

**FRESHWATER MUSSEL SURVEY PROTOCOL FOR THE SOUTHEASTERN
ATLANTIC SLOPE AND NORTHEASTERN GULF DRAINAGES IN FLORIDA AND
GEORGIA**



**United States Fish and Wildlife Service,
Ecological Services and Fisheries Resources Offices**

**Georgia Department of Transportation,
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**Stacey Carlson, Alice Lawrence, Holly Blalock-Herod,
Katie McCafferty, and Sandy Abbott**

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ABSTRACT

Within the Southeastern Atlantic Slope and Northeastern Gulf Drainages of Florida and Georgia, the U.S. Fish and Wildlife Service (Service) has identified a need for a standardized mussel survey protocol that can be used across physiographic provinces. The Service and Georgia Department of Transportation (GDOT) worked cooperatively to develop this Mussel Sampling Protocol (Protocol) to ensure that it fulfills the dual objectives of the Service and GDOT. This Protocol is designed to serve as a tool to qualitatively determine if federally protected species, including candidates, are present within an area. The Protocol ensures a level of consistency and comparability among surveys and should be applied for all mussel surveys that are funded, permitted, or requested by the Service in this area. It establishes minimum qualifications of surveyors, discusses permit requirements, suggests preliminary research needs, details a standard operating procedure for qualitative surveys, and provides guidance for deliverables.

Although the Protocol was developed in conjunction with GDOT for road crossings, it is applicable to any freshwater mussel surveys in wadeable or nonwadeable streams. The standard operating procedure contained in the Protocol outlines a prescribed search area (PSA) to ensure that appropriate stream coverage is achieved while searching for mussels. However, the PSA included in the Protocol is applicable only to surveys conducted in wadeable streams. The PSAs for nonwadeable streams, as well as for other types of projects, should be developed in conjunction with the Service on a case-by-case basis.

I. INTRODUCTION

The Endangered Species Act (ESA) requires consultation with the Service for activities that are authorized, funded, or carried out by a Federal agency that may affect federally listed or candidate species or critical habitat. The Service consults with many local, State, and Federal agencies, as well as private entities, regarding the conservation and protection of federally listed and candidate species. The Service's role in coordinating with various entities in order to protect threatened, endangered, or candidate freshwater mussels has significantly increased as instream construction, maintenance, and relicensing of new and existing structures has become more commonplace. Therefore, this Protocol is intended to provide standard operating procedures for establishing the presence/absence of federally listed or candidate species within a project area and documenting potential impact(s) of projects on these species, as well as ensuring that the most conservative measures are being taken to protect threatened, endangered, and candidate species.

The need for this Protocol stems from increasing impacts to streams in the Southeast due to urban expansion, development, and highway construction, as well as the need for a reporting framework to ensure quality data are collected. It is intended to be used for surveys that determine the presence/absence of federally protected and candidate mussels, their communities, and/or the impacts to these mussels that would occur as the result of highway construction, impoundments, pipeline crossings, dredging, channelization, and riparian land-

use practices. These activities can alter stream characteristics, causing sediment accumulation, loss of suitable habitat, stagnation, accumulation of pollutants, and eutrophication in the immediate area, and for an unknown distance downstream of the proposed project. The Protocol is also intended for use in conducting freshwater mussel status surveys on private, public, or other conservation lands that are funded, permitted, or requested by the Service.

In preparation of this Protocol, an exhaustive literature search was completed, and freshwater malacologists throughout the Southeast region were interviewed. Three proposed methods of determining PSAs (status quo, minimum lengths, and multiplier) were originally presented at the Coosa Summit meeting in Rome, Georgia on February 4-6, 2003, and in poster format at the 2003 Freshwater Mollusk Conservation Symposium in Durham, North Carolina on March 16-19, 2003 (Carlson *et al.* 2003). As comments were received, the status quo option was omitted from further consideration based on review of the compiled survey reports from the GDOT (Carlson *et al.* 2003). The GDOT survey reports indicated that relying exclusively on best professional judgment (as reported in the status quo option) did not produce consistent survey methods in the past. The multiplier method was omitted during the field-testing phase, as it became clear that this method would not be feasible due to the large PSA that would need to be surveyed in large streams and rivers. The minimum length method was consistently chosen as the preferred method by environmental consultants versus the multiplier factor when given the option between the two methods. The actual distances to be surveyed for the minimum length method were finalized after the completion of field-testing in September 2007.

Although this Protocol outlines specific methods for conducting mussel surveys at DOT project sites, it is intended to serve as a guideline for other mussel surveys that are requested or funded by the Service. For some projects (e.g., land development proposals and dam relicensing, etc.), it will be appropriate to modify the PSA (coordination with the Service may be necessary to determine appropriate modifications to the PSA).

There is an inherent difficulty in creating a standardized freshwater mussel protocol, as surveying efforts for presence/absence of federally protected and candidate species is site-specific, and stream types and sizes vary across ecoregions. Establishing survey methods to determine PSAs is also difficult because PSAs are directly linked to project and site-specific impacts. The length of the PSA should be established in relation to the cumulative impacts, both upstream and downstream of the project site. These project-specific impacts are difficult to ascertain without the use of complex models that may not factor variables (e.g., habitat types) also needed to determine PSAs specifically for freshwater mussels. In order to devise a mussel survey protocol without including the use of a model to determine impact distances (which is outside the scope of this Protocol), this Protocol focuses on establishing PSAs based on a method that will provide conservative search distances. This method will establish a PSA that focuses on including a range of mussel habitats indicative of a targeted stream and assumes that the representative mussel species should also be found in these habitats. Specifically, the PSA lengths should include a range of appropriate mussel habitats

to search for a targeted stream type and a high proportion of the potential impacts (i.e., increased sedimentation and altered flow rates) from the specific project.

A standardized survey is important in creating comparable and consistent survey efforts. The methods outlined in this Protocol were created to be specific, but flexible, to account for the site-specific nature of mussel surveys. Please note that this Protocol is a dynamic document subject to change and will be updated as relevant data become available. Specific survey methods were field-tested from 2004 through 2007 for feasibility and applicability in determining the presence/absence of federally protected and candidate mussel species within a potential project area. The Protocol will be posted on the Georgia (www.fws.gov/athens) and Florida Field Offices websites (www.fws.gov/panamacity) with a comment page to send comments on revised versions and/or updated species-related data. There will also be a page documenting substantial changes to the Protocol where applicable. In addition, the Service is currently developing educational programs and materials, including a mussel identification workshop, as well as Florida/Georgia mussel guides, posters and pamphlets.

