



## Chapter 6

# Conservation Actions





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## Introduction

The State Wildlife Action Plan (SWAP or Plan) represents an opportunity to reverse declining trends for numerous Species of Conservation Need (SGCN) and their associated key wildlife habitats (KWHs) through the proposal and implementation of conservation actions. This chapter discusses these conservation actions (**Element #4**), which are the measures taken to conserve, protect, and manage Maryland’s identified SGCN and KWHs. They are intended to eliminate, minimize, and/or mitigate the threats addressed in Chapter 5 (**Element #3**). These actions range in scale; some address only a single species, while others are state-wide actions that would benefit all of Maryland’s flora, fauna, and habitats. They range in scope as well; some call for specific regulations and research activities, while others propose general educational campaigns and coordination efforts.

The Maryland Department of Natural Resources (MD DNR) and its partners co-developed the 2025 SWAP revision’s threats and actions on a one-to-one basis, meaning that every listed threat has an associated action. Over 700 conservation actions have been developed for Maryland’s 2025 SWAP revision for the identified SGCN and KWHs. Given the number of threat–action pairs, the full lists of threats and actions have been relegated to Appendices 6a and 6b. Instead, this chapter provides a broad overview of major action categories, priorities, and origins, mirroring the organization of Chapter 5. It begins with a brief explanation as to how these conservation actions were created. Then, the prioritization scheme for individual actions is explained. This chapter then provides an overview of two sets of Maryland-specific conservation actions. The first set provides examples of conservation actions that address the priority areas articulated in the middle section of Chapter 5; the second set comprises a comprehensive list of all state-wide conservation actions listed in Appendix 6b. Finally, the chapter ends with a regional perspective of these actions, pulling from *The Northeast Regional Conservation Synthesis for 2025 State Wildlife Action Plans* (TCI & NEFWDC 2023), in order to articulate the greater region’s conservation priorities.

Conservation actions in Appendices 6a and 6b are outlined in sufficient detail to guide the development and execution of specific projects and programs to implement those actions. The process for identifying performance measures for priority actions is explained in Chapter 7. If available information is insufficient to describe needed conservation actions, the Plan lists the identified inventory, monitoring, and research needed so that specific conservation actions can be developed. The only exception to this is for species on the State Assessment Priority Species (SAPS) list, which is further explained in Chapter 3 and briefly mentioned below.

## Actions in the 2025 SWAP Revision

As threats and actions were co-developed for Maryland’s 2025 SWAP revision, the review and revision process for this chapter closely mirrors the process already articulated in Chapter 5. To summarize: MD DNR and its partners began by reviewing the threat–action pairs from the 2015 SWAP revision, made needed updates and removals, and then “filled in the gaps” through various meetings, workshops, and other forms of contact. Resources for this process included academic literature, non-governmental organization (NGO) and government reports, recent regulations and proposed regulations, existing best management practices (BMPs), lived experience, and much more. For a more detailed overview of this process, please see Chapter 5. For a comprehensive overview of partner participation in the SWAP in general, see Chapter 8.



For a full list of which organizations participated in Maryland’s 2025 SWAP revision, see Appendix 8a.

Actions are listed at two different scales: the species scale and the habitat scale. This is because different threats are best addressed at different scales. For example, a taxonomic group-specific disease like Rabbit Hemorrhagic Disease Virus Type 2 (RHDV2) is a concern only for one SGCN, the Appalachian cottontail (*Sylvilagus obscurus*), and is therefore more appropriate to address at the population level, being tied to a species as opposed to a habitat or group of habitats. Other concerns, such as the overuse of pesticides, affect a variety of habitats and all or almost all of the species that rely on them. These sorts of threats are best addressed at the habitat or regional level rather than the population level. In this example, this means that, instead of listing overuse of pesticides as a threat for every insect SGCN and the species that rely on them (e.g., birds, bats, small mammals), the threat is listed under all working land and (sub)urban KWHs, where pesticide overuse is most common.

There are some key differences between the conservation actions in Maryland’s 2015 and 2025 SWAP revisions; most notable is the number of actions. Maryland’s previous SWAP had over 1,000 listed conservation actions; the new revision has closer to 700. This is not because 300 actions were either completed, determined to be inappropriate, or simply ignored over the past decade. Instead, it is due to the restructuring and consolidation of many of these actions. The 2015 SWAP had a tendency to cross-list threats and actions across species subgroups and habitats, meaning that many of those 1,000 actions were in fact duplicates. The 2025 SWAP has made an effort to consolidate these duplicates, as outlined in the previous paragraph. This means that many actions previously listed under multiple species groups—assessing the impacts of emerging contaminants, for example—now take the form of a single action with the applicable habitats “tagged.” When reviewing the full list of threats and actions in Appendices 6a and 6b, it may therefore be helpful to have Appendix 3a open as well, which includes the full SGCN list and associated KWHs. Duplicate actions are occasionally permitted when a threat has an outsized impact on a particular species group. For example, even though the threat of wind turbines impacts all species in the High Elevation Ridge Forest, Cliff, Talus, and Rock Outcrop, and Atlantic Ocean KWHs to some degree, they have an outsized impact on certain bat and bird populations. For this reason, these taxonomic groups are permitted to have their own, species group-specific actions.

Habitat-level threats and actions have also been organized differently in the 2025 SWAP revision. Instead of splitting up threats and actions by applicable habitat group, as in the 2015 revision, these larger scale threats and actions are now sorted by threat category (see Chapter 5 for an explanation of these categories) with appropriate regions and habitat groups “tagged.” This was done, in part, because of the way in which these threats and actions were reviewed/created; much of this content came from four day-long regional meetings in eastern, southern, central, and western Maryland. See Chapter 8 for a more detailed explanation of these meetings; a brief overview is also included below in the “Prioritizing Habitat-Level Actions” subsection of this chapter. This tagging system allows the 2025 SWAP to both achieve a higher level of precision and consolidate actions that apply to multiple habitat groups. In other words, tagging applicable regions of Maryland and applicable habitat groups together permits more specific area-focused actions without duplicating them across groups. To use the same example



as above, large-scale industrial wind development is a threat mainly to the western and eastern regions of Maryland. In western Maryland, the threat is to high-elevation ridge habitats, which can take the form of either forests or cliffs/rock outcrops; in eastern Maryland, the threat is primarily to offshore aquatic habitats. Therefore, this threat–action pair is tagged for Maryland’s eastern and western regions, and these habitat groups: forest; glade, barren, and cliff; and bay and ocean. For the sake of further precision, the 2025 SWAP also includes a “Priority KWHs” column that lists any KWHs in the tagged regions and habitat groups that are especially impacted by the threat. This example lists the High Elevation Ridge Forest, Cliff, Talus, and Rock Outcrop, and Atlantic Ocean KWHs. These larger scale threats and actions are included in Appendix 6b. See Chapter 4 for an explanation of habitat groups and KWHs; see Chapter 2 for an explanation of Maryland’s regions.

Another major change is that the invertebrate threats and actions have been completely redone. This is partially due to the overhaul of the invertebrate SGCN determination process and resulting SGCN list, as outlined in Chapter 3. As a part of this process, MD DNR’s State Entomologist worked with partners to determine species-specific threats and actions for every invertebrate SGCN. This resulted in a much more comprehensive list of threats and actions for all invertebrate SGCN, particularly the insects. This includes threats and actions for species groups that were not articulated in the previous SWAP revision, including fireflies, snails, and cave and groundwater invertebrates.

Finally, the addition of the SAPS list means that some research needs that were included in the 2015 SWAP may not be present in the 2025 SWAP revision. This is because the SAPS list contains data deficient species that may have been SGCN in the previous version of the SWAP—but for the purposes of the 2025 revision, only SGCN have been associated with specific threats and actions. All species on the SAPS list can be assumed to have general surveying, research, or identification needs, even if they are not expressly articulated.

### **Prioritizing Conservation Actions**

The U.S. Fish and Wildlife Service (USFWS) requires that all SWAPs identify the relative priorities of their conservation actions. Maryland’s 2025 SWAP revision does so with three categories: low, medium, and high priority. It is important to note that these priorities are all relative; all actions included in the SWAP are important for at least one species or habitat, but prioritization helps identify the most urgent needs in a sea of important actions. Nothing is truly “low” priority, but certain actions are labeled as such to indicate that they are not as pressing as others. For example, all or almost all actions related to the Small Coastal Plain Island KWH are marked as high priority because these islands are disappearing rapidly, and work must be done as soon as possible to ensure their continued existence. On the other hand, actions related to hydraulic fracturing (i.e., fracking) are marked as low priority, as the practice is currently banned in Maryland, though the potential of such a threat means it is included in the SWAP regardless.

