MUSSEL STUDY PLAN

STEVENS CREEK HYDROELECTRIC PROJECT
(FERC NO. 2535)

Prepared for:

Dominion Energy South Carolina, Inc.
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtGroup.com

February 2021

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DOMINION ENERGY SOUTH CAROLINA, INC.

1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC) is the licensee of the Stevens Creek Hydroelectric Project (FERC No. 2535) (Project). The Project, which has an installed capacity of 17.28 megawatts (MW), is located in Edgefield and McCormick counties, South Carolina and Columbia County, Georgia, at the confluence of Stevens Creek and the Savannah River. The Project's dam is located approximately one mile upstream of the Augusta Diversion Dam, and approximately 13 miles downstream of the J. Strom Thurmond Dam (Thurmond Dam). The Stevens Creek Reservoir is approximately 25 miles long, extending upstream to the Thurmond Dam and 12 miles up Stevens Creek. The Project occupies approximately 104 acres of federal lands within the Sumter National Forest.

On November 22, 1995, FERC issued a 30-year license which is scheduled to expire on October 31, 2025. DESC intends to file an application for a new license with FERC on or before October 31, 2023. The Project is currently involved in a relicensing process which involves cooperation and collaboration between DESC, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. DESC established a Water Quality, Fish and Wildlife Resource Conservation Group (RCG), with interested stakeholders to address Project issues related to aquatic and terrestrial resources. During an RCG meeting on November 13, 2019, the US Fish and Wildlife Service (USFWS) formally requested a freshwater mussel study at the Project, particularly in the Stevens Creek arm of the Project reservoir. In a letter dated June 10, 2020, the Georgia Department of Natural Resources (GADNR) requested that the large tributaries on the Georgia side of the Savannah River be included in the study. This study plan was developed in consultation with the USFWS, GADNR, South Carolina Department of Natural Resources (SCDNR) and the RCG.

2.0 RELEVANT SPECIES INFORMATION

2.1 FEDERAL-PROTECTED SPECIES

As part of relicensing, DESC developed a Rare, Threatened and Endangered (RTE) Species Whitepaper for the Project. The whitepaper included a comprehensive list of federal-protected and Forest Service Threatened, Endangered and Sensitive (TES) mussel species that may occur in the Project boundary (Table 2-1) (Kleinschmidt 2020). In order to identify possible federally protected mussel species in the Project area, the USFWS's Information for Planning and Consultation (IPaC) online system was reviewed. Forest Service TES species that may occur in the Project area were also identified. The Forest Service provided a list of their TES Species for the Long Cane Ranger District of the Sumter National Forest on January 15, 2020. These mussel species are included in Table 2-1.

TABLE 2-1 FEDERAL-PROTECTED AND FOREST SERVICE TES MUSSEL SPECIES THAT MAY OCCUR IN THE STEVENS CREEK PROJECT AREA

COMMON NAME	SCIENTIFIC NAME	FEDERAL PROTECTION	FOREST SERVICE TES SPECIES - SNF
Atlantic Spike	*Elliptio producta*		Sensitive
Brook Floater	*Alasmidonta varicosa*		Sensitive
Carolina Heelsplitter	*Lasmigona decorata*	Endangered	Endangered
Roanoke Slabshell	*Elliptio roanokensis*		Sensitive
Yellow Lampmussel	*Lampsilis cariosa*		Sensitive

ATLANTIC SPIKE

The Atlantic spike is found throughout South Carolina and prefers streams or rivers with sandy, rocky, and/or muddy bottoms in sections where the current is moderate. This species is found throughout Maryland, Pennsylvania, North Carolina, Virginia, and South Carolina, although it has been extirpated from some reaches where it was previously found, possibly due to environmental factors including decreased water quality associated with sedimentation and pollution. The host fish for this species is not known.

BROOK FLOATER

The brook floater is a freshwater mussel species that is usually found in high gradient, consistently flowing reaches of rivers and streams. Preferred substrates are characterized by sand and gravel, often with adjacent boulders. This species is sensitive to habitat degradation, including excessive

silt and nutrient inputs, and is also sensitive to hypoxia. Potential host fish include blacknose dace, longnose dace, golden shiner, pumpkinseed, slimy sculpin, yellow perch, and margined madtom. This species is known to occur in Edgefield and McCormick counties in SC. Specifically, it has been documented in several streams in the Stevens Creek basin.

