

## CHAPTER 3. APPROACH

The task of developing the comprehensive strategy has been coordinated among LDWF staff from the Fur & Refuge, Inland Fisheries, Marine Fisheries, and Wildlife Divisions. Additional coordination efforts were accomplished by soliciting input from representatives of other state and federal agencies, universities, non-governmental and environmental organizations, corporations and industry, and the citizens of Louisiana. Without their feedback and expertise completion of the CWCS would not have been possible.

### A. Organizational Structure

#### 1. Technical Committees

A core committee of LDWF staff from the Fur & Refuge, Inland Fisheries, Marine Fisheries, and Wildlife Divisions and Public Information Section, was formed to develop the CWCS (Appendix B). The role of the core committee was to provide steering and technical guidance throughout the strategy development process.

Technical committees formed were comprised of persons with expertise on species of concern and their habitats (Appendix C). These committees helped to develop the species of concern list and provided biological guidance on habitat, threat, and monitoring issues.

As elements of the CWCS developed, the core committee presented them to a statewide focus group for review and comment. This group of federal and state agency personnel, members of non-governmental organizations, corporations and industry, and private citizens all share a common commitment to ensuring the health and diversity of Louisiana's fish and wildlife resources.

#### 2. Coordination with Other Agencies

Several federal and state agencies were identified as having a potential role in the development of the CWCS, and each was asked to designate a representative to be the primary contact for that agency. The following is a list of those agencies and their representatives:

- Louisiana Cooperative Extension Service (Don Reed)
- Louisiana Department of Agriculture and Forestry (Michael Thomas)
- Louisiana Department of Culture, Recreation, and Tourism, Office of State Parks (David Latona)
- Louisiana Department of Environmental Quality (Chris Piehler)
- Louisiana Department of Natural Resources, Atchafalaya Basin Program (Sandra Thompson)
- Louisiana Department of Natural Resources, Coastal Restoration (Brad Miller)
- Louisiana Department of Transportation and Development (Jan Grenfell)

- Louisiana Division of Administration, Office of State Lands (Charles St. Romain)
- National Park Service (Martha Segura)
- National Oceanic and Atmospheric Administration (Richard Hartman)
- National Oceanic and Atmospheric Administration Fisheries (Jeff Rester)
- US Army Corps of Engineers, Atchafalaya Basin (Neil LaLonde)
- US Army Corps of Engineers, Bodcau (Susanne Odom)
- US Army Corps of Engineers, New Orleans (Chris Brantley)
- US Army Corps of Engineers, New Orleans (Nathan S. Dayan)
- US Army Corps of Engineers, New Orleans Planning (Barton Rogers)
- US Army Corps of Engineers, Vicksburg (Dan Twedt)
- US Department of Agriculture (John Pitre)
- US Department of Agriculture (Marty Floyd)
- US Department of Army, Fort Polk (Danny Hudson)
- US Fish and Wildlife Service (Bill Vermillion)
- US Fish and Wildlife Service (Debbie Fuller)
- US Forest Service, Kisatchie National Forest (Ken Dancak)
- US Geological Survey, National Wetlands Research Center (Carroll Cordes)

### **3. Public Involvement and Partnerships**

LDWF recognized early in the strategy development process that to achieve success in implementing this strategy (1) public participation must be a top priority and (2) this effort must be a multi-agency endeavor.

Public meetings were held across the state to inform the community of the CWCS goals and to gather input (Appendix D). In order to garner further public involvement and develop partnerships, LDWF posted information about the CWCS on its website ([www.wlf.louisiana.gov](http://www.wlf.louisiana.gov)), gave live television and radio interviews, and held statewide meetings to identify species of conservation concern, complete habitat threat assessments and to develop strategies to abate habitat threats. Letters that explained what LDWF planned to accomplish through the SWG program and to encourage partnerships with other parties in the creation of the CWCS were mailed to more than 40 non-government organizations including:

- Acadiana Park Nature Station
- America's Wetland
- Audubon Council
- Barataria-Terrebonne National Estuary Program
- Baton Rouge Audubon Society
- Bayou Haystackers
- Bird Study Group
- Black Bear Conservation Committee
- Coalition to Restore Coastal Louisiana
- Coastal Conservation Association
- Farm Bureau Federation

- Gulf Restoration Network
- Louisiana Forestry Association
- Louisiana Coast
- Lake Pontchartrain Basin Foundation
- Lake Pontchartrain Fishermen's Association
- Louisiana Alligator Farmers & Ranchers Association
- Louisiana Aquaculture Association
- Louisiana Catfish Farmers Association
- Louisiana Cattleman's Association
- Louisiana Crab Task Force
- Louisiana Crawfish Farmers Association
- Louisiana Environmental Action Network
- Louisiana Hiking Club
- Louisiana Inshore Shrimper's Association
- Louisiana Landowners Association
- Louisiana Ornithological Society
- Louisiana Oyster Task Force
- Louisiana Oysters Dealers & Growers Association
- Louisiana Shrimp Association
- Louisiana Universities Marine Consortium
- Louisiana Urban Forestry Council
- Louisiana Wildlife Federation
- Mississippi River Basin Alliance
- Northlake Nature Center
- Orleans Audubon Society
- Sierra Club, Delta Chapter
- Terrebonne Fishermen's Organization
- The Nature Conservancy
- Tulane Green Club
- United Commercial Fishermen's Association
- American – Vietnamese Commercial Fishermen's Union

#### **4. Cooperation with Other States**

LDWF is a member of the Southeast Association of Fish and Wildlife Agencies (SEAFWA) Ad-hoc committee that is comprised of states in the USFWS Region 4. Meetings were held to coordinate development of the CWCS, and to facilitate networking among states to solve CWCS-related issues. LDWF also sponsored a meeting of adjacent states including Texas, Arkansas, and Mississippi to coordinate cross-border species and habitat issues.

## B. Species of Conservation Concern

The primary focus of this CWCS is **species of conservation concern**, meaning those wildlife species, vertebrate and invertebrate, that show evidence of population declines within Louisiana. In order to ensure the long-term survival of species of conservation concern and the habitats they depend upon, this plan will focus on:

- habitats in need of protection and restoration;
- species of conservation concern that depend upon these habitats;
- habitats that are presently secure but may be subject to future degradation and loss; and
- species that are considered to be stable at the present but exhibit the potential for future population declines.

