

**INVESTIGATING THE FEASIBILITY OF RIVER RESTORATION
AT ARGO POND ON THE HURON RIVER, ANN ARBOR,
MICHIGAN**

By:

Wendy M. Adams

Meghan Cauzillo

Kathleen Chiang

Sara L. Deuling

Attila Tislerics

A project submitted
in partial fulfillment of the requirements
for the degree of
Master of Science
(Natural Resources and Environment)
at the University of Michigan
August 2004

Faculty Advisor: Associate Professor Gloria Helfand

ABSTRACT

People have long used dams and reservoirs to produce energy, store water, control floods, provide recreation, and spur economic development. Dams also have negative impacts on rivers, such as habitat damage and water shortages downstream. Across the country, state and federal agencies are examining dam removal as a means to restore the ecological integrity of rivers. Argo Dam on the Huron River in Ann Arbor, Michigan, has been identified by the state Department of Natural Resources as a candidate for removal and ecological restoration. For an informed decision to be made on removal, much research is necessary, including studies on hydrologic, ecologic, economic, and social impacts. Our project focused on the human aspects of this issue, with the goal of evaluating the political and economic feasibility of restoring the Argo area. This included identifying stakeholders and determining the value of the dam and pond for users and local residents. Our research methods included a mail survey, interviews, and literature review. We found that the Argo area, and the dam in particular, is not well known among Ann Arbor residents. Nonetheless, after a description of the tradeoffs involved, dam removal was generally supported by residents and the net willingness to pay for removal was approximately \$20 per adult per year. Differences in perceptions about the Argo area varied by proximity to the dam with residents living no farther than one mile from the dam having more familiarity and experience with the site than the average Ann Arbor resident. Removal of Argo Dam is strongly opposed by the rowing community, Argo Pond's most important recreational user group. Due in part to lack of funds, the Ann Arbor City government does not consider removal of Argo Dam to be a priority, but sedimentation and growth of aquatic plants in the pond will require modification of present usage and management practices in the relatively near future. Our client, the Huron River Watershed Council, plans to use our findings to augment ecological and other data that they are gathering to develop proposals for the future of Argo Pond and Dam.

Executive Summary

INVESTIGATING THE FEASIBILITY OF RIVER RESTORATION AT ARGO POND ON THE HURON RIVER, ANN ARBOR, MICHIGAN

INTRODUCTION

In 1995, the Michigan Department of Natural Resources conducted an assessment of the Huron River and identified Argo Dam, along with other dams on the river, as a candidate for removal, as it no longer serves its original purpose of producing hydropower, and its removal could benefit the aquatic environment for this urban stretch of the Huron River (Hay-Chmielewski et al. 1995). In this study, we have examined the social, political, and economic feasibility of removing Argo Dam using stakeholder interviews, an economic analysis, and a mail-based survey. We sought to answer questions about the community's knowledge and perceptions about the dam, the ways in which the community and various stakeholders use the site in its current configuration, the economic values of Argo Dam and Argo Pond as they currently exist, the public's willingness to pay for dam removal or dam maintenance, and the process and players involved in decisions about the future of Argo Dam.

BACKGROUND

Argo Dam in Ann Arbor, Michigan, is one of nineteen dams that impound the main stem of the Huron River. Argo Dam is eighteen feet high and 1940 feet long; 190 feet are composed of the spillway gates and sluice gates, while 1750 feet are earthen embankment (City of Ann Arbor 1971). Argo Dam creates a 92-acre impoundment called Argo Pond, which extends approximately one mile upstream from the dam. The average depth of Argo Pond is ten feet (Barr Engineering Co. 2002). It was originally built to provide power to small mills and was converted hydropower in the early 20th century, but it has been deactivated since 1959. It is now owned by the City of Ann Arbor, and provides mainly recreational benefits associated with the pond and surrounding parkland.

In recent decades, it has become apparent that Argo Dam and Pond produce ecological costs, which were not understood or considered at the time of construction. It presents a physical

barrier to the movement of fish, mussels and other aquatic organisms, many species of which require migration as part of their life cycles. Eutrophication is accelerated in the pond; it offers very different habitat conditions from those that would otherwise be present. The water is warmer and less oxygenated than a free-flowing river. The impoundment reduces the velocity of the river, trapping nutrients which encourage plant growth and releasing sediment which, together with additional sediment from decaying plant material, buries the original bottom substrate habitat needed by many aquatic species. The operation of the dam's gates alters the hydrology of the Huron River: the gates open and close rather abruptly, frequently sending large rushes of water downstream. This has a scouring effect along the banks and bottom of the river, increasing erosion and destroying fish nests. Steve Blumer, with the US Geological Survey (USGS), claims Argo Dam is one of the most extreme examples of dams negatively affecting a river's natural hydrology (Blumer 2003).

Removal of Argo Dam would transform a mile-long section of the river from a lake to a free-flowing, high-gradient river. Currently, every high gradient portion of the Huron River's main stem is dammed from Commerce Township to Lake Erie (Hay-Chmielewski et al. 1995). This is not atypical; in the state of Michigan, dams impound ninety percent of high gradient rivers and one hundred percent of those flowing into the Great Lakes (Blumer 2003). If river restoration were pursued, Argo Pond would be drained, narrowing the river and likely returning its flow to the channel it occupied over a century ago (Riggs 2003). Much of the land that is currently submerged beneath Argo Pond would become available to the City of Ann Arbor for additional riparian parkland and natural areas (Miller 2003; Naud 2003).

METHODS

We used interviews, review of relevant documents and academic literature, and a mail-based survey to gather data for this project. Interviews took place in two phases: an initial series was used to gather background information and plan the survey, and a second series of interviews focused on the interests and perspectives of the various stakeholders. The survey gathered data on usage of and attitudes toward the Argo site. We also used the contingent valuation method to estimate the survey respondents' willingness to pay either to keep or to remove Argo Dam. The survey sample was divided into two strata; 1000 recipients were selected from

within one mile of the Argo site, and another 1000 were selected from the rest of the city of Ann Arbor.

SURVEY RESULTS

Our survey response rate was 49%. Demographically, our survey achieved a broad but not wholly representative sample of the Ann Arbor population. The most notable pattern was underrepresentation of younger, less educated, and lower-income individuals, particularly in the stratum drawn from within one mile of the Argo site. This area is heavily populated by students; due to their transience, relatively few students were included in the source lists from which our samples were drawn.

Attitudes and Usage

We estimated that 43% of the adult residents of the study area (approximately the city of Ann Arbor) visited the Argo area in the 12 months prior to the survey; almost 22% have never been to the Argo area and are not familiar with it. Residents throughout our study area use Argo Pond or the parks around it; we estimate that people who live more than one mile from the pond account for nearly half of the recreational activity occurrences at the site.

The most popular activities at Argo were walking, running, and bicycling, with 53% of the surveyed residents participating; 5% or fewer of the study area residents fished, kayaked, rowed, or skied there. However, over 64% of the kayaking and over 95% of the rowing done by adults in our study area was done at Argo, suggesting that Argo is an important site for these activities.

Respondents generally were supportive of parkland and open space. They felt more familiar with and favorable toward the parks around the pond than toward the pond and the dam itself. About 60% of respondents expressed opinions about the parks around Argo Pond; the remainder indicated they were neutral, didn't know, or didn't answer the question. In contrast, only about 44% and 35% of respondents expressed opinions about Argo Pond and Argo Dam, respectively. Of those who expressed opinions about the parks, 95% had favorable opinions. Seventy-three percent (73%) of respondents with opinions were favorable toward Argo Pond and were least favorable toward the pond's water quality. Just 49% of those with opinions about the dam expressed favorable opinions.

In response to two questions asking whether Argo Dam should be removed or remain in place, about 60% of respondents indicated no preference; of those expressing a preference, small majorities favored keeping the dam. However, when later asked in a referendum format whether they supported dam removal at no cost to them, given only “Yes” or “No” alternatives, fewer than 7% gave no response, and 62% of those who responded indicated they would vote to remove the dam. This change is attributable partly to respondents who had neither agreed nor disagreed in the previous two questions; when forced to choose, two-thirds of those respondents voted for dam removal. Possible reasons why respondents may have moved from uncertainty to a decision include an educational effect from two pages of text preceding the referendum question discussing the background of the dam and the tradeoffs inherent in dam removal, the assurance in this question that dam removal would not cost them anything, differences in format and wording of the questions, or the lack of “Neutral” and “Don’t know” options.

Economic Analysis

The survey utilized the contingent valuation method to estimate willingness to pay for removing or retaining the dam. Our results suggest that opponents of dam removal in our study area are willing to pay approximately \$161 per adult per year to keep the dam and pond in place. Supporters of dam removal are willing to pay less to see the dam removed, approximately \$135 per adult per year. However, supporters of dam removal outnumber opponents; therefore, on average, residents of our study area were willing to pay approximately \$22 per adult per year to remove the dam. With Ann Arbor’s adult population of 95,700 (U.S. Census Bureau 2004), this amounts to a net willingness to pay for dam removal of \$2.1 million per year for our study area.

POLITICAL ANALYSIS

The City Council will make the decision whether to remove Argo Dam. The process for decision-making will include forums for public input; consideration of safety, financial feasibility, and recreational and environmental interests; and permitting through the Michigan Department of Environmental Quality. The process of removing Argo Dam would involve a number of entities within Ann Arbor’s government, including City Council, Parks Advisory Commission, Water Utilities, Parks and Recreation Services, Project Management, and

Planning. There are three overarching issues that need to be addressed if Argo Dam is to be removed: balancing conflicting recreational interests, the buildup of sediment and weed growth, and funding for removal, restoration, and continued maintenance. Even if the dam is not removed, the City must address some of these issues in the near future.

Recreational Interests

Some of Ann Arbor's opportunities for water recreation are unique to the region, especially rowing, drawing users from all over Southeast Michigan. Dam removal will be detrimental to some of those activities. Removal of the dam would require construction of a footbridge to maintain access across the river in the Argo area. Land exposed by dam removal may make it easier for the City to develop more paths to connect the parks and have larger, contiguous natural areas, but additional maintenance will be required from the City's Parks staff. Decision-makers will need to weigh whether the recreational opportunities gained by dam removal are the best use of the site, considering the relative scarcity of the types of open-water recreational opportunities currently available at Argo.

It is very unlikely that dam removal will take place without the successful relocation of the rowing teams. The rowing community, a well-organized and passionate group, would strongly oppose efforts to remove Argo Dam without a good alternative. The City and many survey respondents have also expressed interest in seeing rowing remain somewhere in Ann Arbor. Several criteria will be important in a new rowing location: a stretch of straight, flat water; space for at least one boathouse, trailer storage, and parking; a dock; and proximity to Ann Arbor. Geddes Pond and Barton Pond appear to meet many of these criteria, but have other issues surrounding their use.

The City is content with the rowers' current location at Argo Pond. The City believes that having rowers at Gallup Park, on Geddes Pond, will cause overcrowding, and that there is no space for a boathouse at that park. Private landowners in the Village of Barton Hills will not allow access to Barton Pond, and residents along the shore object to the noise from early morning practices.

A suitable solution to maintain rowing activities may involve moving parts of the rowing community to different ponds. For example, the two high schools could move to Geddes

Pond, which is much closer to Huron High School. The Ann Arbor Rowing Club and the University of Michigan men's team could then move to Barton Pond, if an agreeable contract could be worked out with the surrounding neighborhoods. Such a change would require new infrastructure and access at both ponds. Another option may be to purchase land from Concordia College as a site for rowing facilities on Geddes Pond. Even if the dam stays in place, the rowing community is looking to expand to other areas because of increased rowing traffic and lack of space on Argo Pond.

While they are not a particularly cohesive interest group, some kayakers and canoeists would likely support a proposal that would bring whitewater rapids to Ann Arbor. However, because of the high cost of constructing and maintaining artificial rapids, this would only be feasible at Argo if the area naturally lends itself to such conditions. Further study is required to know what the state of the river would be if the dam is removed.

Plant Growth and Sediment

Argo Pond is filling in with sediment and plant growth, frustrating pond users with cloudy water, offensive odor, and eutrophication. The plant growth problem exists in all three ponds for which the City is responsible. Regardless of where the rowers are located, a long-term plan will be needed for dealing with plant growth and sediment where rowing occurs.

The rowers are interested in pursuing dredging as an option for Argo Pond, but the City would be unlikely to support it because of its high cost. Mowing or harvesting the weeds, dyeing the water to reduce sunlight penetration, and laying a tarpaulin over the riverbed are possible methods of weed control. Mowing and harvesting are only temporary solutions; dyeing the water is aesthetically unpleasing; and the large tarpaulin may be prohibitively expensive. The HRWC will not support removing the plant growth at Argo Pond because it believes that removing the dam is the best solution (Riggs and Rubin 2003).

The City may be able to negotiate a settlement between the rowers and the Village of Barton Hills to help the residents address the plant growth problem in Barton Pond, perhaps through a reservoir drawdown to expose the plants to winter freezes, in exchange for allowing some of the rowers to use the pond to practice. Managing which groups are allowed to use Barton Pond might lead to a workable compromise.

Funding

The City would be unable to fund dam removal and river restoration on its own. Although residents' net willingness to pay through increased property taxes would cover the costs of removal and restoration, the amount of money required for those activities is too small for the City to pursue a millage or bond. Outside funding from state, federal, and/or private sources would be needed to make dam removal a reality. Even though the City is not currently planning for removal of the dam, there appears to be some belief within the City that the dam eventually will be removed, since plans for improving the Argo area have already been scaled down in case the dam is removed and the improvements are rendered useless.

The HRWC would help the City find additional funding sources to help with removal and restoration. The MDNR may use its experience with dam removals to help find funding sources; if they are sufficiently interested in removing Argo Dam, they may also help with attaining appropriations from the state for those purposes (Hanshue 2004). Funders of previous dam removals in Michigan may assist with the removal of Argo Dam, perhaps with the requirement that research on the effects of dam removal be conducted as it proceeds.

CONCLUSIONS AND NEXT STEPS

In the course of our research we found that Ann Arbor citizens are unfamiliar with and hold misconceptions about the Argo site. In particular, many Ann Arbor residents believe that the dam controls flooding or generates electricity, and are unaware of its negative ecological effects. Public support for removal of the dam could be increased through educational efforts on these topics, as well as the ecological, recreational, and aesthetic benefits that are likely to result from removal.

Many important questions remain to be answered before dam removal can proceed. Research on the effects of dam removal on nearby wetlands and the floodplain, options for restoration and recreational amenities following removal, potential funding sources for removal and restoration, and a detailed study of sediment composition would help to inform decision-makers and the general public. Many potentially interested groups are currently uninvolved in this issue; with increased outreach efforts, the involvement of some recreational users and other local environmental organizations could provide increased support and legitimacy to a

dam removal effort. Furthermore, a successful dam removal may be more likely if all interested parties, particularly the rowing community and government agencies with permitting responsibilities, are engaged early in the process to address their concerns.

REFERENCES

- Barr Engineering Co. (2002). Argo Pond Sediment Sampling Study. Ann Arbor, MI.
- Blumer, S. (2003). Interview, 7/3/03. U.S. Geological Survey.
- City of Ann Arbor (1971). Drawing NO 520 C 102 Embankments. City Hall records.
- Hanshue, S. (2004). E-mail to K. Chiang 2/23/04, "Re: Argo Dam Master's Project". Settlement Management Specialist, Michigan Department of Natural Resources.
- Hay-Chmielewski, E. M., P. W. Seelbach, G. E. Whelan and D. B. Jester, Jr (1995). Huron River Assessment. Lansing, MI, Fisheries Division, Michigan Department of Natural Resources.
- Miller, J. (2003). Interview, 12/1/03. Director, Community Services Dept., City of Ann Arbor.
- Naud, M. (2003). Interview, 6/12/03. Environmental Coordinator, City of Ann Arbor.
- Riggs, E. (2003). Interview, 2/19/03. Middle Huron Initiative coordinator, Huron River Watershed Council.
- Riggs, E. and L. Rubin (2003). Interview, 12/19/03. Huron River Watershed Council.
- U.S. Census Bureau (2004). American FactFinder.
http://factfinder.census.gov/home/saff/main.html?_lang=en

ACKNOWLEDGEMENTS

We would like to thank all of the many people who have contributed to this project over the past year and a half. First, we thank our advisor, Prof. Gloria Helfand, for her patience, expertise and timely assistance. We also thank Profs. Michael Moore and John Loomis (Colorado State U.) for providing advice and insight on the economic analysis. Elizabeth Riggs and Laura Rubin of the Huron River Watershed Council got us started in the right direction and provided a great deal of background information on the Argo site and its stakeholders. Professors Ray DeYoung, Paul Mohai, Elaine Hockman (Wayne State U.), and Barbel Knauper (McGill U.) and friends and coworkers gave us valuable feedback on our draft questionnaire and survey protocol. The Shiawassee Team blazed the trail, and bequeathed Larry to us. Chris Cox produced drawings of the Argo site for use in the questionnaire, and Elena Tislerics helped design the cover. The University of Michigan Center for Gene Therapy allowed us to use their office facilities after hours. We are grateful to the many people who allowed us to interview them for this project, including representatives of stakeholder groups and officials of the City of Ann Arbor, particularly Amy Kuras and Matt Naud, who suffered our battery of inquiries with incredible patience. We thank the staff of the School of Natural Resources and Environment for providing administrative support, the Bentley Historical Library for use of images, and the employees of the 24-hour Redford Post Office for being there when we needed them. Funding for this project was provided by the Rackham School for Graduate Studies, the Prentice Foundation, an anonymous donor, and the School of Natural Resources and Environment. Our family, friends and significant others provided support, encouragement and sympathetic ears. Lastly and most importantly, we thank the over 800 people who completed and returned their questionnaires; without them, we would have very little to write about.

TABLE OF CONTENTS

Abstract.....	i
Executive Summary.....	iii
Acknowledgments	xi
Table of Contents	xii
List of Figures	xiii
List of Tables	xiv
List of Abbreviations and Acronyms.....	xvii
1. Introduction.....	1
2. Background.....	7
Dams in the United States	7
Argo Dam and the Huron River	17
3. Methods.....	41
Stakeholder Interviews	41
Economic Evaluation	42
Survey	47
4. Survey Results and Discussion.....	57
Survey Response.....	57
Representativeness of Respondents.....	59
Attitudes and Usage	64
Economic Analysis.....	76
5. Political Analysis	89
Decision-making Context	89
Stakeholders.....	98
Summary	140
6. Conclusions and Recommendations	143
Recommendations.....	144
References	148
Appendix A: Michigan Dam Removals.....	159
Appendix B: MDNR/MDEQ Dam Removal Guidelines for Owners	161
Appendix C: Goals of North Main Street/Huron River Corridor Plan	165
Appendix D: Interviewees and Interview Dates.....	166
Appendix E: Questionnaire and Responses	169
Appendix F: Census Block Groups Included in Survey Area.....	182
Appendix G: E-mails Received During Survey	183
Appendix H: Procedures for Dealing with Item Nonresponse to Questions 3 and 8.....	186
Appendix I: Survey Comments.....	187
Appendix J: Calculating Response Rate	213
Appendix K: Statistical Output for Questions 1-7.....	216
Appendix L: Dam Removal Funding Sources	238

LIST OF FIGURES

2-1.	Heinz Center general method for dam removal decisions	15
2-2.	Maps of Michigan dams	16
2-3.	Map of the Argo area	18
2-4.	Elevation changes, by river mile, from headwaters to mouth of the Huron River.....	19
2-5.	Timeline of Argo Dam history.....	20
2-6.	Map of Brown & Fuller’s addition to Ann Arbor.....	21
2-7.	Ann Arbor Milling Company at Argo and Broadway Bridge, ca 1900-1919	22
2-8.	An early dam at the Argo site.....	23
2-9.	The Huron River in Ann Arbor.....	24
2-10.	The livery at Argo Pond, ca. 1900-1919	25
2-11.	Hydrograph comparing variability of Huron River flow below Argo Dam with a more rural upstream reach	27
3-1.	Five-contact survey protocol.....	49
3-2.	Survey area map	51
4-1.	Age distribution of respondents compared with 2000 Census	60
4-2.	Sex ratios of respondents compared with 2000 Census.....	61
4-3.	Household income of respondents compared with 2000 Census.....	62
4-4.	Educational attainment of respondents over age 25 compared with 2000 Census	63
4-5.	The parts of question 8.....	78
4-6.	Flow chart of logically consistent response options for Question 8.....	78
4-7.	Scatter plot of responses to various bid values	80
5-1.	Map of the five current or potential rowing practice locations in and around Ann Arbor.....	118

LIST OF TABLES

3-1. Relative abundance of CV values	54
4-1. Response category breakdown	57
4-2. Summary demographic statistics	59
4-3. Opinions about parks and recreation in Ann Arbor in general	66
4-4. Familiarity with the Argo area	66
4-5. Participation in various recreational activities anywhere within an hour's drive of Ann Arbor	67
4-6. Participation in various recreational activities at Argo Pond or the parks around it.....	68
4-7. Percentage of recreational activity occurrences at Argo attributable to residents of the Argo stratum, by activity.....	69
4-8. Recreational activity occurrences at Argo as a percentage of the total number of incidents of that activity by residents of the study area.....	69
4-9. Opinions about Argo Pond	71
4-10. Opinions about Argo Dam	72
4-11. Opinions about the parks around Argo Pond.....	74
4-12. Responses to referendum on removing Argo Dam	75
4-13. Responses to referendum on removing Argo Dam by respondents who had no opinion (Neutral, Don't know or did not answer) on dam removal items in Question 6	75
4-14. Number of responses at each bid amount for individuals supporting removal of Argo Dam (Question 8D)	80
4-15. Number of responses at each bid amount for individuals supporting maintaining Argo Dam (Question 8E).....	80
4-16. Independent variables included in logistic regression for question 8A, 8D, and 8E	81
4-17. Logistic regression model of probability choice made in 8A	83
4-18. Predictions of logistic regression model for question 8A	84
4-19. Logistic regression model of probability choice made in 8D.....	84
4-20. Predictions from the pro dam removal logistic regression model of probability choice made in 8D.....	85
4-21. Logistic regression of probability choice made in 8E.....	86
4-22. Predictions from the pro dam maintenance logistic regression model of probability choice made in 8E.....	86

4-23. A summary of WTP generated from the 8D and 8E logit models	87
A-1. Michigan dam removals	159
D-1. Interviewees and interview dates	166
I-1. CV and Concluding Comments	187
I-2. CV Comments	198
I-3. Concluding Comments	204
J-1. Response rate summary	215
K-1. Mann-Whitney ranks for homeowners (1) and students (2) on questions 1E and 1F .	218
K-2. Mann-Whitney test statistics for questions 1E and 1F in regard to homeownership...	218
K-3. Mann-Whitney ranks for homeowners (1) and students (2) on questions 5I, 6B, 6D, 7C, 7D, and 7E.....	219
K-4. Mann-Whitney test statistics for questions 5I, 6B, 6D, 7C, 7D and 7E in regard to homeownership	219
K-5. Mann-Whitney ranks for non-students (1) and students (2) in response to questions 5I, 6B, 6E, 7C, and 7D	220
K-6. Mann-Whitney test statistics for questions 5I, 6B, 6E, 7C and 7D in regard to student status	220
K-7. Frequency table for non-student responses to questions 5I, 6B, 6E, 7C and 7D	221
K-8. Frequency table for student responses to questions 5I, 6B, 6E, 7C and 7D.....	221
K-9. Mann-Whitney test statistics for questions 6A, 6B, 6C, 6E, 6G, 6H, 6I, and 6K in regard to educational attainment	222
K-10. Mann-Whitney ranks for respondents without a college degree (1) and respondents with a college degree (2) in response to questions 6A, 6B, 6C, 6E, 6G, 6H, 6I, and 6K.....	223
K-11. Frequency table for respondents with no college degree	224
K-12. Frequency table for respondents with associate, bachelor or graduate degrees.....	224
K-13. Frequency table for respondents with no college degree	224
K-14. Frequency table for respondents with associate, bachelor or graduate degrees.....	225
K-15. Mann-Whitney test statistics for questions 1B, 1C, 7C, 5C, 5D, 5H and 5L in regard to educational attainment.....	227
K-16. Mann-Whitney ranks for respondents without a college degree (1) and respondents with a college degree (2) in response to questions 1B, 1C, 7C, 5C, 5D, 5H and 5L.....	227
K-17. Mann-Whitney ranks for respondents with per capita incomes of less than \$35,000 (1) and respondents with per capita incomes of greater than \$35,000 (2) in response to questions 1F, 5H, 6F and 7C.....	228

K-18. Mann-Whitney test statistics for questions 1F, 5H, 6F and 7C in regard to per capita income	228
K-19. One-Sample descriptive statistics for question 1A-1F for the Ann Arbor stratum	229
K-20. One-Sample test statistics for questions 1A-1F for the Ann Arbor stratum.....	230
K-21. One-Sample descriptive statistics for questions 5A-5L for the Ann Arbor stratum.....	230
K-22. One-Sample test statistics for questions 5A-5L for the Ann Arbor stratum.....	231
K-23. One-Sample descriptive statistics for questions 6A-6K for the Ann Arbor stratum....	231
K-24. One-Sample test statistics for questions 6A-6K for the Ann Arbor stratum.....	232
K-25. One-Sample descriptive statistics for questions 7A-7F for the Ann Arbor stratum.....	232
K-26. One-Sample test statistics for questions 7A-7F for the Ann Arbor stratum.....	233
K-27. One-Sample descriptive statistics for questions 1A-1F for the Argo stratum.....	233
K-28. One-Sample test statistics for questions 1A-1F for the Argo stratum.....	234
K-29. One-Sample descriptive statistics for questions 5A-5L for the Argo stratum.....	234
K-30. One-Sample test statistics for questions 5A-5L for the Argo stratum.....	235
K-31. One-Sample descriptive statistics for questions 6A-6K for the Argo stratum.....	235
K-32. One-Sample test statistics for questions 6A-6K for the Argo stratum.....	236
K-33. One-Sample descriptive statistics for questions 7A-7F for the Argo stratum.....	236
K-34. One-Sample test statistics for questions 7A-7F for the Argo stratum.....	236
K-35. T-test of independent samples to locate significant differences in usage of the Argo area for recreation between the Argo and Ann Arbor strata.....	237

LIST OF ABBREVIATIONS AND ACRONYMS

AARC	Ann Arbor Rowing Club
CFS	Cubic feet per second
CV	Contingent Valuation
EPA	US Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FTE	Full-Time Equivalent employee
GLP	Great Lakes Paddlers
HRA	Huron River Assessment
HRWC	Huron River Watershed Council
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MRA	Michigan Rowing Association
NAP	Natural Areas Preservation
PAC	Parks Advisory Committee
PROS	Parks and Recreation Open Space
TVA	Tennessee Valley Authority
UMRT	University of Michigan Rowing Team
USGS	United States Geological Survey
WTP	Willingness to Pay

Chapter One

INTRODUCTION

The Huron River is a central feature of the city of Ann Arbor. In fact, the city's founding and early growth were influenced dramatically by the mechanical energy available from the river. Today, the river, its dams and impoundments, and the numerous adjacent parks provide drinking water, hydroelectricity, recreational opportunities, and aesthetic benefits to residents of Ann Arbor and southeast Michigan. Development of the river, particularly the construction of dams, has provided many of these services but has also disrupted the river's natural ecosystem.

In its 1995 Huron River Assessment (HRA), the Michigan Department of Natural Resources (MDNR) identified Argo Dam in Ann Arbor, along with other dams on the Huron, as a candidate for removal, suggesting that dam removal could benefit the aquatic environment through improved water quality, fisheries, and riverine habitat. Inspired by this suggestion, the Huron River Watershed Council (HRWC), a nonprofit organization based in Ann Arbor, initiated several of the necessary steps to advance the issue of removal for Argo Dam, including meetings with the City of Ann Arbor and other key stakeholders. It became clear that some interested parties strongly opposed removal and much more information was needed about stakeholders' perceptions and use of the area before an informed and equitable decision could be made. The HRWC proposed the present study to address some of these informational needs.

Currently, knowledge of the costs and benefits of removing Argo Dam is limited. In addition to the economic costs of removal and restoration, dam removal can have unforeseen ecological effects that include the invasion of exotic species and release of sediment loads that disrupt aquatic life for months or years if improperly managed (Stanley and Doyle 2003). Dam removal, however, can also have positive ecological impacts, including increasing the diversity of habitats and fish and insect species, decreasing sedimentation along the impounded reach and reestablishing sediment and material flows downstream, and restoring migratory fish passage (Heinz Center 2002).

Non-ecological considerations also exist and must be taken into account. Recreational opportunities will change from open-water boating and angling to river fishing, canoeing and kayaking. Wildlife habitat will change from a lentic ecosystem with lacustrine (lake-associated) wetlands to a lotic environment with riverine wetlands. There will also be aesthetic tradeoffs between the large open-water body of the impoundment and the narrower, swift-moving river. All of these tradeoffs should be carefully considered in any decision regarding the dam. Furthermore, along with recreational, ecological, and aesthetic tradeoffs, dam removal and river restoration involve a great deal of time, money and labor and can therefore arouse intense emotions.

A project that proceeds without adequate public participation and support, or adequate consideration of the economic, political, social and ecological consequences, can do lasting damage to the affected community and make future dam removal efforts considerably more difficult, no matter how meritorious and well-planned they may be. Therefore, it is crucial that all stakeholders, including river users and community members, be involved in the decision-making process and the full range of consequences considered. If this is achieved, dam removal may take place without long-term losses and will be able to provide improved water quality, recovered riverine fisheries, reestablished ecosystem health, and unique recreational opportunities.

Included among the steps of assessing the feasibility of removing a dam are identifying stakeholders and their interests, identifying and, if possible, quantifying the full range of current uses of the dam, and evaluating the economic and ecological costs and benefits of removing, altering, or maintaining a dam. In this study of Argo Dam we have elected to focus on the social science aspects of the issue rather than the natural science aspects. We chose this course of study because understanding human attitudes toward and interactions with a dam is very important in assessing its significance. Studying the human reactions to and social perceptions of dam removal and river restoration will be useful in determining the future of the Argo area. Also, any decision made by the City will certainly address social and economic concerns voiced by its residents and officials. However, we emphasize that the best decision should include social, economic, and ecological considerations.

We have attempted to determine whether there is sufficient support for dam removal and river restoration at Argo among stakeholders and the general public to warrant further studies of the ecological and engineering issues involved. We have investigated the following specific questions in the course of this study:

- How do community members perceive the dam, pond, and river?
- In what ways does the surrounding community currently use or value the dam and related features?
- Are there other ways in which the community would like to use the Argo area? Are there changes the community would prefer or value, or does the community value the area most highly in its present state?
- Does the community see a need for and/or favor a restoration effort involving dam removal?
- Who are the stakeholders and how do they perceive the dam, pond, and river?
- Which individuals or groups make the decisions regarding the future of Argo Pond? What is the decision-making process and what are the inputs of stakeholders into this process?
- What aspects of the decision-making process and which political factors could hinder or help the river restoration/dam removal process?
- What level of political support and sources of this support are essential for moving forward with dam removal and river restoration?
- What are the economic values of Argo Dam and Argo Pond as they currently exist?
- What is the history of the Argo Dam/Argo Pond and will that history impede an attempted river restoration effort?
- What recommendations might help the Huron River Watershed Council in their effort to proceed with river restoration at Argo?

We gathered information to answer these questions in two ways: a mail-based survey of 2000 randomly selected Ann Arbor residents, and targeted interviews with government officials and representatives of stakeholder groups. We reviewed relevant academic literature and sought out historical documents to help plan our research and analyze and interpret our findings.

In this report, we present our findings. We begin with the Background chapter, which reviews dams and dam removal in the United States and the history and present uses of Argo Dam. The design and execution of the survey, the rationale underlying our economic analysis, and the procedures for interviewing stakeholders are described in the Methods chapter. The

findings from the survey are discussed in the Results chapter, including economic calculations of individual willingness to pay, perception information, and demographic data. The Political Analysis chapter contains descriptions of the decision-making process and the stakeholders, including the stakeholders' interests, their resources for influencing decision-making, and the potential strategies they may employ, and ends with a discussion of several issues that are important to most or all of the stakeholders. Finally, we conclude with recommendations and conclusions for our client, the HRWC.

THE HURON RIVER WATERSHED COUNCIL

Our external client for this project is the Huron River Watershed Council (HRWC), a nonprofit group based in Ann Arbor, whose mission is:

Along with the member governments (who have land in the watershed under their jurisdiction) and hundreds of individual and business members and volunteers, the Huron River Watershed Council inspires attitudes, behaviors, and economies that protect, rehabilitate, and sustain the Huron River System (Huron River Watershed Council 2004).

The HRWC was the first Watershed Council formed in the state. Their services include hands-on citizen education, technical assistance in policy development, and river protection projects. The HRWC is a member of the Environmental Fund for Michigan (Huron River Watershed Council 2004).

The HRWC became interested in the idea of dam removal in the mid 1990s and began assessing the feasibility of removing the dam and restoring this section of the river. Beginning in 2001, the HRWC held meetings with several key stakeholders to discuss current conditions and uses of Argo Dam and Pond, to inform stakeholders of the impacts of the dam and to gauge the interest in restoring the river through removal of the dam. The HRWC hired an engineering firm to produce an updated map of the bottom of Argo Pond, measure sediment depth, and perform preliminary sediment toxicity analysis in 2002.

Information remains to be gathered before an informed and equitable decision regarding the future of the dam and pond can be made (Riggs and Rubin 2003). These informational needs include analyses of the ecological, technical, social, political, and economic aspects of the removal/restoration process. Comprehensive information about stakeholders' perceptions and values will enable the HRWC to make more informed decisions about how, or even if, to

proceed in regards to influencing the City of Ann Arbor to restore the Argo area. This project helps examine the social, political, and economic feasibility of restoration of the Huron River at Argo Dam and Argo Pond in an effort both to assist the HRWC and to contribute to research regarding measuring community values and interest in river restoration.

Chapter Two

BACKGROUND

DAMS IN THE UNITED STATES

Dams and reservoirs are common and important features of the American landscape. In the United States today, there are an estimated 76,000 dams over six feet in height (U.S. Army Corps of Engineers 2004). If the smallest structures are included, there could be as many as two million dams in the US (Graf 1993). The greatest density of dams exists in the eastern and southeastern states while the largest dams are located in the West (Heinz Center 2002). Millions of Americans rely on dams and reservoirs for flood control, municipal and agricultural water supplies, transportation, electricity, and recreation. In the western US, the construction of dams has increased the capability for irrigation, enabling both agricultural and economic development. Reservoirs in the West store almost four years' worth of runoff, providing water for agricultural use in areas without enough natural precipitation to support the growth of crops (Heinz Center 2002). Dams facilitate navigation on many rivers, such as the Mississippi and Tennessee. Dams generate inexpensive, renewable electricity with far fewer air emissions or liquid and solid wastes than other energy sources. Hydropower currently supplies more than ten percent of the entire US's electricity needs, and seventy percent of the Pacific Northwest's electricity (Heinz Center 2002). The reservoirs created by dams offer recreational opportunities, particularly motorized boating and some kinds of fishing, specifically for warm water or low-oxygen species such as carp and channel catfish. Additionally, many reservoirs are managed by state fish and wildlife departments, so density of fish, particularly popular game species, can be higher than in natural areas. In the western US, many reservoirs exist in areas that would otherwise lack large lakes and, therefore, offer the only locations for motorized boat use (Reisner 1986).

History

The earliest dams in the US were built either to divert or store water or in conjunction with gristmills, sawmills and paper mills, and, later, textile mills. Because of the potential for waterpower, rivers became ideal places to start new settlements. Dams provided much of the

power that drove the Industrial Revolution. The reservoirs created during that era also catered to the increasing need for water for industrial uses.

In 1832, a French engineer perfected the first water turbine, which produced energy much more efficiently than the waterwheels in use at the time. Fifty years later, with advances in electrical engineering, the world's first hydroelectric plant began producing hydropower in Appleton, Wisconsin (McCully 2001).

In 1902, in an effort to spur settlement of the West, Congress passed the National Reclamation Act. The Act created the Reclamation Service, which later became the Bureau of Reclamation, within the Department of the Interior. The Bureau of Reclamation's purpose was to finance western irrigation projects by selling government land, water, and electricity. During the Bureau's most prominent years, it erected the Hoover Dam, which is still the tallest concrete dam in the Western Hemisphere, and the Grand Coulee Dam, the largest producer of hydropower in the Western Hemisphere (Bureau of Reclamation 2004). In 1945, these two dams were the biggest sources of electricity in the world (Reisner 1986).

The US Army Corps of Engineers also constructed many dams in the course of its work to improve navigability of rivers and control flooding. Later the Corps adopted hydropower, flat-water recreation, and irrigation as components of its dam-building mission. Unlike the Bureau of Reclamation's focus in the western US, the Corps built dams throughout the nation.

Dams have been important to public officials and communities as tools for economic development and, thus, quite popular throughout American history. Given their role in the development of the United States, dams and reservoirs are often community landmarks, with a great deal of historical and emotional significance.

Issues

Environmental

While dams often provide social and economic benefits, their construction also imposes various long-term costs. In recent decades, it has become apparent that dam construction involves ecological costs, which typically were not understood or considered at the time of construction. Dams cause the fragmentation of aquatic ecosystems, which leads to the loss of migratory fish. Furthermore, the change in flow regime and patterns caused by

impoundments may alter stream channel configuration, habitat, and other physical and biological processes (Michigan Department of Natural Resources 2004c). Dams change rivers' peak flows and low flows: they can either dampen the fluctuation or increase the fluctuation depending on their operation (Bedient and Huber 1992; Blumer 2003). These impacts are evident in both the reservoir and the reaches of the river downstream of the dam. Many aquatic organisms are negatively impacted when dams disrupt riparian environments: roughly 30 percent of all endangered and threatened animals in the US rely on riparian environments (U.S. Fish and Wildlife Service 2004). The impoundment of streams by dams increases the residence time for water which increases water temperatures in the reservoir and downstream and causes sediment and nutrients in the river to be lost to the bottom of the reservoir. Plant proliferation and decreased aeration in reservoirs also deprive downstream ecosystems of nutrients and dissolved oxygen. In the 1980s, when the negative effects of numerous dams on major rivers became particularly clear, biologists, decision-makers and engineers were able to see the compounded impacts of these factors on our rivers (Graf 2001). Notwithstanding these negative impacts, dams may offer certain ecological benefits, such as preventing large-scale migrations of some exotic species, maintaining genetically distinct populations of wild and hatchery-raised fish, lessening the impacts of droughts in terrestrial locations, and creating new types of habitat (Stanley and Doyle 2003). Reservoirs may also provide homes for riparian birds, migratory waterfowl, and lake fishes, but it is difficult to assess the differences in quality between reservoir habitats and river corridor habitats in some ecosystems.

Sociopolitical

Aging dams have become a particular cause for concern around the nation, especially as dams formerly used for hydropower generation are decommissioned. Owners or state and federal officials have decommissioned many medium-sized to small dams that formerly produced hydropower, in large part due to the efficiency of regional power grids. The ability of centralized power sources to create and provide cheap electricity through the grid system made small hydropower dams a less important source of electricity (Heinz Center 2002).

Local, state, federal, and tribal governments have all had to deal with structurally unsound, environmentally harmful, or economically inefficient dams. There are safety concerns associated with all dams, regardless of their size. The 1972 National Inventory of Dams Act

(P.L. 92-367) mandated periodic inspections of all dams. Federal and state officials assign each dam a safety rating contingent upon the potential for loss of life and/or property in the event of a dam failure. This safety rating guides the frequency of periodic inspections in our study locale of Michigan, with higher hazard dams requiring more frequent inspections than lower hazard dams (Michigan Department of Environmental Quality 2004a). The National Inventory of Dams compiles information about all dams that are considered High or Significant hazards as well as all dams that are either at least 6 feet high with 50 acre-feet of storage or 25 feet high with 15 acre-feet of storage. The NID database has records for 22,780 dams built between 1790 and 1955, which means that nearly one-third of existing dams are currently over 50 years old. Furthermore, by 2020, another one-third will reach at least 50 years of age, which is the estimated lifespan of a reservoir (with proper maintenance) before major structural repairs may be anticipated. Feasibility studies such as the one undertaken in this report should become more common in the next 15 years so that dam removal can be a potential alternative to structural repairs for the growing number of aging dams (U.S. Army Corps of Engineers 2004).

While safety concerns have been increasing, so, too, has Americans' interest in environmental affairs in general, creating a milieu in which society and decision-makers understand and analyze the tradeoffs inherent in dam construction much more thoroughly than in previous decades. In particular, the American public became more aware of the impact of dams on endangered species with the enactment of the Endangered Species Act in 1973 and the highly publicized dispute over the Tellico Dam project in Tennessee. In the Tellico case, federal courts stalled the construction of the Tellico Dam on the Little Tennessee River when it was nearly 75 percent complete due to the discovery of an endangered fish species, the snail darter. This suit was one of a number of cases where the presence of endangered species altered large construction projects, mainly through the insistence of a more environmentally-oriented public. This shift was very important in a political sense because it meant that the public would more thoroughly question government water projects and now had a useful tool for challenging these large projects (Gougen et al. 1980). Another tool for environmentalists, the Clean Water Act, as amended in 1972 and 1977, requires the restoration and maintenance of the biological, chemical, and physical integrity of rivers, which changes the social and political climate within which decision-makers consider dam construction and restoration projects. In

this new environment, and with most of the best dam sites already developed, the rate of new dam construction in the US declined, and decision-makers now give dam removal increased consideration as a valid alternative to repair and maintenance of obsolete dams (Pejchar and Warner 2001).

Even dams that continue to provide hydropower and other amenities have become objects of dam removal pressures by a more environmentally-savvy public. The O'Shaughnessy Dam, which flooded the Hetch Hetchy canyon in northern California, has come under fire from a number of environmental groups despite the fact that its hydropower is a source of revenue for San Francisco and it provides drinking water to the Bay Area. The argument for restoring the Hetch Hetchy canyon is complicated; environmentalists feel that public funds and resources have been mismanaged, that better alternatives exist and that the cost of repairs on the O'Shaughnessy are not worth the investment, but their opponents are concerned about providing water and revenue to San Francisco (Sward and Finnie 2002; EWRI Task Force on Dam Removal 2003; Murphy 2003; National Park Service 2004). Clearly this issue will remain controversial for some time, but its presence in the media indicates a shift in Americans' awareness about the negative impacts of dams.

Economic

As discussed previously, all dams require periodic maintenance and repairs. Maintenance schedules can be expensive, especially considering that many dams do not serve their original purpose of providing hydropower. Especially in situations where the owners of decommissioned dams are not the same parties who collected revenue from the production and sale of hydropower, there is difficulty in accessing funds to help cover the costs of maintaining the physical integrity of the dam. Additionally, few large projects have been designed and planned with the decommissioning costs in mind at the outset, so there are few funds available to help manage the end of a dam's lifespan (Moore 2004). Some of the costs associated with dam projects are related to their limited usable lifespan due to sedimentation of the reservoir and structural deterioration. Problems such as these often necessitate expensive dredging, repair, and reconstruction to address safety concerns and maintain the dam's function. Furthermore, while many US dams are privately owned, some dams have been

abandoned and taken over or sold for a nominal cost to a local, state, or federal government, placing the burden of dealing with them squarely on taxpayers' shoulders.

Another economic motivation for dam removal is that the cost-benefit analyses used in support of federally funded dams were often flawed and outdated. The Teton Dam in Idaho and the Animas-LaPlata project in Colorado demonstrate two examples of these flawed analyses. In the case of the Teton Dam, the benefits had been calculated using the worst drought on record, which made the need for water from the dam seem essential to the survival of people and agriculture in Idaho and Utah. Additionally, the flood protection that the dam would provide was calculated to be 200 percent higher than historical flood losses would predict. The dam was built nonetheless, and within months of completion, the structure failed, causing \$2 billion in damages and costing numerous lives (Reisner 1986). The Animas-LaPlata project in southwestern Colorado has a less tragic ending, but follows a similar course. The as-yet-unfinished project (construction began in spring 2003) underwent three separate benefit-cost analyses. In 1968, at the time of project authorization, a benefit-cost analysis found the benefits to outweigh the costs by a ratio of 1.41 to 1. Economists performed a second benefit-cost analysis using the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and, using the same discount rate, found the benefit to cost ratio to be 0.4 to 1. A third benefit-cost analysis found an even lower benefit-cost ratio (0.31:1) by using a more current discount rate that accounts for future social costs. Economists consider the more recent benefit-cost analyses to be a more accurate reflection of the dam's effects; they eliminated indirect benefits by assuming that the nation is a full employment economy, considered costs attributable to water quality decreases, included the opportunity costs associated with a loss of downstream power generation and the higher operation and maintenance costs due to electricity production and the delivery of water for irrigation (Bureau of Reclamation 1995). Other past benefit-cost analyses have tended to omit social costs like the loss of recreational opportunities on high-gradient rivers and the existence value of canyons. They also overlooked many environmental costs, such as the loss of nutrients to downstream reaches and the creation of barriers to migratory fishes. In some cases, even the economic data itself were flawed, as in the Teton Dam project in Idaho in the 1970s.

National Dam Removals

Current status of dam removal in the US

Although still relatively rare for large dams, dam removal is increasingly frequent for small to medium-sized dams in the United States, providing tangible evidence of a shift in Americans' attitudes toward dams and dam removal. In the United States, over 500 dams have been removed in the past two decades (Stanley and Doyle 2003). Wisconsin stands at the forefront of this movement, having removed over 50 dams since 1967 (Stanley and Doyle 2003). Most of the dams removed thus far have been small, privately owned, run-of-the-river dams (Heinz Center 2002). Dams have been removed for a variety of reasons including economics, safety, ecological restoration, site restoration, flow recreation, and water quality or quantity (Heinz Center 2002).

In 1998, the Federal Energy Regulatory Commission (FERC), which has regulatory authority over hydroelectric dams, ordered the owners of the Edwards Dam on the Kennebec River in Maine to remove it. They found that the economic benefits of generating power were outweighed by the recreational potential of the river if the dam were removed; particularly the restoration of fish migration to reaches upstream of the dam. With the support of the local and state government and a coalition of conservation groups, FERC denied the requested relicensing, making this the first time that the commission had ordered removal of an operating hydroelectric dam (Natural Resources Council of Maine 2004).

Similarly, in 2001, the US House of Representatives passed the Pacific Salmon Recovery Act (HR 1157), seeking authorization for \$250 million a year for three years for the restoration of salmon and steelhead habitat in California, Oregon, Washington, Alaska and Idaho. The Act could provide funding for dam removal on the Lower Snake and Elwha Rivers, among others, but at this time the bill is still in the Senate Commerce, Science and Transportation Committee (S.1825) and does not seem likely to be addressed in the near future.

Dam Removal Decision Process Models

A growing number of organizations are creating dam removal decision process models to help governments and community groups assess the feasibility of dam removal. The models are generally designed to guide dam owners through the process of weighing the dam removal alternative. American Rivers, Trout Unlimited, and the H. John Heinz III Center for Science,

Economics and the Environment (Heinz Center) are national groups with dam removal decision process models, but states are beginning to promote decision process models as well. The State of Michigan Department of Natural Resources, for example, has made a dam removal issues document available to the public through their website, tailoring the process to model dam removal issues that would occur specifically in the state of Michigan (Michigan Department of Natural Resources and Michigan Department of Environmental Quality 2004).

The model promoted by the Heinz Center is a general guideline to the dam removal process and outlines the key areas of interest that should be assessed before any dam removal can occur (Fig. 2-1). The Heinz Center model begins with a call for definitions of the goals and objectives that must be met by the dam. This includes the legally and socially defined original purpose of the dam and any additional issues that have arisen since the original purpose was defined. If a dam is not meeting its original or newly prescribed goals, the dam owner needs consider how to make it do so, or assess the feasibility of removing the dam and finding an alternative way to meet those goals. Within this part of the decision process, the major issues of concern come into the fore. These include safety concerns, environmental impacts, legal and administrative matters, management challenges, economic costs and benefits, and social requirements. Once these issues have been defined, research must determine whether or not dam removal is a feasible alternative given the constraints presented by the major issues of concern. Only after all of these steps have been carried out can the decision between removal and maintenance of a dam occur.

Michigan Dam Removals

Local governments and private companies built dams in Michigan for many of the same reasons they were erected nationwide. These groups impounded Michigan rivers to transport goods, generate electricity, run mills, provide irrigation, support recreation and transportation, and control flooding. The MDNR estimates there are over 2,500 dams in Michigan, most of which were not designed for hydropower (Fig. 2-2) (Michigan Department of Natural Resources and Michigan Department of Environmental Quality 2004).

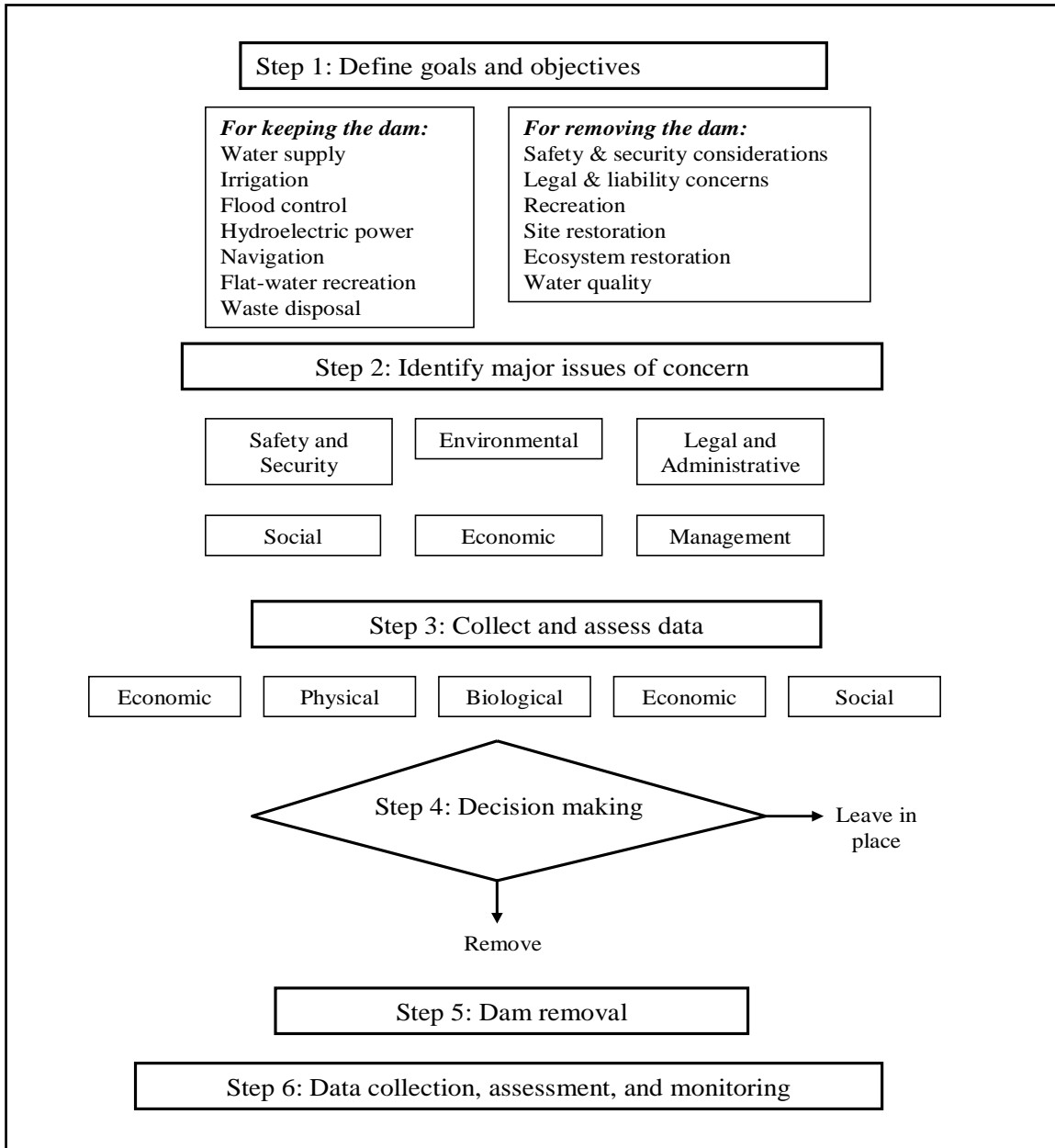


Figure 2-1. Heinz Center general method for dam removal decisions (Heinz Center 2002).

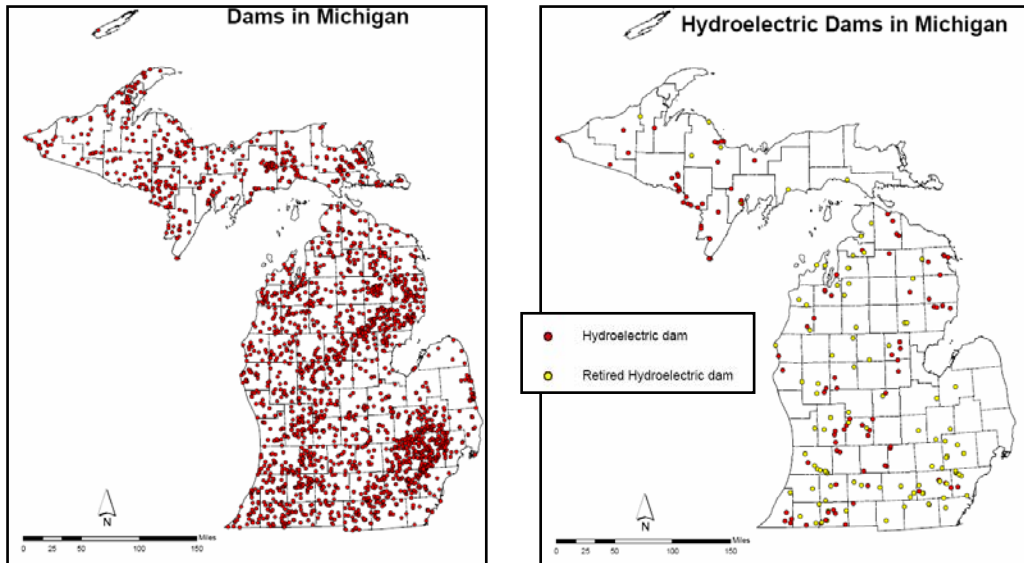


Figure 2-2. Maps of Michigan dams (Institute for Fisheries Research 2003).

The Wacousta dam on the Looking Glass River in Clinton County was the first dam to be removed in Michigan. The 1966 removal involved an earthen, stone, wood and concrete structure and was performed by a private owner at an unknown cost (Hanshue 2001). Since then, seventeen dam removals have occurred in the state for various reasons; eight more are imminent (see Appendix A). Of those seventeen removals, six cost between \$443,000 and \$1.85 million, generally owing to the cost of additional restoration efforts at the site that involved fish passages, recreational improvements, or sediment removal. The majority of the dam removals in Michigan cost from \$12,000 to \$203,000. Most of these dams had previously generated hydropower at some point, and many of those had been transferred to DNR ownership by the time of removal. Some were removed for safety reasons, others to improve fish passage and a few for aesthetic reasons. A number of these removals involved state monies, but quite a few also received grants from federal or private sources (Hanshue 2001) (see Appendix A; see also Appendix L). More recently, the number of proposed dam removals in Michigan, as well as the amount of government and public involvement, has increased.

The MDNR has begun to devote more time and resources to dam issues and advocates removal of dams that no longer serve their intended purpose(s). In fact, in April 2004, the MDNR published a dam removal guide for dam owners that outlined issues that the DNR has found important when assessing the future of any dam, including the benefits of the dam itself,

the amenities provided by the impoundment, and the state of the dam structure, among other things (Appendix B) (Michigan Department of Natural Resources 2004c). By advocating removal, the MDNR hopes to forego greater economic, environmental, or safety costs involved with maintaining an outdated dam (Hanshue 2003; Michigan Department of Natural Resources 2004b).

ARGO DAM AND THE HURON RIVER

Argo Dam in Ann Arbor, Michigan, is one of nineteen dams that impound the main stem of the Huron River. Argo Dam is eighteen feet high and 1940 feet long, and located between two other Ann Arbor dams, Barton Dam two miles upstream and Geddes Dam four miles downstream. Of its 1940 feet of length, 190 feet are composed of the spillway gates and sluice gates, while 1750 feet are earthen embankment (City of Ann Arbor 1971). Argo Dam creates a 92-acre impoundment called Argo Pond, which extends approximately one mile upstream from the dam (Fig. 2-3). The average depth of Argo Pond is ten feet (Barr Engineering Co. 2002).

The Huron River watershed, which drains 908 square miles in seven counties, has a total of 96 inventoried dams. More dams may exist in the watershed, but no complete inventory has been conducted (Riggs and Rubin 2003). The Huron begins at Big Lake and the Huron Swamp in Oakland County at an elevation of 1018 feet and discharges into the northwest corner of Lake Erie at an elevation of 572 feet. From Ann Arbor through Belleville, the river is dominated by a series of seven impoundments: Barton, Argo, Geddes, Superior, Peninsula, Ford, and Belleville. The gradient in these sections is high, dropping approximately 160 feet in elevation over 38 miles (Fig. 2-4). The short segments of the Huron's natural channel found within Ann Arbor and Ypsilanti are about 100 to 124 feet wide and mostly wadeable. The original channel would have had larger riffles and rapids interspersed with deep pools over a gravel-cobble-boulder substrate. Argo Dam is located at approximately 774 feet in elevation at the river's entrance to a more urban setting (Hay-Chmielewski et al. 1995). Along its 136-mile course, the river meanders through wetlands, kettle lakes, and reservoirs before it reaches Lake Erie (Knott and Taylor 2000).

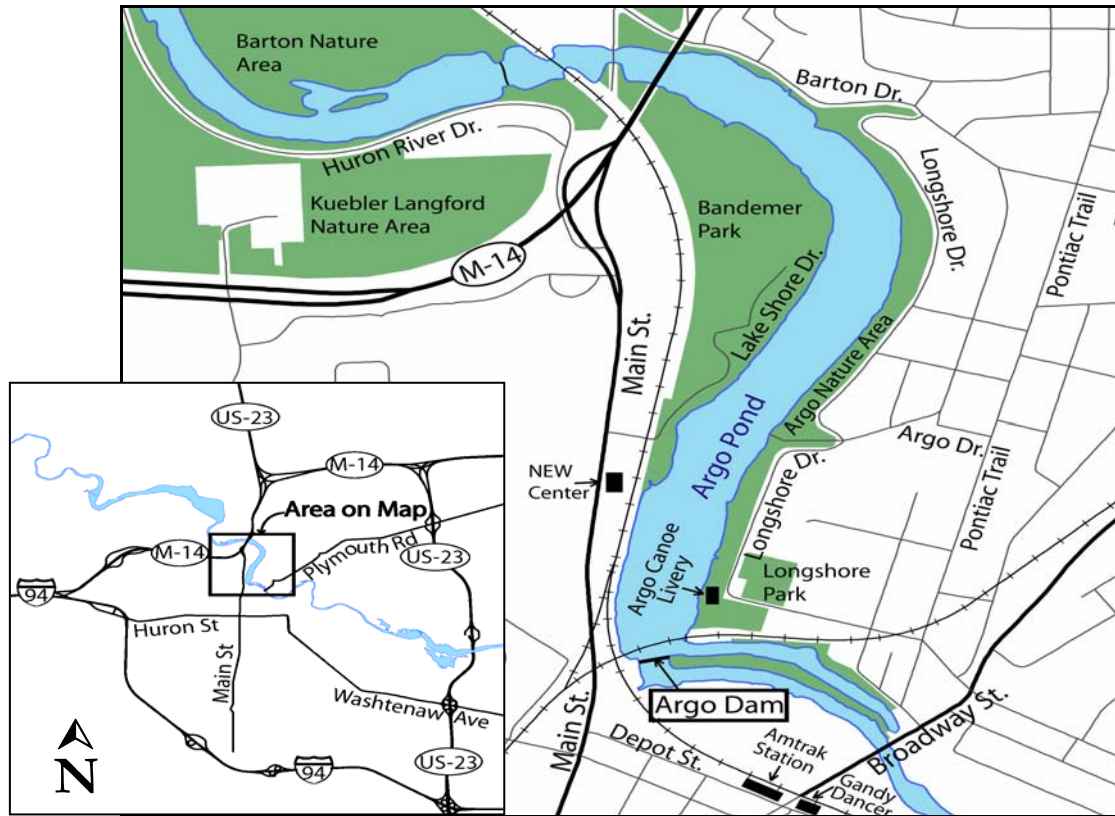


Figure 2-3. Map of the Argo area.

