ATTACHMENT F

Minnesota Department of Natural Resources

Marsh Lake Ecosystem Restoration Project

Mussel Rescue and Translocation Plan for

Pomme de Terre River Restoration

(Prepared June, 2016)

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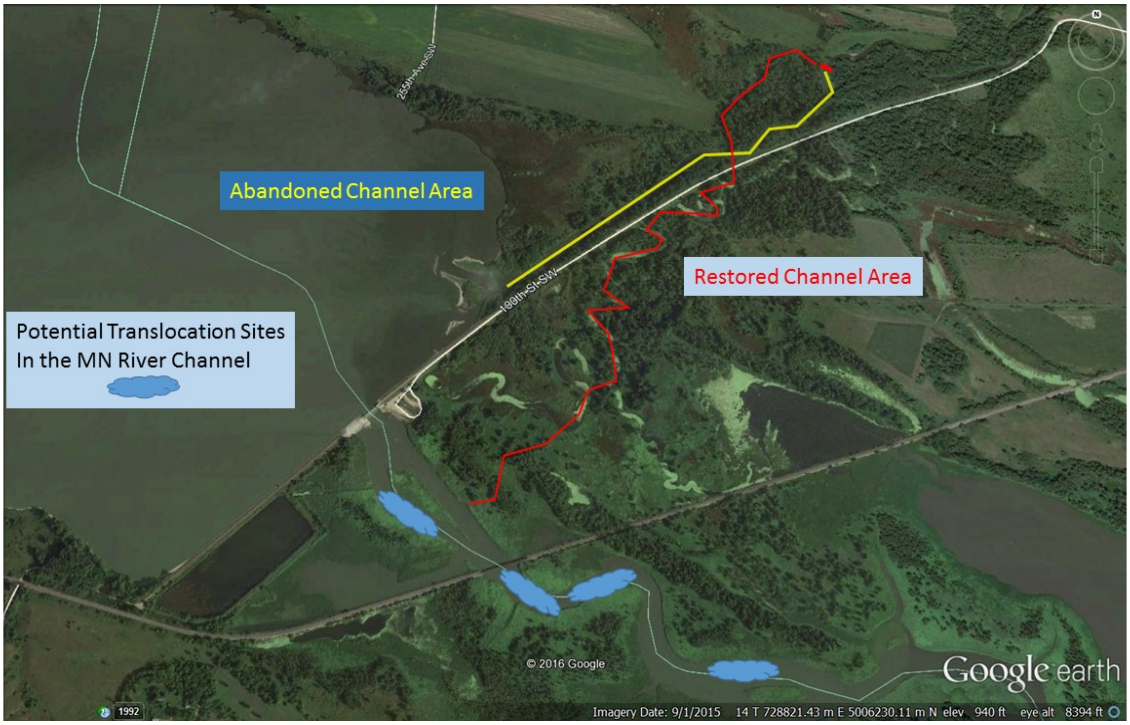

Figure 1. Pomme de Terre River project channel cutoff, channel restoration, and potential mussel translocation sites.

Mussels are an important component of the aquatic ecosystem of the Minnesota River. Surveys completed by the Minnesota Department of Natural Resources (MNDNR) in 2010 indicated that an estimated 71,000 live mussels are living within the Pomme de Terre River channel proposed to be cut off from flow and could be destroyed by desiccation or freezing following the re-routing of the Pomme de Terre River channel into its historic flowage (Figure 1).

COLLECTION PROCEDURE

Staff from the MNDNR, the U.S. Army Corps of Engineers (USACE), and volunteer citizens will collect live mussels from the channel area being cut off from the Pomme de Terre River flows and

move them to one or more sites in the Minnesota River below the Marsh Lake Dam (Figure 1). This will be accomplished by wading and snorkeling to find mussels and then placing them into collection bags. As bags are filled, other agency staff and volunteers will take full bags from the collectors, provide collectors with an empty bag, and take the filled bags to a waiting vehicle for transport to the translocation sites in the Minnesota River below the Marsh Lake Dam. At the Minnesota River bank, mussels will be placed into a holding tank and the empty collection bags returned to the mussel collectors. When the holding tank is full, the boat will take the mussels to the release site(s) in the Minnesota River where agency staff will release the mussels. Mussel collection will begin at the downstream end of the Pomme de Terre River cut-off channel and proceed upstream to the cut-off channel's upstream terminus. This collection effort is estimated to take two to four days and should be pursued between the months of June through September.

