Recovery of Rare Freshwater Mussel Populations in the Upper Clinch and Powell River System (Virginia and Tennessee):

A 10-Year Strategic Plan

Jointly Developed by the Upper Tennessee River Mussel Recovery Group:


Lead Contacts:

Dr. Braven Beaty- Freshwater Scientist, The Nature Conservancy, bbeaty@tnc.org

Tim Lane – Southwest Virginia Freshwater Mussel Recovery Coordinator, Virginia Department of Game and Inland Fisheries, Tim.Lane@dgif.virginia.gov
I. Executive Summary

This shared vision and jointly developed 10-year strategic plan focuses on freshwater mussel population recovery efforts in the Upper Clinch and Powell River system of Virginia and Tennessee. This plan will be implemented collaboratively by Virginia Department of Game and Inland Fisheries, Tennessee Wildlife Resources Agency, the United States Fish and Wildlife Service, Virginia Tech, and The Nature Conservancy—collectively known as the Upper Tennessee River Mussel Recovery Group (MRG). In this brief document, we describe the very tenuous present “baseline” condition of native mussel populations in this river system, clarify our long-term population recovery goals (by 2066), and articulate our shared plan for significantly increasing the security and viability of these imperiled species over the next decade (2016-2026).

Through a consensus-based planning process, we have determined that the most successful approach to rare mussel recovery over the next 10 years involves two key actions: (1) substantially increasing the number of juvenile mussels we can produce in our facilities, and (2) consolidating our deployment of those juvenile mussels into two specific river sections where near term population recovery has the best chance of success.

The centerpiece and top need identified in our 10-year mussel recovery plan is a renovated and expanded mussel culture facility at VDGIF’s Aquatic Wildlife Conservation Center (AWCC) located at the Buller Fish Cultural Station near Marion, VA. We also have a shared commitment to strategically concentrate our deployment of produced mussels (from our three augmentation facilities) into two primary areas: (1) a 12-mile section of the Clinch River in Virginia which runs from Nash Ford downstream to Cleveland, Virginia, and (2) a 30-mile section of the Powell that runs from Snodgrass Ford to Brooks Bridge near the Virginia/Tennessee border (see Map 1 on Page 4). Field assessments and research by MRG partners indicate that suitable habitat and improving water quality exist in these two reaches; and that they have the best potential for population recovery across the entire river system.

With expanded mussel production and strategic deployment over the next ten years, we anticipate that the number of native mussels in two critical sections of the Clinch and Powell river system can be more than doubled. By recovering these two sections, we will greatly improve the overall security of imperiled mussel populations in the Clinch-Powell. Currently, there is only one section of the river system with a self-sustaining and adequately diverse mussel population (the “Tennessee Clinch”).
This means that a single catastrophic event (e.g. a toxic spill) in the wrong place could lead to permanent species losses. Successful implementation of this plan will significantly reduce the risk of catastrophic species losses, increase the number of spatially distinct “healthy mussel” river sections from 1 to 3, and can serve as an example for future Upper Tennessee freshwater mussel recovery efforts.

II. Introduction

The Clinch and Powell rivers upstream of Norris Lake are among the most important freshwater bodies for biodiversity conservation in North America – supporting one of the highest concentrations of rare and imperiled fish and mussel species on the continent\(^1\). Unfortunately, population trend analyses have shown that native mussel communities are severely depressed in most sections of the river system with only one remaining stronghold located in a 30-mile stretch of the Clinch that runs from near the Virginia/Tennessee border downstream to the vicinity of Sneedville, TN (Jones et al. 2014). This mussel decline is a critical problem that requires sustained attention and a bold response from wildlife managers. In addition to their federally listed status and inherent existence value, freshwater mussels provide many benefits to people and natural systems including water filtration, in-stream habitat stabilization, and support of native non-game and sport fisheries.

On-going, collaborative bi-state agency efforts like the Clinch-Powell Clean Rivers Initiative (CPCRI) (www.cpcri.net) are making steady progress to understand the causes for mussel declines; and to improve watershed conditions, stream habitat, and water quality. At the same time, coordinated programs among a key sub-set of CPCRI partners known as the Mussel Recovery Group (MRG), are refining and improving techniques to successfully propagate and augment mussel populations in the two rivers\(^2\).

