



# **Inventory and Monitoring Plan**

## **Port Louisa National Wildlife Refuge**

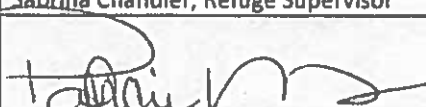



March 2016



**Port Louisa National Wildlife Refuge  
Inventory and Monitoring Plan**

**Signature Page<sup>1</sup>**

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## Introduction

This inventory and monitoring plan (IMP) documents the inventory and monitoring surveys that will be conducted at Port Louisa National Wildlife Refuge (NWR) from 2016 through 2031, or until the refuge's Comprehensive Conservation Plan (CCP) and Habitat Management Plan (HMP) are revised.

The majority of surveys considered in this plan address resource management objectives identified in the HMP (2015) for this refuge. Other surveys are a continuation of past monitoring conducted for the purpose of understanding long-term trends in specific resources or are part of regional and national survey efforts. This IMP was developed according to the Inventory and Monitoring (I&M) policy (701 FW 2) for the National Wildlife Refuge System. Priority resources of concern and habitat objectives identified in the HMP (2015) were also used to identify survey needs. The HMP identified one priority habitat and 13 priority species associated with habitat types available at Port Louisa NWR.

Port Louisa NWR Priority Resources of Concern and associated habitat types (information below was derived from HMP (2015) Tables 3-2 and 3-4):

Priority Resources of Concern	Habitat Types				
	Open Water	Riverine Wetlands	Forest (Bottomland and River Bluff)	Bottomland Scrub/Shrub	Bottomland Prairie
Wood Duck		X	X		
Mallard		X			
Lesser Scaup	X	X			
Bald Eagle			X		
Pectoral Sandpiper		X			X
American Bittern		X			X
Prothonotary Warbler			X		
Yellow-billed Cuckoo			X		
Dickcissel				X	X
Bell's Vireo				X	
Copperbelly Watersnake		X	X	X	
Sedge meadow community					X
Centrarchid Fish	X	X			
Blanding's Turtle		X			

Port Louisa NWR was established in 1958. Located in Louisa County, Iowa near the town of Wapello and in Mercer County, Illinois, Port Louisa National Wildlife Refuge (NWR) bounds more than 8,300 acres of wetlands, grasslands, and forests within the Mississippi River floodplain in southeast Iowa and west central Illinois. The Refuge includes four Divisions: Louisa, Big Timber, Keithsburg, and Horseshoe Bend. Louisa Division is located on the Mississippi River behind a levee and is adjacent to the Odessa Wildlife Management Area (WMA), which is managed by the Iowa Department of Natural Resources (DNR). The Refuge annually coordinates water management activities with the Iowa DNR to provide quality wetland habitat on the Refuge. Keithsburg Division is within a levee system with forested islands and shallow wetlands. Big Timber Division is open to the Mississippi River consisting of sloughs and forested islands. Horseshoe Bend Division is located on the Iowa River and will provide the opportunity for future restoration of floodplain processes as the existing levee system continues to degrade and re-connect the river back to a portion of its floodplain.

The Refuge was established in 1958 through five legislative mandates with the primary purpose of providing habitat and resources for waterfowl and other migratory birds. Horseshoe Bend Division was added to the Refuge after the Flood of 1993 through the Emergency Wetland Resources Act.

Refuge lands are also present in the Iowa River Corridor in Benton, Iowa and Tama counties in Iowa. These lands are managed by the Iowa Department of Natural Resources through a Memorandum of Understanding. The Iowa River Corridor was not included in the CCP or HMP and therefore is not included in this IMP. Separate plans will be done at a later date.

## **Methods**

Station staff generated a list of extant and anticipated surveys by generating a list of all observational efforts to gather information on refuge resources. Survey lists provided by Region 3 Migratory Birds Division and Ecological Services were reviewed during the compilation process. This extensive list was later refined to exclude general observations (reconnaissance) of refuge resources that do not require protocols or data management. The remaining surveys were then assigned a priority score using 24 pre-defined criteria (Appendix A). Priority scores were used to assign the survey to one of three groups that ranked the surveys (Appendix B).

### ***Prioritizing and Selecting Surveys***

The priority ranking of surveys was determined during a one-day meeting at Port Louisa NWR on (March 27, 2014). Refuge Manager Cathy Henry and Refuge Wildlife Biologist Jessica Bolser met with Region 3 Zone Biologist Brian Loges to prioritize and select the surveys. Background information for each survey was summarized in advance by the Wildlife Refuge Biologist and briefly discussed prior to ranking the surveys. The 24 criteria, assignment rules, weighting and score calculation process followed the Criteria for Prioritizing Surveys Entered into the PRIMR Database (Appendix A). The Port Louisa Refuge staff made all decisions required to produce the survey priority scores (Appendix B).

## ***Estimating Capacity***

A cost-benefit analysis (Appendix C) was performed to evaluate the total return of potential sets of selected surveys over the life of the IMP. To determine a budget threshold, the staff responsible for completing natural resource surveys were asked to estimate the portion of their time in a typical year dedicated to the following: analysis and summary, data management, monitoring, research, and supervision. The portions of the year dedicated to the activities required for implementing surveys were converted to weeks. The time required to implement an annual iteration of a survey was also estimated using past experiences with established protocols or anticipated commitment for protocols that have yet to be developed. Since the portfolios were developed to document the total benefit of a set of surveys over the life of the IMP, the exercise was useful in identifying low frequency surveys with high cost efficiencies. Estimated annual costs for implementing surveys are documented in Appendix D. The selected surveys are likely to be implemented because the estimated time commitment for the surveys is commensurate with the available staff time.

## **Results: Selected Surveys**

The prioritization and cost benefit analysis were used in the selection of surveys to be completed over the life of the IMP. In addition to the priority scores, input from Region 3 Migratory Birds Division, Ecological Services, and Water Resources was considered in the selection process. Selected surveys include surveys identified for completion with FY2016 levels of staffing and support (Table 1). The list of surveys selected for implementation represents a commitment to implementation, if staffing remains stable. Changes in available capacity, CCP objectives, or other factors that alter the list of selected surveys through addition or removal of selected surveys will trigger a revision of this IMP (701 FW 2) and updates to the PRIMR database.

The process identified 10 surveys that can be completed with current staffing levels and budget for the duration of this Inventory and Monitoring Plan (Table 1). Secretive marshbird surveys and an invasive species inventory are two surveys with high ranking scores (80th percentile) that have not been selected for implementation. However, both will receive consideration after committing resources to the selected surveys. The marshbird survey is very time intensive, requiring multiple point visits to overcome notoriously low detectability for this guild. Early detection of invasive plants is key to successful control. However, the vegetation cover monitoring protocol will include a rapid assessment for invasives, similar to assessments currently included in the U.S. Army Corps of Engineers (USACE) forest inventory. An estimated annual work schedule for selected surveys is shown in Appendix E, and non-selected surveys are listed in Appendix F. Survey names were updated after the ranking exercise based on national and regional lists of standardized names and available protocols. A Refuge Condition Summary, a reporting tool to summarize status, trends, and desired conditions of the selected surveys, is provided in Appendix G. Environmental Action Statement requirements are addressed in Appendix H.

<b>Survey Name</b>	<b>Rationale</b>
<b>Breeding Landbird Survey</b>	Providing habitat for migratory birds is a primary purpose of the refuge. Floodplain forests are important breeding and migration habitats for landbirds. Surveys will assess passerine use in areas treated with forest management actions to improve tree species diversity and provide multiple canopy layers.
<b>Integrated Waterbird Monitoring and Management</b>	The refuge has a strong management focus on wetland and waterbird management tied to purposes of the refuge. Multiple metrics are relevant to managing impoundments for waterbirds: waterfowl surveys, water level monitoring, shorebird surveys, waterbird surveys, recording management actions & unit level vegetation response.
<b>Water Level Monitoring</b>	Includes staff plates on Horseshoe Bend Division and automatic gaging station and staff plates on Louisa Division. Water levels on the Odessa complex are a high profile information need due to the need to coordinate management with the Iowa DNR.
<b>Vegetative Cover Monitoring</b>	Bottomland prairies and meadows and scrub-shrub habitats provide habitat for species of conservation concern such as Bell's Vireos. Vegetation monitoring surveys are necessary to assess habitat-specific objectives and management actions such as grazing for non-forested habitat types.
<b>Keithsburg Division Contaminants Monitoring</b>	A water quality analysis has been completed twice on the Keithsburg Division due to concerns of agricultural chemical run-off from adjacent landowners. Important for monitoring the success of habitat features installed by USACE.
<b>Aquatic Vegetation</b>	Aquatic vegetation communities on the Keithsburg Division have been impacted by excess nutrients. A habitat restoration project under the USACE Upper Mississippi River Habitat Restoration Program (HREP) began in 2015 to improve water circulation within the division as a mitigation strategy. The information that is acquired through sampling will be an important consideration in the planning phase of a HREP project and monitoring data after the completion of the project will be used to measure changes in aquatic vegetation over time.
<b>Forest Inventory USACE Forest Inventory</b>	Updates and completes USACE Forest Inventories on refuge division that are General Plan lands.
<b>Bat Inventory</b>	Provide baseline information at the refuge level for an at-risk order, including federally threatened and endangered species. Also, survey results will be used to inform forest management activities by USACE partners.
<b>Mid-winter Waterfowl Survey</b>	This survey is part of a long-running, national effort to document wintering waterfowl populations. Completing this survey requires minimal effort.
<b>National Midwinter Bald Eagle Survey</b>	National survey requiring minimal effort.

