
CHAPTER 4: CONSERVATION ACTIONS AND OPPORTUNITIES TO ADDRESS THE KEY ISSUES FACING DELAWARE'S SPECIES OF GREATEST CONSERVATION NEED AND THEIR HABITATS



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Introduction

Conservation Actions are the measures taken to eliminate, minimize, or mitigate the impacts of the issues facing Delaware’s Species of Greatest Conservation Need (SGCN) and their habitats. This chapter addresses Element 4 and presents the actions the Delaware Department of Natural Resources and Environmental Control, Division of Fish and Wildlife (DNREC DFW) and its partners developed and prioritized to address Elements 1, 2, and 3.

Chapter 1 described Delaware’s fish and wildlife species most in need of conservation. Chapter 2 described how Delaware identified key fish and wildlife habitats in the state. The Delaware Wildlife Action Plan (DEWAP) process then identified the key problems and issues facing SGCN and their key habitats, which are presented in Chapter 3. This chapter focuses on the priority conservation actions that address these threats to Delaware’s SGCN and their associated habitats.

The Delaware Wildlife Action Plan Revision conservation planning process began with the 2006 plan as the foundation and updated it using the best, most current, local, state, regional, and national information on threats and actions (Appendix 1.D). Hundreds of the most relevant plans and programs were researched and a draft list of actions was developed. This draft list was refined and prioritized through a process of input and workshops involving partners and stakeholders to identify and rank the highest priority actions recommended over the next decade. The DEWAP process applied standardized “taxonomies” for organizing information and actions (primarily the Tracking and Reporting Actions for the Conservation of Species (TRACS) system), coordinated with the 13 Northeast states in the development of the Northeast Lexicon (Crisfield and NEFWDC 2013). Delaware’s conservation actions and research, survey, and monitoring needs are presented using these terms and categories in this chapter and are organized by the key issue they address.

Regional Context and Priority Actions Identified by Northeast Wildlife Action Plans

After the completion of the 13 Northeast State 2005 Comprehensive Wildlife Conservation Strategies (now called Wildlife Action Plans or WAPs), a survey was conducted as part of the Association of Fish and Wildlife Agencies' (AFWA) National Synthesis to identify the key actions listed by each state in their WAPs (AFWA 2011). A list of these key recurring actions in the northeastern states is presented in Table 4.1.

Table 4. 1 Key Actions identified by Northeastern States Wildlife Action Plans (in descending order of listing recurrences).

| Key Actions Identified by Northeastern State Wildlife Action Plans |
|--|
| Land/Water Protection: Resource & Habitat Protection |
| Planning/Best Management Practices (BMPs): Planning |
| Data Gaps/Research: Monitoring |
| Land/Water Protection: Site/Area Protection |

| Key Actions Identified by Northeastern State Wildlife Action Plans |
|---|
| Education & Awareness: Awareness & Communications |
| External Capacity Building: Alliance & Partnership Development |
| Data Gaps/Research: Property Assessment and Prioritization |
| Data Gaps/Research: Research |
| Land/Water Management: Habitat & Natural Process Restoration |
| Data Gaps/Research: Threats Assessment |
| Land/Water Management: Site/Area Management |
| Data Gaps/Research: Data Collection and Management |
| Law & Policy: Legislation |
| Education & Awareness: Training |
| Law & Policy: Compliance & Enforcement |
| External Capacity Building: Conservation Funding |
| Law & Policy: Policies & Regulations |
| Land/Water Management: Invasive/Problematic Species Control |
| Livelihood, Economic & Other Incentives: Conservation Payments |
| Law & Policy: Private Sector Standards |
| Species Management: Species Management |
| Planning/BMPs: BMPs |
| Other: Non-IUCN Action: Other |
| Data Gaps/Research: Inventory |
| Data Gaps/Research: Exploratory Survey |
| Data Gaps/Research: Evaluation |
| Data Gaps/Research: Species assessment |
| Species Management: Species Recovery |
| Livelihood, Economic & Other Incentives: Conservation-related Livelihood |
| Livelihood, Economic & Other Incentives: Eco-friendly Alternatives |
| Livelihood, Economic & Other Incentives: Market-driven Incentives |
| Livelihood, Economic & Other Incentives: Non-Monetary (cultural, etc.) Values |
| Education & Awareness: Formal Education |

Development of Conservation Actions for the 2015 Revision

Conservation actions and research, survey, and monitoring needs were developed for the original 2006 DEWAP based on a review of hundreds of existing conservation and management plans and information provided by DNREC DFW staff and key partners and stakeholders during the DEWAP input process. These conservation programs and plans were identified through a literature search compiling current local, state and regional, national, and international conservation plans and data sources (listed in Appendices 1.D and 5.A).

Conservation actions for this 2015 revision were developed using a similar process and began with a review of the original 2006 actions. Each action was reevaluated and revised using the Northeast Lexicon criteria.

Delaware Wildlife Action Plan

Progress on actions since the 2006 DEWAP was also evaluated as well as the need to continue the action. Performance measures for each action were identified, and Chapter 5 describes the DEWAP approach to monitoring these measures in more detail.

A series of workshops were held to solicit input and review existing actions and identify additional actions from partners and stakeholders. Draft conservation action reports were sent to 150 stakeholders for review and comment and workshops followed to solicit their input and ranking on each action. These teams identified gaps, suggested new actions, and reviewed the 1500+ actions compiled.

Actions were ranked using the Northeast Lexicon criteria (common terminology that the 13 northeastern states agreed upon) and actions were categorized and coded for consistency and clarity. Similar to the classification of issues described in Chapter 3, two major classification systems were used to categorize conservation actions. A crosswalk between International Union for the Conservation of Nature (IUCN) and TRACS classification systems resulted in a unified, comprehensive action classification system as recommended in the AFWA Best Practices (AFWA 2012) and was developed in coordination with the Northeast Lexicon for Threats and Actions (Crisfield and NEFWDC 2013), see Appendix 4.

The Revision Development Team converted each of the 2006 Issues and Actions to the IUCN and TRACS systems, using the categories identified in Appendices 3 and 4, respectively. Members of the Technical Review Team did the initial round of review, updates, and ranks of these 2006 issues. They were asked to provide six ranks, each on a whole number scale of one through three, which were then averaged to create the final rank for each action. The ranking criteria, adapted from the Northeast Lexicon and Synthesis (Crisfield and NEFWDC 2013; Terwilliger and NEFWDC 2013), can be found in Appendix 4.

During the workshops, teams of experts, partners, and stakeholders identified and contributed to the ranking of the 2007 actions, particularly where there were data gaps and thus actions that were left unranked by the Technical Team. Participants at these workshops, and those who contributed via phone calls and emails, provided additional updated information on previously unidentified actions to address the issues facing Delaware's SGCN. Teams then grouped and condensed these actions, where similar, for species suites, habitat associations, or broader taxa applicability. A similar process was conducted for identifying and updating actions addressing statewide issues and issues affecting each key habitat.

Worksheets and reports with draft actions, organized by issue, were distributed to DNREC and partner programs for their final review of the draft 2015 conservation actions. Partner and stakeholder input was requested on the draft ranks, and draft actions were posted on the web for public review and comment. All comments were recorded and compiled, resulting in the list of conservation actions that are presented in this 2015 DEWAP below.

Priority conservation actions and research, survey, and monitoring needs are organized and presented by the issues they address. The most broad, statewide actions are presented in the first section (Table 4.2), as they apply to most or all SGCN and Priority Wildlife Habitats, and do not need to be repeated. Habitat-specific actions are then listed in the second section for each habitat (Table 4.3), and apply to wildlife

habitats. In the third and final section, taxa-oriented actions are presented that address species directly, most often by ecological groupings (Table 4.4).

Table 4. 2 Number of General Statewide Issues and Actions Identified in the 2015 DEWAP Revision

| IUCN_Level1 Threat Category | # Issues | # Actions |
|---|-----------------|------------------|
| Administrative needs | 16 | 48 |
| Agriculture and aquaculture | 3 | 5 |
| Biological resource use | 5 | 9 |
| Climate change and severe weather | 13 | 30 |
| Education Outreach needs | 7 | 20 |
| Energy production and mining | 2 | 2 |
| Human intrusions and disturbance | 1 | 9 |
| Invasive and other problematic species, genes, and diseases | 11 | 29 |
| Natural system modifications | 10 | 15 |
| Pollution | 8 | 17 |
| Recreation needs | 1 | 1 |
| Residential and commercial development | 15 | 33 |
| Resource management needs | 17 | 38 |
| Transportation and service corridors | 10 | 19 |

Table 4. 3 Number of Habitat Issues and Actions Identified in the 2015 DEWAP Revision

| Habitat_Group | Specific Issue Count | Specific Action Count |
|----------------------------|-----------------------------|------------------------------|
| Agricultural | 2 | 2 |
| All Wetlands | 8 | 22 |
| Estuarine or Marine | 24 | 57 |
| Forested Nontidal Wetlands | 30 | 79 |
| Modified Uplands | 3 | 4 |
| Modified Wetlands | 5 | 10 |
| Natural Forested Uplands | 21 | 62 |
| Natural Unforested Uplands | 29 | 82 |
| Open Nontidal Wetlands | 14 | 53 |
| Riverine | 21 | 50 |
| Statewide | 114 | 275 |
| Tidal Wetlands | 18 | 59 |

Table 4. 4 Number of Taxa Specific Issues and Actions Identified in the 2015 DEWAP Revision

| # Issues | # Actions | Taxa |
|-----------------|------------------|---------------|
| 170 | 290 | Birds |
| 20 | 38 | Fish |
| 72 | 108 | Herpetofauna |
| 112 | 148 | Invertebrates |

| | | |
|----|----|---------|
| 45 | 67 | Mammals |
|----|----|---------|

Identifying conservation actions and research, survey, and monitoring needs provides the foundation for the dynamic process of developing accurate and current information on Delaware’s SGCN and key habitats. Use and dissemination of this information enables the important step of incorporating it into land use decisions and key conservation efforts across the state. Implementation of the actions will require the efforts of many conservation partners working together to incorporate the needs of SGCN and key habitats into their programs and plans throughout the next decade.

Statewide Conservation Actions

In the process of identifying conservation actions for SGCN and their habitats, recurring patterns and priorities emerged that cross taxonomic and ecological boundaries. These more general, statewide conservation actions were recognized to have broad impacts across taxa and habitats and are presented in the first section of tabular reports, *Statewide Conservation Issues and Actions*, beginning on page 4 - 26. These broader conservation actions address the primary statewide issues identified in Chapter 3. For example, surveys, monitoring, and research directly address the need for additional scientific information regarding habitat and species distribution, abundance, and condition. The new information obtained from additional surveys will be used to identify limiting factors and habitat requirements for all SGCN and to identify Geographic Information Systems (GIS) mapping and database management needs. This will inform DNREC and its partners to better identify and address emerging issues such as new disease or invasive species that may pose serious threats over the next decade as well as broad and longer term impacts, such as climate change. Other broad conservation actions attempt to minimize habitat stressors and improve key habitats for SGCN, while others support regional planning and coordination efforts including the Regional Conservation Needs (RCN) program.

Implementing the broad spectrum of high priority conservation actions identified in this chapter will be a challenge. Fortunately, DNREC DFW has developed a collaborative working relationship with many public and private conservation partners to facilitate coordinated research and management. Federal partners, especially the U.S. Fish and Wildlife Service (USFWS), and national, state, and local non-governmental conservation groups have a long history of working with DNREC DFW to benefit the conservation of Delaware’s fish and wildlife. These partnerships helped implement the previous DEWAP priority actions, and will need to expand if the conservation actions and research needs proposed in this document are to be accomplished. It is the intent of DNREC DFW to maximize collaboration with conservation partners in the implementation of the many actions identified in this WAP. The AFWA’s 2011 report on Effectiveness Measures for State Wildlife Grants (SWG) classifies these actions and provides objectives and indicators to measure their outcome. Examples of the DEWAP indicators and performance measures for these actions are provided for each action category and are an important component of the DEWAP database, please see Appendix 4.

The following section provides a general discussion of these general, TRACS level 1 action categories to illustrate their importance and application in Delaware. Following this narrative section, all actions identified for the 2015 DEWAP are listed in the 3 levels described above: statewide, then habitat, and then species/taxa summarized counts listed in Tables 4.2, 4.3, and 4.4, respectively.

Administration and Planning

Many important administrative needs were identified by stakeholders, partners and DEWAP teams. The number of priority administrative needs and actions identified during this DEWAP revision process will require significant effort within DNREC. However, the extent to which they can be implemented is also dependent upon external factors outside of the agency's control. A number of long-standing constraints limit the Department's ability to fully implement the WAP including a need for increased capacity and a need for advocacy from partners and the public to increase available resources.

Over the past several years, DNREC DFW budgets and staffing levels have continued to decline. Whereas hunting and fishing license fees allow matching of existing federal aid for game and fish research and management, there remains insufficient in-house capacity and match for non-game wildlife and SGCN. In many cases, conservation partners have had to fulfill that role. DNREC DFW cannot fully carry out its mission and implement the DEWAP until these capacity issues are addressed. Multiple stakeholders and key partners voiced concerns about the need for additional funding sources and capacity so that the division can more fully achieve its mission.

Working in advance of issues rather than reacting to them will help mitigate impacts on fish and wildlife and their habitats. Planning can be done at many scales – nationally, regionally, statewide, and locally. All of these scales have the ability to promote sound conservation practices that can maximize benefit to Delaware's fish and wildlife in the short and longer term.

The DEWAP has considered and incorporated by reference many partner plans and programs (Appendix 1.D and 5) from endangered species recovery plans to the *Delaware Statewide Forest Strategy* and the *Climate Framework for Delaware*. This provides support for shared priorities and maximizes coordination between local, state, and federal agencies. Partners have the opportunity to include DEWAP information and actions in their planning. In particular, the Priority Wildlife Habitat and Conservation Opportunity Area (COA) maps can be incorporated into state and local land use planning. Next steps could include developing customized information or maps at a finer municipal scale to incorporate these WAP priorities into additional statewide and municipal land use decisions.

Specific planning actions include assisting partners in implementing their plans (see Appendix 1.D) for SGCN and key habitats, as well as incorporating the DEWAP priorities into partners' plans. Examples include coordination and DEWAP integration with the Delaware Department of Transportation (DelDOT), statewide planning, and local comprehensive plans. Outcomes measured for the administrative conservation actions below would include increased (agency and partner) capacity and development of new and enhanced administrative means (incentives and structure) to conserve the SGCN and key habitats and implement the priority actions identified in this DEWAP.

Planning occurs at many levels, and the DEWAP should be used to inform at local, state, regional and national levels. Planning at the regional level will continue through DNREC support of the RCN and other key regional coordination and prioritization efforts.

Actions to Address Climate Change

Delaware supported important Northeast regional efforts to address climate change through the Regional Conservation Needs (RCN) program and the Northeast Fish and Wildlife Diversity Technical Committee (NEFWBTC). This included the Northeast Climate Science Center's (NECSC) synthesis of regional information on climate change (USGS 2015; <http://necsc.umass.edu>). This will be applied over the next decade through implementation of the 2015 DEWAP along with the priority actions from the climate framework and actions to protect habitats identified to be at high risk from sea level rise (SLR) in the SLR vulnerability assessment. To help communities plan for the impacts of climate change, federal, state, and local governments, universities and non-profit organizations have developed various tools that pertain to Delaware including the following.

Developing adaptation strategies for individual species depends on the vulnerability of specific species independent of, or in addition to, the vulnerability of the habitats within which they are found. In general, strategies employed to mitigate impacts to vulnerable habitats would also benefit resident species, although there are a number of characteristics that may increase a particular species' vulnerability.

The Northeast Association of Fish and Wildlife Agencies (NEAFWA) white papers identified the following specific factors:

- **Diet:** Climate change can affect species populations by increasing or decreasing the availability of a primary food source or by changing the seasonal timing of the availability of the food source. In general, species that eat a wide variety of foods are less vulnerable than species that depend on specific foods.
- **Disease:** Higher temperatures can increase growth rates, strains, distribution of disease carriers, and susceptibility of the host animal to diseases and parasites, especially for aquatic species.
- **Habitat:** Climate change will affect plant community composition through changes in temperature, hydrology, and disturbance regimes (storms, fires, insect outbreaks, and diseases). These habitat changes will have direct effects on population sizes that can be supported by suitable habitat (both aquatic and terrestrial). As with diet, species that utilize a broader range of habitat types will be less vulnerable to climate change.
- **Dispersal:** When habitats are degraded and become unsuitable (for any reason), species' abilities to find new habitat depend on their mobility and the connectivity of suitable habitat.
- **Phenology:** In addition to the importance of timing of food availability, some species rely on environmental cues for breeding or migration. Monitoring programs will be needed to determine when populations are declining due to changes in timing and management activities (harvest, stocking, etc.) may be adjusted.

- **Competition and inter-dependence:** Because some species are benefited by changes in climate and habitat while others are negatively impacted, changes in the competitive balance between species or the dependent relationships between species are expected. These changes are complex and likely to be surprising, even with strong monitoring efforts. In the future, new/novel climate niches and associated habitats may completely disrupt established competitive and dependent relationships between species.

In particular, the strategy of introducing species to areas outside their historical range to secure their future under climate change is a controversial adaptation action. Referred to as “managed relocation,” “assisted migration,” or “assisted colonization,” there has been considerable debate in the literature concerning the implementation of this methodology (Beardmore and Winder 2011; Rout et al. 2013). One question is whether such introductions are worth the financial costs and ecological risks, i.e., what might be the potential collateral damage to the ecosystem at the introduction site. Although the small size of Delaware limits the efficacy of conducting such projects within the state, it may be prudent to develop policies regarding managed relocations in advance of requests to conduct such projects. This regional context informed and helped frame the DEWAP approach to climate change.

The Climate Framework for Delaware (Delaware DNREC 2014) summarizes recommendations provided by three workgroups formed under Executive Order 41: Mitigation, Adaptation, and Flood Avoidance. The Climate Framework was approved by the Cabinet Committee on Climate and Resilience (CCoCAR) in December 2014.

Actions to address the impacts of climate change on SGCN are being conducted throughout Delaware by state (DNREC) and federal (USFWS) agencies, non-governmental organizations (NGOs), and private landowners. Current projects include the restoration of impoundments vulnerable to coastal storms and climate change back to tidal marsh (Prime Hook National Wildlife Refuge (NWR) by USFWS); adaptive and strategic retreat of coastal impoundments to provide tidal buffers from coastal storms (Little Creek Wildlife Area DNREC); creating new impoundments from adjacent agricultural fields to provide strategic retreat of existing coastal impoundments (Ted Harvey Conservation Area DNREC); and restoration of coastal forests damaged by saltwater intrusion associated with storm surges (Milford Neck Conservation Area DNREC/Delaware Wild Lands, Inc./The Nature Conservancy (TNC)). All of these projects attempt to examine future climate change scenarios and protect SGCN and their habitats from the effects of climate change and sea level rise. However, increased funding and capacity will be required over the next decade to scale these efforts up to the level necessary to address the magnitude of this threat to Delaware's SGCN.

The outcomes measured for the climate change preparedness conservation actions include:

- Percent of planning and climate preparedness actions implemented as planned;
- Evidence that clear planning needs and outcomes have been identified with input from relevant users;
- Evidence that the planning clearly provides relevant information and process to relevant audiences to achieve the desired response;
- Evidence that planning is reducing key threats; and

- Response of the SGCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Law and Policy

Enforcing laws, and creating regulations and policies to ensure fish, wildlife, and their habitats persist in the future are important roles of DNREC. These laws and policies can prevent detrimental impacts through permitting and environmental review and can promote conservation practices through financial incentives or by generating funding.

Actions identified in this category address the fundamental objective of protecting Delaware's SGCN and their habitats. Human activities, including excessive visitation, may result in direct physical damage to wildlife and habitats. For example, at sandy beaches used as nesting areas by plovers and terns, human activity impacts reproductive success of these ground-nesting species. Other examples include the need to minimize impacts of collection and harvesting of native species in need of conservation by evaluation of current policies and regulations. Development and enforcement of laws, regulations, and policies to conserve Delaware's SGCN and key habitats are an important aspect of DNREC's mission.

Creating laws and policies to ensure fish, wildlife, and their habitats persist in the future is another important role of DNREC DFW. These laws and policies can prevent detrimental impacts to wildlife and their habitats and promote conservation practices through financial incentives or generating funding. Outcomes measured for the law and policy conservation actions below include:

- Percent of law and policy actions implemented as planned;
- Evidence that law and policy change/ action is reducing key threats;
- Degree to which target SGCN or key habitats respond as expected from new or improved law and policy changes; and
- Response of the SGCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Education and Outreach

The 2006 DEWAP identified several actions to address the need for additional support for conservation education and awareness. It called for an increase in communication and outreach to diverse audiences, including private landowners, state and federal regulatory agencies, land trusts, other NGOs, municipalities, schools and the public.

Such actions fulfill the fundamental objective and need to inform Delaware's public and stakeholders. It is necessary to develop cost-effective ways to create effective outreach to parties who can assist with wildlife conservation. Partners, especially NGOs, offer excellent collaborative opportunities, through their facilities and communications, to expand information dissemination for the conservation of SGCN and their habitats. Many examples exist with the partners listed in Appendix 6.A.

Outcomes measured for the education and outreach conservation actions below include:

- Percent of education and outreach actions implemented as planned;

- Evidence that education and outreach clearly provides relevant information and format to relevant audiences to achieve increased awareness, behavior change and other desired response; and
- Response of the SGCN and key habitat to determine if the outcomes were achieved. If not, adaptive management would be applied.

Technical Assistance

This category of actions addresses the need to inform and partner with key public and private conservation entities in the state. There are a number of existing programs within Natural Resources Conservation Service (NRCS), USFWS, DelDOT, Delaware Department of Agriculture (DDA), and other agencies designed to promote opportunities for private landowners and other entities to enhance wildlife conservation and habitat management on their properties (see Chapter 2 and Appendix 5). Landowners may be eligible for funding to perform the task, but may be unaware of the many partners' programs that offer financial and technical assistance. Working with such local, state, regional, and federal partners facilitates a coordinated landowner outreach effort and maximizes the conservation program delivery to preserve the integrity of these important parcels and focal areas.

DNREC can provide technical assistance to DelDOT and municipalities to mitigate the effects of roads and other barriers to wildlife travel. Roads constrain the extent and mobility of wildlife populations whether through direct mortality or acting as impassable barriers. Roadways serve as conduits for the introduction of contaminants, invasive species, and other secondary effects of human infrastructure. For example, vegetation control and herbicide treatments and deicing salts from road run-off can affect fish and wildlife. Road lighting attracts and impacts night-flying moths and other beneficial insects. Potential mitigating actions include more wildlife-friendly designs for energy efficiency and replacement of stream culverts; strategic road placement to minimize the spread of invasive species, especially on public lands; reducing drainage and other road run-off into nearby wetlands; and making connections across or underneath roads to allow for travel and to extend the effective preserve size.

For each of the conservation actions below, the response of the species of GCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied. Outcomes measured for technical assistance actions below include

- Number of individuals receiving technical assistance sorted by topic/action;
- Percent of target audience met across project sorted by topic/action;
- Percent of initiatives that show a reduction in key threats being addressed; and
- Response of the SGCN and key habitat to determine if the outcomes were achieved. If not, adaptive management would be applied.

Assisting Landowners

DNREC provides other types of technical assistance to public and private landowners. For example, Best Management Practices (BMPs) are established guidelines for minimizing adverse impacts to fish, wildlife, and their habitats (e.g. water quality) that landowners can apply to minimize the impact of commercial, industrial, or residential activities. Technical assistance and BMPs could help address widespread issues such as invasive species or encourage more wildlife-friendly practices by the public in their own backyards.

Several federal and state programs provide technical and cost share assistance to landowners for habitat management to protect, restore, enhance and manage habitats that support fish, wildlife and plant species considered at risk. Cost share projects include creation of wildlife habitat (including pollinators), reverting field restoration, warm season grass planting, control of invasives, and wetlands restoration.

Data Collection and Analysis to Address Information and Management Needs

Data collection (research, inventory, survey, monitoring) needs were identified for many SGCN and key habitats in Delaware. Specific actions to fill data gaps are listed under the appropriate habitats in the habitat and taxa sections at the end of this chapter. As data collection and management improve, key habitat and landscape-level maps and tools can be created to assist local land-use boards and commissions in reviewing development projects that may adversely impact SGCN or their key habitats. A more comprehensive wildlife database addressing current status and distribution through GIS mapping will support the development of improved statewide strategies for specific key habitats on state and private lands. Providing this information to partners, private landowners, local/town land managers, and land-use decision-making bodies is crucial to addressing the growing issues and pressures that Delaware's fish and wildlife face.

Scientific inventory and geospatial data in Delaware are improving, but still are not sufficient to produce accurate distribution and status maps for SGCN or all of the key habitats, or the associated vegetative communities. The field inventories and analyses to provide the data and mapping capabilities for the conservation of these GCN fish and wildlife species and key habitats remain a priority research and general planning need.

Improving the mapping of key habitats statewide helps direct distribution and abundance surveys of SGCN (particularly invertebrates) within these key habitats and associated vegetative communities. It also improves information on the locations and relative conditions of key habitats essential to the conservation of SGCN characteristic of or restricted to these habitats. This also allows for analyses and monitoring of the key habitats and their relative condition within their ecological contexts and helps to develop a framework for their conservation within Delaware's waters and landscape.

The DEWAP recognizes that assessment and monitoring of wildlife populations and their key habitats require performance measures upon which to evaluate the effectiveness of the process. However, it is not possible to conduct annual inventories for most SGCN. There is a need to develop an effective monitoring framework for a wide array of SGCN and their key habitats and to assess and monitor the status of these species in the most effective and efficient way. This would position DNREC and its partners to better address emerging needs such as disease and invasive species.

Continuing collaboration with partners to collect and analyze spatial and digital data on Delaware's waters and landscape will provide improved information and opportunity to assess and monitor the extent and condition of key habitats. Additional assessment and monitoring approaches can be incorporated into the WAP monitoring needs such as periodic checks of forest health, water quality, and other environmental monitoring programs that are already conducted in Delaware (see Appendices 1.D and 5). These will all be

evaluated in order to develop an effective monitoring framework for application to SGCN and key habitats, as well as monitoring their spatial and temporal effectiveness.

The 2nd Delaware Breeding Bird Atlas is an example of a highly collaborative survey effort to gather important monitoring data on breeding birds in Delaware. Funded by a SWG, more than 150 volunteers participated in surveys and data entry, collecting more than 117,000 records and providing over 11,300 of hours of in-kind survey time over five years (2008-2012) to document the breeding status of birds throughout the state. Their efforts resulted in updated distribution and breeding status information for all breeding avian SGCN. Results of the Atlas are being published in collaboration with several partner organizations. Partner agencies and organizations include DNREC Division of Parks and Recreation (DPR), USFWS NWRs (Bombay Hook and Prime Hook NWRs), Delmarva Ornithological Society, Sussex Bird Club, Delaware Nature Society, Delaware Museum of Natural History, Delaware Audubon, and the University of Delaware. Collaboration with USGS provided the project with a secure, web-based data entry portal and repository that continues to allow public access to the data. Additionally, private conservation organizations such as Delaware Wild Lands and the Delaware Chapter of TNC and other private landowners provided valuable access to non-public lands for the purpose of data collection. The final results and analysis of the Atlas effort are near completion and will be published in collaboration with several partner organizations.

The Association of Fish and Wildlife Agencies' 2011 report on Effectiveness Measures for State Wildlife Grants classifies surveys as a "Data Collection and Analysis." DEWAP indicators and performance measures for projects that involve data collection and analysis include the following and are a component of the DEWAP database (see Chapter 5):

- Evidence that clear management needs and outcomes have been identified with input from relevant data users;
- Evidence that the researcher clearly provides answers to relevant questions;
- Evidence that data are reaching relevant audiences;
- Evidence that data collection effort resulted in conservation action recommendations; and
- Evidence data are being used to inform conservation actions.

Direct Management of Natural Resources

Conserving SGCN and their key habitats is a fundamental objective of the DEWAP revision. AFWA (2011) defined direct management of natural resources as "stewardship of terrestrial and aquatic species, habitats and/or natural processes to maintain populations or restore ecological functions." These activities include conserving, managing, and restoring fish and wildlife populations and their habitat. Direct management of natural resources is one of the primary missions of DNREC.

Many factors influence management of natural resources, including staffing, budgets, policies that may not have the needed public support/understanding (e.g. creating early successional habitat), lack of knowledge regarding species status or habitat needs, and conflicting land uses.

The spread of invasive species is a major challenge to direct management. Understanding invasive species impacts and invasion processes is essential for determining appropriate management actions. New invasive

species continue to appear and more can be expected given that increasing temperature and other climate change factors exacerbate invasion processes (NWF and MSCC 2013). An additional factor that can promote the spread of invasive species is related to the overabundance of white-tailed deer.

The Wildlife Habitat Incentive Program was established in 1996 as one of several conservation programs that have been incorporated into the federal Farm Bill. Its purpose is to create, restore, and maintain upland and wetland wildlife habitat, with a priority of conserving habitats of threatened, endangered or other wildlife in need of conservation action. DNREC's Fish and Wildlife Division secured funding through this and other programs to assist landowners and coordinate with its federal partners to continue to implement these important wildlife habitat conservation and restoration efforts over the next decade.

Throughout Delaware's coastal marshes, SWG-funded control programs for *Phragmites* have helped restore thousands of acres of impoundment and fresh and brackish tidal marsh habitat critical to numerous SGCN on both public and private lands. Additionally, SWG funding has supported restoration projects in Delaware that directly benefit SGCN. For example, as part of a SWG, funds were used to restore and manage four acres of ancient sand ridge forest habitat, specifically to benefit three SGCN: frosted elfin, tearful underwing moth, and sweetfern underwing moth, all of which are dependent on plant species that are associated with ancient sand ridge habitat. Collaboration with more than 50 volunteers, including members of a local equestrian club, yielded donated time to assist with implementation of this project, generating more than 130 in-kind hours.

For the conservation actions below, the response of SGCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied. The Association of Fish and Wildlife Agencies' 2011 report on Effectiveness Measures for SWGs classifies actions in this category as a "Direct Management of Natural Resources." DEWAP indicators and performance measures for projects that involve Direct Management of Natural Resources include the following and are a component of the DEWAP database (see Chapter 5):

- Percent management actions implemented as planned;
- Evidence that direct management action is reducing key threats;
- Degree to which target SGCN respond as expected from direct management actions;
- Degree to which target habitats/processes respond as expected from direct management actions;
- Species Measures (e.g., population size, reproductive success); and
- Habitat Measures (e.g., size, condition).

Land and Water Acquisition and Protection

Protecting SGCN and their habitats through land acquisition and easement is another means of conserving these species in Delaware. Land protection actions were identified as critical to address the threat of habitat loss due to development and habitat degradation. The DEWAP recognizes that conservation needs to be conducted at all spatial scales, from broad landscapes to the smallest backyard. Every municipality, land trust, and citizen has the capacity to contribute to conservation of the state's fish and wildlife.

In Delaware, most existing preserves are not large enough to support some vulnerable species, due to pressures from public use of the preserves and indirect influences from surrounding land uses. Therefore, a strategy of increasing the size of protected preserves and connecting them to other conserved areas is needed. If acquisitions are prioritized with wildlife conservation as a primary goal, then issues such as habitat management, human disturbance, mortality of animals, and connectivity can be more strategically addressed.

Protection of aquatic systems is also challenging because inputs generated throughout an entire watershed, including contaminants and invasive species, can impact aquatic habitats at great distances from their sources. Freshwater aquatic systems are used for power generation, drinking water, and irrigation, putting additional stresses on these systems. Programs to restore stream connectivity and improve or maintain flow rates and water quality must be expanded. Examples of conservation at this scale are the Delaware Water Resources Registry and the Delaware Bayshore Initiative.

An example of collaborative habitat acquisition facilitated by SWGs was the purchase of the Fitzgerald marsh property by DNREC DFW in 2010. A SWG grant helped DNREC DFW acquire 52 acres of degraded tidal marsh adjacent to an existing state wildlife area (Milford Neck Wildlife Area) and within 0.3 miles of the most significant shorebird stopover site in Delaware Bay (Mispillion Harbor). The site will provide suitable roosting habitat for shorebird SGCN as well as nesting habitat for saltmarsh SGCN including seaside and saltmarsh sparrows. This project was supported financially by the Delmarva Ornithological Society and other non-governmental conservation partners. Other land acquisitions continue to involve conservation partner organizations in prioritization and funding.

The Association of Fish and Wildlife Agencies' 2011 report on Effectiveness Measures for State Wildlife Grants classifies actions in this category as "Acquisition/ Easement/Lease." The DEWAP indicators and performance measures for projects are listed below and are a component of the DEWAP database:

- % of prioritized land purchased, leased, or put into easement
- % of protected land with management and monitoring plans that outline steps required to achieve desired conservation results
- % of land acquisition actions in which management plans are being implemented
- % of initiatives that show a reduction in key threats being addressed by management plan
- % of protected lands at the time of renewal that are: a) renewed; b) converted from lease to easement or c) converted to acquisition
- % of easements or leases in compliance

Conservation Opportunity Areas - Guiding Conservation on the Ground in Delaware

A goal of SWAPs is the development of COAs that map and prioritize opportunities for conservation of key habitats and SGCN. AFWA Best Practices (2012) recommend that WAPs identify and spatially depict priority areas on the landscape that offer the best opportunities and potential for SGCN conservation, designating

them as “Conservation Opportunity Areas” (COAs). Collaborative efforts at the regional scale with North Atlantic Landscape Conservation Cooperative (NALCC), TNC, and UMass Sustainable Landscapes program are developing further regional guidance as well. Identification of COAs was informed by the regional effort to identify COAs, and the DEWAP Core Team and DNREC DFW staff were informed by other partner efforts that identified areas important to Delaware’s wildlife. These included the DE Bayshore Initiative, Delaware Ecological Network, Habitats of Conservation Concern, and Audubon’s Important Bird Areas (IBA), among others.

DNREC and its aquatic partners’ programs informed the aquatic COA identification. Marine and estuarine COA development considered the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA NMFS) Essential Fish Habitat and the Atlantic Coast Fish Habitat Partnership efforts. Freshwater COAs were informed by the regional and statewide connectivity and water quality efforts and the water quality monitoring programs of DNREC and its partners. A DNREC/EPA partnership is developing a Watershed Resources Registry (WRR) which will be used to model and assist in prioritizing freshwater habitats and COAs in Delaware.

COA Development

Factors in the development of COAs include the availability of quality geospatial data for the habitats and species of interest, and information from literature or expert opinion available for habitats and species for which there was not sufficient geospatial data. DNREC and its partners fortunately have relatively good, recent spatial data layers that could be used to develop COAs. Recent mapping of vegetative communities and wetland assessments provide updated, quality fine-scale data.

Rather than create an additional map layer for COAs, Delaware will work with partners and stakeholders to provide integrated online access to the existing and overlapping Geographic Focus Areas and Planning Models in order to fulfill the intent of Conservation Opportunity Areas and build upon the extensive work already completed by state agencies and partner organizations. This supports these existing programs and ensures more consistent use and application of these synergistic programs by DNREC and its partners.

Methods for Developing COAs – Integration of Ongoing Delaware Conservation Efforts

Delaware’s approach to Conservation Opportunity Areas (COAs) is to overlay existing tools and priority areas to help land managers and conservation groups prioritize their work in the state. This approach includes both large-scale, discrete *geographic focus areas* generated by state and partner programs, as well as site-scale *planning models* such as the Delaware Ecological Network (DEN) and the Delaware WRR, which is currently being developed by the Delaware Watershed Assessment Program in conjunction with the U.S. Environmental Protection Agency (USEPA). The Delaware WRR will include models to identify both conservation and restoration opportunities for freshwater aquatic habitats using a set of metrics derived from geospatial data.

The existing DEN also provides an important planning/modeling tool that can be used in combination with the landscape-scale focus areas to assist in preservation and restoration project prioritization. DEN core

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areas and existing corridors represent ranked areas for conservation, while DEN potential corridors provide a blueprint for restoration or conservation in areas that can connect existing cores and corridors. These DEN modeled areas are the foundation of the DEWAP COAs (Figure 4.1).

The DEN serves as the foundation of the DEWAP Priority Wildlife Habitat and COAs. As presented in Chapter 2, Priority Wildlife Habitat includes Core Areas and Existing Corridors. In this chapter describing DEWAP Conservation Actions and Opportunities, COAs are presented to add a spatial component to conservation opportunities to facilitate and focus these actions on the ground. The DEWAP COAs, based upon the DEN model of Priority Habitats, add the additional components of Potential Corridors and other important geographic focus areas identified by existing Delaware conservation efforts to take that a step further. Figure 4.1 presents the DEWAP COAs as the DEN Priority Habitat with the addition of Potential Corridors. The discussion below describes the additional focal areas also considered to be included in the COA. Since most of them are in development, they are not included in the map, but will be mapped when they are available. These additional Focal Areas are described below.



Figure 4. 1 DEN modeled Core Areas, Existing and Potential Corridors as the foundation for the 2015 DEWAP Conservation Opportunity Areas.

Geographic Focus Areas

Several partners and programs have already identified landscape-scale focus areas for conservation in Delaware. These focus areas represent largely intact and ecologically significant landscapes that are being incorporated into the DEWAP COAs.

Delaware DNREC's [Delaware Bayshore Initiative](#) has identified draft focus areas for the Delaware Bayshore region. Watershed-based focus areas have been delineated for the [Delaware Inland Bays](#). The Nature Conservancy and DNREC DFW produced a plan with focus areas for the critical [Blackbird-Millington Corridor](#). The [Great Cypress Swamp](#) area along Delaware's southern boundary is anchored by 10,000 acres of protected lands owned by Delaware Wild Lands, Inc. and is the focus of ongoing conservation and restoration work. The [Nanticoke River Watershed Restoration Plan](#) is a multi-partner plan that identifies restoration and conservation targets for water quality and wildlife habitat throughout this ecologically important area. The Nature Conservancy and the University of Delaware Water Resources Agency (UDWRA) are working actively to conserve the [Brandywine-Christina watershed](#). Since its official designation as a National Wild and Scenic River in 2000, the National Park Service, the White Clay Creek Steering Committee, and partner organizations have been working together to conserve White Clay Creek and implement the [White Clay Creek Watershed Management Plan](#).

The U.S. Forest Service [Forest Legacy Program \(FLP\)](#) provides funds to states to protect working forestlands that are threatened by development or other land uses, either through outright (fee simple) purchase or conservation easements. Delaware's four Legacy areas are: **White Clay Creek**, **Blackbird/Blackiston, Redden/Ellendale**, and **Cypress Swamp**. These areas contain the highest concentrations of forests in Delaware, including significant acreage already protected through public and private ownership.

Efforts continue to identify and compile information on important estuarine and marine habitats in Delaware. Examples include such features as shoals, artificial reefs, oyster reefs, and potential spawning areas (e.g. Marcus Hook for Atlantic Sturgeon). DNREC's DFW continues to identify information and spatial data on estuarine and marine SGCN and areas considered as important to SGCN. Information from multiple sources, including DNREC's DFW, NMFS Essential Fish Habitat, the Atlantic Coast Fish Habitat Management Plan, DNREC's Coastal Program, Mid-Atlantic Regional Council on the Ocean (MARCO), and others will continue to be compiled and evaluated by DFW.

The Delaware River Basin Conservation Initiative provides a framework for evaluating and prioritizing a discrete set of freshwater, estuarine, and bay-related ecosystems and habitat-forming species of the Delaware River Basin Conservation Initiative. The goal was to create a biodiversity-driven conservation blueprint for the Basin that would help to ensure a healthy Delaware River and Bay. With funding and guidance from the National Fish and Wildlife Foundation (NFWF), TNC, Partnership for the Delaware Estuary, and Natural Lands Trust examined a suite of ecosystems and habitat-forming species, including: floodplains, headwaters, non-tidal wetlands, freshwater tidal marsh, brackish and salt marsh, and oysters and ribbed mussels. For each freshwater and tidal marsh ecosystem, factors related to their condition, including aquatic connectivity, flow regime, landscape condition, size, and resiliency were assessed. The

assessment identified conservation priorities for several important ecosystems (see https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/ED_marine_DEbasin_fullreport2011.pdf).

An example of how these focal areas will be used to enhance the DEN model foundation for the DEWAP COAs is illustrated below by adding the Forest Legacy focal areas that are already available (Figure 4.2). Additional area layers from the focal areas mentioned above can be added to enhance the COAs further when data become available. Efforts to improve and refine COAs will continue over the next decade so that they can better inform local and state planning and provide guidance for partners in their statewide conservation efforts.