### **Prioritizing Species-Level Actions**

As the species-scale and habitat-scale threats and actions were developed differently (see Chapter 8 and parts of Chapter 5 for details), methods of calculating their priorities differed. Species-level actions were prioritized according to a set of metrics suggested by the 2022



Northeast Lexicon (Crisfield & NEFWDTC 2022). These seven metrics are explained below in Table 6.1.

**Table 6.1 Prioritization metrics for Maryland’s conservation actions**

| Metric                              | Definition                                                                                                                                                                                                       | Available Levels                                                                                                                                                                                                                                     | Additional Information                                                                                  |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Threat Spatial Extent</b>        | I.e., scope. Within the next 10 years or so, what portion of the population is expected to be negatively impacted by this threat?                                                                                | Small ( $\leq 10\%$ of pop.)<br>Restricted (11-30% of pop.)<br>Large (31-70% of pop.)<br>Pervasive ( $\geq 71\%$ of pop.)<br>Unknown percentage of pop.                                                                                              |                                                                                                         |
| <b>Threat Severity</b>              | Within the next 10 years, how much is this threat expected to reduce the overall population? Percentages correspond to expected population loss.                                                                 | Slight (pop. reduction of 1-10%)<br>Moderate (pop. reduction of 11-30%)<br>Serious (pop. reduction of 31-70%)<br>Extreme (pop. reduction of 71-100%)<br>Unknown pop. reduction                                                                       |                                                                                                         |
| <b>*Threat Impact</b>               | A value based on a matrix of Threat Spatial Extent and Threat Severity; estimates the <b>overall impact of a threat</b> .                                                                                        | Low impact<br>Medium impact<br>High impact<br>Very high impact                                                                                                                                                                                       | This metric is automatically populated based on the inputs of two other metrics. See below for details. |
| <b>Threat Immediacy</b>             | What is the time scale over which impacts of the threat will be observable?                                                                                                                                      | Long-term (10 years or longer)<br>Mid-term (about 5-10 years)<br>Near-term (less than 5 years)<br>Immediate (current or existing)                                                                                                                    | This metric also estimates the immediacy of any associated actions.                                     |
| <b>Likelihood of Action Success</b> | To what degree will the action address the threat or improve species’ populations or habitats? Alternatively, if difficult to estimate, what is the likelihood that this conservation action will be undertaken? | <u>Very likely</u> (91-100%): has already been demonstrated by other projects;<br><u>Likely</u> (31-90%): best management practices or sufficient info available;<br><u>Unlikely/unknown</u> ( $\leq 30\%$ ): not tested or implemented anywhere yet |                                                                                                         |
| <b>*Action Urgency</b>              | A value based on a matrix of Threat Immediacy and Likelihood of Action Success; estimates <b>urgency of taking action</b> .                                                                                      | Low urgency<br>Medium urgency<br>High urgency                                                                                                                                                                                                        | This metric is automatically populated based on the inputs of two other metrics. See below for details. |
| <b>Action Duration</b>              | How long will action take to complete (or need to persist)?                                                                                                                                                      | Less than 2 years<br>2-10 years<br>10+ years (i.e., regular maintenance required)                                                                                                                                                                    | This metric is not actually used in calculations for action priority; separate metric.                  |

\* = Metrics marked with an asterisk were estimated based on other metrics. See ‘Additional Information’ column.





The Threat Impact metric was calculated using an adaptation of the Threat Impact Calculation Matrix used in the [NatureServe Element Rank Estimator](#), as recommended by the 2022 Northeast Lexicon (Crisfield & NEFWDTC 2022). This matrix calculates a threat’s overall impact on a species group or population based on its estimated spatial extent and severity. It is included below in Table 6.2. Further building off this recommendation, MD DNR also adapted this matrix to calculate the urgency of that threat’s associated action (i.e., Action Urgency) by considering the Threat Immediacy and estimated Likelihood of Action Success. This matrix can be found in Table 6.3.

**Table 6.2 Threat Impact matrix**

| Threat Spatial Extent (i.e., Scope) |                             | Pervasive ( $\geq 71\%$ ) | Large (31-70%) | Restricted (11-30%) | Small ( $\leq 10\%$ ) | Unknown |
|-------------------------------------|-----------------------------|---------------------------|----------------|---------------------|-----------------------|---------|
| Threat Severity                     | Extreme (Pop. red. 71-100%) | Very High                 | High           | Medium              | Low                   | Medium  |
|                                     | Serious (Pop. red. 31-70%)  | High                      | High           | Medium              | Low                   | Medium  |
|                                     | Moderate (Pop. red. 11-30%) | Medium                    | Medium         | Low                 | Low                   | Low     |
|                                     | Slight (Pop. red. 1-10%)    | Low                       | Low            | Low                 | Low                   | Low     |
|                                     | Unknown                     | Medium                    | Medium         | Low                 | Low                   | N/A     |

**Table 6.3 Action Urgency matrix**

| Threat Immediacy             |                                  | Immediate | Near-term ( $< 5$ years) | Mid-term (5-10 years) | Long-term ( $> 10$ years) |
|------------------------------|----------------------------------|-----------|--------------------------|-----------------------|---------------------------|
| Likelihood of Action Success | Certain/Very Likely (91-100%)    | High      | High                     | Medium                | Low                       |
|                              | Likely (31-90%)                  | High      | High                     | Medium                | Low                       |
|                              | Unlikely/Unknown ( $\leq 30\%$ ) | Medium    | Medium                   | Low                   | Low                       |

Using these calculated metrics, it was then possible to estimate an action’s relative priority by considering its Threat Impact and Action Urgency via a similar matrix (Table 6.4). Given that these two metrics are already calculated using Threat Severity, Threat Spatial Extent, Threat Immediacy, and Likelihood of Action Success, this means that the resulting prioritization matrix takes all four metrics into account, even though there are only two inputs. The Action Duration metric was not used to calculate an action’s priority, as it was determined that an action should not be given a lower or higher priority based on its estimated completion time, though duration is nevertheless an important consideration.





**Table 6.4 Action prioritization matrix**

| Threat Impact  |        | Very High | High   | Medium | Low |
|----------------|--------|-----------|--------|--------|-----|
| Action Urgency | High   | High      | High   | High   | Low |
|                | Medium | High      | High   | Medium | Low |
|                | Low    | Medium    | Medium | Low    | Low |

The 2025 SWAP revision uses this quantitative prioritization scheme to better standardize priorities across taxonomic groups. This was possible because each taxonomic group had a dedicated group of partners and staff that was able to accurately estimate these metrics based on their own expertise. Additionally, there were less than two dozen taxonomic groups to consider, and many could be consolidated based on shared expertise (i.e., it was possible to hold a single meeting and rely on the same group of staff for all herpetofauna). KWHs, on the other hand, number nearly 60. They also lack the structure of taxonomic group expertise. In other words, while it can be relatively straightforward to identify and contact lepidopterists in and around Maryland, it is much more difficult to do so for Vernal Pool or Cliff, Talus, and Rock Outcrop specialists. This necessitated more of a self-selection process from partners and resulted in the less quantitative—though somewhat more holistic—process of prioritizing habitat-level actions, as outlined below.

### Prioritizing Habitat-Level Actions

Actions at the state, regional, or habitat scale retain the original low, medium, and high priority labels, though the determination process was quite different. This is due, in part, to the manner in which they were created. These larger scale threats and actions were developed during a series of day-long regional meetings attended by MD DNR staff and partners. One meeting was held for each region of Maryland: eastern, southern, central, and western. For further explanation of these regions, please see Chapter 2; Figure 2.2 contains a map of the four regions of Maryland. Each meeting cycled through a set of habitats or topics known to be relevant to that region, with four groups running simultaneously in two sets (i.e., a morning set and an afternoon set). For example, during the eastern regional meeting, habitat groups included larger scale aquatic habitats (i.e., the bays, ocean, and larger rivers); wetlands and floodplains; beaches, dunes, and islands; and forests. Topic groups included aquatic resource concerns (e.g., pollution, overfishing); agricultural landscapes and management; climate change; and other human-introduced issues (e.g., development, invasive species). Habitat-level threats and actions from Maryland’s 2015 SWAP were divided into these categories for attendees to review. Over the course of these meetings, attendees edited, removed, and added to the threats and actions, as needed. See Chapter 8 for a more detailed account of these meetings.

