Management-focused Research Needs of Refuges in the Midwest and Northeast Regions of the U.S. Fish and Wildlife Service, FY2006

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Abstract
Land managers need information about how to improve their management practices to achieve their goals. We conducted a research needs assessment process for the U.S. Fish and Wildlife Service (Service), National Wildlife Refuge System, Midwest and Northeastern Regions during 2006. The process resulted in themes that were used to define a call for research proposals within the U.S. Geological Survey, Biological Resources Discipline, Status and Trends Program (USGS). We solicited input from Refuges to identify the most common management practices and the types of habitats that are the focus of management effort. We reviewed data from two Service databases that record research needs; we also asked refuges to submit research ideas. We worked with regional refuge supervisors to derive a set of priority research needs from the available information and, finally, we conducted a survey of refuge staff to rank the highest priority needs. Impoundments, grasslands, and large river floodplains dominate the concerns of persons entering data into the two Service databases, RONS and FWINS. Unfortunately, both of these existing databases have deficiencies for purposes of identifying refuge research needs. Refuge Supervisors selected ten priority research themes from 236 individual research needs submitted by refuges; they were: human disturbance, grasslands and ground-nesting birds, salt marsh management, cropland management, invasive species management, piping plovers/terns/predators, forest management, reed canary grass control and management, scrub/shrub habitat management, and savanna restoration. Refuges ranked invasive species management highest priority; forest management scored second in priority, followed by mitigating human disturbance. Three topics were chosen by Regional managers for further development through workshops: reed canary grass control and management, forest management, and invasive species management. Workshops on reed canary grass control and forest management were held in July/August 2006. A workshop on invasive species management is scheduled for March 2007. A USGS call for research proposals was issued in November 2006, based on the results of the workshops. The information derived from the needs assessment process is available for future planning and provides a record of research needs that can be mined, summarized, and updated as needed.

Introduction

Managers of public lands and waters often employ actions such as tilling, planting, mowing, grazing, forest thinning, water level manipulation, and invasive species control to achieve their conservation goals and objectives. Resource managers seek to continually improve management actions and decisions through a process is called adaptive management. We conducted a research needs assessment process for the U.S. Fish and Wildlife Service (Service), National Wildlife Refuge System, Midwest and Northeastern Regions during 2006. The process resulted in themes that were used to define a call for research proposals within the U.S. Geological Survey, Biological Resources Discipline, Status and Trends Program (USGS).

We explored the extent of monitoring and research conducted on refuges as well as evidence for specific problems, such as invasive species, water quality, and erosion of wilderness character. We attempted to answer the following questions with regard to the NWRS in Regions 3 and 5:

1. What are the most common habitats under management?
2. What are the most common management actions undertaken on refuges?
3. Are invasive species a problem?
4. To what extent are refuges engaged in wildlife population monitoring or research?
5. How many refuges have water quality problems?
6. Are refuges in Regions 3 and 5 meeting their wilderness character objectives?
7. What specific adaptive management research needs have been identified in existing Service databases?
8. What are the highest priority research needs, from the perspective of Regional and Refuge Managers?

Methods

We used data from a variety of sources to obtain information about future adaptive management research needs (management uncertainties) for

Refuges in the Midwest (Region 3) and Northeast (Region 5).

The Service is required by the Government Performance and Results Act to report measurable results. Refuges and wetland management districts were required to report their accomplishments of 2005 in the Refuge Annual Performance Plan Database (RAPP) (U.S. Fish and Wildlife Service 2005b). We used the summary information reported by Regions 3 and 5; the information in this database was current, comprehensive, and the most detailed report of Refuge activities available.

The Fish and Wildlife Information Needs System (FWINS) is a Science Exchange Program application; the project charter was created in 1999 and revised in 2001 (U.S. Fish and Wildlife Service 2005a). This automated system was designed to manage information about Service research needs and ongoing or completed projects, such as the USGS Science Support Projects. We queried the database for all submitted, but unfunded projects nationwide. Other projects in the database are currently funded or accepted for funding. We reviewed the resulting project list for possible relevance to refuges in Regions 3 and 5 and attempted to associate the projects with the general categories of habitat management prescriptions defined in the RAPP report.

The Refuge Operation Needs System (RONS) captures future tasks identified as needs by refuge staff (U.S. Fish and Wildlife Service 2005c). This information is used to estimate the 'backlog' of unmet operational needs and their estimated costs. The database is currently closed and under review; no entries have been made since about 2003. We queried the database for all records in the Activity Category "Monitoring & Studies" for Region 3 as a first step in evaluating the usefulness of this database. We attempted to associate these records with the general categories of habitat management prescriptions defined in the RAPP report.

These databases are maintained by the Service to meet mission requirements. None of the sources provided ideal information to address this issue, but together they represented the best information available for both Regions.

To further clarify adaptive management research needs, we asked refuges to submit their research needs by e-mail to the Biological Monitoring Team (response period: 23 February to 16 March 2006). We created an Access database from this information. We summarized this information into broad themes, scored each need using 11 criteria, and met with Refuge Supervisors in Regions 3 and 5 during April 2006 to select the top ten themes. We issued an internet survey asking refuges to rank these ten research needs from highest to lowest (response period: 25 April to 10 May 2006). Based on the responses, Regional managers selected three topics to hold workshops to further clarify these needs for purposes of aiding scientists undertaking new research.

Results

2005 Refuge Annual Performance Plan Database (RAPP)

What are the most common habitats under management?
In 2005, a total of 1,838,876 acres were managed by the NWRS in both regions, 1,334,847 acres in R3 and 504,029 acres in R5 (Appendix A). The RAPP reported only general habitat categories of upland, wetland, open water, and riparian miles. Region 3 had nearly equal numbers of acres of wetlands and uplands, followed by open water. Region 5 had more wetland acres, followed by uplands and open water. Region 3 had nearly three times more total acres and riparian miles compared with Region 5. About 12% of the land was in relatively pristine condition (Class 1A) and not in need of management, along with about 24% of riparian miles.

What are the most common management actions undertaken on refuges?
Over 290,000 acres received active management in both regions in 2005, about 16% of the total acres owned. (Some acres may have received more than one type of management.) Most active management is water level manipulation, followed by prescribed burns, and cropland management. However, there are major differences between the two regions in the ranking of management activities, both by acreage and by number of stations engaged in management (Figures 1-4).

The top four activities in Region 3 were water level manipulation, prescribed burns, cropland management, and haying/mowing. The top four activities in Region 5 were water level manipulation, prescribed burns, haying/mowing, and prescribed grazing. Forest stand harvest and forest improvement together were employed by a relatively large number of refuges in both Regions, but over a small number of acres. Only 8 stations in Region 3 and 1 station in Region 5 had approved Habitat Management Plans (HMP); 117 stations in both regions were planning to complete HMP's. (Appendix A).

Are invasive species a problem?
Across both regions, about 26% of the land was considered infested with invasive plants, although Region 5 reported only about 6% (Appendix A). Of these, only 7% of the land was treated or controlled

for invasive plants. In addition, only about 12% of invasive animal populations were controlled; only 8 stations in each region reported controlling animal populations.

To what extent are refuges engaged in wildlife population monitoring or research?
Thirty stations had approved inventory and monitoring plans in the two regions, an additional 104 stations planned to complete them (Appendix A). The large majority of stations in both regions conducted population monitoring. A whopping 1,387 inventory and monitoring surveys were conducted on refuges in Regions 3 and 5 in 2005 and 106 populations had targeted population goals defined in an approved plan. In addition, 429 research studies were conducted in 2005 in both regions. (This excludes T&E species and water quality or contaminant studies.) Management actions were employed for T&E species (265 actions) and non-T&E species (433 actions) in both regions.

How many refuges have water quality problems?
Ninety stations have water quality problems across both regions, 37% of those remain unlisted as 'State 303d' sites (Appendix A). Sixty-six contaminated sites are not listed in two relevant databases (Hazmat and Refuge Cleanup Funds); these could present a threat to refuge waters.

Are refuges in Regions 3 and 5 meeting their wilderness character objectives?
Eighty-nine percent of Wilderness lands in these regions were meeting their wilderness character objectives and all 15 wild and scenic river miles on refuges in Region 5 were meeting their objectives (Appendix A). Less than 10% of Marine Protected Areas (54 in both regions) achieved the unique values defined in Executive Order 13089.

What specific adaptive management research needs have been identified in existing Service databases?
Fish and Wildlife Information Needs System (FWINS)
There were only nine entries in the FWINS database that were of potential interest to Regions 3 and 5 (Table 1). We found the strongest qualitative association between these projects and monitoring (9 projects), but a few had potential relevance for adaptive management of grasslands (2 projects), forests (2 projects), and water level management (3 projects). There were two projects proposing work applying weather radar to mapping the migration pathways for migratory birds, one along the Gulf Coast and one in the Northern Rockies.

Refuge Operation Needs System (RONS)
The RONS database for 'Monitoring and Studies' for Region 3 contained 257 entries. Appendix B is a selected list of records for Region 3 showing some of the entries with the strongest qualitative relationship to adaptive management projects. In general, nearly all of the entries indicated a need for inventory and monitoring of a wide range of habitats and taxa. Some monitoring needs addressed evaluation of restorations of habitat or extirpated populations of animals. Research needs included better understanding of ecosystem processes, hydrology, long-term consequences of habitat change on habitats or populations and several addressed the need for research on visitor impacts to habitats or populations. Accurate habitat maps of refuge lands were also frequently mentioned as pressing needs. We found the information to be only minimally informative for our purposes because it was dated (some identified needs may already have been addressed and no recent needs were entered), and for the most part was so general that specific management uncertainties among different management prescriptions were not identified.

What are the highest priority research needs, from the perspective of Regional and Refuge Managers?
Refuges and the Regional Offices submitted 236 research needs that were condensed into 51 major themes (Appendix C). A summary of these needs is available at https://intranet.fws.gov/region3/ScienceExcellenceandLandscapeConservation/documents/research_needs.pdf. The scoring process resulted in a ranking of the themes. Based on this information, Refuge Supervisors selected their top ten research themes: human disturbance, grasslands and ground-nesting birds, salt marsh management, cropland management, invasive species management, piping plovers/terns/predators, forest management, reed canary grass control and management, scrub/shrub habitat management, and savanna restoration (Table 2).

One hundred sixteen stations responded to the internet ranking survey out of a possible 136 stations (85% response rate); 60 stations responded from Region 3 and 56 stations from Region 5 (Appendices D & E). Invasive species management was the highest ranking research priority, based on the mean rank scores and the number of stations expressing interest (Table 3). Forest management scored second in priority, followed by mitigating human disturbance. Only two stations indicated that none of the topics was important and seven indicated that, despite interest, they could not participate in a workshop on any topic. Lack o f staffing was cited

as the major reason for deferring involvement. Hunting, hiking, and boating topped the list of types of human disturbance occurring at stations.

Three topics were chosen by Regional managers for further development through workshops: reed canary grass control and management, forest management, and invasive species management. Workshops on reed canary grass control and forest management were held in July and August 2006. A workshop on invasive species management is scheduled for March 2007.

Discussion
Habitat management and restoration
The available data indicate that allocation of adaptive management research effort can be justified for any of the following general habitat types: impoundments, grasslands, and forests. Marine Protected Areas may need attention, but we are unaware of any active management action by any refuge for Marine Protected Areas. Impoundments, grasslands, and large river floodplains dominate the concerns of persons entering data into RONS and FWINS. However, these databases are not representative of all refuges in the two Regions (FWINS is a new database and record entry is restricted), and RONS is obsolete (no records entered for two years). Although we examined RONS data for Region 3 only, we elected not to pursue the Region 5 data because of these problems.

The analysis of the RAPP data validated earlier decisions to fund the ongoing adaptive management studies that are focused on impoundments, application of fire to wetland management, and control of Canada Thistle, an invasive species of restored grasslands.

Invasive species
Research attention to invasive species is warranted; this was the highest priority topic identified through the internet survey of refuges.

Reintroductions
Reintroductions of a number of extirpated animal populations were identified as needs in the RONS database and adaptive management could be valuable in addressing these issues. There is great uncertainty associated with the best methods for reintroducing and maintaining most extirpated species. These projects are well suited to graduate student research and this indicates a potentially strong role for the USGS Cooperative Research Units or universities.

Monitoring
Although our purpose was to identify Refuge adaptive management research needs, it was clear

from all the available databases that there is a pressing need to address both short and long-term monitoring needs within the Refuge System. Another report in the Biological Monitoring Technical Report series addresses monitoring needs (Knutson et al. 2006).

Recommendations
The information derived from our needs assessment process is available for future planning and provides a record of research needs that can be mined, summarized, and updated as needed. We recommend that Refuges continue to hold workshops on topics of high research need for purposes of clarifying research needs, communicating these needs to our research partners, and building strong working relationships among refuges and Regions with common management issues.