History of the Argo Area

Early Days-19th Century

Dam construction at the Argo site dates back to the beginning of European settlement of the area. As early as the 1820s, the area around Argo was a popular site for small mill dam construction (Fig. 2-6) (Tefertiller 2002). The Huron River's 42-foot drop in elevation within what is now the City of Ann Arbor made it a prime location for grist mills and light industry. The early dams and mills in the Argo area were instrumental in providing power and economic development for the growing city that became Ann Arbor. In 1829, one of Ann Arbor's founding citizens, Anson Brown, built a flouring mill, Swift and Co., along with a dam and race at Argo to power it (Butz 1974). Brown's vision for Ann Arbor placed his properties and developments in the center of the city, the area known today as Lower Town. After his death, however, the city center moved closer to its current location about a half-mile to the south, the area of Main Street and Huron Street. The area along the river was left to light industrial uses.

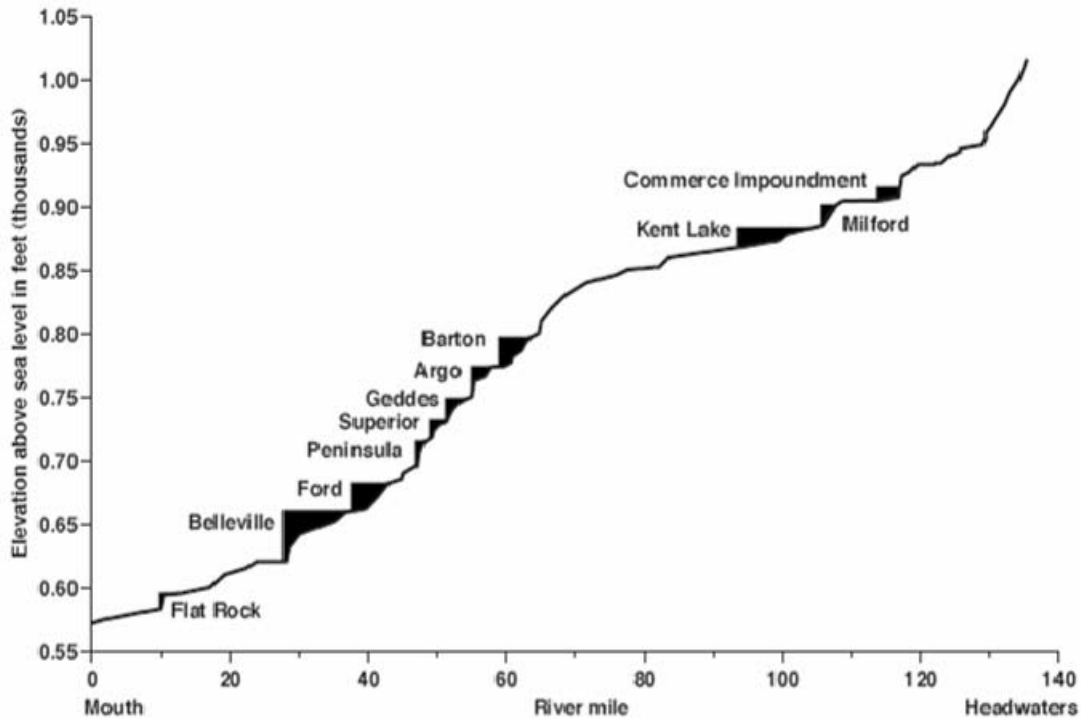


Figure 2-4. Elevation changes, by river mile, from the headwaters to the mouth of the Huron River. Major mainstem dams and the names of the impoundments they create are shown (Hay-Chmielewski et al. 1995).

The owners of the grist mills built in the mid-1830s along Argo also built low-head dams constructed from timber and stone fill to power their operations. They built these mills mainly of wood with wooden gears, wheels and levers. The Swift and Co. Mill later consolidated with other nearby mills to create the Ann Arbor Milling Company and City Mills (Fig. 2-7) (Butz 1974). In 1839, the Michigan Central Railroad reached Ann Arbor, bringing with it the promise of industry and population growth (Olson 1989). Engineers designed the railway to travel through the most scenic part of the area; therefore much of its route runs along the Huron River, including Argo Pond and Dam.

An 1869 map of the area surrounding Argo Pond shows multiple uses of the site, including recreation, power for mills, railroad transport, and ice houses. At that time, the Argo race powered a woolen mill, a flouring mill, and a drill shop. There was also an ice house located on the east bank of the pond, where pond ice harvested in the winter was stored for domestic use during the warmer months (Butz 1974).

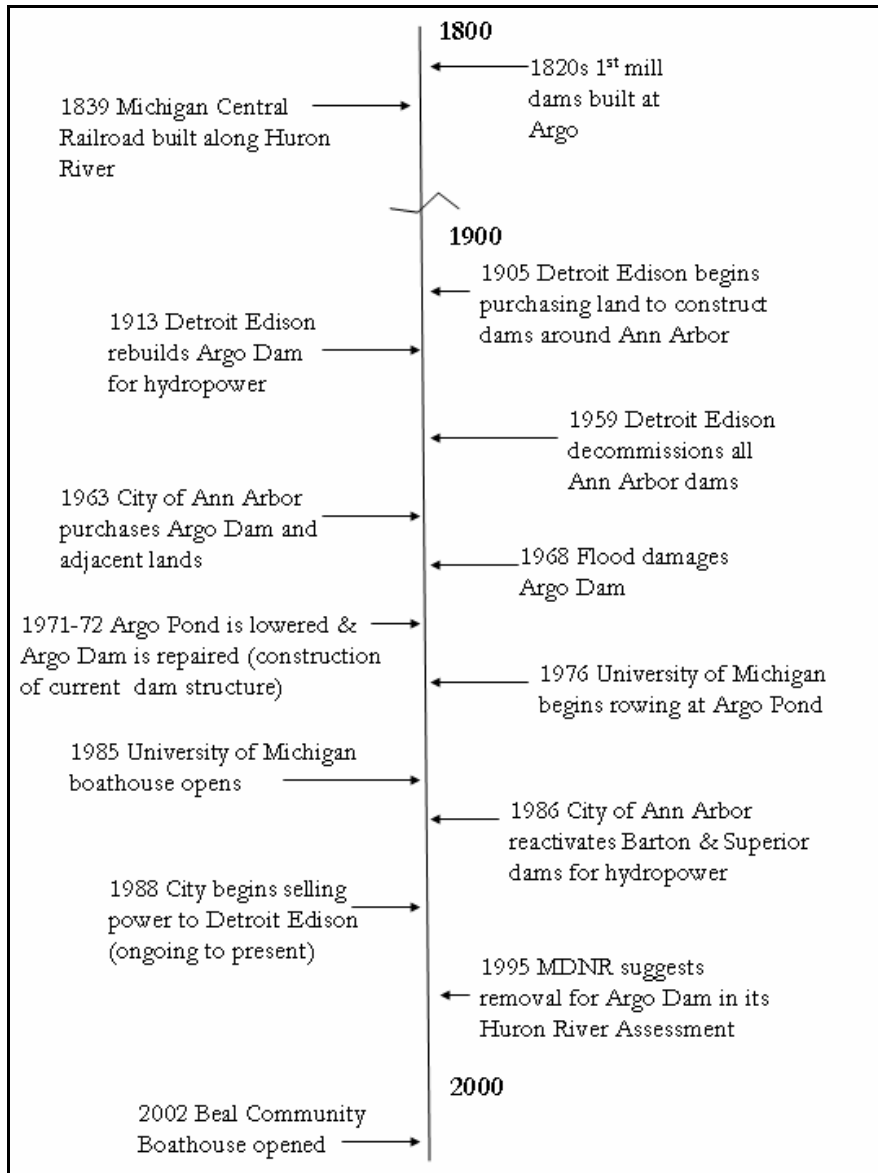


Figure 2-5. Timeline of Argo Dam history.

20th Century

At the turn of the century, Ann Arbor's economic strength was tied to the Huron River through mills and light industry (Ann Arbor District Library 2004). The Michigan Milling Company, a conglomerate of many smaller local mills, estimated an annual output of one million dollars in products in 1913 (Ann Arbor District Library 2004). The Ann Arbor Milling Company (Fig 2-7) burned down in 1903, just one year after construction finished on a new mill and dam. This event set the stage for bigger changes at the Argo site. As early as 1905,

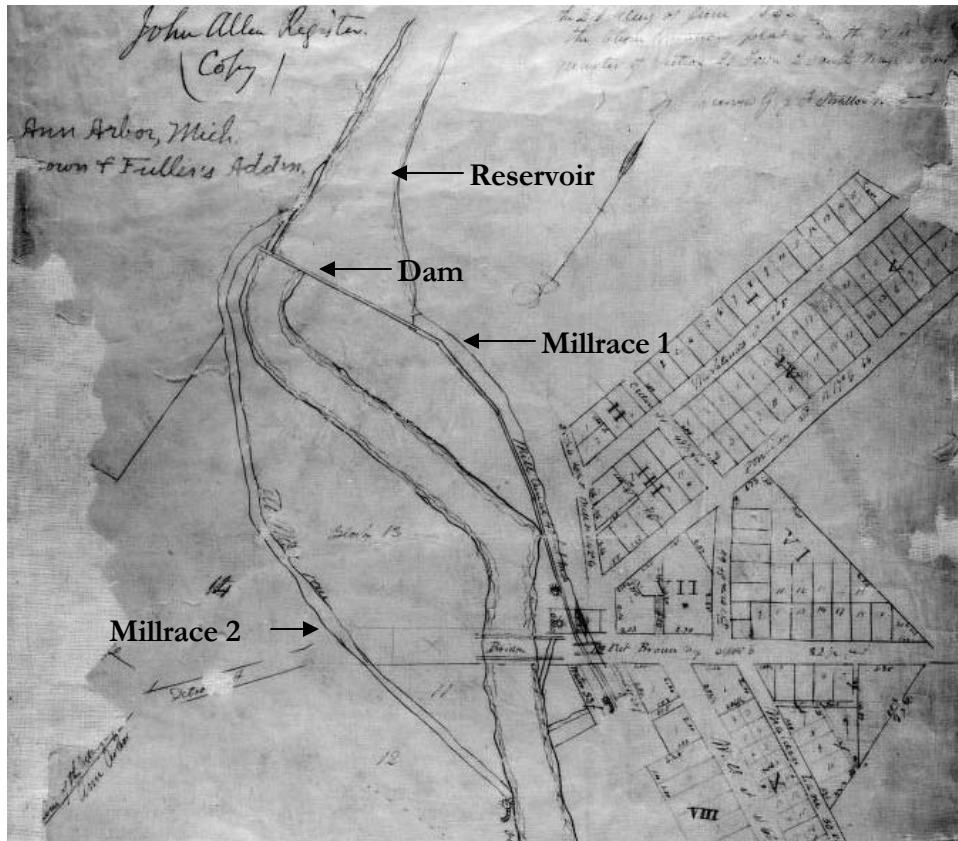


Figure 2-6. Map of Brown & Fuller's addition to Ann Arbor. Surveyed by J.F. Stratton, 1832. This 1832 map of Ann Arbor illustrates the presence of a dam at the current Argo site with a millrace flowing down to a series of mills near Broadway St. There is another millrace to the left of the river that flows down to a mill below the dam on the opposite bank of the river from the Broadway Street mills. It appears that there were as many as five mill wheels in the Argo area in 1832. [Used with the permission of the Bentley Historical Library; Ann Arbor, MI.]

the Detroit Edison Corporation began purchasing the water rights, flowage rights, and land for the construction of dams along the Huron River. Its purchases included the former Ann Arbor Milling Company site, later used as the location for the Argo Dam power station (Olson 1989). By 1908, they had purchased land and riparian rights at the Geddes, Argo, Osborne, Delhi, Barton, Fosters, Superior, Ypsilanti, Dexter and Belleville sites (Olson 1989).

In 1913, Detroit Edison rebuilt the existing dam at Argo to increase its head from 8 feet to 14 feet (Butz 1974). Detroit Edison built it to generate hydropower for Ann Arbor, but they designed Argo differently than the other Ann Arbor dams. Rather than powering generators at the site of the dam, Detroit Edison built this dam to divert the water into a canal that would



Figure 2-7. Ann Arbor Milling Company at Argo and Broadway Bridge, ca 1900-1919.
 [Used with the permission of the Bentley Historical Library; Ann Arbor, MI]

carry it to the powerhouse located near the Broadway Bridge (Ann Arbor Women's Voter's League 1964).

Detroit Edison owned much of the property along the perimeter of Argo Pond since their operations at the dam caused frequent fluctuations in the water level. They owned more property than could be used for power generation, so they attempted a few profitable uses for the site including a dairy and a rest home for girls. By 1959, hydroelectric power generation along the Huron was no longer profitable for Detroit Edison, so the company deactivated all of its hydroelectric plants along the Huron through Ann Arbor. The company was left with extensive land holdings along the Huron River impoundments (Butz 1974). On September 27, 1963, the City of Ann Arbor paid Detroit Edison \$400,000 for 950 acres along the Huron, including the dams and powerhouses at Argo, Barton, Geddes and Superior (Olson 1989). This purchase tripled the city's parkland. Guy Larcom, the city administrator at the time of the transaction, described the Edison purchase as "one of the great things the city did" (Olson 1989). The city decommissioned Argo Dam upon its purchase, and the City Utilities Department became responsible for the maintenance of the structure.

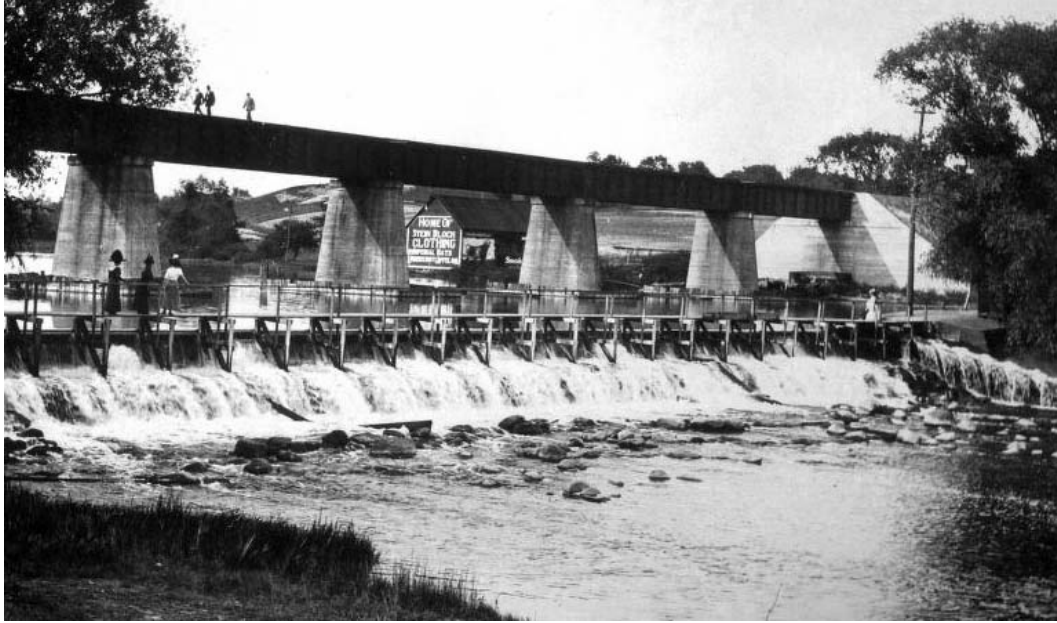


Figure 2-8: An early dam at the Argo site, ca. 1900-1920. [Used with the permission of the Bentley Historical Library; Ann Arbor, MI]

A June 1968 flood caused serious damage to the dams at Argo, Barton, and Superior, and washed out the Geddes Dam entirely (Fig. 2-9). In 1970, Ann Arbor voters approved a three million dollar bond proposal to rebuild and restore the four dams (Parks Department date unknown-a). The city undertook two studies to assess the state of the city's dams and found that Argo needed major structural changes (Tefertiller 2002). In 1971-72, the city lowered Argo Pond's water level to allow installation of new level control gates and to make other repairs to the dam. The city spent a total of \$2.4 million to repair the three damaged dams, with Argo's costs totaling \$625,803 (Parks Department date unknown-a). The Michigan Department of Natural Resources (MDNR) took the opportunity to treat the pond with rotenone to kill all of the fish in the impoundment (Braunscheidel 2001). After the reservoir was refilled, the MDNR proceeded to stock Argo with smallmouth bass, walleye, hybrid sunfish, and rainbow trout.

In April 1971, Ann Arbor citizens passed a millage to provide \$3,500,000 for the city to acquire and develop parks. A large portion of these funds was dedicated to developing the parks along the Huron and recreational opportunities around the four impoundments (Ann Arbor Women's Voter's League 1964). The Barton and Superior dams were reactivated for hydropower generation by the City of Ann Arbor in 1986. The city sold the power from these

two plants to Detroit Edison for \$405,000 beginning in 1988 and continuing through the present (Olson 1989; Naud 2003c).

Recreation at Argo Pond

The Argo impoundment and parkland have been popular recreation sites throughout the 20th century. According to a 1969 property survey, a canoe livery, which included a kitchen and a dance pavilion, existed on the site as early as 1899 (Fig. 2-10) (Parks Department date unknown-b). The University of Michigan had property along Argo Pond as early as 1925 (Parks Advisory Commission 2000). The Society of Les Voyageurs, a University of Michigan club devoted to celebrating the history of the French explorers in the Great Lakes, formed in 1907 and used the site for organized canoe recreation. They still own a lodge adjacent to the Argo Park boat launch and hold annual canoe trips on the Huron River (Graham 2004). Ann Arbor's older citizens remember a popular swimming beach at Argo in the late 1930s-early 1940s. In fact, the 1988 North Main Street/Huron River Corridor Land Use Policy Plan makes plans for a future beach in Bandemer Park, "in the event that the water quality improves" (Planning Commission 1988). Additionally, one of the old ice houses along the Huron is still standing alongside the Ann Arbor Rowing Club's boat storage buildings (Taft and Woodman 2003).

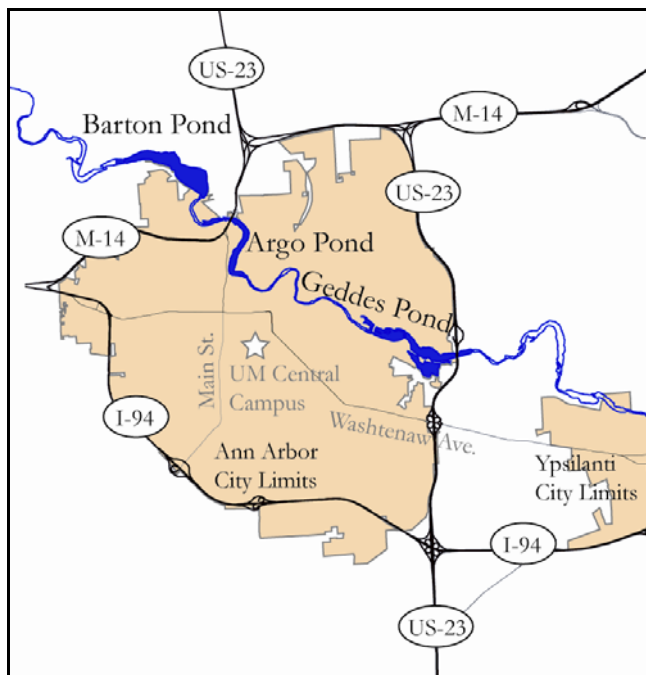


Figure 2-9. The Huron River in Ann Arbor.



Figure 2-10. The livery at Argo Pond, ca. 1900-1919. [Used with the permission of the Bentley Historical Library; Ann Arbor, MI]

Current Status and Issues

The City of Ann Arbor owns Argo Dam and most of the land adjacent to the reservoir. This land is generally managed and maintained by the Utilities, Parks, and Planning Departments of the City of Ann Arbor. Today the benefits of Argo Dam primarily take the form of open-water recreational opportunities and aesthetic qualities associated with the existence of a large, still body of water. The costs of Argo Dam are generally environmental impacts and foregone river recreation.

Environment

Dams affect river ecosystems in a variety of ways. They change flow patterns and channel shapes, destroy necessary habitats, cause habitat fragmentation, block migration of aquatic species, increase evaporation and water temperatures, decrease stream flow and dissolved oxygen, and disrupt the transportation of sediment and woody debris (Graf 2001). Every high gradient portion of the Huron River's main stem is dammed from Commerce Township to Lake Erie (Hay-Chmielewski et al. 1995). This is not atypical; in the state of Michigan, dams impound ninety percent of high gradient rivers and one hundred percent of those flowing into

the Great Lakes (Blumer 2003). The MDNR 1995 Huron River Assessment stated that the Huron River shows all of these impacts and recommended the removal of Argo Dam to reconnect the high-gradient fluvial habitat for plants and animals and restore the natural bed of the river. The Huron River Assessment (HRA) analyzed the geography, history, biological communities, geology, hydrology, channel morphology, soils, land use patterns, special jurisdictions, recreational use, dams and barriers, water quality, fishery management and citizen involvement in the Huron River watershed and within the report, Argo was specifically targeted for removal because it no longer serves its original purpose of producing hydropower (Hay-Chmielewski et al. 1995). Removal of the dam would transform a mile-long section of the river from a lake to a free-flowing, high-gradient river. Argo Pond would be drained, narrowing the river and likely returning its flow to the channel it occupied over a century ago (Riggs and Rubin 2003). Much of the land that is currently submerged beneath Argo Pond would become available for the City of Ann Arbor for additional riparian parkland and natural space (Miller 2003; Naud 2003a).

Hydrology

The altered hydrology is significant below Argo Dam, and the river exhibits effects continuously downstream to the river's receiving water, Lake Erie. The flow fluctuates dramatically at Argo, due to the fact that its gates overcompensate for pond levels that are affected by either the operations at Barton Dam two miles upstream, precipitation events, or waves created on the water that trigger the automated gates to open (Blumer 2003). Argo Pond does not provide significant water storage due to the proximity of the Argo and Barton Dams. If precipitation events cause Barton Dam's gates to open to release water, Argo's gates must open as well. Argo Dam's gates, however, do not open and shut gradually and their releases may create flow waves that continue downriver, causing flow fluctuation problems down to Flat Rock (Seelbach 2003). Steve Blumer, with the US Geological Service (USGS), claims Argo Dam is one of the most extreme examples of dams negatively affecting a river's natural hydrology. Figure 2-11 provides a graphical representation of the fluctuations in flow that occur due to the operations of Argo Dam. The perturbation of the hydrograph is highly correlated with the unpredictable and unrefined releases of water from Argo Dam (Blumer 2003). These frequent changes in flow also impact fish populations because the fish create

nests on the river bottom; the eggs and newly hatched fish are commonly swept downstream by large fluctuations in flow (Seelbach 2003).

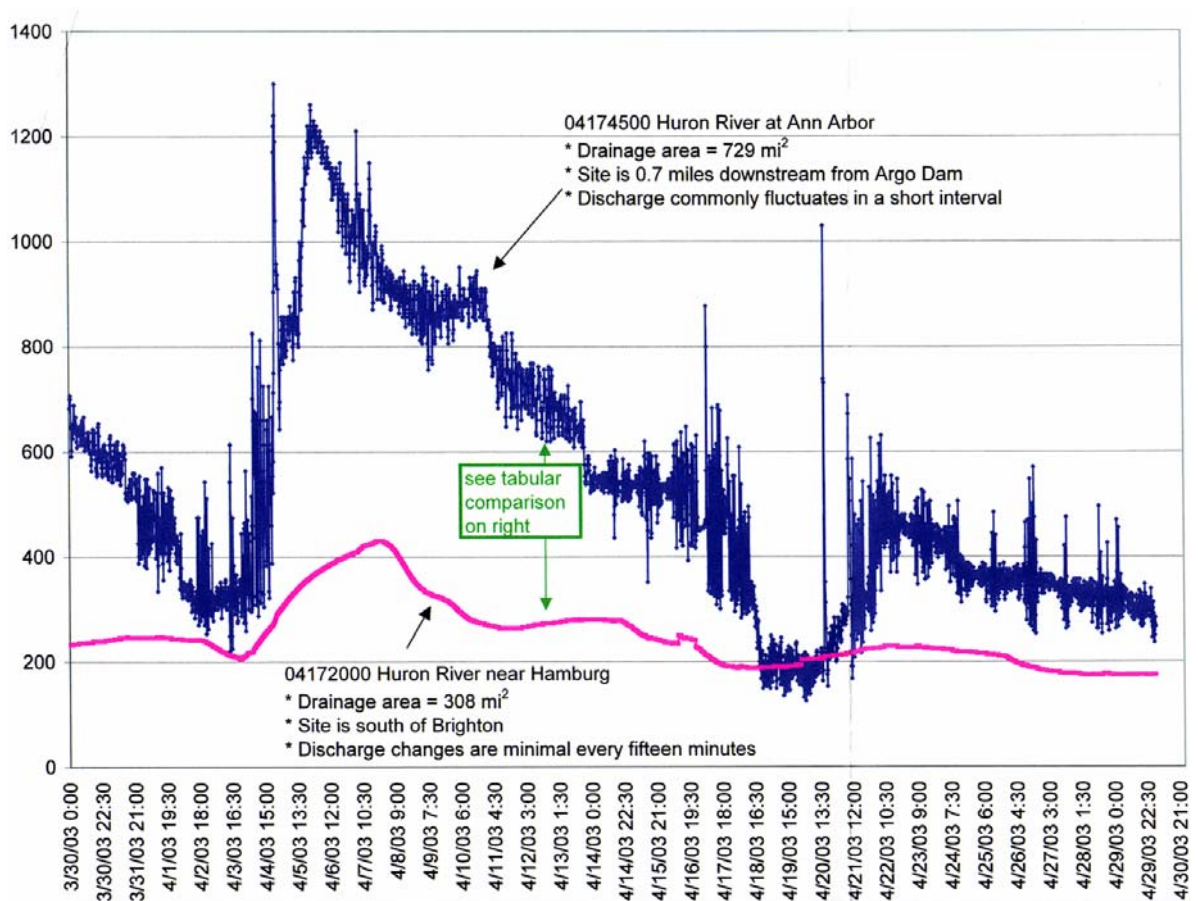


Figure 2-11. Hydrograph comparing variability of Huron River flow below Argo Dam with a more rural upstream reach near Hamburg. Graphic provided by USGS.

Fisheries

The Huron River watershed has more than ninety native and several introduced species of fish. While the number of native species is still large, some species' populations have declined severely or gone extinct since European settlement began in the mid-1700s. Prior to the presence of dams, there were two fish communities: river residents and potamodromous (freshwater migratory) fish from Lake Erie. With the exception of the fish ladder constructed at Flat Rock Dam in 1997, none of the dams in the Huron River watershed provide fish passage, so with the construction of dams, the migration of potamodromous fish upriver to spawn has declined significantly (Hay-Chmielewski et al. 1995).

In the mid-1900s, high pollution levels presented the biggest problems for both fish and mussel populations (Hay-Chmielewski et al. 1995). The enactment of the Clean Water Act helped reduce pollution in the Huron River and improve the water quality. Today, the dams prevent the existence of migratory fish, but the resident fish populations are as stable and healthy as is expected in Midwestern aquatic systems. In the impoundments along the Huron, the population size of resident lake fish, such as carp and largemouth bass, is not very large. The size of individuals within these populations is also smaller than average, which may indicate a less than ideal environment that contains too many environmental stressors for the fish to reach their biologically-determined proportions (Seelbach 2003).

The high fluctuations of discharge experienced downstream from Argo Dam are particularly detrimental to bass populations. Each spring, bass lay eggs in the riverbed; flood events destroy the nest and wash the eggs downstream. The DNR Fisheries Institute created a model called the Instream Flow Incremental Method that correlates spring flows and fall fish populations and demonstrated that bass are negatively affected by large flow fluctuations. The frequent flooding negatively affects the fish habitat from Argo Dam to Gallup Park (Seelbach 2003).

Aquatic Organisms

While the effects of fragmentation on potamodromous fish are evident, physical obstacles to migration also affect resident organisms. Many organisms require spawning habitats that differ from their feeding habitats. Some organisms may require seasonal moves to deal with temperature fluctuations. Both dams and impoundments provide obstacles to migration, as some insects and most native mussels rely on stream flow for transport. Data taken before, during and after the removal of the Stronach Dam on the Pine River in northern Michigan indicate that a number of fish communities are able to take advantage of increased habitat within one to five years of dam removal to increase both the amount of inhabited river and the abundance of fish within the river (Hayes 2003). Since data detailing the composition of the entire aquatic community before dam construction are not available for the Huron River, it is difficult to quantify the impacts of fragmentation on the fish community. However, many of the species found in the Huron will migrate if conditions allow and the populations of those fish have diminished since the construction of dams (Hay-Chmielewski et al. 1995). A study of mussels done by van der Schalie in the years 1931-1933 indicated that the Ann Arbor

stretch of the Huron River contained a large variety of mussel populations historically, but with the presence of dams along the river and high levels of pollution, a follow-up study done in 1969 showed that the populations had declined severely. Due to their sessile nature, it is extremely unlikely that riverine mussel populations can reestablish themselves along the river while dams impound the water (Hay-Chmielewski et al. 1995).

Nutrient Loads and Physical Processes

The series of dams from Barton to Flat Rock prohibits the transport of woody debris that often provides excellent fish habitat and instream flow variation. This type of habitat is especially important to aquatic organisms in a non-rocky geologic setting like southeastern Michigan. Not only does this debris provide excellent habitat and instream turbulence, but it is also highly important as a source of nutrients to the river ecosystem as a whole. On an undammed river system in a typical Michigan watershed, one might expect to see woody debris and other external carbon sources as the major supply of nutrients for some reaches of the river. With dams presenting a barrier to this debris, downstream reaches are starved for nutrients, and reservoirs behind dams fail to act as natural lakes would due to their elevated nutrient inputs (Cole 1994). These elevated nutrient levels can accelerate the natural aging process of a lake known as eutrophication. This process will lead to increased biological productivity, particularly from algal blooms, which creates a rapidly accumulating layer of detritus at the bottom of the reservoir that cannot be decomposed quickly enough to keep the reservoir from becoming shallower. In this process of decomposition, much of the dissolved oxygen in the water is respired by decomposers and the environment becomes less favorable for many plant and fish species (Wetzel 2001). These changes impact not only the biology, but the aesthetics and recreational capacities of the reservoir as well.

The Huron River through Ann Arbor also has elevated pathogen levels. In 2000, the Michigan Department of Environmental Quality (MDEQ) found Geddes Pond out of compliance with water quality standards (WQS) under the Clean Water Act and forced watershed managers to monitor *E. coli* levels using a total maximum daily load (TMDL) guideline that is designed to reduce water pathogen levels by controlling *E. coli* inputs (Michigan Department of Environmental Quality 2001). Dam removal at Argo would need to take this TMDL into consideration.

The Existing Ecosystem

Despite the eutrophication process occurring at Argo Pond, stakeholders have expressed concern about the effects of dam removal on the existing ecosystem (Jaros 2004; Taft and Woodman 2004) (see also Appendix I). Since some form of dam has existed at the Argo site for at least 150 years, the ecosystem has been shaped by the environmental changes that the dam hastens. In response to natural forces and to stocking efforts by the MDNR, warm water lake fish have replaced river fish. Many bird communities use the slow water ecosystem at Argo for nesting. The invertebrate and plant life has undoubtedly changed, shifting to a system that has a much higher level of primary production than would be expected for this stretch of the Huron if the waters were not impounded, such as can be seen upstream from Ann Arbor. In the early spring and late summer, the reservoir is teeming with algal life, which provides a food source for some invertebrates, but when these algae die and settle to the bottom, they contribute to the increasing shallowness of Argo Pond. This ecosystem would likely be displaced by dam removal.

According to Paul Seelbach of the MDNR Fisheries Institute, a slow draw-down of the pond would allow lake fish to move down to Geddes Pond, rather than being injured or killed when the dam is removed. A slow draw-down process would also control the release of sediment that has been deposited in the pond. Stronach Dam, near Manistee, Michigan is an example of a dam that was removed slowly to avoid large releases of sediment that would cause damage to downstream reaches (Seelbach 2003). This dam removal concluded in 2003 and has been studied since 1995 to assess the impacts of removal on channel morphology, fish communities and meso-scale habitat features including pools, riffles and runs (Hayes 2003). In this case, channel morphology and habitat changes included incision of the river in the former impoundment, narrowing of the river through the impoundment and widening of the river immediately downstream from the former dam, streambed elevation increases downstream from the former dam and substrate coarsening in the former impoundment (Hayes 2003).

Restoration

Restoration is generally included in dam removal processes as it is often necessary to help recreate the riparian ecosystem that existed before the dam was constructed. Within one to five years after removal, restoration efforts can provide increased biotic exchange with upstream reaches, increased sediment export to downstream reaches, decreased water levels

within the impoundment area, decreased hydraulic residence time which leads to decreased nutrient storage in the former impoundment, and a return of natural water temperatures and flow fluctuations (Hart et al. 2002). Over the long term, restoration can permit long range migrations of aquatic and terrestrial species, restore former channel structure, balance organic matter inputs and outputs and allow for a more natural form of succession to occur in plant and animal communities (Hart et al. 2002). Following restoration at the Edwards Dam in Maine, communities of popular fish species increased in abundance, aquatic habitats became more diverse, wetland area increased, whitewater recreational opportunities were amplified, natural flows were reestablished, water quality was improved and long-term erosion of shorelines along the former impoundment were reduced (Natural Resources Council of Maine 2004).

While a slow draw-down process can provide a more controlled removal, restoration can present further environmental difficulties. Freshly exposed soil is most easily colonized by invasive species of plants. Great care must be taken to ensure native species get established in the old streambed rather than exotic species (Borneman 2003). Following the removal of the Edwards Dam, short-term erosion increased, which created increased turbidity and sedimentation downstream. Likewise, shoreline that emerged following removal was unsightly (Natural Resources Council of Maine 2004).

Plant Growth

Due to increased nutrient loads and increased shallowness of the pond, plant growth has progressively increased over the last decade. Typical of many impoundments, aquatic plants obstruct the water channel and get caught in equipment, making it very difficult for boats to get through. The plants become a problem for the rowing teams, which are key recreational users of Argo Pond, beginning in mid-July and continuing through the end of the summer (Dove 2003; Hartsuff 2003a).

The City is currently working to remedy problems with excessive weed growth in Geddes and Barton Ponds. Mowing and harvesting are two options for removing weeds. A mower cuts the plants and leaves the cuttings in the water to sink to the bottom of the pond. A harvester both cuts the plants and collects the cuttings, which would result in less weed regeneration than mowing but would not completely eliminate it. Since the mower would leave the cuttings

in the water and aquatic plants are very good at reproducing from cuttings, the pond mower actually worsens the plant problem over the long term (Miller 2003).

Other options for plant growth control include the use of tarpaulins or dyes to block sunlight from the water or the introduction of weevils that feed upon vegetation including Eurasian milfoil, one of the more aggressive water weeds present in the three Ann Arbor impoundments. Although it avoids chemical use, using tarpaulins would be difficult in the Ann Arbor impoundments due to their large size. An inert dye may be used for the same purpose, but has not been seriously researched as an alternative for Argo Pond. This option was considered for use at Barton Pond, but residents were concerned about the aesthetics of the colored water and the city was concerned about the dye's effects on their drinking water operations at Barton (Argo Project Team 2003). The Village of Barton Hills and the Barton Boat Club spent \$15,000 over three years to introduce weevils, which seemed to work initially, but has not provided a long term solution (Argo Project Team 2003).

The Barton Boat Club successfully applied to the MDNR for approval to use an herbicide in Barton Pond in 2000, but the City of Ann Arbor would not allow them to use the chemical. The City of Ann Arbor draws its drinking water from Barton Pond and was concerned that the herbicides would affect drinking water quality, particularly since they do not have special equipment to detect and treat herbicide-infused water (Argo Project Team 2003). With this option voided, the Barton residents researched the possibility of drawing down the water levels in the Barton impoundment during the winter to expose some of the weeds to fatal winter freezes. This alternative had been used on the Barton impoundment until 1989, but now, due to Barton's hydropower capacity, the City has been reluctant to relinquish the \$6,000-10,000 revenues that would be lost if the head were lowered and to undergo the processes of permitting and notification from the Michigan Department of Environmental Quality (MDEQ) and the Federal Energy Regulatory Commission (FERC) (Argo Project Team 2003).

Sediment

Removal of Argo Dam would be expected to restore the original streambed and banks of the Huron River to create spawning habitat for riverine fish species. Desirable as this goal may be, sediment management would be an important consideration at Argo. For over a century, Argo Pond has accrued sediment from overland runoff, decay of organic matter, and upstream

inputs that pass through Barton Dam. Under normal circumstances, impoundments will undergo a gradual filling-in process that is influenced by both water velocity and water quality. When a river enters a reservoir, the velocity decreases and sediments that are carried by the river are lost from the water column. As previously mentioned, impoundments also impact water quality by increasing the temperature and nutrient levels in the reservoir, which leads to increased growth of aquatic vegetation. This aquatic vegetation collects on the bottom of the reservoir when it dies due to low dissolved oxygen levels that prevent the material from being fully decomposed. In the case of Argo Pond, this growth and decay process is likely to be the larger contributor to in-fill, since Barton Dam traps much of the sediment being carried in the Huron from upstream inputs. The sediment in the impoundment was estimated to be at least one foot deep and is up to 7 feet deep in some places (Barr Engineering Co. 2002). The content of the sediment is not fully known. Initial studies have found no contamination in the sediment (Barr Engineering Co. 2002), but much more extensive studies would have to be performed before removing the dam, since contaminated sediment is the greatest environmental and economic barrier to dam removal (American Rivers 2004b).

Recreation

Area residents use the parks around Argo Pond (see Fig. 2-3) for jogging, walking, biking, fishing and other forms of active recreation. Bandemer Park occupies 40 acres on the west bank of the pond and features trails, restrooms, a canoe dock, a fishing deck, a picnic shelter and other amenities. Bandemer Park is also the home to four area rowing clubs, discussed below. Argo Nature Area is a 22-acre park on the east bank of Argo Pond that features an unpaved trail along the river. The Ann Arbor Parks Department boasts of the trail's river views and unique flora. Argo Nature Area is also the location of the Argo Canoe Livery, discussed below. Just east of the pond is the 2.25-acre Longshore Park offering an open field, play equipment, and picnic tables with a view of the river (City of Ann Arbor 2004d). To improve the quality of the fishery at Argo, the MDNR stocked the pond with bass, walleye and sunfish in the mid-1970s and channel catfish in the years 1987 to 1991, 1996, and 1998-2000 (Braunscheidel 2001).

The most current plans for the Argo site come from the Parks & Recreation Open Space Plan (1999-2005), which states that the area of the Huron from Argo Dam along the western shore

to Bandemer Park is critical to “protect river edge, provide access and improve aesthetics [of northern Ann Arbor].” The plan calls for a pedestrian crossing of some sort near Argo, so in 2003, a footpath traversing the dam structure was completed. The plan also mentions the possibility of removing the dam to create access for canoes and kayaks and to improve water quality (Parks Advisory Commission 2000). Other ideas for the Argo site listed in that report include a hike/bike path along the river, sitting areas, fishing platforms and boat docking, restaurants or shopping in residential spaces, an amphitheatre and improved access to the river (Parks Advisory Commission 2000). Pursuant to these plans, the Ann Arbor Parks and Recreation Department completed new walkways in Argo Park in 2002 and in Bandemer Park in 2003 to improve access to, recreational opportunities within and connectivity between these parks.

The City of Ann Arbor operates the Argo Canoe Livery where canoes and kayaks can be rented; a second livery is located approximately 4 miles downstream at Gallup Park on Geddes Pond. Renovations to the Argo Canoe Livery began in 2004 to update facilities, provide canoe storage and improve pathways, parking lots and picnicking areas at a cost of around \$200,000 (Kuras 2004; Reuter 2004). Although some Parks staff members feel that the Argo area is underutilized, the Argo to Gallup canoe trip is one of the most popular city-organized canoe trips, primarily because it is relatively short and is therefore achievable for novices and families. The two liveries share 144 canoes, 14 kayaks, and 13 paddleboats. While Gallup is open every day of the week during the April through October season, Argo is currently only staffed on the weekends. For the last few years, structural deficiencies at the Argo livery necessitated that the majority of canoe trips were organized and led out of Gallup Park, but completion of planned improvements at Argo should permit an expanded schedule and range of activities. Both the Gallup and Argo liveries are very popular; on many summer weekends, every boat is rented. Kayaks are in high demand, and the liveries plan to add six more to their fleet for the 2004 season. Nature watchers and fishermen often rent canoes by the hour at Argo Park (Saam 2003).

Rowers are the most active users of Argo Pond. Four local rowing clubs and approximately 25 individual rowers use Argo Pond as their practice site and maintain boathouses nearby. This amounts to approximately 400-500 rowers using Argo Pond each year. The rowing clubs are opposed to removal, but are concerned with the environmental problems of the pond that

impact their ability to row. Rowing is generally viewed as an environmentally friendly form of water recreation, but in the case of Argo Pond, rowing does have a negative impact on the hydrology below the dam. Due to the sensitivity of Argo Dam's gates, the wake created by the coaching vessels is enough to trigger the gates to release surges of water downstream, causing fluctuations in water levels below the dam that are damaging to that ecosystem (Blumer 2003).

One issue that the City will seriously consider when looking at whether to remove Argo Dam is river space versus park space. The pond provides an area for water activities such as rowing, canoeing, and kayaking, while park space provides opportunities for hiking, picnicking, and other activities. The City attempts to balance the amount of space devoted to each type of recreation based on public interest levels, but is also dedicated to creating a greenway along the Huron and making the parks more interconnected. It will also refer to the North Main plan to integrate the desires of the business and development community with the goals for the Argo area (Appendix C).

Aesthetics

Any discussions regarding removal of Argo Dam face important aesthetic tradeoffs. The most obvious of these tradeoffs occurs in the difference between the look of a large, still body of water and a narrower, faster-flowing river. A restored river would increase the greenbelt along the Huron but could make views of the water more difficult to obtain. That change would undoubtedly be important to those in the current viewshed of the pond, including local residents and businesses along north Main Street. Additionally, there are short-term aesthetic issues that would be unavoidable if the City decided to pursue a restoration effort. First, there would be a period of deconstruction that would probably be unsightly, as it would involve large machinery, increased turbidity of the water, and noise disturbance. Also, a period of time would occur where the exposed sediment would remain uncolonized by plants and therefore reduce recreational enjoyment of both the river and the parks during this time. There may also be an unpleasant smell involved in the exposure of decaying plant material before it is dried by the sun and atmosphere. These temporary inconveniences, however, are much simpler issues than the larger tradeoff between pond aesthetics and river aesthetics. Removal of the dam would provide the benefit of eliminating the concrete structure that currently impounds the river, which many consider unattractive, and could create approximately 50 new acres of

parkland that could be maintained in a way to make the river more accessible from north Main Street, a frequently mentioned issue in the city's Parks and Recreation Open Space Plan (PROS). It would, however, change the aesthetics of the area from a large pond to a narrower river, which is likely to be the more contentious issue, pitting recreational users of the flat-water body that currently exists against those who support the restoration of a free-flowing river.

Safety and Maintenance

The United States Army Corps of Engineers assigned Argo Dam a high downstream potential hazard ranking because of its proximity to an urban area and the size of its impoundment (U.S. Army Corps of Engineers 2004). This ranking has implications for dam design, management, and oversight that are more demanding than the standards used on dams with a lower hazard potential (Michigan Department of Environmental Quality 2004a). The high hazard ranking is assigned to any dam, including most urban dams, whose failure would probably result in loss of life and cause major damage to property (Mississippi Department of Environmental Quality 2004).

The Michigan Department of Environmental Quality (MDEQ) requires the City to maintain the dam according to the regulations for a run-of-the-river dam. Ann Arbor Utilities has responsibility for operating the dam's gates so that a flow rate of at least one hundred cubic feet per second (cfs) is observed downstream. In addition to gate maintenance, Utilities' employees must maintain the earthen embankment that constitutes a substantial portion of the dam. To guarantee safety and to meet state regulations, Ann Arbor Utilities observes the following maintenance schedule:

- Weekly visual inspection of the site
- Monthly inspection of gates
- Annual "Winter Operations Check" involving inspection of heating system, bubbler system, and gate controlling instrumentation;
- Every five years, maintenance and grading of embankment to address erosion.
- Every fifteen to twenty years, replacement of gate chains, painting of gates and side structure.

The estimated cost of weekly, monthly, and yearly maintenance combined is \$15,000 per year. The costs for the five-year and the 15-20-year maintenance the last time that Utilities performed them were approximately \$45,000 and \$140,000 respectively (Bahl 2003).

As mentioned above, another upcoming maintenance issue will be excessive plant growth within Argo Pond. Currently, the rowing groups are the biggest stakeholders in this issue, with plant growth hampering their recreational activities on the pond, but as the pond continues to eutrophy, plant growth may become an issue that will require attention from the City. In the same vein, as sediment continues to accumulate in the impoundment, it will require more aggressive management by the City.

Historical Issues

People often value places for their historical significance. The Argo Area has been an active site in Ann Arbor since the first dams were built in 1829. Argo Dam's presence may be a reminder to some parties of the industrial past of Ann Arbor and could be reason to support the existence of the dam. Furthermore, historical uses of the site, including the poorly-documented Argo Swimming Beach and the well-documented canoe liveries and rowing activities, hold importance for some Ann Arbor citizens, as evidenced by survey comments collected as part of this research project (Appendix I).

Financial Costs

The maintenance costs of the dam itself are not the sole economic concern that would result from removal. The cost of removal of the dam is estimated at \$1-2 million (Hanshue 2003) based on the assumption from preliminary studies that sediment behind the dam is not contaminated with pollutants. This cost would include some basic restoration on the site, but the costs could increase if the City or State required intense management to prevent the invasion of exotic species or management of sediment (Borneman 2003). Depending on the type of restoration that would occur at the site, the costs would range considerably. As noted by the River Alliance of Wisconsin, dam repairs are often underestimated and dam removals are often overestimated. For example, repairs on the Little Falls Dam in Wisconsin were estimated at \$197,000, but totaled \$778,000, while removal of Wisconsin's Mounds Dam cost 85% less than estimated (\$170,000 instead of \$1.1 million) (River Alliance of Wisconsin 2004). Some of the problems related to eutrophication could also be ameliorated with dredging,

which would also create a deeper channel for rowers at Argo. It has been estimated that the cost of dredging would be \$150 per cubic yard, which would put the one-time cost of dredging to restore depth in Argo Pond somewhere in the range of \$28 million dollars, compared with the estimated \$1-2 million to remove the dam and restore the area (Hanshue 2003).

In recent years the parks department has invested in several capital improvement projects in the Argo area. Between 2002 and 2004, a boardwalk was constructed along the eastern shore of the pond, a walkway was constructed over the dam and along the western shore of the pond, and other improvements were made in Bandemer Park. The total cost of these improvements was approximately \$1.2 million; in general, the City spends \$1-\$2.5 million annually on capital improvements for Ann Arbor Parks (Kuras 2003a).

The additional parkland made available by removal of Argo Dam would help the city to achieve some of the goals laid out in the Parks, Recreation and Open Space (PROS) plan for 2000-2005, including one of the most important issues presented by the public: non-motorized connectivity between parks. Between 1988 and 1999, the City acquired over 210 acres of parkland. While it listed only 4.9% of the total acres as “linkage/access” acres, it spent 11.2% of the total funds, or \$801,845, on acquiring these new lands. Clearly, linkage and access acres tend to be more expensive than other types of improvements, making the additional 50 acres of parkland available to connect parks in northern Ann Arbor seem even more attractive (Parks Advisory Commission 2000).

Another concern regarding dam removal may be changes to the river system that could impact the operations of the Argo canoe livery. If the dam is removed, those operations could be altered, positively or negatively. Upon removal, the river would be expected to become narrower and swifter, with some small rapids that may be intimidating to novice canoeists. On the other hand, more experienced canoeists and kayakers who do not currently use the Argo site may be enthusiastic users of these new river features. Likewise, it is possible that a restoration effort could include some streambed engineering that would allow for a slower section of the river to be maintained that would allow less-experienced canoeists to pass safely through the rapids.

The Argo and Gallup liveries had a budget of \$187,837 for FY 2003-2004 (City of Ann Arbor 2003b). The livery increases prices 2-3% for canoeing every few years. Even so, with the high cost of canoe maintenance, the canoe livery cannot balance its books without help from Ann Arbor's parks maintenance millage. The livery may be seen as a regional resource since people from all over Southeast Michigan come to Argo and use it (Saam 2003).

Chapter Three

METHODS

We used interviews, economic analysis and a survey instrument to gauge people's opinions and values for the Argo Area. The interviews targeted key Argo Area stakeholders while the survey questioned a sample of Ann Arbor, Ann Arbor Township, and Barton Hills residents. The survey contained an economic component that was used to generate values for a more detailed economic analysis.

STAKEHOLDER INTERVIEWS

Understanding stakeholder interests in Argo Dam, Argo Pond, and the Huron River and what they see as the various alternatives in the area is an important component of understanding the decision process and the feasibility of river restoration. We examined stakeholder interests through interviews and correspondence. For the eventual purpose of evaluating the political landscape regarding the future of the Argo area, the questions sought to determine the following information:

- Identity of stakeholders
- Stakeholders' motivations
- Stakeholders' interests in the Argo Area
- Stakeholders' level of interest in the possibility of removing Argo Dam
- Stakeholders' preferences for the future of the Argo area
- Stakeholders' roles in the decision-making process
- Process for decision-making
- Structure of the city government
- Role of city's departments in decision-making and implementation
- Sources of funding for removal
- Existing plans for the area
- Financial investment in existing activities

- Current issues being discussed or addressed in the Argo area
- Possible future uses for the area if the dam is removed or if it remains in place

The HRWC provided contact information for people who attended a meeting in August 2001 regarding the possible removal of Argo Dam. Notes and transcripts from the background interviews, as well as interviewees and web searches, helped identify additional stakeholders as well as questions and issues to be addressed in stakeholder interviews. A complete list of interviews and contacts is located in Appendix D.

Initial contacts with stakeholders occurred via email when an email address was available. Some of the people contacted for in-person interviews did not respond after multiple contacts or expressed a preference to communicate over email. Stakeholders who did not respond to multiple emails received phone calls, and those who did not respond to phone calls were sent emails containing questions for them to answer. Those who preferred email to an in-person interview also received questions over email. Of the stakeholders receiving questions over email, all of them responded.

At the interviews, interviewees read and signed informed consent forms acknowledging their willingness to be interviewed, tape recorded, and cited in this report. Interviewers taped all in-person interviews and wrote down notes while conducting the interview. Tapes provided a reference for quotes and clarification where necessary.

Chapter 5, Political Analysis, explores the influence that the stakeholders have over the proposed river restoration and the resources that they possess to support or oppose it.

ECONOMIC EVALUATION

Benefit-cost analysis (BCA) is one way to better understand the tradeoffs offered by a specific policy. It involves carefully examining all of the positive and negative factors associated with a certain policy or action to understand the net impacts of that policy or action. BCA requires researchers to place all of the relevant values, to the extent possible, in one metric, the dollar. For many goods and services, market prices can be used to estimate the value of a good, since the market price reflects what a person is willing to give up to get the good; for example, a

canoe has a fixed price. The value is much more difficult to measure for goods not traded in markets, such as paddling the canoe at a specific location (English and Dale 1998).

To better understand a good's value, it is important first to differentiate between types of goods. Market goods have two basic characteristics: excludability and rivalry. Excludability means it is possible to control who can use the good. For example, golf courses are excludable because use of their facilities is limited to people who pay a fee. Rivalry defines whether one person's use of the good decreases the utility, or enjoyment, of another person's use of the same good. For example, food is rival because consumption of it by one person precludes its consumption by another. Private goods are both excludable and rival. If these traits do not exist completely, the good is often said to have public good characteristics; if they do not exist at all, the good is said to be a pure public good. The atmosphere is an example of a pure public good because it is difficult to stop someone from having access to the atmosphere, and one person's breathing does not affect the quality of a second person's breathing.

Free riding with public goods can lead to reduced or absent ability of markets to provide these goods. Free riding refers to a situation where individuals gain the benefits of a good or service without paying for it. For example, an individual who pays no taxes yet drives on public roads or enjoys parks funded by taxes is a free rider. The failure of excludability permits free riding to happen with public goods, while it does not happen with private goods (Tietenberg 2000).

Another key difference between private and public goods is valuation. The value of a private good or service can be estimated from private market interactions. However, since public goods, by their nature, are not adequately handled by private markets – especially since people can benefit from public goods without paying for them – the value that people put on them cannot be estimated from market data. Other methods must be used.

Argo Pond and the parks around the pond are impure public goods, being partially nonexcludable and partially nonrival. Any individual is free to use Argo Pond, and one person's use of the area does not stop other people from using it; however, as more people use the space, each individual's utility gained from that use decreases.

Discount rate

Not all of these benefits and costs occur at the same time. Some occur today, while others will occur in the future. To understand the difference in values, economists use a discount rate to signify that people assign different values to the same amount of money at different points in time. Discounting reflects that money now is worth more than money in the future because it can be invested; it also reflects human preference for having things now rather than later. Discounting is used to put values at different times into equivalent terms. Specifically, we used discounting to calculate present values on the maintenance costs of Argo Dam for the next 50 years (Office of the Administrator 2000).

Choosing a discount rate is cited by the EPA as “one of the most contentious and controversial aspects” of their analysis of economic factors (Office of the Administrator 2000). Analysts must be careful to use the same discount rate when evaluating numerous projects; otherwise the discount rate can change the impact and relative desirability of the various projects. Higher discount rates discourage investment for the future relative to current consumption (Office of the Administrator 2000).

Discounting has become a controversial method among conservationists for this reason. A low discount rate appeals to environmentalists in some situations because it factors in the importance of future generations for a longer period of time. But no matter how low the discount rate, eventually a future generation’s access to the resource will be valued at essentially zero by people today, making it inefficient to invest for that long-term future. In other cases, though, environmentalists advocate the use of high interest rates because high rates can make some environmentally undesirable activities, such as dam construction, less economically efficient. The Conservationists’ Dilemma states that, while a high interest rate discourages the long-term protection and conservation of environmental resources, it also discourages “investment in projects which transform environments (dams) and in projects which are necessary to extract resources (oil wells)... Since low environmental impacts often extend indefinitely into the future, low discount rates will give them the greatest influence on the benefit-cost ratio” (Norgaard and Howardth 1991).

Nonmarket Valuation

Economists have become increasingly adept in methods to estimate the monetary value of goods and services, such as clean air, that are not traded in a market system. Currently, economists use several methods to estimate these values, including travel cost, hedonic property value, and contingent valuation (Tietenberg 2000). Contingent valuation, or CV, uses survey methods to ask a sample population about their willingness to pay (WTP) for a certain good, service, or scenario, and then uses those WTP values to find a mean value for the population (Mitchell and Carson 1989; Lipton et al. 1995).

CV is a somewhat controversial method because it creates a hypothetical market to determine WTP, as opposed to using actual market behaviors as do travel cost and hedonic pricing. The survey responses are conditional upon the specific situation described in the survey. Economists tend to “prefer evidence based on actual market behavior,” as opposed to that from a theoretical market (Portney 1994). Some have argued the WTP values determined by CV surveys do not accurately value the respondent’s preferences, and even these preferences “are not an expression of true economic preferences” (Diamond and Hausman 1994). Others, including a NOAA panel of experts convened to examine the use of CV in litigation and government studies (Arrow et al. 1993), determined that, with the proper design and methodology, CV can offer estimates of respondents’ true economic preferences (Hanemann 1994).

Because CV does not depend on observation of behavior in a market related to the environmental good, CV has a wider array of applications than the other non-market valuation methods. It is the only currently available method for measuring non-use values. The Argo area has no required fees or registry system, so use and travel data are not easily obtainable. Furthermore, a person need not visit a park to have value for its existence in a certain state. We chose to use CV because it was applicable to our project, well established, and useful for measuring all relevant values of the Argo area (Mitchell and Carson 1989; Lipton et al. 1995).

We employed the referendum method in the CV portion of our questionnaire. The referendum format presents the WTP question to respondents in the format of a ballot proposal, requiring a simple yes or no answer. Economists generally prefer the referendum method to asking people directly their WTP for a good because survey respondents are likely

to be comfortable with it, since it mimics a real ballot question, and provides the best information for analysis (Lipton et al. 1995). This method is advantageous for several reasons. First, it presents the good as a public good; every resident of our survey area has a stake in it and a responsibility for it. Therefore, it emphasizes that each respondent is involved in the decision. Second, citizens with voting experience are already familiar with the referendum format, so the potential for error is minimized (Mitchell and Carson 1989). Residents of Ann Arbor have experience with ballot measures that ask whether they would maintain or increase their property taxes for various city purposes. Finally, the referendum format matches closely with the format of other types of survey questions, making it easy to incorporate into a survey (Mitchell and Carson 1989).

In the referendum format, each individual is asked whether s/he would be willing to pay a specified amount for a specified change in environmental quality. While each individual sees only one value, a variety of values, expected to be both lower and higher than the anticipated WTP for the good, is used in the surveys, so that different individuals respond to different values. This format is likely easier for individuals to respond to accurately as it closely resembles choices they make everyday in market situations. Furthermore, it typically yields higher responses than other methods.

In this case, we asked people to respond to a WTP question both for keeping Argo Dam and for seeking its removal. In this manner, we could capture the value of keeping the status quo, since the respondents were required to pay for this option if they chose it over the alternative, as well as the more traditional CV use of estimating the value of removing the dam. This method was particularly useful to us because we wanted respondents to choose the alternative that they would prefer based both on its merits and its costs. By asking them to pay for either alternative, the data can show the community's value for each option and capture information about preferred alternatives. Furthermore, the status quo, in this case, is not typical, since keeping Argo Dam and Pond in their current states may require additional costs above and beyond those now incurred for maintenance. Using this method does mean that we need more responses than for other types of CV methods (Mitchell and Carson 1989); however, our response rate has yielded enough replies for good analysis.

SURVEY

Choice of Survey Method

A mail-based survey was most appropriate for this project, given the available time and funding and the expertise contained within the group. Mail is less intrusive than telephone calls and therefore better received by participants (Salant 1994). A mail-based survey also made it possible to include visual items (photo, map, and drawings), as well as a sizable amount of text in the contingent valuation (CV) portion of the questionnaire. Mail is likely to produce a set of respondents more representative of the general population than a web- or email-based survey (Bailey 1994; Dillman 2000). A mail-based survey was also simplest to plan and execute with the resources available.

Careful effort was made to avoid the limitations of a mail-based survey. Every aspect of the questionnaire was designed to enable the questionnaire to stand on its own. Questions were kept as short and simple as possible in order to make them easy for respondents to understand (Weisberg et al. 1996). The questionnaire structure was kept simple, and the use of instructions to skip certain questions reduced the likelihood of the questionnaire being filled out improperly due to lack of supervision. Careful, consistent use of questionnaire design elements, such as question numbers, page layout, typefaces, and directional arrows reduced navigational problems (Salant 1994; Dillman 2000). The questionnaire was pre-tested in small groups and reviewed by experts as described below to identify and correct potential problems with directions, question wording, and other aspects of design. Although insufficient resources prevented the use of a monetary incentive, other methods, particularly repeated, personalized contacts, were used to achieve the highest possible response rate.

The order in which respondents saw the various parts of the questionnaire was a particular concern in this survey. The first section of the survey sought the respondents' current opinions and perceptions, while the section that followed asked respondents to choose between two scenarios after reading a section of text that provided background information and described the tradeoffs between the alternatives. While this information was essential to respondents' ability to make an informed choice, it also had the potential to alter the opinions that were measured in the first section, making it important that the first section be completed before the second. While this issue could not be conclusively addressed within the confines of

a mail-based survey, ordering of questions and clear instructions were used to reduce its potential impact.

Questionnaire Planning, Pretesting and Expert Review

We first gathered background information on the Argo site and the dam removal issue by reviewing documents and interviewing key stakeholders and resource people (see Appendix D). As the questionnaire and letters were being developed, they were pre-tested in two small group sessions, with six and four participants. The participants' experiences were made as realistic as possible; for example, they were presented with materials in the proper sequence, in the actual sealed envelopes, personalized to each participant. Participants read the materials and completed the questionnaire, after which they were extensively debriefed by members of the project team. Although the participants in these sessions do not represent a cross section of the Ann Arbor populace, this is not considered critical for pre-testing (Babbie 2004). These small group sessions provided a great deal of valuable feedback, particularly regarding issues of clarity, flow, and design.