**Table 1. Surveys selected for conduct at Port Louisa National Wildlife Refuge 2016—2031.**

Survey Priority <sup>1</sup>	Survey ID Number <sup>2</sup> (FF03RPL U00-)	Survey Name/(Type) <sup>3</sup>	Survey Status <sup>4</sup>	Mgmt. Objective Id <sup>5</sup>	Survey Area <sup>6</sup>	Staff Time (FTE) <sup>7</sup>	Avg. Ann Cost (OPR) <sup>8</sup>	Survey Timing <sup>9</sup>	Survey Length <sup>10</sup>	Survey Coord. <sup>11</sup>	Protocol	
											Citation <sup>12</sup>	Status <sup>13</sup>
1	014	Breeding Landbird Survey (BM)	Current	HMP / 3.A, 2.A, 2.B, 3.B	Entire station	FWS: 0.06	\$200	Spring, Summer, Fall / Recurring - - every three years	2015- Indefinite	Jessica Bolser, Wildlife Biologist	Knutson et al. 2008	National Approved
2	008	Integrated Waterbird Monitoring and Management (IWMM) (CM)	Current	HMP / 1.A, 1.B	Multiple management units	FWS: 0.06	\$300	Spring, Summer, Fall / Recurring - - every year	2012- Indefinite	Jessica Bolser, Wildlife Biologist	Loges et al. 2015	National Approved
3	025	Water Level Monitoring (BM)	Current	HMP / 5.B, 1.A	Multiple management units	FWS: 0.01, Other: 0.01	\$400	Recurring - - every year	2011- Indefinite	Jessica Bolser, Wildlife Biologist	(none)	Initial Survey Instructions
8	005	Vegetative Cover Monitoring (M)	Current	HMP / 3.A, 1.A, 1.C, 1.B, 3.B	Multiple management units	FWS: 0.06, Other: 0.01	\$200	Recurring - - every year	2016- Indefinite	Jessica Bolser, Wildlife Biologist	(none)	Initial Survey Instructions
10	026	Keithsburg Division Contaminants Monitoring (CB)	Current	HMP / 4	Single management unit	N/A	\$1000	Sporadic or Ad Hoc	1989- Indefinite	Jessica Bolser, Wildlife Biologist	(none)	Initial Survey Instructions
11	031	Aquatic Vegetation (CB)	Current	HMP 1.A, 1.C	Single management unit	N/A	\$0	Sporadic or Ad Hoc	2015- Indefinite	Jessica Bolser, Wildlife Biologist	(none)	Initial Survey Instructions



13	006	USACE Forest Inventory (CM)	Current	HMP / 2.A, 2.B	Multiple management units	FWS: 0.06	\$100	Sporadic or Ad Hoc	1990- Indefinite	Jessica Bolser, Wildlife Biologist	USACE St Louis District	Initial Survey Instructions
14	024	Bat Inventory (I)	Current	HMP / 2.A, 2.B	Entire station	FWS: 0.04	\$500	Summer/ Occurs one time only	2015- 2018	Jessica Bolser, Wildlife Biologist	(none)	Initial Survey Instructions
21	028	Mid-Winter Waterfowl Survey (CM)	Current	HMP / 2.A, 1.A, 3.B	Multiple management units	FWS: 0.0	\$20	January/ Recurring - - every year	1955- Indefinite	Jessica Bolser, Wildlife Biologist	(none)	Initial Survey Instructions
23	007	Midwinter Bald Eagle Survey (CB)	Current	HMP / 2.A, 1.A	National	FWS: 0.0	\$20	January/ Recurring - - every year	1997- Indefinite	Jessica Bolser, Wildlife Biologist	(none)	Initial Survey Instructions

<sup>1</sup> The rank for each survey listed in order of priority (e.g., numeric, tiered, alpha-numeric, or combination of these).

<sup>2</sup> A unique identification number consisting of refuge code-computer assigned sequential number. Refuge code comes from the FBMS cost center identifier.

<sup>3</sup> Short titles for the survey name, preferably the same name used in refuge work plans. Also include the PRIMR code for survey type in parentheses. These are: Inventory (I), Cooperative Baseline Monitoring (CB), Monitoring to Inform Management (M), Cooperative Monitoring to Inform Management (CM), Research (R), and Cooperative Research (CR).

<sup>4</sup> Selected surveys planned for the lifespan of this IMP (i.e., Current, Expected).

<sup>5</sup> The management plan and objectives that justify the selected survey.

<sup>6</sup> Refuge management unit names, entire refuge, or names of other landscape units included in survey.

<sup>7</sup> Estimates of Service (FWS) and non-Service (Other) staff time needed to complete the survey (1 work year = 2080 hours = 1 FTE).

<sup>8</sup> Estimates of average annual operations cost for conducting the survey during the years it is conducted (e.g., equipment, contracts, travel) but not including staff time.

<sup>9</sup> Timing and frequency of survey field activities.

<sup>10</sup> The years during which the survey is conducted.

<sup>11</sup> The name and position of the survey coordinator (the Refuge Biologist or other designated Service employee) for each survey.

<sup>12</sup> Title, author, and version of the survey protocol (if there is no protocol to cite, enter None).

<sup>13</sup> Scale of intended use (Site-specific, Regional, or National) and stage of approval (Initial Survey Instructions, Complete Draft, In Review, or Approved) of the survey protocol.

## Narratives for Selected Surveys

**Survey:** Breeding Landbird Survey (FF03RPLU00-014)

**Refuge:** Port Louisa National Wildlife Refuge

**Priority:** 1

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Bottomland Forest; Bottomland prairie/meadow; Bottomland scrub/shrub; River Bluff Forest;

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

Providing habitat for migratory birds is a primary purpose of the refuge. Stopover habitat along major migration corridors (such as the Mississippi river) is critical for the successful migration of birds between breeding and wintering grounds. In addition, the refuge provides habitat for breeding landbirds. Surveys will assess passerine use in areas treated with forest management actions to improve tree species diversity and provide multiple canopy layers.

**What is the population or attribute of interest, what will be measured, and when?**

Biological Integrity; At-risk Biota; Aves (Birds); Passeriformes (Perching Birds); Cuculiformes (Cuckoos); Piciformes (Woodpeckers); *Spiza americana* (Dickcissel); *Vireo bellii* (Bell's Vireo); *Coccyzus americanus* (Yellow-billed Cuckoo); Recurring – possibly every three years on any one refuge division?; spring, summer, and autumn

**Is this a cooperative survey? If so, what partners are involved in the survey?**

NO

**Survey:** Integrated Waterbird Monitoring and Management (IWMM) (FF03RPLU00-008)

**Refuge:** Port Louisa National Wildlife Refuge

**Priority:** 2

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Page 61; Impoundments; Isolated Backwaters and Ephemeral Wetlands;

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

The Integrated Waterbird Management and Monitoring Initiative protocol records bird use, water levels, general habitat condition and management activities at the management unit scale. The data may be used to generate unit specific use-day estimates, document migration chronologies, and explore relationships between count data and habitat condition. Data summaries will guide state dependent decision making at the unit scale, such as choosing a soil disturbance prescription or a seasonal flood regime. Unit level data can be scaled up to refuge or refuge complex as guild specific or species utilities for broad habitat types. Data can be used to assess the efficacy of management actions (accounting for management costs in terms of use-days for targeted populations) and support learning to improve management. Raw count data is also used to answer public inquiries regarding refuge-wide waterfowl populations. Water levels must be monitored to ensure optimum depths are achieved for waterfowl feeding, especially during peak migration. Data are used during drawdowns to inform management as the drawdown progresses.

