

CHAPTER 4. SPECIES OF GREATEST CONSERVATION NEED

A. Species of Greatest Conservation Need

The primary focus of the Louisiana Wildlife Action Plan (WAP) is the recovery of Species of Greatest Conservation Need (SGCN), those wildlife species in need of conservation action within Louisiana. SGCN may be species for which population declines have been documented or suspected, or species that may be subject to population declines within the next 10 years. Other species are included because more data are needed to accurately determine their status. The identification of SGCN is Element # 1 of the Eight Required Elements for State WAPs. This Chapter also addresses Elements # 3 (Threats to SGCN, priority research and survey needs for SGCN) and # 4 (Description of conservation actions necessary to conserve SGCN).

For details on the approach the Louisiana Department of Wildlife and Fisheries (LDWF) used to revise the 2005 SGCN list during the 2015 revision, refer to Chapter 3 (Approach). For additional information on the 2005 approach, refer to Appendix B. This Chapter contains the updated SGCN list for Louisiana, binned by taxonomic group. For a complete list of SGCN in taxonomic order, see Appendix I. Within each taxonomic group, the SGCN are divided into three tiers, with Tier I containing those species that are most in need of immediate conservation action. For detailed information on the factors and methodology used to determine these tiers, see Chapter 3. Research needs and conservation actions that have been identified for Louisiana SGCN can be found in Section C below. There are a total of 345 animal SGCN identified in this 2nd iteration of the Louisiana WAP, compared to 240 SGCN in the 2005 WAP. Ultimately, 25 SGCN identified in the 2005 WAP were removed from the list, and 130 SGCN were added (for details see the Summary of Changes). Almost half (61) of the newly identified SGCN are invertebrates, reflecting a more consistent effort to address these species.

B. Threats, Research Needs, and Conservation Actions

Threats are described briefly for each taxonomic group below. These descriptions are not comprehensive, but rather focus on major or specific threats to each group. Threats were considered at the level of the 1st level threats provided by Salafsky et al. (2008). Table 4.1 provides a summary of which threats are most pervasive in each group.

Table 4.1 1st Level Threats to SGCN

First Level Threat	Mollusks	Crustaceans	Arthropods	Inland Fishes	Marine Fishes	Herps	Birds	Mammals
Residential/Commercial Development		x	x			x	x	x
Agriculture/Aquaculture		x	x			x	x	x
Energy Production & Mining	x	x	x	x	x	x	x	x
Transportation & Service Corridors	x	x	x	x	x	x	x	x
Biological Resource Use	x		x			x	x	x
Human Intrusion/Disturbance	x	x	x	x	x	x	x	x
Natural System Modification	x	x	x	x	x	x	x	x
Invasive & other Problematic Species	x	x	x	x	x	x	x	x
Pollution	x	x	x	x	x	x	x	x
Geological Events								
Climate Change & Severe Weather	x	x	x	x	x	x	x	x

For more information on the threats posed by invasive species and climate change, refer to Chapters 6 and 7 of this WAP, respectively.

Specific research needs and conservation actions are presented below for many SGCN. However, these actions are not exhaustive and are not intended as the only conservation priorities for these species.

C. SGCN by Taxonomic Group

1. Mollusks

North American freshwater mussels (Families Unionidae and Margaritiferidae) are currently one of the world's most imperiled taxonomic groups (Master et al. 2000). Approximately 300 species of mussels are recognized in the United States (U.S.) (Williams et al. 2008). The southeastern U.S. contains the greatest species diversity with approximately 270 species, of which at least 64 species (~ 24% of the U.S. total) are currently known to occur in Louisiana (Neves et al. 1997). Of these 64 species, 24 species are ranked as imperiled or critically imperiled in the state by the Louisiana Natural Heritage Program (LNHP 2015). Federally-listed species include Rabbitsfoot (USFWS 2013), Pink Mucket (USFWS 1976), Fat Pocketbook (USFWS 1989), Inflated Heelsplitter (USFWS 1992), and Louisiana Pearlshell, the only mussel species endemic to Louisiana (USFWS 1989b). In addition to 33 freshwater mussels, two snails, one aquatic and one terrestrial, are included on the SGCN list. Finally, five marine mollusks are included due to their dependence on highly restricted habitats within Louisiana. At

least three of the five marine mollusk SGCN are currently known only from Marine Seagrass Beds at the Chandeleur Islands.

a. Mollusk SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Sandbank Pocketbook	<i>Lampsilis satura</i>	G2	S2
Black Sandshell	<i>Ligumia recta</i>	G4G5	S1
Louisiana Pearlshell	<i>Margaritifera hembeli</i>	G1	S1
Southern Hickorynut	<i>Obovaria jacksoniana</i>	G2	S1S2
Pyramid Pigtoe	<i>Pleurobema rubrum</i>	G2G3	S2
Inflated Heelsplitter	<i>Potamilus inflatus</i>	G1G2Q	S1
Bay Scallop	<i>Argopecten irradians</i>	G5	S1
Sawtooth Penshell	<i>Atrina serrata</i>	G5	S1
Half-Naked Penshell	<i>Atrina seminuda</i>	GNR	S1
Tier II			
Butterfly	<i>Ellipsaria lineolata</i>	G4G5	S1
Pink Mucket	<i>Lampsilis abrupta</i>	G2	S1
Plain Pocketbook	<i>Lampsilis cardium</i>	G5	S1
Fatmucket	<i>Lampsilis siliquoidea</i>	G5	S2
White Heelsplitter	<i>Lasmigona complanata</i>	G5	S1
Hickorynut	<i>Obovaria olivaria</i>	G4	S1
Alabama Hickorynut	<i>Obovaria unicolor</i>	G3	S1
Mississippi Pigtoe	<i>Pleurobema beadleianum</i>	G3	S2
Louisiana Pigtoe	<i>Pleurobema riddellii</i>	G1G2	S1S2
Ouachita Kidneyshell	<i>Ptychobranhus occidentalis</i>	G3G4	S1
Rabbitsfoot	<i>Quadrula cylindrica</i>	G3G4	S1
Monkeyface	<i>Quadrula metanevra</i>	G4	S1
Southern Creekmussel	<i>Strophitus subvexus</i>	G3	S1
Silty Hornsnail	<i>Pleurocera canaliculata</i>	G5	S2
Channeled Whelk	<i>Busycotypus canaliculatus</i>	GNR	S1
Lightning Whelk	<i>Busycon sinistrum</i>	GNR	S1
Tier III			
Mucket	<i>Actinonaias ligamentina</i>	G5	SH
Rayed Creekshell	<i>Anodontooides radiatus</i>	G3	S2
Western Fanshell	<i>Cyprogenia aberti</i>	G2G3Q	SH
Elephant-Ear	<i>Elliptio crassidens</i>	G5	S3
Spike	<i>Elliptio dilatata</i>	G5	S2S3

Ebonyshell	<i>Fusconaia ebena</i>	G4G5	S3
Southern Pocketbook	<i>Lampsilis ornata</i>	G5	S3
Texas Heelsplitter	<i>Potamilus amphichaenus</i>	G1G2	SH
Fat Pocketbook	<i>Potamilus capax</i>	G2	S1
Creeper	<i>Strophitus undulatus</i>	G5	S2
Southern Rainbow	<i>Villosa vibex</i>	G5Q	S2
Texas Pigtoe	<i>Fusconaia askewi</i>	G2G3	S3
Round Pearlshell	<i>Glebulula rotundata</i>	G4G5	S4
Fawnsfoot	<i>Truncilla donaciformis</i>	G5	S3
Flamed Tigersnail	<i>Anguispira alternata</i>	G5	S1

b. Threats to Mollusks

Sand and gravel mining operations pose a direct threat to some mussels, because such activities may result in the degradation or complete loss of habitat. Construction of infrastructure associated with transportation projects may directly impact mussel habitat or lead to reduced water quality, as may the use of off-road vehicles (ORVs) near or upstream of occurrences of SGCN. Modifications to streams, including the building and operation of dams, construction of weirs, removal of snags and woody debris for aesthetic or navigational purposes, and excessive removal of ground or surface water all have the potential to decrease habitat quality and quantity. Additionally, the clearing of riparian zones often leads to increased sedimentation, which increases turbidity and may cause the extirpation of some mollusks. Another threat to water quality is through organic enrichment and the concomitant alteration of the microbial community caused by Feral Hog activity within streams, which may also result in the direct destruction of mussel beds (Kaller et al. 2007). In addition to sediment, the input of household, industrial, and agricultural effluents into streams poses a threat to freshwater mollusks. Sea level rise (SLR) threatens freshwater mollusks in coastal streams due to increases in salinities and threatens marine mollusks through the loss of seagrass beds associated with Barrier Islands. If climate change results in decreased precipitation in our region, many freshwater mollusks may be threatened, because reductions in rainfall could lead to a reduction of in-stream flow.

c. Mollusk Research and Monitoring Needs

- Update historical occurrence records and obtain data on current status, distribution, and abundance of all mussel SGCN (prioritized by S-rank), particularly in the Red River, Bayou Bartholomew, Tensas River, and any areas not surveyed within the last decade.
- Determine the host fish(es) of mussel SGCN.
- Monitor mussel SGCN in streams impacted by pollution events.
- Develop and implement standardized monitoring protocols for mollusk SGCN.
- Delineate marine mollusk habitat at the Chandeleur Islands.
- Determine threats to mussel SGCN (prioritized by S-rank).

SH -Ranked Mussels (Mucket, Western Fanshell, Texas Heelsplitter)

- Determine if these species are extant in Louisiana.

Louisiana Pearlshell

- Implement the recently developed standardized monitoring protocol throughout the range on both public and private lands.

Silty Hornsnail

- Determine the current status and distribution of this species.

Flamed Tigersnail

- Determine the current status and distribution of this species.

Penshells, Whelks, & Bay Scallop

- Determine the current status and distribution of these and other marine mollusks at the Chandeleur Islands.

d. Mollusk Conservation Actions

- Collaborate with the U.S. Fish and Wildlife Service (USFWS) Natchitoches National Fish Hatchery and other partners to develop propagation and restocking techniques and initiate restocking efforts where needed.
- Work with parishes, the Louisiana Department of Transportation and Development (DOTD), and other partners to install oversized culverts below grade to allow passage of host fishes and, otherwise, to minimize impacts of road/bridge/culvert construction and replacement on stream quality.
- Partner with parishes to encourage the retention of riparian buffers and discourage stream clearing for storm water drainage.
- Work with timber companies to encourage designation of streamside management zones (SMZs) within actively managed areas.
- Maintain in-stream flows at levels that will support populations of rare mussels and host fishes.
- Conserve and restore the Chandeleur Islands and adjacent, shallow-water habitats such as Marine Seagrass Beds.
- Restrict or outlaw the use of ORVs in streams, particularly the practice of “mud-riding” through streambeds.
- Discourage the creation of weirs, dams, and reservoirs on streams and rivers supporting mollusk SGCN.
- Work with partners to remove low-water sills on the Pearl River to benefit mollusk SGCN.

- Work with the LDWF Scenic Rivers Program to minimize sand and gravel mining operations in streams that support mollusk SGCN.

Louisiana Pearlshell

- Partner with USFWS and other stakeholders to implement the recommendations and meet the recovery goals of the Louisiana Pearlshell Recovery Plan (USFWS, *In revision*) and the 5-Year Review (USFWS 2011).
- Work with landowners to implement Best Management Practices (BMPs) to improve water quality in streams inhabited by Louisiana Pearlshell.

Inflated Heelsplitter

- Work with the Scenic Rivers Program to prevent negative impacts from sand and gravel mining in the Amite River.
- Manage the Amite River to benefit Freshwater Drum (*Aplodinotus grunniens*), the host fish for this species.
- Work with partners to reduce and mitigate the impacts of urbanization adjacent to the Amite River.