None of the existing Service databases provided specific information that we could use to plan a workshop(s) to develop a specific adaptive management research project. We were obliged to develop our own database for this purpose. We recommend that the FWINS database be used to capture unmet research needs identified at the field station level. To date, this database has been used to record Regional Office (Migratory Birds) research needs primarily. It is important that Refuges efficiently maintain current information about research needs in order to work most effectively with its research partners in USGS, the states, and universities.

Literature Cited

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Table 1. Projects potentially relevant to adaptive management in Regions 3 and 5 and associated potential habitat management prescriptions (FWINS) or monitoring. Project title and FWS Project Officer are identified. An X indicates an association with a management prescription, XX indicates primary habitat management category.

Project	Burn	Graze	Mow	Forest harvest	Forest/shrub improve	Moist Soil	Water Level	Crop	Monitor
1. Status assessment and conservation plan for the black tern (Strassburger, WO)							X		XX
2. American Woodcock Management Plan (Kelley, RO Region 3)	X	X	X		XX	X			X
3. Using weather radar to support Gulf Coast Joint Venture planning activities, waterfowl, shorebirds, colonial waterbirds, landbirds. (Wilson, RO Region 4)									XX
4. Habitat use and nest/brood survival of reintroduced Greater Prairie Chickens in the Nebraska Sandhills (French, FWS Nebraska)	XX	XX	XX						X
5. Status assessment of Black Tern – monitoring catalog (Strassburger, WO)									XX
6. Using radar to delineate migratory bird movement corridors in the Northern Rockies (Sartorius, FWS Montana)									XX
7. Bicknell's Thrush and mountaintop habitat in Adirondacks (Strassburger, WO)				X	X				XX
8. Identification of genetic management units for paddlefish (*Polyodon spathula*) supplementation and conservation programs (Klumb, FWS South Dakota)							X		XX
9. Evaluation of sampling protocols used to determine the status and trends of rare and endangered Missouri River fishes (Klumb, FWS South Dakota)							X		XX

Table 2. Top ten adaptive management research needs selected by Refuge Supervisors in Regions 3 and 5, April 2006.

Habitat/ Wildlife	Research Theme	Description	Research Need (AM, Research, Lit. review, monitoring)
Grasslands, Ground-nesting birds	Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds	Management of grasslands for grassland nesting birds. Identify best management practices which maximize grassland bird productivity. How to best accomplish development of high quality grasslands? Are there circumstances that would necessarily restrict success of grassland restoration they should not be attempted, or not expected to be highly diverse, functional plantings with good wildlife habitat potential? How do we develop cost/benefit analyses to make decisions about management investments? How do we best decide on seed mixes to meet particular site needs?	AM
Cropland Management	Evaluate effectiveness and efficiency and contribution of cropland mgmt programs	Scientific analysis of the amount of agricultural land (crop, pasture, and hay) that is required or appropriate to support populations of trust species expected for the foreseeable future. What is the importance of the farm lands on the refuge for migratory birds (especially non-game) and other wildlife species in different seasons? Evaluate the effectiveness of refuge cropland management efforts to provide for needs of migrating/wintering waterfowl. Identify the priority of cropland management and contributions relative to other potential use of that land base.	AM, Research
Savannah	Methods and factors to consider when restoring natural savannah communities. Identify savannah management practices that best meet refuge objectives.	Identify the best methods for restoring and maintaining savanna ecosystems. What are the triggers that indicate that in situ seed/plant sources inadequately represent historic savanna conditions, and that introduction of species via seeds or plants should begin? What are the appropriate plant species/germplasm sources for introduction to a remnant savanna in any given area/savanna type? How to evaluate if a refuge has a contribution to make toward savannah habitats. Can cattle be used to effectively emulate historic grazing in prairies and savannas? What sort of grazing regime should be used? How does cattle grazing compare with bison/elk grazing in prairies in Region 3? Could patch burn/grazing techniques be beneficial in emulation of landscape scale influences, even though current application is on much smaller scales than the historic prairie landscape, and is more highly manipulative? What is the appropriate timing of burning to restore savanna ecosystems? What triggers the decision to burn?	AM

Habitat/ Wildlife	Research Theme	Description	Research Need (AM, Research, Lit. review, monitoring)
Human Disturbance	What impact do refuge visitors and refuge mgmt presence have on wildlife use of refuge. Boating Impacts to wildlife.	How can we manage the level of disturbance to wildlife caused by refuge visitors and our management activities? Examples are refuge trails, tour routes, special events. Another simple example is the presence of people conducting surveys and inventories of a variety of wildlife. How will increased visitation in future impact wildlife? Can we identify thresholds of human activities to minimize impacts? Determine the effectiveness of providing secure resting and feeding habitat for waterfowl during the fall migration through use of Closed Areas. The CCP of the Upper Miss River NW&FR includes modifications and additions to 22 closed areas. Determine effectiveness of slow-no wake areas and electric motor only areas in reducing disturbance to fish and wildlife particularly nesting and roosting birds on the UMRNW&FR (large floodplain refuges.) Determine impacts of fishing tournaments on fish, wildlife, and habitats of the UMRNW&FR. The Refuge will be working with states to dovetail refuge and state permits to achieve goals.	Research
Invasives	Ecological control of Invasive plants. Refuges work together to develop long-term control model for selected invasives. Identify invasive species impact on wildlife or vegetation communities. Need to identify priorities for control.	Identify ecological principles that influence establishment and perpetuation of selected invasive species. Simple herbicide control of invasives at a site seldom works (long-term), since the invasive species is already the best adapted plant to compete at a site, given site conditions. Information is needed relative to life history and ecology of selected species, so that site conditions may be altered, or conditions suitable for establishment of a selected invasive species are avoided. Additionally, some invasive species may naturally be eliminated from a site if successional processes are allowed to proceed. This information is required to allow FWS staff to make informed decisions relative to invasive species management. Adaptive management study framework for the control of invasive plants and a database to share methods and results across the region. Extensive FWS resources (staff time and funds) are expended each year to control invasive species. However, the FWS has relatively little information about the threat/impact of selected invasive species on achievement of FWS objectives. It is therefore imperative to measure how selected invasives are impacting wildlife/native plant populations. It is suspected that some invasive provide little threat to these resources while others have a significant impact. Only with this information can the FWS make informed decisions about prioritizing which invasive species to control.	AM

Habitat/ Wildlife	Research Theme	Description	Research Need (AM, Research, Lit. review, monitoring)
Piping Plover and Terns	Predator management within tern and plover nesting areas. Best methods to control predation on piping plovers.	Test alternative predator control strategies at multiple sites along the eastern seaboard. Monitor tern and plover nesting success, adult survivorship over a 5 year time frame. Questions: Do different strategies work better at sites with particular environmental conditions? Does the success of different strategies vary based on environmental conditions or is there a 'best' strategy that works best in most places? Are there side-effects of some strategies, such to lower adult survival? Ongoing need to improve the effectiveness, efficiency, and documentation of predator management within tern and plover nesting sites. When is it important to remove piping plover exclosures to reduce adult mortality? What is the impact of increased adult mortality upon the long term viability of these populations?	AM
Salt marsh	Develop/evaluate methods of salt marsh restoration. Develop Salt Marsh Condition Index and associated Index of Biological Integrity to determine condition impacts on obligate salt marsh wildlife community.	What is the effect of OMWM activities, including ditch plugging, on marsh accretion rates and processes? What are the effects of impoundment dikes on seaward salt marsh structure and habitat value? What are the best means for restoring diked salt marshes and surrounding impacted areas? Develop/incorporate a wetland restoration monitoring system for Refuge salt marshes (to include habitat and wildlife) to help determine the success of restoration/enhancement projects and help guide future management actions. What is the best way to restore a ditched marsh to its former hydrology, vegetation, peat, and habitat functions and values? Develop Index of Biological Integrity (IBI) to rank discrete salt marshes on NWRs throughout the Region. Index will be used to identify relative integrity of salt marshes, where restoration efforts may be most effectively implemented, and identify factors which are adversely impacting salt marsh habitats. Subsequent to, or during development of Salt marsh IBI, also measure composition and abundance of obligate salt marsh bird community, at range of IBI values. Information will be used to evaluate impact of impaired salt marshes on salt marsh birds, and help to prioritize salt marsh restoration needs.	AM

Habitat/ Wildlife	Research Theme	Description	Research Need (AM, Research, Lit. review, monitoring)
Forest management for Landbirds	Identify best forest management practices for selected forest wildlife.	Managing to support migrant landbirds, concerns about deer over-browse, invasive species, earthworms, how to maintain understory? Managing the forest to restore the long term health of the system and the suitability for nesting birds and other taxa. Evaluate various forest management options with respect to the response of target organisms in the forest: Planting, flooding, burning, Selective thinning, Timber harvest, timing and spatial distribution, Buy more land, convert from agriculture, Mowing, Dredge spoil deposition (navigable rivers), Mechanically damage trees (to create dead wood). Included in Region 3&5 NWR Adaptive Management Study Needs as #12 under Forest Management. How should forests be managed to support migrating landbirds? (size, tree species composition, age class û structure, edges, landscape spatial distribution) How should forests be managed to support migrating landbirds? Is size important? Tree species composition? Age class, structure? Edges? Determine appropriate hardwood management techniques for neotropical and temperate migratory birds, including the number and variety of trees to be planted, planting location and schedule, and evaluation of deer impacts.	AM, Research
Reed Canary Grass	Develop efficient operational methods to achieve long-term control of reed canary grass.	Identify reed canary grass control combinations using grass-specific herbicides along with fire and other tools in an effort to improve habitat for the suite of bird species that utilize low prairie and wet meadows. What are the most successful techniques to control or eliminate reed canary grass in prairies and sedge meadows and to favor development of a self-sustaining native plant community? Control of Reed Canary Grass within shallow wetlands and wetland edges (Control options on operational scale as opposed to experimental.) Identify best methods for floodplain forest regeneration, specifically in hydrologically altered systems such as the Upper Mississippi River. Include control of invasives, particularly reed canary grass.	AM
Scrub/ Shrub	What are the best and most efficient methods to manage early successional habitats.	Evaluate all the techniques used to maintain or create early successional habitat and identify techniques and/or modification that are environmentally sound and cost effective. Management of coastal / maritime shrublands for migrating landbirds and the New England Cottontail (proposed for T&E listing). Management of shrub communities without stimulating invasives (Bittersweet, Honeysuckles, Multifora Rose, etc).	AM

Table 3. Ranked list of adaptive management research needs, based on numbers of refuges interested in that theme and the mean score for each theme across all refuges (low score = high priority).