Goals

- 1) Provide standardized procedures and recommendations for survey methods used to determine presence/absence of threatened, endangered, or candidate mussel species.
- 2) Provide standardized procedures and recommendations for mussel surveys when additional quantitative information is necessary to determine project impacts on threatened, endangered, or candidate mussel species within the project area.
- 3) Provide comparable and consistent mussel survey methods, which will also allow for expanding the mussel survey Geographic Information Systems (GIS) database and updating Protocol procedures.

II. STANDARD OPERATING PROCEDURES

A. Surveyor Qualifications

Personnel who will be conducting surveys should have sufficient knowledge within the basin they propose to survey. This includes species-specific biology and ecological requirements, and the ability to identify freshwater mussel species from the basin. A mussel surveyor should have sufficient experience, which includes documented field-time, and the ability to demonstrate skills in independently executing survey methods and locating and identifying federally protected and candidate freshwater mussel species. Furthermore, a surveyor should be able to document experience in the safe-care and handling of threatened, endangered, or candidate mussels. Individuals familiar with southeastern freshwater mussels but not with listed or candidate species in the area to be surveyed, should work with a malacologist who has experience with these species. Documentation of field-time and/or a letter of recommendation regarding the surveyor's in-basin experience and their knowledge in surveying, handling, and identifying

freshwater mussels (including threatened, endangered, or candidate species) may be requested.

B. Permit Requirements

Prior to surveying, the surveyor will obtain a section 10(a)(1)(A) recovery permit from the Service (<http://permits.fws.gov>: Application Form 3-200-55). Under the ESA, a section 10(a)(1)(A) permit allows the permittee to handle federally threatened and/or endangered species for scientific purposes. The necessary scientific collecting permits from the appropriate State should also be obtained before surveying (Georgia: Georgia Department of Natural Resources, Wildlife Resources Division; 770-761-3044; Florida: Fred Cross, Regional Fisheries Administrator, 3911 Highway 2321, Panama City, FL 32409, www.myfwc.com). Permission for stream access on private lands should be granted by the appropriate landowners prior to sampling.

C. Preliminary Research

Prior to each stream survey, the surveyor should conduct a thorough review of available resources pertaining to the potentially affected species of concern, candidate species, and threatened and/or endangered mussel species. Such resources include distributional maps, published journal articles, and field malacologists who have experience with the relevant species or drainage area. Other resources include databases maintained by Georgia Department of Natural Resources (Wildlife Resources Division- Georgia Natural Heritage Program), The Nature Conservancy, and the Service, as well as museums. Relevant information to review should include: identification keys (a suggested key is McMahon and Bogan 2001) or characteristics determining identification, historical distribution of listed or candidate mussels and previous collection locations, recovery plans, habitat descriptions, life history (especially spawning seasons), and applicable Federal Register documents (the following website also provides a search for malacological literature - <http://ellipse.inhs.uiuc.edu:591/mollusk/biblio.html>).

Precipitation and U.S. Geological Survey (USGS) gage station data (if available in the project area) should be referenced to determine hindering factors (weather conditions, increased flow) that could affect collecting conditions (i.e. turbidity, temperature, etc.). If gage stations are not available, every attempt should be made to determine the condition of the stream before the survey is executed to ensure conditions are appropriate for surveying. This may include contacting the local Department of Natural Resources, the Service, or other related natural resource offices. If the surveyor anticipates deviations from the Protocol, the surveyor should informally coordinate with the lead Service office for technical assistance regarding listed and candidate species, accepted survey methodologies, and timing of the survey.

Additional consideration should be given to prevent the spread or introduction of nonindigenous species while conducting surveys. Before moving between basins, all

gear, including, but not limited to, wetsuits, collecting bags, boats and trailers, must be washed and dried and deemed free of mud and aquatic plants. Boats and trailers must also be scrubbed and washed down with chlorine bleach, and live wells must be emptied over dry land or in the basin where the water was collected, especially when they have been in basins where zebra mussels have been detected. The website for the Service's Aquatic Nuisance Species Task Force is provided for additional information (www.anstaskforce.gov).

D. Survey Methods

Qualitative and quantitative methods are commonly used for mussel surveys. Qualitative methods typically provide presence/absence data and may provide relative abundance and species diversity if the Protocol methods are followed. Qualitative surveys have been demonstrated to produce more robust species lists, especially when the presence of a rare species is in question (Miller and Payne 1993, Strayer *et al.* 1997, Vaughn *et al.* 1997). Quantitative surveys can provide a multitude of data related to population demography. Both qualitative and quantitative methods provide information that may be pertinent in compliance with the National Environmental Policy Act and the ESA.

This Protocol defines and utilizes qualitative and quantitative survey methods in the following manner. Qualitative surveys are presence/absence surveys using tactile and visual search methods, where catch per unit effort (CPUE) can be calculated based on PSA. These surveys generally do not include the use of quadrat and/or substrate removal methods. For this Protocol, the purpose of conducting qualitative surveys is to provide resource agencies with presence/absence data, assemblage richness, and an indication of relative abundances and recruitments. An indication of recruitment can be ascertained from measuring the smallest specimen found for each federally protected and candidate mussel species located. Qualitative surveys will be recommended at ALL project sites with perennial streams. A second, quantitative, survey may be appropriate at a later date if federally protected species are found within the project area.

Quantitative surveys use abundance-based methods, such as, quadrats and excavation to determine densities and more absolute recruitment data. A quantitative survey could be recommended if the Service needs information in addition to the qualitative survey data to adequately assess potential impacts to the protected species within the project area. The recommendation for a quantitative survey will occur on a case-by-case basis and will require consultation or conferencing with the Service following a qualitative survey if federally protected or candidate mussels may be affected. The Service will review the data collected from the qualitative survey, project descriptions and possible impacts, and literature, as well as consult with malacologists to determine the need for a quantitative survey. Where federally protected or candidate mussels have been located or known to occur, adverse effects are expected, and data gaps exist, the Service will give the benefit of the doubt to the species when prescribing measures to minimize effects, including incidental take.