Once the threats and actions were reviewed, attendees were asked to prioritize the actions using different colors of sticky notes. Pink corresponded to high priority, yellow to medium, and no sticker denoted a low priority action. Attendees were also given an explanation of what to weigh (i.e., the same metrics as listed in Table 6.1) when considering priorities. After the prioritization activity took place, the results were then compiled and used to help determine the final priorities for every threat–action pair.



Between the four regional meetings, this resulted in 500 prioritized threats and actions. However, many of these actions were either very similar to each other or already addressed in the species-level actions. After careful consolidation, the final list of actions at the state, regional, and habitat levels numbered closer to 200. Throughout the consolidation process, each combined action kept all its associated prioritization stickers. For example, if three actions that addressed white-tailed deer management, each with a high priority sticker, were combined into a single action, the resulting action had three high priority stickers. These final sticker counts were then used to determine each action’s relative priority.

Some actions’ final priorities were simpler to assign than others. In the example above, high priority was the clear choice. For an action that came from a single meeting and had no priority stickers, low priority was the clear choice. For other actions—for example, one that resulted from a combination of four, all from different regional meetings and all with different priority stickers—it was necessary to consider other aspects. Additional considerations included:

- Habitats affected: Are the habitats affected at imminent risk? To use an earlier example, actions associated with the Small Coastal Plain Island KWH were usually given higher priority, as they are already rapidly disappearing.
- Urgency: In addition to habitat considerations, do any other factors affect the urgency of the action? For example, current state- and county-level stormwater management regulations are already being overwhelmed due to climate change and must be updated as soon as possible. These sorts of time-sensitive actions were more likely to receive high priority.
- Feasibility: Is the action likely to be implemented? For example, an action with a lower likelihood of success, such as one that would rely upon changes to well-established regulations, was more likely to be given a lower priority.
- Frequency/pervasiveness: How often was the topic raised across all regional meetings? If an action was proposed in all four meetings, for example, it was more likely to be given a higher priority.

Standardization was also an important consideration. For example, if two different actions received the same number and combination of priority stickers, they received the same final priority level. This was especially helpful in determining the cutoffs between levels (i.e., low–medium and medium–high).

All these actions and their relative priorities are included in Appendices 6a and 6b. It is important to note that the section at the end of this chapter, “Addressing Priority Threats for Maryland,” is not necessarily based upon individual actions’ priorities. Instead, this section includes examples of specific conservation actions that address the threat categories articulated at the end of Chapter 5.

## Maryland Actions

This section pulls a selection of threat–action pairs from Maryland’s 2025 SWAP revision. The first subsection addresses the nine priority areas listed in the “Priority Threats for Maryland” section of Chapter 5. The second subsection lists the threats and actions that were determined to



apply to all of Maryland’s regions and habitat groups (i.e., the statewide or “catch-all” actions). Only a small portion of the approximately 700 threat–action pairs are included here. For a comprehensive list of all threats and actions identified for the 2025 SWAP revision, please refer to Appendices 6a and 6b.

### Addressing Priority Threats for Maryland

The nine priority areas, split into fourteen topics, were identified during Maryland’s 2025 SWAP revision process. The fourteen topics comprise eight threat categories and six resource need (or “scarcity”) categories. Although the individual actions that address these topics may not have all received a high priority level, these general areas of concern have been highlighted as topics to pay special attention to in the post-SWAP submission period. In other words, to build on the momentum that the 2025 SWAP revision process has helped create, MD DNR and its partners intend to further efforts in these areas through continued conversation, outreach, and associated coordination efforts to strengthen capacity to address these concerns. See the “Priority Threats for Maryland” section of Chapter 5 for more details on these threat categories, including how they were identified.

The following threats and resource needs were identified as areas of particular concern:

- Threats to urban and suburban habitats
- Threats to coastal habitats
- Threats to working lands
- Managed species
- Invasive (plant) species
- Pollution
- Climate change
- Habitat loss and fragmentation
- Resource needs:
  - Funding
  - Coordination
  - Policy and regulations
  - Education and outreach
  - Research
  - Monitoring

The tables below (Tables 6.5–6.12) pull three actions from across species groups and habitats to provide examples of strategies that address these threats/needs. The six resource-need categories have been compiled into a shared 12-action table instead, as most resource needs span multiple categories (Table 6.13). Unless otherwise marked, most of the example actions are also considered high priority at the individual level. Additionally, a case study is included for climate change in order to emphasize the importance of mapping and modeling in predicting and addressing a changing environment.



**Table 6.5 Examples of actions that address threats to urban and suburban habitats**

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category                      | Threat Description                                                                 | Action Description                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bird SGCN                                    | Residential & Commercial Development | Use of materials that cause collision hazards                                      | Encourage practices that minimize bird window strikes, including alternative lighting and use of glass in buildings. Evaluate and retrofit state-owned buildings with these practices as possible.                                                                                                                                                                                                                     |
| Working lands and (sub)urban KWHs            | Natural System Modifications         | 7.3 Other Ecosystem Modifications: Over-mowing and over-raking (residential areas) | Utilize existing (e.g., Wild Acres) and new educational materials/programs to emphasize the negative impacts of over-mowing and over-raking on the biodiversity of residential landscapes, including the benefits of traditional yard alternatives. Education will need to be done at both the municipal and landowner level in order to address legal barriers (i.e., grass height ordinances) and public perception. |
| (Sub)urban KWHs                              | Pollution                            | 9.6.1 Light pollution                                                              | Create state-level mandates, set of regulations, or educational campaign (similar to Lights Out Baltimore) regarding light pollution, especially during peak bat and bird migration months. Implement these policies and programs at the local community level.                                                                                                                                                        |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.

**Table 6.6 Examples of actions that address threats to coastal habitats**

| Applicable Species/<br>Habitats <sup>1</sup>         | Threat Category                    | Threat Description                                                      | Action Description                                                                                                                                                                                                                                                                          |
|------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coastal KWHs, especially Small Coastal Plain Islands | Transportation & Service Corridors | 4.3.2 Dredging of shipping lanes                                        | Improve coordination between relevant agencies (Army Corps of Engineers [ACOE], MD DNR, etc.) to ensure that dredging occurs during appropriate times of year, dredged material is given beneficial use (i.e., habitat restoration), and dredge placement projects are properly maintained. |
| Aquatic and semi-aquatic KWHs                        | Pollution                          |                                                                         | Better assess and manage instances of point source pollution such as landfills, combined sewer overflows, leaking sewers/septic, residual pharmaceuticals, etc.                                                                                                                             |
| Tiger beetle and firefly SGCN                        | Climate Change                     | 11.5.2 Storm surges: Beach erosion from sea-level rise and storm surges | Assess risks of sea-level rise and develop management plan for Assateague.                                                                                                                                                                                                                  |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.


**Table 6.7 Examples of actions that address threats to working lands**

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category            | Threat Description                 | Action Description                                                                                                                                                                                                                                                            |
|----------------------------------------------|----------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bird SGCN                                    | N/A                        | Habitat loss (from various causes) | Start a Maryland grasslands bird initiative (similar to Virginia's), which could include efforts such as paying farmers to delay haying a few weeks and asking mowers to raise their blade heights.                                                                           |
| Working lands and forested KWHs              | Energy Production & Mining | 3.3.4 Solar farms                  | Encourage (or require) solar development in areas that are already developed, rooftops, brownfields, etc. in order to minimize forest and grassland loss.                                                                                                                     |
| Terrestrial mammal SGCN                      | Pollution                  | 9.3.3 Herbicides & pesticides      | Identify the types of pesticide/herbicide use (e.g., mosquito control, spongy moth control, various forms of agricultural pest control) that are known to or could potentially impact mammalian insectivore populations and take measures to avoid or minimize those impacts. |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.

**Table 6.8 Examples of actions that address managed species**

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category                            | Threat Description                                                                             | Action Description                                                                                                                                                                                                         |
|----------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wetland KWHs                                 | Invasive & Other Problematic Species, etc. | 8.2.2 Increased grazing by vertebrates: Resident (Canada) geese                                | Increase efforts to control resident geese, which are negatively impacting marsh vegetation (e.g., along the Patuxent River).                                                                                              |
| Wetland, stream, and working land KWHs       | Other Options                              | 12.2 Resource Needs: Need for fish, wildlife and/or habitat planning                           | Review beaver management and survey techniques currently employed by state and federal agencies to determine relevance and potential action items for inclusion into Maryland guidance. <sup>2</sup>                       |
| Bird SGCN                                    | Other Options                              | 12.3 Education & Outreach: Need for improved knowledge of fish and wildlife and their habitats | Better educate private landowners on the impacts of invasive plants on native bird populations, especially in the understory. Emphasize the importance of allowing deer hunting on their lands to help address this issue. |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b

<sup>2</sup> = The beaver-related action is medium priority, not high.


