CHAPTER 8: PUBLIC ENGAGEMENT

SWAP Element 8

Descriptions of the necessary public participation in the development, revision, and implementation of the plan.

Suggested components:

A. *The state describes the extent of its efforts to involve the public in the development of its Plan.*
B. *The State describes its continued public involvement in the implementation and revision of its Plan.*

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HOW TO USE THIS CHAPTER:

Chapter 8 of this Regional Conservation Synthesis provides a summary of available information on best practices for engaging the public in the development, revision, and implementation of State Wildlife Action Plans (SWAPs).

- The Regional Overview (Section 8.0) describes the purpose and need for public engagement in fish and wildlife conservation.
- Section 8.1 discusses changes in public values for fish and wildlife and recommendations from the Association of Fish and Wildlife Agencies for agency relevancy.
- Section 8.2 addresses outdoor recreation, the most prominent way that the public is engaged in fish, wildlife, and habitat appreciation and activities. It also addresses public health initiatives that incorporate outdoor recreation activities. State Comprehensive Outdoor Recreation Plans (SCORPs), and growing concerns about high-impact recreational activities on fish, wildlife, and habitats.
- Section 8.3 provides examples of education and outreach recommendations and resources, including extensive resources developed by Project WILD and Project Learning Tree.
- Section 8.4 summarizes resources and tools that address diversity, equity, inclusion, and environmental justice in wildlife conservation and management.
- Section 8.5 describes citizen science projects and programs that engage the public in fish and wildlife conservation in the region.
- Supplemental Information, such as the Threats Classification scheme, can be found in the Excel workbook with *Supplemental Information 3* for Chapter 3.

8.0 REGIONAL OVERVIEW

> *The social and ecological context for fish and wildlife conservation in North America is changing rapidly. Habitat loss, invasive species, declines in biodiversity, and the impacts of climate change are accelerating. At the same time, society is increasingly diverse, urban, and disconnected from nature. The number of hunters and anglers – the historic funding base for state fish and wildlife agencies – is declining. In response to these trends, fish and wildlife agencies must find ways to engage and serve broader constituencies to expand the financial and political support necessary to ensure the future of North America's conservation legacy.* (Association of Fish and Wildlife Agencies [AFWA] and The Wildlife Management Institute 2019, p. 8)

State Wildlife Action Plan (SWAP) Element 8 requires that plans describe how the public is engaged in not only developing but also implementing the plans. Over the past decade, since the 2015 SWAPs were developed, numerous resources and tools have been developed that can inform Element 8 of the 2025 SWAPs. This is particularly important in the Northeast region, with its high population density and levels of urbanization which provide many opportunities for SWAPs to engage the public in both development and implementation of the plans (AFWA and The Wildlife Management Institute 2019).

Guiding Principle 5 of the AFWA landscape conservation guidance states "Make SWAPs more accessible, understandable, and relevant to broad constituencies" (AFWA 2021, page 5). This Regional Conservation Synthesis contributes to two corresponding Recommended Actions:

5.1 Make SWAPs more accessible and user-friendly to both technical and general audiences by making them web-based, easily searchable, and by creating targeted products for specific users.

5.2 Improve communication and marketing to ensure SWAPs and related landscape conservation efforts are valued as an important tool for conserving biodiversity.

The Northeast Fish and Wildlife Diversity Technical Committee (NEFWDTC) website update (https://northeastwildlifediversity.org[1]) in 2023 allows for web-enabling this Regional Conservation Synthesis, the updated Northeast RSGCN Database (version 1.0), the Northeast SWAP Database, and associated communication tools and products. These tools and resources will be searchable with filters to provide detailed information for specific targets, purposes, or users. By linking with other NEFWDTC programs such

as the Regional Conservation Needs (RCN) Grants Program, regional information will be integrated in a centralized online platform available to the states, conservation partners, and the public.

8.1 SHIFTING PUBLIC FISH AND WILDLIFE VALUES

Increasingly, the role of the public is shifting from "stakeholders" in wildlife management to "beneficiaries" of wildlife conservation (Decker et al. 2015, 2019). Many people have associations with certain places, referred to as a "sense of place" in social science literature. Although a sense of place is not quantifiable, it may have defining characteristics that are related to fish and wildlife resources and their habitats. The defining characteristics of coastal communities as a sense of place or identity, for example, include the beach (habitat), the ocean (habitat), and common fish and wildlife like shorebirds, crabs, dolphins, and turtles (species). The undeveloped scenic vistas, forests, and rocky streams of the Appalachian Mountains along with experiences like viewing synchronous fireflies can create a distinctive sense of place for the public, one that is defined by—and in many cases inseparable from--fish and wildlife resources and their habitats. This interconnectedness of social and natural systems can be referred to as "socio-ecological systems" (Young et al. 2006). Colding and Barthel (2019) synthesized twenty years of scientific application of this socio-ecological systems framework, which is often used, in turn, to analyze the resilience of natural resource management systems.

The **Center for Conservation Social Sciences** at Cornell University in New York focuses on the interactions between social and ecological systems through research and outreach programs that advance social science assessment and stakeholder involvement in natural resource management. A list of publications related to the social science of fish and wildlife conservation conducted by the Center is available through its website[2]. Examples of publications from the past five years include studies on a wide variety of topics that can inform SWAP Element 8:

- hunter recruitment and retention,
- landowner views on providing public access for wildlife-dependent recreation,
- black land stewardship in the Northeast,
- response to messages about wildlife disease from hunters,
- incorporating biodiversity in municipal land use planning,
- community-based management approaches,
- inequity in the shale gas industry in the United States,
- good governance principles for environmental policy and planning,

- the effects of aquatic invasive and nuisance species on recreational fishing participation in the Great Lakes,
- public perceptions and attitudes towards large mammals like moose, bears, and wolves,
- integrating social and ecological sciences for natural resource decision making,
- sense of place and place attachments,
- modeling local stakeholder participation in landscape-level wildlife conservation,
- accessibility, and
- education and outreach effectiveness.

Increasing attention and efforts to incorporate social sciences into wildlife management and conservation have resulted in several assessments and analyses that identify shifting perceptions and values of public fish and wildlife values, barriers to public engagement in wildlife-associated recreation and management, barriers to the ability of fish and wildlife agencies to adapt to changing public values, and guidelines and recommendations for maintaining agency relevancy and increasing public engagement.

GOVERNANCE PRINCIPLES FOR WILDLIFE CONSERVATION IN THE 21ST CENTURY

Decker et al. (2015, p. 290) argue that "wildlife conservation is losing ground in the U.S. for many reasons…[with] the net effect [a] decline in species and habitat." Wildlife conservation institutions must adapt to social-ecological conditions to address this trend. Reflecting on the nature of good governance and the challenges governments often face in securing public trust, the authors developed a set of principles for ecologically and socially responsible wildlife conservation that addresses persistent and systemic problems. Challenges and opportunities related to the recommended principles are discussed; and further dialogue among scientists, practitioners, and other leaders in wildlife conservation in the United States is encouraged. The sections below include resources for future discussion developed by the Association of Fish and Wildlife Agencies (AFWA).

THE NATURE OF AMERICANS

The Nature of Americans is a national initiative[3] to understand and connect the American public with nature. It is supported by state and federal agencies, academia, business, and non-governmental organizations (NGO). The initiative addresses the national problem that people are increasingly disconnected from nature, the outdoors, and wildlife; it also describes opportunities for reconnection. Key findings from the national report include (Kellert et al. 2017, pp. 3-5):

- Americans face a significant gap between their interests in nature and their efforts, abilities, and opportunities to pursue those interests.
- Experiences in nature are deeply social.
- Adults and children differ in where they locate unforgettable, authentic nature.
- Access to nature is as much about the quality of places as their quantity.
- Americans value nature in remarkably broad, diverse ways.
- Americans support nature-related programming, funding, and conservation.
- Americans' relationship with nature is complex and nuanced.
- Americans perceive tremendous benefit from experiences in nature.

The Nature of Americans National Report (Kellert et al. 2017) provides 22 actionable recommendations to reconnect Americans with nature, all of which can inform public engagement components of Wildlife Action Plans. These recommendations relate to outdoor recreation, environmental education, outreach, and partnerships.

AMERICA'S WILDLIFE VALUES

The Western Association of Fish and Wildlife Agencies and Midwest Association of Fish and Wildlife Agencies recently administered the **America's Wildlife Values** project, funded by a Multistate Conservation Grant from the U.S. Fish and Wildlife Service, Wildlife and Sport Fish Restoration Program and AFWA. Researchers from Colorado State University and The Ohio State University conducted public and agency culture surveys and developed a multi-level model of the effect of modernization on wildlife management (Manfredo et al. 2018). The purpose of the project was to assess the social context of wildlife management as a way to understand the growing conflict surrounding wildlife management practices.

Four wildlife value orientation types were identified across the United States (Manfredo et al. 2018):

- *Traditionalists*: who believe that wildlife should be used and managed for the benefit of people
- *Mutualists*: who believe that seeing wildlife is a part of their extended social network
- *Pluralists*: whose orientation toward either end of the spectrum (traditionalist vs. mutualist) varies with different situations or in different contexts
- *Distanced*: those with low levels of thought about and interest in wildlife

Nationally the study found 35% of Americans to be mutualists, 28% traditionalists, 21% pluralists, and 15% distanced. Detailed information is available for individual states, illustrating differences in the public's wildlife-related values across regions. The study

RSGCN with Cultural Values

*Seven Northeast RSGCN are identified to have Cultural Values as contributing factors in their identification as RSGCN in 2023: American Shad (*Alosa sapidissima*), Alewife (*Alosa pseudoharengus*), Pale-bellied Brant (*Branta bernicla hrota*), American Black Duck (*Anas rubripes*), American Woodcock (*Scolopax minor*), American Lobster (*Homarus americanus*), and Bay Scallop (*Argopecten irradians*). The Bay Scallop is of particular importance to the Wampanoag Tribe, which is using Tribal Wildlife Grant funds to restore eelgrass habitat in coastal Massachusetts as part of a long-term recovery program for the species.*

also summarizes global shifts in wildlife values over time as the social-ecological environment changes, and how the results of their analyses inform whether shifts are detectable in the United States. The authors conclude that modernization has influenced America's Wildlife Values at the state level, specifically with regard to education, income, and urbanization. They found that higher education, higher income, and living in mid- to large-sized cities is associated with higher proportions of mutualists vs. traditionalists in the population overall. "The primary forces affecting change in values at the state level are population migration and generational replacement" (Manfredo et al. 2018, p. 17).