Beyond the last-remaining mussel stronghold found in the 30-mile section of the Clinch that runs through Hancock County, Tennessee, two additional river sections show the most promise of an assisted recovery: (1) a 12-mile section of the Clinch River in Virginia that runs from Nash Ford downstream to Cleveland Island, and (2) a 30-mile section of the Powell River that runs from Snodgrass Ford to Brooks Bridge near the Virginia/Tennessee border (Map 1). Mussel populations are depressed from

\(^1\) Currently the Upper Clinch-Powell system supports more than 45 species of freshwater mussels (including 20 federally-listed species), and over 130 species of fish (including 4 federally-listed species).

\(^2\) A striking example of the MRG’s early success is the augmentation and recovery of the federally endangered Oyster mussel (*Epioblasma capsaeformis*) at The Nature Conservancy’s Cleveland Island Preserve.
historic numbers in both of these river sections. However, in-stream habitat assessments indicate that suitable habitat is available and there still exists a reasonably diverse mussel assemblage capable of being more fully recovered by wildlife managers.


Thanks to the collective efforts of many agencies and partners involved in CPCRI, we anticipate that watershed conditions and water quality will continue to steadily improve in the Clinch and Powell River system. Therefore, we see a tremendous opportunity to more fully recover rare mussel populations in these two target river sections over the next 10 years. However, this only can be achieved if the MRG partners are able to significantly increase our capacity to produce and augment native mussels from existing culturing facilities (e.g. the AWCC in Marion, VA).

III. Current (“Baseline”) Status of Clinch-Powell Mussel Populations and MRG Augmentation Programs

Before discussing what the MRG believes needs to be accomplished in the next 10 years, it is critical to establish a baseline description of the current situation and a clear vision of what our longer-term desired outcomes are. In this section, we summarize: (1) the current status of resident native mussel populations in the Clinch
and Powell rivers, and (2) the present level of mussel augmentation effort being implemented by MRG partners.

**Baseline Status of Mussel Populations in the Clinch Powell—**

Our understanding of current mussel populations is informed by nearly four decades of in-stream monitoring showing a complex pattern of mussel health across the river system. The current status of mussel populations across 8 distinct river sections is summarized in Table 1. Mussel population health is measured by five indicators: species richness/composition, recruitment of juveniles, presence of rare species, population density, and species diversity.

Table 1. Baseline Condition of Upper Tennessee Mussel Population (2010-2014).

<table>
<thead>
<tr>
<th>RIVER MILE (REACH NAME)</th>
<th>BASELINE CONDITION of UPPER TENNESSEE MUSSEL POPULATION (2010-2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POPULATION INDICATORS</strong></td>
<td></td>
</tr>
<tr>
<td>Species Richness/Composition (% Expected)</td>
<td></td>
</tr>
<tr>
<td>40 (89%)</td>
<td>37 (84%)</td>
</tr>
<tr>
<td>Recruitment (% Subadult)</td>
<td></td>
</tr>
<tr>
<td>Yes (12.8)</td>
<td>Yes (2)</td>
</tr>
<tr>
<td>Representativeness of Rare Species (% of Expected)</td>
<td></td>
</tr>
<tr>
<td>21 (88%)</td>
<td>19 (93%)</td>
</tr>
<tr>
<td>Mean Population Density (Range)</td>
<td></td>
</tr>
<tr>
<td>~25 (7-30.93)</td>
<td>~37 (0.53-8.61)</td>
</tr>
<tr>
<td>Mean Diversity Index (Range)</td>
<td></td>
</tr>
<tr>
<td>2.05 (1.81-3.18)</td>
<td>2.12 (2.05-2.53)</td>
</tr>
</tbody>
</table>

**Color-coded Categories & Descriptions:**

- **Very Good**: Consistent with self-sustaining populations, exhibiting the natural diversity expected (based on historical records), and capable of surviving natural disturbances without management assistance.
- **Good**: Consistent with stable populations, exhibiting the natural diversity expected (based on historical records), and capable of surviving many natural disturbances with some management assistance.
- **Fair**: Declining and in need of significant management assistance for long-term survival.
- **Poor**: In imminent danger of extirpation or severe decline.
- **Unknown**: Data not available to evaluate.

