A SURVEY OF FRESHWATER MUSSELS (MOLLUSCA: BIVALVIA: UNIONIDAE) AT SNAPTAIL (WINTER OR EAST FORK) HYDROELECTRIC PROJECT (FERC #2064) LOCATED ON THE EAST FORK CHIPPEWA RIVER, SAWYER COUNTY, WISCONSIN.

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ABSTRACT: *A freshwater mussel survey was conducted both upstream and downstream of the Snaptail Rapids hydroelectric facility located on the East Fork Chippewa River, Sawyer County, northwestern Wisconsin. This surveys' objectives were to determine the presence or absence of endangered and threatened mussels as well as the determination of any biological barrier effect and habitat fragmentation from the Snaptail dam and powerhouse. No state or federal endangered or threatened species were found. A single state special concern mussel species (round pigtoe) was found both upstream and downstream of the dam. Sites sampled downstream of the dam, upstream of the dam and in the power canal contained similar species richness values and communities. Little community fragmentation was observed. A total of 11 mussel taxa were recorded. Run-of-river operations are recommended to protect existing benthic habitat. A minimum flow is recommended in the bypass channel to enhance local aquatic resources.*

INTRODUCTION

The Snaptail hydroelectric plant is located at East Fork Chippewa River Sawyer County, Wisconsin. This facility is presently undergoing FERC (Federal Energy Regulatory Commission) licensing. As part of this licensing, the applicant should provide a description of wildlife and fishery resources of the project and conduct reasonable studies on these resources to aid the FERC in the license application process.

This document summarizes information collected during a 18 and 19 June 1998 freshwater mussel survey conducted both upstream and downstream of the hydroelectric facility and provides related natural resource management options. The completion of this survey was committed to by the WDNR (Wisconsin Department of Natural Resources.) The survey's purpose was to determine presence or absence of listed freshwater mussels and to determine if any populations were geographically restricted due to the presence or operation of the hydroelectric dam. Freshwater mussel populations have demonstrated in Wisconsin to be fragmented due to the presence and operations of dams. Many dams create a biological barrier to fish, which serve as parasitic hosts for freshwater mussel larvae. Also, most mussels are host specific - larvae will metamorphose only on particualr fish species. If suitable fishes are not present, particular mussel species will not reproduce.

The Snaptail dam is located in T40N, R5W, section 23 SW¼ of SE¼ at rivermile 7.4. The powerhouse is located in T40N, R5W, section 23 SW¼ of SW¼ at rivermile 7.0 (see Figure 1). The dam and powerhouse form a 1.9 mile long impoundment. Construction of the facility created a 0.6 mile long bypass channel towards the south as well as a 0.3 mile long power canal towards the north. The East Fork Chippewa River drains into Lake Chippewa which empties into the Chippewa River. The 176 mile long Chippewa River then empties into the Mississippi River (Figure 2).

METHODS

A total of 3 sites were sampled near the Snaptail hydro project area. Site locations were chosen in order to evaluate the potential effect of the project on mussel distribution. These three sites are: 1) upstream of the impoundment in riverine microhabitat 2) within the impoundment in the canal and 3) downstream of the hydro project in riverine microhabitat (see Figure 1). Collections were made at places where we estimated there were high population densities.

Sampling methods followed the ENDANGERED, THREATENED AND SPECIAL CONCERN AQUATIC INVERTEBRATE SURVEY GUIDELINES FOR WISCONSIN FERC PROJECTS (Appendix 1). Dead mussels were recorded for only the rarest species although many shells of common species were

mentally noted.

RESULTS AND DISCUSSION

No state endangered or threatened mussels were found during the survey. One state special concern mussel (*Pleurobema coccineum*) was found among the 1031 living mussels recorded (Table 1). We recorded representatives of 11 mussel taxa. No additional taxa were represented by dead individuals.

The state special concern round pigtoe (*Pleurobema coccineum*) was found living both upstream and downstream of the dam and in the impoundment.

Community fragmentation was not evident. A total of 10 species were found downstream of the powerhouse and 11 upstream. The only species found upstream and not downstream was *Q. p. pustulosa.* This species may occur downstream but appears to be so rare in the vicinity, it could have easily been overlooked. *Q. pustulosa* commonly occurs in Wisconsin and is not a rare species. The nearest known population occurs 37 rivermiles downstream in the Chippewa River (T. Balding, unpub. data). It is interesting to note that there are three dams, Arpin, Chippewa Flowage and Snaptail, between these two populations. It is possible that the Snaptail population is an isolated, viable remnant from the pre-impounded Chippewa River system.

Although no measurements of age or total shell length were made, visual observation suggested that recruitment of young mussels into these population existed. We were unable to draw this conclusion for species with small sample sizes.