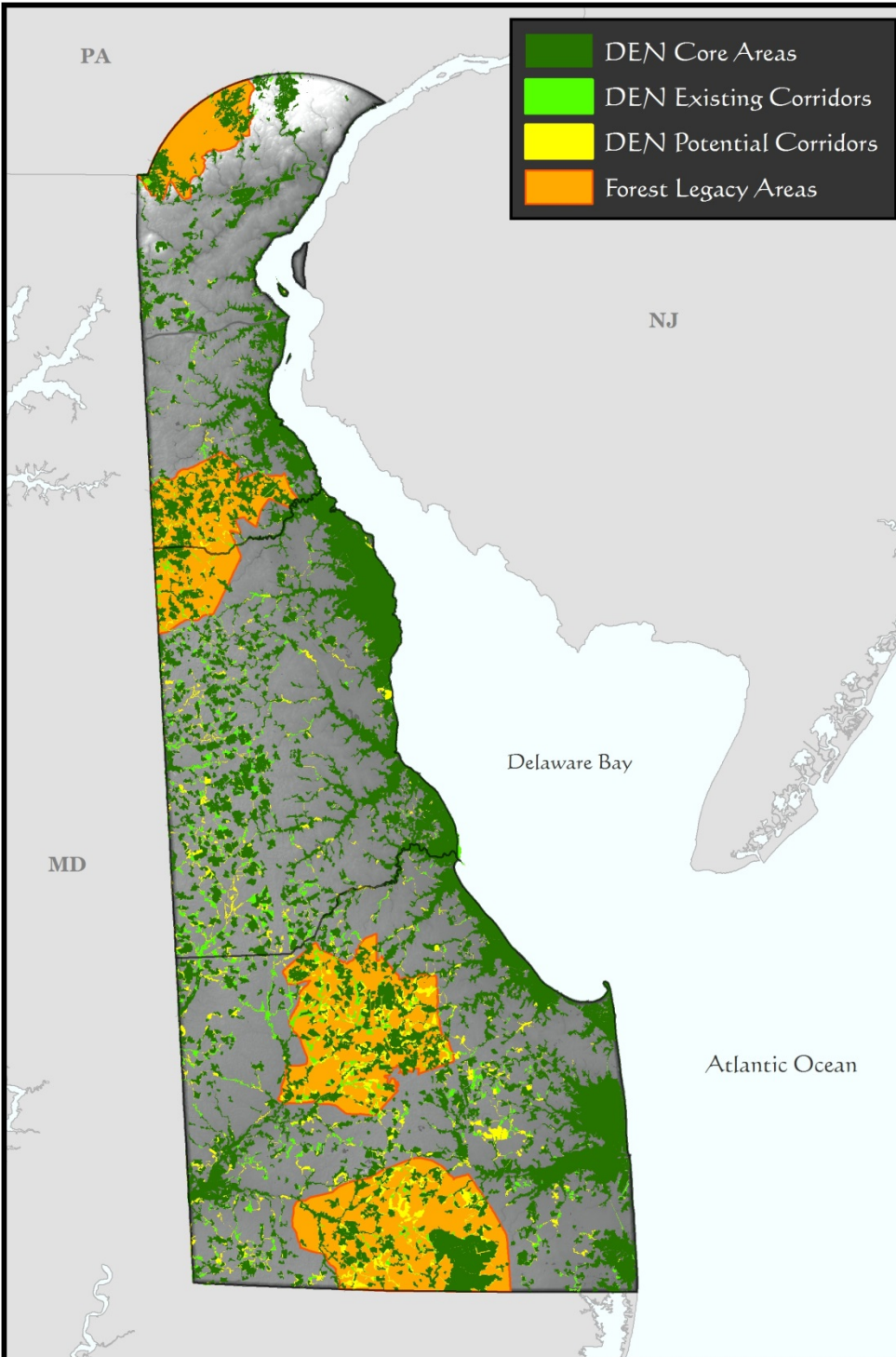


Figure 4. 2 DEN Modeled Conservation Opportunity Areas with Forest Legacy Focal Areas.

Conservation Actions to Conserve Key Habitats

Conservation Actions for Delaware’s priority wildlife habitats are presented in the second tabular report section, **Conservation Actions to Conserve Key Habitats**, under their broader habitat types. Within each broad habitat type, priority actions are presented for each wildlife habitat it contains. Many actions are common to multiple habitats, while others are specific to one or a few more specific habitats (which are listed with the actions). Conservation issues and actions (including research/survey/monitoring needs) are identified for each habitat. Chapter 2 and Appendix 2 describe each key habitat and vegetation community definition, location and condition in more detail. The Association of Fish and Wildlife Agencies’ 2011 report on Effectiveness Measures for State Wildlife Grants classifies these actions and provides objectives and indicators to measure their outcome. Examples of the DEWAP indicators for habitat actions include measuring the response of the habitats to these actions, and are an important component of the DEWAP database.

Taxa and Species-specific Actions

In addition to the previously listed, broad, overarching actions that apply statewide to SGCN and key habitats, the last tabular report section, **Conservation Actions to Conserve SGCN Species and Taxa**, lists conservation actions and research, inventory, and monitoring needs developed to address threats to species, multiple species, or taxa, often at the level of ecological group (see Appendix 1.A). This list also reflects actions and needs identified in partners’ plans for Delaware’s SGCN groups. It is impractical to repeat all those actions here, so they are incorporated by reference in this document and addressed more specifically in step-down taxa plans and annual work plans.

An example is the Delaware River Basin Conservation Initiative, which identified 25 "Focus Species" (Table 4.5) that were selected for their "rarity, status, and/or functional, economic, or iconic importance" in the Delaware River Basin. All but three of these species are considered SGCN in Delaware. The [Delaware River Basin Priority Conservation Areas and Recommended Conservation Strategies](#) identifies priority actions for these species. The Association of Fish and Wildlife Agencies’ 2011 report on Effectiveness Measures for State Wildlife Grants classifies these actions and provides objectives and indicators to measure their outcome. Examples of the DEWAP indicators for species actions include measuring the response of the SGCN to these actions, and are an important component of the DEWAP database.

Table 4. 5 SGCN that are also Focus Species for the Delaware River Basin Strategy (of the 25 focus species, 22 overlap with DE SGCN)

| Common Name | Scientific Name |
|---------------------|---------------------------------|
| Alewife Floater | <i>Anodonta imbecilis</i> |
| American Black Duck | <i>Anas rubripes</i> |
| American Shad | <i>Alosa sapidissima</i> |
| Atlantic Sturgeon | <i>Acipenser oxyrinchus</i> |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> |
| Blue Crab | <i>Callinectes sapidus</i> |

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| | |
|-------------------------------|-------------------------------|
| Bog Turtle | <i>Glyptemys muhlenbergii</i> |
| Bridle Shiner | <i>Notropis bifrenatus</i> |
| Brook Floater | <i>Alasmidonta varicosa</i> |
| Cerulean Warbler | <i>Dendroica cerulean</i> |
| Dwarf Wedgemussel | <i>Alasmidonta heterodon</i> |
| Horseshoe Crab | <i>Limulus polyphemus</i> |
| Longtail Salamander | <i>Eurycea longicauda</i> |
| Louisiana Waterthrush | <i>Seiurus motacilla</i> |
| Northern Diamondback Terrapin | <i>Malaclemys terrapin</i> |
| Red Knot | <i>Calidris canutus rufus</i> |
| Alewife | <i>Alosa pseudoharengus</i> |
| Blueback Herring | <i>Alosa aestivalis</i> |
| Saltmarsh Sparrow | <i>Ammodramus caudacutus</i> |
| Shortnose Sturgeon | <i>Acipenser brevirostrum</i> |
| Tidewater Mucket | <i>Leptodea ochracea</i> |
| Yellow Lampmussel | <i>Lampsilis cariosa</i> |

The following sections provide a tabular report format of all priority conservation actions and steps to address the research, inventory, and monitoring needs for the 2015 DEWAP SGCN and Priority Wildlife Habitats. They are presented at 3 levels, from most broad to most specific: First statewide, then habitat, then species or taxa level. Their counts are summarized in Tables 4.2, 4.3, and 4.4, respectively.

Statewide Conservation Issues and Actions

Administrative Needs

Issue 1 Administrative Needs; Coordination/Administration needs: Need to meet the goals and objectives of the DEWAP and full DNREC agency mission. Rank: 1

Coordination and Administration

- Action 1 Coordination and Administration: Align administration of public lands with agency strengths and core mission (e.g., Parks, trail management; DFW wildlife management, etc.) and SGCN and DEWAP. Rank: 1.3*
- Action 2 Coordination and Administration: Align short-term planning and actions with long-term goals of the DEWAP. Rank: 1.3*
- Action 3 Coordination and Administration: Integrate SGCN and Key Wildlife Habitat conservation priorities into DFW responsibilities so as to integrate game, sportfish, non-game and endangered species management. Fully fund and staff responsibilities for data collection and information management, natural resource management planning and research, monitoring and adaptive management, and coordination of partnerships, education, outreach and enforcement. Rank: 1.7*
- Action 4 Coordination and Administration: Transfer non-wildlife related responsibilities out of DFW in order to better focus staff and fiscal resources on wildlife diversity conservation. Rank: 2*
- Action 5 Coordination and Administration: Ensure balanced representation for all division responsibilities, including wildlife diversity, on the Fish and Wildlife Advisory Council and other Councils. Rank: 2.2*

Outreach

- Action 1 Outreach; Partner/Stakeholder engagement: Establish partnerships with government agencies, conservation organizations, businesses and private landowners to protect, manage and restore extant and historical SGCN occurrences and key wildlife habitats. Rank: 1.3*
- Action 2 Outreach; Partner/Stakeholder engagement: Coordinate, motivate, and support with and for NGOs for improved advocacy and action at State level for habitat conservation. Rank: 1.8*
- Action 3 Outreach; Partner/Stakeholder engagement: Develop/increase advocacy social media and social outreach to improve advocacy at State level for habitat conservation and level of action from small organizations. Rank: 1.8*

Planning

- Action 1 Planning: Identify, evaluate, and discontinue implementation of actions in DFW that might not fit its mission and/or the DEWAP. Rank: 1*
- Action 2 Planning: Improve coordination within DNREC DFW to align internal and external planning with long-term goals of the DEWAP. Rank: 1.3*
- Action 3 Planning: Develop strategic plans for Wildlife Areas, including wildlife diversity and habitat management standards, goals, and objectives. Rank: 1.5*
- Action 4 Planning; State Wildlife Action planning: Include plants as SGCN and address in issues and actions in Wildlife Action Planning. Rank: 1.7*
- Action 5 Planning; State Wildlife Action planning: Align current planning and actions with long-term goals of DNREC and the DEWAP. Rank: 1.8*

Statewide Conservation Issues and Actions

Action 6 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Develop a strategic planning process to "step down" DEWAP into prioritized management prescriptions for SGCN, key habitats, and resolution of "direct threat" conservation issues on public and private lands. Include all relevant conservation actions from existing national, regional, state and site plans. Incorporate information and actions from these prescriptions into resource management plans as appropriate. Rank: 1.8

Issue 2 Administrative Needs; Coordination/Administration needs: Lack of integration/cooperation - Legislators, educators, and "outside" organizations, companies, NGOs, etc. Rank: 1.2

Coordination and Administration

Action 1 Coordination and Administration: Identify and implement ways DNREC can better work with and educate outside organizations, companies and NGOs to improve collaboration and support. Rank: 1.8

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Work with and educate legislators and educators. Rank: 1.8

Issue 3 Administrative Needs; Coordination/Administration needs; Need for coordination for effective program/project management: Private lands conservation - Coordination among private lands conservation programs. Rank: 1.2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement; Others: Encourage all private lands conservation providers to coordinate with DFW to ensure protection of key habitats and SGCN. Rank: 1.5

Action 2 Outreach; Partner/Stakeholder engagement; Others: Encourage all private lands conservation providers to target education and outreach to landowners in or adjacent to core reserves and connecting corridors. Rank: 1.7

Issue 4 Administrative Needs: Private lands conservation - Incentives for landowners. Rank: 1.2

Coordination and Administration

Action 1 Coordination and Administration; Incentives: Develop additional incentives for exceptional management of key habitats or SGCN (similar to the Conservation Security Program). Rank: 1.5

Action 2 Coordination and Administration; Incentives: Develop additional incentives for landowners. Rank: 1.5

Action 3 Coordination and Administration; Incentives: Develop incentives for maintaining existing key habitats or SGCN on private lands (as opposed to current incentives for restoring key habitats or SGCN). Rank: 1.5

Action 4 Coordination and Administration; Incentives: Develop more turn-key services for implementing and managing habitat projects, including providing equipment and staff or contractual services. Rank: 1.5

Action 5 Coordination and Administration; Incentives: Support creation of federal and state income tax exemptions for conservation incentive payments. Rank: 1.5

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Statewide Conservation Issues and Actions

Issue 5 Administrative Needs; Coordination/Administration needs: Funding issues Rank: 1.2

Coordination and Administration

- Action 1 Coordination and Administration: Allow education to be SWG funding eligible. Rank: 1.7*
- Action 2 Coordination and Administration: Find new sources of funding across the board to support initiatives. Rank: 1.7*
- Action 3 Coordination and Administration: Increase funding for Invasive Species Council. Rank: 1.7*
- Action 4 Coordination and Administration: Secure additional state funding for DFW such as adjusting the cost of a hunting/fishing license, establishing a "conservation stamp" for access to wildlife areas, more aggressively advertising the tax checkoff, and/or other means. Rank: 1.7*
- Action 5 Coordination and Administration: Allow law enforcement to be SWG funding eligible. Rank: 1.8*
- Action 6 Coordination and Administration: Develop stable funding source for non-game wildlife diversity. Rank: 1.8*
- Action 7 Coordination and Administration: Provide sufficient DFW "match" to receive the full allocation of available Federal funding from programs such as State Wildlife Grants, Pittman-Robertson, Dingell-Johnson, etc. Rank: 1.8*

Outreach

- Action 1 Outreach; Partner/Stakeholder engagement: Design of funds to non-game species (e.g. binoculars, kayak sales, registering). Rank: 1.7*

Issue 6 Administrative Needs; Coordination/Administration needs; Need for coordination for effective program/project management: Lack of coordination between organizations, agencies, large land owners, large business owners. Rank: 1.3

Outreach

- Action 1 Outreach; Partner/Stakeholder engagement: Better outreach, planning, coordination, and partnerships. Rank: 1.8*

Issue 7 Administrative Needs; Coordination/Administration needs; Need for agency administrative support for effective operations: Lack of coordination to avoid negative impacts to habitats and wildlife from ditching and draining for agriculture and forestry operations. Rank: 1.3

Coordination and Administration

- Action 1 Coordination and Administration; Incentives: Work with the Division of Watershed Stewardship to provide incentives to tax ditch associations to implement BMPs that minimize impacts to key habitats. Rank: 1.2*

Issue 8 Administrative Needs; Coordination/Administration needs: Lack of education about the positive aspects/effects of hunting and fishing. Rank: 1.3

Outreach

- Action 1 Outreach; Recruitment and retention activities: Implement programs that educate the public about the positive aspects/effects of hunting and fishing. Rank: 1.2*

Planning

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Statewide Conservation Issues and Actions

Action 1 Planning: Examine ways to increase number of hunters and fishers, therefore revenue from fees. Utilize more Pittman-Robertson and Dingell-Johnson funds for more wildlife diversity and habitat conservation projects. Rank: 1.2

Issue 9 Administrative Needs: Need for support of the RCN and regional coordination to address urgent emerging issues, regional threats, and regional responsibility species. Rank: 1.3

Coordination and Administration

Action 1 Coordination and Administration: Support the RCN and regional coordination to address urgent emerging issues, regional threats, and regional responsibility species. Rank: 1.3

Issue 10 Administrative Needs; Coordination/Administration needs; Need for agency administrative support for effective operations: Develop and implement management plans for tax ditches that incorporate conservation practices that benefit wildlife and their associated habitats. Rank: 1.5

Planning

Action 1 Planning: Work with Watershed Stewardship, DeIDOT, and landowners to develop and implement management plans which incorporate DEWAP actions. Rank: 1.5

Issue 11 Administrative Needs: Information management for SGCN, key habitat, conservation issue and conservation action data to support adaptive management. Rank: 1.5

Coordination and Administration

Action 1 Coordination and Administration: Provide non-state agencies, organizations and individuals committed to supporting the DEWAP with greater access to SGCN and key habitat information. Rank: 1

Action 2 Coordination and Administration; Incentives: Develop incentives for non-state agencies, organizations and individuals to utilize SGCN and key habitat information in their operations. Market the benefits of using this information such as saving time or funds, or minimizing the potential for legal conflict. Rank: 1.7

Data Collection and Analysis

Action 1 Data Collection and Analysis; Database development and management; Information systems operations and maintenance: Create, implement and/or update spatial computer applications for data management and decision support - e.g. Biotics, Vista, Delaware Invasive Species Tracking System - throughout DFW and other agencies/organizations as appropriate. Rank: 2

Planning

Action 1 Planning: Develop state policies to encourage the integration of SGCN and key habitat data into all State agencies' decision-making, including long-range planning, development of acquisition strategies, targeting of cost-share and incentive programs, and making adaptive management decisions on state-owned land. Rank: 2

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Statewide Conservation Issues and Actions

Issue 12 Administrative Needs: The privatization of insect control, specifically for nuisance mosquito species. Rank: 1.5

Law Enforcement

Action 1 Law Enforcement: Better regulation of private mosquito control applicators (50+ companies) relative to backyard barrier spray adulticide treatments and require them to coordinate with DNREC Mosquito Control Section. Rank: 1.8

Planning

Action 1 Planning: Create and implement requirements for private insect control companies, relying heavily on DNREC Mosquito Control Section in this process. Rank:

Issue 13 Administrative Needs; Coordination/Administration needs: Lack of coordination between DFW and local/county planning agencies relative to the DEWAP. Rank: 1.7

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Improve coordination with State, County, and local planning to control sprawl and habitat fragmentation. Rank: 1.8

Action 2 Outreach; Partner/Stakeholder engagement: Inform County residents and decision-makers on the long-term impacts to their quality of life and importance of data reporting. Rank: 1.8

Issue 14 Administrative Needs; Coordination/Administration needs: Noncompliance of data reporting from outside entities (such as entities under permit and/or survey from DFW). Rank: 1.8

Data Collection and Analysis

Action 1 Data Collection and Analysis: Improve/enforce data reporting and examine new ways to make reporting more efficient. Rank: 1.8

Issue 15 Administrative Needs; Coordination/Administration needs: Lack of unique county regulations to address population density, county regulations should align with statewide recommendations. Rank: 2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Inform/coordinate with State, county and local planning boards to create consistent regulations. Rank: 2.3

Issue 16 Administrative Needs: SGCN and habitats are not adequately protected through current land use policies. Rank: 2

Law Enforcement

Action 1 Law Enforcement: Improve regulations regarding environmental reviews to ensure the protection of SGCN and their habitats. Rank: 2

Planning

Action 1 Planning: Develop regulations/ordinances that protect DEWAP SGCN and their habitats. Rank: 2

Agriculture and Aquaculture

Issue 1 Agriculture and Aquaculture: Agriculture causing habitat conversion and degradation. Rank: 1.2

Coordination and Administration

Action 1 Coordination and Administration: Coordination with appropriate public and private entities to conserve Delaware fish and wildlife. Rank: 1.8

Land and Water Rights Acquisition and Protection

Action 1 Land and Water Rights Acquisition and Protection: Promote and support land and water conservation thru available programs and partners. Rank: 1.8

Planning

Action 1 Planning: Develop and apply BMPs and guidance for conservation of SGCN, other wildlife, and their habitat in agriculture, forestry, and aquaculture practices. Rank: 1.8

Issue 2 Agriculture and Aquaculture: Residential development causing wetland buffer conversion. Rank: 1.3

Technical Assistance

Action 1 Technical Assistance; Tech assistance; With private landowners: Implement cost-share programs, tax reform, market mechanisms and other incentives to encourage SGCN and key habitat management and restoration on private lands. Rank: 1.7

Issue 3 Agriculture and Aquaculture; Livestock farming and ranching: Livestock grazing causing riparian habitat degradation. Rank: 2.3

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Grazing farm management: Institute habitat-conserving livestock and poultry farm practices where grazing or potential habitat degradation occurs. Rank: 2.5

Biological Resource Use

Issue 1 Biological Resource Use; Logging and wood harvesting: Lack of Sustainable Forestry certification requirement. Rank: 1.3

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Encourage certification of private forestland, such as DE Wild Lands and Forestland certification. Rank: 2.2

Issue 2 Biological Resource Use; Logging and wood harvesting: Impacts from forestry practices on wildlife diversity. Rank: 1.7

Planning

Action 1 Planning: Develop an MOU between DFW and Forestry for conservation and management of wildlife diversity in State Forests. Rank: 1.7

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Issue 3 Biological Resource Use; Hunting and collecting terrestrial animals; Persecution/control: Misuse of rodenticides - Poisons Rank: 2.3

Coordination and Administration

Action 1 Coordination and Administration: Work with pest control companies and Tri-State Bird Rescue and Research, Inc. and Research, Inc. to educate companies about this issue and alternatives. Rank: 2.3

Education

Action 1 Education: Educate the public about the proper use of rodenticides, how to avoid unintended "catches", or better alternatives. Rank: 2.7

Issue 4 Biological Resource Use; Hunting and collecting terrestrial animals; Persecution/control: Misuse of rodenticides - Sticky traps, etc. (associated by-catch) Rank: 2.3

Coordination and Administration

Action 1 Coordination and Administration: Work with pest control companies and Tri-State Bird Rescue and Research, Inc. and Research, Inc. to educate companies about this issue and alternatives. Rank: 2.3

Education

Action 1 Education; Student training: Educate the public about the proper use of rodenticides, how to avoid unintended "catches", or better alternatives. Rank: 2.7

Issue 5 Biological Resource Use; Hunting and collecting terrestrial animals; Intentional use: Inappropriate hunting and fishing. Rank: 2.3

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Integrate SGCN conservation into hunting and trapping regulations. Rank: 1.3

Education

Action 1 Education; Student training; Wildlife education: Incorporate information about SGCN conservation into the Hunting and Trapping Guide. Rank: 1.8

Law Enforcement

Action 1 Law Enforcement: Maintain compliance with federal regulations. Rank: 1.7

Climate Change and Severe Weather

Issue 1 Climate Change and Severe Weather; Sea level rise: Overall effects of sea level rise due to climate change, including salinity changes (already happening) and the influence on dams and impoundments. Rank: 1

Coordination and Administration

Action 1 Coordination and Administration; Incentives: Use tax incentives and land conservation tools such as donations of conservation easements to protect habitats. Rank: 2.2

Planning

Statewide Conservation Issues and Actions

- Action 1 Planning: Address the concern that SLR is predicted to cause a high loss of forest due to salt water intrusion and/or fragmentation. Rank: 1.8*
- Action 2 Planning: Plan for climate change scenarios. Rank: 1.8*
- Action 3 Planning: Work with local jurisdictions to update ordinances to promote and encourage proactive response to SLR predictions. Rank: 1.8*
- Action 4 Planning: Adapt coastal impoundments and ponds. Rank: 2*
- Action 5 Planning: Address the concern that letting coastal habitats retreat on conservation lands may cause the surrounding communities to be negatively affected or left isolated and even less protected. Rank: 2*

Issue 2 Climate Change and Severe Weather; Habitat shifting or alteration: Including, but not limited to the following specific issues: coastal/tidal wetland loss (fringe species), habitat loss/fragmentation, inland migration of wetlands, fund allocation difficulties, lack of strategic planning (to insure funds target most appropriate projects), impacts of storms and flooding, and the need to focus on inland protection/funding (i.e. Prime Hook), not just on coast. Rank: 1.3

Coordination and Administration

- Action 1 Coordination and Administration: Target decision makers to inform them of cost/benefits of strategic migration for sea level rise. Rank: 1.8*

Data Collection and Analysis

- Action 1 Data Collection and Analysis: Increase climate change-focused research and monitoring on DNERR land, USFWS, state wildlife areas, state parks, TNC, etc. Rank: 2*

Land and Water Rights Acquisition and Protection

- Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Acquire lands for climate change migration for resiliency for west systems. Rank: 2.3*
- Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Create new habitat inland - target funds for acquisition. Rank: 2.3*

Planning

- Action 1 Planning: Plan for climate change scenarios. Rank: 1.7*
- Action 2 Planning; Species and habitat management planning: Protect areas further west for strategic planning for retreat. Strategic retreat versus hardening. Rank: 1.7*

Issue 3 Climate Change and Severe Weather; Temperature extremes: Thermo habitat changes due to climate change (marine and terrestrial species northern migration, aquatic habitat and organism sensitivity). Rank: 1.3

Data Collection and Analysis

- Action 1 Data Collection and Analysis: Increase climate change-focused research and monitoring on DNERR land, USFWS, state wildlife areas, state parks, TNC, etc. Rank: 2*
- Action 2 Data Collection and Analysis: Prepare to manage different fish and wildlife species and habitats. Rank: 2*

Planning

Statewide Conservation Issues and Actions

Action 1 *Planning: Plan for SLR scenarios. Rank: 1.8*

Issue 4 Climate Change and Severe Weather: Rank: 1.7

Data Collection and Analysis

Action 1 *Data Collection and Analysis: Monitor and research to track the climate effects on environmental conditions and the response in habitats and species. Rank: 1.5*

Action 2 *Data Collection and Analysis: Increase climate change-focused research and monitoring on DNERR land, USFWS, state wildlife areas, state parks, TNC, etc. Rank: 2*

Action 3 *Data Collection and Analysis: Prepare to manage different fish and wildlife species and habitats. Rank: 2*

Education

Action 1 *Education: Educate staff and the public about climate change in Delaware. Rank: 2*

Planning

Action 1 *Planning: Coordinate with local governments, communities, etc. for climate change adaptation projects and planning. Rank: 2*

Action 2 *Planning: Design and implement restoration activities to slow loss of coastal habitats, including the use of BMPs and habitat restoration. Rank: 2*

Action 3 *Planning: Develop a climate change adaptation plan for DNERR. Rank: 2*

Action 4 *Planning: Evaluate need for revisions to stormwater regulations. Rank: 2*

Action 5 *Planning: Evaluate need for revisions to technical standards and specifications for stormwater management. Rank: 2*

Action 6 *Planning: Evaluate strategies for increasing native pollinator habitat on public and private lands in relation to climate change. Rank: 2*

Action 7 *Planning: Incorporate climate change into land stewardship decisions at the Delaware National Estuarine Research Reserve and all conservation lands. Rank: 2*

Action 8 *Planning: Plan for increasing demands for shoreline management and beach preservation; Discuss additional support for living shorelines to support shoreline management and protection. Rank: 2*

Action 9 *Planning: Prepare to restore ecological integrity of unique ephemeral wetlands. Rank: 2*

Action 10 *Planning: Prepare to restore riparian buffers. Rank: 2*

Action 11 *Planning: Scenario planning for anticipated expanded mosquito production season and increased nuisance wildlife complaints. Rank: 2*

Issue 5 Climate Change and Severe Weather: Climate change and severe weather events will exacerbate existing issues to SGCN and key habitats, including increased rates of shoreline erosion. Rank: 1.8

Data Collection and Analysis

Action 1 *Data Collection and Analysis: Research and plan for climate change scenarios. Rank: 1.8*

Action 2 *Data Collection and Analysis: Increase climate change-focused research and monitoring on DNERR land, USFWS, state wildlife areas, state parks, TNC, etc. Rank: 2*

Statewide Conservation Issues and Actions

Action 3 *Data Collection and Analysis: Prepare to manage different fish and wildlife species and habitats. Rank: 2*

Direct Management of Natural Resources

Action 1 *Direct Management of Natural Resources: Rank: 2*

Issue 6 Climate Change and Severe Weather; Droughts: Ground water extraction (irrigation, hydrology, etc.) effects exacerbated by climate change. Rank: 2.2

Data Collection and Analysis

Action 1 *Data Collection and Analysis: Increase climate change-focused research and monitoring. Rank: 2*

Action 2 *Data Collection and Analysis: Prepare to manage different fish and wildlife species and habitats. Rank: 2*

Planning

Action 1 *Planning: Evaluate need for revisions to technical standards and specifications for stormwater management. Rank: 2*

Action 2 *Planning: Plan for climate change scenarios. Rank: 2.5*

Issue 7 Climate Change and Severe Weather: Seasonal/interannual changes (disrupted migration patterns, changes in food and habitat availability, etc.) due to climate change. Rank: 2.2

Data Collection and Analysis

Action 1 *Data Collection and Analysis: Increase climate change-focused research and monitoring on DNERR land, USFWS, state wildlife areas, state parks, TNC, etc. Rank: 2*

Action 2 *Data Collection and Analysis: Prepare to manage different fish and wildlife species and habitats. Rank: 2*

Planning

Action 1 *Planning: Plan for climate change scenarios. Rank: 1.8*

Issue 8 Climate Change and Severe Weather; Habitat shifting or alteration: Vernal pool elimination and changes due to climate changes. Rank: 2.2

Planning

Action 1 *Planning: Plan for climate change scenarios. Rank: 1.8*

Education/Outreach Needs

Issue 1 Education/Outreach Needs; Outreach needs: Outreach/Dissemination. Rank: 1.2

Education

Action 1 *Education; Educator/instructor training: Disseminate DEWAP to federal and state parks/refuges, visitor and nature centers and educate staff about how to share information about the DEWAP. Rank: 1.2*

Action 2 *Education: Develop smart phone apps and other social media for state/public lands for nature education. Rank: 2.5*

Statewide Conservation Issues and Actions

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Encourage cooperation and opportunities for various stakeholders to come together (i.e., Universities, NGOs, etc.). Rank: 1.2

Issue 2 Education/Outreach Needs: Training, education and outreach programs on key habitat ecology, SGCN biology, and conservation issues and actions. Rank: 1.2

Education

Action 1 Education: Enhance DNREC's outdoor education programs (including: Adopt-a-Wetland, Vulnerable Wetlands Initiative, Eco-Explorers, Green Eggs and Sand, etc.) to include SGCN conservation. Rank: 1

Action 2 Education; Educator/instructor training: Provide training for state staff on key habitat ecology, SGCN biology, and conservation issues and actions. Utilize DNREC and other partner's outdoor education programs and facilities. Rank: 2.2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Partner with the state Department of Education to develop a Delaware-specific biodiversity unit for the high school level that emphasizes key habitat ecology and SGCN biology, including training for teachers on integrating habitat enhancement/conservation activities and projects into the classroom curriculum. Rank: 1.2

Action 2 Outreach; Partner/Stakeholder engagement: Increase the number of schoolyard habitats and engage youth. Rank: 1.5

Action 3 Outreach; Recruitment and retention activities: Support expansion of and participation in DNS/NWF "Backyard Wildlife Habitat" program to promote greater citizen involvement in habitat enhancement and stewardship. Promote Living Shorelines using DuPont Nature Center as an example. Rank: 1.5

Action 4 Outreach; Partner/Stakeholder engagement: Expand use of Eco-Explorers, WADE (Wetland Activities for Delaware Educators), Wetland Restoration Guidebook, and other existing school programs, and develop opportunities to integrate key habitat and SGCN conservation content into the above and other existing programs/curricula. Rank: 2

Action 5 Outreach; Recruitment and retention activities: Implement "Leave No Trace" programs such as "The Frontcountry Program" and "PEAK" on public lands to promote greater responsibility for personal choices. Rank: 2

Action 6 Outreach; Recruitment and retention activities: Develop education and outreach for the general public, such as online materials, activities, and "profile brochures" for key habitats and SGCN, and "citizen's guides" for issues and actions. Rank: 2.2

Action 7 Outreach; Recruitment and retention activities: Develop wildlife viewing guides for selected species and/or sites and promote responsible ecotourism. Promote Living Shorelines, Vulnerable Wetland Initiative, Adopt-a-Wetland Program, Wetlands Restoration Guidebook for Delaware landowners. Rank: 2.2

Action 8 Outreach; Recruitment and retention activities: Implement the Certified Citizen Naturalist program to provide for volunteer monitoring, wardening and stewardship of key habitats and SGCN. Recruit and train people to conduct surveys, protect resources, and manage habitats and species. Implement systems for volunteer reporting of results. Rank: 2.2

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 3 Education/Outreach Needs; Education needs; Need for improved knowledge of fish and wildlife and their habitats: Rank: 1.7

Education

Action 1 Education: Work with science educators/institutions to provide training and develop curricula, lessons, activities relevant to the DEWAP, SGCN, and key habitats. Utilize DNREC and other partner environmental education programs and facilities. Rank: 2

Issue 4 Education/Outreach Needs; Outreach needs; Need to maintain and/or increase constituent base: Decline in participation of hunting, trapping, and fishing. Rank: 1.7

Outreach

Action 1 Outreach; Recruitment and retention activities: Recruit and expand hunting and fishing programs, farming, non-consumptive outdoor recreation and conservation. Many areas are now protected due to recreational use. Rank: 2

Issue 5 Education/Outreach Needs: Residential development causing forest habitat conversion. Rank: 1.7

Education

Action 1 Education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Such as Wetland Restoration Guidebook for Delaware Landowners and the DuPont Nature Center's Living Shoreline demonstration area. Rank: 2.3

Issue 6 Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: Lack of information - Cooperate with health department. Rank: 1.8

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration: Cooperate with the health department and provide information to promote SGCN conservation. Rank: 1.8

Issue 7 Education/Outreach Needs; Coordination/Administration needs: Lack of participation in conservation efforts. Rank: 2

Planning

Action 1 Planning: Hold summit (conservation conference for annual coordination) for partners and stakeholders interested in SGCN conservation. Rank: 2.3

Action 2 Planning: Increase participation in wildlife related activities/professions. Rank: 2.3

Action 3 Planning: Work with Universities for interns, programs, and academic training and improve influx of new young professionals. Rank: 2.7

Energy Production and Mining

Issue 1 Energy Production and Mining; Renewable energy: Currently no required state approval or wildlife review. Rank: 2

Planning

Action 1 Planning: Develop regulations on placement and monitoring of wind turbines, wind farm facilities, etc. to assess and mitigate impacts on SGCN. Rank: 1.5

Issue 2 Energy Production and Mining: Emerging energy production issues. Rank: 3

Data Collection and Analysis

Action 1 Data Collection and Analysis: Determine impacts of emerging energy production methods. Rank: 2.5

Human Intrusions and Disturbance

Issue 1 Human Intrusions and Disturbance; Recreational activities: Recreation use on foot and with boats, Personal Watercraft and Off-Road Vehicles, horses (including effects of horse excrement), and bikes impacting SGCN and habitats. Rank: 1.8

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess the impacts of ORVs on sensitive key habitats and wildlife, and use this assessment and long-term monitoring to adapt management as necessary. Rank: 1.3

Law Enforcement

Action 1 Law Enforcement: Strengthen enforcement of regulations for off-road vehicles on managed areas to protect key habitats and SGCN. Rank: 1.5

Issue 2 Human Intrusions and Disturbance; Recreational activities: Recreation use on foot and with boats, Personal Watercraft and Off-Road Vehicles, horses (including effects of horse excrement), and bikes impacting SGCN and habitats. Rank: 1.8

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: To protect SGCN, post and/or fence nesting sites, breeding concentrations or other critical areas and enforce restrictions. Rank: 1.2

Education

Action 1 Education; Student training: Implement "Leave No Trace" programs such as "The Frontcountry Initiative" and "PEAK." Rank: 1.8

Action 2 Education; Student training: Expand Eco-Explorers and DNREC and other partner environmental education programs and curricula. Rank: 2

Law Enforcement

Action 1 Law Enforcement: In appropriate habitats, strengthen enforcement of surf fishing permit regulations on public property to protect SGCN. Rank: 1.3

Action 2 Law Enforcement: Strengthen enforcement of regulations for off-road vehicles on managed areas to protect key habitats and SGCN. Rank: 1.3

Statewide Conservation Issues and Actions

Action 3 *Law Enforcement: Where appropriate, post "no wake" zones to protect key habitats and enforce them. Rank: 1.3*

Outreach

Action 1 *Outreach; Partner/Stakeholder engagement; Others: Work with private landowners to limit access to nesting sites, breeding concentrations or other critical areas to protect SGCN. Rank: 1.3*

Invasive and Other Problematic Species, Genes, and Diseases

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Invasive Plants. Rank: 1

Coordination and Administration

Action 1 *Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of the Delaware Invasive Species Management Plan, as appropriate, to reduce the impacts of invasive species on key habitats and SGCN. Rank: 1.2*

Action 2 *Coordination and Administration; Coordination and administration: Work with the Delaware Invasive Species Council to establish an interagency early detection and rapid response system to respond to new invasions. Rank: 1.8*

Data Collection and Analysis

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Work with the Delaware Invasive Species Council and conservation land managers to conduct quantitative invasive plant surveys of key habitats. Rank: 1.3*

Direct Management of Natural Resources

Action 1 *Direct Management of Natural Resources; Planting/seeding: Require use of native, Delaware indigenous species for new plantings or replantings on lands managed by the state, similar to the Native Plants Policy of the Division of Parks and Recreation. Rank: 1.5*

Action 2 *Direct Management of Natural Resources; Invasive species control: Work with the Delaware Invasive Species Council and conservation land managers to assess and monitor impacts of invasive plants using the Delaware Alien Plant Invasiveness Risk Assessment protocol, and prioritize control efforts based on degree of risk. Rank: 1.8*

Outreach

Action 1 *Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Transportation, Delaware Center for Horticulture and Cooperative Extension to enhance transportation construction and maintenance practices such as requiring the planting of native species, and limiting mowing during breeding, migration or other critical times for SGCN. Rank: 1.2*

Action 2 *Outreach; Partner/Stakeholder engagement: Develop education and outreach, partnerships, voluntary guidelines, incentives, and/or regulations, as necessary, for controlling invasive plants on private property and in private commerce, to minimize impacts to key habitats. Rank: 1.8*

Action 3 *Outreach; Partner/Stakeholder engagement: Partner with the Delaware Invasive Species Council and land management agencies to integrate key habitat and SGCN conservation into invasives control practices. Rank: 1.8*

Planning

CHAPTER 4: Conservation Actions and Opportunities

Statewide Conservation Issues and Actions

Action 1 Planning; Species and habitat management planning; Species management planning: Develop an MOU between DFW and DPR (and any other relevant entities) for management of wildlife diversity in State Parks. Require consultation with DFW on all issues impacting wildlife diversity. Rank: 1.8

Action 2 Planning: Work with the Delaware Invasive Species Council and conservation land managers to develop and implement adaptive management plans for control of invasive species. Rank: 1.8

Action 3 Planning; Species and habitat management planning: Develop management practices for SGCN, key habitats and the abatement of threats on public and private lands, and measure the effectiveness of different management practices, adapting as necessary. Rank: 2

Issue 2 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases: Nuisance wildlife (i.e., Canada Goose (resident), Cats, Turkey Vulture, Cormorant, and others). Rank: 1

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Invasive species control: Address outdoor cat problem thru appropriate options such as ABC plans, etc. Rank: 2

Action 2 Direct Management of Natural Resources; Invasive species control; Animal-biological: Strategically manage and/or control invasive plant and animal species. Rank: 2.2

Education

Action 1 Education; Student training: Provide training on the impacts to native species. Rank: 2

Planning

Action 1 Planning: Support plans for the direct management of invasives. Rank: 2

Issue 3 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Invasive species (i.e., Bradford Pear, Autumn Olive, Cedar Swamp, Wineberry, Ashborer, Walnut Twig Beetle (AA 1,000 Cankers), Phragmites, some Firefly species, and others). Rank: 1.2

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat: Monitor the spread and effect of invasive species commonly used in landscaping into neighboring habitats. Rank: 2

Education

Action 1 Education; Student training: Educate landscapers and homeowners and encourage restricting use of invasive species (mostly plants) and/or removing planted invasives. Utilize DNREC and other partner EE and ARE programs. Rank: 2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Reach out to nurseries and plant suppliers to encourage restricting sale/availability of invasive species (mostly plants). Rank: 2

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 4 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Invasive species (i.e., Bradford Pear, Autumn Olive, Cedar Swamp, Wineberry, Ashborer, Walnut Twig Beetle (Thousand Cankers Disease), Phragmites, some Firefly species, and others). Rank: 1.2

Law Enforcement

Action 1 Law Enforcement: Restrict sale/availability of invasive species (mostly plants). Rank: 2

