

## **Revision of the National Strategy for the Conservation of Freshwater Mollusks** **Issues, Goals and Strategies**

**Overarching Goal of the Strategy:** The goal of this National Strategy is to conserve our nation's native freshwater mollusk fauna and ensure that their ecological, social and economic values to society are maintained at a sustainable level. Specifically, the purpose of this document is to identify conservation, management, research, and monitoring actions necessary to maintain and recover mollusk fauna.

### **Issue 1 – There is a need for a coordinated national strategy for the conservation of freshwater mollusk resources.**

Goal: Review and revise the National Strategy document and Society structure every 10 years.

#### **Strategies**

1. Establish an ad hoc committee every 8 years to review and update the National Strategy document
2. Publish the National Strategy in peer-reviewed journal every 10 years.
3. Help integrate the National Strategy actions into regional, ecosystem, and state action plans.
4. Review the committee structure of the FMCS to ensure that it adequately reflects and addresses the high priority issues and needs of the fauna.

### **Issue 2 – There is a need to understand and conserve the quantity and quality of suitable habitat for freshwater mollusks over time.**

Goal: Maintain, restore, and increase physical, chemical, and biological habitat as necessary to support sustainable populations and communities of native freshwater mollusks.

#### **Strategies**

1. Define mollusk habitat requirements at the sub-organismal, organismal, population, community, river, watershed, and faunal province spatial scales.
2. Define mollusk habitat requirements at the temporal (seasonal, annual, and long-term) scale, including the quality, quantity and timing of water needs.
3. Develop habitat suitability indices to guide conservation and restoration activities.
4. Quantify the amount of occupied and unoccupied habitat.
5. Identify and conserve habitats that will be resilient to changing climates.
6. Reduce habitat fragmentation and increase connectivity of historic habitats.
7. Conserve and restore mollusk habitat through land protection actions such as, easements, acquisitions, and land-owner agreements along riparian and upland areas within watersheds.
8. Identify best habitat management and restoration practices through evaluation and monitoring.
9. Develop effective mitigation alternatives for activities that impact mollusk habitat, and test them through evaluation and monitoring.

### **Issue 3 – There is a need to increase abundance and distribution of self-sustaining mollusk populations.**

Goal: Conserve and, where appropriate, restore populations and communities of native freshwater mollusks.

#### **Strategies**

1. Develop population and community indices to track status over time.

2. Develop conservation and restoration plans (i.e., re-introduction or augmentation) at the river, watershed, and faunal province level as appropriate that considers site selection criteria, population goals, genetic diversity, spread of disease and invasive species, viable host species, monitoring, and reporting.
3. Develop restoration technologies that result in self-sustaining populations yet do not adversely affect resident fish and mollusk populations and their habitats.
4. Publish protocols for handling, transport, quarantine, feeding, and propagation of mollusks.
5. Provide links to existing mollusk conservation and restoration plans.
6. Maintain a database of translocation, propagation, and stocking events.
7. Identify uniform methods and metrics for monitoring outcomes of augmentations and re-introductions.

**Issue 4 – There is a need to better understand the ecology of freshwater mollusks at the individual, population and community level.**

Goal: Increase fundamental knowledge of the biology of these animals so managers can more effectively conserve them.

Strategies

1. Describe life history and host-species relationships at the appropriate watershed scale.
2. Define environmental (temperature, water chemistry, flow, substrate) and nutritional requirements necessary for physiological maintenance, reproduction, and persistence of all life stages of native mollusks.
3. Describe trophic interactions and ecological functions of freshwater mollusks in the environment.
4. Increase knowledge of feeding interactions among mollusk species, both negative (competition) and positive (facilitation).
5. Increase understanding of demographic, genetic and physiological characteristics that influence long-term population stability and survival.
6. Encourage development of population viability analyses in order to predict species persistence.
7. Develop population goals for managing rare and common species.

**Issue 5 – There is a need to increase knowledge of the distribution of freshwater mollusks at multiple scales over time, and to make that information available.**

Goal: Understand status and trends of populations to better manage and conserve species.

Strategies

1. Continue to refine knowledge of systematics, phylogeny, and genetic structure of species.
2. Update and maintain a database of the accepted scientific nomenclature of mollusks.
3. Use survey methods that provide data needed for trend analyses.
4. Identify uniform data collection and reporting standards that will support periodic status assessments.
5. Encourage reporting of mollusk distribution data.
6. Assess and publish the conservation status of mollusks at least every 10 years.

**Issue 6 – There is a need to address the impacts of historic, ongoing, and newly emerging stressors on native freshwater mollusk species and their habitats.**

Goal: Minimize threats to native mollusks and their habitat.