1. Qualitative Surveys

Reconnaissance or preliminary surveys are recommended to assess the areas to be searched, determine areas of suitable mussel habitat, and determine if ambient conditions are suitable for surveying, etc. In general, all surveys should be conducted from the end of April to the end of November. However, the end of April through the end of November timeframe will be flexible based on unseasonable conditions and periods of gravidity. The Service should be contacted if surveys are proposed to be conducted outside of these dates. This timeframe was selected to maximize detectability because this is the typical period when flow, turbidity, and leaf litter are low. Additionally, disturbing these non-thermoregulators during cold air and water temperatures that typically occur outside the survey timeframe could cause wet tissue to freeze when exposed to air and/or increase vulnerability to predation or to being swept downstream due to slower re-anchoring capabilities. There is also evidence that some native mussel species burrow during colder periods. It is unknown if our federally-protected species similarly burrow during colder periods, and until research provides data on this issue, the Service will err on the side of the species and continue to include this information as one of the multiple factors for our timeframe selection. If a survey was conducted two or more years prior to the present, an updated survey or re-evaluation may be recommended. All new surveys or re-surveys should follow the methods described in this Protocol.

Qualitative surveys should consist of tactile and visual searches of all habitats (not just suitable habitats) within the survey area to be searched, or prescribed search area (PSA). To determine PSA, see Section (E) of this Protocol. When delineating the PSA, every attempt should be made to not disturb the sediment. The PSA should begin outside of the disturbance area, such as a scour hole (if present). However, the disturbance area should be assessed independently of the PSA. If the survey is conducted to determine if mussels would be impacted by projects that do not involve linear stream crossings, the PSA should encompass the stream reach that may sustain cumulative impacts from a project, in addition to a distance upstream and downstream of the project site as determined by Section (E) of this Protocol, or as modified in conjunction with the Service. Surveying should be conducted from downstream to upstream to minimize disturbance (i.e., turbidity) and should be conducted from bank to bank.

The qualitative survey should begin by conducting a visual search to examine dead shells along stream shorelines and all exposed areas. The visual search on the bank(s) should be conducted in addition to a tactile (hand-grubbing should be 1-2 inches into substrate to increase detection of more deeply buried mussels) search and, if possible, visual search for individuals within the water. These should be used in conjunction with the following techniques: 1) for areas less than an arm's length in depth, mask and snorkel combined with hand grubbing should be used. In some streams, mask and snorkel is not appropriate and/or feasible due to turbid conditions and extreme

low flows, in which case, only hand-grubbing would be sufficient. The use of view buckets is not appropriate due to the inconsistent nature of water clarity but may be used as a supplemental method. 2) For areas greater than an arm's length in depth, SCUBA diving equipment should be used (divers should follow all applicable safety regulations).

One color photograph should be taken of each live mussel species found during the survey. If individuals of a native mussel species are located, they should be identified and enumerated, up to the first 100 individuals. If live federally protected or candidate species are located, they should be identified, enumerated, and measured for length. If more than 100 individuals of a single federally protected or candidate species are detected, measure lengths for the first 100 individuals and count the remaining individuals. Shells should be measured with calipers to the nearest 0.1 mm for length. Shell length is measured as the greatest distance from the anterior to the posterior shell margin (Appendix A). To minimize stress, all mussels should remain in a mesh collecting bag kept in the water until being measured and photographed one-at-a-time. Mussels should not be exposed to air any longer than it takes to actually measure and photograph the animal. Federally protected and candidate species must be handled gently and returned to the area of collection. They should be carefully rebedded into the sediment in the correct position (Hail *et al.* 2007, Strayer and Smith 2003, Young *et al.* 2003). Care should be taken to orient the mussel in the posterior up position. If uncertain of the correct position, the mussel should be placed on the substrate surface and left to appropriately burrow into the correct direction, position, and depth. The surveyor should only retain shells that no longer contain a live individual (separate State and Federal permits are necessary to retain shells). Relict shells of federally protected species (only) should be enumerated/estimated on the data sheet.

Justifications as to why the standard operating procedures were not followed should be included in the final report, as well as any correspondence or communication with the Service regarding these deviations. The surveyor should collect general information regarding the survey area at the time of the survey. At a minimum, information that should be collected is indicated on the recommended data sheet (Appendix B). Additionally, species checklists for each drainage basin are included in Appendix C (J. Wisniewski pers. comm.. 2007, J. Williams pers. comm. 2006, P. Johnson pers. comm. 2004, Blalock-Herod *et al.* in press, Williams *et al.* in review, H. Blalock-Herod pers. comm. 2004, Williams 2004, Brim Box and Williams 2000).

2. Quantitative Surveys

Quantitative surveys may be recommended when federally protected or candidate species are found and more data regarding population structure or dynamics (density, recruitment levels, survivorship, etc.) are needed to determine threats and assess impacts before and after the proposed project have been completed. Quantitative

surveys will consist of a statistically valid sampling design in which quadrat samples (with at least a certain proportion sampled using substrate removal techniques) are taken within a prescribed area. Appropriate designs may be chosen from Strayer and Smith (2003). A recommended data sheet with pertinent information is included in Appendix B.

The surveyor should coordinate with the Service regarding the quantitative design chosen from Strayer and Smith (2003) to ensure its applicability to the stream and ability to provide needed data. Justifications as to why recommendations were not followed should be included in the final report, as well as any correspondence or communication with the Service regarding quantitative methods.

E. Determining Prescribed Search Area (PSA)

This Protocol describes the method to be used to determine PSA:

Minimum Length

Minimum lengths in this Protocol were adopted from field-testing survey sites in Georgia, Florida, and Alabama through developing species-area curves, and correlate to National Water Quality Assessment (NAWQA) protocol standards and the range of survey lengths suggestions from field malacologists. In wadeable streams, a survey length of 100 m (~300 ft) upstream and 300 m (~900 ft) downstream of the proposed project should be used as a minimum length. In nonwadeable streams, minimum survey lengths will be site-specific and survey methodology should be developed in conjunction with the Service. Wadeable streams are defined as those reaches where an investigator can wade from one end of the reach to the other, even though the reach may contain pools that cannot be waded. Nonwadeable streams are defined as those reaches where an investigator cannot wade from one end of the reach to the other through the deepest part of the stream.

The minimum lengths should incorporate appropriate mussel habitat(s), such as gravel and cobble substrate, islands, sand bars, muddy sand substrates around tree roots, sand/limestone, and pools, riffles, and runs, etc. If appropriate habitat(s) is not included in the minimum length, the surveyor should extend the PSA (within reason) to locate and search appropriate habitat(s). Surveyors should also survey any unique aquatic habitats that may be outside of the PSA. Additionally, if the surveyor determines the minimum length does not encompass all direct/indirect impacts associated with the project, they should extend lengths as necessary.

