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Strategic Bird Monitoring Guidelines for the Northern Gulf of Mexico

WHY STRATEGIC BIRD MONITORING GUIDELINES FOR THE GULF OF MEXICO?

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Bird survey. Photo credit: U.S. Fish and Wildlife Service

WHY STRATEGIC BIRD MONITORING GUIDELINES FOR THE GULF OF MEXICO?

DECISION CONTEXT

THE LARGE-SCALE RESTORATION WORK UNDERWAY in the northern Gulf of Mexico as a result of the 2010 Deepwater Horizon (DWH) oil spill settlement—work that is conducted under the auspices of the RESTORE Act of 2012, Natural Resource Damage Assessment Trustee Council, and National Fish and Wildlife Foundation (NFWF)—presents opportunities to further avian conservation and recovery in the region and improve monitoring of bird populations and their habitats. Collectively, state and federal agencies in partnership with numerous conservation organizations and citizen groups are making tremendous conservation investments to implement restoration projects to benefit birds and their habitats along the coast of Florida, Alabama, Mississippi, Louisiana, and Texas (Baldera et al. 2018). To maximize benefits of these restoration projects, decision makers need access to information related to avian ecology and strategies for evaluating restoration effectiveness (Burger 2018, Baldera et al. 2018).

Currently there are no legal, regulatory or political underpinnings per se to the implementation of a comprehensive bird monitoring strategy for the Gulf of Mexico. However, the Oil Pollution Act of 1990 (Publ. L. 101-380) requires restoration project monitoring and the Deepwater Horizon Programmatic Damage Assessment and Restoration Plan (DHNRDAT 2016) commits the Trustees to a robust monitoring and adaptive management framework. Additionally, several federal and state wildlife agencies have legal mandates to protect and conserve wildlife resources and their habitats for the continuing benefit of the American people. Hence, the success of designing and implementing a collaborative and integrated monitoring strategy for the Gulf of Mexico requires the commitment and dedication of a wide array of conservation partners (e.g., federal agencies, state wildlife agencies, non-governmental organizations, and joint venture partnerships), all operating under different mandates, missions, and budget constraints.

To that end, these Strategic Bird Monitoring Guidelines serve as a tool to identify needs and provide monitoring recommendations to advance collaborative and integrated bird monitoring efforts along the northern Gulf of Mexico.

Recognizing the need to: (1) increase coordination and collaboration across a multitude of stakeholders and partners; and (2) embrace a more formalized means of coordinating and integrating avian monitoring activities, the Gulf of Mexico Avian Monitoring Network (GoMAMN) was established. Representing a variety of agencies and organizations with interest in the Gulf of Mexico, this self-directed, non-regulatory network of conservation partners used the principles of decision theory (Keeney 1982, 1992) and facilitated structured decision making workshops (Lyons et al. 2008, Conroy and Peterson 2013) to identify a suite of monitoring objectives and evaluation criteria to inform prioritization of future monitoring activities. Collectively, these objectives and associated evaluation criteria define "what matters" about monitoring decisions, drive the search for creative alternatives, and become the framework for comparing alternatives (Gregory et al. 2012). An initial product of these workshops was a consensus fundamental problem statement from GoMAMN partners:

"How does the conservation community develop a cost-effective monitoring strategy for the Gulf Coast avian community and ecosystem that evaluates ongoing conservation activities and chronic and acute threats; maximizes learning; and is flexible and holistic enough to detect novel ecological threats with respect to management triggers and to evaluate new and emerging conservation activities?"

To address this question, GoMAMN partners decided that the purpose of GoMAMN is to develop collaborative, integrated avian monitoring across the northern Gulf of Mexico.

Specifically, GoMAMN strives to:

1. Create and maintain a forum by which stakeholders can coordinate and integrate monitoring efforts for birds and their habitats;
2. Establish clearly articulated core-values, data needs, and fundamental objectives underpinning monitoring efforts;

3. Facilitate the implementation of cost-effective yet scientifically robust regional monitoring plans;
4. Standardize data collection and data management efforts that support adaptive management.

Resulting from a successful forum for coordination and communication (i.e., GoMAMN), these Strategic Bird Monitoring Guidelines outline the contemporary thinking related to the identification of fundamental objectives, core-values, and data needs that serve as foundational pieces of avian monitoring in the northern Gulf of Mexico. GoMAMN partners envision a Community of Practice working collaboratively across partners and programs (Figure 1.1) to leverage existing resources, capacities, and expertise to develop and implement a collaborative Gulf-wide avian monitoring program to address these objectives and data needs as a means to inform and advance bird-habitat conservation as part of the broader Gulf restoration efforts. Additionally, GoMAMN partners foresee a higher-level of coordination across the various monitoring committees supporting Gulf Restoration (Figure 1.1), such that bird monitoring objectives, values, and data needs are communicated across initiatives, stakeholders, and decision makers. Coordination and integration of monitoring efforts could maximize the usefulness of bird monitoring data to inform Gulf restoration activities and evaluate restoration success. Here, we provide additional information that serves as both functional sideboards and foundational aspects of the Strategic Bird Monitoring Guidelines for the northern Gulf of Mexico.