Issue 5 Invasive and Other Problematic Species, Genes, and Diseases; Problematic species/diseases of unknown origin: "Super weeds" that have become tolerant/resistant to various herbicides/pesticides. Rank: 1.3

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Invasive species control: Rank: 2.5

Issue 6 Invasive and Other Problematic Species, Genes, and Diseases; Diseases of unknown cause: New emerging diseases. Rank: 1.3

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Wildlife disease management: Prevent and preempt emerging diseases. Rank: 1.7

Issue 7 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Asian Tiger Mosquito control, particularly larval stage. Rank: 1.5

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Invasive species control: Control Asian Tiger Mosquitos. Rank: 2.2

Issue 8 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Japanese Rockpool Mosquito control, particularly larval stage. Rank: 1.5

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Invasive species control: Control Japanese Rockpool Mosquitos. Rank: 2.2

Issue 9 Invasive and Other Problematic Species, Genes, and Diseases; Problematic species/diseases of unknown origin; Named species: Plant diseases (new and emerging, Hypoxalyn canker in Oak, Bacterial leaf scorch, etc.). Rank: 1.5

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Invasive species control: Rank: 1.8

Action 2 Direct Management of Natural Resources; Wildlife disease management: Identify new diseases as they enter the system and address quickly. Rank: 1.8

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 10 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Yellow Fever Mosquito control, particularly larval stage. Rank: 1.5

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Invasive species control: Control Yellow Fever Mosquitos. Rank: 2.2

Issue 11 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Unspecified species: Control of mosquitos and forest pests by aerial application of pesticides. Rank: 2.5

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Work with the Mosquito Control Section and private pest control companies to assess and monitor the impacts of aerial application on SGCN insects, and on the prey base of SGCN insectivorous birds, small mammals and bats. Rank: 1.3

Action 2 Data Collection and Analysis; Techniques development: Work with the Mosquito Control Section and private pest control companies to adapt aerial application practices for conservation of SGCN, as necessary. Rank: 2.5

Issue 12 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Mosquito control. Rank: 2.5

Data Collection and Analysis

Action 1 Data Collection and Analysis; Techniques development: Continue to research and monitor alternative methods of mosquito control - naturals, sound, etc. on property to reduce mosquitos. Rank: 2.5

Natural System Modifications

Issue 1 Natural System Modifications; Dams and water management/use: Negative impacts to habitats and wildlife from ditching and draining for agriculture and forestry operations. Rank: 1.2

Coordination and Administration

Action 1 Coordination and Administration; Incentives: Work with the Division of Watershed Stewardship to provide incentives to tax ditch associations to implement BMPs that minimize impacts to key habitats. Rank: 1.2

Issue 2 Natural System Modifications; Other ecosystem modifications: Hard shorelines. Rank: 1.3

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: Minimize hardened shorelines and promote Living Shorelines. Rank: 1.7

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Target beach communities for strategic retreat rather than walls or hardening. Rank: 1.7

CHAPTER 4: Conservation Actions and Opportunities

Statewide Conservation Issues and Actions

Action 2 Outreach; Partner/Stakeholder engagement: Target developers to promote green solutions like Living Shorelines, Vulnerable Wetland Initiative, and other conservation information for SGCN and their habitats. Rank: 1.7

Issue 3 Natural System Modifications; Dams and water management/use; Dams (size unknown): Natural system modifications - dams (performance measures, dam removal). Rank: 1.5

Data Collection and Analysis

Action 1 Data Collection and Analysis; Techniques development; Habitat restoration methods: Review dam removal plans. Rank: 2.2

Issue 4 Natural System Modifications; Other ecosystem modifications: Long-term effects of use of dredge material (e.g. DE River Project). Rank: 1.8

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat: Research and monitor long-term effects of dredge spoil use on marshes. Rank: 1.7

Issue 5 Natural System Modifications; Dams and water management/use: Tax Ditching (S. DE) - Old infrastructure. Rank: 1.8

Coordination and administration

Action 1 Coordination and administration; Coordination and administration: Prioritization. Balance the need by farmers with environmental consequences. Rank: 2

Action 2 Coordination and administration: Remove the exemption of tax ditches from CWA because they are either navigable waters or are hydrologically connected to navigable waters. Rank: 2.3

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Work with Tax Ditching Association. Rank: 2.3

Issue 6 Natural System Modifications; Dams and water management/use: Surface water diversions causing wetland habitat degradation. Rank: 2

Land and Water Rights Acquisition and Protection

Action 1 Land and Water Rights Acquisition and Protection: Rank: 2

Law Enforcement

Action 1 Law Enforcement: Rank: 2

Issue 7 Natural System Modifications; Dams and water management/use: Tax Ditches - Dredging. Rank: 2

Planning

Action 1 Planning: Rank: 2

CHAPTER 4: Conservation Actions and Opportunities
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Issue 8 Natural System Modifications; Dams and water management/use: Tax Ditches - Management of navigable waters. Rank: 2

Law Enforcement

Action 1 Law Enforcement: Manage and regulate under the federal Clean Water Act tax ditches that are either a navigable water of the U.S. or are hydrologically connected to a navigable water of the U.S. Rank: 2

Issue 9 Natural System Modifications; Dams and water management/use: Tax Ditches - Mowing. Rank: 2

Education

Action 1 Education: Rank: 2

Issue 10 Natural System Modifications; Dams and water management/use; Extraction of ground water (unknown use): Ground water extractions (irrigation, hydrology, etc.) and development drainage. Rank: 2.2

Planning

Action 1 Planning: Rank: 2.5

Pollution

Issue 1 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Chemical use, namely public use unregulated: pest control, herbicides, pesticides (particularly Chiton inhibitors), etc. Rank: 1.3

Education

Action 1 Education: Educate producers, distributors, and the public to the negative impacts to SGCN and habitats from the use and abuse of chemicals. Rank: 2

Issue 2 Pollution; Agricultural and forestry effluents; Nutrient loads: Agricultural and residential development - nutrient loads. Rank: 1.3

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Water management: Reduce nutrient loads from agriculture and residential development into surface waters and groundwater to protect aquatic wildlife and habitats. Rank: 2

Issue 3 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Chemical use, namely public use unregulated: pest control, herbicides, pesticides (particularly Chiton inhibitors), etc. Rank: 1.3

Law Enforcement

Action 1 Law Enforcement: Develop, enhance, and enforce regulations about the distribution and use of chemicals. Rank: 2

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 4 Pollution; Excess energy; Noise pollution: Transportation corridors - Noise pollution. Rank: 1.5

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: Reduce noise pollution through planting native trees (natural noise barrier) and using different concrete blends. Rank: 2

Issue 5 Pollution; Industrial and military effluents; Type unknown: Accidental spills of toxins and sewage. Rank: 1.8

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration: Maintain DFW involvement in the Natural Resource Damage Assessment process. Rank: 1.7

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Emergency Response Branch to integrate key habitat and SGCN protection into emergency response planning. Rank: 1.8

Education

Action 1 Education; Educator/instructor training: Provide training for DFW staff, such as incident management, hazardous materials handling and wildlife rescue, to facilitate involvement in emergency response actions. Rank: 1.8

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Develop/enhance partnerships with Tri-State Birds Rescue and other wildlife rehabilitators to improve emergency response. Rank: 1.2

Issue 6 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Agricultural and forestry operations - Pesticides. Rank: 2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 1.8

Action 2 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentives programs to develop incentives for IPM implementation on farmland. Rank: 1.8

Issue 7 Pollution; Air-borne pollutants; Type unknown: Negative impacts of air pollution to key habitats and SGCN. Rank: 2

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Support research to assess and monitor impacts of air-borne pollutants on key habitats. Rank: 1.8

Law Enforcement

Action 1 Law Enforcement: Enforce existing limits on releases of air-borne pollutants. Rank: 1.7

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 8 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Residential and commercial development practices - Pesticides. Rank: 2

Coordination and Administration

Action 1 Coordination and Administration; Incentives: Work with Cooperative Extension to promote IPM implementation to minimize impacts of residential and commercial pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on private golf courses, recreational facilities and common areas. Rank: 1.8

Issue 9 Pollution; Garbage and solid waste: Beach cleanup activities (raking, events). Rank: 2.3

Outreach

Action 1 Outreach; Recruitment and retention activities: Develop education and outreach for beach cleanup participants about minimizing impacts to SGCN. Rank: 2.3

Recreation Needs

Issue 1 Recreation Needs; Public access needs; Need for more public access to areas or facilities for outdoor recreation: Rank: 2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Provide more public access on public and private lands. Rank: 1.8

Residential and Commercial Development

Issue 1 Residential and Commercial Development; Housing and urban areas: Residential and commercial practices - Piers and docks. Rank: 1.8

Outreach

Action 1 Outreach: Work with county building officials to encourage developers to construct community piers and docks in subdivisions, in place of individual structures. Rank: 1.8

Action 2 Outreach: Work with developers to create design standards for piers and docks that minimize habitat loss or fragmentation. Rank: 1.8

Issue 2 Residential and Commercial Development: Development causing habitat conversion, habitat loss, fragmentation and disturbance. Rank: 1.2

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3, as necessary. Rank: 1.8

Land and Water Rights Acquisition and Protection

Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 2

Outreach

CHAPTER 4: Conservation Actions and Opportunities

Statewide Conservation Issues and Actions

Action 1 Outreach; Partner/Stakeholder engagement: Work with conservation partners, state and county planning officials, and developers to create certification for environmentally-friendly developments, including an associated media campaign with awards. Rank: 2.3

Planning

Action 1 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3

Action 2 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.5

Action 3 Planning; Land use planning: Develop state policies to require incorporation of Key Wildlife Habitats into plans and planning. Rank: 1.7

Action 4 Planning; Land use planning: Encourage all counties to adopt environmental design standards for development projects in order to protect key wildlife habitats and SGCN. Rank: 1.7

Action 5 Planning; Land use planning: Encourage Kent and Sussex counties to adopt overlay zoning ordinances for the DEN and/or green infrastructure. Rank: 1.7

Action 6 Planning; Species and habitat management planning: Implement State and County Strategies for Policies and Spending by restricting development to Levels 1-3, as necessary. Rank: 2

Action 7 Planning; Land use planning: Work with developers to design BMPs that minimize impacts to key habitats and SGCN by preserving and restoring buffers and by reducing edge effects where appropriate and necessary. Rank: 2.2

Technical Assistance

Action 1 Technical Assistance; Environmental review; Review of proposed projects: Improve federal/state/local coordination of environmental reviews to ensure that potential impacts to key habitats and SGCN are minimized for all major projects. Rank: 1.7

Issue 3 Residential and Commercial Development: Habitat loss, fragmentation and disturbance caused by new development. Rank: 1.2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Create certification for environmentally-friendly developments through agency and NGO-established criteria and develop an associated media campaign. Create set of well-publicized awards for environmentally-friendly developments. Rank: 2.2

Issue 4 Residential and Commercial Development; Housing and urban areas: Impervious surfaces - storm sedimentation and water quantity issues (flash flooding). Rank: 1.3

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Using existing data which identifies neighborhoods with impervious surface problems, reach out to them about green solutions and encourage pervious surfaces. Rank: 2.2

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 5 Residential and Commercial Development: Development causing habitat conversion, habitat loss, fragmentation and disturbance. Rank: 1.7

Land and Water Rights Acquisition and Protection

Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Increase public acquisition of key habitats targeted by potential development. Rank: 1.7

Issue 6 Residential and Commercial Development; Commercial and industrial areas: Lack of information - Emerging industry (lack of information on impacts and lack of regulations). Rank: 1.8

Data Collection and Analysis

Action 1 Data Collection and Analysis: Rank: 1.8

Issue 7 Residential and Commercial Development: Rank: 2

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: Work with appropriate agencies to restore coastal habitats. Rank: 1.8

Issue 8 Residential and Commercial Development; Housing and urban areas: Home Owner Associations; City/County Org. require certain lawn maintenance that are not healthy for wildlife or habitats. Rank: 2

Education

Action 1 Education; Student training: Educate Home Owner's Associations, county and town policy makers to promote green practices in lawn maintenance. Rank: 2.3

Issue 9 Residential and Commercial Development: Increased energy demand of new development. Rank: 2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Educate and incentivize developers/contractors in order to increase property values. Rank: 2

Planning

Action 1 Planning: Recommend alternative energy at time of development (e.g., solar). Rank: 2

Issue 10 Residential and Commercial Development; Housing and urban areas: Placement and management of storm water retention ponds/catchment areas, as they can increase mortality of wildlife, becoming population sinks/traps. Rank: 2

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research and monitor effects of stormwater retention ponds on native species and research/develop alternative insect control other than introduction of non-native fish. Rank: 1.8

CHAPTER 4: Conservation Actions and Opportunities

Statewide Conservation Issues and Actions

Action 2 *Data Collection and Analysis; Research, survey, or monitoring - habitat: Research and monitor effects of stormwater retention ponds/catchment areas/road run off and salt impacts. Rank: 2.3*

Direct Management of Natural Resources

Action 1 *Direct Management of Natural Resources: Collaborate/coordinate with appropriate body to develop guidelines/regulations to improve with regards to wildlife and appropriate use of fish for insect control. Rank: 2.3*

Outreach

Action 1 *Outreach; Partner/Stakeholder engagement: Educate public/landowners/developers on effects of stormwater retention pond on species/habitat/hydrology and promote natural wetland solutions. Rank: 2*

Issue 11 Residential and Commercial Development: Development causing habitat conversion, habitat loss, fragmentation and disturbance. Rank: 2.2

Planning

Action 1 *Planning: Smart development utilizing existing infrastructure. Rank: 2*

Issue 12 Residential and Commercial Development: Ground water extraction (irrigation, hydrology, etc.) effects exacerbated by climate change. Rank: 2.2

Data Collection and Analysis

Action 1 *Data Collection and Analysis: Increase climate change-focused research and monitoring around ground water extractions (irrigation, hydrology, etc.) and development drainage. Rank: 2*

Issue 13 Residential and Commercial Development: Ground water extractions (irrigation, hydrology, etc.) and development drainage. Rank: 2.2

Planning

Action 1 *Planning: Plan for climate change scenarios. Rank: 2.5*

Issue 14 Residential and Commercial Development: Cemetery planning doesn't incorporate planning to use land as habitat. Rank: 2.5

Outreach

Action 1 *Outreach: Work with cemetery and other open space land owners/managers to consider SGCN and proper habitats when planning landscaping and mowing schedules. Rank: 2.5*

Issue 15 Residential and Commercial Development: Environmental justice considerations when planning developments and industrial infrastructure. Rank: 2.5

Planning

Action 1 *Planning; Land use planning: Rank: 2.5*

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 16 Residential and Commercial Development: Natural beach dynamics causing loss of spawning habitat. Rank: 2.7

Data Collection and Analysis

Action 1 Data Collection and Analysis: Research the potential benefit of jetties for protecting spawning beaches from wave action. Rank: 1.7

Issue 17 Residential and Commercial Development; Housing and urban areas: Temporary ponding in residential yards resulting in installation of drainage systems (ex: New Castle County) that drain this water to the nearest stream which increases peak discharge and downstream flooding, stream channel/bank erosion and sedimentation. Rank: 2.7

Coordination and Administration

Action 1 Coordination and Administration; Incentives: Create incentives for public implementation of BMP type solutions. Rank: 2.3

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Promote rain gardens and educate homeowners about negative impacts of installing drainage systems in this situation. Breaks for rain barrels and other good practices (e.g. VT). Rank: 1.5

Issue 18 Residential and Commercial Development; Housing and urban areas: Cultivated lawns should be considered as semi impervious surfaces. Rank: 3

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration: Tax/fee for cultivated lawns, impervious surface. Rank: 3

Resource Management Needs

Issue 1 Resource Management Needs; Management decision needs: DE is the only state in the Mid-Atlantic Region without a special program for non-tidal wetlands. Rank: 1

Planning

Action 1 Planning: Contribute to research projects investigating how and where nontidal wetlands are vulnerable to climate change. Rank: 1

Action 2 Planning: Develop a statewide conservation program for nontidal wetlands. Rank: 1

Issue 2 Resource Management Needs: Residential development causing loss of key habitats and SGCN. Rank: 1

Land and Water Rights Acquisition and Protection

Action 1 Land and Water Rights Acquisition and Protection: Support the protection of SGCN and habitats from residential development. Rank: 1

Planning

Statewide Conservation Issues and Actions

Action 1 Planning; State Wildlife Action planning: Implement management for SGCN and key habitats on state lands (and Federal, NGO and private lands if appropriate) in order to protect extant occurrences and restore historic occurrences, and to establish new occurrences where feasible. Rank: 1.4

Issue 3 Resource Management Needs; Resource information collection needs: Baseline information needed. Rank: 1.2

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct research to better characterize the biology of SGCN and the ecology of key habitats as necessary to support adaptive management. Rank: 1.5

Action 2 Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Conduct surveys to more fully document the current distribution and condition of key habitats. Rank: 1.5

Action 3 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct surveys to more fully document the current distribution and status of SGCN, especially in Key Habitats. Rank: 1.5

Action 4 Data Collection and Analysis; Database development and management: Establish Natural Heritage ranks for all SGCN and key habitats not currently tracked by the Natural Heritage Program, and use the results to update SGCN and key habitat lists as necessary. Develop protocols for timely review and revision of all Natural Heritage ranks to maintain currency of SGCN and key habitat lists. Rank: 1.5

Issue 4 Resource Management Needs; Resource information collection needs: Need for more consistent species monitoring, especially for migratory species. Rank: 1.2

Data Collection and Analysis

Action 1 Data Collection and Analysis: Expand consistent species monitoring, particularly to under surveyed migratory species. Rank: 1.8

Issue 5 Resource Management Needs; Resource information collection needs: Need for more information on current distribution of invasive species. Rank: 1.2

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources; Invasive species control: Research and map current distribution of invasives, identify locations of greatest threat and develop a response plan. Rank: 1.5

Issue 6 Resource Management Needs: Resource protection - Funding needed for open space acquisition to protect SGCN and key habitats. Rank: 1.2

Land and Water Rights Acquisition and Protection

Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Provide sufficient funding for the Open Space Program. Rank: 1

Issue 7 Resource Management Needs; Management decision needs: Natural resource management planning - Conservation planning process. Rank: 1.3

Data Collection and Analysis

Action 1 Data Collection and Analysis; Database development and management: Analyze species and habitat management on state conservation lands - Wildlife Areas, Parks, and Forests - and adapt management as necessary to increase key habitat patch size and reduce edge effects on SGCN. Rank: 1.7

Issue 8 Resource Management Needs; Management decision needs: Lack of State ranks for plants. Rank: 1.3

Data Collection and Analysis

Action 1 Data Collection and Analysis; Database development and management: Rank plants (e.g. Nature serve - G/S ranks and DE flora book). Rank: 1.5

Issue 9 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Monitoring and adaptive management - Lack of quantitative measures of success for assessing DEWAP implementation. Rank: 1.3

Data Collection and Analysis

Action 1 Data Collection and Analysis; Database development and management; Database development: Develop a quantitative or semi-quantitative scoring system for representing key habitat condition. Rank: 1.5

Action 2 Data Collection and Analysis: Develop performance indicators that measure the success of conservation actions for abatement of "direct threat" conservation issues by monitoring changes in the extent and severity of impacts from these issues. Rank: 1.5

Action 3 Data Collection and Analysis: Develop performance indicators that measure the success of conservation actions that resolve "indirect threat" conservation issues by monitoring appropriate metrics. Rank: 1.5

Action 4 Data Collection and Analysis: Develop performance indicators that measure the success of SGCN and key habitat management by monitoring trends in distribution and status of SGCN, and distribution and condition of key habitats. Rank: 1.7

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Combine performance indicators into an annual "scorecard" of DEWAP implementation. Provide this scorecard to conservation partners, stakeholders, elected officials, media and the general public in order to enhance accountability. Rank: 1.3

Planning

Action 1 Planning: Create an adaptive management framework that utilizes monitoring to adapt planning and implementation to conservation actions to account for unsatisfactory results, changing conditions and new information. Rank: 2

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 10 Resource Management Needs; Management decision needs: Natural resource management planning - Conservation planning process. Rank: 1.3

Data Collection and Analysis

Action 1 Data Collection and Analysis: Conduct research on the extent and severity of impacts from "direct threat" conservation issues to key habitats and SGCN as needed to support adaptive management. Rank: 1.8

Action 2 Data Collection and Analysis; Database development and management: Develop quantitative or semi-quantitative risk assessment protocols for all "direct threat" conservation issues where they do not already exist, and utilize risk assessment results to prioritize conservation issues. Rank: 1.8

Action 3 Data Collection and Analysis; Database development and management; Information systems operations and maintenance: Develop standardized classifications systems (species, habitats, issues, actions) and data formats, or at least compatible systems and formats, that will facilitate cooperative planning among DFW and conservation partners. Rank: 1.8

Action 4 Data Collection and Analysis; Database development and management: Refine the DEWAP wildlife habitat maps to better inform resource management planning, and develop a protocol for periodic updates. This should include incorporating new information such as the recently completed Gap Analysis Project mapping, and updating existing resource maps such as wetlands, forests and land use/land cover. Rank: 1.8

Issue 11 Resource Management Needs; Resource information collection needs: Rank: 1.5

Data Collection and Analysis

Action 1 Data Collection and Analysis; Database development and management: Continue to refine and update vegetation community classification, descriptions, inventory, and mapping. Rank: 1.5

Action 2 Data Collection and Analysis: Improve mapping consistency and accuracy for habitats by integrating Habitats of Conservation Concern data layer with Delaware Vegetation Community layer. Rank: 1.5

Issue 12 Resource Management Needs; Resource information collection needs: Impact on nontarget species from private insect (mosquito) control companies. Rank: 1.5

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research impacts of pest control on nontarget species. Rank: 1.5

Issue 13 Resource Management Needs; Resource information collection needs: Need for monitoring of SGCN, key habitats, impacts from conservation issues and outcomes of conservation actions. Rank: 1.5

Data Collection and Analysis

Action 1 Data Collection and Analysis; Techniques development; Fish and wildlife research survey and management techniques: Develop or adapt standardized monitoring protocols that incorporate existing state, regional and national monitoring schemes where they exist, and include these protocols in all conservation programs and projects. Rank: 2

Action 2 Data Collection and Analysis: Monitor abatement of impacts to SGCN and key habitats from "direct threat" conservation issues. Rank: 2

CHAPTER 4: Conservation Actions and Opportunities

Statewide Conservation Issues and Actions

Action 3 *Data Collection and Analysis: Monitor outcomes of conservation actions for SGCN and key habitats. Rank: 2*

Action 4 *Data Collection and Analysis: Monitor SGCN and key habitats to determine trends in the distribution and status of SGCN and the distribution and condition of key habitats. Rank: 2*

Issue 14 Resource Management Needs: Nuisance wildlife management - Dedicated response staff. Rank: 1.5

Coordination and Administration

Action 1 *Coordination and Administration; Coordination and administration; Program/project administrative support: Provide additional resources to respond to nuisance wildlife complaints. Rank: 2.4*

Issue 15 Resource Management Needs: Resource protection - Enforcement capacity insufficient. Rank: 1.5

Education

Action 1 *Education; Educator/instructor training: Provide training on existing and future laws and regulations for protection of SGCN and key habitats, and additional staff resources, to handle enforcement of those regulations. Rank: 1.7*

Issue 16 Resource Management Needs; Management decision needs; Need to provide technical assistance: Rank: 1.7

Action 1 *: Partner more with NGOs and nature enthusiasts to address data collection/survey needs and recruit Citizen Scientists, volunteer monitors, wardens, etc. Rank: 1.7*

Data Collection and Analysis

Action 1 *Data Collection and Analysis: Develop a list of needs that volunteers could help address. Rank: 1.7*

Issue 17 Resource Management Needs; Resource information collection needs: Lack of information - Nontarget species research/information. Rank: 1.8

Data Collection and Analysis

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of herbicides, pesticides and unintentional chemical pollution sources on non-target species. Rank: 1.8*

Issue 18 Resource Management Needs; Management decision needs: Facility and Program Operations. Rank: 2

Outreach

Action 1 *Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to develop policies for minimizing impacts from facility and program operations to key habitats and SGCN. Rank: 1.8*

Technical Assistance

Statewide Conservation Issues and Actions

Action 1 Technical Assistance; Environmental review; Review of proposed policies and plans: Review facility and program operations on state conservation lands - Wildlife Areas, Parks and Forests - and develop state policies for minimizing impacts to key habitats and SGCN. Establish MOUs with DPR and the State Forest Service about consultation with DFW on issues impacting key habitats and SGCN in State Parks and State Forests. Rank: 1.3

Issue 19 Resource Management Needs; Management decision needs: Habitat/Wildlife management. Rank: 2.2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to adapt species and habitat management to increase key habitat patch size and reduce edge effects on SGCN. Rank: 1.2

Transportation and Service Corridors

Issue 1 Transportation and Service Corridors; Shipping lanes: Channel dredging to allow for boat/ship traffic. Rank: 1

Data Collection and Analysis

Action 1 Data Collection and Analysis: Continue monitoring, researching, and assessing dredging impacts to wildlife and habitats. Rank: 2

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: Address beneficial use of dredge material. Rank: 1

Action 2 Direct Management of Natural Resources; Water management: Develop and implement time of year restrictions for dredging to minimize negative impacts to wildlife and habitats. Rank: 1

Issue 2 Transportation and Service Corridors; Utility and service lines: Habitat loss and fragmentation - Utility Corridors. Rank: 1.2

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with utilities to develop BMPs to integrate key habitat and SGCN conservation into corridor maintenance, including controlling invasive species, preserving and restoring buffers and reducing edge effects. Rank: 1.5

Planning

Action 1 Planning; Land use planning: Work with utilities and state and local planning officials to integrate key habitat and SGCN conservation into long-range planning for electric, water, sewer, natural gas and petroleum lines. Rank: 1.5

CHAPTER 4: Conservation Actions and Opportunities
Statewide Conservation Issues and Actions

Issue 3 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 1.2

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1

Planning

Action 1 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1

Issue 4 Transportation and Service Corridors: Expanding roadways from residential development causing wetland buffer conversion. Rank: 1.3

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: Maintain or improve hydrologic connections (e.g. restore tidal flow in estuarine systems) when maintaining or constructing buildings, railroads, and highways adjacent to rivers, lakes or wetlands. Rank: 2

Planning

Action 1 Planning: Develop and implement regulations to limit wetland buffer conversion. Rank: 2

Issue 5 Transportation and Service Corridors; Roads and railroads: Negative impacts of transportation construction and infrastructure that disrupts wildlife, their movements, and habitats (including road mortality). Rank: 1.3

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: Create/maintain "citizen crossing brigades" and similar programs. Rank: 1.7

Planning

Action 1 Planning; Land use planning: Use conservation banking to mitigate unavoidable impacts of transportation. Rank: 1.8

Technical Assistance

Action 1 Technical Assistance; Technical assistance; Technical assistance: Integrate wildlife diversity planning into transportation planning. Coordinate with resource agencies early, substantively and continuously throughout transportation planning and project development (including wildlife passages, corridors, and barriers), with particular attention to avoiding vertical curbs whenever necessary and possible. Rank: 1.7

Issue 6 Transportation and Service Corridors: Transportation infrastructure - Culverts. Rank: 1.5

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat: Continue to conduct hydrologic analyses and assess impacts on water volume and hydrology. Rank: 2.2

Statewide Conservation Issues and Actions

Outreach

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Continue to work with DeIDOT to evaluate stream crossings and install the necessary size culverts to allow for proper passage of waters (high flows, floodplain/out-of-bank flow) to reduce erosion downstream caused by high velocity waters due to culvert restriction. Properly sized culverts will also allow floodplains to retain the natural ecological process and allow better movement of fish/invertebrates up and down stream. Rank: 2

Issue 7 Transportation and Service Corridors; Roads and railroads: Salt road treatments. Rank: 1.8

Data Collection and Analysis

Action 1 Data Collection and Analysis; Techniques development: Acquire salinity data in adjacent waterways and wetlands, research alternative methods, and measure salt application (volume). Rank: 2.2

Direct Management of Natural Resources

Action 1 Direct Management of Natural Resources: Minimize salt use on roadways, particularly in sensitive areas. Rank: 2.5

Issue 8 Transportation and Service Corridors; Flight paths: Airport operations - Overflights. Rank: 2

Data Collection and Analysis

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Continue/expand studies of disturbance of SGCN from overflights, and work with Dover Air Force Base to mitigate disturbance. Rank: 1.7

Issue 9 Transportation and Service Corridors: Mowing incompatible to wildlife/habitat and adjacent agricultural fields. Rank: 2

Outreach

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Coordinate with DEL DOT on mowing schedule and location. Outreach/education regarding importance of roadside vegetation for pollinators. Balance weed control with habitat management. Rank: 2

Issue 10 Transportation and Service Corridors; Roads and railroads: Transportation infrastructure - Railroads. Rank: 2.5

Coordination and Administration

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Coordinate maintenance around lines with DE Valley, N Southern Ind. RR Companies. Rank: 2.9

Habitat Conservation Issues and Actions

Estuarine or Marine

Habitat Types: *Marine Offshore*
Marine Oceanic
Marine Nearshore
Estuarine Open Water
Estuarine Coastal

Issue and Actions:

Issue 1 **Pollution: Nutrients and sediments from agricultural, commercial, and residential point and non-point sources causing aquatic habitat degradation. Rank: 1**

Action 1 *Direct Management of Natural Resources: Encourage implementation of existing BMPs in agricultural, residential, and commercial areas. Rank: 1.5*

Action 2 *Education: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring of SGCN and key habitats; recruit people to conduct surveys and protect sites, such as working with landowners on streambank restoration. Rank: 1.5*

Issue 2 **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Invasive and other problematic species and wildlife diseases (i.e., Green Crab, Japanese Shore Crab, Mitten Crab). Rank: 1.2**

Action 1 *Data Collection and Analysis: Assess impacts of invasive and other problematic species and wildlife diseases (i.e., Green Crab, Japanese Shore Crab, Mitten Crab) on key habitats and use this assessment and long-term monitoring to guide adaptive management, education, outreach and enforcement efforts, as necessary. Rank: 1.7*

Issue 3 **Pollution; Industrial and military effluents: Chronic water pollution. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess and monitor the impacts of water pollution on key habitats and SGCN. Rank: 1.7*

Action 2 *Law Enforcement: Support the Division of Water enforcement of existing limits on releases of water pollution. Rank: 1.7*

Issue 4 **Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Negative impacts to habitats and wildlife from pesticides used during agricultural and forestry operations. Rank: 1.3**

Action 1 *Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 2.2*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 5 Natural System Modifications; Other ecosystem modifications: Negative impacts and/or long-term impacts of beach renourishment projects caused by sand mining and sand placement (excavation and embankment). Rank: 1.5

Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Division of Watershed Stewardship in selection and use of nearshore borrow areas to take into consideration key habitats and SGCN conservation. Rank: 1.5

Issue 6 Human Intrusions and Disturbance; Recreational activities: Negative impacts of boats and personal watercraft. Rank: 1.5

Action 1 Law Enforcement: Post "no wake" zones to protect key habitats and enforce them. Rank: 1.2

Action 2 Law Enforcement: Strengthen enforcement of regulations for off-road vehicles on managed areas to protect key habitats and SGCN. Rank: 1.2

Action 3 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess the impacts of boats and personal watercraft on key habitat and SGCN, and use this assessment and long-term monitoring to adapt management as necessary. Rank: 1.5

Action 4 Coordination and Administration; Coordination and administration; Program/project administrative support: Support expansion of the Division of Watershed Stewardship's Clean Marinas Program to reduce pollution impacts to key habitats and SGCN. Rank: 1.7

Action 5 Education; Educator/instructor training: Work with manufacturers and retailers to develop education and outreach for beach users, boaters, and PWC users about minimizing impacts to SGCN. Rank: 1.7

Issue 7 Pollution: Negative impacts of intentional and accidental spills of toxins and sewage. Rank: 1.5

Action 1 Outreach; Partner/Stakeholder engagement: Develop/enhance partnerships with Tri-State Birds Rescue and other wildlife rehabilitators to improve emergency response. Rank: 1

Action 2 Coordination and Administration; Coordination and administration: Maintain DFW involvement in the Natural Resource Damage Assessment process and in ICS (Incident Command System) training. Rank: 1.5

Action 3 Education; Educator/instructor training: Provide training for DFW staff, such as incident management, hazardous materials handling and wildlife rescue, to facilitate involvement in emergency response actions. Rank: 1.5

Action 4 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Emergency Response Branch to integrate key habitat and SGCN protection into emergency response planning. Rank: 1.8

Issue 8 Pollution; Domestic and urban waste water; Sewage: Ocean outfall pipes (state waters). Rank: 1.5

Action 1 Data Collection and Analysis; Techniques development; Habitat restoration methods: Research alternative methods of sewage treatment/disposal. Look at West Coast example of constructed wetlands. Rank: 2

Action 2 Data Collection and Analysis: Research the capability to monitor for pharmaceuticals, diseases, etc. in wastewater post-treatment and prior to disposal. Rank: 2

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 9 Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (large scale): Unintentional effects of commercial fisheries dredging on habitats and SGCN. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Assess impacts to key habitats and SGCN and use this assessment and long-term monitoring to guide adaptive management, including restrictions on frequency and timing, and the designation of "no dredge zones" if necessary. Rank: 1.8

Action 2 Data Collection and Analysis; Techniques development: Support research on designing fisheries dredging gear and techniques that minimize impacts to SGCN. Rank: 1.8

Issue 10 Energy Production and Mining; Renewable energy: Location of wind farm facilities impacting key habitats and SGCN. Rank: 1.7

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with energy companies to develop standards for the location of wind farms to minimize loss and fragmentation of key habitats. Rank: 1.5

Issue 11 Pollution; Domestic and urban waste water: Negative impacts due to nutrient and sediments from residential and commercial development practices. Rank: 2

Action 1 Technical Assistance: Work with local jurisdictions to update ordinances to promote and encourage better erosion and sediment control practices. Rank: 1.8

Action 2 Law Enforcement: Encourage/incentivize the counties to strengthen enforcement of erosion and sediment control regulations. Rank: 1.8

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8

Action 4 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to promote the implementation of BMPs for erosion and sediment control. Rank: 1.8

Action 5 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.8

Issue 12 Transportation and Service Corridors; Shipping lanes: Negative impacts of commercial ships and boats on key habitats and SGCN. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Assess impacts to SGCN from vessel strikes and use this assessment and long-term monitoring to guide adaptive management, education, outreach and enforcement efforts as necessary. Rank: 1.8

Action 2 Law Enforcement: Post "no wake" zones to protect key habitats and SGCN, and enforce them. Rank: 2

Action 3 Outreach; Recruitment and retention activities; For fishing and boating: Work with the shipping and commercial fishing industries to develop education and outreach for boat operators about minimizing impacts to key habitats and SGCN. Rank: 2

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 13 Pollution: Negative impacts of marine debris and solid waste to marine life. Rank: 2

- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Assess impacts to SGCN and use this assessment and long-term monitoring to guide adaptive management, education, outreach and enforcement efforts, as necessary. Rank: 2*
- Action 2 Education: Educate the public about the effects of marine debris (from disposable consumer products) on marine life and alternative measures they can implement. Rank: 2*

Issue 14 Pollution; Herbicides and pesticides: Negative impacts of residential and commercial pesticide and herbicide use. Rank: 2

- Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with Cooperative Extension to develop education and outreach for landowners about the impacts of residential pesticides on SGCN. Rank: 1.8*
- Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with Cooperative Extension to integrate key habitat and SGCN conservation into pesticide applicator training. Rank: 2.2*
- Action 3 Coordination and Administration; Incentives: Work with Cooperative Extension to promote IPM implementation to minimize impacts of residential and commercial pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on private golf courses, recreational facilities and common areas. Rank: 2.2*

Issue 15 Energy Production and Mining; Renewable energy: Negative impacts of tidal turbines on key habitats and SGCN. Rank: 2

- Action 1 Data Collection and Analysis: Monitor proposed sites to gather baseline data prior to installation and implement long-term monitoring of key habitat and potential impacts to SGCN in the event of tidal turbine installation. Rank: 2*
- Action 2 Data Collection and Analysis: Review existing research and conduct further research assessing impacts of tidal turbines. Rank: 2*
- Action 3 Data Collection and Analysis; Techniques development: Support research on improving the design of turbines to minimize impacts to SGCN. Rank: 2*
- Action 4 Outreach; Partner/Stakeholder engagement; Others: Work with energy companies to develop standards for the location of tidal turbines to minimize impacts to SGCN. Rank: 2*

Issue 16 Biological Resource Use; Fishing and harvesting aquatic resources; Intentional use: Negative impacts to habitats, SGCN, and other wildlife due to inappropriate hunting and fishing. Rank: 2

- Action 1 Coordination and Administration; Coordination and administration: Maintain compliance with interstate management agreements. Rank: 1.5*
- Action 2 Law Enforcement: Strengthen enforcement of existing recreational and commercial fishing regulations. Rank: 2*
- Action 3 Education; Student training; Aquatic resource education: Incorporate information about SGCN conservation into the Fishing Guide. Rank: 2.2*
- Action 4 Coordination and Administration; Coordination and administration; Program/project administrative support: Integrate SGCN conservation into fishing regulations. Rank: 2.2*

Delaware Wildlife Action Plan
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Issue 17 Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (subsistence/small scale): Negative impacts to SGCN (e.g. fishing gear entanglement) due to derelict, ghost, or abandoned gear Rank: 2

Action 1 Outreach; Partner/Stakeholder engagement; Others: Evaluate expanding International Coastal Cleanup Day to include recovery of submerged, lost or abandoned fishing gear. Rank: 1.8

Action 2 Outreach; Partner/Stakeholder engagement; Others: Develop education and outreach about reducing the impacts of entanglement on SGCN for distribution with commercial fishing licenses. Rank: 2.2

Action 3 Education; Student training; Aquatic resource education: Incorporate information about reducing the impacts of entanglement on SGCN into the Fishing Guide. Rank: 2.2

Action 4 Outreach; Partner/Stakeholder engagement; Others: Expand efforts to recover and recycle fishing line and gill nets using Florida's "Monofilament Recovery and Recycling Program" or a similar strategy. Rank: 2.5

Issue 18 Transportation and Service Corridors; Shipping lanes: Transportation and utility operations and maintenance - Channel dredging. Rank: 2

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water and US Army Corps of Engineers to integrate key habitat and SGCN conservation into dredging plans. Rank: 1.8

Issue 19 Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (large scale): Negative impacts to wildlife and SGCN due to fisheries bycatch. Rank: 2.2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Assess impacts to SGCN and use this assessment and long-term monitoring to guide adaptive management, education, outreach and enforcement efforts, as necessary. Rank: 1.8

Action 2 Data Collection and Analysis; Techniques development: Support research on designing fishing gear and techniques that minimize impacts to SGCN. Rank: 2.2

Issue 20 Natural System Modifications; Other ecosystem modifications: Habitat loss and fragmentation due to dredge spoil disposal. Rank: 2.3

Action 1 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to identify sites for use of dredge spoils to create/restore key habitats. Rank: 1.7

Action 2 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to incorporate key habitat and SGCN conservation into spoil disposal plans. Rank: 1.7

Action 3 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to mitigate contaminant impacts to SGCN. Rank: 1.8

Issue 21 Natural System Modifications: Loss of SGCN and other wildlife due to entrainment, entrapment, and impingement at water intakes in industrial facilities. Rank: 2.3

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with utilities and industry to assess impacts to SGCN from impingement/entrapment/entrainment, and adapt the design and operation of water intakes as necessary for SGCN conservation. Rank: 1.8

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Issue 22 Pollution; Industrial and military effluents; Seepage from mining: Negative impacts to habitats and wildlife from sand and gravel quarrying. Rank: 2.5

Action 1 Coordination and Administration; Incentives: Work with the Division of Watershed Stewardship and landowner incentive programs to develop BMPs, and corresponding incentives, for quarries to minimize impacts of sediments on key habitats. Rank: 1.7

Issue 23 Pollution; Excess energy; Thermal pollution: Negative impacts to key habitats, SGCN, and other wildlife from thermal pollution from power plants. Rank: 2.5

Action 1 Data Collection and Analysis; Techniques development: Support research to assess impacts of thermal pollution on SGCN to inform better management recommendations. Rank: 2.3

Issue 24 Pollution: Impacts of disposal of contaminated materials into open water. Rank: 2.7

Action 1 Law Enforcement: Restrict open water disposal of contaminated materials. Rank: 2

Issue 25 Natural System Modifications: Loss of SGCN and other wildlife due to entrainment, entrapment, and impingement at water intakes in industrial facilities. Rank: 3.3