During fall waterfowl migration, this survey will be completed weekly by refuge staff at the same time as the Iowa Department of Natural Resources (DNR) waterfowl survey to minimize disturbance to birds. The DNR waterfowl survey also includes waterfowl counts on the Louisa Division and adjacent Odessa Wildlife Management Area. Weekly waterfowl surveys during fall migration have been carried out since the early 1980s on the Louisa Division and adjacent Odessa Wildlife Management Area by the Iowa DNR.

**What is the population or attribute of interest, what will be measured, and when?**

This survey involves direct counts or estimates of waterbirds in managed wetland units. Biological Integrity; Other Biota; Aves (Birds); Anseriformes (Waterfowl, Swans, Geese, Screamers, Ducks); Gruiformes(Rails, Cranes); Galliformes (Fowls, Gallinaceous Birds); Charadriiformes (Auks, Alcids, Oystercatchers, Plovers, Shore Birds, Gulls); Pelecaniformes (Hérons, Ibises, Pelicans); Recurring -- every year; This will occur during spring and fall migration

**Is this a cooperative survey? If so, what partners are involved in the survey?**

This is a cooperative survey during autumn migration, and is completed in conjunction with the Iowa DNR weekly waterfowl surveys.

**Survey:** Water Level Monitoring (FF03RPLU00-025)  
**Refuge:** Port Louisa National Wildlife Refuge  
**Priority:** 3

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Floodplain Connectivity; Impoundments;

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

Water level monitoring is important because different plant and animal resources use wetlands with different water depths and hydroperiods. This information is used in the management of moist-soil units (impoundments) at the Louisa Division and Odessa WMA during annual draw-down and subsequent re-flooding to encourage native plant growth, discourage invasive plant growth, and provide a variety of foraging depths for different waterbird groups. At the Horseshoe Bend Division, monitoring of staff plates provides information about the dynamic hydrologic conditions on the entire Division, and informs long term floodplain modeling and management decisions. At the Keithsburg Division, water level monitoring will inform planned habitat improvement features through the USACE Upper Mississippi River Restoration Program. Water level data loggers were placed in summer of 2015 and are currently being used to collect continuous water level information for the 2015 and 2016 seasons for project planning purposes. Staff plates will be used for long term water level monitoring at the Keithsburg Division.

**What is the population or attribute of interest, what will be measured, and when?**

Water; Hydrology; Recurring -- every year; year round

**Is this a cooperative survey? If so, what partners are involved in the survey?**

Iowa DNR provides location for gauge and provides staff plate readings for calibration on the Odessa WMA. The data for the automatic water level gage is made available online through partnership with NOAA National Weather Service.

**Survey:** Vegetative Cover Monitoring (FF03RPLU00-005)  
**Refuge:** Port Louisa National Wildlife Refuge  
**Priority:** 8

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Objective 3.A. Bottomland prairie/meadow; Objective 3.B. Bottomland scrub/shrub (page 68);

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

Several objectives in the HMP identify desired average amounts of different habitat types to provide habitat for priority resources of concern. Vegetation monitoring surveys are necessary to assess habitat-specific objectives and management actions such as grazing for non-forested habitat types.

Objective 3.A (page 68) in the HMP identified multiple characteristics of bottomland prairie/meadow habitat that can be monitored with vegetation surveys (including: total acreage, percent cover of woody vegetation, percent cover of reed canary grass) to assess management actions. Objective 3.B. (page 68) in the HMP identified guidelines for percent cover and interspersed of woody shrubs in bottomland scrub/shrub for the benefit of priority species, such as Bell's Vireos. The majority of these habitat types occur at the Horseshoe Bend Division and most of the monitoring for these objectives will take place there. Vegetative cover monitoring may also be useful in assessing the effects of hydrological changes on vegetation over time related to Objective 6.

**What is the population or attribute of interest, what will be measured, and when?**

Landscapes (Ecosystem Pattern and Processes); Landscape Dynamics; Plantae (plants); Recurring -- every year; growing season

**Is this a cooperative survey? If so, what partners are involved in the survey?**

NO

**Survey:** Keithsburg Division Contaminants Monitoring (FF03RPLU00-026)

**Refuge:** Port Louisa National Wildlife Refuge

**Priority:** 10

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Objective 4 Water Quality (page 71);

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

Previous water quality sampling efforts at the Keithsburg Division have revealed hyper-eutrophic conditions from excess nutrients (specifically nitrogen and phosphorous). A habitat restoration project under the USACE Upper Mississippi River Restoration Program began in 2015. The information that is acquired through contaminants sampling will be an important consideration in the planning phase of the project, and monitoring data after the completion of the project will be used to measure changes over time.

**What is the population or attribute of interest, what will be measured, and when?**

Water; Water Quality; Sporadic or Ad Hoc;

**Is this a cooperative survey? If so, what partners are involved in the survey?**

Coop Baseline Monitoring; U.S. Fish and Wildlife Service, Environmental Contaminants; U.S. Fish and Wildlife Service, Ecological Services. USACE Rock Island District

**Survey:** Aquatic Vegetation (FF03RPLU00-031)

**Refuge:** Port Louisa National Wildlife Refuge

**Priority:** 11

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Contiguous Backwaters and Side Channels; Impoundments.

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

Previous evaluations of the aquatic habitats within the Keithsburg Division have identified algae and duckweed dominated communities that may be linked to excess nitrogen and phosphorous. A habitat restoration project under the USACE Upper Mississippi River Restoration Program began in 2015 to improve water circulation within the division as a mitigation strategy for excess nutrients. The information that is acquired through sampling will be an important consideration in the planning phase of the project, and monitoring data after the completion of the project will be used to measure changes over time.

**What is the population or attribute of interest, what will be measured, and when?**

Landscapes (Ecosystem Pattern and Processes); Extreme Disturbance Events; Plantae (plants); Hydrocharitaceae (waterlilies, frog's bit, tape-grass); Haloragaceae (water milfoil); Nymphaeaceae (water lilies); Ceratophyllaceae (hornwort); Nelumbonaceae (Indian lotus); Lemnaceae (No common name); Cabombaceae (water-shields); Potamogetonaceae (Pondweed family, pond weed, pondweed); Sporadic or Ad Hoc; April 15th- October 15th

**Is this a cooperative survey? If so, what partners are involved in the survey?**

Coop Baseline Monitoring; U.S. Army Corps of Engineers; U.S. Fish and Wildlife Service, Ecological Services; U.S. Fish and Wildlife Service, Environmental Contaminants

**Survey:** USACE Forest Inventory (FF03RPLU00-006)

**Refuge:** Port Louisa National Wildlife Refuge

**Priority:** 13

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Obj. 2.A Bottomland Forest and Obj. 2.B. River Bluff Forest (page 63).

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

The survey is important for several reasons. First, both the CCP and HMP specify that a forest inventory needs to be completed to determine the current state of forest health and make management recommendations in a Forest Management Plan. Updated Forest Inventory data is needed for the forested islands of the Big Timber Division (Turkey, Turkey Towhead, Otter, and Ramsey), the bottomland forest of the Louisa Division, and the bottomland forest of the Keithsburg Division. This data will guide future forest management activities outlined in the HMP. In addition, forest inventory data will inform restoration activities at the Keithsburg Division, as part of the Keithsburg UMRR (HREP) project. Results from this survey will inform forest management decisions with the goal of conserving and enhancing the age and species diversity on the 3,400 acres of bottomland and 160 acres of river bluff forest.

Forest habitat comprises approximately 40% of the 8,373 acres that make up Port Louisa NWR. Successful management of this important habitat type requires understanding the current condition and how the condition is changing over time. The U.S. Army Corps of Engineers (USACE) foresters guide and participate in the management of the forest habitat on the General Plan lands that make up the Louisa, Keithsburg and Big Timber Divisions. The USACE completed a Forest Stewardship Plan in 2012 for the Upper Mississippi River system, which identified a reduction in overall forest tree species, age, and structural diversity (especially mast-producing trees). The plan provides guidelines for addressing these issues and the metrics and thresholds for evaluating future desired stand conditions (see HMP, table 4-1).

**What is the population or attribute of interest, what will be measured, and when?**

Biological Integrity; Other Biota; Plantae (plants); Rhamnaceae (buckthorns); Ulmaceae (elms); Betulaceae (alder, birch); Salicaceae (willows); Moraceae (mulberries); Juglandaceae (walnuts); Fagaceae (No common name); Sporadic or Ad Hoc; This survey can be done any time of year.

