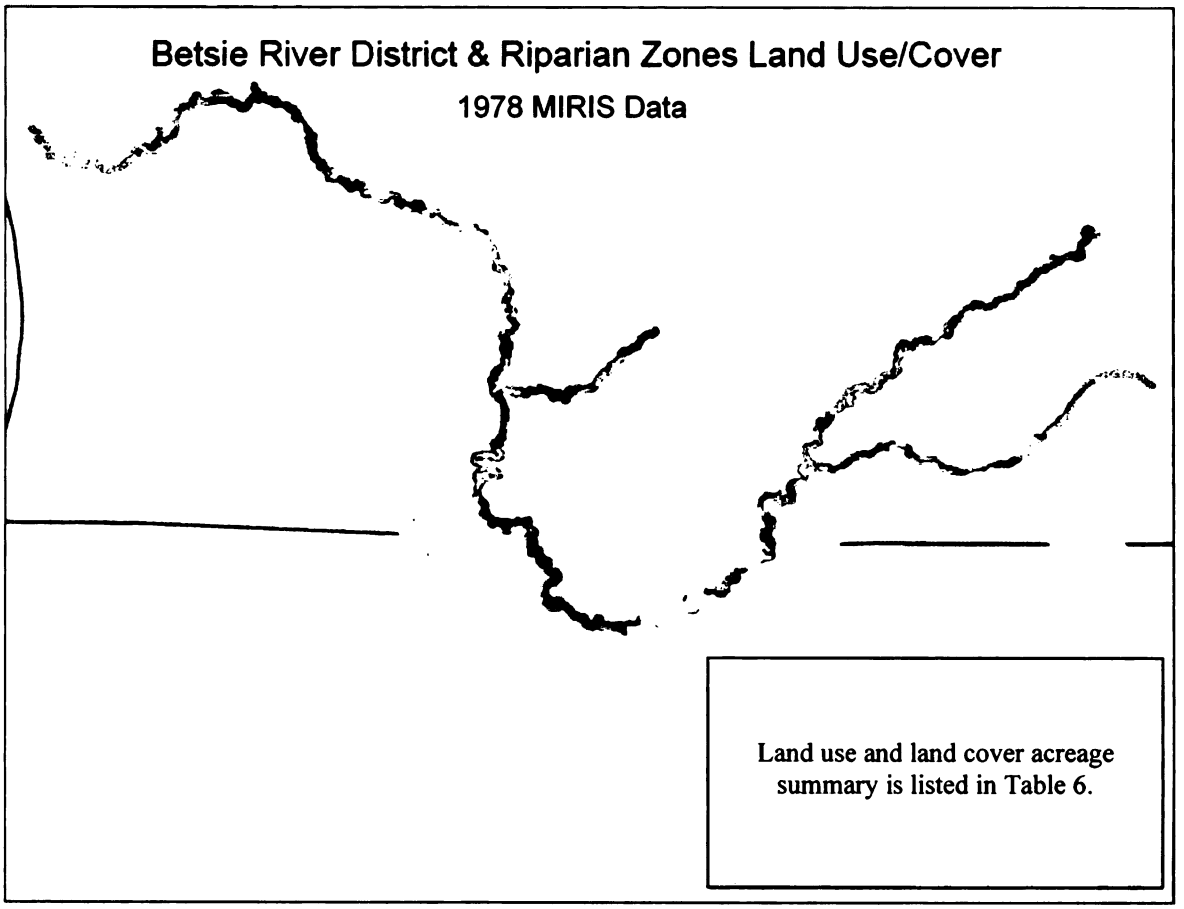


Figure 13. 1978 Betsie River Riparian Buffer Land Use, Cover, and Ownership

1978	100 foot zone	Percent	400 foot zone Acres	Percent
Public Land	466.90	32%	1,683.61	32%
Private Land	971.09	68%	3,519.58	68%
Total	**1,437.99**	**100**	**5,203.69**	**100%**
Agriculture	0.65	0%	16.30	0%
Barren	0.00	0%	0.00	0%
Forest Land	799.18	56%	2,610.64	51%
Rangeland	92.98	6%	750.64	14%
Urban	103.87	7%	408.47	8%
Water	18.94	1%	32.21	1%
Wetlands	422.37	30%	1,385.44	26%
Total	**1,437.99**	**100%**	**5,203.69**	**100%**

Table 6. Summary of 1978 Betsie River Riparian Buffer Land Use, Cover, and Ownership