Research theme	Number of refuges	Mean Score
Invasive species management	54	2.04
Forest management for focal species	49	2.88
Mitigating human disturbance	22	2.89
Scrub/shrub habitat management	33	3.04
Grasslands and ground-nesting birds	33	3.23
Reed canary grass control and management	27	3.47
Piping plovers, terns, and predators	15	4.16
Savanna restoration	14	4.16
Cropland management	12	4.28
Salt marsh management	11	4.45
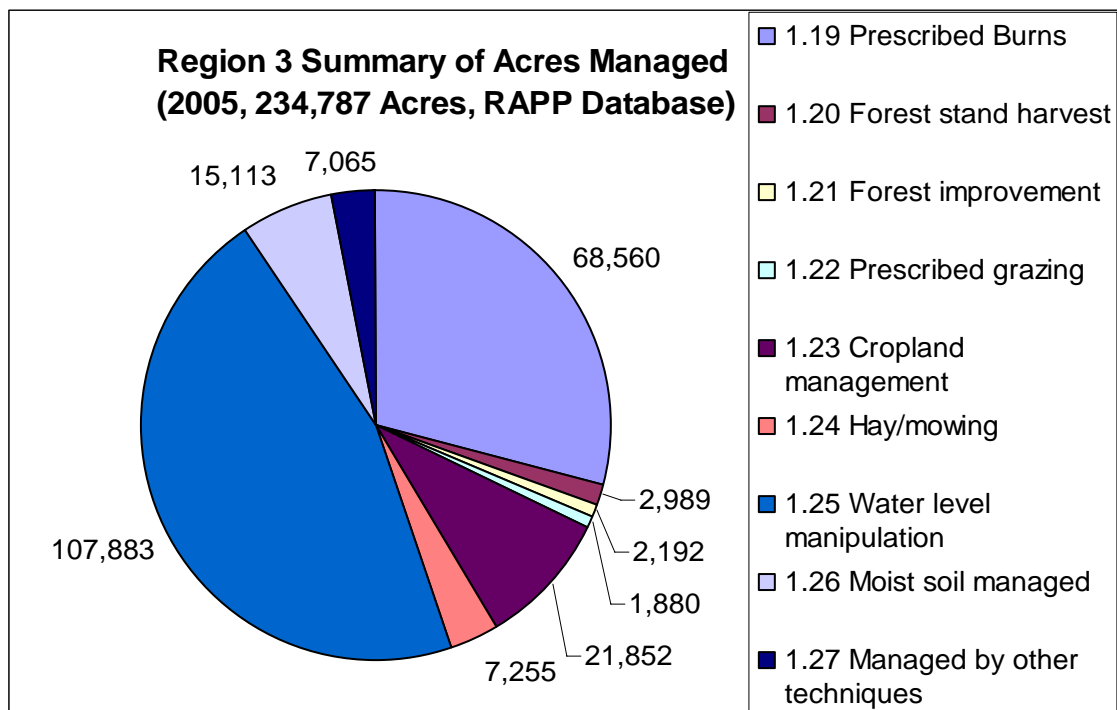
Figure 1. Region 3 summary of acres managed by management prescription, 2005 RAPP.
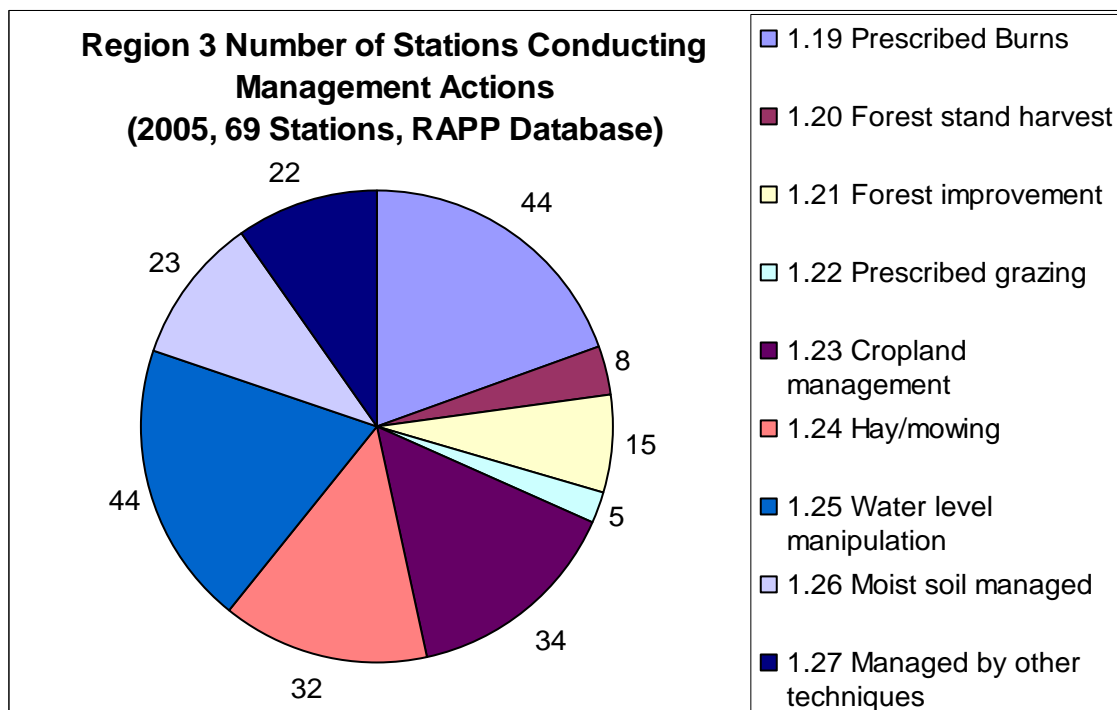
Figure 2. Region 3 number of stations conducting management actions, 2005 RAPP.

**Region 5 Summary of Acres Managed
(2005, 55,675 Acres, RAPP Database)**

3,242 · 3,064 · 4,780 · 1,130 · 1,094 · 4,261 · 3,288 · 4,184 · 30,633

- ■ 1.19 Prescribed Burns
- ■ 1.20 Forest stand harvest
- □ 1.21 Forest improvement
- □ 1.22 Prescribed grazing
- ■ 1.23 Cropland management
- ■ 1.24 Hay/mowing
- ■ 1.25 Water level manipulation
- ■ 1.26 Moist soil managed
- ■ 1.27 Managed by other techniques
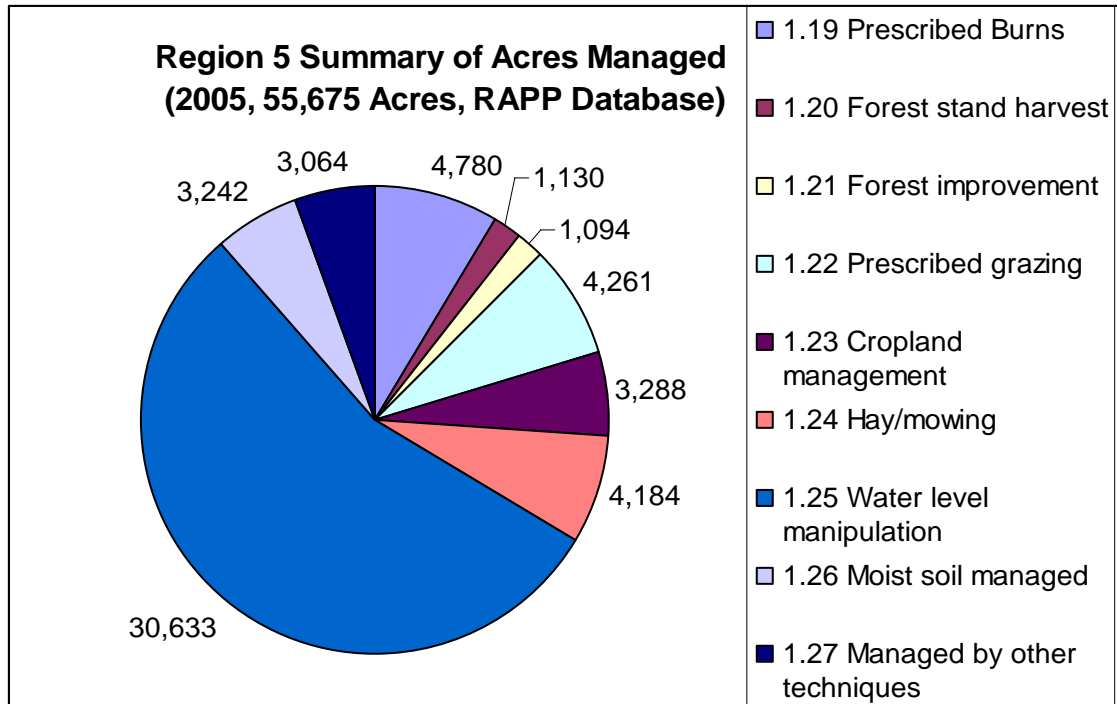
Figure 3. Region 5 summary of acres managed by management prescription, 2005 RAPP.

**Region 5 Number of Stations Conducting
Management Actions
(2005, 73 Stations, RAPP Database)**

15 · 19 · 4 · 16 · 18 · 3 · 28 · 8 · 35

- ■ 1.19 Prescribed Burns
- ■ 1.20 Forest stand harvest
- □ 1.21 Forest improvement
- □ 1.22 Prescribed grazing
- ■ 1.23 Cropland management
- ■ 1.24 Hay/mowing
- ■ 1.25 Water level manipulation
- ■ 1.26 Moist soil managed
- ■ 1.27 Managed by other techniques

Figure 4. Region 5 number of stations conducting management actions, 2005 RAPP.

Appendix A. Refuge annual performance plan summary of accomplishments for Regions 3 and 5, FY2005, reported in numbers of acres.

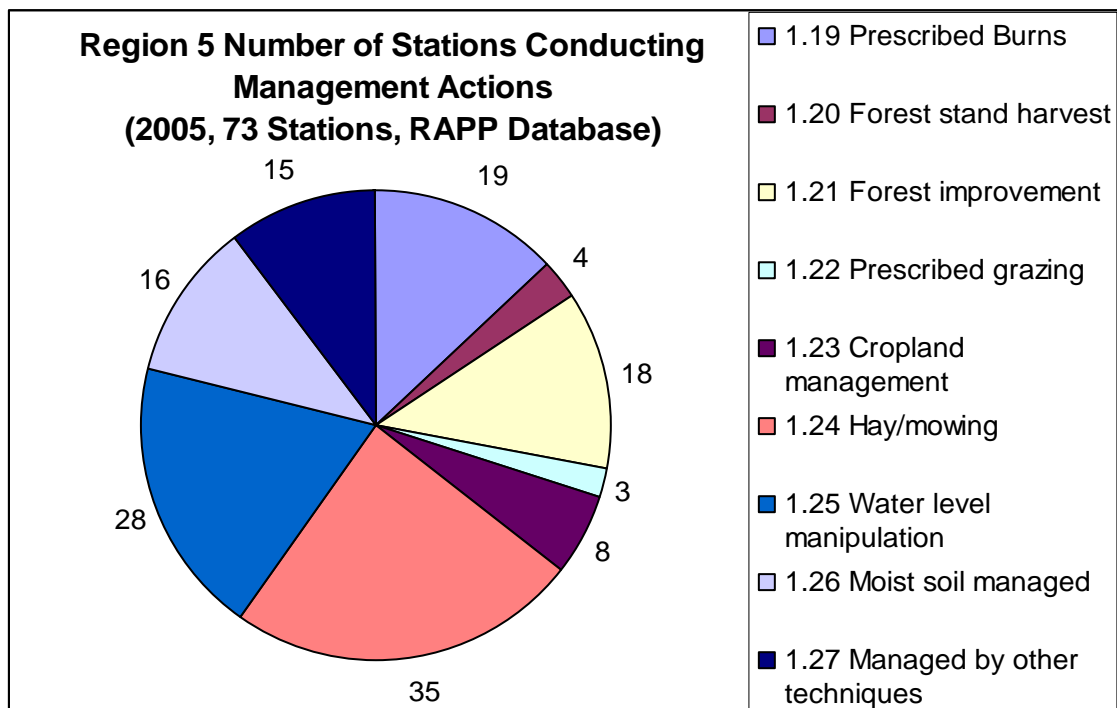| Goal and Elements	Regions		
	Region 3	Region 5	Total
Goal 1 Conserve, Manage and Restore Habitats	**69 Stations**	**73 Stations**	
Goal 1-I. Habitat Condition Classification			
Class 1A Lands where management is not needed			
1.01 Uplands, no management needed	18,485	80,659	99,144
1.02 Wetlands, no management needed	11,519	81,966	93,485
1.03 Open water, no management needed	11,890	14,536	26,427
Total Acres of Class 1A Lands	41,894	177,161	219,055
Class 1B Lands receiving needed management			
1.04 Uplands receiving needed management	173,870	30,922	204,792
1.05 Wetlands receiving needed management	299,683	31,591	331,273
1.06 Open water receiving needed management	35,499	5,671	41,170
Total Acres of Class 1B Lands	509,051	68,184	577,234
Class 2 Lands where management is deferred			
1.07 Upland management deferred	206,314	61,312	267,626
1.08 Wetlands management deferred	188,907	81,987	270,894
1.09 Open water management deferred	23,326	4,595	27,921
Total Acres of Class 2 Lands	418,547	147,894	566,441
Class 3 Lands where restoration is deferred			
1.10 Upland restoration deferred	137,421	11,738	149,159
1.11 Wetland restoration deferred	99,611	89,762	189,373
1.12 Open water restoration deferred	128,322	9,291	137,613
Total Acres of Class 3 Lands	365,354	110,791	476,145
Total Acres by Habitat			
Total uplands	536,090	184,631	720,721
Total wetlands	599,719	285,305	885,024
Total open water	199,037	34,093	233,131
Total of classified acres	1,334,847	504,029	1,838,876
Total Refuge Acres (from Realty)	1,139,282	500,232	1,639,514
II Riparian Mile Condition Classification			
1.13 Riparian miles, no management needed	160	351	511
1.14 Riparian miles receiving management	233	8	241
1.15 Riparian miles management deferred	790	98	888
1.16 Riparian miles restoration deferred	441	26	467
Total Riparian Miles	1,624	484	2,108
Goal 1-II. Habitat Management			
1.17 HMP approved stations	8	1	9
1.18 HMP targeted stations	54	63	117
Total stations with approved or targeted HMP	62	64	126
Specific Management Prescriptions Acres			
1.19 Prescribed burns	68,560	4,780	73,340
1.20 Forest stand harvest	2,989	1,130	4,119
1.21 Forest or Shrubland Improvement	2,192	1,094	3,286
1.22 Prescribed grazing	1,880	4,261	6,141
1.23 Cropland management	21,852	3,288	25,140
1.24 Hayed/mowed grassland	7,255	4,184	11,438
1.25 Water level manipulation	107,883	30,633	138,516