Shifts in wildlife values were found to affect attitudes towards wildlife management issues, increasing the potential for conflict. The study survey included questions related to the highly controversial topic of lethal control of predators and other high-profile environmental issues such as climate change, private property rights, and protection of declining or endangered species. Support for environmental protection over economic growth is higher in states with a greater proportion of mutualists, and belief that private property rights outweigh conservation of declining or imperiled species is more prominent in states with more traditionalists. The composition of wildlife values in a state had a very strong effect on the level of support for lethal control of predators, with opposition increasing with the proportion of mutualists in a state in all hypothetical scenarios while traditionalists are more supportive but that support varies with the scenario (Manfredo et al. 2018).

The America's Wildlife Values study also evaluated factors relating to public participation in wildlife-related recreation and state fish and wildlife agency funding, public trust, and structure. Recommendations from the national report include measures relating to agency culture and the mission of state fish and wildlife agencies, governance styles, accountability, and public engagement. Manfredo et al. (2018, p. 82) recommend an ongoing dialogue within state fish and wildlife agencies, that asks the following questions:

- How can we envision the situation in the state in 20-30 years given current trends?
- What effect will these changes have on the agency?
- How can we retain our traditional emphasis while embracing new stakeholders?
- What challenges or issues exist today that we need to address in achieving our job more effectively?

The answers to all these questions could inform SWAP planning.

FISH AND WILDLIFE RELEVANCY ROADMAP - AFWA

In 2019 the Association of Fish and Wildlife Agencies released the **Fish and Wildlife Relevancy Roadmap: Enhanced Conservation Through Broader Engagement**, version 1.0 (AFWA and the Wildlife Management Institute [WMI] 2019), hereafter referred to as the *Relevancy Roadmap*. The *Relevancy Roadmap* is a practical guide designed to assist fish and wildlife agencies in their efforts to engage and serve broader constituencies, describing the recommendations of the **Blue Ribbon Panel on Sustaining America's Diverse Fish and Wildlife Resources** (AFWA 2016). The guide identifies 19 barriers to engaging broader constituencies relating to agency culture, agency capacity, constituent culture, constituent capacity, and political and legal constraints. Strategies, steps, and tactics are recommended to overcome each barrier, with examples of current agency efforts that are already working to address this issue.

One of the resources developed by the Blue Ribbon Panel's Relevancy Working Group as part of this initiative was an annotated bibliography of literature addressing transformation in state fish and wildlife agencies (AFWA 2018). The annotated bibliography found multiple summary findings, including that the relevance of wildlife conservation, and thus the relevance of state agencies, is determined from the perspective and judgement of citizens not the agencies themselves. The next section summarizes the subsequent 2019 AFWA report on America's Wildlife Values to inform this issue (AFWA 2019).

8.2 OUTDOOR RECREATION

The public is engaged with nature and its fish and wildlife resources through a variety of outdoor recreation activities. Outdoor recreation offers an opportunity for the public to appreciate fish and wildlife and their habitat, fostering a sense of responsibility and support for wildlife conservation. Too much outdoor recreation, however, can lead to

human disturbance that threatens those fish and wildlife resources and their habitats. Several resources are available to assist SWAPs in planning and managing outdoor recreation.

AFWA (2018, p. 1) found that state fish and wildlife agencies need to "recognize and accept that wildlife conservation is in the outdoor recreation business." This literature review of state fish and wildlife agency transformation also found that "wildlife management is the guidance of decision-making processes and implementation of practices to purposefully influence interactions between people, wildlife and habitats to achieve impacts (benefits) valued by stakeholders (citizens)" (AFWA 2018, p. 2). Participation in traditional outdoor recreation activities is declining while at the same time an increasingly diverse and urbanized public creates the need for agencies to adapt to the changing societal context of wildlife management. Traditional stakeholders retain an essential role in wildlife management, however, which should not be diminished (AFWA 2018). This section highlights resources and tools available to address outdoor recreation planning and management, informing the needs identified by AFWA's Blue Ribbon Relevancy Working Group.

8.2.1 OUTDOOR RECREATION PLANNING RESOURCES

TRENDS IN OUTDOOR RECREATION

The **National Survey of Fishing, Hunting, and Wildlife-Associated Recreation** from the USFWS is one of the oldest and most comprehensive wildlife-related recreation surveys in the U.S. First undertaken in 1955, this national survey collects information on anglers, hunters, and wildlife watchers, monitoring the number of people, how often they participate in these activities, and how much money they spend on outdoor wildlife-associated recreation. The survey is conducted every five years, allowing for long-term trend analysis. The monitoring information in the national outdoor recreation survey can inform the status and trends of biological resource use and human disturbance from recreational activities for SWAPs as well as public engagement in wildlife-associated activities. The 2016 survey found a 16% increase in the total number of people over age 16 participating in wildlife-related recreation (USFWS and US Census Bureau 2018). The increase was attributed primarily to those watching wildlife, which increased 20% to more than 86 million people. The most recent survey was conducted in 2022, with results expected to be released mid-2023.

Recent trends indicate that although many Americans still participate in nature-related outdoor recreation, more and more are likely do so through non-consumptive activities and less likely to do so in the context of fishing or hunting (WMI and Responsive Management 2021). The **America's Wildlife Values** project found that "the

percentages of people expressing an interest in future hunting (16%) and fishing (32%) are lower than rates of past participation, while wildlife viewing has higher future interest (52%) compared to past participation" (Manfredo et al. 2018, p. 8). Although future interests were lower than in previous surveys, they were still higher than the results of the 2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation and thus support a need for increased outdoor recreation planning.

STATE COMPREHENSIVE OUTDOOR RECREATION PLANS (SCORPS)

State Comprehensive Outdoor Recreation Plans (SCORPs) describe a state's goals and priorities for outdoor recreation, updated every five years as required by the federal Land and Water Conservation Fund. Individual SCORPs are not on the same revision cycle across the Northeast, with the current plans covering 2017-2022 for some states and 2020-2025 for others. There is extensive public engagement in the development of SCORPs. Polls, surveys, and focus groups are used to determine the public's outdoor recreation needs and wants. Detailed information includes demographic and public participation data on outdoor recreation in the state. The priorities outlined in a SCORP may be implemented at the local level through state and federal grant programs for parks, trails, and a variety of outdoor recreation related projects. The **Society of Outdoor Recreational Professionals** maintains a directory[4] of SCORPs. The 2020 update of the Pennsylvania SCORP, for example, includes the results of a project undertaken by The Trust for Public Land to map public access to the state's outdoor recreation areas, waterways, and trails with demographic data, spatially identifying areas of the greatest need for improved public access. Collaboration and coordination between SWAPs and SCORPs present an opportunity to address both the needs and the potential threats of public access to wild spaces.

STATE FOREST ACTION PLANS

Forests and Woodlands are managed at the state level through **State Forest Action Plans (SFAPs)**. The SFAPs outline conservation strategies and priorities similar to a SWAP and are eligible to receive federal funding as authorized by the Cooperative Forestry Assistance Act (see *Chapter 2* for more information). SFAPs are required to incorporate SWAP information, which states have done within the framework of their habitat assessments, strategies, and shared priorities or goals. The SFAPs of the Northeast were updated in 2020. The US Forest Service and Northeast-Midwest State Foresters Alliance synthesized the 2020 State SFAPs from the Northeast and Midwest and released a regional summary report in 2022 (USFS and Northeast-Midwest State Foresters Alliance 2022). With SFAPs updated on a 10-year cycle that falls halfway between the 10-year cycle of SWAPs, the regional summary report identified "tremendous opportunities for further collaboration on wildlife habitat strategies with state and regional wildlife and forestry agencies, organizations, and other partners" (USFS and Northeast-Midwest State Foresters Alliance 2022, p. 15).

The regional SFAP summary report identifies more than a dozen common themes across the 21 individual documents, including forest-based recreation (USFS and Northeast-Midwest State Foresters Alliance 2022). Individual state Plans include outdoor recreation and environmental education components, providing an opportunity to jointly address the planning and management needs of recreation and education with SWAPs. Individual State Forest Action Plans are available through the National Association of State Foresters[5].

The **US Forest Service Landscape Scale Restoration Grant Program** is a competitive grant program to address landscape level issues on state, tribal, and private forests and woodlands. Conservation strategies of State Forest Action Plans are prioritized, and projects are evaluated and awarded regionally. A **Landscape Scale Restoration Manual** and **Landscape Scale Restoration Project Planning Tool** are both available to guide conservation projects. The planning tool and shared conservation strategies of SFAP and SWAPs, as related to outdoor recreation and environmental education provide opportunities for collaborative projects potentially fundable by the grant program. An inventory of Landscape Scale Restoration Projects is available[6].

RECREATIONAL OPPORTUNITY SPECTRUM (ROS)

The United States Forest Service (USFS) developed the **Recreational Opportunity Spectrum** (ROS) to classify public access to National Forests. This document has informed the federal agency's planning since the 1970s (Clark and Stanley 1979, Brown 1982, Lee et al. 2013). The classification system incorporates land use, the level of human disturbance at a site, and the distance between the site and roads to determine potential outdoor recreation opportunities that the land can sustainably provide. The premise of the ROS is that people are linked with the landscape, where visitors engage in an activity at a setting land managers choose, resulting in experiences and benefits; or that, by managing for specific setting characteristics, managers will provide specific recreation experience opportunities and beneficial outcomes (Lee et al. 2013).

The **National ROS Inventory Mapping Protocol** includes five ROS setting indicators to monitor and analyze the effects of outdoor recreation on public lands owned by the US Forest Service (Hill 2019):

1. *Remoteness* – distance from motorized use of roads and trails
2. *Size*
3. *Evidence of humans* – evidence of visitor impacts and/or management activities (e.g., roads, oil and gas development, mining, timber harvest, vegetation treatments, livestock grazing, development and facilities infrastructure, etc.)
4. *Visitor density* – number of people encountered

5. *Visitor management* – level of information (i.e., signs), interpretation, and regulations placed on visitor activities

"The size of an area is used [as an indicator in the Recreation Opportunity Spectrum] to indicate greater or lesser potential for self-sufficiency related to a sense of vastness, where large, relatively undeveloped areas tend to provide a sense of vastness and smaller, developed areas less so as one moves across the spectrum" (Hill 2019, p. 3). The other three indicators relate to human use and management of outdoor natural spaces, which affect both the characterization of the outdoor recreational space and visitor experiences and perceptions.