Action 1 Law Enforcement: Better enforcement of observer reporting of interactions with SGCN at industrial facilities with water intake systems. Increased transparency. Rank: 2

Riverine

Habitat Types: *Piedmont Small and Medium River
Piedmont Headwaters and Creeks
Freshwater Tidal Open Water
Freshwater Tidal Coastal (Rivers, Creeks)
Coastal Plain Small and Medium River
Coastal Plain Headwaters and Creeks*

Issue and Actions:

Issue 1 Pollution; Agricultural and forestry effluents: Agricultural and forestry operations - Nutrients and sediments. Rank: 1.2

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Agriculture to promote the implementation of BMPs for erosion and sediment control. Rank: 1.2

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.3

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Issue 2 Pollution; Industrial and military effluents: Chronic water pollution. Rank: 1.2

Action 1 Law Enforcement: Support the Division of Water enforcement of existing limits on releases of water pollution. Rank: 1.2

Action 2 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess and monitor the impacts of water pollution on key habitats and SGCN. Rank: 1.7

Issue 3 Pollution; Domestic and urban waste water: Negative impacts due to nutrient and sedimentation from residential and commercial development practices. Rank: 1.2

Action 1 Law Enforcement: Encourage/incentivize the counties to strengthen enforcement of erosion and sediment control regulations. Rank: 1.2

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies and to promote the implementation of BMPs for erosion and sediment control. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.3

Action 4 Technical Assistance; Agency administrative support: Work with local jurisdictions to update ordinances to promote and encourage better erosion and sediment control practices. Rank: 1.8

Issue 4 Pollution; Industrial and military effluents; Seepage from mining: Negative impacts to habitats and wildlife due to sediments from sand and gravel quarrying. Rank: 1.2

Action 1 Coordination and Administration; Incentives: Work with the Division of Watershed Stewardship and landowner incentive programs to develop BMPs, and corresponding incentives, for quarries to minimize impacts of sediments on key habitats. Rank: 1.7

Issue 5 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Negative impacts of invasive plants and wildlife on key habitat and SGCN (i.e., Asiatic Clam, Phragmites, etc.). Rank: 1.3

Action 1 Direct Management of Natural Resources; Planting/seeding: Require use of native, Delaware indigenous species for new plantings or replantings on lands managed by the state, similar to the Native Plants Policy of the Division of Parks and Recreation. Rank: 1.2

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of the Delaware Invasive Species Management Plan, as appropriate, to reduce the impacts of invasive species on key habitats and SGCN. Rank: 1.2

Action 3 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Transportation, Delaware Center for Horticulture and Cooperative Extension to enhance transportation construction and maintenance practices such as requiring the planting of native species, and limiting mowing during breeding, migration or other critical times for SGCN. Rank: 1.2

Action 4 Planning: Work with the Delaware Invasive Species Council and conservation land managers to develop and implement adaptive management plans for control of invasive species. Rank: 1.2

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- Action 5 Direct Management of Natural Resources; Invasive species control: Work with the Delaware Invasive Species Council and conservation land managers to assess and monitor impacts of invasive plants using the Delaware Alien Plant Invasiveness Risk Assessment protocol, and prioritize control efforts based on degree of risk. Rank: 1.3*
- Action 6 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Work with the Delaware Invasive Species Council and conservation land managers to conduct quantitative invasive plant surveys of key habitats. Rank: 1.3*
- Action 7 Outreach; Partner/Stakeholder engagement: Develop education and outreach, partnerships, voluntary guidelines, incentives, and/or regulations, as necessary, for controlling invasive plants on private property and in private commerce, to minimize impacts to key habitats. Rank: 1.5*
- Action 8 Coordination and Administration; Coordination and administration: Work with the Delaware Invasive Species Council to establish an interagency early detection and rapid response system to react to new invasions. Rank: 1.5*
- Issue 6 Transportation and Service Corridors; Shipping lanes: Negative impacts to habitats and other wildlife due to channel dredging. Rank: 1.3**
- Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water and US Army Corps of Engineers to integrate key habitat and SGCN conservation into dredging plans. Rank: 1.2*
- Issue 7 Transportation and Service Corridors: Negative impacts to habitats and wildlife due to altered hydrology from transportation and utility operations and maintenance. Rank: 1.3**
- Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into stormwater management design. Rank: 1.2*
- Issue 8 Natural System Modifications; Dams and water management/use; Extraction of surface water (unknown use): Negative impacts to habitats and wildlife due to extraction of surface water for residential and commercial development practices. Rank: 1.3**
- Action 1 Law Enforcement: Encourage the counties to strengthen enforcement of stormwater management regulations. Rank: 1.2*
- Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.2*
- Action 3 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Division of Watershed Stewardship to promote the implementation of BMPs for stormwater management. Rank: 1.2*
- Issue 9 Natural System Modifications; Dams and water management/use: Negative impacts to habitats and wildlife from ditching and draining for agriculture and forestry operations. Rank: 1.3**
- Action 1 Coordination and Administration; Incentives: Work with the Division of Watershed Stewardship to provide incentives to tax ditch associations to implement BMPs that minimize impacts to key habitats. Rank: 1.2*
- Action 2 Coordination and Administration: Collaborate with the Tax Ditch Association to come to an agreement. Rank: 1.5*

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Action 3 Planning: Discourage the formation of new tax ditches in sensitive areas or where it will cause habitat degradation. Rank: 2

Issue 10 Pollution; Industrial and military effluents; Type unknown: Negative impacts of intentional and accidental spills of toxins and sewage. Rank: 1.5

Action 1 Outreach; Partner/Stakeholder engagement: Develop/enhance partnerships with Tri-State Birds Rescue and other wildlife rehabilitators to improve emergency response. Rank: 1.2

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Emergency Response Branch to integrate key habitat and SGCN protection into emergency response planning. Rank: 1.2

Issue 11 Natural System Modifications; Dams and water management/use: Negative impacts to habitats and wildlife due to altered hydrology from agricultural and forestry operations. Rank: 1.5

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Agriculture to promote the implementation of BMPs for stormwater management. Rank: 1.2

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship and Tributary Action Teams to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.2

Issue 12 Transportation and Service Corridors; Roads and railroads: Negative impacts to habitats and wildlife due to transportation infrastructure causing habitat loss and fragmentation. Rank: 1.5

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.2

Action 2 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.2

Issue 13 Natural System Modifications; Dams and water management/use; Dams (size unknown): Negative impacts to habitats and wildlife due to dam operations. Rank: 1.7

Action 1 Data Collection and Analysis: Assess the impacts of dam removal on key habitats and SGCN, and use this assessment and long-term monitoring to guide adaptive management, including control of sediments and associated toxins as necessary. Rank: 1.2

Action 2 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water and water utilities to evaluate the application of "ecologically sustainable water management" practices to dam operations to minimize impacts to key habitats and SGCN. Rank: 1.2

Action 3 Planning: Complete a cost/benefit analysis of dam removal. Consider the needs of other uses or values (historical, water supply). Investigate other options to solve issues (i.e., fish passages, etc.). Rank: 1.8

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Issue 14 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Negative impacts to habitats and wildlife from pesticides used during agricultural and forestry operations. Rank: 1.8

Action 1 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 1.3

Issue 15 Resource Management Needs; Management decision needs: Habitat/Wildlife management. Rank: 2

Action 1 Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to adapt species and habitat management to increase key habitat patch size and reduce edge effects on SGCN. Rank: 1.2

Action 2 Outreach; Partner/Stakeholder engagement: Evaluate means of managing for SGCN and key habitats on private property, including education and outreach, voluntary guidelines, incentives and regulations, as necessary. Rank: 1.8

Issue 16 Transportation and Service Corridors; Roads and railroads: Negative impacts to habitats and wildlife from road salt. Rank: 2.2

Action 1 Data Collection and Analysis: Work with the Delaware Department of Transportation to assess and monitor impacts to SGCN from road salt, adapt salt application practices as practicable for SGCN conservation, and evaluate alternatives to salt use as necessary. Rank: 1.2

Issue 17 Transportation and Service Corridors: Negative impacts of commercial ships and boats on key habitats and SGCN. Rank: 2.5

Action 1 Law Enforcement: Post and enforce "no wake" zones to protect key habitats. Rank: 1.2

Action 2 Outreach; Recruitment and retention activities; For fishing and boating: Work with the shipping and commercial fishing industries to develop education and outreach for boat operators about minimizing impacts to key habitats and SGCN. Rank: 1.3

Issue 18 Resource Management Needs; Management decision needs: Impacts of facility and program operations on key habitats (i.e. mowing, maintenance, etc.). Rank: 2.8

Action 1 Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to develop policies for minimizing impacts from facility and program operations to key habitats and SGCN. Rank: 1.2

Action 2 Technical Assistance; Environmental review; Review of proposed policies and plans: Review facility and program operations on state conservation lands - Wildlife Areas, Parks and Forests - and develop state policies for minimizing impacts to key habitats and SGCN. Establish MOUs with DPR and the State Forest Service about consultation with DFW on issues impacting key habitats and SGCN in State Parks and State Forests. Rank: 1.7

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Issue 19 Biological Resource Use; Fishing and harvesting aquatic resources; Intentional use: Negative impacts to habitats, SGCN, and other wildlife due to inappropriate hunting and fishing. Rank: 3

Action 1 Education; Student training; Aquatic resource education: Incorporate information about SGCN conservation into the Fishing Guide. Rank: 1.2

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Integrate SGCN conservation into fishing regulations. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration: Maintain compliance with interstate management agreements. Rank: 1.2

Action 4 Law Enforcement: Strengthen enforcement of existing recreational and commercial fishing regulations. Rank: 1.7

Coastal Plain Small and Medium River

Issue 1 Natural System Modifications; Other ecosystem modifications: Negative impacts to habitats and wildlife due to artificial shoreline hardening from shoreline protection practices. Rank: 1.3

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with the Division of Watershed Stewardship to develop education and outreach, incentives, partnerships and/or regulations as necessary to include private landowners in beach renourishment projects, in place of installing bulkheads and revetments, to minimize impacts to key habitats. Rank: 1.2

Issue 2 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Negative impacts due to pesticides from agriculture and forestry practices. Rank: 1.8

Action 1 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 1.3

Agricultural

Habitat Types: *Vegetables*
 Turf
 Row Crops
 Planted Warm Season Grasses
 Pasture
 Orchard/Nursery
 Hay
 Fallow
 Buffers/Filter Strips

Issue and Actions:

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Issue 1 Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: Rank: 2

Action 1 Coordination and Administration: Work with Natural Resources Conservation service to increase enrollment in NRCS conservation programs. Rank: 1.8

Issue 2 Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Agricultural harvesting practices. Rank: 2

Action 1 Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to provide incentives for private landowners to modify harvest methods and timing to minimize impacts to SGCN. Rank: 1.8

Modified Uplands

Habitat Types: *Developed*
 Spruce Plantation
 Piedmont Modified / Successional Forests
 Conifer Plantation
 Coastal Plain Modified / Successional Forests

Issue and Actions:

Coastal Plain Modified / Successional Forests

Issue 1 Agriculture and Aquaculture: Agriculture causing early successional habitat conversion. Rank: 1.5

Action 1 Direct Management of Natural Resources: Promote restoration of native grasslands utilizing selective herbicides and prescribed burning. Rank: 1.3

Developed

Issue 1 Education/Outreach Needs; Education needs; Need for improved knowledge of fish and wildlife and their habitats: Need for increased function of residential and commercial areas serving as wildlife habitat. Rank: 1.8

Action 1 Education: Work with Delaware Nature Society and the National Wildlife Federation to increase enrollment in the Backyard Wildlife Habitat Certification Program. Rank: 1.5

Piedmont Modified / Successional Forests

Issue 1 Climate Change and Severe Weather; Sea level rise: Including the prediction that a high percentage of natural uplands and forests will be lost to salt water intrusion and/or fragmentation. Rank: 1.3

Action 1 Data Collection and Analysis: Monitor and research to track the climate effects on environmental conditions and the response in habitats and species. Rank: 1.5

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Action 2 Direct Management of Natural Resources: Reestablish forest lost to salt water intrusion or fragmentation. Rank: 1.5

Issue 2 Agriculture and Aquaculture: Agriculture causing early successional habitat conversion. Rank: 1.3

Action 1 Direct Management of Natural Resources: Promote restoration of native grasslands utilizing selective herbicides and prescribed burning. Rank: 1.3

Natural Forested Uplands

Habitat Types: *Inland Xeric Sand Forest*
Piedmont Oak Forest
Mesic Mixed Hardwood Forest
Maritime Forest and Shrubland
Coastal Plain Oak-Pine Forest
Basic Mesic Forest

Issue and Actions:

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases: Uncontrolled native species (overabundance of white-tailed deer, Bacterial leaf scorch, southern pine beetle, etc.). Rank: 1.1

Action 1 Direct Management of Natural Resources: Encourage federal, NGO, county, and municipal conservation land managers to increase deer harvest as necessary to reduce impacts to key habitats. Rank: 1.1

Action 2 Direct Management of Natural Resources: Manage deer populations on state lands to reduce populations to ecologically sustainable levels that will reduce impact to SGCN and key habitats. Rank: 1.1

Action 3 Direct Management of Natural Resources: Allow non-farm private landowners to apply for deer damage permit for SGCN and key habitat management. Rank: 1.6

Issue 2 Education/Outreach Needs; Education needs: Delawareans general lack of knowledge/appreciation of forests. Rank: 1.2

Action 1 Education: Raise public awareness and understanding of forest and forest management. Rank: 1.2

Issue 3 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Exotic invasive species (emerald ash borer, Asian longhorned beetle, European pine shoot borer, Sirex woodwasp, Sudden Oak Death, Norway maple, mile-a-minute weed, autumn olive, phragmites, privet, etc.). Rank: 1.2

Action 1 Direct Management of Natural Resources; Invasive species control: Maintain and increase control efforts for invasive species based upon impact priority. Rank: 1.2

Action 2 Direct Management of Natural Resources; Invasive species control: Work with the Delaware Invasive Species Council and conservation land managers to assess and monitor impacts of invasive species using the Delaware Alien Plant Invasiveness Risk Assessment protocol, and prioritize control efforts based on degree of risk. Rank: 1.2

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Issue 4 Residential and Commercial Development: Habitat loss and fragmentation - Residential and commercial structures. Rank: 1.2

- Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.2*
- Action 2 Technical Assistance; Environmental review; Review of proposed projects: Improve federal/state/local coordination of environmental reviews to ensure that potential impacts to key habitats and SGCN are minimized for all major projects. Rank: 1.5*
- Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3. Rank: 1.5*
- Action 4 Planning; Land use planning: Develop state policies to require incorporation of Key Wildlife Habitats into plans and planning (including the DEN). Rank: 1.8*
- Action 5 Planning; Land use planning: Encourage all counties to adopt environmental design standards for development projects in order to protect key wildlife habitats and SGCN. Rank: 1.8*
- Action 6 Planning; Land use planning: Encourage Kent and Sussex counties to adopt overlay zoning ordinances for the DEN and/or green infrastructure. Rank: 1.8*
- Action 7 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting forested key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 2*
- Action 8 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 2*
- Action 9 Outreach; Partner/Stakeholder engagement: Work with conservation partners, state and county planning officials, and developers to create certification for environmentally-friendly developments, including an associated media campaign with awards. Rank: 2*

Issue 5 Agriculture and Aquaculture: Habitat loss and fragmentation - Farmland. Rank: 1.3

- Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.2*
- Action 2 Direct Management of Natural Resources; Create new habitat or natural processes: Restore additional upland forest acreage through afforestation and reforestation of unforested sites (not to address future need). Rank: 1.5*
- Action 3 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting forested key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.8*
- Action 4 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated natural forested uplands key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.8*

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Action 5 *Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, the agriculture industry and the Landowners Incentives Program to develop BMPs, and the corresponding incentives, that minimize impacts to key habitats, preserve and restore buffers, and reduce edge effects for area-sensitive SGCN. Rank: 1.8*

Issue 6 Agriculture and Aquaculture: Habitat loss and fragmentation. Rank: 1.3

Action 1 *Direct Management of Natural Resources; Create new habitat or natural processes: Restore additional upland forest acreage through afforestation and reforestation of unforested sites (not to address future need). Rank: 1.5*

Issue 7 Climate Change and Severe Weather; Sea level rise: Including the prediction that a high percentage of natural uplands and forests will be lost to salt water intrusion and/or fragmentation. Rank: 1.3

Action 1 *Planning; Species and habitat management planning: Incorporate sea level rise scenarios in all relevant area, habitat and species management plans. Rank: 1.2*

Action 2 *: Rank: 1.5*

Action 3 *Direct Management of Natural Resources; Create new habitat or natural processes: Restore additional upland forest acreage through afforestation and reforestation of unforested sites (not to address future need). Rank: 1.5*

Action 4 *Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of actions to address climate change, as appropriate, to reduce greenhouse gas emissions and increase carbon sequestration. Rank: 1.5*

Action 5 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into long-range planning for sea level rise. Rank: 1.8*

Action 6 *Planning: Design and implement restoration activities to slow loss of coastal habitats, including the use of BMPs and habitat restoration. Rank: 2*

Issue 8 Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: Residential and commercial development practices - Residential and commercial structures. Rank: 1.3

Action 1 *Outreach; Partner/Stakeholder engagement; Others: Evaluate mechanisms for protecting key upland forest habitats on private property by means of education and outreach, partnerships, voluntary guidelines, incentives and/or regulations, as necessary. Rank: 2*

Issue 9 Natural System Modifications; Fire and fire suppression; Suppression of fire frequency/intensity: Changes in fire regimes - Fire suppression. Rank: 1.5

Action 1 *Education; Educator/instructor training: Provide staff training on prescribed burning practices for upland forests. Rank: 1*

Action 2 *Direct Management of Natural Resources; Fire management; Prescribed burning: Integrate prescribed burning into management of upland forests as appropriate. Rank: 1.5*

Action 3 *Outreach; Partner/Stakeholder engagement; Others: Develop education and outreach for landowners adjacent to areas targeted for burning. Rank: 1.7*

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Action 4 *Coordination and Administration; Coordination and administration: Evaluate the need for an inter-agency "burn team" to leverage resources and expertise. Rank: 1.7*

Action 5 *Coordination and Administration; Incentives: Provide incentives and/or technical support for private landowners to conduct prescribed burns of upland forests. Rank: 2.3*

Issue 10 Transportation and Service Corridors; Utility and service lines: Habitat loss and fragmentation - Utility Corridors. Rank: 1.5

Action 1 *Planning; Land use planning: Work with utilities and state and local planning officials to integrate key habitat and SGCN conservation into long-range planning for electric, water, sewer, natural gas and petroleum lines. Rank: 2*

Action 2 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with utilities to develop BMPs to integrate key habitat and SGCN conservation into corridor maintenance, including controlling invasive species, preserving and restoring buffers and reducing edge effects. Rank: 2*

Issue 11 Biological Resource Use; Logging and wood harvesting: Clearcutting and other forestry practices. Rank: 1.7

Action 1 *Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.7*

Action 2 *Coordination and Administration; Coordination and administration; Agency administrative support: Encourage the Delaware Department of Agriculture to revise the scoring system of the Agricultural Lands Preservation Act to give increased weight to conservation of key habitats and SGCN. Rank: 1.7*

Action 3 *Planning; Species and habitat management planning; Habitat management planning: Work with the Delaware Forest Service to integrate key habitat and SGCN conservation into forest management planning. Rank: 1.7*

Action 4 *Outreach; Partner/Stakeholder engagement: Work with the Delaware Forest Service and the forestry industry to implement a Master Logger program to encourage landowners to work with loggers who harvest forests sustainably. Rank: 1.8*

Action 5 *Coordination and Administration; Incentives: Work with the Delaware Forest Service, the forestry industry and landowner incentive programs to develop BMPs and corresponding incentives to preserve or restore key habitat buffers and reduce edge effects for area-sensitive SGCN. Rank: 1.8*

Action 6 *Planning; Species and habitat management planning; Habitat Conservation Plan (HCP) development: Develop and implement the Habitat Conservation Plan for Forests in Sussex County to mitigate loss, fragmentation and degradation of Coastal Plain Upland Forests. Rank: 2.2*

Issue 12 Pollution; Garbage and solid waste: Habitat loss and fragmentation - Landfill facilities. Rank: 1.8

Action 1 *Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3, where it applies to landfill facilities. Rank: 1.5*

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Issue 13 Residential and Commercial Development; Commercial and industrial areas: Habitat loss and fragmentation - Industrial facilities. Rank: 2

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3. Rank: 1.5*
- Action 2 Outreach; Partner/Stakeholder engagement; Others: Work with landowners on protecting and restoring key habitats and SGCN on private industrial lands. Rank: 2*
- Action 3 Outreach; Partner/Stakeholder engagement; Others: Evaluate the use of education and outreach, incentives, partnerships, and/or regulations, as necessary, for restoring key habitats and SGCN on closed sand and gravel quarries. Rank: 2.5*

Issue 14 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 2

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.8*
- Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 2*
- Action 3 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 2*

Issue 15 Agriculture and Aquaculture: High percentage of forest lost to salt water intrusion or fragmentation. Rank: 2

- Action 1 Direct Management of Natural Resources: Reestablish forest lost to salt water intrusion or fragmentation. Rank: 2.5*

Issue 16 Resource Management Needs; Management decision needs: Habitat/Wildlife management. Rank: 2.2

- Action 1 Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to adapt species and habitat management to increase key habitat patch size and reduce edge effects on SGCN. Rank: 1.7*
- Action 2 Outreach; Partner/Stakeholder engagement: Evaluate means of managing for SGCN and key habitats on private property, including education and outreach, voluntary guidelines, incentives and regulations, as necessary. Rank: 2*

Issue 17 Biological Resource Use; Hunting and collecting terrestrial animals; Intentional use: Inappropriate hunting and fishing. Rank: 2.2

- Action 1 Law Enforcement: Maintain compliance with federal regulations. Rank: 1.3*
- Action 2 Law Enforcement: Strengthen enforcement of existing hunting and trapping regulations. Rank: 1.5*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Action 3 Education; Student training; Wildlife education: Incorporate information about SGCN conservation into the Hunting and Trapping Guide. Rank: 1.8

Action 4 Coordination and Administration; Coordination and administration; Agency administrative support: Integrate SGCN conservation into hunting and trapping regulations. Rank: 1.8

Issue 18 Resource Management Needs; Resource information collection needs: Lack of coordination of forest stand inventory and harvest regimes with other states (specifically Maryland). Rank: 2.4

Action 1 Data Collection and Analysis: Improve and refine the state's forest inventory and coordinate with surrounding states when developing forest markets. Rank: 2

Issue 19 Resource Management Needs; Management decision needs: Facility and Program Operations. Rank: 2.8

Action 1 Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to develop policies for minimizing impacts from facility and program operations to key habitats and SGCN. Rank: 1.3

Action 2 Technical Assistance; Environmental review; Review of proposed policies and plans: Review facility and program operations on state conservation lands - Wildlife Areas, Parks and Forests - and develop state policies for minimizing impacts to key habitats and SGCN. Establish MOUs with DPR and the State Forest Service about consultation with DFW on issues impacting key habitats and SGCN in State Parks and State Forests. Rank: 1.7

Coastal Plain Oak-Pine Forest

Issue 1 Climate Change and Severe Weather; Sea level rise: High percentage of forest lost to salt water intrusion or fragmentation. Rank: 1.3

Action 1 Direct Management of Natural Resources: Reestablish forest lost to salt water intrusion or fragmentation. Rank: 1.5

Issue 2 Climate Change and Severe Weather; Habitat shifting or alteration: High percentage of forest lost to salt water intrusion or fragmentation. Rank: 2

Action 1 Direct Management of Natural Resources: Reestablish forest lost to salt water intrusion or fragmentation. Rank: 2.5

Issue 3 Human Intrusions and Disturbance; Recreational activities: Recreation use on foot and with boats, Personal Watercraft and Off-Road Vehicles, horses (including effects of horse excrement), and bikes. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess the impacts of ORVs on beach and dune, early successional and forested habitats, and use this assessment and long-term monitoring to adapt management as necessary. Rank: 2.2

Issue 4 Energy Production and Mining; Renewable energy: Energy production - Wind farm facilities. Rank: 2.2

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with energy companies to develop standards for the location of wind farms to minimize loss and fragmentation of key habitats. Rank: 2.2

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Maritime Forest and Shrubland

Issue 1 Climate Change and Severe Weather; Sea level rise: High percentage of forest lost to salt water intrusion or fragmentation. Rank: 1.3

Action 1 Direct Management of Natural Resources: Reestablish forest lost to salt water intrusion or fragmentation. Rank: 1.5

Issue 2 Climate Change and Severe Weather; Habitat shifting or alteration: High percentage of forest lost to salt water intrusion or fragmentation. Rank: 2

Action 1 Direct Management of Natural Resources: Reestablish forest lost to salt water intrusion or fragmentation. Rank: 2.5

Natural Unforested Uplands

Habitat Types: *Unvegetated Sandy Beach*
 Serpentine Barren
 Maritime Dune and Grassland
 Early Successional

Issue and Actions:

Issue 1 Residential and Commercial Development: Habitat loss and fragmentation - Residential and commercial structures. Rank: 1.5

Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.7

Action 2 Planning; Land use planning: Encourage all counties to adopt environmental design standards for development projects in order to protect key wildlife habitats and SGCN. Rank: 1.7

Action 3 Planning; Land use planning: Encourage Kent and Sussex counties to adopt overlay zoning ordinances for the DEN and/or green infrastructure. Rank: 1.7

Action 4 Technical Assistance; Environmental review; Review of proposed projects: Improve federal/state/local coordination of environmental reviews to ensure that potential impacts to key habitats and SGCN are minimized for all major projects. Rank: 1.7

Action 5 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3, where appropriate for residential and commercial development. Rank: 1.7

Action 6 Outreach; Partner/Stakeholder engagement: Work with conservation partners, state and county planning officials, and developers to create certification for environmentally-friendly developments, including an associated media campaign with awards. Rank: 1.7

Action 7 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting unforested upland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.8

Delaware Wildlife Action Plan
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Issue 2 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Invasive Plants. Rank: 1.5

Action 1 Outreach; Partner/Stakeholder engagement: Partner with the Delaware Invasive Species Council and land management agencies to integrate key habitat and SGCN conservation into invasives control practices. Rank: 1.7

Issue 3 Natural System Modifications; Other ecosystem modifications: Habitat loss and fragmentation - Dredge spoil disposal. Rank: 2

Action 1 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to identify sites for beneficial reuse of dredge spoils to create/restore key habitats, incorporate key habitat and SGCN conservation into spoil disposal plans, and mitigate contaminant impacts to SGCN. Rank: 1.8

Issue 4 Resource Management Needs; Management decision needs: Resource management - Facility and Program Operations. Rank: 2.7

Action 1 Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to develop policies for minimizing impacts from facility and program operations to key habitats and SGCN. Rank: 1.7

Action 2 Technical Assistance; Environmental review; Review of proposed policies and plans: Review facility and program operations on state conservation lands - Wildlife Areas, Parks and Forests - and develop state policies for minimizing impacts to key habitats and SGCN. Establish MOUs with DPR and the State Forest Service about consultation with DFW on issues impacting key habitats and SGCN in State Parks and State Forests. Rank: 1.7

Early Successional

Issue 1 Natural System Modifications; Fire and fire suppression; Suppression of fire frequency/intensity: Changes in fire regimes - Fire suppression. Rank: 1.2

Action 1 Education; Educator/instructor training: Provide staff training on prescribed burning practices for early successional habitats. Rank: 1.2

Action 2 Direct Management of Natural Resources; Fire management; Prescribed burning: Increase prescribed fire management of early successional habitats where suitable to benefit SGCN, while providing refugia for fire-susceptible species. Rank: 1.5

Action 3 Outreach; Partner/Stakeholder engagement: Develop education and outreach for land managers and landowners adjacent to areas targeted for burning. Rank: 1.7

Action 4 Coordination and Administration; Coordination and administration: Evaluate the need for an inter-agency "burn team" to leverage resources and expertise. Rank: 1.7

Action 5 Coordination and Administration; Incentives: Provide incentives and/or technical support for private landowners to conduct prescribed burns of early successional habitats. Rank: 1.8

Issue 2 Agriculture and Aquaculture: Habitat loss and fragmentation - Farmland. Rank: 1.3

Action 1 Direct Management of Natural Resources; Create new habitat or natural processes: Restore and enhance additional upland early successional habitat acreage. Rank: 1.5

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

- Action 2* *Coordination and Administration; Coordination and administration; Agency administrative support: Support the Agricultural Lands Preservation Program to protect land from irreversible conversion to other uses. Rank: 1.5*
- Action 3* *Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.7*
- Action 4* *Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, the agriculture industry and the Landowners Incentives Program to develop BMPs, and the corresponding incentives, that minimize impacts to key habitats, preserve and restore buffers, and reduce edge effects for area-sensitive SGCN. Rank: 1.7*
- Issue 3** **Transportation and Service Corridors; Utility and service lines: Frequent/intense mechanical and chemical vegetation management degrading early successional habitats on ROWs. Rank: 1.5**
- Action 1* *Direct Management of Natural Resources; Fire management: Use light-handed 2-3+ year cycle/approach for prescribed burns of service corridors. Require BMPs. Rank: 1.5*
- Issue 4** **Residential and Commercial Development: Habitat loss and fragmentation - Residential and commercial structures. Rank: 1.5**
- Action 1* *Direct Management of Natural Resources; Create new habitat or natural processes: Restore and enhance additional upland early successional habitat acreage. Rank: 1.5*
- Issue 5** **Resource Management Needs; Management decision needs: Resource management - Habitat/Wildlife Management. Rank: 1.5**
- Action 1* *Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to adapt species and habitat management to increase key habitat patch size and reduce edge effects on SGCN. Rank: 1.7*
- Action 2* *Outreach; Partner/Stakeholder engagement: Evaluate means of managing for SGCN and key habitats on private property, including education and outreach, voluntary guidelines, incentives and regulations, as necessary. Rank: 1.7*
- Issue 6** **Transportation and Service Corridors; Flight paths: Airport operations - Bird strike hazard management. Rank: 1.7**
- Action 1* *Outreach; Partner/Stakeholder engagement: Work with airports to integrate early successional habitat into bird strike management. Rank: 1.8*
- Issue 7** **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Non-native grasses preventing SGCN use of early successional habitats. Rank: 1.7**
- Action 1* *Direct Management of Natural Resources; Planting/seeding: Plant suitable native grass/forb mixes for SGCN habitat restoration on early successional sites and follow suitable management practices. Rank: 1.5*

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Issue 8 Residential and Commercial Development; Commercial and industrial areas: Habitat loss and fragmentation - Industrial facilities. Rank: 1.7

Action 1 Outreach; Partner/Stakeholder engagement; Others: Evaluate the use of education and outreach, incentives, partnerships, and/or regulations, as necessary, to encourage early successional habitats on industrial lands. Rank: 2

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3, where it applies to industrial facility development. Rank: 2

Issue 9 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 1.7

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.5

Action 2 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.5

Issue 10 Transportation and Service Corridors; Utility and service lines: Habitat loss and fragmentation - Utility Corridors. Rank: 2

Action 1 Planning; Land use planning: Work with utilities and state and local planning officials to integrate key habitat and SGCN conservation into long-range planning for electric, water, sewer, natural gas and petroleum lines. Rank: 1.7

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with utilities to develop BMPs to integrate key habitat and SGCN conservation into corridor maintenance, including controlling invasive species, preserving and restoring buffers and reducing edge effects. Rank: 1.7

Issue 11 Pollution; Garbage and solid waste: Habitat loss and fragmentation - Landfill facilities. Rank: 2.3

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3. Rank: 1.5

Issue 12 Transportation and Service Corridors; Utility and service lines: Frequent/intense mechanical and chemical vegetation management degrading early successional habitats on ROWs. Rank: 2.5

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with utilities, municipalities, and DeIDOT to establish and follow BMPs for vegetation management. Rank: 1.5

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 13 Education/Outreach Needs; Outreach needs: Changes in fire regimes - Firefighting practices. Rank: 2.8

Action 1 Direct Management of Natural Resources; Fire management; Prescribed burning: Work with the Delaware State Fire School to integrate conservation of key habitats and SGCN into practices for fighting wildfires. Rank: 1.8

Issue 14 Biological Resource Use; Hunting and collecting terrestrial animals; Intentional use: Wildlife harvesting - Inappropriate hunting and fishing. Rank: 2.8

Action 1 Education; Student training; Wildlife education: Incorporate information about SGCN conservation into the Hunting and Trapping Guide. Rank: 1.7

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Integrate SGCN conservation into hunting and trapping regulations. Rank: 1.7

Action 3 Law Enforcement: Maintain compliance with federal regulations. Rank: 1.7

Action 4 Law Enforcement: Strengthen enforcement of existing hunting and trapping regulations. Rank: 1.7

Maritime Dune and Grassland

Issue 1 Climate Change and Severe Weather; Sea level rise: Rank: 1.2

Action 1 Planning; Species and habitat management planning: Incorporate sea level rise scenarios in all relevant area, habitat and species management plans. Rank: 1.2

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of actions to address climate change, as appropriate, to reduce greenhouse gas emissions and increase carbon sequestration. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into long-range planning for sea level rise. Rank: 1.2

Issue 2 Residential and Commercial Development: Habitat loss and fragmentation - Residential and commercial structures. Rank: 1.5

Action 1 Direct Management of Natural Resources: Work with appropriate agencies to restore coastal habitats. Rank: 1.5

Issue 3 Natural System Modifications; Fire and fire suppression: Rank: 1.7

Action 1 Direct Management of Natural Resources; Fire management; Prescribed burning: Research prescribed burning for use as a management tool. Rank: 1.7

Issue 4 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Artificial shoreline hardening. Rank: 1.8

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with the Division of Watershed Stewardship to develop education and outreach, incentives, partnerships and/or regulations as necessary to include private landowners in beach renourishment projects, in place of installing bulkheads and revetments, to minimize impacts to key habitats. Rank: 1.8

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 5 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Beach renourishment. Rank: 1.8

Action 1 Planning; Species and habitat management planning; Habitat management planning: Work with the Division of Watershed Stewardship to develop state policies for the timing of beach renourishment, and standards for composition and placement of materials, to minimize short-term impacts to nesting sites, roosts and other critical areas. Rank: 1.8

Issue 6 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Dune construction/stabilization. Rank: 1.8

Action 1 Planning; Species and habitat management planning; Habitat management planning: Work with the Division of Watershed Stewardship to assess needs of beach-nesting birds for overwash habitat, and work with public and private landowners to adapt stabilization projects to allow for this need. Rank: 2

Issue 7 Transportation and Service Corridors; Flight paths: Airport operations - Overflights. Rank: 2.2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Continue/expand studies of disturbance of SGCN from overflights. Rank: 1.7

Action 2 Coordination and Administration; Coordination and administration: Work with Dover Air Force Base to mitigate disturbance. Rank: 2.5

Issue 8 Pollution; Industrial and military effluents; Type unknown: Industrial operations - Accidental spills of toxins and sewage. Rank: 2.2

Action 1 Outreach; Partner/Stakeholder engagement: Develop/enhance partnerships with Tri-State Birds Rescue and other wildlife rehabilitators to improve emergency response. Rank: 1.7

Action 2 Coordination and Administration; Coordination and administration: Maintain DFW involvement in the Natural Resource Damage Assessment process. Rank: 1.7

Action 3 Education; Educator/instructor training: Provide training for DFW staff, such as incident management, hazardous materials handling and wildlife rescue, to facilitate involvement in emergency response actions. Rank: 1.7

Action 4 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the all emergency responders to integrate key habitat and SGCN protection into emergency response planning. Rank: 1.7

Issue 9 Residential and Commercial Development; Housing and urban areas: Residential and commercial practices - Piers and docks. Rank: 2.3

Action 1 Outreach: Work with developers to create design standards for piers and docks that minimize habitat loss or fragmentation. Rank: 1.8

Action 2 Outreach: Work with county building officials to encourage developers to construct community piers and docks in subdivisions, in place of individual structures. Rank: 2

Delaware Wildlife Action Plan
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Issue 10 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 2.5

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.7*
- Action 2 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.7*
- Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.7*

Issue 11 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Named species: White-tailed deer. Rank: 2.5

- Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Continue to evaluate Quality Deer Management as a long-term strategy for minimizing impacts to key habitats. Rank: 1.7*
- Action 2 Outreach; Recruitment and retention activities; For hunting and shooting: Develop education and outreach encouraging landowners to increase deer harvest on private lands as necessary to reduce impacts to key habitats. Rank: 1.7*
- Action 3 Outreach; Recruitment and retention activities; For hunting and shooting: Encourage federal and NGO conservation land managers to increase deer harvest as necessary to reduce impacts to key habitats. Rank: 1.7*
- Action 4 Outreach; Recruitment and retention activities; For hunting and shooting: Work with hunters to increase deer harvest on state lands as necessary to reduce impacts to key habitats. Rank: 1.7*

Issue 12 Transportation and Service Corridors; Utility and service lines: Habitat loss and fragmentation - Utility Corridors. Rank: 2.7

- Action 1 Planning; Land use planning: Work with utilities and state and local planning officials to integrate key habitat and SGCN conservation into long-range planning for electric, water, sewer, natural gas and petroleum lines. Rank: 1.7*
- Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with utilities to develop BMPs to integrate key habitat and SGCN conservation into corridor maintenance, including controlling invasive species, preserving and restoring buffers and reducing edge effects. Rank: 1.7*

Issue 13 Residential and Commercial Development: Natural beach dynamics causing loss of spawning habitat. Rank: 2.7

- Action 1 Data Collection and Analysis: Research the potential cost/benefit of jetties for protecting spawning beaches from wave action. Rank: 2.2*

Delaware Wildlife Action Plan
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Unvegetated Sandy Beach

Issue 1 Residential and Commercial Development: Shoreline hardening from residential development causing beach habitat degradation. Rank: 1

Action 1 Direct Management of Natural Resources; Living shorelines: Rank: 1.7

Issue 2 Climate Change and Severe Weather; Sea level rise: Rank: 1.7

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into long-range planning for sea level rise. Rank: 1.7

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of actions to address climate change, as appropriate, to reduce greenhouse gas emissions and increase carbon sequestration. Rank: 2

Action 3 Planning; Species and habitat management planning: Incorporate sea level rise scenarios in all relevant area, habitat and species management plans. Rank: 2.2

Issue 3 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Loss of natural beach dynamics from jetties and groins. Rank: 1.8

Action 1 Direct Management of Natural Resources; Hazard or infrastructure removal; Shoreline armoring removal: Work with the Division of Watershed Stewardship to assess and monitor the environmental and economic costs and benefits of individual jetties and groins, and remove those that are ineffective or obsolete. Rank: 2

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to develop a source of funding for using beach renourishment to mitigate the impacts of jetties and groins on key habitats. Rank: 2.2

Action 3 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship to identify new materials and methods that use jetties and groins to protect, create or restore key habitats. Rank: 2.3

Issue 4 Pollution; Garbage and solid waste: Beach cleanup activities (raking, events). Rank: 2

Action 1 Outreach; Partner/Stakeholder engagement: Encourage municipalities to modify or suspend beach raking during nesting periods, peak migration and other critical times for SGCN. Rank: 1.7

Action 2 Planning: Schedule beach cleanup events to avoid nesting periods, peak migration and other critical times for SGCN. Rank: 1.7

Action 3 Planning; Species and habitat management planning; Habitat management planning: Develop state policies for beach raking on state lands to modify or suspend activities during nesting periods, peak migration and other critical times for SGCN. Rank: 2

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 5 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Artificial shoreline hardening. Rank: 2

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with the Division of Watershed Stewardship to develop education and outreach, incentives, partnerships and/or regulations as necessary to include private landowners in beach renourishment projects, in place of installing bulkheads and revetments, to minimize impacts to key habitats. Rank: 1.8

Issue 6 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Beach renourishment. Rank: 2

Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Division of Watershed Stewardship to develop state policies for the timing of beach renourishment, and standards for composition and placement of materials, to minimize short-term impacts to nesting sites, roosts and other critical areas. Rank: 1.8

Issue 7 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Dune construction/stabilization. Rank: 2

Action 1 Planning; Species and habitat management planning; Habitat management planning: Work with the Division of Watershed Stewardship to assess needs of beach-nesting birds for overwash habitat, and work with public and private landowners to adapt stabilization projects to allow for this need. Rank: 2

Issue 8 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Loss of natural beach dynamics from jetties and groins. Rank: 2

