STATE REGULATION OF DAM CONSTRUCTION AND OPERATION IN MICHIGAN: A PROBLEM ANALYSIS

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By

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ABSTRACT

STATE REGULATION OF DAM CONSTRUCTION AND OPERATION IN MICHIGAN: A PROBLEM ANALYSIS

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Recent years have seen increased attention given to the impacts of economic development activities on the quality of the environment. One of many controversies pitting "developers" against "environmentalists" involves the practice of damming free-flowing rivers and streams for a wide array of benefits that such projects can provide. Too often these projects result in serious adverse ecological consequences. As a response to these concerns, this report deals with those regulatory procedures employed in Michigan to control the construction and operation of dams--procedures which are designed to insure optimal protection of riparian rights, the public trust, and the health, safety and welfare of the general public.

The control of damming in Michigan is authorized under the purview of a number of regulatory statutes. Of prime importance are the Inland Lakes and Streams Act of 1972 and the Dam Construction Approval Act of 1971. These laws form a system which allows for State government review

of nearly all dam project proposals in Michigan. It likewise necessitates final approval of each such project before construction is begun. This regulatory system, at least partially because of its bureaucratic structure, is very complicated and confusing. This study addresses two objectives. First, it documents this regulatory system and its structure to provide an accurate, understandable review of how it functions. Secondly, it seeks to pinpoint weaknesses in the system and recommend solutions to those problems.

The effects that the damming of rivers and streams can have are widespread and important. In a social context, the potential hazards of unsafe dams are very real. The effects of dams on river-based water supply systems also must be considered. Ecologically, the effects of damming are evident in many areas. A dam can significantly alter the quality of the river it impounds and have pronounced effects on the hydrology of the area. Dams also display dramatic effects of fish and wildlife resources. Dams constructed for real estate developments, fish and wildlife management, water supply and hydroelectric power generation also exhibit important economic effects. Of legal importance is the fact that the ideas of riparian rights and the public trust are directly related to the practice of impounding water.

Numerous deficiencies currently exist in the system utilized by the Michigan Department of Natural Resources to

control damming practices. These deficiencies are basically either construction safety-oriented or environmental in nature. Some minor deficiencies exist in the basic legal framework of the regulatory statutes. Amendment possibilities do exist. Others involve the administrative rules and regulations which govern the administration of these statutes. Changes here also are a possibility. The most serious inadequacies, however, are evident within the Department and the policies and practices it adheres to. Programs are needed to insure that the public understands this regulatory system. Intradepartmental communication and administration strongly needs examination and improvement. Major emphasis, however, must be placed on the budget and manpower shortages which currently exist within the Department.

Michigan must take every step possible to insure efficient control and use of its prized water resources. One such step should involve examination and reevaluation of procedures used to control the damming of rivers and streams within the state.

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CHAPTER I

INTRODUCTION

> In the United States, dams have traditionally been considered blessings to rural areas because of such benefits as flood control, irrigation, recreation, and power. However, the past few decades have seen the development of an increasingly vocal movement of conservationists who charge that many dams are not needed and are doing irreparable harm to the environment.[1]

The sentiment expressed above certainly holds true for Michigan. The conflict between would-be dam builders and dam construction opponents is typical of concerns arising from more and more types of human activity, and boils down to a confrontation between easily-quantified economic gains and the difficult-to-quantify environment. Do we continue to take chances with the quality of our water resources in order to meet the spiraling demands for benefits that impoundment projects can provide, or do we draw the line and elevate environmental concerns to a level where they can compete with the short-term economic objectives of our society? This in-depth review of the problem

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[1]Darrell J. Turner, "Dams and Ecology: Can They Be Made Compatible?" Civil Engineering-ASCE, September 1971, p. 78.

of dam regulation in Michigan is designed to provide one small step toward an eventual answer to this perplexing question.

A problem exists "when there is a divergence between what currently exists and what is desired."[2] We therefore find ourselves addressing the questions: Does a problem exist with reference to state regulatory procedures to control the construction, operation, and existence of dams within Michigan? Does the situation that "exists" differ from the situation that "ought to be"?

To further examine this question of problem definition, it would be appropriate to apply the minimal necessary and sufficient conditions for the existence of a problem[3] to the question at hand, that being state regulation of dams in Michigan. Each of these conditions can be related to the current situation:

(1) The existence of a decision maker, being the person or persons who have the problem. It becomes obvious that someone involved could have a problem but it is less evident exactly who it is. Here an involved relationship surfaces. The prime decision maker must be considered to be the Michigan Department of Natural Resources (or divisions

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[2]Daniel E. Chappelle, "Lecture Notes: Research Planning--Problem Definition, Problem Selection, Problem Analysis, Study Plans," Michigan State University, East Lansing, Michigan, 1974, p. 1. (Mimeographed.)

[3]Russell L. Ackoff, Scientific Method: Optimizing Applied Research Decisions (New York: John Wiley & Sons, Inc., 1962), p. 30.

thereof, primarily the Hydrological Survey Division), for it is within this organizational structure that both the responsibility and power to control and regulate dams in Michigan lie. It is likewise within this organization that problems could exist with respect to this function. A number of secondary or minor decision makers also can be delineated, those being groups of individuals who in some respect might also have this problem, as well as having some control over it. These are: (a) the Michigan Legislature, for it is from this body that the DNR obtains the statutory authority to regulate dams; (b) the citizens of the State of Michigan, who are directly and indirectly affected by the DNR regulatory decisions and who theoretically have a voice both in the institution of statutory authority and in the regulatory methods the Department employs; and, (c) the West Michigan Environmental Action Council, which, acting as a voice for Michigan citizens, has funded this project in an effort to expose any potential "ills" of the current system.

(2) An outcome desired by the decision maker. The decision makers, both the DNR and the secondary decision makers mentioned, can be assumed to desire the existence of the most effective and efficient means of regulating dams in Michigan.

(3) The existence of at least two unequally efficient courses of action which have some chance of yielding the desired objective. There are numerous facets of the current regulatory-procedural situation which upon

examination could, through alteration or improvement, contribute to a realization of the desired outcome. Each of these possibilities will be given consideration and exposed along with its probable contribution to that desired outcome.

(4) A state of doubt in the mind of the decision maker as to which choice is best. The DNR as well as the citizens of Michigan are uncertain as to which course of action, or combination of courses, would yield their desired outcome, since any possible alternatives can only yield speculated results at this time.

(5) An environment or context of the problem. An environment of factors which affect or could affect the outcome, over which the decision makers have little or no control, definitely exists. These include natural-physical elements as well as social, political and economic factors which exist in different contexts for each group involved.

The concern over regulation of dams in Michigan is but a small part of the growing concern for the protection of man's environment. As man has advanced, his ability to alter the natural state of his surroundings has increased. It is through this concern to protect the stream resource in Michigan that dam regulatory procedures have been justified and by which this study is justified. For we are an integral part of the natural environment, and by destroying that environment, man may well be destroying himself.

The "atmosphere" of the problem at hand consists of a number of important considerations. In order to attain the desired outcome of this study, one must look for evidence of weaknesses in the present regulatory procedures and factors affecting those procedures, pinpoint the problems which have caused those weaknesses and finally search out just where in the problem atmosphere corrections in the situation could be made to avoid these problems. It should be noted here, as a precise statement of the problem is developed, that the main concern of this study is an in-depth documentation of the procedural situation that exists with respect to dam regulation. There has never been a comprehensive study of these procedures before. A program analysis of this regulatory situation is of direct concern.

The damming issue in Michigan is a controversial one, and for good reason. Citizens now appear more concerned with the perpetuation of clear, clean, free-flowing rivers and streams than ever before. Part of this concern might be due to a type of preservation ethic, while most probably is traceable to various recreational desires which to some extent are incompatible with the existence of dams. The damming issue is not confined simply to the question of whether to allow impoundment construction or not. We also are faced with the task of managing those dams now in existence, or even considering the removal of some. Numerous facets of the impounding question will surface

throughout this paper and will be synthesized into an analysis of dam regulation as it exists in Michigan today.

As currently employed, the procedures governing the regulation of the construction and maintenance of dams in Michigan may not insure adequate dam safety, accurate documentation of dam incidence, protection of the rights of riparians, protection of the stream resource, defense of the public trust, and the controlled operation and understanding of the regulatory system. This study is aimed at ascertaining if the regulatory process has failed on these counts, and if so, how it can be altered to remedy the situation.

It is the general goal of this study to provide an objective in-depth look at the Michigan Department of Natural Resources' procedures which regulate the construction, operation, and existence of dams in the State. Through the analysis of these findings it is hoped that alternatives for amending the regulation process can be exposed that, if adopted, will make it possible to realize a more desirable functioning of that system.

CHAPTER II

THE EFFECTS OF DAMMING

Before any attempt can be made to analyze the dam regulatory role of state government in Michigan, the initial need for regulations concerning dam construction, operation, and removal must be justified. This need can be demonstrated easily by discussing the extent of effects which the impounding of water can have in Michigan.

Michigan often has been referred to as the "Water Wonderland," and for good reason. The State possesses 43 river systems consisting of over 36,000 miles of mainstream and tributaries.[1] It likewise contains more than 11,000 inland lakes.[2] The State claims over 728,000 acres of inland standing waters, amounting to nearly 1,200 square miles.[3] It becomes apparent that the water resources of Michigan are one of its most important assets. The magnitude of this resource, coupled with the wide range of

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[1]David G. Frey, Limnology in North America (Madison, Wisc.: The University of Wisconsin Press, 1963), p. 97.

[2]Ibid., p. 96.

[3]Ibid., p. 97.

potential effects that damming can have, thrusts the topic of dam control into the arena of State regulatory duties.[4]

To both discuss and document the effects of impounding water, these effects must be divided into categories. This will aid in an understanding of the ramifications of damming. Caution must be taken, however, to avoid an overdependence on this separation. This is because, although it appears rather easy to aggregate various effects into related subject categories, it is impossible to eliminate the strong relationship that exists not only between these groupings but also between the individual elements of each. It must be realized therefore that the grouping of damming effects into subject categories is made here only to facilitate discussion and is in no way an attempt to eliminate or downplay the strong interdependence that exists between them.

With this in mind, the effects of damming discussed in this chapter will be divided into four basic categories. First, the social effects of the damming issue will be discussed. Considered in this section will be dam safety factors as well as water supply-related factors. Secondly, ecological factors will be looked at. This discussion will

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[4]"The conservation and development of the natural resources of the state are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people. The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment and destruction." Mich. Const. art. 4, sec. 52.

revolve around the relationship between impoundments and the science of limnology. Thirdly, economic factors related to the damming issue will be mentioned. These factors will be centered around recreation and fish and wildlife considerations, water supply factors, and various aspects of hydroelectric power generation and real estate oriented impoundments. Lastly, a brief look will be taken at the legal factors associated with the impounding of water. The two aspects of this division that warrant the most attention will be those related to the idea of riparian rights in water and the concept of the public trust.

The discussions that follow are in no way intended to provide technical in-depth analyses of the four effect categories. They are presented however to give a brief review of the magnitude of effects that can result from the damming of rivers and streams in Michigan.

Before proceeding, one obstacle that has to be overcome should be mentioned. The damming issue in Michigan is "small dam" oriented. That is to say that dams on Michigan watercourses are typically rather small in size. Roughly, only 4.4 percent of the dams in this State have a head height of twenty feet or more, while merely 8.9 percent of Michigan's dams impound more than one hundred surface acres of water.[5] These figures suggest an immediate disadvantage

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[5]Distributions of dams in Michigan by height, impoundment size, owner class and predominant use are presented in Tables 1A through 1D.

as far as past work on the effects of damming. The majority of time and effort devoted to this topic has been funneled into investigations of large-scale, multipurpose damming projects with widespread regional and possibly even international consequences. Surely, no dam in Michigan can compare to large structures such as Coulee and Aswan. It has been on projects of this stature that the most concern has been generated and the most research conducted.[6] Some of this problem is mitigated, however, by dealing here only with the possible effects of smaller scale impoundments, rather than attempting to present precise documented effect studies.

Social Effects

Whereas it becomes relatively easy to delineate damming effects as ecological or environmental in nature, or to ascertain a particular effect to be economic in character, it is more difficult to relegate any potential result of impoundments to the area of social effects. What exactly can be considered "social"? To skirt this difficulty those damming effects will be discussed in this section that could not be conveniently grouped into either ecological, economic or legal effect categories. The two general effects of impounding water that will be considered here are dam safety factors and water supply factors.

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[6]Many large dam projects are discussed, and implications for future proposals are presented in Man Made Lakes: The Accra Symposium, Letitia E. Obeng, ed. (Accra, Ghana: Ghana University Press, 1969).

Dam Safety Factors

It is probably the safety aspect of dams that is most apparent to the public at large. This is because of "front-page" media exposure given to dam failures, many of which have had catastrophic results. The worst dam disaster in history occurred merely twelve years ago when the Vaiont Dam on the Vaiont River in Italy failed on October 9, 1963, taking nearly 3,000 lives.[7] In that same year the Baldwin Hills Reservoir in Los Angeles, California failed, not only resulting in the loss of five lives but also causing an estimated $10 million in property damage.[8] Speaking of these instances Alfred R. Golze said:

> These tragic events are but some of the major dam and reservoir failures which have occurred around the world during the past 100 years. They are illustrations that modern dam design, construction and operation calls for the utmost concern with safety; a dam and reservoir cannot be half safe--they must be 100 percent safe against failure. These disasters serve further to emphasize the great responsibilities that rest with engineers and public officials wherever dams exist.[9]

Even though dam failures present very little danger to human life in the United States,[10] the possibility of

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[7]Alfred R. Golze', "Model Law to Improve Dam Safety," Civil Engineering-ASCE, March 1971, p. 53.

[8]Ibid.

[9]Ibid.

[10]Peter Briggs, Rampage (New York: David McKay, 1973), p. 211.

property loss is extremely great and therefore the question of dam safety still is of major concern.

There have been two noteworthy events in recent years that have dealt with the problem of dam safety. In 1970, the United States Committee on Large Dams drafted a model law aimed at assuring state responsibility for the safety of dams and reservoirs through structure supervision and surveillance. The law was prepared with the hope that changes would be made by individual states in enacting the legislation to meet their own constitutional and legal requirements. The impetus for the drafting of this legislation was prompted by a number of dam failures which occurred in the United States and the Committee's concern for an apparent lack of state level supervision. This attempt, however worthy and needed, is of little importance to the damming question in Michigan since it applied mainly to large water management dams with head heights in excess of twenty-five feet or impoundment capacities in excess of 16.3 million gallons. The general topography of Michigan is not suited to these larger structures[11] and very few exist in the State.

A second attempt to look into the question of dam safety, one which is of more relevance to the Michigan damming issue, was the Engineering Foundation Conference on

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[11]Clifford R. Humphrys, "The Minimum Flow Theory for Michigan Streams," Michigan State University, East Lansing, Michigan, p. 1. (Mimeographed.)

"Safety of Small Dams" which was held at New England College in Henniker, New Hampshire in August of 1974. Recognizing that nearly 55,000 non-federal dams exist in the United States, that numerous small dam failures had occurred across the nation resulting in loss of life, serious damage to public and private property and degradation to the environment, and that the nation is experiencing rapid escalation of dam construction, the conference sought to express the need for a coordinated nation-wide program for "effective regulation, inspection, evaluation, rehabilitation and maintenance of non-federal dams."[12] The topic of small dam safety will no doubt be of major concern to the Engineering Foundation in years to come.

There can be little argument that the safety aspect of dam construction, operation, and maintenance in Michigan is of considerable importance. Some may argue that the dam safety question is of little significance because of the relative smallness of most dams in Michigan, but the fact remains that the most common dam failures are those of small reservoirs.[13] Although the potential for dam failure-related loss of life may be small in Michigan, there are other considerations that must be looked at. We must

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[12]Engineering Foundation, Resolution of 1974 Conference on Safety of Small Dams (New England College, Henniker, N.H.: August 4-9, 1974).

[13]George F. Sowers, "Dam Safety Legislation: A Solution or a Problem," Report before the 1974 Engineering Foundation Conference on Safety of Small Dams (Henniker, N.H.: August 4-9, 1974), p. 5.

consider the potential effects of dam failures on the loss of property, both private and public. Not only could a failing dam result in the loss of buildings and crops located on or near the flood plain, but it also could cause irreparable damage to the public stream resource. Even though there appears to have been a recent trend toward more concern being devoted to safe reservoir construction and use, the construction-safety aspects of the dam itself must remain of major importance.

Water Supply Factors

The second effect of damming relegated to the social effects category is that which deals with water supply. Whereas most Western States have for years relied on impounded river water for their major source of water, Michigan is subject to geographical, geological, and meteorological conditions that have allowed her to draw on other sources. Currently, the majority of municipal water intakes draw their supplies from ground waters, while water drawn from those intakes located on the Great Lakes furnish the most water (in gallons) and serve most of Michigan's residents (nearly 73 percent).[14] River intakes however still exist in Michigan. Today 14 municipal water intakes in this State draw their water supply from river

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[14]Interview with Gordon Oliver, Environmental Health Bureau, Michigan Department of Public Health, Lansing, Michigan, 24 April 1975.

impoundments and serve a total of 490,000 citizens.[15] Cities such as Ann Arbor and Adrian still rely on such intakes for their city water supply.

It should be noted that municipal uses are not the only supply uses that are of concern in Michigan, although because of the more restricted water quality demands they are usually considered the most important. Other uses of impounded waters for supply purposes include direct industrial and commercial supply, supply for crop irrigation and livestock watering as well as water uses for mining and ore processing operations.

Ecologic Effects

Those effects of damming which can be considered of an ecologic nature are the most difficult to deal with for two reasons. First, each is in some way related to the rest, prohibiting a totally isolated discussion of any single one. They are also deeply entwined with those social effects just considered as well as the economic and legal effects which will be looked at following this discussion. Secondly, the ecologic effects of impounding waters take on many forms, each of which could alone be the subject of an extensive research effort. What follows is merely intended to portray the general range of effects damming does and can have on the natural environment in Michigan and is in no way meant to inclusively or

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[15] Ibid.

substantially document any. It is hoped that this presentation will convey the need to pursue more in-depth analyses of the ecological consequences of the unique damming situation that exists in this State.

In general, the historical lack of research on impoundments is now becoming fully recognized:

> Although our knowledge of reservoir limnology is meager, we know that the effects of the release of impounded waters into streams below the impoundment are varied and important, and worthy of considerable more research in the future.[16]

The field of reservoir limnology, which is of particular interest to this effort, consists not only of studies dealing with the effects of an impoundment on downstream waters but also includes the study of conditions in the reservoir itself. As one might guess, the majority of research that has been undertaken on impoundment processes and effects has been confined almost exclusively to large, multipurpose water management dams. This has been because the lower an impoundment's detention time, that is the smaller its size is in relation to its inflow and outflow, the further the limnological considerations of the impoundment will stray from the classical behavior of natural inland lakes. In Michigan, resource managers cannot rely on past research dealing with large scale damming projects to aid them in their decision making, for the processes

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[16]George K. Reid, Ecology of Inland Waters and Estuaries (New York: Van Nostrand, 1961), p. 170.

involved in small scale impoundments are substantially different in extent and character.

Effects of damming on the environment include, but are not limited to, effects on water quality both in the impoundment and downstream from it. The former one is directly related to the concepts of eutrophication and sedimentation, alterations in the hydrological cycle and river flow patterns as well as effects on fishery and wildlife population parameters, and the habitat conditions which influence them. Each of these will be briefly discussed because none should be overlooked when considering the topic of dam regulation in Michigan.

> A small dam constructed across a natural stream can provide vital stream control for man's benefit, but it also can create specific impacts on the environment of an area with many subtle but serious ecological effects.[17]

Water Quality Parameters

Some of the best known environmental considerations related to impoundments are connected with water temperature variations. If any one water quality parameter (in the broadest sense of the term) can be considered to be the "prime mover" with respect to limnological conditions and fluctuations in Michigan reservoirs, it is temperature. Two aspects of the temperature question come into play. They are the concept of reservoir thermal stratification and

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[17]Elwood A. Seaman, "Environment and Ecology at Small Dams," Reclamation Era, May 1971, p. 3.

impoundment warming, and the possibility of downstream temperature effects of impoundment releases.

> Although the thermal cause and the chemical effect of thermal stratification have been adequately studied and reported, the effect of physical factors and the environment on the presence or absence of thermal stratification has received little attention.[18]

Stratification occurrence or absense depends on a number of factors, each of which will vary for different impoundment sites. Some of the factors to be considered are: (1) general soil characteristics of the area; (2) annual precipitation; (3) average summer precipitation; (4) prevailing wind direction; (5) average and maximum wind velocities and frequency of storms; (6) surrounding topography and cover; (7) time of last spring frost; (8) time of first fall frost; (9) impoundment size, shape, depth and orientation; (10) inflow and outflow dynamics; and, (11) weather during the period of the onset of stratification. The two most important factors for small reservoir stratification appear to be impoundment depth and susceptibility to wind generated mixing. The later is as dependent on the orientation of the impoundment and the physiography of the area as it is on wind velocity and direction. Depending on the interaction of these factors and their relative importance in a particular situation, stratification may occur in some reservoirs as shallow as ten feet

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[18] J. M. Symons, S. R. Weibel, and G. G. Robeck, Influence of Impoundments on Water Quality (PHS Publ. No. 999-WP-18, October 1964), p. 38.

but may not occur in other cases where the depth is as great as fifty feet.[19] The absence of the scientific knowledge necessary to accurately assess the dynamics of stratification makes it nearly impossible to confidently predict whether or not a proposed reservoir will undergo summer stratification.

The possibility of an impoundment causing a greater spatial effect of temperature variation exists when the downstream effects of water releases from a reservoir are considered. Since the impounded water is obviously "slowed" compared to its former free flowing condition, it is more susceptible to solar warming in the summer months. This is especially true in shallow reservoirs and shore areas of larger bodies. Unless the temperature of a fully mixed, thermally uniform reservoir, or the temperature of the released water is identical to the preconstruction downstream river temperature, a reservoir will result in the elevation of downstream temperatures in the summer months. This can drastically alter the species composition of aquatic communities which previously existed. To what extent this will occur depends on whether stratification occurs, and if so, what depth the water is released from. It is also quite likely the impounded stream waters will become stagnant enough in winter months to freeze where they previously had not. The existence of these two related

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[19]Seaman, p. 4.

temperature phenomena and to what extent they affect other limnological conditions is largely a factor of the particular dam site in question.

A second water quality parameter which is of concern is the altered balance of the oxygen cycle induced by the establishment of an impoundment. Initially, the creation of a lotic reservoir can depress oxygen exchange with the atmosphere on one hand but could conceivably be balanced by heightened reaeration of released waters that traverse the spillway. Either of these can cause significant downstream oxygen fluctuations. Of greater importance are the potential oxygen effects caused by the new limnological relationships subsequently established in the reservoir. In order to better understand how this effect takes form we must consider the role of photosynthesis in the new impoundment environment.

Although oxygen production by a possible increase in impoundment producer biomass (primarily algae) may produce a net increase in dissolved oxygen concentrations in surface waters, their decomposition in deeper waters with a corresponding oxygen uptake means that the net gain in oxygen resources of the impoundment can be reduced.[20] This problem is of greatest significance when considering thermally stratified reservoirs and can result in total oxygen depletion of hypolimnetic waters. The downstream

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[20]Symons et al., p. 21.

release of such waters can have a drastic effect on stream organisms. A total understanding of reservoir oxygen movements and budgets is hindered by a wealth of uncertain and variable research results and conclusions.[21] Much like the thermal changes induced by dams, oxygen cycle alterations are largely determined by the characteristics of the specific impoundment site under consideration.

> The oxygen budget of these standing bodies of water must be reevaluated, first to understand what mechanisms of oxygenation and deoxygenation are involved, and second to understand how the environment affects the overall budget.[22]

There are numerous other water quality effects of impoundments which will be lumped together and dealt with here for the sake of brevity. Directly related to the role of the various producer species in the impoundment is the resultant change in the cycling of nutrients employed in photosynthetic activity within the impoundment.[23] The occurrence of phytoplankton is of much greater magnitude in the still impoundment waters than in free flowing environments, resulting in increased levels of photosynthetic activity. This increase, along with the changes it induces greatly affects the concentrations of such nutrients

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[21] R. L. Evans and V. Kothandaramen, "Analysis of Variations in Dissolved Oxygen in an Impoundment in Central Illinois," Water Resources Research 12 (August 1971):1037.

[22] Symons et al., p. 23.

[23] Franz Ruttner, Fundamentals of Limnology, trans. D. G. Frey and F. E. J. Frey (Toronto, Canada: University of Toronto Press, 1952), p. 57.

as manganese, iron, sulfer, copper, magnesium, silicon, and cobalt as well as nitrogen and phosphorus. Greater seasonal and diurnal changes in the concentrations of these nutrients, as well as other limnological parameters have been witnessed in impoundments than in corresponding lotic stream reaches.[24]

It will be easier to look at some of these effects, particularly the roles of nitrogen and phosphorus, by including them in a discussion of impoundment eutrophication and the ramifications associated with the phenomenon. The term eutrophication refers to the "natural or artificial addition of nutrients to bodies of water and to the effects of added nutrients."[25] This idea comes into play when it is realized that reservoirs act as barriers to natural river drainage and rapidly accumulate inorganic nutrients and organic matter, making the impoundment highly susceptible to more rapid eutrophication of the type found in many natural lakes today.[26] In response to this nutrient

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[24]H. H. Hannon, J. W. Tatum, and W. C. Young, "The Physiochemical Limnology of a Streach of the Guadalupe River, Texas, With Five Mainstream Impoundments," Hydrobiologia 40 (30 October 1972):297.

[25]National Academy of Sciences, Proceedings of a Symposium on Eutrophication: Causes, Consequences, Correctives (Washington, D.C.: 1969), p. 3.

[26]Bruce L. Kimmel and Owen T. Lund, "Factors Affecting Phytoplankton Production in a Eutrophic Reservoir," Archiv Fur Hydrobiologie 71 (1973):124.

accumulation and magnified by the heightened thermal levels just discussed, increased phytoplanktonic production often results.

It seems surprising that so little research has been done on the topic of reservoir eutrophication and in particular the paramount roles of nitrogen and phosphorus in this process. There does exist a fair amount of information on the nutrient cycles of phosphorus and nitrogen, but it is generally recognized that the behavior of these nutrients in specific impoundment situations is not currently predictable.[27] This type of information is without a doubt necessary for an analysis of the actual effects of any impoundment.

The problems of reservoir eutrophication and the often resultant problem of accelerated sedimentation (although the latter can occur in the absence of the causes and conditions usually associated with the former) can be traced back to the causal factors that are most often responsible. One of the prime concerns is the nature, use, and condition of the contributing watershed, as allochthonus materials are the prime contributors of organic and inorganic nutrients that are often trapped in the impoundment.[28] Some sources of nutrient inputs are municipal and industrial outfalls as well as agricultural land run-off.

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[27]Symons et al., p. 25.

[28]Seaman, p. 5.

These factors are of importance to both reservoir planning and dam impoundment management.