The questionnaire, or excerpts when appropriate, was also reviewed by a number of specialists in various pertinent fields. Reviewers included the following people:

- Ray DeYoung, Associate Professor of Environmental Psychology and Conservation Behavior, Univ. of Michigan School of Natural Resources and Environment (SNRE)
- Gloria Helfand, Associate Professor of Environmental Economics, SNRE
- Elaine Hockman, Adjunct Assistant Professor and statistics consultant, SNRE
- Bärbel Knäuper, Assistant Professor of Psychology, McGill University
- John Loomis, Professor of Agricultural and Resource Economics, Colorado State University
- Paul Mohai, Associate Professor, SNRE and Survey Research Center, University of Michigan Institute for Social Research
- Elizabeth Riggs, Middle Huron Initiative coordinator, Huron River Watershed Council

All survey materials, including the questionnaire, letters, telephone scripts and protocol, were also reviewed and approved by the University of Michigan Behavioral Sciences Institutional Review Board for Human Subjects Research.

Survey Procedure

The survey procedure adhered quite closely to the five-contact protocol of D.A. Dillman (Fig. 3-1) (Salant 1994; Dillman 2000). After reviewing relevant literature and consulting with a number of survey practitioners, it was apparent that these methods are the standard in the field. They produce a high response rate and, therefore, results that are as representative as possible.

<p>First Contact: Pre-survey “priming” letter (October 27, 2003).</p> <p>Second Contact: Questionnaire packet: cover letter, questionnaire, return envelope (November 1, 2003).</p> <p>Third Contact: Follow-up “thank you” and reminder postcard (November 7, 2003)</p> <p>Fourth Contact: Replacement questionnaire packet: new cover letter, questionnaire, return envelope (November 21, 2003).</p> <p>Fifth Contact: Telephone (December 20, 2003 – January 6, 2004) or Priority Mail: new cover letter, questionnaire, return envelope (January 11, 2004)</p>
--

Figure 3-1: Five-contact survey protocol.

Noteworthy variations from the standard five-contact protocol included:

No use of incentive: As mentioned above, due to limited resources, no monetary or material incentive was employed to encourage recipients to respond.

Fifth contact: Due to financial limitations that prevented the use of Priority Mail alone for the fifth contact, a combination of telephone and Priority Mail was employed. We initially attempted to contact non-responders by telephone when we could locate telephone numbers, making contact with approximately 40 percent by telephone. Priority Mail was used in those cases where non-responders could not be contacted by telephone.

Timing of fifth contact: Due to academic schedules and holidays, the fifth contact was not initiated until four weeks after the fourth contact. It took another three weeks to complete, for a total elapsed time of seven weeks since the fourth contact, as opposed to the recommended two to three weeks (Salant 1994; Dillman 2000; Babbie 2004).

Questionnaire Structure

The questionnaire was organized into three main parts, along with introductory and conclusion material (the entire questionnaire is reproduced in Appendix E). Part A primarily measured use of the Argo area and attitudes toward it. It began with two questions dealing with attitudes toward parks and recreation in Ann Arbor in general, and participation in various recreational activities in the larger Ann Arbor area. A navigational question then assessed respondents' familiarity with the Argo area and, if appropriate, directed them to skip one or more of the following questions. The remaining questions in Part A measured participation in various recreational activities in the Argo Area specifically, and attitudes toward Argo Pond, Argo Dam and the parks around the pond. Part B of the questionnaire was the CV portion, to estimate respondents' value of two alternatives: complete removal of the dam or keeping the dam in its current condition. This section included two pages of information on background and tradeoffs, line drawings depicting the two alternatives, and the referendum question that examined respondents' willingness to pay for either keeping or removing the dam. Part C asked respondents demographic questions to determine the make-up of our sample population.

Survey Sample

Two thousand Ann Arbor-area residents, age 18 or older, were randomly selected to participate in this survey. They were selected in two strata, as follows:

One thousand were randomly selected from the area within approximately one mile of the portion of the Huron River that would be most impacted if Argo Dam were removed (Fig. 3-2). A one-mile buffer was drawn around a stretch of the river from upstream of the M-14 bridge to the Broadway bridge downstream of Argo Dam (Fig. 3-2). This area includes sections of the City of Ann Arbor, the Township of Ann Arbor, and the Village of Barton Hills. Twenty-five complete and two partial census block groups (listed in Appendix F) that appeared by visual inspection to be primarily contained within the one-mile buffer zone were identified and included in this stratum. This was termed the "Argo stratum".

An additional one thousand survey recipients were selected from the whole of the City of Ann Arbor, excluding those portions of the city that were included in the first stratum as described

above. This sample, which included one partial and 77 complete blocks (listed in Appendix F) was termed the “Ann Arbor” stratum.

Since nonresidents do not pay Ann Arbor taxes or vote in city elections, and anecdotal evidence suggested that most users of the Argo site live in Ann Arbor, we excluded anyone living outside the city except those portions of Ann Arbor Township and Barton Hills included in the Argo Area stratum.

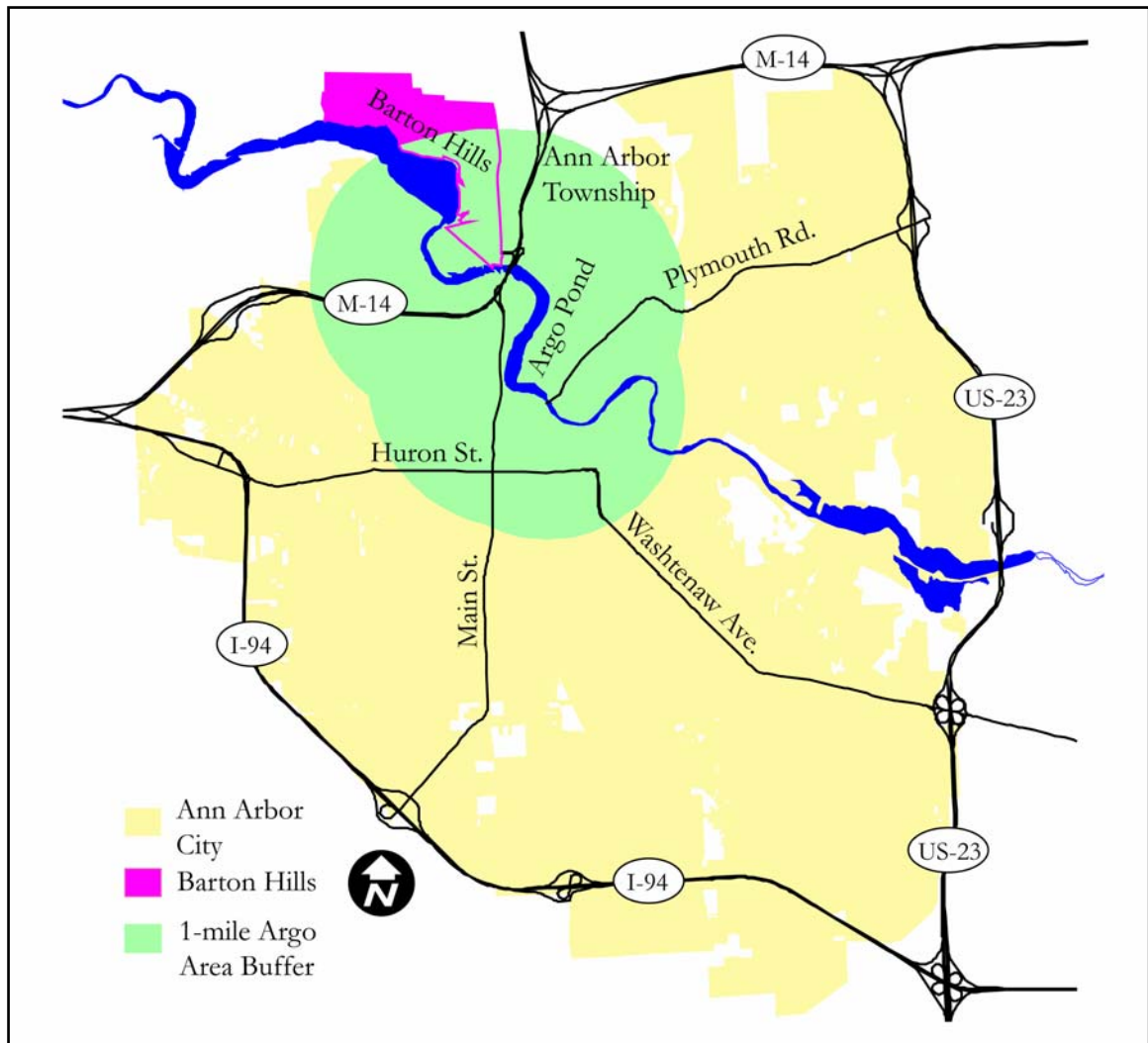


Figure 3-2. Survey area map.

Among the advantages of using a stratified random sample, two were particularly relevant for our purposes. We believed that residents living closer to the affected stretch of the Huron River would likely have stronger feelings on the question of dam removal, and we wanted to

ensure that they were thoroughly surveyed. However, the proposed project at Argo could become a controversial political issue citywide, so we sought to measure opinions throughout the city as well. Stratification allowed us to accomplish both of these goals by sampling at different densities in each stratum. Related to this, stratification allowed us to analyze the two subgroups separately (Scheaffer et al. 1990).

We purchased contact information for respondents from Merit Marketing Group (Ann Arbor, MI); Equifax, Inc. (Alpharetta, GA) was the original compiler of the information. For each stratum, the vendor compiled a list of all residents in the geographic area of interest for whom name and address information were available. Individuals were listed alphabetically, the total number of individuals on the list was divided by the sample size desired (1,000) to determine an interval n , a random starting point in the first n individuals was chosen, and every n th individual thereafter was chosen (Cochran 1977; Fink 2003).

Handling Undeliverable Mail (“Return to Sender”)

Mail sent to about 16 percent of the purchased addresses was returned as undeliverable by the Postal Service. Of these faulty addresses, a large majority (73 percent) was from the Argo Area stratum; this was not surprising, as the Argo area included much of those parts of Ann Arbor primarily populated by students, a particularly transient group.

In general, when an item was returned as undeliverable by the Postal Service, an effort was made to locate a correct address for the individual using the Ann Arbor telephone directory and the University of Michigan online directory. When a new local address was found (in approximately one-third of cases), mailings were re-sent to that address.

Handling Telephone and E-mail Contacts

During the course of the survey, we received approximately 50 telephone and email contacts, from both participants and non-participants. Of these, approximately 40 came by telephone, all from persons who had received our mailings. Most were from individuals asking to be removed from the survey list for various reasons; these requests were honored as quickly as possible. Many of the remainder notified us of problems with addresses or addressees who had moved or were deceased. In contrast, the majority of the emails originated from people who had not received our mailings themselves but who had heard about our study and wanted

to learn more about it or to express their opinions on the subject. Those who expressed a position by email were strongly in favor of retaining Argo Pond and Dam due to the benefits they provide to the rowing community; their comments are included in Appendix G.

Modifications to Fourth and Fifth Contact letters

From our contacts with questionnaire recipients, it became apparent that many were reluctant to complete the questionnaire because they felt insufficiently knowledgeable about the Argo area. To address this problem, language was added to the fourth and fifth contact letters emphasizing that prior knowledge of the Argo area was not needed to participate, and that “don’t know” responses were, in fact, valuable.

Contingent Valuation Section Design

Comparing the monetary costs of the two scenarios was a key aspect of the page showing tradeoffs between the two alternatives. The respondent needed to understand the difference between the cost of removal and the overall cost of maintenance for an accurate assessment of the long-term tax funding needed for each scenario. Therefore, the tradeoffs section of the questionnaire showed the costs and benefits of both keeping the dam in its current condition and removal of the dam. The survey used the current estimate of removal cost from the Michigan Department of Natural Resources, \$1 to \$2 million (Hanshue 2003). Representing the maintenance costs infinitely, which is the predicted life of the dam, was more difficult because costs are incurred annually rather than being a one-time payment. As this cost will be a constant nominal stream, the survey used the present value of an infinite stream:

$$B_{pv} = B/r$$

where B_{pv} is the present value of the total cost, B is the annual cost of maintenance (\$30,000-\$35,000 per year), and r is the discount rate. To reach these values, we assume that r , the discount rate, does not change over time. The discount rate used was the long-term interest rate that Ann Arbor is currently using for the brownfield project in the Lower Town area within the City, 5.465 percent. Using this discount rate, the City will pay between \$550,000 and \$640,000 for the maintenance cost of Argo Dam in present value, assuming maintenance costs remain the same.

Question 8 asked respondents their WTP for either removing or keeping the dam in the referendum format described above. The method of payment was identified as the property tax, because it is a tax that Ann Arbor property owners already pay and with which they are familiar. Furthermore, the city of Ann Arbor would be responsible for removing the dam, and the City could use revenue from a property tax to pay for dam removal.

We broke the WTP question into two parts, based in part on an example found in the literature (Rosenberger and Walsh 1997). The first part asked if the respondent would pay at least \$1 for the good. The second used a randomly chosen value described below. While this setup could be used to indicate whether or not a respondent's WTP was some value between \$1 and the randomly selected amount, we decided that \$1 was too close to zero to significantly affect the WTP. Instead, we used the \$1 question combined with survey comments to gauge protest votes. When a respondent disagreed with the premise of the question itself rather than the value the person was asked to pay, protest votes occurred.

The questionnaires differed in the dollar values used in the third section of the WTP question, question 8. The same dollar value was used for the WTP question for both the dam removal and dam keeping scenarios. If recipients were sent follow-up questionnaire mailings (i.e., if they failed to respond to the first questionnaire sent to them), no effort was made to ensure that they received the same dollar values in follow-up questionnaire mailings as in the initial mailing. Returns from the initial

mailing of 2000 questionnaires indicated very little willingness to pay at the higher reaches of the distribution, so the distribution of dollar values was modified for follow-up mailings. Both distributions are shown in Table 3-1.

Table 3-1. Relative abundance of CV values.

Value	Initial mailing	Follow-up mailings
\$25	10%	11.67%
\$50	10%	11.67%
\$70	10%	11.67%
\$90	10%	11.67%
\$120	10%	11.67%
\$150	10%	11.67%
\$250	10%	10%
\$350	10%	8.33%
\$450	10%	6.67%
\$600	6%	5%
\$800	4%	---

Data Entry, Checking and Cleaning

Data from returned questionnaires were entered into a Microsoft Access database. For questions 2 and 4, which asked about the frequency of participation in various recreational activities, no response was assumed to be equivalent to a response of no recreational activity. We felt this was appropriate for several reasons. In general, it seemed to be the most conservative approach. In the case of question 4, many respondents were directed to skip the entire question based on their answer to question 3 (which would indicate that all their answers to question 4 would be zero). Also, many respondents provided nonzero numerical answers for some items but left others blank, which seemed to imply that the remaining items were zero. However, we did not make this same assumption for items 16 and 17, which asked about the number of adults and children in the household, respectively. Non-responses to these items were assigned no numerical value.

Data-entry accuracy was checked in two ways. A “valid values” check verified that each field included only values appropriate to that field, and any problems were resolved by referring to the original questionnaire. Responses of zero to question 16, number of adults in household, were changed to 1 when the respondent’s birth date indicated that he or she was an adult. Approximately 20% of the questionnaires were double-checked, and any problems corrected. A sample of 99 questionnaires yielded an accuracy rate between 99.5 and 99.9%.

In about 40 cases the respondent indicated in question 10 that he or she lived outside the three municipalities we intended to survey, generally due to having moved recently or receiving the questionnaire at a work address. Data from these questionnaires were discarded entirely, as were data from those questionnaires where the respondent indicated that he or she was not the person to whom the questionnaire was addressed. In a few cases, we received questionnaires with duplicate tracking numbers, likely due to followup mailings “crossing in the mail” with completed questionnaires. The questionnaire from each pair that appeared to originate from a later mailing, based largely on how it was folded, was discarded, and both were discarded where no determination of primacy could be made.

Over the course of data entry, it became apparent that two questions, number three (which assessed respondents’ familiarity with the Argo site and directed some to skip subsequent questions) and the first portion of number eight (the referendum question on dam removal),

were being disproportionately skipped. These were the only items in the questionnaire that included directional instructions, such as arrows. A fair number of respondents appeared to read the question, choose their answer, and follow the navigational instruction properly, *but neglected to mark their answer to the question*. Apparently, although the navigational aids were properly followed for the most part, they were also something of a distraction. Where the respondent's intended choice of answer was clear based on his or her subsequent navigation of the questionnaire, we felt it was appropriate to fill in the unanswered question as specified in Appendix H.

Survey Comments

Comments written on the survey gave a better understanding of the motivations behind respondents' answers in the survey and proved particularly useful for political analysis. All of the comments were entered into a Microsoft Excel spreadsheet, including all written statements on the comment pages, and are included in Appendix I. About 300 respondents included comments on their survey in the CV comments section, the final comments section, or both areas. Comments in other areas of the report were not included due to the difficulty in using this information in a quantitative way and the lack of any standardization in the structure or content of the statements. The CV analysis used the WTP values stated in these comment sections when respondents declared different maximum WTP values than the choices given in the survey.

Chapter 4

SURVEY RESULTS AND DISCUSSION

SURVEY RESPONSE

Over 800 people filled out and returned their questionnaires. We received 361 usable responses from the Argo stratum and 406 usable responses from the Ann Arbor stratum, which constituted 1.31% and 0.6% of the total adult populations of their respective areas, based on the 2000 Census (U.S. Census Bureau 2004).

Table 4-1. Response category breakdown. Response categories are based on those recommended by the American Association of Public Opinion Research (AAPOR 2000).

Response Category	Argo stratum	Ann Arbor stratum	Totals
Completed or partially completed questionnaires	361	406	767
Returned to sender, no new address found	177	70	247
Returned to sender, new address found, no response from new address	54	13	67
Completed by someone other than addressee	2	3	5
Nothing ever returned	286	402	688
Refusal	41	40	81
Addressee ineligible to participate	79	66	145
TOTALS:	1000	1000	2000

We found some noteworthy differences in return patterns between the two strata, particularly in the number of questionnaires returned to sender (a detailed breakdown of responses, and non-responses, is shown in Table 4-1). The number of questionnaires returned to sender was nearly three times higher in the Argo Area than in the rest of Ann Arbor; this result was unsurprising, as the Argo Area encompassed most of the University of Michigan's Ann Arbor campus and its immediate surroundings, including nearly all residence halls. This area is heavily populated by students, a highly transient group. For purposes of calculating response

rates, we did not differentiate between complete and partially complete questionnaires. The number of questionnaires returned mostly blank was very small, although nonresponse to individual items was common. We counted questionnaires returned blank as refusals. Due to limitations in the lists from which our contact information was drawn, a sizable number of individuals in each sample were actually ineligible to participate; these included recipients who had moved out of the survey area, recipients who received the questionnaire at a work address but reside outside the survey area, respondents under the age of 18, and deceased recipients. We usually became aware of these recipients' ineligibility only when we received some sort of response from the recipient or the postal service; we have no way of knowing the eligibility of most nonresponders, who constituted more than half of the original addressees.

Our overall response rate to this survey was 48.56%, using the "Response Rate 4" formula recommended by the American Association for Public Opinion Research (AAPOR 2000) (See Appendix J for response rate calculations.). For purposes of comparison, a mail-based survey of Ann Arbor and Ypsilanti residents conducted by a team of Master's students from the University of Michigan in 1999 obtained a response rate of 33.91% with considerably less followup of nonrespondents than in the present study (Glock et al. 2000). Another mail-based survey conducted in 2001 achieved a response rate of 60% in Washtenaw County (Survey Research Center 2002), but the population surveyed was rather different from ours, as it included the whole county, not just the city of Ann Arbor, and this survey also offered respondents financial or material incentives to complete the questionnaire (Marans 2004).

Specialists in the field differ as to the response rates that are reasonably achievable for a mail-based survey, and whether a response rate such as ours is adequate for analysis and reporting purposes, but they agree that a demonstrable lack of response bias is far more important than simple response rate (Babbie 1990; Bailey 1994; Weisberg et al. 1996; Dillman 2000). Response bias occurs when the members of a sample who respond to a survey are qualitatively different from those who do not, thereby making it difficult to draw conclusions about the entire population from the results of the survey. Although possible, it is more difficult to avoid response bias with a low response rate than with a high response rate. As a means of assessing the demographic representativeness of our respondents and the potential for

response bias, we compared respondents' self-reported demographic information with data from the 2000 Census.

REPRESENTATIVENESS OF RESPONDENTS

Our survey achieved a broad but not perfectly representative sample of the Ann Arbor population (Table 4-2). The most notable pattern is underrepresentation of younger, less educated, and lower-income individuals. This is unsurprising given the demographics of Ann Arbor, with a large, relatively short-term population of young people associated with the University of Michigan. Students, particularly undergraduate students, tend to have lower incomes and less education than the general population of Ann Arbor, and also tend to be quite transient and therefore difficult to sample. We performed statistical analyses on the demographic characteristics of age, sex, income and educational attainment.

Table 4-2. Summary demographic statistics.

	Argo Area stratum:			Ann Arbor stratum:	
	2000 Census	Respondents		2000 Census	Respondents
Age: median age of adults	23*	41		37*	45
Sex: percent male	50.74%	48.60%		48.53%	60.25%
Income: median annual household income*	\$37,500*	\$62,500*		\$55,000*	\$87,500*
Education: percent with a Bachelor's or higher degree	72.87%	85.39%		69.17%	84.64%
Household size: mean	2.04	2.52		2.28	2.40

*Midpoint of category used as median.

Age distribution

People under age 30 were strongly underrepresented among respondents from both sample areas (Fig. 4-1). These differences were statistically significant ($X^2=357.980$ (Argo Area), 80.266 (Ann Arbor); $p < .0005$ for both strata). The disparity is particularly noticeable in the Argo Area, where over 40% of adult residents are aged 18-21, yet only 4% of our respondents are in that age range. Lack of participation on the part of younger residents may explain some of this outcome, but a much more important cause may be that they were underrepresented in the original pool from which the sample was selected.

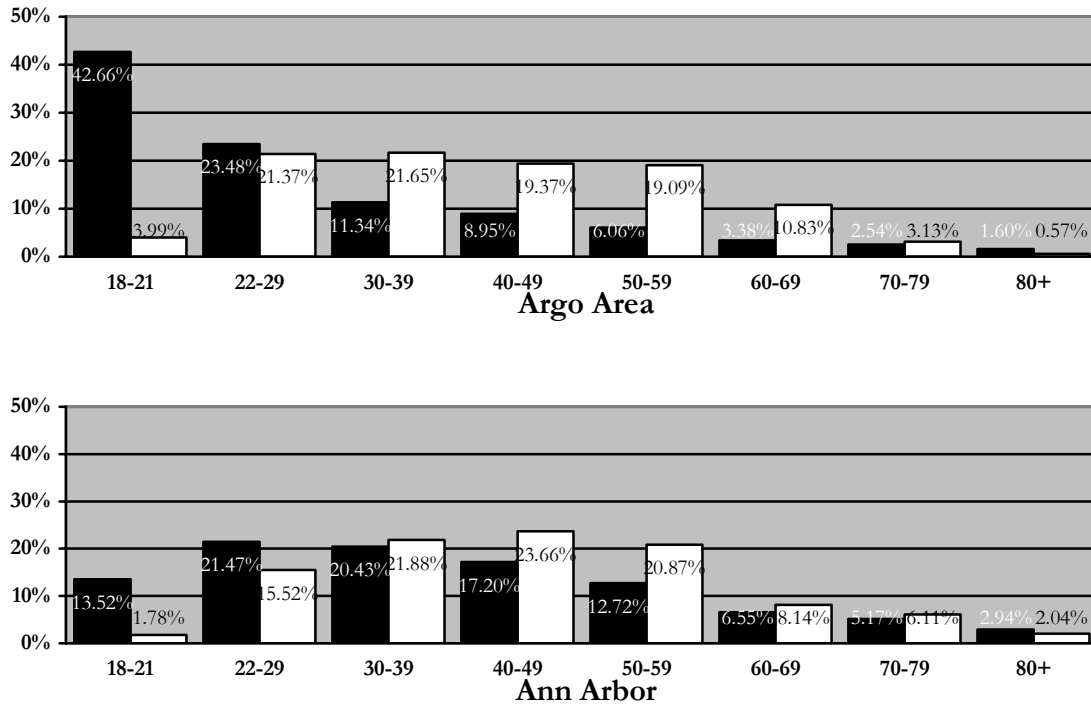


Figure 4-1. Age distribution of respondents compared with 2000 Census. Black bars represent Census data (U.S. Census Bureau 2004), white bars represent respondents' self-reported data (Argo Area: n=351, Ann Arbor: n=393).

Sex ratios

The ratio of male to female respondents closely matched the 2000 Census data for the Argo Area stratum ($X^2=0.655$, $p=.418$), but males were significantly overrepresented among respondents from the Ann Arbor stratum ($X^2=22.493$, $p<.0005$) (Fig. 4-2). The different types of households that predominate in the two strata and the sources of the contact information used in the survey offer a likely explanation for this disparity. The Ann Arbor stratum includes more families and traditional households, where property ownership, telephone service, and other public records are more likely to be in a male's name. Since these records are the ultimate sources for the lists from which our contact information was drawn, it is likely that males were overrepresented in the Ann Arbor stratum to begin with. In contrast, the Argo Area stratum includes a much greater proportion of single individuals, many of them students.

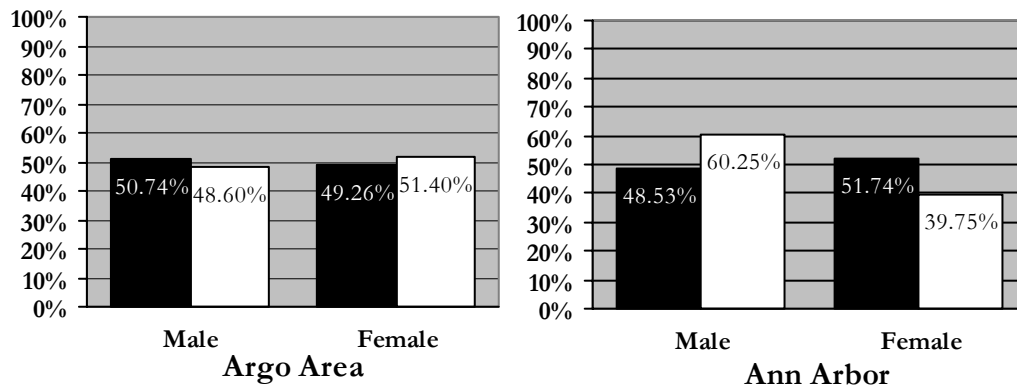


Figure 4-2. Sex ratios of respondents compared with 2000 Census. Black bars represent Census data (U.S. Census Bureau 2004), white bars represent respondents' self-reported data (Argo Area: n=356, Ann Arbor: n=400).

Household Income

In both samples, lower-income households are underrepresented when compared to 2000 Census data ($X^2=82.781$ (Argo Area), 38.962 (Ann Arbor); $p<.0005$ for both strata) (Fig. 4-3). There may be a number of factors that are influencing these results. Lower-income households and students may be less likely to be included on the source lists due to lack of telephones, greater transience, or disinterest on the part of data collectors, whose commercial customers are primarily interested in individuals with greater disposable income. It is possible that respondents from lower income households more frequently chose "I prefer not to indicate" as their income demographic response, which would have caused us to undercount them. Similarly, they may be less likely to complete the questionnaire at all.

Educational Attainment

Although the 2000 Census does not report educational attainment for people under age 25, among respondents age 25 and older, individuals with less than a Bachelor's degree were underrepresented in our pool of respondents (Fig. 4-4), and individuals with graduate or professional degrees were overrepresented ($X^2=49.178$ (Argo Area), 72.750 (Ann Arbor); $p<.0005$ for both strata). Again, this discrepancy is likely due at least in part to less educated individuals being underrepresented in the source lists. It is also possible that the source lists contained a higher proportion of out-of-date addresses for less educated individuals due to greater transience. In addition, individuals with less education may be more likely to be

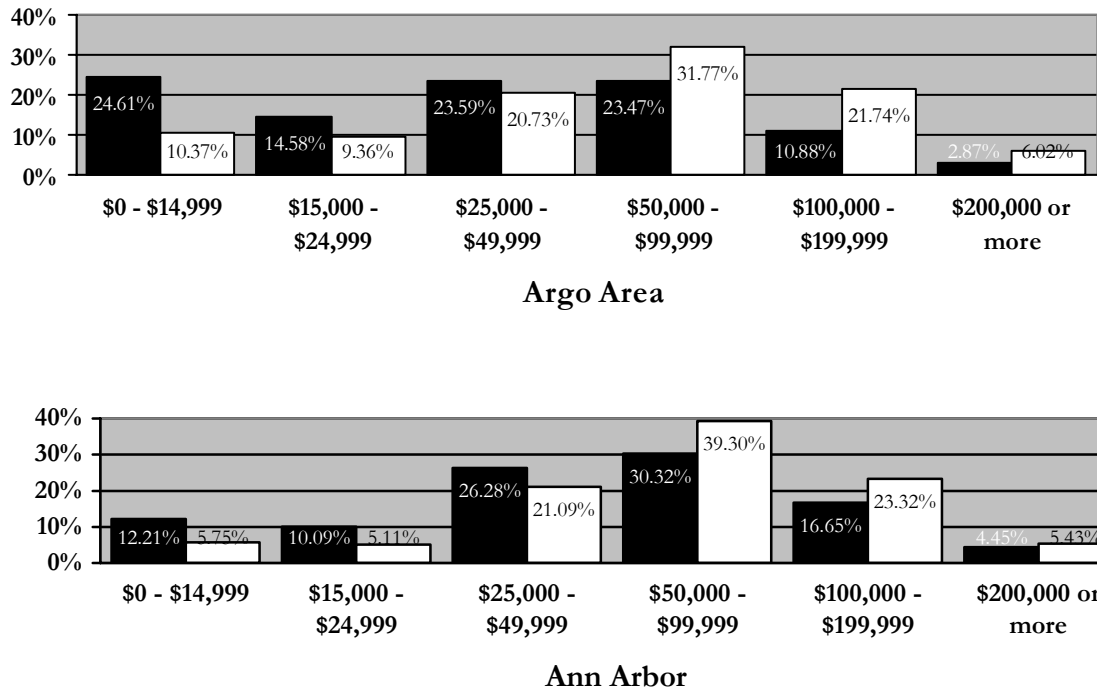


Figure 4-3. Household income of respondents compared with 2000 Census. Black bars represent Census data (U.S. Census Bureau 2004), white bars represent respondents' self-reported data (Argo Area: n=299, Ann Arbor: n=313).

intimidated by the length or content of questionnaires, and therefore less likely to complete and return them (Bailey 1994).

Analysis and Discussion of Demographic Comparisons

The commercial source of the contact information for our 2000 randomly selected survey recipients could not provide useful demographic information on them, nor could they provide summary demographic statistics on the pools from which they drew our samples. Therefore, our sources of demographic information for comparisons are the 2000 Census and the self-reported demographic information from those who responded. It is therefore difficult to isolate potential sources of bias, of which there are at least three: 1) the initial source lists may not have included all members of the population as a whole (coverage error) and may have disproportionately excluded members of certain groups; 2) the randomly selected samples of survey recipients may have been unrepresentative of the source lists (sampling error); or 3) those recipients who responded may have been unrepresentative of the samples (nonresponse error). Sampling error seems unlikely to be a significant problem, given the large size of our

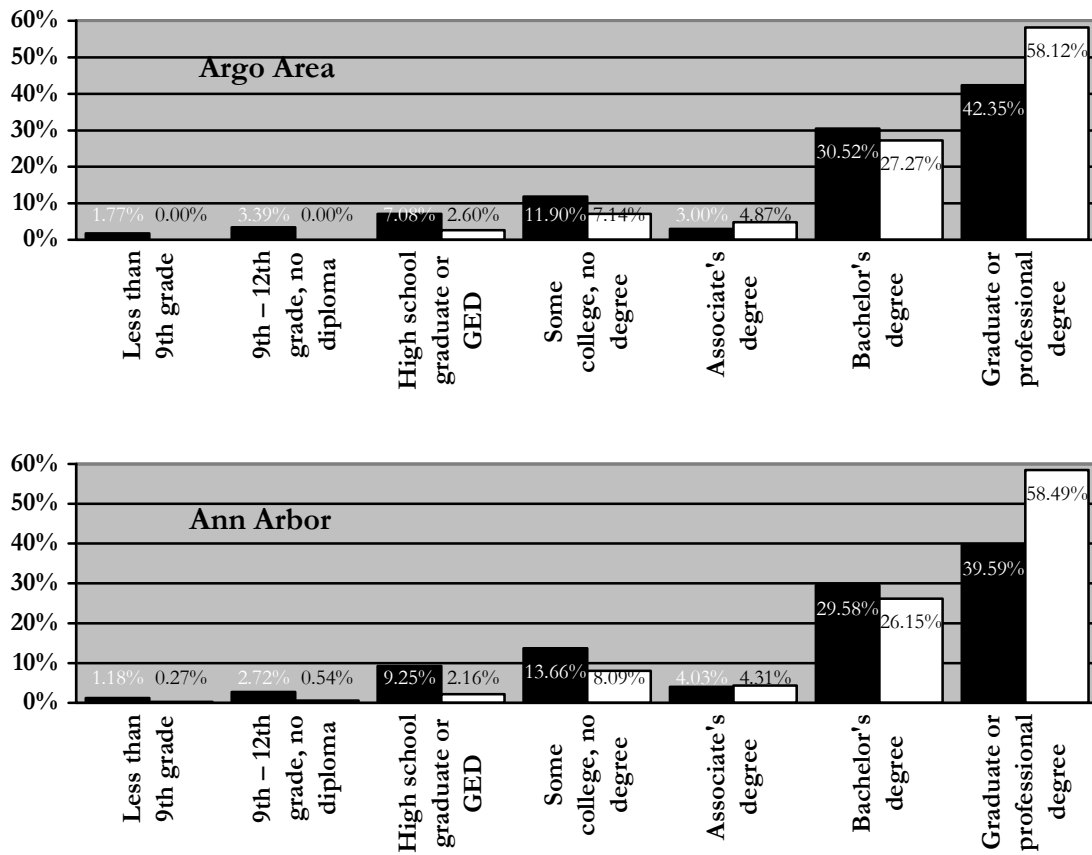


Figure 4-4. Educational attainment of respondents over age 25 compared with 2000 Census. Black bars represent Census data (U.S. Census Bureau 2004), white bars represent respondents' self-reported data (Argo Area: n=308, Ann Arbor: n=371).

samples, but it is much harder to rule out coverage and nonresponse errors. Incompleteness of the source lists probably produced bias, particularly for the Argo Area stratum. The pool from which our supplier drew the 1000 members of the Argo Area stratum contained approximately 13,000 individuals, and the pool from which our supplier drew the Ann Arbor stratum contained approximately 58,000 (Yarger 2003). These are approximately 47% and 85%, respectively, of the populations of those areas according to the 2000 Census (U.S. Census Bureau 2004). However, these percentages actually overestimate the representativeness of the source lists, which clearly included large numbers of individuals who had left the area, particularly in the Argo Area sample. The Argo Area sample posed challenges from the beginning: the vendor warned that students, especially younger students, would be underrepresented in our samples due to their transience and data collectors' tendency to ignore temporary addresses (Pontoni 2003). It is also likely that our respondents

were not perfectly representative of questionnaire recipients, due to some being returned by the US Postal Service; the length or content of the questionnaire may have also caused some recipients not to respond. Unfortunately, lack of demographic information from intermediate steps of the selection process makes it impossible to rule out bias due to either coverage error or nonresponse error, or to assign appropriate shares of bias to each.

Our respondent pool included individuals from a wide range of ages, incomes and educational levels. Although some groups were significantly underrepresented, the practical effect may be small. These same groups may also be less likely to use the Argo area, to have strong feelings about what happens to it, or to vote, in the event that the removal of Argo Dam becomes a citywide political issue.

ATTITUDES AND USAGE

Our survey instrument used a preference scale with values of “Strongly agree”, “Somewhat agree”, “Neutral”, “Somewhat disagree”, and “Strongly disagree”, coded as 1, 2, 3, 4 and 5 respectively. We calculated means from these data to determine the average sentiment of the respondents. Means statistically significantly less than 3 indicate agreement with the given statement, while means significantly greater than 3 illustrate disagreement with the given statement. A “Don’t know” option was also available, and was frequently chosen, particularly for issues involving a level of scientific perspective. Any respondents who selected “Don’t know” or who left the question blank were removed from the calculation of means, so as to determine an average value for citizens who expressed an opinion. The mode highlights the most frequently chosen answer. Survey information was analyzed separately for people living within a one-mile radius (the “Argo stratum”) and all others in the Ann Arbor area (the “Ann Arbor stratum”); see Ch. 3, Methods).

Significance values were calculated using the Mann-Whitney non-parametric rank sum test in the SPSS statistical package. The Mann-Whitney test was chosen because it is the most statistically powerful test available to analyze categorical (ranked) data that may not be normally distributed. Significance in this analysis is indicated by tests with p-values less than 0.05. Significant differences between calculated means and the value 3 were calculated using the 1-sample t-test in SPSS, again excluding blank and “Don’t know” responses.

Question 1: Parks and recreation in Ann Arbor in general

Of all items in the questionnaire, the statement that parkland and open space are valuable uses of tax dollars elicited the strongest agreement from respondents of both strata. Respondents also supported, progressively less strongly, wetlands, canoeing and kayaking opportunities, and rowing and sailing opportunities. They were essentially neutral on the need for better fishing opportunities (Table 4-3 and Appendix K).

While we found no statistically significant differences in the opinions expressed by residents of the two strata, a few responses differed significantly with respect to demographic characteristics. Notably, the question about the need for more rowing and sailing opportunities was more likely to elicit agreement (i.e., respondent chose “strongly agree” or “somewhat agree”) from people who rent their residences than people who own their residences, and from people with per capita household incomes less than \$35,000 than people with higher per capita household incomes.¹ Respondents with college degrees feel more strongly than respondents without college degrees that parks and open space are valuable uses of tax dollars, and that Ann Arbor needs more wetland areas.

Question 3: Familiarity with the Argo area

Question 3 assessed respondents’ familiarity with the Argo area and directed them to answer only the remaining portions of the questionnaire that they were qualified to complete. Not surprisingly, members of the Argo stratum indicated greater familiarity with the Argo area than members of the Ann Arbor stratum and were more likely to have been there in the past year. Nearly half of all respondents indicated that they had been to the Argo area within the previous year (Table 4-4); they were directed to complete all of the remaining questions. A third of respondents indicated that they had not been to the Argo area within the past year but had some familiarity with it; they were directed to skip question 4, which dealt with usage of the Argo area in the past year, and to answer all other questions. The remainder, nearly 20%, indicated no knowledge of the Argo area; they were directed to skip all of the remaining usage and attitudinal questions and proceed directly to the contingent valuation portion of the survey, question 8. Nearly all of the nonresponse to items in questions 4-7 is attributable to

¹Per capita household income was calculated from our dataset by adding the reported number of adults and children and dividing the reported household income by this sum.

Table 4-3. Opinions about parks and recreation in Ann Arbor in general. None of the differences in means between strata were significant (Mann-Whitney non-parametric rank-sum test, $\alpha = 0.05$). Means with crosses† do not differ significantly from the value 3, which corresponds with a “Neutral” opinion.

Statement	Means		Modes	
	Argo stratum	Ann Arbor stratum	Argo stratum	Ann Arbor stratum
I think Ann Arbor needs more open space and parkland.	2.1	2.2	Strongly agree	Somewhat agree
I think parkland and open space are valuable uses of tax dollars.	1.6	1.7	Strongly agree	Strongly agree
I think Ann Arbor needs more wetland areas.	2.4	2.5	Neutral	Neutral
I think Ann Arbor needs better fishing opportunities.	3.0†	2.9	Neutral	Neutral
I think Ann Arbor needs better canoeing and kayaking opportunities.	2.6	2.7	Neutral	Neutral
I think Ann Arbor needs more rowing and sailing opportunities.	2.7	2.7	Neutral	Neutral

Table 4-4. Familiarity with the Argo area. To determine percentages for the study area overall, results from each stratum were weighted to adjust for differences in population.

Statement	Argo stratum	Ann Arbor stratum	Overall (weighted)
I have visited Argo Pond and/or the parks around it within the past 12 months.	58%	37%	43%
I have visited Argo Pond and/or the parks around it, but not within the past 12 months	13%	22%	36%*
Respondents who are familiar with Argo Pond and/or the parks surrounding the pond, but have either never visited them or have not visited them within the past 12 months.*	3%	6%	
I have never visited Argo Pond or the parks around it, but I am aware of them.	11%	11%	
I have never visited Argo Pond or the parks around it, and I don't know anything about them.	15%	24%	22%

*This response category was not an option offered in the questionnaire, but was created during data cleaning to deal with a large number of nonresponses to this question (see Ch. 3, Methods, and Appendix H). Rather than create an artificial weighted average for this category alone, the three middle response categories have been combined into one weighted average (i.e., 36% of our study area residents are aware of the Argo site, but either have never been there or have been there but not within the last 12 months).

these respondents. We therefore concluded that nonresponse was not a reflection upon the content of particular items, and nonresponses were excluded from statistical analysis.

Questions 2 and 4: Participation in recreational activities

Questions 2 and 4 asked respondents about their participation in various recreational activities anywhere within an hour's drive of Ann Arbor (Question 2) and at the Argo site specifically (Question 4) within the last twelve months. For most of the activities we asked about, residents of the Argo stratum were slightly more likely to have participated and had participated more frequently (Table 4-5). This may be due to the lower average age and/or relative absence of family and other responsibilities among residents in the Argo stratum (see Table 4-2). This disparity was even greater when we focused only on recreation at the Argo site (Table 4-6).

Table 4-5. Participation in various recreational activities anywhere within an hour's drive of Ann Arbor.

Activity	% of respondents indicating participation		Mean number of "participations" per respondent	
	Argo stratum	Ann Arbor stratum	Argo stratum	Ann Arbor stratum
Walking, running, bicycling	92%	91%	114.0	90.6
Fishing	14%	13%	1.6	1.7
Canoeing, rafting, tubing	36%	29%	1.4	1.5
Kayaking	11%	6%	0.6	0.4
Crew, sculling, rowing	6%	3%	2.5	0.6
Photography, observing nature/wildlife	73%	72%	30.8	19.7
Socializing, picnicking	79%	77%	13.4	9.7
Cross-country skiing	17%	16%	1.2	0.7
Sledding, ice skating	32%	34%	2.3	3.5
Other	12%	10%	3.7	3.3

Table 4-6. Participation in various recreational activities at Argo Pond or the parks around it. Boldface indicates statistically significant differences between strata in the percentage of respondents indicating participation ($p < 0.05$, SPSS 2-independent sample t-test assuming equal variances, Levene's Test for Equality of Variances).

Activity	% of respondents indicating participation		Mean number of "participations" per respondent	
	Argo stratum	Ann Arbor stratum	Argo stratum	Ann Arbor stratum
Walking, running, bicycling	53%	32%	21.9	6.0
Fishing	6%	4%	0.5	0.2
Canoeing, rafting, tubing	23%	12%	0.7	0.5
Kayaking	6%	4%	0.4	0.3
Crew, sculling, rowing	4%	2%	2.3	0.6
Photography, observing nature/wildlife	38%	22%	8.3	2.9
Socializing, picnicking	30%	19%	2.1	1.0
Cross-country skiing	4%	2%	0.2	0.1
Sledding, ice skating	4%	1%	0.2	0.0
Other	3%	1%	0.7	0.1

Although as individuals Argo stratum residents are more likely to recreate in the Argo area than people who live farther away, when our survey data are weighted by population, due to the larger population of the Ann Arbor stratum, Argo residents account for only slightly more than half of the recreation that occurs at Argo by residents of our study area (Table 4-7). The proportions of Argo and Ann Arbor strata users vary by activity: the Argo stratum fraction is generally higher for those activities for which opportunities are relatively abundant (e.g., walking and sledding), and lower for activities with more demanding site requirements (e.g., kayaking and canoeing), perhaps because fewer suitable places to engage in a particular activity means that Argo will draw participants from a wider area.

Similarly, the Argo site is host to a greater percentage of recreational activity occurrences for those activities with specific site requirements (Table 4-8). We estimate that slightly under 11% of the incidents of recreational walking, running, and bicycling engaged in by residents of our study area were at Argo, but over 95% of the rowing incidents were. These data show that residents of our study area use few alternative sites for rowing within an hour's drive of Ann Arbor.

Table 4-7. Percentage of recreational activity occurrences at Argo attributable to residents of the Argo stratum, by activity. Data have been weighted to adjust for population differences between the two strata.

Activity	% attributable to Argo stratum
Walking, running, bicycling	60%
Fishing	47%
Canoeing, rafting, tubing	37%
Kayaking	37%
Crew, sculling, rowing	62%
Photography, observing nature/wildlife	54%
Socializing, picnicking	46%
Cross-country skiing	59%
Sledding, ice skating	75%
Other	85%
ALL ACTIVITIES	57%

Table 4-8. Recreational activity occurrences at Argo as a percentage of the total number of incidents of that activity by residents of the study area. Data have been weighted to adjust for population differences between the two strata.

Activity	% at Argo
Walking, running, bicycling	11%
Fishing	19%
Canoeing, rafting, tubing	36%
Kayaking	64%
Crew, sculling, rowing	95%
Photography, observing nature/wildlife	19%
Socializing, picnicking	12%
Cross-country skiing	13%
Sledding, ice skating	2%
Other	7%
ALL ACTIVITIES	13%

Many individuals who were sampled tend to use sites other than Argo for much of their recreation. This trend is particularly strong in the walk/bike/run recreation category, where individual annual maximum number of visits to other sites may reach 1000, whereas the individual annual maximum number of visits to Argo only reaches 365. The yearly total number of trips to other sites for canoeing was 1110, while at Argo it was only 426. This may be explained by qualitative differences in the types of canoeing that people like to perform.

Question 5: Attitudes toward Argo Pond

Of the items in this question, our survey population agrees most strongly that Argo Pond is attractive and a good place to canoe and kayak. They also agree that Argo Pond is important to themselves and other people in the area, that it increases property values for adjacent land, and that it has historical significance. Respondents agreed that water quality was good for canoeing and rowing; they were neutral on water quality for fish and wildlife, and felt that water quality was not good for swimming and wading. Respondents slightly agreed that Argo Pond is a good place to fish. Responses regarding whether or not Argo Pond should be returned to a free-flowing river were not significantly different from neutral, but respondents did disagree slightly that the plants growing in the pond decreased its value (see Appendix K).

For most questions regarding Argo Pond, the means of the opinions expressed by those of the Argo stratum do not vary significantly from those expressed by people in the Ann Arbor stratum (Table 4-9). There are two exceptions to this statement. The first exception is in the respondents' perception of the dam's importance to themselves, where both means indicate agreement with the statement, but respondents from the Argo stratum feel more strongly that Argo Pond is important to them. For this statement, the modes were equal between stratum, indicating stronger feelings and/or greater familiarity with the Argo area on the part of the respondents from the Argo stratum. The other exception is in the respondent's feelings about returning Argo Pond to a free-flowing river. In this case, the mean of the Argo stratum is not significantly different from neutral, but the mean of the Ann Arbor stratum indicates that there is slight agreement with the statement for those respondents.

As seen in the analysis of Question 1, significant differences in perception occur between various demographic groups. When asked if Argo Pond should be returned to a free-flowing river, renters and students, two groups that are strongly correlated, were more likely to agree. Negative opinions about water quality, fishing quality, and historical significance of Argo Pond were more likely to be expressed by college graduates. Households with per capita incomes less than \$35,000 were more likely to express positive views about fishing quality at Argo.

Table 4-9. Opinions about Argo Pond. Significantly different means are in boldface (Mann-Whitney non-parametric rank-sum test, alpha = 0.05). Means with crosses[†] do not differ significantly from the value 3, which corresponds with a “Neutral” opinion.

Statement	Means		Modes	
	Argo stratum	Ann Arbor stratum	Argo stratum	Ann Arbor stratum
I think Argo Pond is visually attractive.	2.1	2.1	Somewhat agree	Somewhat agree
I think Argo Pond has good water quality for fish and wildlife.	3.0 [†]	2.9 [†]	Don't know	Don't know
I think Argo Pond has good water quality for swimming and wading.	3.9	3.7	Don't know	Don't know
I think Argo Pond has good water quality for canoeing and rowing.	2.2	2.1	Somewhat agree	Somewhat agree
Argo Pond is important to me.	2.2	2.4	Strongly agree	Neutral
I think Argo Pond is important to most people in the area.	2.1	2.3	Somewhat agree	Somewhat agree
I think Argo Pond is a good place for canoeing and kayaking.	2.0	2.0	Somewhat agree	Somewhat agree
I think Argo Pond is a good place to fish.	2.9 [†]	2.7	Don't know	Don't know
I think Argo Pond should be returned to a free-flowing river.	3.0 [†]	2.8	Neutral	Don't know
The plants growing within Argo Pond decrease the pond's value to me.	3.2	3.1 [†]	Neutral	Neutral
I think Argo Pond increases property values in the area.	2.3	2.2	Somewhat agree	Don't know
I think Argo Pond is an important historical landmark.	2.7	2.5	Neutral	Neutral

Question 6: Attitudes toward Argo Dam

For eight of the eleven items in this section, “Don’t know” was the most common response (Table 4-10); for four items, over 40% of respondents chose “Don’t know” (see Appendix E). This suggests that many respondents feel they know little about the dam itself, at least compared to the pond and the parks nearby. Those respondents who expressed opinions generally felt neutral about Argo Dam’s maintenance, importance as a historical landmark, and impact on fishing quality in the Huron River. They were also neutral on the dam’s importance to most people in the area, but, interestingly, slightly disagreed that it was important to them personally. They agreed that the dam improves recreation on the Huron but felt that it

harmed the river ecosystem. For the statements directly addressing dam removal, respondents slightly disagreed that Argo Dam should be removed; when the question was asked differently, they slightly agreed that the dam should remain in place, although neither preference was statistically different from neutral (see Appendix K).

The mean opinions expressed by members of the Argo and Ann Arbor strata differed significantly only on the questions of the attractiveness of the dam and its historical value. Both strata felt that the dam was unattractive, but members of the Argo stratum felt that more strongly. Members of the Argo stratum disagreed that the dam was historically important, while members of the Ann Arbor stratum were essentially neutral on the question.

Table 4-10. Opinions about Argo Dam. Significantly different means are in boldface (Mann-Whitney non-parametric rank-sum test, $\alpha = 0.05$). Means with crosses[†] do not differ significantly from the value 3, which corresponds with a “Neutral” opinion.

Statement	Means		Modes	
	Argo stratum	Ann Arbor stratum	Argo stratum	Ann Arbor stratum
I think Argo Dam is visually attractive.	3.4	3.2	Somewhat disagree	Neutral
Argo Dam is important to me.	3.2	3.2	Neutral	Neutral
I think Argo Dam is important to most people in the area.	3.0 [†]	3.0 [†]	Don't know	Don't know
I think Argo Dam should be removed.	3.1 [†]	3.1 [†]	Don't know	Don't know
I think Argo Dam is good for fishing quality in the Huron River.	3.1 [†]	3.1 [†]	Don't know	Don't know
I think Argo Dam is a safety hazard.	3.3	3.3	Don't know	Don't know
I think Argo Dam is good for the health of the Huron River ecosystem.	3.4	3.4	Don't know	Don't know
I think Argo Dam is well maintained.	2.9 [†]	2.9 [†]	Don't know	Don't know
I think Argo Dam should remain in place.	2.9 [†]	2.9 [†]	Don't know	Neutral
I think Argo Dam improves recreation on the Huron River.	2.6	2.6	Somewhat agree	Don't know
I think Argo Dam is an important historical landmark.	3.2	3.0[†]	Neutral	Don't know

Significant differences in opinion were notable based on education level. Respondents with college degrees were less likely to agree that the dam is attractive, important to them, important to most other people in the area, good for fishing quality and the health of the Huron River ecosystem, or an important historical landmark. Renters were more likely than homeowners to agree that Argo Dam should be removed. Similarly, when asked if the dam should remain in place, respondents without college degrees were more likely to agree.

Question 7: Attitudes toward the parks around Argo Pond

Respondents have more positive feelings about the parks around the pond than they do about either the pond or the dam itself. They also appear to feel more competent to answer questions about the parks, as evidenced by far fewer “Don’t know” responses (See Appendix E). Respondents from both strata feel rather strongly that the parks around Argo Pond are attractive, are an asset to the community, and offer good recreational opportunities (Table 4-11). People in the Argo stratum felt these ways more strongly than members of the Ann Arbor stratum, to a statistically significant degree. This is likely attributable to their greater familiarity with and use of the parks (Tables 4-4 and 4-6, above). Respondents also agreed that the parks increase adjacent property values, and members of the Argo stratum slightly agreed that they would use the parks more if they were larger. Respondents tended to slightly disagree that the parks would be less valuable if the pond were replaced with a free-flowing river (see Appendix K).

Although respondents generally expressed strongly positive opinions about the parks around the pond, we did see some significant differences along demographic lines. When asked if the parks around the Pond provide good recreational opportunities, renters, students and households with per capita incomes less than \$35,000 were more likely to agree. Additionally, renters and students were both more likely to disagree that the value of the parks around Argo Pond would decrease if it were replaced with a narrower, faster river. Renters were more likely than homeowners to say they would use the parks around Argo Pond more if they were larger.

Table 4-11. Opinions about the parks around Argo Pond. Significantly different means are in boldface (Mann-Whitney non-parametric test, $\alpha = 0.05$). Means with crosses[†] do not differ significantly from the value 3, which corresponds with a “Neutral” opinion.

Statement	Means		Modes	
	Argo stratum	Ann Arbor stratum	Argo stratum	Ann Arbor stratum
I think the parks around Argo Pond are visually attractive	1.9	2.0	Somewhat agree	Somewhat agree
I think the parks around Argo Pond are an asset to the community	1.5	1.7	Strongly agree	Somewhat agree
I think the parks around Argo Pond offer good recreational opportunities	1.7	2.0	Somewhat agree	Somewhat agree
I think the nearby parks would be less valuable if Argo Pond were replaced with a narrower, faster river	3.2	3.2	Don't know	Don't know
I would use the parks around Argo Pond more if they were larger	2.8	2.9 [†]	Neutral	Neutral
I think the parks around Argo Pond increase property values in the area	1.8	1.9	Somewhat agree	Somewhat agree

Question 8: Referendum on removing Argo Dam

Two pages of text that provided background information on Argo Dam and Argo Pond and illustrated the tradeoffs inherent in removing the dam preceded this question. The question itself used a multipart structure to measure the economic value to respondents of either keeping or removing Argo Dam (see Fig. 4-5, below), and will be discussed in much greater detail in the following section. However, the first part essentially measured respondents' attitudes after they had read the information provided. When asked whether they would vote to remove Argo Dam at no cost to themselves, approximately 62% of respondents who answered the question voted “yes”, with little difference between strata (Table 4-12). Interestingly, approximately 60% of respondents did not take a position on earlier questions dealing with dam removal (see Question 6, above), but only 6.9% skipped this new question. Of those respondents taking a position for the first time here, over 61% chose dam removal (Table 4-13). Assuming that respondents completed the questionnaire in the intended order,

we believe that this increase in support for dam removal is largely due to an educational effect from the information that preceded the question. However, it is possible that the difference in formats and wording between the questions, and specifically the assurance that dam removal would not result in costs to respondents, also exerted an effect.

Table 4-12. Responses to referendum on removing Argo Dam.

Response	Argo stratum	Ann Arbor stratum	Overall (weighted)
Yes	63%	61%	62%
No	37%	39%	38%

Table 4-13: Responses to referendum on removing Argo Dam by respondents who had no opinion (Neutral, Don't know or did not answer) on dam removal items in Question 6.

	Response to referendum in Question 8		
	Yes	No	Did not answer
No opinion on "I think Argo Dam should be removed."	61%	30%	9%
No opinion on "I think Argo Dam should remain in place."	62%	30%	9%

Summary

After weighting our survey data to adjust for differences in population between strata, we estimated that 43% of the adult residents of the study area (approximately the city of Ann Arbor) visited the Argo area in the 12 months prior to the survey. In contrast, almost 22% have never been to the Argo area and are not familiar with it. Residents throughout our study area use Argo Pond or the parks around it; we estimate that people who live more than one mile from the pond account for nearly half of the recreational activity occurrences at the site.

The most popular activities at Argo were walking, running, and bicycling; 5% or fewer of the study area residents fished, kayaked, rowed, or skied there. However, over 64% of the kayaking and over 95% of the rowing done by adults in our study area was done at Argo, suggesting that Argo is a very important site for these activities.

Respondents generally were very supportive of parkland and open space. They felt more familiar with and favorable toward the parks around the pond than toward the pond and

particularly the dam itself. On average, about three-fifths of respondents either agreed or disagreed with statements about the parks around Argo Pond; the remainder indicated they were neutral, didn't know, or didn't answer the question. In contrast, on average only 44% and 35% of respondents expressed opinions about Argo Pond and Argo Dam, respectively. Of those who expressed opinions about the parks, 95% indicated favorable opinions (for those items where responses indicated clear favorable or unfavorable feelings). Seventy-three percent (73%) of respondents with opinions expressed favorable opinions of Argo Pond and were least favorable in regards to the pond's water quality. In contrast, a bare majority (51%) of those with opinions about the dam expressed unfavorable opinions.

About 60% of respondents initially had no preference on the question of dam removal. A small plurality disagreed that Argo Dam should be removed (21.9%, vs. 18.7% who agreed); when asked if the dam should remain in place, a small plurality agreed (22.5%, vs. 17.5% who disagreed). Respondents were later asked in a referendum format whether they supported dam removal if it would not cost them anything. This time, when given only "Yes" or "No" as response options, approximately 62% indicated they would vote to remove the dam. Much of this change is attributable to respondents who had neither agreed nor disagreed previously; when forced to choose, two-thirds of those respondents voted for dam removal. Possible reasons for this shift include their being forced to make a choice; alternatively, the text that preceded the referendum question, discussing the background of the dam and the tradeoffs inherent in dam removal, may have led people to move from uncertain to a decision.

ECONOMIC ANALYSIS

Study Design

Because some people value keeping Argo Dam while others prefer removing it, assessing the net benefits of alternatives for Argo requires measuring the values to the public of both keeping the dam and removing the dam. We employed the dichotomous choice contingent valuation method to gather values for both options, which enabled us to capture the preferences of respondents who believe dam removal increases their utility and respondents who believe dam removal decreases their utility. Dichotomous choice gives the respondents a single dollar value to which they can respond yes or no to paying. The survey results reflect that some respondents would pay for dam removal while others would pay to prevent dam

removal. Weights were determined from the percentages of respondents that indicated supporting dam removal or opposing dam removal at no added cost. We calculated the willingness to pay (WTP) of the respondents preferring to maintain Argo Dam and the WTP of the respondents preferring dam removal and restoration. We computed net willingness to pay for dam removal as a weighted difference between the WTP of those supporting removal and the WTP of those opposing removal.

In part A of question 8 (8A), respondents indicated whether they supported maintaining the dam or removing the dam at no cost to them (Fig. 4-5). If answered as we intended, the respondent would select “yes” or “no” and move to the next question in the appropriate column. Three logically consistent options exist for answering the second and third parts of Q8: “yes” responses to payments of one dollar (8B and 8C) and a randomly selected higher amount for either removal or maintenance of the dam (8D and 8E), a “yes” response to payment of one dollar for either option in 8B or 8C followed by a “no” response to payment of a higher amount for either option in 8D or 8E respectively, and a “no” response to payments of both one dollar (8B and 8C) and a randomly selected higher amount for either dam removal or maintenance (8D and 8E) (Fig. 4-6). Because 8B and 8C have different values than 8D and 8E, it is theoretically possible to develop a double bounded logit regression model to estimate the bounds of a respondent’s WTP more accurately than a single value logit model (Hanemann et al. 1991). A “yes” response to either 8B or 8C followed by a “no” response to 8D or 8E allows us to develop bounds, while two “yes” responses and two “no” responses help to raise lower bounds and lower upper bounds, respectively.

If the respondent answered question 8 improperly or the response given was inconsistent with the logical answers described above, we dropped the responses from the data set used for analysis.