2. Crustaceans

There are 338 crawfish species in the U.S., with the southeast being the world's hotspot for crawfish diversity (Taylor et al. 1996). Thirty-five crawfish species are known to occur in Louisiana (Walls 2009). Twenty of these crawfish species are considered rare and local, imperiled, or critically imperiled by LNHP (2015), including at least five endemic or apparently endemic taxa: Teche Painted Crawfish, Calcasieu Painted Crawfish, Ouachita Fencing Crawfish, Caddo Chimney Crawfish, and Calcasieu Creek Crawfish. Population viability of many of these 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 a few sites could also lead to their extinction (Taylor et al. 1996). In addition to crawfish, four species of marine shrimp are included on the SGCN list, primarily due to a lack of data for these species.

a. Crustacean SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Calcasieu Painted Crawfish	<i>Orconectes blacki</i>	G2	S1
Caddo Chimney Crawfish	<i>Procambarus machardy</i>	G1G2	S1
Pine Hills Digger	<i>Fallicambarus dissitus</i>	G4	S2
Tier II			
Teche Painted Crawfish	<i>Orconectes hathawayi</i>	G3	S3

Kisatchie Painted Crawfish	<i>Orconectes maletae</i>	G2	S2
Ribbon Crawfish	<i>Procambarus bivittatus</i>	G5	S2
Javelin Crawfish	<i>Procambarus jaculus</i>	G4	S1
Elegant Creek Crawfish	<i>Procambarus elegans</i>	G4	S2
Twin Crawfish	<i>Procambarus geminus</i>	G3G4	S2
Old Prairie Digger	<i>Fallicambarus macneesei</i>	G3	S2
Flatwoods Digger	<i>Fallicambarus oryctes</i>	G4	S2
Sabine Fencing Crawfish	<i>Faxonella beyeri</i>	G4	S2
Ouachita Fencing Crawfish	<i>Faxonella creaseri</i>	G2	S2
Calcasieu Creek Crawfish	<i>Procambarus pentastylus</i>	G3	S3
Pearl Blackwater Crawfish	<i>Procambarus penni</i>	G3	S3
Flatnose Crawfish	<i>Procambarus planirostris</i>	G4	S3
Pontchartrain Painted Crawfish	<i>Orconectes hobbsi</i>	G4Q	S3
Southwestern Creek Crawfish	<i>Procambarus dupratzi</i>	G5	S2
Tier III			
Vernal Crawfish	<i>Procambarus viaeviridis</i>	G5	S1
Gulf Crawfish	<i>Procambarus shermani</i>	G4	S2
Beach Ghost Shrimp	<i>Callichirus islagrande</i>	GNR	SU
Carolinian Ghost Shrimp	<i>Callichirus major</i>	GNR	SU
Peppermint Shrimp	<i>Lysmata wurdemanni</i>	GNR	SU
Estuarine Ghost Shrimp	<i>Lepidophthalmus louisianensis</i>	GNR	SU

b. Threats to Crustaceans

Loss of habitat due to development or conversion of land for agriculture may threaten some primary and secondary burrowing crawfishes, especially those that have restricted distributions. The threats posed by sand and gravel mining, transportation infrastructure, ORVs, stream modification, Feral Hogs, pollution, and climate change discussed in “Threats to Mollusks” above also apply to many stream dwelling crustaceans. The backfilling of ditches, although not a modification of a “natural” system, nonetheless negatively impacts some crawfishes, because species that utilize ephemeral wetlands sometimes are found associated with ecologically stable ditches. Furthermore, the application of herbicides to control vegetation in such waterways may also threaten some crawfishes by reducing cover and food availability or through direct mortality caused by sensitivity to the herbicide (Walls 2009). An additional potential threat to crawfish SGCN is the introduction of non-native crawfishes into Louisiana waterways.

c. Crustacean Research and Survey Needs

- Research life history strategies of all crawfish SGCN:
 - Size/age at maturity, longevity, and survivorship.
 - Habitat requirements and preferences, including microhabitat preferences.

- Population estimates and trends.
- Reproductive ecology [including fecundity and behavior of ovigerous (“in berry”) females].
- Behavior, including migratory patterns, competition, and niche partitioning.
- Conduct drainage-wide surveys for all crawfish SGCN, including extensive surveys for stream dwelling species beyond bridge crossings and historical localities.
- Determine the appropriate in-stream characteristics that should be targeted during stream restoration activities (e.g., dissolved oxygen levels, depth, flow, canopy cover, submerged structure).
- Examine feasibility and efficacy of providing artificial cover in areas lacking sufficient cover.
- Determine the lethal levels of common pollutants on crawfish.
- Monitor streams and other occurrences of rare crawfishes for the presence of non-native crawfishes and emerging diseases.
- Develop standardized sampling protocols for monitoring known occurrences of rare crawfishes to track population trends and improve understanding of population dynamics.
- Evaluate current habitat threats and develop strategies to abate those threats.
- Investigate the impacts of Chinese Tallow on Ephemeral Pond dwelling rare crawfishes.

d. Crustacean Conservation Actions

- Work with parishes and DOTD to minimize negative impacts of new stream crossings and to mitigate negative impacts of existing stream crossings, including promoting placement of submerged culverts.
- Work with landowners and the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) to encourage the retention of riparian buffers.
- Ensure the presence of adequate cover (wood, vegetation, artificial debris) in streams known to harbor rare crawfish.
- Maintain in-stream flows and water depths at levels that will support populations of rare crawfish.
- Target degraded streams within the known range of one or more rare crawfish for experimental restoration.
- Develop education/outreach materials concerning the unique native crawfishes of Louisiana and the potential threats posed by non-native crawfishes and habitat degradation.
- Protect and restore ephemeral wetlands for the benefit of primary and secondary burrowing species.
- Encourage the retention of vegetation in known ditch occurrences of rare crawfishes.
- Develop Habitat Suitability Indices (HSIs) for rare crawfishes.

Pine Hills Digger & Flatwoods Digger

- Protect and restore mesic/wet open pine systems.

3. Non-crustacean Arthropods

Unlike many more well-known taxa, there is no readily available number of species of non-crustacean arthropods in Louisiana. Fifty-seven insects, one spider, and one scorpion are included as SGCN. For the majority of these SGCN, the primary needs are baseline data, because this group is the most poorly known of Louisiana's fauna. To be sure, the dearth of available subject-matter experts on these taxonomic groups resulted in very limited expert input for these species. The list of butterfly SGCN from the 2005 WAP, along with the list of insects currently tracked by the LNHP, forms the backbone of the non-crustacean arthropod list. Baseline studies of these taxa to address known data gaps may lead to significant revision of this list for the next iteration of the WAP.

a. Non-crustacean Arthropod SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Yellow Brachycercus Mayfly	<i>Sparbarus flavus</i>	G4Q	S2
Pitcher Plant Spiketail	<i>Cordulegaster sarracenia</i>	G1	S1
Texas Emerald	<i>Somatochlora margarita</i>	G2	S2
Louisiana Needlefly	<i>Leuctra szczytkoi</i>	G2	S1
Comanche Harvester Ant	<i>Pogonomyrmex comanche</i>	G2	S2
Schoolhouse Springs Net-spinning Caddisfly	<i>Diplectrona rossi</i>	G1	S1
Spring-loving Psiloneuran Caddisfly	<i>Agarodes libalis</i>	G3	S1
Bay Skipper	<i>Euphyes bayensis</i>	G2G3	S1
Louisiana Eyed Silkmoth	<i>Automeris louisiana</i>	G1G3	S1
Tier II			
Southern Unstriped Scorpion	<i>Vaejovis carolinianus</i>	G5	S1
Hodges' Clubtail	<i>Gomphus hodgesi</i>	G3	S1
Southern Snaketail	<i>Ophiogomphus australis</i>	G1G2	S1
Texas Forestfly	<i>Amphinemura texana</i>	G3	S3
Masked Springfly	<i>Helopicus bogaloosa</i>	G3	S2
Eastern Beach Tiger Beetle	<i>Habroscelimorpha dorsalis venusta</i>	G4T3T4	S2
Sandbar Tiger Beetle	<i>Ellipsoptera blanda</i>	G3G4	S3
Cajun Tiger Beetle	<i>Dromochorus pilatei</i>	G4	S3
Saline Prairie Scarab Beetle	<i>Ataenius robustus</i>	GNR	S1
Little Dubiraphian Riffle Beetle	<i>Dubiraphia parva</i>	G1G3	S1
Six-banded Longhorn Beetle	<i>Dryobius sexnotatus</i>	GNR	S1

Florida Harvester Ant	<i>Pogonomyrmex badius</i>	G5	S1
Morse's Net-spinning Caddisfly	<i>Cheumatopsyche morsei</i>	G1G3	S1
Holzenthals Philopotamid Caddisfly	<i>Chimarra holzenthali</i>	G1G2	S1
Ceraclea Caddisfly	<i>Ceraclea spongillovorax</i>	G3G4	S2
Molson's Microcaddisfly	<i>Hydroptila molsonae</i>	G2G3	S1
Schoolhouse Springs Purse Casemaker Caddisfly	<i>Hydroptila ouachita</i>	G1G2	S1
Hydroptilad Caddisfly	<i>Hydroptila poirrieri</i>	G2	S2
Creole Pearly Eye	<i>Lethe creola</i>	G3G4	S3
Georgia Satyr	<i>Neonympha areolatus</i>	G3G4	S3
Wild Indigo Duskywing	<i>Erynnis baptisiae</i>	G5	S2S3
Lace-winged Roadside Skipper	<i>Amblyscirtes aesculapius</i>	G3G4	S3
Dusky Roadside Skipper	<i>Amblyscirtes alternata</i>	G2G3	S2S3
Celia's Roadside Skipper	<i>Amblyscirtes celia</i>	G4	SU
Arogos Skipper	<i>Atrytone arogos</i>	G3	S1
Dusted Skipper	<i>Atrytonopsis hianna</i>	G4G5	S3
Palatka Skipper	<i>Euphyes pilatka</i>	G3G4	S1
Dion Skipper	<i>Euphyes dion</i>	G4	SU
Obscure Skipper	<i>Panoquina panoquinoides</i>	G5	S1
Meske's Skipper	<i>Hesperia meskei</i>	G3G4	S1
Western Pygmy Blue	<i>Brephidium exilis</i>	G5	S1S2
Eastern Pygmy Blue	<i>Brephidium pseudofoea</i>	G5	S1S2
Gulf Pine Sphinx	<i>Lapara phaeobrachycerous</i>	G3G4	S3
Brou's Mallow Moth	<i>Bagisara brouana</i>	G3	S3
Nutmeg Underwing	<i>Catocala atocala</i>	G3G4	S1S2
Tier III			
Texas Brown Tarantula	<i>Aphonopelma hentzi</i>	GNR	S3
White Sand Tiger Beetle	<i>Ellipsoptera wapleri</i>	G3G4	S2S3
American Bumble Bee	<i>Bombus pensylvanicus</i>	G3G4	S3S4
Frosted Elfin	<i>Callophrys irus</i>	G3	S2S3
Little Metalmark	<i>Calephelis virginensis</i>	G4	S4
Mottled Duskywing	<i>Erynnis martialis</i>	G3	S3
Pepper and Salt Skipper	<i>Amblyscirtes hegon</i>	G5	SU
Cobweb Skipper	<i>Hesperia metea</i>	G4	SU
Yucca Giant Skipper	<i>Megathymus yuccae</i>	G5	S1
Strecker's Giant Skipper	<i>Megathymus streckeri</i>	G5	S1
Falcate Orangetip	<i>Anthocharis midea</i>	G4G5	S4?
Seminole Texan Crescent	<i>Anthanassa texana seminole</i>	G5	S3
King's Hairstreak	<i>Satyrium kingi</i>	G3G4	SU

Appalachian Brown	<i>Lethe appalachia</i>	G4	SU
Monarch	<i>Danaus plexippus</i>	G4	S4

b. Threats to Non-crustacean Arthropods

An overarching stress for many terrestrial non-crustacean arthropod SGCN is habitat destruction and alteration resulting from residential or commercial development, as well as conversion of land to agricultural use. The indiscriminate use of insecticides, particularly neonicotinoids, is also a threat to many insects, including butterflies, skippers, and native bees. Finally, although the extent of impacts on native arthropods by the Red Imported Fire Ant (RIFA) is unknown for many species, there is little doubt that negative impacts are occurring; further investigation of those impacts and the persistence of their effects on SGCN, both invertebrate and vertebrate, are warranted. For aquatic insects, many of the same threats and stressors discussed under mollusks and crustaceans pertain.

c. Non-crustacean Arthropod Research and Survey Needs

- Determine the current distribution, status, and limiting factors of all SGCN to fill knowledge gaps for Louisiana and provide baseline data for future assessments.
- Investigate the use of pollinators, including native bees, as indicators of habitat quality and changes in vegetative communities.
- Conduct surveys and other studies of pollinators, including native bees, to determine potential future designation as SGCN.
- Investigate potential negative impacts of RIFA and other invasive ant species on native arthropods, including grass-dwelling skippers.

Southern Snaketail

- Conduct baseline ecological studies as well as research to determine the effects of flooding and water pollution on larvae.

Pitcher Plant Spiketail

- Conduct baseline ecological studies including research on movements, habitat use, demography, and life history.

Texas Emerald

- Conduct baseline studies including research on ecology of naiads and habitat preferences.

Harvester Ants

- Determine threats and limiting factors for both species.

Louisiana Eyed Silkmoth

- Determine the distribution and status of this species.

d. Non-crustacean Arthropod Conservation Actions

- Include insect conservation (with emphasis on rare insects and pollinators) in public education and outreach efforts.
- Coordinate with Xerces Society and other partners to promote the conservation of non-crustacean arthropods.
- Use prescribed fire to maintain appropriate habitat.

Texas Brown Tarantula

- Maintain appropriate habitat with prescribed fire, including at Kisatchie National Forest (KNF).
- Promote the retention of woody debris by land managers.

Southern Unstriped Scorpion

- Promote the retention of woody debris by land managers.

Stream-dwelling Insects

- Work with parishes and DOTD to minimize negative impacts of new stream crossings and to mitigate negative impacts of existing stream crossings, including promoting placement of submerged culverts.
- Work with landowners and NRCS to encourage the retention of riparian buffers.
- Encourage the retention of woody debris in streams supporting rare insects.
- Maintain in-stream flows at levels that will support populations of rare insects.
- Work with the Scenic Rivers Program to prevent negative impacts from sand and gravel mining.
- Buffer odonate breeding habitat during timber harvest.
- Work with partners such as the Louisiana Department of Environmental Quality (LDEQ) to address impairments to streams that will negatively impact stream dwelling insects.

Hodges' Clubtail, Southern Snaketail, Masked Springfly, & Molson's Microcaddisfly

- Work with partners on watershed-level conservation efforts to benefit these blackwater stream species.
- Retain riparian buffers and conserve Small Stream Forest for these species.

Louisiana Needlefly & Schoolhouse Springs Net-spinning Caddisfly

- Partner with The Nature Conservancy (TNC) to conserve and monitor rare insects at Schoolhouse Springs.
- Work with TNC and other partners to monitor and address threats to these species and the Schoolhouse Springs watershed.