There are a host of water quality factors that can be viewed as a consequence of the tendency toward eutrophication in man made lakes. All to some degree affect uses of the impoundment, especially those involving recreational and aesthetic values. The increased nutrient loads present in the reservoir can often result in seasonal nuisance algal blooms which not only enhance the problems of oxygen cycle alterations and sedimentation but likewise tend to alter the intricate limnological system that has developed. This increased productivity results in altered water-sediment material exchanges as well as influencing a large range of effects on such factors as pH levels, water turbidity, water color, and the role of the bicarbonate buffering system that acts in natural waters.

The importance of the numerous water quality effects of damming cannot be overlooked, but more important is the role each plays in the overall limnological conditions that can result. As was mentioned, both the condition of the impoundment and its effects on downstream water quality must be taken into consideration. The subject of damming and its effects on the aquatic resource must start with an appreciation of the potential water quality changes that can result. Only then can progress be made toward accurately understanding the new aquatic environment established

by a dam and hopefully someday toward being able to reliably predict conditions before an impoundment is constructed.

Hydrological Factors

There are some physical considerations relating to the amounts of water flow that become important from an ecological viewpoint and deserve brief mention. In order to impound water it is necessary at sometime to decrease the natural downstream flow of the watercourse. Minimum flow releases are of prime importance to a number of the environmental factors discussed here. Of greater importance is the possibility of increasing evaporation from the reservoir. Any evaporation will decrease the total annual flow of the river. This quantity change can have significant impacts on water quality both in the impoundment and in downstream reaches. Lastly, a newly created impoundment can affect area water tables, soil permeability characteristics and other aspects of the natural hydrological cycle that previously existed. Even though hydrological relationships such as these are well understood from an engineering perspective, their effects on other environmental considerations such as water quality and fisheries and wildlife have received little attention. This is especially true to the small stream impoundment of greatest concern to the question of damming in Michigan.

Fisheries and Wildlife

The effects of damming on fish and wildlife habitats and population levels are to a large degree a result of the

water quality and hydrological alterations caused by impoundments and the processes which take place within them. It is the effects on fisheries and wildlife that seem to arouse the most public concern. Damming has the potential of causing drastic change in the fauna (as well as the flora) that rely on natural river ecosystems for survival.

In order to better understand the effects of impounding water on fish populations we must realize that dominant Michigan fish species are considered secondary and tertiary consumers and assume positions near the top of the food chain. The effects of damming on flora and fauna which occupy subordinate positions in the chain can therefore be of grave importance, for these species serve as both food supplies to fish populations as well as giving a general indication of the extent of effects caused by a dam. It has been shown that dams can cause increased phytoplankton production, primarily composed of various algal species, which are considered the base of aquatic food chains. On the whole though, the impoundment of water acts as a detriment to the existence of species that occupy more proximal positions in the food chain to the fish population of ultimate concern here.

Although there has been considerable research done on the effect of individual reservoirs on stream fauna, interest in the subject appears not to have progressed to a stage where the actual effects on fauna have been related to general reservoir conditions which could ultimately

facilitate the development of cause-effect models for larger cross sections of reservoirs. It has been shown however that individual impoundments can cause pronounced differences in the macroinvertebrate riffle fauna both upstream and downstream from a dam site.[29] Other research has shown drastic species and population reductions of many insect groups below impoundment sites, which can occur up to seventy miles downstream from the reservoir.[30] Most researchers have determined causal factors to be related to increases in water temperatures and temperature range fluctuations, as well as presenting evidence that population decreases are related to increased siltation both immediately upstream from impoundments as well as downstream from the same dam sites. It has been observed that downstream differences (species reduction) in macroinvertebrate fauna were comparable with those occurring after mild organic point discharge pollution.[31] Although scattered study results such as those mentioned give some indication of the potential effects of damming on small consumer species, the

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[29]H. B. N. Hynes and J. A. Spence, "Differences in Benthos Upstream and Downstream of an Impoundment," Journal of the Canada Fisheries Research Board 28 (January 1971): 35.

[30]D. M. Lehmkuhl, "Change in Thermal Regime as a Cause of Reduction of Benthic Fauna Downstream of a Reservoir," Journal of the Canada Fisheries Research Board 29 (September 1972):1329.

[31]Hynes and Spence, p. 35.

present state of knowledge on this topic can be summed up by the following:

> The damming of small streams to create recreational lakes has become an increasingly common practice and its effects to insect fauna need to be documented.[32]

There is likewise a pronounced lack of research information on noninsect river invertebrate species.

Of the various taxonomic groups that have members which frequent river and lake systems (excluding the class Osteichthyes, i.e., the bony fish species) there seems to have been an overproportionate amount of interest generated and research conducted on the effects of stream alterations on organisms of the phylum Molluska (mollusks). This is probably because these organisms for the most part are more stenotolerant to habitat alterations of the type caused by impoundments than most species groups. On this topic Henry van der Schalie of the University of Michigan's Museum of Zoology said:

> Man has built dams, he has polluted, he has caused flow fluctuations and caused other changes far beyond what these animals can withstand.[33]

The plight of these organisms appears to be closely related to various forms of pollution as well as to those more general aquatic conditions caused by the impounding of

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[32]William L. Hilsenhoff, "Changes in the Downstream Insect and Amphipod Fauna Caused by an Impoundment with a Hypolimnion Drain," Annals of the Entomological Society of America 64 (May 1971):746.

[33]"Thermo Pollution Hard on Snails, Clams, U-M Finds," The North Woods Call, 27 March 1974, p. 6.

rivers and streams. Drastic reductions or complete losses of aquatic mollusks have however been discovered at points where pollution appeared minimal or entirely absent, usually in impounded or dredged sections of streams.[34] These instances appear to account today for as much or more destruction of bottom-dwelling stream life as does pollution, but with only a small fraction of the latter's notoriety.[35] The limnological conditions in reservoirs which have been blamed for destroying these organisms are the decreased water flow near the bottom, which forces benthic species to live in their own waste materials and prohibits the delivery of food matter, and reduced pH levels near the sediment interface which inhibits oxygen exchange with the surrounding water.[36]

Although the effects of impounding on the taxonomic groups just mentioned are very real and of significant ecological importance, they have taken a back seat to concerns related to the effects of damming on fish populations, particularly on cold water species such as trout and salmon.

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[34]David H. Stansbery, "Dams and the Extinction of Aquatic Life," Paper presented at the Center of Science and Industry, Columbus, Ohio, 10 December 1970.

[35]Ibid.

[36]Ibid.

Probably the most easily recognizable effect of a dam is the physical blockage it creates that prohibits the upstream movement of fish. This is important to trout and salmon species because they normally move upstream to spawn. Headwater areas commonly have more suitable water supply for spawning and more favorable habitat conditions for fry survival. Fish passageways or manual transport methods can be used to insure passage, but both are extremely costly and fish movement may still be drastically reduced.[37]

The topic of fish passage around dams becomes of greater importance when the anadromous planting program of the State of Michigan is considered. The economic aspects of this sport resource, as well as the role and cost of fish ladders will be discussed later, but the environmental effects of damming on these migrating fish is of immediate importance. Even though substantial successes have been realized with the introduction of the coho and chinook salmon, dams have appeared to drastically inhibit attempts to successfully introduce Atlantic Salmon into Michigan rivers. Dams appear to contribute to the failure of this species by what fish biologists term "stress."[38] The

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[37]Roger G. Wickland, "The Detrimental Effects of Impoundments on Trout Streams," Michigan Department of Conservation, Lansing, Michigan, 30 December 1965. (Mimeographed.)

[38]"Historic Year for Atlantics," The North Woods Call, 23 October 1974, p. 8.

existence of dams currently dictates the range of potential fish plantings. Dams also contribute to various detrimental ecological effects that act on the fish population. These factors will continue to play an important role in the future administration of Michigan's salmonoid planting program.

Dams likewise have the potential for drastically affecting fish populations by altering habitat conditions. The effect of impoundments on temperature play an important role. Impoundments commonly increase temperature both in the impoundment and often in lengthy downstream reaches to points intolerable for trout.[39] This is a result of increased maximum temperatures as well as extension of time periods over which these maximums prevail. Although downstream water temperatures can be controlled below many deep impoundments by allowing for cold water releases through underspill devices, this is not usually a possible alternative in the commonly unstratified reservoir in Michigan.

Dams can frequently alter other limnological conditions to a point where they detrimentally affect these stenotolerant cold water fish species. Many of these, which relate back to increased reservoir productivity resulting in altered dissolved oxygen and carbon dioxide levels were discussed earlier. The stability and predictability of these fluctuations appear to be of as much importance as

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[39]Wickland, p. 1.

their intensity. Increased reservoir productivity can also result in downstream siltation which can destroy trout spawning beds.[40] This phenomenon is often the cause of water color changes, pH fluctuations and turbidity increases which alter flora distribution and intensity. The direct habitat effects of impoundments appear to be detrimental and often lethal to trout populations, with the damming of certain high gradient streams to produce favorable trout habitat being the only exception.[41]

Another damming effect of importance to fisheries management concerns itself with the problem of lamprey predation on salmonids. The life cycle of the sea lamprey has been under study for some time because of its importance to the anadromous fish programs of Great Lakes area governments. Although various lamprey control practices appear to have brought this parasite under some semblance of control, witnessed by decreases in salmonoid species wounding incidences, the problem has not been totally alleviated.[42] Currently eighty-seven dams constitute barriers to the upstream passage of spawning lamprey in producing

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[40]Oscar M. Brynildson and Ray J. White, Guidelines for Management of Trout Stream Habitat in Wisconsin, Wisconsin Division of Conservation, Madison, Wisconsin, 1967, p. 44.

[41]Ibid.

[42]Michigan Department of Natural Resources, Michigan's Great Lakes Trout and Salmon Fishery, Fisheries Management Report No. 5, Lansing, Michigan, June 1973, p. 96.

tributaries within the State to Lakes Michigan, Huron, and Superior.[43] Removal of any one of these structures without care to continue to maintain an effective passage blockage would open virgin stream territory to the lamprey and expand its present range.

Another consideration that warrants mention is the effect of damming on fish species other than trout. Impoundments usually evolve to support large populations of non-trout fish such as bluegills, perch, sunfish, minnows, etc. These fish species are free to move upstream where they can effectively compete against trout for food and space. Other fish species such as northern pike are effective predators of trout and are often joined by various turtle and waterfowl species which can frequent impoundments. Thus, damming induced effects also can act through competition and predation to detrimentally affect trout streams and the populations they support.

The range of effects that dams have on fish and wildlife populations can be generally attributed to the creation of new habitats. These shifts cause changes in community structure by changing habitat conditions to the advantage of some species and to the disadvantage of others. These changes constitute the sum of the shifts in water chemistry, stream flow alterations and initial species

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[43]Michigan Department of Natural Resources, "Status Report on Dams," Report to the Joint Senate-House Capitol Outlay Committee, Lansing, Michigan, 3 May 1972, Enclosure 7.

population levels, which act through time to determine the new impoundment and downstream communities. In addition to the effects damming may have on fish populations, impoundments also can have significant influences on wildlife populations near reservoir sites.

Whereas it was shown that impoundments often act to the detriment of valuable cold water fish populations, these same dams can provide benefits to many wildlife species. The primary wildlife management use of impoundments is for waterfowl habitat improvement. Michigan has witnessed an extensive history of lowland marsh and swamp drainage projects to reclaim land, which has destroyed large areas of prime waterfowl habitat. Lowland flooding with the aid of dams has helped replace some of this acreage. The Michigan Department of Natural Resources' Wildlife Division helps maintain nearly 460 dams which have wildlife importance, often in cooperation with private hunting clubs.[44] There also is the possibility of providing habitat for controlled populations of fur-bearing animals such as muskrat with the use of flooding dams.

The relation between dams and their effects on wildlife recently has fostered a new concern with respect to proposals for dam removals to benefit fish populations. It has been found that significant portions of endangered

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[44]Interview with John Byelich, Wildlife Division, Michigan Department of Natural Resources, Lansing, Michigan, 21 April 1975.

predatory bird species in Michigan nest near reservoirs that have witnessed substantial development. Many of these are retired hydroelectric facilities. No less than 43 percent of the nesting bald eagle pairs in Michigan nest near and feed on man-made reservoirs.[45] Likewise, more than 90 percent of the breeding osprey pairs in the Lower Peninsula utilize this type of man-made habitat.[46] These reservoirs appear to be some of the few suitable habitat locations remaining in Michigan for these birds. With a growing concern for the plight of endangered species, this aspect of dam regulation cannot be overlooked.

In summary, it can be seen that the ecologic effects of damming are numerous. Currently, however, dam construction and regulation concerns are forced to exist in an atmosphere of incomplete knowledge about these facts. The following statement from the Accra Symposium on Man Made Lakes expresses this thought:

> Thus the chemical, physical, and biological character of a new man-made lake becomes determined largely by the nature of the soils of the land it floods; the chemicals which leach into the water; the salts which are brought in with the floods; the ions which are not retained and the growth deficiencies they cause; the adverse effect caused by unwelcome polluting wastes and the effect of the pollution on the fauna; the new cycles of wave and wind movement which become established; the thermal changes; the plant and animal communities; their various food

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[45] "Dams and Eagles," The North Woods Call, 22 August 1974, p. 4.

[46] Ibid.

> preferences: all these and many more factors make a new lake different. This difference needs studying.[47]

Economic Effects

A third effect category which warrants consideration is that which includes the wide range of effects termed economic in nature. These "dollar related" concerns are directly related to many of the social and ecologic effects discussed previously. A discussion of these effects will be facilitated by considering four major water uses prevalent in Michigan which exhibit economic importance and which are directly tied to the construction and presence of dams. Each of these four uses, which include impoundment real estate development and recreation, fisheries and wildlife, water supply and hydroelectric power generation, exhibit unique economic characteristics. Although for the most part it will not be possible to document specific monetary relationships, it will be possible to present a number of general economic relationships which exist and to show how they relate to the damming question in Michigan.

Real Estate Development and Recreation

A number of direct and indirect economic effects come into play when considering real estate-oriented impoundments and recreational uses often associated with reservoirs. These two water resource uses often exhibit

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[47] Obeng, p. 21.

similar economic ramifications and are therefore dealt with here in the same manner, even though they do not necessarily always exist together.

Some impoundments are constructed solely for the purpose of establishing new subdivisions. The majority of such projects in Michigan were constructed in the period between 1964 and 1968 when there arose a large demand for so-called second homes and retirement havens. Currently there are fifty such developments in existence in Michigan.[48] Aside from the often high costs of such preliminary activities as dam design and construction, flood site clearing, and platting procedures, a number of potential post-construction economic considerations arise which affect the surrounding area.

Most of these effects relate to increased pressures on local community services which result from the new settlement. Frequently these projects are located in relatively unpopulated areas, because the desire for a rural setting is one of the prime demand-stimulating factors. The local community often is unprepared to assimilate the population influx. Inadequacies can arise in police and fire protection services, traffic control, road construction and maintenance, sanitation facilities, or a myriad of other community services. Although septic tank utilization is often chosen as an alternative to circumvent inadequate

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[48]Michigan Department of Natural Resources, "Status Report on Dams," Enclosure 5.

sewage treatment systems, this practice is often highly undesirable from an environmental view as it can introduce large quantities of unwanted nutrients into the impoundment. Increased pressure also can fall on less imperative service needs such as shopping facilities, gasoline outlets, and recreational supply dealers. The true impact on such services often does not surface until well after the development has been planned and construction finished. Correlated with this phenomenon is the resultant increase in local tax base provided for by the new residents. Local communities can be assured of experiencing a new type of development shock.

Although Michigan experienced a pronounced boom in real estate-oriented impoundment construction in the mid-1960s (twenty-six alone were constructed between 1964 and 1966[49]), this trend has appeared to have come to a close at least for the time being. The late 1960s and early 1970s witnessed only a few such developments, and none have been begun since 1972. There are a number of reasons for this decline. Potential buyers have found themselves in an economic bind. Because of the adverse economic situation which began to show its effects in the 1960s, many second home hunters began to find it impractical to own such property as well as finding prevailing mortgage interest rates beyond their means. The increased costs of

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[49] Ibid.

transportation, reflected by increased car prices and elevated fuel costs, surely has played a part in maintaining this trend.

The prevailing economic situation also affects potential developers. In addition to having to consider a decline in demand for their product, they too were faced with high interest rates. Initial investments for such projects could be quite substantial. Another factor that seems to have influenced this downward trend revolves around increased public opposition to such projects. Not only have voices been raised within local communities in opposition to a development "invasion," but conservation-minded groups and individuals also have voiced objection to such practices for environmental reasons. This has made it more difficult for developers to obtain necessary permits and secure needed local approval.

Impoundment projects developed for reasons other than private subdivision development can exhibit similar local economic effects. By the creation of a new lake environment, these reservoirs serve as an attraction to recreationists. The supply of recreational resources is thereby shifted from one characterized by stream and river oriented recreation to a more intensive use distribution dominated by lake centered leisure uses. Usually this will involve a transfer from uses dominated by canoeing and river-type fishing to those typified by such uses as swimming, boating, lake fishing, and water skiing. Other

indirect, less intensive uses can also be established in the area due to the development, all of which can have effects on local areas similar to those created by real estate-oriented impoundments. Speaking of the creation of new lakes, the National Water Commission expressed similar concerns when it said:

> Such reservoirs frequently become magnets for urban residents living in municipalities a considerable distance away. The recreation attraction of the reservoir sets in motion a land development process which will have a significant impact on local service demands and on local tax revenue. Rural governments in the vicinity of the reservoir site are not often equipped to manage the land development, traffic law enforcement, and sanitation problems that follow in the wake of such developments.[50]

It becomes evident that both the construction and maintenance of impoundments can exhibit a wide range of economic effects which can make themselves apparent in a number of ways. These economic considerations are of importance not only to the developer and home or lot owners, but also to local citizens and members of state and local government. Naturally, the magnitude and range of these effects will vary from one situation to another. Regardless, knowledge of them is of prime importance to all parties involved and is necessary not only for optimal development planning decisions and selection and evaluation

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[50]National Water Commission, Water Policies for the Future, A Report prepared for the President and Congress (Washington, D.C.: U.S.G.P.O., June 1973), p. 367.

of alternatives, but also for desirable project proposal action.

Fisheries and Wildlife

A consideration of the relation of damming to fisheries and wildlife in Michigan also presents a number of economic effects. Again, the specific economic effects damming exhibits with regard to Michigan fish and wildlife resources and the utilization of those resources are not available, but a discussion of general economic relationships in this light is important for a comprehensive understanding of the dam regulation issue.

The most important economic factors in this area revolve around the trout and salmon fisheries of the Michigan Great Lakes and the stocking management program of the Department of Natural Resources. Following a major policy decision made in 1966 to rehabilitate the fisheries resource of the Great Lakes, the DNR undertook what has grown to be a very large stocking and management program. Currently this program involves the planting of eight different salmonoid species, with the majority consisting of coho and chinook salmon, lake trout, and rainbow trout. In 1972 alone nearly 10 million fish of these four species were planted in the upper three Great Lakes, bringing the seven-year total to nearly 55 million individuals.[51] The

[51]Michigan Department of Natural Resources, Michigan's Great Lakes Trout and Salmon Fisheries, p. 2.

The costs of establishing and managing this program are substantial.

Significant economic considerations likewise exist with respect to the users of this resource. In 1971 it was estimated that nearly 200,000 fishermen fished over two million angler days for Great Lakes salmon and steelhead.[52] In 1970 it was found that these fishermen spent an estimated $15.5 million to participate in this sport fishery.[53] It is significant to note that 60 percent of these expenditures were made at or near the location fished, which has proved to be a significant monetary injection to many local areas.[54]

The costs of undertaking and maintaining this program, as well as the economic benefits reaped are substantial. The total capital investment in the program amounted to $10.93 million at the end of 1972, with projected costs of operating the program amounting to $1.62 million per year for the next 30 years.[55] A conservative estimate of the net economic value of the program to Michigan resident fishermen shows it will continue at a rate of $17.5 million per year for the next 30 years.[56]

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[52]Ibid., p. 29. [53]Ibid., p. 59. [54]Ibid.

[55]Ibid., p. 56. [56]Ibid.

A general assessment of the efficiency of the program can be made by using these figures to arrive at a benefit/cost ratio of about 11 to 1. Since the management and continuation of this program directly depends on tributaries to the Great Lakes, the role of dams on these spawning streams is of direct importance to the continuation of benefits secured.

The regulation of dam operation and management plays a more direct role in many respects. The Department of Natural Resources has on two occasions removed dams on rivers for fish planting purposes and is currently considering the removal of two others.[57] The costs of these projects and a related management alternative dealing with fish ladder construction is discussed in Chapter IV. Dams also can play an important role by serving as collection and monitoring sites for stream runs, negating the need for placement of temporary weirs.

One aspect of dams often overlooked from an economic standpoint is the role they play in the Great Lakes Sea Lamprey Control Program. Since its inception in 1958, the chemical treatment and management program has cost approximately $33 million, with projected costs for the fiscal year 1975 to run $4.2 million.[58] These figures

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[57]Interview with Ludwig Frankenburger, Fisheries Division, Michigan Department of Natural Resources, Lansing, Michigan, 21 April 1975.

[58]Interview with Alan McLain, Great Lakes Fisheries Commission, Ann Arbor, Michigan, 29 April 1975.

apply to the total program and therefore involve expenditures not only of Michigan but of the Canadian Government and the remainder of the Great Lakes States as well. As mentioned previously, this program is of vital concern to the condition of the Great Lakes particularly from a fisheries standpoint, and numerous dams currently act as effective range restricters for the spawning of this parasite. Any total dam removals on lamprey-producing tributary streams would necessitate either increased expenditures or result in decreased management efficiency.

Dams also must be considered of importance to the overall sport fishing in Michigan from an economic standpoint. Surveys have shown that the total resident fishing population of Michigan amounted to 1.8 million people in 1971, who fished a total of nearly 20 million angler days.[59] Salmonoid fishing accounted for only about 20 percent of the total. Surely we cannot manage dams from a fisheries standpoint solely with cold water species management in mind, because warm water fishing also is of significant economic importance. Overall, it is extremely difficult to deal with such considerations as sport fishing only from an economic point of view, but nonetheless the above synopsis dictates the importance of considering what knowledge we have of sport fishery economics when dealing with dam regulation.

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[59]Michigan Department of Natural Resources, Michigan's Great Lakes Trout and Salmon Fishery, p. 26.

Important economic implications likewise exist with respect to the effects of damming on wildlife. Many of these relate to sport hunting which ranks as an important economic industry in the State of Michigan. Most of these apply to the use of dams to create wildlife flooding areas for the management of waterfowl species. These projects often are maintained in joint cooperation between private land owners (often hunting clubs) and State and federal government units who frequently share the costs involved. The economics of creating these habitats can be considered small in comparison to the economics encountered in instances where dredging and filling projects have destroyed prime wildlife swamp and marsh area habitats. Much like those implications encountered with respect to Michigan's fisheries resources, wildlife economics must also be integrated into the decision making process when analyzing the role of damming and state regulation of impoundment projects.

Water Supply

A fourth use of Michigan's water resources that exhibits economic implications related to the role of damming is water supply. As was shown, the use of impoundments for municipal water supply is fairly limited in Michigan. Only fourteen municipalities utilize river reservoirs for this purpose.[60] Of Michigan's nearly

[60]Oliver, 24 April 1975.

9.1 million people, only 5.38 percent are served by these intakes.[61]

The prime factor under consideration here involves the costs of treating water for municipal supply uses. Municipal supply facilities must provide water that is safe for human consumption, even in areas where these sources supply water to a variety of industrial and commercial uses as well. In Michigan various water intakes necessitate varying degrees of treatment. Regardless, the average Michigan resident uses between 175 and 180 gallons per day.[62] This represents a total of almost 1.3 billion gallons per day. Currently water consumers in this State pay about 60 cents for every 1,000 gallons trated.[63] It is found then, that on the average, water users pay about $780,000 each day to be supplied with usable water in Michigan. In view of the fact that dams have significant potential to alter water quality conditions, the possible secondary effects on treatment costs must be considered, particularly when considering situations which might directly affect any water intake.

Uses of river waters are not limited solely to municipal supply. They are likewise utilized for industrial intakes as well as for irrigation and other agricultural uses. Naturally, economic factors are also relevant to these uses. Even though the exact extent of

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[61] Ibid. [62] Ibid. [63] Ibid.

these uses are not known, the latest DNR information documents some forty river impoundments that contribute to these other supply demands. As with the municipal intakes, these dams assure adequate amounts of impounded waters to meet peak use period demands.

It can be seen that the economic costs and benefits of utilizing impounded water are somewhat uncertain. It does seem obvious however that the role of dams can and does play an important part in the economic factors that do exist and that any comprehensive look into the role of state dam regulation must necessarily consider this aspect.

Hydroelectric Power Generation

A discussion of the economic effects of the last water use category to be examined in this context, the production of hydroelectric power, is somewhat simplified for two reasons. First, the use of hydroelectric facilities in Michigan is on the downswing. No new facilities involving the damming of rivers will be constructed, and our concern therefore lies with operation and removal alternatives that exist for the hydroelectric facilities that remain. Secondly, the contributive role of hydroelectric power generation to total power produced in Michigan is relatively small.

Currently eighty-six operating hydroelectric plants exist in Michigan, with eighteen in the Menominee River Basin, ten in the St. Joseph Basin, six in both the Thunder

Bay and AuSable River Basins and five each in the Grand, Saginaw, and Escanaba River Systems.[64] As important is the fact that approximately ninety-four such plants have been phased out of production, with at least eighty of these structures still in existence. Some of these structures were removed from operation in the late 1960s and early 1970s, while others were retired as far back as the early 1920s. The operating units that exist have proven to still be operationally and economically feasible.

The economic factors of production which are of interest here revolve around the capacity of the remaining operating units to produce electricity. Since the importance of this topic is minimal to the question at hand, and since needed information would be both time consuming and expensive to gather for a comprehensive review, the status of hydroelectric power generation will be dealt with within the confines of the example of the Consumers Power Company.

An attempt will be made to display the economic role of hydroelectric generation in Michigan by viewing Consumers Power for a number of reasons. Consumers Power owns more operating hydroelectric units (11) than any other entity in Michigan and also has retired more units from operation than all other former operators combined (74).[65]

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[64]Michigan Department of Natural Resources, "Status Report on Dams," Enclosure 3B.

[65]Ibid.

The total production design capacities of the 11 operating units sums to 133,600 kilowatts.[66] This amounts to only 2.5 percent of the total capacities of all Consumers Power generating facilities, which sums to 5.35 million kilowatts. The percentage of power contributed by the hydroelectric units is even smaller, because these facilities traditionally produce a smaller portion of their design output than an aggregate of steam and nuclear power production facilities.

In order to better visualize the dollar worth of these facilities we can look at the cost of hydroelectric power to the consumer. Due to the instability and unpredictability of river flows, coupled with the general nature of hydroelectric plant design, it is estimated that Consumers Power hydroelectric units produce about 40 percent of their design capacity as a yearly average.[67] This then yields an output of about 53,440 kilowatts. The cost of power to users varies, depending on the buyer. Industrial and commercial users may pay anywhere from one to five cents per kilowatt hour, whereas residential users are charged an average of 3.4 cents per kilowatt hour.[68] For residential supply, Consumers Power hydroelectric facilities

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[66]Interview with Max Entsminger, Consumers Power Company, Lansing, Michigan, 25 April 1975.

[67]Ibid.

[68]Ibid.

therefore produce roughly $43,607 of electricity each day or nearly $15.7 million per year.