CAROLINA HEELSPLITTER

The Carolina heelsplitter is found in cool, well-oxygenated reaches of rivers and streams. The current range of this species is limited as compared to its historic range. These declines and loss of populations are associated with factors including pollutants from municipal and industrial wastewater releases. The species is sensitive to silt and is generally found in silt-free areas with banks that are stabilized and shaded by trees and shrubs. One of the ten surviving South Carolina populations of Carolina heelsplitter is found in Turkey Creek and its tributaries upstream of the project boundary. The Turkey Creek Carolina heelsplitter population was stocked by the Forest Service, USFWS and SCDNR in 2019. These creeks are part of the Savannah River drainage, located in Edgefield County, SC.

ROANOKE SLABSHELL

The Roanoke slabshell is typically found in large rivers and occasionally in small creeks. The mussel tolerates large variations in flow levels and higher water temperatures, making it able to survive in some locations near dams and hydroelectric plants. In South Carolina, the mussel is found in the Pee Dee River and the Catawba, Congaree and Savannah River basins. Although it has the potential to be found in watersheds on the Long Cane Ranger District in the Savannah River basin, no known records in the Sumter National Forest exist.

YELLOW LAMPMUSSEL

The yellow lampmussel is a freshwater mussel species found primarily in medium to large rivers and streams with a variety of substrates including silt or sand, gravel bars and bedrock cracks. Distribution in South Carolina spans the Savannah, Broad, Wateree, Congaree, and Pee Dee River basins. The species is found in the Long Cane Ranger District in the Lower Stevens Creek and Turkey Creek-Stevens Creek watersheds with the potential to also occur in the Upper Stevens Creek watershed.

2.2 STATE PRIORITY SPECIES

In addition to federal-protected and Forest Service TES species, the RTE Whitepaper included mussel species listed in the South Carolina and Georgia State Wildlife Action Plans (SWAPs) and other priority mussel species that may occur in the Project vicinity (Kleinschmidt 2020). These species are listed in Table 2-2 and Table 2-3.

TABLE 2-2 GEORGIA SWAP AND PRIORITY MUSSEL SPECIES THAT MAY OCCUR IN THE STEVENS CREEK PROJECT VICINITY

COMMON NAME	SCIENTIFIC NAME
Atlantic Pigtoe	*Fusconaia masoni*
Brother Spike	*Elliptio fraterna*
Carolina Slabshell	*Elliptio congaraea*
Delicate Spike	*Elliptio arctata*
Roanoke Slabshell	*Elliptio roanokensis*
Savannah Lilliput	*Toxolasma pullus*
Yellow Lampmussel	*Lampsilis cariosa*

TABLE 2-3 SOUTH CAROLINA SWAP AND PRIORITY MUSSEL SPECIES THAT MAY OCCUR IN THE STEVENS CREEK PROJECT VICINITY

COMMON NAME	SCIENTIFIC NAME
Atlantic Spike	*Elliptio producta*
Eastern Creekshell	*Villosa delumbis*
Eastern Elliptio	*Elliptio complanata*
Eastern Pondhorn (Florida Pondhorn)	*Uniomerus caroliniana*
Yellow Lampmussel	*Lampsilis cariosa*

3.0 STUDY OBJECTIVE

The purpose of this study is to gather quantitative and qualitative data on the diversity, spatial distribution and relative abundance (density) of the mussel fauna inhabiting portions of Stevens Creek, Little Kiokee Creek, and Uchee Creek included within the Stevens Creek Project boundary.

4.0 GEOGRAPHIC AND TEMPORAL SCOPE

Hypolimnetic releases from J.S. Thurmond Reservoir are both low in oxygen and much colder than southeastern river typical temperatures. Therefore, mussel surveys will focus on selected habitats within the Stevens Creek Project boundary that are more likely to support populations of native freshwater mussels. Due to the accumulation of silt in the lower portions of Stevens Creek, a majority of the surveys will take place in the upper portion of Stevens Creek within the Project boundary. USFWS requested that surveys include the reach between the upstream extent of the Stevens Creek reservoir to the confluence with Horn Creek (Figure 4-1). In addition, GADNR requested that surveys include representative sites in the portions of Little Kiokee Creek and Uchee Creek within the Project boundary. Specific survey points will be identified in the field by the lead malacologist performing the study. Surveys will be conducted between late March and late September in 2021. Surveys will be focused during non-rainy periods when water clarity and temperatures are sufficiently high to support wading, snorkeling, and other in-water survey methods. We do not anticipate that scuba will be needed to perform surveys in the identified areas.