Although population densities were not measured, they seemed moderate at the upstream and downstream sites and high in the canal. We visually estimated a population density of 2 mussel/m^2 downstream, and 1.5 mussels/m^2 upstream and about 20 mussels/m^2 in the impoundment. In most river systems population densities are higher in tailwaters than elsewhere and substantially lower in impounded portions. The apparently high and unusual population densities observed in the impoundment may be due to the riverine nature of the location sampled in the power canal. This canal contained little fine sediment, a moderate and probably steady current and stable substrate which is favorable to high population densities.

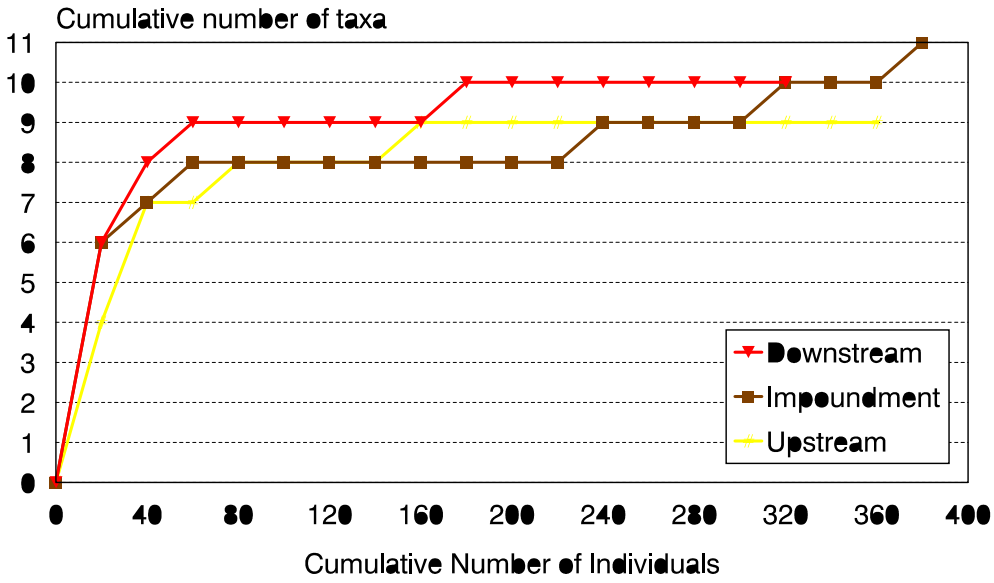
Sampling in the bypass channel was foregone because previous information suggested that this channel is often dewatered. It was expected that no or few freshwater mussels would occur in this channel because of hostile conditions. Freshwater mussels, which are long-lived and largely sedentary, require nearly constant wet conditions and will not survive long in shallow, dry

or low flow conditions.

TABLE 1. DISTRIBUTION AND ABUNDANCE OF EAST FORK CHIPPEWA RIVER FRESHWATER MUSSELS IN THE VICINITY OF THE SNAPTAIL HYDROELECTRIC PROJECT, SAWYER COUNTY, WISCONSIN. JUNE 1998. ( )= numbers recorded dead, ***** = State of Wisconsin Special concern species.

TAXON	**DOWNSTREAM (SITE 01)**	**IMPOUNDMENT (SITE 03)**	**UPSTREAM (SITE 02)**
Actinonaias ligamentina carinata	40 (0)	131 (0)	118 (0)
Amblema plicata plicata	15 (2)	53 (0)	95 (0)
Elliptio dilatata	8 (0)	118 (0)	29 (0)
Fusconaia flava	72 (0)	34 (0)	52 (0)
Lampsilis siliquoidea	49 (1)	3 (1)	4 (0)
Lampsilis cardium	22 (0)	1 (0)	14 (0)
Lasmigona costata	2 (1)	8 (0)	2 (0)
Ligumia recta	57 (0)	9 (0)	34 (0)
Pleurobema coccineum *	32 (0)	7 (0)	18 (0)
Strophitus undulatus undulatus	2 (0)	1 (0)	-------
Quadrula pustulosa pustulosa	------	1 (0)	-------
TOTAL	299 (4)	366 (1)	366 (0)

Figure 3. E Fork Chippewa River Mussel Species Richness downstream, upstream and in impoundment of the Snaptail Dam, Sawyer Co., WI.



MANAGEMENT CONSIDERATIONS

1) Since no state or federally listed mussels occur in locations sampled, it appears no immediate threat from hydroelectric project operations toward listed mussels exists.

2) Run of the river hydroelectric operations are recommended for protection of benthic habitat and organisms. Quickly fluctuating water levels are detrimental to freshwater mussels. Their inability to move quickly away from receding water levels and difficulty moving in rock or rubble substrata make them very vulnerable to periodic desiccation and mortality. Although no listed mussels presently occur in the tailwater or impoundment, a fairly rich fauna remains. Run-of-river operations would also provide protection to abundant aquatic insect, crustacean, gastropod and fish fauna.