Column widths reflect length of reach.

- Ahlstedt et al. 2008 (Carbo Sampling Data); Ahlstedt Trend Data (1979-2006); Carey & Jones 2015; Eckert et al. 2007 (Fletcher Ford Musselrama Data); Eckert et al. 2009 (Cedar Bluff Musselrama Data); Hyde & Jones 2015; Johnson et al. 2012; Jones et al. 2014; Orcby & Nieves 2006; Virginia Tech Long-term Lower Clinch Sampling Data; Best Professional Knowledge.

Recruitment refers to evidence of animals <3 years old.
At this time, only one section of the Clinch River (the “Tennessee Clinch”) has a truly self-sustaining mussel assemblage that exhibits the densities, age class distributions, juvenile recruitment levels, and species diversity that the MRG equates with a “very good” condition. With some notable exceptions, these relatively good conditions extend upstream into Virginia for about 15 river miles. However, beginning at River Mile 220 and moving upstream through much of Scott, Russell, and Tazewell Counties in Virginia, mussel populations are in serious trouble. The only bright spot being the reach of river around the town of Cleveland, Virginia where species are holding on and exhibit relatively good population indicator scores.

In the Powell River, the stressed situation is even more pronounced. The entire upper Powell River mussel assemblage is severely degraded. Along the VA-TN border, the situation is improved yielding to a moderately rich and dense mussel assemblage (Johnson et al., 2012).

Baseline Status of Mussel Augmentation Programs in the Clinch Powell–

The culturing of native mussels and augmentation programs began in earnest around 2000 with the establishment of VDGIF’s Aquatic Wildlife Conservation Center (AWCC) at Buller Fish Cultural Station and the launching of Virginia Tech’s Freshwater Mollusk Conservation Center (FMCC). More recently, in 2006 TWRA began producing mussels at its Cumberland River Aquatic Center (CRAC). Over the years, these agencies have improved their propagation techniques and success rates related to both the number of individual mussels that can be successfully grown in the labs and released, as well as the diversity of species that can be propagated.

Table 2 combines the output of AWCC and FMCC culturing facilities to summarize the MRG’s collective augmentation efforts from 2010-2015\(^3\). Obviously, there has been no need to augment the self-sustaining reach of the Clinch River in Tennessee; and due to currently poor habitat and water quality conditions there has been no effort to deploy hatchery-reared mussels in the Upper Powell River. As Table 2 shows, mussel deployment has been focused on five distinct reaches within the Clinch-Powell system. The largest numbers of animals have been released in the Cleveland and Cedar Bluff sections of the Clinch, along with the Brooks-Bridge to Fletcher Ford section of the Powell.

---

\(^3\) We currently do not have production numbers from the TWRA CRAC facility.
With the resources that have been made available over the past 15 years, MRG partners have been able to establish the credibility of their augmentation programs; and we have refined and sharpened the techniques needed to successfully produce and deploy native mussels. At the present time, we have the experience and technical know-how to take mussel augmentation programs to a much higher level of success. A key limiting factor, however, is that the current production capacity of one of the main existing facilities (AWCC) is maxed-out. Therefore, the number of mussels that we are producing represents only a fraction of what is truly needed to re-establish healthy mussel populations across the Clinch-Powell River system.

To begin achieving population-scale recovery in the decades ahead, it is critical that MRG partners do two things: (1) significantly increase the number of native mussels produced in augmentation facilities, and (2) strategically consolidate and stage the deployment of mussels into the rivers such that only one or two river reaches receive the vast majority of mussels produced over the course of a decade. Rather than continuing to spread augmented mussels across too many sites, the MRG has come to the conclusion that it will be more effective to narrow the focus of mussel deployment and rebuild populations at one or two river reaches at a time, on a decade by decade basis.