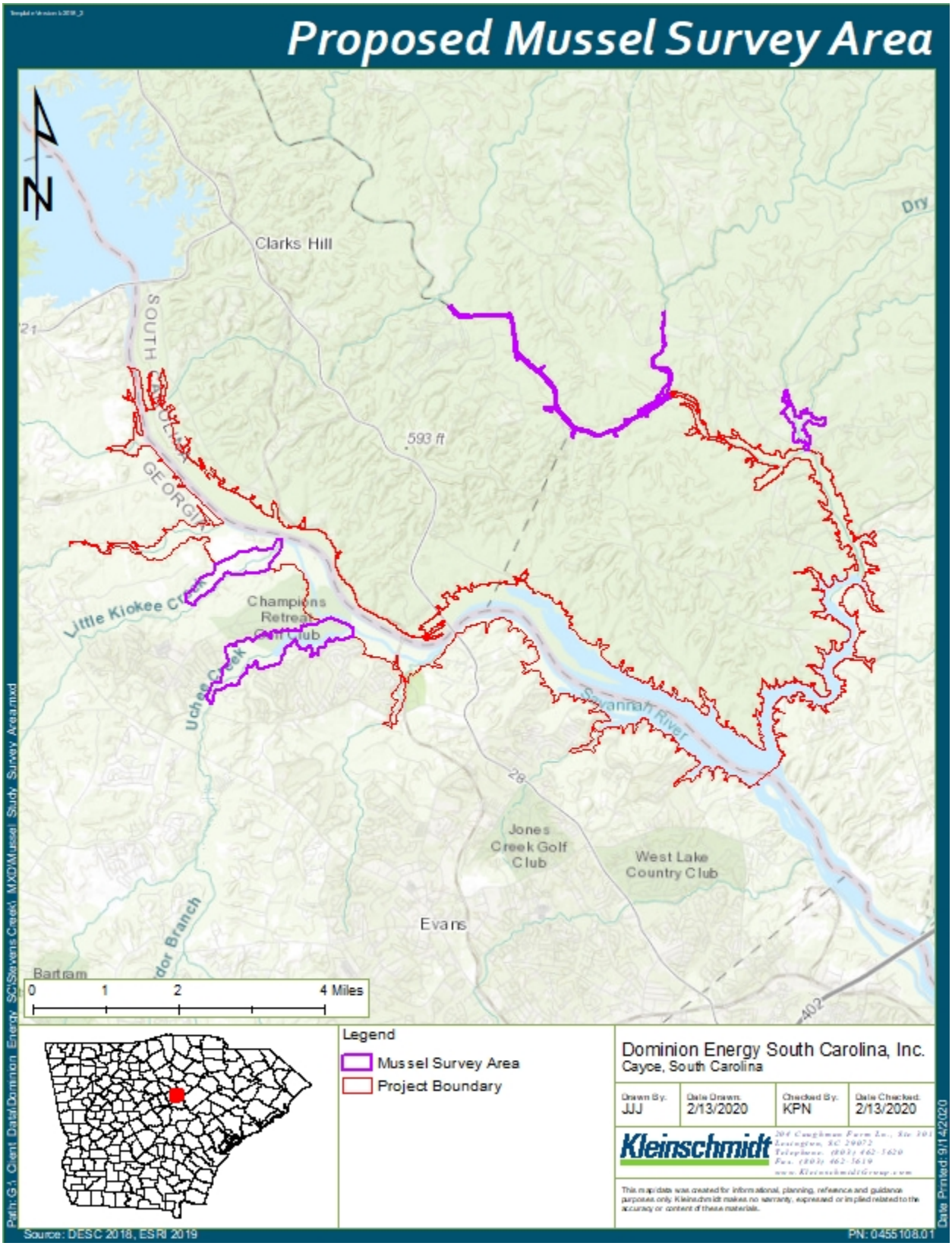

FIGURE 4-1 MUSSEL STUDY AREA

5.0 DATA COLLECTION METHODS

Freshwater mussel surveys in Stevens Creek, Little Kiokee Creek, and Uchee Creek will involve timed visual (qualitative) and tactile inspections (quantitative) of suitable habitat for presence of live freshwater mussels and/or shell material. Prior to sampling, we will review existing mussel distribution data provided by SCDNR, GADNR, and the Forest Service to prioritize areas that should be surveyed or resurveyed. This will aid in identifying established populations of mussels within the project boundary that may be influenced by project operations.

