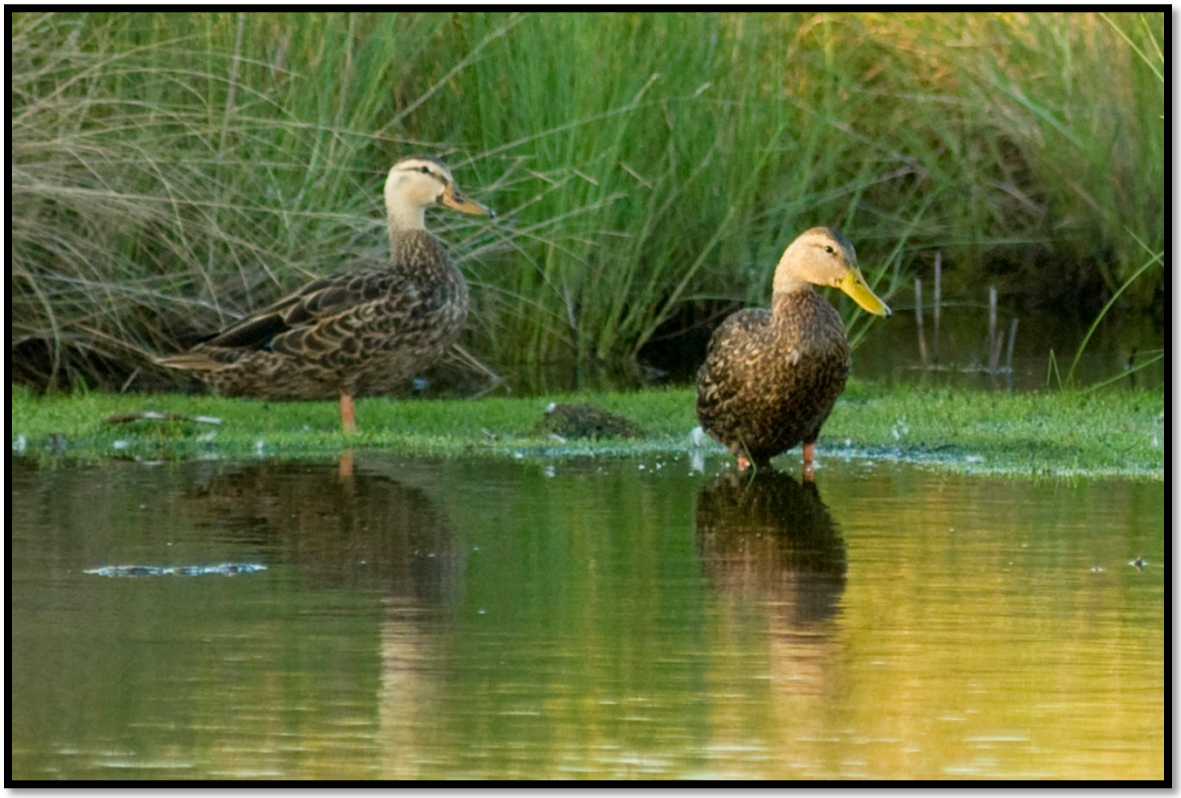
U.S. Fish & Wildlife Service

Interim
Inventory and Monitoring Plan

Delta National Wildlife Refuge



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June 2021

Delta National Wildlife Refuge

Interim Inventory and Monitoring Plan

Signature Page

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Table of Contents

Executive Summary

The Interim Inventory and Monitoring Plan documents the process and selection of prioritized natural resource surveys that will be conducted at Delta National Wildlife Refuge (NWR) from 2021 until the refuge Comprehensive Conservation Plan or Habitat Management Plan is revised or a comprehensive Inventory and Monitoring Plan is completed. This Interim Inventory and Monitoring Plan was developed according to the foundations of the Inventory and Monitoring Policy (U.S. Fish and Wildlife Service 2014) for the National Wildlife Refuge System. This interim approach supports the Inventory and Monitoring Implementation Plan (Newman 2020) for each refuge in the system to have an inventory and monitoring plan developed by 2024.

A virtual workshop was held February 16-17, 2021, with a planning team composed of refuge and Division of Strategic Management staff. Habitat management objectives from the Delta NWR Habitat Management Plan were prioritized within a decision-support assessment prioritization tool for discussion. This process and the tool provided a standard, structured, and transparent approach to prioritizing objectives as a basis for final decisions. Refuge staff then selected the highest prioritized management objectives to evaluate for survey assignment. Management Objectives A-2 (Emergent Marsh Restoration) and A-3 (Emergent Marsh Management) were selected as the top priorities.

A rough assessment of estimated time, cost, and feasibility were determined to facilitate selection of one to three survey approaches for the Interim Inventory and Monitoring Plan. The planning team evaluated one current survey (that evaluates both objectives) and five prospective approaches to assess the selected objectives. Based on various factors, the refuge selected Nonbreeding Waterfowl Use and Abundance survey approach that will estimate migrating and wintering waterfowl on the refuge during peak period. This will also inform the refuge if the 12.6 million waterfowl energy day step-down objective is being realized. Remote Sensing Landscape Assessment monitoring will evaluate the distribution, acres, and wetland structure of change across the refuge, including areas historically and currently being restored. Basic information regarding survey design and instructions for the next actions necessary for successful implementation of the surveys are provided in the Survey Narratives and Next Step Instructions Assessment section.

Key Decision Points:

Highest Priority Management Objectives:

1. A-2 (Emergent Marsh Restoration)
2. A- 3 (Emergent Marsh Management)

    Sub-objective is to provided12.6 million waterfowl-energy-days to support step-down objectives of the North American Waterfowl Management Plan specifically allocated for Delta National Wildlife Refuge.