Protest Votes

One dollar is too close to zero to have an effect on the WTP value calculated, so we instead used the one-dollar value in 8B and 8C to identify protest votes (i.e., the respondent rejects the premise of the question, paying additional taxes for either dam removal or dam maintenance) (Rosenberger and Walsh 1997; Moore 2004). Ten percent of respondents marked 8B or 8C as “no,” indicating that protest votes factor into some Ann Arbor residents’ decisions about additional taxes. We reviewed the written comments for these individuals; they expressed a number of reasons for marking “no,” such as wanting more information, feeling that Ann Arbor’s property taxes are already too high, lacking strong feeling for either option, believing that the status quo should remain with no added taxes, thinking that only park users should pay, finding that the phrasing of “at least \$1 per year” was too vague, and dissatisfaction with the survey itself.

Logistic Regression

The statistical analysis for parts A, D, and E of question 8 used binary logistic regression. Researchers use logistic regression when the dependent variable is limited or discrete rather than continuous as is assumed in ordinary least squares (OLS) regression (Kennedy 2003). Because the questions used here all have answers that are either “yes” or “no” responses, they are coded as “1” and “0” respectively. Logistic regression, or logit, is superior to OLS for equations with limited dependent variables because it eliminates the possibility of getting estimates that suggest a probability higher than one or less than zero.

Since our sample was stratified, we ran the risk of over-representing the Argo group and under-representing the Ann Arbor group in the regression model. To address this problem, we applied fractional weights before performing regression on those models that contained data from both strata. We calculated the weights by comparing the number of respondents to the question of interest to the populations reported in the 2000 Census for each stratum².

²The following weights were multiplied into the data by SPSS when performing the regressions: 8A used 0.6027 for the Argo stratum and 1.3642 for the Ann Arbor stratum, 8D used 0.6108 for the Argo stratum and 1.3478 for the Ann Arbor stratum, and 8E used 0.5955 for the Argo stratum and 1.3794 for the Ann Arbor stratum. For additional information refer to the Help menu of SPSS 11.5.

For the WTP analysis, we split the data sets into two groups: respondents who answered “yes” to 8A and respondents who answered “no” to 8A (Tables 4-14 and 4-15, respectively). 442 respondents indicated a preference for dam removal at no added cost, while 266 indicated a preference for maintaining the dam at no added cost. Both those supporting and opposing dam removal demonstrated price-responsiveness: that is, they agreed to pay less often as the proposed tax increased (Fig. 4-7). We performed a binary logistic regression for each of questions 8A, 8D, and 8E. We selected the most significant independent variables (Table 4-16) through a combination of likelihood ratio tests, correlation matrices, and collinearity tests. One could use the equations produced from the regressions to suggest voting patterns on these questions for Ann Arbor residents with varying characteristics.

Table 4-14. Number of responses at each bid amount for individuals supporting removal of Argo Dam (Question 8D).

Bid	\$25	\$50	\$70	\$90	\$120	\$150	\$250	\$350	\$450	\$600	\$800
Yes	25	20	17	15	16	14	8	6	4	4	0
No	31	27	31	27	22	39	33	36	40	23	7
%Yes	44.6	42.6	35.4	35.7	42.1	26.4	19.5	14.3	9.1	14.8	0.0

Table 4-15. Number of responses at each bid amount for individuals supporting maintaining Argo Dam (Question 8E).

Bid	\$25	\$50	\$75	\$90	\$120	\$150	\$250	\$350	\$450	\$600	\$800
Yes	9	8	12	11	6	8	5	3	2	2	2
No	21	21	20	24	20	16	24	27	24	11	5
%Yes	30	27.6	37.5	31.4	23.1	33.3	17.2	10.0	7.7	15.4	28.6

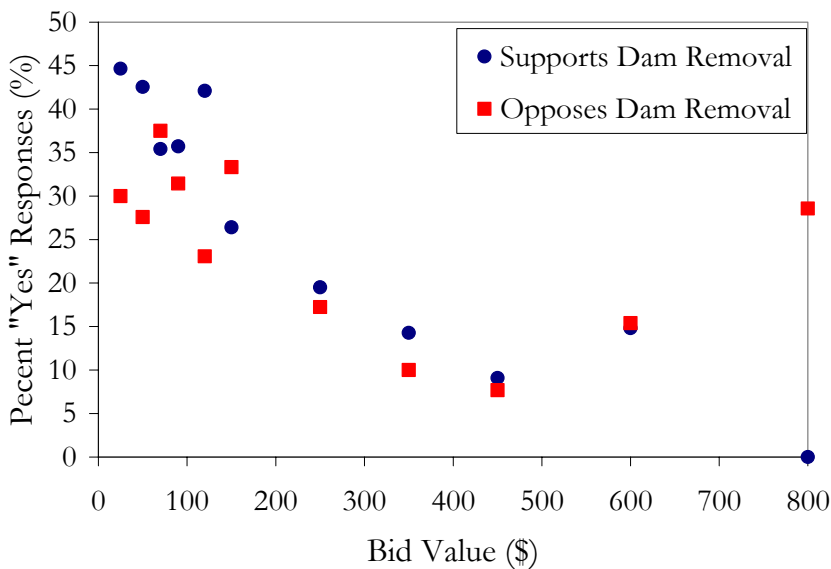


Figure 4-7. Scatter plot of responses to various bid values.

Table 4-16. Independent variables included in logistic regression for question 8A, 8D, and 8E.

Variable Name	Description	Coding*
Age	Age of respondents	2003 – (birth year)
Ownership	Whether respondent rents or owns residence	1=Own, 0 = Rent or Other
Familiarity	Respondent indicated in question 3 having visited the Argo area within the past 12 months	1 = visited in last year, 0 = know about Argo Area, but have not visited in past year, or no knowledge about Argo Area
Male	Respondent's self-reported gender	0 = Female, 1 = Male
Distance from Argo	Estimated distance of residence from Argo Area	Halfway point between numbers in categories provided in Q11
Protest	Whether or not the respondent answered no to paying at least \$1 in additional taxes in 8B/8C	0 = Not a protest vote, 1 = protest vote
Bid Value	The bid amount assigned in questions 8D and 8E	Actual bid value
Canoe or Kayak	Whether or not the individual participated in canoeing or kayaking in the past year.	1 = 2C or 2D is greater than 0; 0 = blank or zero in 2C and 2D
Rower	Whether or not the individual participated in rowing in the past year.	1 = 2E is greater than 0; 1 = blank or zero in 2E

*Discrete variables were coded within SPSS with dummy variables described in coding.

Because the survey gave each individual only a single dollar value, analysts should use a dichotomous choice model such as the logit model to estimate the probability one would pay different values (Loomis et al. 2000). If the probability that an individual will pay a certain dollar amount is fifty percent, then that person is equally likely to choose (that is, indifferent between) either paying the specified amount for the proposed alternative, or not getting the alternative but not paying. As a result, that dollar amount represents that individual's WTP, the maximum amount the individual would pay for the alternative.

The logit model uses this functional form for estimation (Hanemann 1984):

$$(1) \text{ Probability of "Yes"} = \frac{1}{1 + e^{\beta_n * X_n}};$$

where β_n is a vector of coefficients for each variable estimated from logistic regression and X_n is a matrix of the variables, including the bid value specified in questions 8D and 8E, used in the logistic regression. The independent variables were approximated or coded with a dummy

variable using the built-in SPSS function for categorical variables (Table 4-16, above). We used coefficients from the regression to estimate the maximum price that respondents will pay for the public good, either removing or keeping the dam.

To calculate mean WTP for dam removal supporters (WTP_Yes) and the mean WTP for dam maintenance supporters (WTP_No) from the coefficients of the regression, we used the formula (Hanemann 1989):

$$(2) \quad \text{Mean WTP} = \frac{1}{\beta_1} \ln(1 + e^C);$$

where β_1 is the coefficient on the bid value and C is the sum of the intercept and the products of the sample means of the other significant explanatory variables multiplied by their regression coefficients. Our sample is not entirely representative of the actual population, but we were unable to calculate population means for many of the significant independent variables (i.e. percent of rowers). For consistency, we chose to use weighted sample means to represent the populations.

To calculate the WTP_NET for the entire sample, we weighted the WTP_YES and WTP_NO values determined by the logit models, assigned a negative value to the pro-dam group's average WTP, and then aggregated the values. The weights, %WTP_YES and %WTP_NO, were based on the proportion of the populations in each group.

$$(3) \quad WTP_NET = \%WTP_YES*(WTP_YES) - \%WTP_NO*(WTP_NO).$$

One way to calculate average WTP that typically favors the status quo is to include non-responders as having a value of zero for WTP (Loomis et al. 2000). Since we designed our survey to capture values both for and against Argo Dam's removal, we were unable to include zero values for non-responders in the logistic regression. Instead, it was assumed that non-responders were indifferent to the future of the Argo Area and therefore formed an entirely separate group. In this case, including the percentage of non-responders (%NR) as having a WTP of zero (WTP_0) reduces the average WTP but will not change the sign (that is, whether average WTP favors dam removal or dam maintenance).

$$(4) WTP_NET = \%WTP_YES*(WTP_YES) - \%WTP_NO*(WTP_NO) + \%NR*(WTP_0)$$

Results

After eliminating logically inconsistent responses from the data set, the total number of responses to 8A was 713. Of those, 442 respondents voted “yes”, in favor of dam removal, and 271 voted “no”, against dam removal.

Logistic Regression Model for Question 8A

Question 8A asked whether or not the respondent supported dam removal at no added cost. Using regression enabled us to determine which types of people supported dam removal and which type opposed dam removal. The regression produced four highly significant variables (Table 4-17).

Table 4-17. Logistic regression model of probability choice made in 8A.

Variable	Coefficient (β)	Standard Error	T-statistic	Mean	Significance
Age	-0.035	0.006	30.675	44.446	3.05E-08
Home Ownership	0.595	0.204	8.509	0.675	0.003534
Rower	-1.040	0.429	5.874	0.037	0.015367
Protest Vote	-1.202	0.261	21.199	0.179	4.14E-06
Constant	1.840	0.260	50.135	1	1.44E-12

Dependent variable = the probability of saying yes to question 8A, Number of observations included in analysis = 701; -2 log-likelihood is 867.286, Chi-square is 64.023, degrees of freedom = 4, Cox and Snell $R^2 = 0.087$; Negelkerke $R^2 = 0.119$, overall significance of model is 4.132E-13.

Older respondents, rowers, and respondents who protested paying additional taxes for either outcome were more likely to vote in favor of keeping Argo Dam (No to 8A). Ann Arbor property holders were more likely to vote for dam removal (Yes to 8A). The overall significance of the model was high and the model was able to predict nearly 68 percent of the responses correctly (Table 4-18).

Table 4-18. Predictions of logistic regression model for question 8A. Logit models tend to over-predict the number of “1” answers and under-predict the number of “0” answers (Kennedy 2003).

Value observed in 8A	Value predicted for 8A		
	Opposes Dam Removal (0)	Supports Dam Removal (1)	Percent Correct
Opposes Dam Removal (0)	92	174	34.7
Supports Dam Removal (1)	51	384	88.3
Overall Percent			67.9

Logistic Regression for Pro Dam Removal WTP

The respondents who indicated that they supported dam removal in question 8A were directed to answer question 8D. The pro dam removal WTP logit regression model produced a highly significant negative coefficient on the bid value. This result indicates that respondents responded to price. Other significant variables were home ownership status, age, participation in canoeing or kayaking, gender, and self-reported distance from the Argo area (Table 4-19). Sample Mean (1) designates the means of each category for the entire survey, weighted to represent the proportions of populations from the 2000 U.S. Census. Sample Mean (2) assumes that people who support dam removal are different from those who oppose dam removal and represents the means for only the cases included in the relevant regression. For example, in the case of the pro dam removal logit model (8D), the sample means include cases from the 442 respondents who indicated that they supported dam removal by answering “yes” to 8A.

Table 4-19. Logistic regression model of probability choice made in 8D.

Variable	Coefficient (β)	Standard Error	Sample Mean (1)	Sample Mean (2)	Significance
Constant	-0.194	0.451	1	1	0.666
Home Ownership	-0.654	0.282	0.675	0.673	0.020
Age	0.020	0.010	44.446	41.743	0.039
Canoe or Kayak	0.525	0.246	0.334	0.367	0.032
Male	-0.470	0.237	0.569	0.567	0.048
Distance from Argo	-0.126	0.076	3.032	3.007	0.100
Bid Value	-0.004	0.001	-	-	6.622E-07

Dependent variable = the probability of saying yes to question 8D, Number of observations included in analysis = 414; -2 log-likelihood is 438.736, Chi-square is 50.96, degrees of freedom are 6, Cox and Snell $R^2 = 0.116$; Nagelkerke $R^2 = 0.167$, overall significance of model is 3.017E-9.

Home ownership has a negative coefficient indicating that individuals who are homeowners are less likely to be willing to pay additional taxes for dam removal. Results also indicate that females are less likely than males to be willing to pay additional taxes for dam removal. Respondents who live closer to the Argo Area are willing to pay more for dam removal. Their proximity results in increased direct utility; therefore they are likely to experience the perceived benefits more often. Age has a positive relationship with accepting the bid amount. In other words, the older an individual is, the more likely he or she is to accept paying the bid amount. Finally, respondents who canoe or kayak are more likely to answer “yes” to the bid amount specified. In the case of our respondents, canoeists and kayakers who prefer a free flowing river at Argo to a pond are willing to pay more for the changes involved. It should be noted that the canoeing and kayaking community appears to be split in their preference for the fate of Argo Dam (see Chapter 5, Stakeholder Analysis).

The overall significance of the pro dam removal model was high; it was able to predict over 75 percent of the responses correctly (Table 4-20). The model tended to predict that respondents would say “yes” to paying the given value more than they actually did.

Table 4-20. Predictions from the pro dam removal logistic regression model of probability choice made in 8D.

Value observed in 8D	Value predicted for 8D		
	Would not pay (0)	Would pay (1)	Percent Correct
Would not pay (0)	286	12	96.0
Would pay (1)	91	25	21.3
Overall Percent			75.1

Logistic Regression for Pro Dam Maintenance WTP

The pro dam maintenance WTP logit regression (8E) model also produced a highly significant negative coefficient on the bid value. Other significant variables were familiarity with the site, ownership status, and participation in rowing (Table 4-21).

Table 4-21. Logistic regression of probability choice made in 8E.

Variable	Coefficient (B)	Standard Error	Sample Mean (1)	Sample Mean (2)	Significance
Constant	-1.783	0.375	1	1	2.029E-6
Familiarity	1.075	0.315	0.430	0.416	0.001
Home Ownership	0.679	0.348	0.675	0.664	0.051
Rower	0.960	0.561	0.0369	0.058	0.087
Bid Value	-0.002	0.001	-	-	0.021

Dependent variable = the probability of saying yes to question 8E, Number of observations included in analysis = 260; -2 log-likelihood is 259.931, Chi-square is 29.303, Cox and Snell R^2 = 0.107; Nagelkerke R^2 = 0.159, overall significance of model is 2.0221E-5.

The familiarity variable is highly significant and has a positive and large coefficient. Selecting the first response option for question 3 implies a certain degree of familiarity with the Argo Area and signifies that the respondent is a recent user of the area. These traits increased respondents' support for the status quo. Home ownership has a positive relationship with price in the pro dam maintenance regression model. This contrasts the model produced in the pro dam removal model, which produced a negative price to home ownership relationship. As expected, respondents who participate in crew or rowing are more apt to pay to keep Argo Pond and Dam. Rowers are some of the Argo Dam's most ardent and vocal supporters, as they would lose their only practice space in Ann Arbor if the Dam were removed.

The overall significance of the pro dam maintenance model was high, and the model was able to predict over 75 percent of the responses correctly (Table 4-22). The model tended to predict that respondents would say "yes" to paying the given value more than they actually did.

Table 4-22. Predictions from the pro dam maintenance logistic regression model of probability choice made in 8E.

Value observed in 8E	Value predicted for 8E		
	Would not pay (0)	Would pay (1)	Percent Correct
Would not pay (0)	192	4	98.0
Would pay (1)	60	4	5.9
Overall Percent			75.5

This coefficient on the bid value for dam maintenance supporters was less significant than that for dam removal supporters, probably a result of the high percentage of "yes" responses at a bid of \$800. While only seven people who opposed dam removal received a bid value of \$800, two people agreed to pay the amount. The "yes" responses at \$800 represent possible outliers.

The possibility of outliers may have justified performing a regression that omitted respondents who received a bid value of \$800; however, examination of the individuals' incomes and comments indicated that they felt very strongly about keeping the dam. Removal of the \$800 bid value cases produced models that decreased the pro dam maintenance WTP, an effect that increases the net WTP in favor of dam removal. The two models produced from excluding \$800 bid values demonstrated more significant price response and similar significant independent variables.

Willingness to Pay Calculations

The model for the pro dam removal respondents (8D) generated a mean WTP of \$133.10 - \$136.37, while the model for the pro dam maintenance respondents (8E) generated a mean WTP of \$160.88 - \$161.24 (with the range representing the different sample means used in the calculation). The mean net WTP (using the weighting scheme described above) is \$19.88 - \$23.26 per person per year in favor of dam removal. The range of values exists we used two different sample means and both included and omitted non-responders in the calculation of mean WTP. Although individual WTP is higher for maintaining the dam, the larger number of people in favor of removing it leads to the weighted average in favor of removal.

Using Sample Means (2) resulted in a lower mean WTP for both those supporting removal and those opposing removal than the WTP values calculated with Sample Means (1) (Table 4-23). Calculations with both means produced the same general result, a higher mean WTP for those in favor of keeping the dam and a net mean WTP in favor of removing the dam.

Table 4-23. A summary of WTP generated from the 8D and 8E logit models. A positive NET WTP signifies a greater value for removing the dam as opposed to maintaining the dam.

Response	Number	Sample Mean (1) Mean WTP	Sample Mean (2) Mean WTP
YES	442	\$136.37	\$133.10
NO	271	\$161.24	\$160.88
NR	53	\$0.00	\$0.00
Total	766	-	-
NET WTP		\$21.65	\$19.88
Net WTP Including Non-Responders		\$23.26	\$21.36

Summary

After weighting to adjust for differences in population between strata, our results indicate that opponents of dam removal in our study area are willing to pay approximately \$161 per adult per year to keep the dam and pond in place. Supporters of dam removal are willing to pay less to see the dam removed, approximately \$135 per adult per year. However, supporters of dam removal outnumber opponents; therefore, on average, residents of our study area were willing to pay approximately \$22 per adult per year to remove the dam. With Ann Arbor's adult population of 95,700 (U.S. Census Bureau 2004), this amounts to a net willingness to pay for dam removal of \$2.1 million per year for our study area.

Chapter Five

POLITICAL ANALYSIS

The political analysis portion of this research explains how the decision to remove Argo Dam would be made and identifies the stakeholders that would be involved in the decision-making process. The chapter starts with a description of the City of Ann Arbor's government organization and the decision-making process; these provide the structure for further political analysis. Next, the stakeholder analysis presents the stakeholders in five separate groups: city, state, recreational, environmental, and other interests. There are several stakeholders within each of these groups. Each section describes the stakeholder group, its issues, motivations,³ challenges, and its resources⁴ and strategies. The chapter concludes with a discussion of two issues that are important to most or all of the stakeholders, balancing recreational interests and plant growth and sediment.

DECISION-MAKING CONTEXT

City Structure

Ann Arbor is a home rule city under Michigan's Home Rule Act and is funded primarily through property taxes. There are five wards within the city, each of which is represented by two council members. City Council elections take place each year, with half of the council elected in each election. Each member serves a two-year term. The mayor is elected at-large on a partisan ballot every two years. The city follows a hybrid of the Mayor/Council and Council/Manager forms of government: the Mayor presides over the City Council, while the City Administrator serves as the chief administrative officer of the City and carries out City Council policies. The Mayor has power of vote and veto and appoints city residents to the citizen boards and commissions with City Council approval. City Council is the only policy-making body in the City's government. City Council appoints some City staff, including the City Administrator, enacts ordinances, approves the budget, appropriates money, levies taxes, and passes other policies (City of Ann Arbor 2004a). Council members usually specialize in

³ A motivation or interest is something that causes a person or group to act.

⁴ The stakeholders use resources such as money, influence, and manpower to influence the decision-making process.

certain issue areas due to the volume of information about the city's operations (Johnson 2004a).

The City's administrative structure is in flux due to efforts from the current City Administrator to reorganize its agencies. At this point, the City's functions are divided into four main service groups: Safety Services, Public Services, Financial Services, and Community Services. Divisions relevant to this project within Community Services include Parks and Recreation Services and Master Planning Services; relevant departments within Public Services include Project Management and Water Treatment Services (City of Ann Arbor 2004e).

The City Administrator leads the City's staff and is hired by and responsible to the City Council. Each service group is headed by an administrator and has many staff members. They receive direction and guidance from a variety of sources, including the city administrator, citizen boards and commissions, the mayor, and City Council. Ann Arbor has 85 citizen boards, committees, commissions, and task forces, which deal with issues in the city ranging from taxicabs to natural features, economic development, and HIV/AIDS (Ann Arbor Democratic Party 2004). Even so, the City Council remains the final decision-making authority on most issues, especially when financial resources are in question.

City Finances

City Council considers the City's financial situation when making decisions that affect its monetary resources. In 2003, Ann Arbor homeowners paid 45.4418 mills in property taxes for city-, county-, and state-provided services ranging from schools and a community college to trash removal and parks acquisition. Each mill is equivalent to one dollar of tax per \$1000 of taxable home value, so the owner of a house with a taxable value of \$100,000 would pay \$4,544.18 in property taxes annually with the 2003 tax rate. Typically, the taxable value of the home is approximately half of its market value. Of the total millage, 16.9015 mills go to the City for services including general operations, employee benefits, refuse collection, Ann Arbor Transit Authority, street repairs, parks repair and restoration, parks rehabilitation and development, parks acquisition, and debt service (City of Ann Arbor 2004b). Nonhomestead property owners, primarily businesses, paid the same tax rate as homeowners to the City, 16.9015 mills, but paid 57.7879 mills in total property taxes when county and state taxes are included (City of Ann Arbor 2004c). Property taxes comprise over half of the City's revenues

each year. The City has a growing property tax base, but it is limited by state law in the actual amount of tax revenue the city can collect (Naud 2003b).

The City budgeted approximately \$82 million for its General Fund in fiscal year (FY) 2003/2004. In recent years the state has cut back on revenue sharing with local communities, resulting in a \$2,082,865 decrease in annual funds for Ann Arbor between 2002 and 2004. The City has already offered early retirement to its employees, causing more than 10 percent of them to retire. Budgeted full-time equivalent employees (FTEs) have decreased from a high of 1004.08 in FY 2000/2001 to 861.59 in FY 2003/2004 (City of Ann Arbor 2003b). Some budget problems are related to the economic downturn, but they are also linked to the City's past spending practices. Profitable operations, such as City of Ann Arbor Water Utilities, sent their past revenues to the General Fund to go to other departments instead of holding the profits for future capital investment, now needed, within that department. Fiscally, the city is very sound, with good credit and very little debt, but it is having difficulty creating a balanced budget for the coming fiscal year (Hart 2003).

Parks and Recreation Services has a staff of approximately seventy people and a budget of \$6.5 million for FY 2003/2004 (City of Ann Arbor 2003b). The City's General Fund provides for parks maintenance and operations. In addition, there are three dedicated millages for parks repair and restoration, parks rehabilitation and development, and parks acquisition. In FY 2003/2004 these millages were expected to amount to approximately \$3 million for capital improvements from the rehabilitation and development millage, \$2 million for the acquisition of parkland, and \$1.8 million for parks repair and restoration (City of Ann Arbor 2003b). A millage specifically for parks has never been defeated in Ann Arbor. In fact, they routinely pass with large majorities, showing that Ann Arbor residents value parkland and park amenities very highly and are willing to pay higher taxes for them (Kuras 2003a; Naud 2003a). Parks and Recreation Services also derives funding from state and federal grants and private donations and contributions (Parks Advisory Commission 2000; Naud 2003a). Due to recent cuts Parks and Recreation has gone from 84 FTEs in FY 2000/2001 to 71 FTEs in FY 2003/2004 (City of Ann Arbor 2003b).

If removing the dam results in additional parkland, there is no guarantee that funds to restore or maintain that land will be available. Currently, the City has more acres waiting to be

restored or developed into parkland than money to develop them. In fact, a newly acquired piece of property may sit unimproved for 10 years waiting for funds to become available (Kuras 2003a). A recent referendum renewed the parks acquisition millage for the next thirty years and authorized the City to use funds generated by the millage to purchase land outside of the city limits in neighboring townships for park land and natural areas. This millage renewal guarantees that City park land will increase but does not provide funds to manage the additional land (Miller 2003). Any additional parkland at Argo, therefore, may not see a great deal of restoration or capital improvements for many years unless outside funding is secured through grants, or the funds are allocated from the three parks millages. An improved economy could help the financial situation and possibly alleviate current staff shortages (Kuras 2003b).

Funds to remove the dam would not come from the Parks and Recreation budget, but would come from Water Utilities, which owns the dam and would be responsible for removing it (Kuras 2003b; Miller 2003). Water Utilities also pays current maintenance costs of the dam. The City must find funding for both dam removal and restoration because removal without restoration would likely lead to colonization of the new surface by aggressive weeds and exotic species. While the City does not have sufficient funds for dam removal, the amount needed for dam removal and river restoration is also too small an amount to require a vote for a millage or a bond (Naud 2003b). The availability of money from state, federal, or private sources for dam removal and river restoration is critical for removal to occur.

Decision-making Process

The decision-making process for a dam removal within Ann Arbor is not entirely clear. The City has never removed a dam; it would need to coordinate with state and federal agencies to make sure that the removal complies with state laws, such as the Natural Resources and Environmental Protection Act, and federal laws, including the Clean Water Act, Wetlands Preservation Act, and Endangered Species Act. In particular, the state would want to be sure that removal is done correctly and that there is not flooding when water is let out (Hanshue 2003; Naud 2003b). Currently, the City is waiting for movement by the public before it acts (Miller 2003).

Since the City owns the dam, City Council has the ultimate decision-making power as to whether or not it will be removed (Woods 2004). City Council would make its decision based on input from the citizen advisory councils, including the Parks Advisory Commission (PAC), Planning Commission, Environmental Commission, and possibly the Recreation Advisory Commission (RAC). Each commission would likely hold public meetings, in addition to the Council's hearings (Naud 2003b). There could be public hearings in Ward 1, where the dam is located, while Ann Arbor residents and interest groups concerned with the environment and recreation could provide additional input through council members, the PAC, and Parks and Recreation Services. The City may also provide information through water bills sent out by the Water Utilities Department or through the City web site. A task force including city staff, the public, and council members would be created to help decide whether or not to remove the dam (Johnson 2004a). As part of the decision-making process, there would likely be at least one presentation to City Council, perhaps by the HRWC since it is advocating for dam removal (Woods 2004).

As the agency responsible for the dam, Water Utilities would make a recommendation to the City Council, which would then vote on whether or not to remove it (Johnson 2004a). Water Utilities would be part of the initial discussion and its view would hold a lot of weight because the City Council has confidence in the department and its director, Sue McCormick (Woods 2004). Water Utilities may be concerned with sediment management within the pond, funding for removal, and any environmental assessments associated with it (Bahl 2004).

The City Chief Financial Officer, Jeff Stark, usually creates a question-and-answer document that outlines why a particular issue is being considered and the legal issues and the costs surrounding it. Proponents would need to know the financial situation and be sure of the costs and benefits before making a proposal to City agencies and the City Council. It would also be helpful for the City to know what funds would be available for the project, including any funding that can be expected from the state, federal, and private sources (Naud 2003b). The HRWC is very interested in helping the City find additional funding sources to help with removal. American Rivers and other groups could also become involved in the issue. Since it has experience in working with dam removals MDNR may also help find funding sources for removal and restoration, and if they are sufficiently interested in removing Argo Dam, they

may also help with attaining appropriations from the state government for those purposes (Hanshue 2004).

The Parks Advisory Commission (PAC) would also likely be involved with decision-making. Established in 1981, PAC is a citizen liaison board that advises the City Council and provides it with citizen input on recreation and environmental issues. PAC has nine members, eight of whom are appointed by the Mayor with approval from City Council; the ninth member represents the Recreation Advisory Commission. In addition, two City Council members serve as ex-officio members without a vote (Parks Advisory Commission 2000; Kuras 2003b; Miller 2003; Naud 2003a; Woods 2004). The actual involvement of PAC in the decision-making process regarding the removal of Argo Dam may proceed as was observed at the December 16, 2003 PAC meeting. PAC had previously made a recommendation to City Council regarding a proposed land acquisition; City Council considered it and referred a resolution to PAC. If PAC approved the resolution, it would be implemented. If PAC did not approve the resolution, it could make recommendations and add amendments, which would be referred back to City Council. City Council may either move forward with the original resolution or amend it to go back to PAC for approval (Parks Advisory Commission 2003). PAC will study the effect of its recommendations on parks staff especially if they do not have the personnel to carry out proposed projects (Woods 2004).

The staff believe that the City will also have to consider whether to remove part or all of the concrete structure and the earthen embankment, and keeping the gates open to restore flow instead of removing the whole dam (Kuras 2003b; Kuras 2003a). Broader discussions about management of the Huron River watershed may also be a part of this process, particularly due to the City's interest in becoming more involved in larger-scale watershed management (Miller 2003).

One of the challenges during the decision-making process will be providing a way for the public to envision what the area would look like without the dam. The City does not have the expertise to do modeling, so it would have to seek out outside assistance from sources that may include the HRWC, a UM SNRE master's project group, or paid consultants (Borneman 2003).

Depending on the length of the public input process, the decision-making process could take six months or longer. Additional time may be needed for grant applications and hiring consultants for any additional research that needs to be done. The issue of dam removal is made somewhat simpler since the City is the sole landowner along Argo Pond's shore. Had there been many private landowners along the shore, they would be another active stakeholder group to consider since their property would be directly affected by a dam removal, which would have further prolonged and complicated the process. If City Council decides to pursue dam removal, the City would be required to complete the Michigan Department of Environmental Quality (MDEQ)/US Army Corps of Engineers (USACE) Joint Permit Application before receiving the Dam Safety Permit required to remove the dam. The Geological Land Management Division within MDEQ would review the application and issue a permit if they approve the project (Michigan Department of Environmental Quality 2004b). The application is filed jointly with the MDEQ and the USACE so that the USACE can enforce applicable federal regulations such as the Clean Water Act. The application may also be subject to review by the US Environmental Protection Agency and the US Fish and Wildlife Service (Michigan Department of Environmental Quality 2004b).

The MDEQ is charged with regulating all dams in Michigan that are over six feet in height and with an impoundment over five acres. The agency would ensure that state and federal regulations are enforced in the decision-making process as well as during actual dam removal activities. Specifically, the Dam Safety Program within the MDEQ would be responsible for enforcing the Natural Resources and Environmental Protection Act, 1994, PA 451, as amended, to ensure that the dam is removed such that there is "no significant adverse impact on the public health, safety, welfare, property, natural resources, or public trust in those natural resources." (Environmental Science and Services Division 2004; Michigan Department of Environmental Quality 2004a).

An application for a permit to remove or abandon a dam must include the following:

- A site plan
- A description of the method to be employed in removing or abandoning the dam
- An evaluation of the capacity of the remaining structure to pass flood flows after the proposed work is completed.
- A description of the methods to be employed to control sediments during and after removing or abandoning the dam
- A project impact assessment (Environmental Science and Services Division 2004)

After the MDEQ receives the permit application, copies of it are sent for comment to the community in which the dam is located, adjacent riparian owners, and the appropriate watershed council (Environmental Science and Services Division 2004). The MDEQ would accept public input regarding the permit application during a 20 day public review and comment period and a public hearing hosted by the MDEQ (Great Lakes Fishery Trust 2004). The agency must issue the permit or deny the application within 120 days. After the dam is removed, MDEQ staff would inspect the site to determine whether the project was completed in accordance with the approved plans and specifications (Environmental Science and Services Division 2004).

As part of its preparation for the permit application, the City may choose to conduct a feasibility study to estimate costs and establish methods for successful removal, including sediment analysis and assessment of composition and amount of sediment likely to wash downstream in the removal process. This study would be completed in cooperation with engineers and contractors that would be involved with the removal. If necessary, the disposal of toxic sediment would add considerable expense to the project, and could make dam removal unfeasible. A controlled drawdown is one potential method of dealing with the sediment (Great Lakes Fishery Trust 2004).

The US Geological Survey (USGS) may be available to assist with this sediment analysis and other research. The agency is currently developing in-depth, scientific case studies on the effects of dam removals in Michigan; if removal of Argo Dam occurs in the near future, the USGS would be interested in conducting this research at Argo Pond. USGS will only conduct characterization studies, and does not make any management recommendations (Blumer

2003). Outside funding sources may be interested in funding this type of research at Argo Pond. Funding for the dam removal at Big Rapids, Michigan, included stipulations for the USGS to conduct research before, during and after dam removal to determine its effects on the area's physical and biological systems (City of Big Rapids 2004).

If Argo Dam is removed, Project Management would oversee actual removal of the dam and work with engineers, contractors, and consultants (Naud 2003b). After the dam is removed, City Council would work with Parks and Recreation Services and the PAC to decide how to allocate the exposed land. This process would also include public hearings (Johnson 2004a). The planning department within Parks and Recreation Services would make plans about active recreation versus natural areas. They would consider the type of land and its maintenance requirements before making use allocations (Miller 2003). Discussions about usage, restoration, and park linkages probably would not occur until better information on the removal of the dam is made available. The Argo area master plan, which includes the North Main Street area, would have to be revised also (Kuras 2003b). This process could take many years because the land may not be in a condition that allows restoration or improvements for some time, and the City would have to wait until funds are available to begin work on the land (Kuras 2003a; Johnson 2004a).

The City generally tries to increase park space and would likely use the land to expand the parks in the Argo area. It is unlikely that the land would be sold for development, especially if the removal were in response to environmental concerns. The land would probably not be converted to sport fields, but the final land allocation would depend on the City's needs and there is a great demand for soccer fields. Only certain types of improvements would be possible with the uncovered land since council members and other City staff believe it would still be susceptible to flooding and may lie in the 100-year floodplain (Woods 2004).

If the additional parkland were designated as a natural area, Natural Area Preservation (NAP) would take over with monitoring and/or managing vegetation and wildlife. NAP, an agency within the City of Ann Arbor, "works to protect Ann Arbor's natural areas and foster an environmental ethic among its citizens" (City of Ann Arbor 2004f). It is currently working on a wetland restoration project at Bandemer that would have to be reassessed in the event of a

dam removal in addition to any management changes at Argo. Dam removal would change the ecosystems managed by NAP, and it may change neighboring wetlands (Borneman 2003).

If any land is sold to a private entity, the Planning Commission will regulate its use (Hart 2003). The commissioners are appointed for 3 year terms by City Council, and the current commission favors the natural environment. The Planning Commission oversees the Planning Department's work. That department's objective is to focus on what is good for the whole city as opposed to specific wards. It makes recommendations to the Planning Commission on site plans proposed by landowners, and the commission approves or amends them. If the Planning Department creates a land use plan for a portion of Ann Arbor, the Planning Commission approves, amends, or makes different recommendations to the City Council. City Council then makes the final decision on how to act on the land use plans. (Kowalski 2003).

STAKEHOLDERS

Relevant City Actors

Only certain parts of the City government would have direct interests in this decision. These include the mayor and City Council, Parks and Recreation Services, Water Utilities, and the Planning Department.

Mayor and City Council

In making its decision, City Council will consider costs, environmental factors, aesthetics, recreational uses, and the desires of the public (Woods 2004). Due to the downturn in the economy and some financial difficulties, which are described below, cost would be a very important factor. The City may want to remove the dam, but there may not be enough money available for the project. If there is no immediacy to the issue, more urgent concerns would take precedence. Storm water issues are currently the highest priority within Water Utilities (Woods 2004). Despite the City's tight budget, recent capital investments in the Argo area (a boathouse, a walkway over the dam, and walkways on the shores of Argo Pond) are not considered to be so costly that they would strongly influence a decision on dam removal (Johnson 2004a). The walkways on the shores would still be viable with a free-flowing river

instead of a pond, even though they would be further from the water's edge. But, the new path over the dam would be eliminated and the boathouse would have limited usefulness.

In addition to the cost of the project, the City Council will try to judge who and how many people are affected. Recreation, environmental factors, and any effects on the river floodplain would also be considered (Naud 2003b). The City will conduct studies, examine the MDNR's Huron River Assessment (HRA), and get input from environmental groups, PAC, UM men's crew team, anglers, the HRWC, and other interested stakeholders (Woods 2004). The City Council must integrate the views of all interest groups, but it is difficult to tell how each will be weighed in the decision process (Johnson 2004a). The issue will be contentious because the rowing interests and the environmental interests are likely to be on opposing sides, and they are both influential groups.

The current mayor, John Hieftje, was elected in 2000 and re-elected to a second two-year term in 2002. He serves as an alternate HRWC board member and is very interested in improving local kayaking opportunities. He recognizes the environmental benefits of removing the dam and having moving water in the river and is interested in the potential for a whitewater park at the Argo site. Hieftje would want to know what would be necessary to make Argo a whitewater park. Currently, Delhi Metropark is the closest place for whitewater kayaking; a similar opportunity within Ann Arbor would be very convenient for its residents. Other benefits, from his perspective, include the additional land exposed and the elimination of the canoe portage (Hieftje 2004).

Despite these benefits, Mayor Hieftje believes that the dam will remain in place in the near future because of the need for alternatives for the rowing community. However, he also believes that there is room for compromise, and that another location may be found for rowing nearby. In his opinion Geddes Pond may be a feasible alternative site since it is primarily used now during the weekends and summer days, which is not the peak time for rowing use. Hieftje would welcome more information from the HRWC on the environmental aspects of the issue. From his perspective, an education campaign could address the environmental benefits and the total effect on the overall river so that City Council could make a scientifically sound decision. In making its decision, the Council will look for alternatives for

the rowers, clear environmental benefits, and a long-term cost-benefit advantage (Hieftje 2004).

The two members of the City Council who serve as ex-officio members of the PAC, Wendy Woods and Bob Johnson, would be particularly interested in any discussion of dam removal. Woods currently serves as a City Council member representing Ward 5. She is personally interested in increasing recreation area for both passive and active uses. Woods believes that the Huron River is an asset and a beautiful natural resource, and that public access and opportunities at the water's edge should be improved to allow the public to be closer to the river. In her opinion the river should be cleaner and have better habitat for flora and fauna. Woods would like to learn more about dam removal through the DNR's HRA report, research from Water Utilities on the impact of removal on flood control and the possibility of sewer backups, and a report from city departments on how removal would impact the river. A major disadvantage of removal from Woods' perspective is the cost, including staff, opportunity, and political costs if the public does not support dam removal (Woods 2004).

Bob Johnson has held a seat on the City Council for 3 years representing Ward 1, where Argo Dam is located. He has chosen to focus on environmental matters for the City Council in addition to service on the PAC. At this point he is not convinced that taking the dam out is in the best interest of the City. Johnson believes the status quo will remain for the next twenty years because of the expense related to removing the dam. The constituencies are balanced on either side and no tradeoff seems decisive enough to instigate change. The rowing community is large and vocal; he is not sure if removal would create a recreational benefit for as many or more people. Johnson feels that the rowing opportunity at Argo is a unique resource, the loss of which would not be balanced by the creation of extra parkland which replicates other uses already existing in the city (Johnson 2004a).

Although the free-flowing stream would have benefits, Johnson believes that the removal of Argo Dam would not make a difference in the environmental health of the region, since there are many other dams in the area. He does not expect the cost-benefit analysis to favor removal, as the annual maintenance costs are low, and major investment for maintenance occurs only every twenty years. He also feels that a riverside park would be very expensive because the exposed land would need restoration (Johnson 2004a).

Parks and Recreation Services

Parks and Recreation Services maintains 147 city parks, which include about 2000 acres of parkland (City of Ann Arbor 2003a; Kuras 2003a). The facilities in those parks include ice skating rinks, pools, ball fields, natural areas, boat launches, and trails (City of Ann Arbor 2003a). Three properties managed by Parks and Recreation Services (Argo Nature Area, Bandemer Park, and Longshore Park) are adjacent to Argo Pond and would be affected if Argo Dam is removed. As a result, this department will have input in any decision on whether or not to remove the dam and will be affected by that decision. If any action is taken, Parks and Recreation Services would seek to balance the interests of its canoe livery on Argo Pond, rowers, and environmentalists (Miller 2003).

Uncovered land would likely be administered by Parks and Recreation Services; it is expected that subsequent maintenance funds would come from the current parks maintenance millage. Meanwhile, that department already has a tight budget. Large parcels of land may be designated as natural areas, but since there is currently one FTE working in NAP, it may be difficult to greatly expand that program's work (Parks Advisory Commission 2003).

Parks and Recreation Services plans its parks to provide easy public access to parklands and park amenities and to maintain connectivity with other parks in Ann Arbor so that walkers, runners, bikers, and other users may easily access and utilize the parks system. Its work includes a concerted effort to complete a corridor of recreational open space from Barton Pond to Geddes Pond (Parks Advisory Commission 2000). The City hopes that interconnected parks will allow people to experience, appreciate, and learn about the Huron River. The department has recently created a path along the shore of Argo Pond as part of this effort (Kuras 2003a).

Dam removal may facilitate parks connectivity with additional land along the river making it easier for the City to develop more paths to connect the parks, improve access to them, and have larger, contiguous natural areas. However, the ability of pedestrians, cyclists, and others to cross the river is also an important feature of the Argo area's recreational value. Recently a project to create public access across the dam was completed, though it was scaled down considerably due to discussion of removing the dam. Dam removal would eliminate one of the few places where pedestrians may cross the river in that vicinity. In addition, the path

along the earthen millrace just east of the concrete dam structure provides access from the east side of Argo Pond to the dam and over the river to the Main Street area. Because of its importance to the community, dam removal would require the construction of a new bridge to provide a river crossing (Kuras 2003a).

The railroad owned by Norfolk-Southern on the west side of Argo Pond poses a challenge for access to parks on that side of the pond because the City must obtain a right-of-way from the track owner in order to create access across the railroad tracks (Miller 2003). Any rights-of-way across or access to the tracks creates liability for the track owner because it increases the risk of accidents with pedestrians or vehicles. Therefore, Norfolk-Southern is not eager to grant such access. Dam removal could result in the need for increased access across the railroad tracks to parks on the west side of Argo Pond. Norfolk-Southern may be more amenable to granting rights-of-way if the parks near the railroad tracks are larger and more heavily used. However, increased traffic across the railroad tracks may also create more conflicts with Norfolk-Southern.

Another concern for Parks and Recreation Services involves the possibility that planned improvements to the livery facilities at Argo Pond would no longer have value if the dam is removed. The utility of the livery after dam removal depends on the demand for canoe and kayak rentals in an area with free-flowing water as opposed to a pond and whether water levels would at times be too low to permit canoeing and kayaking, as is already occasionally the case on the section of river below Argo Dam. These two issues are difficult to estimate ahead of time given the mixed sentiment from the paddling community and the inability to predict water levels post-removal (Kuras 2003b; Miller 2003; Saam 2003). Some Parks and Recreation staff believe that people prefer canoeing or kayaking on a river instead of a pond, and that the Argo livery could see increased business with the removal of the dam. Also, the removal of the dam would allow the City to offer a trip from Argo Park to Gallup Park that does not require any portage around a dam (Saam 2004).

The Parks and Recreation Open Space (PROS) Plan, which delineates a plan for all of Ann Arbor's parks and open spaces for the near future, does not address the removal of Argo Dam. Since the Parks and Recreation staff do not expect Argo Dam to be removed in the next five to ten years, they have done no planning for removal at this time (Miller 2003).

Despite that, there is evidently some belief within the City that the dam eventually will be removed since plans for improving the area have already been scaled down in case the dam is removed and the improvements are rendered useless. When the idea of removing the dam was first suggested to the City, it was not well received and many City staff members opposed the removal. However, as the benefits such as increased park land have become evident, the City's staff has become more accepting of the idea (Naud 2003b).

Dam removal would strongly change the use of the river at Bandemer Park because it is primarily used by rowers. From Parks and Recreation Services' perspective, the rowing community is one of the larger constituencies to be considered since removal of the dam will result in their displacement. If the dam is removed the City would have to reach a new agreement with the rowers regarding the costs of the boathouse that the City recently built for them in Bandemer Park (Miller 2003). The structure itself has no heat or plumbing so its usefulness for purposes other than storage is limited. However, the City does own the land and there are no restrictions on the property that require continued rowing access at the site (Kuras 2003b).

Due to the level of protest likely to be mounted by the rowing community, the question of relocating the rowers must be discussed in conjunction with dam removal; however, there is no easy solution from the City's perspective. Parks and Recreation staff members believe it is premature to discuss relocating the rowers to Gallup Park at this point. Like Argo, Geddes Pond has problems with aquatic weeds (Miller 2003). Parks staff members also believe there is insufficient space for a boathouse at Gallup Park. Expansion of park land to accommodate a boathouse at Geddes Pond is unlikely because of the railroad along one bank and Concordia College across the river. The rowers may not be able to store their boats at Gallup Park and may have to drive them in every day for practice instead. Also, Gallup Park and Geddes Pond are very popular and host many activities. City staff members are concerned that moving rowing groups to Geddes Pond could cause overcrowding and conflicts with other users. If more users went to Argo, it might take some pressure off Gallup. Barton Pond, another alternative rowing location, is limited by insufficient public access to the pond. The Barton Boat Club, which is primarily for sailboat owners, will not grant access to the rowers. The other place to access the pond is Barton Shores Drive, which has wealthy residents who do not

want the rowers there (Kuras 2003a). If there were other viable alternatives in the area a decision on dam removal may be less contentious, but at this point, the City believes that Argo is the only option for rowing access (Kuras 2003a).

Before addressing excessive aquatic plant growth in Argo Pond that is discussed in Chapter 2, the City would assess the presence of Eurasian water milfoil. Since eutrophication is a natural and inevitable process in impoundments, the City will consider that it may not be worthwhile or appropriate to attempt to slow the spread of weeds. This issue of weed removal may become a broader community question as to whether the public wants a pond or a wetland (Miller 2003).

If the dam were removed, the result would include an increase in green space and a loss of open water. Some City staff believe that there is already enough green space, and that river space would offer more unique recreational opportunities (Miller 2003). Sometimes the availability of unique opportunities, such as rowing, draws people to live in a particular city. Also, people come from all over Southeast Michigan to engage in activities such as rowing, canoeing, and fishing, which shows that the opportunities at Argo are at least somewhat unique to the region (Saam 2003; Argo Project Team 2004; Taft and Woodman 2004). The City has an interest in maintaining or improving its status as a regional destination for these activities, so any plans for dam removal should provide for them.

Water Utilities

Argo Dam is operated and maintained by the Water Utilities department. The main responsibilities of that department are to provide drinking water and wastewater treatment for the city. Its priorities are focused around continued compliance with EPA regulations; ensuring that their equipment satisfies requirements and that any necessary repair, replacement or upgrade of equipment is performed; and fulfilling the city's drinking water needs through a variety of projects including laying water mains (Bahl 2004).

Argo Dam is a liability for Water Utilities since it requires maintenance and insurance and does not serve any purpose for them. However, the department wants to ensure that Argo Dam is safe and well maintained so that it will not fail. Many of the problems that the dam causes them are related to the security of the dam, ice on the pond and on the dam in the winter, the

bike path over the dam, and public access to the dam, including problems with graffiti and the possibility of people slipping and falling, especially in wet or icy conditions (Bahl 2003; Bahl 2004).

Planning Department

From the Planning Department's perspective, the question of Argo Dam's removal should be viewed from the standpoint of the entire watershed. The department does not believe that removing the dam would have much of an effect in that context (Hart 2003). Moreover, the department believes that removal would not occur for at least five to ten years, so it has no post-removal plans. However, if the dam were removed, the Planning Department may use the 1988 North Main Street/Huron River Corridor Land Use Policy Plan (see Appendix C) as a guide for allocating land use since it officially remains part of the City's master plan.

Land contamination resulting from a coal gasification plant which previously operated on the MichCon site just downstream of Argo Dam is of great concern to the Planning Department and the State of Michigan, which wants the land to be sealed. The removal of Argo Dam could change the flood plain, causing problems with flooding on the site and possibly washing contaminants into the river, although the exact effect is unknown at this time. The Planning Department would want to be sure that increased flooding is not a possibility at this site if Argo Dam is removed (Hart 2003).

City Resources and Strategies

The City Council is the ultimate decision-making body for whether to remove Argo Dam. The City's staff, including all the departments discussed above, serves as a resource for the decision-makers; information it provides to City Council will influence the final decision. The staff members control what information is provided and how it is framed, which makes it possible for them to sway the decision-makers. However, the City's staff members are currently split on the issue of dam removal, which will either make for very balanced information for the City Council or a confusing message to it from the staff.

Shortages in financial and staff resources create little incentive for the City's staff to support a resource intensive project such as dam removal and the creation of more parkland for them to manage. However, it is the responsibility of the City's staff and the City Council to fulfill the

needs and wants of city residents. All interested parties will have an opportunity to have their voices heard.

State of Michigan

Michigan Department of Natural Resources

The Michigan Department of Natural Resources (MDNR) is the Michigan state agency charged with the protection, conservation, and management of the natural resources of Michigan, including its forests, waterways, and wildlife (Michigan Department of Natural Resources 2004c). It is another key stakeholder, as it is a steward of water resources and fisheries in the Huron River. The MDNR regularly performs assessments of the state forests and rivers to quantify the economic value of the resources and evaluate their management techniques.

In 1995, the MDNR performed an assessment of the Huron River, which included information about Argo Pond and Dam and recommendations for the management of that site. The stated purpose of the Huron River Assessment (HRA) was to:

have an organized approach to identifying opportunities and solving problems of aquatic resources and fisheries values within the watershed, to provide a way for public involvement in fishery management decisions, and to provide an organized reference for Fisheries Division personnel, other agencies, and citizens who need information about a particular fishery resource. (Hay-Chmielewski et al. 1995)

The assessment is largely focused on the Huron River's, and therefore Argo Pond and Dam's, relationship to fish resources.

The MDNR states in its report that it is very interested in reviving a historically documented smallmouth bass fishery, since it believes there are ample opportunities to catch lake fish in the Ann Arbor area, but fewer opportunities to fish for larger river fish. At the Argo site, the MDNR feels that dam removal would “reduce water temperatures, reduce eutrophication at the site, allow for the passage of woody debris which is very important to the health and natural functions of rivers, increase dissolved oxygen levels, reconnect habitat, increase recreation and create a river corridor for important migratory birds that we are losing” (Hanshue 2003). Only six miles of the Huron's original 136 miles, or 4 percent, of high gradient sections remain unchannelized and unimpounded, so the motivation to reestablish

some of that habitat at Argo is high (Hay-Chmielewski et al. 1995). The MDNR also feels that removal would help to recreate a habitat structure in the Argo area that would be beneficial to fish and other wildlife and would increase the quality of the Huron River ecosystem in the Ann Arbor reach (Hay-Chmielewski et al. 1995).

A Michigan state law prohibits watercraft from creating a wake in Argo, Geddes, and Barton Ponds. In the past, the rowing clubs have received special event exemptions from the MDNR for their coaching vessels, although this exemption has not been continued because it was supposed to apply to one single event instead of the multiple practices throughout the year. The coaching vessels regularly operate in apparent violation of this law, but the MDNR has not pursued prosecuting violations (Riggs 2004a). This no-wake law may also have to be addressed if rowing is relocated to Geddes and/or Barton ponds.

Michigan Department of Environmental Quality

The MDEQ generally tries to remain neutral in dam removal decisions, but will ensure that regulatory requirements are met by any removal. However, the agency would still be concerned with environmental effects including the management of sediment, biological connections, water quality and water quantity. The MDEQ would also be concerned with social issues such as public access, fishing, and property ownership. To ensure the approval of an application for a permit to remove Argo Dam the City would have to be sure that the threat of flooding is not increased downstream, undesirable species are not introduced, any problems with sediment are resolved, and dam removal is designed and planned properly (Pawlowski 2004).

State Resources and Strategies

The MDNR has already used its resources to suggest that Argo Dam would be suitable for removal. Discussion of removing the dam would not be taking place today without their findings, demonstrating the agency's influence. Both the MDNR and MDEQ currently provide resources and information for the maintenance and removal of dams. However, as state agencies it may not be their role to advocate for a particular position; therefore the MDNR and MDEQ may only provide information and enforce regulations as opposed to actively supporting dam removal.

Although the MDNR may not have funding to aid in dam removal, it has the benefit of experience and information. Its involvement in several dam removal operations in Michigan has given it experience in both the administrative and ecological issues involved in removal. Specifically, the MDNR has experience in predicting the stream channel changes that occur with restoration, improving habitat in the floodplain, and enhancing recreational values at the site. This experience could be very useful for developing predictions on what the Argo area would look like after the dam is removed. If dam removal were to occur at Argo, the MDNR may also be able to “facilitate funding by describing ecological benefits of removal, provide expert help to the city, and describe the potential of the fishery” (Hanshue 2003).

Permitting may be simple if MDEQ and MDNR participate in the decision-making and design processes from an early stage so all relevant issues are brought into the process as soon as possible such that they can be addressed and resolved (Pawlowski 2004). Proceeding in this manner would inform the City of what is expected of them to successfully receive the permit.

Recreational Users

Many individuals and groups use Argo Pond and the surrounding parks to pursue a variety of recreational interests, including rowing, canoeing, kayaking, fishing, walking, and biking. They sometimes have conflicting interests and therefore have been discussed as separate user groups.

Rowing Interests

According to our survey results, 95 percent of the rowing activity in Ann Arbor is based at Argo Pond. The rowing community here is a well-organized group of several hundred rowers and their supporters, including four distinct organizations whose members represent a wide range of ages and socioeconomic backgrounds. These organizations are the University of Michigan men’s rowing team (UMRT), the Ann Arbor Rowing Club (AARC), the Huron High School crew team, and the Pioneer High School crew team. Members of the rowing community are committed to and invested in their sport; removal of Argo Dam would face strong opposition from this interest group.

Rowing officially began in Ann Arbor and at Argo Pond in 1976 with the founding of the UMRT. It was a co-ed program, made up of undergraduate and graduate students as well as

members of the community. From its inception UMRT accessed Argo Pond via property owned by Harry Hawkins on the west shore; this land is now part of Bandemer Park (Hartsuff 2003a). In the mid-1980s, the club began competing against other universities and colleges and became limited to undergraduate students to fulfill competition requirements. Others in the community who wanted to continue rowing formed the AARC (Hartsuff 2003b).

Throughout this formative period, Argo Pond was the center of crew activity in Ann Arbor, although the rowers did experiment with other sites. During the 1982-83 season, the UMRT used Barton Pond for practice, accessing the area through private property. It initially wanted to build a boathouse at Barton Pond, but the local residents objected to the noise and activity that came along with the rowers and succeeded in defeating the City Council proposal (Eshenroder 1984; Hartsuff 2003a; University of Michigan Men's Rowing Team 2004). At the time, "Council members agreed that the proposal was one of the tougher issues on which they've had to vote, and several praised the [UMRT] for its 'tenacity' in pursuing the plans for 13 months in the face of heavy opposition" (Eshenroder 1984). The UMRT returned to Argo Pond and built its boathouse on Hawkins' land in 1985 (Hartsuff 2003a). In 1993, Hawkins sold all of his property along Argo Pond to the City for use as parkland (Hawkins et al. 1993; Hartsuff 2003b). Because the City used funds from the Michigan Natural Resources Trust Fund to purchase the land, the land must be used for public outdoor recreation forever; however, the Trust Fund does not specify the type of recreation that must occur on the land⁵ (Michigan Department of Natural Resources 2004a).

The City allows the men's team to continue using the boathouse and charges the team an annual fee of \$250 for grounds upkeep. UMRT retains ownership of the boathouse and leases the site from the City. The other rowing groups continued to use the UMRT boathouse until 1996. That year, the UMRT formally split into separate women's and men's teams. Women's crew became a varsity sport at UM, its funding greatly increased, and the team moved its activities to Belleville Lake in Belleville Township (University of Michigan Men's Rowing Team 2004).

⁵ Several of the rowers mentioned a clause in the deed between Hawkins and the City that would require the City to continue to support rowing at the Argo site (Hartsuff 2003b); however, the deed does not appear to contain such a clause.

During the 2003-2004 season, the UM men's crew team had almost seventy team members, two paid coaches, and two to five volunteer coaches (Hartsuff 2003b; University of Michigan Men's Rowing Team 2004). Gregg Hartsuff serves as the full-time head coach of the team and has worked with the team since 1992 (Hartsuff 2003a). Dues are \$1400 per athlete per year; the team holds several fundraisers to help members pay their dues. The budget for the 2003-2004 season was \$140,000, of which the University provided \$8,000, which is significantly less than the \$1 million the women's team receives from the University (Hartsuff 2004b). The club varsity men's team practices at Argo Pond for about 2.5 hours per day, six days a week, during the season and holds races at Ford or Belleville Lakes because Argo Pond is not long enough for races.

The Michigan Rowing Association (MRA) is composed primarily of alumni of the UM men's team who have stayed in Ann Arbor after graduation. MRA members are allowed to use the UM Men's boathouse. Some are also members of the AARC. This group has several key responsibilities, including negotiating with the City (especially regarding use of the park and lease of the boathouse), handling employment of the coaches, and leading fundraising efforts (Hartsuff 2003a).

The AARC and the Huron High School crew team, which formed in 1992, used the UMRT boathouse until the mid-1990s. During this time, Argo Pond became more congested as the numbers of rowers increased. In 1996, with competition for space and resources at the Argo site and a growing program, the UMRT began to restrict other groups' access to its boathouse. By 1999, all of the AARC's equipment and more than half of Huron's had to be stored outside on trailers. The equipment suffered from vandalism and weather damage. These two groups lobbied the City to build a second boathouse to address these concerns and to accommodate the increasing number of rowers at the site (Huron Rowing Team and Ann Arbor Rowing Club 1999; Dove 2003). The UMRT was agreeable to the idea of an additional storage building but was concerned about the increasing numbers of rowers attempting to use Argo. It felt that a study on the maximum capacity for Argo was necessary before building any additional structures and that the AARC was disregarding its concerns (Hartsuff 1999; Sullivan 2000). With the help of the City, the rowing organizations worked out a compromise solution;

after more than five years of fundraising and negotiations, the City and AARC built the additional boathouse (Department of Parks and Recreation 2000; Dove 2003).

The AARC opened the Beal Community Boathouse in 2002; it serves the two high schools as well as AARC. The City owns the building and paid \$70,000 to construct it (Olson 2000; Dove 2003), while the AARC organized the construction (Taft and Woodman 2003). The AARC has a fifteen-year lease for the boathouse from the City, with a rental fee of \$350 per month, with the ultimate goal of repaying the City for the construction costs. The AARC also pays to insure the boathouse (Taft and Woodman 2004) and rents space to the high school teams to store equipment (Dove 2003). If the dam is removed, it is unclear how these construction costs would be covered and how the space would be used as it has no heat or water utilities. The groups are reportedly already outgrowing the existing boathouses as local interest in rowing has increased (Dove 2003; Taft and Woodman 2003).

The AARC continues to provide opportunities for community members to row. It has sixty to eighty active members who typically row two hours per day during the spring, summer, and fall, and twenty to twenty-five single scullers, who store their boats at the boathouse and row on their own schedules (Hartsuff 2003a). Members represent a wide variety of professions, ages, and experience levels. They utilize used equipment to keep costs down but still own several hundred thousand dollars' worth of equipment, emphasizing the heavy investment that the rowers have made in their sport (Taft and Woodman 2003; Taft and Woodman 2004). The AARC caters to a variety of experience and commitment levels, with two competitive groups, an adult learn-to-row program, a youth learn-to-row program, a youth development program (targeted at high school team members), a junior competitive program, and a learn-to-scull program (Taft and Woodman 2003). The AARC conducts ten learn-to-row sessions every summer for adults, with about 120 participants annually, and additional classes for youth (Taft and Woodman 2004). They employ twenty to twenty-two part-time coaches between April and November, each of whom works six days a week, supervising one of the daily practices (Taft and Woodman 2003; Taft and Woodman 2004).