Although these figures seem significant, several things must be taken into consideration. The daily energy potential of hydroelectric power in Michigan is extremely limited, as those plants owned by Consumers Power represent a large share of Michigan's water powered energy output. The exploitation of hydroelectric power is decreasing as the costs of maintaining many of the sites is catching up with their revenue potential. Lastly, much of our concern is with the disposition of these structures upon retirement, which is dealt with in one of the case studies presented in the next chapter.

In summary, while much of the information available, as well as much of the information presented here, may seem sketchy and inconclusive, the wide range of potential economic effects these various uses of our stream resources can have demonstrate the need to provide for a comprehensive review of the damming issue. For any particular situation, these relationships can be searched out and identified in fine detail. A better understanding of the situation at hand then can be had by viewing these effects along with those social and ecologic effects discussed earlier.

Legal Effects

Legal factors related to the construction and operation of dams in Michigan exist in a somewhat different

context than those effects which were termed social, ecologic or economic in nature. Included in this discussion will be brief looks at the idea of riparian rights and the concept of the public trust. These two concepts must be viewed somewhat differently, for they do not deal with physical or institutional changes caused by damming projects but rather constitute predetermined sets of rights and duties of individuals and the public as a whole. The ideas of riparian rights and the public trust are often difficult to promptly identify or describe despite the fact that they have been the subject of many lengthy court determinations.

Riparian Rights

Private rights in water exist in the legal framework of the riparian doctrine in the State of Michigan. The fundamental aspect of this doctrine is that any owner of land abutting a watercourse has certain rights and privileges in the use of that water as a result of his landed holding. The Michigan Supreme Court has loosely defined riparian rights as: (1) the right to use water for general purposes such as bathing, domestic use, etc.; (2) the right of access to the navigable waters; (3) the right to accretions; and, (4) the right to wharf out to navigable waters.[69] This definition however is of little

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[69]Michigan Department of Natural Resources, "Riparian Rights and the Public Trust in Michigan Public

practical use in applying the doctrine as courts in Michigan adhere to the American rule of reasonable use which necessitates case by case application of its general principles.

Those principles allow a riparian owner to make "reasonable" use of the entire surface of a body of water for any purpose consistent with the public trust and compatible with the rights held by other riparians. Conflicts in use situations between riparians are settled in the legal arena, with courts taking issue on the question of reasonableness. Many times these judgements involve a judicial "weighing" of the values involved while considering possible alternatives to competing uses. The judicial proceedings are often in response to a riparian seeking injunction or other relief after he finds what he considers to be unreasonable usage by another riparian.

This principle applies to any riparian use of a watercourse that could affect the right of another riparian to utilize the same resource and therefore naturally includes impoundment situations. Dams can infringe upon the rights of both upstream and downstream riparians to exercise their reciprocal rights by exhibiting some of the effects of damming discussed earlier in this chapter. These could be evidenced through changes in water quality, hydological relationships or a vast array of environmental

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Lakes and Streams," A Report prepared by the Office of the Attorney General of the State of Michigan (Lansing, Michigan), p. 1.

effects to name a few. The impoundment use would be determined to be either reasonable or unreasonable on the basis of these effects, how they impact on uses by the aggrieved party, the alternatives available to the dam owner, and the relative importance of conflicting values, costs and benefits. It is obvious that this determination must be made on the basis of balancing the needs of different users at a given time and place and prohibits the utilization of any standard rules or formulas to determine reasonableness.

The Public Trust

As mentioned, the rights a riparian owner holds are qualified by the same rights held by other riparians. More important, on any lake or stream which can be considered navigable by State courts, his rights are also qualified by a paramount public trust to the entire body of water. These "rights of the public" are the current result of a long history of governmental conveyance of sovereign rights and responsibilities. Upon being admitted as a state, Michigan acquired these rights, including title to the submerged lands beneath all navigable waters and an inalienable trust in the overlying waters. Even though the bed title was later passed on to riparians, the State retained the public trust in the overlying waters which provided for public navigation, fishing, and other inherent rights of the public.

The idea of the protection of the public trust is of importance to this review because the State has the

authority (as well as an obligation) to protect the public's interest in Michigan's water resources by regulating uses (both in nature and extent) which may infringe on the public trust. The utilization of rivers or streams for dam facilitated uses is one such area. Again, the determination to be made, whether a particular case use is or is not in the interest of the public trust, necessarily involves a case by case evaluation and balancing of the values present, including the costs and benefits of the project. Again, the dynamic nature of the public trust doctrine, coupled with varying methods and opinions which influence not only the use but the eventual determination of its legality, make it impossible to draw direct relationships between damming practices in general and their effect on the public trust.

This chapter was organized to serve two purposes. Through a discussion of the possible effects of dams and how the concepts of riparian rights and the public trust are related, it was intended to foster an appreciation of the wide range of damming effects and the importance they can have not only to individuals but to the public as well. Secondly, it was hoped that this realization will underscore the importance of state dam control and the effectiveness of that regulatory scheme. This general background discussion sets the stage for a review of Michigan's dam regulatory scheme.

CHAPTER III

EXISTING STATE REGULATION PROCEDURES

In preparation for a careful look at the development of dam regulation procedures in Michigan and the current status of both the regulatory process and its principal statutory authority, it would be beneficial to look into the historical factors that in the past have created demands to impound waters of this State. A brief synopsis of these factors will not only aid in the understanding of the governmental regulatory processes that have resulted, but will also set the stage for consideration of the probable future trend in the demand for dams.

History of Dam Construction

Although man has built primitive forms of dams for centuries, our concern lies with a relatively recent period, which perhaps would be called the era of dam building. Long before Michigan was settled, damming of its rivers and streams was fairly extensive due to large populations of beaver. However, these structures were quite different from those to be made by man. Not only were they an integral part of the ecosystem--naturally occurring links of an

intricate scheme--but, more importantly, they were temporary, for they were neither constructed of concrete or steel nor maintained by mechanical gates. When the beaver moved on, their dams soon "disassembled" themselves and proceeded to return their building blocks back into the natural material flows. Man, however, came on the scene as a pioneer, and, as was so often the case, disrupted this natural organization. It is at this point that we become concerned with man's desire to dam.

Early Michigan settlers first found it to be to their advantage to build dams in the early 1800s. At first, these dams were primarily very small impoundment structures at stream mouths near new settlements. The power of the impounded water was harnessed to drive small saw mill operations that mainly existed to supply hardwood lumber to local people for building. In 1837 it was estimated that these small local mills numbered 435.[1] The scale of these operations was soon to explode however, for our forefathers discovered a very valuable resource in Michigan, one that had taken hundreds of years to grow but was to leave by the turn of the century. They had found the almighty white pine.

Michigan's central lower peninsula was squarely in the middle of what was one of the richest timber areas in the world. Acre upon acre of tall, straight, knot free

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[1]Rolland H. Maybee, "Michigan's White Pine Era, 1840-1900," Michigan History, September 1959, p. 422.

white pine awaited the saw of the lumberman. As timber speculation ran rampant, mills were thrown up almost overnight. As timber production peaked in the 1870s, there were over 1600 sawmills in the state.[2] Although many of these (primarily those built after 1850) were steam driven, many had impoundments for water supply, while the older mills still utilized dam head pressure to turn their saws.

Impoundments also were created to facilitate log floatage to the mill. Dams were built that would hold the logs in the backwater until drive time as well as create a head to insure adequate river height to float the logs to the mill sites. As more and more timber was harvested and more remote float routes were used, dam construction took on a more significant scope in cost, size, and numbers. This era of timber harvest ended almost as fast as it had started, for by the early 1900s nearly all of the marketable white pine had been cut. It is estimated that in the 60 year span between 1840 and 1900 nearly 161 billion board feet of white pine were cut in Michigan as well as about 50 billion board feet of cedar, hemlock, and a variety of hardwoods.[3] The timber boom of the eighteenth century explains the first chapter in the history of dam construction in Michigan.

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[2] Ibid.

[3] Ibid.

As agriculture advanced in prominence in Michigan we see a nearly concurrent boom in dam construction, prompted by the need for water power to run grist mills. Many of these structures were first erected during the timber era, and conflicts between lumbermen and millers were not uncommon. There was however one significant difference between the two types of dams. The life span of the timber-oriented dams, particularly those used to facilitate floatage, was much shorter than those built for grist mill purposes. The lumberman's dams were hastily built and had limited durability. The continuing need for the services of the miller, as Michigan became more dependent on agriculture, prompted the construction of very durable facilities. Many of the mill ponds from this era are still maintained today and deserve consideration as we explore the dam regulation question.

The next apparent demand for dams that arose was caused by the advent of hydroelectric generators. The period between 1900 and 1930 saw a surge in dams built for water-powered electrical generating facilities. Several hundred small power companies and municipal electrical utilities sprang up in Michigan. The very stable annual flows of such rivers as the St. Joseph, the Grand, the Kalamazoo, the Saginaw and the Menominee, to name a few, were well suited for larger, more efficient hydroelectric facilities, many of which are still in operation today. These still-existent hydro sites, as well as the mill ponds

mentioned, pose a special problem with respect to the disposition of old dams, one that will be specifically dealt with later in this report.

Although chronologically somewhat less distinct than the demand for dams generatd by the timber and hydroelectric interests, but still of definite importance, is the desire that has existed to build dams for a variety of personal uses. In creating these predominantly small impoundments, which are frequently referred to as farm ponds, builders sought to facilitate such uses as livestock watering, household water supply, and crop water supply as well as boating and swimming recreation. Most of all, however, these ponds are constructed with fish propagation and wildlife habitat control in mind. Due to Michigan's favorability to this use, both in terms of climate and user demand, we find this facet of dam construction of prime importance. It was estimated that by 1963 there were 2,500 of these ponds known to exist in Michigan (although some of these were undoubtedly pit or depression type ponds and therefore did not involve any dam).[4] The desire to construct such ponds has existed over much of Michigan's early history and remains very prevalent today.

Of the various demands for river impoundments that have surfaced, those which have prompted a surge in the damming of waters for water-oriented recreational

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[4]Frey, p. 597.

opportunities are probably of the most current importance. A definite period of dam construction for lake-oriented subdivision development arose shortly after World War II and came to a peak in the mid-1960s. Although Michigan was blessed with a large number of natural lakes, most that were easily accessible to the large population centers of southern Michigan had by this time become nearly totally developed. This aspect of dam construction has become very controversial of late, because it can have widespread impacts. This subject is explored in greater depth in the next chapter.

Resulting Legislative Actions

The history of laws dealing with dams in Michigan is very extensive. A type of hierarchy exists, however, and we find that most of our concern will lie with a few fairly new laws which seem to be the product of a trend toward more governmental control over dams. While discussing the legal progression that has existed with respect to dam regulation, it will be seen that many of the regulatory laws were initiated in response to the various steps that were witnessed in the historical demand to build dams. This brief look into the development of dam-related legislation will expose the most important statutes that warrant consideration and will set the stage for a documentation of the dam regulatory scheme as it exists today.

Historically, the first evidence of any attempt to control and regulate dam construction in this State appeared in the Michigan Constitution of 1850. This provision first delegated a regulatory authority over dam building to a local government level by stating that:

> No navigable stream in this state shall be either bridged or dammed without authority from the board of supervisors of the proper county, under the provisions of law. No such law shall prejudice the right of individuals to the free navigation of such streams, or preclude the state from the further improvement of the navigation of such streams.[5]

This regulatory power was instituted during the time of heightened dam construction for timber and grist mill purposes and seems to be a direct attempt to insure some level of control over a practice that had a wide range of potential effects.

This power soon was defined by the Michigan Legislature in Act No. 156 of the Public Acts of 1851, which was entitled:

> An Act to define the powers and duties of the boards of supervisors of the several counties, and to confer upon them certain local, administrative and legislative powers.[6]

Section 22 of Act 156 provided that any person or persons, or any corporation, wishing to construct a dam on a navigable stream must submit a petition to the board of supervisors of that county asking for permission to build

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[5]Mich. Const. art. 18, sec. 4 (1850).

[6]Act. No. 156 of the Public Acts of 1851, Mich. Compiled Laws, secs. 46.1-46.32.

the structure. The petition must set forth the purpose of the dam, its height, its location, and must include a description of the project as well as a description of provisions for the passage of boats, vessels, rafts, or timber. The statute sets forth provisions concerning public notification for a hearing to consider the petition, where parties both in favor of and opposed to the project may be heard. It is also set forth that if the county allows the dam to be constructed the petitioners must comply fully with the terms and conditions set forth in their petition and that if the dam should be "destroyed or decayed," the petitioners or their heirs, successors or assignees, shall have the right to rebuild the dam without again applying to the board.

Since Michigan's first constitution in 1850 there have been two general revisions, in 1908 and again in 1963. The authority delegated to the counties has remained basically the same. It currently exists as Article VII, Section 13 of the Michigan Constitution of 1963 and reads:

> A navigable stream shall not be bridged or dammed without permission granted by the board of supervisors of the county as provided by law, which permission shall be subject to reasonable compensation and other conditions as may seem best suited to safeguard the rights and interests of the county and political subdivisions therein.[7]

For the most part, the authority of and provisions set forth in Section 22 of Act 156 remain intact today.

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[7]Mich. Const. art. 7, sec. 13.

There were a few alterations put into effect by an amendatory act, that being Act No. 91 of the Public Acts of 1969. These fell into two categories. First, the amendatory act stipulates that any permit issued to build a dam shall "provide for an easement to the public for an adequate and proximate right of way for the portage of small craft around the dam," and secondly it insures that nothing in the act shall be construed to abrogate provisions and requirements of two dam regulatory acts that had been instituted since 1851, those being the Fish Passage Act of 1929 and the Dam Construction Approval Act of 1963. These two statutes will be dealt with shortly. Even though the Constitution, and more specifically Act No. 156 delegated authority to county boards to control dams, our concern with the overall regulatory process will deal mainly with the statutes that have set up the state government permit systems that exist today.

The first instance of state government control over dams in Michigan is found in a very underrated statute, that being Act No. 123 of the Public Acts of 1929, which is often referred to as the Fish Passage Act. Basically this law gave the then Conservation Commission the power to insure that the free passage of fish will be provided for through and over dams, both those in existence and any that may be built in the future. Under the authority of this act the State of Michigan, now more specifically the Department of Natural Resources, has the power to require

dam owners or prospective builders to equip their structures with a fish ladder device to insure the free passage of fish. The statute provides the Department with the reciprocal power to waive the fish ladder requirement in instances where the installation of such ladders is deemed impractical or unnecessary.

Until fairly recently this statute has served merely as a template to issue such waivers. There are two reasons that the provisions of the act remained of little significance until the mid-1960s. Firstly, little scientific information existed concerning the construction, design, and effectiveness of such fish passage devices, and, secondly, it has only been within the last few years that any serious attention has been given to the migration of fish in Michigan watercourses. The recent anadromous fish stocking program undertaken by the State of Michigan has been the major reason for the latter. These changes have strongly affected the fish ladder issue and have caused the emergence of Act 123 as a very intricate cog in the dam regulatory scheme that currently exists.

During the 1960s there emerged a number of statutes that warrant brief mention. Although none are directly involved in the dam permit process, and are subordinate to that state controlled system, they are nonetheless of importance to the damming issue. The Surplus Waters Act, Act No. 20 of the Public Acts of 1964, is one such law. Defined as an act "to regulate the impoundment and

utilization of surplus waters," this statute provides an avenue to manage, develop, and conserve such waters. It sets forth a definition of surplus water, that being water that can be impounded without decreasing the flow of a river or stream below its "optimum" flow. A county board of supervisors may petition the Water Resources Commission of the State of Michigan to undertake a study of the river basin involved and to determine the optimum flow and amounts of surplus waters involved, and if the Commission feels a management plan is feasible it solicits a detailed plan from the county board(s) involved. If the plan is then approved by the Commission, the boards are authorized to construct and maintain the dams necessary for the impoundment of the surplus waters. This however does not exempt the parties involved from obtaining the necessary dam permits required under the procedures to be discussed in the next section of this chapter.

Two related statutes arose about this same time that deal with the possible role of dams in the mining and processing of low grade iron ore. Prompted by Act No. 143 of the Public Acts of 1959, which describes the provision of adequate water supplies for iron ore mining operations to be in the best interest of the general public welfare and sets up a Water Resources Commission permit system for water supply plans, was Act No. 314 of the Public Acts of 1968. This statute expanded on this "need" and made provisions to assure that the needed land could be

obtained by mining operations in pursuit of water supply plans, which could include the use or construction of impounding devices. Again, however, these statutes are of minimal importance to the dam regulatory question because any dams erected and maintained in relation to this mining question are today subject to the prevailing state dam permit systems.

Before proceeding to a discussion of the legal basis for the state dam regulatory processes that are of most concern to this effort, there is one additional statute that warrants mention, the Inland Lake Level Act, Act No. 146 of the Public Acts of 1961. Prompted by the heightened interest in water recreation-oriented real estate developments, the Inland Lake Level Act is centered around procedures to establish legal lake levels in Michigan lakes to protect the natural resources of the state, protect the public health, welfare and safety, and to preserve and protect the values of lake properties. The Inland Lake Level Act is of indirect but nonetheless significant importance. A court determined "normal" lake level can be established upon receipt of a motion from the county board of commissioners, the Department of Natural Resources, or from two-thirds of the freeholders owning land abutting the lake. Following the establishment of a legal level by the presiding Circuit Court, the county board(s) of commissioners in which the waters are situated are to proceed with the necessary steps to maintain that level, which

includes the construction and maintenance of the necessary dams.

The reason this statute warrants special consideration is because it delegates a chief responsibility to counties for the correct maintenance of any dams, as well as assuring that their construction is adequately supervised by that governmental level. Another interesting provision of the Inland Lake Level Act is that any dam which may affect the level of waters in the lake may be acquired by gift, grant, purchase or condemnation by the county or by the Department of Natural Resources in order to carry out the provisions of the act. Both these considerations can play important roles in the state permit systems, the statutory power of which is discussed next.

As has been mentioned previously, the most important aspect of dam regulation in Michigan is a permit procedure under the administration of the Michigan Department of Natural Resources. In reality, this system is comprised of two distinct but related permit processes which have been established under the authority of two different legislative actions. These statutes will only be briefly mentioned here to conclude the discussion of the legal history of dam regulation. Both, along with the procedural framework they have prompted, will be dealt with in more detail in the following section of this chapter.

The first of these currently stands as the Dam Construction Approval Act, and was Act No. 204 of the

Public Acts of 1971. It should be noted however that this statute is an amendatory act and culminates a series of Dam Construction Approval Acts. The Construction Act is commonly referred to as Act 184, for this was the first to be enacted in 1963. It was temporarily amended by Act No. 68 of the Public Acts of 1970 and currently stands in accordance with the 1971 amendment. The changes prompted by each amendment will be discussed shortly.

The second Michigan statute that stands as part of the state dam regulatory framework is the Inland Lakes and Streams Act of 1972. Often referred to as Act No. 346, this statute repealed and replaced an earlier act, that being Act No. 291 of 1965. This statute in general deals with any alterations made to Michigan inland lakes and streams, of which dams are but a small part. For the purpose of examining regulation of dam construction in Michigan, the Dam Construction Approval Act and the Inland Lakes and Streams Act are of paramount importance.

Michigan's Dam Regulatory Permit Systems

Regulation of dam construction, operation, and maintenance in Michigan is realized through a dual permit system authorized by the Dam Construction Approval Act and the Inland Lakes and Streams Act.

The Dam Construction Approval Act

The original Construction Approval Act was a direct response to the increased dam construction activity for water recreation based subdivision developments which surfaced in the post-World War II period. Prior to the passage of this 1963 statute, developers often took little care in the construction of dams, only making sure that the structure remained sound until the lots surrounding the impoundment could be sold. Too frequently the design and construction deficiencies of these dams soon became apparent.[8]

This original Construction Approval Act was:

> An Act to require the obtaining of approval by the Department of Conservation before erection of dams in streams or rivers; to provide fees for granting the approval and for the administration of this act; and to provide a penalty for failure to comply with the provisions of this act.[9]

This statute made it unlawful for any person to construct or permit construction of any dam, on a Michigan river or stream, impounding five acres or more without first obtaining a permit from the Department of Conservation approving plans for the dam's construction and for proper clearing of the land to be flooded. It likewise authorized the Department to inspect the dam during construction and

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[8] "Weak Dam?" The North Woods Call, 1 May 1974.

[9] Dam Construction Approval Act, Mich. Compiled Laws, secs. 281.131-281.135.

after completion, as well as to require payment to the Department of an amount deemed necessary to cover the actual cost of making an engineering study of the plans and of carrying out the needed inspections. Violation of the Construction Approval Act is a misdemeanor.

The original act was concerned solely with dam safety as it attempted to insure safe, adequate dam construction through supervision of submitted plans and on-site inspections. With the growing concern for the quality of the environment and an increasing interest in protecting the stream resource in Michigan, the Construction Act was significantly changed by the 1970 amendatory act. The changes prompted by this latter act were concerned with both the construction-procedural aspects of the law as well as giving the Department the power to consider the environmental impact a proposed dam may have in an attempt to insure protection of the natural resources of the state.

Act No. 63 of the Public Acts of 1970, which became effective July 12, 1970, provided for these following changes in the Dam Construction Approval Act:

1. Removed the requirement that only dams constructed in rivers and streams come under the authority of the act.

2. Added a head limitation so that any dam with a head of five or more feet or one impounding five or more surface acres is covered by the statute.

3. Made it necessary for any submitted construction plans to be prepared by a registered professional engineer.

4. Changed the permit fee requirement from the sum necessary to cover plan review and inspections to a graduated fixed fee based on dam head height.

5. Gave the Department the power to require an underspill device on newly constructed dams with a head of ten feet or more.

6. Required reapplication for the repair or reconstruction of a dam that failed, for whatever reason.

7. Required that the permittee petition the County Board of Supervisors of the appropriate county for the establishment of a legal lake level and a special assessment district for future maintenance of the lake level under the authority of the Inland Lake Level Act. This provision is enforced only for impoundments that are likely to affect other landowners and therefore does not apply to dams constructed solely for a builder's private use on his own property.

8. For the first time, it allowed the Department to consider the potential effect of a proposed impoundment on fish, wildlife, and recreational values in the watershed, as well as the possible infringement on the public rights in the waters of the state, and prohibited the issuance of a permit if the dam would have a "significant adverse effect" on any of these.

9. Required application for formal extension of the permit if construction does not begin within one year following the issuance of a permit.

10. Gave the authority to the Department of Natural Resources, when it deems a hazardous condition may exist in the structure of an existing dam, to require the owner of the dam to submit a report prepared by a registered professional engineer on the condition of the dam. After reviewing the report and conducting an inspection, the Department, if it feels a hazardous condition does exist, may require the owner to make necessary repairs or remove the dam.

The 1971 amendatory act, Act No. 204 of the Public Acts of 1971, added one small but potentially significant provision to the Dam Construction Approval Act. This amendment exempted dams that impound less than five surface acres of water, and have a contributing drainage area of less than one square mile, and which are constructed under the provisions of federal or state soil conservation programs.

The Inland Lakes and Streams Act

The Inland Lakes and Streams Act is the second statute that dictates the present structure of the dam permit system in Michigan. The original law, Act No. 291 of the Public Acts of 1965, did not contain specific provisions regulating dam construction but nonetheless is

important to this discussion for two reasons. First, this statute was the first real effort to insure protection of riparian rights in the state and prevent practices on Michigan watercourses that might impair the public trust. Secondly, this statute was the forerunner of the Inland Lakes and Streams Act of 1972, which in conjunction with the Dam Construction Approval Act forms the state dam regulation scheme that is in effect today.

The Inland Lakes and Streams Act of 1972, Act No. 346 of the Public Acts of 1972, has been considered by many to be a landmark in the field of state level environmental protection legislation. It is entitled:

> An Act to regulate inland lakes and streams; to protect riparian rights and the public trust in inland lakes and streams; to prescribe powers and duties; to provide remedies and penalties; and to repeal certain acts and parts of acts.[10]

This statute regulates alterations made to Michigan inland lakes and streams. In addition to applying to dredging and filling activities and seawall and marina construction, Section 3 of the statute states that a person shall not, without first obtaining a permit from the Department of Natural Resources, "construct, enlarge or diminish an inland lake or stream," or "structurally interfere with the natural flow of an inland lake or stream."

An initial question that arises is, "Exactly what constitutes an 'inland lake or stream'?" The original 1965

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[10]Inland Lakes and Streams Act, Mich. Compiled Laws, secs. 281.731-281.747.

version of this act qualified this by stating that the act applied to "any navigable inland lake or stream wholly or partly within this state." The idea of navigability encompasses an involved, complicated and dynamic concept in the field of water law. As this idea has developed the courts have become more liberal in their interpretations of exactly what constitutes a navigable stream. Historically, such factors as the stream's ability to support commerce, its past ability to float saw logs and more recently its capacity to accomodate recreational use have been considered. Although the concept of navigability is no longer significant to the provisions of the Inland Lakes and Streams Act, a review of the history of Michigan water law with respect to navigability provides important insight into this question and aids in documenting the historical trend this concept has traversed, as well as exposing implications dealing with public rights and duties in such waters.[11]

The concept of navigability is no longer the determining factor for lakes and streams which fall under the authority of the Inland Lakes and Streams Act. This change was instituted by the latest version of the act,

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[11]A comprehensive review of the historical aspects of navigability as they legally relate to the ideas of riparian rights and the public trust in Michigan waterways is presented in Kelly ex rel. MacMullan v. Halden, 214 N.W. 2nd 856, 51 Mich. Appellate 176 (1974).

which went into effect on January 9, 1973. Section 2 of Act No. 346 defines an inland lake or stream as:

> . . . a natural or artificial lake, pond or impoundment; a river, stream or creek which may or may not be serving as a drain as defined by Act No. 40 of the Public Acts of 1956, as amended, being sections 280.1 to 280.623 of the Compiled Laws of 1948; or any other body of water which has definite banks, a bed and visible evidence of a continued flow or continued occurrence of water. . .[12]

This, however, does not include any lake or pond which has a surface area of less than five acres. When dealing with the construction of dams it becomes obvious that many potential impoundment sites will occur in rivers or streams, whether they include internal segments of watercourses or springfed headwater areas, which will in most cases involve locations applicable to this act. One type of damming project which would not fall under these provisions would be the so-called "off-channel" dam, as typified by many sewage treatment lagoon facilities.

Permit Processing and Administration

The currently functioning permit systems established by Acts No. 346 and 184 are, although separate in terms of statutory authority and procedural framework, in fact administratively related. They often take on a complementary relationship. For the purpose of this discussion, the procedures established under each permit

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[12]Inland Lakes and Streams Act, Sec. 2, Mich. Compiled Laws, secs. 281.731-281.747.

process will be explained separately first, followed by an explanation of the complementary relationship that can exist in many situations. This is possible in instances where a proposed project falls under the requirements of the Dam Construction Approval Act as well as those of the Inland Lakes and Streams Act.

The authority to administer the Dam Construction Approval Act lies within the Department of Natural Resources' Bureau of Water Management. More specifically, it is handled by the Hydrological Survey Division's Hydrological Engineering Section. Prior to Departmental permit consideration, a prospective dam builder submits a request to the Hydrological Engineering Section, indicating his or her intentions. With this request the petitioner must supply such pertinent information as the location of the proposed dam, the purpose of the impoundment, its size, the dam head height, and a sketch of existing features and proposed construction.