Selected Highest Priority Surveys:

1. Nonbreeding Waterfowl Use and Abundance
2. Remote Sensing Landscape Assessment

Introduction

The Interim Inventory and Monitoring Plan (IMP) documents the process and selection of prioritized natural resource surveys that will be conducted at Delta National Wildlife Refuge (NWR, refuge) from 2021 until the refuge Comprehensive Conservation Plan (CCP) or Habitat Management Plan (HMP) is revised or a comprehensive IMP is completed. The process prioritizes management objectives and then identifies and prioritizes prospective surveys to evaluate these objectives. This IMP is constrained to monitoring surveys which are explicitly tied to habitat management objectives and associated resources of concern (RoCs) outlined in Delta NWR's HMP (U.S. Fish and Wildlife Service [USFWS] 2013). More specifically, this Interim IMP only addresses the highest prioritized habitat management objectives of the HMP. Therefore, the proposed surveys are exclusively focused on effectiveness monitoring of strategies to achieve objectives through an adaptive management process. As part of this streamlined process, and to address limited capacity and time, a maximum of three surveys covering the refuge's highest natural resource priorities will be selected for current monitoring. This approach does not discount the value and importance of other ongoing or anticipated biotic and abiotic surveys on the refuge that address biological integrity, diversity, and environmental health (National Wildlife Refuge System Improvement Act 1997) or regional and national conservation initiatives.

This Interim IMP was developed according to the foundations of the Inventory and Monitoring policy (701 FW 2) for the National Wildlife Refuge System (NWRS). Furthermore, this approach supports the Inventory and Monitoring Implementation Plan (Newman 2020) for each refuge in the system to have an IMP developed by 2024.

Refuge Purpose

The establishing purposes of Delta NWR are:

> *... as a refuge and breeding ground for migratory birds and other wildlife* (Executive Order 7229, dated November 19, 1935).
>
> *... as a migratory waterfowl refuge, is subject to the use...for quarantine purposes*; (Executive Order 7383, dated June 5, 1936).
>
> *...for waterfowl refuge purposes, is subject to use...with the improvement of navigation in the Mississippi River and the uses thereof, and the administration of the area for wildlife conservation purposes by the Department of Agriculture (now Interior) shall be without interference with any existing or future uses or regulations of the War Department (now Army Corps of Engineers)* (Executive Order 7538, dated January 19, 1937).
>
> *...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds 16 U.S.C* (Migratory Bird Conservation Act).

Additional information concerning the history, purpose and natural resources of Delta NWR is provided in the refuge CCP (USFWS 2008b).

Methods

Prioritizing Management Objectives and Selecting Surveys

Resource management objectives from the Delta NWR HMP (USFWS 2013) were assessed by the Inventory and Monitoring (I&M) Branch ecologists for potentially appropriate combinations of similar objectives, interpretation of objectified strategies, and exclusion of objectives that were not resource oriented and not being considered for further prioritization. Stepped-down waterfowl energy day objectives from the North American Waterfowl Management Plan (see Hagy et al. 2020) were indirectly considered.

This list was then reviewed and refined at a virtual workshop February 16-17, 2021, with refuge staff. Background information, including historical and current monitoring efforts, about the refuge and the resource objectives were briefly discussed prior to prioritizing the objectives and RoCs. The objectives were subsequently prioritized using eight criteria (see Appendix A) within a decision-support assessment prioritization tool. The tool utilized a simple, multi-attribute ranking technique based on a linear additive model, whereby an overall prioritization score for each objective is calculated from the product of the total sum of a performance score of each selected criterion and the weight of that criterion (Goodwin and Wright 2014). This process and the tool provided a standard, structured, and transparent approach to prioritizing objectives as a basis for final decisions. All criteria had equal weight in the process. Objectives were scored collectively by consensus of the refuge manager and biologist at the workshop. A summed score was calculated for each objective and refuge staff then selected which of the highest prioritized objectives to evaluate (maximum of three). Refuge staff made all decisions regarding the scoring of the resource objectives and selecting the priorities, and the reasons for selection were captured within the results section.

After the highest prioritized resource objectives were identified, the workshop participants brainstormed a list of proposed surveys or attributes of interest that could evaluate the wildlife response variables (i.e., RoC) or condition of desired habitat. This evaluation also included any current or historic surveys identified in the Planning and Review of Inventory and Monitoring on Refuges (PRIMR) database. Finally, a rough assessment of estimated time (in FTE, a fraction of the total 2,080 work-year hours), cost (yearly dollar amount), and feasibility to conduct (given things like staffing across the Southeast Louisiana Refuges Complex or ability to accurately monitor, etc.) were determined for each survey/attribute in order to facilitate selection of one to three survey approaches for the Interim IMP (Appendix B). Prioritized surveys for the Interim IMP were selected based on this information.

Delta NWR is part of the Southeast Louisiana Refuges Complex consisting of nine refuges. Staffing shared with these other refuges includes the refuge manager and wildlife biologist. Refuge and Inventory and Monitoring Branch staff participating in the 2-day workshop or assisting in drafting of the plan included:

Planning Team
Jimmy Laurent, Refuge Manager, Delta NWR
Barret Fortier, Wildlife Biologist, SE Louisiana National Wildlife Refuges Complex

Neil Lalonde, Project Leader, SE Louisiana National Wildlife Refuges Complex
Amanda Bessler, Terrestrial Ecologist, I&M Branch
Michelle Moorman, Freshwater Ecologist, I&M Branch
David Richardson, Terrestrial Ecologist, I&M Branch

Additional Support
Heath Hagy, Waterfowl Ecologist, Div. Strategic Resource Management
Adam Smith, Biometrician, I&M Branch

Results and Discussion

Three resource objectives from the Delta NWR HMP (USFWS 2013) were evaluated for prioritization. Objective A-1: Emergent Marsh Protection was excluded from the prioritization process due to it representing more of a strategy than a tangible objective. The remaining two objectives were evaluated based on eight prioritization criteria (Table 1 and Table 2). A survey narrative and next step instruction was completed for each survey selected to evaluate the adopted or prioritized resource objectives.