Lands are assessed using available spatial datasets to categorize the following land classes along a spectrum of these five indicators (Hill 2019):

- *Urban*:
    - Areas within 0.5 mile of motorized routes (including roads, railroads, aircraft landing strips, trails, and waterways)
    - Setting strongly dominated by structures, roads, parking lots, etc.
    - High degree of visitor interaction, people are in constant view
    - Intensive on-site management, obvious signage and agency staff
    - Motorized travel restricted to designated routes
    - Route densities greater than 8 miles per square mile of area
- *Rural*:
    - Areas within 0.5 mile of motorized routes
    - Natural setting is culturally modified such that it is dominant to observers, readily apparent structures are small dominant clusters to scattered
    - Moderate to high visitor interaction on roads, trails and in developed sites, people in constant view
    - On-site management obvious and numerous, mostly in harmony with human environment, obvious signage and agency staff
    - Motorized travel common
    - Route densities between 2.5 and 8 miles per square mile of area
- *Roaded Natural*:
    - Areas within 0.5 mile of motorized routes
    - Motorized vehicle use primarily by standard passenger vehicles
    - Natural setting may have modification that ranges from easily noticed to strongly dominant to observers, structures are scattered
    - Moderate evidence of visitor sights and sounds, moderate to high concentrations of visitor use on roads, moderate to low concentrations on trails and at developed sites
    - Amenities and management controls nearby

    - On-site management noticeable but harmonize with the natural environment, moderate likelihood of encountering agency personnel or volunteers/partners
    - Route densities less than 2.5 miles per square mile of area
- *Semi-primitive Motorized*:
    - Size of at least 2500 acres unless adjacent to a wilderness area or isolated due to topography or other permanent landscape features (with informed judgement)
    - Areas within 0.5 mile of motorized routes (including roads, railroads, aircraft landing strips, trails, and waterways)
    - Motorized vehicle use primarily high clearance or four wheel drive vehicles
    - Low to moderate visitor interaction on trails and developed sites
    - On-site management present but subtle with designated motorized routes or areas
- *Semi-primitive Non-motorized*:
    - Size of at least 2500 acres unless isolated due to topography or other permanent landscape features (with informed judgement)
    - Areas between 0.5 and 3.0 miles from motorized routes
    - High probability of solitude, closeness to nature requiring self-reliance
    - On-site management present but subtle
- *Primitive*:
    - Size of at least 5000 acres
    - Areas at least 3 miles from motorized routes
    - Very high probability of solitude, closeness to nature with little evidence of people, requiring self-reliance
    - Low to non-existent on-site management

The resulting geospatial analysis identifies these six land classes, adding informed professional judgement where needed along with the option to add unique or special opportunity features such as cultural or heritage resources, scenic vistas, adjacent national parks and monuments, or a unique activity or type of use. An ROS inventory map and analysis for public land informs management by identifying places that may need additional management actions to improve existing conditions or reach desired conditions (Hill 2019, Lee et al. 2013). Desired conditions take into account management objectives other than recreation, which may include imperiled species populations and their habitat or designated wilderness areas.

The Trust for Public Land adapted the protocol for a recent outdoor recreation and equity analysis of Pennsylvania's public and open access lands (Trust for Public Land 2020). This tool was developed and has been used to inform planning on National

Forests and National Grasslands with the US Forest Service. The designated land classes were defined as:

- *Urban*: low density developed or greater (designated in the US Department of Agriculture Cropland data layer; see *Chapter 2*, *Section 2.22* for details on this geospatial dataset)
- *Crop*: any crop designated in the US Department of Agriculture Cropland data layer
- *Water*: any waterbody in the National Hydrography Dataset except swamps and marshes
- *Disturbed*: abandoned mines, coal mining operations, and industrial mining operations with 100-meter buffers, excluding remediated lands
- *Back Country*: site located more than 0.5 miles from an unpaved road, 1 mile from a local or low volume road, or 2 miles from a high-volume road
- *Mid Country*: site located more than 0.25 miles from an unpaved road, 0.5 mile from a local or low volume road, or 1 mile from a high-volume road
- *Front Country*: site located more than 0.25 mile from a local or low volume road or 0.5 miles from a high-volume road
- *Rural*: sites within 0.5 miles of a high-volume road or 0.25 miles of a local or low volume road

This assessment technique can identify opportunities to improve access to outdoor recreation, as was done at the county level throughout Pennsylvania. The resulting statewide analysis identified numerous recommendations for how its findings could be incorporated into planning for parks, trails, and open space; partnering with private landowners; prioritizing funding opportunities; collaborating with local planning authorities; economic development; and collaborating with the Department of Transportation regarding opportunities with public transit, signage, and safety improvements (Trust for Public Land 2020). This type of outdoor recreation and equity analysis could be used to identify conserved or protected lands with limited public access, should human disturbance be identified as a threat to imperiled resources on those lands as part of SWAP analyses of threats to Key Habitats for Species of Greatest Conservation Need (SGCN).

8.2.2 OUTDOOR RECREATION MANAGEMENT

In recent years there has been “an unprecedented surge in outdoor recreation,” which simultaneously creates an increased opportunity to engage the public with fish and wildlife conservation but also poses threats to animal, human, and environmental health (AFWA 2022, p. 20). The US Forest Service recognizes the challenge of outdoor

recreation as an economic driver that also carries with it the need to provide high quality recreational access and experiences[7]. With increasing urbanization and population shifts to areas closer to public lands, the agency notes that many forests are now enjoyed as regional and municipal parks, in ways that adds strain to visitor services, facilities, and natural resources. Recreation that is unmanaged contributes to habitat degradation, damaged heritage sites, conflicts between users, and degraded recreation facilities. Existing outdoor recreation facilities and programs may not align with all cultural traditions.

Recently, several states in the NEAFWA region have initiated programs or projects related to outdoor recreation management. During the recent COVID-19 pandemic, visitation to the Adirondack Mountain Reserve of New York exacerbated a long-term trend, leading to issues with parking, trash, and safety concerns. In 2021, the New York Department of Environmental Conservation and the Adirondacks Mountain Reserve initiated a hiking reservation system to manage summer visitation at the most popular trails. Visitation is capped at the number of parking spaces available.

The Vermont Departments of Fish & Wildlife and Forests, Parks & Recreation published a **Wildlife and Recreation: Understanding and Managing the Effects of Trail Use on Wildlife** in 2021 (Naughton 2021). This report includes a literature review of the effects of trail-based recreation on Vermont's wildlife and offers recommendations to minimize those effects. Guidelines for developing a recreation ecology monitoring protocol are also provided.

The New Hampshire Fish and Game Department, with support from the USFWS and other partners, developed a **Trails for People and Wildlife: A Guide to Planning Trails that allow People to Enjoy Nature and Wildlife to Thrive** guidebook and mapping tool that assesses existing trails and informs siting of new trails in the most wildlife-friendly way (New Hampshire Fish and Game Department 2019). The guidebook describes how outdoor recreation can threaten wildlife and how to use the new tool to minimize impacts. It also provides case examples of how conservation organizations have implemented the tool.

Recreational activities are categorized into ten types (see *Supplemental Information 3*, Threat 6.1) that impact a variety of RSGCN and Proposed RSGCN. Only one type of recreational activity, drones (Threat 6.1.6), is not currently known to threaten any Northeast RSGCN or Proposed RSGCN. Motorized vehicle use for recreation (Threat 6.1.1) and recreational boating (Threat 6.1.4) threaten the highest numbers of RSGCN and Proposed RSGCN in the Northeast. Wildlife observation and photography (Threat 6.1.8) and recreational use of beaches (Threat 6.1.10) also threaten a significant number of species.

Recreational activities impact a variety of RSGCN and Proposed RSGCN taxonomic groups in the Northeast. Birds, mammals, and reptiles are the most widely threatened taxonomic groups by multiple forms of recreational activities, with each impacted by six or seven types of human recreational disturbance. Recreational motorized vehicles and boats affect the highest number of taxonomic groups (11 and ten respectively). Nearly 90% of the RSGCN and Proposed RSGCN tiger beetles are threatened by recreational motor vehicle use, as are 56% of the RSGCN and Proposed RSGCN reptiles.

Three habitat types for RSGCN and Watchlist species are particularly sensitive to impacts of outdoor recreation – caves, alpine, and beaches (see *Chapter 2* for detailed information on the extent and condition of these habitats in the Northeast). The following sections describe new management guidelines and resources available for the 2025 SWAPs on this topic.

MANAGEMENT OF HUMAN DISTURBANCE IN CAVES

Caves and karst systems are examples of RSGCN and Watchlist species habitat that are threatened by human disturbance from recreational caving and tourism in the Northeast and beyond (Threat 6.1.7). Seven RSGCN and Proposed RSGCN, including one amphibian and six bats, are threatened by caving. Many large cavern systems are open to the public for tours and exploration and often are referred to as "commercial caves" or "show caves." These cave and cavern systems have been impacted by human disturbance, sometimes for more than a century. Grand Caverns in Virginia has been open to visitors since 1806 and Howe Caverns in New York since 1843. At least one RCN project and two conservation organizations have developed management guidelines to address human disturbance in cave habitats.

In 2016, the RCN Program awarded funding to Connecticut, New Jersey, New Hampshire, Pennsylvania and Rhode Island to increase the suitability of identified bat winter hibernation sites by reducing human disturbance as part of the **Gating Caves for Bat Conservation and Protection** project. Project funds supported construction or improvements of gates to the openings in caves and mines, structural enhancements to the sites to create better habitats, installation of a sign template for consistent messaging, and the placement of remote site surveillance if needed (see *Chapter 4* for additional project details).

The **National Speleological Society** is an organization[8] that has been exploring, conserving and researching caves in the US since 1941. The organization's website includes several environmental education resources on cave fish and wildlife, threats like White Nose Syndrome, safety, and responsible caving practices. The Conservation Division of the National Speleological Society focuses on decontamination procedures to reduce the spread of WNS, restoration and repair techniques, and minimizing the impact of caving by humans with recommended conservation and preservation policy

guidelines. Communication messaging developed by the National Speleological Society to encourage responsible, low impact caving advises visitors to *Cave Softly. Take nothing but pictures. Kill nothing but time. Leave nothing but footprints*.