Spatial Scope

The geography covered by these Strategic Bird Monitoring Guidelines is the northern half of the Gulf of Mexico including an inland buffer across the five Gulf States (Figure 1.2). The geographic extent is bounded on the Gulf side by the southern edge of the Marine Bird Conservation Region (#20) that equates to the United States Environmental Economic Zone (EEZ) with the inland extent defined by the RESTORE Act (i.e., individual state boundary from the Coastal Zone Management Act of 1972 [Publ. L. 109-58]), plus a 25 mile inland buffer, except in Florida, where the east-southeastern extent is defined by the Florida Water Management District boundaries (Florida Department of Environmental Protection 2018) excluding the Northeast Florida Water Management District.
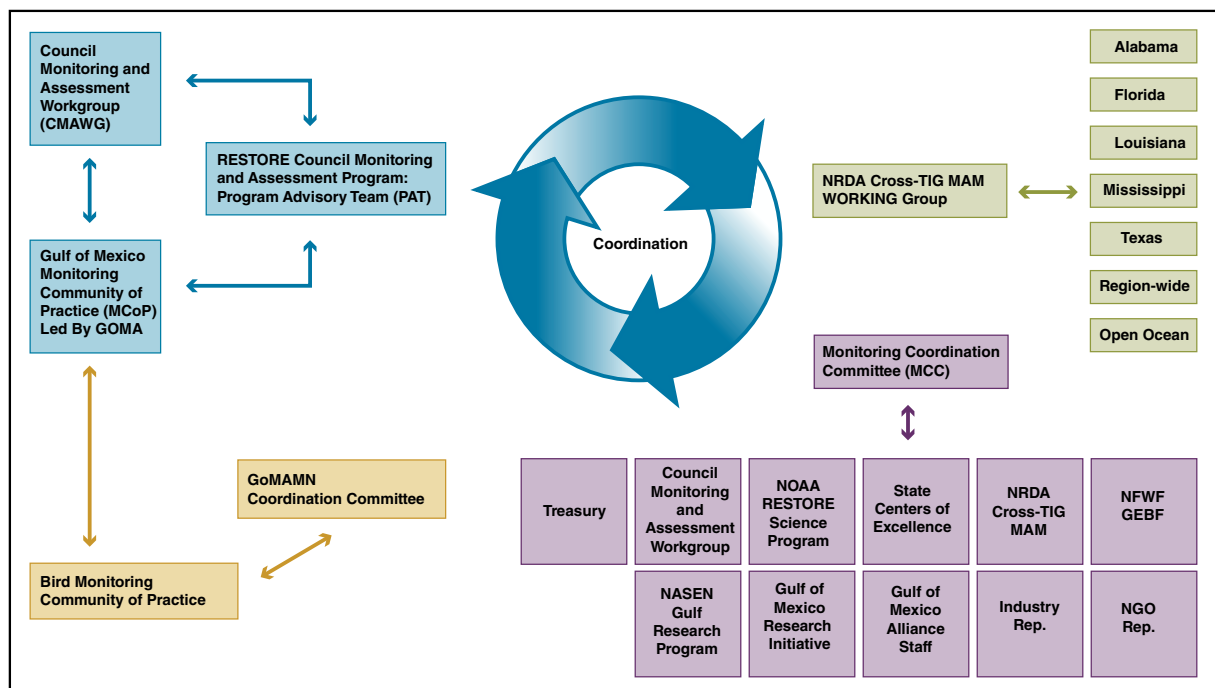
Figure 1.1. *Schematic depicting position of Gulf of Mexico Bird Monitoring Network within the contemporary infrastructure to facilitate cross-program coordination and implementation of monitoring activities across the northern Gulf of Mexico (cross-program infrastructure model adapted from RESTORE Council internal work product, February 2018).*

Figure 1.2. *Geographical boundary used to define bird monitoring objectives and priorities in the Northern Gulf of Mexico.*