This strategy follows a two tiered approach: a coarse filter approach focused on landscape-level habitats, and a fine filter approach focused on individual species. The coarse filter approach allows for identification of those habitats subject to the greatest amount of stress/threats, and most in need of conservation. It is anticipated that roughly 85%-90% of the species in Louisiana can be identified and protected within these habitats using this method (Hartley et al. 2000). The fine filter approach allows for those individual species not covered by the coarse filter approach to be identified and individually managed. Species that are wide-ranging or have very local distributions may benefit from strategies developed for high-ranked or umbrella species.

The species of conservation concern list for the CWCS was developed based on the Natural Heritage methodology (Stein and Davis 2000). In order to categorize the current rarity status of Louisiana's species and habitats, the LNHP within the LDWF assigns ranks to the state's natural communities, vascular plants, vertebrate, and key invertebrate species. Each species or community is assigned a state rank (S1 to S5) (Appendix E) based on the following factors:

- estimated number of Element Occurrences (EOs)
- estimated state abundance
- state range
- adequately protected EOs
- threat of destruction
- ecological fragility

NatureServe, the parent organization for the Natural Heritage Network, assigns global ranks (G1 to G5) to species and natural communities based on the same factors, expanded to include consideration of the status over the entire natural range of each species or natural community (Appendix E).

The LNHP maintains EO data in the Geographical Information System (GIS)-based Biotics data system used by the Natural Heritage Network. Data are collected only for those species that are considered rare or threatened. EO data are collected for both rare

and common natural communities (habitats) known to occur in the state. Species attaining a rank status of S1-S2-S3 form the base list for target species of conservation concern in this strategy.

### **C. Species Prioritization Process**

This strategy focuses on those species of conservation concern that are experiencing population declines in Louisiana and in need of immediate conservation attention. In addition, the strategy will focus on those species that are migratory (primarily birds, butterflies, and to a lesser extent marine mammals) and use habitats within Louisiana during some part of their life cycle. With regard to terrestrial and aquatic invertebrates, the strategy will focus on butterflies, crawfish, and mussels in this first iteration. Future iterations of this strategy will attempt to construct conservation strategies for other groups of terrestrial and aquatic invertebrates in greater detail. However, it is expected that management strategies developed for the current taxonomic groups and their habitats will provide some benefit to terrestrial and aquatic invertebrates not mentioned in the first iteration of this plan.

The following criteria were used in the species prioritization process:

- Species classified as state species of conservation concern (S1-S2-S3)
- Species that are globally ranked as G1, G2, or G3
- Species that have been designated as needing immediate conservation attention through rangewide/nationwide status assessments. Examples include information contained in national bird conservation plans such as the Partners In Flight Conservation Plan, the U.S. Shorebird Conservation Plan, and the North American Waterfowl Plan
- Species which are locally endemic

The draft species list was developed and distributed to seven the technical expert committees (Appendix C) for review. These committees also provided input regarding species distributions by habitat type within Louisiana.

### **D. Taxonomic Groups**

The following discussion by taxonomic group supplies information on the current status for each group within the state. These discussions also provide a supportive line of reasoning regarding development of the **species of conservation concern lists** for each group (Appendix F).

#### **1. Amphibians and Reptiles**

---

There are 134 species of amphibians and reptiles occurring within Louisiana and its adjacent waters (Dundee and Rossman 1989). However, Louisiana is unique among high-diversity states in that it has no endemic species. Most of the species of conservation

concern are stable in adjacent states, which compromises Louisiana's herpetofaunal importance on a global scale. The greatest diversity is in the Florida Parishes, east of the Mississippi River. St. Tammany Parish alone is home to 104 species. Secondary areas of high diversity are in the dissected uplands of central Louisiana. Areas with the lowest species diversities are in the coastal marshes and Mississippi floodplain.

Fourteen species of amphibians (8 salamanders, 4 frogs, 2 toads) and 30 species of reptiles (14 turtles, 3 lizards, 1 skink, 12 snakes) are considered species of conservation concern by the LNHP (2002). The dusky gopher frog and ornate chorus frog are considered extirpated in Louisiana as recent surveys have been unable to document their continued existence (Siegel and Doody 1992, Thomas 1996). All of the marine turtles occurring in Louisiana are federally and state listed as threatened or endangered species. Four of the 5 are considered endangered and one, the loggerhead sea turtle, is considered threatened. U.S. Fish and Wildlife Service (USFWS) recovery plans have been developed for each (NMFS and USFWS 1991a, 1991b, 1992a, 1992b, 1993). Other federally-listed species include the gopher tortoise (USFWS 1990a) and the ringed map turtle (USFWS 1986). The Black pine snake and Louisiana pine snake are candidate species for federal-listing.

Each native amphibian and reptile species was evaluated on the basis of 10 parameters, with values of 1 to 4 (Boundy and Shively, 1997). Associated ranks are the sum for each of the 10 parameters. Seventy-five individuals with herpetological interests in Louisiana were afforded the opportunity to evaluate all of these species. The 23 individuals who comprised the technical committee are listed in Appendix C.

The present target list is based on the combined LNHP and Boundy and Shively lists, except as follows: Southern dusky salamander was added to the list because of documented drastic population declines (B. Means, personnel communication), supported by observations in Louisiana. John Carr (personnel communication) provided the following recommendations for map turtles: common map turtle (*Graptemys geographica*) was removed because the single Louisiana record is probably based on waif dispersal from Arkansas. Mississippi map turtle (*Graptemys pseudogeographica kohnii*) was removed because it is ubiquitous based on recent surveys. Sabine map turtle (*Graptemys ouachitensis sabinensis*) was added because it appears to have been extirpated from parts of its range, and status surveys are needed to determine its distribution. Gulf Coast box turtle (*Terrapene carolina major*) was removed because one of the key ranking factors, commercial harvest, is no longer in effect. Texas horned lizard (*Phrynosoma cornutum*) was removed because there is no evidence that the species was ever native to Louisiana. Southeastern crowned snake (*Tantilla coronata*) was added because it has only been found at one site in the past twenty years (J. Boundy, personnel observation). Timber rattlesnake (*Crotalus horridus*) was added due to a documented steady decline in eastern Texas (C. Rudolph, personnel communication), coupled with its sensitivity to human disturbance factors.

