

Draft Protocol for Mussel Surveys in the Tennessee and Cumberland Rivers
Where Dredging/Disposal/Development Activity Is Proposed
Modified from the Ohio River Protocol, Developed by the
Ohio River Valley Ecosystem Mollusk Subgroup (clarified April 2004)

Introduction: This protocol provides some basic mussel survey methodology and guidance for a more consistent approach to conducting mussel surveys throughout most of the Tennessee and Cumberland rivers. It is a qualitative diving survey technique to be applied to areas proposed for dredging and/or spoil disposal. The protocol is driven by the goals of the survey. It is not the “best” survey technique for all possible purposes, but it is suitable for an area where the goal is to identify mussel concentrations and then avoid them. This level of survey effort is not sufficient to prove the absence of a listed species. It is not quantitative and will not tell you how many mussels are present, or the true relative abundance or density of the community. The collaborators on this protocol development concur that such a detailed level of information is not necessary if the goal is merely to avoid mussel concentration areas. It assumes that surface searching, with a little digging by hand, will not uncover all the mussels which are present in the substrate.

This protocol is a work in progress and does not address in detail all issues and concerns related to dredging/disposal/development activities. It is not yet “officially” approved and endorsed by any federal or state agency, but rather represents the best professional judgment of mollusk experts in the ecosystem. It needs to be adequately field tested to determine if the standards and guidelines presented herein are sufficient to protect the mussel resource and corresponding riverine habitat; therefore, it is subject to change or modification if testing indicates such action is appropriate. After sufficient testing and review is completed, it may be submitted for official agency approval.

This protocol has been utilized by consultants for the Corps (USACE) maintenance dredging program since 2002, and The Ohio River Valley Ecosystem Team (ORVET) Mollusk Group anticipates further testing of this protocol during the summer of 2004. This may provide opportunities to work together with those entities involved in dredging/disposal/development activities, to further develop and fine tune this protocol.

Background: The origin and concept of this protocol arose out of the need to develop standards and guidance in advance of surveys for year 2002; the requirement in the various state Water Quality certifications that mussel surveys must have approved protocols ahead of time; and the application for commercial sand and gravel dredging for many miles of the Ohio River during the fall of 2001 and at recurring intervals (e.g., every five years). Various representatives of state, federal, university and private organizations participated in a conference call during October 2001 to construct an approach and create a protocol. Information gleaned from that conference call was used to construct a protocol which was subsequently reviewed and discussed at the ORVET Mollusk Group in November 2001. A draft protocol was then distributed for review and comment. During a meeting to discuss anticipated dredging activities in the Ohio River, held in Frankfort, Kentucky in February 2002, there was additional discussion regarding

this draft protocol, and the need to clarify portions of the protocol and address additional concerns, especially from the Corps, regarding the protocols potential impact on their navigation dredging activities. Additional comments along with notes from a meeting to discuss the protocol on March 5th, 2002 in Frankfort, Kentucky, have resulted in this latest version of the draft protocol, revised for clarification purposes in April 2004.

Goals:

1. To protect sections of a river which support federally listed mussel species and/or a mussel concentration from the impacts of any dredging/disposal/development activities. For the purposes of this protocol, a mussel concentration is one live animal per square meter. The presence of one live or fresh dead federally listed species will also constitute a mussel concentration requiring protection (for further details, see **Sampling approach**).
2. Arrive at a scientifically sound protocol to identify areas of unionid mussel concentrations, determine if live or fresh dead federally listed mussels are present within the proposed activity area, and identify areas that may support federally listed species.
3. Incorporate this protocol into the Scope of Work (SOW) for those conducting mussel surveys in big rivers where any dredging/disposal/development activity is proposed.

Application of this protocol: Although much of this protocol addresses dredging/disposal activities, it may be adapted for use on other types of projects on the river (such as development of loading facilities etc.). The applicant/action agency should coordinate with state and federal agencies prior to conducting any surveys in order to determine what modifications to the protocol are appropriate. **Note:** Survey data collected on a specific site will be considered valid for **two** years from the date the survey was conducted.

