

OFFICE OF RESOURCE CONSERVATION

State of Illinois

Grant

PROJECT NUMBER: T-53 D-1

PROJECT TITLE: Investigating Mussel Communities in Wadeable Illinois Streams

PURPOSE:

Freshwater mussels are one of the fastest declining taxonomic groups of organisms in North America, yet few consistently collected mussel-community data sets exist in Illinois. This project will collect baseline mussel data in conjunction with existing basin surveys on wadeable streams and other high priority locations in Illinois. These data will fill knowledge gaps in Illinois' Wildlife Action Plan, support revisions of current mussel community indices, assist water quality initiatives, and guide restoration initiatives.

NEED:

Freshwater mussels are one of the fastest declining taxonomic groups of organisms in North America. In Illinois, 24 of the 61 extant species (39%) are listed as threatened or endangered, and a total of 29 mussel species are identified as "species in greatest need of conservation" in Illinois' Wildlife Action Plan (Table 1). An additional 19 species are extinct or have been extirpated from Illinois. Nineteen of the 29 mussels listed as "species in greatest need of conservation" are typically found in small to medium-sized rivers and all but five are occasionally found in wadeable streams. Due to their sensitivity to stream flow and bottom substrate, filter feeding habits, and relative inability to move far in response to environmental stresses, freshwater mussels act as biological indicators of stream condition and biological integrity.

Majority of the existing Illinois mussel data reside in the Illinois Natural History Survey (INHS) Mollusk Collection, Champaign and were collected as a result of various faunal surveys. Many of the records are species-oriented, rather than community oriented, and lack relative abundance information necessary to describe mussel communities similarly to existing fish and macroinvertebrate information collected as part of the Interagency Basin Survey Program. Within the Basin Survey Program, the Illinois Department of Natural Resources (IDNR) and the Illinois Environmental Protection Agency (IEPA) collaborate on sampling fish, macroinvertebrates, in-stream habitat, and water and sediment chemistry in watersheds throughout the state on a rotating five-year basis. Statewide basin survey assessments have been ongoing since the late 1980's, yet mussel data are not routinely collected. As a pilot effort, freshwater mussel-community surveys were performed in conjunction with the basin surveys on wadeable streams from 1999-2006. During that time, mussels were collected at six stream basins or parts thereof. Although these pilot efforts provided standardized sampling guidelines for

mussel collections in wadeable streams, these protocols were not implemented statewide due to staff limitations and budget constraints.

Protocols for sampling and analyzing mussel community data have been developed for wadeable streams, yet the Mussel Community Index (MCI; Szafoni 2002) may need refinement so it can more accurately reflect improvements or degradation in Illinois' aquatic systems. To develop the index, metrics were selected for inclusion based on their documentation in the literature as being important to mussel communities. Therefore, the metrics comprising MCI may not provide clear signals of how streams respond to human impacts on watersheds. Although MCI is a useful tool for comparing mussel communities across sites, the metric scores lack adjustment for natural variability throughout Illinois. Thus, regional differences that exist under natural conditions (i.e., conditions that are minimally impacted by humans) are not considered. A statewide survey of mussel communities would provide the necessary data to further refine the index.

Once refined, the MCI, along with multi-metric indices for fish (Smogor 2000) and aquatic macroinvertebrates (Tetra Tech, Inc 2007), provide the assessment tools necessary to evaluate the impacts of humans on the biota in wadeable systems. Wadeable streams and assessment tools have been the focus of IDNR because:

1. Wadeable streams make up the vast majority of river miles in Illinois.
2. Wadeable streams suffer disproportional impacts to environmental perturbations.
3. Wadeable streams are more amenable to management and/or restoration efforts as implemented by the plan

We acknowledge the need to have comparable data and assessment tools on larger rivers. Data on large river mussel assemblages are as rare and as necessary as those for wadeable streams and wadeable reaches of larger streams. As noted above, the assessment tools to integrate fish, mussel, macro-invertebrate, and physical and chemical data are not established for large river systems (non-wadeable reaches). Further, the costs to collect comparable data on big river mussel communities are problematic. Without direct tie-ins to existing data and tools, we propose to focus efforts where we believe we can achieve the greatest efficiencies of the grant resources as well as the best integration of current assessment efforts with those proposed here.

