U.S. Fish & Wildlife Service

Inventory and Monitoring Plan

Detroit River International Wildlife Refuge

Wet meadow at Humbug Marsh Unit (Photo credit: Greg Norwood, USFWS).

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Detroit River International Wildlife Refuge

Inventory and Monitoring Plan

Signature Page[1]

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[1] Signatures apply to all contents of the IMP.

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Introduction

This Inventory and Monitoring Plan (IMP) documents the inventory and monitoring surveys that will be conducted at Detroit River International Wildlife Refuge from 2017 through 2032, 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 CCP (2005) and HMP (2016) for this refuge. Many surveys are inventories or long-term monitoring programs. This IMP was developed according to the Inventory and Monitoring (I&M) policy (701 FW 2) for the National Wildlife Refuge System.

Detroit River IWR has its origins in a bi-national workshop resulting in a vision document agreed-to among many partners which recognized the significant ecological resources of the region and identified conservation priorities in the Detroit River corridor (MAC 2001). This document called "A Conservation Vision for the Lower Detroit River Ecosystem and the Detroit River International Wildlife Refuge" prioritized the establishment of an International Wildlife Refuge. The lower Detroit River and western Lake Erie now contain 3,797 acres of Essex Region Conservation Authority land and 981 acres of City of Windsor lands that permanently protected from development and further degradation. On the Michigan side, there are 7,897 acres of Michigan Department of Natural Resources land and 6,107 acres of lands owned and/or cooperatively managed by U.S. Fish and Wildlife Service for conservation. When totaled between Canada and U.S, 18,782 acres of land in southwest Ontario and southeast Michigan are now being managed collaboratively for conservation and outdoor recreation in the spirit and intent of the 2001 Conservation Vision. This IMP focuses on the approximately 6,107 acres owned by the Refuge or under cooperative management agreements with partner organizations.

Twenty-eight priority species, found in five habitat types, were identified in the Detroit River IWR HMP. The three highest priority resource objectives, as stated in the HMP are:

<u>Emergent Wetlands Objective</u>

Over the life of the HMP, protect the integrity of Great Lakes Marsh, and provide breeding and migratory stopover for Refuge priority resources such as wood duck, sora, Blanding's turtle, and pied-billed grebe. Wetlands with hydrological connection to Lake Erie and governed by its water levels and natural disturbances (seiches, ice-scour, storm surges) will be conserved in their natural state. A total of 270-acres of impoundments will be manipulated to maintain seasonally inundated to shallow (less than two feet) semi-permanently flooded marsh conditions with a varying range of total emergent vegetated cover. *Phragmites* within priority 1 units (as defined in Table 5-1 of the HMP) will be reduced to a maximum of 10 percent of the total area in the emergent wetland zones or impoundments. Narrow-leaved and hybrid cattail, along with other exotic species, will be reduced to no more than 80 percent of the total area. This equates to up to 400 acres that will annually receive water level manipulation in impoundments, intensive phragmites/cattail retreatment, mowing, and prescribed fire in both coastal wetlands and impoundments.

Moist Soil/Mud Objective

Over the life of the HMP, maintain a minimum of 15 acres of managed moist soil habitat during spring and fall migration at the south impoundment of the Brancheau Unit. Managed moist soil areas will maintain a dominance of annual native vegetation. Other coastal units will maintain shoreline mudflat with sparse vegetation (<25% total area) as water levels allow. These habitats will provide migratory stopover for Refuge priority resources such as blue-winged teal, Wilson's snipe, and lesser yellowlegs.

Wet Prairie Objective

Over the life of the HMP, annually protect and rehabilitate all approximately 100 acres of the Refuge's wet prairies adjacent to natural Great Lakes Marsh and any remnant Lakeplain Wet Prairie if found. These areas should maintain dominance of native vegetation within their natural range of variability such as blue-joint grass, bulrushes, sedges, and cordgrass. These habitats will support eastern fox snake and protect any remaining populations of eastern prairie fringed orchid. Large, monotypic stands of reed canary grass and phragmites in existing, natural wet prairies will be managed to less than 10 percent of the total wet prairie area.

Constructed wet prairies from approximately 118 acres of former agricultural land will be managed to promote a grassland and early successional shrubland with a diversity of forbs to benefit a wide range of native pollinating invertebrates and migratory grassland birds. Woody species will be managed to less than 25 percent in constructed wet prairies. This equates to up to 118 acres of active management per year through prescribed fire and mowing. Invasive species will be controlled enough to maintain a dominance (>50% total area) of native vegetation as opposed to a dominance of non-native species. These habitats will provide for eastern fox snake and eastern prairie-fringed orchid.

Methods

Station staff generated a list of extant and anticipated surveys. This extensive list was later refined to exclude general observations (reconnaissance) of refuge resources that do not require protocols or data management. The remaining 31 surveys were then assigned a priority score using 17 pre-defined criteria (Appendix A). Priority scores were used to assign each survey to one of three groups that defined the status of the surveys (Appendix B).

Prioritizing and Selecting Surveys

The priority ranking of surveys was determined during a one-day meeting at Detroit River IWR on July 9th, 2013. Assistant Refuge Manager Steve Dushane and Refuge Wildlife Biologist Greg Norwood met with Region 3 Zone Biologist Sean Blomquist to prioritize the surveys. Background information for each survey was summarized in advance by the Refuge Wildlife Biologist and briefly discussed prior to prioritizing the surveys. The 17 criteria, assignment rules, weighting and score calculation process followed the Criteria for Prioritizing Surveys

Entered into the PRIMR Database[2] (Appendix A). The Detroit River International 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 maximize the value of the selected surveys, given staffing and budget constraints. Selecting only surveys that can be conducted with anticipated resources should lead to high quality surveys, e.g., commitment to all components of conducting a survey (planning, administration, implementation, data analysis and archiving, reporting and feedback to management).

In the cost-benefit analysis, the value (i.e., benefit) of a selected survey was estimated from the priority score from the SMART ranking process, adjusted for frequency over the life of the IMP. The adjustment helps to identify low frequency surveys with high cost efficiencies (for example, one-time inventories). To determine a cost constraint, the staff responsible for completing natural resource surveys were asked to estimate the portion of their time in a typical year dedicated to activities associated with conducting surveys: data analysis and summary, data management, monitoring, research, and supervision. The time dedicated to surveys was 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.