Goal and Elements	Regions		
	Region 3	**Region 5**	**Total**
Goal 1 Conserve, Manage and Restore Habitats	**69 Stations**	**73 Stations**	
1.26 Moist soil managed	15,113	3,242	18,355
1.27 Managed by other techniques	7,065	3,064	10,128
Total managed acres	234,787	55,675	290,462
Acres/Miles of Habitat Restored			
1.28 Upland Acres Restored	9,690	647	10,337
1.29 Wetland Acres Restored	9,914	1,440	11,354
1.30 Open Water Acres Restored	120	52	172
1.31 Riparian Miles Restored	28	2	30
Invasive Plants Infestation, Treatment, Control			
1.32 Total acres known to be infested by invasives	450,303	29,807	480,110
1.33 Total acres treated for invasives	20,546	9,587	30,134
1.34 Total acres of invasive plants controlled	6,289	4,078	10,367
Invasive Animal Infestation and Control			
1.35 Number of invasive animal populations	134	55	189
1.36 Number invasive animal populations controlled	10	13	23
1.37 Identify 1st invasive species of concern			0
1.38 Identify 2nd invasive species of concern			0
1.39 Identify 3rd invasive species of concern			0
1.40 Identify 4th invasive species of concern			0
1.41 Identify 5th invasive species of concern			0
			0
Goal 1-III. Wildlife Populations, Inventory & Monitoring			
1.42 IM Plans approved stations	17	13	30
1.43 IM Plans targeted stations	52	52	104
Total stations with approved or targeted IM Plans	69	65	134
1.44 Number of I&M surveys	652	735	1,387
1.45 Number of populations with target goals	50	56	106
1.46 Number of target populations increasing	18	21	39
1.47 Number of target populations decreasing	12	17	29
1.48 Number of target populations stable	30	20	50
1.49 Number of population management actions	246	187	433
1.50 Number of research studies	196	233	429
1.51 Number of T&E actions	98	167	265
1.52 Number of written public communications	506	223	729
Goal 2. Air and Water Quality			
Contaminated Sites			
2.01 Class 1 areas meet air quality standards	2	2	4
2.02 Class 1 areas meet air visibility standards	0	0	0
2.03 303d-listed waters stations	33	24	57
2.04 Other water quality problem stations	25	8	33
2.05 Water resource assessments conducted	9	13	22
2.06 Water resource protected (acquired or not needed)	50	44	94
2.07 Contaminated sites not in existing systems	26	40	66
Goal 3. Special Resource Management Areas and Cultural Resources			
Wilderness Areas			

Goal and Elements	Regions		
	Region 3	**Region 5**	**Total**
Goal 1 Conserve, Manage and Restore Habitats	**69 Stations**	**73 Stations**	
3.01 Designated Wilderness stations	10	4	14
3.02 Wilderness Plan approved stations	5	4	9
3.03 Wilderness Plan targeted stations	3	7	10
3.04 Number of designated wilderness acres	43,376	20,153	63,529
3.05 Acres achieving wilderness objectives	37,440	19,128	56,568
Wild & Scenic Rivers			
3.06 Wild and Scenic River miles	0	15	15
3.07 River miles achieving values in WSR Act	0	15	15
3.08 MPA designated stations	10	44	54
3.09 MPA values achieved stations	2	3	5

Appendix B. Selected entries in RONS for Region 3 and associated management prescriptions (1992-1993). No management prescriptions are checked if the need did not indicate an association.

Title	Burn	Graze	Mow	Forest harvest	Forest/ shrub improve	Moist soil	Water level	Crop	Control invasives
Forest wetlands studies				X	X				
Survey breeding waterfowl and endangered species	X	X	X			X	X	X	
Aquatic productivity in refuge pools						X	X		
Expand wildlife and habitat surveys, restore wetlands						X	X		
Monitor and restore tallgrass prairie	X	X	X			X	X		
Conduct 4 sq. mile survey, nongame bird monitoring	X	X	X			X	X		
Biological issues and needs, large river				X	X		X	X	
Conduct nongame bird census	X	X	X	X	X	X	X		
Indiana bat survey				X	X				
Grassland bird/habitat monitoring	x	x	x			x			
Mapping prairie/wetland habitats	x	x	x			x			
Closed areas and waterfowl on Upper Mississippi						X	X		
Evaluate public use impacts on wildlife									
Monitor wildlife and habitat subject to prescribed fire	X								
Develop a time saving, quality index veg sampling method for grasslands	x	x	x						
Habitat management effects on grebes						X			
Study effects of refuge flooding from new spillway on fish spawning…							X		
Increase waterfowl production through fish control									X
Study visitor impacts on wilderness islands									
Reintroduce bison to Sherburne NWR?									
Brood survival - waterfowl	x	x	x						
study removal of sediment from Walnut Creek						x	x		
Reintroduce swamp rabbits to Patoka River NWR?									
Reintroduce Karner blue butterfly to Trempealeau??	x	x	x						

Title	Burn	Graze	Mow	Forest harvest	Forest/ shrub improve	Moist soil	Water level	Crop	Control invasives
Research best management practices to support butterfly populations	x	x	x						x
Investigate water management on inverts and veg						x	x		
Reintroduce bison and elk to Sherburne NWR?	x	x	x		x				
Impact of prescribed burning on insect populations	x	x	x						
Impact of prescribed burning on grassland birds	x	x	x						
Methods of controlling reed canary grass	x	x	x						
Restoration of oak savanna and sedge meadows	x	x	x	x	x	x	x		
Restore floodplain forest for wood ducks				x	x		x		
Management options for controlling white-tailed deer				x	x			x	
Restoration options in streams to restore brook trout									
Reintroduce prairie chickens to Neal Smith?	x	x	x						
Study predator populations at Fergus Falls									

Appendix C. List of 51 major themes from the research needs submitted, scored by 11 criteria. These were summarized from an Access database of 236 needs identified by refuges and the Regional Offices in FWS Regions 3 and 5, available at:
https://intranet.fws.gov/region3/ScienceExcellenceandLandscapeConservation/documents/research_needs.pdf.
Criteria:
A= Type of research need (AM, Research, Lit. review, monitoring)
B= Total score
C= Refuge staff time expended on mgmt. Scale 0-5
D= Current mgmt activity on refuge: No = 1, Yes = 5
E= Numbers of NWRs involved in activity, Region 3 (low, med, high = 1, 5, 10)
F= Number of NWRs involved in activity, Region 5 (low, med, high = 1, 5, 10)
G= Collective NWR acreage involved, Scale 1-5
H= Politics or controversy; Scale 0-5
I= Cost of mgmt action; Scale 1-5
J= Potential contribution to trust resources; Scale 1-5
K= Feasibility of multi-refuge study. Scale 0-5
L= Improved NWR efficiency, Scale 0-5
M= Current multi-refuge study on similar issue: Score neg. 20