Available mussel data are used extensively by diverse stakeholders including state and federal agencies, local watershed groups, and non-governmental organizations. Thus, there exists considerable interest by a broad group of stakeholders in this project. For example, the Natural Resource Damage Assessment (NRDA) Program, operated by the Illinois Trustees, IDNR, and Illinois EPA, assesses injuries to natural resources and the loss of services those resources provide as a result of a release of oil and/or hazardous substances. More quantitative mussel data would provide a baseline on the mussel fauna present, as well as valuing damages in terms of restoration, replacement, and/or acquisition. Further, the data could be used to monitor the success or failure of the restoration projects, by helping to define reference conditions to track restoration success. Mussel data collected with standardized and scientifically-valid sampling protocols may create opportunities for improving water-quality assessments in Illinois. Currently, the Illinois EPA annually collects chemical, physical, biological, habitat and toxicity data on rivers and streams to satisfy reporting requirements found in Section 305(b) of the

Federal Clean Water Act (CWA). The primary purpose of the Section 305(b) process is to provide for an assessment of the overall water quality conditions of Illinois waters. In addition to fish and macroinvertebrates, mussels could be used as part of Illinois EPA's 305(b) stream evaluation process. Additionally, mussels could be used to assign water bodies to appropriate anti-degradation tiers as is being done in Ohio. Further, as Illinois moves forward with developing different tiers for streams currently in the general use category (i.e., tiered aquatic life uses), mussel communities could be an important determinant in correctly assigning waters to a tier.

OBJECTIVES:

1. Choose approximately 120 – 150 wadeable sample sites per year that correspond to scheduled basin survey locations or that meet other selection criteria described in the approach section.
Timeframe: May – June 2008; February – May 2009 and 2010; Percent of Budget: 2%
2. Collect baseline mussel data statewide on 9 – 12 stream basins per year (approximately 120 – 150 wadeable sites) to equal 33 stream basins by 2011.
Timeframe: June – October 2008, 2009, 2010, 2011; Percent of Budget: 80%
3. Collect mussel community data as part of targeted surveys on wadeable streams to supplement baseline data on at least 10 streams annually.
Timeframe: June – October 2008, 2009, 2010, 2011; Percent of Budget: 5%
4. Maintain and update the mussel resource database annually.
Timeframe: November 2008 – May 2009; November 2009 – May 2010; November 2010 – May 2011; Percent of Budget: 4%
5. Investigate the sampling efficiency of current IDNR sampling protocols on wadeable streams to decreasing or increasing amounts of sampling effort.
Timeframe: May 2008 – December 2010; Percent of Budget: 6%
6. Prepare and catalogue specimens.
Timeframe: November 2008 – May 2009; November 2009 – May 2010; November 2010 – May 2011; Percent of Budget: 2%
7. Prepare basin survey reports.
Timeframe: November 2008 – May 2009; November 2009 – May 2010; November 2010 – May 2011; Percent of Budget: 1%

EXPECTED RESULTS AND BENEFITS:

In Illinois' Wildlife Action Plan, the impact of habitat, community, and population stresses on mussel species in greatest need of conservation are not well known. Nineteen of the 29 mussels listed as species in greatest need of conservation are typically found in small to medium-sized rivers and all but five are occasionally found in wadeable streams. Additionally, twenty eight of

the mussel species in greatest need of conservation are moderately to strongly decreasing, yet the goal is to de-list twenty four of these species by 2025 (State Wildlife Action Plan Appendix II pages 313-315). In order to reach this target, systematically sampled mussel community data are needed to better document relative abundances of these species throughout Illinois. Even though this project does not currently include large rivers, wadeable streams comprise the vast majority of river miles in Illinois, suffer disproportional impacts to environmental perturbations, and are more amenable to management and/or restoration efforts as implemented by the plan.