Detroit River IWR has a small staff, with only a wildlife refuge specialist and wildlife biologist available to implement surveys. The estimate of available weeks to implement surveys with current staffing is 12 weeks per year. The estimated annual costs for implementing surveys are documented in Appendix D; total time estimates for the selected surveys are seven weeks for current surveys and another 8.5 weeks for expected surveys.

Results: Selected Surveys

The prioritization and cost-benefit analysis were used in deliberative selection of surveys to be completed over the life of the IMP. In addition to the priority scores, the level of effort required to complete a survey, as well as input from Region 3 Migratory Birds Division and East Lansing Ecological Services Field Office, was considered in the selection process. Selected surveys include surveys identified for completion with FY2017 levels of staffing and support (Table 1). The list of surveys selected for implementation with existing resources represents a commitment to implementation by refuge staff. Changes in available capacity, CCP objectives, HMP 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.

[2] Planning and Reporting Inventory and Monitoring at Refuges (PRIMR) Database (https://ecos.fws.gov/primr/index.gsp). A database developed by the I&M initiative that describes and archives the surveys conducted on refuges, and which is also used to generate summaries for an IMP.

The process identified 7 surveys[3] that can be completed with current staffing levels and budget for the duration of this IMP (Table 1). 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, available protocols and companion surveys that must be completed simultaneously to maximize value. The NOAA Lake level monitoring and USGS stream gauge monitoring surveys are essentially the same survey and were combined and renamed Water level gauges of Detroit River and Lake Erie. The "Wetland Vegetation Cover Survey with annual summary of mean daily Lake Erie water level/water level management" survey was renamed "Great Lakes Marsh Vegetation Monitoring" to better reflect its purpose.

A Refuge Condition Summary, which can be used as 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.

List of Selected Surveys and Rationale for Selection

Name	Rationale
Integrated Waterbird Management and Monitoring (IWMM) Initiative	This survey is intended to monitor bird use and vegetation condition in Refuge units with water control structures. Waterbird and vegetation data will be collected via the Integrated Waterbird Management and Monitoring protocol framework. In addition, water levels in impoundments will be recorded to inform managers on how to meet habitat objectives and protect surrounding private infrastructure. Refuge staff create desired water levels by manipulating the water control structures.
Treatment Evaluation of Phragmites, Invasive Cattail, and Reed Canary Grass	This survey will gather the minimum information necessary to plan invasive species treatments for the current growing season and assess effectiveness of previous treatments.
Aerial Deer Survey	This survey determines the number of white-tailed deer in the Humbug Marsh and Gibraltar Wetlands Units in a single winter aerial survey (usually January or February) conducted by the Michigan DNR, Wildlife Division. The survey determines the number of additional white-tailed deer to take in order to reach the desired population number.
Water level gauges of Detroit River and Lake Erie	Water level trend data can be obtained readily on-line from gauges in western Lake Erie and Detroit River that are managed by the National Oceanic and Atmospheric Administration (NOAA). These data inform Refuge managers about water level averages and seiche events over time in and around coastal marshes and impoundments. This information has many uses relating to ecosystem functions, rehabilitation projects, and management of water control structures.

[3] One additional survey (Ecological Site Inventory and Assessment) was added after the ranking exercise.

	These trend data are required to interpret species distribution and composition changes in Great Lakes Marshes.
Hydrogeomorphic (HGM) Wetland Classification	This survey is important to characterize the hydrology and geomorphic setting of the Refuge's wetlands in order to prioritize and carry out projects that optimize the management and long-term ecological and societal functions of the lands as described in the HMP.
Great Lakes Marsh Vegetation Monitoring	This survey is important to monitor and maintain the integrity of Great Lakes marsh on the refuge. These wetlands are *not* impounded; they are hydrologically connected to Lake Erie and identified as a priority resource of concern in the HMP.
Ecological Site Inventory and Assessment	This survey is conducted on Refuge and conservation partner lands near the refuge. It defines historical and current conditions, ecological threats, and identifies ecological features, especially those unique or rare in the region and in need of protection or restoration.

Table 1. Surveys selected for conduct at Detroit River International Wildlife Refuge 2016—2031.

Survey Priority [1]	Survey ID Number [2] (FF03RDTR00-)	Survey Name/(Type) [3]	Survey Status [4]	Mgmt. Objective Id [5]	Survey Area [6]	Staff Time (FTE) [7]	Avg. Ann Cost (OPR) [8]	Survey Timing [9]	Survey Length [10]	Survey Coord. [11]	Protocol Citation [12]	Protocol Status [13]
1	045	Integrated Waterbird Management and Monitoring (IWMM) (M)	Current	HMP / Page 72	Entire station	FWS: 2	$3,000	Throughout the year/ Recurring -- every year	2017-Indefinite	Greg Norwood, Refuge Biologist	Loges et. al. 2015	National / Approved
2	036	Treatment Evaluation of Phragmites, Invasive Cattail, and Reed Canary Grass (M)	Current	HMP / Page 72	Multiple management units	FWS: 4	$6,000	Summer/ Recurring -- every year	2007-Indefinite	Greg Norwood, Refuge Biologist	(none)	Initial Survey Instructions
3	041	Aerial Deer Survey (M)	Current	HMP / Page 76	Humbug Marsh and Gibraltar Wetlands Units	FWS: 0.25	$375	Winter/ Recurring -- every year	2014-Indefinite	Greg Norwood, Refuge Biologist	(none)	Initial Survey Instructions
4	047	Water level gauges of Detroit River and Lake Erie (BM)	Current	HMP / Page 72	Regional	FWS: 0.75	$1,125	Throughout the year/ Recurring -- every year	2016-Indefinite	(none)	(none)	Initial Survey Instructions
5	026	Hydrogeomorphic (HGM) Wetland Classification (I)	Expected	HMP / Page 72	Entire station	FWS: 3.5	$5,250	Summer/ Occurs one time only	2018-2019	Josh Eash, Hydrologist, USFWS	(none)	Initial Survey Instructions
6	037	Great Lakes Marsh Vegetation Monitoring (BM)	Expected	HMP / Page 72	Entire station	FWS: 3	$4,500	Summer/ Recurring -- every year	2017-Indefinite	Greg Norwood, Refuge Biologist	GLCWC 2008; Uzarski et al. 2014	Initial Survey Instructions
7	081	Ecological Site Inventory and Assessment (I)	Expected	HMP / Page 72	Entire station and partner lands	FWS: 2	$3,000	Summer/occurs one time per area	2018-2022	Greg Norwood, Refuge Biologist	Slaughter and Penskar 2015; Norwood 2016	Initial Survey Instructions