The population is the bottomland forest woody and herbaceous plant community in the forest habitat types. The USACE uses the same protocol to inventory/monitor forest habitat on all of the general plan land on the Upper Mississippi River. This inventory has been (or plans to be) repeated at 10-20 year intervals at the Big Timber, Keithsburg, and Louisa Divisions. In addition this protocol can be used to measure the bottomland forest community at the Horseshoe Bend Division, without the involvement of the USACE.

**Is this a cooperative survey? If so, what partners are involved in the survey?**

Coop Monitoring to Inform Management

U.S. Army Corps of Engineers (Rock Island District)



**Survey:** Bat Inventory  
**Refuge:** Port Louisa National Wildlife Refuge  
**Priority:** 14

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Objective 2.A: Bottomland Forest and Objective 2.B: River Bluff Forest

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

This inventory is important because management of the approximately 3,500 acres of total forested habitat at Port Louisa NWR includes actions that could impact threatened (Northern long-eared bat) or endangered species (Indiana bat). Port Louisa NWR is within the breeding range for these two species, and maternity colonies are known to occur nearby along the Mississippi river. Forest management actions can include cutting and clearing trees to promote species and age diversity. Information gained from a bat inventory will guide forest management actions.

Survey efforts will follow the established guidelines for monitoring Indiana Bats.

**What is the population or attribute of interest, what will be measured, and when?**

Biological Integrity; Chiroptera (bats)

**Is this a cooperative survey? If so, what partners are involved in the survey?**

Yes

U.S. Fish and Wildlife Service, Ecological Services, U.S. Army Corps of Engineers (Rock Island District)

**Survey:** Mid-Winter Waterfowl Survey (FF03RPLU00-028)

**Refuge:** Port Louisa National Wildlife Refuge

**Priority:** 21

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Bottomland Forest; Bottomland scrub/shrub; Impoundments;

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

This survey is part of a long-running, national effort to measure wintering waterfowl populations. Completing this survey requires minimal effort. The results of this survey will not be used to inform management decisions at the refuge level.

**What is the population or attribute of interest, what will be measured, and when?**

Biological Integrity; Other Biota; Aves (Birds); Anseriformes (Waterfowl, Swans, Geese, Screamers, Ducks); Recurring -- every year; 1st two weeks of January

This survey measures wintering waterfowl populations at the national level.

**Is this a cooperative survey? If so, what partners are involved in the survey?**

Coop Monitoring to Inform Management; State Agencies; U.S. Fish and Wildlife Service, Migratory Birds

**Survey:** Midwinter Bald Eagle Survey (FF03RPLU00-007)

**Refuge:** Port Louisa National Wildlife Refuge

**Priority:** 23

**Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?**

HMP: Bottomland Forest; Impoundments;

This survey most directly supports the bottomland forest objective. Wintering and breeding bald eagles are found in bottomland forest habitat adjacent to the Mississippi river on the Louisa, Keithsburg, and Big Timber Divisions and on forested islands on the Big Timber division. In addition, wintering and breeding bald eagles are found in the bottomland forest habitat along the Iowa River on the Horseshoe Bend Division. As of 2015, approximately 8-12 known bald eagle nests are active during the breeding season, although it is quite likely that a few more nests occur on the islands of the Big Timber division.

**Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.**

The results of this survey will not directly influence management decisions. This is a national survey, and results are analyzed at a larger spatial scale than a single survey site.

**What is the population or attribute of interest, what will be measured, and when?**

Biological Integrity; Other Biota; *Haliaeetus leucocephalus* (Bald Eagle); Recurring -- every year; this survey occurs within the first 2 weeks of January

This survey is an index of the winter population of bald eagles at a national scale.

**Is this a cooperative survey? If so, what partners are involved in the survey?**

Coop Baseline Monitoring; R3, Endangered Species Program; State Agencies; U.S. Fish and Wildlife Service, Migratory Birds

Yes, this survey is coordinated in Iowa by the Iowa Department of Natural Resources. This survey is part of a national effort begun by the National Wildlife Federation, with the data currently being maintained and analyzed by the U.S. Army Corps of Engineers. Information and data can be found at: <http://ocid.nacse.org/nbii/eagles/>.

## **Revising the IMP**

The Project Leader will review the refuge capacity and status of surveys annually and determine which of the selected surveys will be implemented in that year. The PRIMR database was updated along with this IMP; it will be updated as approved protocols are linked to the selected surveys and when surveys are added or removed from the set of selected surveys.

The IMP will be revised according to I&M Policy and as CCP and HMP plans are modified (see Revision Signature Page). An IMP revision is triggered when surveys are added or removed from the set of selected surveys. IMP revisions require signatures from refuge staff, Regional I&M staff, Regional Refuge Biologist/Natural Resources Division Chief, but not the Refuge Supervisor or Regional Chief of Refuges.

## **References**

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U.S. Fish and Wildlife Service. 2004. Comprehensive Conservation Plan and Environmental Assessment and for Mark Twain National Wildlife Refuge Complex. USFWS Region 3. Bloomington MN.

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## Appendix A. Criteria and Weights Used to Prioritize Surveys

Each criterion is grouped under one of eight themes that describe a survey's general contribution to a refuge's or broader needs. Rating values (1—2, 1—3, or 1—4) that are used to score each survey are also given for each criterion.

### 1. Refuge Priorities and Management Needs

#### A. Refuge Purpose

Does the survey provide information to evaluate if the refuge is achieving its purpose(s)?

*Note: Surveys that provide information to either directly evaluate or serve as indicators of refuge purpose(s) can be considered as meeting this criterion.*

*Refuge purposes are generally those defined under the Refuge's founding legislation (Executive Order) or under ANILCA in Alaska. A survey addressing wilderness character addresses purpose for a refuge with proposed or designed wilderness. Example: Kodiak NWR was founded to protect the breeding and feeding grounds of brown bears. A brown bear survey directly relates to this purpose.*

1. No
2. Yes, one purpose
3. Yes, two purposes.
4. Yes, three or more purposes

#### B. CCP or Other Management Plan Objectives

How many refuge CCP or other management plan objectives (e.g., HMP, Fire Management Plan, Recovery Plan, Integrated Pest Management Plan) are met by the focus of this survey?

*Example 1: A survey of staff gauge readings for water levels in representative units can be used to evaluate a range of wetland habitat objectives including seasonal, emergent, and permanent types.*

*Example 2: An Early Detection Rapid Response survey can be used to discover the presence of highly invasive plant species in multiple refuge habitats.*

1. Does not address an objective
2. Addresses one objective
3. Addresses two objectives
4. Addresses three or more objectives

#### C. NWRS Objectives

Does the survey provide information to evaluate if the refuge is achieving regional or national objectives of the NWRS such as Biological Integrity, Diversity, and Environmental Health (BIDEH); NWR Resources of Concern (e.g., migratory birds, anadromous fishes, marine mammals); and compatibility of refuge uses especially wildlife-dependent recreation)?

*Federally listed species are addressed under criterion 4A so they should not be considered as a NWR Resources of Concern under this criterion. For BIDEH, only consider surveys*

*Addressing the highest measure of biological integrity, which is viewed as those intact and self-sustaining habitats and wildlife populations existing during historic conditions (see 601 FW 3.10).*

1. No
2. One objective
3. Two objectives
4. Three or more objectives

#### **D. Management Utility (Decision Support) for the Refuge**

Does the survey provide data for recurring management decisions, especially as part of an existing decision framework that is implemented on a regular basis?

*Surveys providing information to either directly evaluate or serve as indicators of high-priority management actions can be considered as earning a 3 or 4 rating for this criterion.*

1. No set application for the refuge
2. May have management implications, but they are not explicitly defined
3. Has management implications, but no current decision framework
4. Part of an existing adaptive management decision framework

## **2. Partner Priorities and Management Needs**

#### **A. FWS Programs**

Does the survey provide information that directly contributes to evaluating the status and trends of resources that are a priority for another FWS regional or national program (e.g., Migratory Birds, Fisheries, Water Resources/Hydrology *other than ESA species*)?

*Example 1: North American Breeding Bird Survey, North American Amphibian Monitoring Program, Mid-Winter Waterfowl Survey, and Circumpolar Biodiversity Monitoring Network are priority surveys for regional or national FWS programs.*

1. Does not address a management priority identified by a FWS regional or national program or initiative
2. Addresses a management priority identified by 1 FWS regional or national program or initiative
3. Addresses a management priority identified by 2 FWS regional or national programs or initiatives
4. Addresses a management priority identified by  $\geq 3$  FWS regional or national programs or initiatives

#### **B. FWS Partners**

Does the survey address an identified priority of a conservation partner, such as a Landscape Conservation Cooperative(s) (LCC), state agencies, or other conservation partner?