MNDNR's River Ecologists will identify all live mussels collected to species, and the mussels will be counted to maintain a record of this effort. Monitoring to assess the survival of relocated mussels and determine if additional monitoring is needed will be done within one year of the relocation.

SCHEDULE

Mussel relocation needs to be scheduled prior to any project construction that would impair the ability to access the Pomme de Terre or Minnesota Rivers, or the dike road to the dam. Relocation should be completed before the channel cut-offs are constructed but within 60 days of the channel cut-off, and not after the channel has been cut-off. The collection and relocation effort is estimated to take two to four days to complete and should be pursued between the months of June to September. Ideally the relocation effort should be accomplished in August. A MNDNR permit to handle live mussels will not be required as MNDNR staff in the Division of Ecological and Water Resources will be conducting this mussel relocation effort.

The April, 2013 Minnesota Freshwater Mussel Survey and Relocation Protocols will be followed as part of this mussel rescue and translocation plan.

MINNESOTA FRESHWATER MUSSEL SURVEY AND RELOCATION PROTOCOL

Minnesota Department of Natural Resources, Division of Ecological and Water Resources
U.S. Fish and Wildlife Service, Twin Cities Field Office

April 2013

PERMITS AND APPROVALS

- Live mussels may not be handled in Minnesota without a permit from the Minnesota DNR. Before conducting survey or relocation projects, contact the Endangered Species Coordinator (651-259-5073; richard.baker@state.mn.us) to apply for a permit.

- Surveys or relocation projects associated with development projects also require a project-specific authorization from the DNR, as specified in the surveyor's permit.

- Only individuals who have been tested and approved by the DNR will be permitted to conduct mussel survey or relocation projects. Contact the Endangered Species Environmental Review Coordinator (651-259-5109; lisa.joyal@state.mn.us) to inquire about becoming qualified as a mussel surveyor in Minnesota.

- Any departure from a condition of this protocol anticipated in advance of a survey or relocation, or needed during a survey or relocation, must be approved by the Endangered Species Coordinator before the departure is implemented.

FEDERALLY LISTED SPECIES

- If you anticipate encountering a federally listed mussel species (see http://www.fws.gov/midwest/endangered/lists/state-mn.html) while conducting mussel surveys, a federal permit may also be required. For further information, contact U.S. Fish and Wildlife Service, Twin Cities Field Office (612-725-3548 ext. 2206).

- If a federally listed species is not anticipated, but is encountered during a survey or relocation, the surveyor must contact the U.S. Fish and Wildlife Service's Twin Cities Field Office (612-725-3548 ext. 2206) within 24 hours of the encounter, unless the surveyor is already authorized to handle the species under a federal permit.

TEMPERATURE AND TIME LIMITATIONS

- Mussel surveys and relocations in Minnesota may only be conducted when air temperature is greater than 32^{o} F. and water temperature is greater than 40^{o} F.

- Surveys must be conducted within three years of the onset of work on a development project.

- Relocations must be conducted within two months of the onset of work on a development project.

LEVEL I MUSSEL SURVEY TO ESTIMATE MUSSEL DENSITY AND TO IDENTIFY ALL SPECIES PRESENT

A. Level I Survey methods:

1. Conduct qualitative timed, meandering searches so that at least one 20-minute "search" is conducted per 2,000 square meters of project impact zone, as defined in the project-specific authorization. Distribute surveys across the project impact zone, concentrating on areas with suitable mussel habitat, especially shorelines and dropoffs. Without compromising the safety of the surveyor, Level I Surveys should leave no more than 100 feet between the edges of any two adjacent searches or between the edge of the survey area and the edge of the project impact zone. (See example, Figure 1) If more than 1 mussel/minute or an endangered or threatened species is collected during the Level I Survey, a Level II Survey may be required.