Temporal Scope

The information presented within the Strategic Bird Monitoring Guidelines reflects our current knowledge and experiences related to avian populations and information needs. Given the dynamic nature of natural and human systems, and therefore conservation needs, it is imperative that the conservation community refines and modifies these monitoring recommendations as additional knowledge becomes available. To that end, we envision these guidelines as a living-document, that will be updated every five years to reflect our increased knowledge and understanding of how bird populations respond to restoration activities and underlying ecological processes. Moreover, many of the monitoring recommendations and core values put forth herein, are rooted in the application of an adaptive management framework. While it is possible to reduce uncertainty via an adaptive management framework in a relatively short-time period (circa 5 years or less), it is also important to recognize the long-term commitment (>20 years) required to understand and reduce uncertainty associated with underlying ecological processes impacting bird populations. This long-term planning horizon (>20 years) coupled with intervening, short-term updates and revisions (e.g., every 5 years) facilitates an adaptive planning framework to guide future restoration and monitoring activities across the northern Gulf of Mexico.

Birds of Conservation Concern

To facilitate communication among stakeholders, partners, decision makers, and land managers, GoMAMN partners developed a list of avian species in need of conservation across the northern Gulf of Mexico ecosystem (see Appendix 1). To compile the list, we used the following rules: (1a) a species must be identified on ≥50% of the five Gulf-facing State Wildlife Action Plans (SWAPs): Florida, Alabama, Mississippi, Louisiana, and Texas; (1b) species that met criteria for rule 1a, were further reviewed and vetted to remove any non-coastal species (e.g., bird species not occurring in coastal habitats); and (2) due to the fact many States did not consider seabirds in their SWAPs, a sub-set of pelagic seabirds were identified, vetted through the GoMAMN Seabird Working Group, and added to the list. Additional information can be found within the respective State SWAPs or by contacting the authors of chapters 3–9.

The final list includes 68 bird species that warrant special attention due to their population status (i.e., Threatened or Endangered, declining population trends, range restrictions, or % of population using the Gulf of Mexico). Hence, this list differs fundamentally from the list of birds published within the DHNRDAT 2016; Table 4.7-3 and subsequent Bird Strategic Framework (DHNRDAT 2017) due to method of derivation and intended uses. The list generated by GoMAMN is

intended to take a more holistic approach and identify avian species of greatest conservation concern in the Gulf region, whereas the DWH-PDARP and Bird Strategic Framework only identifies those species injured during the DWH oil spill. Nevertheless, there is considerable overlap (28 species occur on both lists) between the two lists. As such, decision makers and land managers now have two complementary lists to guide their decision making: one that provides a holistic overview of avian species in need of conservation and one that speaks directly to the recovery of injured resources.

Land Cover Classification

Due to the complexity and variety of ecological systems within the northern Gulf of Mexico, a common nomenclature is warranted to facilitate and standardize communication among stakeholders, partners, and decision makers. To this extent, GoMAMN has adopted the ecological systems nomenclature used by NOAA's Coastal Change Analysis Program (C-CAP) with modifications to better define marine systems and upland open pine systems for GoMAMN purposes (see Appendix 2). Modifications are based upon marine classifications identified within the Coastal and Marine Ecological Classification Standard (Federal Geographic Data Committee, Marine and Coastal Spatial Data Subcommittee 2012) and open pine classifications identified by Nordman et al. (2016). Due to these modifications, some land cover classes (e.g., pine flatwoods, oyster reefs, etc.) are currently not mappable using remote sensing techniques. Nevertheless, we include them within these Strategic Bird Monitoring Guidelines as important land cover classes that support a number of bird species. It is our hope that technological advances will soon permit the remote sensing-based mapping of these important land cover classes. In the interim, users are encouraged to use finer-scale data sets where applicable, e.g., Coastwide Reference Monitoring System (Steyer et al. 2003) and System-wide Assessment and Monitoring Program (Hijuelos et al. 2013).

Using These Strategic Guidelines

Using GoMAMN as a forum to coordinate and collaborate, partners in the Gulf region identified a suite of objectives and associated evaluation criteria through a series of stakeholder workshops. Collectively, these objectives and evaluation criteria have been used to develop Strategic Bird Monitoring Guidelines to facilitate monitoring efforts as the collective Gulf of Mexico restoration enterprise undertakes holistic ecosystem restoration. Specifically, these Strategic Bird Monitoring Guidelines provides greater insight into the fundamental objectives and core values required to advance bird monitoring activities (see Chapter 2), and identifies key data gaps and uncertainties about avian populations across the

northern Gulf of Mexico (see Chapters 3–9). The authors of chapters 3–9, in consultation with other subject matter experts, used the fundamental objectives and core values identified by GoMAMN partners as the guiding principles to articulate the most urgent information needs (i.e., our highest priority bird monitoring activities). As such, each chapter was written in a manner to facilitate decision making at multiple levels—from the program manager trying to figure out what information is needed to the field biologist designing and implementing surveys. Furthermore, with the emphasis on integrated and coordinated monitoring, information from this document could also inform decision making not only within but also across organizational boundaries.