Strategies

1. Prepare white papers on known stressors (impoundments, dredging, heavy metals, pesticides, runoff, invasive species, disease, etc.) describing the risk and magnitude of effects on freshwater mollusks.
2. Describe the impacts of emerging stressors (e.g., climate change, increased energy development, water use conflicts, unregulated contaminants and hormone disruptors) and possible synergistic effects on native mollusk populations.
3. Compile comprehensive “threats assessments” on community, river, watershed, and faunal province spatial scales.
4. Predict how species and communities will change in response to threats.
5. Work with the states and USEPA to modify water quality criteria and develop new standards and total maximum daily loads (TMDLs) to be protective of native mollusks.
6. Advocate for consistent and effective enforcement of environmental protection laws and regulations.
7. Evaluate whether existing laws and regulations adequately protect freshwater mollusks and their habitats.
8. Develop an “early detection and rapid response” system for new aquatic invaders.
9. Develop and publish protocols to avoid the spread of disease and invasive species.
10. Describe the ecological and economic impact of parasites on fish, wildlife, livestock and human health.

**Issue 7 – There is a need to identify the ecosystem goods and services provided by freshwater mollusks and their habitats.**

Goal: Improve science-based consideration of the full social and economic values of mollusk communities and functioning aquatic systems.

**Strategies**

1. Describe ecosystem services provided by freshwater mollusks to humans and rivers.
2. Develop and publish the social and economic values of healthy mollusk communities to society.
3. Update the values and replacement costs of mollusk communities lost due to resource damages and mortality.
4. Publish a comparison of mussel bed replacement costs with other engineered mitigation alternatives.

**Issue 8 –There is a need to strengthen advocacy and build support for the conservation of freshwater mollusks and their habitats.**

Goal: Increase information sharing and communication among citizens and decision-makers at all levels - local, state, regional, national and international – in conserving native freshwater mollusk resources.

**Strategies**

1. Develop a formal communications plan to guide the FMCS into the future, including specialists in outreach and marketing.
2. Identify specific outreach audiences and develop messages targeting each audience – wherever they are – local events, national media outreach, universities and college fairs, etc.
3. Develop science-based tools and communication for local decision makers conducting land-use planning to help them build organizational and public support for land-use practices that conserve mollusks and support healthy aquatic systems. (i.e. landscape-level modeling of ecosystem services, modeling of resilient habitats and population growth, to outreach communication tools.)
4. Develop tools for the general public that build awareness, appreciation and support for conservation of mollusk resources (e.g., Mollusk stamps, coloring books, teaching guides, etc.).
5. Build interest through online engagement - many of our target audiences interact online.

6. Create unique field and virtual experiences, and publicize these events.
7. Empower citizens with necessary outreach materials and information to advocate for consistent and effective enforcement of laws and regulations, or for new protections.
8. Work with international partners to develop a global strategy for the conservation of freshwater mollusks.
9. Increase collaboration with other aquatic societies (e.g., hold joint meetings or other events).
10. Increase publication of information through peer-reviewed journals and popular science articles.

**Issue 9 –There is a need to educate, train, and support current and future generations of resource managers and researchers to ensure that conservation of native freshwater mollusk continues.**

Goal: Maintain and improve the ability of the mollusk conservation community to implement the best available science.

Strategies

1. Provide continuing education opportunities on relevant topics (e.g., identification, sampling protocols, quarantine, transport, captive care, propagation, etc.).
2. Encourage universities, research institutions, and other educators in advancing scientific knowledge of all aspects of mollusk conservation (e.g., FMCS support letters for research).
3. Develop an FMCS Grant program for students and projects.
4. Encourage careers in freshwater mollusk conservation – steer people that are interested in natural history toward the study of freshwater mollusks and careers in aquatic biology (e.g., outreach to educational institutions, college fairs).
5. Manage a database of internships and professional opportunities for students and practicing professionals.
6. Promote development of new coursework for the study and conservation of freshwater mollusks.
7. Recommend minimum standards of education, training, and experience for mollusk biologists.
8. Keep interests of natural resource agencies focused on science and conservation needs for freshwater mollusks through outreach, in-reach, and participation on landscape-level planning groups.
9. Encourage publication of research and management actions.

**Issue 10 – There is a need for consistent, long-term funding to support mollusk conservation efforts.**

Goal: Improve funding allocations for freshwater mollusk conservation.

Strategies

1. Take advantage of existing international, national, state, and local grant programs wherever possible.
2. Advocate prioritization of existing funding for mollusk management and research.
3. Develop guidelines for monetary mitigation banking.