III. DELIVERABLES

A. Early Coordination or Conferencing

Early coordination or conferencing with the Service, and DOT if a DOT project is involved, should take place prior to the survey and is an important aspect in determining whether appropriate survey techniques are being adhered to and/or ensuring that deviations from this Protocol will be accepted. At this stage, the surveyor may contact the Service for technical assistance regarding the project location, mussel species in the area, project impacts, survey methodologies, and length of the PSA. The Service office responsible for the area in which the survey will be conducted should be contacted for technical assistance. All correspondences regarding technical assistance to the lead Service office should be copied to the Service aquatic biologist in the appropriate region, as well as the contact person within the company or department for which the survey is being conducted.

If there are no deviations from the Protocol or need for technical assistance from the Service, it is recommended that the surveyor provide the Service with the basic information below and time frames the mussel survey will be conducted. This information can be informally provided to the Service via a brief letter and/or email, preferably 30 days prior to the start of the survey. Should the surveyor choose not to provide the Service with this information and not to engage in early coordination, the surveyor should be aware that the survey report may not be sufficient and a second survey may be requested.

Information to include in early coordination:

1. Preliminary Research

State the purpose of the survey, and list the Federal species of concern, candidate species, and threatened and/or endangered species that may be expected to occur in the drainage basin in which the stream(s) to be surveyed is located. Include the information required in II. C.

2. Survey Area Description

Provide a brief description of the proposed project that would impact the streams/rivers being surveyed. The stream reach(es) surveyed should be graphically represented on a 7.5 minute USGS topographical map. Provide a description of the area where the stream(s) to be surveyed is located, including physiographic area, general topography, land use, drainage basin, and potential suitable mussel habitat.

3. Methods

Provide a full text description of the equipment to be used; describe the method used to determine survey lengths, or PSA; list the person(s) who will be conducting the field survey and provide a brief summary stating their affiliations, qualifications, and all valid permits; indicate the date(s) during which the survey will be completed; list

the person(s) who will confirm all identifications and provide a brief summary of their affiliations and qualifications. Include descriptions and justifications for any deviations from the Protocol (include any correspondences as an attachment).

B. Reports

At a minimum, the qualitative and quantitative survey reports should include information gathered during early coordination and the following:

1. Results

Provide a detailed summary of the survey results and copies of all data forms. Include summary table(s) of all mussels species found, where they were found, relict shells (federally protected species only), measurements, and water quality parameters taken. Provide discharge data from the closest USGS stream gage when the stream was sampled (obtained from <http://water.usgs.gov/waterwatch>), photographs of representative stream reach(es) surveyed at each site, and project location area. Photographs and survey forms should be attached as appendices.

2. Discussion

Briefly discuss the quality of the habitat(s) observed within the survey area and the suitability of these areas for supporting the threatened and/or endangered species for which the survey was completed. If species of mussels that were expected to be found in the survey area were not located, discuss possible reasons why the species were not found. Deviations from the Protocol should also be discussed and should be related to whether it aided in detecting presence/absence and/or in collecting quantitative survey data. Early coordination and consultation with the Service should be included, especially if it resulted in deviations from the Protocol, such as timing of the survey and determination of PSA. Written correspondences and/or emails can be included as appendices but should be explained as necessary.

3. References

Include all literature sources used in preparation for the survey and for the survey reporting including but not limited to journal articles, unpublished papers, and personal communication.

C. Distribution

Electronic report copies should be sent on a compact disc (CD) to:

All surveys:

Marston Science Library
University of Florida
c/o Vernon Kisling
P.O. Box 117001
Gainesville, FL 32611;

All surveys conducted in Georgia:

U.S. Fish and Wildlife Service
Georgia Ecological Services
c/o Sandy Tucker, Field Supervisor
105 Westpark Drive, Suite D
Athens, Georgia 30606

Georgia Department of Natural Resources
Natural Heritage Program
2117 U.S. Highway 278 SE
Social Circle, Georgia 30025-4714
ATTN: Jason Wisniewski;

Additionally, surveys conducted in Georgia within the Apalachicola-
Chattahoochee-Flint River, and Ochlockonee River basins:

U.S. Fish and Wildlife Service
Panama City Field Office
c/o Jerry Ziewitz
1601 Balboa Ave.
Panama City, Florida 32405

All surveys conducted in Florida:

U.S. Fish and Wildlife Service
Panama City Field Office
c/o Jerry Ziewitz
1601 Balboa Ave.
Panama City, Florida 32405

Florida Fish and Wildlife Conservation Commission
Division of Habitat and Species Conservation
c/o Angela Williams
620 South Meridian Street
Tallahassee, Florida 32399-1600

Florida Fish and Wildlife Conservation Commission
Gainesville Field Office
c/o Jim Williams

7922 NW 71st Street
Gainesville, Florida 32606

and any other entities as required by the State and/or Federal permits. Electronic copies of these reports, if transmitted in bulk, should include a report summary index that includes the site location, lat and long coordinates, drainage, county, and mussel species that were located.

D. Questions

Please send comments or questions to one or all of the following persons:

Alice Lawrence; U.S. Fish and Wildlife Service, Georgia Ecological Services, 105 Westpark Drive, Suite D, Athens, Georgia 30606; Alice_Lawrence@fws.gov

Sandy Abbott; U. S. Fish and Wildlife Service, Georgia Ecological Services, P.O. Box 52560, Fort Benning, GA 31905-2560; Sandy_Abbott@fws.gov

Karen Herrington; U. S. Fish and Wildlife Service, Panama City Field Office, 1601 Balboa Avenue, Panama City, Florida 32405; Karen_Herrington@fws.gov

Sandy Pursifull; U. S. Fish and Wildlife Service, Panama City Field Office, 1601 Balboa Avenue, Panama City, Florida 32405; Sandra_Pursifull@fws.gov

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APPENDIX A

Shell Measurement Diagram



To determine total length of a freshwater mussel, measure the maximum distance between the posterior and anterior shell margins (distance between the two lines). Photo Credit: Jerry Ziewitz

APPENDIX B

Recommended Field Data Sheets

Site Number:	Field Number:	Time Beg:	Date:
Watershed/Drainage:		End:	State:
Waterbody:		Latitude:	Long:
Location:		Stream Order:	Stream Type:
Gage Station:		Surveyor(s):	

Determining PSA	Distance upstream: _____ Distance downstream: _____	Survey Technique	Tactile Only <input type="checkbox"/> Tactile With Snorkel <input type="checkbox"/> Tactile With SCUBA <input type="checkbox"/>
------------------------	--	-------------------------	--