Bat Conservation International is an organization whose mission is to conserve bats through science-based conservation, development of new conservation tools and techniques, and the prioritization of conservation strategies and targets[9]. One of the current goals of the organization is to protect and restore roosting and foraging habitat for bats, including in abandoned mines that provide ideal roosting habitat. Their Abandoned Mines Initiative collaborates with government partners to identify significant bat habitat and develop long-term protection and management plans. Guidance has been developed on the installation of bat-compatible gates at mine entrances and more than 5000 mines have been surveyed by the organization since 2008. Bat Conservation International also partners with federal agencies to develop spatial datasets of priority bat habitats and implement BMPs for bat conservation on public lands.

MANAGEMENT OF HUMAN DISTURBANCE TO ALPINE HABITAT

Alpine habitats are threatened by human disturbance, specifically off-trail recreational use and trampling. Alpine plants are not adapted to being walked on, and it may take decades for bare ground that has been impacted by trampling to fully recover with a healthy plant community. In New York the Adirondack Mountain Club established a summit steward program more than 30 years ago that protects alpine areas from visitor impacts using education to help hikers appreciate the uniqueness and value of the habitat and to foster a sense of responsibility for its care. The stewards enlist visitors to carry rocks from trailheads to the alpine areas to line designated trails and restore degraded areas.

Two Northeast RSGCN butterflies, the White Mountain Arctic (*Oeneis melissa semidea*) and the White Mountain Fritillary (*Boloria chariclea monitus*), are endemic to the alpine habitat on Mount Washington in New Hampshire. The USFWS At-Risk Species Program is partnering with New Hampshire Fish and Game, the White Mountain National Forest, the Mount Washington Observatory, and the Appalachian Mountain Club to develop and produce a public awareness and education campaign that informs the public of the presence and predicament of these species and to create signage marking sensitive areas.

MANAGEMENT OF HUMAN DISTURBANCE ON BEACHES

Beaches and dunes are another example of an important habitat for RSGCN and Watchlist species that is threatened by human disturbance from recreational use in the Northeast. USFWS (2020) synthesizes the current state of knowledge on the impacts of

recreational disturbance to shorebirds and found that levels of recreational use of beach and dune habitats is increasing.

Human disturbance of beach and dune habitat and associated species occurs in many forms. Motor vehicles and recreational boating threaten more RSGCN and Proposed RSGCN than any other type of recreation, including those taking place on beaches. Off-road vehicles degrade beach habitat with tire ruts. They can crush and kill unfledged shorebird chicks and sea turtle hatchlings, and flush nesting, foraging, and roosting birds (Threat 6.1.1). Recreational boating threatens wildlife when beaching boats come ashore in areas that are foraging habitat, flushing birds, and allowing human and pet access to otherwise undisturbed shoals and salt marsh (Threat 6.1.4).

Special events like fireworks displays during the summer months or as part of July 4th celebrations disturb and flush nesting and roosting shorebirds and waterbirds (Threat 6.1.9). The USFWS has developed management guidelines for fireworks near beach-nesting bird sites (USFWS 1997).

One of the most significant forms of human disturbance to beach and dune wildlife is recreational use of beaches, which threatens at least 18 RSGCN and Proposed RSGCN in the Northeast, including 29% of RSGCN and Proposed RSGCN birds, 31% of the reptiles (sea turtles), and 50% of the tiger beetles. The cumulative effect of recreational use of beaches with shoreline modifications and beach development (Threats 7.3.1 and 7.3.4 respectively) has been shown to decrease survival rates and body condition of the federally-listed and RSGCN Piping Plover (*Charadrius melodus*; USFWS 2012, 2020; Threat 6.1.10). USFWS (2020, p. 14) found that human disturbance from recreation "can be functionally equivalent to habitat loss if the disturbance prevents birds from using the area or extends the time and energy needed to fed and rest." Heavy human use of beaches for swimming, sunbathing, athletic activities, fishing, and dog-walking disturb nesting shorebirds and waterbirds in particular. Natural resource managers typically install symbolic fencing and signage around bird nesting areas to educate the public about imperiled species such as RSGCN Piping Plovers and limit potential trampling of nests or handling of eggs. The USFWS has developed management guidelines for recreational activities near beach-nesting bird sites (USFWS 1994, 2015), yet recreation remains a pervasive threat to many SGCN, RSGCN, and Watchlist birds.

To address this threat, conservation partners in the Northeast have developed new guidelines and best practices for evaluating and managing additional aspects of human disturbance to beach wildlife, including beach walking and dogs (Mengak et al. 2019, Comber et al. 2021). Social scientists at Virginia Tech collaborated with the USFWS, the **Atlantic Flyway Shorebird Initiative (AFSI)**, state wildlife agencies, and other partners to develop a strategic communication plan (USFWS 2017), identifying the most effective ways to educate the public about the potential adverse effects of outdoor

recreation on beach wildlife[10]. The AFSI created an online information sharing database to distribute the new guidelines as well as education and outreach materials, signs, infographics, and consistent messaging. These resources provide new information, understanding, and best practices to address threats from recreational use of beach and dune key habitats for SGCN and RSGCN in the Northeast, including consistent messaging and distribution of outreach materials across the region.

8.2.3 PUBLIC HEALTH INITIATIVES

There is "overwhelming evidence [that] shows the physical, psychological, and social wellbeing of humans depends on contact with nature" (Kellert et al. 2017, p. 3). A growing number of programs and initiatives encourage or incorporate outdoor recreation or nature-based activities as part of public health. As the public became increasingly engaged and involved in outdoor recreation, both consumptive and non-consumptive, during the COVID-19 pandemic, it created new opportunities for human interactions with wildlife that have the potential to increase public appreciation for natural resources and the environment. It also created more opportunities for threats such as infectious diseases to spread between humans and animals (AFWA 2022). Holistic public health initiatives are giving new and wider attention to this issue.

ONE HEALTH INITIATIVE

The **One Health Initiative** recognizes the interconnectedness of animal, human, plant, and environmental health with the goal of promoting, improving, and defending the health and well-being of all species through cooperation and collaboration across disciplines[11]. The transdisciplinary approach involves efforts at the local, regional, national, and international scale. Partners in the United States actively participating in the One Health Initiative include the Environmental Protection Agency (EPA), United States Department of Agriculture, Department of the Interior, the Centers for Disease Control and Prevention, multiple professional medical and veterinary associations, academia, and industry. At the state level, the Association of State and Territorial Health Officials, Environmental Council of States, State Environmental Health Directors, and AFWA all support the One Health Initiative.

The **US One Health Commission** creates, connects, and educates networks of partners using the global One Health approach to promote environmental resilience and improve the health outcomes and well-being of animals, humans, and plants[12]. The Commission was created by the American Veterinary Medical Association, American Medical Association, and other partners and issues annual reports that highlight the programs and impacts of the organization's efforts to apply the One Health Initiative in the US and beyond. Some of these programs include an annual **Global One Health**

Day on November 3, hosting One Health Day student event competitions, a monthly newsletter, education and outreach resources and initiatives, a **Bat Rabies Education Team**, and the **One Health Social Sciences Initiative** that encourages collaboration with the social science disciplines. Numerous educational resources and toolkits are available to assist partners in monitoring, managing, and communicating to the public about zoonotic diseases, emerging infectious diseases, antimicrobial resistance, and more.

One of the current strategic and legislative priorities of AFWA is to strengthen the One Health Initiative by incorporating the expertise and resources of state agencies into planning and partnerships, with a particular focus on the prevention of current and emerging zoonotic diseases. AFWA Resolution 2022-02-04 expressly supports the One Health Initiative and encourages application of its principles, including its adoption as a funding priority for the 2022 Multistate Conservation Grant Program. AFWA, the EPA, the Association of State and Territorial Health Officials, and the Environmental Council of States have sponsored informational webinars on One Health, with recordings available[13].

In November 2022 AFWA completed **The Association of Fish and Wildlife Agencies and the One Health Approach: Providing the Foundation for a Leadership Role**. It discusses the opportunity for fish and wildlife agencies to take a leadership role in the One Health Initiative and to fulfill the need for greater representation of the fish, wildlife, and habitat fields in the transdisciplinary approach (AFWA 2022). "At the same time, [this increased role could] capture a wider community of interest in the issues and realities facing wildlife and wildlife agencies. This [opportunity] all comes at a propitious time, considering that there has been increased engagement by the public in outdoor recreation (both consumptive and non-consumptive) because of the social circumstances spurred by the recent Covid-19 pandemic" (AFWA 2022, p. 1). The 2022 white paper provides a comprehensive overview of the One Health approach and the context for AFWA's engagement with it, plus recommendations on how to overcome barriers to implementation of the approach. A list of the jurisdictional One Health institutions and related legislation within the United States and Canada is provided in an appendix, along with a list of resources and toolkits to help implementation of the Initiative.

The Centers for Disease Control and Prevention (CDCP) coordinates federal One Health activities in the United States. Federal efforts related to One Health are described through the agency's website[14]. For example, the CDCP operates a **One Health Harmful Algal Bloom System[15]**. This surveillance system collects information to assist partners in understanding harmful algal blooms and working to prevent associated human and animal illnesses. Health promotion materials and partner toolkits

are available for use by the public, physicians, veterinarians, and other interested groups.

The Department of the Interior supports the One Health approach through the wildlife disease surveillance and research efforts of the United States Geological Survey (USGS) and United States Fish and Wildlife Service (USFWS). The USGS is contributing to the national zoonotic disease response by collaborating with the USFWS, AFWA, and other partners to develop a network that includes all aspects of wildlife disease biosurveillance, from predicting threats, assessing their impacts, and selecting management options to quickly apply the most up-to-date scientific findings. The USGS and USFWS are developing a national wildlife disease database that will enhance the **Wildlife Health Information Sharing Partnership-Event Reporting System** (**WHISPers**, see *Chapters 3* and *5*) and create a new **Aquatic Disease and Pathogen database (AquaDePTH)**. The USFWS zoonotic disease grant program has added a requirement that all grant recipients utilize the WHISPers platform to further enhance the database. The **National Wild Fish Health Survey** of the USFWS partners with natural resource managers to monitor and evaluate aquatic diseases (see *Chapter 5*).