Using this information, if the Department deems that no permit is necessary (this would be because the proposed project did not meet the five-foot-head and five-acre-size limitations of Act No. 184), a request is made of the appropriate Regional Office, and the Fisheries Division to issue a Fish Ladder Waiver,[13] as outlined by the Fish

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[13]A copy of the Fish Ladder Waiver Form is included in the Appendix.

Passage Act. If the waiver is issued the Department notifies the petitioner by letter of non-objection to his request.

If a permit is deemed necessary under the Construction Approval Act, the Hydrological Survey Division sends "Dam Check-Off Forms"[14] to the Fisheries, Wildlife, Forestry, and Lands Division, the Geological Survey Division, and the appropriate Regional Office. These forms are returned to the Hydrological Survey Division within two weeks and are to include a recommendation (approval or disapproval) as well as possible construction features these offices might feel are necessary. The Dam Check-Off Form is used to conduct a survey in an attempt to accurately assess the potential environmental effects of the proposed dam. Necessary field information is obtained by the respective divisions.

At this time an investigation of the adequacy of the water supply of the stream to maintain water levels is also conducted. These review steps are conducted prior to the submission of construction plans and formal application so that an applicant can be advised of probable Departmental action before he expends funds on the preparation of such plans.

After reviewing these recommendations and considering all available information, if it appears that no

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[14]A copy of a Dam Check-Off Form is included in the Appendix.

significant adverse environmental impacts will occur or that no irreplaceable loss to natural resources will result, the petitioner is invited to submit the appropriate application[15] and application fee along with construction plans for the proposed project. These plans must have been prepared by a registered professional engineer and are to include a topographic map of the area to insure that the land to be flooded is owned entirely by the petitioner.

The construction plans and specifications are reviewed with regard to "soil foundation information, foundation preparation, embankment slopes, freeboard, erosion control and structural design details and material specifications for the spillways, and outlet control works."[16] If found necessary, the plans are returned to the applicant's engineer for suggested design changes. Once the plans are found to be adequate a permit is drafted to be signed by the Chief of the Hydrological Survey Division and issued. The permit sets forth conditions to be met by the builder prior to, during, and after construction. These conditions can include, but are not limited to, design of sedimentation control, minimum flow releases

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[15]A Dam Construction Approval Act application is presented in the Appendix.

[16]Leon A. Cook, "Dam Construction and Inspections," Report before the 1974 Engineering Foundation Conference on Safety of Small Dams (Henniker, N.H.: August 4-9, 1974), p. 8.

during and after construction, inspections, and certification by the applicant's engineer.

The project is inspected by Department personnel during construction. If it is deemed the construction is not proceeding according to the submitted plans and permit conditions, the permit is immediately cancelled and the project is treated as if it had commenced without the issuance of a permit. (Procedures used in this instance are discussed below.) Upon completion of a project a statement is required from the supervising engineer, as a condition of the permit, which states that the construction was completed according to the approval plans and specifications. Final approval by the Department of Natural Resources may be given if a final inspection shows the construction to be sufficient. Act No. 184 stipulates that a delay of one year in "commencing construction" shall require formal application for the extension of the permit.

If it is found that a dam is constructed in violation of the provisions of Act No. 184, an inspection of the structure is made by staff personnel. The Department of Natural Resources makes every attempt to place the owner under permit. The owner is notified by certified letter of the violation and is informed that litigation may be initiated. If the Department cannot justify placing the owner under permit, through forcing dam design changes or simply issuing a permit, or if the owner refuses to comply,

the dam is ordered removed, pending the outcome of the court determination.

In accordance with Section 2C of Act No. 184, as provided for in the 1971 amendatory act, if an existing dam is reported to be in questionable condition, an inspection of the site is conducted. If the inspection discloses the possibility of a "hazardous condition," the owner is required to engage the services of a registered professional engineer to prepare a report on the structure's condition, to be submitted to the Department. After a study of this document, if it is determined that a hazardous condition does exist, the owner must make necessary repairs, which would necessitate application for a new construction permit, or remove the dam. The Department has on numerous occasions required the submission of such reports.

In only one such case has the owner opted to remove the dam rather than make necessary repairs. Plans for the removal of this structure (which is situated on the Rogue River and used for industrial water supply purposes by the Rockford Paper Company) are currently being prepared but have been delayed by plans for an alternative water supply system. In all such cases the impoundment is to be dewatered until the dam is removed or repaired.

There is the possibility that a proposed project would require a permit only under Act No. 184 and not be applicable to Act No. 346 provisions. As mentioned, one such instance is in the case of off-channel lagoon

construction. Another case arises when considering dams constructed in extreme headwater regions where intermittent or seasonal flow streams would supply water to the impoundment. Since in this case the stream involved would not provide evidence of a continued flow it would not necessitate application for a 346 permit. In cases such as this, all of the provisions of Act No. 184 would be carried out. (For a graphic representation of this permit scheme, see Figure 1.) In situations where both a Construction Act permit and an Inland Lakes and Streams Act permit are necessary, this procedure is altered, as will be explained following a documentation of existing procedures provided for in Act No. 346.

Most dam construction applications submitted for Act No. 184 approval also must be submitted for approval under the provisions of the Inland Lakes and Streams Act. It is possible for a proposed impoundment project to fall under the authority of only the Inland Lakes and Streams Act and not necessitate application for a Dam Construction Act permit. These instances would occur when the proposed project would not meet the impoundment size and dam head height requirements of Act 184 but would be constructed in an inland lake or stream as defined by Act 346. The permit process used for projects necessitating only a Dam Construction Approval Act permit has just been demonstrated.

Persons desiring to construct an impoundment whose location and dimensions dictate the need to apply for only

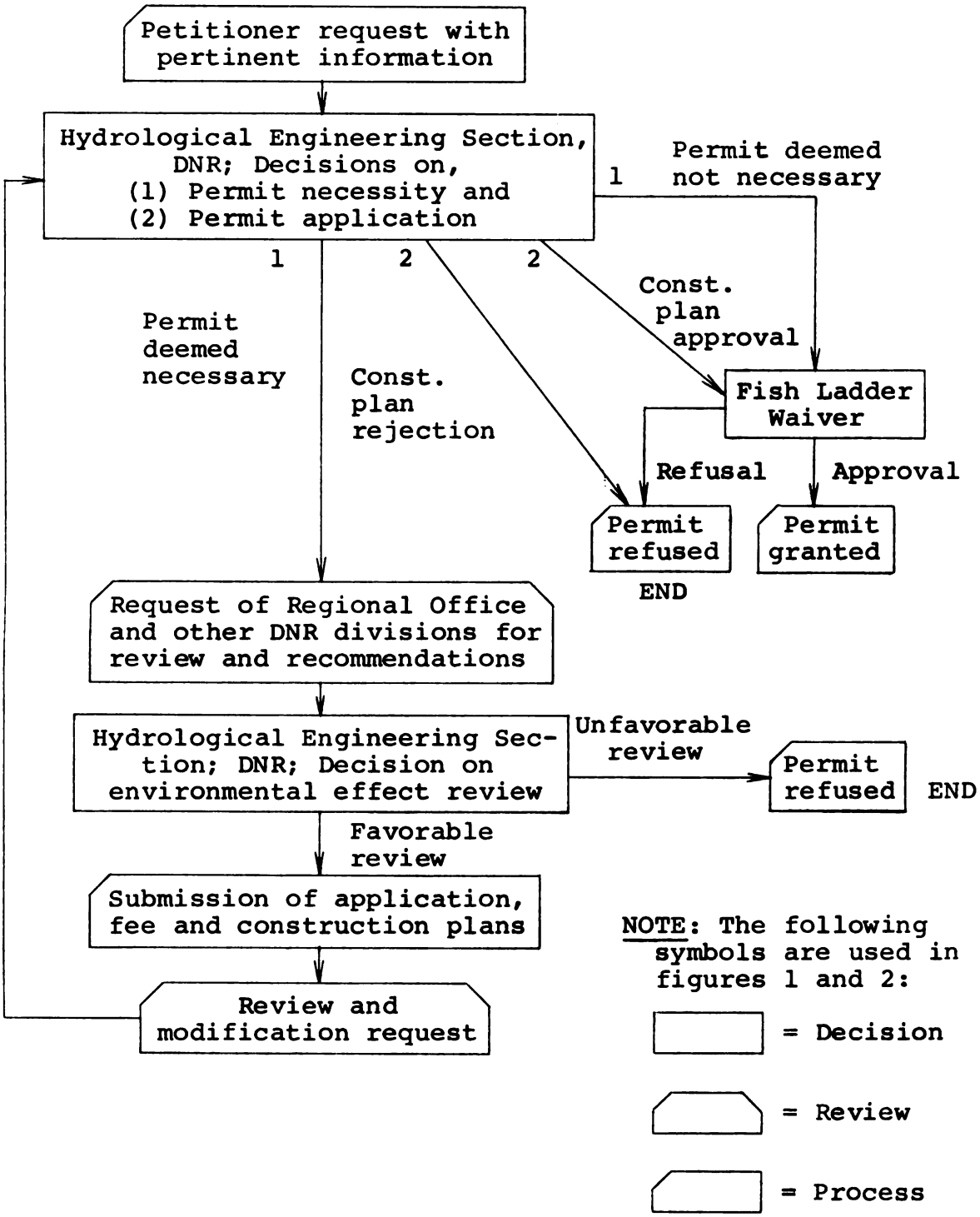

Figure 1. Dam Construction Approval Act Permit Procedure.

an Inland Lakes and Streams Act permit find themselves subject to an entirely new set of procedures than those established by Act 184. (For a graphic representation of Act No. 346 permit procedures, see Figure 2). An Inland Lakes and Streams Act application,[17] along with the $25 application fee is submitted to the Submerged Lands Management Section of the Hydrological Survey Division, which is located in the Department's Bureau of Water Management. Copies of the application are sent to those governmental entities designated in Section 6(2) of the act. Included here would be the city, village, or township and county where the project would be located, the local soil conservation district, the local watershed council and the local port commission if one exists. These copies are accompanied by a statement to the effect that unless a written request is filed within twenty days the Department may issue the permit without a public hearing.[18] Under the authority of Section 6(1), any person may apply to the Department of Natural Resources to receive a monthly list of all applications for Act 346 permits. The cost of this service is $25 per year. Any party entitled to receive copies of individual applications pursuant to Section 6(2)

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[17]An application form for an Inland Lakes and Streams Act permit is included in the Appendix.

[18]A copy of this form, which is often referred to as a Public Hearing Policy Statement, is included in the Appendix.

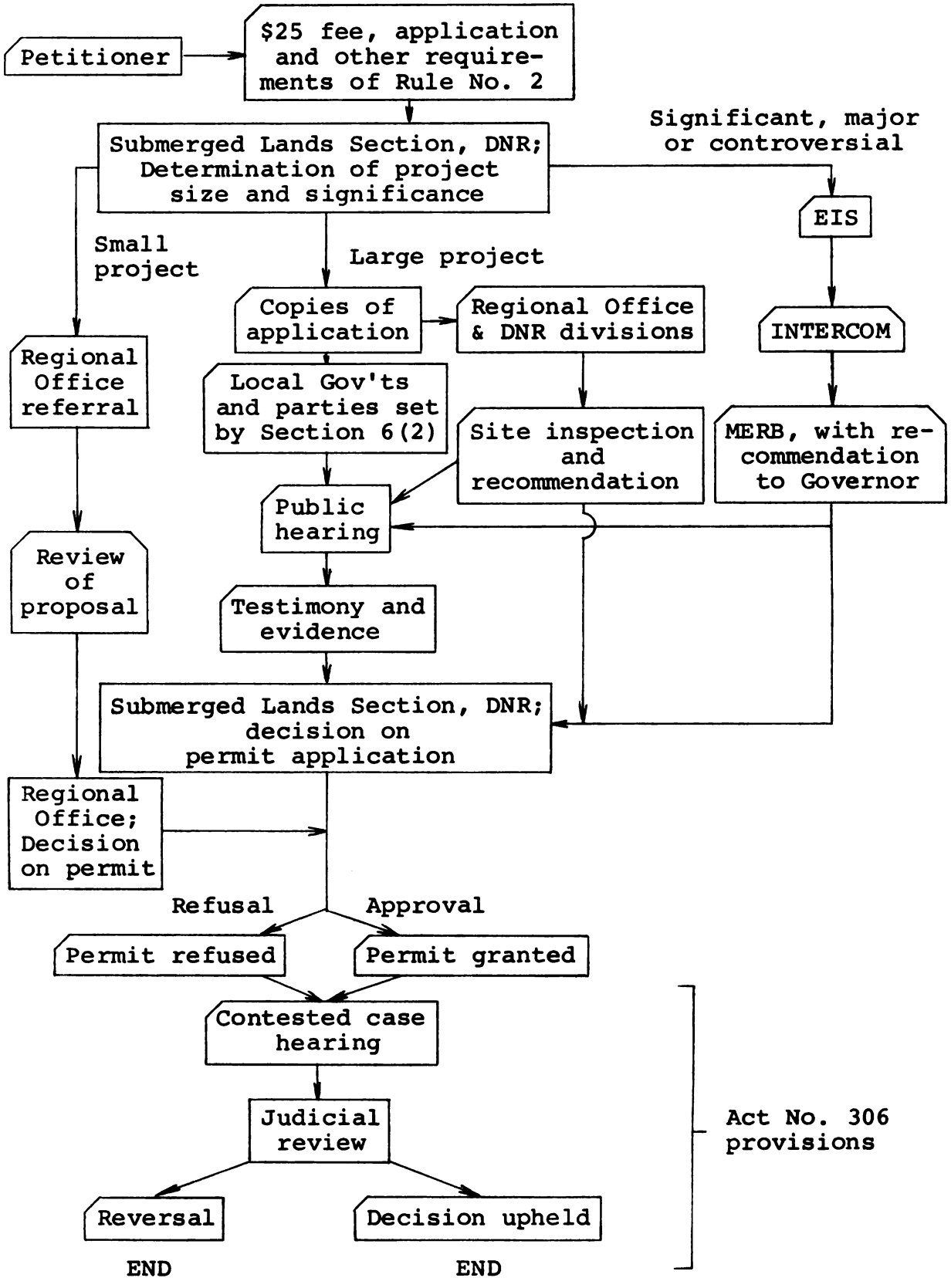

Figure 2. Inland Lakes and Streams Act Permit Procedure.

may request that a public hearing be conducted. This request can also be made by the applicant in question or any riparian owner who was entitled to receive a copy of the application. The Department itself is authorized to call a public hearing if it deems one to be necessary, and exercises this power for any proposal it feels may be controversial.

The Department also submits to its Regional and District Offices copies of applications, a copy of the public hearing policy statement that was sent to those entities specified in Section 6(2), and an Interoffice Communication[19] informing these offices of the proposed project. Field personnel from these offices conduct investigations and inspections of the proposed site and submit recommendations to the Submerged Lands Management Section. These recommendations are the responsibility of the Regional Manager. He bases his report on inspections and effect summaries conducted by the district biologists (whose findings are submitted on a Habitat Impact Analysis form[20]), under the purview of the Regional Submerged Lands Specialist. The findings and possible testimony of these personnel are presented at the public hearing, if one is conducted. A decision by the Submerged Lands Management

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[19]A reproduction of a standard Interoffice Communication Form is included in the Appendix.

[20]A Habitat Impact Analysis Form can be seen in the Appendix.

Section as to whether to issue or deny a permit is made after the public hearing, if one is requested.

Since the Submerged Lands Management Section is burdened with the responsibility of processing a large number of permit applications (1,715 in 1973 and 2,006 in 1974) with a limited number of Lansing personnel (9.5 man years), many applications are delegated to the Regional Office with jurisdiction over the proposed site for investigation and a final application decision. The decision as to which Departmental level will consider the application is made by the Acting Assistant Submerged Lands Management Section Chief. The decision rests on the magnitude and sophistication of the project in question, with all relatively minor proposals forwarded to the field offices. Approximately 85 to 90 percent of the applications are considered minor and processed at the Regional Office level. The majority of these are private riparian-requested seawall structures, minor dredging and filling activities and dredge pond proposals. All impoundment applications are handled through the Lansing Office, with the final decision being made by the Submerged Lands Management Section.

Environmental Impact Statements

Under the authority of Governor's Executive Order 74-4, the Department of Natural Resources may be required to prepare an environmental impact statement (EIS). An impact statement is required from each state agency for

"all major activities within their jurisdiction that may have a significant impact on the environment or human life."[21] This determination is left up to each individual agency, which in permit considerations such as those involving Act 184 and 346 applications, can request the applicant in question to submit an environmental report (AER). Although the Department has no statutory authority to require an environmental report from an applicant, agencies are required to supply a comprehensive impact statement when considering major actions.

Usually the agency involved, such as the Hydrological Survey Division, will request the submission of a document by the applicant which sets forth possible environmental effects of the proposed project. This work is often referred to as an environmental report. The Division, upon receipt of this report, circulates it to other pertinent Department divisions who review the report in relation to their areas of expertise and submit recommendations back to the Hydrological Survey Division. After receipt of these recommendations the Hydrological Survey Division must determine if the proposal can be considered major, significant and/or controversial. If it is deemed to be so, Executive Order 74-4 requires an environmental

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[21]"Guidelines for the Preparation and Review of Environmental Impact Statements," which was prepared to implement Executive Order 74-4, in detail explains all procedures relating to the preparation, processing, review, and final actions concerning environmental impact statements and should be consulted for clarification if necessary.

impact statement to be submitted to the Michigan Environmental Review Board (MERB) and the Inter-Departmental Environmental Review Committee (INTERCOM), the latter which solicits official comments and recommendations concerning the EIS in question, and in turn submits recommendations to MERB. MERB reviews this information and makes its recommendation to the Governor. This drawn-out procedure is only carried out in situations where the Division feels a permit might be issued and is avoided in instances where information received to date dictates denial of the application.

Since the Governor's Executive Order defines one of the seven types of "major state activities" to consist of any "significant alteration of existing land use patterns," the Hydrological Survey Division requests the submission of an environmental report with all real estate-oriented impoundment proposals. (One such situation is dealt with in detail in the following chapter.) Since the establishment of the Michigan Environmental Review Board, an advisory unit to the Governor, in May of 1974, no dam construction-related impact statements have been submitted to it.

Impact statements or assessments submitted for proposed dam projects also are reviewed by the Environmental Review Section of the Program Services Group. A review of the statement is conducted and a recommendation is submitted to the Submerged Lands Section. This recommendation often revolves around the adequacy or

inadequacy of the AER or EIS and includes an opinion as to whether the permit should be issued or denied. The submitted statement as well as the Review Section's recommendations can be presented at the public hearing.

Following a review of all relevant information:

> The department shall issue a permit if it finds that the structure or project will not adversely affect the public trust or riparian rights. In passing upon an application the department shall consider the possible effects of the proposed action upon the inland lake or stream and upon waters from which or into which its waters flow and the uses of all such waters, including uses for recreation, fish and wildlife, aesthetics, local government, agriculture, commerce and industry. The department shall not grant a permit if the proposed project or structure will unlawfully impair or destroy any of the waters or natural resources of the state. This act shall not modify the rights and responsibilities of any riparian owner to the use of his riparian water.[22]

A permit may specify the terms and conditions under which the construction of the project is to be carried out. A permit may be revoked if construction is not carried out in accordance with the provisions of either the permit or the act. Nearly 50 percent of the approved permit applications contain additions to or modifications of the applicant's original proposal which were required by the Department. A final inspection is to be conducted of each project after its completion to certify that it was constructed in accordance with the issued permit.

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[22]Inland Lakes and Streams Act, Sec. 7, Mich. Compiled Laws, secs. 281.731-281.747.

The Administrative Procedures Act

The established framework for the Inland Lakes and Streams Act permit process does not necessarily end with the issuance or denial of a permit. In accordance with the Administrative Procedures Act of 1969, Act No. 306 of the Public Acts of 1969, which is entitled:

> An Act to provide for the effect, processing, promulgation and inspection of state agency rules, determinations and other matters; to provide for state agency administrative procedures and contested cases and appeals therefrom in licensing and other matters. . .[23]

review of state permit decisions is allowed for. This review, which can be instituted following either the issuance or denial of a permit, begins with contested case proceedings. If an "aggrieved party" has exhausted all administrative remedies he is entitled to seek judicial review of the decision, which begins in the local Circuit Court. The specifics of these possibilities can be studied by referral to Act No. 306. These administrative possibilities likewise apply to the Dam Construction Approval Act but were omitted in the discussion since they usually come into play in the consideration of Inland Lakes and Streams Act permits.

Another provision of Act No. 306 that affects the functioning of both state dam regulatory processes is the authority delegated to state agencies to promulgate rules

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[23]Administrative Procedures Act, Mich. Compiled Laws, secs. 24.201-24.313.

and regulations to aid in the administration of these acts. These rules serve to clarify both the avenues of action that need be taken in the permit processes and the criteria to be used in judging permit applications. Rules have been drafted for the Inland Lakes and Streams Act in accordance with Act No. 306. Although the Department of Natural Resources has the power to promulgate rules for the Dam Construction Approval Act, none have been drafted.[24]

Permit Jurisdiction

In those cases where an applicant need apply for permits under both regulatory acts, a hybrid of Act No. 346 procedures and those associated with Act No. 184 is instituted. Under this complementary arrangement the environmental aspects of a project are considered in reviewing the Inland Lakes and Streams Act application and the construction-safety aspects are considered in reviewing the Dam Construction Approval Act application. After a favorable review of the 346 permit request is completed, the applicant is then invited to submit construction plans. It must be made apparent that the dam meets all requirements for issuance of an Inland Lakes and Streams Act permit before this step is taken. The procedures established by Act No. 184 are then carried out, except that those steps involving environmental assessment through the

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[24]Implications of the absence of administrative rules for the Dam Construction Approval Act are presented in Chapter V.

use of the Dam Check-Off Form are omitted. If a favorable review of the construction-safety aspects of the project is then completed, the two permits are issued simultaneously. A close working relationship between the two DNR sections that handle the administration of these two statutes exists.

As described here it is entirely possible that a prospective dam builder would have to secure two state permits before construction. It is also possible that he would have to obtain a permit from the County Board of Supervisors as provided for by Act No. 156 of 1851. This would be necessary if the river or stream in question could be considered navigable by the State of Michigan. This requirement can assure an added measure of local control in such situations.

It is also possible that the prospective builder would have to obtain a federal permit to place a structure on or in any navigable waters of the United States. In this instance a permit would have to be secured for dam construction from the Army Corps of Engineers, pursuant to the authority of the Rivers and Harbors Act of March 3, 1899 (30 Stat. 1151; 33 U.S.C. 401, 403). The concept of navigability in the federal context, to be ultimately decided in a federal court if necessary, is broadly determined by the past, present, or future ability of a

watercourse to support some form of interstate commerce.[25] The navigable waters of the State of Michigan in the federal sense, consist of forty-seven rivers and nineteen lakes.[26] The rivers included in this navigable category are either entire river lengths or segments, beginning at the river mouth and extending upstream to the head of navigation. It should be mentioned that this designation represents merely the views of the Army Corps, because the jurisdiction of the United States (i.e., a determination of which waters are "navigable") can be conclusively determined only through judicial proceedings. This aspect of dam regulation is of relative insignificance because feasible dam sites on these Michigan watercourses have been utilized for some time.

As has been shown, the dam regulation responsibility of the State of Michigan is a complex, involved process. It becomes particularly confusing to persons desiring to construct a dam, as well as to persons simply desiring information as to how the state goes about protecting public rights in Michigan watercourses through control over dam construction and operation. It is hoped that the preceding discussion has provided an accurate and

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[25]Leighton L. Leighty, "The Source and Scope of Public and Private Rights in Navigable Waters," Land and Water Law Review 5 (1970):391.

[26]United States Army Corps of Engineers, "Navigable Waters of the U.S. in U.S. Army Engineer District, Detroit," Chicago, Ill., January 1971. (Mimeographed.)

comprehensible understanding of this regulatory role through a description and synthesis of the numerous components that comprise it.

Dam Incidence in Michigan

There appears one additional area of inquiry that must precede any analysis of the effectiveness of Michigan's dam regulatory efforts. This is some acquaintance with the extent of damming in Michigan, not only in terms of numbers, but also aggregated by owner, use, and size. To date there have been three separate attempts to compile this type of information, none of which can be considered complete or totally accurate.

The first attempt to document the extent of damming in Michigan was conducted by the Fisheries Division of the Michigan Department of Natural Resources. In the interest of the beginning of that Division's ambitious anadromous fish-stocking program, this inventory was compiled in order to try to document any river obstruction or dam which would impede the passage of fish over or around it. This information is vital to the success of that program.

Pursuant to the Field Order dated October 21, 1966, the Chief of the Fisheries Division instructed Department District Offices to compile a file, to be organized by district and subdivided by county, consisting of a two-page form report on every dam that existed in that district. These reports were to be handled by knowledgeable district

personnel, which in all cases resulted in either district fish biologists or district conservation officers compiling the information. The reports provided for the gathering of such information as dam size, owner, location, use, condition and date of construction. The report form also solicited information pertinent to the dam's effects on the stream resource, including stream fish populations, and questioned the possibility of fish passage device construction at the site and the relative need for such facilities. A compilation of dam distribution versus head height, impoundment size, owner and use, which was taken from information obtained in this survey is presented in Tables 1A through 1D.

It must be realized that the information contained in these figures was not compensated for by adding dams constructed or subtracting dams removed since the time of the Fisheries Division survey. This was not attempted for several reasons. Firstly, the effective dates of the reports differed greatly, ranging largely from December 1966 to as late as mid-1971. This was due to the varying times needed to compile the reports in the various districts. Secondly, the data is of very questionable accuracy to begin with, because time and manpower constraints in some instances necessitated inventory by memory rather than by actual site survey. Thirdly, even though a standard form report was utilized, the compilation of information was greatly hindered by inconsistencies,

Table 1.--Dam Incidence in Michigan.

A. Dam Head Height (ft)	Number	Percent of Total
3.0' or less	333	25.4
3.1' to 6.0'	222	16.9
6.1' to 10.0'	335	25.5
10.1' to 20.0'	219	16.7
20.0' to 100.0'	55	4.2
greater than 100'	3	0.2
unknown or unreported	146	11.1
Total	1313	100.0

B. Impoundment Size (Surface acres)	Number	Percent of Total
less than 5 acres	270	20.5
5 to 10 acres	107	8.2
11 to 50 acres	147	11.2
51 to 100 acres	68	5.2
101 to 200 acres	49	3.7
201 to 500 acres	66	5.0
501 to 1000 acres	26	2.0
greater than 1000 acres	33	2.5
unknown or unreported	547	41.7
Total	1313	100.0

Table 1.--Continued.

C. Ownership	Number	Percent of Total
Industry	127	9.7
Department of Natural Resources	194	14.8
Private	689	32.5
Local Government*	196	14.9
Unknown or Unreported	107	8.1
Total	1313	100.0

D. Primary Use	Number	Percent of Total
Power**	120	9.2
Recreation***	603	45.9
Lake Level Maintenance	474	36.1
Irrigation & Livestock Watering	25	1.9
Industrial & Municipal Water Supply	28	2.1
Siltation Control	4	0.3
Unknown or Unreported	58	4.5
Total	1313	100.0

*Includes cities, villages, counties and local governmental bodies such as county road and drain commissions.