Action 1 Direct Management of Natural Resources; Hazard or infrastructure removal; Shoreline armoring removal: Work with the Division of Watershed Stewardship to assess and monitor the environmental and economic costs and benefits of individual jetties and groins, and remove those that are ineffective or obsolete. Rank: 2

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to develop a source of funding for using beach renourishment to mitigate the impacts of jetties and groins on key habitats. Rank: 2.2

Action 3 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship to identify new materials and methods that use jetties and groins to protect, create or restore key habitats. Rank: 2.3

Issue 9 Residential and Commercial Development: Natural beach dynamics causing loss of spawning habitat. Rank: 2.7

Action 1 Data Collection and Analysis: Research the potential cost/benefit of jetties for protecting spawning beaches from wave action. Rank: 2.2

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

All Wetlands

Habitat Types: *Tidal Wetlands*
Open Nontidal Wetlands
Modified Wetlands
Forested Nontidal Wetlands

Issue and Actions:

Issue 1 Climate Change and Severe Weather; Sea level rise: Rank: 1

- Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of actions to address climate change, as appropriate, to reduce greenhouse gas emissions and increase carbon sequestration. Rank: 1.2*
- Action 2 Planning; Species and habitat management planning: Incorporate sea level rise scenarios in all relevant area, habitat and species management plans. Rank: 1.7*
- Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into long-range planning for sea level rise. Rank: 1.8*

Issue 2 Climate Change and Severe Weather; Sea level rise: Rank: 1.2

- Action 1 Data Collection and Analysis: Determine whether these habitats can migrate with SLR. Rank: 1.2*
- Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of actions to address climate change, as appropriate, to reduce greenhouse gas emissions and increase carbon sequestration. Rank: 1.2*
- Action 3 Planning; Species and habitat management planning: Incorporate sea level rise scenarios in all relevant area, habitat and species management plans. Rank: 1.7*
- Action 4 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into long-range planning for sea level rise, considering erosional changes, water temperature, salinity and chemistry (not just SLR). Rank: 1.8*
- Action 5 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into long-range planning for sea level rise. Rank: 1.8*

Issue 3 Pollution; Industrial and military effluents; Type unknown: Accidental spills of toxins and sewage. Rank: 1.3

- Action 1 Outreach; Partner/Stakeholder engagement: Develop/enhance partnerships with Tri-State Birds Rescue and other wildlife rehabilitators to improve emergency response. Rank: 1.7*
- Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Emergency Response Branch to integrate key habitat and SGCN protection into emergency response planning. Rank: 1.8*

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Issue 4 Pollution: Contaminants, nutrients, and sediment from residential and agricultural runoff causing wetland habitat degradation. Rank: 1.3

Action 1 Data Collection and Analysis: Continue to assess the condition of wetlands relative to degradation caused by residential and agricultural runoff. Rank: 1.3

Action 2 Outreach: Promote BMP's for implementation by agriculture, homeowners, pest control industry, right of way/maintenance, landscape professionals. Increase use of IPM, BMPs through education and outreach. Rank: 1.5

Action 3 Education: Promote BMP's for implementation by agriculture, homeowners, pest control industry, right of way/maintenance, landscape professionals. Increase use of IPM, BMPs through education and outreach. Rank: 1.8

Issue 5 Residential and Commercial Development; Housing and urban areas: Piers, docks, boardwalks, gazebos, and other shoreline structures. Rank: 1.3

Action 1 Outreach: Work with county building officials to encourage developers to construct community piers and docks in subdivisions, in place of individual structures. Rank: 1.8

Action 2 Outreach: Work with developers to create design standards for piers and docks that minimize habitat loss or fragmentation. Rank: 1.8

Issue 6 Pollution; Industrial and military effluents; Type unknown: Accidental spills of toxins and sewage. Rank: 1.5

Action 1 Outreach; Partner/Stakeholder engagement: Develop/enhance partnerships with Tri-State Birds Rescue and other wildlife rehabilitators to improve emergency response. Rank: 1.7

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Emergency Response Branch to integrate key habitat and SGCN protection into emergency response planning. Rank: 1.8

Issue 7 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Invasive plants causing wetland habitat degradation. Rank: 1.5

Action 1 Direct Management of Natural Resources; Invasive species control: Focus Phragmites management in key freshwater and low-salinity wetlands. Rank: 1.3

Action 2 Species Reintroduction and Stocking; Native species restoration: Enhance/restore degraded wetlands and adjacent upland habitats (including buffers). Rank: 1.8

Issue 8 Pollution; Agricultural and forestry effluents: Nutrients and sediments. Rank: 1.5

Action 1 Law Enforcement: Encourage the counties to strengthen enforcement of erosion and sediment control regulations. Rank: 1.8

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Agriculture to promote the implementation of BMPs for erosion and sediment control. Rank: 1.8

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8

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Conservation Actions to Conserve Key Habitats

Action 4 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to promote the implementation of BMPs for erosion and sediment control. Rank: 1.8*

Action 5 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.8*

Issue 9 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Residential and commercial development practices - Pesticides. Rank: 2

Action 1 *Coordination and Administration; Incentives: Work with Cooperative Extension to promote IPM implementation to minimize impacts of residential and commercial pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on private golf courses, recreational facilities and common areas. Rank: 1.8*

Issue 10 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Rank: 2.2

Action 1 *Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 1.8*

Forested Nontidal Wetlands

- Habitat Types:** *Piedmont Stream and River Floodplain*
 Piedmont Seepage Swamp
 Bayshore Swamp
 Coastal Plain White Cedar Peat Swamp
 Coastal Plain Stream and River Floodplain
 Coastal Plain Seepage Swamp
 Coastal Plain Flatwood and Depression Swamp
 Bald Cypress Swamp

Issue and Actions:

Issue 1 Natural System Modifications; Dams and water management/use: Agriculture and forestry operations - Ditching and draining. Rank: 1

Action 1 *Coordination and Administration; Incentives: Work with the Division of Watershed Stewardship to provide incentives to tax ditch associations to implement BMPs that minimize impacts to key habitats. Rank: 1.8*

Issue 2 Agriculture and Aquaculture: Habitat loss and fragmentation - Farmland. Rank: 1

Action 1 *Coordination and Administration; Coordination and administration; Agency administrative support: Support the Agricultural Lands Preservation Program to protect land from irreversible conversion to other uses. Rank: 1.2*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

- Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*
- Action 3 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 4 Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, NRCS, the agriculture industry, and the Landowners Incentives Program to develop BMPs, and the corresponding incentives, that minimize impacts to key habitats, preserve and restore buffers, and reduce edge effects for SGCN. Rank: 1.8*

Issue 3 Residential and Commercial Development: Habitat loss and fragmentation - Residential and commercial structures. Rank: 1

- Action 1 Technical Assistance; Environmental review; Review of proposed projects: Improve federal/state/local coordination of environmental reviews to ensure that potential impacts to key habitats and SGCN are minimized for all major projects. Rank: 1.2*
- Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3, where appropriate for residential and commercial development. Rank: 1.2*
- Action 3 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*
- Action 4 Planning; Land use planning: Develop state policies to require incorporation of Key Wildlife Habitats into the plans, including the DEN. Rank: 1.3*
- Action 5 Planning; Land use planning: Encourage all counties to adopt environmental design standards for development projects in order to protect key wildlife habitats and SGCN. Rank: 1.3*
- Action 6 Planning; Land use planning: Encourage Kent and Sussex counties to adopt overlay zoning ordinances for the DEN and/or green infrastructure. Rank: 1.3*
- Action 7 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting forested key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 8 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 9 Outreach; Partner/Stakeholder engagement: Work with conservation partners, state and county planning officials, and developers to create certification for environmentally-friendly developments, including an associated media campaign with awards. Rank: 1.8*

Issue 4 Pollution; Industrial and military effluents: Chronic water pollution. Rank: 1.2

- Action 1 Law Enforcement: Support the Division of Water enforcement of existing limits on releases of water pollution. Rank: 1.2*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 5 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 1.2

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.2

Action 2 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.2

Issue 6 Agriculture and Aquaculture: Ditching & draining for agriculture causing wetland habitat degradation. Rank: 1.2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.2

Issue 7 Biological Resource Use; Logging and wood harvesting: Agricultural and forestry operations - Clearcutting and other forestry practices. Rank: 1.3

Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN within the DE Ecological Network (DEN), for management by public agencies or NGOs. Rank: 1.3

Action 2 Planning; Species and habitat management planning; Habitat management planning: Work with the Delaware Forest Service to integrate key habitat and SGCN conservation into forest management planning. Rank: 1.3

Action 3 Coordination and Administration; Incentives: Work with the Delaware Forest Service, the forestry industry and landowner incentive programs to develop BMPs and corresponding incentives to preserve or restore key habitat buffers and reduce edge effects for area-sensitive SGCN. Rank: 1.3

Action 4 Outreach; Partner/Stakeholder engagement: Work with the Delaware Forest Service and the forestry industry to implement a Master Logger program to encourage landowners to work with loggers who harvest timber selectively and are sensitive to key wildlife habitats. Rank: 1.8

Issue 8 Pollution; Agricultural and forestry effluents: Agricultural and forestry operations - Nutrients and sediments. Rank: 1.3

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Agriculture to promote the implementation of BMPs for erosion and sediment control. Rank: 1.8

Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8

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Conservation Actions to Conserve Key Habitats

Action 3 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.8*

Issue 9 **Pollution; Agricultural and forestry effluents: Contaminants from residential and agricultural runoff causing wetland habitat degradation. Rank: 1.3**

Action 1 *Data Collection and Analysis: Promote BMP's for implementation by agriculture, homeowners, pest control industry, right of way/maintenance, landscape professionals. Increase use of IPM, BMPs through education and outreach. Rank: 1.8*

Issue 10 **Pollution; Garbage and solid waste: Habitat loss and fragmentation - Landfill facilities. Rank: 1.3**

Action 1 *Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3, as related to landfill facilities. Rank: 3*

Issue 11 **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Invasive Earthworms. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess the impacts of invasive earthworms on forests and use this assessment and long-term monitoring to guide adaptive management, education, outreach and enforcement efforts as necessary. Rank: 1.8*

Issue 12 **Pollution; Agricultural and forestry effluents: Nutrients and sediments from agricultural, commercial, and residential point and non-point sources causing aquatic habitat degradation. Rank: 1.3**

Action 1 *Data Collection and Analysis: Promote BMP's for implementation by agriculture, homeowners, pest control industry, right of way/maintenance, landscape professionals. Increase use of IPM, BMPs through education and outreach. Rank: 1.8*

Issue 13 **Biological Resource Use; Logging and wood harvesting: Clearcutting and other forestry practices. Rank: 1.5**

Action 1 *Coordination and Administration; Coordination and administration; Agency administrative support: Encourage the Delaware Department of Agriculture to revise the scoring system of the Agricultural Lands Preservation Act to give increased weight to conservation of key habitats and SGCN. Rank: 1.2*

Issue 14 **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Invasive Plants. Rank: 1.5**

Action 1 *Species Reintroduction and Stocking; Native species restoration: Enhance/restore degraded wetlands and adjacent upland habitats (including buffers). Rank: 1.8*

Issue 15 **Agriculture and Aquaculture: Nutrients, sediments, and chemicals (pesticides and herbicides). Rank: 1.5**

Action 1 *Law Enforcement: Encourage/incentivize the counties to strengthen enforcement of erosion and sediment control and chemical application regulations. Rank: 1.8*

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Conservation Actions to Conserve Key Habitats

Action 2 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8*

Action 3 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to promote the implementation of BMPs for erosion and sediment control and chemical applications. Rank: 1.8*

Issue 16 Pollution; Domestic and urban waste water: Residential and commercial development practices - Nutrients and sediments. Rank: 1.5

Action 1 *Law Enforcement: Encourage the counties to strengthen enforcement of erosion and sediment control regulations. Rank: 1.8*

Action 2 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8*

Action 3 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.8*

Action 4 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to promote the implementation of BMPs for erosion and sediment control. Rank: 1.8*

Issue 17 Natural System Modifications; Dams and water management/use: Agricultural and forestry operations - Altered hydrology. Rank: 1.7

Action 1 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Agriculture and NRCS to promote the implementation of BMPs for stormwater management. Rank: 1.8*

Action 2 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8*

Issue 18 Biological Resource Use; Logging and wood harvesting: Clearcutting and other forestry practices. Rank: 1.7

Action 1 *Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*

Action 2 *Outreach; Partner/Stakeholder engagement: Work with the Delaware Forest Service and the forestry industry to implement a Master Logger program to encourage landowners to work with loggers who harvest timber selectively and are sensitive to key wildlife habitats. Rank: 1.3*

Action 3 *Planning; Species and habitat management planning; Habitat management planning: Work with the Delaware Forest Service to integrate key habitat and SGCN conservation into forest management planning. Rank: 1.3*

Action 4 *Coordination and Administration; Incentives: Work with the Delaware Forest Service, the forestry industry and landowner incentive programs to develop BMPs and corresponding incentives to preserve or restore key habitat buffers and reduce edge effects for area-sensitive SGCN. Rank: 1.3*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 19 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Invasive Plants. Rank: 1.7

- Action 1 Direct Management of Natural Resources; Planting/seeding: Require use of native, Delaware indigenous species for new plantings or replantings on lands managed by the state, similar to the Native Plants Policy of the Division of Parks and Recreation. Rank: 1.2*
- Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of the Delaware Invasive Species Management Plan, as appropriate, to reduce the impacts of invasive species on key habitats and SGCN. Rank: 1.2*
- Action 3 Outreach; Partner/Stakeholder engagement: Partner with the Delaware Invasive Species Council and land management agencies to integrate key habitat and SGCN conservation into invasives control practices. Rank: 1.5*
- Action 4 Outreach; Partner/Stakeholder engagement: Develop education and outreach, partnerships, voluntary guidelines, incentives, and/or regulations, as necessary, for controlling invasive plants on private property and in private commerce, to minimize impacts to key habitats. Rank: 1.8*
- Action 5 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Transportation, Delaware Center for Horticulture and Cooperative Extension to enhance transportation construction and maintenance practices such as requiring the planting of native species, and limiting mowing during breeding, migration or other critical times for SGCN. Rank: 1.8*
- Action 6 Direct Management of Natural Resources; Invasive species control: Work with the Delaware Invasive Species Council and conservation land managers to assess and monitor impacts of invasive plants using the Delaware Alien Plant Invasiveness Risk Assessment protocol, and prioritize control efforts based on degree of risk. Rank: 1.8*
- Action 7 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Work with the Delaware Invasive Species Council and conservation land managers to conduct quantitative invasive plant surveys of key habitats. Rank: 1.8*
- Action 8 Planning: Work with the Delaware Invasive Species Council and conservation land managers to develop and implement adaptive management plans for control of invasive species. Rank: 1.8*
- Action 9 Coordination and Administration; Coordination and administration: Work with the Delaware Invasive Species Council to establish an interagency early detection and rapid response system to react to new invasions. Rank: 1.8*

Issue 20 Natural System Modifications; Dams and water management/use; Extraction of surface water (unknown use): Residential and commercial development practices - Altered hydrology Rank: 1.7

- Action 1 Law Enforcement: Encourage the counties to develop new stormwater management regulations that create and maintain habitat for SCGN species and to strengthen enforcement of these regulations. Rank: 1.8*

Issue 21 Transportation and Service Corridors: Transportation and utility operations and maintenance - Altered Hydrology. Rank: 1.7

- Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into stormwater management design. Rank: 1.3*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 22 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Named species: White-tailed deer. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Continue to evaluate Quality Deer Management as a long-term strategy for minimizing impacts to key habitats. Rank: 1.2

Action 2 Outreach; Recruitment and retention activities; For hunting and shooting: Encourage federal and NGO conservation land managers to increase deer harvest as necessary to reduce impacts to key habitats. Rank: 1.2

Action 3 Outreach; Recruitment and retention activities; For hunting and shooting: Work with hunters to increase deer harvest on all lands as necessary to reduce impacts to key habitats. Rank: 1.8

Issue 23 Natural System Modifications; Dams and water management/use; Extraction of surface water (unknown use); Residential and commercial development practices - Altered hydrology Rank: 1.8

Action 1 Law Enforcement: Encourage the counties to develop new stormwater management regulations that create and maintain habitat for SCGN species and to strengthen enforcement of these regulations. Rank: 1.3

Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8

Action 3 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with the Division of Watershed Stewardship to promote the implementation of BMPs for stormwater management. Rank: 1.8

Issue 24 Pollution; Domestic and urban waste water; Herbicides and pesticides: Residential and commercial development practices - Pesticides. Rank: 2

Action 1 Coordination and Administration; Incentives: Work with Cooperative Extension to promote IPM implementation to minimize impacts of residential and commercial pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on private golf courses, recreational facilities and common areas. Rank: 1.8

Issue 25 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Agricultural and forestry operations - Pesticides. Rank: 2.2

Action 1 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 1.8

Issue 26 Resource Management Needs; Management decision needs: Resource management - Habitat/Wildlife Management. Rank: 2.2

Action 1 Outreach; Partner/Stakeholder engagement: Encourage Federal and NGO conservation land managers to adapt species and habitat management to increase key habitat patch size and reduce edge effects on SGCN. Rank: 1.2

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 27 Biological Resource Use; Hunting and collecting terrestrial animals; Intentional use: Wildlife harvesting - Inappropriate hunting and fishing. Rank: 2.3

Action 1 Education; Student training; Wildlife education: Develop education and outreach for hunters about the Delmarva fox squirrel to minimize impacts from accidental killing. Rank: 1.3

Issue 28 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Gypsy Moth. Rank: 2.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Support continued gypsy moth monitoring by the Delaware Department of Agriculture. Rank: 2.5

Action 2 Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture to provide incentives to landowners for gypsy moth control in key habitats on private lands. Rank: 2.5

Issue 29 Pollution; Industrial and military effluents; Type unknown: Industrial operations - Accidental spills of toxins and sewage. Rank: 3

Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Work with ALL Emergency Responders to integrate key habitat and SGCN protection into emergency response planning. Rank: 1.8

Coastal Plain Stream and River Floodplain

Issue 1 Natural System Modifications; Other ecosystem modifications: Habitat loss and fragmentation - Dredge spoil disposal. Rank: 1.3

Action 1 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to identify sites for use of dredge spoils to create/restore key habitats. Rank: 1.8

Action 2 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to incorporate key habitat and SGCN conservation into spoil disposal plans. Rank: 1.8

Action 3 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to mitigate contaminant impacts to SGCN. Rank: 1.8

Issue 2 Pollution; Garbage and solid waste: Habitat loss and fragmentation - Landfill facilities. Rank: 1.3

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3. Rank: 1.2

Issue 3 Agriculture and Aquaculture; Livestock farming and ranching; Scale unknown: Livestock grazing. Rank: 1.7

Action 1 Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture to provide incentives to landowners to exclude livestock from key habitats. Rank: 1.3

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 4 Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Farmland. Rank: 1.8

Action 1 Planning; Species and habitat management planning; Habitat Conservation Plan (HCP) development: Develop and implement the Habitat Conservation Plan for Forests in Kent and Sussex Counties to mitigate loss, fragmentation and degradation of Coastal Plain Upland Forests. Rank: 1.3

Issue 5 Natural System Modifications; Dams and water management/use; Dams (size unknown): Water use - Dam operations. Rank: 2.5

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water and water utilities to evaluate the application of "ecologically sustainable water management" practices to dam operations to minimize impacts to key habitats and SGCN. Rank: 2.5

Piedmont Stream and River Floodplain

Issue 1 Agriculture and Aquaculture: Ditching & draining for agriculture causing wetland habitat degradation. Rank: 1

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.2

Modified Wetlands

Habitat Types: *Stormwater/Retention Basins*
 Small Pond
 Sewage Treatment Ponds
 Mill Pond
 Lake/Reservoir
 Impoundment
 Dredge Spoil Disposal Area

Issue and Actions:

Issue 1 Natural System Modifications; Dams and water management/use; Extraction of ground water (unknown use): Water use - Groundwater withdrawals. Rank: 1.7

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water to integrate key habitat conservation into protection of "excellent groundwater recharge areas." Rank: 1.3

Action 2 Coordination and Administration: Incorporate current GW monitoring data into plans and regulation development. Rank: 1.8

Action 3 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water to integrate key habitat conservation into long-range water supply planning. Rank: 1.8

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 2 Natural System Modifications; Dams and water management/use; Extraction of ground water (unknown use): Water use - Groundwater withdrawals. Rank: 2

Action 1 Coordination and Administration: Incorporate current monitoring data into plans. Rank: 1.3

Action 2 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water to integrate key habitat conservation into protection of "excellent groundwater recharge areas." Rank: 1.3

Action 3 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water to integrate key habitat conservation into long-range water supply planning. Rank: 1.8

Issue 3 Resource Management Needs: Insect control with OMWM and impoundment management possible effects on SGCN and habitats. Rank: 2.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Continue to research and monitor the impacts of OMWM and impoundment management on SGCN species and habitats. Rank: 2.5

Impoundment

Issue 1 Climate Change and Severe Weather; Sea level rise: Rank: 1.2

Action 1 Direct Management of Natural Resources: Maintain and improve infrastructure (dikes and WCS) to compensate for SLR. Rank: 1

Issue 2 Invasive and Other Problematic Species, Genes, and Diseases: Invasive plants and wildlife species (i.e., muskrat, cattail, phragmites). Rank: 1.5

Action 1 Direct Management of Natural Resources; Invasive species control: Manage nuisance/invasive species. Rank: 1.5

Issue 3 Pollution; Agricultural and forestry effluents: Nutrients and sediments. Rank: 1.5

Action 1 Direct Management of Natural Resources; Instream Modification: Work towards sediment accretion through a variety of techniques including beneficial dredged material. Rank: 1.8

Open Nontidal Wetlands

Habitat Types: *Sea Level Fen*
 Piedmont Seepage Meadow
 Interdunal Wetlands
 Freshwater Shrub Swamp
 Emergent Freshwater Marsh
 Coastal Plain Seepage Fen
 Coastal Plain Pond

Issue and Actions:

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 1 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 1

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.2

Action 2 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.2

Issue 2 Climate Change and Severe Weather; Sea level rise: Rank: 1.2

Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of actions to address climate change, as appropriate, to reduce greenhouse gas emissions and increase carbon sequestration. Rank: 1.2

Action 2 Planning; Species and habitat management planning: Incorporate sea level rise scenarios in all relevant area, habitat and species management plans. Rank: 1.7

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into long-range planning for sea level rise. Rank: 1.8

Issue 3 Natural System Modifications; Dams and water management/use; Extraction of ground water (unknown use): Water use - Groundwater withdrawals. Rank: 1.7

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water to integrate key habitat conservation into protection of "excellent groundwater recharge areas." Rank: 1.3

Action 2 Coordination and Administration: Incorporate current GW monitoring data into plans and regulation development. Rank: 1.8

Action 3 Outreach; Partner/Stakeholder engagement; Government agency: Work with the Division of Water to integrate key habitat conservation into long-range water supply planning. Rank: 1.8

Coastal Plain Pond

Issue 1 Natural System Modifications; Dams and water management/use: Agricultural and forestry operations - Ditching and draining. Rank: 1

Action 1 Coordination and Administration; Incentives: Work with the Division of Watershed Stewardship to provide incentives to tax ditch associations to implement BMPs that minimize impacts to key habitats. Rank: 1.8

Issue 2 Agriculture and Aquaculture: Habitat loss and fragmentation - Farmland. Rank: 1

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support the Agricultural Lands Preservation Program to protect land from irreversible conversion to other uses. Rank: 1.2

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

- Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*
- Action 3 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting forested key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 4 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 5 Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, the agriculture industry and the Landowners Incentives Program to develop BMPs, and the corresponding incentives, that minimize impacts to key habitats, preserve and restore buffers, and reduce edge effects for area-sensitive SGCN. Rank: 1.8*

Issue 3 Residential and Commercial Development: Habitat loss and fragmentation - Residential and commercial structures. Rank: 1

- Action 1 Technical Assistance; Environmental review; Review of proposed projects: Improve federal/state/local coordination of environmental reviews to ensure that potential impacts to key habitats and SGCN are minimized for all major projects. Rank: 1.2*
- Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3. Rank: 1.2*
- Action 3 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*
- Action 4 Planning; Land use planning: Develop state policies to require incorporation of Key Wildlife Habitats into plans and planning (including the DEN). Rank: 1.3*
- Action 5 Planning; Land use planning: Encourage all counties to adopt environmental design standards for development projects in order to protect key wildlife habitats and SGCN. Rank: 1.3*
- Action 6 Planning; Land use planning: Encourage Kent and Sussex counties to adopt overlay zoning ordinances for the DEN and/or green infrastructure. Rank: 1.3*
- Action 7 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting forested key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 8 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 9 Outreach; Partner/Stakeholder engagement: Work with conservation partners, state and county planning officials, and developers to create certification for environmentally-friendly developments, including an associated media campaign with awards. Rank: 1.8*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 4 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 1.2

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.2*
- Action 2 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.2*
- Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.2*

Issue 5 Biological Resource Use; Logging and wood harvesting: Agricultural and forestry operations - Clearcutting and other forestry practices. Rank: 1.3

- Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*
- Action 2 Outreach; Partner/Stakeholder engagement: Work with the Delaware Forest Service and the forestry industry to implement a Master Logger program to encourage landowners to work with loggers who harvest timber selectively and are sensitive to key wildlife habitats. Rank: 1.3*
- Action 3 Planning; Species and habitat management planning; Habitat management planning: Work with the Delaware Forest Service to integrate key habitat and SGCN conservation into forest management planning. Rank: 1.3*
- Action 4 Coordination and Administration; Incentives: Work with the Delaware Forest Service, the forestry industry and landowner incentive programs to develop BMPs and corresponding incentives to preserve or restore key habitat buffers and reduce edge effects for area-sensitive SGCN. Rank: 1.3*

Issue 6 Pollution; Agricultural and forestry effluents: Agricultural and forestry operations - Nutrients and sediments. Rank: 1.3

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Agriculture to promote the implementation of BMPs for erosion and sediment control. Rank: 1.8*
- Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8*
- Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.8*

Delaware Wildlife Action Plan
Conservation Actions to Conserve Key Habitats

Issue 7 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Invasive Plants. Rank: 1.5

- Action 1 Direct Management of Natural Resources; Planting/seeding: Require use of native, Delaware indigenous species for new plantings or replantings on lands managed by the state, similar to the Native Plants Policy of the Division of Parks and Recreation. Rank: 1.2*
- Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Support implementation of the Delaware Invasive Species Management Plan, as appropriate, to reduce the impacts of invasive species on key habitats and SGCN. Rank: 1.2*
- Action 3 Outreach; Partner/Stakeholder engagement: Develop education and outreach, partnerships, voluntary guidelines, incentives, and/or regulations, as necessary, for controlling invasive plants on private property and in private commerce, to minimize impacts to key habitats. Rank: 1.8*
- Action 4 Outreach; Partner/Stakeholder engagement: Partner with the Delaware Invasive Species Council and land management agencies to integrate key habitat and SGCN conservation into invasives control practices. Rank: 1.8*
- Action 5 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Transportation, Delaware Center for Horticulture and Cooperative Extension to enhance transportation construction and maintenance practices such as requiring the planting of native species, and limiting mowing during breeding, migration or other critical times for SGCN. Rank: 1.8*
- Action 6 Direct Management of Natural Resources; Invasive species control: Work with the Delaware Invasive Species Council and conservation land managers to assess and monitor impacts of invasive plants using the Delaware Alien Plant Invasiveness Risk Assessment protocol, and prioritize control efforts based on degree of risk. Rank: 1.8*
- Action 7 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Work with the Delaware Invasive Species Council and conservation land managers to conduct quantitative invasive plant surveys of key habitats. Rank: 1.8*
- Action 8 Planning: Work with the Delaware Invasive Species Council and conservation land managers to develop and implement adaptive management plans for control of invasive species. Rank: 1.8*
- Action 9 Coordination and Administration; Coordination and administration: Work with the Delaware Invasive Species Council to establish an interagency early detection and rapid response system to react to new invasions. Rank: 1.8*

Issue 8 Pollution; Domestic and urban waste water: Residential and commercial development practices - Nutrients and sediments. Rank: 1.5

- Action 1 Law Enforcement: Encourage the counties to strengthen enforcement of erosion and sediment control regulations. Rank: 1.8*
- Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8*
- Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to promote the implementation of BMPs for erosion and sediment control. Rank: 1.8*

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Action 4 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship to integrate key habitat and SGCN conservation into state water quality standards for nutrients and sediments. Rank: 1.8*

Issue 9 **Pollution: Water quality and overall health of remaining Delmarva Bays (from domestic and urban wastewater, agricultural and forestry effluents, and industrial and military effluents). Rank: 1.5**

Action 1 *Direct Management of Natural Resources: Preserve, maintain, or create 300-foot forested buffers around Delmarva Bays. Rank: 1.3*

Issue 10 **Natural System Modifications; Dams and water management/use: Agricultural and forestry operations - Altered hydrology. Rank: 1.7**

Action 1 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Agriculture to promote the implementation of BMPs for stormwater management. Rank: 1.8*

Action 2 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Division of Watershed Stewardship and Tributary Action Teams to ensure integration of key habitat and SGCN conservation and monitoring into all Pollution Control Strategies. Rank: 1.8*

Issue 11 **Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Agricultural and forestry operations - Pesticides. Rank: 2**

Action 1 *Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 1.8*

Issue 12 **Resource Management Needs; Management decision needs: Resource management - Habitat/Wildlife Management. Rank: 2.2**

Action 1 *Direct Management of Natural Resources: Implement the Bog Turtle Recovery Plan. Rank: 1.2*

Tidal Wetlands

Habitat Types: *Tidal Salt Marsh and Shrubland (High)*
 Tidal Salt Marsh (Low)
 Intertidal Sand Flat
 Intertidal Mud Flat
 Freshwater Tidal Swamp
 Fresh and Oligohaline Tidal Marsh and Shrubland
 Brackish Tidal Marsh and Shrubland

Issue and Actions:

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Issue 1 Residential and Commercial Development: Upland buffer loss - Residential and Commercial Structures. Rank: 1

- Action 1 Technical Assistance; Environmental review; Review of proposed projects: Improve federal/state/local coordination of environmental reviews to ensure that potential impacts to key habitats and SGCN are minimized for all major projects. Rank: 1.2*
- Action 2 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3. Rank: 1.2*
- Action 3 Planning; Land use planning: Develop state policies to require incorporation of Key Wildlife Habitats into plans and planning (including the DEN). Rank: 1.3*
- Action 4 Planning; Land use planning: Encourage all counties to adopt environmental design standards for development projects in order to avoid, minimize, and negate effects to key wildlife habitats and SGCN, and work with developers to implement. Rank: 1.3*
- Action 5 Outreach; Partner/Stakeholder engagement: Work with conservation partners, state and county planning officials, and developers to create certification for environmentally-friendly developments, including an associated media campaign with awards. Rank: 1.8*

Issue 2 Pollution; Industrial and military effluents: Chronic water pollution. Rank: 1.2

- Action 1 Law Enforcement: Support the Division of Water enforcement of existing limits on releases of water pollution. Rank: 1.2*

Issue 3 Natural System Modifications; Other ecosystem modifications: Habitat loss and fragmentation - Dredge spoil disposal. Rank: 1.2

- Action 1 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to ensure spoil disposal plans benefit key habitat and SGCN and avoid impacts, enact time of year restrictions on deposition. Rank: 1.8*
- Action 2 Direct Management of Natural Resources; Create new habitat or natural processes: Work with the Division of Watershed Stewardship and the US Army Corps of Engineers to identify sites for beneficial use of dredge spoils to create/restore key habitats. Rank: 1.8*

Issue 4 Residential and Commercial Development: Upland buffer loss - Residential and Commercial Structures. Rank: 1.2

- Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*

Issue 5 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Artificial shoreline hardening. Rank: 1.3

- Action 1 Coordination and Administration; Incentives: Provide incentives for private landowners to restore wetlands, in place of installing bulkheads and revetments, to minimize impacts to key habitats. Rank: 1.3*

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Issue 6 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 1.5

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.2

Action 2 Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.2

Action 3 Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.2

Issue 7 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Nutria. Rank: 1.5

Action 1 Outreach: Educate about the detrimental effects of Nutria. Rank: 1.5

Action 2 Direct Management of Natural Resources; Invasive species control: Eradicate Nutria. Rank: 1.5

Action 3 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess the potential for impacts to key habitats, monitor populations, and develop adaptive management strategies if necessary. Rank: 1.8

Issue 8 Transportation and Service Corridors: Shoreline erosion is exacerbated by commercial ship traffic. Rank: 1.5

Action 1 Direct Management of Natural Resources: Rank: 1.2

Issue 9 Residential and Commercial Development: Open water in the tidal marsh has expanded due to marsh ditching and channelization. Rank: 1.7

Action 1 Direct Management of Natural Resources: Rank: 1.2

Action 2 Planning: Rank: 1.8

Action 3 Direct Management of Natural Resources; Hazard or infrastructure removal: Rank: 2

Fresh and Oligohaline Tidal Marsh and Shrubland

Issue 1 Agriculture and Aquaculture: Upland buffer loss - Farmland. Rank: 1

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support the Agricultural Lands Preservation Program to protect land from irreversible conversion to other uses. Rank: 1.2

Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3

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Action 3 *Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, the agriculture industry and the Landowners Incentives Program to develop BMPs, and the corresponding incentives, that minimize impacts to key habitats, preserve and restore buffers, and reduce edge effects for area-sensitive SGCN. Rank: 1.8*

Issue 2 Transportation and Service Corridors; Roads and railroads: Habitat loss and fragmentation - Transportation Infrastructure. Rank: 1.2

Action 1 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to develop BMPs to integrate key habitat and SGCN conservation into landscaping, mowing, invasive plant control and other road maintenance, including preserving and restoring buffers and reducing edge effects. Rank: 1.2*

Action 2 *Planning; Land use planning: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into long-range transportation planning. Rank: 1.2*

Action 3 *Coordination and Administration; Coordination and administration; Agency administrative support: Work with the Delaware Department of Transportation to integrate key habitat and SGCN conservation into wetland and forest mitigation. Rank: 1.2*

Issue 3 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Artificial shoreline hardening. Rank: 1.2

Action 1 *Coordination and Administration; Incentives: Provide incentives for private landowners to restore wetlands and add living shorelines, in place of installing bulkheads and revetments, to minimize impacts to key habitats. Rank: 1.3*

Freshwater Tidal Swamp

Issue 1 Natural System Modifications; Other ecosystem modifications: Shoreline protection practices - Artificial shoreline hardening. Rank: 1.2

Action 1 *Coordination and Administration; Incentives: Provide incentives for private landowners to restore wetlands, in place of installing bulkheads and revetments, to minimize impacts to key habitats. Rank: 1.3*

Issue 2 Biological Resource Use; Logging and wood harvesting: Agricultural and forestry operations - Clearcutting and other forestry practices. Rank: 1.3

Action 1 *Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*

Action 2 *Outreach; Partner/Stakeholder engagement: Work with the Delaware Forest Service and the forestry industry to implement a Master Logger program to encourage landowners to work with loggers who harvest timber selectively and are sensitive to key wildlife habitats. Rank: 1.3*

Action 3 *Planning; Species and habitat management planning; Habitat management planning: Work with the Delaware Forest Service to integrate key habitat and SGCN conservation into forest management planning. Rank: 1.3*

Action 4 *Coordination and Administration; Incentives: Work with the Delaware Forest Service, the forestry industry and landowner incentive programs to develop BMPs and corresponding incentives to preserve or restore key habitat buffers and reduce edge effects for area-sensitive SGCN. Rank: 1.3*

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Issue 3 Agriculture and Aquaculture: Habitat loss and fragmentation - Farmland. Rank: 1.3

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support the Agricultural Lands Preservation Program to protect land from irreversible conversion to other uses. Rank: 1.2*
- Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3*
- Action 3 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting forested key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 4 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3*
- Action 5 Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, the agriculture industry and the Landowners Incentives Program to develop BMPs, and the corresponding incentives, that minimize impacts to key habitats, preserve and restore buffers, and reduce edge effects for area-sensitive SGCN. Rank: 1.8*

Issue 4 Pollution; Garbage and solid waste: Habitat loss and fragmentation - Landfill facilities. Rank: 1.3

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support rigorous implementation of the State Strategies for Policies and Spending to restrict major development to Levels 1-3. Rank: 1.2*

Issue 5 Transportation and Service Corridors; Utility and service lines: Habitat loss and fragmentation - Utility Corridors. Rank: 1.3

- Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Work with utilities to develop BMPs to integrate key habitat and SGCN conservation into corridor maintenance, including controlling invasive species, preserving and restoring buffers and reducing edge effects. Rank: 1.3*

Issue 6 Residential and Commercial Development; Housing and urban areas: Residential and commercial practices - Piers and docks. Rank: 1.3

- Action 1 Outreach: Work with county building officials to encourage developers to construct community piers and docks in subdivisions, in place of individual structures. Rank: 1.3*
- Action 2 Outreach: Work with developers to create design standards for piers and docks that minimize habitat loss or fragmentation. Rank: 1.8*

Issue 7 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Agricultural and forestry operations - Pesticides. Rank: 2

- Action 1 Outreach; Partner/Stakeholder engagement: Work with the Delaware Department of Agriculture, NRCS, and the agricultural community to promote implementation of IPM to minimize impacts of agricultural pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on farmland. Rank: 1.8*

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Issue 8 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Residential and commercial development practices - Pesticides. Rank: 2

Action 1 Coordination and Administration; Incentives: Work with Cooperative Extension to promote IPM implementation to minimize impacts of residential and commercial pesticides on SGCN. Work also with landowner incentive programs to develop incentives for IPM implementation on private golf courses, recreational facilities and common areas. Rank: 1.8

Tidal Salt Marsh and Shrubland (High)

Issue 1 Agriculture and Aquaculture: Upland buffer loss - Farmland. Rank: 1

Action 1 Coordination and Administration; Coordination and administration; Agency administrative support: Support the Agricultural Lands Preservation Program to protect land from irreversible conversion to other uses. Rank: 1.2

Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Coordinate with partners to acquire title to, or easements on, sites that are critical to the conservation of key habitats and SGCN for management by public agencies or NGOs. Rank: 1.3

Action 3 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting forested key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3

Action 4 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Evaluate means of protecting isolated freshwater wetland key habitats on private property, including education and outreach, voluntary guideline, incentives and regulations, as necessary. Rank: 1.3

Action 5 Coordination and Administration; Incentives: Work with the Delaware Department of Agriculture, the agriculture industry and the Landowners Incentives Program to develop BMPs, and the corresponding incentives, that minimize impacts to key habitats, preserve and restore buffers, and reduce edge effects for area-sensitive SGCN. Rank: 1.8

Taxa Conservation Issues and Actions

Birds

All Birds

- Issue 1 Residential and Commercial Development: Habitat loss and fragmentation. Rank: 1.2**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Identify, manage, and protect critical areas for birds, especially networks of large patches of priority habitats, for immediate conservation. Rank: 1.5*
- Action 2 Land and Water Rights Acquisition and Protection; Conservation area designation: Identify, manage, and protect critical areas for birds, especially networks of large patches of priority habitats, for immediate conservation. Rank: 1.7*
- Issue 2 Invasive and Other Problematic Species, Genes, and Diseases: Predation by pets and subsidized predators (including native species whose populations have increased due to resources provided directly or indirectly by humans). Rank: 1.2**
- Action 1 Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Work with conservation partners to control subsidized predators on public and NGO conservation lands by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 1.5*
- Action 2 Outreach; Partner/Stakeholder engagement; Non governmental organization: Work with retailers and NGOs to develop education and outreach for pet owners to minimize the impacts of pets on SGCN, such as "Cats Indoors." Rank: 1.5*
- Action 3 Education; Student training; Wildlife education: Develop education and outreach for the general public about the impacts of subsidized predators on SGCN. Rank: 1.7*
- Action 4 Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control subsidized predators of beach-nesting birds by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 1.8*
- Action 5 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Research activities of nocturnal predators of beach-nesting birds through the use of specialized equipment (night binoculars and video cameras) and expansion of monitoring to include nighttime hours. Rank: 2*
- Action 6 Law Enforcement: Strengthen enforcement of leash laws for dogs to protect SGCN. Rank: 2*
- Action 7 Coordination and Administration; Incentives: Provide incentives for landowners to control subsidized predators on private property by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 2.8*
- Issue 3 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Negative impacts of invasive species (especially plants) on vital bird habitats. Rank: 1.3**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess threats from invasive plants on habitat quality for birds, and define appropriate management strategies ranging from education and control to eradication. Rank: 2*