Reducing uncertainty and filling the identified data gaps requires field biologists and program managers to reassess traditional monitoring activities by placing greater emphasis on the core values and priorities identified within this report (e.g., working collaboratively to design and implement monitoring efforts across state boundary lines to address a mutual objective). Noteworthy here, these Strategic Bird Monitoring Guidelines do not provide specific survey design and sampling protocols. Given the vast number of data needs across a variety of avian species and habitats, the development and presentation of species-specific survey designs and sampling protocols is beyond the scope of this report; when appropriate, we direct the reader to existing, nationally recognized sampling protocols. It is our hope that program managers and field biologists will embrace GoMAMN as a forum to collaborate and integrate expertise in the design and implementation of future monitoring activities.

The monitoring recommendations outlined within these Strategic Bird Monitoring Guidelines are not regulatory or administratively prescriptive. Instead, they are advisory in nature, with the expectation that they will be incorporated to improve avian conservation through coordinated and collaborative monitoring efforts being implemented by partners, stakeholders, and administrative programs across the northern Gulf of Mexico region. The information presented within these Strategic Bird Monitoring Guidelines reflects over four years of structured and facilitated discussions based on decades of practical, hands-on experience from greater than 100 biologists, land managers, and program administrators. It is our hope that the compilation and synthesis of literature and knowledge presented within these Strategic Bird Monitoring Guidelines will serve as core components to maximize the usefulness of bird data to inform conservation decisions as well as to promote collaborative and integrated monitoring efforts across the northern Gulf of Mexico. ❧

ACKNOWLEDGMENTS

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APPENDIX 1

Gulf of Mexico Avian Monitoring Network Birds of Conservation Concern. Table includes residency status, landcover association, and the North American continental trend and conservation concern scores (Partners in Flight 2017).

Common Name	Monitoring Group	PIF Trend[a]	PIF Continental Concern[a]	PIF-Status[a]	Breeding	Wintering	Migratory	Landcover Association(s)[b]
Mottled Duck	Waterfowl	5	17	Watchlist - Red	X	X		Palustrine Emergent Wetland, Estuarine Emergent Wetland (brackish to saltwater marshes)
Northern Pintail	Waterfowl	4	12			X	X	Palustrine Emergent Wetland, Estuarine Emergent Wetland, Estuarine-Coastal
Lesser Scaup	Waterfowl	4	11			X	X	Palustrine Emergent Wetland, Estuarine Emergent Wetland, Estuarine-Coastal, Estuarine-Tidal Riverine Open Water, Estuarine-Open Water, Marine-Nearshore
Northern Bobwhite	Landbird	5	12	Steep Decline	X	X		Upland Scrub/Shrub, Grassland, Upland Evergreen Forest (Dry & Mesic Longleaf Flatwoods, Mesic Longleaf Pine Flatwoods, Xeric Longleaf Pine Barrens; fire-maintained)
Common Ground-Dove	Landbird	3	9		X	X		Upland Scrub/Shrub, Estuarine Scrub/Shrub, Beach/Dune
Chuck-will's-Widow	Landbird	5	12	Steep Decline	X	X		Upland Mixed Forest, Upland Evergreen Forest
Yellow Rail	Marsh Bird	3	15	Watchlist - Yellow [R]		X		Palustine Emergent Wetland, Estuarine Emergent Wetland, Upland Evergreen Forest (Wet Longleaf & Slash Pine Flatwoods & Savannas)
Black Rail	Marsh Bird	5	17	Watchlist - Red	X	X		Palustrine Emergent Wetland, Estuarine Emergent Wetland
King Rail	Marsh Bird	5	15	Watchlist - Yellow [D]	X	X		Palustrine Emergent Wetland
FL Sandhill Crane[UR, FL] (state listed)	Wading Bird	3*	17*	Watchlist - Yellow [R]	X	X		Palustrine Emergent Wetland, Lacustrine/Riverine, Grassland, Upland Evergreen Forest (Wet Longleaf & Slash Pine Flatwoods & Savannas)
MS Sandhill Crane[T&E]	Wading Bird	1*	15*	Watchlist - Yellow [R]	X	X		Palustrine Emergent Wetland, Lacustrine/Riverine, Grassland, Upland Evergreen Forest (Wet Longleaf & Slash Pine Flatwoods & Savannas)
Whooping Crane[T&E]	Wading Bird	1	16	Watchlist - Yellow [R]	X	X	X	Palustrine Emergent Wetland, Estuarine Emergent Wetland, Estuarine-Coastal (saltmarshes, shallow bays, & exposed tidal flats; also harvested cropfields & pasturelands)
American Oyster-catcher	Shorebird	3	14	Watchlist - Yellow [R]	X	X		Estuarine-Coastal
Piping Plover[T&E]	Shorebird	5	18	Watchlist - Red		X	X	Estuarine-Coastal, Beach/Dune
Wilson's Plover	Shorebird	4	16	Watchlist - Yellow [R]	X		X	Estuarine-Coastal, Beach/Dune
Snowy Plover	Shorebird	4	15	Watchlist - Yellow [D]	X	X		Estuarine-Coastal, Beach/Dune