Instream Features Quantitative	Water Quality
<i>Please specify all units of measurement</i> % Canopy Cover: _____ Wetted Width: _____ Surface Velocity (at thalweg): _____ Water Depth (at thalweg): _____ Bank Height (rt/Lt*): _____ Bank Angle(rt/Lt*): _____	Water Temp: _____ °C Dissolved Oxygen: _____ mg/L Conductivity _____ pH _____ Other: _____ 303d Listed: <input type="checkbox"/> yes <input type="checkbox"/> no Water Clarity <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque

Instream Features Qualitative	Designated Use:
Channel Alteration: <input type="checkbox"/> No <input type="checkbox"/> Yes Describe: _____ Shoring Structures: <input type="checkbox"/> None <input type="checkbox"/> Limerock <input type="checkbox"/> Gabion <input type="checkbox"/> Concrete <input type="checkbox"/> Rip-rap <input type="checkbox"/> Other: _____ Extent: _____ Substrate composition (% est.): Gravel _____ Silt _____ Clay _____ Clay Marl _____ Fine sand _____ Coarse s. _____ Medium s. _____ Boulder _____ Bedrock _____ Cobble _____	Violated Criteria: Heavy Rain in past 7 days: Yes <input type="checkbox"/> No <input type="checkbox"/> Air Temperature: _____ Est. <input type="checkbox"/> Act. <input type="checkbox"/> Survey Weather Conditions: Scattered showers <input type="checkbox"/> Heavy rain <input type="checkbox"/> Clear/sunny <input type="checkbox"/> Steady rain <input type="checkbox"/> % Cloud cover _____

Channel Stability (Check one box for each column):		Impoundments:
Deposition/Aggradation	Incision/Degradation	<input type="checkbox"/> None <input type="checkbox"/> yes (Describe):
Excellent Large, fresh deposits <i>absent</i> High number of deep pools <input type="checkbox"/>	No mass-wasting or significant erosion of banks Channel slightly entrenched High number of deep pools <input type="checkbox"/>	Fish Passage: Blocked? <input type="checkbox"/> yes <input type="checkbox"/> no Describe: _____ Fish Presence: <input type="checkbox"/> Absent <input type="checkbox"/> Rare <input type="checkbox"/> Common <input type="checkbox"/> Abundant Woody Material: <input type="checkbox"/> None/infreq. <input type="checkbox"/> Moderate <input type="checkbox"/> Extensive
Good Large, fresh deposits <i>uncommon</i> Moderate number of deep pools <input type="checkbox"/>	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched Moderate number of deep pools <input type="checkbox"/>	
Fair Large, fresh deposits <i>common</i> Low-moderate number of deep pools <input type="checkbox"/>	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched Low-moderate number of deep pools <input type="checkbox"/>	
Poor Large, fresh deposits <i>very common</i> Few, if any, deep pools <input type="checkbox"/>	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched Few, if any, deep pools <input type="checkbox"/>	

Riparian Features Quantitative	Site Road Crossing																																
Rt* Buffer width(ft): <input type="checkbox"/> 10-25 <input type="checkbox"/> 25-75 <input type="checkbox"/> 78-150 <input type="checkbox"/> 150+ Lt* Buffer width(ft): <input type="checkbox"/> 10-25 <input type="checkbox"/> 25-75 <input type="checkbox"/> 78-150 <input type="checkbox"/> 150+	Road Type: <input type="checkbox"/> Paved <input type="checkbox"/> Unpaved Name (if known): _____ Crossing Type: <input type="checkbox"/> Pipe culvert <input type="checkbox"/> Box culvert <input type="checkbox"/> Bridge <input type="checkbox"/> Paved box culvert																																
Landuse Characterization: (100 feet to either side of the stream) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Rt Bk</th> <th style="text-align: center;">Lt Bk</th> <th style="text-align: center;">%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td style="width:20px; text-align: center;"> </td> <td style="width:20px; text-align: center;"> </td> <td style="width:20px; text-align: center;"> </td> </tr> <tr> <td>Silviculture</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Pasture</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Agricultural</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Residential</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Commercial</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Industrial</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </tbody> </table>		Rt Bk	Lt Bk	%	Natural Forest				Silviculture				Pasture				Agricultural				Residential				Commercial				Industrial				Riparian Features Qual. Local Non-Point Source Pollution Potential: <input type="checkbox"/> No evidence <input type="checkbox"/> Slight <input type="checkbox"/> Moderate potential <input type="checkbox"/> Obvious sources <input type="checkbox"/> Livestock access Describe: _____
	Rt Bk	Lt Bk	%																														
Natural Forest																																	
Silviculture																																	
Pasture																																	
Agricultural																																	
Residential																																	
Commercial																																	
Industrial																																	

Notes															
	Floodplain Access:	Bank Erosion:													
	<table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Rt*</th> <th style="text-align: center;">Lt*</th> </tr> </thead> <tbody> <tr> <td>None</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Partial</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Full</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </tbody> </table>		Rt*	Lt*	None			Partial			Full			<input type="checkbox"/> Non-eroding <input type="checkbox"/> Active Erosion <input type="checkbox"/> Mass-wasting	
	Rt*	Lt*													
None															
Partial															
Full															

List of other aquatic species observed, including invasive species, and their abundance:

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.