Both objectives, Emergent Marsh Restoration (A-2) and Emergent Marsh Management (A- 3), were selected as the top priorities. Though Emergent Marsh Restoration received the higher score (0.625) through the prioritization process, it was decided that both objectives could be adopted and evaluated using similar survey approaches for a subset of RoCs (i.e., migrant and wintering waterfowl). The refuge staff confirmed that the scores mirrored their internal thoughts relative to priority ranking of management objectives (Table 1).

The planning team identified one current survey and one prospective monitoring approach to evaluate the two selected habitat objectives. The refuge's very limited capacity for management, one biologist over nine refuges, as well as the size and access played a large role in the survey selection process. As noted with the objectives, potential management and surveys are very limited by staffing capacity. Based on estimated time, costs, and feasibility, the refuge selected an annual aerial waterfowl count survey approach (Nonbreeding Waterfowl Use and Abundance) to estimate migrating and wintering waterfowl on the refuge during the peak period of the year, as well as a Remote Sensing Landscape Assessment approach to use existing publicly available imagery to monitor changes in the distribution and amount of vegetated areas in the marsh (Table 2; Appendix B). The aerial waterfowl count will visually census the entire refuge for waterfowl and provide a population estimate of use. Recording waterfowl abundance in conjunction with geospatial locations across the refuge, this survey could also be used to assess response of waterfowl populations to past, current, and planned marsh restoration efforts. Furthermore, the waterfowl survey will provide an assessment of regional waterfowl step-down objectives (Hagy et al. 2020) from the North American Waterfowl Management Plan specifically allocated for Delta NWR. Remote sensing and waterfowl abundance surveys will require relatively low amounts of staff time, yet they could inform management decisions for both marsh objectives.

Four other prospective surveys were considered but not selected to evaluate the objectives. A Shorebird Survey was considered to evaluate Marsh Restoration, but it was decided sufficient

staff to conduct repetitive monitoring events in a year could not be expected. This method had been used opportunistically but only as a reconnaissance count. A Secretive Marsh Bird Survey was considered to evaluate Marsh Management, but the refuge does not have the baseline dataset or staff to conduct this assessment given the large scale of the refuge. Baseline information on secretive marsh bird presence will be provided by Louisiana State University and used to determine the potential occurrence of the endangered black rail and the need for more intensive monitoring in the future. Though the mottled duck is a resident breeding species and identified as a priority species in the West Gulf Coastal Plain by the Gulf Coast Joint Venture for conservation actions and population monitoring (Wilson 2007), this survey necessitates the use of helicopter and extensive ground observations and was deemed beyond the capacity of the refuge. A Colonial Breeding Wading Bird Survey (Ground) was also considered but not selected due to not addressing collective RoCs and past data not used to inform management actions.

Table 1. Prioritized habitat management objectives and associated resources of concern from the Delta National Wildlife Refuge Habitat Management Plan (HMP, USFW 2013).

Priority	Objective	Resource of Concern	Priority Score	Status
1	**A-2 Emergent Marsh Restoration** By the end of the planning period for this HMP, restore marsh cover to pre-Hurricane Katrina levels through sediment trapping, by monitoring flow through existing crevasses, reopening crevasses that have silted in, and creating new crevasses in strategic locations whenever potential sites are identified. Intermediate-term objectives include: by 2015, identify 12 sites (1,500 acres) likely to benefit from marsh creation and likely to be responsive to crevasse creation or reopening; once identified, begin seeking resources to restore 1,500 acres of marsh by creating or reopening crevasses.	Waterfowl, shorebirds, secretive marsh birds, colonial breeding wading birds	0.625	Selected
2	**A-3 Emergent Marsh Management** Provide 48,000 acres of quality fresh, intermediate, and brackish marsh and open water areas every year for the 15-year duration of the planning period covered by this HMP, with the following characteristics: an approximate emergent vegetation to open water ratio of 50:50; at least 50 percent of the emergent vegetation consisting of plants of high waterfowl food value, including *Sagittari*a spp. and *Scirpus* spp., while *Colocasia* spp. (Elephant ear/Tara) maintained at less than 50 percent of the emergent plant cover; at least 65 percent of the total marsh area (31,719 acres) maintained as inviolate sanctuary; and predator populations managed so that they do not have a deleterious effect on the resources of concern, especially those that breed on the refuge.	Waterfowl, shorebirds, secretive marsh birds, colonial breeding wading birds	0.001	Selected

Table 2. Surveys selected for evaluating prioritized management objectives for Delta National Wildlife Refuge (***FFO4RLDT00***) (Source: PRIMR)