Appendix 1 (continued).

Common Name	Monitoring Group	PIF Trend[a]	PIF Continental Concern[a]	PIF-Status[a]	Breeding	Wintering	Migratory	Landcover Association(s)[b]
Long-billed Curlew	Shorebird	2	12			X	X	Estuarine-Tidal Riverine Coastal, Estuarine-Coastal (during migration habitat may include: dry short-grass prairie, wetlands associated with alkali lakes, playa lakes, wet coastal pasture, tidal mudflats, saltmarsh, alfalfa fields, barley fields, fallow agriculture fields, & harvested rice fields)
Marbled Godwit	Shorebird	3	14	Watchlist - Yellow [R]		X	X	Palustrine Emergent Wetland, Estuarine Emergent Wetland, Estuarine-Coastal, Beach/Dune, Grassland (heavily to over-grazed pastures, sod farms, fallow dry fields w/ limited stem height & little inundation): coastal mudflats adjoining savannas or meadows, estuaries, alkali ponds, sandy beaches, & sandflats
Red Knot[T&E]	Shorebird	5	13	Watchlist - Yellow [D]		X	X	Estuarine-Coastal, Beach/Dune
Dunlin	Shorebird	4	11			X	X	Estuarine-Tidal Riverine Coastal, Estuarine-Coastal, Beach/Dune
Buff-breasted Sandpiper	Shorebird	4	14	Watchlist - Yellow [D]			X	Grassland (heavily to over-grazed pastures, sod farms, fallow dry fields w/ limited stem height & little inundation)
Western Sandpiper	Shorebird	3	12			X	X	Palustrine Emergent Wetland (exposed margins), Estuarine Emergent Wetland (exposed margins), Estuarine-Coastal (intertidal mud & sandflats, roosting during high tide on exposed tussocks in the saltmarsh)
Sooty Tern	Seabird	3	9		X		X	Beach/Dune, Estuarine-Open Water, Marine-Nearshore, Marine-Offshore, Marine-Oceanic
Least Tern[1]	Seabird	4	14	Watchlist - Yellow [D]	X		X	Estuarine-Tidal Riverine Coastal, Estuarine-Coastal, Estuarine-Tidal Riverine Coastal, Beach/Dune
Gull-billed Tern	Seabird	4	13		X		X	Estuarine-Coastal, Estuarine-Coastal Riverine Coastal, Beach/Dune
Royal Tern	Seabird	2	11		X	X		Estuarine-Tidal Riverine Coastal, Estuarine-Coastal, Estuarine-Tidal Riverine Open Water, Estuarine Open Water, Marine-Nearshore, Beach/Dune
Sandwich Tern	Seabird	2	11		X	X		Estuarine-Tidal Riverine Coastal, Estuarine-Coastal, Estuarine-Tidal Riverine Open Water, Estuarine Open Water, Beach/Dune
Black Skimmer	Seabird	5	14	Watchlist - Yellow [D]	X	X		Estuarine-Coastal
Common Loon	Seabird	1	9			X	X	Lacustrine/Riverine, Estuarine-Open Water, Marine-Nearshore
Audubon's Shearwater	Seabird	4	14	Watchlist - Yellow [D]			X	Marine-Offshore, Marine-Oceanic
Band-rumped Storm-Petrel	Seabird	4	17	Watchlist - Red			X	Marine-Offshore, Marine-Oceanic
Black-capped Petrel[T&E, IUCN]	Seabird	5	20	Watchlist - Red			X	Marine-Offshore, Marine-Oceanic

Appendix 1 (continued).