[1] The rank for each survey listed in order of priority (e.g., numeric, tiered, alpha-numeric, or combination of these).
[2] A unique identification number consisting of refuge code-computer assigned sequential number. Refuge code comes from the FBMS cost center identifier.
[3] 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: Monitoring to Inform Management (M), Baseline Monitoring (BM), Inventory (I).
[4] Selected surveys planned for the lifespan of this IMP (i.e., Current, Expected).
[5] The management plan and objectives that justify the selected survey.

[6] Refuge management unit names, entire refuge, or names of other landscape units included in survey.
[7] Estimates of Service (FWS) and non-Service (Other) staff time needed to complete the survey (weeks).
[8] 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.
[9] Timing and frequency of survey field activities.
[10] The years during which the survey is conducted.
[11] The name and position of the survey coordinator (the Refuge Biologist or other designated Service employee) for each survey.
[12] Title, author, and version of the survey protocol (if there is no protocol to cite, enter None).
[13] 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: *Integrated Waterbird Management and Monitoring (IWMM) Initiative (FF03RDTR00-045)*
Refuge: *Detroit River International 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: Emergent Wetlands; Moist Soil/Mud

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 intended to monitor bird use, and vegetation conditions in Refuge units with water control structures. Waterbird and vegetation data will be collected via the Integrated Waterbird Management and Monitoring protocol. It is necessary to know impoundment levels in order to create the water level conditions to meet habitat objectives and protect surrounding private infrastructure. Refuge staff create desired water levels by manipulating the water control structures. Furthermore, it is necessary to evaluate how well the created habitat conditions are actually benefitting priority waterbirds (including waterfowl, shorebirds, and other priority resources). This provides the necessary feed-back to managers about how well the habitat is being optimized in comparison to other conditions, areas, and water level strategies being employed.

The station habitat management objective for moist soil/mud is to maximize moist soil conditions to promote wetland annuals and moist soil in the 15-acre south impoundment at the Brancheau Unit. This requires water levels to be manipulated to prolong moist soil conditions during the early growing season, regardless of precipitation and weather.

The station habitat management objective for emergent wetlands calls for managing 270 acres of impoundments for seasonally inundated to shallow (less than two feet) semi-permanently flooded marsh conditions with a varying range of total emergent vegetated cover.

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

Birds, Vegetation, Water; Hydrology; Recurring -- every year; Throughout the year

The overall intent of the Refuge's management goals and objectives for water levels in its impoundments is to optimize benefits (food and cover) to migratory waterfowl, shorebirds, and waterbirds during migration. The number and phenology of migrating waterfowl, shorebird, and waterbirds and their vegetative habitat will be measured in relation to the water levels via the Integrated Waterbird Management and Monitoring (IWMM) protocol.

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

NO

Survey: *Treatment Evaluation of Phragmites, Invasive Cattail, and Reed Canary Grass (FF03RDTR00-036)*

Refuge: *Detroit River International 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: Emergent Wetlands; Moist Soil/Mud; Wet Prairie

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 will gather the minimum information necessary to plan invasive species treatments for the current growing season and assess effectiveness of previous treatments. It is intended to monitor the abundance and distribution of invasive species following treatment according to emergent wetlands strategy 2, wet prairie strategies 2 and 4, and moist soil/mud strategy 2.

The station management objective for phragmites populations within priority 1 units (as defined in Table 5-1 of the HMP) will be reduced to a maximum of 10 percent of the total area in the emergent wetland zones or impoundments. Likewise, narrow-leaved and hybrid cattail, along with other exotic species, will be reduced to no more than 80 percent of the total area in the emergent wetland zones or impoundments. This equates to up to 400 acres that will annually receive water level manipulation in impoundments, intensive phragmites/cattail re-treatment, mowing, and prescribed fire in both coastal wetlands and impoundments.

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

Ground or aerial estimate of percent cover of invasive species; *Phragmites australis* (common reed); *Phalaris arundinacea* (reed canarygrass, reed canary grass); *Typha* X *glauca* (white cattail); Recurring -- every year; Summer

This survey determines if the invasive species abundance is at the threshold necessary to warrant management actions that will reduce their population. The overall intent is to maintain the predominant ecological character of the natural Great Lakes Marshes, consistent with the Biological Integrity, Diversity and Environmental Health Policy - 601 FW 3 (USFWS 2003).

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

NO

Survey: *Aerial Deer Survey (FF03RDTR00-041)*
Refuge: *Detroit River International 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: Wet-Mesic 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.

The survey establishes trend data for the number of white-tailed deer within the Humbug Marsh and Gibraltar Wetlands Unit. These data allow evaluation of the effectiveness of the public deer hunt within Humbug Marsh and progress in reaching herd targets established between the Refuge and Michigan DNR. Failure to meet herd targets would necessitate changes in management strategy for the public hunt or establish targets for a cull via special MDNR permits.

There is a high concentration of deer within both the Humbug Marsh and Gibraltar Wetlands Units. The herd appears to be growing according to recent aerial surveys and this is altering many forest processes. The overall intent is to maintain the predominant ecological character of wet-mesic forest on the Refuge, consistent with the Biological Integrity, Diversity and Environmental Health Policy - 601 FW 3 (USFWS 2003).

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

Other Biota; Odocoileus (white-tailed deer); Recurring -- every year; Winter

This survey determines the number of white-tailed deer in the Humbug Marsh and Gibraltar Wetlands Units in a single winter aerial survey (usually January or February) conducted by the Michigan DNR, Wildlife Division.