Survey ID No.[1]	*Survey Name*	*Mgmt. Objective*[2]	*Survey Area*[3]	*Staff Time*[4]	*Ann. Cost*[5]	*Survey Timing*[6]	*Survey Length*[7]	*Survey Coord.*[8]	*Protocol Citation*[9]	*Protocol Status*[10]
FFO4RLD T00-002	Nonbreeding Waterfowl Use and Abundance	A-2, A-3	Entire Refuge	FWS:0.02	$1,000.00	January Annually during "Peak" period	Indefinite	Wildlife Biologist with Regional waterfowl Biologist	None	TBD
FF04RLD T00-007	Remote Sensing Landscape Assessment	A-2, A-3	Entire Refuge	FWS:0.04	$600.00	Every 1-3 years	Indefinite	Wildlife Biologist with Regional I&M Support	None	None

[1] A unique identification number assigned by the Planning and Review of Inventory and Monitoring on Refuges (PRIMR) database. This number is prefaced by the station cost-center code FFO4RLHY00-
[2] The management plan and objectives that justify the described survey (from the HMP).
[3] Station management unit names, entire station, or names of other landscape units included in survey.
[4] Estimates of Service (FWS) and non-Service (Other) staff time needed to complete the survey (1 work year = 2080 hours = 1 FTE).
[5] Average annual operations costs for conducting the survey (e.g., equipment, contracts, travel) not including staff time, TBD = to be determined.
[6] Timing and frequency of survey field activities.
[7] The years during which the survey has been or will be conducted.
[8] Name and position of the survey coordinator for each survey.
[9] Title, author, and version of the survey protocol. (If there is no protocol to cite, enter None).
[10] Scale of intended use (National Framework, Regional Framework, Site-specific) and stage of approval of the survey protocol (Initial Survey Instructions, Complete Draft, In Review, or Approved).

National Environmental Policy Act (NEPA) Compliance

Surveys to be implemented within this Interim IMP were evaluated to determine the level of NEPA documentation required. Based on this review, it was determined the surveys to be conducted under this Interim IMP are categorically excluded pursuant to Department of Interior Manual 516 DM 8.5(B1). The administrative record of this finding is provided in Appendix C.

Survey Narratives and Next Step Instructions Assessment

This section provides the Survey Narrative with a Next Step Instruction assessment and documents the key attributes of the proposed survey approach and justification. Basic information for developing more specific methodology through the next steps instructions is provided. Implementation of the surveys to provide baseline surveillance of the prioritized management objective will be further addressed through Phase 4 of the Natural Resource Prioritization Process.

Nonbreeding Waterfowl Use and Abundance | Current | (PRIMR 1.1): FFO4RLDT00-002)

Management Objectives:

A-2: Emergent Marsh Restoration:
By the end of the planning period for this HMP, restore marsh cover to pre-Hurricane Katrina levels through sediment trapping, monitoring flow through existing crevasses, reopening crevasses that have silted in, and creating new crevasses in strategic locations whenever potential sites are identified. Intermediate-term objectives include: by 2015, identify 12 sites (1,500 acres) likely to benefit from marsh creation and likely to be responsive to crevasse creation or reopening; once identified, begin seeking resources to restore 1,500 acres of marsh by creating or reopening crevasses.

A-3: Emergent Marsh Management:
Provide 49,000 acres of quality fresh, intermediate, and brackish marsh and open water areas every year for the 15-year duration of the planning period covered by this HMP, with the following characteristics: An approximate emergent vegetation to open water ratio of 50:50; at least 50 percent of the emergent vegetation consists of plants of high waterfowl food value, including *Sagittaria* spp. and *Scirpus* spp., while *Colocasia* spp. (Elephant ear/Tara) is maintained at less than 50 percent of the emergent plant cover; at least 65 percent of the total marsh area (31,719 acres) is maintained as inviolate sanctuary; predator populations are managed so that they do not have a deleterious effect on the RoCs, especially those that breed on the refuge.

Sub-Objective from regional waterfowl step-down objectives for the North American Waterfowl Management Plan specifically allocated for Delta NWR: 12.6 million waterfowl-energy-days (Hagy et al. 2020).

Resources of Concern: waterfowl, colonial breeding wading birds, secretive marsh birds, shorebirds

Background and Survey Justification:
Waterfowl is one of four identified RoC related to Delta NWR management objectives. In addition, the refuge has a step-down objective to provide foraging habitat for migrant and wintering waterfowl. The focus of this survey is to evaluate the more defined population objective to support approximately 12.6 million waterfowl-energy-days (Hagy et al. 2020) and document changes in waterfowl use annually through baseline monitoring (i.e., surveillance). The spatial location and abundance of waterfowl can also be used as a measured response to historic and on-going restoration areas.

The refuge has annually conducted a waterfowl survey in support of the National Midwinter Waterfowl Survey. That survey provides the same recommended primary attribute (waterfowl use) needed to evaluate the marsh objectives. Moreover, Hagy (2020) provides a similar survey approach and produces an estimate of total waterfowl use based on the average period of waterfowl migrating and wintering at the refuge (i.e., migration curve).

Survey Objectives:
- Provide an annual population estimate of migrating and wintering waterfowl use by species on the refuge during the approximate winter peak period for baseline monitoring.
- Construct an annual total migrating and wintering waterfowl use estimate based on a migration curve (Hagy 2020).
- Evaluate waterfowl response to the area designated as sanctuary compared to areas open to public disturbance.
- Evaluate long-term waterfowl response to historic and current marsh restoration projects.
- Provide a comparison of winter waterfowl use against regional, refuge-specific waterfowl-energy-day model outputs.

Survey Type:
Monitoring to Inform Management

Is there an established NWRS protocol for the survey? ☐ Yes **X** No
Hagy (2020) outlines the general procedure for modeling total waterfowl use based on a single survey event and the average migration curve for the refuge.