Pitcher Plant Spiketail

- Maintain and restore West Gulf Coastal Plain Muck Bogs and Western Hillside Seepage Bogs within known and potential range.

Sandbar Species

- Work with partners to protect/restore Sandbars in Louisiana rivers.
- Control exotic plants (e.g., Salt Cedar, Torpedo Grass, and Cogon Grass) and animals (e.g., Feral Hogs, RIFA) on Sandbars.
- Restrict or outlaw the use of ORVs on riverine Sandbars.

Saline Prairie Scarab Beetle

- Prioritize Saline Prairie conservation and management.

Six-banded Longhorn Beetle

- Conserve mature hardwood forests wherever found within the range of this species.
- Retain large over-mature trees and snags in floodplains and mesic forests.

Comanche and Florida Harvester Ants

- If RIFA are found to be a limiting factor, control RIFA near known occurrences of these species using methods that are not detrimental to Harvester Ants or other SGCN.
- Use prescribed fire to maintain open pine systems.
- Monitor and, if necessary, buffer timber harvest activities around known occurrences to reduce negative impacts from heavy machinery such as soil compaction.

Native Bees, Butterflies, & Skippers

- Provide refugia during prescribed burning efforts by burning in sections whenever possible, and conduct research to determine impacts of various burning schemes.
- Retain and plant native plants on Rights-of-Way (ROWs).

- Develop reliable, affordable, sources of pollinator friendly native plant material and seed.
- Develop recommendations for private landowners for the seasonal timing of mowing to avoid negative impacts to butterflies and skippers, and implement those recommendations on Wildlife Management Areas (WMAs) and other LDWF properties.
- Retain habitat features such as soil mounds, bare soil patches, and snags on LDWF properties to benefit these species.
- Avoid application of insecticides (particularly neonicotinoids) and broadleaf herbicides on LDWF properties and other public lands when possible.
- Restrict and remove honey bee hives from LDWF properties.

Frosted Elfin, Wild Indigo Duskywing, & Strecker's Giant Skipper

- Use prescribed fire to maintain open pine habitat.

Creole Pearly Eye, Lace-winged Roadside Skipper, & Yucca Giant Skipper

- Conserve native cane stands and restore Canebrakes to provide habitat for these species.

Arogos Skipper

- Expand efforts towards Coastal Prairie management and restoration.

Dusky Roadside Skipper & Gulf Pine Sphinx

- Expand efforts towards Longleaf Pine management and restoration.

Dusted Skipper

- Expand efforts towards the management and restoration of prairie and savanna habitats.

Monarch

- Plant native milkweed species in landscaping, mitigation, and habitat restoration efforts.
- Discourage the planting of non-native milkweed species, and provide outreach about the negative impacts of these species.
- Determine and implement proper mowing schedule on WMAs and other LDWF properties to avoid negative impacts.
- Avoid application of insecticides (particularly neonicotinoids) on LDWF properties and public lands when possible.
- Expand conservation of native grasslands within the state.

Louisiana Eyed Silkmoth

- Conserve large patches of unfragmented Salt Marsh.

4. Inland Fishes

Louisiana's high diversity of inland fishes is due primarily to the complexity of aquatic habitats, which range from small streams, bayous, oxbows and backwater areas, large river systems, and estuarine areas of coastal Louisiana. At least 195 fish species have been recorded from freshwater habitats in Louisiana. Thirty-one species of inland fishes are considered rare and local, imperiled, or critically imperiled (LNHP 2015), and 39 species are considered SGCN. 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 (USFWS 1995) and Pallid Sturgeon (USFWS 1993). The Pearl Darter has a historical range within the state but is now considered extirpated (Suttkus et al. 1994).

a. Inland Fish SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Bluehead Shiner	<i>Pteronotropis hubbsi</i>	G3	S2
Flagfin Shiner	<i>Pteronotropis signipinnis</i>	G5	S2
Bluenose Shiner	<i>Pteronotropis welaka</i>	G3G4	S2
Southeastern Blue Sucker	<i>Cycleptus meridionalis</i>	G3G4	S1
Broadstripe Topminnow	<i>Fundulus euryzonus</i>	G3	S2
Gumbo Darter	<i>Etheostoma thompsoni</i>	GNR	S2
Tier II			
Gulf Sturgeon	<i>Acipenser oxyrinchus desotoi</i>	G3T2	S1
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	G2	S1
Alabama Shad	<i>Alosa alabamae</i>	G2G3	S1
Central Stoneroller	<i>Campostoma anomalum</i>	G5	S2
Bluntface Shiner	<i>Cyprinella camura</i>	G5	S2
Steelcolor Shiner	<i>Cyprinella whipplei</i>	G5	S2
Clear Chub	<i>Hybopsis winchelli</i>	G5	S3
Shoal Chub	<i>Macrhybopsis hyostoma</i>	G5	S3
Bigeye Shiner	<i>Notropis boops</i>	G5	S3
Chub Shiner	<i>Notropis potteri</i>	G4	S3
Suckermouth Minnow	<i>Phenacobius mirabilis</i>	G5	S1
Blue Sucker	<i>Cycleptus elongatus</i>	G3G4	S3
River Redhorse	<i>Moxostoma carinatum</i>	G4	S1

Frecklebelly Madtom	<i>Noturus munitus</i>	G3	S1
Western Sand Darter	<i>Ammocrypta clara</i>	G3	S2
Crystal Darter	<i>Crystallaria asprella</i>	G3	S2
Rainbow Darter	<i>Etheostoma caeruleum</i>	G5	S2
Pearl Darter	<i>Percina aurora</i>	G1	SH
Channel Darter	<i>Percina copelandi</i>	G4	S2
Freckled Darter	<i>Percina lenticula</i>	G3	S1
Bigscale Logperch	<i>Percina macrolepida</i>	G5	S2
Gulf Logperch	<i>Percina suttkusi</i>	G5	S2
Tier III			
Shovelnose Sturgeon	<i>Scaphirhynchus platyrhynchus</i>	G4	S4
Paddlefish	<i>Polyodon spathula</i>	G4	S4
American Eel	<i>Anguilla rostrata</i>	G4	S4
Sturgeon Chub	<i>Macrhybopsis gelida</i>	G3	SU
Sicklefin Chub	<i>Macrhybopsis meeki</i>	G3	SU
Longjaw Minnow	<i>Notropis amplamala</i>	G5	S3
Ironcolor Shiner	<i>Notropis chalybaeus</i>	G4	S3
Gulf Pipefish	<i>Syngnathus scovelli</i>	G5	S4
Redspot Darter	<i>Etheostoma artesiae</i>	G5	S3
Stargazing Darter	<i>Percina uranidea</i>	G3	SU
Saddleback Darter	<i>Percina vigil</i>	G5	S3

b. Threats to Inland Fishes

As with crawfishes and aquatic insects, the threats posed by sand and gravel mining, transportation infrastructure, ORVs, stream modification, Feral Hogs, pollution, and climate change discussed under mollusks also apply to many inland fishes, because many inland fish SGCN occupy similar habitats to those taxa. Invasive species, in addition to aforementioned Feral Hogs, are also a major threat to many fish SGCN. Invasive species negatively impact fish SGCN in several ways, including through habitat degradation, increased competition for resources, and direct predation.

c. Inland Fishes Research and Survey Needs

- Determine trends in range and abundance of invasive fishes via sampling.
- Incorporate recommendations of State Management Plan for Aquatic Invasive Species (LDWF 2005) to control invasive fishes.
- Investigate the impacts of sill removal on all fish SGCN in the Pearl River; including surveys before and after removal.
- Resolve the impacts of in-stream flow alterations on fish SGCN.
- Determine optimal habitat conditions for fish SGCN via modeling.

- Determine which habitat characteristics are most important for restoration activities.
- Investigate the impacts of land-use on fish community structure.
- Implement or continue, where applicable, long-term monitoring of all fish SGCN.
- Research habitat requirements, population trends, and distribution of all fish SGCN.
- Develop HSIs for SGCN to aid in future conservation and restoration efforts.

S1 & S2 Inland Fish SGCN

- Determine the current distribution, habitat requirements, and status, including population trend.

Paddlefish

- Determine the status of this species in coastal rivers.
- Determine spawning and nursery habitat locations within rivers.

American Eel

- Determine distribution and population status in Louisiana.

Alabama Shad & River Redhorse

- Determine if these species are still extant in the Lake Pontchartrain basin via targeted surveys.
- Determine the presence/absence and status of the River Redhorse, especially in the Ouachita basin.

Suckermouth Minnow

- Determine if this species is still extant in the Red and Ouachita River systems via targeted surveys.

Blue Sucker

- Monitor this species in the Sabine River.
- Determine the current distribution, habitat requirements, and status in preferred habitat in Anacoco Creek.
- Target preferred habitat for surveys of spawning and rearing juveniles.

Frecklebelly Madtom & Freckled Darter

- Determine if these species are still extant in the Pearl River system via targeted surveys.

Gulf Pipefish

- Conduct a comparison of genetic structure among river-oxbow populations of this species and estuarine-gulf populations.

d. Inland Fishes Conservation Actions

- Remove non-essential dams and low-water sills in Louisiana watersheds where warranted, and discourage the building of new dams.
- Retain riparian buffers.
- Work with parishes, private landowners, and industrial interests (e.g., timber or petrochemical companies) to disseminate BMPs for SMZs.
- Develop recommendations to improve fish passage through low-head dams.
- Expand outreach/education efforts on the importance of riparian zones.
- Coordinate with LDEQ and the Louisiana Department of Natural Resources (LDNR) to protect stream fishes from anthropogenic threats, including treated and untreated wastewater, non-point surface runoff, and water withdrawals for public and industrial water supplies.
- Restrict or outlaw the use of ORVs in streams, particularly the practice of “mud-riding” through streambeds.
- Work with parishes and DOTD to minimize negative impacts of new stream crossings and to mitigate negative impacts of existing stream crossings, including promoting placement of submerged culverts.
- Partner with neighboring states to address conservation of shared fish resources such as the Suckermouth Minnow and the Western Sand Darter.

S1 & S2 Inland Fish SGCN

- Develop HSIs and develop predictive habitat models for these species to aid in restoration and conservation actions.

Gulf Sturgeon

- Implement the federal recovery plan (USFWS 1995) for Gulf Sturgeon as well as the Louisiana State Conservation Plan for Gulf Sturgeon (LDWF 2015).
- Restock this species where populations may have been negatively impacted by anthropogenic activities.

Pallid Sturgeon

- Implement the federal recovery plan (USFWS 1993 and 2014 revision) for Pallid Sturgeon.

Paddlefish

- Implement the Louisiana recovery plan (Reed 1991) for Paddlefish.
- Restock this species where populations may have been negatively impacted by anthropogenic activities.

American Eel

- Install eel ladders at dams throughout the state to aid passage.
- Remove sills from the Pearl River.

5. Marine Fishes

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. Presence of these species 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 further the understanding of ecological processes in these systems. The Smalltooth Sawfish is the only federally listed marine fish in Louisiana, although no critical habitat has been designated at this time (NMFS 2009). Eighteen species of marine fishes have been identified as SGCN during the 2015 WAP revision. Many of these SGCN are very poorly known, due to a lack of appropriate sampling effort. Therefore, for many of these species, the collection of baseline data is high priority.

a. Marine Fishes SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Smalltooth Sawfish	<i>Pristis pectinata</i>	G1G3	S1
Saltmarsh Topminnow	<i>Fundulus jenkinsi</i>	G3	S3
Texas Pipefish	<i>Syngnathus texanus</i>	G1	SU
Goliath Grouper	<i>Epinephelus itajara</i>	G2	S1
Tier II			
Diamond Killifish	<i>Adinia xenica</i>	G5	S4
Bayou Killifish	<i>Fundulus pulvereus</i>	G5	S4
Opossum Pipefish	<i>Microphis brachyurus</i>	G4G5	SU
Chain Pipefish	<i>Syngnathus louisianae</i>	GNR	S4
Tier III			

Tarpon	<i>Megalops atlanticus</i>	G5	S3
Gold Brotula	<i>Gunterichthys lonigpenis</i>	GQ	SU
Dwarf Seahorse	<i>Hippocampus zosterae</i>	GNR	SU
Large-scaled Spinycheek Sleeper	<i>Eleotris amblyopsis</i>	G5	S4
Emerald Sleeper	<i>Erotelis smaragdus</i>	GNR	SU
Frillfin Goby	<i>Bathygobius soporator</i>	GNR	S4
Violet Goby	<i>Gobioides broussonnetii</i>	G5	S4
Broad Flounder	<i>Paralichthys squamilentus</i>	GNR	SU
Southern Puffer	<i>Sphoeroides nephelus</i>	G5	S5
Lemon Shark	<i>Negaprion brevirostris</i>	GNR	S3

b. Threats to Marine Fishes

Many marine fishes utilize marshes at some point in their life, and coastal marshes are often fragmented and subsequently degraded due to canals associated with energy production and the service corridors related to those activities. Furthermore, modifications to the natural hydrology of many systems have had negative impacts on both the quantity and quality of marsh habitat. Invasive species threaten marine fishes on several fronts, from marsh loss due to nutria herbivory to direct predation of smaller native fishes by Lionfish. As with other aquatic SGCN, pollution from multiple sources is a concern. Finally, SLR and tropical cyclones also threaten habitat that is critical to marine species.

c. Marine Fishes Research and Survey Needs

- Determine the status of little known marine fishes (Frillfin Goby, Violet Goby, Emerald Sleeper, Large-scaled Spinycheek Sleeper) and determine habitat preferences of these species via focused surveys using appropriate gear (traps, oyster trays, etc.).
- Develop and test methods to evaluate species distributions, environmental influences on diversity, evenness, and richness of communities, and identify abiotic factors that influence changes in offshore fish communities.
- Research habitat value of sandy shoals off of Louisiana for SGCN.