Table 2. Baseline Condition of Upper Tennessee Mussel Augmentation Efforts (2010-2015).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Species Released (% of Expected)</td>
<td>0</td>
<td>11 (28%)</td>
<td>8 (19%)</td>
<td>12 (43%)</td>
<td>0</td>
<td>12 (80%)</td>
<td>6 (19%)</td>
<td>0</td>
</tr>
<tr>
<td>Annual Numbers Released</td>
<td>0</td>
<td>15,553</td>
<td>6,204</td>
<td>27,046</td>
<td>0</td>
<td>24,252</td>
<td>21,896</td>
<td>0</td>
</tr>
<tr>
<td>Number of Years of Efforts</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Evidence of Survival (Yes/No)</td>
<td>-</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Survival Rates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Average annual release capacity since 2010 = ~16,000, with a range of 11,000 - 24,000 individuals. 2 Evidence suggests survival in the wild, after release. 3 Future data collection should provide initial estimates of survival rates, and additional dedicated monitoring would contribute to this effort. 4 Pendleton reach survival estimate is mostly from data collected at the Slant mussel release site.
IV. Long-Term Desired Future Condition of Clinch-Powell Mussel Populations (by 2066):

The long-term goal of the Mussel Recovery Group is to move the population status of Clinch-Powell freshwater mussel fauna from its currently tenuous condition (where we only have one reach of the river with a truly healthy population, a scattering of sites that are in a fair condition, and the majority of the river system in a poor condition), towards a desired long-term condition where mussels are thriving across many miles of suitable riverine habitat (in representative, diverse, and sustainable assemblages).

In considering our efforts to achieve this desired future condition, we recognize the importance of developing clear success metrics to track our mussel management progress and return on investment. With this in mind, the MRG has drawn on its collective expertise to develop an achievable, quantitative description of a restored mussel population in the Clinch-Powell River system by 2066. This desired future condition is summarized in Table 3 below. Using the same population indicators and metrics as the baseline condition table, Table 3 describes what success looks like in terms of mussel population recovery. Comparison of Table 1 and Table 3 allows one to understand the magnitude of improvements needed across the river system over the next 50 years. In the section that follows, we articulate how much progress we can make towards our desired future condition in the next decade, and what key resources and strategies are needed to achieve our immediate 10 year goals.

Table 3. Desired Future Condition of Upper Tennessee Mussel Population. (by 2066)

<table>
<thead>
<tr>
<th>RIVER MILE (REACH NAME)</th>
<th>DESIRED FUTURE CONDITION(^1) of UPPER TENNESSEE MUSSEL POPULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Indicators</td>
<td>Species Richness/Composition (% of Expected)</td>
</tr>
<tr>
<td></td>
<td>Recruitment(^3) (% Subadult)</td>
</tr>
<tr>
<td></td>
<td>Representativeness of Rare Species (% of Expected)</td>
</tr>
<tr>
<td></td>
<td>Mean Population Density (Range) mussels/m(^2)</td>
</tr>
<tr>
<td></td>
<td>Mean Diversity Index (Range)</td>
</tr>
</tbody>
</table>

\(^1\) The table is based on 25-50 year time frame. \(^2\) Column widths reflect length of reach. \(^3\) Recruitment refers to evidence of animals <3 years old. \(^4\) The Swords Creek reach needs to be assessed for mussel populations and habitat extent.
V. Our Plan for the Next Ten Years (2016-2026)

There are two key aspects of our 10-year strategic plan. First, we need to find the necessary resources to re-build and expand VDGIF’s Aquatic Wildlife Conservation Center at the Buller Fish Cultural Station in Marion, VA. We assume that an expanded AWCC can increase production and deployment of cultured mussels five- to ten-fold. Second, we need to strategically deploy the increased production capacity of a new VDGIF facility (along with that of Virginia Tech and TWRA’s facilities) by consolidating our releases of cultured mussels primarily into two river sections which show the most promise for an assisted population recovery.

Reflective of these two key actions, our 10-year population recovery goals (shown below in Table 4) highlight expected gains we can make if we concentrate our mussel releases in the Clinch River Cleveland reach and Lower Powell River reach. In the Cleveland reach, we intend to increase our production and mussel deployment up to an average 114,000 mussels per year (a 4-fold increase from present efforts). In the Lower Powell, we aim to increase annual production to 187,000 individuals (an 8.5-fold increase). As the table shows, over the next decade, we will place much less emphasis on other river reaches. We will focus more aggressively on these “deferred reaches” in future decades (once we have successfully improved populations in the Cleveland and Lower Powell sections).