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

YES. Michigan Department of Natural Resources, Wildlife Division.

Survey: *Water level gauges of Detroit River and Lake Erie (FF03RDTR00-047)*
Refuge: *Detroit River International Wildlife Refuge*
Priority: *4*

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

HMP: Emergent Wetlands; Moist Soil/Mud; Submergent Wetlands / Open Water; Wet Prairie;

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 trend data can be obtained readily on-line from gauges in western Lake Erie and Detroit River that are managed by the National Oceanic and Atmospheric Administration (NOAA). These data inform Refuge managers about water level averages and seiche events over time in and around coastal marshes and impoundments. This information has many uses relating to ecosystem functions, rehabilitation projects, and management of water control structures. These trend data are required to interpret species composition and distribution changes in Great Lakes Marshes. The information is critical for completion of Ecological Site Inventory and Assessment *(FF03RDTR00 - 081)* surveys in coastal marshes.

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

Water; Hydrology; Recurring -- every year; Throughout the year

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

Coop Monitoring to Inform Management; National Oceanic and Atmospheric Administration; U.S. Geological Survey

Survey: *Hydrogeomorphic (HGM) Wetland Classification (FF03RDTR00-026)*
Refuge: *Detroit River International Wildlife Refuge*
Priority: *5*

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

HMP: Emergent Wetlands; Moist Soil/Mud; Submergent Wetlands / Open Water; Wet Prairie; Wet-Mesic 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 survey is important to characterize the hydrology and geomorphic setting of the Refuge's wetlands in order to prioritize and carry out projects optimize the management and long-term ecological and societal functions of the lands as described in the HMP. This survey provides a wide array of base-line ecological information so that future projects are most efficient at restoring the natural ecological character of the natural Great Lakes Marshes, consistent with the Biological Integrity, Diversity and Environmental Health Policy - 601 FW 3 (USFWS 2003). This information integrates knowledge of soils, hydrology, past land-use, water quality, and future stressors from climate change and natural water level fluctuations to best protect the most important conservation values of Refuge land.

The components of an HGM can be compiled, analyzed, and interpreted over time as resources become available. A full assessment will require participation from regional hydrology staff and contractors. The Refuge Wildlife Biologist would be anticipated to provide about 3.5 weeks of time for this one-time survey. The work load could be broken up into phases over a longer time period. For instance, past ecological conditions and landforms can be obtained and interpreted when expertise is available either by contract or by staff at the Refuge. Next, Lidar data can be compiled and processed for all areas of interest. Soils data and other geomorphic analyses can be compiled, analyzed, and interpreted as a next step and so on, in order to build a working knowledge of these features over time. Alternatively, a contract can be let to obtain this analysis all at one time if resources are available. Refuge staff must be versed in how to interpret this information or consult with those with the appropriate knowledge with the intent to make the best management decisions possible to achieve established goals and objectives.

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

Water; Hydrology; Occurs one time only; Summer

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

NO

Survey: Great Lakes Marsh Vegetation Monitoring *(FF03RDTR00-037)*
Refuge: *Detroit River International Wildlife Refuge*
Priority: *6*

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

HMP: Emergent Wetlands; Moist Soil/Mud; Submergent Wetlands / Open Water; Wet Prairie

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 important to monitor and maintain the integrity of Great Lakes marsh on the refuge. These wetlands are not impounded; they are hydrologically connected to Lake Erie and identified as a priority resource of concern in the HMP. This survey provides baseline plant community information so that the integrity of natural Great Lakes Marshes can be monitored over time, consistent with the Biological Integrity, Diversity and Environmental Health Policy - 601 FW 3 (USFWS 2003).

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

Vegetation, Ecosystem dynamics; Occurs annually; Summer

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

NO

Survey: Ecological Site Inventory and Assessment *(FF03RDTR00 - 081)*
Refuge: *Detroit River International Wildlife Refuge*
Priority: *7*

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

HMP: Emergent Wetlands; Moist Soil/Mud; Submergent Wetlands / Open Water; Wet Prairie

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 conducted on Refuge and conservation partner lands near the refuge. This work helps the refuge extend conservation management beyond the refuge boundaries and provides a context for management decisions both on and off-refuge. These surveys can provide ecological benchmarks for restoration and other information necessary to restore Refuge land. The survey work provides a holistic interpretation of the current ecological condition. This is done by reviewing site history and past ecological conditions; land-use change; past and current environmental stressors; and assessment of current features, including relevant species lists and reviews for local and regionally important species.

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

Vegetation, Ecosystem dynamics; Occurs annually; Summer

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

NO

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, Appendix I). An IMP revision is triggered when surveys are added or removed from the set of selected surveys.

References

Link to references: http://164.76.130.189/driwr/?q=node/39

These references are not cited in the text above, but they provide supplemental information about the selected surveys.

GLCWC 2008. Great Lakes Coastal Wetlands Monitoring Plan. Great Lakes Coastal Wetlands Consortium, March 2008. www.glc.org/wetlands/final-report.html.

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Jaworski, Eugene and Greg Norwood. "Post-Herbicide Treatment Observations on 10-8-2011 of a coastal Wetland colonized by non-native Reed Cane after one growing season, prior to burning, Strong Unit, Detroit River International Wildlife Refuge". Field Note No. 4. 29 October 2011. Phragmites Research Project. Institute for Geospatial Research and Education (IGRE), Eastern Michigan University, Ypsilanti, MI. 13pp.

Jaworski, Eugene, Jacob Merrell, and Greg Norwood. May 21, 2012. "Field monitoring on 14 and 17 May 2012 of coastal wetlands following burning of reed cane on 5-11-2012, Strong Unit and adjacent

Great Lakes Aggregates Parcel, Detroit International Wildlife Refuge, Michigan". Field Note No.5. Institute for Geospatial Research and Education, Eastern Michigan University, Ypsilanti, MI. 16 pp.

Field Note 5, Addendum A – Post-burn photographs of Strong Unit, of treated *Phragmites* areas. Following Burn on May 11th, 2012 and Field Inspection on May 14th, 2012.