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- Action 2* *Technical Assistance; Environmental review; Review of proposed policies and plans: Assess threats from invasive plants on habitat quality for birds, and define appropriate management strategies ranging from education and control to eradication. Rank: 2.5*
- Action 3* *Coordination and Administration; Incentives: Private lands cost share programs for managing invasive species (e.g. phragmites control program). Rank: 2.5*
- Issue 4** **Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of coordination and sharing of information among regional, state and national data collectors for migrating species within the flyway that utilize habitats in a broad geographical range. Rank: 1.7**
- Action 1* *Data Collection and Analysis; Database development and management: Complete a survey that will be summarized to (1) evaluate how well Delaware is meeting NABCI's avian best management practices and standards; (2) identify Delaware's bird data management capacity and needs; and 3) identify bottlenecks to integrating data among states for regional and national scale analyses. Rank: 1.5*
- Action 2* *Data Collection and Analysis; Database development and management; Database development: Partner with a centralized database (e.g., Avian Knowledge Network) that will enhance Delaware's ability to manage and conserve wide ranging species across broad and biologically meaningful geographic areas. The exchange and integration of avian data into a permanent centralized data management system is a priority action to be accomplished by 22. Rank: 1.7*
- Issue 5** **Residential and Commercial Development: Buildings. Rank: 1.8**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Work with architects, building owners and managers to develop design standards to minimize the impacts of window glass on SGCN, utilizing the resources of the Building and Birds Forum and others. Rank: 1.7*
- Issue 6** **Invasive and Other Problematic Species, Genes, and Diseases; Diseases of unknown cause: Infectious diseases. Rank: 1.8**
- Action 1* *Education; Educator/instructor training: Provide training for DFW staff in procedures for responding to disease outbreaks. Rank: 1.7*
- Action 2* *Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Establish an early detection and rapid response system to react to new invasions. Rank: 2*
- Issue 7** **Resource Management Needs; Resource information collection needs: Need for better information regarding population status, trends, resource and habitat needs for SGCN. Rank: 1.8**
- Action 1* *Data Collection and Analysis: Generate a list of surveys, monitoring, etc. that volunteers could assist with. Rank: 1.5*
- Action 2* *Outreach: Work with birding groups to recruit birders to assist with survey/monitoring. Rank: 1.5*
- Issue 8** **Pollution; Excess energy; Light pollution: Buildings. Rank: 2**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities and building code officials to develop education and outreach for building owners and managers to minimize the impacts of building lights on SGCN, modeled after the "Lights Out", FLAP, WINGS or "Project Safe Flight" programs. Rank: 1.7*

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- Issue 9** **Climate Change and Severe Weather; Habitat shifting or alteration: Change in arrival, nesting times and migration routes due to climate and weather pattern changes. Rank: 2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Monitor phenology of extant SGCN occurrences to determine alteration to migration patterns, arrival on nesting grounds, changes in nesting habits and trends. Conduct surveys for additional occurrences in potential habitats. Rank: 2.5*
- Issue 10** **Transportation and Service Corridors; Utility and service lines: Communications towers and high-tension electric lines. Rank: 2**
- Action 1* *Technical Assistance; Technical assistance; Technical assistance: Support research on improving the design of towers and lines to minimize impacts to SGCN. Rank: 1.5*
- Action 2* *Outreach; Partner/Stakeholder engagement; Others: Work with utilities to develop standards for the placement of towers and lines to minimize impacts to SGCN nesting colonies, roosts, migration routes, movement corridors, and other critical areas. Rank: 1.7*
- Issue 11** **Pollution; Excess energy; Light pollution: Outdoor lighting. Rank: 2**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities and building code and public safety officials to develop design standards for outdoor lighting that minimizes stray light. Rank: 1.7*
- Action 2* *Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities to develop education and outreach for homeowners, business owners and municipalities to promote reduced use of outdoor lighting during nesting, peak migration and other critical times. Rank: 1.7*
- Issue 12** **Invasive and Other Problematic Species, Genes, and Diseases: Predation by pets and subsidized predators. Rank: 2**
- Action 1* *Education; Student training; Wildlife education: Develop education and outreach for the general public about the impacts of subsidized predators on SGCN. Rank: 1.7*
- Issue 13** **Energy Production and Mining; Renewable energy: Wind farm collisions. Rank: 2**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Work with energy companies to develop standards for the placement of wind energy towers to avoid SGCN nesting colonies, roosts, migration routes, movement corridors and other critical areas. Rank: 1.5*
- Action 2* *Technical Assistance; Technical assistance; Technical assistance: Support research for improving the design of wind energy towers to minimize impacts to SGCN. Rank: 2.3*
- Issue 14** **Resource Management Needs; Resource information collection needs: Wind turbine development - lack of information about sounds from vibration at base, electromagnetic field disruptions, placement (migration paths, dredging). Rank: 2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of wind turbines on movement and populations. Rank: 1.5*
- Issue 15** **Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: Education and outreach needs. Rank: 2.2**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2.2*

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Action 2 Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 2.2

Issue 16 Biological Resource Use; Fishing and harvesting aquatic resources; Persecution/Control: Predator control for aquaculture, commercial and recreational fisheries. Rank: 2.3

Action 1 Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 1.5

Action 2 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Research economic or ecological impact of locally super-abundant waterbirds, and monitor impacts of management actions. Rank: 2

All Waterbirds

Issue 1 Climate Change and Severe Weather; Habitat shifting or alteration: Habitat loss. Rank: 1

Action 1 Direct Management of Natural Resources; Create new habitat or natural processes: Control erosion, impede vegetative succession or create new habitat for beach-nesting birds using "clean" dredged materials. Rank: 2.5

Issue 2 Climate Change and Severe Weather; Sea level rise: Sea level rise. Rank: 1

Action 1 Direct Management of Natural Resources; Living shorelines; Erosion control structures: Control erosion, impede vegetative succession or create new habitat for beach-nesting birds using "clean" dredged materials. Rank: 2.5

Issue 3 Pollution; Industrial and military effluents; Oil spills: Contaminants (oil spills) having lethal or sub-lethal effects. Rank: 1.7

Action 1 Law Enforcement: Improve oil spill prevention and emergency response. Rank: 1.8

Issue 4 Pollution; Industrial and military effluents; Type unknown: Contaminants causing SAV reduction from water quality degradation. Rank: 1.7

Action 1 Direct Management of Natural Resources; Planting/seeding; Submerged aquatic vegetation: Re-establish SAV beds for waterfowl in areas where they formerly occurred and where water quality has improved since their disappearance. Rank: 2

Issue 5 Pollution; Agricultural and forestry effluents; Type unknown: Pollution impacts on waterbirds (e.g. heavy metals). Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Age size and sex structure: Research waterbird contaminant loads and effects; maintain long-term data and tissue repositories. Rank: 2.2

Issue 6 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Degraded food resources and habitat for migrating and over-wintering freshwater birds. Rank: 1.8

Action 1 Direct Management of Natural Resources; Create new habitat or natural processes: Restore freshwater wetland bird habitats to provide adequate food supply and stopover habitat for migratory birds. Rank: 2.5

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Issue 7 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Named species: Resident Canada geese causing nuisance fecal accumulation, water quality degradation, and depredation of agricultural crops. Rank: 1.8

Action 1 Outreach; Partner/Stakeholder engagement; Others: Expand partnerships involving farmers, hunters, conservationists, and public agencies that have been addressing Canada goose nuisance and depredation issues. Rank: 1.7

Issue 8 Biological Resource Use; Fishing and harvesting aquatic resources; Persecution/Control: Aquaculture predator control. Rank: 2.3

Action 1 Law Enforcement: Enforce Federal predator control regulations. Rank: 2.5

Action 2 Data Collection and Analysis; Techniques development; Fish and wildlife research survey and management techniques: Use alternative techniques like careful site selection, barriers, bird unfriendly pond construction, colony site translocation, and subsidies to compensate for losses. Rank: 2.5

All Colonial Waterbirds

Issue 1 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7

Issue 2 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Invasive plant control (for Phragmites) causing wetland alteration (nesting habitat or habitat for prey species). Rank: 1.8

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess benefits and threats to herons from existing invasive plant control programs. Rank: 2

Issue 3 Human Intrusions and Disturbance; Recreational activities: Boats, aircraft, ORVs and other recreational activities causing disturbance. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Research waterbird colony dynamics to determine the factors behind colony abandonment and establishment, including adequate buffer distances around colonies to minimize human disturbance. Rank: 1.8

Action 2 Law Enforcement: Identify, post, protect and patrol all accessible colonial waterbird breeding and roost sites, and implement anti-disturbance policies as needed. Intrusive, disruptive disturbance should be tightly managed and monitored by agencies at all sites where it occurs, especially to minimize disruption of nesting, lowered reproductive success, or abandonment of the breeding site. Rank: 2

Issue 4 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Predation by cats. Rank: 2

Action 1 Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control feral cats and keep house cats indoors to protect waterbirds. Rank: 2

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Issue 5 Residential and Commercial Development; Housing and urban areas: Residential development causing tidal wetland buffer conversion. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Research waterbird colony dynamics to determine the factors behind colony abandonment and establishment, including adequate buffer distances around colonies to minimize human disturbance. Rank: 1.8

Action 2 Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2

Issue 6 Pollution; Excess energy; Light pollution: Artificial lighting causing disturbance. Rank: 2.2

Action 1 Law Enforcement: Establish and enforce regulatory programs to reduce the adverse effects of lights both on the water and on the shore. Rank: 2.2

Issue 7 Education/Outreach Needs; Education needs; Need for improved knowledge of fish and wildlife and their habitats: Need for better information on population status, trends, resource and habitat needs. Rank: 2.2

Action 1 Education; Student training; Wildlife education: Develop colonial waterbird guides for ecotour operators; interpretive signs and displays at viewing sites and public boats ramps; and educational materials to describe reasons for predator control. Conduct workshops for tour operators to promote responsible tourism viewing. Rank: 1.8

Action 2 Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2

Colonial Waterbirds - Herons

Issue 1 Resource Management Needs; Management decision needs; Need to conduct environmental reviews: Pollution impacts on waterbirds. Rank: 1.7

Action 1 Planning; Species and habitat management planning; Species management planning: Establish water quality criteria for fish and wildlife. Rank: 2

Issue 2 Pollution; Industrial and military effluents; Oil spills: Contaminants (oil spills) having lethal or sub-lethal effects. Rank: 1.8

Action 1 Outreach; WSFR program/subprogram outreach; Displays exhibits kiosks: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 1.7

Action 2 Law Enforcement: Improve oil spill prevention and emergency response. Rank: 1.7

Issue 3 Pollution; Agricultural and forestry effluents; Type unknown: Contaminants from agricultural runoff causing wetland habitat degradation. Rank: 1.8

Action 1 Outreach; Partner/Stakeholder engagement; Others: Promote BMP's for implementation by agriculture, homeowners, pest control industry, right of way/maintenance, landscape professionals. Increase use of IPM, BMPs through education and outreach. Rank: 1.8

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- Issue 4** **Pollution; Domestic and urban waste water; Run-off: Contaminants from residential runoff causing wetland habitat degradation. Rank: 1.8**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Promote BMP's for implementation by agriculture, homeowners, pest control industry, right of way/maintenance, landscape professionals. Increase use of IPM, BMPs through education and outreach. Rank: 1.8*
- Issue 5** **Pollution; Agricultural and forestry effluents; Soil erosion and sedimentation: Nutrients and sediments from agricultural and residential runoff causing wetland habitat degradation due to community composition changes. Rank: 1.8**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Promote BMP's for implementation by agriculture, homeowners, pest control industry, right of way/maintenance, landscape professionals. Increase use of IPM, BMPs through education and outreach. Rank: 1.8*
- Issue 6** **Residential and Commercial Development; Housing and urban areas: Residential and commercial development encroaching on habitat. Rank: 1.8**
- Action 1* *Land and Water Rights Acquisition and Protection; Land acquisition: Increase public acquisition of land targeted by potential development. Rank: 2.5*
- Issue 7** **Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Contaminants (pesticides) from agricultural runoff or drift having lethal or sub-lethal effects. Rank: 2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Research BMPs for agricultural pesticide use. Rank: 1.7*
- Issue 8** **Pollution; Domestic and urban waste water; Run-off: Contaminants from runoff having lethal or sub-lethal effects. Rank: 2**
- Action 1* *Data Collection and Analysis; Techniques development; Habitat restoration methods: Identify, catalog, and rate techniques that reduce runoff. Rank: 1.8*
- Issue 9** **Pollution; Agricultural and forestry effluents; Type unknown: Pollution impacts on waterbirds (e.g heavy metals). Rank: 2**
- Action 1* *Law Enforcement: Ensure compliance with pesticide use regulations. Rank: 2*
- Action 2* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Research sources of contaminants in herons. Rank: 2*
- Action 3* *Law Enforcement: Restrict open water disposal of contaminated materials. Rank: 2*
- Action 4* *Direct Management of Natural Resources; Hazard or infrastructure removal: Reduce contaminants impacts from industrial and municipal effluents. Rank: 2.5*
- Issue 10** **Residential and Commercial Development; Housing and urban areas: Residential development causing tidal wetland buffer conversion. Rank: 2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Integrate heron foraging and nesting needs on a seasonal basis with other marsh management needs. Rank: 1.5*

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Beach-nesting Birds

- Issue 1** **Invasive and Other Problematic Species, Genes, and Diseases: Predation by subsidized predators- native species (fox, skunk, crows, ghost crabs) whose populations have increased due to resources provided directly or indirectly by humans - or by cats and rats. Rank: 1.2**
- Action 1* *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control predators of beach-nesting birds by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 1.5*
- Action 2* *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control subsidized predators of migratory shorebirds by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 1.5*
- Action 3* *Data Collection and Analysis; Techniques development; Fish and wildlife research survey and management techniques: Develop and test new predator management techniques to protect nests and chicks. Rank: 2*
- Issue 2** **Resource Management Needs; Resource information collection needs: Need for better informations on population status, trends, resource and habitat needs. Rank: 1.3**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7*
- Issue 3** **Human Intrusions and Disturbance; Recreational activities: Recreational beach use causing death or disturbance. Rank: 1.3**
- Action 1* *Law Enforcement: Reduce disturbance to beach-nesting birds (including piping plover) caused by humans and pets. Rank: 1.2*
- Action 2* *Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 1.5*
- Action 3* *Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 1.8*
- Action 4* *Planning; Species and habitat management planning; Species management planning: Implement species and habitat management for any beach-nesting birds that do not yet have one in place (e.g., fencing and posting of nests) on state lands (and Federal, NGO and private lands as appropriate), focusing on extant and historic occurrences; determine the efficacy of different management practices. Rank: 2*
- Issue 4** **Natural System Modifications; Other ecosystem modifications: Beach replenishment causing beach habitat degradation. Rank: 1.5**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Research effects of beach replenishment projects on beach-nesting birds (including piping plovers). Rank: 2*

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- Issue 5** **Pollution; Industrial and military effluents; Oil spills: Contaminants (oil spills) having lethal or sub-lethal effects. Rank: 1.5**
- Action 1* *Law Enforcement: Improve oil spill prevention and emergency response. Rank: 1.7*
- Issue 6** **Resource Management Needs; Management decision needs; Need to provide technical assistance: Habitat loss, degradation and fragmentation. Rank: 1.5**
- Action 1* *Outreach; Partner/Stakeholder engagement; Others: Establish partnerships with government agencies, conservation organizations, businesses and private landowners to protect, manage and restore extant and historical SGCN occurrences and key wildlife habitats. Rank: 1.5*
- Issue 7** **Residential and Commercial Development; Housing and urban areas: Loss of natural beach dynamics from residential development causing beach habitat degradation. Rank: 1.7**
- Action 1* *Direct Management of Natural Resources; Living shorelines; Beach renourishment: Maintain or restore natural beach dynamics that perpetuate high quality breeding habitat for beach-nesting birds. Rank: 2.2*
- Issue 8** **Human Intrusions and Disturbance; Recreational activities: ORVs causing death or disturbance. Rank: 1.7**
- Action 1* *Education; Student training; Wildlife education: Educate the public about SGCN and effects of disturbance on nesting. Rank: 1.2*
- Action 2* *Law Enforcement: Enforce closed nesting areas. Rank: 1.5*
- Issue 9** **Residential and Commercial Development; Housing and urban areas: Shoreline hardening from residential development causing beach habitat degradation. Rank: 1.7**
- Action 1* *Education: Educate local municipalities, land owners, and the general public about the effects of shoreline hardening and discuss alternatives (i.e. Living Shorelines). Rank: 2*
- Issue 10** **Education/Outreach Needs; Education needs; Need for improved knowledge of fish and wildlife and their habitats: Rank: 1.8**
- Action 1* *Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 1.5*
- Issue 11** **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Named species: Dogs off leash causing death or disturbance. Rank: 1.8**
- Action 1* *Education; Student training; Wildlife education: Educate dog owners about SGCN and effects of dogs on nesting. Rank: 1.7*
- Action 2* *Law Enforcement: Enforce leash laws. Rank: 1.8*
- Issue 12** **Resource Management Needs; Resource information collection needs: Need for better information regarding population status, trends, resource and habitat needs. Rank: 1.8**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.5*

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Issue 13 Residential and Commercial Development; Housing and urban areas: Residential development causing beach habitat conversion. Rank: 2

Action 1 Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2

Piping Plover

Issue 1 Resource Management Needs; Management decision needs; Need to provide technical assistance: Need for improved safe monitoring methods for piping plovers. Rank: 1.8

Action 1 Data Collection and Analysis; Techniques development; Fish and wildlife research survey and management techniques: Develop safe techniques for marking piping plovers. Rank: 1.5

Black Skimmer

Rynchops niger

Issue 1 Resource Management Needs; Resource information collection needs: Rank: 1.7

Action 1 Data Collection and Analysis: Research how to create suitable nesting habitat for this species. Rank: 1.8

Action 2 Data Collection and Analysis: Research the importance of Delaware habitats to non-breeding flocks seen here in the summer and how to manage for them. Rank: 1.8

Issue 2 Resource Management Needs; Resource information collection needs: Lack of information about species nesting in Delaware. Rank: 1.7

Action 1 Data Collection and Analysis: Determine why this species doesn't nest here more commonly. Rank: 1.8

Issue 3 Human Intrusions and Disturbance; Recreational activities: Recreational beach use causing death or disturbance. Rank: 1.7

Action 1 Planning; Species and habitat management planning; Species management planning: Implement species and habitat management for black skimmer - e.g. fencing and posting of nests - on state lands (and Federal, NGO and private lands as appropriate), focusing on extant and historic occurrences; determine the efficacy of different management practices. Rank: 1.8

Issue 4 Human Intrusions and Disturbance; Recreational activities: Boats and ORVs causing disturbance. Rank: 1.8

Action 1 Data Collection and Analysis; Research, survey, or monitoring - utilization; Human dimensions: Research effects of disturbance from boats and ORVs on black skimmer. Rank: 2

Common Tern

Sterna hirundo

Issue 1 Human Intrusions and Disturbance; Recreational activities: Boats and ORVs causing disturbance. Rank: 1.8

Action 1 Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 1.7

Action 2 Law Enforcement: Work with law enforcement to curtail effects of disturbance on common tern from boats. Rank: 2

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Issue 2 Human Intrusions and Disturbance; Recreational activities: Contaminants (pollution from boats, power plants, etc.) having sublethal effects. Rank: 1.8

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Research the effects of contaminants on common tern. Rank: 2

Issue 3 Human Intrusions and Disturbance; Recreational activities: Recreational beach use causing disturbance. Rank: 1.8

Action 1 Education; Student training; Wildlife education: Post key common tern nesting areas with signs and work with landowners (including other state agencies) to limit public access. Rank: 1.2

Issue 4 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7

Freshwater Marsh Birds

Issue 1 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.8

Issue 2 Resource Management Needs; Resource information collection needs: Agriculture causing wetland buffer conversion. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Assess threats to sedge wren, including contaminants in eggs and water, human disturbance to nesting birds, and habitat loss and destruction. Rank: 2.2

Action 2 Planning; State Wildlife Action planning: Develop management practices for SGCN, key habitats and abatement of threats on public and private lands; measure the effectiveness of different management practices and adapt as necessary. Rank: 2.2

Issue 3 Natural System Modifications; Dams and water management/use; Extractions of ground water (unknown use): Groundwater withdrawals causing wetland habitat degradation. Rank: 2

Action 1 Planning; Species and habitat management planning; Species management planning: Develop a conservation plan for freshwater wetland birds, to include recovery goals, habitat development, and restoration consistent with North American Waterbird Conservation Plan. Rank: 1.8

Action 2 Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2

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- Action 3 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Food habits: Research feeding habitats, home ranges and patch size requirements of freshwater wetland birds. Rank: 2*
- Action 4 Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Research freshwater wetland bird habitat evaluation criteria based on review of literature and assessment of current distribution. Rank: 2*
- Action 5 Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Restore freshwater wetland bird habitats to provide adequate food supply and stopover habitat for migratory birds. Rank: 2.5*
- Issue 4 Pollution; Agricultural and forestry effluents; Nutrient loads: Nutrients and sediments from agricultural and residential runoff causing wetland habitat degradation due to community composition changes. Rank: 2**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Research factors influencing nest success and productivity of freshwater wetland birds, including population dynamics and habitat selection. Rank: 2*
- Issue 5 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Unspecified species: Predation by domestic animals and subsidized predators due to residential and commercial development encroaching on habitat. Rank: 2**
- Action 1 Planning; Species and habitat management planning; Species management planning: Establish American bittern management/protection guidelines for breeding populations on private lands, and where possible, provide incentives for participation in the protection of breeding sites. Rank: 2.3*
- Issue 6 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 2.2**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.8*

Freshwater Waterfowl

- Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Invasive plants causing wetland habitat degradation. Rank: 1.5**
- Action 1 Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Enhance/restore degraded wetlands and adjacent upland habitats (including buffers). Rank: 2.3*
- Issue 2 Residential and Commercial Development; Housing and urban areas: Residential development causing wetland buffer conversion. Rank: 1.5**
- Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Acquire title to or easement on priority high-quality habitats including nesting, migratory stopover, and wintering areas, and the upstream headwaters and adjacent buffer habitats throughout the watershed that are central to their integrity. Rank: 1.8*

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Action 2 Planning; Land use planning: Maintain or improve hydrologic connections (e.g. restore tidal flow in estuarine systems) when maintaining or constructing buildings, railroads, and highways adjacent to rivers, lakes or wetlands. Rank: 2

Issue 3 Transportation and Service Corridors; Roads and railroads: Roads, railroads, etc. impair hydrologic connections. Rank: 1.5

Action 1 Planning; Land use planning: Maintain or improve hydrologic connections (e.g. restore tidal flow in estuarine systems) when maintaining or constructing buildings, railroads, and highways adjacent to rivers, lakes or wetlands. Rank: 2.2

Issue 4 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Predation by cats and rats. Rank: 1.8

Action 1 Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control feral cats and rats to protect waterfowl (and other species). Rank: 2.2

Action 2 Education: Education the public about the importance of keeping cats indoors to protect waterfowl (and other species). Rank: 2.2

Issue 5 Invasive and Other Problematic Species, Genes, and Diseases; Problematic species/diseases of unknown origin; Named species: Pathogens (botulism, fowl cholera, AI, etc.). Rank: 2

Action 1 Direct Management of Natural Resources; Wildlife disease management: Reduce or control the effect of diseases where the intensity and frequency of occurrence threatens species or populations. Rank: 2.2

Pelagic Birds

Issue 1 Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (large scale): Commercial fisheries bycatch. Rank: 1.7

Action 1 Law Enforcement: Enact international regulation of high seas fishing. Rank: 1.8

Action 2 Planning; Species and habitat management planning; Species management planning: Develop a pelagic bird conservation plan consistent with North American Waterbird Conservation plan. Rank: 2

Action 3 Law Enforcement: Develop guidelines and/ or regulations to reduce commercial fisheries bycatch of pelagic birds. Rank: 2

Action 4 Data Collection and Analysis; Research, survey, or monitoring - utilization; Human dimensions: Research commercial fisheries impacts on pelagic birds. Rank: 2

Issue 2 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2

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Issue 3 **Pollution; Garbage and solid waste: Trash ingestion or commercial fishing gear entanglement. Rank: 1.8**

Action 1 *Data Collection and Analysis; Techniques development; Fish and wildlife research survey and management techniques: Develop non-persistent lines, nets and traps, and research the use of lead sinkers and their effects on waterbird mortality rates. Rank: 2*

Issue 4 **Pollution; Garbage and solid waste: Trash ingestion. Rank: 1.8**

Action 1 *Direct Management of Natural Resources; Hazard or infrastructure removal; Solid waste removal: Remove trash as soon as possible. Rank: 2*

Action 2 *Law Enforcement: Prohibit dumping of debris, used line, and nets and enforce the prohibition. Rank: 2.2*

Issue 5 **Energy Production and Mining; Renewable energy: Wind farm collisions. Rank: 2**

Action 1 *Technical Assistance; Environmental review; Review of proposed projects: Develop standards for placement of wind energy towers to minimize impacts on pelagic birds. Rank: 2.3*

Issue 6 **Education/Outreach Needs; Education needs; Lack of aquatic resources and wildlife education facilities: Education and outreach needs. Rank: 2.2**

Action 1 *Education; Educator/instructor training: Develop a "species profile" brochure for pelagic birds. Develop and conduct workshops for tour boat operators to promote responsible pelagic bird tourism/ viewing. Develop pelagic bird outreach materials for Cape May Lewis ferry. Develop opportunities for pelagic bird ecotourism in shore communities that have tour boat operators. Rank: 1.5*

Saltmarsh Birds

Issue 1 **Climate Change and Severe Weather; Sea level rise: Loss of high marsh and conversion of low marsh to open water as a result of sea level rise. Rank: 1.5**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat: Identify, manage, and protect critical areas for saltmarsh birds, especially networks of large patches of priority habitats that facilitate marsh migration, for immediate conservation. Rank: 2*

Issue 2 **Natural System Modifications; Other ecosystem modifications: Insect control with OMWM and impoundment management causing wetland habitat alterations. Rank: 1.7**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Research impacts of OMWM and impoundment management on SGCN species and habitats. Rank: 2*

Issue 3 **Natural System Modifications; Other ecosystem modifications: Insect control with OMWM causing wetland habitat alterations. Rank: 1.7**

Action 1 *Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Modify OMWM practices to prevent impacts to SGCN species and key habitats; restore key habitats that have been treated. Rank: 2.5*

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Issue 4 Residential and Commercial Development; Housing and urban areas: Residential development causing wetland buffer conversion. Rank: 1.8

Action 1 Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 1.7

Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Prioritize areas for acquisition to protect the most threatened breeding populations. Rank: 1.7

Action 3 Coordination and Administration; Incentives: Implement cost-share programs, tax reform, market mechanisms and other incentives to encourage SGCN and key habitat management and restoration on private lands. Rank: 2.8

Issue 5 Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Agriculture causing wetland buffer conversion. Rank: 2

Action 1 Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 1.8

Action 2 Land and Water Rights Acquisition and Protection; Land acquisition: Prioritize areas for acquisition to protect the most threatened breeding populations. Rank: 1.8

Action 3 Coordination and Administration; Incentives: Implement cost-share programs, tax reform, market mechanisms and other incentives to encourage SGCN and key habitat management and restoration on private lands. Rank: 3

American Black Duck

Anas rubripes

Issue 1 Residential and Commercial Development; Housing and urban areas: Residential and commercial development encroaching on habitat. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat: Identify, manage, and protect critical habitat for black ducks to support wintering populations. Rank: 2

Shrubland Birds

Issue 1 Transportation and Service Corridors; Utility and service lines: Communications towers and high-tension electric lines. Rank: 1.8

Action 1 Technical Assistance; Technical assistance; Technical assistance: Support research on improving the design of towers and lines to minimize impacts to SGCN. Rank: 1.5

Action 2 Outreach; Partner/Stakeholder engagement; Others: Work with utilities to develop standards for the placement of towers and lines to minimize impacts to SGCN nesting colonies, roosts, migration routes, movement corridors, and other critical areas. Rank: 1.5

Migratory Shorebirds

Issue 1 Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: Rank: 1

Action 1 Education; Student training; Wildlife education: Increase awareness of the importance of Delaware Bay as a major migratory stopover and the importance of the shorebird-horseshoe crab relationship. Rank: 1.5

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Action 2 Outreach; Partner/Stakeholder engagement; Others: Promote sister city concept for international shorebird protection. Rank: 1.7

Action 3 Outreach; Partner/Stakeholder engagement; Government agency: Provide added support for Just Flim 'Em, HSC Sactuaries, and Sister Shorebirds. Rank: 2.2

Issue 2 Biological Resource Use; Fishing and harvesting aquatic resources; Intentional use (large scale): Commercial fisheries over-harvesting of prey (horseshoe crabs). Rank: 1.2

Action 1 Education; Student training; Wildlife education: Increase awareness of the importance of Delaware Bay as a major migratory stopover and the importance of the shorebird-horseshoe crab relationship. Rank: 1.5

Action 2 Technical Assistance; Environmental review; Review of proposed policies and plans: Continue to work with ASMFC to manage HSC havest for shorebirds. Rank: 1.7

Action 3 Education; Student training; Wildlife education: Increase awareness of the importance of Delaware Bay as a major migratory stopover and the importance of the shorebird-horseshoe crab relationship. Rank: 1.7

Issue 3 Pollution; Industrial and military effluents; Oil spills: Contaminants (oil spills) having lethal or sub-lethal effects. Rank: 1.2

Action 1 Technical Assistance; Technical assistance; Technical assistance: Supply Shorebird Team with oil spill response kits and ensuer team leaders have oil spill response training. Rank: 1.3

Action 2 Law Enforcement: Improve oil spill prevention and emergency response. Rank: 1.7

Issue 4 Residential and Commercial Development; Housing and urban areas: Habitat loss. Rank: 1.2

Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Identify and protect important habitats including foraging, roosting, and staging areas. Rank: 1.8

Action 2 Outreach; Partner/Stakeholder engagement; Government agency: Work with appropriate agencies to restore coastal habitats. Rank: 2

Issue 5 Human Intrusions and Disturbance; Recreational activities: Recreational beach use causing death or disturbance. Rank: 1.2

Action 1 Law Enforcement: Work with appropriate agencies to reduce disturbance. Rank: 1.5

Issue 6 Human Intrusions and Disturbance; Recreational activities: Recreational beach use causing death or disturbance. Rank: 1.2

Action 1 Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2

Issue 7 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Predation by pets and subsidized predators (i.e., cats, dogs, racoons, red fox, etc.). Rank: 1.2

Action 1 Education; Student training; Wildlife education: Develop education and outreach for the general public about the impacts of subsidized predators on SGCN. Rank: 1.5

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- Action 2* *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Work with conservation partners to control subsidized predators on public and NGO conservation lands by reducing subsidies (refuges, food sources) or by removal of individuals. Rank: 1.5*
- Action 3* *Outreach; Partner/Stakeholder engagement; Non governmental organization: Work with retailers and NGOs to develop education and outreach for pet owners to minimize the impacts of pets on SGCN, such as "Cats Indoors." Rank: 1.5*
- Action 4* *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control subsidized predators of migratory shorebirds by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 2*
- Action 5* *Law Enforcement: Strengthen enforcement of leash laws for dogs to protect SGCN. Rank: 2*
- Action 6* *Coordination and Administration; Incentives: Provide incentives for landowners to control subsidized predators on private property by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 2.8*
- Issue 8** **Human Intrusions and Disturbance; Recreational activities: Boats causing disturbance. Rank: 1.5**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - utilization; Human dimensions: Research boat disturbance on migratory shorebirds to develop guidelines for buffering nesting and feeding birds from disturbance. Rank: 1.8*
- Issue 9** **Residential and Commercial Development; Housing and urban areas: Habitat loss. Rank: 1.5**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Identify and protect important habitats including foraging, roosting, and staging areas. Rank: 2*
- Issue 10** **Invasive and Other Problematic Species, Genes, and Diseases; Diseases of unknown cause: Infectious diseases. Rank: 1.5**
- Action 1* *Education; Educator/instructor training: Continue to provide training for DFW staff in procedures for responding to disease outbreaks. Rank: 1.5*
- Action 2* *Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Establish an early detection and rapid response system to react to new invasions. Rank: 1.8*
- Issue 11** **Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Habitat loss. Rank: 1.7**
- Action 1* *Land and Water Rights Acquisition and Protection; Land acquisition: Identify and protect important habitats including foraging, roosting, and staging areas. Rank: 2*
- Issue 12** **Natural System Modifications; Other ecosystem modifications: Insect control with impoundment management causing wetland habitat alterations. Rank: 1.7**
- Action 1* *Direct Management of Natural Resources; Create new habitat or natural processes; Waterfowl impoundment creation: Improve impoundment management for migratory shorebirds, and coordinate habitat availability throughout the bay. Rank: 1.8*

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Issue 13 **Climate Change and Severe Weather: SLR, storm damage, erosion, etc. Rank: 1.7**

Action 1 *Data Collection and Analysis: Consider historical data, spawning grounds, and site specific information to rank sites for restoration/replenishment needs (beyond just Mispillion and Port Mahon). Rank: 1.7*

Action 2 *Direct Management of Natural Resources: Restore appropriate beaches for shorebird and HSC benefits (beyond just Mispillion and Port Mahon). Rank: 1.7*

Ruddy Turnstone

Arenaria interpres

Issue 1 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Continue to monitor bird movements, including color marked and radio-tagged individuals, to identify patterns of habitat use, including yearly fluctuations in important foraging/roosting/staging areas. Rank: 1.8*

Action 2 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Age size and sex structure: Continue to monitor turnstone weight gains during the stopover period as a measure of flock condition and health of the stopover. Rank: 1.8*

Action 3 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Continue to monitor turnstone with aerial and boat surveys and by resighting color-marked individuals to develop data for population and survival estimates. Rank: 1.8*

Sanderling

Calidris alba

Issue 1 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Continue to monitor bird movements, including color marked and radio-tagged individuals, to identify patterns of habitat use, including yearly fluctuations in important foraging/roosting/staging areas. Rank: 1.8*

Action 2 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Age size and sex structure: Continue to monitor sanderling weight gains during the stopover period as a measure of flock condition and health of the stopover. Rank: 1.8*

Action 3 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Continue to monitor sanderling with aerial and boat surveys and by resighting color-marked individuals to develop data for population and survival estimates. Rank: 1.8*

Issue 2 **Residential and Commercial Development; Housing and urban areas: Residential development. Rank: 1.5**

Action 1 *Outreach; Partner/Stakeholder engagement; Government agency: Work with appropriate agencies to restore coastal habitats. Rank: 2*

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Issue 3 Residential and Commercial Development; Housing and urban areas: Residential and commercial development encroaching on habitat. Rank: 1.7

Action 1 Outreach; Partner/Stakeholder engagement; Government agency: Work with appropriate agencies to reduce disturbance. Rank: 1.7

Red Knot

Calidris canutus

Issue 1 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.3

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Continue to monitor horseshoe crab egg density as an index of food availability and the health of migratory shorebird stopover sites. Work with ASMFC to re-establish dredge survey which is used in the ARM. Rank: 1.7

Action 2 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Age size and sex structure: Continue to monitor red knot weight gains during the stopover period as a measure of flock condition and health of the stopover. Rank: 1.7

Action 3 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Continue to monitor red knot with ground, aerial, and boat surveys and by resighting color-marked individuals to develop data for population and survival estimates. Rank: 1.7

Action 4 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Continue to monitor bird movements, including color marked, geolocator, and radio-tagged individuals, to identify patterns of habitat use, including yearly fluctuations in important foraging/roosting/staging areas. Rank: 1.8

Whimbrel

Numenius phaeopus

Issue 1 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Continue to monitor whimbrel with aerial and ground surveys to determine population trends. Monitor trends in migratory habitat quality. Rank: 2.2

Peregrine Falcon

Falco peregrinus

Issue 1 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Contaminants having sublethal effects. Rank: 2.2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Research contaminants in peregrine eggs and prey remains to identify contaminant threats. Rank: 2.2

Issue 2 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 2.2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7

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Neotropical Passage Migrants

Issue 1 Residential and Commercial Development: Buildings. Rank: 1.2

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with architects, building owners and managers to develop design standards to minimize the impacts of window glass on SGCN, utilizing the resources of the Building and Birds Forum and others. Rank: 1.5

Issue 2 Transportation and Service Corridors; Utility and service lines: Communications towers and high-tension electric lines. Rank: 1.3

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with utilities to develop standards for the placement of towers and lines to minimize impacts to SGCN nesting colonies, roosts, migration routes, movement corridors, and other critical areas. Rank: 1.5

Action 2 Technical Assistance; Technical assistance; Technical assistance: Support research on improving the design of towers and lines to minimize impacts to SGCN. Rank: 1.7

Issue 3 Pollution; Excess energy; Light pollution: Buildings. Rank: 1.5

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities and building code officials to develop education and outreach for building owners and managers to minimize the impacts of building lights on SGCN, modeled after the "Lights Out", FLAP, WINGS or "Project Safe Flight" programs. Rank: 1.5

Issue 4 Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: International threats - e.g. destruction of cerulean warbler winter habitat due to cocaine production in S. America. Rank: 1.7

Action 1 Outreach; Partner/Stakeholder engagement; Others: Promote sister city concept for international songbird protection. Rank: 1.8

Cavity-nesting Birds

Issue 1 Residential and Commercial Development; Housing and urban areas: Residential development causing conversion of forests containing snags. Rank: 1.3

Action 1 Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2

Action 2 Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Implement species and habitat management for cavity-nesting birds - e.g. retaining/creating snags - on state lands (and Federal, NGO and private lands as appropriate), focusing on extant and historic occurrences; determine the efficacy of different management practices. Rank: 2

Issue 2 Biological Resource Use; Logging and wood harvesting: Habitat loss, degradation and fragmentation due to forestry operation practices. Rank: 1.8

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess threats to cavity-nesting birds, including habitat loss and destruction and silvicultural practices. Rank: 2

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Issue 3 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.8**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.8*

Issue 4 **Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: Residential development. Rank: 2.2**

Action 1 *Outreach; Partner/Stakeholder engagement; Government agency: Establish partnerships with government agencies, conservation organizations, businesses and private landowners to protect, manage and restore extant and historical SGCN occurrences and key wildlife habitats. Rank: 1.8*

Aerial Invertivores

Issue 1 **Transportation and Service Corridors; Roads and railroads: Transportation construction and infrastructure. Rank: 1.8**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Assess threats to cliff swallow, including habitat loss/conversion and bridge maintenance. Rank: 2*

Issue 2 **Human Intrusions and Disturbance: Anthropogenic nest disturbance. Rank: 2**

Action 1 *Education: Educate builders and the general public about the sensitivity of the Common Nighthawk to nest disturbance, and offer suggestions of time of year to avoid nesting areas. Rank: 1.7*

Issue 3 **Resource Management Needs; Resource information collection needs: Disappearance of suitable rooftops for nesting is likely to be an issue. Rank: 2**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat: Research alternative suitable nesting habitat options for the Nighthawk. Rank: 1.7*

Issue 4 **Resource Management Needs; Resource information collection needs: Lack of information about the reason for the decline of many Aerial Invertivores/Insectivores. Rank: 2**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.5*

Action 2 *Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Assess threats to invertivores. Rank: 1.7*

Issue 5 **Transportation and Service Corridors; Roads and railroads: Use of transportation infrastructure for nesting. Rank: 2**

Action 1 *Direct Management of Natural Resources; Fish and wildlife habitat structures; Nesting habitat improvements: Establish partnerships with municipalities and DeIDOT to create/protect and maintain structures suitable for cliff swallow breeding colonies. Rank: 2*

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Issue 6 **Resource Management Needs; Resource information collection needs: Need for better information of population status, trends and resource needs. Rank: 2.2**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2.2*

Ground-nesting Birds

Issue 1 **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Predation by pets and subsidized predators. Rank: 1.3**

Action 1 *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Work with conservation partners to control subsidized predators on public and NGO conservation lands by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 1.5*

Action 2 *Outreach; Partner/Stakeholder engagement; Non governmental organization: Work with retailers and NGOs to develop education and outreach for pet owners to minimize the impacts of pets on SGCN, such as "Cats Indoors." Rank: 1.5*

Action 3 *Education; Student training; Wildlife education: Develop education and outreach for the general public about the impacts of subsidized predators on SGCN. Rank: 1.7*

Action 4 *Law Enforcement: Strengthen enforcement of leash laws for dogs to protect SGCN. Rank: 2*

Action 5 *Coordination and Administration; Incentives: Provide incentives for landowners to control subsidized predators on private property by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 3*

Land Birds

Issue 1 **Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Need for better information on population status, trends, resource and habitat needs. Rank: 1.7**