**Includes hydroelectric generation as well as mill power and other private power uses.

***Includes fish ponds, hatcheries, wildlife flooding, swimming and general recreation uses.

omissions, and nonuniform notation by district reporters. This is evidenced by the high percentage of unknown or unreported responses, especially in the case of impoundment size.

Speculation can be employed to provide insight into how this picture might differ today. Since 1965 (which might be considered a reasonable preconstruction approval date for dams that have been built since the Fisheries dam survey), nearly 150 dam construction permits have been issued under the authority of the Dam Construction Approval Act, or roughly fourteen per year. We must realize that this total is not an accurate representation compensator for the number of dams built, since not all dam projects require a permit.

Since most dam builders, especially persons desiring small impoundments for their own personal use, typical of most dams in Michigan, are not familiar with the science of dam construction, they seek technical advice on their project. This advice is often available from the Soil Conservation Service of the United States Department of Agriculture. It is estimated that the SCS in Michigan provides assistance on between 105 and 120 dams per year, of which only two to three exceed the five acre limit of the Dam Construction Approval Act.[27] The Soil Conservation

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[27]Interview with Arthur H. Cratty, State Conservationist, United States Department of Agriculture, Soil Conservation Service, East Lansing, Mich., 28 February 1975.

Service does not keep a central file of this information, but it is retained by the various Soil Conservation District Offices. Even by adopting a conservative estimate of a net increase of 100 dams per year, Michigan may well contain in excess of 2000 dams today. This inventory has been the only attempt to date to document the existence of all dams in Michigan, regardless of physical dimensions, prominent use or ownership.

A second inventory, this attempt being of a specific limited scope, was compiled in early 1972. Prompted by a request form the Joint Michigan Senate-House Capitol Outlays Committee, which surfaced during hearings on the 1970-71 Recreation Bond Program Projects, the Department of Natural Resources submitted a report documenting the scope of the dam abandonment problem in Michigan. The report was a joint effort of the Fisheries Division and the Hydrological Survey Division. This thirty-five page report was completed in June of 1972.

The desire of the Joint Committee to obtain this information was a result of a specific incident. Because of a decision by the Federal Power Commission to enforce stricter licensing procedures for hydroelectric dams, numerous smaller facilities in Michigan were retired from active duty by power companies in the late 1960s. The transfer of these structures to local governments and private citizens posed a potential threat to the objective of the Department of Natural Resources to establish an

anadromous sport fishery. One such retired dam, the Newago Dam on the Muskegon River, was removed to allow for fish passage by the Department with funds appropriated by the Michigan Legislature. (It will be dealt with specifically in the next chapter.) The high cost of this project prompted the legislature to attempt to obtain information that would give it an indication of the need for future efforts of this type.

This inventory showed that eighty-six operating hydroelectric plants, ninety-four retired hydroelectric plants, and sixty mill ponds are still maintained in Michigan.[28] The report divides these hydroelectric structures and lists them by river basin and ownership, in specific tables for operating and retired units. The report also lists forty-eight artificial impoundments maintained by dams for real estate developments in the state.[29] The report likewise contains a list of dams that presently constitute blockages to upstream movement of lamprey from Lakes Michigan, Huron, and Superior.[30] Although this report was requested with the notion of possibly introducing legislation to deal with a potential dam abandonment problem, no concrete action ever was taken.

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[28]Michigan Department of Natural Resources, "Status Report on Dams," Enclosures 4 and 6.

[29]Ibid., Enclosure 5.

[30]Ibid., Enclosure 7.

The third and most recent attempt to document dam incidence in Michigan was finished in June of 1974. Authorized by the National Dam Safety Law, Public Law 92-367 of August 8, 1972, it is simply entitled "Inventory of Michigan Dams." Concerned with potential dam safety problems and desiring to compile a national picture of dam numbers and their conditions, the United States Congress ordered a national dam inventory to be conducted by the Chief of Engineers of the Army Corps of Engineers. The report discussed here is Michigan's portion of that national survey.

Concerned with the possibility that inadequate inspections of dams could pose a threat to human life, the inventory was intended to survey any dam which: (1) was twenty-five feet or more in height or (2) had an impounding capacity at maximum water storage elevation of fifty acre-feet or more, but not including any dam which is not in excess of six feet in height regardless of storage capacity or which has a storage capacity not in excess of fifteen acre-feet, regardless of height. By comparing these size requirements to the Michigan dam size distributions presented in Table 1A, it can be seen that a large portion of dams in this state (at least 40 percent have head heights of less than six feet and therefore fail to qualify on the basis of height alone) were not included in this national inventory. The national inventory, which has not been fully evaluated at this time, will hopefully give an

indication of whether there is a need for a national dam inspection program in addition to those carried out by specific federal agencies on dams owned or controlled by them.

The Michigan inventory documented 649 dams that meet the physical requirements of the law. Of these, 87 are considered federal dams (that is, they are inspected by some federal agency) and 562 are non-federal. Federal dams consist of hydroelectric facilities inspected by the Federal Power Commission and various conservation-oriented dams inspected by the United States Fish and Wildlife Service, as well as those inspected by the Forest Service, U.S.D.A.

This inventory was completed in two parts. The first portion consisted of ascertaining information such as the dam's name, location and height, the nearest downstream city and its size, the type of construction, the year built, the types of uses, and the impoundment volume. Since time was limited, this information was obtained largely from the Fisheries Division's Inventory of dams and from the Hydrological Survey Division's permit files. Impoundment volume was estimated by multiplying impoundment surface acreage by one-half the head height. This assumes that the impoundment is triangular in shape and does not allow for irregular form or impoundment siltation, resulting in very questionable accuracy. Much of the information collected during the first phase of this inventory can be

considered only as accurate as the information it was based on.

Phase two of the inventory was compiled only for a small portion (169) of the 649 dams listed. Information recorded here included spillway specifications, owner, who designed and constructed the dam, who inspects the dam, and the authority under which the inspection was, or is being, carried out. This information is very inconsistent because much of it was not readily available. Attempts were made to record this information only for dams falling into the federal category (87 in number) or those constructed under the purview of Act No. 184, which the inventory showed to be only 82 additional structures. Only the information recorded during the first phase of the inventory is available for the remaining 480 dams.

In summary, it can be said that the three inventory attempts presented here are fragmentary at best, and that an accurate, totally inclusive documentation of the scope of damming in Michigan simply does not exist.

CHAPTER IV

SELECTED CASE HISTORIES

Before one can understand the role of State government in the regulation of dams in Michigan, identify problems inherent in that scheme, and suggest proposals for solutions to those problems, one must first look at some specific, individual dam "case histories." These examples can be used to document the various steps in the regulatory process, as that process actually works. Five dam case histories are included here.

The five case histories chosen for descriptive analysis were selected with two criteria in mind. One criterion was accessibility of information. Cases that were well documented, with the necessary information readily available, were chosen because totally new, independent research efforts along these lines were not justified in view of the present study's general objectives. The second selection criterion was potential problem applicability. That is, cases were chosen to expose as many different aspects of the regulatory process as possible, thereby casting light on what might be called

typical dam issues that could be expected to arise with some regularity in the future.

Each case description will include the history of the impoundment situation, plus all issues with broad implications which surfaced during research regarding it.[1] These problems or issues are explored in detail in Chapter V, where the dam regulatory scheme in Michigan is critically examined and proposals are made for change in that scheme.

Packing Materials Company Dam

As was discussed in Chapter III, the Department of Natural Resources makes every effort to place an impoundment constructed in violation of the Dam Construction Approval Act under permit. This "after the fact" permit issuance policy was employed recently with regard to a dam owned by the Packing Materials Company. This case is explored below in order to outline procedures followed in instances where a dam is built without obtaining the necessary permit(s) beforehand.

History

During an aerial survey conducted on February 5, 1974, by the District Law Supervisor of the Department of

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[1]The information contained in these case histories was obtained from numerous sources. Much of the material was reconstructed from the files of the Michigan Department of Natural Resources, particularly those of the Hydrological Survey Division. Local governmental units and private

Natural Resources, a large impoundment project was observed to be under construction in the Northeast corner of Oceana County (Section 1, T. 16 N., R. 16 W.) in Michigan's Lower Peninsula. The project underway involved the clearing and bulldozing of a swamp area containing several springs and unnamed intermittent creeks, tributaries to the Big South Branch of the Pere Marquette River, and the construction of a one-half mile dyke. Department files contained no record of a project permit having been issued. This information was relayed to regional law personnel and forwarded to the Hydrological Survey Division for action.

Before determining which course of action to follow, DNR personnel including representatives of the Bureau of Water Management and Regional and District Offices, and a representative of the Attorney General's Office conducted an on site inspection of the project on March 28, 1973. They were accompanied by the President of Packing Materials and his legal representative. After consultation it was decided that a Dam Construction Act permit was necessary but that an Inland Lakes and Streams Act permit would not be required since construction had begun prior to the effective date of this statute. The Company agreed to apply for a construction permit and were informed that in accordance with Department practices a DNR review of the project would be conducted prior to permit application.

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parties supplied valuable information and insight, as did many state government employees.

The builder was instructed not to do any additional work until approval was given, because the dam permit might be denied.

Packing Materials' plans were somewhat uncertain at this juncture. Unaware of the necessity to obtain a construction permit, the Company had planned an 11-1/2-foot dam to impound about 130 acres of water to a maximum depth of 10 feet. Preparation began in 1969. The purpose of the project had not been decided upon at this time, as Packing Materials stated the impoundment might be used for trout rearing, pay fishing, or as an employee recreation area. The developer had sought advice on his construction proposal from an engineering consulting firm which felt the plans were adequate from both safety-construction and environmental standpoints.

A Department-wide review of the environmental aspects of the project was conducted on March 29, 1973. Dam Check-Off Forms were distributed to solicit comments and permit decision recommendations. The Wildlife Division felt there would be no adverse effect on area wildlife and that a permit should be issued. Reports from Region II expressed concern regarding elevated water temperature and its effect on the temperature of the main stream one-half mile away, but also recommended permit approval. A somewhat different opinion was voiced by the Fisheries Division, which was of the opinion that the project already had resulted in substantial water quality degradation and

that most of the damage that had been done could not be rectified by removal. This Division therefore recommended approval but presented four suggestions to be incorporated into permit stipulations that it felt would ameliorate present conditions.

Packing Materials was then invited to submit an application, a $400 application fee and construction plans. They were also required to submit a resolution stating that the impoundment was not "for the purpose of creating a residential or recreational subdivision, and the corporation does not intend, within the foreseeable future, to develop for resale subparcels of the property surrounding the impoundment." This was necessitated by Michigan's Interim Land Use Policy which had been passed by the Natural Resources Commission and was then in effect.[2]

Dam Construction Permit No. 74-1 was issued on April 24, 1974, along with a Fish Ladder Waiver. The permit included eight specific provisions. These related to final post-construction Department approval, embankment slope specifications, minimum flow releases of 1 cfs during and after construction, and provisions for downstream siltation minimization. The project is still under construction,

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[2]This policy stated that the Department of Natural Resources would not "in any way abet any new use of land and associated water resources which has the potential to cause major irreversible damage to the quality of Michigan's environment." This policy was to serve as temporary insurance that Department decisions would not "later prove to be inconsistent with the State Land Plan as ultimately adapted."

with periodic State inspection, and is not expected to be completed and filled for some time.

Issues and Implications

A number of factors which are collectively unique to the situation at hand but often can be individually applicable to other dam cases become apparent and warrant further mention because they suggest potential problems which might be encountered in Michigan's regulatory function.

The most basic and probably the most important aspect of this case type deals with the question of dam construction without the necessary permit(s). In these instances the Department of Natural Resources has two basic options. It can initiate criminal action by seeking a warrant through the County Prosecutor in District Court, or seek an injunction for removal or corrective action in civil proceedings, in cooperation with the Attorney General's Office, where District Courts cannot effect needed restoration. The other option open to the Department, that being permit issuance "after the fact," is the route most often taken. There have been numerous reason why the Department of Natural Resources has chosen to take this option, which will be critically explored in the following chapter.

Typical of many impoundment projects (as was displayed when the ecologic effects of damming were discussed), is the high degree of uncertainty that exists with respect

to the environmental impact of a project. This is the case with the Packing Materials dam. There is still some question as to whether the water supply sources will be sufficient to fill the reservoir to the planned level. The possibility of a need for ground water well supplementation still exists. The construction permit specified a minimum flow release of 1 cfs of unspecified temperature (from previously constructed bottom-spills). The exact effect of this provision has not been explored despite the fact that it was unacceptable to the Fisheries Division. Permit specifications regarding sedimentation control were very general in nature, necessitated by incomplete knowledge of the extent and effect of downstream sedimentation. It must be noted that the impoundment has not yet been filled.

A third related issue involves the controversial topic of impoundment real estate developments. In view of the fact that the use to which the reservoir would be put is still uncertain, the Department of Natural Resources required a resolution stating that the land around the impoundment would not be subdivided for resale, as this practice would require the preparation of an environmental impact statement.[3] The term "foreseeable future" seems somewhat open-ended in view of the fact that a real estate-oriented impoundment would have been subject to much closer

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[3]William G. Milliken, Governor of the State of Michigan, Executive Order 1974-4 (May 3, 1974).

scrutiny in the permit review stage than the project actually was.

Lake Metamora

A review of the Lake Metamora impoundment is presented for the purpose of reviewing procedures and circumstances involving dam failures. This case is of particular interest because it displays not only the general case of dam failures but also the importance of county government regulation of reservoir projects which fall under the authority of the Inland Lake Level Act, and the function this local government level can serve.

History

Lake Metamora is only one of the numerous real estate oriented impoundments constructed in the mid-1960s. Under the authority of the original Dam Construction Approval Act, application for permit was made on October 22, 1963. Following a review of the construction plans and an on-site inspection, a dam construction permit was issued by the Hydrological Survey Division on December 24, 1963.

The project, located in Lapeer County (Section 6; T. 6 N., R. 10 E.), called for the damming of Farmers Creek. The dam was to be twenty-one feet in height and was to impound a total of ninety-one surface acres of water for a recreation lake which was intended to support lakeside home sites. Construction began in July of 1964.

During this initial construction period, Department of Natural Resources' personnel conducted periodic inspections of the site. The inspections subsequently revealed construction specifications which deviated from those presented in the approved set of plans. Construction was halted and revised sets of construction plans and specifications were submitted. Changes included alterations in spillway elevations and relocation of the emergency spillway. These plans were approved and a revised dam construction permit was issued on February 24, 1965. Subsequent to inspections made during and after this second construction phase, the Department gave final construction approval to the dam on March 8, 1967. It must be remembered that this project fell under the authority of the original Dam Construction Approval Act which did not provide for an environmental review of the proposal.

The second phase in the history of Lake Metamora, that phase which deals with the ultimate failure of the dam, began in early 1971. Pursuant to Section 24, Subsection 1 of the Inland Lake Level Act, any dam impounding waters on which a legal lake level has been established will be inspected by a registered professional engineer under the purview of the county drain commissioner of the county in which it is located every three years from the date of completion of the structure. In 1971 the first such inspection of the Metamora Dam was conducted by Bol-Mac Engineering. The few unfavorable conditions cited in the

report were not considered by the Department to be an immediate threat to the safety of the dam. Whether these conditions were the forerunners of the eventual failure causes is still uncertain. Also provided for in Section 24 of Act No. 146 is an authority delegated to the Department of Natural Resources to require a county drain commissioner to repair or remove a dam within six months of such an inspection if it should show the public safety to be endangered.

The deteriorating condition of the dam became acute in early 1974. The Lapeer County Drain Commissioner became concerned over its worsening condition and notified the Hydrological Survey Division. An inspection was conducted by DNR personnel on May 19, 1974, and an excess amount of seepage was noted. The Hydrological Survey Division, having found the safety of the structure to be in question, notified the Lapeer County Board of Commissioners of its intention to order repair. The condition of the dam worsened by the day, ending in disintegration of the riser foundation and failure of the structure three days later on May 22nd. The washout was eventually traced to construction with inferior grade concrete.

The question no longer was, "What is the condition of the dam and is it safe?" Lake property owners and county officials now were concerned with the speedy and effective reconstruction of the dam and filling of the reservoir. It is at this juncture that the role of county

government in the Lake Metamora case becomes of particular interest.

The normal procedure for dam reconstruction is to force reapplication for a dam construction permit under the authority of Section 2, Subsection 4 of the Dam Construction Approval Act (this provision was added by the 1970 amendatory Act, Act No. 68 of the Public Acts of 1970). The reconstruction is then supervised through the Hydrological Survey Division. It was decided in this case to allow the County to oversee the reconstruction work under the Authority of the Inland Lake Level Act. An Inland Lakes and Streams Act permit was deemed necessary and issued before the work began.

A special assessment district was established by the County Drain Commissioner. There is no public access to the reservoir and therefore the Department of Natural Resources was excluded in this determination. Construction plans were prepared, revised after Hydrological Survey review, and reconstruction begun. The dam was totally reconstructed by the end of October of that year and the lake restored to its legal level before December 31. The cost of the project, paid for in total by the Lake Metamora home and property owners, amounted to $18,000.

Issues and Implications

The history of Lake Metamora and its eventual failure suggest three areas of concern. The first involves

present practice regarding on-site inspections during dam construction. These inspections currently are handled on an individual basis and are hindered by manpower shortages. The intended purpose of construction inspections today is to ensure compliance with permit conditions and ensure standard construction practices consistent with both dam safety and sound environmental considerations.

The Lake Metamora situation displayed problems of inadequate on-site inspections in two ways. First, contractors had deviated from approved plans and begun construction on spillway devices in violation of their first permit. More frequent inspections could have halted construction before these changes had begun and facilitated a better review of their necessity and impact. The cause of the eventual failure, use of insufficient-quality concrete, could possibly have been detected by more thorough inspections and been corrected. Many related inadequacies are avoided today by requiring the contractor or participating engineer to submit a signed statement that the dam was built according to specified practices as a condition of the permit.

A second concern exposed by this situation involves practices employed in the inspection of dams after construction. Although the DNR has the authority to inspect dams when a hazardous condition may exist, the Dam Construction Approval Act makes no provisions for the periodic inspection of all dams. The triannual inspections

authorized by Act No. 146 apply only to dams impounding waters on which a legal lake level has been established. The fact that the failure of the structure in question here occurred as a relative "surprise" suggests the need for some form of periodic inspection program to ensure the safety of dams in Michigan.

The third and most basic area of concern related to the Lake Metamora situation involves the question of government level responsibility and effectiveness. The decision to allow county level officials to supervise the reconstruction appears to have exposed several advantages. First, county government is better suited to working with local groups and is more responsive to their concerns. In this case, it resulted in a better understanding between lake property owners, contractor, and government officials. Secondly, this procedure resulted in quick action. The County appeared more receptive to local concerns and pressures and was able to complete construction in about five months and return the reservoir to its previous level in less than two additional months. Lastly, since there was no public access on the lake and reconstruction was financed by private money, the local unit of government seems the more logical choice. Overall, the decision to allow county supervision of reconstruction under the authority of the Inland Lake Level Act fostered a better working relationship between involved parties and ensured optimal results for all involved.

Barryton Dam

An analysis of State regulation of damming necessarily deals with much more than control of the construction of new dams. In light of the State Government's role as guardian of Michigan's natural resources, the management of those dams now in existence also must be considered. Many concerns revolve around maintenance and repair considerations as well as dam removal alternatives. When analyzing such situations it is found that the disposition of retired hydroelectric facilities to private individuals or local governments can create serious problems. The dam owned by the Village of Barryton is explored here in order to examine these potential problems.

History

The Barryton dam was constructed in 1875 for milling purposes. The structure was later acquired by Consumers Power Company, which installed power generating facilities to furnish electricity to the Village. The dam was retired from active power production in 1920 and sold to the Village of Barryton in Mecosta County (Section 27; T. 6 N., R. 7 W.) on the Chippewa River.

The controversy that has arisen began in July of 1969 when heavy rainfall resulted in overtopping of the structure due to lack of an adequate spill capacity and inadequate freeboard. Similar flood conditions occurred again in May of 1974. On both occasions the Village

ordered a section of the structure's earth embankment to be bulldozed to prevent a total washout of the dam.

The problem is complicated by homeowners in the Chippewa Vista Recreational Subdivision who contend that irresponsible operation of the dam by Village officials has caused flooding of the cottages. The subdivision is located approximately three miles downstream of the reservoir. The homeowners have been trying to get the Village to drain the impoundment prior to spring breakup, thinking that the impoundment would provide sufficient flood storage to reduce downstream flood stages. It is significant to note that the subdivision was platted in the early 1960s, prior to the present Plat Law, and many sites are located on the flood plain of the Chippewa.

It seems highly probable that flooding of the subdivision would occur regardless of whether or not the Barryton Dam existed or how it was operated. The maximum storage capacity of the reservoir is estimated to be 230 acre-feet, with a head of 10 feet. The 10, 50, and 100 year frequency flood discharges of the Chippewa have been calculated to be 1,400 cfs, 2,100 cfs, and 2,500 cfs respectively. These figures reveal that even at a once-in-10-year flood stage, the reservoir could impound less than two hours of river flow and is therefore highly unlikely to provide any significant flood storage capacity.

The threat of total dam failure, which certainly is a possibility for a structure of Barryton's age and

condition, necessitates the most concern. The failure of the structure would empty the impoundment in between three and six hours and supplement the river's discharge by 700 to 900 cfs. Such an increase, coupled with already-high river flows, could cause serious downstream damage, especially to the Vista Subdivision.

Following the 1974 flood, Hydrological Survey Division engineers inspected the dam, suspecting a potentially hazardous condition. Since it was found that the dam might pose a threat to the public safety, the Village was required to submit a report prepared by a registered professional engineer, under the authority of Section 2c of the Dam Construction Approval Act. The Village Council tabled action on this matter because of a lack of the funds necessary to hire an engineer. It was suggested by the Hydrological Survey Division that since there was some development of private property on the impoundment that a legal lake level be established and a special assessment district set up to finance the report and any needed repairs. The Village Council has balked at this option because this route (under provisions of the Inland Lake Level Act) would technically turn control of the dam over to Mecosta County. A second reason, one which is more important to the Village, is the financial burden of this type of assessment. The total population of the Village is only 350, many of whom are retirees, and it is felt that these homeowners could not afford this expense.

The Department of Natural Resources, realizing the financial position of the Village and the danger which exists because of the dam's insufficient design, requested in September of 1974 that all stop logs be removed and the reservoir dewatered until action could be taken. The Village ignored this request citing aesthetic, recreational and fire protection water supply reasons for maintaining the impoundment's level. The Village has made every attempt to lower the level of the impoundment prior to anticipated high water in order to help alleviate downstream problems. The Village however still has no intention of fully dewatering the reservoir. The Department of Natural Resources is currently pursuing legal remedies to force drawdown of the reservoir through the Office of the Attorney General.

Issues and Implications

Two major problems immediately become apparent. First, the dam is in need of modification in order to prevent its total failure in the event of future flood conditions. This work would consist of the construction of an emergency spillway large enough to prevent overtopping of the structure. Provisions of the Dam Construction Approval Act necessitates the contracting of an engineer to prepare a preconstruction report of the needed work. It is the State's duty to ensure protection of the public safety. Secondly, the Village of Barryton is financially

unable to accomplish this. Local public funds are woefully insufficient and private economic positions make the establishment of a special assessment district impractical. Funds will have to be obtained elsewhere. This problem is compounded by the Village's will to maintain impoundment levels, and opposition from downstream property owners who feel the dam is responsible for high flood stages.

The Barryton predicament is not unique. As was witnessed earlier, power companies have sold numerous structures for nominal considerations upon retiring dams from active power production. Often it seems buyers were not aware of the costs they might face in the future. These situations become more complicated when it is realized that local persons and communities develop strong interests in the maintenance of the reservoir. These interests generate from property orientations, aesthetic benefits and numerous recreational uses. It is often later found that owners are neither financially nor technically capable of maintaining the structure.

The magnitude of this problem of dam disposition can be better realized when it is recognized that 196 dams are owned by local governmental units in Michigan.[4] Of this total, 15 are owned by village and city governments

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[4]See Chapter III, Table 1C. It must again be emphasized that these figures should be viewed only as close approximations.

and still produce electricity.[5] Another 46 are retired hydroelectric units, most of which where acquired by their present owners since 1950.[6] The maintenance of these structures may soon become a problem to many of these local governments.

Newaygo Dam

The third case history to be covered in this Chapter, that dealing with the so-called Newaygo Dam, is presented for the purpose of exploring a situation involving the removal of an impounding structure. As was mentioned, at no time since the enactment of the Dam Construction Approval Act of 1970, which authorized forced removal of any dam that might be endangering the public safety, has the Department of Natural Resources exercised this power. The Newaygo Dam case therefore demonstrates a somewhat different instance of dam removal. It will, however, raise a number of related issues that are relevant to both this study's scope and its objectives.

History

The Newaygo Dam, which was located in the City of Newaygo (Newaygo County, Section 19; T. 12 N., R. 12 W.) on the Muskegon River, was built in 1900. The dam was reconstructed in 1916 by the Newaygo Portland Cement Company

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[5]Michigan Department of Natural Resources, "Status Report on Dams," Enclosure 3.

[6]Ibid., Enclosure 4B.

which in turn sold the structure to Consumers Power Company in 1922. The dam was operated by Consumers Power until December 27, 1965, when it was retired from active power production. The dam subsequently was sold to the Michigan Department of Natural Resources in October of 1967 for the sum of one dollar.

The Newaygo Dam produced hydroelectric power over the 43 year span from 1923 until its retirement in 1965. The electrical output of the Newaygo Dam fluctuated between 10 million kwh and 12.5 million kwh,[7] a very stable but nonetheless fairly insignificant output. The dam was eventually retired from production for two reasons. First, economies of scale favored fossil fuel electric generation over hydroelectric production, as the costs of maintaining the dam structure in proper operating condition were increasing to prohibitive levels. Secondly, the ability of hydroelectric power generation to meet peak demands is frequently inconsistent, and as the Newaygo area became more populated, sources that could reliably meet these peaks were favored.[8]

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[7]Interview with Arthur Hume, Consumers Power Company, Cornell, Michigan, 3 June 1975.

[8]The ability to meet peak demand periods is of prime concern to effective and reliable electrical supply. One form of hydroelectric power which is extremely useful in both meeting and redistributing power to peak demand periods is pumped sotrage production, such as that in operation near Ludington, Michigan.

The Michigan Department of Natural Resources acquired the dam for a unique reason. The Fisheries Division sought removal of the structure in conjunction with its comprehensive fish management program. The Newaygo Dam was breached on December 28, 1968, and thereafter removed. The removal was undertaken to both allow salmon passage past the Newaygo site and to open the upstream reach to walleye spawning where conditions were move favorable to this species.[9] The cost of the removal, which was financed by legislative appropriation, was $120,000. The Newaygo Dam was the first such structure removed for fish management purposes.[10]

An otherwise "closed case" became extremely more involved. A suit for damages was filed against the State, contending that the Newaygo removal contributed to flood water damages to downstream riparian property on July 1, 1969, and again on February 1 and 2 of 1971. The two property owners who brought suit contended that the dam removal was responsible for extensive deposition of gravel and silt washed from the impoundment which resulted in damage to their waterfront properties. The defendant (the

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[9] A lamprey barrier was not maintained because Croton Dam lies only 14 miles upstream from the Newaygo site. It was found there would be no additional costs of chemical treatment to include this reach in the existing control program.