As noted above, the assessment tools to integrate the biological, and physical, and chemical data have not been established for large river systems (non-wadeable streams). Even without the assessment tools and the absence of large river mussel sampling in this project, we believe we can achieve the greatest efficiencies of the grant resources as well as the best integration of current assessment efforts by confining our study to wadeable streams. Although our methods are currently limited to small and medium-sized rivers and creeks we believe it may be possible to incorporate large rivers in future years.

Fish and habitat data collected at the same sites through the Basin Survey Program will help managers identify key habitats and presence of fish hosts, which are crucial for the long term sustainability of mussel populations. Sedimentation and flow disturbance are the most significant habitat stressors facing mussel communities in Illinois (Appendix II pages 313-315). This project will foster collection of habitat data at the same sites as mussels, which will help managers better document the extent of habitat stressors on mussel communities. Other uses for the statewide baseline monitoring of mussel communities in wadeable streams conducted during this three year project will be used for: identifying and managing high-quality examples of all wadeable river and stream communities (Desired conditions for stream habitats, number 19, page 51), identifying locations of and subsequently restoring populations of imperiled and extirpated mussels (Desired conditions for mussels, pg. 40; Streams Campaign Action 4, page 63), identifying suitable habitats for reintroducing native mussels where decimating factors have been eliminated and natural recovery is unlikely (Streams Campaign Action 4b, page 63), and tracking the spread of detrimental exotic species in hopes of preventing and controlling further invasions (Streams Campaign Action 5, page 63). Baseline data, together with special surveys to support ongoing Federal Aid and/or IDNR projects, will assist Office of Resource Conservation staff in identifying priorities for management and protection efforts.

APPROACH:

Objective 1. Choose approximately 120 – 150 wadeable sample sites per year that correspond to scheduled basin survey locations or that meet other selection criteria described in the approach section

Although the basin surveys funded under F-67-R include wadeable and non-wadeable sites, this project is limited to wadeable conditions. When possible, sites sampled will coincide with stream reaches selected for basin survey samples under F-67-R. If non-wadeable sites are sampled under F-67-R, then wadeable reaches will be sought upstream or the sample will be moved to a nearby stream that is wadeable. The criteria below will be used to further guide site selection.

Data collected through this project will provide the necessary data to further refine the Mussel Community Index (MCI; Szafoni 2002) currently used by IDNR. One metric currently considered for inclusion into the MCI is community intactness. Single sample intactness is defined as the proportion of live species from a single community sample to the total number of live, dead, and relic species collected from the site. Ultimately, we would hope to calculate historical intactness, which is the proportion of live species from a single community sample to the total number of live, dead, and relic species collected from the site over time. To facilitate future refinement of the index, preference for sampling will be given to sites that currently have only a single sample known from the site. An additional community sample from the site would provide the information necessary to calculate historical intactness.

Although MCI is a useful tool for comparing mussel communities across sites, the index may need refinement so it can more accurately reflect improvements or degradation in Illinois' aquatic systems. To evaluate how the metrics comprising MCI respond to levels of human impacts on watersheds, mussel community samples from a range of disturbance are needed. We will determine disturbance levels at each possible sample site, and will target sample sites that ensure adequate numbers of samples from least-, more-, and most-disturbed conditions (e.g., at least ten samples for each disturbance level for each major river basin), which will be necessary for future revisions to MCI.

Objective 2. Collect baseline mussel data statewide on 9 – 12 stream basins per year (approximately 120 – 150 wadeable sites) to equal 33 stream basins by 2011.

This project is designed to complement the existing interagency Basin Survey Program, in which fish, macroinvertebrates, instream habitat, and water and sediment chemistry are sampled in watersheds throughout the state on a rotating five-year basis. We will annually collect mussel data on 9-12 Illinois stream basins (approximately 120-150 wadeable sites per year), completing statewide coverage of all 33 basins during the project. Because this is a three year project versus a five year rotation for F-67-R, basins may be sampled with different amounts of intensity to ensure a statewide coverage is reached during the project. Basins that have recent mussel data (Figure 1) may be sampled less than those where few if any mussel community data exist.