Table 6.9 Examples of actions that address invasive plant species

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category                            | Threat Description                                       | Action Description                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------|--------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All                                          | Invasive & Other Problematic Species, etc. | 8.1 Invasive Non-Native / Alien Plants & Animals         | Better coordinate invasive species monitoring and management efforts through evidence-based, localized plans. Utilize existing partnerships (e.g., National Capital PRISM) and create new ones in order to share resources, prioritize areas/actions, have a stable volunteer base, and create lasting partnerships. <sup>2</sup> |
| All                                          | Invasive & Other Problematic Species, etc. | 8.1.2 Terrestrial plants                                 | Support the refining and implementation of state-level invasive species legislation.                                                                                                                                                                                                                                              |
| Tiger beetle SGCN                            | Invasive & Other Problematic Species, etc. | 8.1.2 Terrestrial plants: Invasive species along streams | Remove invasive plant species (e.g., Japanese knot weed and stiltgrass) along streams where this species (Appalachian tiger beetle [ <i>Cicindela ancocisconensis</i> ]) is known to occur.                                                                                                                                       |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.

<sup>2</sup> = The coordination-focused action is medium priority, not high.

Table 6.10 Examples of actions that address pollution

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category           | Threat Description                                                                                                                                                         | Action Description                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Freshwater mussel SGCN                       | Agriculture & Aquaculture | 2.1.1 Annual cropping systems (field crops): Nutrient and sediment laden run-off, and other impacts to stream hydrology, habitat quality, etc. from field crop agriculture | Restore ecological integrity of streams through BMP implementation, revegetation, and cooperative landowner agreements to reduce effects from agricultural practices (e.g., fertilizers, pesticides, and herbicides).                                                                                                                                    |
| Aquatic and semi-aquatic KWHs                | Pollution                 | 9.1.1 Domestic wastewater                                                                                                                                                  | Better engage with utility companies and owners of septic systems (especially in riparian zones) in order to identify solutions to failed/failing wastewater infrastructure. To ensure future failures do not occur, work with government entities and NGOs in order to brainstorm, create, and enforce higher standards for maintenance and inspection. |
| Aquatic and semi-aquatic KWHs                | Pollution                 | 9.1.2 Runoff                                                                                                                                                               | Develop more incentives for green infrastructure projects, especially those related to stormwater management. Prioritize pervious surfaces and reduce impervious surfaces when possible.                                                                                                                                                                 |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.




Table 6.11 Examples of actions that address climate change

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category | Threat Description                                                                                                | Action Description                                                                                                                                                                                     |
|----------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Small Coastal Plain Island KWH               | Climate Change  | 11.1 Habitat Shifting & Alteration: Sea-level rise                                                                | Prioritize the conservation and restoration of rapidly disappearing islands, which are a vital habitat type for colonial waterbirds, tiger beetles, diamond-backed terrapins, and more.                |
| Bird SGCN                                    | Climate Change  | 11.1.2 Phenological mismatch: Changes in timing of ecological processes causing issues for long-distance migrants | Continue researching the effects of phenological mismatches and the impact to the survival of species, as well as potential habitat management practices that may mitigate these effects. <sup>2</sup> |
| All                                          | Climate Change  | 11.4 Changes in Precipitation & Hydrological Regimes                                                              | Update both state- and county-level stormwater management regulations, as climate change has been overwhelming current regulations.                                                                    |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.

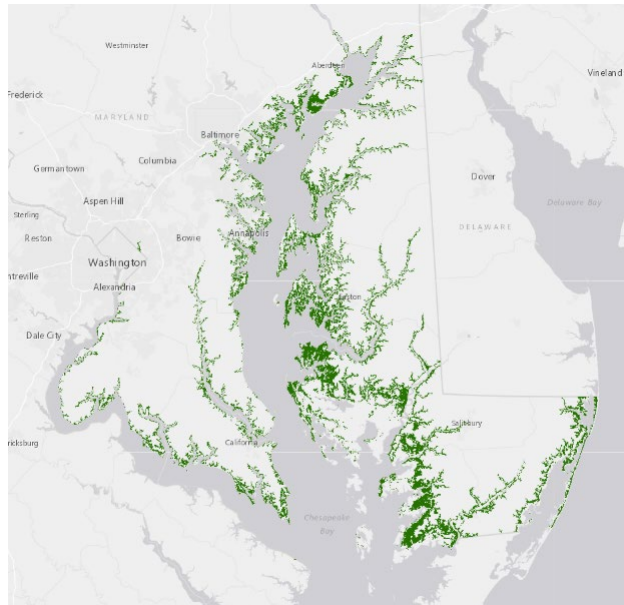
<sup>2</sup> = The bird-related action is medium priority, not high.

### **Case Study: Sea-Level Affecting Marsh Model (SLAMM), Wetland Adaptation Areas (WAAs) and the Maryland Habitat Connectivity Network (HCN)**

One of the most important aspects of addressing climate change is first understanding *where* and *how* it is expected to affect Maryland’s species and habitats. Maps and models are two of the main tools that MD DNR and its partners rely on to reach this understanding.

In order to visualize wetland movement under certain sea-level rise scenarios, the Sea-Level Affecting Marsh Model (SLAMM) was run for all 16 coastal counties and Baltimore City.

Using elevation, sea-level, erosion rates, and other input data, SLAMM attempts to predict where certain habitat types may be present in the future. Three model years were selected for the sea-level rise (or SLR) scenario: 2050 (1.37 feet of rise), 2070 (2.32 feet), and 20100 (4.03 feet). The areas where wetlands are predicted to be present are considered the “wetland adaptation areas” (WAAs). These WAAs include both wetlands that persist as sea levels rise and wetlands that convert from upland land types. In order to differentiate between them, a data layer was produced for 2100 to show only areas where upland land types are projected to convert to wetlands (see *Uplands to Wetlands in 2100*).

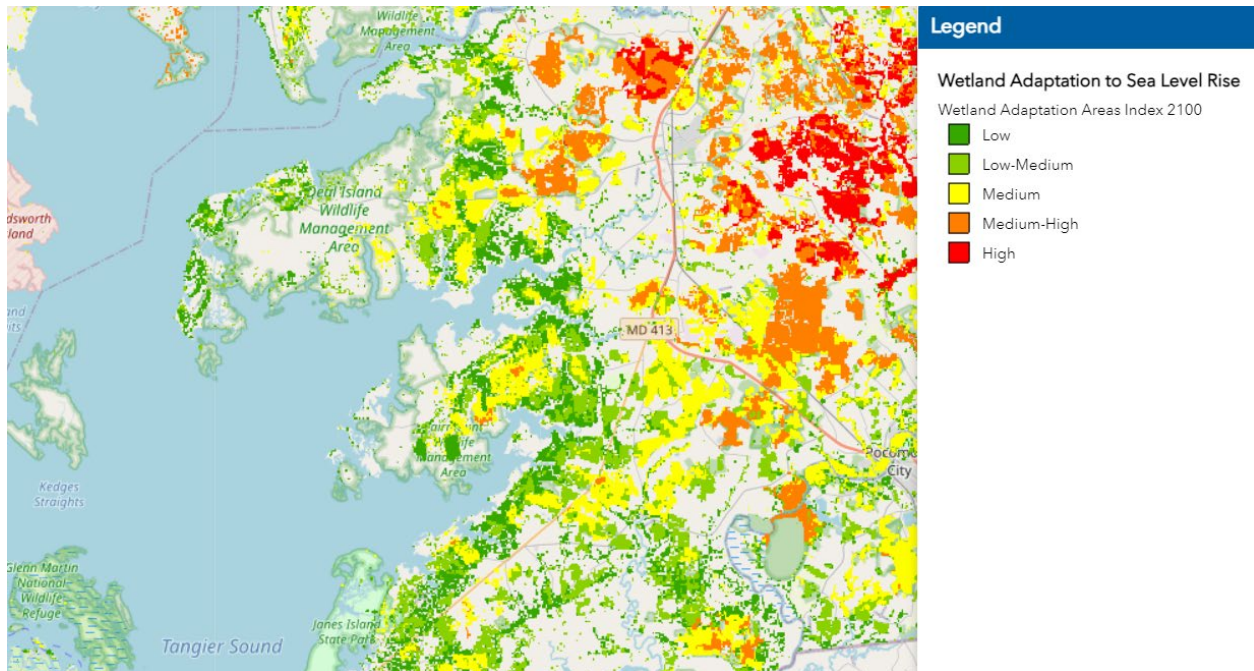


*Uplands to Wetlands in 2100 (MD DNR)*





In addition, a conservation model (the Wetland Adaptation Areas Index, or WAA) was developed to prioritize the most important areas for wetland adaptation for the year 2100. Conservation criteria used include areas that may support future wetland migration, wildlife habitat and corridors, high priority living resources, vulnerable wetland habitat, and suitable soils for wetland establishment. A “high” designation in this data layer represents areas with the greatest potential for providing high quality wetland habitat.