[10] A second dam, the Homestead Dam on the Betsie River was removed in 1973-74 for fish management reasons at a cost of $180,000. The Fisheries Division is currently studying the possibility of removing additional structures.

State of Michigan) contended that the floods, as well as the heavy rains which preceded, were an act of God and therefore claimed no responsibility for the silt damage. On August 2, 1972, the Michigan Court of Claims, with Circuit Judge James E. Hoff presiding, awarded the plaintiffs a total of nearly $57,000 in damages. The State appealed the ruling, the decision was upheld, and the damages paid. The removal of the Newaygo Dam therefore cost the State of Michigan almost $177,000, excluding the costs of the defense and related expenses.

Issues and Implications

The most obvious issue which presents itself is that which deals with dam removal. The cost of removing an impounding structure can be extremely high. Removal cost depends on a variety of factors, including the size of the dam and the impoundment, the type of construction, the nature of the surrounding topography and settlement pattern, the nature of the watercourse, the type of removal procedure used and the extent of precautions taken to preserve downstream conditions. The level of these costs is very seldom appreciated until it becomes necessary to remove a structure.

More specifically, the future removal of larger dams, typically situated on downstream reaches of tributaries to the Great Lakes, for fish management purposes should be considered. Naturally, the removal of such

structures first necessitates acquisition of the structure. One management alternative which presents itself is the addition of fish ladders to structures that do not warrant total removal. It is estimated that the cost of these installations roughly approximate the cost that would be incurred in total structure removal.[11] It can be seen therefore that these costs are also usually very high.[12]

The general effects of removing dams must also be taken into consideration. Effects on downstream reaches can be drastic, as the opening of a reservoir which has served as a suspended materials trap can release large quantities of these substances into the stream channel. Caution must be taken to understand these potential effects and efficiently control them during removal. In many respects these effects are analogous to those ecologic effects of damming discussed earlier, as they are unique to particular dam instances and nearly always difficult to ascertain.

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[11]Interview with Thomas R. Doyle, Michigan Department of Natural Resources, Lansing, Michigan, 28 January 1975.

[12]Two recent cases illustrate this. The Berrien Springs Dam on the St. Joseph River is currently being equipped with a fish ladder with a vertical rise of 24 feet, at a cost of $303,000. This cost is being equally shared by the dam's owner, the Indiana and Michigan Power Company, and the Federal Government with funds supplied under the authority of the Anadromous Fish Act. The Department of Natural Resources recently completed the construction of a fish ladder over the 6 foot high 6th Street Dam on the Grand River in Grand Rapids, at a cost of $177,000.

In a somewhat different light, the removal of a dam and the accompanying lowering of an impoundment are often opposed by persons who depend on the reservoir impoundment level. Even though no prescriptive rights can be secured by impoundment riparians,[13] community development patterns are often extremely dependent on the maintenance of the impounded water level.

Lake Doster

The fifth and final case to be explored involves the Lake Doster Development. Originally selected as an example of a dam constructed for the purpose of establishing lake oriented subdivision development, the Lake Doster situation also will provide important insights into a number of areas not specifically related to this intensive use type. These areas will include: (1) dam proposal instances where both a Construction Approval Act permit and an Inland Lakes and Streams Act permit are required; (2) dam cases that can be considered major, significant, and controversial in nature; (3) proposals which necessitate employment of procedures outlined in the Administrative Procedures Act; and, (4) the utilization of the intent of the Michigan Environmental Protection Act and the emergence of this statute as a tool in State permit processing functions. Each will prove

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[13]Drainage Board v. Village of Homer, 351 Mich. 73 (1957).

invaluable in helping to both explain the dam permit scheme and suggest problems inherent in its current function.

One unfortunate shortcoming should be noted. As would be encountered in the coverage of any incomplete case, a review of the Lake Doster controversy will only present a portion of that case's history and will very soon become outdated. However, this review will document an important part of Michigan's dam regulatory role, a critical review of which is the major objective of this effort.

History

The Lake Doster case involves the impounding of the headwaters of Silver Creek, a tributary to the Kalamazoo River in Allegan County (Section 26; T. 1 N., R. 11 W.). In fact, this controversy involves both a completed structure and a second dam which has been proposed. Prior to the enactment of the original Dam Construction Approval Act in 1963, the Lake Doster Development Company constructed a dam impounding the extreme headwater area of Silver Creek, which consisted of a number of springs and small intermittent streams. This project created a 230-acre lake on which a recreation-oriented subdivision was begun. As part of this real estate development a second lake, to be called Greater Lake Doster was planned. This lake was to be adjacent to the first and impound an additional 570 surface acres of water. A Dam Construction Approval Act permit (No. 64-7) was issued for Greater Lake Doster on March 12, 1964.

For a variety of reasons construction was not begun and extensions of this permit were granted on June 2, 1965, February 10, 1967, January 27, 1969, March 3, 1971, March 23, 1972, and January 24, 1973, the last with an expiration date of March 1, 1974. At this time it became apparent that the proposed development would likewise fall under the authority of the Inland Lakes and Streams Act which had gone into effect in January of 1973, because Silver Creek was covered by the statute's definition of an inland stream. The developer contested this decision, claiming that construction had begun before the enactment of the Inland Lakes and Streams Act and therefore a permit under this statute was not necessary. On-site inspections in October of 1973 could find no evidence that construction had commenced. Following meetings with Hydrological Survey Division personnel and representatives of the Attorney General's Office in October and November of 1973, the developer agreed to submit an application for an Inland Lakes and Streams Act permit. This application was received on January 21, 1974, with the understanding that an additional extension of the Greater Lake Doster Dam Construction Act permit would be withheld pending approval of the permit applied for under the authority of Act No. 346.

Nine days after receiving the permit application, in accordance with Section 6(2) of the Inland Lakes and Streams Act, the Hydrological Survey Division submitted copies of

the application to parties entitled to receive it, along with a statement delineating the policy on public hearings. Numerous requests for a public hearing were received, the first coming from Trout Unlimited on February 7, 1974. A hearing date was set for April 18, 1974, and appropriate notice was given as stipulated by conditions set forth in Section 6(4) of Act No. 346.

In view of existing Department policies, as dictated by Executive Order 1971-10,[14] Hydrological Survey requested the submission of an environmental impact assessment (equivalent today to an environmental report) by the developer on February 15, 1974. This request was made because the project was considered major in extent and was definitely controversial in nature. The Department of Natural Resources required the submission of this document for two additional reasons. First, if a permit were to be issued, the DNR would have to prepare an environmental impact statement for State government review. The developer's assessment can serve as an initial step in this process. Secondly, with an assessment in hand, the Department can more easily conduct a review of the environmental aspects of the proposal. Lake Doster Development Company submitted such an assessment, prepared by M. D. Ismond, Conservation Consultant, on September 30, 1974.

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[14]This Order was the forerunner of Executive Order 1974-4, which superseded it on May 3, 1974.

Probably the most significant aspect of the Lake Doster situation is that of the public hearing. Conducted as an informal information session, and in this instance chaired by the Submerged Lands Management Section Chief, the hearing was attended by over two hundred interested individuals, all of whom were invited to speak. Topics covered included fish and wildlife considerations, hydrological factors, aesthetics, sanitation plans and potential problems, and lengthy discourses involving the merits of development and economic growth versus conservation and environmental protection. Local citizens, local government officials, private organizations, and State employees all participated and made known their feelings regarding the permit decision that would be made. Also presented at the hearing were statements which persons wished to have entered into the record plus petitions signed by local citizens which contained 940 signatures opposed to the development and 84 in favor of the Greater Lake Doster plan.

The transcript of the hearing, which was freely available to interested parties, was distributed for Department review and preliminary recommendations concerning the application. The Fisheries Division voiced immediate disapproval, citing the destruction of the valuable fish resource in Silver Creek. Region 3 and District 12 personnel violently opposed the project on fisheries,

hydrologic, and wildlife grounds.[15] The Department of Public Health recommended that a plan for central sewer service be prepared before permit consideration, as it felt the area was unacceptable to an additional septic tank load. The Wildlife Division could find no significant detrimental effects on area wildlife and deferred to the views of the Fisheries Division.

More important, however, were comments solicited from these same State government entities some four months later when they were petitioned to review all information available, including the developer's environmental impact assessment, and submit final comments prior to a decision on the permit application. Final recommendations were similar to earlier comments but with one added objection. The Fisheries and Water Quality Divisions, as well as the Hydrologic Studies Unit of the DNR, felt the assessment submitted by the developer was woefully inadequate. Region 3 and District 12 personnel expressed similar feelings. All recommended denial. Only the Department of Public Health failed to suggest denial. It did recommend, however, that the application not be considered until an acceptable sanitation plan was submitted, feeling provisions spelled out in the assessment were not adequate.

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[15]Field office recommendations for disapproval were based on studies conducted by the District Fisheries Biologist of trout populations in Silver Creek and temperature effect tabulations projected for downstream areas.

The application by Lake Doster Development Company for an Inland Lakes and Streams Act permit was therefore totally rejected on April 14, 1975, by the Hydrological Survey Division staff. The permit denial, as well as citing findings of fact and interpretations of law, stated the following major reasons for rejection of the application: (1) insufficient hydrological data left a large amount of doubt as to whether the reservoir would ever fill; (2) considerable organic soils in the proposed basin would render the impoundment eutrophic from inception; (3) probable adverse effects on downstream water quality would result; (4) loss of upland game habitat would occur; (5) a probable establishment of large permanent waterfowl populations in the impoundment would likely follow; (6) the loss of the naturally sustained brook and brown trout fishery in portions of Silver Creek would be inevitable; and, (7) the proposal was inconsistent with the Interim Land Use Policy adopted by the Natural Resources Commission.[16]

Lake Doster Development Company naturally does not agree with the State's action. The Company has therefore

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[16]In addition to prohibiting any new use of land which has potential to cause major environmental damage, the Interim Land Use Plan states: "Examples of proposed development and/or use which will be even more critically scrutinized under this policy than before include, but are not necessarily limited to: impoundments and other major alterations in natural watercourses; new subdivisions, whether platted or not, and expansion of existing subdivisions. . ."

filed as an aggrieved party. The Natural Resources Commission will establish a format for a contested case hearing to review the matter. The Commission will likewise appoint a hearings officer for this case. This procedure is in accordance with the Administrative Procedures Act, Act No. 306 of the Public Acts of 1969. Any subsequent judicial review and determination, which can be requested by either party, will likewise be conducted under the authority of this statute and proceed in accordance with general court rules.

Issues and Implications

As witnessed in the four preceding case histories, a number of issues also present themselves for further evaluation with respect to the Greater Lake Doster proposal. The most encompassing area is that which deals with the administration of the Inland Lakes and Streams Act and the processing of these permits by the Hydrological Survey Division. Numerous factors inherent in this scheme will be explored in Chapter V with respect to both statutory revision possibilities and administrative shortcomings of the current permit processing function. Areas which will be explored include budget and manpower supply and demand, the role of the environmental impact statement, time factors for application review and permit administration, and the role of public hearings as a vehicle for voicing support and opposition to a proposal.

A second issue which will arise will concern itself with the judicial review of permit decisions and the legal employment of the "environmental ethic" in deciding these controversies. Few can argue the dynamic nature of the weighting of environmental factors versus economic considerations. If the Greater Lake Doster proposal is eventually settled in the legal arena, which seems extremely likely, the authority of the Inland Lakes and Streams Act both as an administrative tool and as a means of protecting Michigan's resources will be either firmly established or effectively crippled.

In this same light is the new role played by concerned citizens. In the form of both individuals and groups, Michigan residents came forward to express their views. Emotional cries were muffled by numerous independent scientific attacks on the soundness of the Doster proposal. The effect and importance of public concern and involvement is also extremely dynamic, as protests on a very similar development failed to stop the issuance of a permit, in 1971, just four years ago.[17]

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[17]Environmentalists contested the issuance of a Dam Construction Approval Act permit in late 1971 on much the same grounds cited for denial of the Greater Lake Doster permit under Act 346. The DNR had issued a permit for the damming of Charlevoix County Creek for a subdivision development. Although the Circuit Court at that time upheld the permit decision, the development appears to have been scrapped because of economic reasons and expiration of the permit. The Michigan Environmental Protection Act of 1970 was the prime tool utilized by the plaintiffs in contesting this case.

The last issue to be considered, and possibly the most important, not only to this case but also to the future of Michigan's environment, is the attempt to integrate, and apparent success of integrating, State licensing functions such as those authorized by the Inland Lakes and Streams Act and the obligatory authority relegated to the State as outlined by the Michigan Environmental Protection Act (Act No. 127 of the Public Acts of 1970). This Act states that:

> In any such administrative, licensing, or other proceedings, and in any judicial review thereof, any alleged pollution, impairment or destruction of the air, water or other natural resources or the public trust therein, shall be determined, and no conduct shall be authorized or approved which does, or is likely to have such effect so long as there is a feasible and prudent alternative consistent with the reasonable requirements of the public health, safety and welfare.[18]

Even though Act No. 127 does not specifically mention damming, its importance to the regulatory role of State government in the protection of Michigan's natural resources through permit functions is paramount. For the first time, this statute provides, or forces, an avenue for the Department of Natural Resources to take the initiative in such licensing matters.[19]

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[18]Michigan Environmental Act of 1970, Sec. 5(2), Mich. Compiled Laws, secs. 691.1201-691.1207.

[19]Some of the provisions of the Michigan Environmental Protection Act of 1970 have recently been jeopardized by special interest attempts to exempt certain concerns from adhering to stipulations of the statute. Stephan Meyer, "Is S.B. 1003 Necessary: An Evaluation of a Proposal to Amend the Environmental Protection Act," Report from the Committee on Land and Water 16 (October 1975):18.

CHAPTER V

PROBLEMS AND RECOMMENDATIONS

The four preceding chapters have documented the regulatory role as it is played by the Michigan Department of Natural Resources in controlling the construction, operation, and existence of dams in this State. This chapter examines problems currently inherent to the DNR's overall regulatory scheme and presents recommendations to circumvent those problems. It his hoped that these suggestions will open additional avenues for constructive criticism, and will result in beneficial changes in the dam-regulation system that functions today in Michigan.

Four kinds of problems and related action recommendations follow: First, problems that exist within dam-regulation legislation are explored. This will consist primarily of suggested amendments to, and deletions from, the two main statutes which regulate damming in Michigan, the Dam Construction Approval Act of 1971, and the Inland Lakes and Streams Act of 1972. Next, the Departmental rules and regulations concerning the control of damming, and established under the authority of the Administrative Procedures Act are critically examined. Thirdly, the basic

policies employed by the Department of Natural Resources in the administration of these laws are explored. Lastly, suggestions are presented with regard to needed research and further work related to this study's objective.

The problems and solutions discussed in this chapter are the product of a variety of input sources. Many problem areas were unearthed during the research which led to the analysis of the five cases covered in Chapter IV. Others were distilled from personal views and opinions expressed by both state government personnel encountered during this study, and informed, concerned citizens outside the bureaucratic controlling structure. An attempt has been made to combine these views with the author's perception of the regulatory system, and to provide a display here which represents a comprehensive, objective, critical review of dam regulation in Michigan today.

Dam Regulatory Statutes

Before considering specific provisions of the Inland Lakes and Streams Act and the Dam Construction Approval Act, there is one basic question which warrants attention, and which emerges as more comprehensive in nature than the problems and recommendations which will follow. This question deals with the overall adequacy of the statutory framework which supports dam regulation in Michigan. Do the statutes which exist provide a framework capable of insuring efficient dam regulation, consistent

with the protection of the public trust in the natural resources heritage of the citizens of the State of Michigan and the public health, safety, and welfare of these citizens?

A more basic concern is that of the adequacy of the dual permit system as it now exists. This concern revolves around the two areas of State authority relating to the regulation of damming. The first, that of assuring sound, safe dam construction from an engineering perspective, is secured through the Dam Construction Approval Act. This review authority has existed for twelve years. A "token," open-ended environmental clause was added in 1970 and is contained in Section 2b of the statute. This section allows for permit denial in instances where adverse environmental effects will result. Since the original intent of this statute was to insure only structure safety, size limitations were included and remain in the current version of the statute. These limitations, as discussed in Chapter III, exempt dams which are less than five feet in height and impound less than five surface acres of water. From a safety perspective, these limitations seem adequate.

The second review function involves assessment of the environmental effect of proposed impoundment projects, to insure optimal protection of the public trust in Michigan's water resources. The environmental clause of the Dam Construction Approval Act was diminished in importance by enactment of the Inland Lakes and Streams Act in January of

1973. This statute allows for a more thorough review by the Department of Natural Resources in the case of any dam to be constructed in a body of water which has definite banks, a bed, and visible evidence of a continued flow or continued occurrence of water. The only dam proposals which legally do not necessitate permit approval under this statute by the DNR are those involving off-channel dikes and lagoons, and dams which would impound waters of noncontinuous flow sources such as intermittent streams or springs. These types of dams would, however, be given an environmental review under the authority of the Dam Construction Approval Act if they exceed the minimum size stipulations of that statute.

The current statutory base provides for both types of review--safety and environmental impact--for nearly all dam proposals which warrant them. There appear, however, to be some minor statutory changes possible which would insure that all dams constructed in Michigan receive an adequate environmental review and that any dam whose size dictates the need for review of construction plans to insure sound design are considered in this context. Proposals for such changes are offered below, together with descriptions of the problems they are designed to alleviate.

The Inland Lakes and Streams Act[1]

Before changes to this statute are suggested, it should be noted that numerous activities in addition to dam construction fall under the authority of Act No. 346. Practices such as dredging, filling, and seawall construction, as well as stream crossings for bridge or culvert placement, also necessitate obtaining a permit under this law. (Permit applications for dam projects amounted to only 1.5 percent of all applications submitted under this Act in 1973 and 1974.) Although the objectives of this study center around the regulation of damming in Michigan, what follows may also aide in assessing the Inland Lakes and Streams Act's role in regulating these other practices in Michigan as well.

Problem. The Department of Natural Resources currently is failing to adhere to permit decision time limits as stipulated in Section 6(5) of Act No. 346.

This section states that the Department of Natural Resources shall grant or deny a permit within sixty days after the filing of an application, or within ninety days if a public hearing is held. Of 145 applicants examined by

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[1]Much of the information in this section, as well as many of the problems and recommendations which will be presented, were uncovered in conjunction with a special investigative committee formed in early 1975 by the Michigan Department of Natural Resources at the request of the Natural Resources Commission to explore the Department's administration of the Inland Lakes and Streams Act. Meetings held by the committee, which was chaired by Mrs. Joan Wolfe of the Commission, during early 1975, unearthed numerous problems that have been encountered in the first two years of administering this landmark legislation.

the Auditor General's Office during its latest audit, for the period March 1, 1972, through March 31, 1974, 51 permits, or roughly 35 percent, were not issued or denied in accordance with this statutory provision. As was witnessed in the review of the Lake Doster situation, where almost one year elapsed between application and permit denial, this delay can be excessive.

A large part of the problem can be traced to a shortage of manpower to conduct the needed investigative work prior to deciding whether to approve to deny a permit request. (This aspect will be explored further below.) As an alternative to maintaining strict adherence to the time limits currently in effect, which would seem to require an increase in available manpower, the amount of time the Department has to act on an application could be increased. A combination of these two alternative courses of action may be appropriate.

Recommendation. Section 6(5) of the Inland Lakes and Streams Act should be amended to allow 90 days for application review and 120 days for permit action in instances where a public hearing is held and/or an environmental report is requested by the Department of Natural Resources or the Michigan Environmental Review Board.

Extensions of these time limits would allow, in theory at least, for a more thorough investigation and review of the proposal. There should be additional time provided for the review of environmental reports and the subsequent review of environmental impact statements, which currently is not provided for. The comprehensive review

procedures necessitated by Executive Order 74-4, as well as the preliminary review of submitted reports, which is in part conducted by the Environmental Review Section within the Department of Natural Resources, display a need for the adoption of the extended time limits.

Problem. Provisions for violations of Act No. 346 are not adequate to insure sufficient incentive to prevent illegal project construction.

Section 13(2) of the Inland Lakes and Streams Act states that a person violating the Act is guilty of a misdemeanor, which carries a maximum criminal fine of $100. This penalty limit does not provide the necessary deterrent to prevent construction without first obtaining a permit, or to insure compliance with specific conditions contained in issued permits.

The most efficient administration of the Act would be realized if all projects could be given preconstruction review and permit consideration. Instances such as the Packing Materials Dam could be commonplace, and the DNR has been faced with numerous "after the fact" permit-decision situations. Coupled with the large amount of time and trouble involved in seeking restoration of the environment or project removal in illegal construction instances, this problem needs special consideration. Related to this problem are situations which involve deviations from permit conditions and the submission of false application information.

Recommendation. Section 13(2) of the Inland Lakes and Streams Act should be altered to provide for a maximum penalty of $1,000 for any violation of the statute or any intentional violation of specific permit stipulations, during or after construction.

This amendment might provide the necessary deterrent to prevent illegal construction activities and minimize Departmental problems encountered in attempting to handle illegal projects. It also would help insure comprehensive review of proposals prior to construction, which is not currently possible in all cases.

Problem. The Department of Natural Resources and the Hydrological Survey Division are currently failing to adhere to the provisions of Section 6(3) of Act No. 346, which mandates that the Department make a final inspection of all completed projects and certify that they have been constructed in compliance with permit conditions.

The extent of this problem is indicated by the fact that no inspection certifications have been carried out in the Department's Region III. In 1974, applications submitted from this Region amounted to nearly 61 percent of the total number filed in the entire State, or 1,223 out of 2,017. The main reason for the failure is a lack of available field personnel. The decision faced again is whether to take the actions necessary to provide the personnel needed to meet this statutory requirement or to amend the legislation to provide more time for inspection.

Recommendation. The Department of Natural Resources must make every effort to insure that finished projects are completed in accordance with permit specifications by conducting final inspections of all projects and issuing certifications of approval.

Because this recommendation does not involve the amendment of any legislation, its implementation, which will require an increase in the number of field personnel available for inspection duties, will be discussed at a later point in this chapter.

Problem. The current policy of requesting the submission of an environmental report by the applicant, with the eventual filing of an environmental impact statement by the Department of Natural Resources for permit activities which require one in accordance with Executive Order 74-4, does not provide for the most efficient, expedient, and objective review of the environmental effects of a proposed project.

There are a number of reasons for the current inadequacies. Firstly, the process can take a long time and result in large expenditures of funds by the Department of Natural Resources. These costs can be attributed to Departmental review of the applicant's environmental report as well as to the preparation of an environmental impact statement if necessary. Secondly, the reports submitted by the applicant frequently fail to meet both Department expectations and requirements, as they often appear to be nothing more than attempts at development justification. Such was the case with the Lake Doster proposal. This inherent bias of many impact reports is totally inconsistent with the desired objectivity of environmental review.

Recommendation. The Inland Lakes and Streams Act should be amended to provide for the contracting of a third party, acceptable to both the Department and the applicant, to prepare an environmental report for proposals considered major, significant, or controversial, and to include the cost of the document's preparation in the fee schedule of the statute, to be paid by the applicant and transmitted by the Department.

This amendment would tend to insure both the submission of an accurate, objective document, which would greatly facilitate Departmental review, and that permits issued under the Inland Lakes and Streams Act are consistent with its purpose of protecting the public trust and riparian rights in Michigan's inland waters. This document would likewise provide a substantial base for the preparation of an environmental impact statement by the Department in instances where a permit may be issued. A list of acceptable persons or groups qualified to undertake this type of work could be provided by the Department and could logically include private consulting firms experienced in environmental effect assessment, as well as university faculty who could coordinate the needed investigative work on these projects in the form of funded research studies.

The Dam Construction Approval Act

As mentioned, the major purpose of this regulatory statute is to insure that dams constructed and maintained in Michigan are done so in a manner consistent with sound engineering practices and compatible with the protection of the public health, safety, and welfare. The recommendations that follow are presented as part of an overall plan which is structured to maintain Act No. 184 as a safety-construction-oriented law, while utilizing its general scope to insure that dam proposals which do not fall under the authority of the Inland Lakes and Streams Act are

effectively reviewed from an environmental perspective. The general goal of these recommendations is to construct an effective dam regulation scheme by altering Act No. 184 to provide for efficient coordination of statute jurisdiction and administration. Since the Dam Construction Approval Act is more limited in scope and applies only to dams, it seems more logical to center major statutory amendment suggestions around this law rather than one which deals with a wider range of activities, as does the Inland Lakes and Streams Act.

Problem. There are currently inadequate provisions for the periodic inspection of dams in Michigan for the purpose of insuring continued safe structure condition.

As was documented above, all dams impounding water on which a legal lake level has been established are inspected every third year, in accordance with county government responsibilities outlined in the Inland Lake Level Act. This inspection program is coordinated by the Hydrological Survey Division of the Michigan Department of Natural Resources. At this time only 254 impounding structures are covered by this inspection stipulation. In addition, the Federal Power Commission inspects at regular intervals, all hydroelectric power facilities that have operating licenses issued under its authority. Currently, only 52 dams fall into this category. Likewise, 33 dams are inspected periodically by other federal agencies such as the Fish and Wildlife Service and the United States Department of Agriculture. In total, therefore, only 339

dams receive regular inspections under these programs in Michigan. This amounts to only 52 percent of the 649 dams which physically qualified to be included in the dam inventory authorized by Public Law 92-367 in 1972, and less than 56 percent of the 612 dams in Michigan which exceed five feet in height, as reported by the inventory which was compiled by the DNR Fisheries Division.

Recommendation. The Dam Construction Approval Act should be amended to provide for mandatory periodic inspections of all dams which are not inspected under the authority of Act No. 146 or by federal entities, and which are five feet or more in height or impound five or more surface acres of water.

Any dam, the failure of which could pose a significant threat to life or property (including damage to property considered part of the public trust), should be inspected at regular intervals. In this way many dam failures could be prevented, as most causes of failure exhibit symptoms of trouble long before trouble develops.[2] Michigan's dam inspection program should provide for the inspection of these structures every two years by a qualified structural hydrologic engineer familiar with aspects of dam construction, maintenance, repair and failure, to be permanently employed by the Hydrologic Studies Unit of the Hydrological Survey Division. This information would greatly facilitate the identification of potential

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[2]The only causes of failure which do not provide prior warning are inadequate spillway capacity and loose sand liquification induced by earthquakes, the latter a highly unlikely occurrence in Michigan. George F. Sowers, p. 13.

hazardous conditions and make possible expedient repair or removal.

As important as the establishment of this authority is the designing of a comprehensive, effective inspection scheme. This should include efficient, uniform inspection formats as well as standard procedures for evaluating, organizing, and storing inspection information. This program must necessarily include provisions for obtaining, standardizing and combining inspection information obtained from the other dam inspection programs. The specifics of this plan should be designed and compiled by the person(s) who will oversee the program, and spelled out in as fine a detail as possible for inclusion in administrative rules and regulations established under the authority of the Administrative Procedures Act.[3]

Problem. The arbitrary operation of some dams in Michigan holds the potential to cause extensive damage to stream biota below impoundment sites, as there currently exist no statutory assurances that flow releases will be maintained at the minimum levels necessary to prevent damage to the stream ecosystem.