Field survey methods will follow freshwater mussel survey standard operating procedures (SOP) established by the SC DNR (Appendix A) and will be conducted by a qualified malacologist with expertise in Savannah River fauna. Although the number and specific location of qualitative survey points will likely be refined in the field based on professional judgement of the lead malacologist, it is expected that a range of 5 to 10 representative sites, of approximately 100 meters per site, will be distributed along Stevens Creek. The number of representative sites surveyed in Little Kiokee Creek and Uchee Creek will be determined by the lead malacologist following discussions with the GADNR malacologist.

Particular attention will be placed upon the examination of potential Carolina heelsplitter (*Lasmigona decorata*) (federal-endangered species and South Carolina state-endangered species) habitat within areas of Stevens Creek, as well as habitat for the Forest Service TES species and state-priority species listed in Section 2.0. If key species (Carolina heelsplitter, Forest Service TES species, and state-priority species listed in Section 2.0) are detected during the qualitative survey, quantitative surveys will be performed to determine relative abundance.

Exact methods for conducting visual and tactile searches will vary depending on water depth and survey method. Daily and weekly fluctuations of the Stevens Creek reservoir within a 4.5-foot band to accommodate flow releases from Thurmond Dam result in routine changes to the water surface elevation, microhabitat characteristics (e.g., water depth and water velocity), and water levels along shoreline habitats. The maximum reservoir drawdown of 4.5-feet exposes approximately 575 acres of littoral zone habitat (FERC 1995). Because of this, mussel surveys will focus primarily on those areas below the 4.5-foot depth contour where mussels are likely to become established.

Specific sampling protocols, using the SCDNR methods, for both qualitative and quantitative surveys to be employed during this study are included below (Appendix A) (SCDNR 2020).

Qualitative

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). When delineating the PSA, every attempt should be made to not disturb the sediment. Shells should be collected from along all exposed areas in the PSA including banks and midchannel bars. The visual search on the bank(s) should be conducted in addition to hand grubbing (probing substrate with hands 1-2 inches into substrate) search and a visual search for individuals within the water (SCDNR 2020).

Recommended survey equipment will vary with stream condition. Mask and snorkel with hand grubbing should be used in areas with water depth less than an arm's length. When habitat type or turbidity preclude the use of a mask and snorkel, only hand grubbing would be sufficient. View buckets/bathyscopes may be used as a supplemental method. (SCDNR 2020).

Surveys should be conducted from downstream to upstream to maximize visibility and should cover the stream from bank to bank using a single pass and multiple observers. A minimum search rate of 10 m^2/min (Smith et al. 2001) should be employed to ensure adequate coverage. Individuals of a native mussel species should be identified and counted, up to the first 100 individuals of each species found. One representative color photograph should be taken of each native mussel species found. If live, federally or state protected species are located, they should be identified, counted, measured for length, and photographed. If more than 100 live individuals of a single federally or state protected species, measure lengths for the first 100 individuals and count the remaining individuals. When measuring length of a mussel, calipers should be used to record the greatest distance from the anterior to the posterior shell margin to the nearest 0.1 mm (SCDNR 2020).

Quantitative

Quadrat surveys are used to estimate recruitment and the density or relative species abundance at a fixed site. Because mussels are typically non-uniformly distributed throughout a site, reach, or river, large sample sizes are required (SCDNR 2020). This method is not as effective for documenting species richness or the presence of rare species due to a smaller total search area but

does provide higher detection rates for juvenile mussels. This method is not recommended for monitoring mussels at a watershed or range wide scale but can be extremely useful for monitoring specific sites or meta-populations of interest (SCDNR 2020).