Wetland Adaptation Areas Index data layer (2100), Somerset County (MD DNR)

By modeling where future wetlands may be lost, migrate, or persist, staff and partners can proactively plan for conservation action across Maryland’s coastal zone. SLAMM is able to portray nine unique wetland types, from forested wetland to inland fresh marsh to transitional salt marsh. While these future habitat types and locations are only projections, it can be helpful to visualize and to use as a starting point for planning purposes. Land acquisition, adaptation strategies, wildlife migration, and marsh restoration are just a few examples of how SLAMM and WAA data can be used.

These data layers, including the Wetland Adaptation Areas (2050, 2070, and 2100) and SLAMM (2050, 2070, and 2100), are located on Maryland’s [Coastal Atlas](#) and hosted on [iMap](#). The SLAMM project was funded by the National Oceanic and Atmospheric Administration (NOAA) and was run in collaboration with George Mason University and The Nature Conservancy.

In addition to understanding the location and quality of wetland habitats, it is also important to understand the connectivity of habitats, wetland or otherwise, across the Maryland landscape. Habitat connectivity is particularly important with regards to climate change because it allows species to adapt to the changing environment around them, facilitating necessary movements such as migration and range shifts. To capture this connectivity, the Maryland Habitat Connectivity Network (HCN) data (previously known as Green Infrastructure) was created. This data layer maps upland forest, wetland, and aquatic hubs; upland forest and aquatic corridors;



and potentially restorable gaps in habitat connectivity. Hubs are defined as contiguous habitat blocks of at least 50 acres that include a minimum of 10 acres of forest interior habitat, habitat for rare or sensitive species, biologically important rivers and streams, and/or existing conservation lands managed for natural values. Corridors are defined as 1,100-foot-wide linear areas that follow the most natural or best ecological routes between hubs, which allow animals, plant seeds, and water to move between hub areas. This mapping allows MD DNR and its partners to identify and prioritize areas for conservation, restoration, and protection.

The resulting map is located on [MERLIN Online](#) and hosted on [iMap](#). HCN features were mapped in partnership with the Chesapeake Conservancy, using their 2017/2018 1-meter resolution Land Use Land Cover (LULC) dataset.

**Table 6.12 Examples of actions that address habitat loss and fragmentation**

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category                    | Threat Description                 | Action Description                                                                                                                                                                                                                        |
|----------------------------------------------|------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All                                          | N/A                                | Habitat loss (from various causes) | Encourage implementation of BMPs that minimize and reduce habitat fragmentation in land use plans, especially for large, contiguous forest blocks and old growth conditions that are connected by effective movement/dispersal corridors. |
| Stream, river, and floodplain KWHs           | Transportation & Service Corridors | 4.1 Roads & Railroads              | Improve habitat connectivity in streams via blockage removal, culvert retrofit, and transportation BMPs.                                                                                                                                  |
| Terrestrial mammal SGCN                      | Transportation & Service Corridors | 4.1.1 Roads                        | Look into feasibility of small wildlife road crossings, especially in the context of the 2025 Wildlife Connectivity and Crossings Act.                                                                                                    |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.

**Table 6.13 Examples of actions that address resource needs**

| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category            | Threat Description                                                                                                              | Action Description                                                                                                                                                                      |
|----------------------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Freshwater mussel SGCN                       | Energy Production & Mining | 3.2.1 Underground mines: Coal mine permitted to operate underneath and discharge mine water into the Casselman River circa 2010 | Conduct population monitoring in the Casselman River to assess potential impacts from permitted coal deep mine.                                                                         |
| Working lands and forested KWHs              | Energy Production & Mining | 3.3.4 Solar farms                                                                                                               | Site and design solar projects in a way that minimizes impacts on (and potentially benefits) SGCN and their habitats. Distribute guidelines and enforce regulations at the state level. |



| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category                            | Threat Description                                                                             | Action Description                                                                                                                                                                                                                                                                                            |
|----------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cave and Karst KWH                           | Human Intrusions & Disturbance             | 6.3.3 Vandalism                                                                                | Decrease cave vandalism/breaking and entering through tactics such as emergency gating, cameras, increased signage, and improved response time. Explore options for funding these interventions.                                                                                                              |
| All                                          | Invasive & Other Problematic Species, etc. | 8.4 Pathogens: Unknown/unstudied diseases                                                      | Continue to support research to monitor wildlife health and identify emerging zoonotic diseases.                                                                                                                                                                                                              |
| All                                          | Other Options                              | 12.2 Resource Needs: Lack of funding                                                           | Explore options for a permanent and significant source of funding for conservation work. Options to pursue include a portion of an existing state tax, a new state tax, a biodiversity license plate, charging for environmental review, or federal sources (i.e., Recovering America's Wildlife Act [RAWA]). |
| Terrestrial mammal SGCN                      | Other Options                              | 12.2 Resource Needs: Need to develop new technique                                             | Develop more effective survey and monitoring techniques, including live capture methods for insectivores.                                                                                                                                                                                                     |
| Amphibian SGCN                               | Other Options                              | 12.2 Resource Needs: Lack of initial baseline inventory                                        | Conduct eDNA surveys in subwatersheds to determine presence/absence of certain species.                                                                                                                                                                                                                       |
| Bird SGCN                                    | Other Options                              | 12.3 Education & Outreach: Need for improved knowledge of fish and wildlife and their habitats | Increase public outreach and education regarding what habitats and management practices are beneficial for birds.                                                                                                                                                                                             |
| All                                          | Other Options                              | 12.3 Education & Outreach: Outreach needs                                                      | Provide more outreach and education on available technical assistance programs, easements, etc. There are already a variety of available programs (state government, county government, University of Maryland Extension, etc.), but many landowners do not know they exist.                                  |
| Bat SGCN                                     | Other Options                              | 12.4 Administrative Needs: Need for coordination for effective program/project management      | Coordinate inventory, monitoring, and research across Maryland and surrounding states.                                                                                                                                                                                                                        |



| Applicable Species/<br>Habitats <sup>1</sup> | Threat Category | Threat Description                                                                        | Action Description                                                                                                                                                                                                                                                                      |
|----------------------------------------------|-----------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Forested KWHs                                | Other Options   | 12.4 Administrative Needs: Need for coordination for effective program/project management | Increase collaboration between foresters, wildlife conservationists, landowners, and others when creating forest stewardship plans. Potentially do this through a standing group that can establish considerations for wildlife, management techniques, educational materials, etc.     |
| Groundwater wetland KWHs                     | Other Options   | 12.5 State Specific Issues: Need for increased legal protection                           | Strengthen protections for vernal pools, springs, and other isolated wetlands. May want to establish a vernal pool (and related habitat) conservation workgroup across multiple fields of expertise in order to better identify, map, and create management actions for these habitats. |

<sup>1</sup> = The “Applicable Species/Habitats” column also refers to an action’s source table in Appendix 6a or 6b.

### Statewide Actions

During the refining of the habitat-level threats and actions list, a number of actions were identified as being applicable to all or nearly all regions, habitat groups, and KWHs in Maryland. These do not necessarily reflect the highest priority actions. Instead, this group includes actions that are less tied to specific places and habitats; most are more general BMPs or resource needs. Table 6.14 below lists all these statewide or “catch-all” actions. It may be helpful to refer to the “Threat Classification System” section in Chapter 5 for the listed threat categories and codes.