Collections will be made using visual and hand-grab methods following established IDNR protocols (see Appendix A). Mussels will be identified to species, sexed, aged, and returned to the stream. Dead and relic shells will be identified, recorded, and voucher specimens collected. The Illinois EPA will conduct habitat assessment and assess water quality parameters at basin survey sites. Staff funded through this project will collect similar information at non-basin survey sites. Information on stream size, bottom substrate, and depth may be helpful for future enhancements to the MCI.

Objective 3. Collect mussel community data as part of targeted surveys on wadeable streams to supplement baseline data on at least 10 streams annually.

Data gaps will be discovered and ongoing special projects will identify sites (approximately 20) where targeted surveys need to be completed. Examples of targeted surveys anticipated are: sites in smaller tributaries than are routinely sampled as part of the Basin Survey program, sites

that represent a disturbance type in a given watershed that are needed for future enhancement to the MCI, sites needed to fill data gaps or update collection records that are older than 25-30 years and fill a specific need (e.g., permit review), sites in which mussel die offs occur during the project duration, or sites in which IDNR is funding stream restoration activities (e.g., in Conservation Opportunity Areas). These sites will be in addition to the sites identified in Objective 2 and will be sampled using the same protocols.

Objective 4. Maintain and update the mussel resource database annually.

A previous State Wildlife Grant (Grant Number T-12-P-1; Illinois Mussel Database: Maintenance and Enhancement; Job 3.3 Develop the mussel database as part of the Fisheries Analysis System (FAS) and link to existing INHS museum collections) funded the development of Microsoft Access desktop database, which was developed to capture qualitative and quantitative mussel data in an easily accessible format. This desktop model includes four basic modules: Habitat Assessment and Location, Community (species found, the number of individuals, live, dead, relict, etc.), Mussel Condition Index (MCI, calculates an index of condition based on the mussel assemblage), and Demographics (individual specimen lengths and characteristics). Digital station photos are stored to track large scale changes at a sample site. The tables that support the modules are relational, using site, species, and event codes as keys. Quality control measures (drop down lists, check boxes, input masks, etc.) have been put into place to prevent errors. In addition, all data will be reviewed and quality controlled. During the duration of this grant, we expect that the functionality of this desktop mussel database will be added to IDNR Office of Resource Conservation's Statewide Streams Database (SSD). The SSD is part of the IDNR's Enterprise GIS system, which includes a spatial component as well as tabular data storage. We will collaborate closely with IDNR to ensure all data are migrated to the SSD when it is operational.

Objective 5. Investigate the sampling efficiency of current IDNR sampling protocols on wadeable streams to decreasing or increasing amounts of sampling effort

This objective will be investigated by a graduate student at the University of Illinois, under the direction of Dr. Cao.

The current IL-DNR sampling protocol for mussel assemblages requires about 4 man-hours search in a representative reach by visual detection and hand grab, except for very small streams, for which a search of 1-2 man-hours is recommended.

To evaluate how well this protocol characterizes the species composition and abundance of the reach-wide assemblage, we will intensively sample 10 of the basin-survey sites the first year of the project that differ in sizes in different river basins. A two-person crew will keep searching a reach until no more species (dead or alive) is found and record the number of hours used. Visual detection, hand grab, and a dredge sampler are employed to obtain a complete or nearly-complete list of mussel species together with their relative abundance. We will determine the sample representativeness by comparing the routine samples (4 man-hours) with the accurate estimates of species composition and relative abundance. We will also examine whether we need to adjust sampling efforts according to stream sizes and other habitat characteristics at a site. Up

to 10 additional sites will be sampled in the second year depending on how efficiency varies among stream conditions.

Objective 6. Prepare and catalogue specimens.

Voucher specimens of each species from each site will be taken and deposited at the Illinois Natural History Survey (INHS) Mollusk Collection, Champaign. After completion of the field season, two technical scientists, under direction of Kevin Cummings, will begin preparing and cataloguing specimens according to INHS protocols. Data collected through this project will be made available to the public through the INHS collections database and peer-reviewed journal articles.