Action 1 *Technical Assistance; Environmental review; Review of proposed policies and plans: Incorporate landbird monitoring into existing waterfowl and shorebird monitoring programs. Rank: 1.7*

Issue 2 **Pollution; Air-borne pollutants; Acid rain: Contaminants (acid rain, pesticides) having lethal or sub-lethal effects. Rank: 1.8**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Age size and sex structure: Assess threats to birds from accumulation of contaminants. Rank: 2*

Issue 3 **Agriculture and Aquaculture; Livestock farming and ranching; Scale unknown: Livestock grazing causing riparian habitat degradation. Rank: 2.2**

Action 1 *Direct Management of Natural Resources; Grazing/Farm management: Institute habitat-conserving livestock grazing practices where grazing occurs. Rank: 2.2*

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**Raptors - Hawks, Falcons, Eagles,
Owls**

- Issue 1 Residential and Commercial Development; Housing and urban areas: Residential development causing forest habitat conversion. Rank: 1.5**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - utilization; Human dimensions: Assess threats to forest raptors, including human disturbance of nesting birds, habitat conversion and contaminants. Rank: 2*
- Action 2 Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Research habitat requirements of forest raptors. Rank: 2*
- Issue 2 Transportation and Service Corridors; Utility and service lines: Communications towers and high-tension electric lines. Rank: 1.8**
- Action 1 Technical Assistance; Technical assistance; Technical assistance: Support research on improving the design of towers and lines to minimize impacts to SGCN. Rank: 1.2*
- Action 2 Outreach; Partner/Stakeholder engagement; Others: Work with utilities to develop standards for the placement of towers and lines to minimize impacts to SGCN nesting colonies, roosts, migration routes, movement corridors, and other critical areas. Rank: 1.2*
- Issue 3 Resource Management Needs; Resource information collection needs: Lack of information regarding cause of injuries and deaths. Rank: 1.8**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Gather data/information regarding injury and death and determine cause. Rank: 1.5*
- Issue 4 Biological Resource Use; Hunting and collecting terrestrial animals; Persecution/Control: Misuse of rodenticides - Poisons. Rank: 1.8**
- Action 1 Coordination and Administration: Work with pest control companies and Tri-state Bird Rescue to educate companies about this issue and alternatives. Rank: 2.3*
- Action 2 Education; Student training: Educate the public about the proper use of rodenticides, how to avoid unintended "catches", or better alternatives. Rank: 2.7*
- Issue 5 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.8**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7*
- Issue 6 Invasive and Other Problematic Species, Genes, and Diseases; Diseases of unknown cause: Infectious diseases. Rank: 2**
- Action 1 Education; Educator/instructor training: Provide training for DFW staff in procedures for responding to disease outbreaks. Rank: 1.3*
- Action 2 Planning; Organizational strategic and CMS planning; Organizational strategic and operational planning: Establish an early detection and rapid response system to react to new invasions. Rank: 2*

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Issue 7 Human Intrusions and Disturbance: Raptor injury and death. Rank: 2.2

Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Gather data and resources to coordinate tristate bird rescue. Rank: 1.3

All Forest Birds

Issue 1 Residential and Commercial Development: Buildings. Rank: 1.7

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with architects, building owners and managers to develop design standards to minimize the impacts of window glass on SGCN, utilizing the resources of the Building and Birds Forum and others. Rank: 1.8

Issue 2 Transportation and Service Corridors; Utility and service lines: Communications towers and high-tension electric lines. Rank: 1.8

Action 1 Technical Assistance; Technical assistance; Technical assistance: Support research on improving the design of towers and lines to minimize impacts to SGCN. Rank: 1.5

Action 2 Outreach; Partner/Stakeholder engagement; Others: Work with utilities to develop standards for the placement of towers and lines to minimize impacts to SGCN nesting colonies, roosts, migration routes, movement corridors, and other critical areas. Rank: 1.5

Issue 3 Pollution; Excess energy; Light pollution: Buildings. Rank: 2

Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities and building code officials to develop education and outreach for building owners and managers to minimize the impacts of building lights on SGCN, modeled after the "Lights Out", FLAP, WINGS or "Project Safe Flight" programs. Rank: 1.5

Forest Interior Birds

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Named species: Excessive herbivory by deer causing forest habitat degradation. Rank: 1.5

Action 1 Direct Management of Natural Resources; Invasive species control; Animal-biological: Increased control of deer population. Rank: 1.7

Action 2 Direct Management of Natural Resources; Wildlife damage management: Mitigate deer impacts on habitat of forest interior birds. Rank: 1.7

Issue 2 Biological Resource Use; Logging and wood harvesting: Habitat loss, fragmentation and degradation due to forestry operations and pesticide use. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Assess threats to forest interior birds, including habitat conversion and fragmentation, silvicultural practices, and sensitivity to pesticides currently used to control gypsy moths and other forest pests. Rank: 1.8

Issue 3 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Abundance determination: Implement a MAPS program for forest interior birds. Rank: 1.8

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Issue 4 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.8**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.5*

Action 2 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Abundance determination: Research comparative occurrence and breeding success of forest interior birds among beaver wetlands, naturally occurring wetlands, and mitigated wetlands. Rank: 2*

Issue 5 **Residential and Commercial Development: Residential and commercial development causing habitat fragmentation. Rank: 1.8**

Action 1 *Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2*

Issue 6 **Biological Resource Use; Hunting and collecting terrestrial animals; Unintentional effects: Residential development. Rank: 1.8**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Abundance determination: Research effects of game management practices on occurrence, breeding density, and nesting success of forest interior birds. Rank: 2*

Issue 7 **Biological Resource Use; Logging and wood harvesting: Negative impacts of forestry operations on forest interior birds, silviculture practices (clearcutting) incompatible with forest bird conservation. Rank: 2**

Action 1 *Planning; Species and habitat management planning; Species management planning: Incorporate forest interior bird conservation objectives into forest management through policy and planning. Rank: 1.3*

Action 2 *Planning; Species and habitat management planning: Incorporate forest interior bird conservation objectives into forest management through policy and planning. Rank: 1.5*

Forest Interior Wetlands Birds

Issue 1 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.8**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7*

Issue 2 **Natural System Modifications; Dams and water management/use; Extraction of ground water (unknown use): Groundwater withdrawals causing wetland habitat degradation. Rank: 2**

Action 1 *Planning; Species and habitat management planning; Species management planning: Develop a conservation plan for freshwater wetland birds, to include recovery goals, habitat development, and restoration consistent with North American Waterbird Conservation Plan. Rank: 1.8*

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- Action 2 Outreach; Partner/Stakeholder engagement; Others: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites. Rank: 2*
- Action 3 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Food habits: Research feeding habitats, home ranges and patch size requirements of freshwater wetland birds. Rank: 2*
- Action 4 Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Research freshwater wetland bird habitat evaluation criteria based on review of literature and assessment of current distribution. Rank: 2*
- Action 5 Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Restore freshwater wetland bird habitats to provide adequate food supply and stopover habitat for migratory birds. Rank: 2.5*
- Issue 3 Pollution; Agricultural and forestry effluents; Nutrient loads: Nutrients and sediments from agricultural and residential runoff causing wetland habitat degradation due to community composition changes. Rank: 2**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Reproduction: Research factors influencing nest success and productivity of freshwater wetland birds, including population dynamics and habitat selection. Rank: 2*

Pine Specialist Birds

- Issue 1 Education/Outreach Needs; Outreach needs; Need to develop and/or maintain a broad base of support for agency goals and objectives: Residential and commercial development encroaching on habitat. Rank: 1.5**
- Action 1 Outreach; Partner/Stakeholder engagement; Non governmental organization: Establish partnerships with government agencies, conservation organizations, businesses and private landowners to protect, manage and restore extant and historical SGCN occurrences and key wildlife habitats. Rank: 1.8*
- Issue 2 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 2**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2*

Grassland Birds

- Issue 1 Residential and Commercial Development: Buildings. Rank: 1.3**
- Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with architects, building owners and managers to develop design standards to minimize the impacts of window glass on SGCN, utilizing the resources of the Building and Birds Forum and others. Rank: 1.7*

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- Issue 2** Residential and Commercial Development; Housing and urban areas: Residential development causing early successional habitat conversion. Rank: 1.3
- Action 1* Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Implement species and habitat management for grassland birds - e.g. planting of warm-season grasses, prescribed burns - on state lands (and Federal, NGO and private lands as appropriate), focusing on extant and historic occurrences; determine the efficacy of different management practices. Rank: 1.8
- Issue 3** Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Loss of habitat. Rank: 1.5
- Action 1* Direct Management of Natural Resources; Planting/seeding; Herbaceous vegetation: Increase the percentage of native grasses and forbs for grassland birds. Rank: 2
- Issue 4** Transportation and Service Corridors; Utility and service lines: Residential development causing early successional habitat conversion. Rank: 1.5
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Research comparative quality of powerline right-of-way habitats and natural habitats for grassland birds. Rank: 2
- Issue 5** Transportation and Service Corridors; Utility and service lines: Communications towers and high-tension electric lines. Rank: 1.7
- Action 1* Technical Assistance; Technical assistance; Technical assistance: Support research on improving the design of towers and lines to minimize impacts to SGCN. Rank: 1.5
- Action 2* Outreach; Partner/Stakeholder engagement; Others: Work with utilities to develop standards for the placement of towers and lines to minimize impacts to SGCN nesting colonies, roosts, migration routes, movement corridors, and other critical areas. Rank: 1.5
- Issue 6** Natural System Modifications; Other ecosystem modifications: Early successional habitat degradation. Rank: 1.7
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Assess threats to grassland birds including habitat loss/conversion, succession, edge effects and predation. Rank: 2
- Issue 7** Natural System Modifications; Fire and fire suppression; Suppression of fire frequency/intensity: Fire suppression causing habitat degradation due to natural succession. Rank: 1.7
- Action 1* Land and Water Rights Acquisition and Protection; Conservation area designation: Protect or restore natural barrens that support species in disturbed areas. Rank: 2.7
- Issue 8** Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.8
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7

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Issue 9 **Resource Management Needs; Resource information collection needs: Need for information on habitat suitability. Rank: 1.8**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Research the suitability of early successional habitats resulting from natural disturbances vs. forestry practices vs. power line rights-of-way, including breeding densities and nesting success. Rank: 2*

Issue 10 **Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Agriculture causing early successional habitat degradation. Rank: 2**

Action 1 *Coordination and Administration; Incentives: Implement cost-share programs, tax reform, market mechanisms and other incentives to encourage SGCN and key habitat management and restoration on private lands. Rank: 3*

Issue 11 **Pollution; Excess energy; Light pollution: Buildings. Rank: 2.2**

Action 1 *Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities and building code officials to develop education and outreach for building owners and managers to minimize the impacts of building lights on SGCN, modeled after the "Lights Out", FLAP, WINGS or "Project Safe Flight" programs. Rank: 1.5*

Shrubland Birds

Issue 1 **Natural System Modifications; Fire and fire suppression; Suppression of fire frequency/intensity: Fire suppression causing habitat degradation due to natural succession. Rank: 1.2**

Action 1 *Direct Management of Natural Resources; Fire management; Prescribed burning: Implement prescribed burns to restore early successional habitats. Rank: 2*

Issue 2 **Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Lack of winter cover and access to quality brooding areas, primarily from removal of hedgerow and conversion of field edges. Rank: 1.2**

Action 1 *Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Need to encourage hedgerow establishment and other winter cover for protection from predators and severe weather event. Also need to promote native ESH habitats with forb component and high % of bare ground. Rank: 2.3*

Issue 3 **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Non-native grasses causing degradation of early successional habitats. Rank: 1.2**

Action 1 *Direct Management of Natural Resources; Planting/seeding; Herbaceous vegetation: Plant suitable cover types and enforce required management practices. Rank: 2*

Issue 4 **Biological Resource Use; Hunting and collecting terrestrial animals; Unintentional effects: Lead shot ingestion. Rank: 2.3**

Action 1 *Planning; State Wildlife Action planning: Assess impacts to SGCN and use this assessment and longterm monitoring to guide adaptive management, education, outreach and enforcement efforts, as necessary. Rank: 2.2*

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American Woodcock

Scolopax minor

- Issue 1** Residential and Commercial Development; Housing and urban areas: Lack of forest management on public lands; Need to encourage 'Young Forest' habitats. Rank: 1.2
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Abundance determination: Implement species and habitat management for woodcock on state lands (and Federal, NGO and private lands as appropriate), focusing on extant and historic occurrences; determine the efficacy of different management practices. Rank: 2.3
- Issue 2** Residential and Commercial Development; Housing and urban areas: Residential development causing early successional habitat conversion. Rank: 1.2
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Abundance determination: Implement species and habitat management for woodcock on state lands (and Federal, NGO and private lands as appropriate), focusing on extant and historic occurrences; determine the efficacy of different management practices. Rank: 2.3
- Issue 3** Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, resource and habitat needs. Rank: 1.5
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7

Fish

All Fish

- Issue 1** Resource Management Needs; Resource information collection needs: Lack of baseline data unavailable for native fish stocks. Rank: 1.8
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Gather baseline data of native fish stocks. Rank: 2
- Issue 2** Education/Outreach Needs; Education needs; Need for improved knowledge of fish and wildlife and their habitats: Need better fish identification available for the public. Rank: 1.8
- Action 1* Technical Assistance; Technical assistance; Technical assistance: Coordinate with fisheries division to include SGCN species in their new fish ID App (Bruce Cole). Rank: 1.7
- Issue 3** Invasive and Other Problematic Species, Genes, and Diseases; Problematic species/diseases of unknown origin; Unspecified species: Assess the impacts fish stocking effects on native fish populations. Rank: 2
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Determine the impacts of non-native species (eg. Trout) stocking on native species. Rank: 2
- Issue 4** Pollution; Domestic and urban waste water; Sewage: Negative impacts effluent pipes and dredging have on fish populations. Rank: 2
- Action 1* Data Collection and Analysis: Continue to research and monitor the effects effluent pipes and dredging have on fish populations. Rank: 2.2

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Action 2 Coordination and Administration; Coordination and administration; Program/project administrative support: Coordinate with NOAA, DNREC, USACOE, USFWS, NMFS. Rank: 2.2

Freshwater Fish

Issue 1 Transportation and Service Corridors; Roads and railroads: Impacts of inadequate culverts on migratory species. Rank:

Action 1 Direct Management of Natural Resources; Dam and barrier removal: Insert and increase number of adequately sized culverts where appropriate. Rank: 1.8

Issue 2 Natural System Modifications; Dams and water management/use; Dams (size unknown): Impacts of dams on migratory species and overall habitat(s), including habitat conversion. Rank: 2

Action 1 Data Collection and Analysis: Complete pre and post removal analysis of fish and wildlife species. Rank: 1.5

Action 2 Direct Management of Natural Resources; Dam and barrier removal: Dam removal or enhancement where appropriate. Rank: 1.8

Action 3 Planning: Integrate research findings into plans for waterway enhancements (including dam building, improvements, and removals). Rank: 1.8

Action 4 Data Collection and Analysis: Complete cost/benefit analysis of dam removal. Consider the needs of other uses or values (historical, water supply, etc.). Investigate other options, such as fish passages. Rank: 1.8

Issue 3 Transportation and Service Corridors; Roads and railroads: Impacts of inadequate culverts on migratory species. Rank: 2

Action 1 Data Collection and Analysis: Complete pre and post repair/replace analysis of fish and wildlife species. Rank: 1.8

Action 2 Data Collection and Analysis: Complete cost/benefit analysis of repairing/replacing inadequate culverts. Consider the needs of other uses or values (historical, water supply, etc.). Investigate other options to solve the issue. Rank: 2

Diadromous & Anadromous Fish

Issue 1 Transportation and Service Corridors; Roads and railroads: Impacts of inadequate culverts on migratory species. Rank:

Action 1 Direct Management of Natural Resources; Dam and barrier removal: Insert and increase number of adequately sized culverts where appropriate. Rank: 1.8

Issue 2 Resource Management Needs: Need for better information on population status, trends and resource needs and management. Rank: 1.8

Action 1 Planning; Species and habitat management planning; Species management planning: Assess threats to critical areas for all life cycle stages of diadromous fish (i.e. Shortnose Sturgeon), and develop a management plan to protect and improve these habitats. Rank: 2

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Action 2 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2

Issue 3 Natural System Modifications; Dams and water management/use; Dams (size unknown): Impacts of dams on migratory species and overall habitat(s), including habitat conversion. Rank: 2

Action 1 Data Collection and Analysis: Complete pre and post removal analysis of fish and wildlife species. Rank: 1.5

Action 2 Direct Management of Natural Resources; Dam and barrier removal: Dam removal or enhancement where appropriate. Rank: 1.8

Action 3 Planning: Integrate research findings into plans for waterway enhancements (including dam building, improvements, and removals). Rank: 1.8

Action 4 Data Collection and Analysis: Complete cost/benefit analysis of dam removal. Consider the needs of other uses or values (historical, water supply, etc.). Investigate other options, such as fish passages. Rank: 1.8

Issue 4 Transportation and Service Corridors; Roads and railroads: Impacts of inadequate culverts on migratory species. Rank: 2

Action 1 Data Collection and Analysis: Complete pre and post repair/replace analysis of fish and wildlife species. Rank: 1.8

Action 2 Data Collection and Analysis: Complete cost/benefit analysis of repairing/replacing inadequate culverts. Consider the needs of other uses or values (historical, water supply, etc.). Investigate other options to solve the issue. Rank: 2

Marine Estuarine Fish

Issue 1 Biological Resource Use; Fishing and harvesting aquatic resources; Intentional use (large scale): Commercial fisheries over-harvesting. Rank: 1.7

Action 1 Data Collection and Analysis: Assess impact of commercial fisheries over-harvesting fish populations. Rank: 2

Action 2 Education; Student training; Aquatic resource education: Promote a stewardship ethic among fishers to reduce mortality of estuarine and marine fish from commercial fisheries. Rank: 2

Action 3 Law Enforcement: Regulation enforcement and monitoring. Rank: 2

Issue 2 Transportation and Service Corridors; Shipping lanes: Dredging timing sensitive to benthic feeders presence. Rank: 2

Action 1 Planning; Species and habitat management planning: Consider estuarine and marine species and habitat impacts from dredging. Rank: 2

Issue 3 Natural System Modifications; Other ecosystem modifications: Sand grain size for beach renourishment eliminating benthic inhabitants. Rank: 2

Action 1 Planning: Sand grain - size requirement for beach nourishment. Rank: 2.2

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All Fish & Shark

- Issue 1** **Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of coordination and sharing of information among regional, state and national data collectors for species that utilize habitats in a broad geographical range. Rank: 1.2**
- Action 1* *Data Collection and Analysis; Database development and management: Complete a survey that will be summarized to (1) evaluate how well Delaware is meeting best management practices and standards; (2) identify Delaware's fish data management capacity and needs; and 3) identify bottlenecks to integrating data among states for regional and national scale analyses. Rank: 1.8*
- Action 2* *Data Collection and Analysis; Database development and management; Database development: Partner with a centralized database (e.g. Avian Knowledge Network) that will enhance Delaware's ability to manage and conserve wide ranging species across broad and biologically meaningful geographic areas. The exchange and integration of data into a permanent centralized data management system is a priority action. Rank: 1.8*
- Issue 2** **Transportation and Service Corridors; Shipping lanes: Negative impacts increased shipping and larger ships have on wildlife. Rank: 1.8**
- Action 1* *Data Collection and Analysis: Assess threats from ship traffic such as oils spills and other hazardous materials. Rank: 2.2*
- Issue 3** **Pollution; Industrial and military effluents; Oil spills: Negative impacts increased shipping and larger ships have on wildlife. Rank: 1.8**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Assess threats from ship traffic such as oils spills and other hazardous materials. Rank: 2.2*
- Issue 4** **Pollution; Excess energy; Noise pollution: Increased shipping and larger ships - Effects of noise. Rank: 2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of underwater noise on wildlife. Rank: 2.2*
- Issue 5** **Resource Management Needs; Resource information collection needs: Lack of information about effects of underwater noise. Rank: 2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of underwater noise on native fish and sharks. Rank: 2.2*
- Issue 6** **Human Intrusions and Disturbance; War, civil unrest, and military exercises: Negative impacts of underwater human activities (e.g., Naval activities/seismic testing). Rank: 2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Continue to research and monitor the impacts of naval activities and seismic testing. Rank: 2*
- Action 2* *Coordination and Administration; Coordination and administration; Program/project administrative support: Coordinate with Navy/seismic testing through Fish and Wildlife Coordination Act (USFWS/NMFS), which requires federal agencies or federally funded activities to coordinate with USWFS and/or NMFS. Rank: 2*

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Issue 7 **Resource Management Needs; Resource information collection needs: Wind turbine development - lack of information about sounds from vibration at base, electromagnetic field disruptions, placement (migration paths, dredging). Rank: 2**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of wind turbines on movement and populations. Rank: 2*

All Shark

Issue 1 **Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (large scale): Commercial fisheries bycatch. Rank: 2**

Action 1 *Data Collection and Analysis: Develop fishing practices that reduce shark and ray bycatch and/or increase post-release survivorship. Rank: 1.8*

Action 2 *Planning; Species and habitat management planning; Species management planning: Impement and enforce fishing practices that reduce shark and ray bycatch and/or increase post-release survivorship. Rank: 1.8*

Herpetofauna

All Reptiles and Amphibians

Issue 1 **Transportation and Service Corridors; Roads and railroads: Vehicle collisions. Rank: 1.2**

Action 1 *Direct Management of Natural Resources; Fish and wildlife habitat structures; Wildlife escape structures: Work with the DE DOT to develop standards for directional fencing and underpasses for new or existing roads to protect SGCN. Rank:*

Action 2 *Data Collection and Analysis: Map high kill zones from reports. Rank: 1.2*

Action 3 *Technical Assistance: Produce recommendations for DeIDOT to implement on high kill areas. Rank: 1.2*

Action 4 *Planning: Produce set of options for problem areas. Rank: 1.2*

Action 5 *Outreach; Recruitment and retention activities; For wildlife watching: Implement a Master Naturalist/Citizen Scientist program of volunteer monitoring and wardening of SGCN and key habitats; recruit people to conduct surveys and protect sites, such as fencing high road-kill areas. Rank: 1.8*

Action 6 *Planning; Species and habitat management planning; Species management planning: Gate non-essential roads, close roads temporarily during breeding migrations, reduce speed limits, add cautionary signage, use directional fencing and underpasses to protect herpetofauna. Create volunteer progrmas for rescue missions. Rank: 2*

Action 7 *Education: Produce set of criteria for when wildlife crossing signs are appropriate. Rank: 2.3*

Issue 2 **Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Need for conservation plan(s) for all herpetofauna that are found to be rare. Rank: 1.3**

Action 1 *Planning; Species and habitat management planning; Species management planning: Develop conservation plans for all rare herpetofauna consistent with the international Plan for Amphibian and Reptile Conservation. Rank: 2*

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Action 2 *Direct Management of Natural Resources; Fish and wildlife habitat structures: Implement species and habitat management for all rare herpetofauna (ex. for the corn snake - e.g. prescribed burning, closing of roads, and construction of artificial hibernacula - on state lands (and Federal, NGO and private lands as appropriate), focusing on sites with extant or historic populations; determine the efficacy of different management practices. Rank: 2*

Issue 3 **Residential and Commercial Development; Housing and urban areas: Residential development causing habitat conversion. Rank: 1.3**

Action 1 *Land and Water Rights Acquisition and Protection; Conservation area designation: Protect corridors and patches of suitable habitat for herps that enhance survival during migration and movement. Rank: 1.7*

Issue 4 **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Use of non-native plants for erosion control, silviculture, etc. Rank: 1.8**

Action 1 *Direct Management of Natural Resources; Planting/seeding; Herbaceous vegetation: Control invasive plants that impact life history of herpetofauna. Rank: 2.2*

Issue 5 **Transportation and Service Corridors; Roads and railroads: Difficulty in crossing roads due to curbs. Rank: 1.8**

Action 1 *Direct Management of Natural Resources; Fish and wildlife habitat structures; Wildlife escape structures: Work with the DE DOT to ensure that whenever curbs are being installed near wetlands they should be Deldot Type 2, Type 1-2, or Type 3-2 to specifically assist amphibians and turtles. Rank: 1.5*

Action 2 *Technical Assistance: DFW needs to provide comments during Environmental Reviews of new developments regarding herpetofaunal-friendly curbs. Rank: 1.8*

Issue 6 **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Herpetofaunal diseases and parasites (i.e., Ranavirus, the chytrid fungus *Batrachochytrium dendrobatidis*, etc.), predation by cats, and issues from other invasive species. Rank: 1.8**

Action 1 *Education; Student training: Educate boaters, fishermen, recreational users of water areas to decontaminate their hip boots/waders to prevent the spread of diseases among reptiles and amphibians. Currently in Delaware the preferred decontamination protocol involves the spray application of a bleach solution. Rank: 1.8*

Action 2 *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control feral cats and educate the public about the importance of keeping cats indoors. Rank: 2*

Action 3 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Do surveys to determine extent of diseases and impacts to species. Conduct or support research into solutions. Rank: 2.2*

Action 4 *Education: Produce educational material regarding disinfection of boots/gear/clothing to minimize human-aided spread of diseases. Rank: 2.2*

Issue 7 **Natural System Modifications; Fire and fire suppression; Suppression of fire frequency/intensity: Fire suppression causing habitat degradation due to natural succession. Rank: 2**

Action 1 *Direct Management of Natural Resources; Fire management; Prescribed burning: Implement prescribed burns to restore early successional habitats. Rank: 1.5*

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- Issue 8** **Biological Resource Use; Hunting and collecting terrestrial animals: Persecution and pest control techniques and inappropriate collection for the pet trade, bait, or for the international trade market (Many turtles are being shipped overseas for food markets.). Rank: 2**
- Action 1* *Education; Student training; Wildlife education: Develop education and outreach for the public and the pet trade about impacts on SGCN. Rank: 1.8*
- Action 2* *Technical Assistance; Environmental review; Review of proposed policies and plans: Evaluate the need for additional means of protecting SGCN from collecting, including voluntary guidelines and regulations, as necessary. Rank: 1.8*
- Action 3* *Law Enforcement: Halt illegal collection of herpetofauna using an interagency enforcement program. For turtles specifically, PIT-tag turtles at sites vulnerable to collection. Rank: 2*
- Action 4* *Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 2*
- Action 5* *Law Enforcement: Encourage enforcement agencies to patrol for possible violators of state and federal laws and local ordinances regarding herps. Rank: 2.5*
- Issue 9** **Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Predation by subsidized predators - native species (raccoon, fox, skunk) and pets, whose populations have increased due to resources provided directly or indirectly by humans. Rank: 2.1**
- Action 1* *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Work with conservation partners to control subsidized predators on public and NGO conservation lands by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 1.8*
- Action 2* *Outreach; Partner/Stakeholder engagement; Non governmental organization: Work with retailers and NGOs to develop education and outreach for pet owners to minimize the impacts of pets on SGCN, such as "Cats Indoors." Rank: 1.8*
- Action 3* *Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Control subsidized predators of herps by reducing subsidies (refuges, food sources), erecting exclosures, or by removal of individuals. Rank: 2.7*
- Action 4* *Education; Student training; Wildlife education: Develop education and outreach for the general public about the impacts of subsidized predators on SGCN. Rank: 2.7*
- Action 5* *Law Enforcement: Strengthen enforcement of leash laws for dogs to protect SGCN. Rank: 3*
- Issue 10** **Pollution; Domestic and urban waste water; Run-off: Contaminants from residential pesticides having lethal or sublethal effects. Rank: 2.5**
- Action 1* *Data Collection and Analysis: Complete literature search to determine effects of chemicals. Rank: 2*
- Action 2* *Education; Student training: Know the effects of herbicides and pesticides on herps and follow the instructions on the container labels. Use plants that require minimal chemicals and seek ways to implement bio-control measures. Rank: 2.5*

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Wetland and Riparian Turtles

Issue 1 Residential and Commercial Development; Housing and urban areas: Habitat and loss and fragmentation. Rank: 1

Action 1 Land and Water Rights Acquisition and Protection; Conservation area designation: Protect habitat through purchase and easements. Rank: 1.7

Issue 2 Residential and Commercial Development: Negative impacts of residential and commercial development, including loss and fragmentation of habitat. Rank: 1

Action 1 Outreach; Partner/Stakeholder engagement: Establish partnerships with government agencies, conservation organizations, businesses and private landowners to protect, manage and restore extant and historical SGCN occurrences and key wildlife habitats. Rank: 1.7

Issue 3 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, and resource needs. Rank: 1.2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7

Action 2 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Genetics: Investigate the genetic variability of bog turtle throughout its range. Rank: 1.8

Issue 4 Natural System Modifications; Dams and water management/use; Extraction of surface water (agricultural use): Flooding for farm ponds, reservoirs, and other impoundments have caused wetland habitat degradation. Rank: 1.7

Action 1 Direct Management of Natural Resources; Vegetation management: Manage and maintain habitat to ensure suitability. Rank: 2.2

Issue 5 Natural System Modifications; Dams and water management/use; Extraction of ground water (unknown use): Groundwater withdrawals causing wetland habitat degradation. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Determine recharge areas for groundwater-fed habitat and conduct hydrological monitoring. Rank: 1.5

Issue 6 Resource Management Needs; Management decision needs; Need to provide technical assistance: Habitat and loss and fragmentation. Rank: 1.9

Action 1 Species Reintroduction and Stocking; Native species restoration; Rehabilitation: Possibly reintroduce bog turtles into areas from which they have been extirpated or removed if determined advisable and only in situations where the surrounding area is protected from development. Rank: 2.3

Issue 7 Resource Management Needs; Resource information collection needs: Need for better information of genetic viability of extant bog turtle population. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Genetics: Investigate the genetic variability of bog turtle throughout its range. Rank: 1.8

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Bog Turtle

Glyptemys muhlenbergii

- Issue 1** Residential and Commercial Development; Housing and urban areas: Residential development causing non-forested wetland habitat degradation. Rank:
- Action 1* Outreach; Partner/Stakeholder engagement; Others: Establish partnerships with private landowners having bog turtles on their land. Coordinate with land management agencies to implement management on state lands (and Federal, NGO and private lands as appropriate), focusing on sites with extant or historic populations. Rank:
- Issue 2** Residential and Commercial Development: Encroachment on bog turtle habitat from residential and commercial development. Rank: 1
- Action 1* Land and Water Rights Acquisition and Protection; Land acquisition: Protect bog turtle habitat through purchase and easements. Rank: 2.2
- Issue 3** Agriculture and Aquaculture: Habitat and loss and fragmentation. Rank: 1
- Action 1* Land and Water Rights Acquisition and Protection; Private lands agreements: Protect bog turtle habitat through purchase and easements. Rank: 1.8
- Issue 4** Resource Management Needs; Resource information collection needs: Continue collecting better information on population status, trends and habitat resources and needs for bog turtles. Rank: 1.2
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7
- Issue 5** Biological Resource Use; Hunting and collecting terrestrial animals; Intentional use: Illegal collection. Rank: 1.2
- Action 1* Law Enforcement: Enforce protection of extant bog turtle populations and their habitats using existing regulations. Rank: 1.8
- Issue 6** Biological Resource Use; Hunting and collecting terrestrial animals; Intentional use: Collection for pet trade. Rank: 1.3
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Genetics: Research genetics of bog turtle populations to identify genetic markers that can be used to determine the extent of gene flow between sites and identify the origin of confiscated turtles. Rank: 1.8
- Action 2* Law Enforcement: Enforce protection of extant bog turtle populations and their habitats using existing regulations. Rank: 2
- Action 3* Law Enforcement: Share site information and expertise with state and federal law enforcement to increase surveillance of bog turtle sites vulnerable to collection. Rank: 2

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Issue 7 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases; Unspecified species: Invasive plants causing wetland habitat degradation. Rank: 1.5

Action 1 Technical Assistance; Environmental review; Review of proposed policies and plans: Develop management practices for SGCN, key habitats and abatement of threats on public and private lands; measure the effectiveness of different management practices and adapt as necessary. Rank: 2

River and Bay Turtles

Issue 1 Residential and Commercial Development; Housing and urban areas: Residential development causing beach habitat conversion. Rank: 1.2

Action 1 Planning; Species and habitat management planning; Species management planning: Assess threats to terrapin and develop a conservation plan that focuses on protecting nesting areas. Rank: 1.7

Issue 2 Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (large scale): Commercial fisheries bycatch. Rank: 1.5

Action 1 Law Enforcement: Research/consider requiring TEDs for commercial crabbers and/or conduct survey to see if they are already using them. Rank: 1.8

Issue 3 Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of coordination and sharing of information among regional, state and national data collectors for species that utilize habitats in a broad geographical range. Rank: 2

Action 1 Data Collection and Analysis; Database development and management; Database development: Partner with a centralized database (e.g. Avian Knowledge Network) that will enhance Delaware's ability to manage and conserve wide ranging species across broad and biologically meaningful geographic areas. The exchange and integration of data into a permanent centralized data management system is a priority action. Rank: 2

Action 2 Data Collection and Analysis; Database development and management: Complete a survey that will be summarized to (1) evaluate how well Delaware is meeting best management practices and standards; (2) identify Delaware's herpetology data management capacity and needs; and 3) identify bottlenecks to integrating data among states for regional and national scale analyses. Rank: 2.5

Issue 4 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends and resource needs. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2.3

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Sea Turtles

- Issue 1** **Resource Management Needs; Resource information collection needs: Need to develop and support partnerships to enhance data collection efforts. Rank:**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Participate in the National Marine Fisheries Program's sea turtle tagging network by tagging turtles captured in trawl surveys or trap nets or caught in commercial pound nets; outfit a portion of these turtles with sonic transmitters to monitor movements. Rank: 2*
- Issue 2** **Transportation and Service Corridors; Shipping lanes: Increased shipping and larger ships - increased risk of collisions. Rank: 1.2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Assess threats to sea turtles such as ship strikes. Rank: 1.5*
- Issue 3** **Biological Resource Use; Fishing and harvesting aquatic resources: Commercial fishing gear entanglement. Rank: 1.3**
- Action 1* *Direct Management of Natural Resources: Participate in Take Reduction Teams. Fisheries person already on some of these teams but should also have a non-game biologist included. Rank: 1.5*
- Action 2* *Direct Management of Natural Resources: Support the rescue of stranded whales and turtles by the Marine Mammal Stranding Center. Participate in the mid-Atlantic disentanglement team's work to free whales and turtles from fishing gear and debris. Rank: 1.5*
- Issue 4** **Pollution; Industrial and military effluents; Oil spills: Increased shipping and larger ships - potential for oil spills and other hazardous materials. Rank: 1.3**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Assess threats to sea turtles from ship traffic such as oils spills and other hazardous materials. Rank: 1.2*
- Issue 5** **Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Need for up to date management plan that addresses current issues. Rank: 1.3**
- Action 1* *Planning; Species and habitat management planning; Species management planning: Develop a sea turtle management plan that determines critical areas, assesses threats such as boat strikes and commercial fishing gear entanglement, and recommends management such as no wake zones, critical habitat designations, and commercial fishing gear modifications. Rank: 1.2*
- Issue 6** **Resource Management Needs; Management decision needs; Need to provide technical assistance: Need to develop and support partnerships to enhance data collection efforts. Rank: 1.3**
- Action 1* *Outreach; Partner/Stakeholder engagement; Non governmental organization: Improve partnerships with internal groups conducting strandings and establish partnerships with groups such as the Marine Mammal Stranding Center to support necropsies in order to determine major food sources and cause of death. Rank: 1.3*
- Issue 7** **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends, and resource needs. Rank: 1.5**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Determine abundance and distribution of loggerhead turtle and other sea turtles in Delaware Bay. Rank: 1.8*

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- Issue 8** **Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of coordination and sharing of information among regional, state and national data collectors for species that utilize habitats in a broad geographical range. Rank: 1.7**
- Action 1* *Data Collection and Analysis; Database development and management: Complete a survey that will be summarized to (1) evaluate how well Delaware is meeting best management practices and standards; (2) identify Delaware's herpetology data management capacity and needs; and 3) identify bottlenecks to integrating data among states for regional and national scale analyses. Rank: 1*
- Action 2* *Data Collection and Analysis; Database development and management; Database development: Partner with a centralized database (e.g. Avian Knowledge Network) that will enhance Delaware's ability to manage and conserve wide ranging species across broad and biologically meaningful geographic areas. The exchange and integration of data into a permanent centralized data management system is a priority action. Rank: 1*
- Issue 9** **Pollution; Domestic and urban waste water; Sewage: Ocean outfall pipes (state waters) - medicinal content endocrine inhibitors, cancer rate increasing and plankton layer degraded by chlorine. Rank: 1.7**
- Action 1* *Data Collection and Analysis: Investigate potential impacts to sea turtles. Rank: 1.7*
- Issue 10** **Human Intrusions and Disturbance: Underwater human activities that cause noise interference with wildlife communication and/or navigation. Rank: 1.7**
- Action 1* *Coordination and Administration; Coordination and administration; Program/project administrative support: Coordinate with Navy/seismic testing through Fish and Wildlife Coordination Act (USFWS/NMFS), which requires federal agencies or federally funded activities to coordinate with USFWS and/or NMFS. Coordination should include some monitoring for actual impacts to species during underwater activities. Rank: 1.7*
- Action 2* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research impacts of naval activities and seismic testing. Rank: 1.7*
- Issue 11** **Resource Management Needs; Resource information collection needs: Wind turbine development - lack of information about sounds from vibration at base, electromagnetic field disruptions, placement (migration paths, dredging). Rank: 1.8**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of wind turbines on movement and populations. Rank: 2*
- Issue 12** **Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Various difficulties for sea turtles nesting on Delaware beaches. Rank: 2.2**
- Action 1* *Planning; Species and habitat management planning; Species management planning: Develop an action plan for when sea turtles nest on Delaware Beaches. Rank: 1.5*
- Issue 13** **Pollution; Excess energy; Noise pollution: Underwater noise (all sources). Rank: 2.2**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of underwater noise on sea turtles. Rank: 1.3*

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Sand Specialist Reptiles

Issue 1 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends and resource needs. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.5*

Issue 2 **Biological Resource Use; Hunting and collecting terrestrial animals; Intentional use: Collection for pet trade. Rank: 2.2**

Action 1 *Law Enforcement: Develop a law enforcement plan to protect corn snake breeding occurrences from disturbance and curtail illegal collection, including an "operation game thief" type program to reward people who provide information that assists with apprehending snake collectors. Rank: 2.2*

Other Reptiles

Issue 1 **Biological Resource Use; Hunting and collecting terrestrial animals; Persecution/Control: Nuisance wildlife management impacts on snakes. Rank: 1.5**

Action 1 *Education; Student training; Wildlife education: Develop education and outreach for the public about impacts on SGCN. Rank: 1.5*

Groundwater Lotic Amphibians

Issue 1 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends and resource needs. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2*

Issue 2 **Resource Management Needs; Resource information collection needs: Need for better information on population status, trends and resource needs. Rank: 1.7**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Determine recharge areas for groundwater-fed breeding pools of longtail salamander and conduct hydrological monitoring. Rank: 1.7*

Action 2 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2*

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**Ephemeral Wetland Obligate
Amphibians**

- Issue 1 Residential and Commercial Development; Housing and urban areas: Residential development causing conversion of forests containing vernal pools. Rank: 1**
- Action 1 Planning; Species and habitat management planning; Species management planning: Assess threats to tiger salamander populations and critical areas, and develop a plan to mitigate threats and link breeding sites via corridors. Rank: 1.5*
- Action 2 Planning; State Wildlife Action planning: Implement management for SGCN and key habitats on state lands (and Federal, NGO and private lands if appropriate) in order to protect extant occurrences and restore historic occurrences, and to establish new occurrences where feasible. Rank: 2.2*
- Issue 2 Resource Management Needs; Resource information collection needs: Need for better information on population status, trends and habitat resources and needs. Rank: 1.7**
- Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.7*

Invertebrates

All Invertebrates

- Issue 1 Administrative Needs; Coordination/Administration needs; Need for coordination for effective program/project management: Lack of coordination with institutional collections. Rank: 1.3**
- Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Improve coordination with major collections, especially U of Delaware, DMNH, Philadelphia Academy of Sciences, AMNH, and Smithsonian, including joint projects. Rank: 1.7*
- Issue 2 Administrative Needs; Coordination/Administration needs; Need for coordination for effective program/project management: Lack of coordination with Maryland DNR on invert conservation and Delmarva survey efforts. Rank: 1.3**
- Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Work closely with MD DNR staf on Delmarva-wide invertebrate survey and management projects. Rank: 1.7*
- Issue 3 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of museum specimen data integrated into conservation planning and state databases. Rank: 1.3**
- Action 1 Data Collection and Analysis; Database development and management; Information systems operations and maintenance: Survey major museum collections and the literature for Delaware specimens and compile data in a database of specimens, rather than occurrences. This data can then be used to update Biotics occurrences. Rank: 1.8*