**Table 6.14 Statewide conservation actions for Maryland**

| Threat Category                      | Threat Description             | Action Description                                                                                                                                                             | Action Priority <sup>1</sup> |
|--------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Residential & Commercial Development | 1.3 Tourism & Recreation Areas | Increase funding for additional staffing, public education efforts, and environmentally sensitive design with regards to recreational areas in or near important SGCN habitat. | Low                          |
| Residential & Commercial Development | 1.3 Tourism & Recreation Areas | Streamline process (i.e., waivers and permits) for public lands to implement "keep out zones" as needed to protect sensitive SGCN habitat.                                     | Low                          |
| Residential & Commercial Development | 1.3.1 Parks and sports fields  | Work with municipal and county planning and zoning offices to ensure a balance of natural areas versus traditional recreational areas (e.g., sports fields).                   | Low                          |
| Residential & Commercial Development | 1.3.1 Parks and sports fields  | Discourage the use of artificial turf and promote/incentivize native turf grass alternatives.                                                                                  | High                         |
| Energy Production & Mining           | Fossil fuels                   | Continue and increase efforts to establish in-state mitigation funds to offset damages caused by fossil fuel extraction and related operations.                                | High                         |



| Threat Category                            | Threat Description                                      | Action Description                                                                                                                                                                                                                                                                                                   | Action Priority <sup>1</sup> |
|--------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Energy Production & Mining                 | Fossil fuels                                            | Explore the feasibility of increased nuclear power generation through means such as small modular reactors, expanded capacity at existing sites, etc. Work with entities such as the Power Plant Research Program (PPRP) and Public Service Commission (PSC) to do so.                                               | Low                          |
| Energy Production & Mining                 | Fossil fuels: methane gas                               | Increase efforts to monitor, map, and mitigate methane gas leaks from various sources.                                                                                                                                                                                                                               | High                         |
| Transportation & Service Corridors         | 4.1 Roads & Railroads                                   | In order to minimize habitat fragmentation by transportation infrastructure, work with the Maryland Department of Transportation (MDOT) to improve transportation planning for new roads and encourage/facilitate additional opportunities for public transportation.                                                | Mid                          |
| Human Intrusions & Disturbance             | 6.1 Recreational Activities                             | Build a culture of stewardship among natural area user groups through tactics such as roundtable meetings, inclusion in field work days, educational signage and talks, encouraging use in less sensitive areas, etc.                                                                                                | Mid                          |
| Invasive & Other Problematic Species, etc. | 8.1 Invasive Non-Native / Alien Plants & Animals        | Increase MD DNR's capacity for invasive species monitoring and management by funding data analysis efforts (animals), deepening involvement with preexisting removal efforts (plants), and encouraging staff to get certified in herbicide application (plants).                                                     | High                         |
| Invasive & Other Problematic Species, etc. | 8.1 Invasive Non-Native / Alien Plants & Animals        | Better coordinate invasive species monitoring and management efforts through evidence-based, localized plans. Utilize existing partnerships (e.g., National Capital PRISM) and create new ones in order to share resources, prioritize areas/actions, have a stable volunteer base, and create lasting partnerships. | Mid                          |
| Invasive & Other Problematic Species, etc. | 8.1.1 Terrestrial animals: Predation from domestic cats | Continue to educate the public on effects of free-ranging cats on wildlife. Research population management options other than trap-neuter-release programs.                                                                                                                                                          | Mid                          |
| Invasive & Other Problematic Species, etc. | 8.1.2 Terrestrial plants                                | Support the refining and implementation of state-level invasive species legislation.                                                                                                                                                                                                                                 | High                         |
| Invasive & Other Problematic Species, etc. | 8.1.2 Terrestrial plants                                | Continue and increase targeted efforts regarding invasive species removal, especially on state lands.                                                                                                                                                                                                                | High                         |





| Threat Category                            | Threat Description                                                                         | Action Description                                                                                                                                                                                                                                                                | Action Priority <sup>1</sup> |
|--------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Invasive & Other Problematic Species, etc. | 8.1.2 Terrestrial plants                                                                   | Prioritize the planting of and education about native plants, especially on state-owned properties.                                                                                                                                                                               | High                         |
| Invasive & Other Problematic Species, etc. | 8.1.2 Terrestrial plants                                                                   | Explore the feasibility of banning the sale of invasive plant species.                                                                                                                                                                                                            | High                         |
| Invasive & Other Problematic Species, etc. | 8.1.2 Terrestrial plants / 8.1.4 Aquatic plants                                            | Create visitation management plans for public lands in order to reduce the spread of invasive plants (e.g., brush/shoe wash stations).                                                                                                                                            | Low                          |
| Invasive & Other Problematic Species, etc. | 8.1 Invasive Non-Native / Alien Plants & Animals / 8.2 Problematic Native Plants & Animals | Continue to manage all invasive non-native and problematic native plants and animals impacting key wildlife habitats.                                                                                                                                                             | Low                          |
| Invasive & Other Problematic Species, etc. | 8.4 Pathogens: Unknown/unstudied diseases                                                  | Continue to support research to monitor wildlife health and identify emerging zoonotic diseases.                                                                                                                                                                                  | High                         |
| Pollution                                  | PFAS                                                                                       | Work with the Maryland Department of the Environment (MDE) to further reduce the use of PFAS and other endocrine-disrupting chemicals.                                                                                                                                            | Low                          |
| Pollution                                  | 9.3.3 Herbicides & pesticides                                                              | Develop strict protocols for restricting the use of pesticides, such as for mosquito control, in SGCN habitats.                                                                                                                                                                   | Low                          |
| Pollution                                  | 9.3.3 Herbicides & pesticides                                                              | Regulate pest companies to only allow <i>Bacillus thuringiensis</i> (BT) treatments rather than broad spectrum pesticides.                                                                                                                                                        | High                         |
| Pollution                                  | 9.3.3 Herbicides & pesticides: Commercial/residential use                                  | Initiate new marketing and public service campaigns to educate the public on the harmful effects of inappropriate or off-label use of herbicides and pesticides, particularly those which are commercially available. Promote Integrated Pest Management (IPM) as an alternative. | High                         |
| Pollution                                  | 9.4.1 Garbage                                                                              | Improve public education on litter management, particularly on state lands. Utilize plastic pollution reduction campaigns such as 'pack it out' stations with provided bags.                                                                                                      | High                         |
| Pollution                                  | 9.4.1 Garbage                                                                              | Build on existing work (e.g., MDE's Historic Landfill Initiative) to locate and remove legacy waste disposal sites.                                                                                                                                                               | Low                          |





| Threat Category | Threat Description                                                   | Action Description                                                                                                                                                                                                                                                                                            | Action Priority <sup>1</sup> |
|-----------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Climate Change  |                                                                      | Better coordinate efforts in monitoring how/which species are affected by climate change (both plants and animals) in order to track populations, monitor overall impact, and adapt land management practices appropriately.                                                                                  | Mid                          |
| Climate Change  |                                                                      | Prepare for new invasive species and pathogens that are likely to establish themselves in Maryland due to changing climatic conditions. Create new guidance and rely on existing documentation, including MD DNR's Climate-Ready Fisheries Planning Menu (2024).                                              | Mid                          |
| Climate Change  |                                                                      | Work with local and county governments to develop more localized models and plans for climate resiliency. Include aspects of flood response, stormwater management, storm damage, and major heat events.                                                                                                      | Low                          |
| Climate Change  |                                                                      | Encourage the use of electric vehicles and lawn care equipment. Emphasize the multiple negative impacts of fossil fuel-powered equipment, including climate change and noise pollution, and continue to discourage overall usage through "leave the leaves" campaigns and similar initiatives.                | Mid                          |
| Climate Change  | 11.4 Changes in Precipitation & Hydrological Regimes                 | Update both state- and county-level stormwater management regulations, as climate change has been overwhelming current regulations.                                                                                                                                                                           | High                         |
| Other Options   | 12.2 Resource Needs: Lack of funding                                 | Explore options for a permanent and significant source of funding for conservation work. Options to pursue include a portion of an existing state tax, a new state tax, a biodiversity license plate, charging for environmental review, or federal sources (i.e., Recovering America's Wildlife Act [RAWA]). | High                         |
| Other Options   | 12.2 Resource Needs: Need for fish, wildlife and/or habitat planning | Include habitat protection and connectivity needs in local and county land zoning plans (e.g., comprehensive plans) through increased communication, outreach, and/or incentives to counties planning departments.                                                                                            | Mid                          |
| Other Options   | 12.2 Resource Needs: Need for fish, wildlife and/or habitat planning | Periodically re-evaluate state conservation status (i.e., S-ranks) for SGCN.                                                                                                                                                                                                                                  | High                         |