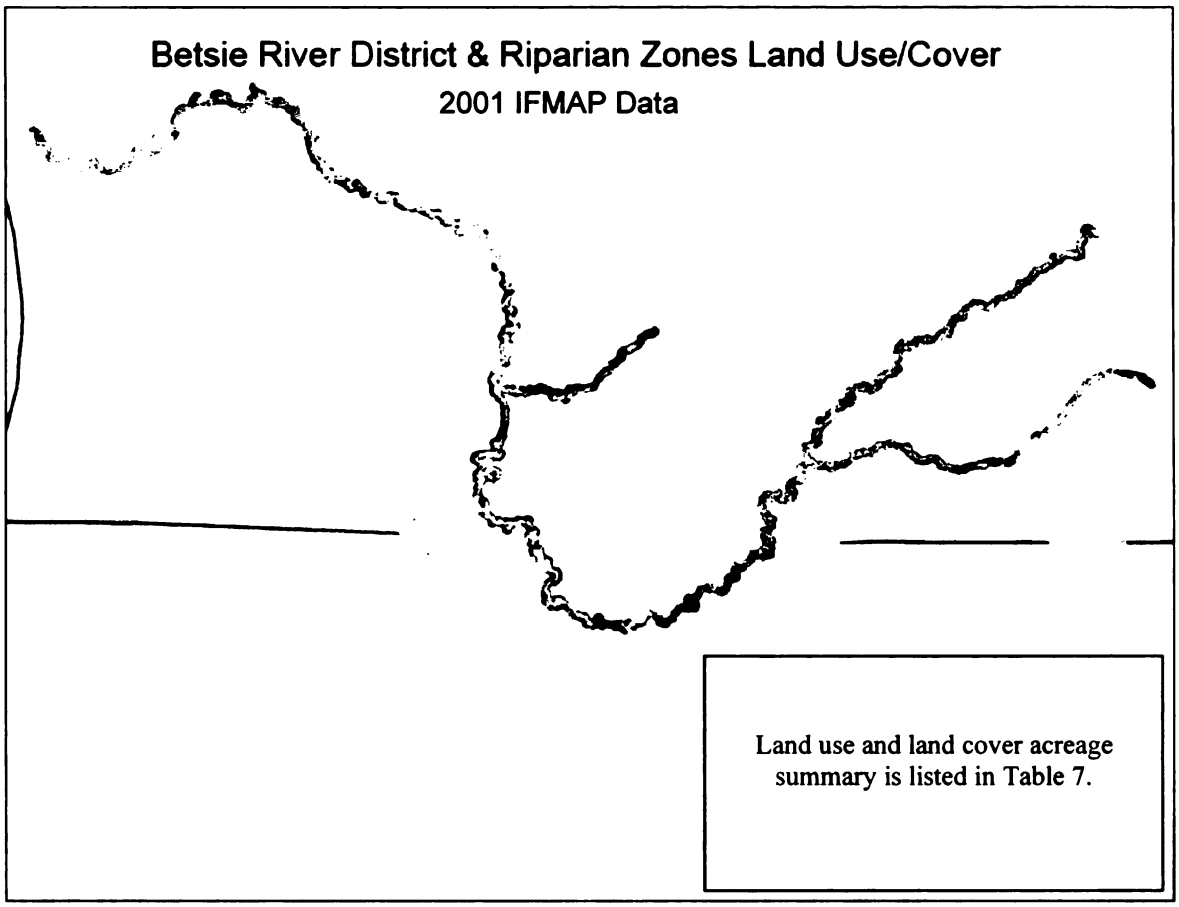


Figure 14. 2001 Betsie River Riparian Buffer Land Use, Cover, and Ownership

2001	100 foot zone	Percent	400 foot zone Acres	Percent
Public Land	466.90	32%	1,683.61	32%
Private Land	971.09	68%	3,519.58	68%
Total	**1,437.99**	**100**	**5,203.68**	**100%**
Agriculture	3.65	0%	59.57	1%
Barren	0.10	0%	3.79	0%
Forest Land	442.61	30%	2073.90	40%
Rangeland	67.25	5%	561.78	11%
Urban	14.39	1%	105.83	2%
Water	17.32	1%	23.81	0%
Wetlands	911.91	63%	2375.00	45%
Total	**1457.43**	**100%**	**5,203.68**	**100%**

Table 7. Summary of 2001 Betsie River Riparian Buffer Land Use, Cover, and Ownership