Location: For Tennessee River investigations, this protocol is considered most appropriate for river reaches **downstream of Ft. Loudon Dam**. For Cumberland River investigations, this protocol is considered most appropriate for river reaches **downstream of Cordell Hull Dam**. Although portions of this protocol (e.g., sampling technique) may be applicable upstream of these areas, any upstream activities will, at this time, need to be addressed on a case-by-case basis with appropriate state and federal agency representatives.

Notification: Survey plans should be provided to appropriate state and federal officials at least two weeks prior to the time the actual survey will occur. Appropriate state and federal officials will be notified at least one week prior to the time the actual survey will occur. In addition, state and federal agencies should be given at least 30 days to review survey results prior to the anticipated start of the dredging/disposal/development activity.

Survey period: Mussel surveys may only be conducted from **May 1 to October 31, and at a water temperature at or above 60°F**. Any survey work outside this period will be done only under extenuating circumstances, and with separate approval obtained from the appropriate state

and federal agencies prior to conducting the work, and possibly a different protocol.

Visibility/Flow requirements: Since this is a qualitative surface survey relying primarily on visual cues, minimum visibility is **one-half meter** (approx. 20 inches), with or without lights, at depth of the survey. This distance is approximately the length of one side of a quarter meter square sampling frame. When recording visibility along with other data, quantify the actual visibility rather than just note that it met the minimum requirement. Recording this information will help determine if the one-half meter minimum distance should be modified in the future. Due to the difficulty of conducting surveys at high flows, the surveys should be conducted at a maximum **cfs**, as read from the upstream dam (see table). If suitable visibility and flow are not present at the intended time of the survey, then the survey must be re-scheduled, or a different protocol employed in consultation with the appropriate state and federal agencies. (e.g., more extensive quantitative surveys with excavations may be required).

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Comment: Yes it should be graded downward as it moves upstream, 30,000 for Pickwick, 15,000 at Nickajack and Chickamauga, 10,000 at Watts Bar and Ft. Loudon. On the Cumberland 15,000 below Cheatham and Old Hickory, 7,500 below Cordell Hull.

Project	Maximum CFS as measured at upstream dam
Tennessee River System	
Pickwick	30,000
Nickajack	15,000
Chickamauga	15,000
Watts Bar	10,000
Ft. Loudon	10,000
Cumberland River System	
Cheatham	15,000
Old Hickory	15,000
Cordell Hull	7,500

Standard data to be collected: **Required data** will include persons collecting information, diver(s) and mussel identifier, surface weather conditions, air and water temperature, visibility (see aforementioned visibility requirements), discharge from upstream dam, collecting time, river location, GPS coordinates of ends of dive transects, depth and substrate information by 10 m segment or quadrat (use Wentworth size scale to determine percent silt, sand, gravel, cobble, boulder, bedrock, scoured substrate, etc.), relative compaction of the sand and gravel substrate, an estimate of the percent zebra mussel coverage of the substrate, and identification of mussels, both live and dead, to species. Age range of each mussel species will be recorded to provide an indication of whether or not there has been successful recruitment in recent years. The following data will be provided for all federally listed mussels: length, age, reproductive status (if appropriate at time of survey), and sex. A voucher specimen of a species of mussel observed dead will be provided to the appropriate state and/or federal agency representative. A photograph of any live federally listed mussel observed will be provided to the appropriate state and/or federal representative. A photograph of live state listed species, if not previously vouchered, will be provided to the appropriate state representative. **Optional data** will include

the presence/absence of live snails, photograph of state listed species, and other information the collector deems worthy to include.