Field Note 5, Addendum B – Post-burn photographs of the Great Lakes Aggregates Property, of treated Phragmites areas. Following burn on May 11th, 2012 and Field inspection on May 17th, 2012.

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Appendix A. Criteria and Weights Used to Prioritize Surveys

1) **Station purpose:** Does the survey provide information to evaluate if the station is achieving its purpose(s)?
   Note: A survey addressing wilderness character addresses purpose for a station with proposed or designed wilderness.
   1. No
   2. Yes
2) **Other legal mandates**: Does the survey provide information to evaluate whether or not the station is addressing legal mandates besides refuge purposes such as Biological Integrity, Diversity, and Environmental Health (BIDEH); NWR Resources of Concern (e.g., migratory birds, anadromous fishes, marine mammals); maintaining water rights; and compatibility of refuge uses especially wildlife-dependent recreation?
   Note: Federally listed species are addressed under criterion #7 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). Example 1: Because 99% of the wet prairie habitat has been lost throughout the Willamette Valley, remnant prairie on WL Finley NWR represents the highest order of BIDEH on the refuge where habitat monitoring is a priority survey. Example 2: The refuge staff at Detroit River IWR is currently preparing its hunt plan where monitoring the population of white-tailed deer during the hunting season on refuge would inform this plan.
   1. No
   2. Yes
3) **Large investment in management actions**: Does the survey inform whether or not the station is achieving one or more CCP, HMP, or other management plan objectives involving management actions requiring substantial expenditure of funding and staff time?
   Example: If conducting wetland management actions requires considerable staff time and funding annually, then surveys that evaluate response of vegetation and waterfowl to wetland management actions could be considered a high priority.
   1. No
   2. Yes
4) **Controversy**: Does the survey support decision making to assess a suspected or known controversial refuge management action, refuge use, or species?
   Note: Examples of suspected or known controversial refuge management actions include mammalian predator control and use of pesticides. Examples of suspected or known controversial refuge uses (recreational and economic) can include establishing new close areas from waterfowl hunting, opening a refuge to white-tailed deer hunting, use of genetically modified crops, and livestock grazing.
   1. No
   2. Yes
5) **Known or suspected threats:** Will the survey provide information to potentially reduce the duration of the threat(s) to the station, cost to the station due to those threat(s), or effect station resources of concern due to those threat(s) during the current or future CCP planning cycles?
   Examples of known or suspected threats include the following: proposed water withdrawal within the station's watershed, a new invasive species, impacts of proposed development, combinations of threats such as increased fire cycles promoting invasive species, and man-made and natural disasters (e.g., hazardous spills, hurricanes).
   1. The survey does not address threat(s)
   2. Low: The survey potentially informs 1 of 3 factors (duration, cost, or effect on resources)
   3. Medium: The survey potentially informs 2 of 3 factors (duration, cost, or effect on resources)

4. High: The survey potentially informs all 3 factors (duration, cost, and effect on resources)

6) **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 abiotics (soils, waters).*
   1. No
   2. Yes

7) **Species or vegetation community with a listing status**: Is the species or vegetation community (the focus of the survey) 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)?
   Example 1: An inventory of small mammals where one or more of the species likely or suspected to be found on the refuge is state or globally listed. Example 2: Surveys of abiotic factors affecting species should be considered under this criterion. Monitoring water quality parameters in wetlands inhabited by state-listed aquatic birds to assess potential effects to avian species.
   1. Not state or federally listed nor globally ranked
   2. State listed or ranked by state's natural heritage program
   3. Globally listed only (G1 or G2)
   4. Federally listed (Endangered, Threatened, or Candidate)

8) **FWS priorities:** Does the survey provide information that directly contributes to evaluating the status and trends of resources that are a priority for the NWRS or other FWS regional or national program (e.g., Migratory Birds, Fisheries, T&E species, Water Resources/Hydrology) or the national I&M initiative (e.g., phenology, baseline inventories, water quality)?
   Example 1: North American Breeding Bird Survey, Woodcock Singing Ground Counts, North American Amphibian Monitoring Program, Mid-Winter Waterfowl Survey, and Circumpolar Biodiversity Monitoring Network are priority surveys for regional or national FWS programs.
   Example 2: A survey to determine the status and trends of a federally listed landbird species would be a priority for both the Migratory Birds and T&E Species 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 ≥3 FWS regional or national programs or initiatives

9) **Survey coverage for species or vegetation community:** What proportion (%) of the species' (sub)population or vegetation communities' geographic range under U.S. jurisdiction will be covered by the survey on the station?
   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

10) **Survey utility**: How many station CCP, HMP, or other management plan objectives can be evaluated by the 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 1 objective
    3. Addresses 2 objectives
    4. Addresses 3 or more objectives
11) **Survey leveraging**: Is the survey conducted or integrated with one or more other surveys? Applies to multiple stations and/or on/off refuge property.
Note: This criterion applies to surveys that were designed to be conducted in conjunction with each other in order to fully evaluate the status and trends of the target resource and its habitat. Example 1: The landbird point count protocol requires habitat parameters be collected in conjunction with avian data. Example 2: Habitat parameters and avian population counts are collected for the Integrated Waterbird Management and Monitoring project.
    1. Survey is not integrated with other surveys
    2. Survey is integrated with 1 other survey
    3. Survey is integrated with >1 other surveys
12) **FWS partners**: Does the survey address high or medium priorities of relevant Landscape Conservation Cooperatives (LCC), state agencies, or other conservation partners?
    1. Does not address a management priority identified by FWS partners (e.g., LCC, state agency).
    2. Addresses a management priority identified by 1 FWS partner (e.g., LCC, state agency).
    3. Addresses a management priority identified by 2 FWS partners (e.g., LCC, state agency).
    4. Addresses a management priority identified by ≥3 FWS partners (e.g., LCC, state agency).
13) **Cooperative surveys**: At what scale does the survey most benefit the science information needs required for resource management?
Note: Only surveys with a standard protocol and established systems of data management and analysis are scored higher than a 1. This criterion is applicable to surveys covering areas on and adjacent to the station. 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 1 refuge.
    2. Medium scale: Applicable to a smaller group of refuges or single refuge complex.
    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, Woodcock Singing Ground Counts, North American Amphibian Monitoring Program, and Circumpolar Biodiversity Monitoring Network).
14) **Survey duration**: Over what time scale will the objective(s) addressed by the survey need to be evaluated?
Note: Long-term surveys will need to be consistently implemented over multiple generations of the species or successional stages of habitat to evaluate achievement of objective(s).
    1. Short-term: 1-15 years
    2. Long-term: >15 years.
15) **Cost of data collection, analysis, and reporting**: What is the cost (e.g., staff time, contractor cost, equipment, sample analysis/processing, annual funding) for survey design, implementation, data management, data analysis, and reporting?