This method involves a fixed site location. The site is divided into a 0.25 m^2 grid and excavation quadrats are chosen using systematic sampling. To reduce time in water, multiple observers use snorkeling to excavate the 0.25 m^2 quadrat to 6 inches in depth. A minimum of 3 percent of the survey area should be surveyed when using this method (SCDNR 2020).

Live and fresh dead mussels collected during the survey will be identified to species, enumerated and returned to their habitat consistent with SCDNR SOP (Appendix A), although some shell material and/or live specimens may be preserved and returned to the laboratory for taxonomic confirmation. All sampling stations, as well as any significant mussel beds found during sampling, will be documented using a GPS receiver. Mussel habitat and substrate surveyed at each sample location, as well as the species collected during the survey, will also be noted and photo documented. Basic water quality parameters (temperature, dissolved oxygen and conductivity) will be collected near the substrate at representative sample areas. Turbidity will also be measured near the substrate at representative sample areas using a secchi disk. Any equipment used as part of the sampling will be cleaned before and after sampling in each area.

6.0 SCHEDULE

Field surveys will be conducted from late March to late September of 2021 over 2-3 days. Study methodology, timing and duration may be adjusted based on consultation with resource agencies and interested stakeholders. A final report will be issued to the RCG within four months of the completion of field work.

7.0 REFERENCES

Federal Energy Regulatory Commission (FERC). 1995. Final Environmental Assessment for Hydropower License. Filed November 7, 1995.Kleinschmidt. 2020. Stevens Creek Hydroelectric Project FERC No. 2535: Rare, Threatened, and Endangered Species Whitepaper. February 2020.

South Carolina Department of Natural Resources (SCDNR). 2020. Freshwater Mussel Survey Protocol. March 2020.

APPENDIX A

SCDNR FRESHWATER MUSSEL SURVEY PROTOCOL

FRESHWATER MUSSEL SURVEY PROTOCOL

DNR

March 2020

Morgan Kern
Wildlife Biologist III

Division of Wildlife and Freshwater Fisheries
Emily Cope, Deputy Director

NEED

Survey efforts for freshwater mussels is site specific, considering stream types, sizes across ecoregions and survey objective. However, a standardized survey protocol is critical for generating comparable and consistent survey efforts. The methods outlined hereafter are intended to be flexible while remaining specific to account for variation in survey environment. This is a living document subject to change and will be updated as relevant data become available.

SURVEY WINDOW

In general, all surveys should be conducted from the end of March to the end of October. This timeframe was selected to maximize detectability as this is the typical period when flow, turbidity, and leaf litter are low. Disturbing exothermic mussels during months with cold air and water temperatures could cause tissue to freeze and/or reduces their ability to burrow into the substrate. Decreased burrowing ability increases chances of predation and the probability of movement downstream during high water flow. Additionally, there is evidence that some native mussel species burrow during colder periods (Carlson et al. 2008).

RECONNAISSANCE

Prior to implementing any stream survey protocol, a thorough review of available resources related to the potentially affected species of concern, candidate species, and threatened and/or endangered mussel species should be completed. This review should include recovery plans, habitat descriptions, life history (spawning and or brooding seasons), characteristics determining identification, historical distributions including distributional maps, published journal articles, museum records, and communications with field malacologists with relevant experience.

Freshwater mussel survey results can be affected by the river conditions. Precipitation and U.S. Geological Survey (USGS) gage station data, if available, should be consulted prior to initiating survey work. Notes on weather conditions, increased flow, turbidity, and temperature should be taken on site to record survey conditions. Surveys should be rescheduled if unfavorable conditions for sampling are recorded.

BIOSECURITY

In order to reduce the spread or introduction of nonindigenous species while conducting surveys, survey gear should be washed and dried, free of mud and aquatic vegetation. The list of gear needing to be cleaned includes wetsuits, gloves, collecting bags, dry bags, boats and trailers etc.

SURVEY METHODS

Qualitative and quantitative methods are commonly used for mussel surveys. When choosing the type of survey that will be conducted, the objective of the study should be considered. Qualitative methods typically provide presence/absence or occupancy data and may provide relative abundance and species diversity if the protocol methods are followed. Qualitative surveys also produce the most robust species lists, especially for detection of rare species (Miller and Payne 1993, Strayer et al. 1997, Vaughn et al. 1997). Quantitative surveys can provide a multitude of data related to population demography or changes in a population over time.