The United States Department of Agriculture (USDA) contributes to the One Health Initiative through its programs that seek to maintain or reduce health risks to animals, humans, and the environment[16]. USDA programs and projects incorporating the One Health approach include those related to antimicrobial resistance, avian influenza, and influenza in swine, among others. A new antimicrobial resistance dashboard and a biosecurity tool to help prevent and minimize future pandemics are currently in development. The USDA Animal and Plant Health Inspection Service (APHIS) has established programs to monitor and research animal and plant health and has adopted the One Health approach into much of its work[17]. During the federal Fiscal Year 2023, APHIS offered a $25 million grant program to research SARS-CoV-2, the virus that causes COVID-19, in animals. APHIS maintains a public surveillance dashboard of SARS-CoV-2 detected in animals[18].

EPA contributions to One Health[19] include:

- the **Total Environment Framework** that evaluates children's neurodevelopment and obesity; **Report on the Environment** (see *Chapter 5*);
- the **EnviroAtlas** that combines large geospatial datasets relating to human, animal and environmental health;
- wastewater-based disease surveillance; and
- efforts related to:
    - harmful algal blooms,
    - climate change,

- watershed planning and protection,
- the citizen science project **Smoke Sense** that monitors wildfire smoke exposure,
- the **AirNow** partnership that monitors air quality,
- pesticides exposure and regulation, and
- decontamination of biological contamination events.

CONSERVATION MEASURES PARTNERSHIP (CMP) RESOURCES

The Conservation Measures Partnership (CMP) recently completed two comprehensive socio-ecological projects. The **Population, Health and Environment Collaborative Learning Initiative** sought to improve the understanding of the value of integrating public health and biodiversity conservation[20]. This global project conducted five case studies that gathered real world evidence to improve the population, health and environment model and definition. The **Holistic Approach for Healthy and Resilient Social-ecological Systems Collaborative Learning Initiative** developed a clear definition of "holistic approach;" a situation assessment to determine when more holistic approaches are needed; a working theory of change; and recommendations on when and how to successfully use a holistic approach[21]. The premise of the initiative is that a multifaceted, holistic approach is warranted to achieve and sustain desired conservation and human health objectives because a significant portion of the high conservation value areas of the world are inhabited, surrounded, and/or owned or managed by people. The initiative recommends that public health and natural resource conservation objectives should be integrated within socio-ecological landscapes.

8.3 EDUCATION AND OUTREACH RESOURCES

Education and outreach are identified in the SWAPs as potentially effective tools to address the conservation needs of species and their habitats. Effective engagement of the public and stakeholders to implement SWAP Element 8 can be informed by recent resources, guidelines, and toolkits for shared conservation messaging, environmental education, and outreach activities. The NEAFWA **Northeast Conservation Information and Education Association**, for example, promotes public information, education, and participation in conservation activities in the Northeast region. The **Academics for Land Protection in New England (ALPINE) Network** provides educational resources for educators at the region's colleges and universities, from curriculum and case studies to events and programming[22].

The mission of the **National Environmental Education Foundation (NEEF)** is to cultivate an environmentally conscious and responsible public[23]. Established by the National Environmental Education Act and overseen by the EPA, the organization partners with governmental agencies, corporations, conservation organizations and others to develop and share environmental education resources, training, and opportunities. NEEF sponsors or partners with others to fund several opportunities focusing on public lands. These include accessibility grants to enhance access for people with disabilities, community learning centers, and demonstration projects that partner federal land-owning agencies with middle and high school students to deliver STEM programming. The Foundation co-sponsors the annual National Public Lands Day community event and Climate Superstars Challenge for middle school students, plus other programs to support habitat enhancement projects on public lands.

The **One Health Commission** has developed numerous environmental educational resources and toolkits for grades K-12, designed to strengthen science, health, and related curricula and enhance students' understanding of the interconnectedness of human, animal, and environmental health[12]. The Commission also is developing a **One Health Vector-Borne Diseases Education Initiative** to educate the public about how to protect themselves and their animals from vector-borne diseases.

The **Facilitating Local Stakeholder Participation in Collaborative Landscape Conservation: A Practitioners' Guide** describes the conceptual social science background on public participation and stakeholder influence in landscape conservation (Doyle-Capitman and Decker 2018). Insights into the preferences of local stakeholders for participating in collaborative landscape conservation planning are detailed, from motivations for participation to preferences on how they participate. Challenges associated with insufficient local stakeholder participation in planning include fairness, performance, legitimacy, inclusivity, transparency, and direction. All are addressed in the Guide. Best practices guidance is provided to promote local stakeholder participation and to guide systematic collection of social data. This resource also provides valuable guidance on how to integrate local stakeholder participation and social data into collaborative landscape conservation planning.

The **North American Bird Conservation Initiative (NABCI)** has collected success stories for bird conservation, a resource of successful outreach and education activities that have actively engaged the public[24]. Northeast RSGCN and Watchlist species featured in the success stories include Piping Plover (*Charadrius melodus*) and Golden-winged Warbler (*Vermivora chrysoptera*). Other examples address habitats, such as a New York project to engage private landowners in conserving and managing early successional habitat, or particular stakeholder groups, like land trusts. The Upper Mississippi River and Great Lakes Region Joint Venture has developed a decision-support tool that informs wetland conservation priorities. It integrates development and

human demographic data to maximize potential shared benefits to birds and people. These examples of successful approaches drawn from across the nation can inform effective education and outreach activities in SWAPs.

In addition to these resources and examples, three other recent efforts have developed extensive tools to facilitate communication, outreach, and environmental education of fish and wildlife conservation.

THE LANGUAGE OF CONSERVATION - WORDS MATTER

Recent studies have assessed the language of conservation and how it does or does not work to inform education and outreach and engage the public in conservation efforts. In 2018, the Nature Conservancy (TNC) commissioned a survey the American public, resulting in a set of communication guidelines for the **Language of Conservation** (TNC 2018). These guidelines include three critical elements: water, wildlife, and way of life. The primary impact or element of a conservation project should always be water, which Americans prioritize as a critical reason to become engaged in conservation. Benefits to wildlife is the second highest priority for conservation messaging. Communication should also include localized examples to illustrate how conservation efforts contribute to preserving a "way of life" that is unique and important to that area. Recommendations also include list of words and terms to use or to avoid. "Nature's benefits" versus "ecosystem services" is one example.

The **Words Matter: Determining How to Engage the American Public Through the Language of Conservation** project and report also provides a series of recommendations for effective communication and messaging to engage the public in wildlife conservation (WMI and Responsive Management 2021). This report identifies a need for effective words and messages that affirm the importance of conservation at a time when demographics, wildlife values, and funding sources for wildlife conservation are changing. This public engagement project assessed the language in current use for communicating with the public about conservation issues; qualitative research incorporating the results of focus groups across each of the AFWA regions; and quantitative research using insights gained from the focus groups to conduct a national survey. The survey designs ensured that race, age, gender, and region were accurately represented. The results of the survey were evaluated using the four wildlife value orientations of Manfredo et al. (2018) described in Section 8.1.

The Words Matter project (WMI and Responsive Management 2021, pp. vii-xiii) found that:

- Fish and wildlife agencies should communicate how their conservation work relates to and affects water quality and the health of rivers, lakes, and streams.

Whenever possible, the work of fish and wildlife agencies should be linked to water quality and the health of water resources.

- Key conservation messages should be phrased as simply and unambiguously as possible.
- Fish and wildlife agencies should embrace the word "protect" when communicating about fish and wildlife and conservation.
- Certain terms and phrases may give the impression of an overly controlling approach to fish and wildlife management, which may alienate some audiences.
- The term "healthy" resonates well in conservation messages.
- The adjectives "safe" and "clean" are often used by Americans when describing the benefits provided by state fish and wildlife agencies.
- To build support for solutions to conservation problems, focus on what may be "lost."
- Conservation messages will be more effective when focused on key outcomes rather than the process of "scientific management."
- Agencies should use the phrase "responsible recreation" when communicating about hunting, fishing, and other activities.
- Terms that evoke shared resources, such as "future generations," "coexist," and "balance," appear to resonate well with general audiences.
- Most Americans feel it is equally important that fish and wildlife in the United States be "conserved" and "preserved."
- Among the least important things for agencies to communicate with the public about are the economic benefits associated with fish and wildlife.
- In general, there do not appear to be any conservation words or phrases that a significant percentage of Americans feel are overused.
- Most Americans believe that, in order to thrive, fish and wildlife need some management but should otherwise be left alone.
- Many people do not know the difference between "game" and "nongame" wildlife; in fact, more people think they know the meanings of the two terms than actually do.
- Conservation messages that include the words "we" and "our" will be more effective with some audiences than others.
- Specificity with population numbers will help to increase concern about imperiled species.
- Residents may be more likely to approve of controversial activities like trapping if they know that such activities are sanctioned by their state fish and wildlife agency.

These findings inform the most effective education and outreach messaging actions identified in SWAPs and can help guide their implementation.

PROJECT WILD - AFWA

AFWA developed **Project WILD** with the mission to provide wildlife-based conservation and environmental education resources that cultivates responsible actions towards wildlife and associated natural resources[25]. Curriculum materials for ages pre-K to grade 12 were designed by experts in the fields of education and natural resource management. Training workshops and professional development online courses are available. In addition to the wide range of activities provided by Project WILD that address fish, wildlife, habitats, and threats, three subject concentrations focus on activities relating to particular wildlife and natural resources:

- **Aquatic WILD** – the hydrologic cycle, aquatic species and their habitats
- **Flying WILD** – birds, their life cycles, and habitats
- **Growing Up WILD** - plant and animal activities for early childhood education

Professional program resources for educators are available for Art & Illustration, Climate Change, Inclusion, and Remote Learning. Conceptual framework materials include connections between Project WILD and Next Generation Science Standards, Head Start Early Learning Outcomes, AFWA's K-12 Conservation Education Scope and Sequence, Common Core State Standards for English / Language Arts and Mathematics, Scout Badges, art and music, K-12 Physical Education Standards, and citizen science[26]. Links to other organizations and programs are provided for additional resources related to specific topics.