## 2. Birds

---

Approximately 160 species of birds are year-round residents or probable confirmed breeders in Louisiana (Wiedenfeld and Swan 2000) and another 244 are known to regularly migrate through or winter in the state or its immediate adjacent waters (Lowery 1954). There are 69 species on the CWCS species of conservation concern list of which 42 species are considered critically imperiled, imperiled, or rare and local by the LNHP (2002). Shorebirds and songbirds constitute the majority of species. Nine species are game birds. Recovery plans have been developed by the USFWS for federally-listed avian species found in Louisiana including the brown pelican (*Pelecanus occidentalis*), bald eagle (*Haliaeetus leucocephalus*), red-cockaded woodpecker (*Picoides borealis*), piping plover (*Charadrius melodus*), and interior least tern (*Sterna antillarum athalassos*) (USFWS 1986, 1990b, 2003; LDWF 2005). The brown pelican was delisted in the U.S. Atlantic coast, Florida, and Alabama in 1985. The USFWS was petitioned in 1998 to delist the species in Louisiana. However, the brown pelican is currently listed as endangered in the state and is ranked imperiled (S2) by the LNHP. The bald eagle (USFWS 1989a), which has been recently proposed for delisting (USFWS 1999), is expanding its range in the state.

Five of the 8 federally-listed species are believed to be extirpated in Louisiana. There are occasional reports of sightings of the ivory-billed woodpecker (*Campephilus principalis*) in the state, with the latest report occurring in the spring of 1999. A subsequent attempt to document its presence in Louisiana was unsuccessful (Fitzpatrick 2002), and it is no longer considered to occur in Louisiana. However, with the recent discovery of this species in Arkansas in 2004 (Fitzpatrick 2005), LDWF made the decision to include the ivory-billed woodpecker on the CWCS species list in the event that it may be rediscovered in the state. Other species with historical range in Louisiana but now considered extirpated include Attwater's greater prairie chicken (*Tympanuchus cupido attwateri*), Bachman's warbler (*Vermivora bachmanii*), and Eskimo curlew (*Numenius borealis*). Efforts are currently being considered to reintroduce the whooping crane to Louisiana (S. King, personnel communication).

Biological objectives for avian species targeted in this strategy reflect the combined objectives of the Partners-in-Flight (PIF) North American Landbird Conservation Plan (Rich et al. 2004), North American Waterfowl Management Plan (NAWMP Committee 2004), North American Waterbird Conservation Plan (Kushlan et al. 2000), U.S. Shorebird Conservation Plan (Brown et al. 2001), American Woodcock Management Plan (USDI 1990), Northern Bobwhite Conservation Initiative (Dimmick et al. 2002), and USFWS species recovery plans.

The species of conservation concern list for birds was developed using multiple data sources. The first step was to consult the LNHP (2002) species of conservation concern list and to expand this list with data from the USFWS proposed list of priority bird species occurring in Louisiana (C. Hunter, personnel communication) and the PIF list. PIF scores for each of the 4 Bird Conservation Regions (BCR) occurring within



Louisiana were averaged to provide an overall score for all species which breed, winter, or reside in the state. PIF scores were determined by methods described in Rich et al. (2004). Species above the numeric ranking value (n=19) for low importance set forth by the PIF national plan were considered of critical importance and added to the list. Birds of low importance and rare birds tracked by LNHP were placed on the state watch list which is comparable to the stewardship list developed by PIF. The second step was to distribute this list to the 37 technical advisory experts for review and revision (Appendix C).

Species that do not occur on a regular basis within the boundaries of the state or that are no longer found within the state were excluded. These species include the Cerulean warbler (*Dendroica cerulea*) and Bewick's wren (*Thryomanes bewickii*). Some museum collection data from the Louisiana State University (LSU) Museum of Natural Science, detailing occurrences of certain species within the state, were used to further refine the list.

### 3. Mammals

---

Seventy mammal species have been recorded from Louisiana or its immediate adjacent waters (Lowery 1974). Ten species are considered critically imperiled, imperiled, or rare and local by the LNHP (2002). Three bat species, the silver-haired bat (*Lasiurus noctivagans*), big brown bat (*Eptesicus fuscus*), and northern myotis (*Myotis septentrionalis*), were recently discovered in Louisiana (Crnkovic 2003), and are considered as critically imperiled (S1) in the state. Louisiana is the most eastern and southern state in the distribution of the hispid pocket mouse (*Chaetodipus hispidus*) (NatureServe 2005) and it is currently ranked as an imperiled species. The eastern harvest mouse (*Reithrodontomys humulis*), southeastern shrew (*Sorex longirostris*), long-tailed weasel (*Mustela frenata*), and spotted skunk (*Spilogale putorius*) also are considered either imperiled or vulnerable in Louisiana. Of the eight federally-listed species, only the Louisiana black bear (*Ursus americanus luteolus*) and the West Indian manatee (*Trichechus manatus*) are currently receiving conservation attention in the state. The red wolf (*Canis rufus*) (USFWS 1990c) is considered to be extirpated from Louisiana, and the Florida panther (*Puma concolor coryi*) and ringtail (*Bassariscus astutus*) are of historical occurrence in Louisiana (Leberg et al. 2004, M. Hafner personnel communication, M. Carloss, personnel communication). Recovery plans for the Louisiana black bear (USFWS 1995b), West Indian manatee (USFWS 2001), finback whale (*Balaenoptera physalus*) and sei whale (*Balaenoptera borealis*) (USFWS 1998), and Florida panther (USFWS 1995a) have been developed by the U. S. Fish and Wildlife Service. There are no plans to reintroduce the Florida panther to Louisiana at this time.

Nutria (*Myocastor coypus*) and wild hogs (*Sus scrofa*) are two invasive mammal species that threaten several target habitats. Native to South America, nutria first became established in coastal Louisiana in the 1930's after escaping or being released from captivity. Soon after, feral populations were established near the Gulf Coast and in the early 1940's, expanded their range from into marshes from Port Arthur, Texas to the



Mississippi River. Nutria damage became evident in Louisiana in the 1950's when their population was estimated to have reached 20 million. Nutria was the primary target for Louisiana trappers from the 1960's to the early 1980's, when prices for fur on the world market and in Louisiana fell drastically. Since then, the annual trapping harvest has declined significantly which has caused an increase in the destructive effects of nutria grazing on coastal wetlands. Nutria have been blamed for accelerating coastal erosion, destroying marsh plants, and decreasing muskrat (*Ondatra zibethica*) populations. Wild hogs were introduced intentionally for domestic use in colonial times and in the mid-1900s for sport hunting. They inhabit forests and marshes throughout Louisiana and they can cause extensive damage to hurricane-protection levees and natural habitats throughout the state by rummaging, digging, and generally damaging soils and plants (LDWF 2004).