Common Name	Monitoring Group	PIF Trend[a]	PIF Continental Concern[a]	PIF-Status[a]	Breeding	Wintering	Migratory	Landcover Association(s)[b]
Wood Stork[T&E]	Wading Bird	3	12				X	Palustrine Forested Wetland (bottomland hardwoods), Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Emergent Wetland; utilizes freshwater aquaculture ponds (catfish, crawfish)
Magnificent Frigatebird	Seabird	4	16	Watchlist - Yellow [R]	X		X	Marine-Nearshore, Marine-Offshore
Masked Booby	Seabird	3	12		X		X	Marine-Nearshore, Marine-Offshore, Marine-Oceanic
Northern Gannet	Seabird	1	10			X		Estuarine-Open Water, Marine-Nearshore, Marine-Offshore
Brown Pelican	Seabird	1	10		X	X		Estuarine-Coastal, Estuarine-Open Water, Estuarine-Tidal Riverine Open Water, Marine-Nearshore, Marine-Offshore
American Bittern	Marsh Bird	4	12		X	X	X	Palustrine Emergent Wetland
Least Bittern	Marsh Bird	3	10		X		X	Palustrine Emergent Wetland, Estuarine Emergent Wetland (brackish to saltwater marshes)
Snowy Egret	Wading Bird	1	7		X	X		Palustrine Emergent Wetland, Estuarine Emergent Wetland, Palustrine Forested Wetland, Palustrine Scrub/Shrub Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine-Tidal Riverine Coastal
Little Blue Heron	Wading Bird	4	11		X		X	Palustrine Forested Wetland, Estuarine Forested Wetland, Estuarine Emergent Wetland
Tricolored Heron	Wading Bird	2	11		X	X		Estuarine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine-Tidal Riverine Coastal
Reddish Egret	Wading Bird	3	15	Watchlist - Yellow [R]	X	X		Palustrine Emergent Wetland, Estuarine Emergent Wetland (brackish to saltwater marshes), Estuarine Scrub/Shrub, Estuarine-Coastal
Osprey	Raptor	1	7		X	X		Palustrine Emergent Wetland, Estuarine Emergent Wetland (brackish to saltwater marshes), Estuarine Forested Wetland, Estuarine-Tidal Riverine Open Water
Swallow-tailed Kite	Raptor	3	12		X		X	Palustrine Forested Wetland (bottomland hardwoods), Lacustrine/Riverine, Estuarine Forested Wetland, Upland Evergreen Forest (Wet Longleaf and Slash Pine Flatwoods & Savannas); in se. U.S., nesting & foraging habitat includes various combinations of managed pine forest, hydric pinelands with understory of wetland plants, pine fringe of floodplain & hardwood swamp forests, cypress swamp, wet prairies, freshwater & brackish marshes, hardwood hammocks, tall trees edging sloughs & bayous, mixed cypress-hardwood swamp forest, & mangrove forest
Bald Eagle	Raptor	1	9		X	X		Palustrine Forested Wetland, Estuarine Forested Wetland

Appendix 1 (continued).

