

and take other actions agreed to by the group. The coordinating office will be responsible for meeting arrangements; arranging conference calls; distributing/providing access to materials, meeting minutes, and draft products; achieving broad distribution of final products; working toward group consensus on decisions; ensuring any needed modifications to the Strategy are accomplished in a timely fashion; and cooperating with the next coordinating office to ensure a smooth transition for accomplishing future reviews.

### **Adapting and Monitoring the Strategy**

How management can be adapted to new information depends on the frequency that decisions are made and the degree to which uncertainty affects those decisions. For recurrent (e.g., annual) management decisions, management can adapt to changing conditions (e.g., species status) at each decision point. For conservation strategies that are set in place for a period of time, perhaps indefinitely, strategies can employ adaptive management: (1) by periodic review of the framework that provided the rationale for the Strategy; (2) when monitoring observations are significantly inconsistent with assumptions underlying Strategy framework; or (3) at any time when the decision maker(s) determines that Strategy framework components should be revised to reflect new information, new methodologies, or changing values. The framework review and modification (see above) will provide the opportunity to review and adapt the Strategy as warranted.

As the Strategy is translated into specific projects (Figure 8), there will be many opportunities to use formal adaptive management methodologies (Williams et al. 2009, Runge 2011) to reduce key uncertainties and improve management effectiveness. For example, there is some uncertainty in BMPs when augmenting or establishing a population. Adaptive management in combination with controlled research could be a relatively rapid approach to develop BMPs, guiding population management into the future.

### **Monitoring Implementation and Effectiveness**

A monitoring program will provide feedback on implementation and effectiveness of the Strategy. Inference from monitoring must account for multiple management scales—both landscape and local—where management projects are implemented. The monitoring program will measure attributes associated with conservation objectives including measures of recovery (e.g., trend in abundance, occupancy, habitat quality) and operational efficiencies and costs (e.g., staff and operational costs). Status of threats should be considered so that management effectiveness can be determined. Learning can occur by comparing predictions of management effectiveness to observed results, and in that way learning can be used to improve future management implementation. Other design considerations, such as sampling units and frequency, sample size, and location of units, may be determined by examining tradeoffs between the value of the information obtained and associated monitoring costs.

Methods to define sampling units and techniques should follow established guidelines (e.g., Strayer and Smith 2003). Procedures for database management and periodic reporting should be established and followed. Because of the complexity of designing an effective monitoring program, a separate workshop may be needed to coordinate among Federal, State, and NGO

monitoring activities, standardization of sampling protocols, a centralized database, periodic reporting, and processes for incorporating what is learned from monitoring into improved future conservation and management actions.

## **Related Documents and Policies**

Implementation of actions described in this Strategy will support attainment of relevant reclassification and delisting criteria contained in approved USFWS fish and mussel recovery plans. Likewise, ongoing implementation of the Strategy will guide updated estimates of time and cost expenditures to achieve reclassification or delisting of UTRB species in the future. Additionally, the Strategy will help accomplish the identified aims of State agencies and NGOs that also have goals similar to USFWS for conserving and recovering UTRB imperiled aquatic species (e.g., National Native Mussel Conservation Committee 1998, TNC 2009, Cumberlandian Region Mollusk Restoration Committee 2010, Virginia Department of Game and Inland Fisheries 2010).