Mammal species included in this plan are generally those currently tracked by LNHP because they are considered to be critically imperiled or imperiled due to their rarity or vulnerability. Furthermore, the current list of mammal species tracked by LNHP was reviewed by experts (Appendix C), and their comments are incorporated into the list. As a result of their review, two bat species were added (southern myotis and northern myotis) and there was one recommendation to keep the ringtail in the target species list.

#### **4. Fishes**

---

##### **a. Freshwater Fish**

Louisiana's high aquatic species diversity is due primarily to the complexity of aquatic habitats which range from small quiet streams and bayous, oxbows, and backwater areas, to large river systems such as the Mississippi, Atchafalaya, and Red, to estuarine areas of coastal Louisiana. One hundred forty-eight species of freshwater fishes are known to occur in Louisiana (Douglas 1974). Of these, roughly 21 species inhabit both fresh and salt-water environments. Twenty-seven species are considered critically imperiled, imperiled, or rare and local (LNHP 2002). A management plan for the paddlefish in Louisiana has been developed by LDWF (Reed 1991). Federally-listed species for which recovery plans have been developed include the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) (USFWS et al. 1995c) and pallid sturgeon (*Scaphirhynchus albus*) (USFWS 1993). The pearl darter (*Percina aurora*) has a historical range within the state but is now considered extirpated (Suttkus et al. 1994).

The fisheries technical team (Appendix C) identified 109 species of freshwater fish that are or may be of conservation concern within the state. Some of these species are widely distributed, whereas others have localized distributions. For example, many species only occur in small, clear-flowing sandy-bottom streams east of the Mississippi River (Douglas 1974). Little is known about the life history or distribution of many of these more restricted fish species. Potential threats experienced by fish species differ among river systems and drainage types.

The list of freshwater fish species of conservation concern (Appendix F) was obtained from state ranks provided by NatureServe (2005) and the LNHP database. University personnel from LSU and University of Louisiana at Monroe (ULM) were consulted for potential modifications to the NatureServe data. State ranks were modified for Gulf sturgeon, paddlefish, and blue sucker (*Cypleptus elongatus*) based on recent sampling by LDWF Inland Fisheries personnel.

## **b. Marine Fish**

Marine fishes occur in a wide range of habitats, from low-salinity marshes and estuaries to deep-water and open-ocean pelagic environments. Due to the productivity of Louisiana's coastal wetlands and bays, about 95% of its recreational and commercial fishery production comes from species that are estuarine-dependent for some portion of their life cycle.

Less well known are population levels of the non-commercial species of fish and invertebrates – the vast majority of the species present – that inhabit these estuarine environments. Their presence is believed to be critical to the functioning of the natural systems, and further surveys are needed to determine the status of these populations. Surveys might also be designed to provide information that furthers the understanding of ecological processes in these systems.

Louisiana wetlands are currently experiencing rapid changes associated with a wide range of natural and anthropogenic influences. These changes have the potential to reduce populations of a wide variety of organisms. There is no comprehensive list of marine fish species found along the Louisiana Gulf Coast, but ichthyologists estimate that approximately 400 species occur in the state's marine waters. Both wetland loss and stabilization of those losses are long-term issues, and the biological effects of these issues on the species that depend on these habitats are not well understood. This is especially true of species that are not commercially or recreationally harvested. While a fair amount of information exists on environmental and ecological requirements of commercially important species such as penaeid shrimp species, blue crab (*Callinectes sapidus*), and several of the estuarine and marine finfish species, comparable information is not available for most other species. While commercially valuable stocks may serve as umbrella species for a group of non-commercial species with similar life history parameters, many of these species life history parameters are not well understood.

Several anadromous species have been listed as species of conservation concern due to degradation of essential habitats, such as sea grass beds, estuarine marshes, and freshwater spawning and nursery areas (Musick et al. 2000). These include syngnathids (pipefishes and seahorses), an anadromous sturgeon, one topminnow, and an anadromous herring. Additional anadromous species may have been extirpated.

The focus of the state's management for this wide variety of species is to better understand how natural and anthropogenic events influence the abundance and diversity

of species in these environments. The species selected for this process have close affinity to marsh or submerged vascular vegetation for most or all of their life cycle.

The list of marine fisheries species of conservation concern (Appendix F) was compiled through input from LDWF personnel, university specialists and by analysis of seine data from the LDWF Finfish Monitoring Program (Appendix C). These species were chosen because they are not heavily fished, either recreationally or commercially, and are not generally caught as by-catch, but are ecologically important as an indicator species due to their dependence on Louisiana's coastal marshes. They represent different salinity regimes from 0 to 30 ppt. for all marine habitats listed.

## 5. Mussels

---

North American freshwater mussels (Family Unionidae and Margaritiferidae) are currently one of the world's most imperiled taxonomic groups (Master et al. 2000). There are 297 species and subspecies of mussels recognized in the United States (Turgeon et al. 1988). The southeastern United States contains the greatest species diversity with 269 species, of which 64 species (21.5% of the U.S. total) are currently known to occur in Louisiana (Neves et al. 1997). Of these, 30 species are ranked as critically imperiled or imperiled in the state by the LNHP (2002). Federally-listed species include pink mucket (*Lampsilis abrupta*) (USFWS 1976), fat pocketbook (*Potamilus capax*), inflated heelsplitter (*Potamilus inflatus*) (USFWS 1992), and Louisiana pearlshell (*Margaritifera hembeli*), the only mussel species endemic to Louisiana (USFWS 1989b). The brass mucket (*Actinonaias ligamentina*) is considered extirpated from the state. Twenty-nine rare mussel species for the state are known to occur in multiple states, and six of these species have ranges reaching into Canada. Two of the state's species are found in only one other state besides Louisiana, the Mississippi pigtoe (*Pleurobema beadleianum*) in Mississippi and the Louisiana pigtoe (*Pleurobema riddellii*) in Texas.

Invasive species that displace native bivalves and threaten Louisiana's mussels are the Asiatic clam (*Corbicula fluminea*) and the zebra mussel (*Dreissena polymorpha*). The Asiatic clam was first found in Louisiana in the early 1960's (Vidrine 1993), and they currently inhabit the Pearl, Red, Mississippi, Calcasieu, Sabine and Atchafalaya River basins and probably other basins as well. The zebra mussel, first found in Louisiana early in 1993 (Vidrine 1993), has settled in portions of the Mississippi and the Atchafalaya rivers using the Mississippi River as a travel corridor into Louisiana. Washboard (*Megalonaias nervosa*), three-ridge (*Amblema plicata*), ebonyshell (*Fusconaia ebena*), mapleleaf (*Quadrula quadrula*), and pimpleback (*Quadrula pustulosa*) are the harvestable mussels in Louisiana for the culture industry (Vidrine 1993).