Sampling Units/Metrics: **X** Yes ☐ No
The survey is based on a 100% visual census of the entire refuge stratified by sanctuary vs non-sanctuary units to estimate waterfowl numbers; therefore, there is not a sampling unit. The metrics of interest are the spatial location and abundance of waterfowl by species.

Sampling Frame: **X** Yes ☐ No
The entire refuge, stratified by sanctuary and non-sanctuary units.

Sampling Design: ☐ Yes ☒ No
No sampling design has yet been outlined; however, it is anticipated the refuge will measure waterfowl use similar to its previous method of relying on an estimation of the waterfowl through a census (100% visual coverage belt transects) of the refuge via aerial fixed-wing survey. Location points to the counts will be used to create heat maps to determine counts in relation to restoration areas.

Sampling Timing: ☒ Yes ☐ No
Preferred sampling period will be the first 2 weeks of January. Sampling will be coordinated with other waterfowl survey efforts across the Southeast Louisiana Refuges Complex. Data analysis for annual total waterfowl use estimate will be based on a migration curve for the refuge from approximately October to April (Hagy 2020).

Management Trigger ☐ Yes ☒ No
No threshold of annual waterfowl use has been identified that would trigger a change of current management on the refuge. However, through monitoring, the step-down objective can be evaluated to determine if the model-derived objective is tangible given the current marsh conditions.

Methods: ☒ Yes ☐ No
Aerial survey to count waterfowl by species on the entire refuge will be done annually during approximate peak waterfowl occurrence (January). A fixed-wing aircraft flying at low altitude (<500 ft.) will be used for one to two observers to fly overlapping belt-transects. Waterfowl counts will be estimated and spatially referenced along the flight path. Georeferenced locations of groups of birds will be used to generate models of bird distributions at the time of the survey (i.e., heat maps). These maps can be coupled over time to provide information on waterfowl use relative to waterfowl food resources. Spatial data will be used to evaluate waterfowl response to marsh being restored as well as relative to areas designated as sanctuary. Waterfowl use abundance estimates will be done using procedures outlined by Hagy (2020).

Data Entry Format: ☐ Yes ☒ No
TBD

Data Storage / Archiving: ☒ Yes ☐ No
Data presently resides on the biologist's computer and also on the Shared Drive for the Southeast Louisiana Refuges Complex (S://Biology)

Data Verification/Quality Control Process: ☐ Yes ☒ No
TBD

Data Analysis Methods and Software: ☐ Yes **X** No
Data have been recorded only as the single discrete survey count by species. No analysis of the data has been done to evaluate changes over time nor specific distribution or abundance on the refuge.

Reporting: ☐ Yes X No
No annual report is completed nor has long-term analysis of the data been undertaken.

Next Step Instructions:

Based on the above assessment, over the next year the following steps should be undertaken to more fully document and implement the survey.

1. Develop Initial Survey Instructions in accordance with Hagy (2020) to estimate total waterfowl use based on the average migration curve for the refuge.
2. Create appropriate maps to delineate sanctuary units as well as marsh restoration boundaries.
3. Obtain and centralize existing migrating and wintering waterfowl data into a single data file system on the refuge server.
4. Summarize long-term waterfowl use data and examine potential trends.
5. Yearly archive report and data files into a ServCat Project Reference and update PRIMR.

Remote Sensing Landscape Assessment | Current | (PRIMR 1.2): FFO4RLDT00-007)

Management Objectives:

A-2: Emergent Marsh Restoration:
By the end of the planning period for this HMP, restore marsh cover to pre-Hurricane Katrina levels through sediment trapping, monitoring flow through existing crevasses, reopening crevasses that have silted in, and creating new crevasses in strategic locations whenever potential sites are identified. Intermediate-term objectives include: by 2015, identify 12 sites (1,500 acres) likely to benefit from marsh creation and likely to be responsive to crevasse creation or reopening; once identified, begin seeking resources to restore 1,500 acres of marsh by creating or reopening crevasses.

A-3: Emergent Marsh Management:
Provide 49,000 acres of quality fresh, intermediate, and brackish marsh and open water areas every year for the 15-year duration of the planning period covered by this HMP, with the following characteristics: An approximate emergent vegetation to open water ratio of 50:50; at least 50 percent of the emergent vegetation consists of plants of high waterfowl food value, including *Sagittaria* spp. and *Scirpus* spp., while *Colocasia* spp. (Elephant ear/Tara) is maintained at less than 50 percent of the emergent plant cover; at least 65 percent of the total marsh area (31,719 acres) is maintained as inviolate sanctuary; predator populations are managed so that they do not have a deleterious effect on the RoCs, especially those that breed on the refuge.

Resources of Concern: waterfowl, colonial breeding wading birds, secretive marsh birds, shorebirds

Background and Survey Justification:
Ongoing restoration and efforts to maintain and enhance the marsh system is key to management of Delta NWR and attainment of positive responses by the RoCs. Since the 1990s, the refuge has undertaken restoration projects through depositing navigation dredged spoil materials to create shallow water areas. These sites have been direct planted with emergent plants or naturally revegetated over several years. The restored sites enhance marsh ecosystem functions as well as provide additional barriers against further marsh loss. In addition to the spoil island formations, the diversion of water in navigation channels through designed breaks (crevasses) and levees provides for the natural depositions of sediments in areas lacking emergent vegetation. Compared to depositing spoil materials and direct planting, this process is a less expensive strategy to rebuild emergent marsh and contributes to the broader restoration of the coastal marsh ecosystem.

Concurrent with ongoing marsh restoration efforts, the emergent marsh is constantly being inundated by large-scale weather events (i.e., tropical storms and hurricanes) which have the capacity to decimate thousands of acres of marsh. The loss of marsh is unsustainable and will lead to further negative effects without continued restoration efforts to build back the emergent marsh.