Buffer zones: Once a mussel concentration is identified, the following buffer zones apply - 1500 feet upstream, 500 feet downstream, and 500 feet adjacent to the limits of a federally listed mussel and/or mussel concentration, to the area of any dredging and/or disposal activity, except as noted in the following section concerning channel maintenance navigation dredging.

Note: There are additional buffer zone requirements regarding the distance from shore commercial sand and/or gravel dredging is allowed. Contact the appropriate state agency for their current regulations.

If **navigation dredging** will occur less than 500 feet from a mussel concentration, then the following will apply:

- The applicant/action agency will consult with the appropriate state and federal agency representatives to determine what level of mussel survey effort is to be conducted prior to dredging activity. It is very likely the state and/or federal agency representative will require additional search effort, especially to determine if federally listed mussels are present, in addition to survey effort already described under the **Sampling approach** portion of this protocol.
- Bathymetric monitoring of the site will occur prior to, immediately after, and one year after the dredging activity. This information will be provided to the appropriate state and federal agency representative within two weeks after each phase of bathymetric monitoring occurs. After the post one year bathymetric monitoring is conducted, the applicant/action agency will consult with the appropriate state and federal agency representative, to determine if additional bathymetric monitoring will be required.

Sampling approach: Transects shall be established throughout the proposed site perpendicular to the river, spaced no farther than 50 meters (m) apart and using a minimum of three transects, and spanning (length and width wise) the proposed project areas. Each transect will be 100 m long unless channel conditions or safety concerns will not permit. Each transect will be subdivided into 10 m semi-quantitative segments. Along each transect, divers shall visually search an area one meter wide for mussels. A visual search includes moving cobble and woody debris, hand sweeping away silt and small detritus, and disturbing the upper one to two inches of substrate in order to better view the mussels which may be there. Substrate information along each transect will be recorded by 10 m segment and using the Wentworth scale. Depth and percent coverage by zebra mussels will also be recorded. A minimum of five minutes of visual searching will be expended in each segment in which mussels and/or suitable mussel habitat is present. Mussels observed along each transect will be recorded as occurring in a particular segment. In each 10 m segment mussels observed will be bagged and brought to the surface for further processing and positive identification, unless the appropriate state and federal agency representative both agree to permit some mussel identification to occur at the survey depth.

When mussel densities within any 10 m segment reach ≥ 1.0 mussel/m² for two consecutive transects, at least 15 minutes of qualitative search time will be spent in the most suitable habitat between the two transects.

Divers will sample a 1 m quadrat at the 10, 25, 50, 75, and 100-m marks along each transect line.

The mussels collected from quadrats will be processed separately from other mussels collected along the transect line.

However, any species which may resemble a federally listed species must be brought to the surface for positive identification. Appropriate information describing the habitat conditions along each transect, such as depositional areas, silt, mud, detritus, hard-pan sand, and scoured areas where mussels cannot burrow, etc., shall be recorded for each 10 meter segment. If no mussels are observed in two adjacent transects, with at least one of the transects containing apparent suitable mussel habitat, then a dive search of a minimum of 10 minutes in length will occur between the two transects in the area of suitable mussel habitat. If any live and/or fresh dead mussels are found between the two transects during the search dives, then an additional transect will be placed there and a search conducted as previously described.

The agreed-upon threshold of a mussel concentration is one animal per square meter, but not all mussels present are visible at the substrate surface. For the purposes of this protocol, only 50% are assumed visible. Consequently, an observed density of 0.5 animals per square meter would indicate an actual density of at least 1 animal per square meter.

Therefore, if five or more live mussels are observed within any 10 square meter segment of the transect (i.e., the observed density is greater than or equal to one-half mussel per square meter), and/or if a federally listed mussel is present, then the appropriate buffer zones will be established around that segment within which dredging and/or disposal activity will not occur.

Note: If there is a desire to conduct a mussel survey in a different manner than as described above or under different environmental conditions, then it will need to be handled on a case-by-case basis with the appropriate state and federal representatives.