Lemon Shark

- Determine species distribution in Louisiana.
- Implement long-term monitoring of the Lemon Shark nursery at the Chandeleur Islands.

Smalltooth Sawfish & Goliath Grouper

- Determine if there are reproducing populations of either species in Louisiana.

Tarpon

- Sample blackwater habitat using appropriate gear (e.g., cast nets, stop-nets, etc.) to determine status and habitat use.
- Research conservation genetics of Tarpon in Louisiana.

Texas Pipefish and Opossum Pipefish

- Determine current status and range of this species in Louisiana.

Broad Flounder

- Determine the status of this and other small flatfishes.

Southern Puffer

- Develop sampling methods and conduct targeted surveys to determine current status.

d. Marine Fishes Conservation Actions

- Conserve and restore Barrier Islands.
- Partner with the U.S. Army Corps of Engineers (USACE) to encourage the beneficial use of dredge material.
- Work with the Coastal Protection and Restoration Authority (CPRA), Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) program, USACE Louisiana Coastal Area (LCA) program, and other partners to incorporate strategies for SGCN into future coastal restoration efforts.

Smalltooth Sawfish

- Implement Smalltooth Sawfish Recovery Plan (NMFS 2009).

Tarpon

- Conserve blackwater habitat where found to benefit juvenile Tarpon.

Saltmarsh Topminnow

- Create and maintain emergent marsh islands, including in the Atchafalaya Delta WMA, to benefit this species.

Pipefishes

- Conserve and restore marsh habitat and Submersed Aquatic Vegetation (SAV) beds.

Goliath Grouper

- Construct and retain artificial reefs.

Large-scaled Spinycheek Sleeper

- Restore oyster reefs to benefit this species.

6. Amphibians and Reptiles

One hundred forty species of amphibians and reptiles occur in Louisiana and its adjacent waters (Dundee and Rossman 1989, LNHP 2015). However, Louisiana is unique among high-diversity states in that it has no endemic species. The greatest richness is in the Florida Parishes, east of the Mississippi River. St. Tammany Parish alone is home to 102 species. A secondary area of high richness is in the dissected uplands of central Louisiana. Areas with the lowest species richness include the coastal marshes and Mississippi River floodplain.

Sixteen species of amphibians (10 salamanders, 6 frogs) and 35 species of reptiles (17 turtles, 5 lizards, 13 snakes) are considered SGCN by LNHP (2015). The Dusky Gopher Frog and the Ornate Chorus Frog are considered extirpated in Louisiana (last observed in 1967 and 1954, respectively), and follow-up surveys have been unable to relocate them at historical sites or potential sites (Siegel and Doody 1992, Thomas 1996, Leonard et al. 2003). All marine turtles occurring in Louisiana are federally and state listed: three of the five are endangered, and the Loggerhead Sea Turtle and Green Sea Turtle are 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), Ringed Map Turtle (USFWS 1986), and Dusky Gopher Frog (USFWS 2001). The Black Pinesnake and Louisiana Pinesnake are candidate species for federal listing, with the Louisiana Pinesnake recently proposed for listed as threatened.

a. Amphibian and Reptile SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Louisiana Slimy Salamander	<i>Plethodon kisatchie</i>	G3G4	S1
Four-toed Salamander	<i>Hemidactylum scutatum</i>	G5	S1
Southern Crawfish Frog	<i>Lithobates areolatus areolatus</i>	G4	S1
Tier II			
Eastern Tiger Salamander	<i>Ambystoma tigrinum tigrinum</i>	G5	S1
Southern Dusky Salamander	<i>Desmognathus auriculatus</i>	G5	S1
Webster's Salamander	<i>Plethodon websteri</i>	G3G4	S1

Gulf Coast Mud Salamander	<i>Pseudotriton montanus flavissimus</i>	G5	S1
Southern Red Salamander	<i>Pseudotriton ruber vioscai</i>	G5	S2
Gulf Coast Waterdog	<i>Necturus beyeri</i>	G4	S3
Ornate Chorus Frog	<i>Pseudacris ornata</i>	G5	SH
Dusky Gopher Frog	<i>Lithobates sevosus</i>	G1	SH
Tier III			
Southern Red-backed Salamander	<i>Plethodon serratus</i>	G5	S1
Red River Mudpuppy	<i>Necturus louisianensis</i>	G5	S3
Strecker's Chorus Frog	<i>Pseudacris streckeri</i>	G5	S1
Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	G5	S3
Hurter's Spadefoot	<i>Scaphiopus hurterii</i>	G5	S3

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Ringed Map Turtle	<i>Graptemys oculifera</i>	G2	S2
Pearl River Map Turtle	<i>Graptemys pearlensis</i>	G2G3	S3
Western Chicken Turtle	<i>Deirochelys reticularia miaria</i>	G5	S2
Ornate Box Turtle	<i>Terrapene ornata</i>	G5T5	S1
Black Pinesnake	<i>Pituophis melanoleucus lodingi</i>	G4T2T3	S1
Louisiana Pinesnake	<i>Pituophis ruthveni</i>	G2	S2
Eastern Diamond-backed Rattlesnake	<i>Crotalus adamanteus</i>	G4	S1
Texas Horned Lizard	<i>Phrynosoma cornutum</i>	G4G5	SX
Tier II			
Loggerhead Sea Turtle	<i>Caretta caretta</i>	G3	S1B, S3N
Green Sea Turtle	<i>Chelonia mydas</i>	G3T3	S1N
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	G1	S1B, S3N
Sabine Map Turtle	<i>Graptemys sabinensis</i>	G5T5	S3
Mississippi Diamond-backed Terrapin	<i>Malaclemys terrapin pileata</i>	G4T3Q	S3
Stripe-necked Musk Turtle	<i>Sternotherus minor peltifer</i>	G5	S1
Gopher Tortoise	<i>Gopherus polyphemus</i>	G3	S1
Common Rainbow Snake	<i>Farancia erytrogramma erytrogramma</i>	G4	S2
Northern Mole Kingsnake	<i>Lampropeltis rhombomaculata</i>	G5T5	S1S2
Gulf Saltmarsh Snake	<i>Nerodia clarkii clarkii</i>	G4	S3S4
Pine Woods Littersnake	<i>Rhadinaea flavilata</i>	G4	S1
Southeastern Crowned Snake	<i>Tantilla coronata</i>	G5	S1
Pygmy Rattlesnake	<i>Sistrurus miliarius</i>	G5	S2

Harlequin Coralsnake	<i>Micrurus fulvius</i>	G5	S2
Tier III			
Atlantic Hawksbill Sea Turtle	<i>Eretmochelys imbricata imbricata</i>	G3T3Q	SZ
Alligator Snapping Turtle	<i>Macrochelys temminckii</i>	G3G4	S3
Smooth Softshell	<i>Apalone mutica</i>	G5	S3
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	G2	SZ
Ouachita Map Turtle	<i>Graptemys ouachitensis</i>	G5	S3
Razor-backed Musk Turtle	<i>Sternotherus carinatus</i>	G5	S4
Western Slender Glass Lizard	<i>Ophisaurus attenuatus attenuatus</i>	G5T5	S3
Eastern Glass Lizard	<i>Ophisaurus ventralis</i>	G5	S3
Southern Prairie Skink	<i>Plestiodon septentrionalis obtusirostris</i>	G5T5	S1
Coal Skink	<i>Plestiodon anthracinus</i>	G5	S3
Western Worm Snake	<i>Carphophis vermis</i>	G5	S1
Timber Rattlesnake	<i>Crotalus horridus</i>	G4	S3S4
Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>	G5	S3

b. Threats to Amphibians and Reptiles

As with other taxa, habitat fragmentation, degradation, and conversion resulting from development, agriculture, and transportation infrastructure serve as major stressors to many reptiles and amphibians. Magnitude of impact to these species is exacerbated by their limited mobility which prevents escape to refugia. Annual movements undertaken between breeding and non-breeding habitats characteristic of some reptile and amphibian SGCN exposes individuals to vehicle strikes, Feral Cats, and other hazards. For those species associated with upland habitats, including open pine systems, incompatible habitat management practices such as fire suppression, roller-chopping, and bedding may be an issue. For coastal species, the impacts of oil spills, SLR, and tropical cyclones may be locally devastating. Amphibians are vulnerable to many of the same threats that were discussed for other aquatic species (e.g., improper riparian zone management, climate change, etc.), with species in ephemeral wetlands and smaller streams most likely to be impacted. Over-collecting for the pet trade or for food has the potential to lead to or accelerate declines of long-lived turtle species. Wanton killing of snakes may be a significant source of mortality for some uncommon species such as Eastern Diamond-backed Rattlesnakes. So called “ghost traps” (i.e., derelict crab traps) are well known as a source of mortality for terrapins in some locations, and sea turtles are vulnerable to the impacts of by-catch in the absence of turtle-excluder devices (TEDs). Sandbar-nesting riverine turtles are vulnerable to human disturbance at nesting beaches, as well as nest flooding resulting from inopportune water releases upstream of such beaches. Red Imported Fire Ants are a serious threat to many terrestrial, adult amphibians and reptiles, as well as to the eggs and hatchlings of aquatic turtles. Some native species, such as Raccoons and Coyotes are also a significant source of mortality for some of these SGCN.

c. Amphibian Research and Survey Needs

- Monitor for emerging diseases in Louisiana amphibian populations including, but not limited to, chytridiomycosis (via *Batrachochytrium dendrobatidis* or *B. salamandrivorans*), ranavirus, and Perkinsus-like organism.

Eastern Tiger Salamander

- Determine current status and distribution in Louisiana via intensive, targeted surveys.
- Locate new breeding ponds.
- Conduct intensive, long-term monitoring of known breeding ponds.

Four-toed Salamander

- Locate important ephemeral ponds used for breeding.

Southern Dusky Salamander

- Clarify current distribution and status of this and other *Desmognathus* species in Louisiana.
- Investigate possible causes of decline for this species and other salamanders, including new or emergent diseases.

Southern Red-backed Salamander

- Conduct baseline surveys to clarify distribution and abundance.
- Investigate possible causes of decline for this species and other salamanders, including new or emergent diseases.

Webster's Salamander

- Determine current status of this species, particularly in West Feliciana parish.

Louisiana Slimy Salamander

- Generate population estimate and monitor population for determination of trend.

Gulf Coast Mud Salamander & Southern Red Salamander

- Determine current distribution and status via intensive, targeted surveys.

Gulf Coast Waterdog & Red River Mudpuppy

- Determine current distribution and abundance of both *Necturus* species via intensive sampling.

Ornate Chorus Frog

- Clarify current status via intensive, targeted surveys.
- Locate suitable habitat.

Strecker's Chorus Frog

- Clarify current status in Northwest Louisiana via intensive, targeted surveys.

Eastern and Hurter's Spadefoot

- Determine breeding locations via intensive surveys.

Dusky Gopher Frog

- Locate suitable ponds for reintroduction or areas for the creation of ponds (including Bogue Chitto National Wildlife Refuge (NWR) and Lake Ramsey WMA).

Southern Crawfish Frog

- Determine current status and distribution in Louisiana via intensive, targeted surveys.
- Conduct intensive, long-term monitoring of known breeding ponds.
- Locate potential reintroduction sites and locate new breeding ponds.
- Encourage timber companies to use BMPs (including the use of prescribed fire and elimination of bedding) when managing appropriate Crawfish Frog habitat.

d. Amphibian Conservation Actions

- Implement habitat management recommendations of Partners in Amphibian and Reptile Conservation (PARC) (Bailey et al. 2006) to benefit amphibian SGCN whenever possible on LDWF managed lands, and promote the implementation of such recommendations by private landowners.

Eastern Tiger Salamander

- Work with partners and private landowners to conserve breeding habitat (Ephemeral Ponds).
- Work with partners (DOTD, Parishes, etc.) to improve connectivity between breeding ponds (e.g., culverts and fences) to reduce mortality by vehicle strikes and facilitate gene flow.
- Encourage timber companies to use BMPs (including the use of prescribed fire and elimination of bedding) when managing appropriate Eastern Tiger Salamander habitat.

- Conserve and create open-canopy ponds (e.g., Flatwoods Ponds and other ephemeral wetlands).

Four-toed Salamander

- Determine important ephemeral ponds used for breeding.

Southern Red-backed Salamander

- Encourage timber companies to use BMPs for Hardwood Slope Forest to benefit this species.

Webster's Salamander

- Create and disseminate BMPs for Webster's Salamander
- Conserve Webster's Salamander on WMAs as well as private property by working with landowners.

Louisiana Slimy Salamander

- Implement BMPs and SMZs in appropriate habitat.
- Retain snags, logs, and other woody debris.

Gulf Coast Mud Salamander & Southern Red Salamander

- Implement BMPs to beneficially manage habitat for these species.

Gulf Coast Waterdog & Red River Mudpuppy

- Promote conservation compatible land-use around known occurrences.
- Work with appropriate partners to address water quality issues in streams where occurrence is documented or suspected.
- Promote the use of SMZs to protect water quality in watersheds where these species are found.
- Retain submerged, woody debris.