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Coastal zones	Predator management within tern and plover nesting areas	Test alternative predator control strategies at multiple sites along the eastern seaboard. Monitor tern and plover nesting success, adult survivorship over a 5 year time frame. Questions: Do different strategies work better at sites with particular environmental conditions? Does the success of different strategies vary based on environmental conditions or is there a 'best' strategy that works best in most places? Are there side-effects of some strategies, such to lower adult survival?	AM	29	2	5	1	1	5	5	3	4	1	2	
2	Coastal zones	Management of coastal zones to support migrating shorebirds	Compare alternative vegetation management strategies to improve habitat quality for migrating shorebirds. Update management strategies annually based on shorebird monitoring data from previous year. Questions: What habitat conditions are preferred by different guilds of migrating shorebirds? What vegetation management strategies are most successful and cost-effective? Cost-benefit analysis.	Lit. review	21	1	1	1	5	5	1	1	2	2	2	
3	Floodplain forest	Restoration of floodplain forests to benefit migrating and breeding landbirds and other species of concern	Restoration at sites currently occupied by degrading forests. Compare alternative forest restoration techniques at multiple sites currently occupied by degrading forests. (Silver maple forests are being replaced by Reed Canary Grass beds.) The most successful methods, based on monitoring data, will be applied to new locations. All sites will be monitored according to a protocol designed according to adaptive management principles. This may incorporate long-term monitoring data points.	Research	28	1	5	5	1	5	1	3	4	1	2	
4	Floodplain forest	Bioindicators of large floodplain terrestrial ecosystems	In a project related to the one above, develop a set of bioindicators of terrestrial floodplain habitat quality by defining a set of focal species (plants and animals) and designing a monitoring program that will	Monitoring	25	1	1	5	1	5	1	1	3	5	2	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
			inform managers when specific management actions are needed. These will include macro-indicators as well as micro-indicators.													
5	Floodplain forest	Forests from cropland	Review the results of recent 'natural' and planned restorations of large floodplain ecosystems from former agricultural crop land and develop a set of 'best management practices' to guide future restorations. Identify needed management-focused research that will fine-tune future restorations.	Lit. Review	26	1	5	5	0	4	3	2	3	1	2	
6	Freshwater marsh	Strategies for reducing the invasion and spread of X invasive species.	Review paper comparing the available strategies. Is there a set of management strategies that should be compared at multiple sites? Do we need to develop new strategies? Multi-site adaptive management study comparing the most promising control strategies. Identify site characteristics associated with success and failure. Include all potential land managers (states, NGO's, other federal partners).	Lit Review, AM	51	3	5	10	10	5	2	3	4	4	5	
7	Freshwater marsh	Bioindicators of freshwater marsh ecosystems	Develop a set of bioindicators of marsh habitat quality by defining a set of focal species (plants and animals) and designing a monitoring program that will inform managers when specific management actions are needed. These will include macro-indicators as well as micro-indicators.	Monitoring	41	1	1	10	10	5	1	1	3	5	4	
8	Freshwater Marsh	Spatial analysis of migrating waterfowl and habitat use.	Define the spatial and ownership distribution of habitats used by migrating waterfowl along the Atlantic and Mississippi Flyways. Use models to describe the overall habitat requirements of migrating waterfowl, by guild. Design a monitoring plan for NWRS and other partners to assess waterfowl use of the available habitats, and provide managers with a global assessment that will help various agencies improve the timing and distribution of needed habitats.	Research, monitoring	37	3	5	10	0	5	2	3	4	2	3	
9	Algific slopes	Algific slopes	Determine sun/shade impacts on algific slopes, particularly related to Northern monkshood (this relates to habitat restoration options adjacent to algific slopes).Determine function and association of sinkholes to cold air flow and hydrology of algific slopes (basically we need to understand more about how algific slopes work).	Research	6	0	1	1	0	1	1	1	1	0	0	
10	Cropland Management	Evaluate effectivness and efficiency and contribution of cropland mgmt programs	Scientific analysis of the amount of agricultural land (crop, pasture, and hay) that is required/appropriate to support populations of trust species expected for the foreseeable future. What is the importance of the farm lands on the refuge for migratory birds (especially non-game) and other wildlife species in different seasons? Evaluate the effectiveness of refuge cropland management efforts to provide for needs of migrating/wintering waterfowl. Identify the priority of cropland management and contributions relative to other potential use of that landbase.	AM, Research	49	3	5	10	5	4	5	4	4	5	4	
11	Double-crested Corm	Determine impact of D-C cormorants on habitat.	Is double-crested cormorant control effective in preventing or reversing damage to habitat (trees, shrubs, and herbaceous layers)? What monitoring thresholds should trigger management action to control cormorant numbers? Will composting cormorants on the island introduce unacceptable levels of contaminants into the ecosystem?	Research	10	1	1	1	0	1	3	1	1	0	1	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
12	Forest mgmt	Identify best forest management practices for selected forest wildlife.	Managing to support migrant landbirds, concerns about deer over-browse, invasive species, earthworms, how to maintain understory? Managing the forest to restore the long term health of the system and the suitability for nesting birds and other taxa. Evaluate various forest management options with respect to the response of target organisms in the forest: Planting, flooding, burning, Selective thinning, Timber harvest, timing and spatial distribution, Buy more land, convert from agriculture, Mowing, Dredge spoil deposition (navigable rivers), Mechanically damage trees (to create dead wood)	AM, Research	46	2	5	10	10	5	1	3	3	3	4	
13	Forest mgmt	Identify best methods to restore Forests.	How can we promote the return of native herbs, invertebrates, etc to pre-disturbance conditions when converting farmland to forests (or wetlands) in order to recreate a fully functional community? Identify best methods for floodplain forest regeneration, specifically in hydrologically altered systems such as the Upper Mississippi River. Include control of invasives, particularly reed canary grass.	AM, Research	38	3	5	5	5	5	1	3	4	3	4	
14	Forest mgmt	Measurement of forest health and integrity.	Forest management conservation targets, BMP's for forest management, early successional forest, forest composition and structure, etc. ow can we promote the return of native herbs, invertebrates, etc to pre-disturbance conditions when converting farmland to forests (or wetlands) in order to recreate a fully functional community? How can we best use data from long-term monitoring, permanent plots to provide trigger points for needed floodplain forest management actions. Identify appropriate bioindicators of forest restoration: Neotropical birds (breeding and migrating) Red-headed Woodpeckers, Red-shouldered hawk, Indiana bat, Amphibians, reptiles, Invertebrates, Lichens as bioindictors? Understory plants in savannas, Forest ecosystem itself (large floodplain forests = rare ecosystem	Literature review, Monitoring	41	1	1	10	10	5	1	1	3	5	4	
15	Grassland	Develop grassland restoration model to evaluate potential sites for grassland restoration.	How to best accomplish development of high quality prairie reconstructions? Are there circumstances that would necessarily restrict success of prairie reconstructions such that they should not be attempted, or not expected to be highly diverse, functional plantings with good wildlife habitat potential? How do we develop cost/benefit analyses to make decisions about management investments? How do we best decide on seed mixes to meet particular site needs?	AM, Literature review	46	4	5	10	5	4	1	3	4	5	5	
16	Grassland	Develop Grassland Management Model	What practices or combination of practices could be used to maintain prairie plantings with a high diversity of native plant species? Are there trigger mechanisms such as plant appearance, species presence, or phenology that could be used to indicate need for particular treatments? mowing frequency and timing and height; fire frequency, timing, and intensity; grazing frequency, timing and intensity; weather patterns; timing of plantings; type of seed mixes; successional planting; soil nutrient load. What combination of native cool season plant species should be used in prairie reconstructions? (Cool season native species are rarely used in prairie plantings but they were an important	AM	43	4		10	5	4	1	5	4	5	5	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
			component of historic native prairies and may offer significant benefits to wildlife, to weed suppression, and to ecosystem function and sustainablility.)													
17	Human Disturbance	Boating Impacts to wildlife.	Determine effectiveness of slow-no wake areas and electric motor only areas in reducing disturbance to fish and wildlife particularly nesting and roosting birds on the UMRNW&FR (large floodplain refuges.) Determine impacts of fishing tournaments on fish, wildlife, and habitats of the UMRNW&FR. The Refuge will be working with states to dovetail refuge and state permits to achieve goals.	Research	30	2	5	1	1	5	5	3	3	2	3	
18	Human Disturbance	What impact do refuge visitors and refuge mgmt presence have on wildlife use of refuge.	How can we manage the level of disturbance to wildlife caused by refuge visitors and our management activities? Examples are refuge trails, tour routes, special events. Another simple example is the presence of people conducting surveys and inventories of a variety of wildlife. How will increased visitation in future impact wildlife? Can we identify thresholds of human activities to minimize impacts? Determine the effectiveness of providing secure resting and feeding habitat for waterfowl during the fall migration through use of Closed Areas. The CCP of the Upper Miss River NW&FR includes modifications and additions to 22 closed areas.	Research	58	3	5	10	10	5	5	5	5	5	5	
19	Impound-ments	Determine appropriate annual hydrological regime within impounded wetlands to achieve refuge objectives.	Process/methods to identify optimum hydrological regime within managed wetlands to achieve refuge objectives. Long-term hydrological regime which might be annual or multi-year. Short-term seasonal hydrological manipulations to enhance waterbird use of managed wetlands. Impact of fish populations on quality of waterfowl habitat within shallow wetlands. Develop strategies to use under various conditions in order to optimize food production for wildlife in impounded wetlands.	AM	33	4	5	10	10	4	1	4	5	5	5	-20
20	Impound-ments	Strategies to manage large on-river impoundments or navigation pools.	Continue monitoring the response of vegetation, wildlife, mussels, and fish to poolwide drawdowns. Develop standardized methodology across all pools. Use vegetation monitoring results to document change in the availability and distribution of foods important to migratory waterfowl.	Monito ring	35	2	5	5	1	4	5	3	4	2	4	
21	Invasives	Ecological control of Invasive plants. Refuges work together to develop long-term control model for selected invasives.	Identify ecological principles that influence establishment and perpetuation of selected invasive species. Simple herbicide control of invasives at a site seldom works (long-term), since the invasive species is already the best adapted plant to compete at a site, given site conditions. Information is needed relative to life history and ecology of selected species, so that site conditions may be altered, or conditions suitable for establishment of a selected invasive species are avoided. Additionally, some invasive species may naturally be eliminated from a site if successional processes are allowed to proceed. This information is required to allow FWS staff to make informed decisions relative to invasive species management. Adaptive management study framework for the control of invasive plants and a database to share methods and	AM	52	1	5	10	10	5	1	5	5	5	5	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
			results across the region (SBM target species: multiflora rose, swallowworts, garlic mustard, autumn olive, honeysuckle, bittersweet, Japanese knotweed).													
22	Invasives	Invasive Species Detection and Prioritization	Invasive species detection. Development of digital multi-spectral imaging methods to detect invasive species. Create a monitoring network as an early warning system to detect and allow eradication of new exotic introductions. (See NWR proposal to map/monitor invasives and IPANE model.) Complete an invasive plant inventory with the goal of a achieving a 10 percent reduction in acres affected by 2010.	Monito ring	54	4	5	10	10	5	1	5	4	5	5	
23	Invasives	Identify invasive species impact on wildlife or vegetation communities. Need to identify priorities for control.	Extensive FWS resources (staff time and funds) are expended each year to control invasive species. However, the FWS has relatively little information about the threat/impact of selected invasive species on achievement of FWS objectives. It is therefore imperative to measure how selected invasives are impacting wildlife/native plant populations. It is suspected that some invasive provide little threat to these resources while others have a significant impact. Only with this information can the FWS make informed decisions about prioritizing which invasive species to control.	Resear ch	45	2	5	10	10	5	1	1	4	4	3	
24	Invasives	Large-scale control of woody invasive plants into prairies.	What are effective means of woody plant control on the scale of hundreds or thousands of acres, when heavy equipment cannot be used for mechanical control methods? (In some circumstances, woody species control is especially difficult due to wet soil conditions, or presence of highly invasive, clonal woody species such as black locust (Robinia pseudoacacia) or European poplar (Populus alba).) In these conditions, what can be used to control highly invasive, clonal species?	AM	22	1	1	5	0	5	1	1	4	2	2	
25	Landbirds	Identify forest management practices to enhance target species of breeding landbirds.	Included in Region 3&5 NWR Adaptive Management Study Needs as #12 under Forest Management. How should forests be managed to support migrating landbirds? (size, tree species composition, age class û structure, edges, landscape spatial distribution) On UMRNW&FR we would be particularly interested in how this relates to floodplain forest. How should forests be managed to support migrating landbirds? Is size important? Tree species composition? Age class, structure? Edges? Determine appropriate hardwood management techniques for neotropical and temperate migratory birds, including the number and variety of trees to be planted, planting location and schedule, and evaluation of deer impacts.	Literat ure review	49	3	5	10	10	5	1	3	4	4	4	
26	Landbirds	Identify priority sites and management practices to enhance stop-over sites for migrating landbirds.	Determine abundance, species composition, and timing of spring passerine bird migration in floodplain and upland forests in the Upper Mississippi River corridor. Link habitat use patterns with habitat variables including local and landscape structural variables and food abundance indices. Link habitat use patterns with indices of bird body and metabolic condition, sex and age ratios, and food choice and foraging observations. Determine important migration stopover areas. Identification of key neotropical bird habitats and migratory routes.	Resear ch, monito ring	48	2	5	10	10	5	1	3	5	3	4	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
			Identify key migration stop-over sites. Develop habitat model for important stop-over sites, incorporating geography, patch sizes, habitat variables, and other criteria. This migratory bird stop-over habitat model will then be applied to refuge lands during the CCP or HMP process to identify which refuges may make an important contribution toward migrating landbirds.													
27	Landbirds	Identify best management practices to maintain scrub/shrub dominated habitats for early successional wildlife.	Maintain and increase native shrub-dominated cover (e.g., bayberry, chokeberry, sumac, viburnum) and nectar-producing forbs (e.g., pokeweed, goldenrod) on the existing mid-successional management units to increase the availability of feeding and resting habitat for shrub-dependent migratory birds, including raptors, that rely on these resources.	Literature review, research	38	2	5	5	5	5	1	3	4	4	4	
28	Marshbirds	Identify impact of refuge wetland management practices on secretive marshbird communities.	Impact of impoundment management practices on use/distribution of secretive marshbirds on a refuge. Marshbird Monitoring (secretive marshbirds and sparrows) that includes the success of breeding birds (not just presence and absence) to help identify if management actions could improve success (create more high marsh to reduce flooding events, control predators, etc).	AM	48	2	5	10	10	5	1	2	4	5	4	
29	Phragmites	Develop effective control options that result in long-term control of phragmites.	Need effective long-term management strategies to control Phragmites. Phragmites Control. Some patches of phrag develop within middle of saltmarsh veg communities. What are factors that contribute to this, and what are best control methods?	Research	43	3	5	5	10	2	1	4	3	5	5	
30	Phragmites	Develop Biological Control for phragmites	Complete work on the development of the biological control methodology for Phragmites and develop an action plan to prioritize key treatment areas. (Substantial work done at Cornell which we need to bring to completion and implement.)	Research	24	0	1	5	5	2	1	1	3	1	5	
31	Piping Plover	Vegetation structure impact on quality of piping plover habitat.	Vegetation/Habitat manipulation on plover breeding grounds. Do plovers select breeding sites dependant upon vegetative cover percentage or does it matter? If a high vegetative cover area was manipulated (sprayed, disced, burned, etc,) to open up sand areas, will this have a positive effect on breeding numbers/success? Long-lasting (2+ years) vegetation control strategies to improve the quality of habitat for breeding terns and plovers	Research, AM	16	1	1	1	1	2	3	1	2	2	2	
32	Piping Plover	Invertebrate abundance and influence on piping plover productivity.	Feeding/Invertebrate study on piping plover breeding grounds. Is food type/availability/abundance a determining factor in nest site selection for breeding plovers.	Research	14	1	1	1	1	2	1	1	2	2	2	
33	Piping Plover	Best methods to control predation on piping plovers.	Ongoing need to improve the effectiveness, efficiency, and documentation of predator management within tern and plover nesting sites. When is it important to remove piping plover exclosures to reduce adult mortality? What is the impact of increased adult mortality upon the long term viability of these populations?	AM	30	3	5	1	1	2	4	4	4	3	3	
34	Reed Canary Grass	Develop forest restoration methods which reduce	Identify best methods for floodplain forest regeneration, specifically in hydrologically altered systems such as the Upper Mississippi River. Include control of invasives, particularly reed canary grass. (HIGHEST	Research	35	1	5	10	1	3	1	4	3	3	4	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
		probability or RCG invasion.	PRIORITY)													
35	Reed Canary Grass	Develop efficient operational methods to achieve long-term control of reed canary grass.	Identify reed canary grass control combinations using grass-specific herbicides along with fire and other tools in an effort to improve habitat for the suite of bird species that utilize low prairie and wet meadows. What are the most successful techniques to control or eliminate reed canary grass in prairies and sedge meadows and to favor development of a self-sustaining native plant community? Control of Reed Canary Grass within shallow wetlands and wetland edges (Control options on operational scale as opposed to experimental.)	AM	42	3	5	10	1	3	1	5	4	5	5	
36	Saltmarsh	Develop Saltmarsh Condition Index and associated Index of Biological Integrity to determine condition impacts on obligate saltmarsh wildlife community.	Develop Index of Biological Integrity (IBI) to rank discrete saltmarshes on NWRs throughout the Region. Index will be used to identify relative integrity of saltmarshes, where restoration efforts may be most effectively implemented, and identify factors which are adversely impacting saltmarsh habitats. Subsequent to, or during development of Saltmarsh IBI, also measure composition and abundance of obligate saltmarsh bird community, at range of IBI values. Information will be used to evaluate impact of impaired saltmarshes on saltmarsh birds, and help to prioritize saltmarsh restoration needs.	Monitoring	39	1	5	0	10	5	2	1	5	5	5	
37	Saltmarsh	Develop/evaluate methods of saltmarsh restoration.	What is the effect of OMWM activities, including ditch plugging, on marsh accretion rates and processes? What are the effects of impoundment dikes on seaward salt marsh structure and habitat value? What are the best means for restoring diked salt marshes and surrounding impacted areas? Develop/incorporate a wetland restoration monitoring system for Refuge salt marshes (to include habitat and wildlife) to help determine the success of restoration/enhancement projects and help guide future management actions. What is the best way to restore a ditched marsh to its former hydrology, vegetation, peat, and habitat functions and values?	AM	37	3	5	0	5	5	2	3	5	4	5	
38	Saltmarsh	What is impact of Rx Fire on saltmarsh and effective use of fire.	Impact of fire on saltmarsh communities. What is natural fire return rate within a saltmarsh.	Research	17	1	1	0	1	5	1	1	2	3	2	
39	Savannah	Identify savannah management practices that best meet refuge objectives.	Can cattle be used to effectively emulate historic grazing in prairies and savannas? What sort of grazing regime should be used? How does cattle grazing compare with bison/elk grazing in prairies in Region 3? Could patch burn/grazing techniques be beneficial in emulation of landscape scale influences, even though current application is on much smaller scales than the historic prairie landscape, and is more highly manipulative? What is the appropriate timing of burning to restore savanna ecosystems? What triggers the decision to burn?	AM	29	3	5	1	0	3	1	3	4	5	4	
40	Savannah	Methods and factors to consider when restoring natural savannah communities.	Identify the best methods for restoring and maintaining savanna ecosystems. What are the triggers that indicate that in situ seed/plant sources inadequately represent historic savanna conditions, and that introduction of species via seeds or plants should begin? What are the	AM	24	3	1	1	0	3	1	3	4	4	4	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
			appropriate plant species/germplasm sources for introduction to a remnant savanna in any given area/savanna type? How to evaluate if a refuge has a contribution to make toward savannah habitats.													
41	Scrub/ Shrub	Habitat requirments of wildlife which are dependent upon early successional vegetation communities.	Little information is available relative to the minimum patch size requirements for wildlife that use early successional habitats. This information is needed for both breeding birds, as well as for birds during migration or wintering periods. To effectively contribute toward wildlife that use early successional habitat patches, this information is needed.	Research	37	3	5	5	5	3	1	3	4	3	5	
42	Scrub/ Shrub	Identify appropriate locations to provide early successional management that can be efficiently maintained within that seral stage.	The FWS expends significant resources on creation/maintaining early successional habitats. In doing this, we often are fighting natural successional processes at great cost. However, some sites conditions are conducive to the maintenance of early successional habitats, either as a result of hydrology, soil, or other site specific conditions. Information is required for staff to evaluate potential sites and determine the site's natural capacity for maintaining these important habitats. Identify how early successional habitats should be incorporated into the landscape on a watershed or larger scale to achieve maximum effectiveness.	Research	29	1	1	5	5	3	1	2	3	3	5	
43	Scrub/ Shrub	What are the best and most efficient methods to manage early successional habitats.	Evaluate all the techniques used to maintain or create early successional habitat and identify techniques and/or modification that are environmentally sound and cost effective. Management of coastal / maritime shrublands for migrating landbirds and the New England Cottontail (proposed for T&E listing). Management of shrub communities without stimulating invasives (Bittersweet, Honeysuckles, multifora rose, etc).	AM	36	2	5	5	5	3	1	3	4	3	5	
44	Sedge Meadow	Develop best management practices to maintain sedge meadow habitats.	Timing and hydrological influences on controlling shrub/scrub invasion into sedge meadows with use of Rx Fire. How can we control invasive species in a sedge meadow? (Cattail, phragmites)	AM	23	2	5	5	1	2	1	1	2	2	2	
45	Water Quality	Monitoring quantity/quality of water coming into refuges, and identify management practices to address.	Quantity and quality of water coming into and leaving refuge system lands. Need to have a monitoring system in place to identify problems. At this point in time, little to no information to address water quantity and quality is available. What size and type of buffer do we need between our farmlands and our waterbodies to ensure that our water bodies are not being contaminated from pesticide/fertilizer rich runoff from the farmlands? Are grassy or wooded buffers better to protect water quality and improve habitat conditions in the waterbodies for waterbirds? Where are they needed, where are they adequate?	Research, monitoring	48	1	5	10	10	5	3	3	4	4	3	
46	Waterbird Disease	Identify management actions to minimize waterbird disease.	Investigate areas where high levels of trematode transmission are occurring to define possible management actions aimed at lessening the impact of these parasites on waterbirds. Since 2002, an estimated 20,300 to 24,370 waterbirds, including 6,630 to 7,875 lesser scaup have died as a result of trematodiasis, many on Lake Onalaska (Navigation	Research	26	1	1	5	1	3	3	3	4	2	3	