PROJECT LEARNING TREE

Project Learning Tree provides educational resources and activities to engage children in learning about the environment through the lens of forests and trees[27]. This award-winning environmental education and community-based service-learning program is designed for educators, parents, natural resource managers, and community leaders working with children from preschool to grade 12. Collections of activities are freely available online, including activity guides for grades K-8, nature activities for ages 1-6, and family activities to do at home. Sample lesson plans, educator tips and STEM strategies provide tools and resources to include environmental education in existing curricula. A **Forest Literacy Framework** includes resources and guides to educate about forests and sustainable forest management. Materials and tools focus on forest concepts relating to public health, climate change, urban forests, green jobs, wildfire, and Indigenous connections to the land.

The Branch newsletter is a monthly resource with free tools and resources, professional development and grant opportunities, new lesson plans, and educator tips for reaching about the environment. Professional development training is available both online and through state-level programs. An annual **Green Schools Conference** focuses on the

newest trends and innovations is providing healthy, sustainable learning environments and education. Guidance on engaging students in greening their schools and conducting **GreenSchools Investigations** are available, along with grants to implement needed projects identified by the investigations. Project Learning Tree state coordinators can provide localized assistance and resources; local professional development workshops; and networking with mentor teachers, community members, and resource professionals.

8.4 DIVERSITY, EQUITY, INCLUSION, AND JUSTICE RESOURCES

The levels of understanding and the number of resources and tools available to improve diversity, equity, inclusion, and environmental justice have advanced significantly over the past decade. These resources inform SWAP Element 8 to engage a broader audience in fish and wildlife conservation. Diversity, equity, and inclusion can be addressed at the administrative level with agency personnel, through public access to nature, and through education and outreach activities. Environmental justice can be addressed through policies, inclusive public engagement, grant prioritization, and conservation actions.

8.4.1 ADMINISTRATIVE RESOURCES

The AFWA *Relevancy Roadmap* includes an overarching recommended action that "Agency leadership and governing bodies need to demonstrate commitment to being more inclusive of diverse perspectives and interests in fish, wildlife, their habitats and outdoor recreation activities" (AFWA and WMI 2019, p. 11). The Roadmap identified eight barriers that may exist within state fish and wildlife agency culture and capacity related to diversity and inclusion (AFWA and WMI 2019, p. 10):

- Agency culture and values do not align with nature-based values and outdoor interests of broader constituencies.
- Agency is not adaptive to the changing nature-based values and outdoor interests of broader constituencies.
- Agency has competitive and siloed culture that inhibits collaboration.
- Agency lacks sufficient and diverse funding to provide programs and services to broader constituencies.
- Agency lacks capacity to identify, understand, engage with, and serve the needs of broader constituencies.
- Agency lacks capacity to develop and implement plans that engage and serve broader constituencies.

- Agency lacks capacity to create and sustain effective partnerships to serve broader constituencies.
- Agency lacks expertise and knowledge to provide outdoor recreational experiences that serve broader constituencies.

Detailed strategies and tasks to overcome each of these barriers are described in the *Relevancy Roadmap*, which also includes a framework to increase diversity and inclusion in administrative programs.

In December 2021, the **Open Standards for the Practice of Conservation**, or **Conservation Standards**, released a Phase I analysis of **Diversity, Equity, Justice, and Inclusion Approaches** in conservation efforts. Phase II of this project includes an initial situation analysis; consideration of known barriers to adopting diversity, equity, inclusion and justice aspects in conservation projects; and design of tools and strategies with clear objectives and audiences. The latter will allow the **Conservation Measures Partnership (CMP)** to develop Conservation Standards for improving diversity, equity, inclusion, and justice in conservation programs and actions. The Phase I report and survey results for Phase II are currently available on the Conservation Standards website of resources[28].

The Wildlife Society (TWS) is conducting a similar assessment and is preparing a resource guide and library to improve diversity, equity, and inclusion in fish and wildlife management[29]. These tools and resources should be available in 2023.

The **Ohio Division of Wildlife Near-term Relevancy Plan for Engaging Ohio's African Americans and Young Adults**, completed in February 2022, aims to increase the relevance of conservation to a broader audience, focusing on African Americans and young adults in particular (ODOW 2022). The Relevancy Consulting Team that led this effort includes former state fish and wildlife agency experts, academic experts, the Wildlife Management Institute, and others. The team is currently working on a similar project for the Missouri Department of Conservation and in 2022 was awarded a Multi-State Conservation Grant to assist four states across the country in their efforts to implement the AFWA *Relevancy Roadmap*. One of those four states is Connecticut. More information about these projects to advance diversity, equity, and inclusion in state-led conservation efforts is available on the Wildlife Management Institute website[30].

8.4.2 PUBLIC ACCESS RESOURCES

The outdoor recreation planning resources described in Section 8.2 provide opportunities to address the diversity, inclusivity, equity, and justice needs of

communities and states. The current Pennsylvania SCORP, for example, is subtitled "Recreation for All," a statement of its commitment to increasing public access to all-inclusive facilities (PA DCNR 2020). This prioritization of inclusivity is incorporated into state grant funding for proposed recreation projects, with the goal of providing universal public access to local outdoor recreation facilities. Integrating the priorities of SCORPs with the priorities of SWAPs provides landscape-scale opportunities to enhance diversity and inclusion in outdoor recreation activities; broaden public perceptions of the values of fish and wildlife resources; and manage human disturbance of imperiled species and their habitats in a more inclusive way.

PARKSCORE AND PARKSERVE

The Trust for Public Land has conducted a national assessment of public parks, using criteria of equity, access, per capita investment, amenities, and acreage that calculate a **ParkScore** rating[31]. Interactive maps and downloadable reports are available at the municipal level, identifying opportunities to improve equitable access to park spaces. Washington, D.C., had the highest ParkScore of the 100 largest cities in the country, and Arlington, Virginia, New York City, and Boston, Massachusetts, were also in the top 12 cities nationally. To the extent that RSGCN and Watchlist species utilize developed areas as habitat (see *Chapter 2*), this equitable access assessment informs opportunities to engage large segments of the public with urban wildlife conservation.

The Trust for Public Land's **ParkServe** program identifies areas within cities that have the greatest need for parks, focusing on the Census Block scale[32]. The ParkServe methodology starts with identifying areas that are not within a 10-minute walk or drive to designated recreational access (e.g., parks, open access lands, trails, or water access points). Populated areas that are outside of a 10-minute walking or driving radius (depending on the analysis) are assigned a level of park need, ranging from 3 (moderate) to 5 (very high). Three demographic variables from the from the spatial software and analysis company Esri's 2018 Forecast Census Block Groups are used to generate weighted calculations and to assign the level of need:

- Population density (weighted at 50%),
- Density of children age 19 and younger (weighted at 25%), and
- Density of households with income less than 75% of the median household income for the county (weighted at 25%).

The Pennsylvania Department of Conservation and Natural Resources recently partnered with The Trust for Public Land to assess public access to outdoor recreation areas for the entire state using this approach[33]. Analyses and interactive maps were developed for all public parks, trailheads, and open access recreation areas within a 10-minute walk; for state parks, local parks, and trailheads within a 10-minute walk; for trailhead access within a 10-minute drive; for water access within a 10-minute drive;

and for drive times to the Appalachian Trail which traverses the state (30-, 60-, 90-, and 120-minute ranges), which traverses the state. The assessment also identified ways for adjacent communities to connect to the Appalachian Trail by locating areas where new trails of half a mile or less in length would connect existing public lands to the national trail. The statewide assessment found that 53% of Pennsylvania's residents resided within a 10-minute walk to open access recreational lands (Trust for Public Land 2020). Supplemental analyses compared the access of historically marginalized versus non-marginalized groups (both racial and economic) to outdoor recreational spaces, providing an equity assessment at the County level.

The forthcoming Midwest Conservation Blueprint of the Midwest Landscape Initiative incorporates these ParkServe scores as one of its indicators to identify priority lands for conservation across the Midwest region, recognizing its value as a tool to inform inclusive landscape level conservation planning.

SOCIETY OF OUTDOOR RECREATION PROFESSIONALS

The **Society of Outdoor Recreation Professionals** is a national organization of outdoor recreation and related professionals whose goal is to protect natural and cultural resources while providing sustainable public access to recreation[34]. The organization provides training, technical guidance, and networking. The **2021-2025 Strategic Plan for the Society of Outdoor Recreational Professionals** outlines goals and objectives to provide justice, equity, diversity, and inclusion in sustainable outdoor recreation opportunities that contribute to the overall sustainability of communities, ecosystems, and economies. A library collection of technical resources for topics from diversity, equity, inclusion, and accessibility to environmental education, responsible recreation, recreation conflict, heritage recreation, visitor use management, and access to public lands is available through the organization's website[35].

8.4.3 OUTREACH AND EDUCATION RESOURCES

Environmental education and outreach programs can incorporate features or target particular audiences to enhance diversity, equity, and inclusion for everyone. At parks and other public spaces, interpretive programs and tours can include features designed specifically to serve the needs of blind, deaf, or hard of hearing individuals. Providing facilities that incorporate Americans with Disabilities Act (ADA) features (e.g., trails, boardwalks, fishing docks) allows individuals and groups with disabilities to participate in programming and enjoy natural spaces and their wildlife. Specific events may target Spanish-speaking communities, African-Americans, or LGBTQ communities. For example, **Black Birders Week** was organized by The BlackAFInSTEM Collective in 2020 and is now supported by many partners like the National Audubon Society, the

Cornell Lab of Ornithology, the National Oceanic and Atmospheric Administration, and many others. It is held in late May and early June.

The **Children & Nature Network** is a nonprofit organization whose mission is to increase equitable access to nature for children across the globe[36]. The Network offers a Resources Hub and a research library with free toolkits, infographics, reports, and advocacy tools to facilitate connecting families, children, and communities to nature. More than 45 resources in the collection address diversity and equity, from research detailing inequalities in opportunities for children to engage with nature to the importance of incorporating the Traditional Ecological Knowledge of Indigenous peoples in conservation. A weekly newsletter provides information on new research, resources, and stories connecting children with nature. The Children & Nature Network has partnered with **Nappy**, a free stock photography company, to add to their collection of stock photos that include people of color engaged in outdoor activities. These photos can be useful in a broad range of media, educational, and outreach materials.