Eastern Spadefoot

- Work with timber companies to implement BMPs in appropriate habitats.
- Work with landowners to preserve known breeding locations (ephemeral wetlands).

Dusky Gopher Frog

- Create breeding ponds or manage to remove hardwoods from existing ponds in suitable habitat for reintroduction attempts.
- Work with TNC and other partners to provide education and outreach about this species to the public, including landowners.
- Explore opportunities for propagation and reintroduction into Louisiana.

Southern Crawfish Frog

- Explore opportunities for reintroduction.
- Restrict use of bedding during silvicultural activity in suitable or historical habitat.

e. Reptile Research and Survey Needs

- Monitor for emerging diseases in Louisiana reptile populations including, but not limited to, snake fungal disease, upper respiratory tract disease (Gopher tortoise), herpesvirus, etc.

Loggerhead Sea Turtle & Kemp's Ridley Sea Turtle

- Assess beach habitat statewide for nesting suitability and prioritize areas for nesting surveys.
- Document occurrence and level of nesting activity.
- Continue to collect and update data on the distribution of these species in state waters via coordination with Marine Fisheries, and incorporate sea turtle by-catch data into the LNHP database in order to clarify status and distribution.

Alligator Snapping Turtle

- Construct life-history table.
- Monitor population throughout the state to inform population trend calculation.
- Investigate impacts of commercial fisheries by-catch and continued recreational harvest on populations.

Riverine Turtles

- Determine the magnitude of impact of submergence of sandbars due to water releases from upstream reservoirs on productivity of riverine turtles.
- Determine peak nesting times for riverine turtles in all major rivers to support efforts to minimize negative impacts to productivity.

Ringed & Pearl River Map Turtles

- Conduct ecological studies of reproduction, nest success and recruitment.
- Generate population estimates via intensive mark-recapture (or mark-resight) surveys.

Western Chicken Turtle

- Determine occurrence, distribution, habitat preference, and nesting ecology.
- Determine habitat use, movements, and activity patterns via radio telemetry or other tracking technology.

Mississippi Diamond-Backed Terrapin

- Conduct nesting surveys and research to determine nesting ecology.
- Collect life history data necessary to construct life-history tables.
- Investigate active crab trap and ghost trap by-catch in areas known to have viable terrapin populations.
- Investigate methods to reduce capture in crab traps (i.e., By-catch Reduction Device (BRD) and/or to develop biodegradable panels to limit by-catch in ghost traps.

Ornate Box Turtle

- Determine current status by conducting intensive surveys of historical localities and suitable habitat.
- Perform life history studies on extant populations, if rediscovered.
- Determine habitat use, movements, and activity patterns via radio telemetry.

Stripe-necked Musk Turtle

- Determine current status.

Razor-backed Musk Turtle

- Clarify status and determine the effect of commercial harvest on populations via targeted surveys and long-term monitoring.

Gopher Tortoise

- Generate population estimate and determine distribution.
- Monitor reproduction and recruitment.
- Assess nest depredation, including impacts of mammalian predators and RIFA.
- Investigate the feasibility of re-stocking tortoises.

Western Slender Glass Lizard

- Determine habitat requirements, particularly the relationship between this species and grassy swales.

Southern Prairie Skink

- Determine current status.

Coal Skink

- Determine status and habitat preferences.

Texas Horned Lizard

- Determine current status and document any extant occurrences.
- Investigate the possibility of reintroduction.

Western Worm Snake

- Determine current status and distribution via intensive surveys in historical range.

Common Rainbow Snake

- Determine current status and distribution, as well as basic ecology, via intensive surveys.
- Determine best trapping methods for this species.

Eastern Hog-nosed Snake

- Determine current status and distribution.
- Determine limiting factors and potential causes of decline.

Northern Mole Kingsnake

- Determine current status and distribution via intensive surveys

Black Pinesnake

- Determine the current status of this species via surveys of historical range.

Louisiana Pinesnake

- Determine the limits of the species' range and population size in Louisiana.
- Research nesting ecology, nest success, and other basic life-history factors.

- Determine best methods for detection and monitoring.
- Determine the extent to which ROWs are used and the condition of snakes using ROWs.
- Investigate impacts of timber harvesting on this species, particularly roller chopping.
- Investigate the effects of various land uses on this species.

Pine Woods Littersnake

- Determine status, distribution, and basic life-history traits.

Southeastern Crowned Snake

- Perform studies of basic ecology.
- Determine what factors are contributing to the range contraction observed for this species.

Harlequin Coral Snake

- Determine if this species is extant in Louisiana via intensive surveys.

Eastern Diamond-backed Rattlesnake

- Determine if viable populations of this species occur in Louisiana.

Timber Rattlesnake

- Monitor for the presence of disease in Timber Rattlesnakes.

f. Reptile Conservation Actions

- Encourage the use of wildlife friendly erosion control blankets.
- Provide education and outreach to reduce the wanton killing of snakes.
- Partner with DOTD to provide road crossings to limit road mortality.

Sea Turtles

- Promote the use of TEDs.
- Provide educational/outreach materials and services regarding sea turtles in Louisiana.
- Protect potential and documented nesting beaches in Louisiana.
- Restore and undertake stewardship activities to improve habitat quality of Louisiana beaches.
- Address potential impacts to these species during Environmental Permit reviews.
- Outlaw intentional release of helium-filled balloons.

Loggerhead Sea Turtle & Kemp's Ridley Sea Turtle

- Protect and restore Louisiana Beach habitat.
- Require mitigation measures during dredging operations near where females aggregate prior to breeding, particularly areas west of the mouth of the Mississippi River.

Alligator Snapping Turtle

- Headstart and restock to supplement local populations as needed.
- Control nest predators, including RIFA, in known nesting areas.
- Retain riparian buffers as well as emergent and submerged, woody debris.
- Discourage winter drawdowns to increase hatchling survival.
- Promote a recreational harvest check system and require commercial fishermen to report by-catch landings.

Smooth Softshell & Map Turtles

- Work with partners to protect/restore sandbars in Louisiana rivers.
- Control exotic plants and animals on sandbars.
- Restrict or outlaw the use of ORVs on sandbars and in streams, particularly the practice of “mud-riding” through streambeds.
- Partner with USACE to reduce the impacts of dredging and channelization on sandbar-nesting turtles.
- Work with the Scenic Rivers Program and other partners to minimize the impacts of gravel mining on sandbar-nesting turtles.
- Retain emergent and submerged, woody debris (subsidize if warranted) and provide education and outreach regarding their importance.
- Work with USACE, Sabine River Authority (SRA), and other appropriate partners to time the regulation of water levels to minimize impacts to nesting turtles.

Smooth Softshell & Sabine Map Turtle

- Work with Toledo Bend to manage water levels in a manner compatible with sandbar-nesting turtles.

Western Chicken Turtle

- Locate and protect ephemeral wetlands and surrounding, important nesting areas.
- Incorporate adjacent uplands into wetland protection and restoration efforts.
- Implement BMPs to benefit this species, particularly the elimination of bedding during silvicultural operations.

Diamond-backed Terrapin

- Conserve and restore Coastal Dune Grassland, Coastal Dune Shrub Thicket, and shell rake habitat to ensure availability of adequate nesting sites.
- Remove derelict crab traps from coastal waters to limit incidental mortality of Diamond-backed Terrapins.
- Promote and if possible require the use of TEDS on crab traps.

Ornate Box Turtle

- Conserve, restore, and provide and promote stewardship of Coastal Prairie.

Gopher Tortoise

- Work with landowners to manage habitat for the benefit of Gopher Tortoises.
- Provide education and outreach regarding Gopher Tortoise and the importance of leaving tortoises in native habitat.
- Develop a comprehensive “waif” tortoise plan for the state.
- Maintain and restore open pine habitat, especially through the use of prescribed fire
- Translocate isolated tortoises to known areas of lower concentration to bolster reproduction; provide disease screenings prior to translocations.
- Implement predator control and assess nest depredation in important tortoise areas as needed.

Western Slender Glass Lizard

- Conserve and restore Longleaf Pine habitats, Coastal Prairies, and Cheniers, including restoration and management of native grasses.

Eastern Glass Lizard

- Manage for marsh-upland transitional ecotone with tall grass (especially at Grand Isle and Big Branch Marsh NWR).

Northern Mole Kingsnake

- Manage and restore open-pine habitats.

Black Pinesnake

- Manage and restore open-pine habitat within the historical range of this species.
- Discourage bedding and stump removal during silvicultural operations.

Louisiana Pinesnake

- Maintain and restore open-pine habitat within the species' range especially through the use of prescribed fire.
- Partner with Louisiana Pinesnake Working Group.
- Work with zoos on reintroduction projects.
- Work with landowners to manage habitat for the benefit of Louisiana Pinesnakes.
- Develop Candidate Conservation Agreements with Assurances (CCAA) with private landowners.

Southeastern Crowned Snake

- Maintain hardwood areas within open-pine habitats within this species' range.

Timber Rattlesnake

- Provide public education and outreach about rattlesnakes.
- Promote corridors linking Bottomland Hardwood Forest fragments.
- Consider patch size needs of this species during development of timber prescriptions and construction of transportation infrastructure.

7. Birds

Approximately 160 species of birds occur as breeders or year-round residents in Louisiana (Wiedenfeld and Swan 2000), and more than 300 additional species are known to migrate through or spend the nonbreeding season in the state or its adjacent waters (Cardiff et al. 2014). There are 91 species on the SGCN list of which 51 species are considered rare and local, imperiled, or critically imperiled by the LNHP (2015). Recovery plans have been developed by the USFWS for federally-listed birds including the Whooping Crane, Red-Cockaded Woodpecker, Piping Plover, and Interior Least Tern (USFWS 1994, 2003, 1996, 1990). The Brown Pelican was delisted in the U.S. Atlantic coast, Florida, and Alabama in 1985 and was delisted in the rest of its range, including Louisiana, in 2009. The Bald Eagle was delisted in 2007. The *rufa* subspecies of the Red Knot was federally-listed as threatened in 2014.

Five of the nine extant or presumed extant, federally-listed bird species are believed to be extirpated in Louisiana.¹ Despite sporadic, occasional reports of Ivory-Billed Woodpecker (*Campephilus principalis*) sightings, observers have invariably failed to document credible or compelling evidence of the persistence of this species in our state. The most recent, presumed credible report was of a pair of birds observed in Pearl River WMA in April 1999, but all subsequent attempts to document the woodpecker's presence in Louisiana were unsuccessful (Fitzpatrick 2002). With the presumed discovery of this

¹ Passenger Pigeon (*Ectopistes migratorius*) and Carolina Parakeet (*Conuropsis carolinensis*), not included in this figure, were once both commonly occurring species in Louisiana, but went extinct in the early 1900s.

species in Arkansas in 2004 (Fitzpatrick et al. 2005), LDWF made the decision to include the Ivory-billed Woodpecker on the 2005 WAP SGCN list in the event of a confirmed re-discovery here. However, the species is removed from the list of SGCN for this revision due to the lack of recent, verifiable sightings; Ivory-billed Woodpecker is no longer considered to occur in Louisiana by LDWF. Other species with historical range in Louisiana but now considered extirpated here include Attwater's Greater Prairie-Chicken, Eskimo Curlew, and Bachman's Warbler. Efforts are currently underway to reintroduce the formerly-extirpated Whooping Crane to Louisiana.

a. Bird SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Reddish Egret	<i>Egretta rufescens</i>	G4	S1
White-tailed Kite	<i>Elanus leucurus</i>	G5	S1B, S1S2N
Yellow Rail	<i>Coturnicops noveboracensis</i>	G4	S3S4N
Black Rail	<i>Laterallus jamaicensis</i>	G4	S2N, S1B
Whooping Crane	<i>Grus americana</i>	G1	SXN
Snowy Plover	<i>Charadrius nivosus</i>	G3	S1B,S2N
Wilson's Plover	<i>Charadrius wilsonia</i>	G5	S2B, S1N
Piping Plover	<i>Charadrius melodus</i>	G3	S2N
American Oystercatcher	<i>Haematopus palliatus</i>	G5	S1
Red Knot	<i>Calidris canutus</i>	G4	S2N
Sooty Tern	<i>Onychoprion fuscatus</i>	G5	S1B
Interior Least Tern	<i>Sternula antillarum athalassos</i>	G4T2Q	S1B
Gull-billed Tern	<i>Gelochelidon nilotica</i>	G5	S2
Caspian Tern	<i>Hydroprogne caspia</i>	G5	S1S2B,S3N
Common Tern	<i>Sterna hirundo</i>	G5	S1B,S3N
Black Skimmer	<i>Rynchops niger</i>	G5	S3
Common Ground-Dove	<i>Columbina passerina</i>	G5	S1B,S2N
Southeastern American Kestrel	<i>Falco sparverius paulus</i>	G5T4	S2
Sprague's Pipit	<i>Anthus spragueii</i>	G4	S2N
Smith's Longspur	<i>Calcarius pictus</i>	G5	S1N
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	G4	S2N
Cerulean Warbler	<i>Setophaga cerulea</i>	G4	S2N
Bachman's Sparrow	<i>Peucaea aestivalis</i>	G3	S3
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	G5	S1B,S3N
Tier II			
Mottled Duck	<i>Anas fulvigula</i>	G4	S4