#	Habitat/ Wildlife	Title	Description	A	B	C	D	E	F	G	H	I	J	K	L	M
			Pool 7). HIGHEST PRIORITY													
47	Wetlands	Develop and evaluate wetland restoration methods to achieve naturally functioning wetlands.	How should we restore wetlands that have been altered by prior land uses? Wetlands were restored and control structures rendered unusable, but historic wetland characteristics have not been achieved. Hydrology, vegetation, and fish occupancy are all issues. Evaluating success of wetland restoration efforts. How do we know when we are successful?	AM	40	2	5	10	5	3	1	3	4	3	4	
48	Wetlands	Identify natural hydrological regimes of refuge water bodies, and influence of altered regimes on habitats.	What are the effects of naturally occurring historical drawdown events on refuge natural shallow lakes on the surrounding habitats and ditches flowing into and out of the lake. Effect of waterlevel within ditches (over 100 miles and 34+ water control structures) on the adjacent organic soils and habitats.	Research	40	2	5	10	5	3	1	3	4	3	4	
49	Nest Boxes	Critical evaluation of contribution of refuge nest box programs. Do they increase production sufficiently to merit expenditure of staff time and resources to manage?	Should we continue the existing wood duck box program? The refuge supports (through volunteers), 150+ woodduck boxes. Personal observation is that we produce very few broods. Some concerns: are we a sink for waterfowl, is dump nesting a problem and should boxes be adjusted, fisher now occur on the refuge on a regular basis - should this change cause us to eliminate boxes, should a trapping program be initiated? What is impact on production if nest box program is eliminated?	Research	51	5	5	10	10	5	1	4	1	5	5	
50	Waterfowl	Spatial analysis of migrating waterfowl and habitat use.	Define the spatial and ownership distribution of habitats used by migrating waterfowl along the Atlantic and Mississippi Flyways. Use models to describe the overall habitat requirements of migrating waterfowl, by guild. Design a monitoring plan for NWRS and other partners to assess waterfowl use of the available habitats, and provide managers with a global assessment that will help various agencies improve the timing and distribution of needed habitats.	Monitoring	50	4	5	10	5	3	4	5	4	5	5	
51	Grasslands, Ground- nesting birds	Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds		AM	49	4	5	10	5	3	3	4	5	5	5	

Appendix D. Memo and survey of refuges requesting them to rate the top ten research needs.

Melinda Knutson/R3/FWS/DOI
04/25/2006 09:43 AM

To
FW5 RW Refuge Biologists, FW5 RW Refuge Managers, FW3 RW Biologists, FW3
FO RW Project Leaders
cc
FW5 RW Senior Leadership Team, FW3 RO RW Office Heads, Jan D
Taylor/R5/FWS/DOI@FWS, Harold Laskowski/R5/FWS/DOI@FWS, Todd
Sutherland/R3/FWS/DOI@FWS, Socheata Lor/R3/FWS/DOI@FWS, Patricia J
Heglund/BRD/USGS/DOI@USGS, Melinda Knutson/R3/FWS/DOI@FWS
Subject
adaptive management needs survey: due 10 May

The Biological Monitoring Team is working to identify the highest priority
topics to focus a new adaptive management project, planned to start in
FY2007. In February we asked field stations to submit their ideas for
adaptive management and research needs. We summarized these ideas and
discussed them in April with the Regional Refuge Supervisors in Regions 3
and 5. The list below was derived from our conversations with the Regional
Refuge Supervisors. We plan to hold workshops on the highest priority
topics during July and August to help refuges and interested scientists
further clarify issues and identify possible solutions. After the
workshops, a Request-for-Proposals (RFP) will be released to solicit
multi-refuge adaptive management studies that address topics identified at
the workshops. Refuges will have the opportunity to confirm if they wish
to participate in a particular study at that time.

The purpose of this survey is to solicit your ratings of the importance of
the topics. We will use this information to decide which topics warrant
further development via workshops. We are requesting one response per
refuge or wetland management district. If your station is part of a refuge
complex, please complete a survey for each refuge within the complex. To
facilitate discussion among refuge staff in making your response, we have
attached a PDF file of the survey. This survey will take less than 10
minutes to complete. If you have trouble with the online survey, just
fill out the paper version and mail to Melinda Knutson. If you have
questions, contact Melinda or Todd Sutherland.

Please use the following link to complete the survey:
http://www.zoomerang.com/recipient/survey-intro.zgi?p=WEB22597QHQRNK
Please complete the survey by 10 May.

Thanks!

Melinda
Melinda Knutson, Ph.D.
Wildlife Biologist, Biological Monitoring Team
U.S. Fish and Wildlife Service
Upper Midwest Environmental Sciences Center
2630 Fanta Reed Rd.
La Crosse, WI 54603
PH 608-781-6339

FAX 608-783-6066
melinda_knutson@fws.gov

Adaptive Management Needs Survey

The Biological Monitoring Team is working to identify the highest priority topics to focus a new adaptive management project, planned to start in FY2007. In February we asked field stations to submit their ideas for adaptive management and research needs. We summarized these ideas and discussed them in April with the Regional Refuge Supervisors in Regions 3 and 5. The list below was derived from our conversations with the Regional Refuge Supervisors. We plan to hold workshops on the highest priority topics during July and August to help refuges and interested scientists further clarify issues and identify possible solutions. The purpose of this survey is to solicit your ratings of the importance of the topics. We will use this information to decide which topics warrant further development via workshops.

We are requesting one response per refuge or wetland management district. If your station is part of a refuge complex, please complete a survey for each refuge within the complex. We used the RAPP list of reporting units to define our list. Project leaders should assign the most appropriate staff to complete the survey. This survey will take less than 10 minutes to complete.

Thanks!

1. Enter your name.

2. Identify your Region (pull down list).

3. Choose your station name (pull down list).

4. Please rate the importance of each of the following adaptive management topics to the management of your station.
    Very high priority(1), High priority(2), Medium priority(3),Low priority(4), Not applicable(5)

    1. Mitigating human disturbance: What refuge management practices can be employed to mitigate the negative effects of refuge visitors and refuge management presence on wildlife, including the use of closed areas to control boating disturbance?
    2. Grasslands and ground-nesting birds: Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds.
    3. Saltmarsh management: Explore best management practices for the conservation and restoration of salt marshes, including use of a Saltmarsh Condition Index and associated Index of Biological Integrity.
    4. Cropland management: Evaluate effectiveness, efficiency, and contribution of cropland management programs to the FWS Refuge mission.
    5. Invasive species management: How can refuges work together to identify the impacts of invasive species on native communities of plants and animals and identify priorities for invasive species control?
    6. Piping plovers and terns and predators: Explore best management practices for predator management within tern and piping plover nesting areas.
    7. Forest management for focal species: Identify best forest management and restoration practices to benefit high priority forest wildlife, including land birds.
    8. Reed canary grass control and management: Develop effective management practices to achieve long-term control of reed canary grass.
    9. Scrub/shrub habitat management: What are the best methods of managing early successional habitats for high priority species?
    10. Savanna restoration: Identify savanna management practices that best meet refuge objectives.

5. Please select any adaptive management topics from the list below that your station would be willing to participate in, if we convene a workshop or a study to address it. Participation will include sending a representative to one or more workshops with USGS and other scientists to clearly define the problem such that a FWS/USGS cooperative study can be developed. Funding is available to support travel to such a meeting. Participation will also mean that your field station will be considered for inclusion in the study and your biology staff may be asked to coordinate or participate in data collection.

   1. Mitigating human disturbance: What refuge management practices can be employed to mitigate the negative effects of refuge visitors and refuge management presence on wildlife, including the use of closed areas to control boating disturbance?
   2. Grasslands and ground-nesting birds: Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds.
   3. Saltmarsh management: Explore best management practices for the conservation and restoration of salt marshes, including use of a Saltmarsh Condition Index and associated Index of Biological Integrity.
   4. Cropland management: Evaluate effectiveness, efficiency, and contribution of cropland management programs to the FWS Refuge mission.
   5. Invasive species management: How can refuges work together to identify the impacts of invasive species on native communities of plants and animals and identify priorities for invasive species control?
   6. Piping plovers and terns and predators: Explore best management practices for predator management within tern and piping plover nesting areas.
   7. Forest management for focal species: Identify best forest management and restoration practices to benefit high priority forest wildlife, including land birds.
   8. Reed canary grass control and management: Develop effective management practices to achieve long-term control of reed canary grass.
   9. Scrub/shrub habitat management: What are the best methods of managing early successional habitats for high priority species?
   10. Savanna restoration: Identify savanna management practices that best meet refuge objectives.

6. If you did not select any topics from the list above, please indicate your concerns below.
   1. None of the listed topics are important to the management of my station. (Please describe a topic that would be more useful to you.)
   2. My station lacks the time to participate in workshops, coordination, or data collection on any topic this year or next year.
   3. Other (please describe).

7. Please describe a topic that would be more useful to you.
8. Identify categories of human disturbance that may be appropriate for multi-refuge studies at your refuge:
   1. Auto-tour route disturbance
   2. Hiking trails
   3. Boating
   4. Hunting
   5. Beach-use
   6. Other, please describe

Thanks for your participation!!

Appendix E. Survey results.

zoomerang

Survey Results (Included Responses)

Adaptive Management Needs Survey
Report created on: Monday, May 15, 2006 11:41:00 AM

The results of your survey are displayed below. If your survey includes text responses, click the "View" button to read individual results. To exclude a particular response, click the Included Responses button. You can then view the set of individual responses that are currently included and select those you wish to exclude. Results below contain only Included responses

Go to Individual Complete Responses:

☐ Show respondent's emails.