Common Name	Monitoring Group	PIF Trend[a]	PIF Continental Concern[a]	PIF-Status[a]	Breeding	Wintering	Migratory	Landcover Association(s)[b]
Short-eared Owl	Raptor	5	12	Steep Decline		X		Grassland, Upland Scrub/Shrub, Upland Evergreen Forest (Dry & Mesic Longleaf Flatwoods, Xeric Longleaf Pine Barrens), Beach/Dune
Red-headed Woodpecker	Landbird	5	13	Watchlist - Yellow [D]	X	X		Upland Deciduous Forest, Upland Mixed Forest
Red-cockaded Wood-pecker[T&E]	Landbird	5	18	Watchlist - Red	X	X		Upland Evergreen Forest (Dry & Mesic Longleaf Flatwoods, Mesic Longleaf Pine Flatwoods, Wet Longleaf & Slash Pine Flatwoods & Savannas; fire-maintained)
SE American Kestrel[2, FL] (state listed)	Raptor	4*	17*	Watchlist - Yellow [R]	X	X		Upland Deciduous Forest, Upland Mixed Forest, Upland Scrub/Shrub
Peregrine Falcon	Raptor	2	10			X	X	Lacustrine/Riverine, Estuarine Forested Wetland, Estuarine Shrub/Scrub Wetland, Estuarine Emergent Wetland, Estuarine-Coastal, Beach/Dune
Loggerhead Shrike	Landbird	5	12	Steep Decline	X	X		Upland Scrub/Shrub, Upland Evergreen Forest (Xeric Longleaf Pine Barrens), Beach/Dune
Brown-headed Nuthatch	Landbird	4	13		X	X		Upland Evergreen Forest
Sedge Wren	Marsh Bird	1	7			X	X	Palustrine Emergent Wetland, Estuarine Emergent Wetland (brackish to saltwater marshes), Upland Evergreen Forest (Wet Longleaf & Slash Pine Flatwoods & Savannas)
Marsh Wren	Marsh Bird	1	7		X	X		Palustrine Emergent Wetland, Estuarine Emergent Wetland (brackish to saltwater marshes)
Wood Thrush	Landbird	5	14	Watchlist - Yellow [D]	X		X	Upland Deciduous Forest, Upland Mixed Forest
Louisiana Waterthrush	Landbird	2	12		X		X	Upland Deciduous Forests (with med-high gradient 1st to 3rd order flowing streams/rivers), Palustrine Forested Wetland (bottomland hardwoods)
Prothonotary Warbler	Landbird	4	14	Watchlist - Yellow [D]	X		X	Palustrine Forested Wetland (bottomland hardwoods)
Swainson's Warbler	Landbird	1	13		X		X	Upland Deciduous Forest, Upland Mixed Forest, Upland Evergreen Forest, Palustrine Forested Wetland (bottomland hardwoods)
Yellow-throated Warbler	Landbird	2	10		X	X	X	Upland Deciduous Forest, Upland Mixed Forest, Upland Evergreen Forest
Bachman's Sparrow	Landbird	5	16	Watchlist - Red	X	X		Upland Evergreen Forest
Grasshopper Sparrow[3]	Landbird	5	12	Steep Decline	X	X		Grassland
Henslow's Sparrow	Landbird	3	14	Watchlist - Yellow [R]		X		Upland Evergreen Forest (Wet Longleaf & Slash Pine Flatwoods & Savannas; fire-maintained)
Le Conte's Sparrow	Landbird	5	13	Watchlist - Yellow [D]		X		Grassland
Nelson's Sparrow	Marsh Bird	1	12			X	X	Estuarine Emergent Wetland
Seaside Sparrow[4]	Marsh Bird	2	14	Watchlist - Yellow [R]	X	X		Estuarine Emergent Wetland

Appendix 1 (continued).

Common Name	Monitoring Group	PIF Trend[a]	PIF Continental Concern[a]	PIF-Status[a]	Breeding	Wintering	Migratory	Landcover Association(s)[b]
Painted Bunting	Landbird	3	11		X		X	Upland Deciduous Forest, Upland Mixed Forest, Upland Scrub/Shrub, Upland Evergreen Forest (Dry & Mesic Longleaf Flatwoods, Mesic Longleaf Pine Flatwoods, Dry & Mesic Hilly Pine Woodlands)
Rusty Blackbird	Landbird	5	12	Steep Decline		X		Upland Evergreen Forest, Grassland, Upland Scrub/Shrub, Palustrine Forested Wetland (bottomland hardwoods); forages in stubble fields, pasture lands, plowed & idle fallow fields, and swamp borders, wet woodlands and pond edges

[a]Derived from Partners in Flight Species Assessment Database (PIF 2019)- http://pif.birdconservancy.org/ACAD/Database.aspx

[b]Used C-CAP or CMEC Classifications- attempted to associate species to discrete habitat type(s) using landcover classes and information from species accounts in the Birds of North America Online- https://birdsna.org/Species-Account/bna/home. Refer to Chapter 1 and Appendix 2 for more information.

[1]This refers to the non-listed coastal breeding population of Least Tern and not the federally-listed Interior Propulation of Least Tern- https://ecos.fws.gov/ecp0/profile/speciesProfile.action?spcode=B07N

[2]The SE American Kestrel is not a federally listed species under ESA and the last candidate review was in 1994. However, it is a state-listed (FL) species- https://ecos.fws.gov/ecp0/profile/speciesProfile.action?spcode=B072 and http://myfwc.com/media/1515251/threatened-endangered-species.pdf

[3]This refers to the non-listed wintering population of Grasshopper Sparrow and not the breeding population of FL Grasshopper Sparrow that is federally listed- https://ecos.fws.gov/ecp0/profile/speciesProfile.action?spcode=B07G

[4]This refers to and includes all of the subspecies/races of breeding Seaside Sparrows in the GoM and not the breeding population of Cape Sable Seaside Sparrow that is federally listed- https://ecos.fws.gov/ecp0/profile/speciesProfile.action?spcode=B00Q

[UR]The FL Sandhill Crane is Under Review as per 2011 Petition and is a state-listed (FL) species- https://ecos.fws.gov/ecp0/profile/speciesProfile.action?spcode=B0NM and http://myfwc.com/media/1515251/threatened-endangered-species.pdf

[T&E]Federally listed species, candidate species, or species Under Review- https://www.fws.gov/endangered/

[IUCN]International Union for Conservation of Nature- per the IUCN RedList this species is considered Endangered https://www.iucnredlist.org/species/22698092/132624510. Further, it is Proposed Threatened (with 4d) under ESA https://ecos.fws.gov/ecp0/profile/speciesProfile.action?spcode=B0AS

*Derived via expert opinion using rules and criteria setforth in Partners in Flight Species Assessment Technical Handbook (Panjabi et al. 2017)- http://rmbo.org/pubs/downloads/PIF%20Handbook%20Version%202017.pdf

APPENDIX 2

Gulf of Mexico Avian Monitoring Network: Ecological Systems and Landcover Classes.

