

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**

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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

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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

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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 (*Lasionycteris 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**

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##### **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

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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 beadleanum*) 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

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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

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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