Objective 7. Prepare basin survey and other reports.

At the completion of a major stream basin, the INHS research scientist will work with IDNR stream biologists to analyze the mussel data collected together with other information gathered as part of F-67-R Job 101.1 “Baseline data collection: basin surveys.” The research scientist will assist IDNR staff in publishing a characterization of the stream condition as a reference for each basin. Stream condition assessments based on Mussel Condition Index (Szafoni 2002) will be provided and integrated into ongoing IDNR projects as appropriate (e.g., Biologically Significant Streams). We will prepare annual and final reports to satisfy our responsibilities to the research sponsor.

LOCATION:

This three year project will be conducted statewide by Illinois Natural History Survey staff located in Springfield and Champaign, as well as researchers and students at the University of Illinois (Figure 1).

PROJECT SCHEDULE:

	05/08 – 11/08	12/08 – 04/09	05/09 – 11/09	12/09 – 04/10	05/10 – 11/10	12/10 – 04/11	05/11 – 10/11
Objective 1. Choose sites to be sampled.	X		X		X		
Objective 2. Collect baseline mussel data.	X		X		X		X
Objective 3. Conduct targeted surveys.	X		X		X		X
Objective 4. Update the mussel resource database.		X		X		X	
Objective 5. Investigate sampling efficiency.	X	X	X	X	X	X	
Objective 6. Prepare and catalogue specimens.		X		X		X	X
Objective 7. Prepare basin survey reports.		X		X		X	X

LITERATURE CITED:

- State of Illinois. 2005. The Illinois Comprehensive Wildlife Conservation Plan and Strategy – version 1. Prepared by the Illinois Department of Natural resources and approved by the U.S. Fish and Wildlife Service.
- Smogor, R. 2000. Draft manual for calculating Index of Biotic Integrity scores for streams in Illinois. Prepared for: Illinois Environmental Protection Agency and Illinois Department of Natural Resources. 23 pp.
- Szafoni, R.E. 2002. Freshwater mussel classification index. *In* Illinois natural areas inventory - approved standards and guidelines. pp. 66-71.
- Tetra Tech, Inc. 2007. Illinois benthic macroinvertebrate collection method comparison and stream condition index revision. Prepared for: Illinois Environmental Protection Agency. 11 pp.

Table 1. Rare (R), state-threatened (ST), and state- or federally-endangered (SE, FE) mussels identified in Appendix II of the Illinois Wildlife Action Plan (State of Illinois 2005).

Scientific Name	Common Name	Status
<i>Alasmidonta viridis</i> (Rafinesque, 1820)	Slippershell	ST
<i>Arcidens confragosus</i> (Say, 1829)	Rock Pocketbook	R
<i>Cumberlandia monodonta</i> (Say, 1829)	Spectaclecase	SE
<i>Cyclonaias tuberculata</i> (Rafinesque, 1820)	Purple Wartyback	ST
<i>Cyprogenia stegaria</i> (Rafinesque, 1820)	Fanshell	FE, SE
<i>Ellipsaria lineolata</i> (Rafinesque, 1820)	Butterfly	ST
<i>Elliptio crassidens</i> (Lamarck, 1819)	Elephantear	ST
<i>Elliptio dilatata</i> (Rafinesque, 1820)	Spike	ST
<i>Epioblasma triquetra</i> (Rafinesque, 1820)	Snuffbox	SE
<i>Fusconaia ebena</i> (Lea, 1831)	Ebonysell	ST
<i>Lampsilis fasciola</i> Rafinesque, 1820	Wavyrayed Lampmussel	SE
<i>Lampsilis abrupta</i> (Say, 1831)	Pink Mucket	FE, X
<i>Lampsilis higginsii</i> (Lea, 1857)	Higgin's Eye	FE, SE
<i>Lasmigona compressa</i> (Lea, 1829)	Creek Heelsplitter	R
<i>Lasmigona costata</i> (Rafinesque, 1820)	Flutedshell	R
<i>Ligumia recta</i> (Lamarck, 1819)	Black Sandshell	ST
<i>Plethobasus cooperianus</i> (Lea, 1834)	Orangefoot Pimpleback	FE, SE
<i>Plethobasus cyphus</i> (Rafinesque, 1820)	Sheepnose	SE
<i>Pleurobema clava</i> (Lamarck, 1819)	Clubshell	FE, SE
<i>Pleurobema cordatum</i> (Rafinesque, 1820)	Ohio Pigtoe	SE
<i>Potamilus capax</i> (Green, 1832)	Fat Pocketbook	FE, SE
<i>Ptychobranhus fasciolaris</i> (Rafinesque, 1820)	Kidneyshell	SE
<i>Quadrula cylindrica</i> (Say, 1817)	Rabbitsfoot	SE
<i>Quadrula metanevra</i> (Rafinesque, 1820)	Monkeyface	R
<i>Simpsonaias ambigua</i> (Say, 1825)	Salamander Mussel	SE
<i>Toxolasma lividis</i> (Rafinesque, 1831)	Purple Lilliput	SE
<i>Venustaconcha ellipsiformis</i> (Conrad, 1836)	Ellipse	R
<i>Villosa iris</i> (Lea, 1829)	Rainbow	SE
<i>Villosa lienosa</i> (Conrad, 1834)	Little Spectaclecase	ST