In 1998, Pioneer High School started a crew program, joining the Huron team at Argo and sharing the AARC boathouse. Both high schools currently have rowing programs and use Argo Pond to practice during the spring and fall. Each of the high school programs involves

sixty to eighty students who practice for 1.5 hours per day for six days per week during the season, which runs during the spring and summer (Hartsuff 2003a). Each of these rowing programs is the largest coed team at its school (Taft and Woodman 2004). Organizers of the Pioneer team have discussed increasing the program to 100 students but currently limit the number of members because of the size limitations of the pond and boathouse (Dove 2003). Each school has a well-organized group of parents, called the Board of Trustees at Pioneer and the Huron Rowing Association at Huron, which helps manage the team and its finances.

The Pioneer High School crew team became a varsity sport in 2003. Mike Dove has been the head coach since the team's formation in 1998 and previously served as the head coach for the Huron High School crew team (Hartsuff 2004b). The Board of Trustees, primarily parents of current rowers, owns the rowing equipment and rents space for it. The team has an annual budget of about \$36,000. Student athletes pay an annual fee of \$400 to \$500 to row, half of which individuals can pay through fundraising; athletes and their families are investing not only time but also money into the sport (Dove 2003).

The Huron High School team has a similar structure to that of Pioneer but has been a varsity sport longer (Dove 2003). Huron is exploring hiring two more rowing coaches, one of whom would focus exclusively on the ninth grade program (Ann Arbor Rowing Club 2004).

Relations among the various rowing organizations in Ann Arbor have improved greatly over the last five years due to changes in leadership, the addition of storage space in the AARC boathouse, and decreased reliance upon UMRT's equipment (Hartsuff 2003b). The various entities that make up the rowing community in Ann Arbor meet about eight times per year under the auspices of the Organization for Ann Arbor Rowing (OAAR) to discuss issues that affect all of the clubs. These include scheduling, fundraising, long-term planning, and improving communication between the groups and with the City (Hartsuff 2003b).

Rowing involves a considerable investment at both the individual and the group levels. A good rowing shell can cost from \$5,000 (for a 1-person boat) to \$25,000 (for an 8-person boat). Boats and motors for coaches, oars, trailers and vehicles to tow them also represent significant investments. The City of Ann Arbor has invested in rowing as well, in the form of the boathouse and maintaining road access (Dove 2003).

In total, about 400 to 500 people are currently involved in the rowing community in Ann Arbor and use Argo Pond to practice (Hartsuff 2003a). In addition to the above mentioned groups, several single scullers (one person controls two oars; in rowing, one person controls one oar) also use the pond and rent boathouse space but are not otherwise associated with any particular group (Hartsuff 2003b). These individuals may become involved in a wider effort to oppose dam removal, perhaps through the organization whose boathouse they use or under OAAR.

The UM women's rowing team may also become more involved at Argo in the future. During the fall of 2003, the women's team used Argo Pond during the afternoons for its novice team to practice, to alleviate time and transportation constraints. Previously, it had used Belleville Lake, as it had better facilities and was less crowded with other rowers. The women's team may use the Pond for future fall seasons and have not yet made a decision regarding the 2004 season (Ann Arbor Rowing Club 2003f; Rothstein 2004).

Argo Pond continues to be the practice location for most of the City's rowers and has several characteristics that make it the best place to row in Ann Arbor, given the current political and environmental conditions. Argo Pond is a relatively long, flat body of water that allows several boats to be on the water at the same time (within the traffic patterns created by OAAR). There is a history of rowing at the site spanning the last three decades. Rowers are accustomed to coming to Argo to practice and people are used to seeing them there. All of the rowing facilities in Ann Arbor are located at the Argo site. With two boathouses to store equipment, free (albeit limited) parking, a dock, and other facilities right at the water's edge, Argo serves as the hub for rowing in Ann Arbor. Rowers of different ages and from different organizations all meet in the same location to pursue their interest in rowing. Historically, the City has funneled rowing towards the Pond and has not wanted it to spread to other places in Ann Arbor (Taft and Woodman 2004). Finally, the site's location within the City is convenient for rowers; many high school and college students are currently able to transport themselves to and from practice, either by vehicle or on foot (Taft and Woodman 2004).

The rowing community provides some basic maintenance of the Pond to keep it in rowable condition. During the spring, the groups remove floating debris brought downstream by spring floods and snow melt. This debris, if left in the water, could puncture their boats

(Hartsuff 2003a). They also maintain a dock to access the water (Dove 2003). The rowing community provides trash pickup and portable restrooms on site (Taft and Woodman 2003). They also monitor aquatic vegetation growth and recently began to cut the plants growing in Argo to ensure that boats can continue to pass. The City is apparently unaware of the mowing activities and therefore does not consider it when managing Argo Pond. The City does not provide much maintenance for the site, only occasional road maintenance, landscaping, and waste removal (Hartsuff 2003a).

Motives

The primary concern of the rowers is that there remains a local place for all of the organizations to practice, one that has the proper facilities and City and community support. They see Argo Pond as the best place to do this sport because of its history, their investment in the current site, and its location within the City of Ann Arbor. They consider it the best option for rowing in Ann Arbor and, if any changes are made, are interested in expanding their rowing options in the City. AARC in particular feels that it would lose the ability to row in Ann Arbor if the dam is removed, and that the City has pushed rowers towards Argo and away from other impoundments in the past (Taft and Woodman 2004). John Van Bolt, President of the Huron Rowing Association, echoed the comments of others with his description of the issue:

Argo Pond is a valuable and irreplaceable recreational asset in Washtenaw County and the Huron Rowing Association strongly supports its continued use...elimination of the Pond would eliminate the current site for recreational and competitive rowing in [Ann Arbor]. Indeed, Argo Pond is home to the only high school rowing programs between Wyandotte and Grand Rapids (Van Bolt 2003).

Others discussed the tradeoffs related to removal. A few agreed with the general principle of dam removal but disagreed with the choice of Argo Dam, such as this survey respondent:

I am torn. While from the alternatives described [see Appendix E] it seems the health of the river would be improved by the dam's removal. However, my daughter began high school crew this year and it is such a valuable part of her life and our family's that I would want to preserve Argo Pond.

For the paid staff, rowing is not just a recreational interest; it is a profession. As an example, for Hartsuff, removing Argo Dam would mean losing his primary source of income. He is also confused about the role of the HRWC in the removal effort. He generally supports the

HRWC's efforts to promote clean water and other objectives, but "now it seems like their main goal will cost me my life" (Hartsuff 2003a). These economic issues further emphasize the importance of finding an alternative rowing location for dam removal to occur.

We also received survey comments and emails from individuals with identified connections to the rowing community, either as current or former rowers, parents of rowers, or members of supporting organizations. These individuals enjoy watching the rowers practice on the pond, want to ensure that rowing continues to be available for Ann Arbor residents, or have other, less direct connections to the rowers. Many of these individuals indicated their support for the rowing community and their opposition to the removal of Argo Dam. Many non-rowing members of the public would only support dam removal if the City provided an alternative practice space to the rowers (see Appendix I).

Plant Growth

Despite its many advantages, Argo Pond presents several challenges for rowing, the most immediate being plant growth in the pond, as discussed in Chapter 2. The plants become a problem in mid-July and persist through the end of the summer (Dove 2003; Hartsuff 2003a). The high schools do not row as much in the summer and are not as affected by the weeds, but they realize that the expanding plant growth will begin to more severely affect their programs in the next few years (Dove 2003). In 2003, OAAR purchased a pond mower to clear aquatic plants from the path used by the rowers (Hartsuff 2003b). All of the rowing organizations that use Argo Pond contributed funds towards the \$2000 purchase price. (Ann Arbor Rowing Club 2003c; Hartsuff 2003a). The pond mower effectively reduces weeds for a short time and creates a clear surface path for the rowers; without it rowing would be nearly impossible in the late summer (Ann Arbor Rowing Club 2003b; Hartsuff 2003b). However, the rowing organizations realize that the pond mower is a short-term solution and that they need a long-term resolution to the issue (Taft and Woodman 2004). Neither OAAR nor any individual group discussed the pond mower with the City before or after the purchase or use of it (Hartsuff 2003b). Dove acknowledges that the public may not necessarily like the idea of the pond mower, but, as of this writing, no one has raised concern over it, perhaps due to lack of knowledge of its use (Dove 2003).

OAAR is exploring other options to deal with the aquatic plants problem (Taft and Woodman 2004), continuing discussions that began six years ago when the plant growth issues at Argo first became apparent (Hartsuff 2004b). Some believe herbicides would be the easiest and least expensive solution. In 2003, OAAR explored chemical options, focusing on herbicides that would not affect fish. It received an estimate of \$3000 to clear the weeds from interfering with the rowing path for the rowing season; it is still researching this option (Ann Arbor Rowing Club 2003e). It expects resistance to this solution from some in the City who would be concerned with ecosystem integrity both at Argo and further downstream (Hartsuff 2003b; Hartsuff 2004b). OAAR has also explored the use of a tarpaulin to block sunlight to the plants or a harvester to cut and collect the plants, and the large tarpaulin appears to be the most appealing solution at this time from the rowers' standpoint (Hartsuff 2004b).

Sedimentation

Sedimentation is a more long-term problem affecting rowing at Argo Pond. As rowing requires only a few feet of water, the gradual filling in of the pond has not yet affected practices (Hartsuff 2003a; Taft and Woodman 2003), although it has increased plant growth. The rowers have noticed the change in depth. Hartsuff estimated that, in the early 1990s, the water was ten to eleven feet deep near the dam; now it is about six to seven feet deep (Hartsuff 2003a). Dredging is the most commonly discussed solution to the sedimentation problem, although the rowers have not fully explored the potential costs of dredging Argo Pond (Ann Arbor Rowing Club 2003b; Hartsuff 2003b; Taft and Woodman 2003). AARC has interpreted the lack of sediment contamination from the 2002 Barr Engineering sediment study to mean that it would be relatively easy to dredge the pond (Taft and Woodman 2003), but would require City and state approval. According to the HRWC, it would be difficult to get approval for dredging for recreational purposes at Argo Pond (Riggs 2004b). Hartsuff would prefer to see dredging as the solution to the sedimentation and weed problem, instead of removing the dam or using chemicals in the water. He states that dredging is a relatively common solution for the sedimentation and weed problem for rowing communities across the country. Although he is unsure about the costs of dredging, he thinks the expense is likely too high for the resources of the rowing community (Hartsuff 2003a).

Size of Argo Pond

There are a few minor issues with Argo Pond related to its size. It is small and gets crowded; although it is useful for practicing, the pond is not long enough to hold a race or regatta. A typical race requires about 2000 meters of straight water and while Argo Pond has about 3500 meters available for training, it does not have a long enough straight stretch to allow for a race (Hartsuff 2004a). The boats cannot row side by side in some sections of the water because the pond is too narrow (Michigan Rowing Association 1983). Currently, on a typical day, there are twelve to sixteen boats on the water at peak usage times, causing some traffic problems (Dove 2003).

Neighbor Complaints

The neighbors in the surrounding area have made a few complaints to the City about the noise and traffic that rowing brings to the area (Ann Arbor Rowing Club 2003b). The rowers are not supposed to start practice until 6 AM to help alleviate some of these problems, but rowing can be a loud sport, with the coaches using a bullhorn to communicate with the rowers. Rowing also brings large numbers of people to the pond, making it less appealing for more passive forms of recreation.

Alternatives to Argo Pond

Because of these challenges of plant growth, sedimentation, traffic, and potential dam removal, the rowers have explored alternatives to Argo Pond in the past and continue to do so. If the City decides to remove Argo Dam, it will likely help the rowers find an alternative site to row to appease both the rowers and the public (Hieftje 2004). Already, some in the rowing community have argued that rowing needs to be spread among numerous sites because there are so many people rowing at Argo. They have explored options in the past and have not found any feasible alternatives (Taft and Woodman 2004). In order for any site to be feasible, it would need a straight, still path of water that is of reasonable length, ideally 2000 m so that regattas could be held at the site. It must also have room to build a boathouse, a dock, and parking for participants and trailers (Taft and Woodman 2004). The two most commonly discussed alternatives are Geddes Pond and Barton Pond (Fig. 5-1).

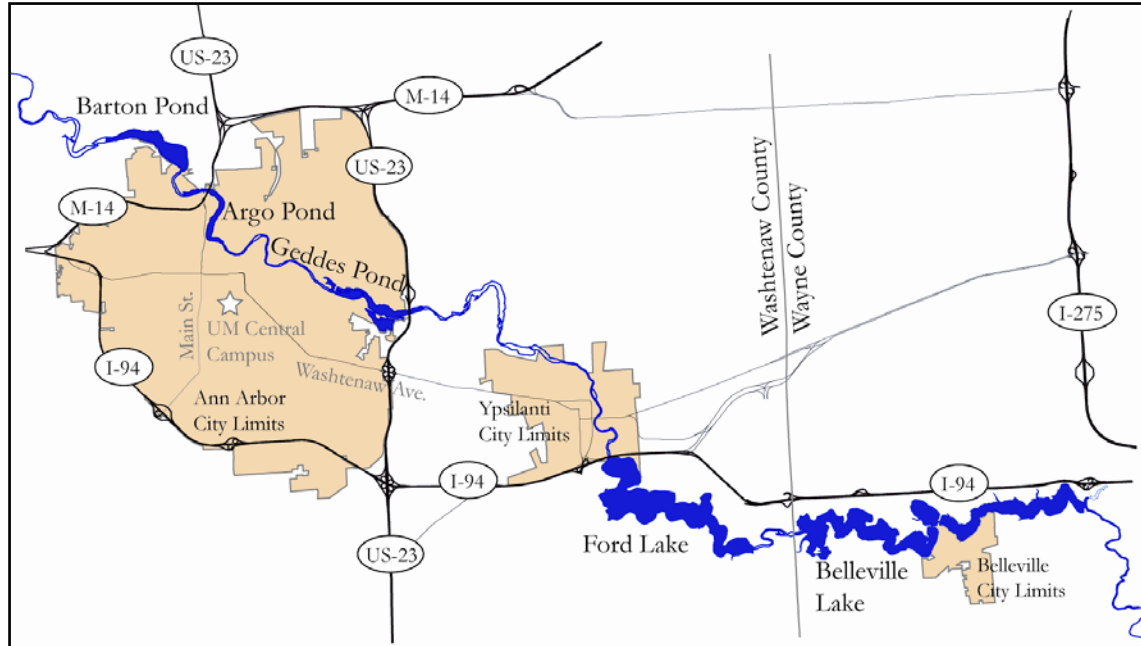


Figure 5-1. Map of the five current or potential rowing practice locations in and around Ann Arbor.

Barton Pond would provide a good place to row for several reasons. It is close to Ann Arbor, has about 2500 m available for training, and is wider than Argo (Michigan Rowing Association 1983; Hartsuff 2004a). Rowers have used it before; the UMRT practiced there during the early 1980s, and AARC used it for practices in the mid-1990s. There are three practical problems with the site, however. First, access is difficult. The public road to Barton Park is too steep for the boat trailers; therefore, the rowers would likely have to use private property to access the site (Dove 2003). Also, there is no public transportation to the site, making it more difficult to access for city residents. Second, the clubs would need space to build at least one boathouse and park cars and trailers (Michigan Rowing Association 1983). Most of the property around the Pond is in private hands. It could be difficult to find a place on the small amount of publicly owned land along the shore for a boathouse. Third, the Barton Hills residents are a powerful group politically because of their wealth and the time and energy they are willing to devote to promoting their interests. This group can be very vocal and have previously opposed rowing at Barton Pond because of the noise and traffic that comes with the sport. Their opposition was instrumental in the defeat of the Barton Park boathouse

proposal in 1983. Therefore, gaining at least their tacit approval would be necessary for rowing to occur at Barton Pond (Dove 2003; Hartsuff 2003b).

Geddes Pond has about 2500 m of rowing space between Geddes Dam and the footbridge over the Pond (Hartsuff 2004a). Other advantages of this pond include the access to public transportation (two bus lines serve the surrounding area), the available space for parking, and the opportunities for spectators to view rowing activities (Michigan Rowing Association 1983). Furthermore, it is very close to Huron High School, which would make transportation much easier for that team. However, there are several key concerns surrounding the rowers' use of Geddes Pond. Most importantly, the City does not seem interested in having any rowing at the site because Geddes Pond is already a heavily used recreational resource. It is possible that historical mandates of the site do not permit rowing there (Dove 2003; Hartsuff 2003a). Another important concern is that, although Geddes Pond is overall both wider and longer than Argo, the pond is not as wide as Argo across its entire length because of the bridges in the area. The two bridges at the southern end of the pond prevent two lanes of rowing traffic in opposite directions, making it more difficult to have numerous boats on the water at the same time and potentially causing safety problems from potential accidents (Hartsuff 2003b; Hartsuff 2004c). Also, the plant growth problem at Geddes, discussed further below, is actually worse than at Argo and restricts rowing to a narrower path (Hartsuff 2004c). Hartsuff believes that rowing could occur at Geddes, "but for the amount of rowing we have in Ann Arbor, it would not be as safe or productive as Argo" (Hartsuff 2004c). Geddes already has a lot of traffic from canoeists, paddle boats, and other water recreation that could conflict with rowing traffic patterns (Taft and Woodman 2003; Taft and Woodman 2004). Gallup Park is a busy place, very popular with Ann Arbor residents, especially during the summer months, and adding more uses could overload the capacity of the pond and surrounding park. When the rowers have approached the City in the past (as recently as 2002) about practicing at Geddes, they have been rebuffed (Ann Arbor Rowing Club 2002; Dove 2003). Another major problem is the lack of a boathouse for storage at Geddes. Moving some rowing activities to Geddes would require the rowing organizations or the City to build at least one more boathouse. The City believes that there is currently no room for additional structures on the City-owned land surrounding Geddes Pond, but some in the rowing community do not agree (Hartsuff 2003a). Hartsuff spoke to Concordia College in 1996 about accessing Geddes Pond

via their property, but the athletic director thought that the student body already had a variety of athletic opportunities and was uninterested in the proposal at the time. Hartsuff did not vigorously pursue the option at that time and has not since. More recently, Huron High School has considered further exploring options at Geddes Pond because of the current congestion problems at Argo (Hartsuff 2004b).

Both Geddes and Barton Ponds have plant growth problems similar to that at Argo. The Barton Boat Club is currently working with the City and the HRWC to find a solution to these problems on Barton Pond. The plant problem at Geddes Pond is more severe than at Argo, possibly due to an increased nutrient load and a larger surface area (Hartsuff 2003b). The City is beginning to consider ways to address the plant growth problems at both Geddes and Barton Ponds.

The third and most difficult alternative for the rowers would involve moving to either Ford or Belleville Lakes (Fig. 5.1). Both of these lakes have longer paths of straight, flat water, meaning that 2000 m races would be possible at these locations. However, both are located outside of Ann Arbor city limits and the roundtrip would require one hour of additional transportation time (Hartsuff 2003b; Rothstein 2004). The UM women's varsity team currently uses Belleville Lake for practices, while the Eastern Michigan University Women's team uses Ford Lake, but other rowing organizations do not have the same resources as these University-supported varsity teams. The UM men's team would have much greater difficulty recruiting and keeping members due to the added travel time and transportation costs (Hartsuff 2003a). The high schools will not drive to either lake because of liability and safety concerns (Taft and Woodman 2004). Also, the UM women's team can easily use Belleville Lake because they only row in the spring and fall, avoiding the heavy recreational use of that lake in the summer. Other groups, especially AARC, need a site that they can use throughout the summer, increasing the potential for traffic problems and conflicting interests and uses (Taft and Woodman 2004). Furthermore, Belleville Township would be unlikely to approve a second rowing group at the site; the lease for the UM women's team already has strictly restricts how and when other teams can use the facilities (Rothstein 2004).

Resources and Strategies

The rowing community would be very involved in the decision process and is already discussing the potential for a fight to oppose removal of the dam (Dove 2003). The rowers will likely work as a group on this issue and have attended various events that the HRWC has held regarding the issue (Ann Arbor Rowing Club 2003b; Taft and Woodman 2004).

The rowing organizations have numerous resources at their disposal to use in opposing the removal of Argo Dam. Most important is their overall organization, both within and among the four groups. The UMRT has its University affiliation, its own internal organization, and the MRA as organizational structures. MRA members and officers would likely be involved in any decision regarding activities of the UM men's team for the potential removal of Argo Dam. The University's Recreational Sports Department oversees the team and could become involved on the behalf of the UMRT if it sees the situation as important for the future of the UM men's team (Hartsuff 2003b). AARC is very well organized, with an elaborate webpage (www.a2crew.com), monthly board meetings, and conscious efforts to reach out to the public. Its public outreach attempts have focused on increasing awareness and recognition of the rowing community and hopefully public consideration for its concerns. AARC formed a strategic planning committee in late 2002, in part to address the potential conflict surrounding Argo Dam (Ann Arbor Rowing Club 2003d; Ann Arbor Rowing Club 2003f). Fundraisers also serve as community relations tools by raising public awareness of the rowing community (Hartsuff 2003a). The process of getting the new boathouse built has given AARC experience working with the City. The high school teams are a powerful group as well, as the parents of the high school rowers are politically active and aware and willing to fight to protect their children's interests. The high school parents have already won several political battles, including gaining varsity recognition for rowing at both high schools and increasing the rowing budget. The crew teams' budgets have continually increased over the past several years when few other sports have been able to lobby successfully for more funding (Taft and Woodman 2004). OAAR brings the various groups together to discuss maintenance and safety as well as political strategies and efforts. It provides the organizational structure that would enable them to develop a strong and effective opposition quickly.

Other resources include people and contacts. The rowing groups include several hundred rowers as well as many other members who support those individuals, especially the parents of the high school students. Additionally, in comments received in the survey, several people who identified with the rowing community but are not actual members indicated that they would strongly oppose the potential removal of Argo Dam. All of these individuals have a strong passion for the sport, which makes them a key resource as they would be willing to devote time, energy, and perhaps some financial support to the opposition effort. Although the number of individuals involved in this group is a relatively small percentage of the overall City population, their cohesiveness and enthusiasm in supporting their interests makes the group a strong political force and one more powerful than larger, less organized groups (Peltzman 1976). Moreover, the clubs have open communication channels with the City, which has consulted with members of the rowing community before making changes that might affect their use of the resource. AARC in particular has continued to work to improve communications with both the City and with the Ann Arbor News to increase public knowledge about rowing and build support for rowing interests among residents.

The rowing community expects a big political fight over the future of Argo Dam. It expects the HRWC to continue to advocate for removal with the City, and it plans to put many of its resources towards opposing removal (Hartsuff 2003b). At this point, the rowing groups are keeping informed about the status of the removal proposal and are beginning to organize their opposition. Representatives have attended the HRWC and City informational meetings regarding the future of Argo Pond (Ann Arbor Rowing Club 2003a). AARC is exploring registering website names, such as Save-ArgoPond.com, in an effort to help organize opposition efforts among both the rowing and non-rowing population (Ann Arbor Rowing Club 2003a).

The rowers feel that the HRWC is pushing an issue that the public and City oppose. They would respond to a removal proposition by raising awareness about their views to ensure that the public and decision makers understand the current benefits that the pond offers (Taft and Woodman 2004). “We would want to clarify misinformation and educate people,” said Mike Taft of AARC (Taft and Woodman 2004). In the opposition effort, the rowers would make several arguments about the pond, dam, and the surrounding area, many of which do not

stand up to strong scrutiny, especially in regard to the findings of this report. There are several key points that they will likely use to support their opinion:

- **Costs:** Some of the rowers believe that the cost of removal would actually be higher than is being reported and that the City will spend much more money removing the dam than it incurs in ongoing maintenance (Taft and Woodman 2004).
- **Effects on other recreation:** The rowers feel that other recreational opportunities, particularly canoeing and kayaking, would decrease if Argo Dam is removed. They also believe that the City's canoe livery at Argo Pond will not let its boats travel down the rapids that would form as a result of dam removal and that a narrower, faster-moving river would alter the perceptions of the Argo area for developers.
- **Rowing has a low environmental impact.** Rowing boats only disturb the top few inches of the water column and rarely approach the banks of the river as do kayakers and canoeists. (Taft and Woodman 2003).
- **Aesthetics:** The rowers think that if the City removes the dam, it would fail to restore the site so that the area would become unsightly and useless (Taft and Woodman 2004). They would promote the idea that the river will be much less appealing, with more invasive species, after removal. Developers interested in the area would lose interest because of the change in the viewshed.
- **Habitat and wildlife:** Wildlife habitat has been altered to maximize the niches created by the presence of the dam; removing the dam would destroy that habitat (Hartsuff 2003b). The rowers also allege that smaller populations of fish would live in the river than in the pond (Taft and Woodman 2004).
- **Flooding:** The rowing community fears that removing the dam will lead to increased flood potential for the City of Ann Arbor.
- **Why Argo Dam?:** Many do not see what benefits removal would yield as there are dams above and below Argo and therefore the river would not be returned to a pre-settlement state (Taft and Woodman 2004).
- **Timeline:** The rowers believe that this decision is not one that the City needs to address until twenty or more years in the future (Taft and Woodman 2004).
- **Location of facilities:** The rowers think that Ann Arbor residents want facilities right next to the water; if the water level changes, the current structures will be far from the water's edge, requiring further investments in the site for walkways, picnicking, etc. [(Taft and Woodman 2004).

The rowing community would likely focus efforts on the City and general public at the local level and would also explore options to prevent removal at the state level, likely through DNR (Taft and Woodman 2004).

Paddlers

The paddling community includes people that rent canoes and kayaks from the Ann Arbor Parks and Recreation Services' liveries as well as individuals who own their own equipment. There are a wide variety of ages and ability levels within the paddling community, ranging from those who only paddle once a year or less to those who do it weekly or more. Paddling occurs all along the Huron River; the passage of the river through Ann Arbor provides residents with a local place to paddle that is less developed than Geddes Pond. Paddling typically involves a substantial initial investment in a boat and necessary equipment (if one buys one's own equipment), but is relatively inexpensive after that. Interest in kayaking has increased in the last two years as evidenced by the addition of six more kayaks to the City's livery this year.

Currently, Argo Pond is a quiet, still place to paddle; some consider it more natural and less crowded than Geddes Pond downstream (Morley 2004). Gregg Hartsuff of the UM men's rowing team estimates seeing 10 to 15 paddlers on the pond each day during the team's summer practice sessions (Hartsuff 2003a). The flat water is ideal for teaching beginners and for round-trip excursions, which do not require extra transportation between upstream and downstream sites. Paddlers can either stay in Argo Pond or portage around the Dam and paddle downstream (Morley 2004). Survey comments and communications with paddlers indicate that some consider the portage around Argo Dam to be quite a deterrent to paddling there, while others find it relatively easy and like that it moves paddlers away from the more turbulent water directly downstream of the dam (Morley 2004).

Removal of Argo Dam could affect paddling in several ways. The current would increase in the narrower river; as a result, it might only be possible to paddle downstream in a one-way trip. Most paddlers prefer moving water, but many would miss the opportunities currently provided by the flat water of the pond. If the dam is removed, Ford Lake and Geddes Pond would provide similar local flat water opportunities (Morley 2004). The high gradient of the area indicates that it may have the potential to become a whitewater area for paddlers, a feature that is currently unavailable in Ann Arbor. A restoration of this type was very successful in

Williamston, Michigan (Barnett 1999). Right now, the closest place to Ann Arbor to experience rapids is at Delhi Metropark, about twenty minutes north of Ann Arbor. However, as current City livery policies prohibit livery canoes and kayaks from being taken through whitewater, either a change in policies to allow livery boats to be used in this manner or an engineered path around the rapids would be necessary for these boats. Due to the difficulty of paddling along natural areas of the river in late summer when the water levels are low, removing Argo Dam would create additional natural river reaches where quicker water and varying water levels could make paddling more arduous. Removal of Argo Dam may have little effect on the participation of long-time paddlers, since many are already accustomed to traveling to sites depending on their interest.

Great Lakes Paddlers (GLP) is a group that organizes many paddlers in Southeast Michigan. It provides a forum for individuals with their own equipment to organize paddling trips, as well as social opportunities to gather with other paddlers. There are currently about eighty members in the organization, which requires annual dues of \$15. Individuals within the group organize trips throughout the state, with a number of trips along the Huron River in and around Ann Arbor every year. GLP typically plans a few cooperative activities with the local Sierra Club and the Ann Arbor Canoe Liveries each year (Morley 2004).

GLP has been peripherally involved in discussions about potential removal of Argo Dam. According to Jim Morley, President of GLP, the organization's membership is divided on the question. Some would prefer to retain the still water currently in the pond as a place to teach beginners and as an easy site to access without having to deal with transportation issues, while others would prefer to restore some high gradient water in Ann Arbor for more challenging paddling opportunities. Morley thinks that there are nice places to participate in both flat water and moving water paddling near Ann Arbor; neither the continuance nor removal of Argo Dam would frustrate GLP's activities (Morley 2004). Notwithstanding this division, GLP is involved in promoting conservation issues and, if persuaded that removal of Argo Dam will greatly improve the ecological integrity of the area, more members may support removal.

The Society of Les Voyageurs is a group of UM students and alumni that organizes events such as trips and movies focused on outdoor activities, especially paddling. Founded in 1907,

Les Voyageurs is the oldest society at the University. The Society owns a cabin and boathouse on Longshore Drive by Argo Pond; many of its paddling expeditions occur on the Pond. The group has about 400 members, five of whom are active members, or current students at the University, who may live at the cabin. The remaining members are all University alumni, who typically remain involved in the group's activities and retain their access to the group's canoes and boathouse after they have left the University. The Society owns five working canoes, including one war canoe, which seats fourteen people and requires a large, flat body of water such as Argo Pond to maneuver (Society of Les Voyageurs members 2004).

Several members responded to email requests for information, although none claimed to speak for the organization as a whole. Like GLP, Les Voyageurs would likely be split regarding removal of Argo Dam, for similar reasons. Currently, it is easy for members to canoe at Argo Pond without the need for additional people for transportation between the put-in and take-out site, which would be required if the area had a swifter current that would make paddling upstream very difficult. A narrow river would still allow for canoeing, albeit moving water instead of flat water, and would mean that the cabin would be farther from the river's shore, which would require members to carry their canoes farther (Society of Les Voyageurs members 2004).

Some paddlers prefer the flat water at Argo Pond because it provides easy round trips and increased freedom to travel in more than one direction and it is a good place for novice paddlers. Flowing water offers rapids and increased flow, which other paddlers think provides a more interesting experience. Paddlers' involvement would likely depend on personal water preference, current use of Argo Pond and the Delhi rapids, and interest in the larger issues surrounding removal, such as ecological and economic costs and benefits. Educating the paddlers about the environmental impacts of the dam might influence many to support removal. Overall, many of the paddlers seem less concerned with the specific changes that removal would cause to the sport and more interested in the affect on the health of the river.

Resources and Strategies

With the potential split in the paddling community, it is unlikely that groups will become actively involved in the discussion on removal of Argo Dam. Individuals may actively support one side or the other, depending on their preferred paddling environment. Some GLP

members would attend meetings about the potential removal but are unlikely to become more involved. Les Voyageurs is more likely to become engaged in the discussion due to the location of their cabin, but it appears to be a rather loosely organized group.

Anglers

We interviewed seven anglers over the course of two days, all of whom were fishing either in Argo Pond or just below the dam, to learn more about the views of this stakeholder group. Of the seven people interviewed, three live in Ann Arbor and four are from other cities, including Detroit. Three only fish near Argo Pond while the remaining four fish at other locations as well as the Argo Pond area. Other locations that the interviewees mentioned fishing at include Duke Island Road (a catch and release pond), the Detroit River, Flat Rock, Barton Pond, Belleville Lake, and Cleveland Lake (Argo Project Team 2004).

All seven were fishing from the shore or the sides of the dam, five in the moving water below the dam. None that we interviewed were using the fishing docks along the shore of Argo Pond. Several indicated that they would prefer to be able to fish from a boat, but it was too expensive, and the lack of access to a boat appears to be the main challenge to the anglers. One individual stated that he had better luck fishing in a canoe than from shore. The majority of the anglers preferred to fish directly below the dam and catch walleye, bluegill, rock bass, sunfish, crappie, carp, and catfish in the area (Argo Project Team 2004).

Relaxation and food were the two main motivations given for fishing at Argo, with most anglers interviewed expressing both. Three interviewees specifically mentioned relaxation and fun, while several others suggested it. Five individuals indicated eating their catch at least occasionally; two interviewees did not keep their catch, although one did often give away the bigger fish to others to eat. One interviewee cited concerns over water quality as his primary reason for not taking the fish home and the other stated that he gave his catch to friends and family and did not like to eat any fish (Argo Project Team 2004).

One individual comes to Argo almost every weekend from Detroit (and has been for about five years), bringing his children along, and caught enough fish during the summer of 2003 to eat through January 2004. He prefers to fish at Argo because he feels that the river is cleaner there, meaning that his children can swim in the river and the fish are safe to eat. He also

appreciates the wide variety of fish to catch and the parks surrounding the river that make it more relaxing (Argo Project Team 2004).

When asked about the potential removal, most of the interviewees said that they would like to see Argo Dam remain in place. Many questioned why the City would even consider the proposal and thought that the removal would harm the fishery in the area. Individuals that were not opposed to the removal had no opinion on it (Argo Project Team 2004).

Resources and Strategies

The anglers that we interviewed did not appear to be associated with any organized group and primarily came to Argo by themselves or with a few friends. Therefore, any involvement of the anglers would likely be on an individual basis. None of the interviewees seemed strongly motivated to act upon their opposition to removal or very informed about the numerous tradeoffs surrounding removal. Additionally, as many are not from the City of Ann Arbor, some are likely to change fishing locations as opposed to becoming involved in the issue.

Environmental Groups

The primary groups involved in local environmental efforts are the HRWC, the Sierra Club, the Ecology Center, and the Washtenaw Land Trust. The Sierra Club and the Ecology Center have both the reputation and the history of being the most politically active environmental organizations in Ann Arbor. They were involved in the passage of the \$28 million environmental millage in 1990; recently, these organizations were involved in the passage of Proposal B to create a greenbelt and preserve open space by buying land outside of the City (Betzold 2004).

At this time, only the HRWC is heavily involved in the issues surrounding the potential removal of Argo Dam, having supported this research project among other actions. Although neither the Sierra Club nor the Ecology Center is currently involved in this issue, both may get involved in the near future if the issue continues to develop and receives more attention from the City and other stakeholders. While the extent of their involvement and the alternative they choose to support depends on the extent of the controversy and the feelings of their members, media attention and public interest in the issue increases the likelihood of their participation. Both groups have been active in other issues close to Argo Dam. These groups participated in

the effort to prevent an apartment development in what is now Bluffs Nature Area in the late 1990s (Betzold 2004). The Washtenaw Land Trust focuses primarily on protecting open space from development. As the area surrounding Argo Dam will likely be preserved either as a pond or as new parkland, this group is not expected to become involved.

The Huron River Watershed Council

The HRWC is an Ann Arbor-based non-profit environmental organization concerned with issues surrounding the Huron River watershed. Established in 1965 under Michigan's Local River Management Act, the HRWC is the oldest Watershed Council in the state. Its activities include public education efforts (such as an Adopt-A-Stream program and a mass media Information and Education Campaign), providing technical assistance and research for policy development, and supporting and encouraging river protection projects. The HRWC's professional staff is sought after by local, regional and national audiences for its expertise and experience.

The HRWC's overarching objective is to improve and protect the Huron River and its watershed. To achieve this principal objective, the HRWC sponsors projects along the Huron River and its tributaries to encourage sustainable use of the river and improve water and ecosystem quality throughout the region. With its offices along the western shores of Argo Pond, where the Huron River enters a much more urban and ecologically altered environment, the HRWC has always been interested in the health of the Huron in Ann Arbor. Argo Dam, near the beginning of the Ann Arbor reach, has therefore drawn the attention of the organization. The HRWC sees the removal of Argo Dam as part of an effort to improve the water quality over the entire watershed (Riggs and Rubin 2003)

The HRWC has led the effort to remove Argo Dam for the last several years, having become interested in the project after the publication of the MDNR report in 1995 and following the successful campaign for the removal of the Mill Creek Dam in Dexter. It has initiated several of the necessary steps to assess the feasibility of removing the dam and restoring this section of the river. In 2001, the HRWC held a meeting with a number of key stakeholders: the City of Ann Arbor and its Utilities, Planning, and Parks and Recreation departments, MDNR biologists, various recreation interests, and local residents. The HRWC hired an engineering firm to produce an updated bathymetric map of Argo Pond, measure sediment depth, and

perform preliminary sediment toxicity analysis in 2002. It is also exploring removing Peninsula Dam, the third dam proposed for removal in the MDNR report.

The HRWC identified Argo Dam as a focus for efforts for several reasons. Most importantly, the MDNR suggested it would be a candidate for removal because it no longer serves its original purpose; its removal has potential to benefit the fluvial ecosystem. Argo Dam negatively affects water quality by decreasing its velocity and dissolved oxygen content and increasing the fluctuation in flow rates, organic matter, and temperature (Hay-Chmielewski et al. 1995). Also, the removal of this dam is much more feasible than other dams along the Huron River because the dam is not used for flood retention or power generation.

Another important point influencing removal is location. The City of Ann Arbor is a very environmentally aware and forward-thinking city. Ann Arbor residents tend to favor environmentally friendly and park-related policies, as evidenced by their continued support for associated millages, such as the recently passed Greenbelt Initiative for green space. Per capita, Ann Arbor has more residents that are members of environmental organizations than any other city in the United States and has many more environmental organizations than most cities of a similar size (Garfield 2004a; Garfield 2004b). Furthermore, residents pride themselves on being on the cusp of new strategies and initiatives and dam removal is currently a trend among environmentally-aware cities and states around the country (Riggs and Rubin 2003). The HRWC recognizes that Ann Arborites are more likely to be open to a dam removal than other communities in Michigan and feels that a campaign to remove Argo Dam has the potential to be successful (Riggs and Rubin 2003). Also, the Dam is located right next to the offices of the HRWC and the staff views the area every day. This proximity likely has increased the attention that the organization has paid to Argo Dam and is another factor indicating why the HRWC identified it over other potential dam removals.

Removal could increase parkland in the immediate area. The preliminary engineering study conducted on behalf of the HRWC estimated that removal would uncover 50 additional acres of land along the riverfront, land that would be potentially available for many different recreational uses. The City would receive ownership of the new land and would likely create parks on it. The removal process could also increase residents' awareness of the current parks around Argo Pond (Riggs and Rubin 2003).

The HRWC also thinks that the long-term costs to the City would be much less if the dam is removed. Currently, the City is responsible for both the maintenance and liability costs for the dam. Liability costs are increasing because of increased security concerns (Bahl 2003). Removal, on the other hand, would have a one-time cost for the engineering and restoration plus ongoing park maintenance costs (Riggs and Rubin 2003). As all dams must be rebuilt or removed eventually, the HRWC sees the removal of Argo Dam as a cost that would occur in the future anyway; they support removing the dam today in order to reclaim the Ann Arbor reach of the Huron River for citizens to enjoy now.

Furthermore, the HRWC sees the plant growth problem at Argo Pond as one that already impairs recreational use and that will only worsen with the dam present. Stakeholders, particularly the rowing community, have voiced complaints about the excessive plant growth. However, no user group has yet to offer resources to pay for a long-term solution. The pond's recreational opportunities and water quality will continue to degrade unless the dam is removed or major action such as dredging occurs (Riggs and Rubin 2003).

The HRWC acknowledges that Argo Dam is a long way from being removed and is attempting to address the obstacles to removal in order to move the proposal forward. It is increasing communication with the rowing community to attempt to understand their concerns and interests. The organization is also encouraging the City to move towards a more in-depth review of the situation, and recent conversations have been encouraging. During its first proposal to the City in 1995, the HRWC received a negative response from the Parks Department. More recently, City employees have been much more open to discuss the proposal and the benefits of removal (Riggs and Rubin 2003). Furthermore, City interest in dam removal has increased (Naud 2003b), although there remains hesitance to act on the part of City agencies and elected officials without demonstrated public support (Riggs and Rubin 2003). The HRWC also plans to work with landscape architects to develop drawings of what the Argo area may eventually look like following dam removal and river restoration to help both the City and the public visualize restoration (Riggs and Rubin 2003). A final challenge would be finding funding sources to help the City defray costs of the project, but the HRWC's past experience with other dam removals and working with state and non-profit funding sources would be helpful in overcoming this challenge.

Resources and Strategies

The HRWC has many resources at its disposal both to support its position that the dam should be removed and to help with the removal process. It has contacts with both stakeholders and decision-makers through its work on other projects in the area. For example, the HRWC is among a group of stakeholders currently involved in efforts at Barton Pond and Gallup Pond to alleviate problems with plant growth. The HRWC also has contacts with funding sources and other experts necessary both to explore and conduct the potential removal.

If removal does occur, the HRWC can apply its previous experience organizing dam removals to ensure success at Argo. Most recently, it has been involved in the effort at Dexter Mill Pond, helping the owners find and apply for additional funding, conducting ecologic and hydrologic studies, applying for necessary permits, and providing other general support. It would likely fulfill a similar role to Ann Arbor if the City chooses to remove Argo Dam.

To promote removal, the HRWC plans to continue its efforts to educate policy makers and the public about the issues surrounding the decision. Many in the community are not currently aware of this issue or its potential implications, although community support is critical for the successful removal of the dam. One key aspect of the HRWC's effort will be to educate the public about the negative impacts of the dam and the tradeoffs involved with removal. Supporting this research project has been a key step in the education process, as the survey has raised awareness among respondents and generated data on the tradeoffs. The HRWC will also work to involve the media better about the issue in Ann Arbor and throughout Michigan (Riggs and Rubin 2003).

The HRWC is also interested in conducting more studies on the site to increase public awareness, augment current knowledge about the site, and attract potential funding sources. These studies include wetlands delineation, aquatic food web ecology, hydrologic analyses, bathymetric mapping, and more detailed sediment analyses. The HRWC would also like a better understanding of which City departments and individuals would be involved in the decision and implementation process, given the City's recent administrative reorganization (Riggs and Rubin 2003).

Along with the public education phase, the HRWC is interested in involving a third party facilitator to try to find solutions to issues related to dam removal at Argo Pond. The removal could not occur if there were strong opposition to the project; frank discussions among all of the stakeholders are necessary to move forward (Riggs and Rubin 2003).

Sierra Club

The current membership of the Huron Valley Group of the Sierra Club is between 3,000 and 3,500 people over Washtenaw, Lenawee and Monroe Counties, 2,500 of whom live in Ann Arbor (Betzold 2004). Of these, between 50 and 100 are active members, meaning they regularly attend club functions. The Sierra Club has been involved in several ballot initiatives and referenda, most recently the Parks and Greenbelt Ballot Proposal. Typically, they work with the Ecology Center and the HRWC on local issues and with Trout Unlimited, Michigan United Conservation Clubs, and others on statewide efforts (Shiffler 2003). The Sierra Club's political efforts recently have centered on sprawl and open space issues in the City; however, members were involved in the successful effort to pass a county parks millage in 1990 and are involved in educational campaigns to make Ann Arbor citizens more environmentally aware (Betzold 2004).

The local leadership of the Huron Valley Group is completely volunteer-based; the only paid staff in the state are based in Lansing and associated with the Michigan Chapter (Shiffler 2003). Although all volunteer, the numerous members are involved in local political issues. Some credit Doug Cowherd, current co-chair of the local group, with making the Sierra Club among the most powerful political organizations in Ann Arbor (Betzold 2004). Cowherd credits about a dozen local leaders, including himself and Mike Garfield, and the volunteer work of many hundreds for the success that the Sierra Club and other have had regarding environmental issues (Cowherd 2004).

The Huron Valley Group has not yet discussed the issues surrounding the removal of Argo Dam and has not taken a stand on removal. This group has never been involved in a dam removal effort, although other local Sierra Club chapters, such as the Valley of the Fox Group in Batavia, Illinois, have such experience (Valley of the Fox Group Sierra Club 2004). For it to become involved on either side of the discussion over whether to remove Argo Dam, the

potential gains would need to exceed the costs of the political fight. To make a decision, the members will likely focus on the following issues and questions:

- Sedimentation: What type of sediment is filling in the Pond?
- Wildlife: How would the removal affect fish? How would removal affect other wildlife, especially birds?
- Shoreline: What would it look like? For what would it be used?
- Parks: Would removal affect usage of other parks? Would it increase park usage in the North Main area, or provide better access to local parks for Ann Arbor citizens?
- Recreation: What would be the impact on canoeing? Will there be opposition to the removal from the crew teams that currently use Argo Pond?
- Environmental Health: How would removal affect the algal problems in the reservoir? Would it change invasive species or water quality conditions? Would invasive species out-compete native species in recolonizing the newly-exposed sediment? Would removal negatively affect the ecosystems above and below the reservoir? What are the environmental tradeoffs of dam removal?
- Other effects: Would dam removal change the flood potential? Would it decrease liability costs for the City? Would it increase or decrease the City's maintenance costs for the area? (Shiffler 2003)

Resources and Strategies

The local Sierra Club has many resources at its disposal. Its active members are a well-informed group who communicate and lobby with other members, local government, media, and the general public for support of certain issues. Members also provide dues, which help fund specific activities of the group. Access to the resources, such as contacts and technical expertise, of the national office of the organization can also provide additional funding and support if the issue is important enough, although it is unlikely that the national organization will become involved in the question of dam removal at Argo. Its contacts within southeast Michigan also allow the local Sierra Club group to form coalitions with other interested stakeholders. For example, in its campaign to prevent urban sprawl, the Sierra Club formed relationships not only with other environmental groups, but also with members of the business and farming communities (Betzold 2004).

As the Sierra Club has yet to take a position on this issue, it is difficult to anticipate the strategies it would undertake to promote its view. In the past, public education has been a key aspect of Sierra Club efforts through communication with members, media advertisements, and local meetings. Also, it has organized club outings to highlight certain issues through bike tours and other activities (Shiffler 2003). Depending on how deeply the organization decides to become involved, it could devote few or many resources to educating the community, promoting grassroots organizing and advocacy (such as encouraging supporters to attend public hearings, write letters to the editor, and voice their views to elected officials), and working with other stakeholders to support its position.

Ecology Center

The Ecology Center is a locally-based environmental non-profit organization that focuses on environmental justice and works to promote clean air, clean water, and healthy communities in the Great Lakes region. It has more than 5,000 members and an annual budget of \$4.2 million. The Center employs 50 staff members and focuses on grassroots efforts to achieve its objectives. These grassroots efforts include working with local and regional governments to develop environmentally-friendly policies, focusing on trash and human-health related topics, and an education program targeting teachers and children, which trains teachers, holds environmental festivals, and develops educational materials.. It spends the majority of its advocacy resources on state-level and regional work. In addition to grassroots activities, the Ecology Center runs Ann Arbor's recycling program, which occupies the majority of its staff and budget (Garfield 2004a; The Ecology Center 2004).

With the Center's focus on clean resources and healthy communities, it is primarily interested in the water quality issues surrounding the Huron River. To make a decision regarding whether to support or oppose the removal of Argo Dam, it would concentrate on how the removal could affect water quality. Although interested in learning more about the issues and tradeoffs surrounding removal, its support would depend on priorities established by the board of directors. These priorities are based on member interests, consistency with strategic mission, and whether its involvement would bring added value to the issue. At this point, the Ecology Center is unlikely to actively support or oppose the removal of Argo Dam unless its board decides it is a high-priority issue (Garfield 2004c).

Resources and Strategies

Despite its large budget, the Ecology Center has very limited resources for new issues, given its current involvement in several other campaigns, which currently fit its priorities. Its effectiveness on environmental justice issues is made possible by a wide member base and good contacts with local decision makers and local environmental leaders and organizations. With its grassroots focus, the Ecology Center would primarily use direct action methods, such as demonstrations, letter writing campaigns, canvassing, and other advocacy techniques to promote its position (The Ecology Center 2004). The type and level of strategies used would depend on how active the Ecology Center decides to become in supporting its position, once the board has selected a position (Garfield 2004c).

Other Interests

There are several other stakeholders that do not fit into the previously mentioned categories but have important interests that should be considered in any removal effort. These include the surrounding neighborhoods, DTE, and real estate developer Peter Allen.

Surrounding Neighborhoods

There are several neighborhoods that surround Argo Pond. Attempts were made to talk to representatives from this group to better understand their interests and values. Only one person responded to contact attempts, Evan Jaros of the Crossings of Ann Arbor Condominium Association. This building is located on Long Shore Drive, next to Longshore Nature Area, on the east shore of Argo Pond, and is very close to the dam. We attempted but failed to contact someone from the Northside Neighborhood Association, a collection of houses located on the east side of the pond between Argo Drive, Pontiac Trail, and Cloverdale Street. There is not a neighborhood association for the west shore of Argo Pond as this area is primarily for commercial use.

Jaros lives at the Crossings of Ann Arbor and serves as the contact person for the neighborhood organization, representing the sixty-four unit owners. The group has at least one annual meeting to discuss issues of concern, although turnout is typically low. The majority of the population of the Crossings ranges from the mid-twenties to mid-thirties, being slightly younger than that of the surrounding neighborhood. However, both the neighboring

houses and the condominium residents are typically single people or couples without children. Most of the individuals living here are not involved in commenting on or showing support or opposition on City issues (Jaros 2004).

Jaros' biggest fear for the area is an increase in development, both in the residential areas and parks surrounding the pond, and feels that most of his neighbors have similar views. The neighborhood currently has a friendly and open atmosphere. Increasing development, especially through the construction of additional apartment buildings or condominiums, could harm that ambiance. He would not want to see the parks further developed by paving walking paths, adding parking, and new buildings. Right now the paths are used primarily by walkers and bikers, preserving what Jaros considers to be a more natural and serene area with many big trees. He does not want to see the Argo and Longshore Nature Areas become like Gallup Park. If the dam is removed, Jaros would want to ensure that it would help the local environment, would not mean increased development of the parks that would change the atmosphere currently there, and would retain connectivity between the parks on either side of the river with a bridge. The two nature areas would be his great concern for development; while he would hope that the more natural feel of Bandemer Park could be preserved as well, that is not as high a priority (Jaros 2004).

Resources and Strategies

If neighbors become involved, they will participate on an individual basis, as the organization of neighborhood groups is weak to non-existent. However, according to Jaros, if the neighbors see the removal effort as a threat to their property interests through changes in view and park access or their enjoyment of the parks through increased development of the parks, they may form a more organized opposition to the removal effort (Jaros 2004).

DTE Energy

Just below the dam on the south bank of the river is a fourteen-acre site at the intersection of Broadway and Depot Streets, currently owned by Michigan Consolidated Gas Co. (MichCon), a subsidiary of DTE Energy, the primary energy provider for Ann Arbor and most of Southeast Michigan (DTE Energy 2004). MichCon has owned the site since the early 1900s, operating a coal gasification plant there. It had filled in the northern third of the site, relocating the channel of the Huron River to produce hydropower and provide water for the

gasification plant. MichCon stopped operations at the plant in the 1940s (Michigan Department of Environmental Quality 2002) and demolished it in 1959 (Ganz 2004b). A DTE Energy service facility is currently at the site, which includes several buildings and parking lots that remain in use. The western portion of the site is undeveloped and has some vegetation (Michigan Department of Environmental Quality 2002).

In 1985, MichCon identified the site as one of several contaminated sites in Michigan and began remediation work to prepare it for other uses (Ganz 2004b). MichCon performed a Remedial Investigation in 1996 and found contamination of the soil and groundwater with BTEX (Benzene, Toluene, Ethylbenzene & Xylene), PAHs (polynuclear or polycyclic aromatic hydrocarbons), and metals (Michigan Department of Environmental Quality 2002). Since then, remediation efforts have included soil and debris removal, ground water monitoring, bank cleanup and stabilization, and bio-remediation (Ganz 2004b). DTE would like to complete remedial actions at the site in the next few years and is unsure about future uses of the land (Ganz 2004a).

DTE's primary concern is the impact that removal of Argo Dam could have on future flooding of the site. This site is within the 100-year floodplain of the Huron River and lies next to the 90-degree bend in the river directly below Argo Dam. The last serious flood at the site occurred in the late 1970s. More recently, water levels have reached the edges of structures and roads but have not caused any damage. Flooding may have the potential to erode the contaminated soil and debris that remain on the site, destabilizing the site and contaminating the river. DTE would like to see river waters remain at a specific level to ensure that the river does not go dry during drought as well because of the aesthetic and olfactory issues that could arise (Ganz 2004a).

DTE also wants to ensure that the public does not have access to the site, as it remains private property. DTE will not allow (nor has the City expressed an interest in) an easement to provide public access on its land beside the river. A spokesman from DTE contends that the City parks already provide good public pathways. The City has expressed an interest in the property, but DTE has no plans to sell the site, as its location makes it a good base for serving customers in the three surrounding counties (Ganz 2004a).

Resources and Strategies

DTE is a major corporation in southeast Michigan, with the multiple resources that come with that role. It has experience working with City and state officials, providing a history and familiarity with the government system and the relevant officials. Furthermore, it has access to these officials through past work. Also, as one of the largest taxpayers in the City, DTE has additional experience interacting with decision makers and regulators. It has funding to promote its interests, as well as contacts and influence with policymakers at the local and state level.

Peter Allen

Peter Allen is head of Peter Allen and Associates, a real estate and development firm in Ann Arbor. He is one of several developers who may become involved if dam removal is proposed and several stakeholders have mentioned the importance of his views on the issue. Allen owns several properties in the Argo area. He is interested in redeveloping the North Main Street area, including opening up the riverfront and increasing access to the river from downtown (Allen 2004). Many of his visions are reflected in the North Main Plan, but most of these ideas to improve the North Main businesses have not come to fruition (Riggs and Rubin 2003). With these interests and his past involvement with the Ann Arbor government in his development projects, he is apt to be involved in any discussion to remove Argo Dam (Allen 2004). Furthermore, both supporters and opponents of removal feel that Allen and other developers would express their views.

To implement his vision, Allen has had numerous discussions with City officials and other property owners to promote connectedness between the City parks and business areas. He would like to improve links, especially for pedestrians, between the various areas of Ann Arbor so that it is easier to walk and bike for transportation between areas of town. He believes that removal of Argo Dam would lead to a more attractive river than the current pond and would allow for increased connections between the parks and downtown. (Allen 2004).

Resources and Strategies

Allen would become involved in the discussion to remove Argo Dam and would focus primarily on public access and the opportunity to link the parks. He has already had numerous discussions with City officials about his ideas to increase connections, and he has hosted tours

of the sites for City officials to visualize his plans. With his connections to City officials and community business leaders, knowledge of city government, and financial background and resources, Allen could be a key proponent of dam removal. His influence will depend in large degree on how involved he decides to become in the issue.

SUMMARY

There are two overarching issues that need to be addressed if Argo Dam is to be removed. Any decision to remove or maintain the dam must balance recreational uses and address the build up of sediment and weed growth. The interaction of the stakeholders with regards to these issues is discussed here.

Balancing Recreational Uses

The stakeholders highlighted several key recreational interests, which necessitated striking a balance between recreational opportunities on flat water versus those that exist on land and in rivers. Currently, Ann Arbor has a fair amount of parkland available to its residents, however water space is more difficult to create and in more limited supply in the area. Some of the recreational opportunities created by water are unique to the region, including rowing. Any decision regarding the future of Argo Dam and Argo Pond must attempt to achieve a balanced outcome for all interests.

It is very unlikely that Argo Dam will be removed without successful relocation of the rowing teams. City representatives and survey respondents have expressed interest in seeing rowing remain somewhere in Ann Arbor. Both the City and the rowers are content with their current location at Argo Pond, but they will need a long-term plan for dealing with plant growth and sediment to continue to row there.

Furthermore, the UM women's crew team has just returned to using Argo Pond for some of its practices. Its use adds to the size and power of the rowing community as women's crew is a varsity level sport making it more probable that the University will strongly back its interests and become heavily involved in the decision-making process.

Crowding issues and the complications preventing rowing at Geddes and Barton Ponds mean that access to rowing for all of the teams may involve splitting up the various rowing groups

and assigning them to different locations. For example, the two high school teams could move to Geddes Pond, allowing teams of similar ages to stay in the same area. These two teams do not practice in the summer, when usage of Geddes Pond is at its highest. AARC and the UM men's team could then move to Barton Pond, if an agreeable arrangement could be worked out with the surrounding neighborhoods.

Regardless of where the rowers are situated, the rowing groups and City may want to come to agreement on who is responsible for maintaining the site for rowing. Neither the rowers nor the City are satisfied with maintenance and clean-up at Bandemer Park, both of them believing it should be the responsibility of the other.

The creation of a whitewater park would create new recreational opportunities to make up for the loss of rowing at Argo Pond. Many in the paddling community would strongly support a proposal making it possible to paddle rapids within the City. It would give the City a unique resource in the region, but would require additional investment.

Plant Growth and Sediment

Argo Pond is filling in with sediment and ever increasing plant growth, causing problems for all who use the pond. The rowers are interested in pursuing dredging as an option for Argo Pond, but the City would probably be unwilling to support it because of the high cost, either at Argo or any other location in the City. Dyeing the water has been mentioned for Barton and could possibly work at Argo as the water's color change would not be as problematic there. The idea of using a tarp is unlikely to be implemented because of the quantity of tarp required to cover the pond. The HRWC has stated that it will not support removing the plant growth at Argo because it thinks that removing the dam is the best solution and it is feasible (Riggs and Rubin 2003). The HRWC will continue to work with stakeholders to address the plant growth issue at Barton and Geddes Ponds, because although it feels dam removal is the best solution at those locations as well, it is not feasible at this time (Riggs and Rubin 2003).

The City may be able to help Barton Hills residents address the plant growth problem in Barton Pond, perhaps through a drawdown, in exchange for allowing some of the rowers to use Barton Pond to practice. By managing which groups are allowed to use Barton Pond and rowers' practice times, the City could create a workable compromise.

Chapter Six

CONCLUSIONS AND RECOMMENDATIONS

Our research suggests that while removal of Argo Dam is possible, it will be a difficult process because of the strong opposition. We found that of the features in the Argo area, the parks around the pond are more important to residents than the pond itself, and the pond is more important than the dam. Most residents feel strongly that the parks around Argo Pond are attractive, are an asset to the local area, provide good recreational opportunities, and increase local property values. They feel that Argo Pond is a suitable place for most types of recreation and that the pond is generally attractive and good for property values. They feel that Argo Dam improves recreation on the Huron, despite their belief that it is unattractive and that it harms the health of the river ecosystem. A majority of the Ann Arbor public would be in favor of removing Argo Dam if they were aware of the costs and benefits inherent in dams and dam removal, and they would be willing to pay for removal and restoration. In fact, based on the willingness to pay exercise in our survey, we estimate a net economic benefit of approximately \$2 million per year citywide from dam removal. However, while the general public is supportive of removal, the pond's most important recreational user group, the rowing community, is strongly opposed to removal and would work very hard to prevent it without a satisfactory alternative site. Nonetheless, the rowers agree that aquatic plant growth in the pond is a serious problem, severely limiting its usefulness for recreation. Most other user groups are divided on the question of dam removal; they are not likely to take positions as groups, although individuals from these groups will probably be found on both sides of the debate. Dam removal remains a distant outcome at this time, as City officials believe that it is not an urgent issue, the City's budget is already tight, and no alternative site is currently available to the rowing community.

While our survey results indicate a general willingness on behalf of the public to support dam removal, there are numerous issues that must be considered before dam removal can progress. If the HRWC aims to pursue dam removal, it will likely be necessary to encourage the City to act, address the objections of key stakeholders, and motivate the public to be involved in the process. As means to those ends, we make the following recommendations to the HRWC.

RECOMMENDATIONS

Additional Research

Research on the following topics would be useful to help inform the decision-making process and the general public:

- The effect of dam removal on the flood plain and the likelihood of floods and sewer backups
- Sediment composition and rate of accumulation
- The shape of the river following removal; including an assessment of the feasibility of whitewater rapids and an analysis of the unnaturally sharp bend in the river below Argo Dam, particularly as it pertains to the contaminated sites owned by MichCon adjacent to the river
- Potential wetland loss or creation
- Restoration options; including whether or not both the millrace and the concrete structure would need to be removed, whether partial dam removal is a possibility and whether permanently opening the gates to restore water flow would suffice.

Research on these topics will help to assess the feasibility and outcomes of dam removal. It will also aid in efforts to educate the public and decision-makers. The HRWC may choose to conduct this research in coordination with the City of Ann Arbor, the University of Michigan, or consultants. Additionally, the USGS and MDNR have both expressed interest in being involved in dam removal efforts that could serve as case studies for future Michigan dam removals. Information from sources other than the HRWC may add legitimacy and counteract potential charges of bias from dam removal opponents, and could facilitate fundraising for the removal.