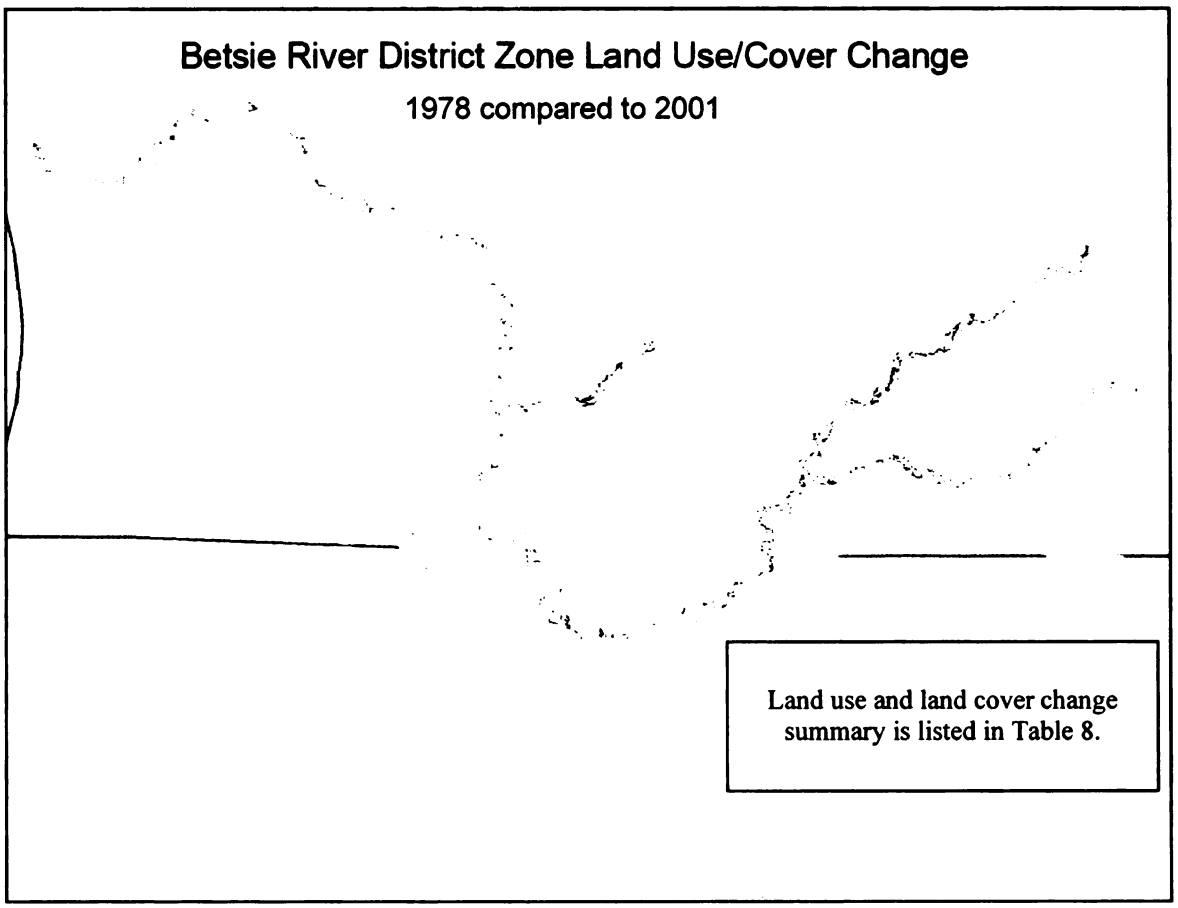


Figure 15. 1978 to 2001 Betsie River Riparian Buffer Land Use Change

	Acres	Percent
No Change	2,655.96	51%
Change to non-developing	2,325.84	45%
Change to developing	221.87	4%
Total	**5,203.67**	**100%**

Table 8. Summary 1978 to 2001 Betsie River Riparian Buffer Land Use Change

Within the 5,203 acres of land within the 400 foot-wide Natural River District, 2,655 acres (51%) showed no change in land use. Between 1978 and 2001, 2,325 acres (45%) showed a change from one non-developed land use to another non-developed use or from one developed land use type to another developed type. Two hundred twenty-one acres (4%) showed a change from non-developed land use type to a developed land

use type (Table 8). The rate of land use conversion for the 23 years between 1978 and 2001 from non-developed land use to developed land use was 9.6 acres/year (0.18%/year) within the NRD.

In an effort to reduce some of disagreement between the 1978 and 2001 land use and land cover data, several of the land use categories were summarized into two general categories of developed (urban, agricultural, barren, rangeland) and non-developed (all types of forest, all wetland types, open water) and compared these two categories. This summarizing accounts for some of the change from one non-developed land use type to another non-developed type in Table 8. The change in urban acreage between 1978 and 2001 highlights the disagreement between the two data sets. Research by Pijanowski (2006) on land use in the Muskegon River watershed in Michigan highlights the disagreement between MIRIS and IFMAP data and the need to consider the potential large discrepancies between the data sets when comparing change over time.

DISCUSSION

Management Team Interview

The agency interview indicated that Department Management Team members had a moderate level of knowledge regarding administration of the Program. The interview also established that MT members had a strong level of support for the Program and its ecosystem management approach and habitat protection role within the Department. A good understanding and strong support will be critical for the Program in moving forward with future planning, rule development, and designation projects which are often controversial for both the Program and Department.

The interview highlighted the need for the Program to engage with the Department's Statewide Council and eco-team management process. This multi-Divisional council has representation of all Department Divisions and is seen as the appropriate forum for addressing Natural Rivers Program issues and for receiving feedback on future planning and prioritization projects. As a result, Statewide Council and/or eco-teams will become the forum for future Natural Rivers Program projects.

MT members also prioritized updating existing Program plans, rules, and documents, but recognized the importance of new designations and greater local assistance. They felt that by being up-to-date, the Program would be more successful on moving ahead with new designations and more effective with outreach efforts to local units of government and property owners in the future.

Resource monitoring was identified by all 14 of the MT members as important to the long-term success of the Program within the Department. They agreed that compliance monitoring remained critical, as it is a major component of the administration of the Program. However, because resource protection and enhancement are goals of the Act, a greater level of resource monitoring and evaluation, in addition to compliance monitoring, should be integrated into the Program. At a minimum, baseline data collection and a monitoring plan should be developed for each designated river, provided current Program staffing and budgets allow for additional projects.

The interview further identified the values that most management team members recognize as important for protecting and enhancing through designation. Ecologic, scenic, and free flowing were identified by at least 50% of the MT member as the most important values to protect through designation. From a Program Manager's perspective,

it was interesting to hear the level of emphasis that was placed on the ecologic value and how the MT members tied it to ecosystem management at the Department level. Reporting on the condition of these highly-rated values will be important to include in a monitoring plan. Also of interest was the importance given to the scenic/aesthetic value. This value may be more qualitative than the others to measure, but it is recognized as a critical component of any Natural River designation. Developing a reliable metric for the scenic/aesthetic values will be important when evaluating the condition of designated rivers and reporting their condition to the MT members.

Water Conservation

As summarized previously, the water quality data collected for the Lewis Bridge site indicated that for TP during the time period studied at the Lewis Bridge site, the average yearly TP concentrations within the Betsie River were (24 ug/l), which is below the EPA threshold of (30 ug/l) within the Sub-Ecoregion 56. This indicates potential good water quality, however, additional water quality measures need to be added to make for a more rigorous water quality sample of the Betsie River.

