WISCONSIN MUSSEL RELOCATION PROTOCOL (revised 11/2014)

This protocol was developed in conjunction with the Wisconsin Department of Natural Resources for relocating native mussels out of harms way from areas of potential instream impacts.

The following protocol is intended as a framework for the development of a project specific Relocation Plan. A Relocation Plan may be required for a project permit, or other authorization. It should address all areas of instream disturbance and be reviewed and approved by WDNR staff prior to implementation.

Relocation Schedule

Relocations will occur in a timeframe that allows completion of all relocation work immediately prior to initiation of activities that impact the streambed. This is to ensure that mussels do not emigrate or recruit in the relocation area before construction is initiated. The relocation schedule may be modified to occur in advance of project activities if mussels are not expected to move into the impact area (i.e. mussel moved in the late fall for an activity starting in early spring). Time restrictions may also apply based on the gravid period of the listed species at the site. To minimize thermal stress to the mussels, water temperature should be at least 40^{o}F.

Relocation Personnel

A malacologist experienced in unionid collection and monitoring techniques will coordinate relocation and monitoring efforts. The malacologist must be familiar with the identification of unionid mussel fauna and have particular expertise in the identification of rare species. If deemed necessary, a quality assurance (QA) team may be designated to ensure project quality.

Relocation Team

The relocation team is responsible for relocation and monitoring efforts. The team provides personnel and equipment needed to complete relocation and monitoring according to this protocol. The team is responsible for acquiring all state, federal or other permits necessary for handling mussels at the site. Sufficient staff must be available to ensure safety and quality of work and minimize stress to the mussels during all phases of the relocation effort. If a QA team is designated, the relocation team will coordinate with them throughout the relocation and monitoring effort. The relocation team will prepare reports following both the relocation and monitoring efforts.

Quality Assurance Team

If designated, the QA team is responsible for ensuring that all relocation and monitoring protocols are followed and require any corrective actions of the relocation team. The QA team will observe collection, handling, species identification, placement procedures, and may monitor air and water temperatures during the relocation effort. The QA team will check collection areas to ensure an acceptable number of mussels are removed and inspect the transplant area to ensure that mussels are distributed properly throughout the transplant site and positioned correctly in the substrate.

Transplant Area

Transplant Area Location

Prior to the relocation effort, the relocation team will select a suitable transplant site.
The site must be approved by the QA team or natural resource agency staff and should:

1. Be close to the collection area
2. Have similar or better water quality, substrate, and fish fauna to the collection site
3. Not be influenced by factors detrimental to unionids (e.g. point discharge, dredging, navigation)
4. Have an existing or historical mussel population with similar species composition

Transplant Area Delineation

Samples will be collected within the transplant site to determine existing unionid density and substrate composition before relocating unionids. Mussels collected during sampling will be returned to the transplant area.

Unionid Collection from the Impact Area

Impact Area Delineation

Mussels will be relocated from all areas of temporary or permanent instream impact. If the impact is a bridge, the new bridge structure and any temporary structures used to construct the bridge (i.e. causeways, temporary bridge, barging staging areas) should be considered in the area of impact. All impact areas should include an appropriate buffer as dictated by substrate and flow conditions at that site. The impact area should be clearly marked. The markers will remain in place throughout the relocation effort, and all instream construction activities will be limited to these areas. This is to ensure that impacts to the streambed are contained within the areas where mussels were removed. The appropriate state or federal natural resource agency should review any changes in construction plans and modify the impact area prior to the start or continuation of any work.

As an example - A proposed bridge and subsequent mussel relocation might entail removing mussels from areas around the location of the proposed bridge piers and temporary causeway used to build the bridge. Estimates of the area of impact could be determined from the bridge plans (including buffer zones) for the piers and causeway. The estimate of mussels impacted would be based on original survey results from the site or other data deemed representative. Areas with substrate unsuitable for mussels would not need to be included in the delineated area of impact.

Unionid Collection from the Impact Area

Following delineation of the impact area, the relocation team will establish transects or a grid within the collection area. All mussels in the impact area will be collected. Collecting from downstream to upstream is recommended as the most efficient approach. All mussels will be collected into mesh bags that will be maintained in the water. The number of mussels collected in each bag will be based on the size and number of mussels and adjusted to avoid overcrowding. All areas will be traversed at least twice to ensure all (100%) or an acceptable percentage of the total number (i.e. 95%) of mussels within the area are collected.