Table 4. 10-year Population Recovery Goals for Upper Tennessee Mussel Augmentation Efforts.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Species Released (% of Expected)</td>
<td>0</td>
<td>8 (18%)</td>
<td>8 (18%)</td>
<td>13 (46%)</td>
<td>0</td>
<td>5 (29%)</td>
<td>14 (44%)</td>
<td>0</td>
</tr>
<tr>
<td>Annual Numbers Released</td>
<td>0</td>
<td>2,000</td>
<td>2,000</td>
<td>114,000</td>
<td>0</td>
<td>4,000</td>
<td>187,000</td>
<td>0</td>
</tr>
<tr>
<td>Number of Years of Efforts</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Evidence of Survival (Yes/No)</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1 These goals have been identified through Mussel Recovery Group planning workshops (11/15; 1/16), strategically focusing on augmenting two reaches (Highlighted here; Cleveland & Brooks Bridge/ Fletcher Ford) to recovery. Small releases at additional reaches (Speers Ferry and Pendleton Island) will likely occur in order to test the suitability of the shoals for future augmentation efforts. Augmentation efforts in the Cedar Bluff reach will continue in the near-term due to programmatic priorities, targeting golden riffleshell and Cumberland bean (and a few additional species, as appropriate).

4 The specifics on added capacity at AWCC will be determined by updating the existing engineering study that has been completed by VDGIF. The update is expected in 2017.
Expanding VDGIF’s Mussel Culture Facility in Marion, VA

The repair and expansion of the AWCC is an essential next step if we are to have a real chance at population level mussel recovery in the Clinch and Powell River system. Presently, as shown in Table 2, the combined effort of AWCC and FMCC facilities is allowing us to produce and release approximately 15,000 cultured juvenile mussels into the Clinch and Powell River system on an annual basis. This level of production has allowed us to make modest gains at some river shoals, and it has given us an opportunity to substantially improve our propagation techniques over time. However, with our current capacities, we are simply not able to produce the numbers we need to restore populations to self-sustaining levels across the river system. For example, it would take up to a century to recover the Cleveland reach of the Clinch River to our desired condition if we rely on current production numbers.

Mussel augmentation facilities have been in place at the AWCC for 14 years. The facility is a tremendous asset to our recovery programs in the Clinch and Powell river system and other river systems in Virginia, Tennessee, and North Carolina. Unfortunately, the facility’s condition has deteriorated and is in need of significant repair and expansion if we are to achieve the ambitious goals we have set forth in the coming decades. In 2006, a preliminary engineering study was completed to determine the needs and opportunities related to an upgrade and expansion. In 2016, it is critical to update the engineering study and then secure additional funding to properly repair, expand, and adequately staff the facility.

Consolidation of Effort towards Two Select River Reaches-

After careful consideration and a healthy debate, the MRG has determined that there are a number of benefits that come with consolidating our release of cultured mussels into two reaches of the Clinch and Powell River system. Admittedly this is a change from our “business as usual” practice, where we have released lab-reared juvenile mussels across five or six river reaches. However, if we become more disciplined and restrictive in where we release mussels, the MRG maintains that we can make bigger gains by substantially recovering mussel populations in two critical river sections over the next decade. If we increase our production numbers, but continue to spread mussels too thinly across too many sites, we won’t achieve the same level of ecological impact that will come with consolidating our augmentation efforts more narrowly. By focusing on the Cleveland and Lower Powell reaches, we will reach a major population recovery milestone by 2026: an expansion in the number of “healthy mussel” Clinch and Powell river sections from one (i.e. the situation today) to three. Once we can bring the Cleveland and Lower Powell sections to a level of health that compares with the “Tennessee Clinch”, we can then build on this momentum and expand our future efforts to other parts of the Clinch and Powell River system, and other rivers in the Upper Tennessee basin.5

5 For example, the Nolichucky River.
VI. MRG Partners Support for These 10-Year Outcomes

Admittedly, this 10-year vision relies heavily on investments and strategic decisions that will need to be made by VDGIF regarding the expansion of the AWCC. That said, the entire MRG wants to provide support for the key actions described in this document. Below is a brief explanation of how MRG partners intend to contribute towards mussel population recovery in the next 10 years (and beyond):