Long-term water quality data for the Betsie River was limited to the Lewis Bridge site, which has been discontinued since 1993. Since the designation of the Betsie River as a Natural River, water quality in the Betsie River has been monitored by the Department of Environmental Quality at a variety of locations and durations throughout the watershed. DEQ MISWIMS database contains 16 individual reports that include a variety of water quality information, however, only one report provided the long-term data of interest. Unfortunately, this sampling site is no longer in operation.

For the future, the Department of Environmental Quality has developed a surface water monitoring strategy that will include using Procedure 51, which is their qualitative biological and habitat survey protocol for wadable streams in Michigan. In order to develop a long term consistent water quality monitoring process, partnering with the DEQ to develop a monitoring plan for the Betsie and other Natural Rivers will be a Program priority, and reliance on DEQ staff expertise for a routine summary of water measures will be critical. Use of the Procedure 51 protocol would be a better measure than only the water chemistry data presented within this research. Procedure 51 samples multiple values that are important to the Natural Rivers Program, including macroinvertebrates, fish communities, habitat status, non-point source information, as well as water chemistry. The habitat metric includes condition of the bank and riparian area, channel condition and in-stream cover and substrate composition.

Fish

The fisheries data for the Betsie River was somewhat limited for the rainbow trout or steelhead, which was the indicator or key species selected. The Betsie River does not support a large resident population of rainbow or brown trout, although both are present in the river. The river does, however, support a good steelhead fishery and is heavily managed for steelhead, and therefore, they became the focus of the data collection in this research.

It appears from the current steelhead data that the Betsie River is showing a significant trend of increased wild steelhead production. Even with the river's higher than desired water temperatures, natural reproduction is occurring and adult fish are returning to spawn (Tonello, personal communication 2009). It appears that the Betsie

River's overall habitat attributes may be supporting natural reproduction of steelhead. However, Fisheries Division staff continue to monitor steelhead reproduction and adult returns.

An argument could be made that with the marginal stream temperatures, Natural River protection is even more important for the Betsie, since any additional impacts, no matter how minor, could cause significant changes within the river system. Changes of any kind, even slight ones, could push conditions outside the range of steelhead survival. As mentioned previously, partnering with Fisheries Division field staff to develop a plan for monitoring the fishery values of all designated rivers and selecting the appropriate key species depending on the river system will be critical to the success of a monitoring program. The potential for combining or partnering with DEQ staff and their Procedure 51 fish collection data may be useful for a Natural Rivers monitoring protocol.

Riparian Buffer

The GIS project showed promise as a tool for the Program to remotely monitor and evaluate the changing condition of the watershed and riparian buffer. This information could prove useful for monitoring land use change within the Natural River District and could focus field monitoring efforts to those areas indicating the greatest amount of land use change. The spatial representation of the land use and land use change within the watershed and corridor could serve as powerful education and outreach tools during Natural River public meetings. A comparison between designated and non-designated rivers would be possible using the GIS tool.

As noted previously, of the 5,203 acres of land within the 400 foot-wide Natural River District, 2,655 acres (51%) showed no change in land use and 2,325 acres (45%)

showed a change from one non-developed land use to another non-developed use or from one developed land use type to another developed type. A total of 221 acres (4%) showed a change from non-developed land use type to a developed land use type.

Limits to the accuracy of the current buffer comparison in this study are the result of comparing two different methods of original data creation for the land cover information used. The 1978 data was derived from hand digitized CAD files that have been converted into a GIS format. The 2001 data was derived from automated classification of satellite imagery. Comparing the two data sets will not result in a completely accurate image. There also exists a 1992 data set which was created using a different method than the 2001 data, so comparing those years would also result in some uncertainty. I chose to use the 1978 data because it was closer in time to the Natural River designation date of 1973 for the Betsie River. Comparing the 1978 data to the 2001 data would provide the greatest time span for change to occur. For any future mapping of additional rivers, I would also use the 1992 data for a second comparison.

The mapped area for the Betsie that indicated change in land use from non-developed to developed should be put to use and ground checked for accuracy of the data and for compliance with the Natural River development standards, realizing the significant amount of variation in the data sets. As with the collection of other resource data, partnering with other Department staff with the knowledge and expertise to help answer our GIS question will be of great benefit. Developing a complete set of Natural River District buffer land use maps may be the initial step in developing a long term monitoring and evaluation plan if reliable data sets can be used for comparison.

Acquiring data of a finer scale for review of the Natural River District would be of greater benefit for this method of assessment.

The resource monitoring data collection exercise was important in order to begin to understand the complexity of gathering and evaluating resource data that could be used evaluate the Natural Rivers Program. Understanding the resource questions to ask and where to find the data to answer the questions will require a team approach and involve team members from other Departments, Divisions and agencies. This research indicates that existing resource data can be used to monitor and assess certain resource values. However, it is clear that not all the Natural River values will have data available for assessment and monitoring.

Fortunately, the Management Team members supported the Natural Rivers Program and the concept of resource monitoring and have recommended the Statewide Council and eco-teams as the appropriate forum from which to initiate future projects that require Department-wide involvement. The important task will be to identify the necessary information needed to develop a monitoring plan that will reflect the condition of the resource and performance of the Natural River designation. The metrics contained in Table 3 will provide the basis for a monitoring plan.