Education

In the course of our research we found a general lack of knowledge and some misconceptions about the Argo site and the costs and benefits of dams and dam removal. Decision-makers may like to have a question-and-answer document that addresses the issue of dam removal, why it is being discussed, and the potential advantages and disadvantages (Naud 2003a). The following topics should be included:

- Location and description of Argo Dam
- Dam's purpose, specifically that it does not provide flood control or generate electricity, and that its purpose is not likely to change in the near future
- Negative ecological effects of the dam, emphasizing that it increases unwanted plant growth, increases water temperature and causes other water quality issues, fragments habitat for aquatic organisms, and disrupts and/or alters normal flows of both water and nutrients to downstream reaches
- Impact of poor water quality on fish and wildlife species
- Dam removal's effects on ecosystem including benefits such as improved water quality, increased dissolved oxygen levels, decreased nutrient loading, and increased fish migration and diversity
- Expected appearance of the river after removal including water width and depth with a visual representation of the site.
- Changes in the floodplain and the effect of those changes on flooding at the MichCon site and the DTE substation
- Changes in wetland areas
- Possibility of 50 acres of parkland that could be created if the dam were to be removed.
- Effect on recreational opportunities and the possible creation of a portage-free kayak or canoe route from Argo to Gallup.

Alternative Sites for Rowing

Dam removal is very unlikely to occur without the successful relocation of the rowing community. Both the rowing teams and the City are satisfied with Argo Pond as the site for their activities, so finding a new location for them will be a challenge. The rowers are strongly opposed to the idea of removing Argo Dam, thus it will be extremely important to engage them and develop options that meet their needs. The two most promising alternative sites for rowing are Geddes and Barton Ponds, but all alternatives, and combinations of alternatives, should receive due consideration.

Gallup Park on Geddes Pond is already heavily used for other activities and the City feels that it does not have sufficient space to provide the entire rowing community with parking and boathouses to store their equipment. One possibility is to relocate only a portion of the

rowing teams, perhaps the high school and/or University teams, to this site so that use of the park does not increase too dramatically. Another option may be to negotiate the purchase of land from Concordia College for rowing facilities.

Residents of the Village of Barton Hills have opposed allowing rowers to use Barton Pond due to the associated early morning noise. However, those same residents require the City of Ann Arbor's cooperation in addressing the problem of excessive water weeds in Barton Pond, leaving room for negotiation between Ann Arbor and Barton Hills over access to the pond for rowing and the removal of weeds.

Roles of Other Stakeholders

A coalition of environmental groups and recreational users of the Argo site may be better able to promote dam removal. Environmental groups such as the Sierra Club and Ecology Center could contribute considerable influence within the City and valuable experience running grassroots campaigns. Recreational users such as paddlers and pedestrians are currently divided on the question of dam removal and unlikely to play a decisive role in the debate, but outreach and education could persuade individuals to take an active role in supporting dam removal. The rowers should be expected to partner with other groups and individuals to oppose removal as well.

A successful dam removal may be more likely if as many interests as possible are engaged as early as possible, regardless of whether they support or oppose dam removal, so that no key parties are neglected only to disrupt plans later in the process. In addition, MDNR, MDEQ, and USGS will have key roles in the permitting process and may be able to provide resources to aid in removal.

Funding for Removal and Restoration

The City government does not feel it has the means to remove the dam and restore the area within its current budget. Although our willingness to pay exercise indicated that citizens would be willing to pay for removal through increased property taxes, the City generally seeks millages only for significantly more expensive undertakings. Likewise, some of our survey respondents indicated feeling overtaxed or suggested that someone else should provide funding for dam removal, such as the state or the former owner of the dam. The HRWC may

want to take the lead in identifying outside sources of funding for dam removal and restoration. The City Council is much more likely to move forward with dam removal if they believe that outside funding is available. Private funding possibilities as well as funding from the state and federal governments should be explored and developed as much as is possible prior to making any formal proposal to City Council. MDNR and MDEQ may be of assistance in seeking resources. Funders of previous dam removals in Michigan may also be interested in assisting with the removal of Argo Dam, perhaps contingent on the incorporation of research into the effects of dam removal (see Appendix L).

Historical Significance

Our survey results indicate that sizable minorities of Ann Arbor residents feel that Argo Pond and Dam have historical significance. As has been done in other dam removal projects, it may be worthwhile for the HRWC to consider ways to create a historical tribute to the dam and pond if the dam is removed. Interpretative signage and/or portions of the dam structure have been used in other dam removals to help maintain the historical significance without maintaining the structure itself and have often improved relations between affected communities and dam removal proponents (American Rivers 2004c; Johnson 2004b; Wisconsin Department of Natural Resources 2004).

IN CONCLUSION

Our research indicates that while there are misconceptions about the Argo area, river restoration involving dam removal could be feasible for Argo Pond. We believe that the large number of stakeholders and heavy recreational use of the Argo area make an effort to remove Argo Dam a long and challenging undertaking. It would require careful planning, engagement of all interested parties, and much research, public outreach and diplomatic skill. However, it has the potential to be highly successful, yielding ecological benefits and new recreational opportunities while accommodating the interests of those who would be adversely affected. If successful, the process could be a model for dam removals nationwide.

REFERENCES

AAPOR (2000). Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. Lenexa, KS, American Association for Public Opinion Research.

Allen, P. (2004). Interview, 2/21/04. Peter Allen and Associates.

American Rivers (2004a). 60 Dams in 15 States to be Removed in 2004. <http://www.amrivers.org/60damsin15statestoberemovedin2004.html> (accessed 8/6/04).

American Rivers (2004b). American Rivers website. <http://www.amrivers.org> (last accessed 07/27/04).

American Rivers (2004c). McGoldrick Dam, Ashuelot River. http://www.amrivers.org/doc_repository/DamRemovalCaseStudies/McGoldrick%20Dam%20Ashuelot%20River%20NH.pdf (accessed 8/6/04).

Ann Arbor Democratic Party (2004). Ann Arbor Advisory Boards. <http://www.aadems.org/boards/index.htm>, (accessed 6/24/04).

Ann Arbor District Library (2004). "The Making of Ann Arbor: 1900-1919, Population and Economic Growth". <http://moaa.aadl.org/PictHistory/1900-1919pg1.php> (accessed 2/15/2004).

Ann Arbor Rowing Club (2002). AARC Board Meeting Minutes, October 6 2002. <http://www.a2crew.com/docs/min10-02.doc> (accessed 3/14/04).

Ann Arbor Rowing Club (2003a). AARC Board Meeting Minutes, August 12 2003. <http://www.a2crew.com/docs/min08-03.doc> (accessed 3/14/04).

Ann Arbor Rowing Club (2003b). AARC Board Meeting Minutes, July 1 2003. <http://www.a2crew.com/docs/min06-03.doc> (accessed 3/14/04).

Ann Arbor Rowing Club (2003c). AARC Board Meeting Minutes, June 10 2003. <http://www.a2crew.com/docs/min07-03.doc> (accessed 3/14/04).

Ann Arbor Rowing Club (2003d). AARC Board Meeting Minutes, November 11 2003. <http://www.a2crew.com/docs/min11-03.doc> (accessed 3/12/04).

Ann Arbor Rowing Club (2003e). AARC Board Meeting Minutes, November 11 2003. <http://www.a2crew.com/docs/min11-03.doc> (accessed 3/14/04).

Ann Arbor Rowing Club (2003f). AARC Board Meeting Minutes, October 14 2003. <http://www.a2crew.com/docs/min10-03.doc> (accessed 3/14/04).

Ann Arbor Rowing Club (2004). AARC Board Meeting Minutes, January 13 2004. <http://www.a2crew.com/docs/min01-04.doc> (accessed 3/14/04).

Ann Arbor Women's Voter's League (1964). Tour information sheet. Ann Arbor, MI, Parks Department, City of Ann Arbor, City Hall records, 6th floor.

Argo Project Team (2003). Notes from meeting regarding Barton Pond and plant growth issues. 6/24/03.

Argo Project Team (2004). Interviews with anglers at Argo Pond, 5/16/04 and 6/19/04.

Arrow, K., R. Solow, E. Leamer, R. Radner, H. Schuman and P. R. Portney (1993). "Report of the NOAA Panel on Contingent Valuation." Federal Register **58**(4601).

Babbie, E. R. (1990). Survey Research Methods. Belmont, CA, Wadsworth.

Babbie, E. R. (2004). The Practice of Social Research. Belmont, CA, Thomson/Wadsworth.

Bahl, S. (2003). Interview, 6/27/03. Superintendent of Water Treatment Plant, Water Utilities, City of Ann Arbor.

Bahl, S. (2004). Telephone interview, 6/24/04. Superintendent of Water Treatment Plant, Water Utilities, City of Ann Arbor.

Bailey, K. D. (1994). Methods of Social Research. New York, NY, Free Press.

Barnett, J. (1999). "Ed Noonan, the River Man, Creates a White-Water Rapids Course." EJ News **3**(2).

Barr Engineering Co. (2002). Argo Pond Sediment Sampling Study. Ann Arbor, MI.

Bedient, P. B. and W. C. Huber (1992). Hydrology and Floodplain Analysis. Boston, MA, Addison-Wesley.

Betzold, M. (2004). The Green Machine. Ann Arbor Observer. February. pp. 21-27.

Blumer, S. (2003). Interview, 7/3/03. U.S. Geological Survey.

Borneman, D. (2003). Interview, 12/17/03. Manager, Natural Areas Preservation, City of Ann Arbor.

Braunscheidel, J. (2001). Water Survey: Argo Pond. Lansing, MI, Michigan Department of Natural Resources.

Bureau of Reclamation (1995). Animas-La Plata Project Colorado New Mexico. Economic and Financial Analyses Update, United States Department of the Interior.

Bureau of Reclamation (2004). Bureau of Reclamation website. www.usbr.gov (accessed 6/1/04).

Butz, C. (1974). A History of the Huron River in Ann Arbor (report written for NR 403, Prof. Charles Cares). Ann Arbor, MI, University of Michigan.

- City of Ann Arbor (1971). Drawing NO 520 C 102 Embankments. City of Ann Arbor, City Hall records, 6th floor.
- City of Ann Arbor (2003a). Departments: Parks and Recreation. <http://www.ci.ann-arbor.mi.us/Parks/parks.html> (accessed 4/11/03).
- City of Ann Arbor (2003b). Sustaining the Quality of Life in Ann Arbor: Adopted, City of Ann Arbor, Michigan, 2003/2004 Budget.
- City of Ann Arbor (2004a). Ann Arbor City Council. <http://www.ci.ann-arbor.mi.us/council.html> (accessed 4/15/04).
- City of Ann Arbor (2004b). Ann Arbor Finance - Homestead Tax Rate. <http://www.ci.ann-arbor.mi.us/Finance/Assessor's/homerates.html#h02-03>. (accessed 6/23/04).
- City of Ann Arbor (2004c). Ann Arbor Finance - Nonhomestead Tax Rate. <http://www.ci.ann-arbor.mi.us/Finance/Assessor's/nonhomerates.html#n02-03> (accessed 6/23/04).
- City of Ann Arbor (2004d). Ann Arbor Park Listings and Features. http://www.ci.ann-arbor.mi.us/Parks/parklistings_1.html (accessed 7/27/04).
- City of Ann Arbor (2004e). City of Ann Arbor 2004-2005 Recommended Budget. <http://www.ci.ann-arbor.mi.us/Finance/Accounting/Recommended%20Budget%202004-2005.pdf> (accessed 6/21/04).
- City of Ann Arbor (2004f). Natural Areas Preservation. www.ci.ann-arbor.mi.us/Parks/NAP/nap.html (accessed 7/21/04).
- City of Big Rapids (2004). Dam Removal Project Overview. <http://www.ci.big-rapids.mi.us/damremoval/damoverview.pdf> (accessed 1/20/04).
- Cochran, W. G. (1977). Sampling Techniques. New York, John Wiley & Sons.
- Cole, G. A. (1994). Textbook of Limnology. Prospect Heights, IL, Waveland Press, Inc.
- Cowherd, D. (2004). Letter to the Editor. Ann Arbor Observer. March. p. 16.
- Department of Parks and Recreation (2000). Meeting Notes: Argo Pond Rowers. City of Ann Arbor, City Hall records, 6th floor.
- Diamond, P. A. and J. A. Hausman (1994). "Contingent Valuation: Is Some Number Better than No Number?" Journal of Economic Perspectives 8(4): 45-64.
- Dillman, D. A. (2000). Mail and Internet Surveys: The Tailored Design Method. New York, John Wiley & Sons.
- Dove, M. (2003). Interview, 12/19/03. Head Coach, Pioneer High School Crew Team.

- DTE Energy (2004). About Us. <http://my.dteenergy.com/aboutUs/> (accessed 4/13/04).
- English, M. R. and V. H. Dale (1998). Next steps for tools to aid environmental decision making. Tools to Aid Environmental Decision Making. V. H. Dale and M. R. English, Eds. New York, NY, Springer: 317-328.
- Environmental Science and Services Division (2004). State of Michigan Department of Environmental Quality Permit and Licensing Requirements. Lansing, MI, Michigan Department of Environmental Quality.
- Eshenroder, O. (1984). Council rejects boathouse at Barton Pond. Ann Arbor News. September 11.
- EWRI Task Force on Dam Removal (2003). White Paper on Removal of Functioning Dams, Environmental & Water Resources Institute of the American Society of Civil Engineers.
- Fink, A. (2003). How to Sample in Surveys. Thousand Oaks, CA, SAGE Publications.
- Ganz, P. (2004a). E-mail to K. Chiang, "Re: Argo Area Master's Project", 1/30/04. Regional Manager, DTE Energy.
- Ganz, P. (2004b). E-mail to K. Chiang, "Re: Argo Area Master's Project", 2/18/04. Regional Manager, DTE Energy.
- Garfield, M. (2004a). E-mail to K. Chiang, "Re: Argo Area Master's Project", 2/23/04. Director, The Ecology Center, Ann Arbor, MI.
- Garfield, M. (2004b). E-mail to W. Adams, "Re: March 2004 Ann Arbor Observer letter", 7/6/04. Director, The Ecology Center, Ann Arbor, MI.
- Garfield, M. (2004c). Letter to the Editor. Ann Arbor Observer. March. pp. 16-17.
- Glock, H., B. Lowery, I. Redman, S. Sprague and T. Weber (2000). Health Risk Communication and Perception: A Case Study of Pesticide Residues on Food. School of Natural Resources and Environment. Ann Arbor, MI, University of Michigan.
- Gougen, T., P. M. Karig and S. L. Yaffee (1980). Discussion Draft: Tellico Dam and Reservoir (A & B), Kennedy School of Government, Harvard University.
- Graf, W. L. (1993). Landscapes, Commodities and Ecosystems: The Relationship between Policy and Science for American Rivers. Washington, DC, Water Science and Technology Board, National Research Council.
- Graf, W. L. (2001). "Damage control: Restoring the physical integrity of America's rivers." Annals of the Association of American Geographers **91**(1): 1-27.
- Graham, C. (2004). The Society of Les Voyageurs. <http://www.umich.edu/%7elvs/> (accessed 6/6/04).

- Great Lakes Fishery Trust (2004). Big Rapids Dam Removal, Big Rapids, MI.
<http://www.ci.big-rapids.mi.us/damremoval/damoverview.pdf> (accessed 1/20/04).
- Hanemann, M. (1984). "Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses." American Journal of Agricultural Economics **67**(2): 332-341.
- Hanemann, M. (1989). "Welfare Evaluations in Contingent Valuation Experiments with Discrete Response Data: Reply." American Journal of Agricultural Economics **71**(4): 1057-1061.
- Hanemann, W. M. (1994). "Valuing the Environment Through Contingent Valuation." Journal of Economic Perspectives **8**(4): 19-43.
- Hanemann, W. M., J. Loomis and B. Kanninen (1991). "Statistical Efficiency of Double-Bounded Dichotomous Choice Contingent Valuation." American Journal of Agricultural Economics **73**(4): 1255-1263.
- Hanshue, S. (2001). Michigan Dam Removal Case Studies. Lansing, MI, Fisheries Division, Michigan Department of Natural Resources.
- Hanshue, S. (2003). Interview, 7/3/03. Settlement Management Specialist, Michigan Department of Natural Resources.
- Hanshue, S. (2004). E-mail to K. Chiang 2/23/04, "Re: Argo Dam Master's Project". Settlement Management Specialist, Michigan Department of Natural Resources.
- Hart, D. D., T. E. Johnson, K. L. Bushaw-Newton, R. J. Horwitz, A. T. Bednarek, D. F. Charles, D. A. Kreeger and D. J. Velinsky (2002). "Dam removal: Challenges and opportunities for ecological research and river restoration." Bioscience **52**(8): 669-681.
- Hart, K. (2003). Interview, 12/8/03. Director, Planning Department, City of Ann Arbor.
- Hartsuff, G. (1999). E-mail to P. Stuckman, "Rowing at Argo", 4/2/99. Coach, University of Michigan Men's Crew Team.
- Hartsuff, G. (2003a). Interview, 7/16/03. Coach, University of Michigan Men's Crew Team.
- Hartsuff, G. (2003b). Interview, 12/22/03. Coach, University of Michigan Men's Crew Team.
- Hartsuff, G. (2004a). Email to W. Adams, "Re: Argo Area Project", 7/14/04. Coach, University of Michigan Men's Crew Team.
- Hartsuff, G. (2004b). E-mail to W. Adams, "Re: Argo Area Project", 6/14/04. Coach, University of Michigan Men's Crew Team.
- Hartsuff, G. (2004c). E-mail to W. Adams, "Re: Argo Area Project", 6/15/04. Coach, University of Michigan Men's Crew Team.

Hawkins, H. P., J. B. Hawkins and E. H. Beatty (1993). Warranty Deed to City of Ann Arbor. City of Ann Arbor, City Hall records, 6th floor

Hay-Chmielewski, E. M., P. W. Seelbach, G. E. Whelan and D. B. Jester, Jr (1995). Huron River Assessment. Lansing, MI, Fisheries Division, Michigan Department of Natural Resources.

Hayes, D. (2003). Impact of Removal of Stronach Dam, Manistee, Michigan (unpublished work).

Heinz Center (2002). Dam Removal: Science and Decision Making. Washington, DC, H. John Heinz III Center for Science, Economics and the Environment.

Hieftje, J. (2004). Interview, 4/2/04. Mayor, City of Ann Arbor.

Huron River Watershed Council (2004). About HRWC. <http://www.hrwc.org/1about.htm> (accessed 7/30/04).

Huron Rowing Team and Ann Arbor Rowing Club (1999). Memo to the Parks Advisory Commission regarding South Bandemer Boathouse. City of Ann Arbor, City Hall records, 6th floor.

Institute for Fisheries Research (2003). The Fisheries Library. http://www.michigan.gov/dnr/0,1607,7-153-10364_10951_19056---,00.html (accessed 10/27/03).

Jaros, E. (2004). Interview, 2/29/04. President, Board of Directors, Crossings of Ann Arbor.

Johnson, R. (2004a). Interview, 2/20/04. City Councilperson, ex-officio member of the Park Advisory Commission, Ann Arbor, MI.

Johnson, T. (2004b). "Removing a Community Landmark", presentation at EWRI Dam Removal - Lessons Learned conference. University of Michigan, Ann Arbor, MI.

Kennedy, P. (2003). A Guide to Econometrics. Cambridge, MA, MIT Press.

Knott, J. and K. Taylor (2000). The Huron River: Voices from the Watershed. Ann Arbor, MI, University of Michigan Press.

Kowalski, M. (2003). Interview, 6/19/04. Assistant City Planner, Planning Department, City of Ann Arbor.

Kuras, A. (2003a). Interview, 6/18/03. Planner, Parks and Recreation Services, City of Ann Arbor.

Kuras, A. (2003b). Interview, 12/17/03. Planner, Parks and Recreation Services, City of Ann Arbor.

Kuras, A. (2004). Concept Plan for Argo Canoe Livery Site. Ann Arbor, MI, City of Ann Arbor.

Lipton, D., K. Wellman, I. Sheifer and R. Weiher (1995). Economic Valuation of Natural Resources: A Handbook for Policymakers, NOAA Coastal Ocean Program.

Loomis, J. B., P. Kent, L. Strange, K. Fausch and A. Covich (2000). "Measuring the Total Economic Value of Restoring Ecosystem Services in an Impaired River Basin: Results from a Contingent Valuation Survey." Ecological Economics **33**(1): 103-17.

Marans, R. W. (2004). E-mail to A. Tislerics, 3/19/04. Survey Research Center, Institute for Social Research, Univ. of Michigan.

McCully, P. (2001). Silenced Rivers: The Ecology and Politics of Large Dams. London, Zed Books.

Michigan Department of Environmental Quality (2001). Total Maximum Daily Load for Escherichia Coli in Geddes Pond, Huron River, Washtenaw County, Surface Water Quality Division, Michigan Department of Environmental Quality.

Michigan Department of Environmental Quality (2002). MichCon Broadway Site: Site Summary. Jackson, Michigan.

Michigan Department of Environmental Quality (2004a). "Dam Safety". http://www.michigan.gov/deq/0,1607,7-135-3313_3684_3723---,00.html (accessed 8/3/04).

Michigan Department of Environmental Quality (2004b). MDEQ/USACE Joint Permit Application Training Manual. http://www.michigan.gov/deq/0,1607,7-135-3307_29692_24403-76158--,00.html (accessed 7/21/04).

Michigan Department of Natural Resources (2004a). About MNRTF. http://www.michigan.gov/dnr/0,1607,7-153-10366_11864-36732--,00.html (accessed 5/10/04).

Michigan Department of Natural Resources (2004b). "Dams and Dam Removal". http://www.michigan.gov/dnr/0,1607,7-153-10364_27415---,00.html (accessed 8/3/04).

Michigan Department of Natural Resources (2004c). "Department of Natural Resources". www.michigan.gov/dnr (accessed 6/13/04).

Michigan Department of Natural Resources (2004d). Potential Grant Sources for Stream Habitat Restoration in Michigan. http://www.michigan.gov/dnr/0,1607,7-153-10364_27415-80441--,00.html (accessed 8/6/04).

Michigan Department of Natural Resources and Michigan Department of Environmental Quality (2004). "Dam Removal Guidelines for Owners". <http://www.michigandnr.com/PUBLICATIONS/PDFS/fishing/dams/DamRemovalGuidelinesForOwners.pdf> (accessed 7/23/2004).

- Michigan Rowing Association (1983). Michigan Rowing Association Boathouse Project: Site Selection Assistance Request. City of Ann Arbor, City Hall records, 6th floor.
- Miller, J. (2003). Interview, 12/1/03. Director, Community Services Dept., City of Ann Arbor.
- Mississippi Department of Environmental Quality (2004). "Frequently Asked Questions for Dam Safety".
http://www.deq.state.ms.us/MDEQ.nsf/page/L&W_FAQs_for_Dam_Safety?OpenDocument (accessed 7/20/04).
- Mitchell, R. C. and R. T. Carson (1989). Using Surveys to Value Public Goods: The Contingent Valuation Method. Washington, DC, Resources for the Future.
- Moore, M. (2004). Personal communication. Associate Professor, School of Natural Resources and Environment, University of Michigan.
- Morley, J. (2004). Interview, 2/17/04. President, Great Lakes Paddlers.
- Murphy, D. E. (2003). San Francisco Journal; City by the Bay Becomes A Bottler, to Loud Attack. New York Times. March 26. New York, NY.
- National Park Service (2004). "Yosemite National Park".
<http://www.nps.gov/yose/index.htm> (accessed 3/7/04).
- Natural Resources Council of Maine (2004). "The Edwards Dam".
http://www.nrcm.org/Edwards_Dam/main.html (accessed 7/27/04).
- Naud, M. (2003a). Interview, 6/12/03. Environmental Coordinator, City of Ann Arbor.
- Naud, M. (2003b). Interview, 11/26/03. Environmental Coordinator, City of Ann Arbor.
- Naud, M. (2003c). Personal communication. Environmental Coordinator, City of Ann Arbor.
- Norgaard, R. B. and R. B. Howardth (1991). Sustainability and discounting the future. Ecological Economics: The Science and Management of Sustainability. R. Costanza, Ed. New York, NY, Columbia University Press: 88-101.
- Office of the Administrator (2000). Analysis of Social Discounting. Washington DC, U.S. Environmental Protection Agency.
- Olson, J. (1989). 200 Years on the Huron -- Part Two. Ann Arbor Observer. 07/1989. Ann Arbor, MI: 36-45.
- Olson, R. (2000). Memorandum to Mayor and Council: Resolution to authorize \$70,000 and approve an agreement for construction of a boathouse in Bandemer Park. City of Ann Arbor, City Hall records, 6th floor.
- Parks Advisory Commission (2000). 2000-2005 Ann Arbor Parks, Recreation and Open Space Plan. Ann Arbor, MI., City of Ann Arbor.

Parks Advisory Commission (2003). Park Advisory Commission Meeting, 12/16/03. City of Ann Arbor.

Parks Department (date unknown-a). Dedication of the Dams on the Huron River. City of Ann Arbor, City Hall records, 6th floor.

Parks Department (date unknown-b). Property Appraisal. City of Ann Arbor, City Hall records, 6th floor.

Pawlowski, J. (2004). E-mail to K. Chiang, "Re: Argo Dam Master's Project - DEQ Permitting", 7/26/04. Dam Safety Engineer, Michigan Department of Environmental Quality.

Pejchar, L. and K. Warner (2001). "A river might run through it again: Criteria for consideration of dam removal and interim lessons from California." Environmental Management **28**(5): 561-575.

Peltzman, S. (1976). "Toward a more general theory of regulation." Journal of Law and Economics **19**(2): 211-240.

Planning Commission (1988). North Main Street/Huron River Corridor Land Use Policy Plan. Ann Arbor, MI.

Pontoni, M. (2003). Meeting, 10/9/03. Merit Marketing Group, Inc., Ann Arbor, MI.

Portney, P. R. (1994). "The Contingent Valuation Debate: Why Economists Should Care." Journal of Economic Perspectives **8**(4): 3-17.

Reisner, M. (1986). Cadillac Desert: The American West and Its Disappearing Water. New York, NY, Viking.

Reuter, A. (2004). Picture-perfect paddling: The prettiest view of spring starts at the Huron River. The Ann Arbor News. 4/27/04. pp. E1, E2.

Riggs, E. (2004a). E-mail to Argo Project Team, "Motorcraft Law", 7/13/04. Watershed Planner, Middle Huron Initiative Coordinator, Huron River Watershed Council.

Riggs, E. (2004b). Personal communication, 7/13/04. Watershed Planner, Middle Huron Initiative coordinator, Huron River Watershed Council.

Riggs, E. and L. Rubin (2003). Interview, 12/19/03. Huron River Watershed Council.

River Alliance of Wisconsin (2004). Restoring the Milwaukee River through Waubeka Dam Removal. http://www.wisconsinrivers.org/SmallDams/waubeka_dam.html (accessed 7/20/04).

Rosenberger, R. S. and R. G. Walsh (1997). "Nonmarket value of western valley ranchland using contingent valuation." Journal of Agricultural and Resource Economics **22**(2): 296-309.

- Rothstein, M. (2004). E-mail to W. Adams, "Re: Question on Women's team use of Argo Pond", 4/7/04. Head Coach, University of Michigan Women's Crew Team.
- Saam, C. (2003). Interview, 6/24/03. Facility Supervisor, Argo and Gallup Canoe Liveries, City of Ann Arbor.
- Saam, C. (2004). E-mail to S. Deuling, "Re: Argo master's project", 6/30/04. Facility Supervisor, Argo and Gallup Canoe Liveries, City of Ann Arbor.
- Salant, P., Dillman, D.A. (1994). How to Conduct Your Own Survey. New York, John Wiley & Sons.
- Scheaffer, R. L., W. Mendenhall and L. Ott (1990). Elementary Survey Sampling. Boston, MA, PWS-KENT.
- Seelbach, P. W. (2003). Interview, 6/16/03. Research Biology Specialist and Research Program Manager, Institute for Fisheries Research, Michigan Department of Natural Resources/University of Michigan.
- Shiffler, N. (2003). Interview, 12/22/03. Co-chair for Conservation, Huron Valley Group, Sierra Club.
- Society of Les Voyageurs members (2004). E-mails to K. Chiang, "Re: Argo Area master's project", 3/16-21/04.
- Stanley, E. H. and M. W. Doyle (2003). "Trading off: the ecological effects of dam removal." Frontiers in Ecology and Environment 1(1): 15-22.
- Sullivan, C. (2000). E-mail to S. Rapundalo and G. Clark, "Proposed Boathouse in Bandemer", 5/22/00. Assistant Coach, University of Michigan Men's Rowing Team.
- Survey Research Center (2002). Detroit Area Survey 2001: Presentation to the Southeast Michigan Council of Governments (SEMCOG). http://www.caup.umich.edu/workfolio/DAS2001/semcog917/pages/Slide_10.jpg.html (accessed 3/20/04).
- Sward, S. and C. Finnie (2002). S.F. looted region's water system, diverted millions into city coffers; Now \$3.6 billion sought to repair and expand aging Hetch Hetchy. San Francisco Chronicle. 9/15/02. San Francisco, CA.
- Taft, M. and R. Woodman (2003). Interview, 7/16/03. Ann Arbor Rowing Club.
- Taft, M. and R. Woodman (2004). Interview, 2/13/04. Ann Arbor Rowing Club.
- Tefertiller, R. (2002). Argo Dam, Ann Arbor, Michigan. Ann Arbor, MI, Huron River Watershed Council.
- The Ecology Center (2004). About the Ecology Center. <http://www.ecocenter.org/about.shtml> (accessed 4/13/04).

Tietenberg, T. (2000). Environmental and Natural Resource Economics. New York, NY, Addison-Wesley.

U.S. Army Corps of Engineers (2004). National Inventory of Dams. <http://crunch.tec.army.mil/nid/webpages/nid.cfm> (accessed 7/19/04).

U.S. Census Bureau (2004). American FactFinder. <http://factfinder.census.gov/home/saff/main.html?lang=en>

U.S. Fish and Wildlife Service (2004). The Endangered Species Program. <http://endangered.fws.gov/> (accessed 7/1/04).

University of Michigan Men's Rowing Team (2004). History. <http://www.umich.edu/~umrowing/history/history.html> (accessed 3/14/04).

Valley of the Fox Group Sierra Club (2004). Valley of the Fox Group, Sierra Club: Batavia votes to let state remove Fox Dam. <http://illinois.sierraclub.org/vof/index.htm> (accessed 6/10/04).

Van Bolt, J. (2003). E-mail to Argo Project Team, 11/5/03. President, Huron Rowing Association.

Weisberg, H. F., J. A. Krosnick and B. D. Bowen (1996). An Introduction to Survey Research, Polling, and Data Analysis. Thousand Oaks, CA, Sage Publications.

Wetzel, R. G. (2001). Limnology: Lake and River Ecosystems. San Diego, CA, Academic Press.

Wisconsin Department of Natural Resources (2004). Dam Abandonment - Oak Street Dam, Baraboo, WI. <http://dnr.wi.gov/org/gmu/lowerwis/oakstreet.htm> (accessed 8/6/04).

Woods, W. (2004). Interview, 3/5/04. City Councilperson, ex-officio member of the Parks Advisory Commission, City of Ann Arbor.

Yarger, M. R. (2003). E-mail communication, 10/20/03. Merit Marketing Group, Inc., Ann Arbor, MI.

Appendix A

MICHIGAN DAM REMOVALS

Table A-1. Michigan dam removals. Compiled using information provided in (Hanshue 2001; American Rivers 2004a).

Dam name	River name	County	Owner	Cost	Year	Notes
Wacousta dam	Looking Glass River	Clinton	private/unknown	unknown	1966	
Newaygo dam	Muskegon River	Newaygo	Consumers Power	\$84,000	1969	Released sediment affected downstream property
Smyrna dam	Flat River	Ionia	MDNR	\$40,000	1973	Public safety hazard
Homestead dam	Betsie River	Benzie	unknown	\$131,000	1974	Lamprey barrier was installed on the sill
Wager dam	Grand River	Ionia	Consumers Power/MDNR	\$17,000	1976/1984	Partially removed before 1976; completed in 1984
Salling dam	AuSable River	Crawford	private/MDNR	\$130,000	1988	Safety hazard, ordered removed
Silver Lead Creek dam	Silver Lead Creek Chocolay River	Marquette	KI Sawyer AFB/MDNR	\$15,000	1997	Removed in 2 stages; earthen, then concrete
Unnamed	Red Cedar River	Ingham	City of Williamston	\$800,000	1998	Created off channel pond & kayak course
Unnamed	Falls River	Baraga	Village of L'Anse	\$130,000	1998	Removed using Lake Superior Basin Trust funds
Glover dam	Kimmerlee Creek Dowagiac River	Cass	private	\$12,000	1998	Extensive restoration; removed due to liability
Big Rapids dam	Muskegon River	Mecosta	City of Big Rapids	\$1,200,000	2001	Safety concern; former owner Consumers Power

Dam name	River name	County	Owner	Cost	Year	Notes
Harris dam	Chippewa River	Isabella	City of Mt. Pleasant	\$721,000	2002	Used Natural Resource Trust Fund money
Randall dam	Coldwater River	Branch	Union City	Unknown	2002	Safety hazard
Mill Pond Dam	Chippewa River	Isabella	Unknown	Unknown	2002	Safety & fishery restoration. Removal opened 71 miles of habitat. Funded by MI Natural Resources Trust Fund.
Copemish Dam	First Creek Bear Creek	Manistee	Village of Copemish	\$50,000	2003	Removed by Road Commission for road crossing and fish passage.
Stronach dam	Pine River	Manistee	Consumers Energy	\$750,000	2003	Operational life short due to rapid sedimentation
Mill Pond dam	Mill Creek/Huron River	Washtenaw	City of Dexter	\$20,500	2003	The HRWC helped plan and find grants for this removal.
Marquette City dam #1	Dead River	Marquette	unknown	\$200,000	2004	Marquette Co. Conservation District will remove
Charlotte City dam	Battle Creek River	Eaton	City of Charlotte	\$180,100	2004	MDNR funding, improve water quality and fisheries
Elm Street dam	Battle Creek River		Consumers Energy/MDNR	Unknown	2004	Former cooling lake for Consumers Power
Dimondale dam	Grand River	Ingham	Lansing Board of Power & Light	\$442,400	2004	Sediment containment to occur at dam site through partial removal
Rice Creek Dam	Rice Creek/Kalamazoo River	Calhoun	City of Marshall	\$203,000	2004	Joint effort between Calhoun Conservation District, DNR, Trout Unlimited and City.
Kimberly-Clark dam	N. Branch Spars Creek/Sturgeon River		MDNR		2004	Dam is 2 feet high by 200 feet long and was used for a recreational trout pond
Tannery Creek dam	Tannery Creek	Emmet	Unknown	Unknown	2004	Removal will restore 3 miles of fragmented brook trout habitat
Sturgeon Falls dam	Sturgeon River	Dickinson	We Energies	\$1,845,000	~2007	FERC licensing agreement

Appendix B

MDNR/MDEQ DAM REMOVAL GUIDELINES FOR OWNERS

These guidelines were published by the Michigan Departments of Natural Resources and Environmental Quality in April 2004. The stated purpose is “to suggest issues that may need to be considered when deciding the future of a dam, and to assist in implementing a dam removal project” (Michigan Department of Natural Resources and Michigan Department of Environmental Quality 2004).

First Step: Consider What Purposes the Dam Serves

1. A. Consider whether the dam itself provides any benefits, such as:
 - a. Power production.
 - b. Prevents movement of sea lamprey or other aquatic nuisance species.
 - c. Fish exclusion for fisheries management purposes.
 - d. Historic significance.
 - e. Provides bridge, rail or road crossing.
- B. Consider whether the impoundment created by the dam may serve one or more of the following services:
 - a. Water supply for irrigation, fire suppression.
 - b. Flood control.
 - c. Navigation and transportation.
 - d. Recreational boating, fishing, swimming, or park use.

Second Step: Consider Problems with the Dam Structure

- A. Safety and Security of the Dam
2.
 - a. Do boats, canoes or swimmers frequent the site—are they at risk?
 - b. Does the site attract anglers?
 - c. Is the dam itself in poor condition and/or subject to an order from DEQ to repair or remove the dam?
 - d. What potential property damage would occur if the dam was to fail?
- B. What are the Costs and Liabilities of Keeping the Dam
3.
 - a. Repair cost estimate.
 - b. Maintenance cost estimate.
 - c. Operational concerns.
- C. What Environmental Impacts Should Be Considered? (Consult your local DNR

and DEQ offices for assistance).

- a. Water quality and aquatic habitat benefits of stream restoration.
- b. Improvement of fisheries and wildlife habitat.
- c. Recreational uses of the impoundment compared to a restored stream.
- d. Other ecological or economic considerations.

Third Step: Considerations for Dam Removal

4. A. Would Removal Eliminate or Reduce Safety and Security Problems?
- B. Would Removal Improve Recreational Use of the Site?
- C. Cost Estimates
 - e. Preliminary estimate of dam removal cost.
 - f. Sediment removal or management.
 - g. Stream bank restoration.
 - h. Replacement of dam dependent services (water supply, road crossing, etc)
- D. Potential Funding Sources
 - a. Private or Community Foundation funding
 - b. Environmental Grants
 - c. State or Federal Assistance Programs

Fourth Step: Working with DEQ Dam Safety Program and/or DNR Fisheries Division

- A. Contact the DEQ dam safety program for information about the condition of the dam, and for permit application requirements and procedures.
- B. Contact the DNR, Fisheries Division for information about the fisheries and wildlife values with and without the dam.
- C. General guidance on the removal of a dam (if a viable option).
- D. Information about potential funding sources for dam removal (if a viable option)
- E. Other requirements for planning, design and modification of the dam.

Fifth Step: Explore Resident and Community Concerns Including Local Watershed Council, Conservation Clubs, Economic Development Groups, others

- A. Historic and aesthetic values of the dam and/or impoundment
 - a. Does the dam help define the community or suggest specific important aspects of its history? What alternatives may be considered to retain a portion of the dam as monument to its history in the community?
 - b. Would creation of an off-channel pond retain recreational uses or aesthetic values, while allowing return of a free-flowing river?

- c. What fisheries and wildlife values would likely occur in the area with and without the dam?
- B. Property Owner Interests
- a. Residents of the impoundment may or may not have riparian rights to the water (access).
 - b. Property values may change with and without the dam.
 - c. Lake association or other resident or adjacent park owners may be interested in taking over ownership and maintenance of the dam.
- C. Other Social Issues
- a. Public safety issues with or without the dam.
 - b. Park or other public use of the area: projected changes
 - i. Alternatives to preserve or replace valued recreational uses
 - c. Flooding concerns—hydraulic analysis may be needed to project how floodplains would be altered if the dam were breached.
 - d. Other local economic considerations (waterfront business development with and without the dam).

Sixth Step: Collect and Assess Information (Professional Engineering and/or Legal Services Necessary)

- A. Legal Issues
- a. Who owns the dam structure and surrounding lands?
 - b. Any riparian ownership or flowage rights?
 - c. Any potential sources of sediment contamination?
 - d. Regulatory concerns or limitations?
- B. Engineering Issues
- a. Condition of the dam and deadlines to take action (if appropriate).
 - b. Accessibility to the dam for repair or removal.
 - c. Potentially affected structures (e.g. bridges, utility crossings).
 - d. Sediment quantification and removal.
 - e. Flood storage capacity and changes in floodway.
 - f. Upper limit of the impounded stream.
 - g. Hydrology (gage data or hydrologic model).
 - h. Alternatives to modify or remove the dam.
- C. Economic Issues
- a. Final cost estimate of dam repair/rehabilitation of the impoundment.
 - b. Potential liability in the event of dam failure.
 - c. Potential operation, maintenance and repair cost savings.

Seventh Step: Taking Action

5. A. Secure Local, State and Federal Permits.

- B. Complete Site Land Survey, Final Design Engineering Plans.
- C. Secure Funding (construction, site restoration and monitoring).
- D. Determine Sediment Management Plan (may include dredge and disposal or in place stabilization as recommended by DEQ and DNR).
- E. Secure Authorization for Site Access.

Appendix C

GOALS OF NORTH MAIN STREET/HURON RIVER CORRIDOR PLAN

The City Council adopted the *Summary Land Use Policy Plan: North Main Street/Huron River Corridor* (North Main Plan) as part of the city's master plan in October, 1988. Although the document is over fifteen years old, it is officially still part of the master plan and as such guides development of the area. It may also indicate public sentiments for how the area should be developed. The North Main Plan included the following recommendations and guidelines for the North Main Street and Argo areas (Planning Commission 1988):

- Consider the Huron River an amenity for Ann Arbor and its residents
- A mixture of public and private development below Argo Dam on the MichCon and Detroit Edison sites and on the area west of Argo Pond
- Area along the river, north of Argo Dam limited to public uses
- Improvements on North Main Street to create a boulevard with separate inbound and outbound lanes and a 40-foot wooded median which would make a pleasurable approach to the city and produce a positive impression
- Improved public access along the shoreline, especially for handicapped, elderly and very young persons, but also additional vehicular access and parking
- Continuous access and linkage along the river from Riverside Park just south of Argo Pond to Barton and Oxbow Park on the north to promote use of the river and shoreline
- A River Activity Center just south of Bandemer for various recreational uses, including a boathouse for the Michigan Rowing Association's team, because "The Argo Pond area is the only location in the river suitable for a rowing facility."

Appendix D

TABLE D-1. INTERVIEWEES AND INTERVIEW DATES

Name	Position and Organization	Background Interview	Political Interview
Peter Allen	Peter Allen and Associates	None	In-person interview February 21, 2004
Sumedh Bahl	Water Utilities Department Director, City of Ann Arbor	In-person interview June 27, 2003	Phone interview June 24, 2004
Steve Blumer	Network Operations Chief, US Geological Survey	In-person interview July 3, 2003	None
David Borneman	Manager, Natural Areas Preservation, City of Ann Arbor	In-person interview June 25, 2003	In-person interview December 17, 2003
Michael Dove	Coach, Ann Arbor Pioneer High School Crew	None	In-person interview December 19, 2003
Paul Ganz	DTE Regional Relations - Ingham, Livingston and Washtenaw Counties	None	E-mailed questions and responses January 2004
Michael Garfield	Executive Director, Ecology Center	None	E-mailed questions and responses February 2004
Sharon Hanshue	Settlement Management Specialist, Michigan Department of Natural Resources	In-person interview July 3, 2003	E-mailed questions and responses February 2004
Karen Hart	Director, Planning Department, City of Ann Arbor	None	In-person interview December 8, 2003
Gregg Hartsuff	Coach, U-M Men's Rowing Team	In-person interview July 16, 2003	In-person interview December 22, 2003

Name	Position and Organization	Background Interview	Political Interview
John Hieftje	Mayor, City of Ann Arbor	None	In-person interview April 2, 2003
Evan Jaros	Crossings of Ann Arbor	None	In-person interview February 29, 2004
Robert Johnson	City Councilperson, ex-officio member of the Park Advisory Commission	None	In-person interview February 20, 2004
Matt Kowalski	Assistant City Planner, Planning Department, City of Ann Arbor	In-person interview June 19, 2003	None
Amy Kuras	Planner, Parks and Recreation Services, City of Ann Arbor	In-person interview June 18, 2003	In-person interview December 17, 2003
Jayne Miller	Community Services Administrator, City of Ann Arbor	None	In-person interview December 1, 2003
Michael Moore	Professor, School of Natural Resources and Environment, University of Michigan	None	In-person interview December 5, 2003
Jim Morley	President, Great Lakes Paddlers	None	In-person interview February 17, 2004
Matthew Naud	Environmental Coordinator and Emergency Manager, City of Ann Arbor	In-person interview June 12, 2003	In-person interview November 26, 2003
Elizabeth Riggs	Middle Huron Initiative coordinator, Huron River Watershed Council	In-person interview February 19, 2003	In-person interview December 19, 2003
Laura Rubin	Executive Director, Huron River Watershed Council	None	In-person interview December 19, 2003
Cheryl Saam	Facility Supervisor for Argo and Gallup Canoe Liveries	In-person interview June 24, 2003	None
Paul Seelbach	School of Natural Resources and Environment, Adjunct Faculty, and Institute for Fisheries Research	In-person interview June 16, 2003	None
Nancy Schiffler	Conservation Co-Chair, Huron Valley Group, Sierra Club	None	In-person interview December 22, 2003

Name	Position and Organization	Background Interview	Political Interview
Mike Taft	Ann Arbor Rowing Club	In-person interview July 16, 2003	In-person interview February 13, 2003
Ron Woodman	Ann Arbor Rowing Club	In-person interview July 16, 2003	In-person interview February 13, 2003
Wendy Woods	City Councilperson, ex-officio member of the Park Advisory Commission	None	In-person interview March 5, 2004

Appendix E

QUESTIONNAIRE AND RESPONSES

This appendix contains the actual questionnaire used in our survey, reduced in size slightly. The data reported are from a total of 766 eligible respondents. The data are “raw”; it has not been weighted by stratum or otherwise manipulated.

Except for questions 2 and 4, the number in brackets after each question stem is the number of people who gave usable responses to that item. For questions 2 and 4, the number in brackets is the number of respondents who indicated participating in that activity at least once, and excludes those respondents who gave unquantifiable answers (e.g., “many”, “frequently”). The total number of times reported by respondents for each activity was divided by the number of respondents who indicated participating in that activity to obtain the average number of times reported here. In some cases, the number of individuals who participated in particular activities was relatively small, and so the number of times the “average” respondent participated in the activity would be considerably lower than the averages reported here.

The full data set from all 766 eligible respondents will be available online at the School of Natural Resources website (www.snre.umich.edu); as of this writing, the exact URL is not known.



Argo Pond and Argo Dam: A Community Survey



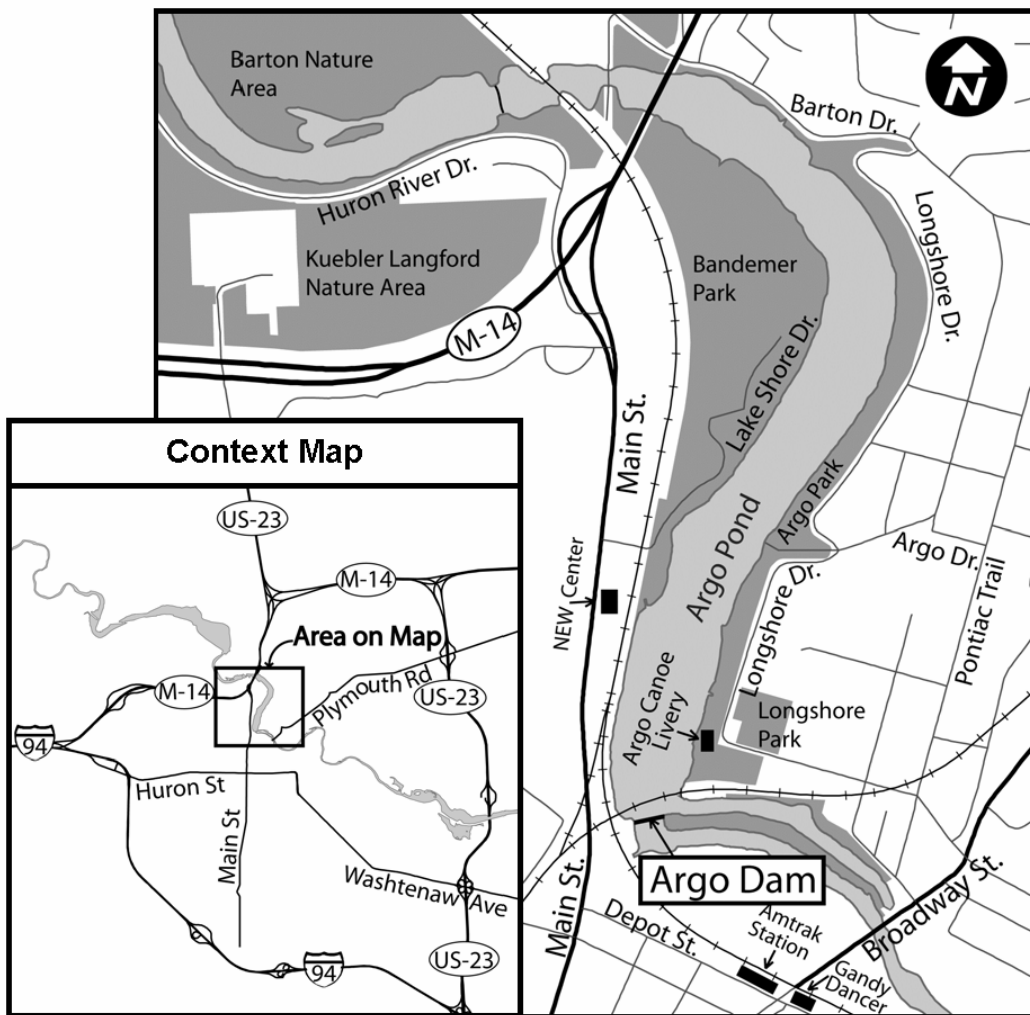
THE UNIVERSITY OF MICHIGAN
SCHOOL OF NATURAL RESOURCES
& ENVIRONMENT

Argo Project Team
School of Natural Resources and Environment
University of Michigan
Dana Building, 460 E. University
Ann Arbor, MI 48109-1115
argoproject@umich.edu

Argo Pond and Argo Dam: A Community Survey

Thank you for taking the time to fill out this questionnaire. As you may be aware, there is some discussion in Ann Arbor about the future of Argo Dam, Argo Pond and the parks around the pond. By filling out this questionnaire, you will help us learn how residents in the area feel about the Argo area as it is now and possible options for the future. **This questionnaire should be filled out only by the person to whom it was addressed.**

Please use this map to help you fill out this questionnaire. When we refer to the “Argo area” in this questionnaire, we mean Argo Pond and the park areas around it.



Part A: Use and Attitudes

In this part of the questionnaire, we would like to find out how you currently feel about parks and recreation in Ann Arbor, and especially the features around Argo Pond. We also want to find out how much you use the Argo Pond area and other areas near Ann Arbor.

1 This question asks for your opinions about parks and recreation in Ann Arbor in general. Please mark the box that **best** describes the degree to which you agree or disagree with each of the following statements.

	Strongly agree ▼	Somewhat agree ▼	Neutral ▼	Somewhat disagree ▼	Strongly disagree ▼	Don't know ▼
I think Ann Arbor needs more open space and parkland. [760]	33.82%	33.82%	19.21%	8.68%	4.08%	0.39%
I think parkland and open space are valuable uses of tax dollars. [758]	56.46%	29.95%	7.78%	2.77%	2.11%	0.92%
I think Ann Arbor needs more wetland areas. [757]	23.78%	25.36%	29.85%	8.45%	5.15%	7.40%
I think Ann Arbor needs better fishing opportunities. [756]	11.11%	13.23%	46.16%	12.96%	7.67%	8.86%
I think Ann Arbor needs better canoeing and kayaking opportunities. [759]	12.91%	27.40%	39.92%	9.62%	3.69%	6.46%
I think Ann Arbor needs more rowing and sailing opportunities. [760]	11.71%	25.39%	40.00%	10.79%	5.00%	7.11%

2 Please estimate the number of times in the last 12 months that you participated in each of the following recreational activities anywhere within an hour's drive of Ann Arbor.

Walking, running, bicycling [686*]	111.29 times	Photography, observing nature/wildlife [550*]	34.33 times
Fishing [105*]	11.94 times	Socializing, picnicking [592*]	14.64 times
Canoeing, rafting, tubing [249*]	4.46 times	Cross-country skiing [125*]	5.53 times
Kayaking [63*]	6.35 times	Sledding, ice skating [251*]	9.00 times
Crew, sculling, rowing [33*]	34.21 times	Other: _____ [81*]	32.37 times

*Number of respondents giving nonzero responses

Please continue to the next page

3 Please mark the box to the right of the statement that **best** describes how familiar you are with Argo Pond and/or the parks around it (the “Argo area” – see map on page 1), and then follow the directions given. [756]

I have visited Argo Pond and/or the parks around it <u>within</u> the past 12 months.	46.96%	→	START AT QUESTION 4 below.
I have visited Argo Pond and/or the parks around it, but <u>not</u> within the past 12 months.	17.72%	→	SKIP QUESTION 4, START AT QUESTION 5 (page 4).
<i>One of these two (see Appendix H)</i>	4.37%		
I have never visited Argo Pond or the parks around it, but I am aware of them.	11.11%	→	SKIP QUESTION 4, START AT QUESTION 5 (page 4).
I have never visited Argo Pond or the parks around it, and I don't know anything about them.	19.84%	→	SKIP QUESTIONS 4 THROUGH 7, START AT Part B (page 7).

4 Please estimate the number of times in the last 12 months that you participated in each of the following recreational activities at Argo Pond or the parks around the pond.

Walking, running, bicycling [322*]	32.03 times
Fishing [41*]	6.66 times
Canoeing, rafting, tubing [131*]	3.25 times
Kayaking [36*]	7.11 times
Crew, sculling, rowing [25*]	42.80 times
Photography, observing nature/wildlife [226*]	18.32 times
Socializing, picnicking [184*]	6.22 times
Cross-country skiing [23*]	4.30 times
Sledding, ice skating [19*]	4.00 times
Other: _____ [14*]	18.57 times

*Number of respondents giving nonzero responses

Please continue to the next page

5 This question asks for your opinions about Argo Pond specifically, not the dam or the parks along its shores. Please mark the box that best describes the degree to which you agree or disagree with each statement.

	Strongly agree ▼	Somewhat agree ▼	Neutral ▼	Somewhat disagree ▼	Strongly disagree ▼	Don't know ▼
I think <u>Argo Pond</u> is visually attractive. <i>[607]</i>	24.55%	46.13%	13.67%	7.25%	0.99%	7.41%
I think <u>Argo Pond</u> has good water quality for fish and wildlife. <i>[609]</i>	4.43%	16.26%	21.02%	14.94%	3.94%	39.41%
I think <u>Argo Pond</u> has good water quality for swimming and wading. <i>[605]</i>	2.15%	4.96%	16.36%	21.82%	21.16%	33.55%
I think <u>Argo Pond</u> has good water quality for canoeing and rowing. <i>[609]</i>	17.41%	42.20%	14.45%	5.09%	1.81%	19.05%
<u>Argo Pond</u> is important to me. <i>[611]</i>	25.86%	28.97%	31.91%	5.56%	4.09%	3.60%
I think <u>Argo Pond</u> is important to most people in the area. <i>[612]</i>	19.77%	34.80%	17.97%	7.03%	1.47%	18.95%
I think <u>Argo Pond</u> is a good place for canoeing and kayaking. <i>[611]</i>	21.11%	44.19%	12.77%	3.60%	1.31%	17.02%
I think <u>Argo Pond</u> is a good place to fish. <i>[610]</i>	5.08%	14.43%	27.21%	7.87%	2.79%	42.62%
I think <u>Argo Pond</u> should be returned to a free-flowing river. <i>[606]</i>	15.02%	13.04%	23.76%	11.39%	11.72%	25.08%
The plants growing within <u>Argo Pond</u> decrease the pond's value to me. <i>[610]</i>	4.75%	14.10%	33.44%	15.90%	10.00%	21.80%
I think <u>Argo Pond</u> increases property values in the area. <i>[609]</i>	15.44%	33.99%	19.05%	3.45%	2.30%	25.78%
I think <u>Argo Pond</u> is an important historical landmark. <i>[610]</i>	14.43%	20.33%	27.70%	8.69%	5.90%	22.95%

Please continue to the next page

6 This question asks for your opinions about Argo Dam specifically, not the pond or the parks around the pond. Please mark the box that best describes the degree to which you agree or disagree with each of the following statements.

	Strongly agree ▼	Somewhat agree ▼	Neutral ▼	Somewhat disagree ▼	Strongly disagree ▼	Don't know ▼
I think Argo <u>Dam</u> is visually attractive. [611]	5.24%	17.02%	23.90%	24.39%	15.22%	14.24%
Argo <u>Dam</u> is important to me. [611]	6.71%	12.93%	39.28%	16.69%	14.40%	9.98%
I think Argo <u>Dam</u> is important to most people in the area. [611]	4.58%	17.18%	25.70%	13.58%	5.56%	33.39%
I think Argo <u>Dam</u> should be removed. [610]	11.80%	11.64%	20.00%	11.97%	15.57%	29.02%
I think Argo <u>Dam</u> is good for fishing quality in the Huron River. [612]	2.78%	8.17%	22.88%	8.17%	5.56%	52.45%
I think Argo <u>Dam</u> is a safety hazard. [611]	2.29%	10.31%	21.93%	14.73%	9.82%	40.92%
I think Argo <u>Dam</u> is good for the health of the Huron River ecosystem. [612]	2.94%	9.15%	18.14%	11.93%	11.93%	45.92%
I think Argo <u>Dam</u> is well maintained. [613]	2.94%	12.89%	24.63%	10.93%	1.79%	46.82%
I think Argo <u>Dam</u> should remain in place. [613]	12.07%	15.99%	24.96%	9.46%	12.40%	25.12%
I think Argo <u>Dam</u> improves recreation on the Huron River. [614]	11.56%	28.66%	16.78%	9.12%	6.84%	27.04%
I think Argo <u>Dam</u> is an important historical landmark. [612]	7.52%	14.05%	27.29%	11.11%	11.93%	28.10%

Please continue to the next page

- 7** This question asks for your opinions about the parks around Argo Pond, not the dam or the pond itself. Please mark the box that best describes the degree to which you agree or disagree with each of the following statements.

	Strongly agree ▼	Somewhat agree ▼	Neutral ▼	Somewhat disagree ▼	Strongly disagree ▼	Don't know ▼
I think the parks around Argo Pond are visually attractive. <i>[615]</i>	27.48%	48.94%	9.59%	6.67%	1.30%	6.02%
I think the parks around Argo Pond are an asset to the community. <i>[617]</i>	50.57%	37.60%	5.83%	1.30%	0.49%	4.21%
I think the parks around Argo Pond offer good recreational opportunities. <i>[616]</i>	34.90%	42.53%	10.23%	4.22%	0.65%	7.47%
I think the nearby parks would be less valuable if Argo Pond were returned to a free-flowing river. <i>[614]</i>	8.63%	13.68%	18.08%	18.89%	12.38%	28.34%
I would use the parks around Argo Pond more if they were larger. <i>[615]</i>	10.57%	23.09%	30.57%	16.75%	7.15%	11.87%
I think the parks around Argo Pond increase property values in the area. <i>[615]</i>	26.83%	41.30%	11.22%	0.65%	0.49%	19.51%

Please continue to the next page

Part B: Value of Argo Alternatives

In this part of the questionnaire, we will ask you to consider two possible alternatives for the Argo area, and make choices about them. We want your choices to be as informed as possible, so please read the following background information and descriptions of the two alternatives.

Argo Dam was built in 1920 by Detroit Edison to produce electricity. The City of Ann Arbor has owned the dam since 1950, but stopped producing electricity there in 1963. Argo Dam does not prevent or control flooding. It is estimated that the current structure of Argo Dam will last at least 50 more years if properly maintained.

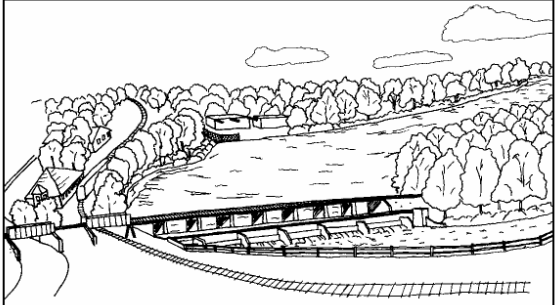
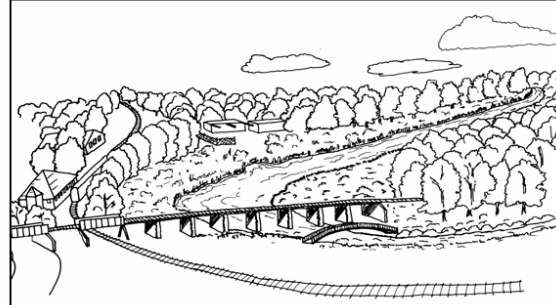
Argo Pond would not exist without the dam. Argo Pond is used primarily for rowing; other uses include canoeing, kayaking, and fishing. It is the only site in Ann Arbor currently available to rowers. Argo Livery, located on the east side of the pond, offers canoe rentals and trips. Walkers, bicyclists, birdwatchers, and others use the dam and surrounding parkland. Construction has begun on a path that will cross the dam and connect the area parks.

All reservoirs, such as Argo Pond, go through a natural aging process. Silt and plant material build up over time. The pond is gradually becoming shallower, while algae growth and changes in water quality affect the kinds of fish and other animals that can live in the pond.