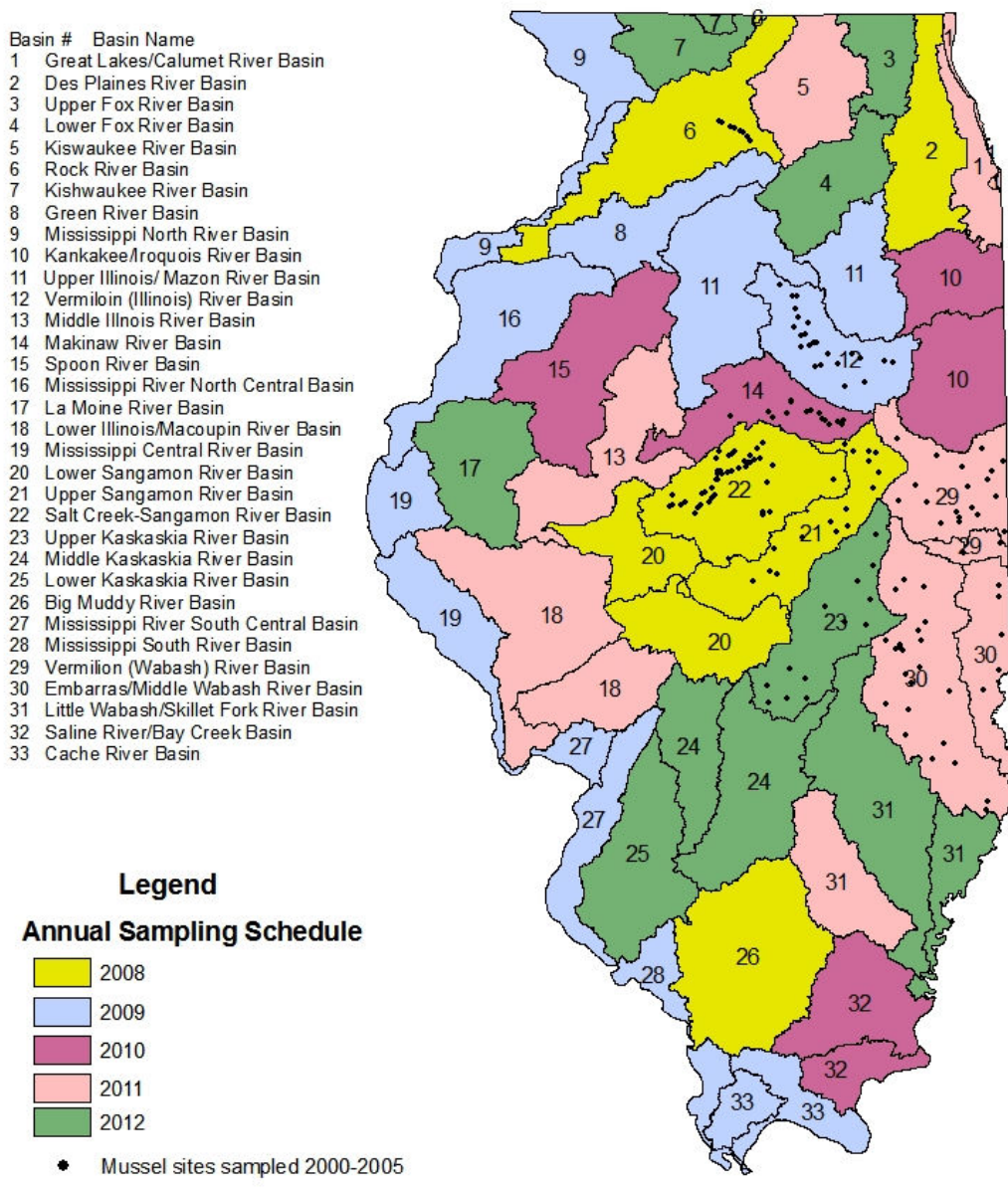


Figure 1. Annual sampling schedule for the Basin Survey program (F-67-R). Basins scheduled for sampling in 2011 and 2012 will be divided among 2008-2010 to ensure a statewide coverage is reached during this project. Basins that have recent mussel data may be sampled less than those where few if any mussel community data exist.

Appendix A.

Protocol for Surveying Freshwater Mussels

in Wadeable Streams and Wadeable Portions of Large Rivers

December, 2002

Background and Rationale:

Freshwater mussels are important components of stream and river ecosystems. Due to their sensitivity to stream flow and bottom substrate, filter feeding habits, and relative inability to move far in response to environmental stresses, freshwater mussels act as biological indicators of stream condition and biological integrity. Larval mussels require fish hosts for completion of development to adulthood and for dispersal. Many mussels require specific fish host species. Therefore, mussel populations can be indicators of healthy fish populations.

This report describes a protocol to survey and assess freshwater mussel populations. This protocol provides point-in-time as well as baseline data for ecosystem evaluation and monitoring. As in all sampling protocols, emphasis is on finding an optimum balance between field effort and the collection of biologically meaningful data.

Goals:

To provide reliable and repeatable techniques for assessing qualitative and quantitative composition of the freshwater mussel community in streams at sampled stations

To provide data for monitoring freshwater mussel populations on a local, regional, and watershed basis