CONCLUSION

My overall goal with this research was to provide a foundation for advancing the Natural Rivers Program forward into its next decade of riparian and river habitat protection in Michigan. I wanted to explore the level of knowledge and support for the Program within the Department and review several selected values from the Act for their potential as resource monitoring metrics. As a result of this research, the Natural Rivers

Program may be in a more Department integrated, resource oriented, socially acceptable, and legislatively sustainable position for the future.

Beyond the results from the agency interview, the opportunity to discuss the Natural Rivers Program in a one-on-one setting with all of the members of the Executive Division Management Team and the Fisheries Division Management Team was a unique opportunity. As a result of the interviews, all Management Team members may have a greater recognition of the Program values and benefits, and I have a greater appreciation for the multiple perspectives and diversity of the Management Team. The awareness that the Management Team has regarding the Program will make future Natural River policy implementation across Division lines more efficient and effective. Personally and professionally I have benefited from the opportunity to listen to the Management Team member's perceptions and comments about the Program and will apply their insights into the administration of the Program in the future. The Natural Rivers Program will benefit from the support and direction that Management Team members provided during the Management Team Interviews.

RECOMMENDATIONS

As a result of this research, Natural River Program staff will begin to utilize Statewide Council when Program issues arise that involve other Division staff or may impact management of other Division programs. In order to stay current with Statewide Council, the Program should utilize this forum for information items, as well as issue items.

The Program will also begin development of an assessment and monitoring plan for all Natural Rivers that would link the Program values to an appropriate metric to

determine the current status of the resource. Using the metrics from Table 3 as a starting point, I recommend using an existing protocol, like Procedure 51, to measures multiple resource values within one process. Measures of in-stream habitat, riparian zone condition, and fish species richness would be inclusive of multiple values and provide a good indication of the condition of the Program values. Given the limited resources within state government, our monitoring will have to be effective at determining the condition of multiple resource values with the fewest number of metrics. I will present the monitoring plan concept to the Fisheries Division Management Team for their information and guidance and utilize the Statewide Council as appropriate. The monitoring plan should incorporate ecological, social, and economic metrics to the extent possible. Program staff will also initiate development of an economic impact study for the Natural Rivers Program through Michigan State University, PERM staff as a component of a long term monitoring strategy.

The revision and update of a comprehensive administrative rule package will also be completed. This process will include presenting the rule update plan and package to the Statewide Council for their information. A comprehensive rule set has been drafted and is ready for initiation through the formal rules review process. In addition to the rule package, a revision and update of Program outreach and education products is needed, including the Natural Rivers web page. Up-to-date outreach products will be critical to the success of any future designation campaign.

Program staff will also initiate the completion of a draft strategy for prioritizing a list of proposed rivers for Natural River designation. This strategy will include a criteria list for the next designated rivers. Even though the Management Team did not rate new

designations as the highest priority, a prioritization of proposed Natural Rivers was seen as important and will become a higher priority following the completion of Program updates. It will be a Program goal that the priority list of designated rivers develops into the complete system of designated Natural Rivers in Michigan.

There is the potential to expand the respondent group to be surveyed regarding the Natural Rivers Program. Potential groups may include the Natural Resources Commissioners, eco-team members, Divisional field staff, local unit of government officials affected by Natural Rivers, property owners, watershed councils, restoration committees, and other constituent groups with an interest in designated Natural Rivers. The survey could be modified depending on the respondent group being surveyed.

Program staff should also begin to share information more actively with other states regarding the Natural Rivers resource assessment and monitoring plan. Thirty-three other states have river protection programs modeled after the federal Wild and Scenic Rivers Act. There exists a great potential to network with other states involved in similar programs.

APPENDIX A

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT (EXCERPT)

Act 451 of 1994

PART 305

NATURAL RIVERS

324.30501 Definitions. [M.S.A. 13a.30501]

Sec. 30501. As used in this part: (a) "Free flowing" means existing or flowing in natural condition without impoundment, diversion, straightening, riprapping, or other modification.

(b) "Natural river" means a river that has been designated by the department for inclusion in the wild, scenic, and recreational rivers system.

(c) "River" means a flowing body of water or a portion or tributary of a flowing body of water, including streams, creeks, or impoundments and small lakes thereon.

(d) "System" means all of those rivers or portions of rivers designated under this part.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30502 Natural river; designation; purpose; long-range plans; publicity; cooperation. [M.S.A. 13a.30502]

Sec. 30502. The department, in the interest of the people of the state and future generations, may designate a river or portion of a river as a natural river area for the purpose of preserving and enhancing its values for water conservation, its free flowing condition, and its fish, wildlife, boating, scenic, aesthetic, floodplain, ecologic, historic, and recreational values and uses. The area shall include adjoining or related lands as appropriate to the purposes of the designation. The department shall prepare and adopt a long-range comprehensive plan for a designated natural river area that sets forth the purposes of the designation, proposed uses of lands and waters, and management measures designed to accomplish the purposes. State land within the designated area shall be administered and managed in accordance with the plan, and state management of fisheries, streams, waters, wildlife, and boating shall take cognizance of the plan. The department shall publicize and inform private and public landowners or agencies as to the

plan and its purposes, so as to encourage their cooperation in the management and use of their land in a manner consistent with the plan and the purposes of the designation. The department shall cooperate with federal agencies administering any federal program concerning natural river areas, and with any watershed council established under part 311, when such cooperation furthers the interest of the state.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30503 Qualifications for designation; categories of rivers. [M.S.A. 13a.30503]