DETERMINING PRESCRIBED SEARCH AREA (PSA)

PSAs should be determined using minimum lengths. Methods for determining minimum lengths in wadeable streams were adopted from the “Freshwater Mussel Survey Protocol for the Southeastern

Atlantic Slope and Northeastern Gulf Drainages in Florida and Georgia" which were field-tested at survey sites in Georgia, Florida, and Alabama using species-area curves (Carlson et al. 2008). Wadeable streams are defined as reaches where investigators can wade from one end of the reach to the other. Nonwadeable survey methods are not covered in this document.

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. The minimum lengths should include appropriate mussel habitat (gravel and cobble substrate, islands, sand bars, muddy sand substrates around tree roots, sand/limestone, and pools, riffles, and runs, etc.). The surveyor should extend the PSA when possible to include appropriate habitat when they are not included in the original PSA and should also include any unique aquatic habitats outside of the PSA. Additionally, if the surveyor determines the minimum length does not encompass all of the areas of interest or effect, the lengths should be extended as necessary.

QUALITATIVE

Qualitative surveys are presence/absence surveys using tactile and visual search methods, where catch per unit effort (CPUE) can be calculated based on a PSA. CPUE searches require minimal set-up time and crew sizes. These surveys are predominately visual and do not include the use of quadrat and/or substrate removal methods past hand grubbing (probing with hands 1-2 inches into substrate to increase detection of more deeply buried mussels). CPUE surveys can maximize the spatial coverage of survey sites and, therefore, often result in finding more rare species than quantitative methods.

Normally, qualitative surveys are used to provide resource agencies with presence/absence data or occupancy data, assemblage richness, and a general indication of relative abundances and recruitments. Independent of species, freshwater mussels ≤25 mm in length are evidence of recent reproduction (Haag and Warren 2007). A relative age class can be obtained from external annuli counts to determine the general age distribution of a population. Visual and tactile surveys can be biased towards larger animals but provide less habitat disturbance. Since excavation is not employed in this method, the detection rate for juveniles is often low (Wisniewski et al. 2013). Qualitative surveys will be recommended for all sites and the results would be used to determine the need and/or scope of a second quantitative survey.

Methods

Qualitative surveys should consist of tactile and visual searches of all habitats (not just suitable habitats) within the survey area to be searched, or PSA. When delineating the PSA, every attempt should be made to not disturb the sediment. Shells should be collected from along all exposed areas in the PSA including banks and midchannel bars. The visual search on the bank(s) should be conducted in addition to hand grubbing (probing substrate with hands 1-2 inches into substrate) search and a visual search for individuals within the water.

Recommended survey equipment will vary with stream condition. Mask and snorkel with hand grubbing should be used in areas with water depth less than an arm's length. When habitat type or turbidity preclude the use of a mask and snorkel only hand grubbing would be sufficient. View buckets/bathyscopes may be used as a supplemental method. At greater depths, SCUBA diving equipment should be used (divers should follow all applicable safety regulations).

Surveys should be conducted from downstream to upstream to maximize visibility and should cover the stream from bank to bank using a single pass and multiple observers. A minimum search rate of 10 m^2/min (Smith et al. 2001) should be employed to ensure adequate coverage. Individuals of a native mussel species should be identified and counted, up to the first 100 individuals of each species found. One representative color photograph should be taken of each native mussel species found. If live, federally or state protected species are located, they should be identified, counted, measured for length,

and photographed. If more than 100 live individuals of a single federally or state protected species, measure lengths for the first 100 individuals and count the remaining individuals. When measuring length of a mussel, calipers should be used to record the greatest distance from the anterior to the posterior shell margin to the nearest 0.1 mm.

All mussels should remain in a mesh collecting bag kept in the water until being measured and photographed one-at-a-time to reduce stress. Federally or state protected species must be handled with care and returned to the area of collection. Individuals should be rebedded into the sediment in the correct position (Hail et al. 2007, Strayer and Smith 2003, Young et al. 2003). Mussels should only be rebedded in the correct orientation, if this is not known, they should be placed on the substrate surface and left to burrow on their own. The surveyor should only retain shells of dead animals; moribund animals must be left in the stream (separate state and federal permits may be required to collect shells). Relict shells of federally protected species should be enumerated on the data sheet regardless of decision to retain shells. Justifications for deviations from these recommendations should be included in the final report.