*These priorities should be obtained from documents such as the State Wildlife Action and Joint Venture plans. The staff should document where they obtained these priorities and if they were high- or medium-level priorities. The refuge itself does not count as a partner.*

1. Does not focus a management priority identified by FWS partners (e.g., LCC, state agency)
2. Focus on a management priority identified by one FWS partner (e.g., LCC, state agency)
3. Focus on a management priority identified by two FWS partners (e.g., LCC, state agency)
4. Focus on a management priority identified by three or more FWS partners (e.g., LCC, state agency)

### 3. Ecological Applications

#### A. FWS Surrogate Species

Does the survey focus on a surrogate species selected by the FWS?

1. No
2. Yes, one FWS surrogate species
3. Yes, two FWS surrogate species
4. Yes, three or more FWS surrogate species

#### B. Refuge Processes

Does the survey focus on an ecological process (e.g., fire, water temperature, climate) that is changing at a rate that is important to the refuge or an indicator species associated with that process?

1. No
2. Yes, one significant ecological process or species
3. Yes, two or more significant ecological processes or species

#### C. Survey Breadth

The focus of the survey is:

1. A single species or abiotic parameter
2. Multi-species or multi-abiotic parameters
3. A community – multi-trophic level or biota
4. An ecosystem – biotic community and abiotic parameters

### 4. Additional Legal Mandates

#### A. Listed species or vegetation communities

Is the objective of the survey a species or vegetation community federally listed under ESA, state listed (threatened or endangered only), ranked by the state's natural heritage program (S1 or S2 rank only), globally ranked by NatureServe (G1 or G2 rank only), or globally listed on the IUCN Red List of Threatened Species (Critically Endangered, Endangered, or Vulnerable only)?

1. Not state, federally or globally ranked
2. Yes, state listed or ranked by state's natural heritage program

3. Yes, globally listed by NatureServe or IUCN
4. Yes , federally listed under the ESA as threatened or endangered

## **B. Non-ESA or Refuge Purpose Mandate(s)**

Is the survey required to meet a legislated mandate other than the federal ESA or those that stipulated Refuge Priorities or Management Needs (Item 1, above)?

1. No
2. Yes, one mandate
3. Yes, more than one mandate

# **5. Immediacy of Need**

## **A. Controversy**

Does the survey support decision-making to address an action or management decision related to refuge resources that is controversial to an external party?

*Note: Document why the refuge staff knows or suspects an action is controversial because the interpretation can vary from person to person. Controversy can be associated with the general public, specific interest group(s) (e.g., animal rights activist, cooperative farmers), or one or more conversation partners. This criterion is focused on a high level of known or suspected controversy from outside interests where the Service could be litigated, refuge actions that could result in a precedent setting action, or severely damage a working relationship with the state or other conversation partner. This criterion does not pertain to suspected or known issues among refuge staff members and/or other FWS employees. Examples of controversy include changes to livestock grazing, predator control, and changes to harvest regulations or water allocation.*

1. Not controversial and little to no potential for controversy
2. Not currently controversial, but potentially or suspected of controversy
3. Known controversy, but data or immediate management action is not currently needed but may be in the near future
4. Pressing controversy; data required to support immediate management action

## **B. Threat**

Does the survey support decision-making to monitor and mitigate a known or suspected threat to refuge resources?

*Note: This criterion scores surveys addressing known or suspected threats. It does not apply to baseline monitoring intended to detect new (i.e., unknown) threats or changes. If surveys are determined from Natural Resources Management Plan, focus on the threat reduction strategies identified in that plan and use adopt the scoring strategy shown in parentheses. Examples of threats may include invasive species, pollutants or toxins, and climate change.*

1. No existing threat or potential for a threat to Refuge resources  
(the survey does not relate to threat reduction strategies)



2. No known threat, but potential for a threat to Refuge resources  
(Yes, supports decision making to address a threat reduction strategy with a score of \_\_\_\_[e.g. 2.5])
3. Known threat to Refuge resources, but immediate management action is not currently needed but may be in the near future (Yes, supports decision making to address a threat reduction strategy with a score of \_\_\_\_[e.g. 3.0])
4. Urgent threat to Refuge resources; immediate data are needed to support management action (Yes, supports decision making to address a threat reduction strategy with a score of \_\_\_\_[e.g. 3.5])

## 6. Scope and Scale

### A. Baseline data

Does the survey provide high-priority information that contributes to baseline data needs?

Example: Inventories of species guilds (e.g., invertebrates, plants, reptiles) or abiotic parameters (soils, waters).

1. No
2. Yes

### B. Survey Scope

What proportion (%) of the species', subspecies', or communities' (i.e., vegetation) geographic range under U.S. jurisdiction will be covered by the survey on the refuge?

*Example 1: 75% of Laysan Albatross population nest on Midway NWR. Conducting a survey to monitor the breeding population size on the refuge would cover >10% of the entire species' population and score 3.*

*Note: Surveys of abiotic factors affecting these species or vegetation communities should also be considered for this criterion. Example 2: 60% of the wintering waterfowl in the Pacific Flyway use wetlands in the Central Valley of California including the San Luis NWRC. Monitoring water levels by reading staff gauges weekly from October to March in managed wetlands is an important abiotic survey to indicate if there are sufficient acres of suitable foraging habitat to support 60% of the wintering waterfowl. Because water is essential to maintain refuge wetlands for wintering waterfowl, "survey coverage" would equate to waterfowl population surveys and score 3.*

1. Low: Survey covers <1% of the species' or communities' population/range
2. Medium: Survey covers 1-10% of the species' or communities' population/range
3. High: Survey covers ≥10% of the species' or communities' population/range

### C. Spatial Scale

What is the largest scale at which survey results will be applied for resource management?

*Note: Only surveys with a protocol that establishes methods for data management and analysis are scored higher than a 1. The area of inference for larger-scale surveys (e.g., North American Amphibian Monitoring Program) should be considered from the refuge*

*perspective unless the refuge directly contributes to analyses at a larger scale. This criterion is applicable to surveys covering areas on and adjacent to the refuge. Example: If a refuge participates and contributes to a regional survey involving neighboring US Forest Service lands, then this criterion would apply.*

1. Small scale: Applicable to only a single refuge or sites on a refuge
2. Medium scale: Applicable to a few refuges, a refuge complex, or includes the refuge and a small area beyond the refuge boundary
3. Large scale: Applicable to multiple refuges/complexes across an entire ecoregion, LCC, or region
4. Continental scale: Component of a large landscape level survey (e.g., North American Breeding Bird Survey, North American Amphibian Monitoring Program, and Circumpolar Biodiversity Monitoring Network)

#### **D. Integration**

Is the survey conducted in conjunction with, reliant on, or required by another survey to provide a more complete picture of the targeted resource?

*Note: if surveys are based on priorities established by an Natural Resources Management Plan, then consider the following question and use the scoring language in parentheses— (Are survey results used to inform one or more priority management strategies identified in the NRMP? [Refer to NRMP results chains]).*

*Example 1: Habitat parameters and avian population counts are collected for the Integrated Waterbird Management and Monitoring project. Example 2: Berry density data and salmon spawning data work in conjunction with bear density and habitat use data to predict salmon escapement goals required to maintain bear populations.*

1. No
2. Yes, survey is conducted in conjunction with another survey, but the results are independent (Yes, the survey results are used to inform 1 priority management strategy in the NRMP)
3. Yes, the results from this survey are reliant on, or required by, another survey for a complete picture of the targeted resource (Yes, the survey results are used to inform  $\geq 2$  priority management strategies in the NRMP)
4. Yes, the results from this survey are reliant on, or required by, more than one other survey for a complete picture of the targeted resource. (Not used)

#### **E. Data Quality and Scope**

Which of these characterizes the survey data?

1. Data with unknown measurement error or accuracy (raw counts)
2. Index or surrogate values without known statistical properties
3. Estimates of attribute values and measures of reliability with known statistical properties
4. Exact data from calibrated equipment (minimal measurement errors, as in automated sensors)

## 7. Protocol

### A. Sampling Design

At what stage of development is the sampling design?

*Note: The I&M initiative has a standardized format for survey protocols that contain 8 critical elements. A survey protocol with all 8 elements and has been peer-reviewed meets these criteria.*

1. Survey has no written sampling design
2. The sampling design is in development (drafted)
3. The sampling design is in formal review
4. There is a published or I&M-approved sampling design

### B. Field Methods

At what stage of development is the field method protocol?