Presently, no targeted efforts have been made to monitor the short-term and long-term effectiveness of restoration projects. In addition, the rate of ongoing loss of emergent marsh through natural storm events and consequences of navigation projects has not been evaluated. The use of remote sensing monitoring will provide a readily available process to examine both historical and current marsh restoration as well as changes in the overall ecological integrity of the marsh.

Survey Objectives:

- Every 1-3 years, map the distribution of acres lost or gained with specific focus on areas historically and currently undergoing restoration.
- Determine the distribution and amount of vegetated versus non-vegetated areas on the refuge and assess wintering waterfowl response in these areas.

Survey Type:
Monitoring to Inform Management

Is there an established NWRS protocol for the survey? ☐ Yes X ☐ No

Sampling Units/Metrics: X Yes ☐ No
The sampling unit will be based on the finest scale of remote sensing imagery available. Older imagery will be restricted to 30-meter pixels while more current and future imagery might be classified by 1- to10-meter resolution.

Sampling Frame: X Yes ☐ No
The entire refuge is of interest; however, the specific sampling frame for marsh restoration will be restricted to defined areas where crevasses have been created along with deposition of dredged soil and levees to accrete soils and build emergent marsh.

Sampling Design: ☐ Yes X No
The refuge will be evaluated based on 100% coverage of the marsh community.

Sampling Timing: ☐ Yes **X** No
Availability of imagery in the public domain will dictate the period of data acquisition. The period of leaf-on (i.e., growing season) would be preferred to better delineate areas of vegetation

and unique spectral signatures which might provide a means to delineate certain plant species (e.g., Phragmites).

Management Trigger: ☐ Yes ☒ No
The management objectives do not define a trigger point.

Methods: ☐ Yes ☒ No
Modeling change detections in attributes of interest will be based on GIS tools in Esri or ERDOS Image software as well as other tools and resources available through U.S .Geological Services (USGS). The methods will involve periodic (1-5 years) assessment of imagery against previous sampled periods, or against a baseline reference, to evaluate changes.

Data Entry Format: ☐ Yes ☒ No
Imagery date will be stored in standardized raster file formats. Processed data will be converted to polygon vectors as Shapefiles or Feature Classes.

Data Storage / Archiving: ☐ Yes ☒ No
All data will be housed on the Southeast Louisiana Refuges Complex Shared Drive (S:/Biology). Additional data files will be archived to a ServCat Project Reference.

Data Verification/Quality Control Process: ☐ Yes ☒ No
TBD

Data Analysis Methods and Software: ☐ Yes ☒ No
Extraction tools from Esri will be used to estimate changes in the metrics of interest (acreage, elevation, percent vegetation cover). Once appropriate models are identified, a workflow will be developed to extract metrics at the refuge level using refuge boundaries.

Reporting: ☐ Yes ☒ No
TBD – expect summary report based on any change detection modeling. Reports are to be archived in ServCat.

Next Step Instructions:

Over the next year, based on the above assessment, the following steps should be undertaken to more fully document and implement this survey.

1. Determine a full sampling design and methodology with I&M Branch.
2. Explore partnership with USGS and Science App to utilize existing modeling efforts.
3. Acquire and evaluate GIS outputs from existing modeling efforts to assess changes in marsh acreage, elevation, and/or vegetation.

4. Develop Initial Survey Instructions (this will contain design, methods, analysis, and reporting) to allow for replication of the imagery processing.
5. Complete report, add to ServCat under a Project Reference, and update PRIMR.

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Wilson, B.C. 2007. North American Waterfowl Management Plan, Gulf Coast Joint Venture: Mottled Duck Conservation Plan. North American Waterfowl Management Plan, Albuquerque, NM. 27 pp.

Appendix A. Management Objectives Prioritization Tool.

The prioritization tool uses a **s**imple, multi-attribute ranking technique (Goodwin and Wright 2011) which can be used for the decision-making process. This tool has traditionally been used to rank (i.e., prioritize) potential surveys to be conducted on a refuge as part of an Inventory and Monitoring Plan. For current purposes, the tool criteria were modified to evaluate and prioritize habitat management objectives and associated resources of concern (RoCs). The Prioritization Tool has been developed to provide a standardized ranking approach with structure and transparency.

Table A-1. Criteria and weighting values used to prioritize management objectives. Higher value weights represent criteria that were considered more important in the scoring process.

Criteria	Weight Assigned
Management action on objective within next 5 years	**0.125**
Listed species or rare vegetation communities	**0.125**
Ability to monitor and manage habitat response	**0.125**
Ability to monitor and manage resource of concern response	**0.125**
Refuge's potential impact on resource of concern	**0.125**
Habitat management response: Ability to move the dial	**0.125**
Representative species:	**0.125**
Consequences to inaccurate or insufficient feedback	**0.125**

Criteria 1
Likelihood of taking a management action within next 5 years

Does the management objective have the likelihood that a management action (i.e., strategy) will be undertaken at least once in the next 5 years?

1. No
2. Yes

Criteria 2

Listed species or Rare Vegetation Communities

Does the management objective address an RoC that is federally listed under the Endangered Species Act, state listed (threatened or endangered), or ranked by the state's natural heritage program (S1 or S2 rank only)?

1. No, the RoC has no elevated status by federal or state statutes.
2. Yes, objective focuses on a species listed by the state.
3. Yes, the RoC has been identified as at-risk and petitioned for listing.
4. Yes, objective focuses on at least one federally listed species.