QUANTITATIVE

Quantitative surveys use abundance-based methods, such as, capture mark recapture (CMR), quadrats with excavation, and transects. These surveys are used to estimate densities, population changes overtime, and more absolute recruitment data. A quantitative survey might be requested if a federally or state protected species is found and more data regarding population structure or dynamics (density, recruitment levels, survivorship, etc.) are needed. Quantitative surveys will consist of a statistically valid sampling design that should be validated based on survey objectives. Appropriate designs may be chosen from Strayer and Smith (2003). A general description of these methods can be found below. Justifications for deviations from these recommendations should be included in the final report.

Capture Mark Recapture

The CMR survey method is used for estimating apparent survival, recruitment, recapture probabilities, and changes in meta-populations. CMR is among the most common methods used to monitor population status and demography. There are many modeling approaches that provide estimate population parameters with appropriate data collection (Williams et al. 2002). Visual and tactile surveys can be biased towards larger animals but provide less habitat disturbance. Since excavation is not employed in this method, the detection rate for juveniles is often low (Wisniewski et al. 2013).

This method involves a fixed site location that would be sampled using visual and tactile searches. These surveys should consist of complete coverage using a single pass and multiple observers. Snorkeling, view buckets, or SCUBA are acceptable detection methods. Sites are searched following a maximum of 10 m wide lanes that run parallel to flow. A minimum search rate of 10 m^2/min (Smith et al. 2001) will be employed to ensure full coverage. Recovered species of interest would be tagged using Hallprint or passive integrated transponder (PIT) tags glued to the shell. If Hallprint tags are used, it is recommended that two tags are used per individual, one on each valve.

Quadrat Survey

Quadrat surveys are used to estimate recruitment and the density or relative species abundance at a fixed site. Because mussels are typically non-uniformly distributed throughout a site, reach, or river (Downing and Downing 1992; Strayer and Smith 2003), large sample sizes are required (Smith et al. 2001; Pooler and Smith 2005). This method is not as effective for documenting species richness or the presence of rare species due to a smaller total search area but does provide higher detection rates for juvenile mussels. This method is not recommended for monitoring mussels at a watershed or range wide scale but can be extremely useful for monitoring specific sites or meta-populations of interest.

This method involves a fixed site location. The site is divided into a 0.25 m^2 grid and excavation quadrats are chosen using systematic sampling. To reduce time in water, multiple observers use snorkeling or SCUBA to excavate the 0.25 m^2 quadrat to 6 inches in depth. A minimum of 3 percent of the survey area should be surveyed when using this method (Pooler and Smith 2005).

REPORTS

PRELIMINARY RESEARCH

State the purpose of the survey and list the federal and state 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.

SURVEY AREA DESCRIPTION

The area of stream surveyed should be graphically represented on a 7.5-minute USGS topographic map. A description of the area, including physiographic area, general topography, land use, drainage basin, and potential suitable mussel habitat should be included.

METHODS

Provide a full text description of the equipment to be used along with a description of the method used to determine PSA or survey lengths. A brief description of the affiliations, qualifications, and all valid permits of the persons who conducted the survey in the stream noting the person or persons who were identifying mussel species. Indicate the date(s) during which the survey was completed along with descriptions and justifications for any deviations from the recommendations including stream conditions.

RESULTS

Include a detailed summary of the survey results. Records of all mussel species found including shells of interest and the locations where they were found, measurements, and water quality parameters should be included in summary tables. Information on stream conditions including discharge data from the closest USGS stream gage when the stream was sampled. Photographs, including representative area surveyed at each site and individual mussels, as well as copies of all data survey forms should be attached as appendices.

DISCUSSION

Describe the quality of the habitat observed within the survey area and the suitability of these areas for supporting the targeted species. If individuals of the target mussel species were not located, potential reasons for their absence should be discussed. Deviations from recommendations should also be discussed, relating to how they helped meet the survey objective and any other pertinent information should be included.

REFERENCES

All literature sources used in preparation for the survey and for the survey reporting should be included.

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