Mussel species included in this plan (Appendix F) are those currently tracked by the LNHP because they are considered to be critically imperiled or imperiled due to their rarity or vulnerability. Furthermore, the current list of mussel species tracked by the LNHP was reviewed by experts (Appendix C) and their comments were incorporated into the list.

## 6. Crustaceans

---

There are 338 crawfish species in the United States, the southeast being the world's hotspot for crawfish diversity (Taylor et al. 1996). Thirty-four crawfish species are known to occur in Louisiana (Crandall and Fetzner 2001; J. Walls, personnel observation). Fourteen of these crawfish species are considered critically imperiled, imperiled, or rare and local by the LNHP (2002), including two endemic species, the Calcasieu painted crawfish (*Orconectes blacki*) and Kisatchie painted crawfish (*Orconectes maletae*). Regardless of the preferred habitat, the viability of many of the rare crawfish is threatened because of their small ranges. Any habitat degradation severe enough to cause extirpation of these species at a single site or sites could also lead to their extinction (Taylor et al. 1996).

Crustacean species included in this plan (Appendix F) are those currently tracked by the LNHP because they are considered to be critically imperiled or imperiled due to their rarity or vulnerability. Furthermore, the current list of crustacean species tracked by the LNHP was reviewed by experts (Appendix C) and their comments were incorporated into the list.

## 7. Butterflies

---

The LNHP does not currently track butterflies species, nor does it have current data on the status of this taxonomic group in Louisiana. However, LDWF's strategy committee has agreed that efforts should be made to include butterfly species as targets within the CWCS. University experts (Appendix C) were consulted and asked to provide information on Louisiana's current butterfly diversity and their biological status, along with recommendations on which species are of conservation concern (Appendix F).

## E. Habitats

Developing a species conservation strategy must begin with identifying habitats or natural communities present within the state and assessing:

- their importance to species of conservation concern
- threats facing each habitat
- the habitat's viability

Once this is accomplished the habitats are then ranked.

The habitat types within the state have been separated into terrestrial and aquatic systems. Separate categories allow for a thorough review of habitats within the two systems, and facilitate implementation of conservation actions based on similarity of management techniques and strategies. Terrestrial systems include all habitat types

(wetlands and uplands) that are important to birds, mammals, amphibians, reptiles, and butterflies. Aquatic systems include the bayous, streams, rivers, marshes, and lakes and bays that are important to fish, mussels, crustaceans, and many reptile species (turtles).

## **1. Terrestrial Habitats**

Natural communities are composed of groups of plant and animal species that regularly or often occur in association with each other in certain landscapes or physical environments. Habitat types are the specific natural communities where a plant or animal resides or is ordinarily found. Nature is seldom divided into discrete units and is characteristically composed of a continuous mosaic of natural communities. The factors that help to define a particular community (i.e., associated vegetation, soil, substrate, hydrology, topography, climate, fire history) usually exist along gradients, and therefore every occurrence of a natural community will be unique in some way. The habitat classification developed for the strategy has levels of distinctiveness that are defined according to the physical and biotic factors that occur repetitively at various locations, and are recognized as habitat or potential habitat for native wildlife species occurring within Louisiana.

A system for classifying natural communities and an inventory of a region's natural resources are essential for a complete understanding of the natural resources of that region, and also provide the framework for determining the area's protection priorities and research needs. Protecting natural communities preserves the ecological functions of the area while also providing the added benefit of safeguarding both the rare and common species occurring within that community type.

The terrestrial habitat types described in this document are based on the natural community classification outlined by LNHP (1986-2004) which was developed using the National Vegetation Classification (NVC). The NVC system, created by TNC to address the needs of their conservation planning and programs, is now accepted as a classification standard used by all federal agencies (Grossman et al. 1998, Anderson et al. 1998). Some of the natural community types in the LNHP document were combined based on similarities in floristics and management strategies. It should be noted that the term terrestrial is used loosely here to refer to all non-aquatic habitats associated with a soil substrate and having emergent to upland vegetation types.

Appendix G lists the terrestrial habitat types of Louisiana by ecoregion within the state and provides state and global rankings assigned to each habitat type by LNHP. Accurate mapping of habitat distributions is not currently possible for many terrestrial types due to data gaps, but general vegetation distributions are available. Figure 3.1 contains a broad view of presettlement natural vegetation types within the state (Newton 1972). Louisiana contains six ecoregions (Fig. 2.3) or areas of general similarity in ecological systems and natural resources present to those areas. Terrestrial habitat types were assigned by ecoregion to facilitate viability and stress assessments of those habitat types and the development of conservation strategies. Strategies were structured based on threats ongoing in each particular ecoregion of the state that potentially affect wildlife



habitats. State ranks are developed by LNHP and global ranks by NatureServe based on research, scientific literature, statewide inventories, and consultation with scientific experts.

## 2. Aquatic Habitats

Aquatic habitats were separated into two categories: freshwater and marine systems. Freshwater systems were assessed by management basin as defined by the LDEQ (Fig. 2.11). Habitats within basins were assessed by the following stream type designations: backwater, head water, main channel, side channel, and tributary. Marine systems assessments were based on geomorphic features of the water bottoms located in Louisiana's coastal waters. Marine habitats included: soft mud bottom, shell/shellhash bottom, hard mud/clay bottom, sandy bottom and open water.

As with terrestrial habitats, strategies for aquatic habitats were structured based on threats ongoing in each particular basin, or the coastal waters that potentially affect wildlife habitats. Unlike terrestrial habitats, there are no state or global rankings developed for these habitats.