Flow releases from impoundments provide the water which must support the river downstream from the dam site. Naturally, the amount of water present is as important as its condition. As was discussed in Chapter II, the most sensitive stream inhabitants to the changes typically caused by dams are the invertebrate groups and various families of

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[3]Recommendations dealing with the administrative rules will be considered at a later point in this chapter.

aquatic plants. Flow releases from structures must be maintained at levels necessary to insure that no damage to these groups of organisms results from insufficient downstream flow, and that natural downstream environments are maintained to as great an extent as possible.[4]

Recommendation. The Dam Construction Approval Act should be amended to provide, where possible, for the establishment of minimum flow releases for all dams that exist in Michigan, as well as any dams to be built in the future.

The first obstacle to be encountered involves who should establish these figures. Department of Natural Resources district fisheries biologists should be petitioned to submit recommendations for minimum flow releases for all dams within their jurisdiction which do not currently have such a provision, and which these personnel feel should have them. Some standard drought flow measure should be used in determining these recommended figures, such as the once-in-ten-year drought flow of a seven-day duration. These figures should then be reviewed by Hydrological Survey Division personnel and increases made where necessary. A complete list of these flow figures should then be supplied to field enforcement personnel as well as structure owners and operators. It should then become a standard practice

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[4]The extreme case of insufficient flow release can currently be witnessed at the Carp Lake Reservoir on the Carp River in Marquette County. Water is diverted from the impoundment through an aquaduct nearly five miles in length for power production purposes. No flow is allowed over or through the dam, resulting in a totally dry stream bed below the structure.

to include a minimum flow release as a condition of every new Dam Construction Approval Act permit to be issued.

Problem. The disposition of dams, primarily the sale of retired hydroelectric facilities, is currently not handled in a manner consistent with the interests of the citizens of Michigan or the management goals of State government.

The problems that can be encountered in the sale of impounding structures were clearly illustrated in the review of the Barryton situation. The Department of Natural Resources must make certain that when a dam is sold, it is sold to a buyer with both the financial capability and technical expertise necessary to maintain the structure.

Recommendation. A section should be added to the Dam Construction Approval Act which would necessitate obtaining approval from the Hydrological Survey Division of the Department of Natural Resources prior to the sale or transfer of any impounding structure.

This provision would insure that the new owner of the structure could maintain it in a safe operating condition, as well as giving the State an added measure of control over the future use of a dam. A closer working relationship could also be established between the Department and dam owners. In this manner conditions could also be supplied to the new owner regarding the future maintenance and operation of the dam. This provision would also provide an opportunity for the State to inform a potential buyer just what his future responsibilities will be, and will help prevent occurrences such as the Barryton predicament.

Problem. The current fee schedule structure of the Dam Construction Approval Act does not provide for the equitable and efficient financing of permit review-related work.

The first shortcoming becomes evident much like a similar problem involving Act No. 346. This consideration involves the financing and submission of environmental impact statements. As documented earlier, a dam proposal can fall under the authority of the Dam Construction Approval Act while failing to qualify for coverage under the Inland Lakes and Streams Act. In such cases, and when the dam project can be considered signficant, major or controversial and therefore necessitates the preparation of an environmental report and/or an environmental impact statement, provisions must likewise be made for an objective environmental review under the procedure. An addition to Act No. 184 should be structured similar to the amendment which would alter the fee structure of the Inland Lakes and Streams Act to provide for the funding of impact documents prepared by third parties.

The other problem related to fee provisions involves the current failure of application fees to provide adequate monies for the financing of permit review. The Dam Construction Approval Act stipulates that the fees shall be deposited to "defray the cost of reviewing plans and specifications and field inspections during and after construction."[5]

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[5]Dam Construction Approval Act, Sec. 2(2), Mich. Compiled Laws, secs. 281.131-281.135.

The current schedule which requires no fee for dams with a head less than five feet, and graduates amounts to a maximum of $600 for a dam with a head of twenty-five feet or more, does not provide for the most equitable funding of permit review.

Recommendation. Section 2(2) of the Dam Construction Approval Act should be amended, abandoning the graduated fee schedule, and adopting a fee payment policy which requires the payment of a sum calculated to cover the actual cost of reviewing the submitted construction plans and making on-site inspections during construction.[6] This change should also include provisions for the payment of an amount necessary to contract for the preparation of an environmental report if the proposal does not fall under the authority of the Inland Lakes and Streams Act.

This change in the fee schedule would have two distinct advantages. First, it would establish a more equitable distribution of payments among dam owners and prospective owners. It would eliminate the minimum application fee of $200, which is now required for any dam between five and eight feet in height. It would also more closely equate the cost of reviewing plans with the cost of building the dam. Secondly, it could provide the funds necessary to conduct adequate review of such proposals, whereas under current budget constraints this is not always possible.

Administrative Rules and Regulations

The second area for which problems will be described and recommendations presented involves the promulgating and

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[6]This provision would be similar to that which was contained in the original Dam Construction Approval Act,

use of State agency rules. Under the authority of the Administrative Procedures Act of 1969 (Act No. 306), administrative procedures can be adopted by State agencies for the purpose of implementing laws authorizing the administration of permit or license matters. More specifically, the Act defines a rule as:

> . . . an agency regulation, statement, standard, policy, ruling or instruction of general applicability, which implements or applies law enforced or administered by the agency, or which prescribes the organization, procedure or practice of the agency . . .[7]

It is evident that the use of such "administrative laws" can not only provide an added means of defining agency intentions and powers for the purpose of more definitive bureaucratic functioning, but also can assist in clarifying the State's authority in the minds of the general public. This is especially true with respect to the two dam-regulating statutes under scrutiny here.

The Inland Lakes and Streams Act

Departmental administration of Act No. 346 is facilitated through not only rules and regulations drafted under the authority of the Administrative Procedures Act, but also through a general policy statement known as Department Letter 140.

Act No. 184 of 1963. This type fee schedule was amended to a fixed fee type in the 1970 amendatory act.

[7]Administrative Procedures Act, Sec. 7, Mich. Compiled Laws, secs. 24.201-24.313.

Department Letter 140 was first drafted on September 27, 1967, in order to clarify for Department personnel policy and function-related questions with respect to the then new Inland Lakes and Streams Act. This original letter is still in effect today, nearly seven years later. A new version of this document currently is being prepared and reviewed by the Hydrological Survey Division of the Department of Natural Resources but at this time is only in preliminary draft form. Its completion has been delayed to permit inclusion of recommendations solicited by the Natural Resources Commission from its ad hoc Inland Lakes and Streams Investigative Committee.

Director's Letter 140 contains a general discussion of the history of the statute and its implications as they relate to the State's regulatory obligation, including a look at the Act's purpose, that being, "to protect riparian rights and the public trust in inland lakes and streams." It is this portion of the Letter which presents the most serious problem. "On paper" it can be shown that the protection of riparian rights may be inconsistent with the protection of the public trust, in the sense that the sum of individual riparian "reasonable" uses may in fact not always be the best way to protect Michigan's water resources and the general public's rights in those resources. The Letter also contains a summary of procedures to be used by the Department in processing permit applications, which is included to clarify administration. These general

guidelines are an attempt to insure uniform treatment of all application submissions, reviews, and denials or approvals. Lastly, the Letter contains a short discussion of field personnel responsibilities as they relate to the detection and termination of illegal projects, and appropriate legal actions to follow.

It should be an internal policy of the Hydrological Survey Division that it will undertake a rewriting of Department Letter 140 every three years. Rewriting is necessitated because the Department's procedures continually change, as do the general policies it adheres to regarding the administrative and legal role of the statute. Experience gained in the administration of this complex law should be reflected in periodic rewrites of Department Letter 140. It also should be a policy of the Division to see to it that appropriate field personnel (particularly those directly involved in application review and permit action) have sufficient input into this process, because it is these employees who are most closely affected by this document.

The rules and regulations governing the administration of the Inland Lake and Streams Act were drafted and filed with the Secretary of State in 1972, following the signing of Act 346 in January of that year. Paralleling the need for periodic review and rewriting of Department Letter 140 is the current need to critically review the rules which govern the administration of the Inland Lakes and

Streams Act. In 1972, the Hydrological Survey Division began administering an Act that proved to be much more involved than first expected. Problems that have been encountered in its handling, as well as general experience the Department has gained, have led it to a new and better understanding of the role of this regulatory statute.[8] Here, too, serious consideration must be given to the opinions and recommendations of field personnel who administer the Act.

Numerous shortcomings of the rules and regulations which govern the administration of the Inland Lakes and Streams Act became evident during the investigative work involved in this study. Many more would surely have surfaced had the topic scope included project types other than merely dam construction. Only those problems which have surfaced regarding the role of the rules and their relation to dam construction are dealt with here in detail.

Problem. The administrative rules and regulations currently in effect to assist in the administration of the Inland Lakes and Streams Act do not provide sufficient consideration of the project category of impoundment projects.

A review of the format of the rules reveals that particular sections have been devoted specifically to bridge construction (Rule 11 through Rule 14) and pipeline and other utility water crossings (Rule 22 through Rule 29), but

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[8]The Inland Lakes and Streams Act Investigative Committee is also delving into possible shortcomings of the administrative rules that are in effect in hopes of providing amendment suggestions which could result in the more effective administration of the statute.

that similar specific consideration has not been given to dam construction projects. It may be argued that this is not warranted because of the relatively small number of Act 346 permits issued for dam construction. It must be realized, however, that just as the continuous detrimental effects of an impoundment project can be great, so can those short-term effects witnessed during the construction of a dam. Both must be guarded against with extreme caution.

Recommendation. A section should be added to the administrative rules for Act No. 346 which provides explicit procedures and stipulations to be adhered to in the erection of impounding structures.

This change would provide for the uniform administration of permits issued for damming projects, something which has not been the case in the past. It also would insure a higher level of consideration for the potential effects of impoundments. This rule amendment should be formulated with the assistance of at least the following: (1) an expert in the field of dam structure design and engineering; (2) one or more experts in the area of stream ecology and impoundment limnology; (3) an expert in the field of hydrology; (4) a representative of the Michigan Attorney General's Office; and, (5) field personnel familiar with past impoundment construction projects and their effects. Naturally, Hydrological Survey Division personnel who have had experience with the drafting and implementation of the current set of rules also should be involved.

This addition to the rules and regulations should include, but not be limited to: (1) adequate explanation of procedures for application, which are somewhat different because of the complementary jurisdiction of the Dam Construction Approval Act and Act 346; (2) adequate stipulations to insure the prevention of sedimentation and related stream damage during construction; and, (3) general requirements concerning the related topics of site clearing, site access, and flow manipulation during construction, as well as any environmentally relevant factor which may be of importance in particular dam cases.[9] These precautions should be spelled out to insure that a comprehensive view is taken of such projects, and that they are completed with a minimum of environmental disturbance.

Problem. Current policies regarding permit extensions and construction time limits do not provide for the most effective means of insuring minimum environmental damage and allowing for adequate reevaluation of project proposals.

Rule 3 of the administrative rules, which deals with permit conditions, merely states that work shall be completed within a specified term, normally not more than one year, and that an extension of time may be granted by the Department. These stipulations are insufficient. They fail to consider that environmental conditions as well as social

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[9]Many of the precautions that must be taken during dam construction must be definition be included in the rules and regulations drafted under the authority of the Dam Construction Approval Act rather than those governing the Inland Lakes and Streams Act.

values may be dynamic with respect to any proposed project. These changing attitudes must be given higher consideration than they currently receive.

Recommendation. Rule 3 should be changed to contain: (1) a clause which states that a permit will expire if construction is not started within one year, unless a shorter period is set forth in the permit; (2) definitions of what constitutes a start of construction; (3) a stipulation that only one extension may be granted, not to exceed one additional year, after which time a new permit must be applied for; and, (4) assurances that field personnel, especially district office staff, will have the major authority to issue or deny extension requests.

Currently, expiration dates are set on a case-by-case basis and may go beyond one year. Because numerous factors may change over longer periods of time, it should be policy to limit the period of the permit to one year. Local attitudes concerning the desirability of such projects and environmental conditions relevant to a project are just two of the factors that could change. By limiting projects to one extension, for no more than one year, avenues for continued public input through the hearing process would be provided for, as no project could commence, if two years has passed since permit issuance without construction having started, without reapplication, and a new proposal review. It likewise should be stipulated that field personnel must be included in the decision as to whether or not an extension should be issued. On occasions their opinions have not been solicited, drawing heated criticism and resentment from field offices.

Problem. Rule 4 of the administrative rules governing environmental assessment does not provide adequate

guidelines for the evaluation of potential adverse environmental effects and currently seems to saddle the Department with a burden of proof contrary to both the intent of the legislation and interpretations of its authority.

Currently, this rule states that all existing and potential adverse environmental effects shall be determined and a permit shall not be issued unless the Department determines that the adverse effects are minimal and will be mitigated to the extent possible; that the resource affected is not a "rare resource"; that the public interest in the proposal is greater than the interest in the unavoidable degradation of the resource; and that no feasible and prudent alternative location is available. These provisions, even though favorable in nature, fail to spell out the position the Department should take in the review of project effects on the environment.

Recommendation. A clause should be drafted to be added to the rules of Act No. 346 which explains the EIS contracting system proposed earlier in this chapter. This rule change should specifically make it the obligation of an applicant to prove that the project is in the public interest, in terms of those general conditions currently contained in Rule 4 dealing with potential adverse environmental effects.

The Department has in the past operated under the assumption that it must first prove a project to be inconsistent with the broad idea of the public trust and the health, safety and welfare of Michigan's citizens in order to deny a permit. This philosophy is reflected in the current version of Department Letter 140. At worst, the Department should only have to involve itself with first helping to ascertain the physical, environmental effects of

a proposed project, while leaving the initial job of attempting to prove the project will be consistent with the public trust to the applicant, and preparing itself to answer the applicant's contentions. This is the basic reason why environmental impact statements came about, and it seems only logical that the applicant carry the first burden of defending a project.

These recommended changes in the administrative rules and regulations established under the authority of the Inland Lakes and Streams Act by no means represent solutions to all the problems which have been witnessed in the statute's brief administrative history. They do, however, represent the most important areas of concern that have surfaced with respect to impoundment questions during the research that went into this effort. Many less drastic shortcomings also exist with respect to other project types. Many of these have been uncovered by the committee which is investigating Act 346 and which plans to continue to critically explore possible changes in the rules that will address these additional problems as well.

The Dam Construction Approval Act

The Dam Construction Approval Act initiated a permit system for dam construction practices upon its passage in 1963. This system has been in operation for nearly twelve years. The concern discussed here with respect to the utilization of administrative rules and regulations is a

broad but straightforward one: The fact is that, for all of those twelve years and up to this time, the Department of Natural Resources has administered this permit system without the aid of administrative rules.

Problem. The lack of administrative rules and regulations to assist in the implementation of the Dam Construction Approval Act has resulted in inferior operation of the construction permit system and has deprived the Hydrological Survey Division of a powerful tool which would greatly facilitate the optimal functioning of the law.

Even though Section 3 of the Dam Construction Approval Act authorizes the Department of Natural Resources to adopt rules under the provisions of Act No. 306, the Administrative Procedures Act, the Department has not opted to draft such rules. There seem to have been at least three reasons for this decision. Firstly, the process which accompanies the adoption and promulgation of administrative rules is a long and difficult one. During past years there has been a shortage of time and manpower within the Department to undertake this kind of task. Secondly, it appears that Department personnel have not realized the important role such rules could play in the administration of the permit system. Lastly, there has been the feeling that because of the nonuniformity of individual dam structures, the adoption of minimum construction and design criteria, which would typically comprise much of the rules, would inhibit the flexibility Department engineers have felt they must have in order to properly supervise the planning, design, and erection of impounding structures in Michigan.

These reasons no longer seem sufficient to justify the absence of administrative rules and regulations to aid in the administration of Act No. 184.

Recommendation. The Hydrological Survey Division of the Michigan Department of Natural Resources should undertake the promulgation of administrative rules under the authority of the Administrative Procedures Act of 1969 to aid in the implementation of the Dam Construction Approval Act, and establish the adoption of such rules as a high level priority.

In a general sense, the existence of administrative rules would give the Department of Natural Resources a firmer foundation on which to base a rejuvenated permit system. The rules initially would establish a standard procedure for dam construction permits, from the application stage through to construction completion. The rules also could be written to address specific procedural areas where problems have appeared in the past, the solutions to which do not necessitate statutory changes. In this same light, the rules also could be utilized to establish a standard synthesis of the authorities delegated by the Dam Construction Approval Act and the Inland Lakes and Streams Act. The respective roles of these two statutes, in both statutory and administrative contexts, have been somewhat "tangled" since 1972.[10]

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[10]The DNR, through its Director, has recently taken steps to help alleviate this general problem area. Recognizing the complexity of its permit systems, which currently includes at least 114 different kinds of permits, the Department has formed an "interim permit coordination office." It will function as an information distribution center to familiarize the general public with these various

In addition to meeting this general organizational need, there are a number of more specific areas that such rules should address. The first of these would involve the establishing of a procedural format for the periodic dam inspection program recommended to be established through an amendment to Act 184. The rules could establish inspection priorities by dam type, owner, age, location and history, as well as delineate minimum structure conditions that would have to be met. In this light, the rules would provide a working definition of the word "hazardous" as used in Section 2C of the statute and ideally result in the prevention of dam failures like that which occurred at Lake Metamora. The rules also should address the topic of minimum flow releases. This could be handled in two steps. Firstly, the rules could establish a procedural framework for setting minimum flow releases for all dams in Michigan. Because of construction type and stream flow characteristics, this may not be desired for all impounding structures within the State. Minimum flow releases should be established initially by field fisheries and habitat biologists with certification by the Hydrological Survey Division. An appeal procedure should be provided for. The second step would involve assurances that minimum flow release figures will be included in all future Dam Construction Approval Act permits, including those issued for dam redesign or repair.

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permits. It is intended to be the forerunner of a similar permanent office to be established.

Failure to adhere to this stipulation then would constitute a violation of permit conditions.

The most important topic the rules must address is the formulation of policies to insure compliance with stipulations established both in the administrative rules and in individual permits. The major concern here must be with the structural aspects of the project, although practices adhered to and stipulations to be met on any project would have been considered previously in terms of the environmental effects they would have. The primary focus should be the establishment of an efficient on-site inspection program to be implemented during construction. The program should include provisions for: (1) inspections at frequent enough intervals to insure that violation of permit stipulations does not occur; (2) that inspections are made by qualified engineers as well as qualified biologists, to insure that construction practices are effectively carried out from both an engineering standpoint and an environmental perspective; and, (3) that a working relationship can be established between inspectors and project foremen or managers. The rules should likewise contain a clause which makes it mandatory for the permittee to submit an affidavit to the Department which states that the structure was erected in accordance with rule conditions and specific permit stipulations, to be signed by a registered professional engineer. Although this condition frequently has been included in Dam Construction Approval Act permits in the past, its inclusion

in the rules will insure its application in all instances. The adoption of these practices could almost eliminate dam failures in Michigan.

It is certain that Hydrological Survey Division personnel, government officials, and the general public will seek to have additional areas addressed in the rules, when and if they are drafted. The recommendations made above were selected to coincide with problems which emerged as worthy of the most immediate attention. As with the Inland Lakes and Streams Act's rules, periodic evaluation and redrafting of the administrative rules and regulations promulgated under Act 184 also certainly will be desirable. It should therefore be the policy of the Department of Natural Resources to allow for the periodic amending of the rules governing the administration of Act No. 184 when necessary.

Departmental Policy and Function

The problems uncovered to this point concerning the regulation of damming in Michigan have been dealt with by either proposing changes to the statutory framework which establishes that regulatory obligation or by suggesting changes to the administrative rules and regulations which control that obligation. Other problems have arisen, however, which lend themselves to less cumbersome solutions. These are the class of problems which can be alleviated through intradepartmental avenues not requiring tedious

legislative procedures. It appears that most roads to efficiency in dam regulation begin here.

Departmental Budget and Manpower Shortages

All too frequently bureaucratic entities answer charges of inefficiency with excuses which cite a lack of the resources necessary to perform their duties. While these excuses may not always be valid, manpower shortages do appear to constitute one of the major causes of many of the problems that have been witnessed within the Department of Natural Resources' Hydrological Survey Division as it attempts to protect Michigan's water resources.

Problem. The Hydrological Survey Division and the field offices it relies on currently have neither the budget nor the manpower necessary to efficiently administer the Dam Construction Approval Act and the Inland Lakes and Streams Act, which form the foundation for control of dam construction and operation in Michigan.

The basic lack of fiscal resources is evidenced by the following:

1. Permit-processing time delays. As discussed earlier, a large percentage of the Act 346 permits processed are not issued or denied within the statutory time deadlines. Thirty-five percent of those permits examined in the Auditor General's audit of the Environmental Protection Branch of the Department of Natural Resources, for the period March 1, 1972, through March 31, 1974, did not adhere to this time requirement. This is blamed on new permit coordination duties that the Survey has been forced to undertake.

Although an increase in time limits as proposed would help alleviate this problem, additional manpower still is needed, as many permit requests require prompt action.

2. Inadequate construction inspections. The Lake Metamora case is but one example of situations where on-site inspections during construction would have prevented dam failure. The past has revealed that field offices in particular cannot provide the man hours necessary to conduct these frequent inspections. It also is important that the environmental effects of a project's construction be monitored continuously to prevent unnecessary damage. This is also true for most other project types which require application for permit under the authority of the Inland Lakes and Streams Act.

3. Inability to conduct final construction certification. The specifics of this problem were discussed in an earlier section when it was noted that the Department has not been able to meet its statutory responsibility of giving certification to all completed projects, mainly because of a shortage of personnel.

4. The fact that the Hydrological Survey Division feels it is accomplishing only 50 percent of its responsibilities in the area of supervising the control of alterations to Michigan waterways, and only 75 percent of those relating to the construction and maintenance of

dams.[11] Overall, the Survey estimates it is handling less than 55 percent of its major environmental responsibilities. Currently, only 11.5 man years are available (9.5 in the Lansing Office, one in Region II and one in Region III) for administration of the Inland Lakes and Streams Act and related Great Lakes alteration controls. Only 2.0 man years (both stationed in Lansing) are currently provided to oversee the regulation of construction and maintenance of dams, including the permit system established by the Dam Construction Approval Act.

In response to these shortages, the Hydrological Survey Division has requested the allocation of an additional $208,817 for the funding of 10.5 additional positions.[12] These personnel are needed in two capacities. Some (3.5 man years) are requested to aid in handling the increased duties attributed to hearings and litigation workloads caused by Act 346. The remaining 7.0 man years would be distributed between the Lansing Office and the Regional Offices to cope with the huge work load necessitated by permit processing obligations at those levels.

The budget problems that the Hydrological Survey Division has encountered are not unique. Concerning the

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[11]Dale W. Granger, Hydrological Survey Division Chief, Memo to William G. Turney, Chief, Bureau of Water Management, Michigan Department of Natural Resources (March 14, 1975).

[12]This figure includes the cost of supportive services such as State costs of retirement and fringe benefits, over and above minimal salary requirements.

responsibility of state governments to control damming practices, Professor George Sowers of the Georgia Institute of Technology writes:

> Unfortunately, as far as the author knows, there is no state or federal agency that has been given sufficiently great appropriation to fulfill all the obligations assigned to it.[13]

The problem of inadequate budgets and the manpower shortages that result warrants immediate attention.

Recommendation. The Michigan Department of Natural Resources and the State Legislature should take immediate steps to alleviate the budget shortage that currently exists in the Hydrological Survey Division. Sufficient funds should be obtained to provide a minimum of the recommended 10.5 man years for the implementation of Act No. 346 and another 3.0 man years for assistance with the regulation of dam practices under the Dam Construction Approval Act. The funds should be obtained soon by either incorporation in the 1975-76 fiscal year budget or by emergency legislative appropriation.

The need for these additional positions is not hard to document. Since the enactment of Act 346 in 1972, the number of permit applications received has increased at an average rate of 15 percent per year. This has greatly increased the work loads of district level personnel, most of whom have other responsibilities as well. It has been shown that these field offices are already falling short of both their administrative and legislative obligations with respect to permit review, project inspection, and construction follow-up. It is to alleviate this group of permit process-related problems that 7.0 man years have been

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[13]George F. Sowers, p. 25.

requested for the Submerged Lands Management Section of the Hydrological Survey Division.

The additional 3.5 man years requested for this Section are needed to cope with increasing responsibilities that have arisen because of upswings in the number of hearings requested. The hearing process and the larger group of procedures outlined in the Administrative Procedures Act are of importance to applicants, the public in general, and the Department as well. There also has been an additional burden placed on present employees because of the large amount of litigation which has been initiated under this statute. The future effectiveness of the Inland Lakes and Streams Act to protect the public trust and riparian rights in Michigan waterways will be determined in part by how well the administration of the permit program is funded in the future.

Just as there is a need for additional personnel in the Submerged Lands Management Section, there is a need for more personnel in the Hydrologic Studies and Lakes Engineering Units of the Hydrological Engineering Section. Although permit-processing procedures established for dam construction are handled adequately, other dam-related responsibilities are grossly neglected because of a shortage of personnel. Currently, only 2.0 man years are available to regulate the construction and maintenance of dam facilities in Michigan. It is the author's contention that a minimum of 3.0 additional man years are needed. These

personnel would be responsible chiefly for the maintenance of a periodic inspection program, as recommended above. Qualifications for these positions and the needed budget amounts would be determined after the establishment of basic goals and objectives for the inspection program. These added positions also would free the current staff to concentrate more heavily on the review of new permit applications and on new-dam construction.

Intradepartmental Communication and Administration

The problems discussed in this section are very real but for some reason do not seem to have drawn the attention of others that those relating to statutory inadequacies or budgetary shortages already have. The solutions to this set of problems can be implemented easily within the Department. The ease with which these solutions can be adopted in no way should deemphasize their importance or the gravity of the problems they are designed to deal with.

Problem. The potential for quick and smooth administration of the permit systems established by the Inland Lakes and Streams Act and the Dam Construction Approval Act has not been realized because of poor lines of communication which exist between central office personnel and field office staffs.

This lack of communication is manifested in many ways. There seems to be no standard line of contact concerning information on procedural matters as they relate to permit processing functions, for example. Secondly, disagreements between these offices have frequently arisen

because of failures to clearly explain rationale behind decisions concerning permit applications. This appears to stem from the fact that contact between staff members in Lansing and field personnel is limited. Thirdly, there seems to be a gross difference of opinion between the two office levels concerning the intent of much of the regulatory legislation and the way in which it should be administered. A closer working relationship must be established between Department personnel if the most efficient regulation and protection of Michigan's water resources is to be achieved. Two proposals will be presented.

Recommendation. The Hydrological Survey Division should hold yearly seminars for the purpose of acquainting personnel with accepted procedures, considering policy changes and improvements, exchanging ideas and experiences, and developing a closer working relationship between involved field personnel and Lansing administrators.