INCLUDED RESPONSES ➤

EXCLUDED RESPONSES ➤

Included Respondents: 116
Excluded Respondents: 14

EXCLUDE BLANK RESPONSES

○ **Cross Tabulate**
Cross reference multiple questions

○ **Download Results**
Receive results in spreadsheet format

Launch Date	04/25/2006 - 9:32 AM
Modified Date	
Close Date	05/12/2006 - 9:54 AM
Email Invites	0
Visits	198
Partials	11
Completes	130

Responses: ● Completes only ○ Partials only ○ Completes & Partials

1. Enter your name:

VIEW 116 Responses

2. Identify your region:

		Number of Responses	Response Ratio
Region 3		60	52%
Region 5		56	48%
Total		116	100%

3. Choose your station name:

	Number of Responses	Response Ratio
52562-AMAGANSETT NATIONAL WILDLIFE REFUGE	1	2%
53630-AROOSTOOK NATIONAL WILDLIFE REFUGE	1	2%
53513-ASSABET RIVER NATIONAL WILDLIFE REFUGE	1	2%
51510-BACK BAY NATIONAL		

WILDLIFE REFUGE	1	2%
51531-BLACKWATER NATIONAL WILDLIFE REFUGE	1	2%
53541-BLOCK ISLAND NATIONAL WILDLIFE REFUGE	1	2%
51550-BOMBAY HOOK NATIONAL WILDLIFE REFUGE	0	0%
51630-CANAAN VALLEY NATIONAL WILDLIFE REFUGE	1	2%
52515-CAPE MAY NATIONAL WILDLIFE REFUGE	1	2%
53561-CARLTON POND WATERFOWL PRODUCTION AREA	1	2%
51570-CHINCOTEAGUE NATIONAL WILDLIFE REFUGE	1	2%
52564-CONSCIENCE POINT NATIONAL WILDLIFE REFUGE	0	0%
53535-CROSS ISLAND NATIONAL WILDLIFE REFUGE	1	2%
51590-EASTERN NECK NATIONAL WILDLIFE REFUGE	1	2%
51650-EASTERN SHORE OF VIRGINIA NWR	1	2%
52510-EDWIN B. FORSYTHE NATIONAL WILDLIFE REFUGE	1	2%
52566-ELIZABETH ALEXANDRA MORTON NWR	0	0%
52520-ERIE NATIONAL WILDLIFE REFUGE	1	2%
51612-FEATHERSTONE NATIONAL WILDLIFE REFUGE	0	0%
51651-FISHERMAN ISLAND NATIONAL WILDLIFE REFUGE	1	2%
53536-FRANKLIN ISLAND NATIONAL WILDLIFE REFUGE	1	2%
53570-GREAT BAY NATIONAL WILDLIFE REFUGE	0	0%
51580-GREAT DISMAL SWAMP NATIONAL WILDLIFE REFUGE	1	2%
53511-GREAT MEADOWS NATIONAL WILDLIFE REFUGE	1	2%
52530-GREAT SWAMP NATIONAL WILDLIFE REFUGE	1	2%
52540-IROQUOIS NATIONAL WILDLIFE REFUGE	1	2%
51621-JAMES RIVER NATIONAL WILDLIFE REFUGE	1	2%
53547-JOHN H. CHAFEE NATIONAL WILDLIFE REFUGE	1	2%

53571-JOHN HAY NATIONAL WILDLIFE REFUGE	0	0%
52570-JOHN HEINZ NWR AT TINICUM	0	0%
53580-LAKE UMBAGOG NATIONAL WILDLIFE REFUGE	1	2%
51540-MARTIN NATIONAL WILDLIFE REFUGE	1	2%
53518-MASHPEE NATIONAL WILDLIFE REFUGE	1	2%
51610-MASON NECK NATIONAL WILDLIFE REFUGE	1	2%
53517-MASSASOIT NATIONAL WILDLIFE REFUGE	1	2%
53520-MISSISQUOI NATIONAL WILDLIFE REFUGE	1	2%
53514-MONOMOY NATIONAL WILDLIFE REFUGE	1	2%
52550-MONTEZUMA NATIONAL WILDLIFE REFUGE	1	2%
53530-MOOSEHORN NATIONAL WILDLIFE REFUGE	1	2%
51581-NANSEMOND NATIONAL WILDLIFE REFUGE	1	2%
53515-NANTUCKET NATIONAL WILDLIFE REFUGE	1	2%
53542-NINIGRET NATIONAL WILDLIFE REFUGE	1	2%
53516-NOMANS LAND ISLAND NATIONAL WILDLIFE REFUGE	1	2%
51611-OCCOQUAN BAY NATIONAL WILDLIFE REFUGE	1	2%
51660-OHIO RIVER ISLANDS NATIONAL WILDLIFE REFUGE	0	0%
53512-OXBOW NATIONAL WILDLIFE REFUGE	1	2%
52563-OYSTER BAY NATIONAL WILDLIFE REFUGE	0	0%
53550-PARKER RIVER NATIONAL WILDLIFE REFUGE	1	2%
51640-PATUXENT RESEARCH REFUGE	0	0%
53533-PETIT MANAN NATIONAL WILDLIFE REFUGE	1	2%
51512-PLUM TREE ISLAND NATIONAL WILDLIFE REFUGE	0	0%
53537-POND ISLAND NATIONAL WILDLIFE REFUGE	1	2%
51623-PRESQUILE NATIONAL WILDLIFE REFUGE	1	2%

	Number of Responses	Response Ratio
51560-PRIME HOOK NATIONAL WILDLIFE REFUGE	1	2%
53553-RACHEL CARSON NATIONAL WILDLIFE REFUGE	1	2%
51622-RAPPAHANNOCK RIVER VALLEY NWR	1	2%
53543-SACHUEST POINT NATIONAL WILDLIFE REFUGE	1	2%
53534-SEAL ISLAND NATIONAL WILDLIFE REFUGE	1	2%
52565-SEATUCK NATIONAL WILDLIFE REFUGE	0	0%
52611-SHAWANGUNK GRASSLANDS NWR	1	2%
53590-SILVIO O. CONTE NFWR	1	2%
52650-ST. LAWRENCE WETLANDS & GRASSLAND MGMT DIST	1	2%
53546-STEWART B. MCKINNEY NATIONAL WILDLIFE REFUGE	1	2%
53560-SUNKHAZE MEADOWS NATIONAL WILDLIFE REFUGE	1	2%
52571-SUPAWNA MEADOWS NATIONAL WILDLIFE REFUGE	1	2%
51532-SUSQUEHANNA NATIONAL WILDLIFE REFUGE	0	0%
52568-TARGET ROCK NATIONAL WILDLIFE REFUGE	0	0%
53554-THACHER ISLAND NATIONAL WILDLIFE REFUGE	1	2%
53545-TRUSTOM POND NATIONAL WILDLIFE REFUGE	1	2%
52610-WALLKILL RIVER NATIONAL WILDLIFE REFUGE	1	2%
51571-WALLOPS ISLAND NATIONAL WILDLIFE REFUGE	0	0%
53572-WAPACK NATIONAL WILDLIFE REFUGE	0	0%
52561-WERTHEIM NATIONAL WILDLIFE REFUGE	0	0%
Total	56	100%

4. Choose your station name:	Number of Responses	Response Ratio
32510-AGASSIZ NATIONAL WILDLIFE REFUGE	1	2%
33590-BIG MUDDY NATIONAL FISH AND WILDLIFE REFUGE	1	2%
31531-BIG OAKS NATIONAL	1	2%

WILDLIFE REFUGE		
32640-BIG STONE NATIONAL WILDLIFE REFUGE	1	2%
32641-BIG STONE WETLAND MANAGEMENT DISTRICT	1	2%
31541-CEDAR POINT NATIONAL WILDLIFE REFUGE	1	2%
33650-CHAUTAUQUA NATIONAL WILDLIFE REFUGE	1	2%
33643-CLARENCE CANNON NATIONAL WILDLIFE REFUGE	0	0%
33610-CRAB ORCHARD NATIONAL WILDLIFE REFUGE	1	2%
32555-CRANE MEADOWS NATIONAL WILDLIFE REFUGE	1	2%
32630-CYPRESS CREEK NATIONAL WILDLIFE REFUGE	1	2%
33510-DESOTO NATIONAL WILDLIFE REFUGE	1	2%
32586-DETROIT LAKES WETLAND MANAGEMENT DISTRICT	0	0%
31521-DETROIT RIVER INTERNATIONAL WILDLIFE REFUGE	0	0%
32596-DRIFTLESS AREA NATIONAL WILDLIFE REFUGE	1	2%
33654-EMIQUON NATIONAL WILDLIFE REFUGE	0	0%
32585-FERGUS FALLS WETLAND MANAGEMENT DISTRICT	1	2%
32524-FOX RIVER NATIONAL WILDLIFE REFUGE	1	2%
32580-GLACIAL RIDGE NATIONAL WILDLIFE REFUGE	1	2%
32521-GRAVEL ISLAND NATIONAL WILDLIFE REFUGE	0	0%
33640-GREAT RIVER NATIONAL WILDLIFE REFUGE	1	2%
32522-GREEN BAY NATIONAL WILDLIFE REFUGE	1	2%
32600-HAMDEN SLOUGH NATIONAL WILDLIFE REFUGE	1	2%
31512-HARBOR ISLAND NATIONAL WILDLIFE REFUGE	1	2%
32520-HORICON NATIONAL WILDLIFE REFUGE	1	2%
31511-HURON NATIONAL WILDLIFE REFUGE	1	2%
33581-IOWA WETLAND MANAGEMENT DISTRICT	1	2%

31513-KIRTLANDS WARBLER WILDLIFE MANAGEMENT AREA	1	2%
32525-LEOPOLD WETLAND MANAGEMENT DISTRICT	1	2%
32588-LITCHFIELD WETLAND MANAGEMENT DISTRICT	1	2%
33652-MEREDOSIA NATIONAL WILDLIFE REFUGE	0	0%
31522-MICHIGAN ISLANDS NATIONAL WILDLIFE REFUGE	0	0%
31731-MICHIGAN WETLAND MANAGEMENT DISTRICT	1	2%
33660-MIDDLE MISSISSIPPI RIVER NWR	1	2%
32541-MILLE LACS NATIONAL WILDLIFE REFUGE	1	2%
33540-MINGO NATIONAL WILDLIFE REFUGE	1	2%
32590-MINNESOTA VALLEY NATIONAL WILDLIFE REFUGE	1	2%
32591-MINNESOTA VALLEY WETLAND MANAGEMENT DIST	1	2%
32581-MORRIS WETLAND MANAGEMENT DISTRICT	0	0%
31530-MUSCATATUCK NATIONAL WILDLIFE REFUGE	1	2%
33670-NEAL SMITH NATIONAL WILDLIFE REFUGE	1	2%
32530-NECEDAH NATIONAL WILDLIFE REFUGE	0	0%
32645-NORTHERN TALLGRASS PRAIRIE NWR	1	2%
31540-OTTAWA NATIONAL WILDLIFE REFUGE	1	2%
33541-OZARK CAVEFISH NATIONAL WILDLIFE REFUGE	1	2%
31560-PATOKA RIVER NATIONAL WILDLIFE REFUGE	1	2%
33542-PILOT KNOB NATIONAL WILDLIFE REFUGE	1	2%
33630-PORT LOUISA NATIONAL WILDLIFE REFUGE	1	2%
32540-RICE LAKE NATIONAL WILDLIFE REFUGE	1	2%
32583-RYDELL NATIONAL WILDLIFE REFUGE	1	2%
31510-SENEY NATIONAL WILDLIFE REFUGE	1	2%
32550-SHERBURNE NATIONAL WILDLIFE REFUGE	1	2%

31520-SHIAWASSEE NATIONAL WILDLIFE REFUGE	1	2%
33560-SQUAW CREEK NATIONAL WILDLIFE REFUGE	1	2%
32577-ST. CROIX WETLAND MANAGEMENT DISTRICT	1	2%
33570-SWAN LAKE NATIONAL WILDLIFE REFUGE	0	0%
32560-TAMARAC NATIONAL WILDLIFE REFUGE	1	2%
32561-TAMARAC WETLAND MANAGEMENT DISTRICT	1	2%
32578-TREMPEALEAU NATIONAL WILDLIFE REFUGE	1	2%
33621-TWO RIVERS NATIONAL WILDLIFE REFUGE	1	2%
33580-UNION SLOUGH NATIONAL WILDLIFE REFUGE	1	2%
32579-UPPER MISSISSIPPI RIVER NFWR	1	2%
32572-UPPER MISSISSIPPI RIVER NFWR-LA CROSSE DIST	1	2%
32595-UPPER MISSISSIPPI RIVER NFWR-MCGREGOR DIST	1	2%
32576-UPPER MISSISSIPPI RIVER NFWR-SAVANNA DIST	1	2%
32574-UPPER MISSISSIPPI RIVER NFWR-WINONA DISTRICT	1	2%
31542-WEST SISTER ISLAND NATIONAL WILDLIFE REFUGE	1	2%
32620-WHITTLESEY CREEK NATIONAL WILDLIFE REFUGE	1	2%
32587-WINDOM WETLAND MANAGEMENT DISTRICT	1	2%
Total	59	100%