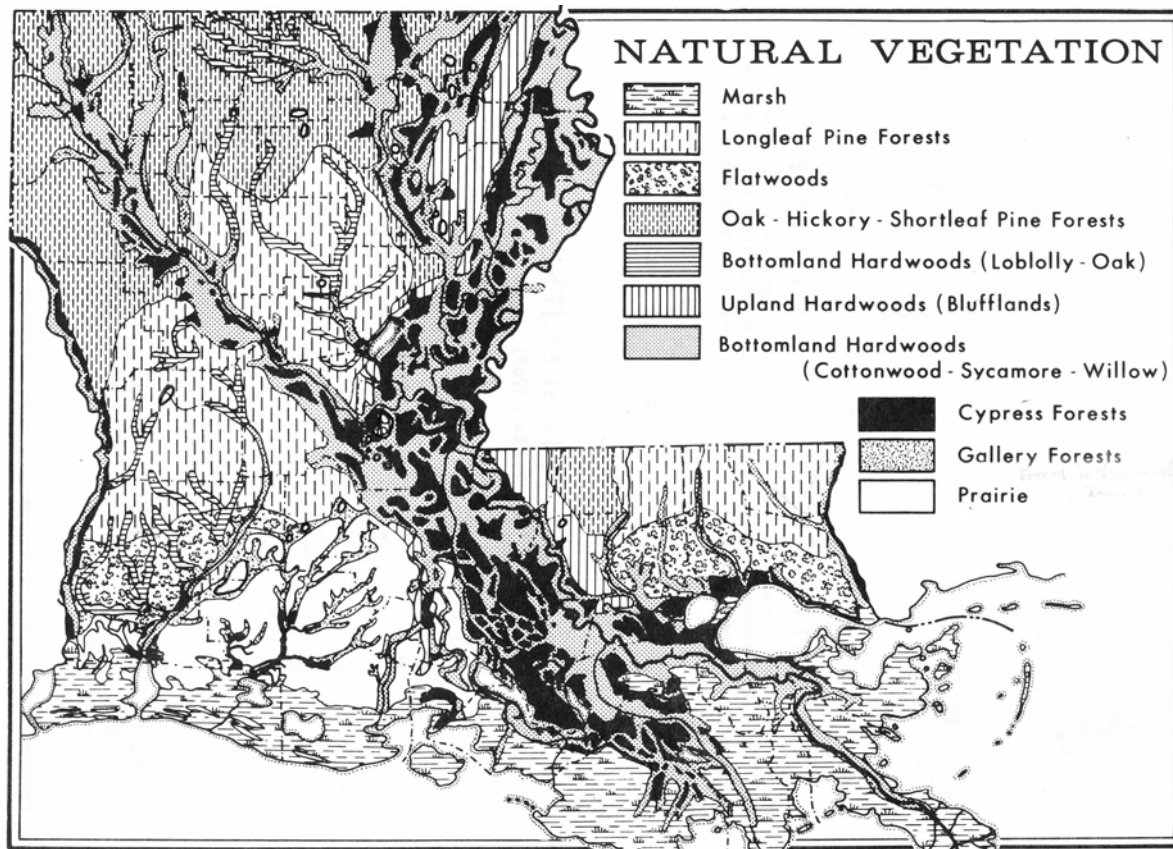


Figure 3.1. Primary natural vegetation types and presettlement distribution in Louisiana (Newton 1972).



## F. Threats to Species of Concern and Related Habitats

The majority of the threats affecting Louisiana wildlife and their respective habitats are the direct or indirect result of encroachment by human development and related development pressures. Rapid population growth and subsequent demands on the state's natural resources have resulted in substantial habitat losses. Early impacts from human activities, such as the establishment of the state's agriculture base, resulted in the clearing and cultivation of prime alluvial areas, and have all but extirpated the coastal prairies of the southwestern parishes. Live oak cheniers and natural levee forests, found at higher elevations in the Gulf Coast Prairies and Marshes ecoregion, were the first to be developed for construction of roadways and home sites. During the last century the leveeing of the Mississippi River, construction of canal networks, and other development activities in marsh habitats have seriously degraded the state's coastal ecosystems. Expected population increases over the next century will create greater demands for residential sites, increase water usage and wastewater issues, increase the number of vehicles on the roads, and increase commercial and industrial development. All of these issues will have some impact on Louisiana's wildlife and associated habitats.

In order to effectively identify and address the widespread threats to wildlife habitats, an assessment of habitat viabilities and threats to each habitat type was needed. A listing of habitat threats and sources of those threats was compiled using TNC's Site Conservation/Measures of Success Workbook software (2000) and from input provided by the LDWF Core Committee and the CWCS Habitat Assessment Committee (Appendix H). Habitat types were evaluated by ecoregion, basin or coastal waters. Viability was assessed as a measure of the following three conditions:

- Size - a measure of the area of the habitat's occurrence
- Condition - an integrated measure of the composition, structure, and biotic interactions that characterize the occurrence
- Landscape Context - an integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the habitat occurrence and connectivity

Threats were then identified for each habitat type within ecoregion, basin, or coastal waters and these threats were rated by severity (level of damage expected over the next 10 years) and scope (geographic scope of impact expected over the next 10 years). A stress rating for each threat was calculated using the combination of severity and scope ratings. Next, the sources of the threats were rated as to their contribution to the overall threat and its irreversibility potential. For example, habitat destruction/conversion was identified as a major threat to Eastern Longleaf Pine Savannahs in the East Gulf Coastal Plain. Tremendous population growth has occurred in this ecoregion (20-30% increase between 1990-2000) and is expected to continue at a high level over the next decade (Figure 2.2). This threat was given a "Very High" rating in both severity and scope due to the sources of the habitat conversion threat, namely residential development. The combined ratings for severity and scope resulted in a stress rating of "Very High". The contribution of residential development to Eastern Longleaf Pine Savannah habitat

destruction/conversion was considered “Very High” and it was rated “Very High” in irreversibility potential. A source rating for the threat (residential development) was calculated from the combined scores for contribution and irreversibility. The final threat rating resulted from the combined source/stress rating from the viability table. The rankings of threats and sources of threats resulting from these assessments were used to prioritize threats to habitats within ecoregion, basin or coastal waters and this information was then used to develop conservation strategies addressing major threats for each habitat type. In order to develop conservation strategies to address the threats to species and their associated habitats, statewide meetings were held in order to gather technical and public input (Appendix I). As an example of the assessment procedure, the spreadsheets from the East Gulf Coastal Plain habitat/threats assessment may be viewed in Appendix J. A listing of all Threats and Sources of Threats identified during this assessment process and their definitions are found in Appendix K and Appendix L, respectively.