Northern Bobwhite	<i>Colinus virginianus</i>	G5	S3
Wood Stork	<i>Mycteria americana</i>	G4	S3N
Brown Pelican	<i>Pelecanus occidentalis</i>	G4	S3
American Bittern	<i>Botaurus lentiginosus</i>	G4	S4N
Little Blue Heron	<i>Egretta caerulea</i>	G5	S3N, S4B
Glossy Ibis	<i>Plegadis falcinellus</i>	G5	S2
Roseate Spoonbill	<i>Platalea ajaja</i>	G5	S3
Swallow-tailed Kite	<i>Elanoides forficatus</i>	G5	S1S2B
King Rail	<i>Rallus elegans</i>	G4	S3B, S4N
Sandhill Crane	<i>Antigone canadensis</i>	G5	S2N
Upland Sandpiper	<i>Bartramia longicauda</i>	G5	S4N
Long-billed Curlew	<i>Numenius americanus</i>	G5	S5N
Hudsonian Godwit	<i>Limosa haemastica</i>	G4	S3N
Marbled Godwit	<i>Limosa fedoa</i>	G5	S4N
Buff-breasted Sandpiper	<i>Calidris subruficollis</i>	G4	S3N
Short-billed Dowitcher	<i>Limnodromus griseus</i>	G5	S5N
American Woodcock	<i>Scolopax minor</i>	G5	S1B, S5N
Coastal Least Tern	<i>Sternula antillarum</i>	G4	S4B
Forster's Tern	<i>Sterna forsteri</i>	G5	S5
Royal Tern	<i>Thalasseus maximus</i>	G5	S5
Sandwich Tern	<i>Thalasseus sandvicensis</i>	G5	S4B
Greater Roadrunner	<i>Geococcyx californianus</i>	G5	S3
Short-eared Owl	<i>Asio flammeus</i>	G5	S3N
Chuck-will's-widow	<i>Antrostomus carolinensis</i>	G5	S4B
Chimney Swift	<i>Chaetura pelagica</i>	G5	S5B
Red-cockaded Woodpecker	<i>Picoides borealis</i>	G3	S2
Crested Caracara	<i>Caracara cheriway</i>	G5	S1
Peregrine Falcon	<i>Falco peregrinus</i>	G4	S3N
Loggerhead Shrike	<i>Lanius ludovicianus</i>	G4	S4
Bell's Vireo	<i>Vireo bellii</i>	G5	S1B
Warbling Vireo	<i>Vireo gilvus</i>	G5	S1B
White-breasted Nuthatch	<i>Sitta carolinensis</i>	G5	S3
Marsh Wren	<i>Cistothorus palustris</i>	G5	S4
Wood Thrush	<i>Hylocichla mustelina</i>	G5	S4B
Worm-eating Warbler	<i>Helmitheros vermivorum</i>	G5	S3B
Louisiana Waterthrush	<i>Parkesia motacilla</i>	G5	S3B
Prothonotary Warbler	<i>Protonotaria citrea</i>	G5	S5B
Swainson's Warbler	<i>Limnithlypis swainsonii</i>	G4	S4B

Kentucky Warbler	<i>Geothlypis formosa</i>	G5	S4B
American Redstart	<i>Setophaga ruticilla</i>	G5	S3B
Prairie Warbler	<i>Setophaga discolor</i>	G5	S4B
Yellow-throated Warbler	<i>Setophaga dominica</i>	G5	S4B
Field Sparrow	<i>Spizella pusilla</i>	G5	S4BS5N
Lark Sparrow	<i>Chondestes grammacus</i>	G5	S3
Henslow's Sparrow	<i>Ammodramus henslowii</i>	G4	S3N
Le Conte's Sparrow	<i>Ammodramus leconteii</i>	G4	S4N
Seaside Sparrow	<i>Ammodramus maritimus</i>	G4	S4
Rusty Blackbird	<i>Euphagus carolinus</i>	G4	S3N
Tier III			
Northern Pintail	<i>Anas acuta</i>	G5	S5N
Canvasback	<i>Aythya valisineria</i>	G5	S4N
Redhead	<i>Aythya americana</i>	G5	S4N
Lesser Scaup	<i>Aythya affinis</i>	G5	S5N
Least Bittern	<i>Ixobrychus exilis</i>	G5	S5B
Osprey	<i>Pandion haliaetus</i>	G5	S3
Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5	S3
Clapper Rail	<i>Rallus crepitans</i>	G5	S5
Dunlin	<i>Calidris alpina</i>	G5	S5N
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	G5	S4
Yellow-throated Vireo	<i>Vireo flavifrons</i>	G5	S4B
Brown-headed Nuthatch	<i>Sitta pusilla</i>	G5	S5
Sedge Wren	<i>Cistothorus platensis</i>	G5	S4N
Hooded Warbler	<i>Setophaga citrina</i>	G5	S5B
Nelson's Sparrow	<i>Ammodramus nelsoni</i>	G5	S5N
Painted Bunting	<i>Passerina ciris</i>	G5	S5B
Dickcissel	<i>Spiza americana</i>	G5	S4B
Eastern Meadowlark	<i>Sturnella magna</i>	G5	S4

b. Threats to Birds

Many threats discussed for other taxa also apply to birds, including habitat degradation, fragmentation, and conversion resulting from development or agriculture. For birds, habitats most in peril include Barrier Islands, threatened primarily by natural system modification, climate change, SLR and subsidence, and tropical cyclones, and coastal forests of all types (e.g., Coastal Live Oak-Hackberry Forest, Barrier Island Live Oak Forest, etc.), threatened by a number of factors, many of which overlap those of Barrier Islands. Additionally, the conversion of agricultural land from rice and crawfish aquaculture to lower wildlife value crops is of concern for many wetland dependent

species. Migratory species may be threatened by habitat loss within their breeding and nonbreeding ranges, including loss of stopover sites. Disturbance of nesting birds, particularly of colonial nesting species, may greatly negatively impact productivity and should be prevented. Stewardship at beach nesting bird colonies can be extremely effective. Natural system modifications of all types, including fire suppression and hydrological modification threaten a wide range of bird species. Aforementioned habitat impacts and stressors listed below will likely exacerbate loss of birds when those impacts are combined with effects of climate change. High mobility of birds may mitigate impacts to some species, but others, particularly coastal obligates, remain at high risk due to SLR.

In addition to loss of habitat or habitat function, birds suffer direct mortality from many other anthropogenic sources including ingestion of plastics, electrocutions from power lines, fisheries' by-catch, collisions with infrastructure (e.g., communication towers, wind turbines, power lines, glass windows, etc.), vehicle strikes, poisoning from toxic releases, predation by outdoor cats, and many others. Although great strides have been made in recent decades in addressing and reducing some sources of pollution, including pesticides such as DDT, pollution of various types remains a threat to bird SGCN. Inland, nearshore, and offshore oil spills pose serious direct threats to both inland species and, particularly, coastal species, which frequently nest in high densities. Although not yet a major issue in Louisiana, concern exists regarding the potential impacts of wind farms on birds, especially in areas of high bird density (e.g., rice fields with waterfowl or wading birds) or areas utilized by large, soaring species such as vultures and eagles, which are killed disproportionately compared to other bird groups. Mortality resulting from collisions with communication towers is significant, but may be minimized, in part, by changing light schemes on these towers or even the structures themselves. Glass windows kill more birds in the U.S. than all other mortality factors except outdoor cats; more than 350 million birds are killed annually in the U.S. due to window-strikes (Loss et al. 2014). Incorporation of bird-safe or bird-friendly building design into new structures could aid in reducing this loss [see Audubon Minnesota's Bird-Safe Building Guidelines (2010) and American Bird Conservancy's Bird-friendly Building Design (2011)]. Reduction of the reflectance of existing windows and covering windows with screen (traditional or natural materials) will reduce mortality.

The most insidious threat to birds is predation by Feral Cats (including outdoor, owned cats), which are considered a Tier I invasive species in the 2015 WAP (Chapter 6). Cats kill far more birds annually in the U.S. than all other direct anthropogenic sources (Loss et al. 2013), with current estimates exceeding 2 billion birds per year. Other invasives, both plants and animals, threaten native birds as well, whether through predation, competition for nest cavities or other resources, or habitat modification. In addition, the full extent of intentional, illegal destruction of birds is unknown, but for some high profile species, it is a conspicuous source of mortality.

c. Bird Research and Survey Needs

- Use standardized monitoring protocols for birds such as the national protocol for secretive marsh birds, the U.S. Geological Survey (USGS) Breeding Bird Survey (BBS) protocol, and others.
- Participate in regionwide planning and survey efforts such as Southeast Partners in Flight (SEPIF) and the Gulf of Mexico Avian Monitoring Network (GOMAMN).
- Work with the USGS National Wildlife Health Center to monitor emerging avian diseases that have the potential to affect wildlife populations, such as Avian Influenza (H5N2 and the high pathogenicity H5N8).
- Derive population estimates and objectives for all bird SGCN.
- Validate existing and future modeling efforts.
- Update the Louisiana Breeding Bird atlas.
- Implement a statewide network of VHF towers to allow tracking of birds to inform full life cycle conservation.
- Collect baseline life-history data to allow for the construction of life-history tables.

Waterfowl

- Evaluate the effectiveness of current coastal marsh conservation and restoration strategies at providing waterfowl habitat.
- Evaluate the importance of crawfish aquaculture for waterfowl.
- Quantify the importance of refugia from hunting pressure for winter waterfowl conservation.

Mottled Duck

- Research demography (e.g. nest success, brood success rates, annual recruitment, and annual survival rates), molting habitat needs, and limiting factors, including how these measures are impacted by landscape characteristics and management activities.
- Identify primary mortality sources for all life stages.

Lesser Scaup

- Research ecology and movements of wintering Lesser Scaup.

Northern Bobwhite

- Monitor populations through breeding bird, call count, and hunter harvest surveys.
- Monitor Northern Bobwhite response to habitat management.

Colonial Nesting Waterbirds

- Collect baseline life-history data to allow for the construction of life-history tables.
- Conduct colony surveys to update LNHP database.
- Develop a long term monitoring framework and methodology that may be used to determine status and trends of colonial nesting waterbird populations.
- Identify foraging areas and quantify distances traveled by individual birds to reach those areas.
- Monitor disturbance and effects of disturbance at nesting colonies.
- Develop management recommendations for inclusion in coastal restoration plans.

Wood Stork

- Characterize use and availability of foraging and roosting habitat.
- Derive a population estimate and population objective for this species.

Brown Pelican

- Collect baseline life-history data to allow for the construction of life-history tables.
- Determine population trends and guide management decisions via long-term monitoring.

Reddish Egret

- Locate nesting, roosting, and foraging areas to prioritize conservation actions.
- Quantify the response of breeding birds to management activities that may impact nesting colonies.
- Implement satellite tracking of Reddish Egrets to determine stopover sites and important wintering areas.
- Conduct targeted surveys (including nesting surveys) to accurately determine population size or index.
- Determine limiting factors on reproduction.
- Ensure goals of studies align with regional goals of the Reddish Egret Working Group.

Swallow-tailed Kite

- Monitor public and private lands to fill data gaps in breeding distribution and abundance.
- Quantify magnitude of threats that may be limiting occupancy and productivity.
- Identify potential factors for observed decreases in breeding density within portions of the current breeding range in Louisiana.
- Participate in the region-wide, pre-migration roost monitoring program.

Bald Eagle

- Research stopover sites, migration routes, and threats to Bald Eagles.
- Monitor nests, successful breeding pairs, and fledged birds by aerial surveys every five years.

Rails

- Quantify proportion of population that is resident vs. migratory.
- Expand existing surveys (including callback surveys and nest surveys) to determine population densities and distribution statewide.
- Determine population densities and distribution during the non-breeding season.
- Develop a long term collaborative monitoring framework and methodology for assessing secretive marsh bird populations that may be used to determine status and trends region wide.

Yellow Rail

- Determine habitat needs.
- Investigate the use and value of rice fields to Yellow Rails pre- and post-harvest.
- Determine current winter distribution and abundance.

Black Rail

- Determine current winter distribution and abundance as well as breeding status.

King Rail

- Determine brood survival and other demographic measures across habitats including working wetlands.
- Validate existing and future modeling efforts.

Shorebirds

- Collect data on prey availability and habitat use including the influence of landscape scale characteristics to inform management and aid in the development of BMPs.
- Develop management recommendations for inclusion in coastal restoration plans.

Snowy Plover & Wilson's Plover

- Monitor breeding and nonbreeding populations statewide.
- Develop management recommendations for inclusion in coastal restoration plans.

Piping Plover

- Monitor trends in abundance and distribution via long-term surveys.

American Oystercatcher

- Conduct targeted surveys (including nesting surveys) to accurately determine population size or index.
- Conduct research to assess the limiting factors on reproduction.
- Implement satellite tracking of American Oystercatchers to determine stopover sites and important wintering areas.
- Locate nesting, roosting, and foraging areas to prioritize conservation actions.
- Ensure goals of studies align with regional goals of the American Oystercatcher Working Group.

Red Knot

- Conduct satellite telemetry studies of Red Knots to determine subspecies and elucidate habitat use and migratory routes of Red Knots that winter in Louisiana to promote more efficient full life cycle conservation of this species.
- Develop management recommendations for inclusion in coastal restoration plans.

American Woodcock

- Develop protocols to monitor winter abundance of American Woodcock.
- Determine limiting factors for breeding and non-breeding birds.

Terns

- Research limiting factors for nesting terns.
- Develop management recommendations for inclusion in coastal restoration plans.
- Monitor breeding and non-breeding populations statewide.