*The Nature Conservancy*

The Conservancy will continue to serve on the MRG- contributing our expertise and staff capacity for monitoring and augmentation activities. TNC will seek to generate private funding in support of mussel augmentation programs⁶ TNC will own, maintain, and (where possible) expand its string of private nature preserves along the Clinch and Powell Rivers at key mussel habitat sites. In the next 10 years, TNC anticipates additional land protection work around key mussel shoals. The TNC preserve system will continue to be available to all MRG partners for mussel augmentation and monitoring efforts. More broadly across the Clinch-Powell watershed, the Conservancy will continue to chair the Clinch-Powell Clean Rivers Initiative and make deep investments in stream restoration, water quality improvement, land protection, compatible river recreation, and community outreach.

*VDGIF*

VDGIF will continue to serve as the lead agency for the Upper Tennessee MRG. To accommodate space and resources needed to address the needs of the water resources of Virginia, VDGIF has taken the preliminary steps towards designing renovations to the AWCC and Buller Fish Cultural Station. The restoration and expansion of the AWCC will enable the department to increase its production and grow-out capabilities of freshwater mussels and research and develop new techniques to culture additional rare and critically endangered species. This will facilitate VDGIF’s commitment toward increasing mussel restoration efforts in the Clinch and Powell rivers. VDGIF will develop recovery plans for state-listed mussel species in the Upper Tennessee River Basin and pursue recovery efforts for these species, as well as Species of Greatest Conservation Need as identified in VA’s Wildlife Action Plan. In order to adaptively manage efforts during the proposed ten-year augmentation period, VDGIF staff will provide empirical data to the MRG by initiating long-term population assessments, monitoring individual growth and survival for stocked mussel species, and conducting habitat suitability studies within the identified augmentation reaches. VDGIF is also committed to providing MRG partners with technical assistance in field and laboratory projects related to mussel restoration and recovery in the Clinch and Powell rivers over the time period.

---

⁶ As an example, TNC recently secured $100,000 from TVA for a joint Powell River project with VDGIF and Virginia Tech.
United States Fish and Wildlife Service

The FWS-TN will continue to serve on the MRG- contributing our expertise and staff capacity for monitoring and augmentation activities. FWS will seek federal funding in support of mussel population assessments, contaminant assessments, habitat improvement, and augmentation programs. FWS will continue land protection work around key mussel shoals in the Clinch-Powell. FWS will develop Recovery Plans for recently listed mussels in the Clinch-Powell and pursue recovery efforts for Federally listed species. FWS will evaluate at-risk mussel species in the Clinch-Powell to determine whether Federal protection is warranted for additional species.

Virginia Tech

The Freshwater Mollusk Conservation Center (FMCC) at Virginia Tech, Blacksburg can continue to play an integral role in conservation and restoration of mussel populations in the Clinch and Powell rivers to help meet the needs of this 10-year strategic plan jointly developed by TNC and MRG partners. The FMCC can propagate and culture mussels for the plan, and help monitor them at population restoration sites in each river. Further, the FMCC can provide research support to improve propagation and culture technology (e.g., identify host fishes), monitor genetic diversity of stocked mussels, and assist with database management of project activities. The main limiting factor and need for FMCC is salary support for staff.

Tennessee Wildlife Resources Agency

TWRA will continue to cooperate with MRG partners to achieve shared mussel conservation and restoration goals put forth in this plan. TWRA will seek state and federal funding in support of mussel propagation and augmentation. TWRA’s Cumberland River Aquatic Propagation facility can assist with juvenile mussel culture and grow out as staffing and capacity are expanded. TWRA staff will assist with mussel brood stock collection, mussel transport, and stocking along with other fieldwork and monitoring efforts.
Appendix A: Project Team

Brian Watson; VDGIF
Jess Jones; FWS-VA, VT
Hua Dan; TWRA
Brian Evans; FWS-VA
Roberta Hylton; FWS-VA
Braven Beaty; TNC
Stephanie Chance; FWS-TN
Bob Butler; FWS-Region 4
Don Hubbs; TWRA
Bill Kittrell; VDGIF
Sarah Colletti; VDGIF
Joe Ferraro; VDGIF
Tim Lane, VDGIF
Angie Watland, TNC (Lead Facilitator)
Brad Kreps, TNC