2. UTM coordinates must be recorded with a GPS unit (NAD 83, Zone 15) at the starting point or centroid of each 20-minute search. Each search will consist of methodically seeking mussels within the survey area using sight and feel, wading in shallow water, and using SCUBA in deeper water. All live mussels or empty shells found will be identified to species, and one example of each mussel species found during the survey will be photo-documented. Each specimen of any federally-listed species will be photo-documented. A record of the total number of mussels and species found in each search will be used to generate a cumulative species curve.

3. Once processed, all live mussels will be held in submerged mesh bags and then relocated to suitable habitat at least 30 meters upstream of the project impact zone. Specimens of endangered or threatened mussel species will be returned to the substrate by hand, placed on their side, and allowed to burrow on their own. Other species may be returned to the substrate from the water surface.

4. In order to document as completely as possible the presence of mussel species within the survey area, the Level I survey will include a shoreline search for dead shells, which will be identified to the species.

B. The Level I Survey report must be provided in electronic format, and include at least:

1. A detailed description of methods used
2. A map or aerial photo clearly showing the partitioning of the project impact zone into 2,000 square meter search areas, and identifying each search's starting point or centroid
3. A table providing UTM coordinates for each search's starting point or centroid
4. Substrate composition, depth, and other physical conditions within the search area
5. The total number of live or dead mussels of each species found within each search
6. The total number of mussels encountered per minute within each search
7. One photograph of an example of each species found during the survey
8. One photograph of each specimen of any federally-listed species found during the survey
9. The number and shell condition of any species found only as an empty shell during the survey
10. A cumulative species curve (see Figure 2) that demonstrates the probability that all species present were discovered during the survey
11. A summary table (using the electronic spreadsheet available under "Submitting Data" at http://www.dnr.state.mn.us/eco/nhnrp/nhis.html, and including all required fields) covering all species encountered during the survey
12. Any additional reporting requirements specified in the surveyor's permit or project-specific authorization

LEVEL II MUSSEL SURVEY TO ESTIMATE THE NUMBER OF INDIVIDUALS OF EACH SPECIES PRESENT

A. Level II Survey Methods:

1. A grid consisting of cells no larger than 20 meters x 20 meters will be used to locate quadrat sample locations throughout any portion of the project impact zone in which the Level I Survey encountered mussels at a rate of at least 1 mussel per minute or where state-listed species were encountered. The base point of the grid will be located randomly to avoid bias in estimating density. (See example, Figure 3) A quadrat will be located at each grid intersection. At each quadrat location, a ¼ m^2 total substrate quadrat sample will be collected from within a quadrat frame equipped with a ¼ inch mesh bag (Figure 4). At each quadrat location, all mussels and substrate will be removed to a depth of 10-15cm, placed into the mesh bag, and brought to the surface.

2. All mussels collected will be identified to species, measured for length, and aged by counting annual growth arrest lines. This information and UTM coordinates obtained with a GPS unit (NAD 83, Zone 15) will be recorded for each quadrat location. At least one photograph will be taken of an example of each species found during the survey. Each specimen of any federally-listed species will be photo-documented. Once processed, all live mussels will held in submerged mesh bags and then relocated to suitable habitat at least 30 meters upstream of the project impact zone. Specimens of endangered or threatened mussel species will be returned to the substrate by hand, placed on their side, and allowed to burrow on their own. Other species may be returned to the substrate from the water surface.