To develop a classification system that permits evaluation of stream biological values and freshwater mussel resources based on parameters collected in these surveys

Objective: Pre-survey reconnaissance

Based on purpose of survey, determine if demographic data are needed (Appendix 1).

Develop list of species historically known from the basin. Note rare, threatened, or endangered species and their general habitat preferences.

Obtain topographic or other maps, including areas @1 mile above and below designated station.

Objective: Select and describe mussel survey reach

In the field, select survey reach based on available instream habitat, substrate types, and historic species composition (if known). The selected reach should encompass all or most of the instream habitat types present at the station, especially those most important to freshwater mussels (e.g. gravel riffles). Substrates important for rare or listed species that may be present should be included in the sampled reach, if available. Describe the sampling reach location by stream name, county, section-township-range, general location (e.g. 2 miles W Charleston), specific location (e.g. upstream 2330E bridge), and stream order (if known).

Mark approximate boundaries of sampled reach on topographic maps and/or develop a hand-drawn “pirate”-type map on Field Data Sheet to enhance relocation of reach for future surveys. If possible, record GPS coordinates.

Photograph sampled reach from downstream end (i.e. looking upstream).

Objective: Characterize instream / substrate habitat in sampled reach

Record general observations on stream size, substrate type, current, water clarity, water depth, instream structure, and condition of riparian zone on Field Data Sheet.

Objective: Determine freshwater mussel species composition and relative abundance.