Staff invited to these informational "training sessions" should include: (1) the Lansing Hydrological Survey Division staff involved with permit processes concerning inland waterway alterations; (2) field personnel involved in these permit procedures including, but not limited to, Regional Managers, Regional Submerged Lands Specialists, Regional and District Fisheries and Wildlife Biologists, and District Law Supervisors; and, (3) representatives of the Attorney General's Office who deal with environmental litigation. These sessions could serve many purposes. First, field personnel could be briefed on the legal aspects of permit decisions. The importance of

preliminary field work to permit decisions which eventually result in litigation has been underemphasized in the past. Secondly, standard procedures for permit considerations could be established and discussed. Thirdly, these seminars should foster better understandings of what fellow employees are responsible for and how they view their responsibilities. Lastly, the sessions could serve to inform personnel about particular case situations and how typical problem matters should be dealt with. The beneficial possibilities of such sessions are great.

Recommendation. A Dam Permit Review Committee should be established by the Department of Natural Resources for the purpose of reviewing certain dam project proposals and issuing or denying permits.

Many of the communication problems extant between staff members appear to be due in part to differences of opinions with regard to particular permit cases. It seems at times that some field and divisional recommendations are not given the consideration their authors feel they deserve. This problem could be alleviated by establishing a standing committee to discuss and decide upon permit applications. It seems logical to test this type of approach on those select cases involving dam projects for three reasons. These projects frequently have fostered a large amount of public concern and participation in the past. Damming projects exhibit a wider range of environmental effects, which are also more continuous in nature than most project types. Lastly, the need to coordinate two permit systems

for any one project increases the chances of inadequate review and potential oversight.

To insure a comprehensive review of important impoundment proposals, the final decision on an application for an Inland Lakes and Streams Act permit and/or a Dam Construction Approval Act permit should be made by this committee for any dam proposal which: (1) requires, or will require, the preparation of an environmental impact statement; (2) has received any recommendation for denial from Department personnel solicited, and which may be granted a permit; (3) has necessitated the holding of a public hearing; and, (4) the Hydrological Survey Division feels it does not have adequate legal grounds for denial.

The composition of this committee will naturally be of great importance, because all relevant disciplines should be represented to insure as comprehensive a review as possible. The committee should consist of: (1) the Submerged Lands Management Section Chief and his assistant; (2) the Hydrological Engineering Section Chief; and, (3) a representative of the Office of Environmental Review of the Program Services Group. In addition to these permanent members, a field staff delegation should be included in each project decision. This delegation should include the District Fisheries and Wildlife Biologist for the area in question, the Regional Submerged Lands Specialist, and any other field personnel the permanent members of the committee deem necessary. The committee also should contain other

Departmental employees who submitted recommendations upon request from the Hydrological Survey Division with respect to the proposal in question. The committee would likewise be encouraged to invite persons with the needed expertise in particular areas to supply relevant information and opinions when it feels it is necessary.

The establishment of this committee would provide several advantages. Most importantly, it would vastly improve the lines of communication, which currently are based chiefly on telephone conversations and mail exchange. Face-to-face cooperative efforts would surely improve communication between involved personnel. Secondly, this formal committee arrangement would minimize the amount of information that could be mishandled or misinterpreted. Each party submitting recommendations would have a chance to present its arguments and discuss the relative importance of points that have been made. Lastly, the utilization of a committee-based permit decision would minimize time delays, because repeated written exchanges, subject to lengthy delays, could be replaced with an open forum held in one meeting session. A final permit decision, or proposals for modification of a permit application could then be promptly resolved.

Information and Education

A third area of concern which falls under the heading of departmental policy and function involves the

improvement of communication between the Department of Natural Resources and the members of the general public. It has been shown that on many occasions there has been a gross lack of understanding within various parts of the Department concerning the administration and function of the regulatory statutes handled by the Hydrological Survey Division. This lack of understanding is even more pronounced outside the Department.

Problem. The Department of Natural Resources currently does not maintain an active program to inform and educate permit applicants and members of the general public regarding regulations established by Act 346, which has resulted in a lack of understanding within these groups and a suboptimal level of regulatory efficiency.

If the Department is to benefit by establishing standard procedures within its structure, it must make these procedures known to persons and groups who are forced to abide by them. The efficiency of the permit systems established by the Dam Construction Approval Act and the Inland Lakes and Streams Act depends directly on open lines of communication and the establishment of close working relationships between the Hydrological Survey Division and the general public. The alleviation of this problem can be achieved by the combination of two efforts which are recommended here.

Recommendation. The Hydrological Survey Division should institute a program structured to better inform members of the general public about the regulatory permit system it administers.

An effort such as this initially should consist of the preparation of a brochure designed to inform potential

permit applicants of departmental philosophy and procedures. This information could be distributed with permit application forms. The brochure should explain the procedural path an application follows as it is processed as well as give specific directions as to how to complete and submit an application. Secondly, the brochure should attempt to convey the intent of Act 346 and explain the legal concepts of "riparian rights" and "the public trust." Thirdly, the booklet could outline related procedures dictated by the Administrative Procedures Act. Lastly, such a publication could briefly outline some of the detrimental effects such projects can have. This information package should be geared primarily to those seeking applications for projects which fall under the authority of Act 346. An addendum, however, could be prepared to explain similar points with respect to the Dam Construction Approval Act and included in mailings where applicable.

The completion of such a brochure and its use could mean the following: (1) a decrease in additional preapplication contacts for clarification purposes, which frequently contributes to permit-processing delays; (2) a decrease in the number of submitted applications containing insufficient information and which necessitate contact for explanation and resubmission; and, (3) a possible decrease in the number of applications, because persons contemplating such projects may be swayed by the potential damage they can cause and therefore alter their plans. All three certainly would

streamline operations and free the personnel involved to concentrate on more important issues.

Recommendation. The Hydrological Survey Division should initiate a program aimed at developing a better working relationship between itself and persons or groups of persons who are frequently involved in Inland Lakes and Streams Act permit situations.

This program could be two-fold in nature. The first part of the effort should include the development of an information and education campaign to supplement the brochure-mailing program just discussed. This effort would be more general in nature and could utilize publications (possibly including the information brochure that would be sent out with application forms), audiovisual techniques, and group presentations, to inform and educate Michigan citizens about the structure and function of the procedures used to protect and regulate Michigan's waterways. This educational campaign could be prepared in conjunction with the Department's Information and Education Division. Possible outlets for such information would include lakeowners associations, watershed councils, county extension directors and their organizations, and other groups interested in the orderly use and protection of our inland water resources. The possibilities for active help and participation by such groups in this program should not be overlooked, while the Department strives to establish this good working relationship.

The second part of this overall program would be an attempt to educate and inform those persons or groups who

frequently apply for, or are involved in, Act 346 permits. In this fashion the Department could reduce the frequency of conflicts between itself and these groups. These groups have typically included other government entities such as road commissions and township and county sewer boards, who accounted for 21 percent of the applications submitted in 1974, utilities such as Michigan Bell and Consumers Power, who submitted 13 percent of the applications filed in that year, and private riparian groups, because this general grouping accounted for 51 percent of 1974's applications.

These problems, which have been included under the heading Information and Education, have been those which appear to have received the least attention in the past. This has been partially because of budget and manpower shortages. Many times, efforts to reach the public, such as those outlined here, have been given low priorities when time, money, and personnel constraints have arisen. Immediate attention should be given to this problem area and to the recommendations proposed, because it appears that here lies the greatest potential for improvements in efficiency and effectiveness of the regulatory measures administered by the Hydrological Survey Division.

Needed Research

Whereas all of the problems and recommendations discussed to this point have related directly to the administration of the Inland Lakes and Streams Act and/or the Dam

Construction Approval Act, those which will be dealt with below are of a slightly different nature. These are specific areas of concern where there is currently a gross lack of the information necessary to insure efficient management of the construction, operation, and existence of dams in Michigan.

Problem. The management of dams in this State is hindered by the absence of an accurate and complete inventory of dams currently in existence.

As was documented above, there have been numerous attempts to compile an inventory of dams within the State, none of which could be considered complete or accurate. The effective management of dams, particularly from a construction-safety perspective, depends directly on the availability and accuracy of inventory information.

Recommendation. An immediate effort should be made, coordinated by the Hydrological Engineering and Submerged Lands Management Sections of the Department of Natural Resources, to compile an accurate and complete inventory of all impounding structures in Michigan.

Such an inventory should include the same set of information which was gathered for the inventory compiled in accordance with Public Law 92-367 and outlined in Chapter III. This inventory is by far the most accurate compiled to date and its design provides an excellent format, with all of the necessary information, and should be used as a starting point toward the effort recommended here. The information collected should be incorporated into a storage and filling system together with data gathered and analyzed during the periodic inspection program which

was outlined earlier in this chapter. Of particular importance here would be the accurate determination and recording of the physical dimensions and condition of dam structures. The effectiveness of any inspection and inventory program can be only as good as the system used to organize and store the information gathered.[14]

Of more immediate benefit will be the ascertaining of other information with regard to these structures. The determination of the owner of the structure and the retention of this information on file will be one such type of information. This will ease correspondence with owners concerning the upkeep of their dams. It also could facilitate removal of impounding structures in situations where dams have been abandoned. The simple fact is that the Department of Natural Resources is currently attempting to regulate a practice, the extent of which is not accurately documented.

Problem. Not enough information currently is available concerning the actual and potential environmental effects of damming rivers in Michigan, which subsequently hinders the effective administration of the regulatory statutes under question here and the protection of the rivers and streams of Michigan by the Department of Natural Resources.

As was stated in Chapter III, the limnological effects of impounding rivers and streams in Michigan are in no way clear cut or well understood. Not nearly enough is known about either the effects of existing dams on river

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[14]Ibid., p. 13.

ecosystems in Michigan or about the probable effects of dams in the proposal stage. To effectively administer environmental-regulatory statutes geared toward the protection and preservation of waterways in Michigan, such as Acts 346 and 184, a better understanding of the nature and extent of these effects must be obtained.

Recommendation. A cooperative effort should be launched to compile all information available concerning the environmental effects of damming in Michigan and to conduct additional research to obtain the ability to predict the environmental effects of a particular proposed dam before it is constructed.

The need for this type of research was evident continually throughout Chapter II when the ecological effects of damming were discussed. A cooperative effort is recommended to insure as comprehensive a look at this phenomenon as possible with the widest range of disciplines represented. University-based research could be one coordinative approach used. There are numerous divisions within the Department of Natural Resources, as well as other state, federal, and local units of government, which could become involved. The Fisheries Division of the Department of Natural Resources and the Water Quality Appraisal and Comprehensive Studies Sections of the Bureau of Water Management, which devote much of their time to intensive stream investigation and modeling, could provide valuable assistance. The efforts of private conservation groups and non-governmental research specialists also could be utilized.

It may be asked what the primary purpose or goal of such a research project would be. It would be to collect the information necessary to provide a complete and comprehensive review of the effects damming has had on the stream and river ecosystems of Michigan. From this information it should then be possible to provide reasonably accurate predictions concerning the overall environmental effects of impoundment projects still in the proposal stage. The ultimate objective would be the development of an accurate predictive simulation model for computer application that would provide a definitive description of the environmental effects a dam will have. Having this information available surely would avoid speculation concerning the detrimental effects of a project from an environmental standpoint. The importance of having this type of information available has been well expressed by Darrell J. Turner:

> Since ecological conditions vary from one locale to another, it is impossible to assume that dams in general, or even in most cases, do more harm than good or vice versa. Students of the dam-ecology problems generally agree, however, that each situation must be examined carefully and comprehensively before construction is begun.[15]

Summary

The problems and recommendations presented above have been many and have covered a wide variety of areas. Implementation of the recommendations would in some instances be relatively easy, while in other cases it would

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[15]Darrell J. Turner, p. 80.

necessitate the expenditure of large amounts of time and money. It is obvious, however, that something must be done to revitalize the regulatory systems authorized by the Inland Lakes and Streams Act and the Dam Construction Approval Act.

For the most part, the recommendations made in this chapter were presently independently. That is to say, they were considered separately, without establishing priorities or discussing feasibilities. These should be briefly dealt with here. This study has shown that the most urgent need of Michigan's dam regulatory program is additional funds. With adequate money and manpower many of the problems uncovered here could be solved. The recommendations presented concerning administrative problems can also in many respects be labeled urgent. Most, however, would depend on the funds and manpower available to implement them. Of lesser urgency are those problems and recommendations which deal with statutory weaknesses and administrative rule shortcomings. This is not to say, however, that they are not important or that they will not become more urgent in the future.

The feasibility of implementing these recommendations is also of importance. It must be recognized that in many respects the most urgent problems are the most difficult to deal with. The acquisition of additional monies looks highly unlikely. With current attempts to streamline and economize in state government it will be extremely

difficult to obtain more funds. The implementation of intradepartment based recommendations is probably the most feasible as these relate chiefly to administrative matters. Budget shortages do, however, as mentioned, prevent some from being currently feasible. The feasibility of statutory amendment possibilities is of less importance because these avenues will return the least amount of gain when compared to other remedy areas.

The fact remains, that the common practice of damming free-flowing rivers, coupled with the wide range of effects it can cause, does dictate a need for effective administrative procedures to protect Michigan's inland waterways. It is hoped that this study will provide an important stepping stone toward the realization of that objective.

APPENDIX

Forms Used By the Department of Natural Resources to Regulate Dams in Michigan

STATE OF MICHIGAN
MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Fish Ladder Waiver

Having inspected the plans for the dam to be built by _____

_____ of _____

to be located on _____

and it appearing from such inspection that a fish ladder is not required at the present time, the said requirement is not abrogated but waived until further notice:

1. The waiver shall not be construed to amount to an abrogation under Section 1 of Act 123, Public Acts of 1929.
2. The waiver shall continue for an indefinite period of time until, in the judgment of the Director of Natural Resources, the fish conditions or the fish management program of the Department of Natural Resources or other conditions not presently foreseeable require the installation of a fish ladder.
3. The Director shall give ninety (90) days notice prior to termination of any waiver to indicate that a fish ladder or other appropriate device shall be constructed to permit the free and uninterrupted passage of fish over or through said dam.
4. The dam to which this waiver applies is located in the Township of _____, County of _____, on _____ (River, Stream, Creek).

Dated: _____

_____
Director, Michigan Department of Natural Resources

By _____
Chief, Bureau of Resources Management

9/73

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

Dam Check-Off Form

TO: Fisheries; Wildlife; Forestry; Lands; Flood Control; Region ___

FROM: Dale W. Granger, Chief, Hydrological Survey Division

SUBJECT: Proposed Private Dam No._____ Date _____

Owners Name _____ Address_____

Stream Name _____ _____

Sec. _____ Town _____ Range _____County_____

Head _____ Proposed Lake Area _____Existing Lake_____

Inquiry received for contruction of an impoundment. Please return this form to the Hydrological Survey Division with your recommendations and comments within two weeks. Necessary field information will be obtained by the respective divisions.

Recommendations:

Approval_____ Disapproval_____ Conference_____

Fish ladder required _____ not required _____ underspill_____

Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

Signed _____

Date _____

R 4523
Rev 2/71

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

APPLICATION FOR DAM PERMIT

(Act 184, P.A. 1963 As Amended)

1.

NAME OF APPLICANT	PHONE NUMBER
ADDRESS	
CITY, STATE, ZIP CODE	

2.

NAME OF STREAM OR DRAINAGE WAY		AREA OF POND IN ACRES
COUNTY	SECTION, TOWN, RANGE	HEAD OF DAM IN FEET
PURPOSE		AMOUNT OF FEE

3.

Watershed Data	ACRES	COVER	SOIL	TERRAIN
Flow Data	DESIGN FREQUENCY cfs	MAX. COMPUTED DISCHARGE cfs		MIN. COMPUTED DISCHARGE cfs
Tailwater Data	MAX. ELEVATION	NORMAL ELEVATION		MIN. ELEVATION
Impoundment Level Data	MAX. ELEVATION	NORMAL ELEVATION		MIN. ELEVATION
	MAX. ACRES	NORMAL ACRES		MIN. ACRES
Spillway Capacity	MAXIMUM cfs	NORMAL cfs		EMERGENCY cfs

Does the proposed impoundment constitute any part of a public water supply ☐YES ☐NO

Is there any provision for a supplementary water supply? ☐YES ☐NO

Is there any provision for draw down? ☐YES ☐NO If so, to what level? _____

4.

NAME & ADDRESS OF REGISTERED CIVIL ENGINEER THAT PREPARED PLANS, SPECIFICATIONS, & DESIGN.	NAME & ADDRESS OF REGISTERED CIVIL ENGINEER THAT WILL WILL SUPERVISE construction.
_____ Signature	_____ Signature
Reg. No. _____	Reg. No _____

LIST MAPS, PLANS, SPECIFICATIONS, & OTHER DATA ATTACHED TO APPLICATION.

A request for plans, or abrogation of the requirements of Act 123, P.A. 1929, for a fish ladder is hereby made.

OWNER SIGNATURE _____

DATE _____ TITLE _____

NOTE: Read Act 184, P.A. 1963 As amended and instructions on reverse side before completing this application.

R 4525
3/71

INSTRUCTIONS

GENERAL RULES

Complete separate application in triplicate for each dam. All information shall be typed or printed in ink.

The Director of the Dept. of Natural Resources or his authorized representatives shall have the right of ingress and egress to the site, for the purpose of inspection of the structure and impoundment site.

All plans and working drawing shall not be smaller than 21" x 30" nor larger than 24" x 36". Scale of drawings shall be appropriate to the size of the sheets and the details considered.

All plans and working drawings shall show views of the dam and inlet and outlet channels at the dam superimposed upon the topography of the dam site; a profile of the axis of the dam; a profile of the axis of the spillway; a typical section of the dam; a sufficient number of views of the control structure in proper dimension and to scale to show all details necessary for complete analysis of stresses and to show cutoff walls and other foundation treatment; location of drill holes or exploration pits in relation to structure; log of materials encountered in drilling each hole or pit.

Specifications for construction shall include a detailed description of the methods to be used in performing each class of work and detailed requirements for the various materials that will enter into the control structure and dike. Specifications are to be bound in book or loose leaf form.

Notice shall be given the Dept. of Natural Resources at least 10 days before construction is started and within 10 days following completion.

The Department of Natural Resources may require the filing of any additional information which, in its opinion, would have some bearing on the safety of the dam, which might affect the area down-stream in case of dam failure, or other items.

A *Dam* means any artificial barrier or obstruction, together with any appurtenant works, across a stream, river, water course or natural drainageway area which results in an impoundment of more than five acres or a head of five feet or more at the designed normal operating level. All structures which are necessary to impound a single body of water shall be considered as one dam.

SECTION I

Name of applicant may be a private owner, a company, or a corporation.

SECTION II

Amount of fee may be obtained from Act 184, P.A. 1963 as amended.

SECTION III

This data is the responsibility of the Registered Civil Engineer.

SECTION IV

Maps, plans and specifications shall include a location map and a map showing the drainage basin, drainage channels, and the general locale of the dam and land ownership. Quadrangle maps of the U.S.G.S. or county road maps may be used. A topographic map or maps of the impoundment outline, normal and maximum impoundment levels, impoundment area in acres, proposed extent of clearing trees and other objects from the impoundment site and proposed water depths above stumps.

Signature shall be that of the owner or in the case of a company or corporation the authorized representative and his title.

DNR USE ONLY

PERMIT NO.

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

APPLICATION FOR PERMIT

(Act 346 P.A. 1972)

Date

In accordance with Act 346, P.A. 1972, the undersigned herewith makes application for a permit to:

(Indicate type of project proposed)

1 Project located in _____ County _____ Township

Section _____ T _____ R _____ on _____
(name of lake or stream)

2 Legal description of upland property at project site.

Name of Plat _____ Lot Number(s) _____

Is the applicant the owner of the above described property? ☐ Yes ☐ No If not attached the name and address of record owner and authorization for project

3 State reason for this proposed project (be specific)

4 Attach a drawing of existing and proposed site. (please refer to instructions on reverse side in preparing drawing)

5 If you have made application to the U.S. Army Corps of Engineers for this project and have received a process or permit number, please insert number _____

6. Statutory application fee of $25.00 required with all non-governmental applications; make check payable to the State of Michigan.

PAYMENT OF FEE DOES NOT GUARANTEE PERMIT.

7 Return completed application and accompanying material to: DEPARTMENT OF NATURAL RESOURCES, HYDROLOGICAL SURVEY DIVISION, STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926

Applicant's Signature _____

Typed or printed name _____

Address _____

City, State, Zip Code _____

Phone Number _____

APPLICATIONS NOT FULLY COMPLETED WILL BE RETURNED

(See instructions on reverse side)

FOR CASHIER'S USE ONLY — DO NOT WRITE IN THIS SPACE

R 4506 Rev. 7/75

APPLICATION FOR PERMIT

State of Michigan
Department of Natural Resources

Name of Remittor

Address

Purpose

Act 346

R 4506 Rev. 7/75

INSTRUCTIONS for completing application

In accordance with Act 346, P.A. 1972, as amended, the undersigned hereewith makes application for a permit to indicate type of project, i.e. dredge, place fill, construct seawall, construct or place bridge or culvert, modify or enlarge existing structure, etc.

1. Location of Project: The County, Township, Section, Town and Range, and the name of the lake or stream must be given.

2. Legal description of upland property where project is located (can be taken from tax statement). Attach an additional sheet if necessary.

   If applicant is not the record owner the name and address of the record owner, along with a letter of authorization or copy of easements, etc. must be attached.

3. State reason for proposed project. A brief statement indicating applicant's purpose is required.

4. Drawing need not be prepared by an engineer or surveyor; however, it must be in black ink or black pencil on standard weight paper of 8½" x 11" sheet size (see exception below), and the drawing must:
   a. be drawn to scale,
   b. have arrow showing north,
   c. show all existing and proposed structures,
   d. show dimensions of shore frontage, existing and proposed structures,
   e. show configuration of shoreline on both sides of your frontage,
   f. show sufficient soundings to represent bottom contours,
   g. indicate by arrow the direction of current in rivers,
   h. show names of waterways and prominent points, and
   i. show relative location to political subdivisions; include location map and address of project site.

   EXCEPTION: Blueprints and drawings on sheets larger than 8½"x 11" are acceptable; however, five (5) copies must be submitted with application.

5. In the event the project for which permit is being sought involves the use of explosives and/or tools, and equipment other than non-powered tools it shall be the responsibility of the permittee to meet all requirements of Act 53, Public Acts of 1974.

Use complete address when submitting application. Provide complete address for applicant.

APPLICATIONS NOT FULLY COMPLETED WILL BE RETURNED!

OFFICE OF
DEPARTMENT OF NATURAL RESOURCES
HYDROLOGICAL SURVEY DIVISION
STEVENS T. MASON BUILDING
LANSING, MICHIGAN 48926
(517) 373-3930

Process # _____ Date _____

PUBLIC NOTICE

When an application is received for a permit to authorize work in, or over, the inland waters of Michigan, the statute provides that a notice regarding the application shall be sent to the Director of Public Health or local Health Department designated by him, the city, village, or township, and the county where the project is to be located, the local Soil Conservation District, the local Watershed Council organized under Act No. 253 of the Public Acts of 1964, if any, and the local property owners association or port commission, if any.

Those persons objecting to the issuance of a permit may request a public hearing by writing to this office not later than 20 days from the date of issuance of this notice and clearly stating their objections. The determination as to whether a permit will be issued, or a public hearing held, will be based on an evaluation of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, pollution, and the general public interest. Comments on these factors will be accepted and made part of the files and will be considered in determining whether it would be in the public interest to grant a permit. Objections should be factual and specific in describing the reasons upon which the protest is founded.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

TO:
_____ Regional Manager, Region I Headquarters (Marquette)
_____ Regional Manager, Region II Headquarters (Roscommon)
_____ Regional Manager, Region III Headquarters (Lansing)
_____ Chief, Fisheries Division
_____ Chief, Wildlife Division
_____ Chief, Waterways Division
_____ Chief, Forestry Division
_____ Chief, Lands Division
_____ Chief, Water Quality Control Division
_____ Chief, Marine Safety Section
_____ Department of State Highways & Transportation
_____ Department of Public Health
_____ _____

FROM: Submerged Lands Management Section,
Hydrological Survey Division

SUBJECT:
_____ Act 346, P.A. 1972: Appl. _____ Corres. _____
_____ Act 247, P.A. 1955, as amended: Appl. _____ Corres. _____
_____ Corps of Engineers: Public Notice _____ Process _____
_____ _____

Water Involved: _____

We are forwarding copies of this material to you for:

Investigation /____/ Information /____/

Please submit your findings and recommendations to this office not later than _____.

REMARKS:

By: _____

11/74

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
HYDROLOGICAL SURVEY DIVISION

HABITAT IMPACT STATEMENT

ACT 346-247 PROCESS NO
USCE PROCESS NO
SUBMITTED BY

GENERAL INFORMATION (Read Instructions Before Completing)

1 IS DRAWING COMPLETE AND ACCURATE? ☐YES ☐NO (Attach Sketch)	2 DOES PROJECT EXTEND BELOW THE O H W M ☐YES ☐NO	3. IS O H W M ACCURATELY SHOWN ON DRAWING? ☐YES ☐NO (Attach Sketch)
4 USES OF AREA ☐HUNTING ☐FISHING ☐BOATING ☐OTHER (Explain on Reverse)	5 ADJACENT SHORELINE DEVELOPMENT ☐RESIDENTIAL ☐COMMERCIAL ☐INDUSTRIAL ☐AGRICULTURAL ☐WILD STATE (Explain on Reverse)	
6 PUBLIC USE ☐INFREQUENT ☐AVERAGE ☐CONSIDERABLE	7 WATER DEPTH & BOTTOM CHARACTERISTICS (Soil Types, Vegetation, Etc.)	
8 WILL PROJECT EFFECT ☐EROSION ☐SANITATION ☐FLOWS ☐FLOOD PROTECTION ☐OTHER UPLAND USES EXPLANATION.		
9 POTENTIAL EFFECT TO RIPARIAN/PUBLIC LAND OR WATER RIGHTS:		
10 POTENTIAL DAMAGE TO ADJACENT WATER AREAS		

FISHERIES INFORMATION

1 WATER TYPE ☐WARM ☐COLD ☐LAKE ☐STREAM	2 SPECIES PRESENT & EFFECTED
3 FISHERIES VALUE RATING (SEE INSTRUCTIONS) A - SPAWNING 1 2 3 4 5 B - FEEDING 1 2 3 4 5 C - COVER 1 2 3 4 5 D NURSERY 1 2 3 4 5	4 POTENTIAL EFFECT ON FISHERIES (INCLUDE ANGLING) 5 PROJECT AREA REPRESENTS WHAT PERCENT OF SIMILAR HABITATION ON THIS WATER ☐ %

WILDLIFE INFORMATION

1 TYPE OF HABITAT ☐OPEN WATER ☐WET MARSH ☐DRY MARSH ☐TIMBERED SWAMP ☐UPLAND ☐LOWLAND BRUSH	2 SPECIES PRESENT & EFFECTED
3 WILDLIFE VALUE RATING (SEE INSTRUCTIONS) A - FOOD & COVER 1 2 3 4 5 B - NESTING & BROOK REARING 1 2 3 4 5 C - HABITAT VALUE 1 2 3 4 5	4 POTENTIAL EFFECT ON WILDLIFE 5 PROJECT AREA REPRESENTS WHAT PERCENT OF SIMILAR HABITATION ON THIS WATER ☐ %

INSTRUCTIONS

1. Provide incorrect or missing information in item number 1 of application. Use reverse side.
2. Value rating has low score of 1 and high score of 5 (Circle One)
3. Use reverse side for explanations and additional comments if needed.

R 4559
10-72

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