1. Survey has no written field methods
2. The field methods are in development (drafted)
3. The field methods are in formal review
4. There is a published set or I&M approved protocol for field methods

### C. Data management, analysis, and reporting

At what stage of development is the data management, analysis, and reporting?

1. Survey has no written protocol for data management, analysis, and reporting
2. Written protocol for data management, analysis, and reporting is in development (drafted)
3. Written protocol for data management, analysis, and reporting is in formal review
4. There is a published record or I&M approved protocol guiding data management, analysis, and reporting

## 8. Cost

### A. Monetary

What is the estimated annual non-personnel cost to complete the survey?

This includes startup costs to the refuge, and any contracts, facility, and equipment cost.

*Be sure to adjust the cost of surveys that do not occur every year to an annual estimate. Regional biology or I&M staff assisting the refuge with the prioritization process should note this scale is reversed from those used for the other criteria (higher values are given to surveys that cost less operating to conduct). It is recommended that this criterion be given a low weight in the criteria ranking and rating process (the first step of using the prioritization tool) in cases where a refuge has a large number of surveys that are not currently being conducted. In these cases, the details of the protocol, and hence the costs be poorly known for planned surveys. Similarly, if selection is based on assignment of survey status that factors in a refuge's capacity after the prioritization process, then*

*evaluators may wish to assign 0 ratings to this criterion to avoid overemphasizing refuge capacity.*

1. >\$10,000
2. >\$5,000–\$10,000
3. >\$1,000–\$5,000
4. Up to \$1,000
5. No cost

## **B. Personnel**

What is the estimated refuge personnel time required to complete the survey? This includes field work, data analysis, and reporting.

*Note: as with monetary costs, the scale is reversed (higher values represent less time to complete surveys). It is recommended that this criterion be given a low weight in the criteria ranking and rating process in cases where a refuge has a large number of surveys that are not currently being conducted. In these cases, the details of the protocol, and hence the time and personnel requirements will be poorly known for planned surveys. Similarly, if selection is based on assignment of survey status that factors in a refuge's capacity after the prioritization process, then evaluators may wish to assign 0 ratings to this criterion to avoid overemphasizing refuge capacity.*

1. >240 hrs
2. >80–240 hrs
3. >40–80 hrs
4. 0–40 hrs

## **C. Security/Source of Funding**

How is this survey funded?

*Note: as with criteria 8A and B, if selection is based on assignment of survey status that factors in a refuge's capacity after the prioritization process, then evaluators may wish to assign 0 ratings to this criterion to avoid overemphasizing refuge capacity.*

1. Require full support from a non-Refuge funding source for completion, and source has not been identified or is not secure
2. Requires partial support from a non-Refuge funding source that is not secure and reliable
3. Requires partial support from a non-refuge funding source, but the funding source is consistent and secure for the expected duration of the survey (high level of confidence that funding will remain)
4. Could be fully supported using Refuge base funds, or has no monetary cost to the Refuge

## Terms Used in the Prioritization Criteria

For Criterion #1, refuge purpose is defined within the National Wildlife Refuge System Mission and Goals and Refuge Purposes policy (601 FW 1).

The NWRS Improvement Act defines “purposes of the refuge” as the “purposes specified in or derived from the law, proclamation, Executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.”

Refuges acquired under the authority of general conservation laws take on the purpose of the law. Examples of such laws include the Endangered Species Act of 1973, as amended; the Migratory Bird Conservation Act; the Fish and Wildlife Act of 1956, as amended; the Fish and Wildlife Coordination Act, as amended; the Emergency Wetlands Resources Act of 1986; and the Alaska National Interest Lands Conservation Act of 1980. Executive orders and proclamations, Secretary’s Orders, public land orders, and refuge-specific legislation generally declare the purpose(s) of the refuge, sometimes broadly (e.g., “as a preserve and breeding ground for native birds”) and sometimes very specifically (e.g., “to protect and preserve in the national interest the Key deer and other wildlife resources in the Florida Keys”).

As written in the Wilderness Act of 1964, the purposes of the Act are to be “within and supplemental” to the purpose(s) of those refuges with designated wilderness. We interpret this to mean the wilderness purposes become additional purposes of the refuge, yet apply only to those areas of the refuge designated as wilderness. Wilderness designations provide additional considerations for determining the administrative and management actions we need to take to achieve a refuge’s purpose(s) on designated wilderness areas within the Refuge System.

Throughout the criteria, the term refuge refers to one or more refuges in the NWRS. Based upon 601 FW 1, a refuge is defined as “...all lands, waters, and interests therein administered by the Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas managed by the Refuge System for the protection and conservation of fish and wildlife, including threatened and endangered species, as determined in writing by the Director of the Service, by Secretary’s Order, or so directed by the President.”

Definitions of refuge management activities and refuge uses derived from the Compatibility policy (603 FW 2.6) that apply to all refuges:

**Table A1. Weight Applied to Prioritization Criteria.**

The following 24 criteria were weighted by refuge staff at Port Louisa NWR (relative values in parentheses with highest values representing criteria that are most important to refuge staff) and used to rank surveys through a Simple Multi-Attribute Ranking Technique (SMART tool).

<b>Criteria</b>	<b>Station specific weight</b>	<b>Comparison to even weight</b>
1A. Refuge Purpose	0.088	0.046
1B. CCP or Other Management Plan Objectives	0.098	0.056
1C. NWRS Objectives	0.000	-0.042
1D. Management Utility (Decision Support) for the Refuge	0.059	0.017
2A. FWS Program Need	0.059	0.017
2B. FWS Partner Need	0.059	0.017
3A. FWS Surrogate Species	0.049	0.007
3B. Refuge Processes	0.059	0.017
3C. Survey Breadth	0.059	0.017
4A. Listed Species or Vegetation Communities	0.069	0.027
4B. Other Legal Mandates	0.000	-0.042
5A. Controversy	0.039	-0.002
5B. Threat	0.039	-0.002
6A. Baseline Data	0.049	0.007
6B. Survey Scope	0.029	-0.012
6C. Spatial Scale	0.039	-0.002
6D. Integration with Other Survey	0.059	0.017
6E. Attribute Quality and Scope	0.000	-0.042
7A. Sampling Design Stage	0.000	-0.042
7B. Field Methods Stage	0.000	-0.042
7C. Data Management, Analysis, and Reporting	0.029	-0.012
8A. Monetary	0.029	-0.012
8B. Personnel	0.039	-0.002
8C. Security/Source of Funding	0.039	-0.002

## Appendix B. Prioritization Scores of All Ranked Surveys

Values used to prioritize and select the surveys likely to be conducted through 2030 at Port Louisa National Wildlife Refuge. Prioritization scores were generated for candidate surveys by refuge staff using 24 criteria for each survey (Appendix A). Candidate surveys represent specific surveys or general information needs and were not always associated with specific protocols. Groups 1, 2, 3, 4, and 5 = >90<sup>th</sup>, >80<sup>th</sup>, >70<sup>th</sup>, >50<sup>th</sup>, and <50<sup>th</sup> percentiles respectively.

**Table B-1** Ranking of priority scores from the SMART tool for all considered surveys.

<b>Survey</b>	<b>Final Rank</b>	<b>Final Score</b>	<b>Group</b>
Landbird Survey	1	0.65	1
Integrated Waterbird Monitoring And Management (IWMM)	2	0.61	1
Water Level Monitoring (Lsa/Odessa)	3	0.58	2
Secretive Marshbird Monitoring	4	0.56	2
Invasive Species Inventory/Monitoring	5	0.56	2
Reed Canary Grass AM Vegetation Survey	6	0.54	3
Late Summer/ Early Fall Shorebird Surveys	7	0.54	3
Vegetative Cover Monitoring	8	0.54	3
Monitoring Avian Productivity And Survivorship (MAPS)	9	0.51	3
Keithsburg Division Contaminants Monitoring	10	0.50	3
Aquatic Vegetation	11	0.50	4
Water Level Monitoring (Hsb And Lsa)	12	0.44	4
Forest Inventory	13	0.44	4
Bat Inventory	14	0.41	4
Fisheries Surveys	15	0.41	4
Amphibian And Reptile Surveys	16	0.41	5
Bathymetry	17	0.41	5
Mussel Surveys	18	0.40	5
BBS Vacant Mo Or Iowa Routes	19	0.39	5
Butterfly Surveys	20	0.35	5
Mid-Winter Waterfowl Survey	21	0.33	5
Pollinator Inventory	22	0.29	5
Mid-Winter Eagle Survey	23	0.29	5
Aquatic Invertebrates	24	0.26	5
Small Mammals Surveys	25	0.26	5
American Woodcock Singing Ground Survey	26	0.25	5

## Appendix C. Cost-benefit Analysis

The following table includes results from direct selections and linear programming approaches (all optimized sets). The optimized portfolios used the total of all frequency adjusted scores as an objective function. Main constraints included costs (weeks) and surveys selected prior to solving the linear function (summation of frequency adjusted scores across all surveys). Portfolios represent sets of selected surveys as IMP variants.