Criteria 3

Ability to Monitor and Manage Habitat Response

Based on literature review or professional judgement, what is the ability to manage and monitor the habitat response?

1. **Low**: Management actions may be possible but may be impractical to implement and/or monitor.
2. **Medium**: Management actions are possible and practical to implement and monitor but may be difficult or intensive.
3. **High**: Management actions are possible and practical to implement and monitor.

Criteria 4

Ability to Monitor and Manage Resource of Concern Response

Based on literature review or professional judgement, what is the ability to manage and monitor the RoC response?

1. **Low**: Management actions may be possible but may be impractical to implement and/or monitor.
2. **Medium**: Management actions are possible and practical to implement and monitor but may be difficult or intensive.
3. **High**: Management actions are possible and practical to implement and monitor.

Criteria 5

Refuge's Potential Impact on Resource of Concern

What proportion (%) of the species', subspecies', or communities' (i.e., vegetation) geographic range under U.S. jurisdiction will be addressed by the objective on the refuge? (Refuge contribution to the success of RoC)

1. **Low**: Refuge covers <1% of the species' or communities' protected population/range. Refuge has little responsibility to RoC or small or minor habitat to have largescale impact on RoC.
2. **Medium**: Refuge covers 1-10% of the species' or communities' population/range. Refuge has a moderate responsibility to an RoC or moderate amount of habitat to support RoC.
3. **High**: Refuge covers ≥10% of the species' or communities' population/range. Refuge has almost sole responsibility to an RoC (s) or a large amount of habitat to support an RoC

Criteria 6

Response to Management: Ability to Move the Dial

What is the impact that management might have in meeting the objective?

1. **Low**: Species documented (or professional opinion) to respond positively to habitat management but might take immense amounts of management effort, cost, or time. Professional judgement may also be less certain of a positive impact.
2. **Medium**: Species documented (or professional opinion) to respond very positively to habitat management but might take a lot of time and effort.
3. **High**: Species documented (or professional opinion) to respond very positively to habitat management and without immense amounts of management effort or time.

Criteria 7

Representative Species

What is the objective's ability to represent or fulfill other species habitat needs?

1. **Low**: Species is not clearly documented and (based on refuge I&M or professional judgement) is less likely or uncertain to represent other (focal, umbrella, indicator, or keystone) species. Species is either very specific, or a generalist in terms of habitat requirements related to other species, guilds, or groups utilizing the refuge.
2. **Medium**: Species is not clearly documented, but (based on refuge I&M or professional judgement) may potentially represent other (focal, umbrella, indicator, or keystone) species. Species likely shares a suite of habitat requirements with other species, guilds, or groups utilizing the refuge.
3. **High**: Species likely to represent needs of other (focal, umbrella, indicator, or keystone) species. Species known to share a suite of habitat requirements with other species, guilds, or groups utilizing the refuge.

Criteria 8

Consequences to Inaccurate or Insufficient Feedback

What level are the consequences to not having accurate feedback and it having a significant long-term negative impact on the habitat and/or resources if decisions were not correct? (Consider reversibility of actions, risks to decisions)

1. **Low**: Incorrect management has little to no chance of causing setback or detriment to the species or habitat. It is possible to reverse management strategies taken (if incorrect), or strategies don't require major or large-scale changes.
2. **Medium**: Incorrect management has moderate chance of causing setback or detriment to the species or habitat. It is possible, but may be a lot of work, to reverse management strategies taken (if incorrect).
3. **High**: Incorrect management (or being wrong on thinking and/or assumptions) would possibly set back or be detrimental to the species or habitat (management for RoC may require drastic or large-scale alterations). Not very easy or possible to reverse management strategies taken (if incorrect).

Appendix B. Workbook for Brainstorming and Selecting Refuge Monitoring Survey Priorities

This workbook includes a compilation of monitoring surveys that are currently implemented and that are needed based on the prioritized objectives (derived from the refuge Comprehensive Conservation Plan and Habitat Management Plan). Surveys that satisfy multiple program priorities and objectives are listed more than once. Current surveys are acquired from the Planning and Review of Inventory and Monitoring on Refuges database with an updated review from the refuge. Surveys were compiled by refuge staff and zone ecologists based on the objectives and include any current surveys or prospective survey approaches. Survey time (estimated FTE; 1 FTE = 2,080 work year hours), cost (yearly dollar amount), and feasibility (e.g., staffing or ability to accurately monitor) were estimated for each, to aid in selecting which one to three surveys would be undertaken.

Table B.1. Selected habitat management objectives; any current surveys being conducted related to the objective; potential survey approaches; and the time, cost, and feasibility of those surveys.

Prioritized HMP Objective	Survey Brainstorm	Survey Time, Cost, and Feasibility
A-2 Emergent Marsh Restoration	Waterfowl Survey (Aerial) (Current)	Conduct 1 day annually in early January (.02 FTE); $1,000; Selected. This will be feasible and can address several needs per refuge and regional data needs. It will be an annual 100% visual coverage of the landscape. May need to consider adding location points to the counts to create heat maps to determine counts in relation to restoration areas. It will be subject to aircraft availability. No ground count possible.
A-2 Emergent Marsh Restoration	Remote Sensing Landscape Assessment (Prospective)	Evaluate every 2-5 years or if an acute land-use activity is identified; (.04 FTE); $500.00; Selected. Ongoing data mining process utilizing remote sensing data in public domain to capture local land use changes. There is information available that can be used to monitor the current 12 crevasses. Modeling specific changes in the system cannot be done due to limited capacity but simple changes in metrics of interest can be derived through GIS tracking: Accretion, acreage, maintenance/construction,
A-2 Emergent Marsh Restoration	Shorebird Survey (Ground) (Prospective)	Conduct 3-5 days annually through (.02 FTE); $1,000; Not selected. Important component for refuge, but no real capacity, especially with relation to other more important surveys. Has only been done as a reconnaissance count.