Collect dead shell material including identifiable shell fragments, keeping the best available dead shell for each species. Exposed bars, shallow near-shore areas, and animal middens should be particularly sought out and searched. It is not necessary to collect all dead shells.

Collect all live mussels visually detected. Individuals may be observed via “trails”, exposed shells, siphons or mantle lures, or siphoning channels in substrate. Efforts should be made to sample all available substrate types in sampled reach. However, more time should be spent in high quality habitats and habitats of rare and listed species known from the basin.

Hand grab for buried individuals in all substrate types with greater effort in high quality and rare species habitats. Many mussels will not be detectable by visual cues alone. Hand grabbing may be the only method of sampling in turbid or deeper waters. Hand grabbing is important in loose gravels, near shore substrates, and within roots of aquatic vegetation.

A minimum of 4 man-hours per station is recommended and is necessary on large streams and rivers or in highly complex habitats. However, on very small streams and ditches (< 10' wide), 1-2 man-hours may be sufficient.

Note presence and general abundance (absent, rare, uncommon, common, abundant) of *Corbicula* (Asian clam) and *Dreissena* (zebra mussel), but do not collect individuals (but see below).

Objective: Characterize freshwater mussels community structure.

Complete the Field Data Sheet.

For each species encountered alive, record number of live individuals, any signs of reproduction observed, and number of individuals in each age class. *At a minimum*, record the number of live individuals in the 0 - 3 age class. When collecting demographic data, record gender, shell length (mm), and age class / number of growth rings for each live individual on Demographic Data Sheet.

For each species recorded only by dead shell material, classify best shell as recent dead or relict based on condition of periostracum and nacre (see bottom of Field Data Sheet for definitions).

Voucher 1-2 individuals per species, including exotics, using dead or relict shells where possible. For species with sexual dimorphism, voucher a male and female if available. Efforts should be made to voucher rare species by dead shell material. Record the number and type of voucher material on the Field Data Sheet.

Note any other physical, chemical, or biological factors that may impact current or future surveys at this site (e.g. active drainage maintenance ½ mile upstream; riparian corridor in set aside program).

Note time spent searching and report as number of man-hours. Record names of crew members and characterize sampling efficiency as fair, good, or high based on water and substrate condition. Numbers of man-hours will vary depending on crew size and proficiency, stream size, substrate diversity, mussel species richness and abundance, and water conditions.

Return live mussels to appropriate habitat / substrate ensuring that they are set into the substrate with the posterior end slightly exposed.

Objective: Data Summarization and Reporting

Mussel survey reports should document survey results, summarize mussel community status, and provide comparison to any past mussel sampling, if known. New species location, large changes in mussel numbers or species, and potential threats can be described.

For all surveys, complete Field Data Sheet and Mussel Resource Value Worksheet.

For demographic surveys, complete the information at the top of the Mussel Demographic Survey Data Sheet.

Submit copies of Field Data Sheet, map, and IDNR Mollusk Collections sheet along with all vouchers to Mollusk Collections, Illinois Natural History Survey, 607 E. Peabody Drive, Champaign, IL 61820. Include copies of any digital photos of the sample station. Retain originals for your files.

Submit copies to appropriate district or regional biologists as necessary if you are sampling outside your district/region.

When sampling INAI sites, Element Occurrence Record locations, or reporting new listed species locations or mussel communities of statewide significance (see Mussel Resource Value Worksheet), submit copies of data sheets to Natural Heritage Database staff with Element Occurrence Form.

Freshwater Mussel Survey Protocols Wadeable Streams and Wadeable Sections of Large Rivers

DATA NEEDS

Field Data Sheet;
Mussel Resource Value

Demographic
Data Sheet

Recommended Data Needs for:

General Sampling (e.g. new locations, exploratory surveys)	R	O
INAI surveillance (Cat. VI and VII)	R	O
Element Occurrence Update and INAI Cat. II	R	R/O*
Population Monitoring Long or Short Term (e.g. basin surveys, pre- and post-project assessments)	R	R

R = Recommended

O = Optional but desirable

* Recommended for listed or target species, optional for other species