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- Issue 4** **Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning; Lack of specific management planning. Rank: 1.3**
- Action 1* *Planning; Species and habitat management planning; Habitat management planning: Create management plans for various ecological groups of inverts / habitat types to assist land managers and partners. Rank: 1.8*
- Issue 5** **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of updated S-ranks and EO data. Rank: 1.3**
- Action 1* *Data Collection and Analysis; Database development and management; Information systems operations and maintenance: Update all S-Ranks for invertebrates and add all currently available data to Biotics database as well as a specimen database. Rank: 1.2*
- Issue 6** **Administrative Needs; Coordination/Administration needs; Need for coordination for effective program/project management: Lack of coordination among Delaware experts. Rank: 1.7**
- Action 1* *Coordination and Administration; Coordination and administration; Program/project administrative support: Formalize invertebrate advisory group. Rank: 1*
- Issue 7** **Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of coordination and sharing of information among regional, state and national data collectors for species that utilize habitats in a broad geographical range. Rank: 1.7**
- Action 1* *Data Collection and Analysis; Database development and management; Database development: Partner with a centralized database (e.g. Avian Knowledge Network) that will enhance Delaware's ability to manage and conserve wide ranging species across broad and biologically meaningful geographic areas. The exchange and integration of data into a permanent centralized data management system is a priority action. Rank: 1.7*
- Action 2* *Data Collection and Analysis; Database development and management: Complete a survey that will be summarized to (1) evaluate how well Delaware is meeting best management practices and standards; (2) identify Delaware's invertebrate data management capacity and needs; and 3) identify bottlenecks to integrating data among states for regional and national scale analyses. Rank: 1.8*
- Issue 8** **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of invertebrate inventory / monitoring of priority habitats for rare inverts. Rank: 1.7**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Conduct invertebrate inventories of the following priority habitats: piedmont seepage wetlands, coastal plain ponds, xeric sand ridges, Atlantic white cedar wetlands, and interdunal swales. Rank: 2.2*
- Issue 9** **Resource Management Needs; Resource information collection needs: Need for accurate identification of invertebrates. Rank: 1.7**
- Action 1* *Education; Educator/instructor training: Partner with University of Delaware Dept. of Entomology so that students and classes can help identify insects. Rank: 1.8*

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Tiger Beetles

- Issue 1** **Climate Change and Severe Weather; Storms and flooding: Loss of foredune habitat due. Rank: 1.2**
- Action 1* *Planning; Land use planning: Identify beach and dune system inland migration areas and conduct land use planning to allow for habitat movement. Rank: 2.2*
- Issue 2** **Natural System Modifications; Fire and fire suppression; Trend unknown: Fire-dependent habitat modification. Rank: 1.3**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Monitor tiger beetles in burned and unburned sites, and/or compare pre and post treatment. Rank: 2.3*
- Issue 3** **Human Intrusions and Disturbance; Recreational activities: Increase in permitted vehicular traffic on beaches. Rank: 1.3**
- Action 1* *Planning; Land use planning: Explore alternative revenue streams to minimize increasing resource impacts of surf vehicle permits. Rank: 1.8*
- Issue 4** **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Rank: 1.5**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Rank: 1.5*
- Action 2* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Rank: 1.8*
- Action 3* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Monitor status and trends of the extent and condition of key habitats. Rank: 2.3*
- Issue 5** **Natural System Modifications; Other ecosystem modifications: Beach replenishment. Rank: 1.7**
- Action 1* *Planning; Land use planning: Evaluate all beach replenishment projects for effects on potential tiger beetle habitat. Rank: 2.5*
- Issue 6** **Natural System Modifications; Other ecosystem modifications: Loss of forest gaps. Rank: 1.7**
- Action 1* *Technical Assistance; Technical assistance; Technical assistance: Produce and distribute a guide to forest management for tiger beetles. Rank: 1.3*
- Issue 7** **Climate Change and Severe Weather; Sea level rise: Loss of foredune habitat due. Rank: 1.8**
- Action 1* *Planning; Land use planning: Identify beach and dune system inland migration areas and conduct land use planning to allow for habitat movement. Rank: 2.2*
- Issue 8** **Human Intrusions and Disturbance; Recreational activities: ORV and foot traffic in dune systems. Rank: 2**
- Action 1* *Law Enforcement: Protect interdunal wetlands and dunes from disturbance. Rank: 2*

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Issue 9 Residential and Commercial Development; Housing and urban areas: Residential development causing beach habitat conversion. Rank: 2

Action 1 Planning; Species and habitat management planning; Species management planning: Develop a management plan for beach-dwelling tiger beetles that landowners and land managers can follow if beetles are found on their property. Rank: 2

Virginia Big-headed Tiger Beetle

Tetracha virginica

Issue 1 Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Population status unknown. Rank: 1.3

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct light-trapping surveys for this species in potential habitat. Rank: 2

Other Beetles

Issue 1 Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Lack of baseline inventory data. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Complete baseline inventory of Delaware forest-associated beetles, with focal taxa Carabidae, Cerambycidae, Lucanidae, as these groups are well known and often affected by forest quality and fragmentation. Rank: 2.3

American Burying Beetle

Nicrophorus americanus

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Conduct presence/absence surveys in potential habitat, giving priority to sites with historic occurrences. Rank: 1.7

Seth Forest Water Scavenger Beetle

Hydrochus spangleri

Issue 1 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of species-specific planning for globally imperiled species. Rank: 1.3

Action 1 Planning; Species and habitat management planning; Species management planning: Complete species-specific management plan. Rank: 1.2

Freshwater Beetles

Issue 1 Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Lack of baseline inventory data. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Complete baseline inventory of Delaware water beetles and their habitat associations. Rank: 2.3

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Fireflies

Issue 1 Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Lack of complete baseline inventory. Rank: 1.3

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Complete a baseline inventory of Delaware Laympyridae. Rank: 1.7

Bethany Beach Firefly

Photuris bethaniensis

Issue 1 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of species-specific planning for globally imperiled species. Rank: 1.3

Action 1 Planning; Species and habitat management planning; Species management planning: Complete species-specific management plan. Rank: 1.2

Issue 2 Climate Change and Severe Weather; Sea level rise: Loss of interdunal swales due to sea level rise. Rank: 1.8

Action 1 Planning; Land use planning: Identify beach and dune system inland migration areas and conduct land use planning to allow for habitat movement. Rank: 2.2

Issue 3 Human Intrusions and Disturbance; Recreational activities: ORV and foot traffic in dune systems. Rank: 2

Action 1 Law Enforcement: Protect interdunal wetlands and dunes from disturbance. Rank: 2

Issue 4 Residential and Commercial Development; Housing and urban areas: Residential development causing beach habitat conversion. Rank: 2

Action 1 Planning; Species and habitat management planning; Species management planning: Develop a management plan for beach-dwelling tiger beetles that landowners and land managers can follow if beetles are found on their property. Rank: 2

A Firefly

Photuris mysticalampas

Issue 1 Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Population status unknown. Rank: 1.3

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Inventory for additional occurrences. Rank: 1.5

Wetland and Riparian Turtles

Issue 1 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of taxa- or guild-specific habitat restoration guidelines. Rank: 1.5

Action 1 Planning; Species and habitat management planning; Habitat management planning: Design site-specific planting guidelines for early successional habitat restoration on state lands to ensure maximum benefit for lepidoptera. Rank: 1.7

Issue 2 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of taxa- or guild-specific habitat restoration guidelines. Rank: 1.7

Action 1 Planning; Species and habitat management planning; Habitat management planning: Design site-specific planting guidelines for early successional habitat restoration on state lands to ensure maximum benefit for lepidoptera. Rank: 1.7

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All Butterflies and Skippers

Issue 1 Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of technical assistance to land managers for habitat management of rare invertebrates. Rank: 1.8

Action 1 Planning; Species and habitat management planning; Species management planning: Provide relevant EO data, habitat needs, and dispersal information to partners and land managers to facilitate conservation of metapopulations. Rank: 1.8

Issue 2 Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of technical guidance on habitat creation for other DNREC Programs. Rank: 2

Action 1 Technical Assistance; Technical assistance; Technical assistance: Provide habitat management planning guidance and technical assistance within DNREC, e.g. to the HSCA Advisory Committee, stormwater program, etc. Rank: 2.2

Non-tidal Forested Wetland Butterflies

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences of state endangered and highly G-ranked species to determine population status and trends. Rank: 1.7

Frosted Elfin

Callophrys irus

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences of state endangered and highly G-ranked species to determine population status and trends. Rank: 1.7

Issue 2 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of species specific planning. Rank: 2.3

Action 1 Planning; Species and habitat management planning; Species management planning: Develop management plans for frosted elfin and work with land managers to incorporate these plans on public and private lands where this species occurs. Rank: 1.8

Bronze Copper

Lycaena hyllus

Issue 1 Agriculture and Aquaculture: Ditching & draining for agriculture causing wetland habitat degradation. Rank: 1.2

Action 1 Data Collection and Analysis: Determine critical areas for bronze copper. Rank: 1.8

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Issue 2 **Agriculture and Aquaculture: Ditching & draining for agriculture causing wetland habitat degradation. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.8*

Black Dash

Euphyes conspicua

Issue 1 **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences of state endangered and highly G-ranked species to determine population status and trends. Rank: 1.7*

Baltimore Checkerspot

Euphydryas phaeton

Issue 1 **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences of state endangered and highly G-ranked species to determine population status and trends. Rank: 1.7*

Issue 2 **Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of regional species management cooperation. Rank: 1.5**

Action 1 *Planning; Species and habitat management planning; Species management planning: Collaborate with MDDNR on Baltimore Checkerspot recovery team efforts. Rank: 1.7*

Monarch

Danaus plexippus

Issue 1 **Agriculture and Aquaculture; Annual and perennial nontimber crops: Decline of Asclepias sp. Rank: 1.3**

Action 1 *Direct Management of Natural Resources; Planting/seeding; Herbaceous vegetation: Plant Asclepias sp., especially A. syriaca at all suitable early successional state wildlife areas. Rank: 1.2*

Mulberry Wing

Poanes massasoit massasoit

Issue 1 **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences of state endangered and highly G-ranked species to determine population status and trends. Rank: 1.7*

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Myrina Fritillary

Boloria selene myrina

Issue 1 Natural System Modifications; Other ecosystem modifications: Wetland habitat degradation due to natural succession. Rank: 1.3

Action 1 Direct Management of Natural Resources; Vegetation management: Implement species and habitat management for s-b fritillary - e.g. retarding succession in wetlands - on state lands (and Federal, NGO and private lands as appropriate), focusing on extant and historic occurrences; determine the efficacy of different management practices. Rank: 2.7

Issue 2 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Rank: 1.7

Action 1 Planning; Species and habitat management planning; Species management planning: Develop models for designating s-b fritillary critical areas based on species occurrence. Rank: 2.3

Issue 3 Resource Management Needs; Resource information collection needs: Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 2.2

Rare Skipper

Problema bulenta

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences of state endangered and highly G-ranked species to determine population status and trends. Rank: 1.7

Issue 2 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of species specific planning. Rank: 2.3

Action 1 Planning; Species and habitat management planning; Species management planning: Develop management plans for frosted elfin and work with land managers to incorporate these plans on public and private lands where this species occurs. Rank: 1.8

Checkered White

Pontia protodice

Issue 1 Resource Management Needs; Resource information collection needs: Rank: 1.8

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.8

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Chermock's Mulberry Wing

Poanes massasoit chermocki

Issue 1 **Transportation and Service Corridors; Roads and railroads: Rank: 1**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.5*

Issue 2 **Agriculture and Aquaculture: Ditching & draining for agriculture causing wetland habitat degradation. Rank: 1.2**

Action 1 *Data Collection and Analysis: Determine critical areas. Rank: 1.5*

Issue 3 **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5**

Action 1 *Data Collection and Analysis: Monitor extant SGCN occurrences of state endangered and highly G-ranked species to determine population status and trends. Rank: 1.5*

Estuarine / Marine Invertebrates

Issue 1 **Transportation and Service Corridors; Shipping lanes: Dredging-timing sensitive to benthic feeders presence. Rank: 1.5**

Action 1 *Coordination and Administration; Coordination and administration: Consider estuarine and marine species and habitat impacts from dredging. Rank: 1.5*

Issue 2 **Pollution; Domestic and urban waste water; Sewage: Rehoboth Beach Project - negative impacts of effluent pipes and dredging. Rank: 2**

Action 1 *Coordination and Administration; Coordination and administration; Program/project administrative support: Coordinate with NOAA, DNREC, USACOE, USFWS, NMFS. Rank: 1.5*

Issue 3 **Natural System Modifications; Other ecosystem modifications: Sand grain size used for beach nourishment eliminating intertidal inhabitants. Rank: 2**

Action 1 *Coordination and Administration; Coordination and administration: Sand grain - size requirement for beach nourishment. Rank: 1.8*

Horseshoe Crab

Limulus polyphemus

Issue 1 **Climate Change and Severe Weather; Habitat shifting and alteration: Natural beach dynamics causing loss of spawning habitat. Rank: 1**

Action 1 *Data Collection and Analysis: Research the potential benefit of jetties for protecting spawning beaches from wave action. Rank: 2*

Issue 2 **Climate Change and Severe Weather: Sea level rise. Rank: 1**

Action 1 *Direct Management of Natural Resources: Restore or improve spawning habitat with beach replenishment, provided measures are implemented to minimize adverse project-related impacts on horseshoe crabs and other resources. Rank: 1.8*

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Issue 3 Natural System Modifications; Dams and water management/use: Rip-rap, intended to stabilize the shoreline, has created a barrier for spawning horseshoe crabs (i.e., along Port Mahon Road). Rank: 1.2

Action 1 Direct Management of Natural Resources; Hazard or infrastructure removal; Shoreline armoring removal: Rehabilitate a portion of hardened shorelines to balance the needs of wildlife resources and infrastructure protection. Rank: 1.8

Issue 4 Resource Management Needs; Resource information collection needs: Need for better public involvement and increased resource information gathering. Rank: 1.5

Action 1 Outreach; Partner/Stakeholder engagement; Others: Develop a Citizen scientist program to assist with horseshoe crab monitoring. Rank: 2.2

Issue 5 Biological Resource Use; Fishing and harvesting aquatic resources: Commercial fisheries over-harvesting. Rank: 1.7

Action 1 Technical Assistance; Environmental review; Review of proposed policies and plans: Review current harvest restrictions and ensure they are adequate. Rank: 1.8

Action 2 Law Enforcement: Ensure enforcement of regulations is adequate. Rank: 2

Action 3 Law Enforcement: Manage populations through appropriate coastwide measures to provide the necessary quantities of adults and eggs for fish and wildlife resources. Rank: 2

Action 4 Law Enforcement: Regulate horseshoe crab harvest by restricting the harvest method; limiting daily possession, catch, and/or landings; limiting harvest seasons; limiting the location of harvest; or limiting the number of harvesters. Rank: 2

Crassostrea virginica

Crassostrea virginica

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Diseases of unknown cause: Infectious diseases. Rank: 1.2

Action 1 Education; Educator/instructor training: Provide training for DFW staff in procedures for responding to disease outbreaks. Rank: 2

Freshwater Mussels

Issue 1 Natural System Modifications; Dams and water management/use: Cumulative impact of dams. Rank: 1.2

Action 1 Species Reintroduction and Stocking; Native species restoration; Translocation: Reintroduce native freshwater mussel species by translocation of existing stock where appropriate. Rank: 1.7

Issue 2 Pollution: Cumulative impact of pollution. Rank: 1.5

Action 1 Species Reintroduction and Stocking; Native species restoration; Translocation: Reintroduce native freshwater mussel species by translocation of existing stock where appropriate. Rank: 1.7

Issue 3 Natural System Modifications; Dams and water management/use: Dams limit dispersal and recolonization of historically occupied stream reaches. Rank: 1.5

Action 1 Direct Management of Natural Resources; Dam and barrier removal; Dam removal: Remove dams impeding recolonization of historically occupied or otherwise suitable stream reaches, except in areas where such removal may result in destruction of sensitive downstream populations via mobilization of sediments, pollutants, etc. Rank: 2

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- Issue 4** **Climate Change and Severe Weather; Storms and flooding: Increased flood frequency. Rank: 1.7**
- Action 1* *Species Reintroduction and Stocking; Native species restoration; Translocation: Reintroduce native freshwater mussel species by translocation of existing stock where appropriate. Rank: 1.7*
- Issue 5** **Climate Change and Severe Weather; Sea level rise: Saltwater intrusion from sea level rise. Rank: 1.7**
- Action 1* *Species Reintroduction and Stocking; Native species restoration; Translocation: Reintroduce native freshwater mussel species by translocation of existing stock where appropriate. Rank: 1.7*
- Issue 6** **Resource Management Needs; Resource information collection needs: Lack of current population information on freshwater mussels. Rank: 1.8**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Survey existing populations and EOs. Rank: 2*

Freshwater Aquatic Insects

- Issue 1** **Resource Management Needs; Resource information collection needs: Lack of information on macroinvertebrates, specifically mayflies as indicators of rare habitats. Rank: 1.3**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Gather baseline information on macroinvertebrates. Rank: 1.7*
- Issue 2** **Resource Management Needs; Resource information collection needs: Rank: 1.7**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Assess water quality of headwaters and seeps. Rank: 1.7*
- Issue 3** **Resource Management Needs; Resource information collection needs: Lack of baseline inventory for Tipulidae. Rank: 1.7**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct baseline inventory for Tipulidae in collaboration with Chen Young or John Gelhaus. Rank: 1.8*
- Issue 4** **Resource Management Needs; Resource information collection needs: Lack of current species occurrence data on freshwater invertebrates. Rank: 1.7**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Survey headwater streams and seepage swamps for freshwater aquatic invertebrates. Rank: 1.3*
- Action 2* *Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Identify high quality streams for targeted inventory effort. Rank: 1.5*
- Issue 5** **Resource Management Needs; Resource information collection needs: Lack of information on groundwater invertebrates. Rank: 1.7**
- Action 1* *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Survey hypotelminorheic seepage areas statewide for groundwater-associated invertebrates, using methodology of recent Maryland study (Culver et al 212). Rank: 1.5*

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Action 2 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Survey Hockessin karst system for groundwater-associated invertebrates. Rank: 1.7

Issue 6 Invasive and Other Problematic Species, Genes, and Diseases; Problematic species/diseases of unknown origin; Unspecified species: Fish stocking effects on invertebrates. Rank: 2.8

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Determine effects of fish stocking on native invertebrate populations. Rank: 1.5

Forest Tree Canopy feeding Moths

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Named species: White-tailed Deer (*Odocoileus virginianus*) overbrowsing reducing tree diversity and limiting canopy tree regeneration. Rank: 1.2

Action 1 : Reduce white-tailed deer populations to ecologically sustainable levels that will minimize impacts on plant biodiversity (at least <25 deer / sq mile). Rank: 2

Issue 2 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Forest Understory feeding Moths

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Named species: White-tailed Deer (*Odocoileus virginianus*) overbrowsing reducing shrub and forb diversity and abundance thus eliminating hostplant resources and lepidoptera metapopulations. Rank: 1.2

Action 1 : Reduce white-tailed deer populations to ecologically sustainable levels that will minimize impacts on plant biodiversity (at least <25 deer / sq mile). Rank: 2

Issue 2 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Freshwater Wetland Forb feeding Moths

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

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Meadow Forb feeding Moths

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Problematic native species/diseases; Named species: White-tailed Deer (*Odocoileus virginianus*) overbrowsing reducing shrub and forb diversity and abundance thus eliminating hostplant resources and lepidoptera metapopulations. Rank: 1.2

Action 1 : Reduce white-tailed deer populations to ecologically sustainable levels that will minimize impacts on plant biodiversity (at least <25 deer / sq mile). Rank: 2

Issue 2 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Issue 3 Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of technical guidance for land managers. Rank: 1.7

Action 1 : Create meadow restoration and creation technical guidance for use by state and private land managers that specifically references SGCN lepidoptera and native bee habitat and resource needs. Rank: 1.3

Other Moths

Issue 1 Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of genus-specific planning. Rank: 1.5

Action 1 Planning; Species and habitat management planning; Species management planning: Complete a management plan for genus *Papaipema*. Rank: 1.7

Issue 2 Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Lack of complete baseline inventory. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Complete baseline inventory of moth genera *Catocala* and *Zale* begun by K. Heckscher. Rank: 1.7

All Odonates

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: State Biotics database needs updating with more current information from taxa experts. Rank: 1.7

Action 1 Data Collection and Analysis; Database development and management; Information systems operations and maintenance: Update Biotics Eos to reflect available information. Rank: 1.2

Issue 2 Invasive and Other Problematic Species, Genes, and Diseases; Problematic species/diseases of unknown origin; Unspecified species: Fish stocking effects on invertebrates. Rank: 2.8

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Determine effects of fish stocking on native invertebrate populations. Rank: 1.5

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**Low Gradient Small Stream and Seep
Odonates**

Issue 1 Residential and Commercial Development; Commercial and industrial areas: Commercial development impacts to small, non-jurisdictional seep and stream habitats. Rank: 1.3

Action 1 Coordination and Administration: Support state-level efforts to improve isolated wetland protection. Rank: 1.8

Issue 2 Residential and Commercial Development; Housing and urban areas: Residential development impacts to small, non-jurisdictional seep and stream habitats. Rank: 1.3

Action 1 Coordination and Administration: Support state-level efforts to improve county land use practices. Rank: 1.8

Burgundy Bluet

Enallagma dubium

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Pale Bluet

Enallagma pallidum

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Banner Clubtail

Gomphus apomyius

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Midland Clubtail

Gomphus fraternus

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

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Sable Clubtail

Gomphus rogersi

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Taper-tailed Darner

Gomphaeschna antilope

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Brown Spiketail

Cordulegaster bilineata

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Selys' Sundragon

Helocordulia selysii

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Elfin Skimmer

Nannothemis bella

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

Treetop Emerald

Somatochlora provocans

Issue 1 Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7

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Laura's Clubtail

Stylurus laurae

Issue 1 **Resource Management Needs; Resource information collection needs; Lack of up-to-date existing information: Lack of recent monitoring of element occurrences for Endangered odonates. Rank: 1.5**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor existing element occurrences. Rank: 1.7*

Pollinators

Issue 1 **: Contaminants from residential pesticides having lethal effects. Rank:**

Action 1 *: Educate homeowners about Integrated Pest Management, plant diversity in the home landscape, and pollinators. Rank:*

Issue 2 **Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Lack of baseline inventory data for solitary bees and wasps. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct baseline inventory of solitary bees and wasps, including existing data compilation, museum specimens, and targeted field inventory. Rank: 1.5*

Issue 3 **Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Lack of baseline inventory of *Bombus* sp. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct baseline inventory of bumblebees, including existing data compilation, museum specimens, and targeted field inventory. Rank: 1.5*

Issue 4 **Resource Management Needs; Resource information collection needs; Lack of initial baseline inventory: Lack of baseline inventory of hoverflies (Diptera: Syrphidae), which are frequently important pollinators. Rank: 1.3**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Conduct baseline inventory of syrphid flies, including existing data compilation, museum specimens, and targeted field inventory. Rank: 1.8*

Issue 5 **Resource Management Needs; Resource information collection needs: Lack of baseline inventory of land snails and their habitat associations. Rank: 1.5**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Baseline inventory: Rank: 2*

Issue 6 **Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Lack of management planning for *Bombus*. Rank: 1.5**

Action 1 *Planning; Species and habitat management planning; Species management planning: Complete management plan for *Bombus* sp. In Delaware. Rank: 1.3*

Issue 7 **Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of technical guidance for land managers. Rank: 1.5**

Action 1 *Planning; Species and habitat management planning; Habitat management planning: Create habitat restoration and creation technical guidance for use by state and private land managers that specifically references SGCN lepidoptera and native bee habitat and resource needs. Rank: 1.3*

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- Issue 8 Residential and Commercial Development; Housing and urban areas: Residential insecticide and herbicide use having direct and indirect effects on pollinators. Rank: 1.5**
- Action 1 Outreach; Partner/Stakeholder engagement; Others: Educate homeowners about Integrated Pest Management, plant diversity in the home landscape, and pollinators. Rank: 2.2*
- Issue 9 Agriculture and Aquaculture; Annual and perennial nontimber crops: Incompatible agricultural practices reducing available early successional habitat. Rank: 1.7**
- Action 1 Technical Assistance; Technical assistance: Create technical guidance and practice standards for pollinator habitat creation for use in Delaware Landowner Incentive Program and/or adopt existing Delaware NRCS Conservation Cover 327 Pollinator Practices. Rank: 1.7*
- Action 2 Coordination and Administration; Incentives: Increase cost-share and rental payments for the Delaware Landowner Incentive Program Upland Early Successional Habitat Enhancement Practice. Rank: 2.5*
- Issue 10 Invasive and other problematic species and genes: Invasive plants causing habitat degradation. Rank: 1.7**
- Action 1 Direct Management of Natural Resources; Planting/seeding; Herbaceous vegetation: Restore degraded habitat by planting a diversity and abundance of nectar and pollen laden native plants. Rank: 2.2*
- Issue 11 Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of technical guidance for land managers. Rank: 1.7**
- Action 1 Planning; Species and habitat management planning; Habitat management planning: Create habitat restoration and creation technical guidance for use by state and private land managers that specifically references SGCN lepidoptera and native bee habitat and resource needs. Rank: 1.3*
- Issue 12 Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Negative effects of neonicotinoids on pollinators. Rank: 1.8**
- Action 1 Outreach; Partner/Stakeholder engagement; Others: Target lawn care industries, golf courses, farmers and agriculture to reduce use of pesticide and fertilizer and promote green solutions. Rank: 2*
- Action 2 Outreach; Partner/Stakeholder engagement; Others: Target retail businesses to reduce selling of harmful pesticides (i.e., Home Depot signed agreement to not sell certain ones). Rank: 2*
- Issue 13 Pollution; Excess energy; Light pollution: Outdoor lighting. Rank: 2.3**
- Action 1 Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities to develop education and outreach for homeowners, business owners and municipalities to promote reduced use of outdoor lighting. Rank:*
- Action 2 Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities and building code and public safety officials to develop design standards for outdoor lighting that minimizes stray light. Rank: 1.7*
- Action 3 Outreach; Partner/Stakeholder engagement; Others: Work with electric utilities to develop education and outreach for homeowners, business owners and municipalities to promote reduced use of outdoor lighting. Rank: 1.7*

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Monarch

Danaus plexippus

- Issue 1** Residential and Commercial Development: Monarch Butterfly (*Danaus plexippus*) population decline. Rank: 1.7
- Action 1* Land and Water Rights Acquisition and Protection: Follow Federal guidelines to address pollinator conservation; Address the decline in Milkweed, breeding habitat, etc. Rank: 1.5
- Issue 2** Agriculture and Aquaculture: Monarch Butterfly (*Danaus plexippus*) population decline. Rank: 1.8
- Action 1* Planning: Follow Federal guidelines to address pollinator conservation; Address the decline in Milkweed, breeding habitat, etc. Rank: 1.5

Mammals

Delmarva Fox Squirrel

Sciurus niger cinereus

- Issue 1** Residential and Commercial Development; Housing and urban areas: Residential development causing forest habitat conversion. Rank: 1.5
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - habitat; Baseline inventory: Determine habitat availability and use for fox squirrel. Use established GIS component to go onsite and evaluate locations. Rank: 1.5
- Issue 2** Residential and Commercial Development; Housing and urban areas: Residential development causing forest habitat conversion. Rank: 1.8
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Population assessment: Monitor extant SGCN occurrences to determine population status and trends. Conduct surveys for additional occurrences in potential habitats, giving priority to sites with historic occurrences. Monitor status and trends of the extent and condition of key habitats. Rank: 1.6
- Action 2* Species Reintroduction and Stocking; Native species restoration; Translocation: Translocate fox squirrels into suitable habitats to maintain population viability. Rank: 2
- Action 3* Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about SGCN biology, key habitat ecology, threats and conservation actions. Rank: 2.4
- Action 4* Land and Water Rights Acquisition and Protection; Private lands agreements: Pursue non-regulatory land protection alternatives, e.g. easements, for fox squirrel. Rank: 2.4
- Issue 3** Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Agriculture causing forest habitat conversion. Rank: 2.3
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - habitat: Monitor extent of forest removed for agriculture that falls within DFS travel corridors or occupied habitat. Rank: 2.3
- Issue 4** Biological Resource Use; Hunting and collecting terrestrial animals; Unintentional effects: Illegal hunting or hunter confusion with gray squirrel. Rank: 2.3
- Action 1* Education: Develop education and outreach strategies that provide information to hunters about DFS in order to minimize the possibility of an accidental killing. Rank: 2.3

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Issue 5 Residential and Commercial Development; Housing and urban areas: Residential development causing forest habitat conversion. Rank: 2.5

Action 1 Law Enforcement: Enforce compliance with existing Federal laws regarding fox squirrel. Rank: 2.5

Marine Mammals

Issue 1 Pollution; Excess energy; Noise pollution: Increased shipping and larger ships - effects of noise. Rank: 1

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of underwater noise on marine mammals. Rank: 1

Issue 2 Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (large scale): Commercial fishing gear entanglement. Rank: 1.5

Action 1 Direct Management of Natural Resources; Hazard or infrastructure removal: Support the rescue of stranded whales by the Marine Mammal Stranding Center. Participate in the mid-Atlantic disentanglement team's work to free whales and other marine mammals from fishing gear and debris. Participate in Take Reduction Teams. Fisheries person already on some of these teams, but there should also be a non-game biologist included. Rank: 1.5

Issue 3 Pollution; Industrial and military effluents; Oil spills: Increased shipping and larger ships - potential for oil spills and other hazardous materials. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Assess threats to marine mammals from ship traffic such as oils spills and other hazardous materials. Rank: 1.5

Action 2 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Have a plan in place to rescue/rehab oiled/contaminated marine mammals. Rank: 1.5

Issue 4 Resource Management Needs; Resource information collection needs: Lack of information about effects of underwater noise. Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of underwater noise on marine mammals. Rank: 1.5

Issue 5 Transportation and Service Corridors; Shipping lanes: Increased shipping and larger ships - increased risk of collisions. Rank: 1.7

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Assess threats to marine mammals such as ship strikes. Rank: 1.7

Issue 6 Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of coordination and sharing of information among regional, state and national data collectors for species that utilize habitats in a broad geographical range. Rank: 1.7

Action 1 Data Collection and Analysis; Database development and management: Complete a survey that will be summarized to (1) evaluate how well Delaware is meeting best management practices and standards; (2) identify Delaware's marine mammal data management capacity and needs; and 3) identify bottlenecks to integrating data among states for regional and national scale analyses. Rank: 1.7

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- Issue 7** Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of staff for the purpose of coordination and sharing of information among regional, state and national data collectors for species that utilize habitats in a broad geographical range. Rank: 1.7
- Action 1* Data Collection and Analysis; Database development and management: Ensure that there is staff dedicated to transferring data to the centralized database with NMFS/NOAA. Rank: 1.7
- Issue 8** Resource Management Needs; Management decision needs; Lack of fish, wildlife and/or habitat planning: Need to coordinate recovery planning of whale populations with other agencies. Rank: 1.7
- Action 1* Planning; Species and habitat management planning; Species management planning: Work with the National Marine Fisheries Service to implement whale recovery plans as needed. Develop a state whale conservation plan. Rank: 1.7
- Issue 9** Resource Management Needs; Resource information collection needs: Wind turbine development - lack of information about sounds from vibration at base, electromagnetic field disruptions, placement (migration paths, dredging). Rank: 1.7
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of wind turbines on movement and populations. Rank: 1.7
- Issue 10** Pollution; Domestic and urban waste water; Sewage: Ocean outfall pipes (state waters) - medicinal content endocrine inhibitors, cancer rate increasing. Rank: 1.8
- Action 1* Data Collection and Analysis: Research potential impacts of sewage in DE Waters on marine mammals (and sea turtles). Rank: 1.8
- Issue 11** Pollution; Domestic and urban waste water; Sewage: Ocean outfall pipes (state waters) - plankton layer degraded by chlorine and other sewage-related inputs. Rank: 1.8
- Action 1* Data Collection and Analysis: Conduct literature search and laboratory research on the effects of sewage on plankton. Rank: 1.8
- Issue 12** Pollution; Domestic and urban waste water; Sewage: Rehoboth Beach Project - negative impacts of effluent pipes, dredging, and other potential effluent disposal projects. Rank: 1.8
- Action 1* Coordination and Administration; Coordination and administration; Program/project administrative support: Coordinate with NOAA, DNREC, USACOE, USFWS, NMFS. Rank: 1.8
- Issue 13** Biological Resource Use; Fishing and harvesting aquatic resources; Unintentional effects (large scale): Commercial fishing gear entanglement. Rank: 1.8
- Action 1* Planning; Species and habitat management planning; Species management planning: Develop a state management plan for whales and other marine mammals that protects critical migration routes, and participate in whale (and other marine mammal) recovery team work. Rank: 1.8
- Action 2* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Research whale (and other marine mammal) interactions with commercial fishing gear. Rank: 1.8
- Issue 14** Transportation and Service Corridors; Shipping lanes: Ship strikes. Rank: 2
- Action 1* Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations; Movement: Assess threats to whales and other marine mammals from impacts such as ship strikes. Rank: 2

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Issue 15 Human Intrusions and Disturbance; War, civil unrest, and military exercises: Underwater human activities - Naval activities/seismic testing. Rank: 2

Action 1 Coordination and Administration; Coordination and administration; Program/project administrative support: Coordinate with Navy/seismic testing through Fish and Wildlife Coordination Act (USFWS/NMFS), which requires federal agencies or federally funded activities to coordinate with USWFS and/or NMFS. Rank: 2

Bobcat

Lynx rufus

Issue 1 Biological Resource Use; Hunting and collecting terrestrial animals: Severe decline in population due to cumulative effects of over-hunting. Rank: 1.8

Action 1 Species Reintroduction and Stocking: Rank: 1.8

All Small Mammals

Issue 1 Resource Management Needs; Resource information collection needs: Lack of information about status of these species (moles, shrews, rodents and weasels are lacking data). Rank: 1.5

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Conduct surveys to determine the status of small mammals in Delaware. Rank: 1.5

All Bats

Issue 1 Invasive and Other Problematic Species, Genes, and Diseases; Invasive non-native/alien species/diseases: Predation by domestic pets and subsidized predators. Rank: 1.3

Action 1 Direct Management of Natural Resources; Invasive species control: Control feral cats and keep house cats indoors to protect bats. Rank: 1.3

Action 2 Education; Student training; Wildlife education: Develop education and outreach for the general public about the impacts of subsidized predators on SGCN. Rank: 1.3

Action 3 Land and Water Rights Acquisition and Protection; Land acquisition: Preserve bat roost sites within forest cut blocks. Increase the ratio of edge to open areas to provide higher quality roosting areas and foraging habitats. Rank: 1.3

Action 4 Coordination and Administration; Incentives: Provide incentives for landowners to control subsidized predators on private property by reducing subsidies (refuges, food sources), erecting enclosures, or by removal of individuals. Rank: 1.3

Action 5 Direct Management of Natural Resources; Invasive species control; Animal-mechanical: Work with conservation partners to control subsidized predators on public and NGO conservation lands by reducing subsidies (refuges, food sources), erecting enclosures, or by removal of individuals. Rank: 1.3

Action 6 Outreach; Partner/Stakeholder engagement; Non governmental organization: Work with retailers and NGOs to develop education and outreach for pet owners to minimize the impacts of pets on SGCN, such as "Cats Indoors." Rank: 1.3

Issue 2 Biological Resource Use; Hunting and collecting terrestrial animals; Persecution/Control: Nuisance wildlife management impacts on bats. Rank: 1.5

Action 1 Education; Educator/instructor training: Enhance training for pest control companies to minimize impacts on SGCN and increase educational opportunities for NWCO. Rank: 1.5

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Issue 3 Biological Resource Use; Hunting and collecting terrestrial animals; Persecution/Control: Nuisance control. Rank: 1.7

Action 1 Education; Student training; Wildlife education: Implement outreach and education programs - on-site programs and exhibits; print and video materials; web-based products - about timing for exclusions and importance of bats in ecosystem. Rank: 1.7

Issue 4 Energy Production and Mining; Renewable energy: Wind facilities collisions. Rank: 1.7

Action 1 Technical Assistance; Technical assistance; Technical assistance: Support research for improving the design of wind facilities to minimize impacts to SGCN. Rank: 1.7

Action 2 Outreach; Partner/Stakeholder engagement; Others: Work with energy companies to develop standards for the placement of wind energy towers to avoid SGCN nesting colonies, roosts, migration routes, movement corridors and other critical areas. Rank: 1.7

Issue 5 Biological Resource Use; Logging and wood harvesting: Accidental removal of bat roost trees in forest blocks. Rank: 2

Action 1 Land and Water Rights Acquisition and Protection; Land acquisition: Protect bat roost trees within forest blocks. Increase the ratio of edge to open areas to provide higher quality roosting areas and foraging habitats. Rank: 2

Issue 6 Agriculture and Aquaculture; Annual and perennial nontimber crops; Scale unknown: Contaminants from agricultural runoff having lethal or sub-lethal effects. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research impacts of pesticides (for gypsy moths and other forest pests) on forest bats. Rank: 2

Issue 7 Resource Management Needs; Management decision needs; Need to provide technical assistance: Lack of coordination and sharing of information among regional, state and national data collectors for species that utilize habitats in a broad geographical range. Rank: 2

Action 1 Data Collection and Analysis; Database development and management: Complete a survey that will be summarized to identify Delaware's bat data management capacity and needs and identify bottlenecks to integrating data among states for regional and national scale analyses. Rank: 2

Action 2 Data Collection and Analysis; Database development and management; Database development: Continue to partner with a centralized database (e.g., NABat) that will enhance Delaware's ability to manage and conserve wide ranging species across broad and biologically meaningful geographic areas. The exchange and integration of data into a permanent centralized data management system is a priority action. Rank: 2

Issue 8 Biological Resource Use; Logging and wood harvesting; Intentional use (large scale): Loss of habitat due to forestry operations. Rank: 2

Action 1 Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research best management practices for forest bats and the effects of silvicultural practices on forest bat habitat. Rank: 2

Action 2 Data Collection and Analysis; Research, survey, or monitoring - habitat; Monitoring: Review and possibly implement BMPS as they are developed by National Forest Service and USFWS/state teams, particularly concerning silvicultural practices. Rank: 2

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Issue 9 **Pollution; Agricultural and forestry effluents; Herbicides and pesticides: Pesticides for invasive species having negative impacts on cave bats. Rank: 2**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research impacts of pesticides (for gypsy moths and other forest pests) on cave bats. Rank: 2*

Issue 10 **Resource Management Needs; Resource information collection needs: Wind turbine development - lack of information about sounds from vibration at base, electromagnetic field disruptions, placement (migration paths, dredging). Rank: 2**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research effects of wind turbines on movement and populations. Rank: 2*

Issue 11 **Transportation and Service Corridors; Utility and service lines: Communication towers and high-tension electric lines. Rank: 2.5**

Action 1 *Technical Assistance; Technical assistance; Technical assistance: Support research for improving the design of towers and lines to minimize impacts to SGCN. Rank: 2.5*

Tree Bats

Issue 1 **Biological Resource Use; Logging and wood harvesting; Intentional use (large scale): Silviculture practices (clearcutting) incompatible with forest bat conservation. Rank: 1.7**

Action 1 *Direct Management of Natural Resources; Create new habitat or natural processes; Habitat conversion: Preserve bat roost sites within forest cut blocks. Rank: 1.7*

Issue 2 **Natural System Modifications; Fire and fire suppression; Increase in fire frequency/intensity: Prescribed burns in upland forests causing bat roosting and foraging habitat degradation. Rank: 2.5**

Action 1 *Data Collection and Analysis; Research, survey, or monitoring - fish and wildlife populations: Research impacts of the intensity and timing of prescribed burns on forest bats. Rank: 2.5*

Cave Bats

Issue 1 **Invasive and Other Problematic Species, Genes, and Diseases; Problematic species/diseases of unknown origin; Named species: White nose syndrome in bats. Rank: 1.3**

Action 1 *Direct Management of Natural Resources; Wildlife disease management: Continue efforts to reduce impacts of WNS in DE hibernacula - both to DE bats and to decrease the chances of spread of WNS to other locations. Rank: 1.3*

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