Numerous national organizations and programs are working to create a more inclusive and representative engagement with the outdoors and natural resources, offering multiple opportunities to partner with SWAP planning and implementation:

- Outdoor Afro[37]
- Latino Outdoors[38]
- Outdoor Asian[39]
- Center for Native American Youth[40]
- LGBTQ+Outdoors[41]
- Out in the Field[42]
- Fresh Tracks[43]
- Justice Outside[44]
- Rethink Outside[45]
- Amplify the Future[46]

Programs and projects that engage urban and suburban residents in wildlife conservation and outdoor recreation are described in *Chapter 2, Section 2.24* (Developed Areas habitat). Resources to increase engagement with Tribal communities are described in Section 8.5 below.

Project WILD offers numerous resources to enhance inclusivity and diversity in environmental education. They include educational training webinars by subject matter experts, universal design principles and lessons, differentiated instruction, culturally responsive teaching, outdoor learning, environmental education for second language learners of English, and activity modifications for students with autism spectrum disorder[26].

8.4.4 ENVIRONMENTAL JUSTICE RESOURCES

Environmental justice is commonly defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, policies, and regulations. One of its core principles is that everyone should enjoy the same degree of protection from environmental and health hazards and have equal access to the decision-making process to have a healthy environment in which to live, learn, and work[47]. The following resources are available to assist SWAPs in their efforts to incorporate and address environmental justice issues.

TREE EQUITY SCORES

American Forests developed **Tree Equity Scores** to differentiate the amount of tree cover between wealthy and impoverished communities[48]. Tree Equity Scores are calculated on a scale of 0 to 100 (with 100 = tree equity) based on a neighborhood's existing tree canopy, population density, employment, income, surface temperature, race, age, and health. Scores are measured at the Census Block level and aggregated into scores at the municipality level. The baseline target for tree canopy varies with the location of the municipality (selected in partnership with the US Forest Service), with 40% tree canopy cover in forested areas, 20% in grassland areas, and 15% in desert areas. The target tree canopy metric was adjusted depending on the population density to set more achievable targets. Areas of higher population density were assigned an adjustment factor of 0.5, and those with very low population density were adjusted by 1.5 (based on research conducted by The Nature Conservancy).

A Priority Index is calculated to highlight the need for planting to reach Tree Equity, taking into account income (people living in poverty), unemployment rate, urban heat island severity, race, ratio of seniors and children to working-age adults, and a composite health index. Where data are available, a history of redlining is also incorporated into the index. The Priority Index is applied to the gap between the existing tree canopy and target tree canopy to generate the Tree Equity Score. A **Tree Equity Score National Explorer** includes a calculation of the annual ecosystem service benefits from the proposed tree canopy cover at the county level[49]. A landscape level view of Tree Equity Scores for the urbanized region from Wilmington, Delaware, through Philadelphia, Pennsylvania, to Trenton, New Jersey, shows the areas of inequity in urban tree canopy cover (Figure 8.4.1).

In 2020, American Forests received a Coordination and Collaboration in the Resilience Ecosystem Program grant from the National Oceanic and Atmospheric Administration to apply the Tree Equity Score approach to the entire state of Rhode Island; conduct a

community-based urban heat field campaign in four municipalities; scale the empirical municipal results statewide; and integrate the results into the Tree Equity Scores. Over

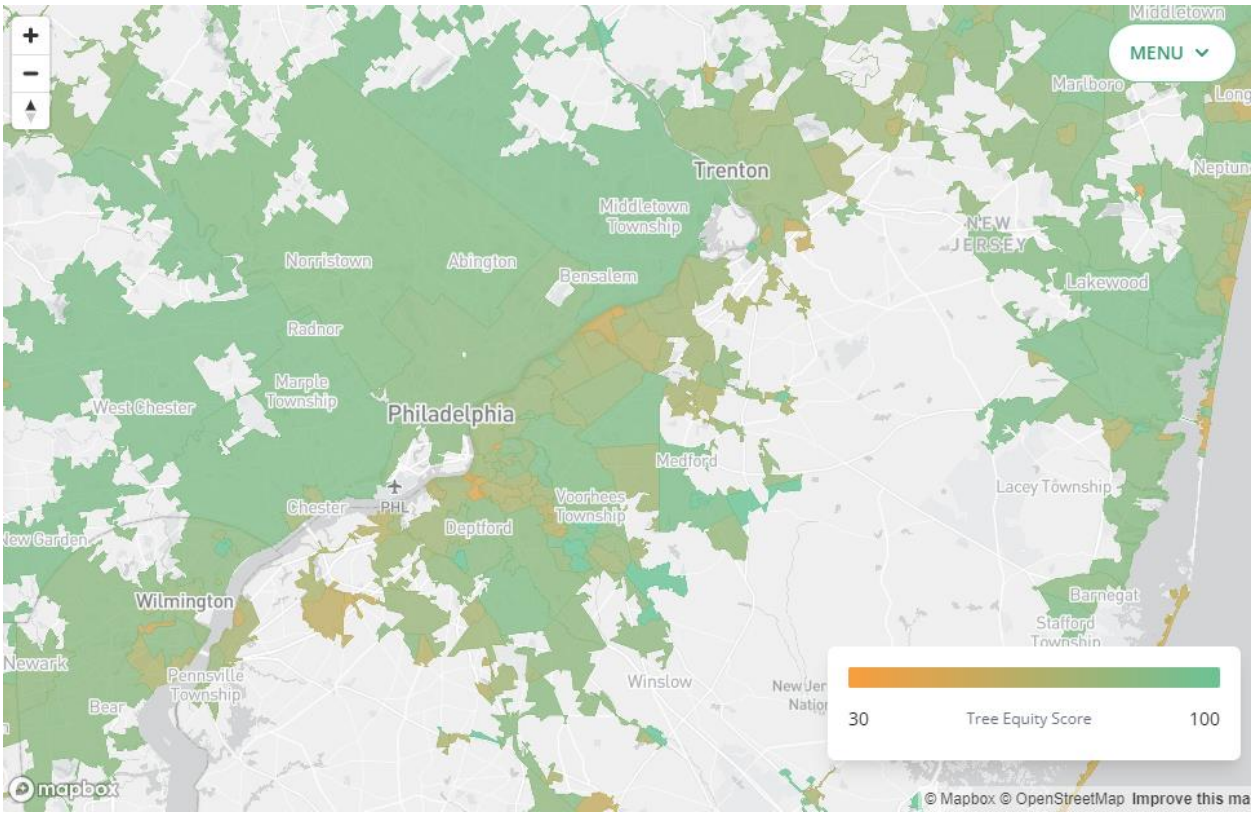

Figure 8.4.1 Tree Equity Scores from an analysis by American Forests for the urban corridor from Wilmington, Delaware, to Trenton, New Jersey, with green areas with higher tree equity and orange areas with less tree equity, identifying opportunities to create or enhance urban forests to achieve equity and the associated ecosystem service benefits (from https://treeequityscore.org/map).

time the urban heat campaigns (i.e., planting trees to mitigate urban heat islands) will provide the data needed to create a national ambient temperature and humidity dataset, ultimately contributing to climate resilience (and environmental justice) by mitigating the localized effects of extreme heat.

The forthcoming Midwest Conservation Blueprint of the Midwest Landscape Initiative incorporates Tree Equity Scores as one important indicator in its efforts to identify priority lands for conservation across the Midwest region, recognizing its value as a tool to inform equitable landscape level conservation planning.

ENVIRONMENTAL JUSTICE RESOURCES – EPA

The Environmental Protection Agency addresses environmental justice in numerous ways. To achieve environmental justice, the federal agency states that everyone must receive the same degree of protection from environmental and health risk, and that there must be equal access to the decision-making process, allowing everyone to have a healthy environment in which to live, work, and learn.

The EPA provides several strategic planning resources related to environmental justice as well as links to collaborative partnerships (e.g., the International Human Rights and Rights of Indigenous People)[47]. The **EJScreen** online screening and mapping tool allows the public to search environmental justice issues by location[50]. Information available on EJScreen includes environmental justice indices, pollution sources, socioeconomic indicators, health disparities, climate change data, critical service gaps (i.e., Broadband gaps, food deserts, medically underserved), and additional demographic and supplemental data. The environmental justice indices provide information on diesel and non-diesel particulate matter, ozone, air toxics cancer risk, air toxics respiratory hazards, traffic proximity, lead paint, Superfund site proximity, Risk Management Plan facility locations (i.e., sites with potential chemical accident management plans), hazardous waste proximity, underground storage tanks, and wastewater discharge. Comparisons between local (Census Block Group) and state or national averages can be generated.

The agency also offers technical assistance and grant funding for environmental justice projects. For example, the Fiscal Year 2023 grant funding opportunity is providing $100 million nationwide to help underserved and overburdened communities address environmental justice issues. Environmental justice grants are available through the Collaborative Problem-Solving Cooperative Agreement Program, Government-to-Government Program, Thriving Community Technical Assistance Centers Program, Small Grants Program, and Communities Pass-through Funder Program. Additional grant programs related to environmental justice include Brownfields Grants, Environmental Workforce Development and Job Training Grants, Urban Waters Small Grants, Diesel Emissions Reduction Act Grants, and Extramural Research Grants.

ENVIRONMENTAL JUSTICE RESOURCES – NOAA

The National Oceanic and Atmospheric Administration (NOAA) offers numerous environmental justice resources and tools[51]. The environmental justice activities of NOAA relate to weather and climate disasters in vulnerable communities. From thawing permafrost to rising sea level, from droughts to wildfires, from worsening heat waves to flooding, the federal agency recently created a NOAA Climate Council to enhance the equitable delivery of the climate science and services that NOAA provides. NOAA Fisheries developed a series of social climate change indicators focusing on the well-

being of coastal communities engaged in fishing activities. A **Practitioner's Guide to Fisheries Social Impact Assessment**, published in 2020, presents the legal and policy framework for social impact assessments, guidelines on conducting the assessments, and tools to assist in developing assessments (Clay and Colburn 2020). The NOAA Coordination and Collaboration in the Resilience Ecosystem (CCRE) Program offers competitive grants for climate adaptation and resilience projects, with special consideration given to projects that incorporate and address social justice and equity issues or that prioritize diverse and/or vulnerable communities[52]. Among the projects recently funded by this program is a statewide application of the Tree Equity Score and Mapping Tool described above across Rhode Island.