### G. Threats to Terrestrial Habitats

Threats that appeared repeatedly across terrestrial habitats and ecoregions included:

- Habitat destruction or conversion
- Habitat fragmentation
- Habitat disturbance
- Altered habitat composition and structure

**Habitat destruction or conversion** involves actions that permanently alter a habitat so that natural functions and values of the ecosystem are disrupted and are not considered restorable. Historically, this threat was widespread across all habitats throughout the state, and it remains a current threat facing wildlife habitats throughout Louisiana. When habitat destruction or conversion occurs, **habitat fragmentation** follows. The remaining habitat becomes isolated on the landscape as it is divided into smaller and smaller blocks. Wildlife populations in these fragmented habitats are isolated from other breeding populations, face increased competition for limited resources, and come into conflict with other land uses.

The sources of threat for both **habitat destruction** and **habitat fragmentation** include:

- **Residential development** – This source of threat is greatest in the EGCP, UEGCP, and areas surrounding major urban centers of the state
- **Commercial/industrial development** – This source of threat follows occurrence patterns similar to residential development
- **Conversion to agriculture or other forest types** – These actions completely remove the natural plant associations of a habitat, can damage soils, and displace native wildlife species
- **Development of pipelines, roads or utilities** – Construction activities destroy habitats, result in fragmentation of surrounding habitats, and can serve as vectors for invasive and alien species introductions

- **Channelization of rivers or streams** – This source of threat directly destroys aquatic species habitat
- **Gravel mining** – These activities also destroy aquatic habitats, often impact adjacent small stream forests
- **Construction of ditches, drainage or diversion systems** – This source of threat alters natural hydrology of a site and can result in destruction of wetland habitats

**Habitat disturbance** involves actions that may alter some aspects of a habitat, but these changes, while serious, are generally not permanent, or can be ameliorated through restoration efforts or management actions.

The sources of threat for **habitat disturbance** include:

- **Invasive/alien species** - Invasive plant and animal species pose a serious source of threat for most habitat types across the state, and can profoundly alter natural systems. These species can out-compete native species for limited resources, and many become pervasive, dominating entire habitats. Early detection and control are essential to halt the expansion of invasives.
- **Incompatible forestry practices** - This source of threat includes forest management activities that may alter in some way the natural processes or characteristics of a habitat type. These practices include but are not exclusive to activities such as broad application of herbicides that decrease diversity and alter composition of herbaceous plant layers, fire suppression causing denser tree and understory cover and decreased diversity in the understory, logging on sites when soils are saturated causing rutting and compaction, even-aged forest management and monoculture stands which decrease habitat diversity, and bedding of an area to enhance timber production of off-site commercial species.
- **Residential development** – This source of threat includes indirect affects from residential communities to surrounding natural habitats such as non-point source pollution causing degradation of wetlands, recreational use that damages soils, and introduction of invasive species that out-compete native flora and fauna.
- **Development of pipelines, roads or utilities** – This source of threat includes construction and maintenance activities that alter surrounding natural habitats such as stream siltation, storage of construction equipment, application of herbicides, and clearing of rights-of-way.
- **Construction of ditches, drainage or diversion systems** – This source of threat includes activities that alter the hydrology of natural systems such as construction of drainage ditches to either remove water from or divert water to a site.
- **Channelization of rivers or streams** – As with development of pipelines, roads and utilities, this source of threat includes construction and maintenance activities that alter surrounding natural habitat.

**Altered composition and structure** refers to changes in plant community species composition and community structure that result from human activity. Plant species usually associated with, or naturally occurring in, a certain habitat may or may not be present, they may not occur in expected numbers, or other species generally not occurring

in the habitat might become established. In addition, the natural habitat structure may be altered such that wildlife food and foraging areas, or nesting sites are no longer available. As with habitat disturbance, these changes can seriously alter a habitat type, but they can often be reversed through appropriate management or restoration efforts.

The sources of threats identified for **altered composition and structure** include:

- **Fire suppression** - Refers to the changes occurring in the historic frequency or patterns of fire in a natural habitat due to competing or surrounding land use practices, and public perceptions. Many of Louisiana's natural communities are fire adapted or dependent including all longleaf pine associations, bogs, and prairies. These plant and animal species associations developed in the presence of regular fire cycles, and fire is critical to maintaining these natural habitats. Fire has numerous benefits to natural systems (Moore 2001), including:
  - Seedbed preparation
  - Reducing woody plant competition
  - Preventing establishment and spread of invasive species
  - Recycling nutrients
  - Reducing hazardous fuel build-up
  - Maintaining herbaceous layer species diversity
  - Maintaining quality and abundance of food and nesting sites for many species

When natural fire regimes are altered or removed, all of the above benefits are lost, and the natural system composition and structure is altered through species succession and/or the establishment of invasive species.

- **Invasive/alien species** – Invasive or exotic plant species alter natural systems by out-competing native plants for habitat resources and replacing them within the plant community composition. Invasive or alien animal species can also alter composition and structure through severe disturbance of a habitat causing loss of certain native plant species in an area or allowing the introduction of invasive plants.
- **Incompatible forestry practices** – Some forestry or forest management practices such as establishment of monoculture stands, planting of off-site tree species or fire suppression alter the plant associations normally found in a habitat and change the natural community structure.
- **Construction of ditches, drainage or diversion systems** - These activities alter the hydrology of natural systems that can lead to a change in plant and animal species composition.
- **Livestock production practices** – These practices can damage aquatic habitats by decreasing water quality and related factors that, in turn, cause changes in aquatic species associations of a habitat.
- **Operation of dams and reservoirs** – As with construction of ditches, drainage or diversion systems, these activities alter the hydrology of natural systems, disrupting the transport of important nutrients and sediments and block the

movement of aquatic species that can lead to a change in native species associations.

## **H. Threats to Aquatic Habitats**

The decline of many native fish and mussel species is a result of the reduced quantity and quality of available habitat. Other specific causes of decline include levee construction, damming and channelization of the state's major rivers, including the Atchafalaya, Mississippi, Pearl, Red, and Sabine Rivers, for flood control and navigation along with agricultural uses, deforestation, erosion, pollution, and introduced species.

Threats that appeared repeatedly across basins included:

- Modification of water levels/changes in natural flow patterns
- Sedimentation
- Habitat disturbance
- Nutrient loading
- Altered composition and structure

Top sources of threats across all basins include:

- Channelization of rivers or streams
- Construction of navigable waterways
- Dam construction
- Invasive/alien species
- Levee or dike construction
- Oil and gas drilling
- Operation of dams and reservoirs
- Commercial/industrial development
- Conversion to agriculture or other forest types

## **I. Prioritization of Terrestrial Habitats by Ecoregions**

Conservation actions or strategies were developed for each terrestrial habitat and key wildlife species of conservation concern within each of the habitats to address threats identified by the habitat assessments. In order to maximize conservation benefits using available resources, ranking or prioritization lists of habitats were developed. These lists of priority habitats will allow LDWF to direct conservation efforts to those wildlife habitats and associated species of concern that need the most attention, and will bring the greatest benefit to the maximum number of species.