APPENDIX C

Species Checklist Data Sheets

ACF River Basin Freshwater Mussels

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: _____ man-hours

Unionidae

Live	Fresh Dead	Relict Shell		Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Alasmidonta triangulata</i>	_____	_____	_____	<i>Pleurobema pyriforme</i>
_____	_____	_____	<i>Amblema neislerii</i>	_____	_____	_____	<i>Pyganodon cataracta</i>
_____	_____	_____	<i>Anodonta heardi</i>	_____	_____	_____	<i>Pyganodon grandis</i>
_____	_____	_____	<i>Anodontoides radiatus</i>	_____	_____	_____	<i>Quadrula infucata</i>
_____	_____	_____	<i>Elliptio arctata</i>	_____	_____	_____	<i>Toxolasma paulus</i>
_____	_____	_____	<i>Elliptio chipolaensis</i>	_____	_____	_____	<i>Uniomerus columbensis</i>
_____	_____	_____	<i>Elliptio complanata</i>	_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Elliptio crassidens</i>	_____	_____	_____	<i>Utterbackia peggyae</i>
_____	_____	_____	<i>Elliptio fraterna</i>	_____	_____	_____	<i>Villosa lienosa</i>
_____	_____	_____	<i>Elliptio icterina</i>	_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Elliptio nigella</i>	_____	_____	_____	<i>Villosa villosa</i>
_____	_____	_____	<i>Elliptio purpurella</i>	_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Elliptoideus sloatianus</i>	_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Fusconaia sp.</i>	_____	_____	_____	
_____	_____	_____	<i>Glebula rotundata</i>	_____	_____	_____	
_____	_____	_____	<i>Hamiota subangulata</i>	_____	_____	_____	
_____	_____	_____	<i>Lampsilis binominata</i>	_____	_____	_____	
_____	_____	_____	<i>Lampsilis straminea</i>	_____	_____	_____	
_____	_____	_____	<i>Lampsilis teres</i>	_____	_____	_____	
_____	_____	_____	<i>Lasmigona subviridis</i>	_____	_____	_____	
_____	_____	_____	<i>Medionidus penicillatus</i>	_____	_____	_____	
_____	_____	_____	<i>Megaloniaias nervosa</i>	_____	_____	_____	<i>Corbiculidae</i>
_____	_____	_____		_____	_____	_____	<i>Corbicula fluminea</i>

Altamaha River Basin Freshwater Mussels

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Alasmidonta arcula</i>
_____	_____	_____	<i>Anodonta couperiana</i>
_____	_____	_____	<i>Elliptio complanata (sp. ct.)</i>
_____	_____	_____	<i>Elliptio dariensis</i>
_____	_____	_____	<i>Elliptio hopetonensis</i>
_____	_____	_____	<i>Elliptio icterina</i>
_____	_____	_____	<i>Elliptio shepardiana</i>
_____	_____	_____	<i>Elliptio spinosa</i>
_____	_____	_____	<i>Lampsilis dolabraeformis</i>
_____	_____	_____	<i>Lampsilis splendida</i>
_____	_____	_____	<i>Pyganodon gibbosa</i>
_____	_____	_____	<i>Toxolasma pullus</i>
_____	_____	_____	<i>Unio merus carolinianus</i>
_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Villosa delumbis</i>
_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Other unionid</i>

Corbiculidae

_____	_____	_____	<i>Corbicula fluminea</i>
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Tennessee River Basin Freshwater Mussels GA Only

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: _____ man-hours

Unionidae

Live	Fresh Dead	Relict Shell		Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Alasmidonta marginata</i>	_____	_____	_____	<i>Pleurobema oviforme</i>
_____	_____	_____	<i>Alasmidonta viridis</i>	_____	_____	_____	<i>Potamilus alatus</i>
_____	_____	_____	<i>Actinonaias ligamentina</i>	_____	_____	_____	<i>Ptychobranchus fasciolaris</i>
_____	_____	_____	<i>Amblema plicata</i>	_____	_____	_____	<i>Pyganodon grandis</i>
_____	_____	_____	<i>Elliptio dilatata</i>	_____	_____	_____	<i>Quadrula cylindrica cylindrica</i>
_____	_____	_____	<i>Epioblasma capsaeformis</i>	_____	_____	_____	<i>Quadrula verrucosa</i>
_____	_____	_____	<i>Epioblasma florentina walkeri</i>	_____	_____	_____	<i>Toxolasma cylindrellus</i>
_____	_____	_____	<i>Epioblasma lenoir</i>	_____	_____	_____	<i>Toxolasma lividis</i>
_____	_____	_____	<i>Epioblasma torulosa gubernaculum</i>	_____	_____	_____	<i>Toxolasma parvus</i>
_____	_____	_____	<i>Fusconaia barnesiana</i>	_____	_____	_____	<i>Villosa iris</i>
_____	_____	_____	<i>Fusconaia subrotunda</i>	_____	_____	_____	<i>Villosa taeniata</i>
_____	_____	_____	<i>Lampsilis cardium</i>	_____	_____	_____	<i>Villosa trabalis</i>
_____	_____	_____	<i>Lampsilis fasciola</i>	_____	_____	_____	<i>Villosa vanuxemensis</i>
_____	_____	_____	<i>Lampsilis ovata</i>	_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Lasmigona complanata</i>	_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Lasmigona costata</i>				
_____	_____	_____	<i>Lasmigona holstonia</i>				
_____	_____	_____	<i>Leptodea fragilis</i>				
_____	_____	_____	<i>Medionidus conradicus</i>				
_____	_____	_____	<i>Obovaria subrotunda</i>				
				Corbiculidae			
				_____	_____	_____	<i>Corbicula fluminea</i>

Choctawhatchee River Basin Freshwater Mussels AL/FL

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell		Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Amblema plicata</i>	_____	_____	_____	Other unionid
_____	_____	_____	<i>Anodontoides radiatus</i>	_____	_____	_____	Other unionid
_____	_____	_____	<i>Elliptio icterina complex</i>				
_____	_____	_____	<i>Elliptio mcMichaeli</i>				
_____	_____	_____	<i>Fusconaia burkei</i>				
_____	_____	_____	<i>Glebula rotundata</i>				
_____	_____	_____	<i>Hamiota australis</i>				
_____	_____	_____	<i>Lampsilis haddletoni</i>				
_____	_____	_____	<i>Lampsilis straminea</i>				
_____	_____	_____	<i>Lampsilis teres</i>				
_____	_____	_____	<i>Medionidus acutissimus</i>				
_____	_____	_____	<i>Pleurobema strodeanum</i>				
_____	_____	_____	<i>Ptychobranthus jonesi</i>				
_____	_____	_____	<i>Pyganodon grandis</i>				
_____	_____	_____	<i>Quadrula succissa</i>				
_____	_____	_____	<i>Toxolasma sp.</i>				
_____	_____	_____	<i>Uniomerus tetralasmus</i>				
_____	_____	_____	<i>Utterbackia imbecillis</i>				
_____	_____	_____	<i>Utterbackia peggyae</i>				
_____	_____	_____	<i>Villosa choctawensis</i>				
_____	_____	_____	<i>Villosa lienosa</i>				
_____	_____	_____	<i>Villosa vibex</i>				
_____	_____	_____	<i>Villosa villosa</i>				
				Corbiculidae			
				_____	_____	_____	<i>Corbicula fluminea</i>

Escambia River Basin Freshwater Mussels AL/FL

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Margaritiferidae

Live	Fresh Dead	Relict Shell		Live	Fresh Dead	Relict Shell	
_____	_____	_____	Margaritifera marrianae	_____	_____	_____	<i>Quadrula asperata</i>