Sec. 30503. A river qualifying for designation as a natural river area shall possess 1 or more of the natural or outstanding existing values cited in section 30502 and shall be permanently managed for the preservation or enhancement of such values. Categories of natural rivers shall be defined and established by the department, based on the characteristics of the waters and the adjoining lands and their uses, both as existing and as proposed, including such categories as wild, scenic, and recreational. The categories shall be specified in the designation and the long-range comprehensive plan.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30504 Land acquisition; purpose; interest acquired; consent. [M.S.A. 13a.30504]

Sec. 30504. The department may acquire lands or interests in lands adjacent to a designated natural river for the purpose of maintaining or improving the river and its environment in conformance with the purposes of the designation and the plan. Interests that may be acquired include, but are not limited to, easements designed to provide for preservation and to limit development, without providing public access and use. Lands or interests in lands shall be acquired under this part only with the consent of the owner.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30505 Federal financial assistance programs; leases; expenditures; purposes. [M.S.A. 13a.30505]

Sec. 30505. (1) The department may administer federal financial assistance programs for natural river areas.

(2) The department may enter into a lease or agreement with any person or political subdivision to administer all or part of their lands in a natural river area.

(3) The department may expend funds for works designed to preserve and enhance the values and uses of a natural river area and for construction, management, maintenance, and administration of facilities in a natural river area conforming to the purposes of the designation, if the funds are appropriated by the legislature.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30506 Public hearings; notice. [M.S.A. 13a.30506]

Sec. 30506. Before designating a river as a natural river area, the department shall conduct public hearings in the county seat of any county in which a portion of the designated natural river area is located. Notices of the hearings shall be advertised at least twice, not less than 30 days before the hearing, in a newspaper having general circulation in each such county and in at least 1 newspaper having general circulation in the state and 1 newspaper published in the Upper Peninsula.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30507 Land uses; zoning; local ordinances; state rule. [M.S.A. 13a.30507]

Sec. 30507. After designation of a river or portion of a river as a natural river area and following the preparation of the long-range comprehensive plan, the department may determine that the uses of land along the river, except within the limits of an incorporated municipality, shall be controlled by zoning contributing to accomplishment of the purposes of this part and the natural river plan. County and township governments are encouraged to establish these zoning controls and additional controls as may be appropriate, including, but not limited to, building and subdivision controls. The department may provide advisory, planning, and cooperative assistance in the drafting of

ordinances to establish these controls. If the local unit does not, within 1 year after notice from the department, have in full force and effect a zoning ordinance or interim zoning ordinance established under authority of the acts cited in section 30510, the department, on its own motion, may promulgate a zoning rule in accordance with section 30512. A zoning rule may also be promulgated if the department finds that an adopted or existing zoning ordinance fails to meet adequately guidelines consistent with this part as provided by the department and transmitted to the local units concerned, does not take full cognizance of the purposes and objectives of this part, or is not in accord with the purposes of designation of the river as established by the department.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30508 Zoning ordinance or rule; purpose. [M.S.A. 13a.30508]

Sec. 30508. A zoning ordinance adopted by a local unit of government or a zoning rule promulgated by the department shall provide for the protection of the river and its related land resources consistent with the preservation and enhancement of their values and the objectives set forth in section 30502. The ordinance or rule shall protect the interest of the people of the state as a whole. It shall take cognizance of the characteristics of the land and water concerned, surrounding development, and existing uses and provide for conservation of soil, water, stream bed and banks, floodplains, and adjoining uplands.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30509 Zoning ordinance or rule; establishment of districts; powers; distance. [M.S.A. 13a.30509]

Sec. 30509. The ordinance or rule shall establish zoning districts within which such uses of land as for agriculture, forestry, recreation, residence, industry, commerce, and additional uses may be encouraged, regulated, or prohibited. It may limit or prohibit the placement of structures of any class or designate their location with relation to the water's edge, to property or subdivision lines, and to flood flows and may limit the subdivision of lands for platting purposes. It may control the location and design of highways and roads and of public utility transmission and distribution lines, except on lands or other interests in real property owned by the utility on January 1, 1971. It may prohibit or limit the cutting of trees or other vegetation, but such limits shall not apply for a distance of more than 100 feet from the river's edge. It may specifically prohibit or limit mining and

drilling for oil and gas, but such limits shall not apply for a distance of more than 300 feet from the river's edge. It may contain other provisions necessary to accomplish the objectives of this part. A zoning rule promulgated by the department shall not control lands more than 400 feet from the river's edge.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30510 Local zoning ordinance; conformance with applicable law; construction.

Sec. 30510. A local unit of government, in establishing a zoning ordinance, in addition to the authority and requirements of this part, shall conform to the township zoning act, 1943 PA 184, MCL 125.271 to 125.310, or the county zoning act, 1943 PA 183, MCL 125.201 to 125.240, including, but not limited to, the variance provisions of those acts. Any conflict shall be resolved in favor of the provisions of this part. The powers granted under this part shall be liberally construed in favor of the local unit or the department exercising them, in such manner as to promote the orderly preservation or enhancement of the values of the rivers and related land resources and their use in accordance with a long-range comprehensive general plan to ensure the greatest benefit to the state as a whole.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 ;--Am. 2000, Act 17, Imd. Eff. Mar. 8, 2000 .