B. Level II Survey report must be provided in electronic format, and include at least:

1. A detailed description of methods used
2. A map or aerial photo clearly identifying the placement of the grid and location of each quadrat
3. The dimensions of the study grid and UTM coordinates for each quadrat within the grid
4. Substrate composition, depth, and other physical conditions within each quadrat
5. Number of specimens of live and dead mussel of each species found within each quadrat
6. One photograph of an example of each species found during the survey
7. One photograph of each specimen of any federally-listed species found during the survey
8. A summary table of the length and age frequencies for each species present, summarized across all quadrats
9. A summary table (using the electronic spreadsheet available under “Submitting Data” at http://www.dnr.state.mn.us/eco/nhnrp/nhis.html, and including all required fields) covering all species encountered during the entire survey
10. Any additional reporting requirements specified in the surveyor’s permit or project-specific authorization

RELOCATION OF MUSSELS FROM A PROJECT IMPACT ZONE

"Relocation" entails physically moving all mussels within the project impact zone to a suitable habitat ("recipient site") at least 30 meters upstream of the project impact zone. Other than mussels relocated following a Level I or Level II Survey, relocation will be conducted only if required and as specified in a project-specific authorization from the MNDNR, and, if federally listed species are present, as permitted by the USFWS. Relocation of mussels away from a project impact zone must take place within two months of the project's initiation.

A. Selection of Recipient Site
   1. Prior to the relocation, a Level 1-type reconnaissance survey will be conducted to identify an area of suitable habitat at least 30 meters upstream of the upstream edge of the project impact zone. The recipient site should be similar in size to the project impact zone, and support a similar pre-existing mussel assemblage and mussel density to the project impact zone. The recipient site's substrate should not be greatly compacted such that relocated mussels will have difficulty burrowing into the substrate following relocation.
   2. Mussel density within the recipient site after completion of the relocation should be no more than double the pre-existing mussel density, and should not exceed 50 individuals per square meter.
   3. A downstream recipient site will be considered if no suitable upstream site can be found.

B. Relocation Methods
   1. For the purpose of quality control, between 24 and 48 hours in advance of beginning the relocation project, 20 randomly selected mussels of various sizes and species per acre of project impact zone will be collected from within the impact zone, marked by placing a dot of superglue or tag on the shell, and randomly and widely returned to the impact zone substrate from the water surface.
   2. The relocation will be conducted by systematically removing all mussels from the project impact zone to a depth 10-15cm. The relocation effort will not be considered adequate until 90% (18 per acre) of the mussels marked for quality control purposes have been found. All mussels will be held in submerged mesh bags until relocated.
   3. Upon completion of the removal of mussels, a final Level I-type timed search will be conducted in the relocation site. If the final search yields more than 2 mussels, relocation will continue until fewer than 2 mussels are found during a 20-minute search.
   4. Each relocated mussel will be identified to species and a tally of the total number of relocated individuals of each species will be maintained.
   5. Each relocated specimen of an endangered or threatened species will be measured for length, aged by counting annual growth arrest lines, and marked with a slash line, dot of colored and rubberized superglue, or glued tag.
   6. Presence of zebra mussels on any relocated native mussel will be noted. Zebra mussels will be removed from any specimen of an endangered or threatened species.
   7. Additional relocation details will be determined in consultation with MNDNR staff and specified in the DNR project-specific approval. Any relocation involving federally listed species will require separate USFWS review and approval of methodology.

C. Placement of Mussels in Recipient site

   Specimens of endangered or threatened mussel species will be returned to the substrate by hand, placed on their side, and allowed to burrow on their own. Other species may be returned to the substrate from the water surface.

D. The relocation report must be provided in electronic format, and include at least:
   1. Map or aerial photo clearly identifying the recipient site
   2. UTM coordinates (in NAD 83, Zone 15) of the corners of the recipient site
   3. Methods used and results of determining mussel species and density present at the recipient site prior to the relocation
   4. Number of specimens of each species relocated
   5. The length and age estimate, and method of marking for each specimen of endangered or threatened species relocated
   6. Any additional reporting requirements specified in the surveyor's permit or project-specific authorization