Inspection of Impact Area

The impact area will be inspected for collection thoroughness by the relocation team (and by the QA team if one is designated). Searches will be conducted within the delineated areas and results will be compared with total collection density. If results indicate an unacceptable percentage of the estimated number remains, the relocation team will recollect the area until an acceptable removal percentage has been achieved.

Holding, Processing & Transport of Unionids

Following collection of mussels from the substrate, the mussels will be maintained in water at ambient temperature during holding and subsequent transport to the relocation site. Out of water time during processing should be kept to the minimum required to identify, mark and measure. Air and water temperatures should be monitored throughout the relocation process. All unionids may be measured and marked to distinguish them from resident unionids at the relocation site if required. At a minimum, all mussels collected will be identified, counted, and relocated. Special status species will be identified, sexed (if appropriate), measured, aged, and uniquely marked on both valves. Gravidity of females should be noted (if appropriate) and the determination should be conducted cautiously. The method to be used for marking mussels should limit handling, be accomplished with a minimum out of water time, be fairly permanent, match shell type and size, and be easily readable after several years.

All mussels will be carefully handled and, except for processing time, will be held in water at ambient temperatures (e.g. bags in river, circulating tank, etc.) while out of the substrate. Time out of substrate will be limited to the time required for collection, processing, holding and transport between the collection and relocation areas. Time out of substrate will not exceed a predetermined amount of time that has been agreed upon.

Placement of Mussels at Transplant Site

All special status species will be relocated to a location established at the transplant site for monitoring rare species. The special status mussels will be hand placed in a natural position within the substrate. Optimally the density following translocation should not exceed twice the initial density of the relocation site, unless a higher density has been agreed to. The remaining mussels may be distributed by hand along the surface of the substrate, from the surface of the water above suitable substrate, or hand placed in the substrate. Mussels should be distributed evenly (by boat, diver, or wading) in suitable habitat. The transplant area will be inspected, following relocation, to ensure unionids are distributed properly.

Monitoring

A monitoring program is essential to evaluate the success of any relocation project. At a minimum, the monitoring program should include a quantifiable assessment of special status species survival. Survival will be assessed by placing special status species in a known area and monitoring them at least one year following relocation. Collected mussels will be identified, counted, measured, aged, and replaced. Special status species collected during the monitoring effort will be returned to the location where they were collected at that time. Dead shell of any species will be collected and at a minimum, mortality of relocated special status species will be compared with mortality of other relocated and resident mussels.

Monitoring Personnel

Personnel from the relocation team will be responsible for conducting all monitoring, unless other agents are agreed upon.
An initial swimover is required at completion of the relocation efforts. One month monitoring may be required if there is concern for immediate survival or other factors. Yearly and subsequent monitoring may be required depending on the type of project, species involved and sensitivity of the resource.

Initial Swimover and One-Month Monitoring

Mortality should be assessed upon completion of the initial relocation effort. To assess immediate mortality, a one-month swim-over may be conducted over the area being monitored and all fresh-dead mussels retrieved. In addition, a cursory search outside of the relocation area should be conducted to recover shells that may have been displaced and observe mussels that may have moved. General condition and behavior of the relocated and resident mussels should be noted. A one-month swim-over may not be required in waters lacking adequate visibility, to avoid excessive handling of recently transplanted mussels.

Yearly Monitoring

During yearly monitoring a swim-over survey should be conducted over the entire relocation area being monitored and all fresh-dead shells, marked and unmarked, retrieved. The entire relocation site or a subsample of it will be searched using a quantifiable method (e.g. quadrats, transects along a grid, etc.) and all live mussels encountered will be identified and marks noted if present. Marked special status species are to be measured and checked for gravidity, if appropriate and not stressful. All mussels are to be kept at ambient temperatures and handled with minimum out of water time. The location of all special status mussels encountered within the relocation area will be noted. Special status species will be replaced in the substrate in the same location from which they were collected and all other mussels will be replaced in the same general location.

Possible Further Monitoring

If data after one year of monitoring indicates survival has not stabilized or is less than an acceptable limit (e.g. 90%, 75%.), the relocation team will coordinate with the QA team (if designated) and appropriate state or federal agencies to determine if additional monitoring should be continued.

Reports

An initial report will be prepared by the relocation team following completion of the relocation, detailing methods, data from relocated mussels, population characteristics in the relocation area, and data from the impact site. Monitoring reports following each effort will detail methods and results, as well as any problems encountered.