Public officials are discussing possible changes for Argo Dam, Pond and the surrounding parkland. In 1995, the Michigan Department of Natural Resources recommended removal of Argo Dam since it no longer serves its original purpose of producing electricity and removing it could improve conditions for river fish. The Ann Arbor Parks Department has said that if Argo Dam were to be removed, a footbridge would be built near the present location of the dam.

Please continue to the next page

Please consider the following two possible alternatives for the Argo site:

<p align="center">Alternative 1 Maintain the Argo site in its current condition</p>	<p align="center">Alternative 2 Remove Argo Dam completely</p>
	
COSTS	
<p>Maintenance costs about \$30,000 per year (estimated \$550,000 - \$640,000 over the next 50 years), paid from City of Ann Arbor property taxes.</p> <ul style="list-style-type: none"> • Roughly 50 years from now, the dam is likely to need major repairs, replacement or removal. • The pond will eventually require additional maintenance to keep it from filling with sediment. 	<p>Removal and restoration would cost an estimated \$1-2 million; ongoing dam maintenance costs would be eliminated.</p>
RECREATION	
<p>The pond would continue to be available for all current uses, such as rowing, canoeing and fishing.</p>	<p>More than half the area of the pond (about 50 acres) would be gained as additional parkland.</p> <ul style="list-style-type: none"> • The pond would become a narrower, faster-moving river with mild rapids that might be preferred by canoeists and kayakers. • Rowing would no longer be possible at the site.
FISH	
<p>Warmer water and lower levels of oxygen in the water favor lake fish such as bluegill and carp over river fish such as smallmouth bass.</p>	<p>Populations of lake fish such as bluegill and carp would be reduced, but populations of river fish such as smallmouth bass would increase.</p>
VIEW	
<p>Nearby homes and businesses would continue to have a view of a large body of water.</p>	<p>Nearby homes and businesses would have a view of a narrower, faster-moving river and/or new parkland.</p>
STRONGEST SUPPORTERS	
<p>The strongest supporters of this alternative believe Argo Pond is the best place in Ann Arbor for rowing, and it should be preserved.</p>	<p>The strongest supporters of this alternative believe Argo Dam is bad for the health of the river, and it should be removed.</p>

8 If an election were held today, would you vote YES or NO on a local ballot proposal that would **remove Argo Dam and create the conditions described in Alternative 2?** Assume there would be **no added cost to you** and a NO vote would result in the conditions described in Alternative 1. *[713]*

61.99% YES



If YES, would you vote YES or NO on the Argo Dam removal proposal with an added cost to you of at least \$1 per year in property taxes (or rent)? *[460]*

92.39% YES 7.61% NO

Would you vote YES or NO on the Argo Dam removal proposal with an added cost to you of per year in property taxes (or rent)? *[445]*

29.44% YES 70.56% NO

38.01% NO



If NO, would you vote YES or NO on a program to maintain Argo Dam and Pond in their current condition with an added cost to you of at least \$1 per year in property taxes (or rent)? *[282]*

84.40% YES 15.60% NO

Would you vote YES or NO on the program to maintain Argo Dam in its current condition with an added cost to you of per year in property taxes (or rent)? *[281]*

25.27% YES 74.73% NO

(OPTIONAL) Please use the space below to explain your choices, if you would like to do so.

170 respondents made comments in this section (see Appendix I).

Please continue to the next page

Part C: Other Helpful Information

Your answers to the questions in this part are important to help the researchers analyze the results of this questionnaire. All information you provide will be kept completely confidential.

9 What year were you born? [744]

19 _____ *Median: 1960*
Mean: 1959.17

10 Where do you live? [756]

93.65% Ann Arbor City
5.82% Ann Arbor Township
0.53% Barton Hills Village
0.00% Other: _____

11 How far is your residence from Argo Pond? [741]

8.37% Less than one-half mile (a 5 minute walk)
14.04% Between one-half and one mile (a 10-15 minute walk)
16.73% Between one and two miles (a 15-25 minute walk)
23.08% Between two and three miles (a 30-45 minute walk, or a 5 minute drive)
26.18% Between three and five miles (a 10 minute drive)
11.61% More than five miles (a 15 minute drive)

12 Do you own or rent your place of residence? Please mark the box next to the statement that best describes your residence status: [754]

65.92% I own my residence
31.96% I rent my residence (including dormitories)
0.93% I live with someone else (such as a parent) without paying rent
1.19% Other: _____

13 Please mark the box next to the statement that describes the highest level of education you have completed. [751]

0.13% Less than 9th grade
0.27% 9th-12th grade, no diploma
2.53% High school graduate or GED
9.19% Some college, no degree
4.53% Associate's degree
29.96% Bachelor's degree
53.40% Graduate or professional degree

14 What is your gender? [756]

54.76% Male
45.24% Female

15 Are you currently a student (enrolled sometime during the 2003-2004 academic year)? Please mark the box next to the statement that best describes your current student status. [725]

78.62% I am not currently a student
4.55% I am currently a part-time student
16.83% I am currently a full-time student

16 How many adults (age 18 or older) lived in your household in 2002? [758]

_____ adults *Median: 2*
Mean: 2.14

17 How many children (under age 18) lived in your household in 2002? [748]

_____ children *Median: 0*
Mean: 0.51

18 What was your household income in 2002 before taxes? Please mark the box next to the correct range. [740]

2.70% Less than \$5,000
2.03% \$5,000 - \$9,999
1.89% \$10,000 - \$14,999
5.95% \$15,000 - \$24,999
6.35% \$25,000 - \$34,999
10.95% \$35,000 - \$49,999
14.59% \$50,000 - \$74,999
14.86% \$75,000 - \$99,999
13.65% \$100,000 - \$149,999
5.00% \$150,000 - \$199,999
4.73% \$200,000 or more
17.30% I prefer not to indicate

Please continue to the next page

Thank you for taking the time to complete this questionnaire! Please use the space below for any comments or questions:

184 respondents made comments on this page (see Appendix I).

Please return your completed questionnaire in the envelope provided, to:

Argo Project Team
School of Natural Resources and Environment
University of Michigan
Dana Building, 430 E. University
Ann Arbor, MI 48109-1115

Thank you for your participation!

This survey is being conducted by a team of researchers in the University of Michigan School of Natural Resources and Environment. If you have questions about your participation in this research, please contact the Behavioral Sciences Institutional Review Board, Kate Keever, 1040 Fleming Building, 503 Thompson St., Ann Arbor, MI 48109, (734) 936-0933, e-mail: irbhsbs@umich.edu.

Appendix F

CENSUS BLOCK GROUPS INCLUDED IN SURVEY AREA

Census block groups included in the Argo Area stratum

4001 001	4003 002	4007 003	4021 002	4032 001	4038 002
4001 002	4005 001	4008 001	4021 003	4032 002	4060 001**
4002 001	4006 001	4008 002	4021 004	4034 001	
4002 002	4007 001	4008 003	4022 001	4036 001*	
4003 001	4007 002	4021 001	4031 001	4038 001	

*only blocks 1003, 1004, 1005, 1006, 1012, 1013, 1014, 1015

**only blocks 1023, 1024, 1034, 1035, 1036

Census block groups included in the Ann Arbor stratum

4003 003	4006 004	4032 003	4041 003	4046 002	4053 002
4003 004	4006 005	4033 001	4041 004	4046 003	4053 003
4003 005	4006 006	4033 002	4042 001	4046 004	4053 004
4003 006	4022 002	4033 003	4042 002	4046 005	4053 006
4004 001	4023 001	4034 002	4043 001	4051 001	4054 001
4004 002	4023 002	4034 003	4043 002	4051 002	4054 002
4004 003	4025 001	4034 004	4043 003	4052 001	4054 003
4005 002	4025 002	4035 001	4044 001	4052 002	4055 001
4005 003	4026 001	4035 002	4044 002	4052 003	4055 002
4005 004	4026 002	4036 001*	4045 001	4052 004	4056 001
4005 005	4027 001	4036 003	4045 002	4052 005	4056 002
4006 002	4027 002	4041 001	4045 003	4052 006	4056 003
4006 003	4027 003	4041 002	4046 001	4053 001	4056 004

*only blocks 1000, 1001, 1002, 1007, 1008, 1009, 1010, 1011, 1016

Appendix G

E-MAILS RECEIVED DURING SURVEY

Within a few days of the initial survey mailing, a number of people who were not part of our survey sample but who learned of the survey contacted us to express their views. Their e-mails are reproduced below, unedited except for the substitution of “XX” for identifying information. Most of those who contacted us indicated some connection to rowing on Argo Pond, and expressed opposition to removing Argo Dam. These contacts are an indicator of the strength of feeling, and perhaps the degree of organization, on the part of those who wish to retain the dam to preserve rowing on Argo Pond.

I understand you are surveying AA residents with regards to a proposal to remove the Argo Dam. I haven't seen this survey, but would be opposed to changing the flow of the river. I've been advised that removing the dam would make it useless for rowers. Ann Arbor has an active rowing community that would be adversely affected. Crew is a co-ed varsity sport at both Huron and Pioneer High Schools. Combined, their crew teams total more than 150 rowers. The AA Rowing Association and the U of M men (club sport) also use the river for practices. Unless there were some over-riding community health and safety issue, I am opposed to any changes that would adversely impact their ability to continue rowing on the river. XX

If the Argo Dam is removed then we lose our place to row. I can understand the some people think that there are too many dams on the Huron River, and i have to agree with them, but why this particular dam? If the Argo Dam is removed then all the rowing clubs and teams that use that area will have no place to row, then what? The rowing community will be in an uproar. Thanks, XX

All of us involved in crew teams and recreational rowing in Ann Arbor hope you are not seriously considering tearing down the Argo dam. The UM Rowing Team, both local high school crew teams, and many enthusiastic adult participants and fans would be unable to continue if this happened. XX

To Whom It May Concern: I am writing to call your attention to the serious consequences which would result from the elimination of Argo Dam and Argo Pond. As I am sure you know, Argo Pond is used by the rowing teams from Ann Arbor Huron High School, Ann Arbor Pioneer High School, the University of Michigan Men's Crew and the Ann Arbor Rowing Club. (Further information and links may be found at www.huronrowing.org) The two high school teams and the UofM team each have about 70 team members who train daily on Argo Pond in the Spring and Fall. Ann Arbor Rowing Club members add another 10-20 daily users. In short, Argo Pond has over 200 daily users during the months of April, May, June, August, Sept. and Oct., all in addition to the recreational use by scullers, canoes and kayaks from early Spring to late Fall. The Ann Arbor Rowing Club conducts it's popular and successful Learn-to- Row program from it's boathouse in Bandemer Park during the summer and conducts competitive regattas there. Community support for this recreational resource in Ann Arbor was demonstrated this Fall with the formal dedication of the recently constructed Beal Community Boathouse in Bandemer Park. The boathouse, constructed by the City of Ann Arbor Dept of Parks and Recreation, is the home of the two high school teams as well as the Ann Arbor Rowing Club. Elimination of the Pond will, of course, render the boathouse essentially useless for its intended purpose. More importantly, elimination of the Pond would eliminate the current site for recreational and competitive rowing in Washtenaw County. (Indeed, Argo Pond is home to the only high school rowing programs between Wyandotte and Grand Rapids.) Argo Pond is a valuable and irreplaceable recreational asset in Washtenaw County and the Huron Rowing Association strongly supports it's continued use. XX

I understand that this is the correct email contact regarding a study about removing Argo Dam. As a member of the Board of the Huron High School Rowing Association, I would like to express extreme dismay over the proposed removal of the dam at Argo Pond. The pond that Argo Dam provides is used every day in the fall and spring by over a hundred rowers. There are over 70 kids who row for Huron High School alone, plus Pioneer High School, Ann Arbor Rowing Club and (I believe) the Univ of Mich mens team. In addition, kayakers and canoers use the pond often in nice weather. The pond is a very important resource for the town. Huron High was first in the state at the high school level last season, and it will be impossible to keep up that record without Argo Pond to row on. I am also concerned about the dam's use as a flood control measure for the lower town area near the Broadway Bridge. And the city just finished a hiking/ biking path around the pond, so that investment would be wasted if the dam were removed. Frankly, I see no need whatsoever to remove Argo Dam. It is not important for fish migration like so many dams in states like Maine and Washington, so it does not block wildlife. Many ducks and herons live and fish along its banks. I always see a heron or hear a kingfisher when I am at the boat house waiting for my son to finish practice; there are often wood ducks as well as mallards, geese, etc. The wildlife in the area depend upon the pond. I would hope that the School of Natural Resources study would include considering the wishes of the residents of Ann Arbor to whom Argo Pond provides an important resource.

Sincerely, XX

Huron Rowing Association Board

I am a parent of an Ann Arbor Huron High rower. For four years I have seen what a great sport this is, developing sportsmanship, teamwork and athletic endurance. In the last 4 years I have seen the team develop so that it is now a serious contender for other schools, prep schools and colleges in this midwest area. They now have over or close to 100 rowers, not including Pioneer and Ann Arbor Rowing Club. The team travels all over on weekends during both Fall and Spring competing. They have big investments in equipment, boats and time spent on developing their skills. What a difference it has made in my son and his outlook on life! To destroy this wonderful program and all the other recreational opportunities that are used on Argo Pond would be unthinkable! Concerned Parent and Citizen of Ann Arbor

I received a questionnaire seeking my opinions about the Argo area. Unfortunately I am not familiarized with that project. I just moved to Ann Arbor a year ago and didn't have the chance to visit the Argo Pond area yet. You might have to contact somebody else. I apologize for my ignorance and hope to have the chance to help you in the future with a different survey. Sincerely, XX

Well, I just heard about this yesterday and I want to know the reasoning behind wanting to take the dam out. I also wanted to know what the final decision is going to be based on, the advantages and/or disadvantages that will take place in doing this and why this even became a topic of conversation. These are the type of questions I have. XX

Appendix H

PROCEDURES FOR DEALING WITH ITEM NONRESPONSE TO QUESTIONS 3 AND 8

QUESTION 3:

- Where Q3 was left blank, but the respondent answered any item in question 4 with nonzero values, we inferred that he or she intended to mark the first box for Q3.
- Where Q3 was blank, and every question up to Q8 was also blank, we inferred that the respondent intended to mark the fourth box for Q3.
- Where Q3 was blank, and Q4 was blank or all zero values and the respondent answered questions 5-7, we inferred that the respondent intended to choose either the second or third options for Q3; it was not possible to know which, but we created a unique value specifically for this situation.

QUESTION 8:

- Where the respondent failed to choose either “yes” or “no” for the first part of Q8, but then answered *only* the left-side questions for the remainder of Q8, we inferred that he or she intended to choose “yes” for the first part.
- Where the respondent failed to choose either “yes” or “no” for the first part of Q8, but then answered *only* the right-side questions for the remainder of Q8, we inferred that he or she intended to choose “no” for the first part.

Where these specific criteria were not met, such as a respondent answering questions for both “yes” and “no” on Q8, we made no inferences. If the first part of Q8 was not answered, the data record was not included in any part of the CV analysis.

Appendix I

SURVEY COMMENTS

The questionnaire included two separate areas for comments. A comments space on page 9 specifically invited respondents to explain the choices they made in the contingent valuation referendum question, and a space on the back cover (page 11) solicited any comments or questions. Many participants commented in both spaces; because their comments in the two sections were frequently similar, their comments are shown together in the “CV and Concluding Comments” section below. Comments from respondents who only commented in one or the other comment space are in the “CV Comments” and “Concluding Comments” sections that follow.

Comments were copied directly from the survey. Unreadable words were marked XXX. Identifying features, such as names or telephone numbers, were changed to a general descriptor and italicized to protect the respondent’s identity. For example, Jane Doe became *name*.

TABLE I-1: CV AND CONCLUDING COMMENTS

CV Comments (p. 9)	Concluding Comments (p. 11)
The cost is insignificant compared to the recreational benefits.	1. Save and maintain the pond. 2. Improve access and parking for the canoe livery. 3. Manage the fishery.
1) no increase in taxes for maintaining the pond or dam is not acceptable. Mission creep in general will wipe out original goals. 2) A nature center should be put in along the line of a "hands on museum" to teach the kids about our natural resources. Open year round with seasonal activities with reasonable admission fee for kids. A large picture window aquarium built along the dam to view the Barton Pond life. The power House station should be restore historically. see next page (11) for 3)	3) stock the Argo ponds properly with desirable fishing (quality) species charge a reasonable taking fee to fund the operation of the Argo Park grounds, etc.
If the question had been put to me 100 years ago about whether or not to build the dam I might have than rejected it. But in 2003 the ecology, especially has adapted to this dam/pond. Downstream has a lot of potential flooding problems because of the building that has been done on the shore. I love the pond. I would fight any attempt to do away with it.	A pedestrian bridge over the dam would do wonders for the park.

CV Comments (p. 9)	Concluding Comments (p. 11)
<p>There is no good reason to radically change the area right now. Especially since the dam has 50 more years of life. \$50 a year would add too much man-made "interference" to an area that is very natural. (for example the bridge over Black Pond near Leslie Sci Center totally spoiled the pond!!) The only problem I see is the ugly collection of debris at the top side of the dam under the walkway.</p>	<p>Alternative 2 costs more and reduces the utility of the water. Bandemer Park is very underused. I have never seen anyone use the pavilion there. We don't need more parkland there. However the pond has lots of rowers, both U of M and otherwise. The supporters of alternative 2 do not have a very strong argument. Upstream pollution is probably the major problem concerning the health of the river. Who are the supporters? Developers? Local people?</p>
<p>Based on knowledge proved within</p>	<p>Am not well informed on issues. Additional info. could affect my feelings. Would appreciate more detailed in re cost/benefit and rowing opportunities and locations. Signature</p>
<p>I don't understand this question. The prior page shows clearly that keeping the dam is less expensive. Why would taxes go up to maintain it?</p>	<p>Ann Arbor is incapable of managing a project of this size w/o using an already gold-plated budget. See the Broadway Bridges replacement.</p>
<p>Don't know</p>	<p>Ann Arbor's natural parks are very special and should be preserved, expanded and enhanced as much as possible. However, it would be too bad to eliminate a venue for rowing activities.</p>
<p>I need more information on the river's health after its removal--it sounds like the right way to go--a return to a natural XXX--but I will miss the sheet of water there--and how far upstream would the effect go? All the way to Barton?</p>	<p>Barton Dam is still being used? It is mentioned nowhere here. Is the real estate there too prime to alienate its rich owners? Parks along rivers are very nice...so are swift rivers. But: I like the idea of rowing but I'm unlikely to do it. But Ford lake would be rather far away to commute, for the rowers. But the river deserves to return to its natural state insofar as we can actually accomplish this. With Barton Dam above the other dam below Dixons road--it seems about academic. You can tell I'm conflicted.</p>
<p>As a row-boat fisherman (& canoe). I need navigable water--boat access--Barton Pond has poor boat access--and Geddes is choked with weeds from runoff. Runoff is more critical issue than dam.</p>	<p>Bass fishing is excellent in Argo Pond--so can't see how removing dam can/will "improve" it--seems silt, runoff, etc will just run down to Geddes pond causing more problems there (?). Also lack of boat/canoe access to Huron River in general in AA is an issue (as noted Barton Pond has poor access--) seems water flow could just be increased w/ dam (?).</p>
<p>It seems that the rowing option would be a key loss w/ dam removal. I have no idea how XXX rowing XXX XXX XXX. Isn't there also rowing on Barton Pond?</p>	<p>Because of a medical condition, I have not jogged or walked for pleasure in the last 2 years. This has (temporarily) changed my recreational activities. I've used Argo Canoe livery in the past. Not sure whether loss of the dam would negatively affect that option.</p>
<p>I have seen the value of crew to the two high schools and the adults in AARC. The pond is beautiful. It is not worth \$1 M to remove the dam.</p>	<p>Crew is one of the fastest growing sports in A2. Over 150 kids between Pioneer and Huron (larger than football). This sport teaches discipline, teamwork, and is great conditioning. Without a convenient alternative, removing Argo Pond is irresponsible. Another factor is the size of Argo Pond is attractive compared to a narrower river (of which we have many more miles between Dexter and above to here).</p>
<p>I want whatever costs the least and pisses off the environment freaks most.</p>	<p>For a School of Natural Resources and Environment, you wasted a lot of paper by repeatedly mailing me this crap. From now on, leave me alone.</p>

CV Comments (p. 9)	Concluding Comments (p. 11)
I do not know +/- re keeping/removing dam	Garbage is always a problem. I am looking forward to the completing of the walk way across the dam. Bikers in the Lonphere trail are a problem.
I love the idea of removing the Argo Dam, however I wouldn't and couldn't support an additional \$250/year in property taxes to do so.	Good luck with your research!
I believe it's only fair to return the river to it's original state of being. At \$1 cost or \$150 cost per year, we've got to respect what the land was meant to be as opposed to what we would like it to be. Rivers are meant to flow not be stagnant and collect sediment. Even at the cost of loosing rowing recreation, we gain a more natural environment and opportunities for other recreational practices.	Good luck, whatever the outcome.
It's left up to the voter.	How do you no me? You don't have to write back. Thank you. P.S. You don't have to send anymore paper here.
My taxes have increased enough already. \$150 just seems like an awful lot of money.	I am all in favor of returning the river back to its original course--natural course. The increased parkland, and health of the river would be too obvious benefits produced by the removal of the dam.
Where does \$70/yr come from? A fund to pay for reconstruction which will not be needed for 50 years? Get real. This much money will raise more than Prop B!!! You don't need all this \$ to maintain it.	I am not sure why the dam has no role in preventing or controlling flooding. All dams do. For my other comments about the initial map, annual maintenance cost (very misleading), etc. Most of the fishing at the present times is not in the waterXXX, but from fixed points. Pond is a no-wake zone. It is very difficult to conceive how much flow would exist w/o the Argo Dam, or how far across the river would be. Please also see my comment regarding canoes at the rapids--none of the liveries (skips Argo) allow passage of rapids in their canoes. Removing the dam would probably eliminate canoeing on this stretch of river (thru rentals). Thanks for the survey. CMA. Also, swimming and wading is illegal in the metro parks exception designated, lifeguard zones! I am sure "Ann Arbor" also has same rules!
I would support the removal	I apologize for being late...
I'm in favor of keeping Argo Dam for now until Ann Arbor has a compable [sic] location for rowing and a strong reason why it need to be removed.	I do think Ann Arbor currently has sufficient of wetlands and parks. As city grows, these wetlands and parks may have to grow proportionately.
What about alternative #3, the artificial rapids which would maintain the pond level while giving a superior aesthetic to the dam See small project on Red Cedar River in Williamstion; and Delhi is basically dam debris in-situ	I find rowing to be a huge detracton to the experience at Argo. The wake of chase boats in no-wake zone. The screaming over bull-horn and their un willingness to yield to canoeist has reduced my paddling there. The current level of impact by rowers on low impact users is highly undesirable. The oak/hickory forest on the east shore is the nicest natured area in A2, but is ruined by all the motorboats and bull-horns.

CV Comments (p. 9)	Concluding Comments (p. 11)
<p>I was on the Huron Crew team and know many people on and participate in AARC (Ann Arbor Rowing Club). And the ability to row there is crucial to the success of the programs on all levels from High school to college to AARC. I also walk the path along the pond and the view while walking the path is breathtaking at times, and believe the path through the woods would become just that; a walk through the woods without the water.</p>	<p>I grew up right on the pond and really enjoy the scenery. With the addition of the new walkway on Barton and the parks in the area there proximity to the water is what makes them so beautiful.</p>
<p>I would vote yes for a higher amount. If a new park area like Galup [sic] was planned then \$50 maybe O.K.</p>	<p>I grew-up canoeing the Huron River with my family. I would canoe a lot more if I did not have to portage my canoe around the dam. Currently I avoid it. I like the trip from Argo to Galup [sic].</p>
<p>You have left out the third proposal, engineered rapids, that I am strongly in favor of. Of the two remaining options, I prefer to leave as is. I don't agree that either leaving the dam or removing it are the best alternatives or the only choices.</p>	<p>I have an 1880 Panoramic map of Ann Arbor that shows what looks to be the dam and spillway already there. The description of Detroit Edison having built the dam in 1920 would be perhaps be better written as "the current dam...", while pointing out the use of the spillway (millrun) much earlier. Why not ask about the engineered rapids proposal? Most of the 600+ times spent walking/running/bicycling were not recreational, but it isn't clear from the question that you only wanted recreational biking and walking trips. It's amazing how often U of M people consider walking and biking to be recreational, despite the high number of non-motorized utility trips on campus. That creeping Southeast Michigan car-only mentality?</p>
<p>Probably my rent would not increase by \$450 per year because taxes are generally based on the value of the property. I said NO on that question because it is well over a half month's rent, which seems like too much of the relative burden.</p>	<p>I have few opinions since I only visited once ~5 years ago. You could improve your survey on questions by explaining what you mean by "socializing" and "walking," which in my experience and daily activities unrelated to parks. I do think that people view Argo and Broadway parks as being a bit dangerous. As I recall, Argo in particular seemed isolated.</p>
<p>One question you do not address, is how far would the rowers have to go to be able to row?</p>	<p>I have lived in A2 my whole life. I have many fond memories of canoeing on the Huron River. Now I mostly use the pontoon boats at Gallup Park with my nieces. I am strongly in favor of continued improvements to parks around and uses of the Huron River. I would like more ways of accessing the river from as many different locations as possible.</p>
<p>Cost us outcome and impact. Information given.</p>	<p>I have lived in A2 since 1959. Lived on Pontiac Tr number. My niece is on Pioneer Crew. Skeptical of agendas of initiators of surveys.</p>
<p>It seems that removing the dam would bring the area to a more "natural" state, but \$250 is a lot of money for a renter...Also, I would enjoy the added park space because I use that more than water activities.</p>	<p>I have not heard of this project proposal until you sent me this survey. So, thanks for getting me informed! Good luck!</p>
<p>I would like to help, but I don't use it enough to pay so much in taxes.</p>	<p>I hope this is not too late!</p>

CV Comments (p. 9)	Concluding Comments (p. 11)
<p>Yes, we must take responsibility for the mistakes that were made by Detroit Edison in 1920. We have to pay back nature for the power (electricity) that we used. The Dam is useless, the River is not.</p>	<p>I hope we remove the Dam. It's the right thing to do. I strictly canoe upstream at this time. Hudson Mills to Delhi is my main canoe run year-round. Thank-you for pursuing this project. Signature</p>
<p>The crew teams are a valuable contribution to the positiv development of students in Ann Arbor--they rely on Argo Dam/Pond heavily. I strongly agree to keep the Pond/Dam and would pay high taxes to maintain it.</p>	<p>I hope you ask all parents of crew team members and the Ann Arbor Rowing Club, and Michigan crew team to complete a survey. They/we rely heavily on the pond for rowing, and it bring lots of people to the parks for enjoyment. We also help voluntarily maintain the sites by removing brush and cleaning up.</p>
<p>You need to figure some other way for funding Ann Arbor is overrated in property taxes all ready.</p>	<p>I like the educational values for the area they need to be kept up for future generations. Dismantling of such locations always change the natural learning environment for the young creative mind. These areas keep life real for young minds to see in actuality rather than just a picture in a book. We need to look at way to restore many historic sites. We can find and create all kinds of funds for less educational things with no cost to residents; why can't it be done in this situation. The future is always change, but its what you change and how you change it. *Is best for the ecosystem or man's greedy efforts more money in someone's pocket.</p>
<p>Maybe [S1]. 450 extra per year would NOT benefit me or my family. We do not use waterways that much here in MI and that extra \$ is not beneficial to us. If we took advantage of canoes, etc, maybe it would be worth it, but Ann Arbor is expensive enough. People have families to support, tuitions to pay. Why the extra taxes?</p>	<p>I moved to Michigan 6 months ago from Florida. I am not familiar with the damn or the river's water safety. If I had more information about the water and environment, maybe I could be more help. The damn is not aesthetically pleasant, it doesn't serve a purpose any more, but why would it cost us much more to remove? Good luck.</p>
<p>Proposal B was only ~ \$45/yr; \$350/yr seems very high in comparison, of course, any proposal wouldn't say or state #350/year.</p>	<p>I run 3 or 4 times a week. Several of my runs go along the Huron River, I run on both sides, at/in Kuebler Langford Nature Area and in the Barton Nature Area. I have often thought that paths could/should be better, this is an area I would spend money on time. The parks around the Argo Dam, Brandemer Park and Argo Park, I never use. It just seems too hard to get to, and if I made the effort, there doesn't seem like there is anything to enjoy. I would be interested to see if additional space could be added to the current parks. Then there might be something, because it is big enough, to enjoy with a family. Best of luck with your study. Feel free to contact me in the future if you wish.</p>
<p>It seems the river would have more limited use if the dam were removed</p>	<p>I see no reason to spend millions to improve the conditions for river fish. A.A. could do well to maintain the parks they have now. The tennis courts are deplorable.</p>

CV Comments (p. 9)	Concluding Comments (p. 11)
<p>Take the removal costs and spread them over more years. Argo dam isn't a big enough issue in the public eye so that it's removal would pass @ \$150/yr. The greenbelt passed @ \$75/yr. Because benefits to all were huge. Try \$25/yr max.</p>	<p>I support removal because I think the river should be as close as possible to its natural state. To get \$\$ to remove it you need to run a campaign similar to Greenbelt. Show pictures people respond to pictures. Before: dam ugly [drawing included]. After: beautiful flowing river [drawing included]. Show pictures of people recreating on river, etc...pulling a lively bass out of the river vs. a big ugly carp. Good luck.</p>
<p>I believe that the city of Ann Arbor should keep the dam and start producing electricity again! It is a historical site, and should do what it was made to do!</p>	<p>I think Argo Dam should be used as an electricity producer. Did you think of this? I don't especially care what happens to Argo Pond and Dam, but my Dad told me to fill this out, so, whatever. Thanks for being concerned.</p>
<p>It seems unfair to charge 800.00. That is 16 mills isn't it? I would pay a reasonable amount. Not 800.00 a year. I would pay \$15-20 a year for betw. 5 and 10 years, which is still a lot, in my opinion. Does it all have to come from our property taxes? Can't Detroit Edison or other corps. chip in?</p>	<p>I would be thrilled to see the dam removed. I am concerned about the Huron River. I've been living close to the river and visiting it often (walking, running, biking) for over 20 years. It seems somewhat less health, now than when I first knew it. The park around Argo Dam is beautiful with the nature plants and grasses. If the water could be deeper and faster flowing that would be great. Or however it would be--my goal for the park would be to faster healthier wetlands that could be enjoyed recreationally too.</p>
<p>The pond is a useful area of slow/smooth water for canoeing both upstream and for leisurely floating around. This works well for children and families. There appears to be faster nonrower river sections above and below Argo. The damn seems to be a net benefit to me and neighbors.</p>	<p>I would consider supporting removal of the damn--the information provided is clear, but slight; e.g. how would the additional parkland be used, how good would parks be with 1-2 million in removal and restoration. Thank you.</p>
<p>The question is biased to create two answers: 1) yes 2) No--but unwilling to spend \$90/year. I can't vote yes because alternative 2 is half-baked. Show that hydro-electric is not feasible and make the rowers happy. The question seems to be designed to support the leanings of it's authors. Things don't happen like that in Ann Arbor.</p>	<p>I would need to know 2 things before I could support the removal of Argo Dam: 1. Does the potential exist for the restoration of hydro-electric power supply? What is the cost/value? 2. What is plan B for the rowers? If the inevitable committee is the result of this, I would be willing to volunteer.</p>
<p>\$150 sounds high, but I would pay more than \$1.00</p>	<p>I'm curious what the facts are about water quality in Argo Pond --safe to swim? --safe to eat fish?</p>
<p>\$250 seems harsh. Something in the middle--\$100-- would be more acceptable. Going from \$1 all the way up to 250 is a stretch for me.</p>	<p>I'm sorry this is so late. I hope you can still use it.</p>

CV Comments (p. 9)	Concluding Comments (p. 11)
I don't understand the effects/advantages of removing Argo Dam without removing other dams along away.	It was hard for me to answer the personal use questions as I live on the edge of Barton Pond. Thus I see and observe it every day, so my answers are skewed. Otherwise as a sedentary person, I don't use the parks much but I love them. I think we need to fix the parks we have within the city more than we need t add to them. Barton, Argo v. Gallup ponds need to be cleaned of aquatic plants! The level should be lowered in winter. It would be OK with me if Barton Dam were removed and the river let to run free--I don't know if that's true of my neighbors. Question 1) is worded badly, I think I am strongly in favor of obtaining land outside the city (green belt idea), but within the city, maintenance (including possible removal of Argo Dam) is more important. Signature and phone
I am ultimately concerned with the health of the river. Unfortunately \$450 is a large sum of money to add to my yearly expenses. \$1 a year is hardly noticed. (obviously). I'm not sure of the consequences, but this is where I, personally, stand financially.	It would be interesting to me to obtain results from this survey. I would like to be informed if possible.
For me, \$1 per year equals \$0 per year. I would pay \$350 per year for a few years, but not for 50 years.	I've only lived in Ann Arbor for 3 months, so my opinion may not be as relevant as the opinions of residents who have lived here longer.
Given the explanations given on the previous page, I would prefer to have more parkland and a free-flowing river, which would still accommodate canoists and kayakers. As a graduate student I could not afford a \$450 increase in rent, as my rent is already so high beyond my financial capability.	My apologies for such a delay in response. I hope the research project helps provide important voice(s) to the decisions about Argo Dam. My best, <i>Initial</i> .
The river that does not flow or that get perverted due to additional structures such as dam well be more vulnerable to "uncleanliness." Any harmful bacteria or germ may grow up faster and unwanted water plants may grow up. The inefficient concrete structure such as dam only gives those unfavorable effects on healthy and beautiful parks area around it.	My legal name is <i>Name</i> . You may want to use this name for authority of this study. " <i>Name</i> " is just nickname or business name amongst my close colleagues. Thanks.
For how many years? Assuming many years.	Open water alternatives exist for rowers @ Gallup park (above Dixburo pond). What is the average cost per acre of park land within city limits? I would guess at least \$40,000/acre easily justifying the removal of Argo on an economic argument. Ecologically, the river would be more healthy.
I cannot choose based on the info shared: I would not know if there is an alternative (that could address water quality issues and preserve rowing opportunities. I would want to know if there are other locations in Ann Arbor suitable for rowing...even if somewhat less ideal.	Questions on page 4 & 5 seemed to be asking for opinions on some matters that are more fact based then opinion based. I have some general idea on the quality of the Huron for certain activities, but not enough to answer many of those questions.
\$250/yr is absurd. No citizen would agree to that unless they lived on the lake.	Return the river to its original state.

CV Comments (p. 9)	Concluding Comments (p. 11)
My answer to the last question is that I don't know.	Rowers have alternatives. The U-M woman's team has Ford Lake and the men's team could to. I have some physical disabilities so don't avail myself of a lot of recreational activities. But I have canoed the Huron River and may do so again. The removal of the dam would be very welcome. Why would the \$120 per year be for, as the one questions posed. That gave me pause.
'Taxes are already too high in Ann Arbor. "City Hall" needs to be more fiscally response. They are a laughing stock.	See page 9--The taxes here are too high. Fiscal responsibility is not evident in "City Hall" (look at those ridiculous retirement packages. Sign me up for one of those, school board and school administrator.
If removing the dam would really better for the river, then do it. Also, I'm a canoer and learning to kayak; it would be great to have some rapids in town. Any chance some of the resulting park could be a dog park? I would pay even more for that.	Seriously, rapids for kayaking and space for a dog park would be worth the tax increase. Those are great bonuses for taking care of the river.
Where else would the crew teams practice?	Since the city of Ann Arbor put funds into improving the walkway on the north side of Argo Pond--building it and clearing the area--wouldn't it be off the river and not relate to much? I can't imagine the odor from the dried up pond bottom for a period of time! Seems like \$1-2 million could be spent in a more valuable way.
The cost is not huge and it seems the best way to return the place to its natural shape. I would support this option in any case, more so when the damn no longer serves its original purpose.	Sorry it took so long. I am the busy mother of two!
I like it the way it is, view and activities and parkland. But voted remove it (maybe). Change isn't always what it is forecast to become. I don't look forward to probably 10 years of de-construction, rivers bed trash removal and freshly planted, immature landscape. But for future generations, Maybe it's ok.	Sorry late in returning. Wife finally did it for spouse. We were un-aware of potential change, appreciate being able to give our opinion. Didn't know ponds were "Bad" (sediment, plant-algae problems). We don't like change (loosing nice big water) but if it has to change give emphasis to "free" flowing river and rapids, possibly ike Delhi rapids or North of Ypsi with chance for riverside trails and parks along all the way. Row teams can go to Barton Pond or Gallup if Argo is destroyed. And emphasize the health of the "natural river" in this stretch. Also, try to get easy public access to Barton Pond to kind of placate people who'd mourn the loss of the wide river above Argo. Also emphasize that Argo Dam is a dead dam of no use and is evolving into environmental and fiscal problems. Can they/we get grants to ease the cost of Argo Dam destruction?
Seems much too high an estimate [under 8D]	Sorry to be slow to respond. I would appreciate a summary of survey results.

CV Comments (p. 9)	Concluding Comments (p. 11)
<p>Argo Pond is the best place in town for paddling (kayak, canoe) in town location is convenient. Barton pond is hard to access with a boat. Gallup is overpopulated whereas Argo is more wild. You can see wood ducks at Argo. Have also seen coots, rails, green heron. As an avid kayaker, I appreciate Argo as a scenic, wildlife-rich, leisurely in-town paddling spot. Low water levels that make most of the Huron unnavigable in late summer do not affect Argo. If I want rapids, I go to Delhi, draining Argo is unlikely to result in rapids of any significance to a kayaker or canoeist, and will take away towns most scenic paddling spot. If I want a narrower, swifter river, I just put in below the dam, then I rollerblade back to the car and then go pick up the boat. So why take away Argo? Gaining nothing, and losing a great wild pond.</p>	<p>Survey has made me aware of how much I use and value Argo Pond. Has also made me realize Argo Pond is unique and not easily replaced by Barton or Gallup Ponds. Argo Pond is wilder and more scenic and better for viewing wildlife, particularly water birds, from a kayak or canoe. Btw, the UM crew boats are a very pretty sight from the M-14 overpass in the mornings looks like Boston.</p>
<p>Consideration of the ecosystem (after 80 years of the dam being in place and plants/animals adapting to new situations) should be viewed prior to any removal of the dam. Parks/open space/costs must be secondary to this condition.</p>	<p>Thank you for letting me express my views. Anything that returns our environment to its original state is a bonus to us and our children, but in this case the environment may have changed over the last 80 years. The question should be asked, will the removal of the dam destroy the existing ecosystem? We need to remove the "human element" from this decision. Thank you.</p>
<p>I don't really know if I would pay \$50 per year--I would rather have checked "maybe."</p>	<p>Thank you for making me aware of this issue.</p>
<p>I used to live near Barton Pond and ran and skied in the area a lot. It and the boating activities are a definite cultural asset to the city. However the overall (health) quality of the watershed is an overriding concern. Feasibility of generating electricity again should be explored. It's renewable energy. You don't provide much information on alternatives for boating activities. As for fishing, I think if we take care of the watershed fishing will largely take care of itself. I wouldn't vote to change it until I knew a lot more but I would be very interested one way or the other.</p>	<p>Thank you for this opportunity.</p>
<p>Argo dam is no longer used for electric power generation. Argo Pond's recreational use is marginal--even without the dam, Ann Arbor would still have the Argo Area's river and parks. Dam maintenance is expensive, especially in the long term (100 yrs.). This is an easy one--get rid of the dam! Rivers need to flow unless there is some compelling societal argument for a dam, such as hydroelectric power in an area where other power is not available.</p>	<p>Thank you very much for doing this survey! I don't know how I got chosen, but I'm glad I did. I've read a lot about this issue and am pleased to have a small voice in decisions on the future of the Huron River. One point on survey structure--pg. 9, ques. 8: why no middle ground between \$1 and \$350/yr? And for how many years? I'm willing to go to \$350/yr. by cutting donations to other environmental efforts I now support, but I suspect few others are willing!</p>
<p>Why are the options \$1 and \$600?? Why do the strongest supporters of Alternative 2 believe the dam is bad for the health of the river?</p>	<p>Thanks for asking!</p>

CV Comments (p. 9)	Concluding Comments (p. 11)
<p>My main concern is the health of the river ecosystem and the health of the people using the river. I believe the water is polluted and that is the real issue to address. I think people should be able to use the river for rowing, but a better alternative would be clean water so people could swim and actually eat the fish they catch.</p>	<p>Thanks for asking. Where can I see the results?</p>
<p>I opt for removing the dam because I think it would improve the health of the river. Also, in addition to the cost of maintaining the dam, I believe there would be additional expenses associated with maintaining the pond which aren't listed in this document. I don't think A2 necessarily needs more parks. I would like to see a river walk developed with some retail/recreational development, shopping, restaurants, etc. This would bring in tax revenue needed to restore the river without raising the tax burden on A2 residents. Our taxes are already too high! Also, whatever happens I want to see the area made more wheelchair-accessible.</p>	<p>Thanks for doing this. It is important work. Please don't raise my taxes much less than \$20/year is OK but no more than that.</p>
<p>Alternative 2 is more natural, more aesthetically attractive, better for canoeing, and I think better for the area in general. I'd be happy to pay \$1 a year or even a little more for this, but \$120 per year is too steep.</p>	<p>Thanks for the opportunity to add my opinion!</p>
<p>I'm not certain why rent would effect property taxes. Rent in this town is TOO HIGH with or without the pond or dam.</p>	<p>The dam (and pond) have [sic] been there all my life. I like it. Leave it alone.</p>
<p>\$350 is a lot of money, and I am very ambivalent about this topic.</p>	<p>The dam should not be removed unless consideration is given to those who use it for rowing (the pond). If we can find an alternative place for rowing (Geddes Park near US23, for example) than removing the dam should be considered. The city will need to give facilities (like a boat house for the UM crew team) at tax new location. Argo pond is the only place for rowing, but there are other places to canoe and kayak. We need to be fair to the rowers.</p>
<p>I'm operating on the assumption that removing the dam and restoring the river would be a cost only for a short time--and then it would subside. Maintaining the dam will cost less per year perhaps--but the cost will always be present, and down the road, it will eventually cost at least as much to re-build the dam as it would to remove it.</p>	<p>There are many lakes and ponds in the vicinity of Ann Arbor that could be used for rowing. But there are few larger rivers in the county, so they are valuable as streams, not dammed. However, it is crucial that the restoration be handled carefully, preferably by using natural succession, with management to prevent erosion, keep out invasives [sic], and also allow a level of access to the river for canoes, kayaks, and hikers in places along the shore.</p>

CV Comments (p. 9)	Concluding Comments (p. 11)
I think it's beautiful that we have an opportunity for the XXX recreation of rowing/canoeing/kayaking on a lovely site within the city. One of my favorite of spring is the first boaters on the pond--people shouldn't have to drive out of town for this opportunity.	This is a complex question, and I believe the XXX of the alternatives depend on the details, which go way beyond the simple (although XXX XXX) XXX discussions of pp 7-8. You may get XXX XXX "XXX" vs. "recreational" answers... I've also got a familiar XXX XXX of your questionnaire XX XX page 9, which I found voting confusing. For p. 8, you XX XX had situations I XX XX. For "status quo" XXX alternatives 2 on the XX XX "changes." (And the pictures XX XXX the image). On p. 9, however the alternatives as XXXXXXXXXXXX. t'd be XXX if you did not XXXX
The above questions are very badly worded and confusing. They make it hard to tell whether one is answerable about actual vote, whether you'd vote at all, etc. A logical nightmare...	This is an important local issue and merits careful thought to be resolved most intelligently.
Could rowers row at ? Gallup in area in front of admin. Building.	This questionnaire seems biased in favor of removal of dam (example ques 8 has removal of day highlighted in bold). This may have significant effect on returned questionnaires.
I am not answering this. The data could be used to alter the outcome of a vote or to rephrase questions put to voters.	This was a nice survey until you tried a "Gallup Poll." Please do not turn Argo pond issue to a manipulated vote.
I made my decision based on my concerns for the environment and health of the river, lots of algae growth doesn't sound like a good thing.	To make alternative 2 sound more attractive or at least more acceptable to rowing supporters, I'd suggest the project team and the Ann Arbor city publish a list/brochure about nearby places (whether within or outside the city) suitable for rowing.
When will people realize that the best you can do for the environment/nature is to leave it along!! I think the best location for a new wetland would be the otherwise wasted space in the area of Geddes and East U!!	What about Barton Pond, Gallup Pond, Ford Lake?? The Huron will never be free-flowing as it once was. Michigan/USA will never be wilderness again.
Why isn't electricity being produced? How much would it cost to re-start that generator? At todays electric rates, can re-starting and maintaining production of energy pay for itself? At what rate is that possible. Would you rather have Argo Dam or let Bush tear up Alaskan Wilderness for oil? I vote for the dam. Its here, its not that bad, and its a reasonable clean energy-producing method.	What about dredging. Siltification is reversible in this size project.
Difficult to assess this threshold ["NO" value response] that you XXX so carefully XXX.	With much larger dams just upstream and downstream of this one, I cannot imagine that the removal of Argo Dam would establish a "free flowing river." Why start the removal with the one closest to downtown? Dam removal has been great in places, the XXX in Maine for instance, but this one doesn't make so much sense.
Am more likely to take advantage of more parkland than actual river use.	Would be very important to me to know actual cost of XX taxes before considering a vote. As a condo owner, this is often difficult to estimate.

CV Comments (p. 9)	Concluding Comments (p. 11)
I think removal would be usually better and create great canoeing. I would also like to have something worked out for U of M rowers--prior to vote--either Barton pond or Gallup.	Would love new park millage to help create some sort of continuous bike/walk path from Dexter to Gallup. More land (flat) might make this possible.
The increase in tax per year is necessary and a greater increase will help the process of removal go more smoothly/faster while a lower increase will just lengthen the process. Even though I love rowing, the river's health (natural state) is more important. I can always learn to kayak. More parkland compensates for the loss.	Your persistence in getting survey responses is to be commended. Why didn't you provide the background on Argo Pond at the very beginning of the survey? It would have affected some of my earlier replies.

TABLE I-2: CV COMMENTS

\$350 is just too high. I would pay an extra \$15/month.
\$350 per year is too costly. \$30 per year is more reasonable.
\$350 seems very high.
\$350/year seems highly unrealistic for such a project!
\$450 per year is quite a bit of money. I would want to know a lot more about the project for that amount. For instance, how many years, what total amount raised would be, etc.
\$450 per year is way too much for such a thing.
\$50 is too much..., but I could pay \$1.
\$600 per year! Over 50 years, that is \$30,000! I value free-flowing rivers, but that money could be better spent. I would certainly spend another \$100-\$200 per year to remove the dam.
\$90 per property owner in Ann Arbor is significant and I would need to know exactly what that kind of money would be used for, especially since dam maintenance would be eliminated. Explanation of the \$1 would also be needed but I am assuming it would cover some additional park maintenance costs associated with expanded park area.
1) Your questions are a little unclear (follow-up). I would vote to keep the dam in all three cost scenarios. 2) My thinking is that the dam is in place already and has been for some time so the damage to the river is already done. Let the rowers enjoy their sport. However, once the dam reached the point where it must be removed or replaced I would lean toward removal to restore the river.
1.00 a year seems way too low to accomplish and maintain either alternative. But--600.00 more taxes a year would be most difficult. I support all open space and park proposals and the taxes XXX by XXX do add up to a lot.
Alternatives are needed for rowers.
Although there may be an historical element, the health of the river is more important to me.
Argo Dam is important for rowing, but I can't pay an additional \$250/year for ANYTHING.

Both alternatives cost a lot of money, but the removal will cost a lot more. Since I never used the Argo pond and walked in the Argo park only once in 20 years, you better ask people who use the pond and park often.
Depends on how long the added expense would be added to my taxes--not for 30 years. I think the health of the river is more important than recreation considerations.
Detroit Edison built the Dam and profited from it, why not charge Detroit Edison to remove it?
DK
Don't have strong feelings on this issue--would pick proposal that costs the least.
Don't know [8E]. See below. 1) As a sociologist, it would have been good to have been surveyed about how "strongly" I felt about response (I don't feel strongly either way, and as you can see, I even changed my mind); 2) Ultimately, I know students from UM and Huron H.S. who use Argo for rowing/skulling. In the face of no real environmental concerns, I would vote to keep the dam so they don't lose this area for practice. If there were real environmental concerns that could be alleviated by taking down the dam, then I would vote to do so (strongly). Thanks.
Don't know.
for how many years? [marked yes] for two years or less. If the dam currently serves no function other than to allow rowing opportunities in an artificially created pond, I think it is best to remove it and allow the river to flow as nature originally intended it to.
How many years?
I agree that removing the dam would improve the river, but I think the cost might be prohibitive. To me \$25 per year per taxpayer is way too much for something that would be a benefit, but is not urgent or essential to our civic life.
I am absolutely not well-enough informed on this issue to make a judgment at this point. Would probably vote for whatever would sustain the health of the river, but there are so many ramifications to removing the dam, it's hard to choose either way. Good luck with your research!
I am actually uncertain and made the above choice with the assumption that dam removal would already result in more parks.
I am not sure about how I would vote. I have not thought about this and would need more information. I have slight preferences for the river to be returned to a free flowing river with a bridge across it (now I cross at the damn) but I like to see the rowers on the river and would hate for them to loose access.
I am torn. While from the alternatives described it seems the health of the river would be improved by the dam's removal. However, my daughter began high school crew this year and it is such a valuable part of her life and our family's that I would want to preserve Argo Pond.
I believe that environmental health is more important than recreational freedom. It XX is also worth sending the amount that I would spend on a dinner out to restore the health of the river.
I believe that the dam should be retained and the extant canal, etc. Should be returned to power production use--the revenues of which could be used, in part, to render the facility self sustaining. This would presumably have to be in conjunction with Edison, as the powerhouse remains their property. Although of a much larger scale, Barton Dam was returned to power production and operates today.

<p>I do not fish, row, skull, ski, etc. in this area (or at all for that matter), nor have I ever been there. Conceivably, if I spent time in the area and/or took up more activities I would be more inclined to break wide and pay more in property taxes.</p>
<p>I do not know a lot about the Argo area. I live near Gallup Park and the Arb and use those parks. Since I do not row and support environmental initiatives, removing the dam seems sensible. However, I do not use the area and would defer to those who do.</p>
<p>I don't know anything about Argo.</p>
<p>I don't know enough to decide how I would vote for sure.</p>
<p>I don't row or kayak so it doesn't really matter much to me. I'm also not very informed about fish health/types, so I base my decision no on any scientific information.</p>
<p>I don't support taxes as a legitimate way to raise money for any project. Unless you would fund this project through voluntary means, I would oppose it.</p>
<p>I drive over the pond every day to work and enjoy it, however I would be OK with either out come. If the pond is removed please make an alternative place for rowing.</p>
<p>I feel that parks and wildlife are very important to me and the city. Taxes in Ann Arbor are already so high, that I must admit I'm not willing to increase my property taxes for more parks. As a homeowner in A2 I realize that the parks do increase my property value but how much higher can it get. If it got more expensive I would be forced out, like so many other working class people in Ann Arbor. If there were a vote I would only go \$10.00 a year for the removal of Argo Dam. I guess it doesn't mean enough to me pay more, we can barely afford to live here as is.</p>
<p>I generally think that removing the dam is a good idea for the health of the river, for safety reasons and so we can easily canoe from Dexter to Gallup Park. I would feel badly about the high school crew team not having a place to row, however, and therefore it would not be worth a \$50/yr. property tax increase.</p>
<p>I hardly have a preference. Since there are rowing options farther down the Huron, I don't think removing the dam would be that bad. But given the costs (~\$1/2 vs. \$1-\$2 M over 50 years) I don't see the compelling need to act now. Perhaps you should include a guess of the costs in 50 years...i.e. cost of replacement or removal of the dam then.</p>
<p>I hold no strong opinions on this subject.</p>
<p>I like the alternative of removing the dam as it creates more park space and returns it to a more natrual state. I would also be willing to incur some lost to support this process, however \$450/year is more than I would be interested in spending.</p>
<p>I like the fact that it's possible to paddle (kayak/canoe) upstream from Argo--no need to shuttle cars. On the other hand, if the dam is bad for the river maybe it should go.</p>
<p>I like to canoe and regularly use Ann Arbor parks to walk and enjoy scenery. I think the river is underused as a point of natural beauty in this town. Argo Dam seems to disrupt the few of the park area surrounding the river. Find it definitely disrupts the canoeing. Those considerations seem worth a nominal cost to taxpayers, not a significant (\$25 /taxpayer) one.</p>
<p>I may support removal of the dam if an accompanying riverside park plan was included. Cost is not an issue for me.</p>
<p>I only plan to live in the USA 1-2 more years. If I would plan to stay here longer I would definitely be willing to pay higher taxes for things to improve the society where I live.</p>

I prefer better fishing habitat and more natural conditions.
I really do not know enough about this to complete #8.
I row in the pond.
I think Argo Dam should be preserved and improvement should be made to maintain the Argo Dam and the area along the dam whenever it is possible.
I think Argo Pond is very valuable as the only rowing site in the area, but the flow of the river should be increased to some extent to improve water quality, reduce the silt buildup, and increase the quality of fish.
I was originally inclined to vote no because I love the beauty of water and would hate to remove such beauty from the homes and businesses near the pond (especially if some of them are located there because of the pond). However, the bigger priority for me is the natural health of the environment. The dam is an artificial construct which currently only serves the purpose of recreation (such as rowing). There are plenty of other nearby places to row (just outside of Ann Arbor), so that isn't a strong enough reason to keep the dam. I value the health of the river and its fish over human recreation.
I would need to learn more about the costs and benefits of removing the dam to answer the voting questions accurately. The voting answers I gave are more intuitive than reasoned.
I would only reluctantly vote yes on Alternative 2. I have only driven by the area and never used the pond or nearby parks personally.
I would suggest making Argo Dam electro-generating as a model project with some add'l tax dollars.
I would vote yes if I knew that there were other places for rowing, as I believe this area is where the univ. crew team is located. My vote of no is also contingent on the belief that the pond would be kept up over time and not fill in sediment etc. Thank you!
I would vote yes, if the environmental effect on the river wildlife and parks were very, very beneficial.
I would want to see how the money was being allocated before I really made a decision.
I'm not a MI resident, so I would not be voting on this issue.
I'm relatively indifferent between the alternatives based on the comparisons given (view, fish, etc) and would be curious to hear more in-depth arguments from both sides before making a decision.
I'm sorry I'm not a good candidate to reply to this scenario. I'm older-77 Bless you Signature.
Impact of flood control not mentioned. Not enough information to mae an informed opinion.
Is the \$450 a typo? Seems high?
It (the dam) is maintained now without an added tax, why would there be a need to add one to continue in the same vain?
It seems like a good idea, but expensive for a park I don't use much.
It would be nice if there were a choice to create electricity using the dam. If that were the case, I would vote differently. Otherwise, I prefer to let nature take its course

<p>It's a nice bike-riding spot, and the crew is scenic (although I don't participate). (My 9-year-old son says "the dam is cool")</p>
<p>It's been a long time since I've been to the Argo site. It was hard to answer the questions. After reading the alternatives, I think that the dam should be removed if it is affecting the health of the river. Also the additional park land could be made more attractive than what's there already. I'm willing to pay a higher rent to achieve these goals.</p>
<p>Know/knowing the background I have just read, I believe it would be better for the natural environment: therefore the community as a whole to remove the dam.</p>
<p>Let nature take its course wherever possible. Man need not dominate, but should preserve when viable.</p>
<p>Look into getting federal funds/support for returning the river to its natural stat. Can fund raisers be held to reduce taxpayers' burden?</p>
<p>Manmade dams are unnatural. Humans create problems when we alter nature. Remove the dam and let nature take its course. It's a small task for Ann Arbor when it's compared to the Snake and the Columbia.</p>
<p>Not informed enough and haven't lived here long enough to fully understand ramifications of either.</p>
<p>Not sure--need more info.</p>
<p>People who use it should pay for it--not everyone who pays taxes.</p>
<p>Pond is fine. Parks fine. Don't think dam is good for river health. However in no case would I be willing to fork out an additional \$600 per year. If taking damn out reduces costs quickly and long-term, then I'd support it.</p>
<p>Question 8.yes.a seems too vague. The at least is too open-ended. 8.yes.b does not explain whether the cost is yearly once (as would be expected) or for a period of a number of years.</p>
<p>Rowing is an important sport to allow/maintain in Ann Arbor.</p>
<p>Saddens me to think of the rowers but otherwise seems better/healthier for A2 overall to remove dam.</p>
<p>Saving the environment is worth \$90/yr to me.</p>
<p>Since the city of Ann Arbor is already stretched in budget and we, the residents, also face fiscally tight times, I cannot agree to raise taxes again! Let's tighten our belts and find some alternatives. In my book, \$640,000 over 50 years is more acceptable than \$1-2 mil. in this unstable economy.</p>
<p>Sorry, not enough info to make a decision on a vote for an area I know nothing about nor do I know what the majority of the public desires.</p>
<p>The background info should be placed before the survey questions at page 1 for more informed answers. I would vote yes on alternative 2 if the cost is less than \$5 per year in property taxes.</p>
<p>The current Argo Dam is ugly & will likely continue deteriorating to become more of an eye-soar. I wish it could be replaced with a more attractive dam, but not if the cost to individual taxpayers would be upwards of \$250/yr. Or more. It'll be a lot cheaper to simply remove the current dam and construct and maintain a food bridge.</p>

<p>There is no way the costs described on page 8 should cost 150 PER YEAR. The math just does not Add up. And how many years does per year imply, 1? 10? 20????</p>
<p>There really isn't enough info about H2O quality here to make a "ballot" decision. I would have answered many questions differently in part A of this survey knowing just a bit more than you gave in Part B.</p>
<p>This figure [\$450] is totally unreasonable and appears to be a false choice selected to screen out the extreme environmentalists.</p>
<p>This is a though question. I guess I'd vote yes for sure if there is going to be any other chance for rowing somewhere else in AA. My answer is based mostly on the health of the pond. Not knowing for how long I'd have to pay \$70 (I assume I'd be \$70 forever). I'm not sure about it. I believe many others use the parks and the pond than AA resident, so maybe a user fee would be good. If I had to pay less than \$70/yr, I'd be more willing to pay.</p>
<p>This is difficult to answer. The health of the river is important--a place to row is not, removing the dam would be good if the river is endangered by it. But, a cost of 1-2 million mentioned in the previous page is huge given more pressing needs.</p>
<p>This is not a choice to be made in a vacuum. I would favor removal of the dam, but only if the several million in resources required to do this would not be removed from other, more pressing program to preserve open space. The Argo area is will protested now, and we can leave it alone at low cost. Let's fix this after we've done all we can to prevent degradation of less well protected places.</p>
<p>To me it seems obvious that at the end of the dam's life we would still have to pay for its removal so cost wise alt. 2 is more efficient in the long term. Also I do a lot of walking and would enjoy the extra space. I also think restoring wetlands and floodplains is important in general to healthy ecosystems.</p>
<p>We have an obligation to future residents to preserve the quality of our rivers.</p>
<p>Why not generate electricity AGAIN</p>
<p>With 100,000 residents @ \$1.00/year * 10 years plus maintenance for ten years = \$1,300,000</p>
<p>With a cap on spending I would be willing to support maintaining Argo Dam and Pond. "At least \$1 per year" could mean any amount and I would not support that.</p>
<p>With the explanation on alternative costs, I don't see where Alt 1 could ever be as costly as Alt 2. At some point, the average cost of maintenance may rise to equal the average (amortized) projected cost of removing the dam (amortized) over 10-20 yrs. That would be the time to remove the dam.</p>
<p>XXX the parks as they are but if recreation XXX XXX parks and the XXX of the water its XXXX. I do not mind change. Am not sure I like the dam and parks survey XXX it.</p>
<p>XXX what a choice \$1 or \$350--would there be a happy medium somewhere?</p>
<p>Your summary leaves me feeling that removal is a good idea, but not important or cultural, but so XXX I'm reluctant to allocate big \$ towards it.</p>

TABLE I-3: CONCLUDING COMMENTS

<p>I expected that the west side of the pond was going to be cleaned up and converted to a municipal park. That clearly isn't happening. Although I appreciate the arguments for removing the dam, I would hate to lose the unique water sport opportunities that are now provided.</p>
<p>I would have been helpful to add some facts about the current state of the pond and dam, the real consequences of the removal of the dam, and real costs to the community in term of taxes. The information you provided was either insufficient or exaggerated.</p>
<p>My main concern is the health of the Huron River ecosystem.</p>
<p>I am a Belgian post-doc scholar and only live here since January 4th, 2003. I am not yet well integrated in community life here.</p>
<p>In general, I believe in removing dams that no longer serve their purpose. I prefer free-flowing rivers.</p>
<p>The answers to the first part of the survey were greatly influenced by a lack of knowledge of the pond/park, its history and current status. IF I knew that the dam does not control flooding, some of my answers would obviously be different. A lack of exposure/knowledge of this park may greatly influence your survey (especially if you survey too small a population).</p>
<p>Enjoy so many parks in our community--just never go this side of town enough to experience Argo. I don't really feel well enough informed about this--however, filling out this survey has helped. We generally support all park requests--that's what makes our town so great, among other things.</p>
<p>Take the dam out. I am sure the rowers and rowing club could re-locate to Barton or Geddes Pond's.</p>
<p>1) would Ann Arbor water quality be affected by the removal of Argo Dam? 2) What type of park is being proposed if the dam is removed; open area native species, closed area, etc? 3) What would happen to the canoe livery if the dam were removed?</p>
<p>Good luck removing the dam. I hope it improves canoeing conditions.</p>
<p>I would like to see this section of the river returned to its free flowing state, however; I would want some wetlands retained on its banks, if they occurred naturally.</p>
<p>What happens if you turn it into a free flowing, will there be flow control in spring. What about the residents who live on Argo pond. Were they surveyed. What impact will Argo pond absence have on the beauty?</p>
<p>Although I can appreciate the idea of returning the Argo Dam area pond, to a free flowing river (or more natural state), its present condition provides the greatest diversity of activities and provides a nice compliment to the other parts of the Huron River. Additionally, now is not the time to spend 1-2 million dollars for a projected [sic] that may be nec. in the not so distance future. Further this time could allow for better planning and financing of the project.</p>
<p>Thank you for taking the time to solicit community input.</p>
<p>My wife and I are octogenarians who have resided in Ann Arbor for over 60 years. We have spent many happy times in and around Argo Pond, hiking, canoeing, biking, et al. But current mobility limitations have substantially slowed these endeavors. Keep Argo Dam and keep the pond. We appreciate your concerns.</p>

<p>The best place to canoe or kayak is further up the river where it is more like its natural state! The argument that canoeing & kayaking would be lost is the exact opposite of what would happen. I believe those activities would be improved because Argo Pond is my least favorite place to paddle currently. The bigger issue, however, is what will make Ann Arbor the most natural & best for its floral and faunal natives (other than people) because there are becoming increasingly less places to enjoy these things in our state. I'll chip in for the rowing team if they need to start taking field trips further away. The prospect of the dam's removal is quite compelling to say the least. I will do my best to follow this issue!</p>
<p>Dams are bad for the health of the ecosystem. If no use of dam, then best it be dismantled. Let nature take its own course. The lesser human intervention the better.</p>
<p>I don't visit the parks any more--my children and grandchildren enjoy kayaking, canoeing, and rowing on the pond and river.</p>
<p>I am pro more parks or open space. However, I am not familiar with Argo. Ann Arbor needs more social/XXX fields! There are 5,000 AA kids play soccer and fuller has only fields</p>
<p>We support the removal of Argo Dam, but are concerned about the expenses. Thank you.</p>
<p>I enjoy Argo Pond but the Dam an algae growth are gross. A free moving would probably be very lovely and give me the same feeling of nature and beauty that Argo Pond does. I hope that that the city canoe rental wouldn't go away from Argo. A footbridge where the dam is a great idea.</p>
<p>I really think Ann Arbor parks need a pond the size of Argo for recreational uses. I think that the cost of maintaining the pond be over enough years to make the cost per year much less than \$50 per year.</p>
<p>Please note this was forwarded from my previous Ann Arbor address. I lived in Ann Arbor last year but am no longer a resident of the city.</p>
<p>I strongly oppose the removal of Argo Dam and would be willing to oppose it publicly and campaign for keeping it in place. While I generally support what the Huron Watershed Council stands for, I do not agree with them on dam removal. As a supporter of the HRWC I would recommend that they place their energy and resources elsewhere.</p>
<p>Before I received this questionnaire I was unaware of this issue. Thanks for the info. I'd like to know the outcome of this survey. Please feel free to send me more information on the progress of this project. Signature</p>
<p>Good Job!!</p>
<p>I do not feel that any new taxes should be imposed in order to improve Argo Pond or Argo Dam. Taxes are high enough. Our parks are beautiful the way they are now. What else do we have to prove?</p>
<p>Thank you for the survey. This is good process for the community.</p>
<p>I am very surprised that removal of the Argo Dam is being considered. This is a ridiculous use of tax dollars considering the modest improvement to the river and XXX XXX in recreational opportunities. The river already has rapids; it has few ponds.</p>
<p>I think the dam should go. I also think that with the high level of funding parks get in A2 that the city could figure some manner of removal w/o added taxation. I do worry about the opportunity lost for high school rowing and do not know where the alternatives are to Argo Pond for this. I think the health of the river definitely trumps human recreation opportunities. Thanks. P.S. Please let me know how I was chosen for this: Nam.</p>

<p>I am not a good subject for this survey. I think I went canoeing from the Argo Park livery once about 15 years ago when visiting a friend in A2. As a shades here in the late 70's-early 80s, I didn't have a clue about Argo Park and its environs. I returned to A2 (after 20 years) to live a year ago. I have been so busy trying to stay on top of work and family obligations and health issues that, regrettably, my outdoor time is very limited. If I get in a walk, it's a good day. So I am not as all informed on the issues you are addressing--If on that basis you still want me to do the survey. Send it back and I'll do my best.</p>
<p>I am in support of anything that preserves nature, for nature's sake. It is not our right to destroy God's world. God's world is here for us to study and wonder at. I believe that angels wings will tough the pond, damned or not. First, find out Jesus' preference in fish, then make your decision on. What is good for Jesus is good for all of us! Love and best wishes--me.</p>
<p>Learning about the health of the river definitely affected my opinion--I think the dam should go.</p>
<p>The research and writings of Christopher Alexander would be wise to follow the large patterns should be considered before. The large patterns should be considered before the end details in any urban planning or architecture. Therefore, in my humble opinion, Part B should have come before Part A in your questionnaire. You may get people contradicting themselves otherwise. A faster moving river, with the water bubbling over rocks, will become more aerobic. Oxygen, ozone and hydrogen peroxide is how nature cleanses itself of pollution and anaerobic microbes. A free moving river will be cleaner and better smelling. The water around the dam and power station smells foul. I think people stay away because of this. A dangerous dam with "danger: keep off" signs on it is not inviting, and repels people from the area. No intelligent parent would bring their children anywhere near that dam. In contrast, a wooden foot bridge spanning a free flowing river would be safe, aesthetically pleasing and inviting. I would like to see Detroit Edison pay for a portion of the dam's removal costs.</p>
<p>The Argo Park and river pathway is a wonderful area to walk in Ann Arbor. It's too bad that M14 is so audible. I don't know enough about the ramifications to river health if the dam was removed, and would like to know more about that. Thanks, Name.</p>
<p>I feel Ann Arbor has two urgent needs: 1) a subway as above ground rail system connecting Ann Arbor with outlying cities Flint, Lansing, Jackson, Kalamazoo, Toledo, etc. 2) a network of bicycle/inline skating paths segregated from the road ways. Some bike lanes can't be helped, however Ann Arbor is an excellent bicycle town. Alternative transportation long over due. We are being drowned in a sea of automobiles and XXX buildings and repair of roadways can never keep up to the added traffic.</p>
<p>The city of Ann Arbor recently spend \$550,000 to purchase 10 acres of questionable park land. I support removing the dam.</p>
<p>I believe that removing Argo Dam would be a good idea. People can row at Barton or Geddes ponds, but there is little free-flowing river access w/in the city limits.</p>
<p>I moved out of Ann Arbor a year ago to Battle Creek, but I'm still interested in this issue. There is a possibility I might move back to Ann Arbor, where I lived for over 30 years. Accordingly, I answered the questions as if I still were living in Ann Arbor. I hope they are useful to you.</p>
<p>1) Very nice survey. Persistence pays off. 2) What alternatives for the crew team are being considered? This is the only down-side as I see it.</p>
<p>I think that water quality, preservation of ecological balance and health of the fish population supercede the need for a place to row. There's plenty of rowing possible in the metro park system. I'd be willing to accept a \$50-75/yr tax burden, but not the \$150 described here.</p>

I like the pond, I like seeing the rowers on the pond--I drive by it twice a day on my commute and the pond is a plus. I enjoy walking/running from Barton to Argo, especially the trail parts where water is insight. However, after getting this questionnaire I talked a bit w/ a friend who has a PhD in benthics from SNRE. She talked about the health of the river, sediment and algae, fish ecology and gave some (mental) images of a restored river. That helped give it appeal. While I'm kind of attached to the pond visually I could be convinced that river health would be improved by removing the dam--but it would take some education about the environmental benefits and the creation of some new positive visual images. P.S. I also appreciated the friendly reminder phone call letting me know you'd still accept this late. Thanks!