Note: Surveys requiring novel techniques, many repeated visits or large numbers of staff will likely be more expensive to implement. Similarly, surveys requiring assistance for the development of protocols and analysis of data will be more costly. Conversely, if a standardized protocol, database, analysis, and/or reporting system are available, then the costs of implementing such a survey may be much lower than if these elements must be designed and tested upfront. Also, consider partners (e.g., universities), who assist or fully implement surveys, as a basis for estimating costs.

1. High: >5% of annual funding or staff time for the refuge biological program is dedicated to the survey
2. Medium: 1-5% of annual funding or staff time for the refuge biological program is dedicated to the survey
3. Low: 0.1- 1% of annual funding or staff time for the refuge biological program is dedicated to the survey
4. Very Low: <0.1% of annual funding or staff time dedicated for the refuge biological program is dedicated to the survey

16) **Data analysis**: Are the survey data analyzed for use at the station level?
Note: The frequency and intensity of management is dependent upon station objectives. In some cases, baseline inventory or monitoring is appropriate if active management is not anticipated for the foreseeable future. In contrast, monitoring to detect threshold conditions or for adaptive management may be needed to maintain certain habitats (e.g., moist-soil wetlands) requiring considerable, annual management activities to achieve desired conditions.

1. None: Study design does not allow data to be analyzed
2. Low: Data have not been analyzed but they are available for analysis
3. Medium: Data can/have been analyzed on infrequent basis
4. High: Data can/have been analyzed on regular basis

17) **Data use**: Are the survey results reported and used to inform current and future management decisions?
Note: See description from criterion #15.

1. None: Study design does not allow results to be readily reported. Therefore, results are not used in management decisions.
2. Low: Date have not been analyzed but are available for reporting so they may be used to inform management at the refuge(s).
3. Medium: Results can/have been reported, but these results have not been used to guide management at the station, regional, or larger landscape levels.
4. High: Currently reported on regular intervals and used to inform management at the refuge(s), regional, or larger landscape levels.

Table A1. Weight Applied to Prioritization Criteria.
The following 17 criteria were weighted by refuge staff at Detroit River IWR (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 Rating Technique (SMART tool).

	Criteria	Station-specific weight	Comparison to even weight
1	Station purpose	0.10	0.04
2	Other legal mandates	0.05	0.00
3	Large investment in management actions	0.07	0.01
4	Controversy	0.04	-0.02
5	Known or suspected threats	0.05	-0.01
6	Baseline data	0.06	0.00
7	Species or vegetation community listing status	0.04	-0.02
8	FWS priorities	0.07	0.01
9	Survey coverage for species or vegetation community	0.05	-0.01
10	Survey utility	0.06	0.00
11	Survey leveraging	0.06	0.00
12	FWS partners	0.05	-0.01
13	Survey spatial context	0.05	-0.01
14	Survey duration	0.00	-0.06
15	Cost of data collection, analysis, and reporting	0.06	0.00
16	Data analysis	0.08	0.02
17	Data Use	0.11	0.05

Appendix B. Prioritization Scores of All Ranked Surveys

Values used to prioritize and select the surveys likely to be conducted through 2031 at Detroit River International Wildlife Refuge. Prioritization scores were generated for candidate surveys by refuge staff using 17 criteria for each survey (Appendix A). Candidate surveys represent specific surveys or general information needs and were not always associated with specific protocols. Scores were then used as a starting reference to assign the survey status. Original survey names are used here; see Page 4 for changes to names of selected surveys.

Table of priority scores from the SMART tool for all considered surveys.

Survey	Final Score	Score Rank	Status
NOAA lake level monitoring	0.700	1	Current
USGS stream gauge monitoring	0.685	2	Current
Aerial Deer Survey	0.565	6	Current
Treatment Evaluation of phragmites, invasive cattail, reed canary grass	0.430	16	Current
Impoundment water levels	0.371	21	Current
HGM	0.445	13	Expected
Eastern Prairie Fringed Orchid	0.598	3	Future
Marshbird Survey	0.595	4	Historic
Wetland Vegetation Cover Survey with annual summary of mean daily Lake Erie water level/water level management.	0.536	7	Future
Wet Prairie Monitoring	0.512	9	Future
Waterfowl survey	0.586	5	Historic
Grassy Island ground water monitoring	0.515	8	Historic
American Woodcock Survey	0.489	10	Historic
Shorebird Survey	0.461	11	Historic
Bald Eagle Monitoring	0.446	12	Future
Gibraltar Wetlands Forest Invasives Inventory	0.439	14	Future
Lower Great Lakes January Waterfowl Survey (as part of Mid-Winter Waterfowl Survey)	0.434	15	Historic
Humbug Marsh Deer Browse Evaluation	0.422	17	Historic
Forest Ecological Inventory	0.421	18	Future
Phragmites Reduction: Comparison via remote-sensing of 2017 Imagery to 2009 Baseline	0.407	19	Historic
Coordinated Canvasback Survey	0.396	20	Historic
Fish survey	0.369	22	Historic
Lake sturgeon	0.339	23	Future
Common Tern Monitoring	0.322	24	Historic
Muskrat Monitoring	0.316	25	Future
Fox Snake Survey	0.309	26	Historic
Rusty Blackbird Survey	0.307	27	Historic
Northern Flicker Survey	0.291	28	Historic
Blanding's Turtle Survey	0.246	29	Historic
Detroit River Hawk Watch	0.215	30	Historic
Multi-agency water quality in the lower Detroit River and the western Lake Erie basin.	0.172	31	Historic

Appendix C. Cost-benefit Analysis

We used linear programming to find the optimum sets of ranked surveys using the total of all frequency adjusted scores as an objective function. Main constraints included costs (13.5 weeks) and surveys selected prior to solving the linear function (summation of frequency adjusted scores across all surveys). Portfolios represent alternative sets of selected surveys and are used for decision support; they do not dictate survey selections. Original survey names are used here; see Page 4 for changes to names of selected surveys.