Unionidae

_____	_____	_____	<i>Amblema plicata</i>	_____	_____	_____	<i>Quadrula succissa</i>
_____	_____	_____	<i>Anodonta suborbiculata</i>	_____	_____	_____	<i>Toxolasma sp.</i>
_____	_____	_____	<i>Anodonta sp.</i>	_____	_____	_____	
_____	_____	_____	<i>Anodontoides radiatus</i>	_____	_____	_____	<i>Uniomerus tetralasmus</i>
_____	_____	_____	<i>Elliptio arctata</i>	_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Elliptio crassidens</i>	_____	_____	_____	
_____	_____	_____	<i>Elliptio icterina</i>	_____	_____	_____	
_____	_____	_____	<i>Elliptio mcmichaeli</i>	_____	_____	_____	<i>Villosa choctawensis</i>
_____	_____	_____	<i>Elliptio sp.</i>	_____	_____	_____	<i>Villosa lienosa</i>
_____	_____	_____	<i>Fusconaia ebena</i>	_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Fusconaia escambia</i>	_____	_____	_____	<i>Villosa villosa</i>
_____	_____	_____	<i>Fusconaia rotulata</i>	_____	_____	_____	
_____	_____	_____		_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Glebulia rotundata</i>	_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Hamiota australis</i>	_____	_____	_____	

Corbiculidae

_____	_____	_____	<i>Lampsilis ornata</i>	_____	_____	_____	<i>Corbicula fluminea</i>
_____	_____	_____	<i>Lampsilis straminea</i>	_____	_____	_____	
_____	_____	_____	<i>Lampsilis teres</i>	_____	_____	_____	
_____	_____	_____	<i>Medionidus acutissimus</i>	_____	_____	_____	
_____	_____	_____	<i>Megalonaias nervosa</i>	_____	_____	_____	
_____	_____	_____	<i>Obliquaria reflexa</i>	_____	_____	_____	
_____	_____	_____	<i>Plectomerus dombeyanus</i>	_____	_____	_____	
_____	_____	_____	<i>Pleurobema strodeanum</i>	_____	_____	_____	
_____	_____	_____	<i>Ptychobranthus jonesi</i>	_____	_____	_____	
_____	_____	_____	<i>Pyganodon grandis</i>	_____	_____	_____	

Yellow River Basin Freshwater Mussels AL/FL

page ___ of ___

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Elliptio crassidens</i>
_____	_____	_____	<i>Elliptio icterina</i>
_____	_____	_____	<i>Fusconaia escambia</i>
_____	_____	_____	<i>Hamiota australis</i>
_____	_____	_____	<i>Lampsilis straminea</i>
_____	_____	_____	<i>Medionidus acutissimus</i>
_____	_____	_____	<i>Pleurobema strodeanum</i>
_____	_____	_____	<i>Ptychobranhus jonesi</i>
_____	_____	_____	<i>Quadrula succissa</i>
_____	_____	_____	<i>Toxolasma sp.</i>
_____	_____	_____	<i>Uniomerus tetralasmus</i>
_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Villosa choctawensis</i>
_____	_____	_____	<i>Villosa lienosa</i>
_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Other unionid</i>

Corbiculidae

_____	_____	_____	<i>Corbicula fluminea</i>
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Coosa River Basin Georgia Freshwater Mussels GA

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell		Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Alasmidonta mccordi</i>	_____	_____	_____	<i>Pleurobema georgianum</i>
_____	_____	_____	<i>Amblema elliotii</i>	_____	_____	_____	<i>Pleurobema hanleyanum</i>
_____	_____	_____	<i>Anodonta suborbiculata</i>	_____	_____	_____	<i>Pleurobema perovatum</i>
_____	_____	_____	<i>Ellipsaria lineolata</i>	_____	_____	_____	<i>Potamilus purpuratus</i>
_____	_____	_____	<i>Elliptio arca</i>	_____	_____	_____	<i>Ptychobranthus greeni</i>
_____	_____	_____	<i>Elliptio arctata</i>	_____	_____	_____	<i>Pyganodon grandis</i>
_____	_____	_____	<i>Elliptio crassidens</i>	_____	_____	_____	<i>Quadrula asperata</i>
_____	_____	_____	<i>Epioblasma metastriata</i>	_____	_____	_____	<i>Quadrula rumphiana</i>
_____	_____	_____	<i>Epioblasma othcaloogensis</i>	_____	_____	_____	<i>Quadrula verrucosa</i>
_____	_____	_____	<i>Hamiota atilis</i>	_____	_____	_____	<i>Strophitus connasaugaensis</i>
_____	_____	_____	<i>Lampsilis ornata</i>	_____	_____	_____	<i>Strophitus subvexus</i>
_____	_____	_____	<i>Lampsilis straminea</i>	_____	_____	_____	<i>Toxolasma corvunculus</i>
_____	_____	_____	<i>Lampsilis teres</i>	_____	_____	_____	<i>Truncilla donaciformis</i>
_____	_____	_____	<i>Lasmigona alabamensis</i>	_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Lasmigona etowahensis</i>	_____	_____	_____	<i>Villosa lienosa</i>
_____	_____	_____	<i>Leptodea fragilis</i>	_____	_____	_____	<i>Villosa nebulosa</i>
_____	_____	_____	<i>Ligumia recta</i>	_____	_____	_____	<i>Villosa umbrans</i>
_____	_____	_____	<i>Medionidus acutissimus</i>	_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Medionidus parvulus</i>	_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Megaloniaias nervosa</i>	_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Obliquaria reflexa</i>	_____	_____	_____	
_____	_____	_____	<i>Pleurobema decisum</i>	Corbiculidae			<i>Corbicula fluminea</i>