**Table C-1.** Parameters framing IMP portfolios presented in Table C-2.

Portfolio	Parameters
1	Top-down selection from ranked list
2	Optimized for maximum benefit
3	Optimized constrained to select all bird surveys
4	Optimized constrained to select all group 1 surveys
5	Optimized constrained to select all group 1& 2 surveys
6	Optimized constrained to select all group 1,2,3 surveys
7	Optimized constrained for all abiotic surveys
8	Optimized constrained for all animals except birds
9	Optimized constrained to select all annual surveys
10	Optimized constrained to select all inventories
11	Optimized constrained to select forest inventory & top 3
12	Optimized constrained to select forest inventory, top 3, no group 5
13	Optimized constrained to select no group 5
14	Optimized constrained to select only groups 4&5
15	Optimized constrained to select only groups 1&2
16	Optimized constrained to select only groups 1,2,&3
17	Selection surveys greatest time investment
18	Optimized for maximum benefit with 10 weeks
19	Optimized for maximum benefit with 15 weeks
Final	Final selected set



**Table C-2** Efficiencies in terms of frequency adjusted total benefit for 19 potential IMP portfolios and the final selected set. Portfolios (x= selected surveys) were created by direct selections or by solving for optimal sets (maximum benefit within constraints) as described in table C-1. Benefit scores are derived from the ranking results presented in table B-1 as the proportion of the total frequency adjusted benefit from all surveys.

Survey Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Final
Landbird Survey	x	x	x	x	x	x	x	x	x		x	x	x		x	x	x		x	x
Integrated Waterbird (IWMM)	x		x	x	x	x			x		x	x	x		x	x	x			x
water level monitoring (Odessa)	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x
secretive marshbird monitoring	x	x	x	x	x	x	x	x				x	x		x	x	x			
invasive species	x	x		x	x	x	x	x		x		x	x		x	x	x			
reed canary grass AM	x					x			x			x	x			x	x			
Shorebird Surveys	x		x			x			x							x	x			
vegetative cover monitoring	x	x				x	x	x				x	x			x	x			x
Avian Prod. & Survi. (MAPS)	x		x			x			x							x	x			
Keithsburg Contaminants	x	x	x	x	x	x	x	x	x	x	x	x	x			x		x	x	x
aquatic vegetation	x	x	x	x	x		x	x	x	x	x	x	x	x				x	x	x
water level monitoring (hsb)	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x
forest inventory										x	x	x	x	x						x
bat inventory	x	x	x	x	x		x	x	x	x	x	x	x	x				x	x	x
fisheries surveys	x	x	x	x	x	x	x	x	x	x	x	x	x	x				x	x	
amphibian and reptile surveys	x	x	x	x	x		x	x	x	x	x			x					x	
Bathymetry		x	x	x	x	x	x	x	x	x	x			x				x	x	
mussel surveys		x	x	x	x	x	x	x	x	x	x			x				x	x	
BBS vacant Mo or Iowa routes		x	x	x	x		x	x	x	x	x			x			x	x	x	
Butterfly Surveys		x	x	x	x	x	x	x	x	x	x			x				x	x	
mid-winter waterfowl survey		x	x	x	x		x	x	x	x	x			x			x	x	x	x
pollinator inventory		x		x	x		x	x		x				x					x	
mid-winter eagle survey		x	x	x	x		x	x	x	x	x			x			x	x	x	x
aquatic invertebrates		x		x	x		x	x	x	x				x					x	
Small Mammals Surveys		x	x	x	x	x	x	x	x	x	x			x				x	x	
Am. Woodcock Singing Ground		x	x	x	x		x	x	x		x			x			x		x	
Benefit	0.58	0.93	0.86	0.92	0.92	0.74	0.93	0.93	0.87	0.86	0.85	0.56	0.56	0.68	0.13	0.32	0.24	0.72	0.86	0.25
Weeks/year	20	21	21	21	21	21	21	21	21	21	21	21	21	19	8	16	17	10	15	20
# Surveys	15	21	20	21	21	16	21	21	21	18	18	13	13	16	5	10	13	13	18	12

## Appendix D. Estimated Annual Costs for Implementing Surveys

(Selected surveys with a historic status are excluded).

Survey Name	Survey ID Number	Survey Priority	Survey Status	FWS Staff Total	Total Cost
Breeding Landbird Surveys	FF03RPLU00-014	1	Current	\$2,885	\$3,085
Integrated Waterbird Monitoring and Management (IWMM)	FF03RPLU00-008	2	Current	\$2,885	\$3,185
Water Level Monitoring	FF03RPLU00-025	3	Current	\$481	\$1,843
Vegetative Cover Monitoring	FF03RPLU00-005	8	Current	\$2,885	\$3,566
Keithsburg Division Contaminants Monitoring	FF03RPLU00-026	10	Current	\$481	\$1481
Aquatic Vegetation	FF03RPLU00-031	11	Current	\$1,923	\$1,923
USACE Forest Inventory	FF03RPLU00-006	13	Current	\$2,885	\$2,985
Bat Inventory	FF03RPLU00-024	14	Current	\$1,923	\$2,423
Mid-Winter Waterfowl Survey	FF03RPLU00-028	21	Current	\$48	\$68
Midwinter Bald Eagle Survey	FF03RPLU00-007	23	Current	\$72	\$92
Secretive Marshbird Monitoring	FF03RPLU00-018	4	Future	\$3846	\$3,846
Monitoring Avian Productivity and Survivorship (MAPS)	FF03RPLU00-012	9	Future	\$3,846	\$3,846
Fisheries Surveys	FF03RPLU00-011	15	Future	\$481	\$3,000
Amphibian and Reptile surveys	FF03RPLU00-023	16	Future	\$1,923	\$1,923
Bathymetry Surveys	FF03RPLU00-009	17	Future	\$3,846	\$3,846
Mussel Surveys	FF03RPLU00-010	18	Future	\$3,846	\$3,846
Butterfly Surveys	FF03RPLU00-015	20	Future	\$3,846	\$3,846
Aquatic Invertebrate Surveys	FF03RPLU00-030	24	Future	\$1,923	\$1,923
Small Mammals Surveys	FF03RPLU00-020	25	Future	\$481	\$481
				<b>Staff Total</b>	<b>Total Cost</b>
<b>Total for selected (current and expected) surveys:</b>				\$16,468.00	\$19,651.00
<b>Total for future surveys:</b>				\$13,942.00	\$20,307.00

**Appendix E. Estimated Annual Work Schedule for Selected Surveys,  
January – December.**

<b>Survey Name</b>	<b>Survey ID Number</b>	<b>Survey Priority</b>	<b>Jan- March</b>	<b>April- June</b>	<b>July- Sept</b>	<b>Oct- Dec</b>
Breeding Landbird Survey*	FF03RPLU00-014	1	A,DE,R,P	FW	FW	DE,
Integrated Waterbird Monitoring and Management (IWMM)	FF03RPLU00-008	2	FW,DE,A, R	FW,DE,P	T,FW,DE	FW,DE
Water Level Monitoring	FF03RPLU00-025	3	FW,DE,A, R	FW,DE,P	T,FW,DE	FW,DE
Vegetative Cover Monitoring	FF03RPLU00-005	8	A,DE,R,P	FW	FW	FW,DE,
Keithsburg Division Contaminants Monitoring*	FF03RPLU00-026	10	FW,DE,A, R	FW,DE,P	T,FW,DE	FW,DE
Aquatic Vegetation	FF03RPLU00-031	11	A,DE,R,P	FW	FW	DE
USACE Forest Inventory*	FF03RPLU00-006	13	FW, A,DE,R,P	FW	FW	FW,DE
Bat Inventory	FF03RPLU00-024	14	A,DE,R,P	FW	FW	DE
Mid-Winter Waterfowl Survey	FF03RPLU00-028	21	FW,DE,	~	~	~
Midwinter Bald Eagle Survey	FF03RPLU00-007	23	FW,DE,	~	~	~

P=Planning, T=Training, FW=Field Work, DE=Data Entry, A=Analysis, R=Reporting

\*Denotes Inventory or Monitoring conducted at 2-20 year intervals (not annual work).