| Threat Category | Threat Description                                                                                            | Action Description                                                                                                                                                                                                                                                                      | Action Priority <sup>1</sup> |
|-----------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Other Options   | 12.3 Education & Outreach: K-12 education needs                                                               | Encourage more schools to adopt Maryland's (relatively) new environmental literacy standards.                                                                                                                                                                                           | Mid                          |
| Other Options   | 12.3 Education & Outreach: Lack of understanding and appreciation of rare, threatened, and endangered species | Continue existing and create new efforts for education/outreach regarding the importance of conserving the state's rare, threatened, and endangered species. Utilize specific stories and species in order to have a greater, more personal/emotional impact.                           | Low                          |
| Other Options   | 12.3 Education & Outreach: Lack of understanding regarding how wildlife conservation is funded                | Increase education/outreach to the public regarding how wildlife conservation is funded, emphasizing that no general state tax dollars go towards this work.                                                                                                                            | Mid                          |
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                     | Provide more outreach and education on available technical assistance programs, easements, etc. There are already a variety of available programs (state government, county government, University of Maryland Extension, etc.), but many landowners do not know they exist.            | High                         |
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                     | Work with less "traditional" conservation partners such as scout groups, church groups, and civic centers to better distribute conservation-related messages and information.                                                                                                           | Mid                          |
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                     | Work more closely with smaller, community-based environmental NGOs to improve direct connections between people and nature (i.e., human-nature relationship building). Explore additional possibilities for funding these smaller-scale NGOs.                                           | Low                          |
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                     | Build public interest in natural area stewardship through additional community workdays, opportunities for student volunteer hours, and creatively funded positions (e.g., AmeriCorps). Invasive species removal projects and surveying efforts are good ways to reach the most people. | High                         |
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                     | Reach more people with conservation messaging through less traditional online means (YouTube shorts, Reddit, podcasts, etc.).                                                                                                                                                           | Low                          |
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                     | Improve the marketing of conservation plans to the general public in order to increase awareness and interest.                                                                                                                                                                          | Low                          |



| Threat Category | Threat Description                                                                                        | Action Description                                                                                                                                                                                                                                                                       | Action Priority <sup>1</sup> |
|-----------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                 | In certain outreach and education efforts, especially those to less receptive audiences, (continue to) center the economic valuation of Maryland's natural resources to make the case for investment in wildlife conservation.                                                           | Low                          |
| Other Options   | 12.3 Education & Outreach: Outreach needs                                                                 | Increase efforts to influence legislators making infrastructure decisions that affect important habitat, especially in the realm of energy infrastructure.                                                                                                                               | Mid                          |
| Other Options   | 12.3 Education & Outreach: Disproportionately low outreach to non-English speakers                        | Increase existing efforts (i.e., funding, materials, staff capacity) for non-English language outreach and education. Until capacity is larger, focus on the translation of existing materials and providing a presence at public cultural events.                                       | Low                          |
| Other Options   | 12.3 Education & Outreach: Lack of focus on underrepresented communities                                  | Make a concerted effort to include a more diverse group of participants in outreach efforts, volunteer opportunities, and other events by diversifying timing, availability, and length of engagement opportunities.                                                                     | Mid                          |
| Other Options   | 12.3 Education & Outreach: Lack of oversight for HOAs, corporate bodies, and other quasi-community groups | Increase outreach to homeowner associations (HOAs) and similar organizations in order to promote environmentally friendly land management practices for groups with large holdings. Consider setting up advisory committee(s) of HOA members, government representatives, and NGO staff. | Low                          |
| Other Options   | 12.3 Education & Outreach: Lack of public trust in state management and expertise                         | Improve data sharing and transparency in targeted areas. Hold more meetings and roundtables with stakeholders as well as the general public in order to increase trust, transparency, and input in the decision-making process.                                                          | Mid                          |
| Other Options   | 12.3 Education & Outreach: Lack of social science expertise                                               | Better incorporate social sciences into outreach and education techniques in order to reach diverse sets of people and encourage behavior change.                                                                                                                                        | Mid                          |
| Other Options   | 12.4 Administrative Needs: Need for coordination for effective program/project management                 | Pursue opportunities for larger scale coordination and collaboration. Specific needs include species/habitat inventory, research (existing and future), invasive species management, and more.                                                                                           | High                         |



| Threat Category | Threat Description                                                                                          | Action Description                                                                                                                                                                                                                                                                          | Action Priority <sup>1</sup> |
|-----------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Other Options   | 12.4 Administrative Needs: Need for coordination for effective program/project management                   | Facilitate better coordination between state agencies, conservation organizations, and other nonprofit groups to reduce competition for funding sources and volunteers, and increase effectiveness.                                                                                         | Mid                          |
| Other Options   | 12.5 State Specific Issues: Lack of smaller scale land easements                                            | Explore ways to incentivize less wealthy landowners (i.e., lower- and middle-income landowners who typically do not benefit from easement tax incentives) to conserve land. Tactics could include the selling of tax credits, financial assistance to cover legal and surveying costs, etc. | Low                          |
| Other Options   | 12.5 State Specific Issues: Need to meet land preservation goals                                            | Continue to work towards land preservation goals set by the 2023 Maryland the Beautiful Act.                                                                                                                                                                                                | Low                          |
| Other Options   | 12.5 State Specific Issues: Need for increased legal protection                                             | Consider additional protections for SGCN that are not (yet) listed as Threatened or Endangered in Maryland.                                                                                                                                                                                 | Low                          |
| Other Options   | 12.5 State Specific Issues: Need for updates to existing laws/regulations and enacting new laws/regulations | Provide a tax break for people who donate land easements across all Maryland counties, not just some of them.                                                                                                                                                                               | Low                          |

<sup>1</sup> = Since these are statewide actions, the “Applicable Species/Habitats” column was replaced with “Action Priority.”

## Regional Actions

Chapter 4 of *The Northeast Regional Conservation Synthesis for 2025 State Wildlife Action Plans* (TCI & NEFWDTC 2023) summarizes how regional priority conservation actions identified by the 2017 SWAP Synthesis (TCI & NEFWDTC 2017) are being implemented by the Northeast Regional Conservation Needs (RCN) Program, USFWS Science Applications (SA), and Competitive State Wildlife Grant (CSWG) partner projects throughout the region. Chapter 4 of this document lists seven priority regional conservation actions grounded in the common themes and priorities of the 2015 Northeast SWAPs (TCI & NEFWDTC 2017) and further prioritized by the Northeast Fish and Wildlife Diversity Technical Committee (NEFWDTC) and its SWAP Coordinators, Threat Working Groups (TWG), and taxonomic teams.

Critical to the implementation of these priority actions is the existence of the RCN program, which is the main conduit for funding projects of regional interest in the Northeast. The RCN Program formalizes a cooperative approach to address SGCN needs across multiple states. The purposes of the RCN program are to develop, coordinate, and implement conservation actions that are regional/sub-regional in scope, and to build upon the many regional initiatives that already exist. The RCN program continues to provide information and support conservation actions and management that help to protect SGCN and their habitats. The RCN program utilizes



a funding mechanism that is equitable to all Northeast states and the District of Columbia, creating a base of funding for regional projects. A full list of projects awarded through this program can be found at [NEAFWA's website](#).

According to the 2023 synthesis, the seven priority action areas for the Northeast region are:

- Develop science-based information and tools to conserve regional SGCN (RSGCN) and key habitats in the Northeast.
- Conserve Northeast RSGCN and their habitats from habitat loss and degradation by addressing development, natural systems modification, and biological resource use.
- Protect native species and habitats from the introduction and spread of disease and invasive species in the Northeast.
- Conserve aquatic habitats by addressing pollution and aquatic connectivity in Northeast waters.
- Address climate change impacts to Northeast RSGCN and their habitats.
- Coordinate inclusively across state boundaries to maximize efficiency and effectiveness of fish and wildlife diversity conservation in the Northeast.
- Develop and implement effective regional scale monitoring to inform adaptive management of regional priorities and conservation in the Northeast.

As in Chapter 5, certain portions of the 2023 synthesis have been included below regarding these seven priority actions. Their complete descriptions can be found in the [full document](#). Many of these priorities closely align with those identified during the course of Maryland's 2025 SWAP revision, as articulated in the final section of this chapter, though the actions are broader and more focused on increasing the region's capacity and consistency in addressing certain threats.

### **Regional Action: Develop Information and Tools**

The 2005 and 2015 Northeast SWAPs identified data deficiency as a limiting factor in the effective conservation of SGCN and their habitats in their states. They identified species and habitats of greatest conservation need, but differences in available data, capacity, and approaches to prioritization posed a further challenge to collaborative, regional conservation. Many of the SWAP SGCN and SGCN/Watchlist species lack the current, consistent status, habitat, threat, and other information needed to inform effective conservation in the Northeast.

Priority actions to address this need are as follows:

- Identify and develop regionally consistent information and priorities for species, key habitat, and threats, including climate vulnerability.
- Develop and apply targeted and inclusive communication of NEFWDC priorities and products (from SWAPs, RCN, and key partners) to inform and guide regional conservation planning and incorporate into partner plans at all levels.
- Strategically focus “on-the-ground” conservation actions for regional habitat and species priorities by providing incentives, science-based best practices, techniques, tools, and information on land and water conservation to conserve RSGCN and their habitats.