I recommend that the dam be modified to again produce electricity. Sell the electricity to Detroit Edison to off set maintenance cost of the Argo Pond and Dam. The use of water power to produce electricity would result in less use of coal or nuclear power; thus, a benefit to less use of natural resources. The dam and pond environment would remain "as is" and produce clean electricity. The Energy Policy Act of 1992 addresses: the topic of production of electricity.

My sister lives in Barton Hills so I often make the drive from Georgetown Subdivision where I live. The biggest improvement through the years has been the removal of the "junkyard" along Main Street. However, the view of the pond/river for motorists is still obscure. It would be nice if the City could afford to buy more of the privately-owned property to expand parkland to Main Street so even if one is too busy to physically be in the beauty of the water setting, one could still view the natural scene.

DO NOT REMOVE ARGO DAM

It's an intriguing idea, but I don't know enough about it to clearly picture the costs/benefits. Since I enjoy the pond as it exists, I "voted" no, but could easily change my mind if I saw meaningful advantages to removal.

Sorry it took me so long to get back to you.

Restore to free flowing river!!

Thank you for bringing the Argo Pond and Dam proposals to my attention--I will endorse to increase my understanding of the impact on the environment of each of these possibilities in order to make a more fully informed choice.

I think the best way to deal with nature is to leave it alone, and in this case, remove the dam.

I hope that there would/will be bigger swimming area in Argo Pond. Pass to Nicholas Arboritum park may be done bigger and safer. Signature and address

Any way to preserve nature is important.

The Argo Dam area has many great parks that I used to visit almost daily when I lived closer. Everything is nice as is but it sounds like removal of the dam would be better for the health of the river and for more popular activities (canoeing, kayaking, fishing, etc.) and is probably an inevitability anyway since the dam serves no purpose now and will not last forever.

If you want to row, go to the Detroit river or some lake. We need green areas and healthy environment. Let the river run free.

I use the paths around the Argo Pond/Bird Hills area extensively. I consider them a tremendous asset to the area. I fear that, if Argo Pond were removed, it would just be another opportunity for developers to spoil the area.

<p>Before construction began on the Broadway bridge, I used to run from my apt. to Argo area rather frequently. I think the area's a valuable resource b/c it feels like you're out in nature, rather than running along the road. However, I often wanted to return from my run on the other side of the pond and would often cross on the dam, which wasn't ideal. As for the dam itself, it's terribly ugly and fouls up the whole landscape. It would be great to have a bridge there instead. And parks on both shores would be great too. If I made it up to the Barton area to cross, my return trip was along a desolate stretch of railroad tracks. More parks area is so badly needed in this region.</p>
<p>Very interesting idea. I would like to see the river restored to its original, fast-moving state (assuming Barton Pond--which I like and feel is an asset--is not affected). I really have no feelings about the desirability of maintaining Argo Pond for rowing, and it would be nice to improve canoing [sic] and kayaking opportunities. Swimming and fishing are irrelevant to me.</p>
<p>I have just moved into a house that is very close to Argo Pond. I hope to use the area for recreational activities.</p>
<p>Thanks for the information. Enlightened me.</p>
<p>I've been Ann Arbor little more than 1 year. Sending this kind of serious questionnaire to resident who has lived in less than 3 years s not proper. I'll be glad to help but I doubt if my answer can help to decide future of community properties.</p>
<p>My husband remembers when the river was like prior to the dams construction. It was unattractive. The dam added a lot to the look of the river. We like the river the way it is now. Going back to nature could be a big mistake.</p>
<p>I am glad you are doing a study. More rivers could use a few dams removed. Good work with your research.</p>
<p>I just moved back to Ann Arbor--a year ago--after 20 years absence; hence my 'neutral' reply on so many questions.</p>
<p>As a rower, I do have an interest in seeing Argo Dam maintained. I also believe that recreational canoers and kayakers do as well. Most of them paddling on Argo Pond are not looking for faster water. As an Ann Arbor taxpayer, I would be concerned about how this proposal fits in with current plans by the City of Ann Arbor for North Main Street and the parks. In addition to the recent completion of the path/boardwalk around Argo Pond--and a footbridge at Argo Dam soon to come (not just when the dam is removed)--the city has assisted the rowing community in improving Bandemer Park. They have financed a new boathouse serving Pioneer, Huron, and AARC as well as parking and landscaping that serves all 4 clubs (and sometimes UM women and EMU women as their water is not suitable always for their training purposes). I do feel that the growth of rowing in Ann Arbor and the lack of other suitable water in Ann Arbor should be considered.</p>
<p>How was the \$600 figure arrived at for #8. Would that really be a possible figure? For either option.</p>
<p>Question 2 ambiguous--outdoor running? I assumed so in answering.</p>
<p>I haven't spent much time at Argo Park but do like the idea of a free-flowing river. Seems like if the dam will deteriorate and have to be replaced eventually, do it now and save the money on 50 years of maintenance.</p>
<p>Sorry for not turning this in in time Hope it's not too late</p>
<p>I grew up on the north side. My family still has 3 homes that area, so I am attached to it. I don't want to see it taken away for no apparent reason. It would totally change the character forever.</p>

<p>I believe the health of the natural river best serves the Ann Arbor community. The range from \$1 to \$150 in additional property taxes seemed to great. I would agree to an increase, just not \$150.00, a median selection would reflect my choice better</p>
<p>I have not sufficient background information to say that my answers are given confidently. In particular, my answer to question 8, regardless of the price for either choice, could change if I spend more time researching this issue for an actual vote. Thanks for considering my input and giving me the incentive to start looking into the particulars. I look forward to the report next spring, online.</p>
<p>I should tell you that, although I have been retired for 3 1/2 years, I was an employee of Detroit Edison/DTE energy for 34 years. Although I was never involved in hydro generation (my area was financial) I developed a certain admiration for the history and lore of the small dam systems throughout the state. This may have impacted my responses somewhat, although fundamentally the economics as presented could not possibly suggest the removal of Argo Dam.</p>
<p>There is an abundance of concrete in the area which, if replaced by natural material and landscaping (native) would greatly enhance the look and feel of the place. There is something "dead" about the area (stagnant would better describe it) in contrast to the Huron, say around Delhi metro park. This is disheartening to anyone who associates river with life, especially children. I think every child should have an experience of "river" (the sound of flowing water, the feel of splashing etc.). It would be great to have an area that entices more child participation but in an absolutely natural way.</p>
<p>One problem that I have with all riverside parks is the population of profane and abusive bums who hang around drinking at the parks. This is a problem!</p>
<p>Sorry I'm late--I was out of the country 10/31-11/11</p>
<p>There may be a 3rd alternative, if sports/recreation is a major consideration. Has any thought been put into the idea of splitting the river above the dam, keeping a smaller version of the dam in place and having another portion of the river open for free flow? This may still maintain a smaller pond yet open the river up to keep it healthy. This is probably a more expensive alternative. The St. Joseph River near South Bend is an example of a location where this has been done, and may be a site worth looking at for inspiration.</p>
<p>I wish you all the best in your endeavor(s) to keep Ann Arbor the interesting place it is--I love Ann Arbor XXX its parks and rivers and walking places.</p>
<p>We love the boardwalk, which has drawn us to Bandemer Park on several occasions. The freeway overpass is unfortunate, and we would love to see a full circle path that continued on to the present dam or a nicer bridge to get back over the river.</p>
<p>I would want more information on the pros and cons of each but in favor of restoring to original state.</p>
<p>I think that being on the river adds to property value, but I don't think damming it adds to the value. If the pond were XXX the new vegetation on the west side of the river may block some of the street and highway noises, XXX the northside neighborhoods.</p>
<p>I think it is important to keep as much healthy land and wildlife in Ann Arbor as possible. If it were up to me we'd have more parks and less shopping areas and condos!</p>
<p>I am a strong supporter for leaving the Argo Dam as is. It is the best place in A2 for (rowing, canoeing, kayaking) cause you can go up-stream and down-stream. Plus I love the larger view of the water. Argo pond is important to me.</p>
<p>The dam makes canoeing from there to Gallup Pond a real pain. Getting into the chute to the bypass to the portage is hard.</p>

<p>I've lived in Ann Arbor all my life so I have many good memories of Argo Dam and the Huron River.</p>
<p>Unfortunately I do not know much about the Argo Pond and surrounding area--wish I could have been of more help.</p>
<p>I don't feel very strongly about this issue. Generally, I prefer returning areas to their natural conditions (removing dam). But, if this is a very good place for rowing, and removing the dam would result in people having to drive longer distances to row/canoe/kayak, I would prefer the dam stay.</p>
<p>My family and I are very frequent users of Ann Arbor's parks and recreational facilities. We believe the Argo Pond area is one of Ann Arbor's most attractive natural areas. However, it is not very "user-friendly" so we do not visit it very often. The wooden bike/walkways that have been installed along portions of the river/pond and these park improvements have resulted in greater utilization for biking, walking, etc. My children are somewhat fearful of the Argo Dam when we canoe. We were unaware of most the current issues confronting Argo Pond and Argo Dam prior to completing this survey. We suspect that many in the community are similarly unfamiliar with the consequences of alternative course under consideration. We expect that there would be a community outreach initiative by city officials before any ballot proposals would be sought for any change.</p>
<p>I enjoy the parkland in Ann Arbor. My preferred recreation is kayaking, so my vote is based on the "better kayaking" claim.</p>
<p>I think more information is needed to have residents decide whether or not the dam is bad for the health of the river.</p>
<p>A good questionnaire! Improve, don't delete XXX XXX. We walk more XX and XXX, facilities. The entire subject should be carefully XXX and then to the general problem from their XXX. A Park and Recreation commission study and XXX to the general public.</p>
<p>Just because I don't row on Argo Pond, doesn't mean I don't want to have the opportunity to row on it someday.</p>
<p>Ecology of the river is the prime importance. Recreational activities will be fitted to the true nature of the river and land at that location. Moreover, the Huron River @ Main/Argo area is one of the main gateways into our tours. A more pastoral setting for the current mix use (residential, low industry, recreational) will be good for Ann Arbor. Aim for a hybrid of San Antonio's river and Stratford Ontario's river use.</p>
<p>I wish you had sent it to someone that may have known more about the issues.</p>
<p>I would like to maintain the dam as long as possible with minimum expense involved. I would not vote for extensive repairs to keep it. When it becomes inevitable to keep it then it may be demolished and developed in natural area suggested in alternative 2.</p>
<p>Connecting Argo well and clearly to other parts is more important to me than whether the dam stays or goes.</p>
<p>I know of no one working for the MDNR that lives near Argo Pond or even in Ann Arbor. They should keep their nose out of local issues.</p>
<p>Question 8 added cost of at least to me means no upside.</p>
<p>I would like to see a bike path along the river. I know plans have been drawn up, but it has taken a long time. I have biked from Argo to Dixboro Dam but would like to see less gravel--Thanks. I know taking out the dam would make trails easier.</p>

<p>Considering the millage that recently passed for new parks and protected land in the A2 area it seems the community would encourage and agree with the proposed plan #2 to create more parks. This is clearly a priority to the residents of A2. Thank you and good luck!</p>
<p>Unclear why maintenance cost of \$30,000 per year for 50 years estimated at \$550,000 to \$640,000.</p>
<p>Cost to remove dam in dollars and damage to the river (disturbing a century of sediment and pollution [sic] build up that will be disturbed if dam is removed) is being grossly under estimated. The best thing that can be done to reduce water plants and compromise water quality is to 1) Stop ILLEGAL release of raw sewage from all treatment plants operated by municipalities up stream from DAM (and legal releases if there is such a thing) MILLIONS of GALLONS per year. 2) Better control of agricultural run off. 3) Better control of septic and industrial run off in Huron watershed up stream. The DAM is history and should not be distributed. The water quality cannot be improved if cities and town continue to flush toilets into the river thru plant releases. Sorry this took so long good luck.</p>
<p>I am a former rower but strongly support dam REMOVAL to enhance the natural values of the ecosystem. Good luck on your survey. P.S. Put in some class 2 or 3 rapids.</p>
<p>Sorry I didn't do this sooner to save you repeated mailing costs. Good luck.</p>
<p>Do what is healthiest for the river.</p>
<p>When I was younger I used Argo Pond mostly for canoeing a great deal more than I do now. I am surprised at how much Argo Pond, and the river above, has silted over. It appears to need more water, but if this isn't going to happen, then a free flowing river might be better, although Barton Hills might lose Barton Pond (?). I think Gallup Park pond needs more water--it is becoming covered with algae. A free flowing river might be better for Argo Park, and more water for Gallup Pond. I believe I lean forward removal. Will Island park flood more?</p>
<p>I think the dams in [sic] nice and should probably stay. Unless it is damaging the rivers health and a serious problem [sic].</p>
<p>We often walk by Argo Pond/Dam. When we sat by the dock, often we encountered bees or hornets so much so that they necessitated our leaving the site. The benches were helpful until recently when they were burnt. Also the trail that is paved by the Huron River and leads to the steps beside Argo Dam often has overflowed water. In the winter this gets treacherous due to freezing and this being ice. The chicken wire overhead in spots is designed to hold back overhead crumbling concrete bits. This definitely needs refurbishment.</p>
<p>Questions 5 and 6 are hard to answer without the background information given on page 7. On question 8, I interpreted "at least \$1" to mean "about \$1"</p>
<p>While I very much appreciate the over 140 parks in Ann Arbor, it is necessary that their maintenance not raise property taxes as I'm on a limited income.</p>
<p>1) Much of the year, rain or shine, up to 100 or so rowers show up daily (from before sunrise to past sundown to XXX the XXX). How many other recreational facilities can equal that? 2) If flood concerns often cited are real, land recovered by removing the dam should have limited usefulness. 2) Present "flowing" portions of the Huron seem neither particularly attractive or recreational. Why should the Argo section be any better in it's "natural" state?</p>
<p>One way to improve the fishing access to Argo Pond is to build a few fishing piers at a few of the parks. This XXX help create a better fish habitat.</p>
<p>Since I do not live near the dam, have never walked near it, have only driven past it millions of times, I think people who use it or live nearby should be consulted.</p>
<p>I want the river to be healthy. If that means removing the dam, then I support its removal.</p>

Being 80 yrs. old and trying to make a long story short. Remove the dam and let the river flow freely. I am an avid walker and nature buff.

There you have it.

I can see advantages to it being a free flowing river, and also as a pond. For a canoeist it is more interesting as a free flowing river. For a sailor/rower it is better as a pond.

Argo pond and Argo Dam are very closed to my home. They are very important to me. I would be very grateful if they can keep the best for cleaning water beautiful constants there such like wayside pavilions or kiosks, etc.

Appendix J

CALCULATING RESPONSE RATE

MINIMUM RESPONSE RATE: RESPONSE RATE 1

The American Association of Public Opinion Research recommends this formula for calculating the minimum response rate (AAPOR 2000):

$$\frac{Q}{Q + \text{RTS} + \text{RTSN} + \text{OP} + \text{N} + \text{R}}$$

Q: number of completed or partially completed questionnaires

RTS: number returned to sender, no new address found

RTSN: number returned to sender, new address found, no response from new address

OP: number completed by someone other than addressee

N: number for which nothing was ever returned

R: number of refusals

This formula excludes only those survey recipients who are known to be ineligible, and assumes that all addressees of unknown eligibility were in fact eligible to participate. Inserting the relevant values from Table 4-1, we calculated the overall response rate as follows:

$$\frac{767}{767 + 247 + 67 + 5 + 688 + 81} = \frac{767}{1855} = 41.35\%$$

ESTIMATING ELIGIBILITY: RESPONSE RATE 4

The assumption that all addressees of unknown eligibility are actually eligible is not usually reasonable, however. The following equation, based on AAPOR's Response Rate 4 (AAPOR 2000), can be used to calculate a more accurate response rate when the proportion of eligible respondents (e_x) among those of unknown eligibility can be estimated:

$$\frac{Q}{Q + e_1(\text{RTS}) + e_2(\text{RTSN} + \text{OP} + \text{N}) + \text{R}}$$

It is impossible to know precisely what fraction of our addressees who never responded, or whose mail was returned to us as undeliverable, were in fact eligible to participate, but it is

clear that the fraction was substantially less than 100%. When mail was returned to us as undeliverable, with no further information available, we attempted to locate current address information for the intended recipient using the Ann Arbor telephone directory and the University of Michigan online directory. Based on the results of these efforts, we estimate that no more than 50% of those addressees were still living in the area and therefore eligible to participate (i.e., $e_1 = .5$). Based on the results of our efforts to locate telephone numbers for the 5th Contact, we also estimate that of those addressees from whom nothing was ever returned, or nothing was returned from a new address following an initial return to sender, no more than 80% were actually eligible to participate (i.e., $e_2 = .8$). The rest have probably moved out of the area; their mail was likely either forwarded to their new address, or discarded by the current resident at their old address, rather than being returned to us. Similarly, based on the comments on the completed questionnaires, we estimate that no more than 80% of the original addressees who gave the questionnaire to someone else to complete were actually eligible. Using these estimates of eligibility for recipients of unknown eligibility, we determined what is probably a more accurate overall response rate using this formula:

$$\frac{767}{767 + 0.5(247) + 0.8(67 + 5 + 688) + 81} = \frac{767}{1575.9} = 48.56\%$$

EXCLUDING RETURNED MAIL

Other practitioners exclude from the response rate calculation all cases in which no contact is made with the intended recipient (i.e., mail is returned to sender) (Babbie 1990). This produces the following formula:

$$\frac{Q}{Q + \text{RTSN} + \text{OP} + \text{N} + \text{R}}$$

Inserting the appropriate values, we calculated a third estimate of the overall response rate:

$$\frac{767}{767 + 67 + 5 + 688 + 81} = \frac{767}{1608} = 47.70\%$$

Table J-1. Response rate summary.

Formula Used	Argo Area stratum	Ann Arbor stratum	Overall
Minimum response rate (Response Rate 1) (AAPOR 2000)	39.20%	43.47%	41.35%
Estimating eligibility (Response Rate 4) (AAPOR 2000)	47.25%	49.79%	48.56%
Excluding returned mail (Babbie 1990)	48.52%	46.99%	47.70%

Appendix K

STATISTICAL OUTPUT FOR QUESTIONS 1-7

CORRELATIONS

As per capita income increases, it is more likely that the respondent is a homeowner rather than a renter. Similarly, as income increases, it becomes less likely that the respondent is student, but is likely to have a high level of education. Respondents with higher incomes may be expected to have smaller households, as the number of children and number of adults is negatively correlated with income, which makes sense because the income was calculated per capita in each household. There is a weak, but statistically significant at the 0.05 level, negative correlation between age and income; that is, as age increases, income decreases. Additionally, as income increases, the respondent is more likely to live farther from the Argo site. This corroborates Census 2000 data that indicates that the area near the Argo site has a higher percentage of rental and campus housing than the rest of Ann Arbor.

A larger proportion of the respondents who were renters lived in the City of Ann Arbor than in the Village of Barton Hills or Ann Arbor Township, although the number of respondents from outside the City of Ann Arbor was quite small.

As educational level increased, it becomes less likely that the respondent is also a renter, but not surprisingly, respondents who were students were also likely to be renters. For students, it was likely that their household contained more adults than for non-students, and it was less likely that they had children.

Surprisingly, gender is correlated with number of children in the household, where men tended to report having more children than women. For our respondents, as the number of children increases, the likelihood of being a homeowner also increases.

DEMOGRAPHIC STATISTICS

The statistical package SPSS was used to calculate frequency tables, medians, modes, counts and means with standard errors. Frequency tables provide counts and percentages of

respondents who chose each specific value in any given question. The Mann-Whitney non-parametric rank sum test was used to determine if the values given by individuals in the Argo stratum differed from those given by individuals in the Ann Arbor stratum to a statistically significant degree. The Mann-Whitney test can be used to determine whether or not two independent samples, in our case the Ann Arbor and Argo strata (or renters and homeowners, students and non-students, etc.), are part of the same population. The Mann-Whitney test does not assume that the sample mean is necessarily the center of the dataset, which is important in our case as our central value, 3, is an arbitrarily assigned number on a values scale and we do not expect our sample to necessarily be normally distributed. The Mann-Whitney test, when performed on ordinal data, first ranks each case without regard to the given subgroup, in our case, renters or homeowners, students or non-students, etc., and then sums those ranks within each subgroup. This value is reported as the Sum of Ranks. The Mean Rank value is the ranks adjusted for differences in N, the number of individuals in each subgroup. If the Mean Rank value for each subgroup is about equal, this indicates that there are only random differences between the two subgroups. That is never the case with our dataset as our subgroups are specifically divided by responses to demographic questions.

After assigning the ranks to calculate the sum and mean, the test calculates the frequency with which higher ranks occur in one subgroup over the other for both of the subgroups. The smaller of these two values is reported as the Mann-Whitney U statistic. The Wilcoxon W statistic is the rank sum of that smaller-valued sample set. The Z statistic gives an approximation of the a normal distribution and is useful in that it can be used along with the two-tailed significance value to indicate the probability of attaining a value equal to or more extreme than the Z value. Thus if the asymptotic significance value is less than 0.050, the independent samples have significantly different ranks that cannot be explained by probability, which indicates that the samples differ qualitatively. In our case, these qualitative differences occur in response to our perception questions. For example, in the Student results for question 5I below, the Mann-Whitney test demonstrates that there is significance to the 0.003 level that students' responses differ from non-students' responses. The frequency tables allow the direction of change to be detected so the data reveals that students agree more strongly than non-students with the statement, "I think Argo Pond should be returned to a free-flowing river." In the following section, only results that have a significance value less than

0.050 are included, so results from questions that are not included in the tables can be assumed to have failed the statistical test for significance.

Homeownership results

For the variable *mw_tenure*, which summarizes the results of the demographic question regarding homeownership (Appendix E, Q12), Group 1 includes any respondent who owns their residence and Group 2 consists of respondents who either rent their residence or who live with someone else without paying rent. This test analyzes whether the responses of homeowners are significantly different from those of renters. In this case, renters and homeowners differed significantly in regards to questions 1E, 1F, 5I, 6B, 6D, 7C, 7D and 7E.

Table K-1. Mann-Whitney ranks for homeowners (1) and students (2) on questions 1E and 1F.

Question	<i>mw_tenure</i>	N	Mean Rank	Sum of Ranks
1E	1.00	467	356.13	166313.00
	2.00	224	324.88	72773.00
	Total	691		
1F	1.00	463	355.56	164624.50
	2.00	225	321.74	72391.50
	Total	688		

Table K-2. Mann-Whitney test statistics for questions 1E and 1F in regard to homeownership.

Question →	1E	1F
Mann-Whitney U	47573.00	46966.50
	0	0
Wilcoxon W	72773.00	72391.50
	0	0
Z	-2.040	-2.214
Asymp. Sig. (2-tailed)	.041	.027

a Grouping Variable: *mw_tenure*

Table K-3. Mann-Whitney ranks for homeowners (1) and students (2) on questions 5I, 6B, 6D, 7C, 7D, and 7E.

Question	mw_tenure	N	Mean Rank	Sum of Ranks
5I	1.00	317	234.60	74369.50
	2.00	129	196.21	25311.50
	Total	446		
6B	1.00	384	260.07	99865.00
	2.00	153	291.42	44588.00
	Total	537		
6D	1.00	307	222.36	68263.00
	2.00	120	192.63	23115.00
	Total	427		
7C	1.00	401	287.07	115116.00
	2.00	156	258.25	40287.00
	Total	557		
7D	1.00	307	207.90	63824.50
	2.00	124	236.06	29271.50
	Total	431		
7E	1.00	379	275.76	104514.00
	2.00	151	239.74	36201.00
	Total	530		

Table K-4. Mann-Whitney test statistics for questions 5I, 6B, 6D, 7C, 7D and 7E in regard to homeownership.

Question →	5I	6B	6D	7C	7D	7E
Mann-Whitney U	16926.50	25945.00	15855.00	28041.00	16546.50	24725.00
	0	0	0	0	0	0
Wilcoxon W	25311.50	99865.00	23115.00	40287.00	63824.50	36201.00
	0	0	0	0	0	0
Z	-2.928	-2.226	-2.292	-2.062	-2.178	-2.533
Asymp. Sig. (2-tailed)	.003	.026	.022	.039	.029	.011

a Grouping Variable: mw_tenure

Student results

For the variable mw_student which summarizes the results of the demographic question regarding student status as it relates to opinion questions (Appendix E, Q15), Group 1 consists of respondents who are not students, and group 2 consists of students are full or part-time students. This test analyzes whether the opinions of students vary significantly from those of non-students. In this case, students and non-students differed significantly in response to questions 5I, 6B, 6E, 7C, and 7D.

Table K-5. Mann-Whitney ranks for non-students (1) and students (2) in response to questions 5I, 6B, 6E, 7C, and 7D.

Question	mw_student	N	Mean Rank	Sum of Ranks
5I	1.00	356	220.71	78574.00
	2.00	73	187.14	13661.00
	Total	429		
6B	1.00	432	254.69	110024.00
	2.00	90	294.21	26479.00
	Total	522		
6E	1.00	232	141.82	32903.00
	2.00	43	117.37	5047.00
	Total	275		
7C	1.00	449	277.76	124715.00
	2.00	94	244.48	22981.00
	Total	543		
7D	1.00	342	202.38	69214.50
	2.00	76	241.53	18356.50
	Total	418		

Table K-6. Mann-Whitney test statistics for questions 5I, 6B, 6E, 7C and 7D in regard to student status.

Question →	5I	6B	6E	7C	7D
Mann-Whitney U	10960.00	16496.00	4101.000	18516.00	10561.50
	0	0		0	0
Wilcoxon W	13661.00	110024.0	5047.000	22981.00	69214.50
	0	00		0	0
Z	-2.166	-2.382	-1.976	-2.037	-2.622
Asymp. Sig. (2-tailed)	.030	.017	.048	.042	.009

a Grouping Variable: mw_student

Table K-7. Frequency table for non-student responses to questions 5I, 6B, 6E, 7C and 7D.

	Non-Student									
	5I		6B		6E		7C		7D	
Response	Count	%	Count	%	Count	%	Count	%	Count	%
1	69	19.4%	37	8.6%	15	6.5%	165	36.7%	42	12.3%
2	59	16.6%	56	13.0%	32	13.8%	207	46.1%	66	19.3%
3	111	31.2%	201	46.5%	114	49.1%	51	11.4%	92	26.9%
4	60	16.9%	71	16.4%	42	18.1%	23	5.1%	83	24.3%
5	57	16.0%	67	15.5%	29	12.5%	3	0.7%	59	17.3%

Table K-8. Frequency table for student responses to questions 5I, 6B, 6E, 7C and 7D.

	Student									
	5I		6B		6E		7C		7D	
Response	Count	%	Count	%	Count	%	Count	%	Count	%
1	18	24.7%	3	3.3%	2	4.7%	41	43.6%	3	3.9%
2	16	21.9%	14	15.6%	14	32.6%	46	48.9%	12	15.8%
3	25	34.2%	28	31.1%	18	41.9%	7	7.4%	16	21.1%
4	7	9.6%	28	31.1%	5	11.6%			29	38.2%
5	7	9.6%	17	18.9%	4	9.3%			16	21.1%

Education results

For the variable mw_nodegree, which summarizes the results of the demographic question regarding educational attainment (Appendix E, Q13), Group 1 consists of respondents who do not have a college degree and Group 2 consists of respondents who have an associate, bachelor or graduate degree. The test assesses whether the responses of respondents with high levels of educational attainment (at least one college degree or more) differed qualitatively from the responses of respondents with less education (no college degree). In this case, participants differed in their responses to questions 1B, 1C, 5C, 5D, 5H, 5L, 6A, 6B, 6C, 6E, 6G, 6H, 6I, 6K, and 7C. This test found the most significant differences between subgroups, indicating that educational attainment does impact opinions on these types of questions.

Table K-9. Mann-Whitney test statistics for questions 6A, 6B, 6C, 6E, 6G, 6H, 6I, and 6K in regard to educational attainment.

Question →	6A	6B	6C	6E	6G	6H	6I	6K
Mann-Whitney U	10787.000	12227.50 0	6797.000	4507.500	4751.500	3886.000	9083.000	7876.000
Wilcoxon W	12867.000	14307.50 0	8228.000	5732.500	5786.500	4627.000	10913.00 0	9529.000
Z	-3.393	-2.720	-3.250	-2.592	-2.766	-2.935	-2.952	-3.348
Asymp. Sig. (2-tailed)	.001	.007	.001	.010	.006	.003	.003	.001

a Grouping Variable: mw_nodegree

Table K-10. Mann-Whitney ranks for respondents without a college degree (1) and respondents with a college degree (2) in response to questions 6A, 6B, 6C, 6E, 6G, 6H, 6I, and 6K.

Question	mw_nodegree	N	Mean Rank	Sum of Ranks
6A	1.00	64	201.05	12867.00
	2.00	452	266.63	120519.00
	Total	516		
6B	1.00	64	223.55	14307.50
	2.00	477	277.37	132303.50
	Total	541		
6C	1.00	53	155.25	8228.00
	2.00	349	208.52	72775.00
	Total	402		
6E	1.00	49	116.99	5732.50
	2.00	236	148.40	35022.50
	Total	285		
6G	1.00	45	128.59	5786.50
	2.00	281	169.09	47514.50
	Total	326		
6H	1.00	38	121.76	4627.00
	2.00	282	165.72	46733.00
	Total	320		
6I	1.00	60	181.88	10913.00
	2.00	393	233.89	91918.00
	Total	453		
6K	1.00	57	167.18	9529.00
	2.00	376	224.55	84432.00
	Total	433		

Table K-11. Frequency table for respondents with no college degree.

		No college degree															
Response	6A		6B		6C		6E		6G		6H		6I		6K		
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
1	9	14.1	9	14.1	6	11.3	9	18.4	6	13.3	6	15.8	21	35.0	16	28.1	
2	17	26.6	14	21.9	20	37.7	10	20.4	8	17.8	12	31.6	8	13.3	12	21.1	
3	18	28.1	26	40.6	21	39.6	19	38.8	19	42.2	16	42.1	20	33.3	16	28.1	
4	15	23.4	6	9.4	2	3.8	7	14.3	7	15.6	2	5.3	4	6.7	6	10.5	
5	5	7.8	9	14.1	4	7.5	4	8.2	5	11.1	2	5.3	7	11.7	7	12.3	

Table K-12. Frequency table for respondents with associate, bachelor or graduate degrees.

		Associate, Bachelor or Graduate degree															
Response	6A		6B		6C		6E		6G		6H		6I		6K		
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
1	23	5.1	32	6.7	21	6.0	8	3.4	11	3.9	11	3.9	51	13.0	28	7.5	
2	85	18.8	62	13.0	83	23.8	39	16.5	47	16.7	66	23.4	88	22.4	73	19.4	
3	124	27.4	209	43.8	134	38.4	118	50.0	89	31.7	132	46.8	131	33.3	148	39.4	
4	132	29.2	95	19.9	81	23.2	41	17.4	66	23.5	64	22.7	54	13.7	61	16.2	
5	88	19.5	79	16.6	30	8.6	30	12.7	68	24.2	9	3.2	69	17.6	66	17.5	

Table K-13. Frequency table for respondents with no college degree.

		No college degree													
Response	1B		1C		5C		5D		5H		5L		7C		
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
1	36	40.9%	17	19.8%	5	10.0%	21	36.8%	14	28.6%	22	36.7%	34	52.3%	
2	28	31.8%	17	19.8%	8	16.0%	25	43.9%	12	24.5%	15	25.0%	20	30.8%	
3	14	15.9%	32	37.2%	12	24.0%	7	12.3%	21	42.9%	16	26.7%	8	12.3%	
4	4	4.5%	6	7.0%	13	26.0%	2	3.5%	1	2.0%	3	5.0%	2	3.1%	
5	6	6.8%	14	16.3%	12	24.0%	2	3.5%	1	2.0%	4	6.7%	1	1.5%	

Table K-14. Frequency table for respondents with associate, bachelor or graduate degrees.

		Associate, Bachelor or Graduate degree													
Response	1B		1C		5C		5D		5H		5L		7C		
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
1	384	59.1%	161	26.7%	7	2.0%	81	19.0%	17	5.8%	63	15.6%	176	35.3%	
2	196	30.2%	170	28.1%	22	6.4%	229	53.6%	72	24.5%	106	26.3%	241	48.4%	
3	43	6.6%	190	31.5%	85	24.6%	79	18.5%	143	48.6%	152	37.7%	54	10.8%	
4	17	2.6%	58	9.6%	117	33.9%	29	6.8%	46	15.6%	50	12.4%	24	4.8%	
5	10	1.5%	25	4.1%	114	33.0%	9	2.1%	16	5.4%	32	7.9%	3	0.6%	

Table K-15. Mann-Whitney test statistics for questions 1B, 1C, 7C, 5C, 5D, 5H and 5L in regard to educational attainment.

Question →	1B	1C	7C	5C	5D	5H	5L
Mann-Whitney U	21975.00 0	21180.50 0	13936.50 0	6718.000	9836.500	4666.500	8939.000
Wilcoxon W	233550.0 00	203890.5 00	16081.50 0	7993.000	11489.50 0	5891.500	10769.00 0
Z	-3.978	-2.875	-1.981	-2.640	-2.566	-4.225	-3.386
Asymp. Sig. (2-tailed)	.000	.004	.048	.008	.010	.000	.001

a Grouping Variable: mw_nodegree

Table K-16. Mann-Whitney ranks for respondents without a college degree (1) and respondents with a college degree (2) in response to questions 1B, 1C, 7C, 5C, 5D, 5H and 5L.

Question	mw_nodegree	N	Mean Rank	Sum of Ranks
1B	1.00	88	444.78	39141.00
	2.00	650	359.31	233550.00
	Total	738		
1C	1.00	86	401.22	34504.50
	2.00	604	337.57	203890.50
	Total	690		
7C	1.00	65	247.41	16081.50
	2.00	498	286.52	142684.50
	Total	563		
5C	1.00	50	159.86	7993.00
	2.00	345	203.53	70217.00
	Total	395		
5D	1.00	57	201.57	11489.50
	2.00	427	247.96	105880.50
	Total	484		
5H	1.00	49	120.23	5891.50
	2.00	294	180.63	53104.50
	Total	343		
5L	1.00	60	179.48	10769.00
	2.00	403	239.82	96647.00
	Total	463		

Income results

The income analysis was performed using respondents' reported household income divided by the number of adults plus the number of children reported in the household. This calculation gives the per capita income for each household. For this analysis (new_mw), Group 1 consists of households with a per capita income less than \$35,000, while Group 2 consists of households with a per capita income greater than \$35,000. The per capita income results illustrate that there are few questions where income influences opinions on questions regarding Ann Arbor parks and the Argo area in particular.

Table K-17. Mann-Whitney ranks for respondents with per capita incomes of less than \$35,000 (1) and respondents with per capita incomes of greater than \$35,000 (2) in response to questions 1F, 5H, 6F and 7C.

Question	new_mw	N	Mean Rank	Sum of Ranks
1F	1.00	261	265.34	69255.00
	2.00	309	302.52	93480.00
	Total	570		
5H	1.00	128	127.38	16304.00
	2.00	155	154.08	23882.00
	Total	283		
6F	1.00	129	132.31	17068.50
	2.00	161	156.07	25126.50
	Total	290		
7C	1.00	194	213.21	41363.50
	2.00	260	238.16	61921.50
	Total	454		

Table K-18. Mann-Whitney test statistics for questions 1F, 5H, 6F and 7C in regard to per capita income.

Question →	1F	5H	6F	7C
Mann-Whitney U	35064.000	8048.000	8683.500	22448.500
Wilcoxon W	69255.000	16304.000	17068.500	41363.500
Z	-2.830	-2.921	-2.496	-2.165
Asymp. Sig. (2-tailed)	.005	.003	.013	.030

a Grouping Variable: new_mw

ATTITUDINAL STATISTICS

Significant Differences between Means and Neutral

In these analyses, significant differences between calculated means and the value three, which signifies a neutral preference in response to our attitudinal questions, were assessed using one-sample t-tests in the statistical package SPSS. The one-sample t-test allows sample means to be tested for significant difference from a given value. In our dataset, the value 3 represents a “neutral” response to any given question, so we wanted to ascertain that sample means were indeed different from a “neutral” opinion. If the sample means passed this t-test, we were able to assign general labels of “agree” or “disagree” to means less than or greater than three, respectively.

Ann Arbor Stratum

In this analysis, all means were significantly different from neutral with the exception of 5B (I think Argo Pond has good water quality for fish and wildlife), 5J (The plants growing within Argo Pond decrease the pond’s value to me), 6C (I think Argo Dam is important to most people in the area), 6D (I think Argo Dam should be removed), 6E (I think Argo Dam is good for fishing quality in the Huron River), 6H (I think Argo Dam is well maintained), 6I (I think Argo Dam should remain in place), 6K (I think Argo Dam is an important historical landmark), and 7E (I think the parks around Argo Pond increase property values in the area).

Table K-19. One-Sample descriptive statistics for question 1A-1F for the Ann Arbor stratum.

Question	N	Mean	Std. Deviation	Std. Error Mean
1A	404	2.2005	1.14545	.05699
1B	399	1.6817	.93047	.04658
1C	374	2.4626	1.14730	.05933
1D	364	2.8654	1.00742	.05280
1E	377	2.6525	.95856	.04937
1F	374	2.7273	.99622	.05151

Table K-20. One-Sample test statistics for questions 1A-1F for the Ann Arbor stratum. All means were significantly different from neutral.

Question	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
1A	-14.029	403	.000	-.79950	-.9115	-.6875
1B	-28.301	398	.000	-1.31830	-1.4099	-1.2267
1C	-9.059	373	.000	-.53743	-.6541	-.4208
1D	-2.549	363	.011	-.13462	-.2385	-.0308
1E	-7.039	376	.000	-.34748	-.4446	-.2504
1F	-5.294	373	.000	-.27273	-.3740	-.1714

Table K-21. One-Sample descriptive statistics for questions 5A-5L for the Ann Arbor stratum.

Question	N	Mean	Std. Deviation	Std. Error Mean
5A	272	2.0588	.94705	.05742
5B	178	2.8820	.99298	.07443
5C	193	3.7254	1.10030	.07920
5D	238	2.1218	.83050	.05383
5E	288	2.4410	1.06414	.06270
5F	244	2.3074	1.03825	.06647
5G	247	2.0486	.81504	.05186
5H	177	2.7458	.94616	.07112
5I	220	2.7955	1.21969	.08223
5J	225	3.1289	1.01608	.06774
5K	218	2.1972	.93207	.06313
5L	226	2.5177	1.11640	.07426

Table K-22. One-Sample test statistics for questions 5A-5L for the Ann Arbor stratum. The means of questions 5B and 5J were not significantly different from neutral.

Question	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
5A	-16.390	271	.000	-.94118	-1.0542	-.8281
5B	-1.585	177	.115	-.11798	-.2649	.0289
5C	9.159	192	.000	.72539	.5692	.8816
5D	-16.312	237	.000	-.87815	-.9842	-.7721
5E	-8.915	287	.000	-.55903	-.6824	-.4356
5F	-10.420	243	.000	-.69262	-.8235	-.5617
5G	-18.346	246	.000	-.95142	-1.0536	-.8493
5H	-3.575	176	.000	-.25424	-.3946	-.1139
5I	-2.487	219	.014	-.20455	-.3666	-.0425
5J	1.903	224	.058	.12889	-.0046	.2624
5K	-12.716	217	.000	-.80275	-.9272	-.6783
5L	-6.495	225	.000	-.48230	-.6286	-.3360

Table K-23. One-Sample descriptive statistics for questions 6A-6K for the Ann Arbor stratum.

	N	Mean	Std. Deviation	Std. Error Mean
6A	254	3.1850	1.13914	.07148
6B	274	3.2117	1.06514	.06435
6C	198	2.9545	1.02900	.07313
6D	209	3.0813	1.25885	.08708
6E	151	3.0993	1.03121	.08392
6F	170	3.3294	1.04783	.08036
6G	170	3.3941	1.14249	.08763
6H	149	2.8993	.85222	.06982
6I	224	2.8973	1.21765	.08136
6J	214	2.5701	1.14746	.07844
6K	210	2.9619	1.15683	.07983

Table K-24. One-Sample test statistics for questions 6A-6K for the Ann Arbor stratum. The means of questions 6C, 6D, 6E, 6H, 6I and 6K were not statistically different from neutral.

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
6A	2.589	253	.010	.18504	.0443	.3258
6B	3.290	273	.001	.21168	.0850	.3384
6C	-.622	197	.535	-.04545	-.1897	.0988
6D	.934	208	.351	.08134	-.0903	.2530
6E	1.184	150	.238	.09934	-.0665	.2652
6F	4.099	169	.000	.32941	.1708	.4881
6G	4.498	169	.000	.39412	.2211	.5671
6H	-1.442	148	.151	-.10067	-.2386	.0373
6I	-1.262	223	.208	-.10268	-.2630	.0577
6J	-5.481	213	.000	-.42991	-.5845	-.2753
6K	-.477	209	.634	-.03810	-.1955	.1193

Table K-25. One-Sample descriptive statistics for questions 7A-7F for the Ann Arbor stratum.

	N	Mean	Std. Deviation	Std. Error Mean
7A	287	2.0627	.87879	.05187
7B	298	1.6946	.74583	.04320
7C	284	1.9613	.87480	.05191
7D	210	3.1714	1.17353	.08098
7E	268	2.8993	1.07453	.06564
7F	241	1.8921	.73936	.04763

Table K-26. One-Sample test statistics for questions 7A-7F for the Ann Arbor stratum. The mean of question 7E did not differ significantly from neutral.

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
7A	-18.069	286	.000	-.93728	-1.0394	-.8352
7B	-30.213	297	.000	-1.30537	-1.3904	-1.2203
7C	-20.010	283	.000	-1.03873	-1.1409	-.9366
7D	2.117	209	.035	.17143	.0118	.3311
7E	-1.535	267	.126	-.10075	-.2300	.0285
7F	-23.262	240	.000	-1.10788	-1.2017	-1.0141

Argo Stratum

In this analysis, all means were significantly different from neutral with the exception of 1D (I think Ann Arbor needs better fishing opportunities), 5B (I think Argo Pond has good water quality for fish and wildlife), 5H (I think Argo Pond is a good place to fish), 5I (I think Argo Pond should be returned to a free-flowing river), 6C (I think Argo Dam is important to most people in the area), 6D (I think Argo Dam should be removed), 6E (I think Argo Dam is good for fishing quality in the Huron River), 6H (I think Argo Dam is well maintained), and 6I (I think Argo Dam should remain in place).

Table K-27. One-Sample descriptive statistics for questions 1A-1F for the Argo stratum.

	N	Mean	Std. Deviation	Std. Error Mean
1A	353	2.0935	1.06322	.05659
1B	352	1.5682	.86786	.04626
1C	327	2.3609	1.10689	.06121
1D	325	2.9846	1.09843	.06093
1E	333	2.5676	.99959	.05478
1F	332	2.6657	1.02519	.05626

Table K-28. One-Sample test statistics for questions 1A-1F for the Argo stratum. The mean of question 1D was not significantly different from neutral.

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
1A	-16.019	352	.000	-.90652	-1.0178	-.7952
1B	-30.954	351	.000	-1.43182	-1.5228	-1.3408
1C	-10.442	326	.000	-.63914	-.7596	-.5187
1D	-.252	324	.801	-.01538	-.1353	.1045
1E	-7.894	332	.000	-.43243	-.5402	-.3247
1F	-5.942	331	.000	-.33434	-.4450	-.2237

Table K-29. One-Sample descriptive statistics for questions 5A-5L for the Argo stratum.

	N	Mean	Std. Deviation	Std. Error Mean
5A	290	2.0828	.86455	.05077
5B	191	3.0366	1.06806	.07728
5C	209	3.9187	1.01815	.07043
5D	255	2.1882	.97400	.06099
5E	301	2.1761	1.03870	.05987
5F	252	2.1071	.88391	.05568
5G	260	2.0192	.88511	.05489
5H	173	2.8671	.95218	.07239
5I	234	2.9786	1.40644	.09194
5J	252	3.1825	1.09254	.06882
5K	234	2.2692	.94036	.06147
5L	244	2.7295	1.15139	.07371

Table K-30. One-Sample test statistics for questions 5A-5L for the Argo stratum.
 Questions 5B, 5H and 5I had means which did not differ significantly from neutral.

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
5A	-18.067	289	.000	-.91724	-1.0172	-.8173
5B	.474	190	.636	.03665	-.1158	.1891
5C	13.044	208	.000	.91866	.7798	1.0575
5D	-13.309	254	.000	-.81176	-.9319	-.6916
5E	-13.762	300	.000	-.82392	-.9417	-.7061
5F	-16.035	251	.000	-.89286	-1.0025	-.7832
5G	-17.867	259	.000	-.98077	-1.0889	-.8727
5H	-1.836	172	.068	-.13295	-.2758	.0099
5I	-.232	233	.816	-.02137	-.2025	.1598
5J	2.652	251	.009	.18254	.0470	.3181
5K	-11.888	233	.000	-.73077	-.8519	-.6097
5L	-3.670	243	.000	-.27049	-.4157	-.1253

Table K-31. One-Sample descriptive statistics for questions 6A-6K for the Argo stratum.

	N	Mean	Std. Deviation	Std. Error Mean
6A	270	3.4444	1.16112	.07066
6B	276	3.2138	1.14794	.06910
6C	209	2.9952	1.04466	.07226
6D	224	3.1384	1.46209	.09769
6E	140	3.1357	1.00510	.08495
6F	191	3.3298	1.08633	.07860
6G	161	3.3727	1.18226	.09318
6H	177	2.9379	.93029	.06992
6I	235	2.9447	1.34336	.08763
6J	234	2.6325	1.19440	.07808
6K	230	3.1913	1.22132	.08053

Table K-32. One-Sample test statistics for questions 6A-6K for the Argo stratum.
 Questions 6C, 6D, 6E, 6H and 6I had means which did not differ significantly from neutral.

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
6A	6.290	269	.000	.44444	.3053	.5836
6B	3.094	275	.002	.21377	.0777	.3498
6C	-.066	208	.947	-.00478	-.1472	.1377
6D	1.417	223	.158	.13839	-.0541	.3309
6E	1.598	139	.112	.13571	-.0322	.3037
6F	4.196	190	.000	.32984	.1748	.4849
6G	4.000	160	.000	.37267	.1887	.5567
6H	-.889	176	.375	-.06215	-.2001	.0759
6I	-.631	234	.528	-.05532	-.2280	.1173
6J	-4.707	233	.000	-.36752	-.5214	-.2137
6K	2.376	229	.018	.19130	.0326	.3500

Table K-33. One-Sample descriptive statistics for questions 7A-7F for the Argo stratum.

	N	Mean	Std. Deviation	Std. Error Mean
7A	291	1.9244	.91036	.05337
7B	293	1.4539	.65853	.03847
7C	286	1.7308	.79531	.04703
7D	230	3.1826	1.34510	.08869
7E	274	2.8029	1.14731	.06931
7F	254	1.7913	.72215	.04531

Table K-34. One-Sample test statistics for questions 7A-7F for the Argo stratum. All means were significantly different from neutral.

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
7A	-20.155	290	.000	-1.07560	-1.1806	-.9706
7B	-40.187	292	.000	-1.54608	-1.6218	-1.4704
7C	-26.989	285	.000	-1.26923	-1.3618	-1.1767
7D	2.059	229	.041	.18261	.0078	.3574
7E	-2.843	273	.005	-.19708	-.3335	-.0606
7F	-26.674	253	.000	-1.20866	-1.2979	-1.1194

USAGE STATISTICS

In this section, we wanted to assess the differences in the number of times that respondents from either the Ann Arbor or Argo stratum indicated that they had participated in various recreational activities. A t-test of two independent samples was used to determine whether respondents from one stratum were using the Argo area parks for recreation more than the other stratum.

Table K-35. T-test of independent samples to locate significant differences in usage of the Argo area for recreation between the Argo and Ann Arbor strata. Statistically different means exist for questions 4A, 4F, 4G and 4I. The Levene's test assesses equality of variance for each question. Questions 4A, 4F, 4G and 4I all successfully passed Levene's test.

	Variance	Levene's Test		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
4A	Equal	61.275	.000	-5.227	762	.000	-15.926	3.047
	Unequal			-5.044	516.039	.000	-15.926	3.157
4B	Equal	8.301	.004	-1.500	764	.134	-.271	.181
	Unequal			-1.458	567.926	.146	-.271	.186
4C	Equal	1.125	.289	-.943	763	.346	-.207	.219
	Unequal			-.969	682.123	.333	-.207	.214
4D	Equal	1.031	.310	-.555	764	.579	-.129	.233
	Unequal			-.562	755.164	.574	-.129	.230
4E	Equal	11.294	.001	-1.724	762	.085	-1.738	1.007
	Unequal			-1.651	449.485	.099	-1.738	1.052
4F	Equal	19.178	.000	-2.804	762	.005	-5.413	1.930
	Unequal			-2.730	581.703	.007	-5.413	1.983
4G	Equal	10.417	.001	-2.267	762	.024	-1.088	.480
	Unequal			-2.234	673.654	.026	-1.088	.487
4H	Equal	14.330	.000	-1.921	764	.055	-.149	.078
	Unequal			-1.840	463.372	.066	-.149	.081
4I	Equal	17.698	.000	-2.135	764	.033	-.159	.074
	Unequal			-2.019	382.176	.044	-.159	.079

Appendix L

DAM REMOVAL FUNDING SOURCES

Potential Grant Sources for Stream Habitat Restoration and Improvement Projects, and Associated Recreation Projects in Michigan (Michigan Department of Natural Resources 2004d)

Great Lakes Protection Fund-For projects designed to improve the ecological health of the Great Lakes aquatic resources by restoring the physical hydrology of the environment.

U.S. Army Corps of Engineers, Continuing Authorities Program-For aquatic ecosystem restoration projects. Cost sharing is required for studies, design, and construction.

Trout Unlimited, Embrace-A-Stream Program-For resource projects involving restoration, protection, conservation, and management of trout and salmon fisheries and their habitats. Award maximum of \$10,000, with one-to-one matching funds required.

U.S. Fish and Wildlife, Fish Passage Program Funds-Purpose is to address aquatic species passage programs, including dams. Awards maximum unlimited. Non-federal matching funds probably required.

FishAmerica Foundation-Purpose is for fisheries improvement and habitat work. Funding provided for project work only, engineering studies not funded. Award maximum-\$10,000 with no matching fund requirements.

Federal Watershed Protection and Flood Prevention Act-To rehabilitate or decommission dams and other water resource projects constructed under previous federal agricultural development or flood control programs. Federal funds provided up to 65% of total cost.

Great Lakes Commission, Great Lakes Basin Program for Soil Erosion and Sediment Control-Federally financed through the Farm Bill, this funding source supports innovative soil conservation and water quality enhancement projects throughout the Great Lakes basin. Projects supported by the Great Lakes Basin Program directly address the causes of erosion, non-point pollution from stormwater runoff, and sediment buildup. Project cost match required of 25% and project awards are generally around \$25,000.

Michigan Department of Natural Resources, Inland Fisheries Grants-For habitat and fishery improvement projects. One-to-one matching fund requirement.

Natural Resource Trust Fund-Funding is made available during a semi-annual project solicitation for recreational improvements, property acquisition for public recreation and open space purposes. Administered by the DNR Grants Section.

Natural Resources Conservation Service-Funding may be available to remove or repair dams constructed with federal funding for agriculture, flood control and other specifically legislated mandates.

Great Lakes Fishery Trust-Supporting new angler access, education and research projects providing benefits to the fisheries of the Great Lakes and their users. Specific fish passage and dam management projects may be supported.