Prioritized HMP Objective	Survey Brainstorm	Survey Time, Cost, and Feasibility
A-3 Emergent Marsh Management	Waterfowl Survey (Aerial) (Current))	Conduct 1 day annually in early January (.02 FTE); $1,000; Selected. This will be feasible and can address several needs per refuge and regional data needs. It will be an annual 100% visual coverage of the landscape. May need to consider adding location points to the counts to create heat maps to determine counts in relation to restoration areas. It will be subject to aircraft availability. No ground count possible.
A-3 Emergent Marsh Management	Remote Sensing Landscape Assessment (Prospective)	Conduct 1 time every 5 years or post hurricane events (.04 FTE); $500.00; Selected. There is information available that can be used to monitor acres gained and lost. There is not enough capacity to do modeling, but this may be possible as a simple GIS exercise.
A-3 Emergent Marsh Management	Secretive Marsh bird Survey (Prospective)	Conduct 3 times annually on at least 40-50 points across refuge (.12 FTE); $4,000; Not selected. Researchers will be collecting some data, but refuge does not have standing dataset or capacity or baseline to consider this survey moving forward.
A-3 Emergent Marsh Management	Mottled Duck Survey (Aerial) (Prospective)	Conduct 1 day annually in early March (.02 FTE); $1,000; Not selected. Important component for refuge, but no real capacity, especially with relation to other more important surveys.
A-3 Emergent Marsh Management	Colonial Breeding Wading Bird Survey (Ground) (Prospective)	Conduct March-May (.02 FTE); $600.00; Not selected. Doesn't address collective resources of concern, and data was only reconnaissance.

Appendix C. Environmental Action Statement for Delta National Wildlife Refuge Interim Inventory and Monitoring Plan

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) (40 CFR 1500-1508), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the following proposed action does not require additional NEPA documentation.

Proposed Action, Alternatives, and NEPA Documentation
The proposed action is to implement an Interim Inventory and Monitoring Plan (IMP) for Delta National Wildlife Refuge. This Interim IMP provides specific guidance for surveys of the fish, wildlife, plant, habitat, and abiotic resources associated with Delta National Wildlife Refuge. This Interim IMP supports the purposes and helps achieve the goals and objectives outlined in the Comprehensive Conservation Plan for the refuge. There are no considered alternatives to the Interim IMP, given the administrative requirement to complete this step-down plan.

In accordance with 43 CFR 46.205 and 40 CFR 1508.4, surveys within this Interim IMP are covered by the following Departmental categorical exclusion because they would not have significant environmental effects.

> 516 DM 8.5 B(1). "Research, inventory, and information collection activities directly related to the conservation of fish and wildlife resources which involve negligible animal mortality or habitat destruction, no introduction of contaminants, or no introduction of organisms not indigenous to the affected ecosystem."

Extraordinary Circumstances (43 CFR 46.215):
Could This Proposed Action (*check (✓) yes or no for each item below)*:

Yes	No	
☐	☑	a. Have significant adverse effects on public health or safety?
☐	☑	b. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (EO 11990); floodplains (EO 11988); national monuments; migratory birds; and other ecologically significant or critical areas?
☐	☑	c. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?
☐	☑	d. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?
☐	☑	e. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?
☐	☑	f. Have a direct relationship to other actions with individually insignificant but cumulatively significant environmental effects?

☐ ☑ g. Have significant impacts on properties listed, or eligible for listing, on the National Register of Historic Places as determined by the bureau?

☐ ☑ h. Have adverse effects on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species?

☐ ☑ i. Violate a Federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?

☐ ☑ j. Have a disproportionately high and adverse effect on low income or minority populations (EO 12898).

☐ ☑ k. Limit access to and ceremonial use of Indian sacred sites on Federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (EO 13007).

☐ ☑ l. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and EO 13112).

☐ ☑ m. Have material adverse effects on resources requiring compliance with Executive Order 11988 (Floodplain Management), Executive Order 11990 (Protection of Wetlands), or the Fish and Wildlife Coordination Act?

☑ The proposed action is covered by a categorical exclusion as provided by 43 CFR §46.210 or 516 DM 8.5. No further NEPA documentation will therefore be made.

☐ An Extraordinary Circumstance could exist for the proposed action and, so an EA/EIS must be prepared.

JIMMY LAURENT

Digitally signed by JIMMY LAURENT
Date: 2021.06.13 07:03:53 -05'00'

Jimmy Laurent, Refuge Manager

Date

Supporting Documents:

U.S. Fish and Wildlife Service. 2008a. Delta and Breton National Wildlife Refuges Draft Comprehensive Conservation Plan and Environmental Assessment. Atlanta, GA 174 pp.

U.S. Fish and Wildlife Service. 2008b. Delta and Breton National Wildlife Refuges Comprehensive Conservation Plan. U.S. Fish and Wildlife Service, Region 4, Atlanta, GA 140 pp.

Interim Inventory and Monitoring Plan Revision Signature Page

Interim Inventory and Monitoring Plan Revisions

Delta National Wildlife Refuge

Action	*Signature/Printed Name*	*Date*
Survey list and priority changed:		
Submitted By:	Refuge Manager/Project Leader	
Reviewed By:	Regional Inventory and Monitoring Chief	
Approved By:	Refuge Supervisor	