Popular Name: Act 451

324.30511 Districts; valuation for tax purposes. [M.S.A. 13a.30511]

Sec. 30511. Upon adoption of a zoning ordinance or rule, certified copies of the maps showing districts shall be filed with the local tax assessing officer and the state tax commission. In establishing true cash value of property within the districts zoned, the assessing officer shall take cognizance of the effect of limits on use established by the ordinance or rule.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30512 Rules; enforcement; promulgation; variance; existing use.

Sec. 30512. (1) The department shall prescribe administrative procedures and rules and provide personnel as it considers necessary for the enforcement of a zoning ordinance or rule enacted in accordance with this part. A circuit court, upon petition and a showing by the department that there exists a violation of a rule properly promulgated under this part, shall issue any necessary order to the defendant to correct the violation or to restrain the defendant from further violation of the rule.

(2) The department shall promulgate a zoning rule to implement this part. The rule shall include procedures for receiving and acting upon applications from local units of government or landowners for change of boundaries or change in permitted uses in accordance with chapter 4 of the administrative procedures act of 1969, 1969 PA 306, MCL 24.271 to 24.287. An aggrieved party may seek judicial review under chapter 6 of the administrative procedures act of 1969, 1969 PA 306, MCL 24.301 to 24.306.

(3) A variance from a zoning rule promulgated by the department to implement this part may be applied for and granted pursuant to section 4 of the uniform condemnation procedures act, 1980 PA 87, MCL 213.54, and the variance provisions of the zoning rule.

(4) The lawful use of any building or structure and of any land or premise as existing and lawful at the time of enactment of a zoning ordinance or rule or of an amendment of a zoning ordinance or rule may be continued although the use does not conform with the ordinance, rule, or amendment. The ordinance or rule shall provide for the completion, restoration, reconstruction, extension, or substitution of nonconforming uses upon reasonable terms as set forth in the zoning ordinance or rule.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 ;--Am. 2000, Act 17, Imd. Eff. Mar. 8, 2000 .

Popular Name: Act 451

324.30513 National wild and scenic river system; administration. [M.S.A. 13a.30513]

Sec. 30513. This part does not preclude a component of the system from becoming a part of the national wild and scenic river system under the wild and scenic rivers act, Public Law 90-542, 16 U.S.C. 1271 to 1287. The department may enter into written cooperative agreements for joint federal-state administration of rivers that may be designated under the wild and scenic rivers act.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

324.30514 Area plans; approval; rules. [M.S.A. 13a.30514]

Sec. 30514. The department shall approve preliminary and final plans for site or route location, construction, or enlargement of utility transmission lines, publicly provided recreation facilities, access sites, highways, roads, bridges, or other structures and for publicly developed water management projects, within a designated natural river area, except within the limits of a city or incorporated village. The department may require any measure necessary to control damaging erosion or flow alteration during or in consequence of construction. The department shall promulgate rules concerning the approvals and requirements provided for in this section.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

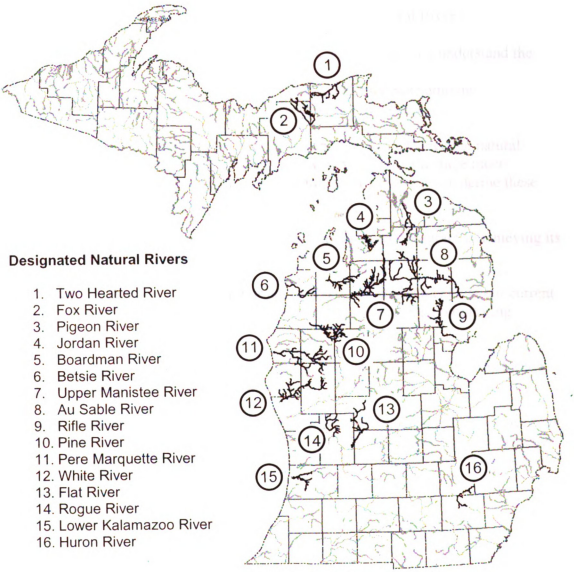
324.30515 Construction of part. [M.S.A. 13a.30515]

Sec. 30515. This part does not prohibit a reasonable and lawful use of any other natural resource that benefits the general welfare of the people of this state and that is not inconsistent with the purpose of this part.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995 .

Popular Name: Act 451

Michigan Designated Natural Rivers



Designated Natural Rivers

1. Two Hearted River
2. Fox River
3. Pigeon River
4. Jordan River
5. Boardman River
6. Betsie River
7. Upper Manistee River
8. Au Sable River
9. Rifle River
10. Pine River
11. Pere Marquette River
12. White River
13. Flat River
14. Rogue River
15. Lower Kalamazoo River
16. Huron River

APPENDIX C

Natural Rivers Program Interview

(1) How familiar are you with the Natural Rivers Program?

Not at all familiar	Moderately familiar
A little bit familiar	Very familiar

(2) Do you have any personal experience with a designated Natural River?

(3) Given your level of familiarity with the Program, how well do you understand the Program?

Don't understand at all	Understand a moderate amount
Understand a little bit	Understand a great deal

(4) The purpose of the Natural Rivers Program is to protect and enhance the natural resource values that are listed in the statute. How would you rank the three most important values you find in the Natural Rivers statute? How would you define these values?

(5) What would you consider as evidence that the Natural Rivers Program is achieving its goals for protecting and enhancing the named values?

(6) Is long-term Program monitoring important to you or the Department? Is our current monitoring adequate, and how would you recommend implementing a monitoring program?