BROADLY DEFINED ECOLOGICAL SYSTEMS	LANDCOVER CLASSES	DEFINITION
Agricultural Land	Cultivated Crops	Contains areas intensely managed for production of annual crops. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.
	Pasture/Hay	Contains areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle and not tilled. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
Grassland	Grassland/Herbaceous (and wet prairie)	Contains areas dominated by grammanoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling vegetation, but can be utilized for grazing.
	Pine Savanna	Contains areas dominated by grammanoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. Pine basal area typically less than 20sq ft/acre.
Forest Land (upland)	Deciduous Forest	Contains areas dominated by trees generally greater than 5 meters tall and greater than 20 percent of the total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
	Evergreen Forest	See flatwoods and pine barren landcover classes.
	Dry & Mesic Longleaf Flatwoods	Contains open canopies with irregularly scattered longleaf pine, clumps of midstory scrub oaks and a grassy understory.
	Mesic Longleaf Pine Flatwoods	Contains irregularly scattered longleaf pine, slash pine, or south Florida slash pine on sites where soils show a spodic horizon (wet during the winter and dry in the summer) with a herbaceous ground layer.
	Xeric Longleaf Pine Barrens	Contains open woodlands dominated by longleaf pine and a turkey oak or blackjack oak midstory with herbaceous ground layer on consistently dry sites.
Forest Land (Upland)	Mixed Forest	Contains areas dominated by trees generally greater than 5 meters tall and greater than 20 percent of the total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover. Both coniferous and broad-leaved evergreens are included in this category.
Scrub Land	Scrub/Shrub	Contains areas dominated by shrubs less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes tree shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
Palustrine Wetlands	Palustrine Forested Wetland	Includes tidal and nontidal wetlands dominated by woody vegetation greater than or equal to 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent.
	Palustrine Shrub/Scrub Wetland	Includes tidal and non tidal wetlands dominated by wood vegetation less than 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent. Species present could be true shrubs, young trees and shrubs, or trees that are small or stunted due to environmental conditions.
	Palustrine Emergent Wetland	Includes tidal and non tidal wetlands dominated by persistent emergent vascular plants, emergent mosses or lichens, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation cover is greater than 80 percent. Plants generally remain standing until the next growing season.

Appendix 2 (continued).

BROADLY DEFINED ECOLOGICAL SYSTEMS	LANDCOVER CLASSES	DEFINITION
Estuarine Wetlands	Estuarine Forested Wetland	Includes tidal wetlands dominated by woody vegetation greater than or equal to 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.
Estuarine Wetlands	Estuarine Scrub/Shrub Wetland	Includes tidal wetlands dominated by woody vegetation less than 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.
	Estuarine Emergent Wetland	Includes all tidal wetlands dominated by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens). Wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent and that are present for most of the growing season in most years. Total vegetation cover is greater than 80 percent. Perennial plants usually dominate these wetlands.
Beach / Dune	Beach/Dune	Includes material such as silt, sand, or gravel that is subject to inundation and redistribution due to the action of water. Substrates lack vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable.
Water and Submerged Lands	Open Water	Includes areas of open water, generally with less than 25% cover of vegetation or soil. Does not include marine waters; does not include oyster reefs.
	Marine - Nearshore	Includes marine area from landward side to the 30m contour line.
	Marine - Offshore	Includes marine area from 30m contour line to the continental shelf break.
	Marine - Oceanic	Includes marine area from continental shelf break to open ocean.
	Oyster Reefs	Straight or sinuous, ridge-like reefs formed by oysters and typically found in the intertidal zone.
	Palustrine Aquatic Bed	Includes tidal wetlands and deepwater habitats in which salinity due to ocean derived salts is below 0.5 percent and which are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. Total vegetation cover is greater than 80 percent.
Water and Submerged Lands	Estuarine Aquatic Bed	Includes tidal wetlands and deepwater habitats in which salinity due to ocean derived salts is equal to or greater than 0.5 percent and which are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. Total vegetation cover is greater than 80 percent.

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