ENVIRONMENTAL JUSTICE RESOURCES – CDCP

The federal Centers for Disease Control and Prevention and its Agency for Toxic Substances and Disease Registry developed the **Social Vulnerability Index**. It uses 16 US Census factors to characterize the potential negative effects of external stressors, such as natural or human-caused disasters and disease outbreaks on human health[53]. The index ranks vulnerability on a scale of zero (lowest) to one (highest). An interactive national map and associated databases help communities be better prepared for and recover from emergency events. Thematic maps highlight specific vulnerabilities for a selected geographic area and data year at the county and census tract level.

The forthcoming Midwest Conservation Blueprint of the Midwest Landscape Initiative incorporates the CDC Social Vulnerability Index as one of its indicators to identify priority lands for conservation across the Midwest region, recognizing its value as a tool to inform equitable landscape level conservation planning.

ENVIRONMENTAL JUSTICE RESOURCES - US DOT

The federal Department of Transportation (DOT) incorporates environmental justice considerations into all its policies, programs, and activities. The agency ensures opportunities for low-income and minority communities to influence transportation planning and decision-making. Each of the federal Administrations within the agency is governed by the DOT Environmental Justice Strategy. The environmental justice programs of the DOT are supported by the **Rebuilding American Infrastructure with Sustainability and Equity (RAISE Grants) Program**[54]. RAISE Grants fund projects that assist communities by improving equity and safety in transportation projects that have significant local or regional impact, with dedicated funding and no cost sharing requirements for projects located in Areas of Persistent Poverty or Historically Disadvantaged Communities.

8.5 CITIZEN SCIENCE

In 2012 the Association of Fish and Wildlife Agencies (AFWA) released **Best Practices for State Wildlife Action Plans – Voluntary Guidance to States for Revision and Implementation**, a national guidance for SWAPs (AFWA 2012). One of the best practice recommendations is to augment state fish and wildlife programs with citizen science programs as appropriate to expand capacity.

Citizen science has grown dramatically in recent years, allowing the public to engage in fish and wildlife conservation in innumerable ways. *Chapter 1* describes citizen science projects that are species-based, many of which address Northeast RSGCN and Watchlist species. *Chapter 2* describes citizen science projects that are habitat-based for each of the 24 habitats for RSGCN and Watchlist species in the Northeast. *Chapter 5* discusses data resources that compile publicly generated information to inform regional conservation efforts (Table 8.5.1).

Citizen science project directories are available online, with projects associated with federal agencies or funding listed at citizenscience.gov, and those associated with non-governmental programs at scistarter.org and anecdata.org.

Table 8.5.1. Numerous non-governmental and citizen science databases are publicly available online that contain inventory, monitoring, and status information on fish and wildlife resources of the Northeast.

Informational Database	Location and Description
Discover Life	https://www.discoverlife.org/ International database and encyclopedia of plant and animal species observations and profiles for more than 1.4 million species with 822,000+ known distribution maps.
FishBase	https://www.fishbase.se/search.php International database of 35,000+ fish species profiles with taxonomy, location, conservation status, habitat, biological use, protection status, trophic ecology, life history, identification keys, citations, and imagery.
Global Biodiversity Information Facility (GBIF)	https://www.gbif.us/ National species database for animals, plants, and fossils in the US and its Territories. More than 825 million observation records with taxonomy, occurrence status, location, date, issues and flags, source dataset, and publisher (e.g., USGS, NatureServe, NOAA). Previously known as the Biodiversity Information Serving Our Nation (BISON) database.
Global Invasive Species Database	http://www.iucngisd.org/gisd/ International database of invasive species with species profiles that include taxonomy, species description, native distribution, alien distribution, impacts, life cycle stages, reproduction, spread pathways, management techniques, references, and photographs.

Informational Database	Location and Description
iNaturalist	https://www.inaturalist.org/ Public observations of animal and plant species across the world, which are searchable by name or location with information on the seasonality, number, life stage, and sex of observations. Includes more than 411,000 species and 125 million observations contributed by 5.9 million people.
Invasive and Exotic Species of North America	https://invasive.org Database of invasive and exotic species profiles that include taxonomy, origin, life cycle, distribution, imagery, and invasive listing sources. Includes plants, insects, pathogens, and other species.
ITIS	https://www.itis.gov/ Integrated Taxonomic Information System (ITIS) is the authoritative taxonomic information source on animals, plants, fungi, and microbes of North America and the world and is the taxonomic reference standard for RSGCN and the national SGCN database maintained by the USGS.
IUCN Red List of Threatened Species	https://www.iucnredlist.org/ International Union for Conservation of Nature (IUCN) maintains a Red List of Threatened Species with comprehensive information on the global extinction risk status of animal, fungus, and plant species. Information on more than 153,000 species includes taxonomy, conservation status, status assessments, geographic range, population trends, habitat and ecology, threats, use and trade, and needed conservation actions.

Informational Database	Location and Description
NatureServe Explorer	https://www.natureserve.org/ NatureServe Explorer includes detailed information on the taxonomy, distribution, conservation status, ecology, life history, population, management and monitoring needs, threats, habitat, and biological research needs of more than 100,000 species of plants, animals, and ecosystems.
World Register of Marine Species (WoRMS)	https://www.marinespecies.org/ International authoritative classification and catalog of marine species names with more than 241,500 species recognized. Species profiles include taxonomy, distribution, attributes, images, conservation status, and associated datasets. Taxonomic reference standard for marine RSGCN.
Ocean Biodiversity Information System (OBIS)	https://obis.org/ International database of marine species observational records with more than 108 million records for nearly 180,000 species searchable by taxa, species, location, dataset, or data source. Species profiles include taxonomy, distribution, observation dates, number of observation records, environmental conditions of the observations, data quality, and associated datasets. Taxonomic reference standard for marine RSGCN.
SeaLifeBase	https://www.sealifebase.ca/ International database of 85,000 marine species searchable by species, location, taxonomic group, or ecosystem with information on life history, trophic ecology, data source, photographs, and more.

Informational Database	Location and Description
AmphibiaWeb	https://amphibiaweb.org/ AmphibiaWeb includes nearly 8600 amphibian species profiles from around the world that are searchable by species, location, taxa, or photograph. Species profiles in the database include taxonomy, distribution, reasons for decline, and conservation status.
Amphibian Disease Portal	https://amphibiandisease.org/ International database monitoring the distribution of amphibian pathogens *Batrachochytrium dendrobatidis* (Bd) and *B. salamandrivorans* (Bsal).
Birds of the World	https://birdsoftheworld.org/bow/home International database of birds across the world with comprehensive life history profiles searchable by species or family. Includes identification, taxonomy, systematics, distribution, habitat, movements and migration, diet and foraging, sounds and vocal behavior, behavior, breeding, demography and populations, conservation and management, priorities for future research, and photographs. Integrated with eBird database.
eBird	https://ebird.org Public observations of bird species across the world, which are searchable by species name or location in a database that includes species maps, photographs, and sounds.
Audubon Christmas Bird Count	https://www.audubon.org/conservation/science/christmas-bird-count Database of December bird observations across the US and Canada since 1900 with location, species counts, weather conditions, sponsoring organization, and participants.

Informational Database	Location and Description
Botanical Information and Ecology Network (BIEN)	https://bien.nceas.ucsb.edu/bien/ International database of georeferenced plant locations, plot inventories and surveys, species geographic distribution maps, plant traits, species-level phylogeny, and cross-continent, continent, and country-level species lists with more than 464,000 species.
BugGuide	https://bugguide.net/node/view/15740 Database of insects, spiders, and related species with identification keys, imagery, taxonomy, and species profiles with information on range, habitat, season, food, and citations.
Bumble Bee Watch	https://www.bumblebeewatch.org/ Database of 122,000+ observations of bumble bees and their nests across North America with verified identification of species, location, conservation status, observation date, and related information.
Butterflies and Moths of North America (BAMONA)	https://www.butterfliesandmoths.org/ International database of Lepidoptera observations across North America with regional species checklists, taxonomy, and species profiles for more than 7000 species with distribution maps, identification, life history, flight, caterpillar hosts, adult food, habitat, conservation status, management needs, verified sightings, and imagery.
eButterfly	https://www.e-butterfly.org/#/ Database of butterfly 491,000+ observations across North and Central America for 1,250+ species with species profiles including weekly frequency of observations, taxonomy, distribution, imagery, and citations.

Informational Database	Location and Description
North American Butterfly Association Butterfly Count	https://www.naba.org/butter_counts.html International database of butterfly observations since 1993 across 400+ 15-mile count circles in North America.
Land Snails and Slugs of the Mid-Atlantic and Northeastern US	https://www.carnegiemnh.org/science/mollusks/index.html Database of known terrestrial snails and slugs of the Northeast and Mid-Atlantic regions with imagery, taxonomy, and species profiles.
Atlas of Common Freshwater Macroinvertebrates of Eastern North America	https://www.macroinvertebrates.org/#/ Database of freshwater macroinvertebrate species for eastern North America with identification keys, diagnostic characteristics, high resolution imagery, genus overview, habitat, pollution tolerance, feeding habits, movements, and distribution. Integrated with the PocketMacros app.
Mayfly Central	https://www.entm.purdue.edu/mayfly/ Database of Ephemeroptera (mayfly) species across North America, including records for 573 species in the US organized by taxonomy.
Freshwater Mussel Host Database	https://mollusk.inhs.illinois.edu/57-2/ Database of more than 2700 known host interdependent relationships for freshwater mussels searchable by mussel or host species or family with location, data source, and natural or lab evidence for the relationship.
Nature's Notebook	https://www.usanpn.org/natures_notebook National database of 500,000+ phenology records for plants and animals tracking seasonal changes, with featured campaigns to track nectar sources for pollinators, the emergence of mayflies, flowers for bats, insect pests, and non-native invasive plants.

Informational Database	Location and Description
Odonata Central	https://www.odonatacentral.org/#/ Database of Odonata (dragonflies and damselflies) observations in the Western Hemisphere including species, location, date, level of confidence in identification, and imagery with more than 300,000 records.

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8.7 ENDNOTES

Many online resources are available for learning about topics in this chapter. However, URLs are not permanent resources; pathways may be changed or removed over time. These endnotes were all accessed in January and February of 2023, and were active at that point in time.

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