### **Regional Action: Protect from Habitat Loss and Degradation**

The 2005 and 2015 SWAPs, the 2017 SWAP Synthesis, and the 2023 RSGCN process consistently identified that habitat loss and degradation from development, natural systems modification, and biological resource use as top threats facing Northeast RSGCN and their habitats. The Northeast region is among the most developed and modified areas in the United States, impacting RSGCN species and their associated habitats. A coordinated, regional approach and set of tools and guidelines to address land and resource use on Northeast landscapes and waters are needed, especially in the face of increasing impacts from climate change.

Priority actions to address this threat are as follows:

- Provide and encourage incorporation of SWAP and regional priorities into land, water and natural resource use plans, decisions, and management programs across the Northeast.
- Provide information and guidance with best practices and consistent protocols for RSGCN and their key habitats.
- Work with agencies and entities that regulate impacts to fish and wildlife habitats to develop and implement holistic, effective, consistent policies and approaches that incorporate climate projections into risk assessments across Northeast lands and waters to conserve and restore RSGCN and their habitats.

### **Regional Action: Protect from Disease and Invasive Species**

The 14 Northeast 2005 and 2015 SWAPS, the 2017 SWAP Synthesis, and the 2023 RSGCN process identified Invasives and Disease as top regional threats to fish and wildlife diversity in the Northeast. Imperiled species and habitats can be severely impacted or lost due to invasive species or disease, even if all other conservation objectives are met. Invasive species may be less negatively impacted by climate change than native species; or may even benefit from these changes. To effectively prevent or address these impacts, an effective, collaborative regional scale effort is required.

Priority actions to address this threat are as follows:

- Develop regionally coordinated and targeted early detection and rapid response strategies for the control and management of invasive, non-native species that pose threats to native wildlife or communities.
- Work with and through Northeast partners and networks for effective, inclusive, regional conservation.
- Use climate projections to estimate timelines and locations most vulnerable to invasive species spread and establishment.
- Coordinate with agencies and entities that regulate impacts to fish and wildlife habitats to develop and implement effective, consistent policies, incentives, and approaches to address invasives and disease across Northeast lands and waters.

### **Regional Action: Address Pollution and Aquatic Connectivity**

The 2015 SWAPS, 2017 SWAP Synthesis, and NEFWDTC identified pollution and the loss of aquatic connectivity as top threats facing aquatic RSGCN and their habitats across the Northeast.





Many RSGCNs are associated with aquatic habitats in the Northeast, but these habitats continue to be affected by pollution, water quantity and quality management challenges, and aquatic connectivity issues that can benefit from watershed-focused regional approaches. Climate change will exacerbate water quality issues, requiring environmental assessments and restoration actions to evaluate past management in light of these additional challenges to effectively address present and future conservation goals.

Priority actions to address this threat are as follows:

- Provide regional SWAP priorities for incorporation into local, state, and regional water management and watershed planning efforts, highlighting RSGCN and key habitats.
- Work with partners to improve aquatic connectivity, water management, and water quality for RSGCN and their habitats.
- Work with agencies and entities that regulate impacts to fish and wildlife habitats to develop and implement effective, consistent policies and approaches across Northeast lands and waters.

#### **Regional Action: Address Climate Change Impacts**

The 2015 SWAPS, 2017 SWAP Synthesis, and NEFWDTC identified climate change as one of the top five threats facing Northeast RSGCN and their habitats. One of the largest current challenges related to climate change is uncertainty. As information related to climate change and its effects becomes more available, it is increasingly important to incorporate climate-change scenarios into conservation decisions for priority regional species and habitats and to develop climate-smart actions.

Priority actions to address this threat are as follows:

- Collaborate with key climate change partners to provide the best available scientific data for RSGCN and climate-related conservation issues to inform existing and new actions developed to address climate change as both a threat and threat amplifier.
- Incorporate climate projections and information to assess future scenarios of risk and use this information to develop climate-smart actions.
- Use existing climate vulnerability data when possible and conduct Climate Change Vulnerability Assessments to assess risk.
- Develop a regional Climate Adaptation Strategy guided by the 2021 national plan, NE CASC, and other key partners' expertise and resources.

#### **Regional Action: Improve Coordination Across State Boundaries**

Conservation efforts for RSGCN must continue to include collaborative, cooperative landscape and watershed scale approaches, as species distributions and movements are not restricted by state boundaries. At the same time, constraints posed by limitations of funding and capacity make such collaborative efforts challenging. NEAFWA's technical committees are charged with developing and implementing regional projects that identify and address the top conservation targets and threats in the Northeast. Many of the needed actions are not under the authority or purview of state fish and wildlife agencies, so coordination and effective communication between the agencies impacting or regulating those impacts is essential. Clear, consistent,



inclusive messaging and communication are needed to inform and engage broader participation across the region.

One recent manifestation of this collaboration is the Northeast Landscape Wildlife Conservation Committee. Established in 2022 and housed within NEAFWA, the Committee builds on decades of interjurisdictional conservation in the Northeast and provides leadership and direction on large-scale landscape conservation needs and opportunities across the Northeast region. As a landscape-scale conservation partnership, the Committee undertakes work in the context of the long-term goal of sustaining healthy, connected, and resilient cross-border ecosystems that provide essential ecosystem and societal values for current and future generations. To emphasize the importance of cross-state collaboration, Maryland has added a new action that articulates our intention to remain involved with this effort, adapted from language provided by the Committee (see Appendix 6b).

Additional priority actions to address this need are as follows:

- Continue to collaborate and coordinate across state boundaries for effective landscape and watershed scale conservation of these regional priority species and habitats.
- Build state capacity and funding to more fully conserve, restore, and protect the SGCN, RSGCN, and their key habitats as identified in the 14 Northeast SWAPs.
- Develop improved, inclusive communication approaches for outreach, education, and technical assistance to target audiences including policy and land use decision makers, land managers, stakeholders, and the broader public to inform and engage them in addressing the top threat impacts to SGCN and key habitats.
- Coordinate with agencies and entities that regulate key impacts to fish and wildlife to develop and implement effective, consistent policies and approaches across Northeast lands and waters.

### **Regional Action: Develop and Implement Regional Monitoring**

The 14 Northeast 2005 and 2015 SWAPS, the 2017 SWAP Synthesis, and the 2023 RSGCN process identified monitoring as a key need for effective fish and wildlife diversity conservation in the Northeast. Substantial efforts and investments have been made to conserve RSGCNs and key habitats across the Northeast region. A coordinated monitoring approach and consistent methodologies are also necessary to determine the effectiveness of these conservation efforts and inform adaptive management at the regional scale.

Priority actions to address this need are as follows:

- Review and evaluate priorities, data, and tools, and their implementation.
- Review regional targets, indicators, incentives, laws, programs, and policies to ensure current relevance and conservation effectiveness.
- Develop and improve regional monitoring efforts to evaluate effectiveness and inform adaptive management at multiple scales.



- Work with agencies and entities that regulate impacts to fish and wildlife habitats to develop and implement effective, consistent monitoring policies and approaches across Northeast lands and waters.

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This chapter provides information pertinent to **Element #4** regarding conservation actions determined to be necessary to conserve the identified species and habitats, as well as the priorities for implementing such actions. It focuses on actions that address priority threat categories, which are applicable statewide, or are considered regional priorities. All conservation actions are listed in Appendices 6a and 6b. Chapter 7 will provide information pertinent to **Element #5** regarding approaches and strategies for monitoring Maryland’s Species of Greatest Conservation Need (SGCN), their habitats, and the effectiveness of implemented conservation actions.

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## Citations and Sources

- Crisfield, E. and the Northeast Fish and Wildlife Diversity Technical Committee (NEFWDTTC). 2022. *The 2022 Northeast Lexicon: Terminology conventions and data framework for State Wildlife Action Plans in the Northeast Region*. Northeast Association of Fish and Wildlife Agencies: Washington, DC.
- Terwilliger Consulting Inc. (TCI) and Northeast Fish and Wildlife Diversity Technical Committee (NEFWDTTC). 2017. Northeast State Wildlife Action Plan (SWAP) Synthesis: Regional Conservation Priorities. Northeast Fish and Wildlife Diversity Technical Committee of the Northeast Association of Fish Wildlife Agencies: Locustville, VA.
- Terwilliger Consulting, Inc. (TCI) and the Northeast Fish and Wildlife Diversity Technical Committee (NEFWDTTC). 2023. “Chapter 3: Threats to Northeast Habitats and Species.” In *Northeast Regional Conservation Synthesis for 2025 State Wildlife Action Plans*. Northeast Association of Fish and Wildlife Agencies: Washington, DC.