Table C-1 Efficiencies in terms of frequency adjusted benefit for 15 potential IMP portfolios. A through F were optimized for maximum 15 year benefit from all selected surveys (1= selected, 0= not selected). The portfolios G to O were chosen by the Detroit River IWR staff for comparison with the optimized portfolios.

Survey	Portfolio*:														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Aerial Deer Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
American Woodcock Survey	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Bald Eagle Monitoring	1	1	0	1	1	1	1	1	0	0	0	0	0	1	0
Blanding's Turtle Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Tern Monitoring	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Coordinated Canvasback Survey	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0
Detroit River Hawk Watch	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Eastern Prairie Fringed Orchid	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0
Fish survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest Ecological Inventory	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0
Fox Snake Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gibraltar Wetlands Forest Invasives Inventory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassy Island ground water monitoring	1	1	0	1	1	1	0	0	0	0	0	0	1	1	0
HGM	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0
Humbug Marsh Deer Browse Evaluation	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0
Impoundment water levels	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1
Lake sturgeon	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0
Lower Great Lakes January Waterfowl Survey (as part of Mid-Winter Waterfowl Survey)	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0
Marshbird Survey	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Multi-agency water quality in the lower Detroit River and the western Lake Erie basin.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Muskrat Monitoring	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
NOAA lake level monitoring	1	1	0	1	1	1	1	0	1	1	0	0	1	0	1
Northern Flicker Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phragmites Reduction: Comparison via remote-sensing of 2017 Imagery to 2009 Baseline	0	0	0	1	1	0	0	0	0	0	1	1	1	0	0
Rusty Blackbird Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shorebird Survey	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
Treatment Evaluation of Phragmites, invasive cattail, reed canary grass	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1
USGS stream gauge monitoring	1	1	0	1	1	1	0	0	0	1	0	0	1	1	1
Waterfowl survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wet Prairie Monitoring	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wetland Vegetation Cover Survey with annual summary of mean daily Lake Erie water level/water level management.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Total Benefit	4.56	4.87	2.56	4.74	4.74	4.87	4.03	3.51	1.97	2.24	1.81	2.12	4.23	4.29	2.75
15 year cost	147.7	161.2	170.2	182.7	182.7	168.7	190.2	199.2	177.5	186.0	192.2	213.2	410.0	141.8	210.8
Total # Surveys	9	10	6	10	10	10	9	8	4	4	4	5	8	10	5

*Constraints in optimization routines. Portfolio A: Top Priority; Portfolio B: ES request; Portfolio C: Mig Birds request; Portfolio D: Water Resource request; Portfolio E: Inventory focused; Portfolio F: Constrained only by time; Portfolio G-L: Detroit River Staff 1-6; Portfolio M: All requests; Portfolio N: Detroit River Staff 7; Portfolio O: Detroit River Staff Selection April 2015.

Appendix D. Estimated Annual Costs for Implementing Surveys

Historic surveys are excluded. Total cost includes operating and staff time costs. Staff estimate that seven weeks of time is sufficient for a full time biologist to conduct current surveys. The three expected surveys will require 5 weeks annually and another 3.5 weeks for the non-recurring HGM.

Survey Name	Survey ID Number	Survey Priority	Survey Status	FWS Staff Total	Total Cost
IWMM	FF03RDTR00-045	1	Current	$3,000.00	$3,000.00
Treatment Evaluation of Phragmites, Invasive Cattail, and Reed Canary Grass	FF03RDTR00-036	2	Current	$6,000.00	$6,000.00
Aerial Deer Survey	FF03RDTR00-041	3	Current	$375.00	$375.00
Water level gauges of Detroit River and Lake Erie	FF03RDTR00-047	4	Current	$1,125.00	$1,125.00
Hydrogeomorphic (HGM) Wetland Classification	FF03RDTR00-026	5	Expected	$5,250.00	$5,250.00
Great Lakes Marsh Vegetation Monitoring	FF03RDTR00-037	6	Expected	$4,500.00	$4,500.00
Ecological Site Inventory and Assessment	FF03RDTR00-081	7	Expected	$3,000	$3,000
Bald Eagle Monitoring	FF03RDTR00-009		Future	$962.00	$962.00
Eastern Prairie Fringed Orchid Survey	FF03RDTR00-038		Future	$5,192.00	$5,692.00
Forest Ecological Inventory	FF03RDTR00-046		Future	$11,423.00	$11,423.00
Gibraltar Wetlands Forest Invasive Species Survey	FF03RDTR00-040		Future	$11,423.00	$12,023.00
Lake Sturgeon Survey	FF03RDTR00-012		Future	$481.00	$481.00
Muskrat Monitoring	FF03RDTR00-044		Future	$935.00	$935.00
Wet Prairie Monitoring	FF03RDTR00-039		Future	$7,269.00	$7,869.00
				Staff Total	Total Cost
Total for selected (current and expected) surveys:				$23,250.00	$23,250.00
Total for future surveys:				$37,685.00	$37,685.00

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

Survey Name	Survey Priority	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Impoundment IWMM	1	FW,DE	FW,A	FW,R	FW	FW	FW	FW	FW	FW	FW	T,A	P,R
Treatment Evaluation of Phragmites, Invasive Cattail, and Reed Canary Grass	2	P	P	P	T	T	FW	FW, A, R	R, P	P	P	P	P
Aerial Deer Survey	3	FW	FW	DE	DE	DE	A	R	P	P	P	P	FW
Water level gauges of Detroit River and Lake Erie	4	P,R	DE,R	DE,R	DE	DE	DE	DE	DE	DE	DE	DE	DE,AA
Hydrogeomorphic (HGM) Wetland Classification	5	P, R	R	R	R	R	FW	FW	DE	DE	DE	DE	A
Great Lakes March Vegetation Monitoring	6	A	R	P	P	T	FW	FW	FW	FW	DE	DE	A
Ecological Inventory and Site Assessment	7	P	P	P	P	P	FW	FW	FW	FW	DE	A	R

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

Appendix F. Non-selected Surveys

A status of future denotes surveys that have been prioritized but have 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.