3) Additional habitat and protection of existing biota in the bypass channel could be enhanced by a continuous minimum flow. Periodic dewater is detrimental to fish, insects, mollusks and other aquatic organisms and permanent watering would add to the aquatic productivity of the vicinity.

REFERENCES USED

Balding, Terry A. 1997. Mussel survey field data sheets for Chippewa River population survey including various other small streams in WI. plus maps, 4 addenda. Unpublished, unpaginated.

APPENDIX 1

ENDANGERED, THREATENED AND SPECIAL CONCERN AQUATIC INVERTEBRATE SURVEY GUIDELINES FOR WISCONSIN FERC PROJECTS.

Compiled by the Wisconsin Department of Natural Resources (Nov. 1991).

I. Identify state and federal endangered, threatened and special concern species that may be present based on historic records and zoogeography. The Natural Heritage Inventory Program of the WDNR Bureau of Endangered Resources in Madison or the FERC Endangered Resources Coordinator can help provide this information. This preliminary species screening will provide a list of anticipated bird species.

II. Record all field and laboratory data on standard survey forms. These data should include: date, exact location (to quarter of quarter section), habitat description (include substrate, current, water and air temperature), USGS quadrangle name, county, copy of map with location that contains listed species, number of listed invertebrates observed, any evidence of threats to population, name of taxon, whether or not specimens were collected, and the museum at which specimens were deposited.

III. Conduct field survey at times of the year and day and under conditions when animals or their remains are likely to be present and are the most easily identified. For most insects, this would be during May and June prior to emergence or during the hatching time if exuviae are collected. If more than one listed species is potentially present and are most easily identified at different times of the year, the project will have to be surveyed multiple times during the year.

IV. The survey should be conducted using a qualified invertebrate zoologist who is familiar with local fauna and can recognize listed and common invertebrates in the field.

V. All invertebrates should be identified to species where possible and those that are of uncertain identification and could be listed species should be preserved using standard techniques for later laboratory identification. One voucher specimen of each listed fish species should be kept for museum deposition if its removal will not permanently harm the population.

VI. Any listed species observed incidentally should be recorded.

VII. Secure any endangered resource or Scientific Collectors permits that are needed. Contact WDNR Bureau of Endangered Resources, Madison Wisconsin.

VIII. Additional Survey Guidelines for Aquatic Insects.

1).For the collection of nymphs and other listed aquatic invertebrates, a net of mesh size appropriate for target organisms should be used. A 3/16" or 1/8" bar mesh should be used for odonates. Smaller (500 or 600 microns) should be used for smaller invertebrates. Hand picking of rocks is needed for some insects (some coleoptera, tricoptera).

2).Kick net samples should be taken in a number of different microhabitats but microhabitats that are preferred for listed species should be sampled the most. A total of at least 200 members of each listed group (dragonflies, mayflies etc.) should be collected if possible.

3).Samples of exuviae are the easiest way to sample and provide the most information per unit effort. This method should be use where ever possible and should be done at the time of the year and under conditions that exuviae are present. The entire shoreline of the tailwater from the dam downstream 2 miles and at least 5% of the suitable habitat of the reservoir shoreline should be searched. Emergence time of each listed species that could be potentially present should be taken into account when designing a survey. In addition, previous weather conditions that do affect exuviae preservation should be considered. For example, exuvial samples should not be collected during August for a species that emerges in early June and should not be surveyed for immediately after a rain storm or high water which destroys exuviae.

IX.Additional Survey Guidelines for Mussels.

1).The entire shoreline of the reservoir should be surveyed for shell accumulations. The entire shoreline of the tailwater extending from the dam downstream 2 miles should be thoroughly searched. These shoreline searches should be conducted during low or normal water levels to ensure that shell remains are not inundated.

2).Collections of living and dead mussels using SCUBA, snorkeling gear or wading should be done within the reservoir and tailwater. The technique used depends on water conditions. Within each of the tailwater and reservoir, at least three sampling stations should be established based on results of the

shoreline surveys. Within each station, mussels should be gathered incrementally. Incremental collections are defined as collections of mussels off all species present in groups of 20 individuals. The collection of all mussel species as opposed to just collecting listed species, will provide community information. It will also assure that specimens are identified to the species level out of the water where it is easier that making identifications underwater. Mussels should be gathered at a station until a plateau of six points is reached when the cumulative number of mussels is plotted against the cumulative number of species for each station. Exceptions to this amount of collection effort include: a) the total absence of any mussels and b) the inability to secure the required amount of specimens in one-half person day of collecting effort.

3).During both shoreline and in-stream collecting, any living or dead mussels or any other listed species should be noted if observed incidentally.

4).All listed mussels should be measured by total length, total height and externally aged. Gravidity should be determined by examination of the marsupia. The purpose of collecting this information is to collect data on presence or absence of reproduction to determine population viability.