A process was formed to create the habitat priority list, and, as with the threats assessments, this process was completed by ecoregion (Chart 3.1). Within each ecoregion, the habitats were divided into two groups or tiers based on whether or not they occurred only in that ecoregion (Tier 1) or in multiple ecoregions (Tier 2). This first step

in the process gave priority to those habitats with limited ranges, ensuring that threats to these habitats and conservation needs would not be overlooked.

In the second step, completed within each tier, the habitats were divided into two groups, matrix habitats or secondary habitats. A matrix habitat is a natural community that represents the primary or predominant habitat type found within a particular region (ecoregion, parish, river basin, etc.) or is considered to have dominated a region prior to European settlement. Determination of presettlement matrix habitats for a region is based on factors such as local vegetation, soils, topography, hydrology, climate, fire history, and historic accounts and records. Secondary habitats were considered all other habitats naturally occurring in a particular ecoregion.

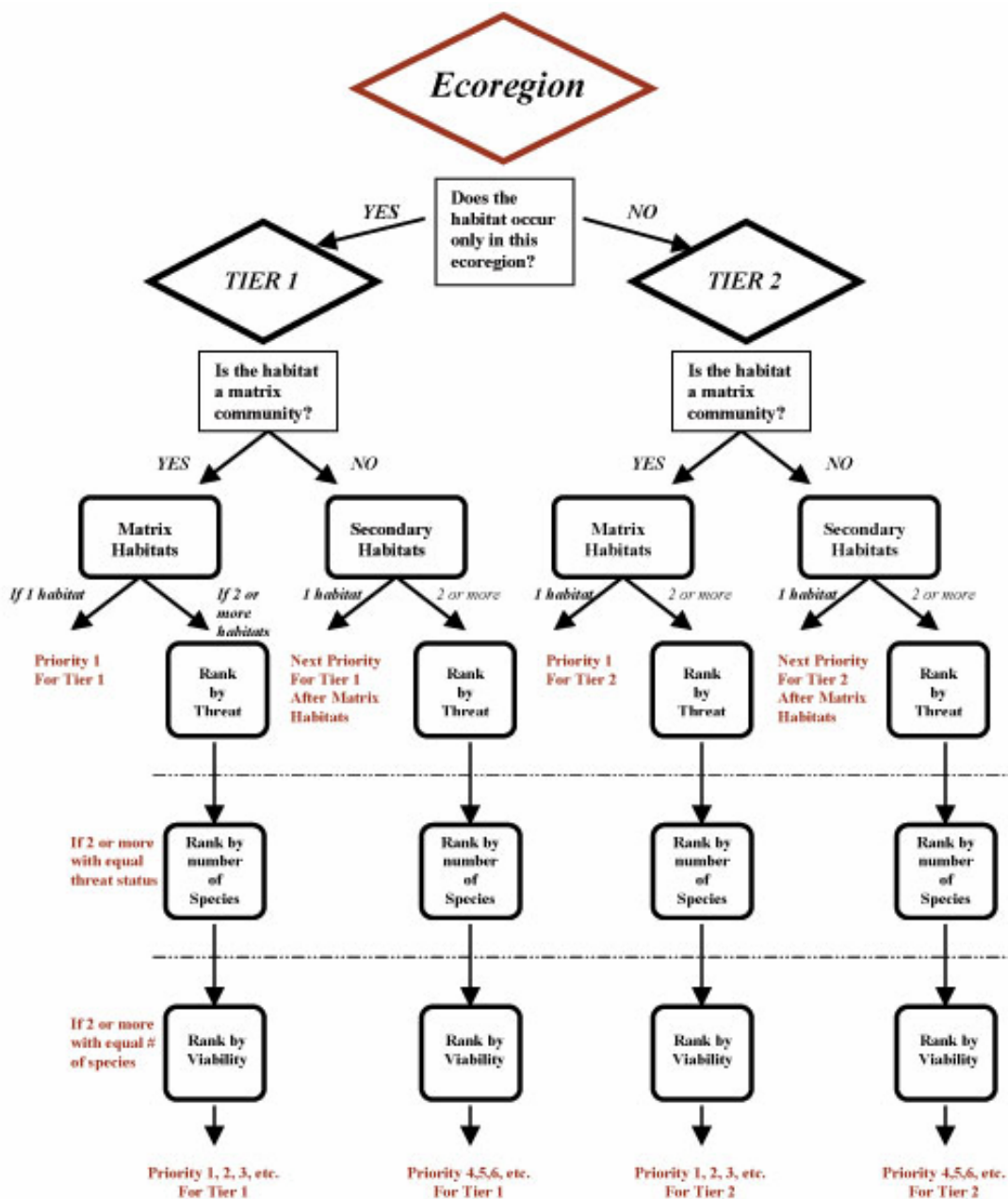


Chart 3.1. Terrestrial habitat prioritization process flowchart.



The third part of the process is completed within both the matrix and secondary habitat groups of each tier. If there is only one habitat, then it becomes priority one. If there are two or more habitats in a group, then they are ranked using three variables. The first variable is threat status. Habitats with a very high threat status are given first priority, followed by high threat status habitats, and then medium and low threat status habitats. If there is more than one habitat within a threat status category, then these habitats are ranked by number of species of conservation concern, and those habitats with the highest number of species are given preference. If the number of species between habitats is the same, then their final ranking is determined by viability rank. In this case, those habitats with good viability have first preference, followed by rankings of fair and poor viability. The resulting terrestrial habitat priority lists are found in Appendix M. It should be noted that Agriculture-Crop-Grassland was not included in the prioritization process because it is an artificial habitat type, not a natural community. However, since many species of conservation concern utilize this habitat type, strategies were developed to address threats to the habitat, and conservation actions were planned to implement the strategies.

#### **J. Prioritization of Aquatic Habitats**

Establishing priorities within aquatic habitats is difficult due to the overall lack of ecological and biological information for the majority of aquatic habitats and associated species of conservation concern. With this first iteration, development of a priority process was not possible due to these data gaps. Therefore, the highest priority for freshwater and marine systems is to initiate and support research on species assemblages to determine their ecological and biological needs.

This Page Intentionally Left Blank