## Appendix F. Non-selected Surveys

A status of ‘future’ denotes surveys that have been prioritized but have a low chance of being conducted during the span of the IMP because of low priority or because the capacity to conduct the survey will be difficult to secure. Historic status surveys have been recently completed or discontinued and were not ranked.

<b>Survey Name</b>	<b>Survey ID Number</b>	<b>Survey Priority</b>	<b>Survey Status</b>
Secretive Marshbird Monitoring	FF03RPLU00-018	4	Future
Monitoring Avian Productivity and Survivorship (MAPS)	FF03RPLU00-012	9	Future
Fisheries Surveys	FF03RPLU00-011	15	Future
Amphibian and Reptile surveys	FF03RPLU00-023	16	Future
Bathymetry Surveys	FF03RPLU00-009	17	Future
Mussel Surveys	FF03RPLU00-010	18	Future
Butterfly Surveys	FF03RPLU00-015	20	Future
Aquatic Invertebrate Surveys	FF03RPLU00-030	24	Future
Small Mammals Surveys	FF03RPLU00-020	25	Future
Weekly Fall Migration Waterfowl Surveys	FF03RPLU00-022	NA	Historic
Grassland/ Wet Meadow Vegetation Surveys	FF03RPLU00-017	NA	Historic
American Woodcock Singing Ground Survey	FF03RPLU00-021	NA	Historic
Pollinator Surveys	FF03RPLU00-016	NA	Historic
Abnormal Amphibian Monitoring	FF03RPLU00-027	NA	Historic
Reed Canary Grass Adaptive Management	FF03RPLU00-013	NA	Historic
North American Amphibian Monitoring Program (States)	FF03RPLU00-019	NA	Historic
Landbird Point Count Surveys	FF03RPLU00-032	NA	Historic

## Appendix G. Refuge Condition Summaries

This summary can be used as a reporting tool throughout the life of the IMP to track the status, trends, and desired conditions of the selected surveys. Updates to summary can be made during annual reviews and reported in Annual Habitat Work Plans (AHWP). Updates to this table do not require an IMP revision, but should be uploaded as a digital file associated with the ServCat record that contains the approved IMP.

**Port Louisa NWR - REFUGE SUMMARY TABLE**

**Date of last update: 10/20/2015**

Resource Theme Level 1 <sup>1</sup>	Resource Theme Level 2 <sup>1</sup>	Attribute <sup>2</sup>	Current Condition (values) <sup>3</sup>	Source of Current Condition <sup>4</sup>	Desired Condition (values) <sup>5</sup>	Source of Desired Condition <sup>6</sup>	Within Desired Condition? <sup>7</sup>	Survey Name and PRIMR ID (FF03RPLU00-) <sup>8</sup>
<b>Water</b>	<b>Hydrology</b>	Flood regime (weeks flooded) in managed impoundments	TBD	TBD	>60% cover moist-soil annual plant species such as beggarticks, millet, nodding smartweed, nutsedge to provide food resources for migratory waterfowl in Seasonally flooded wetlands. <50% cover hardstem & river bulrush Semi-permanently flooded wetlands. 50% coverage by native emergent and submergent aquatic vegetation such as coontail, elodea, etc. Permanently flooded wetlands	HMP	TBD	<b>Integrated Waterbird Monitoring and Management (IWMM) (008)</b>

<b>Water</b>	<b>Water Quantity</b>	Water levels (feet msl) in Lake Odessa	TBD	TBD	Iowa DNR water level plan is to hold water at an elevation of 534 feet mean sea level (msl) over the winter with water circulation through the system for fish, start a slow draw down in the spring and through the summer to reach 532.5 feet by mid-July with water circulation	HMP	TBD	<b>Water Level Monitoring (025)</b>
<b>Water</b>	<b>Water Quality</b>	nitrate levels (mg/L)	TBD	TBD	Decrease annual average concentration by 10%	HMP	TBD	<b>Keithsburg Division Contaminants Monitoring (026)</b>
<b>Biological Integrity</b>	<b>Invasive Species</b>	Bottomland prairie composition (% cover)	TBD	TBD	<60% native warm-season grasses > 40% native forbs	HMP	TBD	<b>Vegetative Cover Monitoring (005)</b>
<b>Biological Integrity</b>	<b>Invasive Species</b>	forest Invasive herbaceous	TBD	TBD	<10% cover	USACE Upper Mississippi River Forest Stewardship Plan (2012)	TBD	<b>Vegetative Cover Monitoring (005)</b>
<b>Biological Integrity</b>	<b>Invasive Species</b>	forest Invasive woody	TBD	TBD	<10% cover	USACE Upper Mississippi River Forest Stewardship Plan (2012)	TBD	<b>USACE Forest Inventory (006)</b>

<b>Biological Integrity</b>	<b>At-risk Biota</b>	site occupancy for forest roosting bats	TBD	TBD	Protection of all known maternity colonies	Indiana Bat Recovery Plan	TBD	<b>Bat Inventory (024)</b>
<b>Biological Integrity</b>	<b>Other Biota</b>	Bottomland Forest structure	TBD	TBD	Basal area 90-160 ft <sup>2</sup> /acre with ≥25% in older age classes, ≥ 2 large dead or stressed trees/acre	USACE Upper Mississippi River Forest Stewardship Plan (2012)	TBD	<b>USACE Forest Inventory (006)</b>
<b>Biological Integrity</b>	<b>Other Biota</b>	Waterbird use during migration	TBD	TBD	TBD	HMP	TBD	<b>Integrated Waterbird Monitoring and Management (IWMM) (008)</b>
<b>Biological Integrity</b>	<b>Other Biota</b>	Presence / absence Bell's vireo during breeding season	TBD	TBD	100% occupancy in shrub-scrub habitats	HMP	TBD	<b>Breeding Landbird Survey (014)</b>
<b>Biological Integrity</b>	<b>Other Biota</b>	Tree Cavity Density	TBD	TBD	≥2 visible holes < 10 in diameter/acre. 1 den tree/large cavities (> 10 inch diameter)/10 acres	USACE Upper Mississippi River Forest Stewardship Plan (2012)	TBD	<b>USACE Forest Inventory (006)</b>

#### REFERENCES

USFWS (United States Fish and Wildlife Service). 2015. Port Louisa NWR Habitat Management Plan. Wapello, IA  
USACE Upper Mississippi River Forest Stewardship Plan (2012)

## Appendix H. Environmental Action Statement (EAS)

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 Inventory and Monitoring Plan (IMP) for the Port Louisa National Wildlife Refuge. This IMP is a step down plan from the 2004 Comprehensive Conservation Plan (CCP) and associated Environmental Assessment (EA) for the Refuge. This IMP provides more-specific guidance for surveys of Refuge's fish, wildlife, plant, habitat, and abiotic resources to fulfill the Refuge's purposes and help achieve Refuge's goals and objectives.

The EA for Port Louisa NWR CCP included goals and objectives for the refuge and assessed the impacts associated with a range of reasonable alternatives to achieve those goals and objectives. The rationale for selection of one specific alternative for implementation is explained in the Finding of No Significant Impact (FONSI) accompanying the final CCP. The goals, objectives, and survey strategies included in this IMP fall within the bounds of those described and assessed in the CCP and EA or EIS.

Pursuant to 40 CFR 1502.9, no additional NEPA documentation is required to implement this IMP beyond the EA and FONSI prepared concurrently with the CCP. No substantial changes to the proposed action alternative that was identified, analyzed, and selected for implementation within the CCP, EA, and FONSI are proposed through this IMP. Similarly, no significant new information or circumstances exist relevant to environmental concerns and bearing on the proposed action or its impacts.

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

"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." 516 DM 8.5B(1)

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Project Leader/Refuge Manager

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Date

*[Note: this signature and dating is not required if a statement is placed below the IMP signature page indicating that the Project Leaders signing of that page applies to all contents of this IMP].*

Reference: U.S. Fish and Wildlife Service. 2004. *Comprehensive Conservation Plan and Environmental Assessment and for Mark Twain National Wildlife Refuge Complex*. USFWS Region 3. Bloomington MN.



## IMP Revision Signature Page

### IMP Revisions Port Louisa National Wildlife Refuge

<i>Action</i>	<i>Signature /Printed Name</i>	<i>Date</i>
Survey list and priority changed:		
Submitted By:	Refuge Manager/Project Leader	
Reviewed By:	Regional I&M Coordinator	
Approved By:	Refuge Supervisor	