Ochlockonee River Basin Freshwater Mussels FL/GA

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Shell			
_____	_____	_____	<i>Alasmidonta wrightiana</i>		
_____	_____	_____	<i>Anodonta couperiana</i>		
_____	_____	_____	<i>Elliptio complanata (sp. ct.)</i>		
_____	_____	_____	<i>Elliptio crassidens</i>		
_____	_____	_____	<i>Elliptio icterina</i>		
_____	_____	_____	<i>Elliptoideus sloatianus</i>		
_____	_____	_____	<i>Glebula rotundata</i> (Florida only)		
_____	_____	_____	<i>Hamiota subangulata</i>		
_____	_____	_____	<i>Lampsilis straminea</i>		
_____	_____	_____	<i>Lampsilis teres</i>		
_____	_____	_____	<i>Medionidus simpsonianus</i>		
_____	_____	_____	<i>Megaloniaias nervosa</i>		
_____	_____	_____	<i>Pleurobema pyriforme</i>		
_____	_____	_____	<i>Pyganodon grandis</i>		
_____	_____	_____	<i>Quadrula infucata</i>		
_____	_____	_____	<i>Toxolasma paulus</i>		
_____	_____	_____	<i>Uniomerus columbensis</i>		
_____	_____	_____	<i>Utterbackia imbecillis</i>	_____	Other unionid
_____	_____	_____	<i>Utterbackia peggyae</i>	_____	Other unionid
_____	_____	_____	<i>Villosa lienosa</i>		
_____	_____	_____	<i>Villosa vibex</i>		
_____	_____	_____	<i>Villosa villosa</i>		
				Corbiculidae	
				_____	<i>Corbicula fluminea</i>

Suwannee River Basin Freshwater Mussels

page ____ of ____

Field Number:

Date:

County/State:

Locality:

Surveyors:

Search Time:

man-hours

Unionidae

Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Elliptio buckleyi</i>
_____	_____	_____	<i>Elliptio complanata</i>
_____	_____	_____	<i>Elliptio icterina</i>
_____	_____	_____	<i>Elliptio sp.</i>
_____	_____	_____	<i>Lampsilis straminea</i>
_____	_____	_____	<i>Lampsilis teres</i>
_____	_____	_____	<i>Medionidus walkeri</i>
_____	_____	_____	<i>Pleurobema reclusum</i>
_____	_____	_____	<i>Pyganodon cataracta</i>
_____	_____	_____	<i>Quadrula kleiniana</i>
_____	_____	_____	<i>Toxolasma paulus</i>
_____	_____	_____	<i>Uniomerus carolinianus</i>
_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Utterbackia peninsularis</i>
_____	_____	_____	<i>Villosa lienosa</i>
_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Villosa villosa</i>
_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Other unionid</i>

Corbiculidae

_____	_____	_____	<i>Corbicula fluminea</i>
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Tallapoosa River Basin Freshwater Mussels (above Fall Line)

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Elliptio arca</i>
_____	_____	_____	<i>Elliptio arctata</i>
_____	_____	_____	<i>Fusconaia sp. cf. cerina</i>
_____	_____	_____	<i>Hamiota altilis</i>
_____	_____	_____	<i>Pyganodon sp.</i>
_____	_____	_____	<i>Quadrula asperata</i>
_____	_____	_____	<i>Toxolasma parvus</i>
_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Villosa lienosa</i>
_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Other unionid</i>

Corbiculidae

_____	_____	_____	<i>Corbicula fluminea</i>
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Satilla River Basin Freshwater Mussels

page ____ of ____

Field Number:

Date:

County/State:

Locality:

Surveyors:

Search Time:

man-hours

Unionidae

Live

Fresh Dead

Relict Shell

_____ *Elliptio downiei*

_____ *Utterbackia imbecillis*

_____ *Other unionid*

_____ *Other unionid*

Corbiculidae

_____ *Corbicula fluminea*

St. Marys River Basin Freshwater Mussels

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Anodonta couperiana</i>
_____	_____	_____	<i>Elliptio icterina</i>
_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Villosa villosa</i>
_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Other unionid</i>

Corbiculidae

_____	_____	_____	<i>Corbicula fluminea</i>
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Ogeechee River Basin Freshwater Mussels

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell	
_____	_____	_____	<i>Alasmidonta arcula</i>
_____	_____	_____	<i>Elliptio angustata</i>
_____	_____	_____	<i>Elliptio complanata (sp.ct.)</i>
_____	_____	_____	<i>Elliptio congarea</i>
_____	_____	_____	<i>Elliptio fisheriana</i>
_____	_____	_____	<i>Elliptio hopetonensis</i>
_____	_____	_____	<i>Elliptio icterina</i>
_____	_____	_____	<i>Elliptio producta</i>
_____	_____	_____	<i>Fusconaia masoni</i>
_____	_____	_____	<i>Lampsilis cariosa</i>
_____	_____	_____	<i>Lampsilis splendida</i>
_____	_____	_____	<i>Leptodea ochracea</i>
_____	_____	_____	<i>Pyganodon cataracta</i>
_____	_____	_____	<i>Toxolasma pullus</i>
_____	_____	_____	<i>Uniomerus carolinianus</i>
_____	_____	_____	<i>Utterbackia imbecillis</i>
_____	_____	_____	<i>Villosa delumbis</i>
_____	_____	_____	<i>Villosa vibex</i>
_____	_____	_____	<i>Other unionid</i>
_____	_____	_____	<i>Other unionid</i>

Corbiculidae

_____	_____	_____	<i>Corbicula fluminea</i>
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Savannah River Basin Freshwater Mussels GA

page ____ of ____

Field Number:	Date:
County/State:	Locality:
Surveyors:	Search Time: man-hours

Unionidae

Live	Fresh Dead	Relict Shell
_____	_____	_____ <i>Alasmidonta triangulata</i>
_____	_____	_____ <i>Alasmidonta varicosa</i>
_____	_____	_____ <i>Alasmidonta undulata</i>
_____	_____	_____ <i>Elliptio angustata</i>
_____	_____	_____ <i>Elliptio complanata (sp. ct.)</i>
_____	_____	_____ <i>Elliptio congaraea</i>
_____	_____	_____ <i>Elliptio folliculata</i>
_____	_____	_____ <i>Elliptio fraterna</i>
_____	_____	_____ <i>Elliptio icterina</i>
_____	_____	_____ <i>Elliptio producta</i>
_____	_____	_____ <i>Elliptio roanokensis</i>
_____	_____	_____ <i>Fusconaia masoni</i>
_____	_____	_____ <i>Lampsilis cariosa</i>
_____	_____	_____ <i>Lampsilis splendida</i>
_____	_____	_____ <i>Leptodea ochracea</i>
_____	_____	_____ <i>Pyganodon cataracta</i>
_____	_____	_____ <i>Toxolasma pullus</i>
_____	_____	_____ <i>Uniomerus carolinianus</i>
_____	_____	_____ <i>Utterbackia imbecillis</i>
_____	_____	_____ <i>Villosa delumbis</i>
_____	_____	_____ <i>Other unionid</i>
_____	_____	_____ <i>Other unionid</i>

Corbiculidae

_____	_____	_____ <i>Corbicula fluminea</i>
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