5. Please rate the importance of each of the following adaptive management topics to the management of your station.

The top percentage indicates total respondent ratio; the bottom number represents actual number of respondents selecting the option	1 Very high priority	2 High priority	3 Medium priority	4 Low priority	5 Not Applicable
1. **Mitigating human disturbance:** What refuge management practices can be employed to mitigate the negative effects of refuge visitors and refuge management presence on wildlife?	19% 22	20% 23	26% 30	24% 28	11% 13
2. **Grasslands and ground-nesting birds:** Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds.	16% 18	16% 19	22% 25	22% 26	24% 28
3. **Saltmarsh management:** Explore best management practices for the conservation and restoration of salt marshes, including	5%	7%	5%	3%	79%

use of a Saltmarsh Condition Index and associated Index of Biological Integrity.	6	8	6	4	92
4. **Cropland management:** Evaluate effectiveness, efficiency, and contribution of cropland management programs to the FWS Refuge mission.	4% 5	4% 5	13% 15	16% 18	63% 73
5. **Invasive species management:** How can refuges work together to identify the impacts of invasive species on native communities of plants and animals and identify priorities for invasive species control?	41% 47	33% 38	15% 17	6% 7	6% 7
6. **Piping plovers and terns and predators:** Explore best management practices for predator management within tern and piping plover nesting areas.	9% 10	5% 6	9% 11	16% 18	61% 71
7. **Forest management for focal species:** Identify best forest management and restoration practices to benefit high priority forest wildlife, including land birds.	31% 36	17% 20	11% 13	14% 16	27% 31
8. **Reed canary grass control and management:** Develop effective management practices to achieve long-term control of reed canary grass.	20% 23	13% 15	11% 13	13% 15	43% 50
9. **Scrub/shrub habitat management:** What are the best methods of managing early successional habitats for high priority species?	15% 17	23% 27	23% 27	21% 24	18% 21
10. **Savanna restoration:** Identify savanna management practices that best meet refuge objectives.	7% 8	4% 5	17% 20	9% 10	63% 73

6. Please select any adaptive management topics from the list below that your station would be willing to participate in, if we convene a workshop or a study to address it. Participation will include sending a representative to one or more workshops with USGS and other scientists to clearly define the problem such that a FWS/USGS cooperative study can be developed. Funding is available to support travel to such a meeting. Participation will also mean that your field station will be considered for inclusion in the study and your biology staff may be asked to coordinate or participate in data collection.

	Number of Responses	Response Ratio
Mitigating human disturbance: What refuge management practices can be employed to mitigate the negative effects of refuge visitors and refuge management presence on wildlife?	22	24%
Grasslands and ground-nesting birds: Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds.	33	36%
Saltmarsh management: Explore best management practices for the conservation and restoration of salt marshes, including use of a Saltmarsh Condition Index and associated Index of Biological Integrity.	11	12%
Cropland management: Evaluate effectiveness, efficiency, and contribution of cropland		

management programs to the FWS
Refuge mission.

| | 12 | 13% |

Invasive species management:
How can refuges work together to
identify the impacts of invasive
species on native communities of
plants and animals and identify
priorities for invasive species
control?

| | 54 | 59% |

**Piping plovers and terns and
predators:** Explore best
management practices for predator
management within tern and piping
plover nesting areas.

| | 15 | 16% |

**Forest management for focal
species:** Identify best forest
management and restoration
practices to benefit high priority
forest wildlife, including land birds.

| | 49 | 54% |

**Reed canary grass control and
management:** Develop effective
management practices to achieve
long-term control of reed canary
grass.

| | 27 | 30% |

**Scrub/shrub habitat
management:** What are the best
methods of managing early
successional habitats for high
priority species?

| | 33 | 36% |

Savanna restoration: Identify
savanna management practices
that best meet refuge objectives.

| | 14 | 15% |

7. You did not select any topics for your station to participate in, please indicate your concerns below.

		Number of Responses	Response Ratio
None of the listed topics are important to the management of my station.		2	8%
My station lacks the time to participate in workshops, coordination, or data collection on any topic this year or next year.		7	28%
VIEW Other, please describe:		16	64%
	Total	25	100%

8. Please describe a topic that would be more useful to you.

VIEW 1 Responses

9. Identify categories of human disturbance that may be appropriate for multi-refuge studies at your refuge:

	Number of Responses	Response Ratio
Auto-tour route disturbance	9	41%
Hiking trails	12	55%
Boating	10	45%

Hunting		13	59%
Beach-use		7	32%
VIEW Other, please describe:		13	59%

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Cross Tabulation Results

BACK

AM_Needs_Final_2
Completes only
Report created on: 5/15/2006 9:51 AM

The table below shows the results from comparing the following selected questions.

Please rate the importance of each of the following adaptive management topics to the management of your station.: Mitigating human disturbance: What refuge management practices can be employed to mitigate the negative effects of refuge visitors and refuge management presence on wildlife?

	Total	Identify your region::	
		Region 3	Region 5
Total	**116**	60	56
Very high priority	22	11	11
High priority	23	12	11
Medium priority	30	15	15
Low priority	28	15	13
Not Applicable	13	7	6

Please rate the importance of each of the following adaptive management topics to the management of your station.: Grasslands and ground-nesting birds: Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds.

	Total	Identify your region::	
		Region 3	Region 5
Total	**116**	60	56
Very high priority	18	12	6
High priority	19	11	8
Medium priority	25	14	11
Low priority	26	13	13
Not Applicable	28	10	18

Please rate the importance of each of the following adaptive management topics to the management of your station.: Saltmarsh management: Explore best management practices for the conservation and restoration of salt marshes, including use of a Saltmarsh Condition Index and associated Index of Biological Integrity.

	Total	Identify your region::	
		Region 3	Region 5
Total	**116**	60	56
Very high priority	6	0	6
High priority	8	0	8
Medium priority	6	0	6
Low priority	4	1	3
Not Applicable	92	59	33

Please rate the importance of each of the following adaptive management topics to the management of your station.: Cropland management: Evaluate effectiveness, efficiency, and contribution of cropland management programs to the FWS Refuge mission.

	Total	Identify your region::	
		Region 3	Region 5
Total	**116**	60	56
Very high priority	5	2	3
High priority	5	3	2
Medium priority	15	11	4
Low priority	18	15	3
Not Applicable	73	29	44

Please rate the importance of each of the following adaptive management topics to the management of your station.: Invasive species management: How can refuges work together to identify the impacts of invasive species on native communities of plants and animals and identify priorities for invasive species control?

	Total	Identify your region::	
		Region 3	Region 5
Total	**116**	60	56
Very high priority	47	27	20
High priority	38	20	18
Medium priority	17	9	8
Low priority	7	0	7
Not Applicable	7	4	3

Please rate the importance of each of the following adaptive management topics to the management of your station.: Piping plovers and terns and predators: Explore best management practices for predator management within tern and piping plover nesting areas.

	Total	Identify your region::	
		Region 3	Region 5
Total	**116**	60	56
Very high priority	10	1	9
High priority	6	0	6
Medium priority	11	7	4
Low priority	18	14	4
Not Applicable	71	38	33

Please rate the importance of each of the following adaptive management topics to the management of your station.: Forest management for focal species: Identify best forest management and restoration practices to benefit high priority forest wildlife, including land birds.

	Total	Identify your region::	
		Region 3	Region 5
Total	**116**	60	56
Very high priority	36	22	14
High priority	20	5	15

Medium priority		13	7	6
Low priority		16	8	8
Not Applicable		31	18	13

Please rate the importance of each of the following adaptive management topics to the management of your station.: Reed canary grass control and management: Develop effective management practices to achieve long-term control of reed canary grass.

	Total	Identify your region::	
		Region 3	**Region 5**
Total	**116**	60	56
Very high priority	23	21	2
High priority	15	12	3
Medium priority	13	9	4
Low priority	15	8	7
Not Applicable	50	10	40

Please rate the importance of each of the following adaptive management topics to the management of your station.: Scrub/shrub habitat management: What are the best methods of managing early successional habitats for high priority species?

	Total	Identify your region::	
		Region 3	**Region 5**
Total	**116**	60	56
Very high priority	17	7	10
High priority	27	11	16
Medium priority	27	12	15
Low priority	24	19	5
Not Applicable	21	11	10

Please rate the importance of each of the following adaptive management topics to the management of your station.: Savanna restoration: Identify savanna management practices that best meet refuge objectives.

	Total	Identify your region::	
		Region 3	**Region 5**
Total	**116**	60	56
Very high priority	8	8	0
High priority	5	4	1
Medium priority	20	18	2
Low priority	10	7	3
Not Applicable	73	23	50

Please select any adaptive management topics from the list below that your station would be willing to participate in, if we convene a workshop or a study to address it. Participation will include sending a representative to one or more workshops with USGS and other scientists to clearly define the problem such that a FWS/USGS cooperative study can be developed. Funding is available to support travel to such a meeting. Participation will also mean that your field station will be considered for inclusion in the study and your biology staff may be asked to coordinate or participate in data collection.

	Total	Identify your region::

	Region 3	Region 5
Total	**91**	51	40
Mitigating human disturbance: What refuge management practices can be employed to mitigate the negative effects of refuge visitors and refuge management presence on wildlife?	22	13	9
Grasslands and ground-nesting birds: Test grassland management practices to determine their impact on the reproductive success of ground-nesting birds.	33	18	15
Saltmarsh management: Explore best management practices for the conservation and restoration of salt marshes, including use of a Saltmarsh Condition Index and associated Index of Biological Integrity.	11	0	11
Cropland management: Evaluate effectiveness, efficiency, and contribution of cropland management programs to the FWS Refuge mission.	12	5	7
Invasive species management: How can refuges work together to identify the impacts of invasive species on native communities of plants and animals and identify priorities for invasive species control?	54	36	18
Piping plovers and terns and predators: Explore best management practices for predator management within tern and piping plover nesting areas.	15	0	15
Forest management for focal species: Identify best forest management and restoration practices to benefit high priority forest wildlife, including land birds.	49	25	24
Reed canary grass control and management: Develop effective management practices to achieve long-term control of reed canary grass.	27	24	3
Scrub/shrub habitat management: What are the best methods of managing early successional habitats for high priority species?	33	8	25
Savanna restoration: Identify savanna management practices that best meet refuge objectives.	14	12	2

You did not select any topics for your station to participate in, please indicate your concerns below.:

	Total	Identify your region::	
		Region 3	Region 5
Total	**25**	9	16
None of the listed topics are important to the management of my station.	2	1	1
My station lacks the time to participate in workshops, coordination, or data collection on any topic this year or next year.	7	3	4
Other, please describe:	16	5	11

Identify categories of human disturbance that may be appropriate for multi-refuge studies at your refuge:

	Total	Identify your region::	
		Region 3	Region 5
Total	**22**	13	9
Auto-tour route disturbance	9	5	4
Hiking trails	12	7	5
Boating	10	5	5
Hunting	13	8	5
Beach-use	7	4	3
Other, please describe:	13	4	9

Survey Results (Included Responses)

Adaptive Management Needs Survey

Questions that required written responses are displayed by individual query. The "Report Overview" button
or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

7. You did not select any topics for your station to participate in, please indicate your concerns
below.

#	Response
1	Regional Supervisor indicating my preferences
2	Carlton Pond WPA is unstaffed.
3	Sunkhaze Meadows NWR has only one staff person.
4	Satellite Refuge not actively managed.
5	Big Stone NWR is better suited for AM Projects.
6	NTGP NWR units are covered under MN&IA WMDs.
7	Station lacks biologist,so no staff to lead effort
8	We own no fee title land within the Tamarac WMD.
9	small staff; interest in disturbance and predators
10	Mashpee is small, topics are not high priority
11	Refuge is small and difficult to access
12	Funding and time MAY be limiting
13	Time and funding MAY be limiting
14	Possibly interested; time and staff may be limited
15	interested, but staff and time may be limiting
16	interested, but staff and time may be limiting

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Survey Results (Included Responses)   REPORT OVERVIEW

Adaptive Management Needs Survey

Questions that required written responses are displayed by individual query. The "Report Overview" button
or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

8. Please describe a topic that would be more useful to you.

#	Response
1	The topics are important. However, NTGP NWR has no staff except for me. The units are managed by WMDs in MN and IA and would be included in their WMD surveys.

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Survey Results (Included Responses)   REPORT OVERVIEW

Adaptive Management Needs Survey

Questions that required written responses are displayed by individual query. The "Report Overview" button
or "Back" button will return you to your survey results.

Each individual respondent is referenced under the # column.

9. Identify categories of human disturbance that may be appropriate for multi-refuge studies at your refuge:

#	Response
1	vehicle use on beach
2	Day to day operations of the Refuge
3	dogs, cross country skiing
4	off road vehicle ravel
5	Fishing
6	reral residential development, urbanization
7	1. Residential development near the refuge 2. Impacts of increases in impervious surfaces on water quality and quantity
8	recreational use of coastal islands
9	Fishing
10	snowmobiles, atv's
11	horseback riding, biking and jogging trails
12	wildlife observation, educational requests
13	birding, wildlife observation