Survey Name	*Survey ID Number*	*Survey Status*
Bald Eagle Monitoring	FF03RDTR00-009	Future
Eastern Prairie Fringed Orchid Survey	FF03RDTR00-038	Future
Forest Ecological Inventory	FF03RDTR00-046	Future
Gibraltar Wetlands Forest Invasive Species Survey	FF03RDTR00-040	Future
Lake Sturgeon Survey	FF03RDTR00-012	Future
Muskrat Monitoring	FF03RDTR00-044	Future
Wet Prairie Monitoring	FF03RDTR00-039	Future
Aquatic Macrophyte Survey	FF03RDTR00-014	Historic
Breeding Bird Atlas	FF03RDTR00-005	Historic
Common Tern Monitoring	FF03RDTR00-008	Historic
Detroit River Hawk Watch	FF03RDTR00-007	Historic
Fish Inventory	FF03RDTR00-019	Historic
Frog and Toad Inventory (Calls Only)	FF03RDTR00-021	Historic
Grassy Island Water Monitoring	FF03RDTR00-023	Historic
Herpetological Inventory	FF03RDTR00-002	Historic
Marsh Bird Inventory	FF03RDTR00-020	Historic
Marsh Bird Inventory (MNFI)	FF03RDTR00-022	Historic
Mussel Inventory	FF03RDTR00-004	Historic
Near-Shore Fish Inventory	FF03RDTR00-018	Historic
North American Migration Count	FF03RDTR00-003	Historic
Odonata and Lepidoptera Inventory	FF03RDTR00-015	Historic
Phragmites Reduction: Comparison Via Remote-Sensing of 2017 Imagery to 2009 Baseline	FF03RDTR00-042	Historic
Plant Community Database Inventory	FF03RDTR00-013	Historic
Plant Species Inventory	FF03RDTR00-017	Historic
Spring Bird Migration Survey	FF03RDTR00-016	Historic

Appendix G. Refuge Condition Summary

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.

Detroit River International Wildlife Refuge- REFUGE SUMMARY TABLE **Date of last update: 2/23/2017**

Resource Theme Level 1[1]	Resource Theme Level 2[1]	Attribute[2]	Current Condition (values)[3]	Source of Current Condition[4]	Desired Condition (values)[5]	Source of Desired Condition[6]	Within Desired Condition?[7]	Survey Name and PRIMR ID (FF03RDTR00-)[8]
Biological Integrity	**Invasive Species**	monitor the abundance of invasive species	**<u><10% total area of phragmites or <80% total area of invasives</u>**: Gibraltar Bay Unit Gibraltar Wetlands Unit Holloway Unit Plum Creek Bay Unit Ford Marsh Unit Strong Unit **<u>>10% total area of phragmites or >80% total area of invasives</u>**: Brancheau Unit Humbug Marsh Unit Refuge Gateway Fix Unit	See References	<10% total area of phragmites; <80% total area of invasives	HMP	No	**Treatment Evaluation of Phragmites, Invasive Cattail, and Reed Canary Grass (036)**
	Other Biota	population monitoring	Not quantified		7	HMP	No	**Aerial Deer Survey (041)**
		biodiversity and abundance	Not quantified	Pg. 30-32, HMP	Not quantified			**Great Lakes Marsh Vegetation Monitoring (037)**

Resource Theme Level 1[1]	Resource Theme Level 2[1]	Attribute[2]	Current Condition (values)[3]	Source of Current Condition[4]	Desired Condition (values)[5]	Source of Desired Condition[6]	Within Desired Condition?[7]	Survey Name and PRIMR ID (FF03RDTR00-)[8]
Water	**Hydrology**	monitor water levels	Specific elevations TBD; moist-soil conditions and semi-permanently flooded conditions per HMP; Flood prevention to adjacent landowners	HMP	Specific elevations TBD; Moist-soil conditions and semi-permanently flooded conditions per HMP; Flood prevention to adjacent landowners	HMP	Yes	**Impoundment IWMM (045)**
		monitor water levels	Refuge coastal wetland water levels remain *same as* Detroit River and Lake Erie (i.e., coastal connectivity is protected)	HMP	Refuge coastal wetland water levels remain *same as* Detroit River and Lake Erie (i.e., coastal connectivity is protected)	HMP	Yes	**Water level gauges of Detroit River and Lake Erie (047)**
		characterize hydrology	N/A	HMP	Optimized protection of natural communities	HMP	TBD	**Hydrogeomorphic (HGM) Wetland Classification (026)**

[1] Level 1 and 2 refer to the PRIMR Resource Themes 1 and 2 and cannot be altered.

[2] Characteristics of a system that are of interest of survey and can be observed or estimated. Biodiversity, abundance, survival, growth rate, habitat quality, and harvest rate are all system attributes that a monitoring program might seek to quantify.

[3] If known, current conditions of system being measured at the ten Priority 1 Units according to HMP.

[4] Document in which current condition is reported. If not available enter "unknown" or "N/A".

[5] Desired conditions of system being measured.

[6] Document in which desired condition is reported. If not available enter "unknown" or "N/A".

[7] Does the current condition and desired condition match? YES/NO/To Be Determined (TBD)

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 Detroit River International Wildlife Refuge. This IMP is a refinement of the 2005 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 the Refuge's goals and objectives.

The EA for Detroit River International Wildlife Refuge's 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 EA.

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 CRF 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)

_____ _____

Project Leader/Refuge Manager 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. 2005. Comprehensive Conservation Plan and Environmental Assessment for Detroit River International Wildlife Refuge. USFWS Region 3. Bloomington MN.*

Appendix I. IMP Revision Signature Page

IMP Revisions
Detroit River International Wildlife Refuge

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