(7) What do you think are the most important priorities over the next 12 months for the Natural Rivers Program? Why is this important?

(8) Realizing the potential impact Natural River designation can have on the management of other Department programs (such as timber harvest, recreation planning, and fisheries or wildlife management), how strongly do you support the Natural Rivers Program goals?

Very strongly	Not very strong
Moderately strong	Not at all

(9) In thinking about ecosystem management, which is one of the Department's key initiatives, how well do feel the Natural Rivers Program integrates the ecosystem management approach into its administration?

(10) Do you have any questions for me about this survey or the Natural Rivers Program?

APPENDIX D

Principal Investigator Assurance of An Exempt Protocol

Name of Principal Investigator: William Taylor

Title of Project: Perceptions of the Natural Rivers Program

IRB #: X09-070

The Human Research Protection Program (HRPP) has deemed this project as exempt, in accord in federal regulations of projects exempt from Institutional Review Board (IRB) review. As an exempt protocol, the appropriate IRB will not be further involved with the review or continued review of the projects, as long as the project maintains the properties that make it exempt.

- Since the HRPP is no longer involved in the review and continued review of this project, it is the Principal Investigator who assumes the responsibilities of protection human subjects in this project and ensures that the project is performed with integrity and within accepted ethical standards, particularly as outlined by the Belmont Report (see exempt educational materials).
- The Principal Investigator assumes responsibility for ensuring that the research subjects be informed of the research through a documented or undocumented consent process, if appropriate.
- The Principal Investigator assumes the responsibility to maintain confidentiality of the subjects and the data, and maintain the privacy of the subjects and protection of the data through appropriate means. If data is anonymous, the investigators will make no attempt to identify any individuals.
- The Principal Investigator assumes the responsibility that co-investigators and other members of the research team adhere to the appropriate policies to protection human subjects, maintain confidentiality and privacy, and adhere to accepted ethical standards.
- If the Principal Investigator adds additional investigators to an exempt protocol, he/she may inform the HRPP of the additions. This may be of particular importance to graduate students if the Graduate School requires proof of IRB approval.
- Any complaints from participants regarding the risk and benefits of the project must be reported to the HRPP.
- Since the Principal Investigator and co-investigators are charged with human subject protection and adhering to ethical principles in exempt research, it is appropriate that investigators be trained in human subject principles. The Principal Investigator and all members of the research team are required to complete MSU IRB educational requirements or equivalent.

- Any change in the protocol which may raise the project from exempt to an expedited or full review category must be presented to the HRPP. If there is any question about a change in protocol the Principal Investigator should consult the Director of the HRPP. Failure to submit changes which raise the protocol out of the exempt category will be considered non-compliance and will be subject to investigation and action by the HRPP.

By signing below, the Principal Investigator assures that he/she will abide by the terms of this assurance and the HRPP exempt policy.

_____ _____

Signature of Principal Investigator Date

05/05/05

APPENDIX E

Research Participant Information and Consent Form

Thank you for taking the time to consider participating in this research study regarding **"Perceptions and Values of the Natural Rivers Program".**

Purpose of this research:
You are being asked to participate in a research study regarding your values and perceptions of the Natural Rivers Program. This study is being conducted as part of my Master of Science program through Michigan State University, Department of Fisheries and Wildlife. As a member of the Department's management team, you have been selected to answer a brief survey regarding your perceptions, priorities, and values relative to the Natural Rivers Program.

What you will do:
This one-on-one survey should take approximately 20-30 minutes to complete. Any information you share in this survey will be kept strictly confidential and your confidentiality will be protected to the maximum extent allowable by law. This survey will be electronically recorded and all data will be destroyed upon completion of this study. This survey is completely voluntary, and you may choose to not respond or to skip any question that you do not want to answer. You may also withdraw from this study at any time.

Benefits and Risks
There are no known risks associated with participating in this study. Potential benefits for participating in this research include the opportunity to learn about the Natural Rivers Program and to help guide the future of the program.

Contact information:
If you have any questions or concerns about this survey, please feel free to contact Steve Sutton at 517-241-9049 or Suttons@michigan.gov.

If you have questions regarding your rights as a research subject, contact the Michigan State University Institutional Review Board at irb@msu.edu, 517-355-2180, or Michigan State University, Human Research Protection Program, 202 Olds Hall, East Lansing, MI 48824.

Documentation of informed consent:
Your signature below means you voluntarily agree to participate in this research study.

Signature _____ Date _____

I agree to allow audio recording of the interview ____ Yes ___ No _____ Initials

APPENDIX F

Natural Rivers Program survey supplement

Natural River Values as found in the Act

1. Water Conservation
2. Free Flowing condition
3. Fish
4. Wildlife
5. Boating
6. Scenic
7. Aesthetic
8. Floodplain
9. Ecologic
10. Historic
11. Recreation

Program Success

1. Water quality monitoring
2. Fisheries surveys
3. Scenic quality
4. Property values
5. Riparian corridor condition
6. Property owner or river user opinion

Program Priorities

1. Designate additional rivers into the Natural River System.
2. Update older administrative rules and management plans.
3. Develop new and revise outreach and education products.
4. Develop additional monitoring of the existing Program.
5. Provide greater assistance to local units of government regarding program administration and river protection.
6. Pursue acquisition of scenic easements along designated Natural Rivers (no public access).
7. Pursue locally designated rivers through local governments.

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