Sooty Tern

- Develop a long term monitoring framework and methodology for assessing populations of this and other pelagic birds that may be used to determine status and trends.

Landbirds

- Participate in population monitoring programs such as USGS BBS as well as Christmas Bird Counts (CBCs).

Common Ground-Dove

- Conduct baseline studies, including studies to clarify distribution and abundance.

Greater Roadrunner

- Conduct baseline studies, including studies to clarify distribution and abundance.

Chuck-will's-widow

- Participate in the national Nightjar Survey Network program to collect population data.
- Work with Louisiana Amphibian Monitoring Program (LAMP) to increase collection of data for this species, as it is not well-surveyed by other monitoring programs.
- Research distribution patterns, habitat availability and use, nesting success, and territory size requirements.

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Southeastern American Kestrel

- Conduct baseline studies, including studies to clarify distribution and abundance.
- Quantify magnitude of limiting factors and threats to the population such as predation and West Nile virus.

Loggerhead Shrike

- Collect data on year-round distribution and abundance, vital rates, territory size, and availability of suitable nesting sites across habitats.
- Evaluate changes in available habitat over time.
- Initiate research into causes of decline and determine limiting factors on both residents and migrants.
- Quantify direct and indirect impacts of RIFA on breeding and wintering birds.
- Quantify proportion of population that is resident vs. migratory.
- Ensure goals of studies align with regional goals of the Loggerhead Shrike Working Group.

Neotropical Migratory Landbirds

- Implement energetics study of food resources on Cheniers and other critical stopover habitats to develop an energetics model relating habitat to refueling rates
- Determine impact of habitat characteristics and landscape scale variables on the value of stopover habitat.
- Develop and access weather radar as a tool to provide information to prioritize habitats for conservation and restoration.

- Utilize geolocators or other tracking technology to determine connectivity of breeding and nonbreeding areas.

Bell's Vireo

- Determine population abundance and distribution in the northern portion of the state and develop species management recommendations.

Sprague's Pipit

- Collect baseline data, including distribution, habitat use, and habitat requirements.

Prothonotary Warbler

- Utilize geolocators or other tracking technology to determine connectivity of breeding and nonbreeding areas, including stopover sites.

Bachman's Sparrow

- Develop estimates of current distribution and population size statewide.
- Determine relationship between population size and vegetation succession on quality sites and investigate utility of management of refugia.
- Research dispersal behavior to maximize the benefits of future habitat management.
- Monitor reproductive success to determine limiting factors.

Field Sparrow

- Determine breeding and nonbreeding population abundances and assess the amount and quality of available habitat statewide.

Grasshopper Sparrow

- Determine breeding and nonbreeding population abundances and assess the amount and quality of available habitat statewide.

LeConte's Sparrow

- Determine suitable grassland patch size, species composition, structure and landscape habitat matrix needed to support nonbreeding birds.

Nelson's Sparrow

- Determine current abundance and distribution in relation to habitat changes.

Seaside Sparrow

- Estimate annual survivorship, especially during non-breeding season.
- Assess accuracy of Partners in Flight (PIF) population estimate.
- Model population response to predicted habitat changes, such as SLR.
- Determine current abundance and distribution in relation to habitat changes.

Rusty Blackbird

- Determine nonbreeding population abundance and habitat use.

d. Bird Conservation Actions

- Provide comments on proposed wind energy projects to minimize impacts, utilizing the USFWS voluntary guidelines for siting wind energy.
- Conduct education/outreach on the negative impacts of Feral Cats on bird populations.
- Develop plan to reduce impact of Feral Cats on bird populations.
- Promote the design and construction of bird-friendly buildings.
- Partner with CPRA and other coastal partners to ensure habitat restoration and creation efforts maximize benefits to wildlife.
- Develop partnerships for habitat management with Landscape Conservation Cooperatives (LCCs) and Joint Ventures (JVs).
- Manage habitat to benefit bird SGCN through the Private Lands Program.
- Utilize the East Gulf Coastal Plain Joint Venture's (EGCPJV) Communication Strategy for Prescribed Fire and Fire Adapted Habitats

Waterfowl

- Create, enhance, and maintain high-quality habitat across Louisiana.
- Work with Ducks Unlimited (DU), Delta Waterfowl (DW), NRCS, and USFWS to ensure that quality habitat is distributed across the landscape.
- Encourage rice farming, rather than conversion to crops with lower wildlife value, north of coastal marshes, and promote practice of traditional rice production methods over less valuable, dry-seeded rice farming.
- Partner with DU, DW, USFWS, and other partners to conserve habitat on the northern breeding grounds.
- Work with the CPRA, CWPPRA program, USACE LCA program, and other partners to incorporate strategies specifically targeting important wintering areas in all future coastal restoration efforts.
- Support efforts to replace or improve infrastructure for managing coastal marshes, such as the efforts funded through the Louisiana Waterfowl Project South.
- Support efforts to provide strategically located refugia in the agricultural landscape of southwest Louisiana, such as currently provided through the Waterfowl Rest Areas Program.

Mottled Duck

- Create and/or restore large blocks of nesting habitat in agricultural lands and coastal marshes.
- Provide brood-rearing habitat from mid-April through July in agricultural landscapes through wetland restoration and water delivery.
- Maintain low salinities (<6-8 parts per thousand) in coastal marsh through hydrologic restoration to enhance brood-rearing habitats.
- Where warranted and feasible, improve nest success by minimizing interactions with predators.

Northern Bobwhite

- Develop partnerships for habitat management with LCCs and JVs.
- Manage habitat to benefit this species through the Private Lands Program.
- Implement recommended habitat restoration actions specified by the National Bobwhite Conservation Initiative (NBCI).
- Manage habitat to benefit this species on WMAs, NWRs, National Forests, and other public lands where appropriate.

Waterbirds, including Colonial Nesting and Solitary Nesting

- Support CPRA, CWPPRA program, USACE LCA program, and other partner efforts for shoreline stabilization and habitat restoration, especially that of Barrier Islands and other coastal islands, and incorporate strategies specifically targeting important nesting and nonbreeding areas in all future coastal restoration efforts by these and other partners.
- Provide CPRA and other coastal restoration partners necessary information on colonial nesting birds to ensure habitat restoration and creation efforts maximize benefits to wildlife.
- Develop new and improve existing partnerships for protection and restoration of coastal marshes.
- Monitor colonies for impacts of predators and conduct targeted predator removal as needed.
- Provide public education regarding the importance of waterbird nesting colonies and shorebird staging/feeding areas to reduce the negative effects of recreational use on these areas.
- Work with landowners to implement management and conservation recommendations for waterbirds.
- Coordinate with the LCCs and JVs to implement recommendations of shorebird and wading bird conservation plans.
- Create bird nesting islands when and where feasible, and explore potential partnerships and funding mechanisms to support such construction.
- Provide artificial nest platforms to increase available nest sites where warranted.

Reddish Egret

- Apply colony-specific management actions as needed.
- Create or improve alternate colony sites.
- Improve foraging habitat within ten kilometers of existing colonies.
- Implement the Gulf Coast Joint Venture's (GCJV) Reddish Egret Conservation Plan
- Collaborate with the Reddish Egret Working Group to further goals common to the region.

Swallow-tailed Kite

- Provide recommendations to minimize forestry impacts on nesting or roosting birds, including the importance of retaining large canopy and super-emergent trees, as well as timing timber harvest activities to avoid critical periods.

Bald Eagle

- Coordinate with timber companies for Bald Eagle management plans.
- Implement buffers around easily accessible nest trees to minimize disturbance.

Rails

- Work with NRCS to promote and maintain the presence of working wetlands on the landscape.
- Promote crawfish aquaculture and rice production to maintain suitable habitat for rails.

Whooping Crane

- Support establishment of a resident population of Whooping Cranes in Louisiana.
- Continue education and outreach activities related to the Whooping Crane reintroduction.

Shorebirds

- Identify, conserve, and monitor shorebird nonbreeding locations, including stopover sites.
- Partner with LCCs, JVs, USFWS, NRCS, and other interested groups to encourage land-owners to manage water levels to provide habitat for shorebirds during migration; acquire and manage properties for shorebird use in underrepresented areas.
- Manage moist soil units on WMAs and refuges to provide suitable stopover habitat where appropriate.

Long-billed Curlew

- Provide inland, managed, dry to saturated habitat, moderately to densely covered in short to medium height grasses (preferably native species), from July 15 to November 5.
- Provide additional acreage of similar habitat, if found to be limited on landscape, from 15 March to 31 May.

Buff-breasted Sandpiper

- Provide inland, managed, short grass habitat or bare soil/water interface habitat, ideally pesticide and herbicide free, from July 15 to November 5.
- Provide additional acreage of similar habitat, if found to be limited on landscape, from 15 March to 31 May.

Short-billed Dowitcher

- Provide inland, managed habitat that is saturated to flooded (optimal flooding depths range from 2-16 cm), with sparse or no vegetation from July 15 to November 5.
- Provide additional acreage of similar habitat, if found to be limited on landscape, from 15 March to 31 May.

American Woodcock

- Develop partnerships with state and federal agencies, Non-governmental organizations (NGOs), and the private sector to implement the American Woodcock Management Plan.
- Manage habitat to benefit this species on state, federal, and private lands where appropriate.

Shorebirds & Seabirds

- Work with CPRA, USACE, and other partners to continue the beneficial use of dredge material.
- Work with the CPRA, CWPPRA program, USACE LCA program, and other partners to incorporate strategies specifically targeting important nesting and wintering areas in all future coastal restoration efforts.

Plovers and Coastal Least Tern

- Work with landowners/parishes to exclude grazing livestock from beaches.
- Control Feral Hogs on and around known nesting beaches.
- Restrict or outlaw the use of All-Terrain Vehicles (ATVs) and other ORVs from nesting areas, especially during nesting season.
- Conserve and restore mainland beach and Barrier Island habitats.

- Use signs, stewards, and symbolic fencing to protect nesting birds.
- Develop a comprehensive survey methodology to determine long-term trends in population abundances.

Terns

- Develop partnerships to strengthen the protection and restoration of Barrier Islands.
- Use signs, stewards, and symbolic fencing to protect nesting birds.
- Develop a comprehensive survey methodology to determine long-term trends in population abundances.

Interior Least Tern

- Work with partners to protect/restore sandbars in Louisiana rivers.
- Control exotic plants and animals on sandbars.
- Restrict or outlaw the use of ATVs and other ORVs on sandbars, especially during nesting season.
- Partner with USACE to reduce negative impacts of dredging and channelization on sandbars.
- Work with the Scenic Rivers Program and partners to minimize the impacts of gravel mining on sandbars.
- Implement conservation recommendations of the USFWS recovery plan (USFWS 1990) and Interior Least Tern Five-Year Review (2013).
- Work with USACE to regulate water levels during breeding season to avoid negative impacts.
- Determine the feasibility of using abandoned barges as artificial nesting habitat.
- Secure funding to support long-term efforts to locate and monitor nesting colonies.

Landbirds

- Utilize PIF documents for informing management decisions.
- Work with NRCS, USFWS, U.S. Forest Service (USFS), and other partners to develop and distribute outreach materials concerning the importance of early successional habitats for SGCN.
- Promote and conduct forest management practices that benefit landbirds.

Red-headed Woodpecker & Brown-headed Nuthatch

- Use prescribed fire to maintain open pine systems.
- Use the Open Pine Desired Forest Conditions (DFCs) and the Open Pine Decision Support Tool in the management of open pine habitats.
- Encourage landowners to use group-selection and single-tree selection harvesting methods and maintain or increase the number of standing snags.

Red-cockaded Woodpecker

- Implement the Louisiana Statewide Red-cockaded Woodpecker (RCW) Safe Harbor Program.
- Support USFWS recovery efforts outlined in the RCW Recovery Plan (USFWS 2003).
- Establish new RCW populations.
- Investigate potential land acquisition to increase and support RCW populations.
- Encourage longer Longleaf Pine rotation ages when compatible with the landowner's management objectives.

Southeastern American Kestrel

- Develop a nest box program focusing on known or suspected nesting areas and engage the public in this program.

Loggerhead Shrike

- Conserve and acquire Coastal Prairie and other native grasslands.
- Maintain low, thick, shrubs in grasslands and pastures (3-10 shrubs or small trees per acre), where compatible with habitat restoration goals of region.
- Collaborate with the Loggerhead Shrike Working Group to prioritize goals common to partners.

Neotropical Migrant Landbirds

- Promote sustainable land-use practices on remaining Cheniers.
- Work with landowners to exclude or reduce grazing livestock from Cheniers.
- Conserve and restore coastal forest habitats, including reforestation where appropriate.
- Acquire and manage nonbreeding habitat in Mexico, Central and South America, and the Caribbean.
- Restore and manage Bottomland Hardwood Forest within the Mississippi River Alluvial Plain (MAV).

Prothonotary Warbler

- Retain snags for nesting and supplement with nest boxes if nest sites are a limiting factor.

Grassland Birds

- Partner with NRCS and the Louisiana Native Plant Initiative (LNPI) to promote establishment of native grasses, including local ecotypes.
- Promote the economic benefits of using privately-owned prairies to produce hay.

- Continue efforts to support prescribed burning of prairies and other grassland habitats.

Bachman's Sparrow & Henslow's Sparrow

- Work with landowners to encourage use of BMPs for prescribed fire management and timber harvesting techniques to improve habitat quality.
- Conserve and restore Longleaf Pine grassland habitats.