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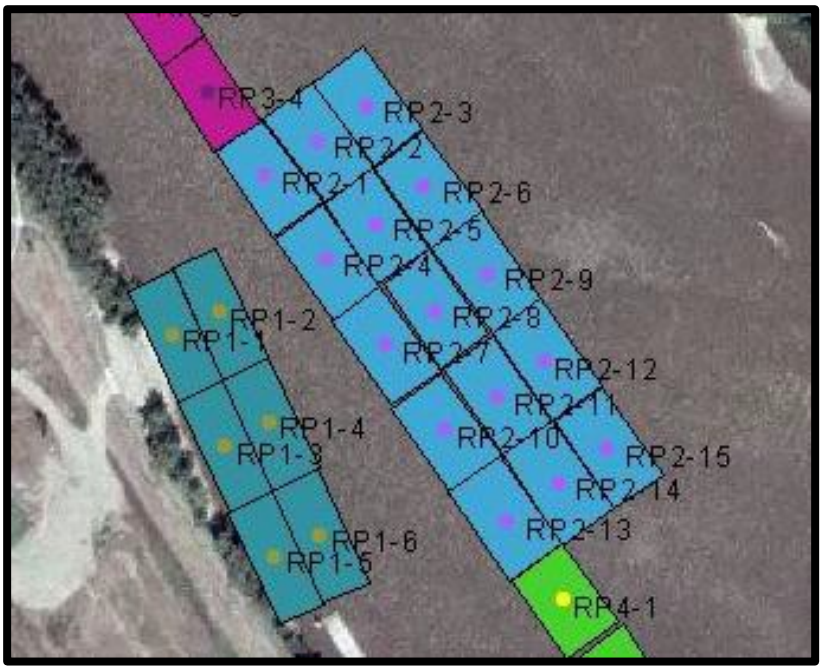

Figure 1. Example of Level I Survey for estimating mussel density within the impact zone of a proposed bridge construction project. Each block was subjected to a 20-minute qualitative survey.

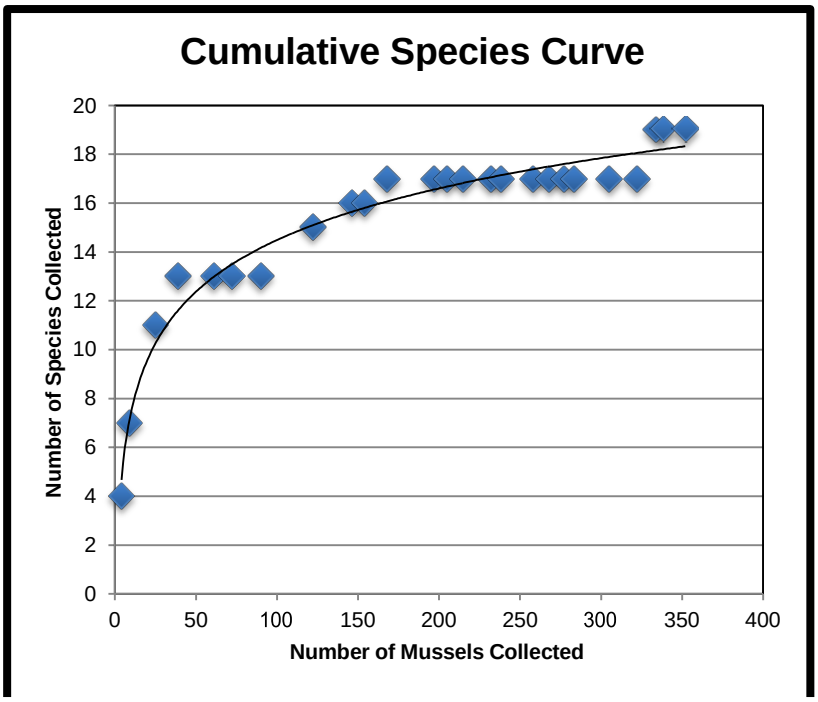

Figure 2. An example of a cumulative species curve, demonstrating the liklihood that all species present have been documented at least once. Contact the Minnesota Endangered Species Coordinator for assistance in preparing a cumulative species curve. (example provided by Heidi Dunn, Ecological Specialists, Inc)

Figure 3. Example of Level II Survey grid at same site as in Figure 1. A quadrat was sampled at each point.

Figure 4. A ¼ meter square quadrat sampler with attached ¼ inch mesh bag.