LeConte's Sparrow

- Manage native grasslands with the application of prescribed fire at appropriate fire return intervals.

Seaside Sparrow

- Create and restore Salt to Brackish marsh, preferably in blocks $\geq 10,000$ acres, containing areas of medium and tall height Smooth Cordgrass (*Spartina alterniflora*), interspersed with ponds, tidal creeks, and bare ground areas.

9. Mammals

Seventy mammal species have been recorded in Louisiana or its adjacent waters (Lowery 1974). Thirteen species are considered rare and local, imperiled, or critically imperiled by the LNHP (2015). There are four federally-listed mammal species in Louisiana that are considered SGCN. Recovery plans for the Louisiana Black Bear (USFWS 1995b) and West Indian Manatee (USFWS 2001) have been developed by USFWS. Both the Red Wolf (*Canis rufus*) and Florida Panther (*Puma concolor*) have been removed from the SGCN list, as they no longer occur in the state. Three of the four whale species included on the 2005 SGCN list have also been removed, as they do not regularly occur in state waters, and therefore may not be impacted by conservation actions within Louisiana.

a. Mammal SGCN

<u>Common Name</u>	<u>Scientific Name</u>	<u>G-Rank</u>	<u>S-Rank</u>
Tier I			
Southeastern Shrew	<i>Sorex longirostris</i>	G5	S2
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	G1G2	S1
Oak Ridge Pocket Gopher	<i>Geomys breviceps breviceps</i>	G5	S4T1
Eastern Spotted Skunk	<i>Spilogale putorius</i>	G4	S1
Tier II			
Southeastern Myotis	<i>Myotis austroriparius</i>	G3G4	S4

Big Brown Bat	<i>Eptesicus fuscus</i>	G5	S2
Eastern Chipmunk	<i>Tamias striatus</i>	G5	S3
Bachman's Fox Squirrel	<i>Sciurus niger bachmani</i>	G5	S5T3
Hispid Pocket Mouse	<i>Chaetodipus hispidus</i>	G5	S2
Eastern Harvest Mouse	<i>Reithrodontomys humulis</i>	G5	S3
Prairie Vole	<i>Microtus ochrogaster</i>	G5TX	SH
Louisiana Black Bear	<i>Ursus americanus luteolus</i>	G5T2	S3
Ringtail	<i>Bassariscus astutus</i>	G5	S1
Long-tailed Weasel	<i>Mustela frenata</i>	G5	S3
West Indian Manatee	<i>Trichechus manatus</i>	G2	S1N
Tier III			
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	G5	SZ
Rafinesque's Big-eared Bat	<i>Corynorhinus rafinesquii</i>	G3G4	S4
Eastern Pipistrelle	<i>Perimyotis subflavus</i>	G5	S4
Baird's Pocket Gopher	<i>Geomys breviceps sagittalis</i>	G5	S4
Golden Mouse	<i>Ochrotomys nuttalli</i>	G5	S4
Northern Pygmy Mouse	<i>Baiomys taylori</i>	G4G5	SU
Bottlenose Dolphin	<i>Tursiops truncatus</i>	G5	S5
Sperm Whale	<i>Physeter macrocephalus</i>	G3G4	SZ

b. Threats to Mammals

Louisiana's mammal SGCN are highly diverse in ecology and habitat preference, and as such, almost all of the 1st level threats identified by Salafsky et al. (2008) apply to at least one mammal SGCN. Many of these species are subject to direct habitat loss and degradation resulting from development and agriculture, as discussed for other taxa. Marine mammals are at risk from oil spills and other toxic releases, and, as with birds, wind farms pose a potential threat to many bats. Also of concern for bat SGCN is the replacement of "bat-friendly" bridges with designs that are of lower value to these species. Some SGCN, including predators, rodents, and bats, are subject to varying degrees of human persecution. As with all SGCN, natural system modification is one of the most serious threats to many mammals. One of the most high profile threats to bats is White-nose Syndrome, which has not yet been documented in Louisiana, but has been detected in neighboring states. Whether terrestrial or aquatic, all mammal SGCN are potentially impacted by pollution. Finally, although many mammals are predicted to be fairly resilient to the impacts of climate change, there is some level of risk, particularly to range-restricted species.

c. Mammal Research and Survey Needs

- Implement or develop standard protocols for monitoring mammal populations to determine trends.

Bachman's Fox Squirrel

- Document the current extent of range in Louisiana and collect baseline population data.
- Utilize or modify hunter harvest surveys to monitor harvest rates for this subspecies.

Eastern Chipmunk

- Determine the current distribution and status of this species in Louisiana.
- Research habitat requirements and potential limiting factors.

Northern Pygmy Mouse

- Determine current abundance and distribution via targeted surveys.

Hispid Pocket Mouse

- Determine current abundance and distribution via targeted surveys.
- Research habitat requirements and basic life history.

Oak Ridge Pocket Gopher

- Determine the current status and distribution of this subspecies in Louisiana.
- Research the natural history of this subspecies in Louisiana.

Baird's Pocket Gopher

- Research the role of prescribed fire regime on population dynamics.
- Develop a protocol for estimating population size.
- Conduct studies on food habits, specific habitat preferences, and limiting factors.
- Investigate usage of utility ROWs, especially within the range of the Louisiana Pinesnake.
- Investigate methods to increase colonization rates of clearcuts or restored habitat.

Prairie Vole

- Determine current status in state via intensive, targeted surveys in historical range.

Golden Mouse

- Determine current abundance and distribution via targeted surveys.
- Research habitat requirements and preferences.

Eastern Harvest Mouse

- Determine current abundance and distribution via targeted surveys.
- Research life history and habitat requirements.

Southeastern Shrew

- Determine current abundance and distribution and habitat use via targeted surveys.
- Research impacts of RIFA on this species.

Bats

- Conduct surveys statewide in order to locate important roost sites.
- Monitor for the presence of White Nose Syndrome (WNS) at known roost sites.

Big Brown Bat

- Conduct life history studies to address data gaps for this species in the state.
- Conduct telemetry studies to determine habitat, foraging ecology, and day roost locations.

Southeastern Myotis

- Determine locations of large winter roosts via telemetry.

Northern Long-eared Bat

- Conduct surveys to determine current status, distribution, and habitat use.
- Determine habitat use and foraging ecology via telemetry.

Long-tailed Weasel

- Determine current status and distribution via intensive surveys.
- Determine habitat preferences and requirements of this species.

Eastern Spotted Skunk & Ringtail

- Determine current status in state via intensive, targeted surveys in historical range.

West Indian Manatee

- Determine habitat use, movement patterns, and behavior in Louisiana waters.
- Evaluate SAV availability and the potential need for restoration.

- Develop a database of warm water discharge locations throughout the coastal zone.

Bottlenose Dolphin

- Document mortality events and track mortality rates.
- Collect data for population estimates.
- Collect genetic and other samples from stranded animals.
- Expand efforts to create and maintain a photo catalogue of individual animals to allow for population monitoring.

Sperm Whale

- Collect data from stranded whales to increase knowledge of this species in state waters.

d. Mammal Conservation Actions

West Indian Manatee

- Raise public awareness of this species to increase reports of sightings to the LNHP.
- Provide educational/outreach materials about this species.
- Respond to manatee strandings and conduct necropsies when possible.

Bachman's Fox Squirrel

- Develop habitat management recommendations to benefit this subspecies.

Eastern Chipmunk

- Conserve Southern Mesophytic Forests to provide habitat for this species.

Hispid Pocket Mouse

- Support use of prescribed fire to maintain appropriate habitat.

Prairie Vole

- Conserve and restore Coastal Prairie.

Oak Ridge Pocket Gopher

- Promote BMPs that favor the growth of herbaceous plants where this subspecies is found.

Baird's Pocket Gopher

- Develop a HSI for pocket gophers in Louisiana.
- Promote prescribed fire and restore open pine habitat within the range of this species, and continue Coastal Prairie stewardship actions.

Golden Mouse

- Include the retention of vertical structure (vines, tangles, etc.) in habitat management recommendations and BMPs.

Bats

- Partner with DOTD to implement the use of bat-friendly bridges during bridge replacements.
- Promote the benefits of bat colonies and develop partnerships with landowners to protect roosts.
- Develop BMPs for bats and disseminate to timber companies and other private landholders.

Rafinesque's Big-eared Bat & Southeastern Myotis

- Use Desired Stand Conditions (DSCs) and BMPs found in the Lower Mississippi Valley Joint Venture (LMVJV) document "Restoration, Management, and Maintenance of Forest Resources in the Mississippi Alluvial Valley (MAV)," including the retention of snags.
- Work with landowners to implement proper habitat management to benefit these species.

Louisiana Black Bear

- Increase connectivity through the establishment and maintenance of corridors.
- Partner with DOTD to provide road crossings to limit road mortality.
- Support outreach and education to increase public acceptance of bears and reduce nuisance behavior.
- Work with landowners to manage habitat to benefit this species.
- Work with USFWS and other partners to implement the recovery plan (USFWS 1995b) for this species.

Bottlenose Dolphin

- Support outreach/education on this species in LA, particularly how to minimize human impacts on species.

D. General Conservation Actions

Rather than being specific to a single SGCN or particular suite of SGCN, the following actions will provide benefits to many or all SGCN or natural communities, thereby benefitting large numbers of SGCN. As with the conservation actions presented earlier in this chapter, this list is plastic and not comprehensive. Actions are divided into five categories: Partnerships, Education, Research and Inventory, Habitat Impact Avoidance, and Stewardship Implementation.

1. Partnerships

- Partner with NGOs, state and federal agencies, industry, and private landowners to promote conservation of natural communities.
- Partner with DOTD, particularly in planning phases, to address wildlife-vehicle strike minimization measures such as creating wildlife crossings.
- Utilize social media outlets to engage, inform, and interact with the public about wildlife habitats and their conservation.
- Work with the legislature to develop tax incentives for landowners to encourage conservation of rare habitat types.
- Direct the curricula of the local chapters of the Louisiana Master Naturalist Program; ensure that students are being trained in relevant subjects; frequently utilize certified Master Naturalists to help accomplish conservation projects.
- Increase support for landowner outreach and citizen-based voluntary conservation initiatives such as the Natural Areas Registry Program.
- Work closely with Interagency Review Team (IRT) to ensure that proposed mitigation banks will have the highest possible ecological value; interact with mitigation bank sponsors to assist with decision making, if requested.
- Partner with the Southeastern Regional Partnership for Planning and Sustainability (SERPPAS) to develop and expand training opportunities for prescribed burning certification and to promote prescribed fire and conservation in the Southeast.
- Promote WAP priorities within the framework of the Southeastern Conservation Adaptation Strategy (SECAS) in order to develop regionwide conservation strategies for SGCN and their habitats.

2. Education

- Provide educational information on natural communities and their importance to SGCN to landowners and managers through participation in outreach events, presentations, and workshops, and through the LDWF website.
- Encourage the design of university curricula that emphasize natural habitat diversity in fields of applied science (e.g. landscape architecture, landscape and urban planning, and renewable natural resources conservation); communicate the

need for field biology training to University department heads and administrators, as well as the Board of Regents.

- Promote education about the impact of invasive plant and animal species on natural habitats and methods to eradicate or control invasives through literature, radio and television, and interactive workshops.
- Provide information on WAP SGCN and associated habitats for teachers and other workshop participants (Future Farmers of America (FFA), Envirothon, etc.) to ensure their use in Louisiana schools.
- Develop and publish information regarding beneficial management practices and desired habitat conditions for all habitat types.
- Increase number of publications picturing and describing Louisiana wildlife, plants, and habitats (e.g. field guides, accounts of flora and fauna of particular sites or habitats).
- Establish a television program that takes the audience across Louisiana, introducing them to diverse habitats.
- Leverage resources such as the Teaming With Wildlife Coalition and Master Naturalist chapters to improve public awareness of conservation issues.

3. Research and Inventory

- Intensify surveys to determine the current conservation status of all natural communities and to gain additional information about poorly-known habitats.
- Engage the public in documenting and reporting species and habitat occurrences through citizen science initiatives.
- Continue survey work to document “up-and-coming” exotic invasive species that are expected to eventually have a negative impact on Louisiana’s biological resources.
- Use remote sensing to determine location and extent of habitats, incorporating ground truthing and involvement of scientists sufficiently versed in plant ecology.
- Continue and expand, as deemed appropriate, to investigate and quantify the effects of oil spills on SGCN via additional research and monitoring, as well as mechanisms to mitigate for such impacts.

4. Habitat Impact Avoidance

- Inform appropriate planning commissions about types of habitats and their locations to avoid impact to these habitats.
- Provide habitat information to oil, gas, and seismic companies and encourage resource survey and mining techniques that avoid or minimize impacts to wildlife habitats.
- Create a web-based biodiversity information server to allow clients to determine species and habitats potentially impacted by their proposed development projects.

5. Stewardship Implementation

- Promote the utilization of federal cost share programs (e.g. NRCS) to address habitat conservation issues such as invasive species problems and implementation of stewardship practices (e.g. prescribed burning).
- Provide funding and assistance to landowners for exotic species control in high quality habitat occurrences.
- Increase the number of cost share/cost elimination programs that apply stewardship practices on the landscape (e.g. Prescribed Burn Initiative); expand existing programs to apply to additional habitats and increase their geographic reach.
- Increase LDWF's capability to apply stewardship on private lands by having more certified prescribed fire applicators, more staff certified to apply herbicides, and staff qualified to use mechanical equipment to improve habitat (e.g., brush removal in prairies).

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