# CHAPTER 4: MONITORING

Monitoring comes in many forms and can serve many different conservation purposes. At the most basic level, monitoring can simply note whether or not a species continues to be present at a given location. At a more detailed level, monitoring can help managers determine the effectiveness of conservation actions and, in turn, adapt management activities to maximize their benefits.

## *I. Monitoring Programs & Projects*

This Plan documents a broad spectrum of threats to SGCN wildlife and their habitats in New Jersey. The identification of focal species and geographic focal areas is the start of a more focused conservation approach, but to increase the value of this plan further, additional work is needed to prioritize work. DFW staff will reach out to consult with conservation partners and stakeholders in the next three years to prioritize projects and actions, and identify monitoring methods to measure success. The USFWS developed TRACS to help identify the metrics by which conservation actions and projects can be evaluated (Appendix M). DFW will lead the process to change or design projects that include appropriate performance metrics to judge the success of conservation actions, and the steps for adapting actions in response to those metrics.

The DFW leverages its relationships with agencies and organizations with conservation interests and/or influences to help construct appropriate and achievable monitoring metrics and programs. Organizations have a variety of interests and roles in wildlife and habitat conservation which lends to the challenge of identifying performance metrics and programs for the wide variety of projects and SGCN wildlife. The DFW will promote the use of results-chain graphics (as presented in B., below) and the TRACS approach to develop target goals and metrics.

### A. Past & Current Monitoring Programs

Many of New Jersey's SGCN and habitats have active monitoring programs, some dating back more than 60 years. Table 6 provides a concise list of these 62 programs. Some of these ongoing monitoring programs will provide data useful to evaluating the effectiveness of conservation projects and actions.

Notable monitoring programs in New Jersey include:

- The ENSP's **Landscape Project** maps critical wildlife habitat using species occurrence data applied to dynamic data on suitable habitat types. Adopted by the NJDEP in 1993 to define habitat, it is a powerful tool for conservation planning.
- The DFW's **Habitat Change Analysis Project** (HCAP) tracks wildlife habitat transition and fragmentation trends over time. The ongoing analysis uses GIS to identify potential habitat from available land use and land cover data based on species habitat associations and range extents. Products from the analysis include up-to-date, multi-level, species-specific habitat change information to support agency management initiatives
- **Submerged Aquatic Vegetation Monitoring** in Barnegat Bay is a long-term project that provides an indicator of water quality and the health of the food web for aquatic and waterfowl species.

- The **Breeding Bird Survey** in New Jersey is part of the national breeding bird survey that is used to detect bird population trends nationally and, to a lesser degree, within the state. Conducted largely by skilled volunteers, the data are considered each time the state reassesses bird species conservation status and trends.
- The **New Jersey bald eagle survey** has successfully tracked the expansion of nesting bald eagles since the time when there was just one nest in the state. The survey is primarily conducted by volunteers, and results are used to track recovery of the state population and as part of the federal monitoring plan for bald eagles.
- The **Saltmarsh Habitat and Avian Research Program** is a new survey that was designed to detect population trends in a group of bird species that are difficult to survey. It is already proving useful for carrying out adaptive management for rare species.
- The **winter bat hibernacula survey**, begun in 1995, has provided valuable data on bat populations after widespread mortality due to white-nose syndrome. It will remain an important measure of cave-dwelling bat populations well into the future.
- Since 1968, the DFW's **Trout Production Stream monitoring** has identified and classified New Jersey waters according to their suitability for trout. The classification levels are based on a waterway's ability to support trout year-round (lakes) or occurrence of natural production, presence/absence of trout, and/or trout associated species (streams). The classifications became part of the state's Surface Water Quality Standards in 1981, and trout-suitable waterways received greater protection under state regulations.
- Since 1992, the NJDEP has conducted **benthic macroinvertebrate sampling** at more than 760 Ambient Macroinvertebrate Network (AMNET) stations within the state's 20 Watershed Management Areas. Results are used to evaluate aquatic life use, designate Category One waters, and inform New Jersey's Long-Term Water Monitoring and Assessment Strategy and other publications.

**Table 6.** Summary of 62 Species and Guild-Level Monitoring Programs by the NJDEP and Conservation Partners.

| Monitoring Program or Action | Implementation Lead | Monitoring Level | | | Monitoring Target | Metrics | Start Year |
|---|---|---|---|---|---|---|---|
| | | Species | Guild | Habitat | | | |
| **HABITATS** | | | | | | | |
| Habitat Change Analysis Project (HCAP) | DFW | | | X | Habitat of endangered and threatened wildlife | Acres of suitable habitat, acres of change, etc. | 1986- |
| Forest Inventory/Analysis | U.S. Forest Service | | | X | Forests | Acres, Species | 1955- |
| Submerged Aquatic Vegetation Monitoring | NJDEP Water Monitoring & Standards | | | X | Habitat quality | Acres, Species | 1968- |
| Rivers and Streams Chemical/Physical Monitoring | NJDEP Bureau of Freshwater & Biological Monitoring | | | X | Water/habitat quality | Water chemistry | 1975- |
| Ambient Surface Water Quality Monitoring Network | NJDEP Bureau of Freshwater & Biological Monitoring | | | X | Water quality | Water chemistry | 1976- |
| NJ Natural Heritage Program | NJ Natural Lands Trust | X | | X | Rare plant communities | Plant species occurrence | 1980- |

*Table 6 (monitoring programs) continued*

| Monitoring Program or Action | Implementation Lead | Monitoring Level | | | Monitoring Target | Metrics | Start Year |
|---|---|---|---|---|---|---|---|
| | | Species | Guild | Habitat | | | |
| **HABITATS (*continued*)** | | | | | | | |
| Marine Water Monitoring | NJDEP Bureau of Marine Water Monitoring | | | X | Water quality | Water chemistry | 1989- |
| Landscape Project Critical Habitat Mapping | DFW | X | | X | Habitats used by rare wildlife | Acres of documented habitat | 2001- |
| Lake Monitoring | NJDEP Bureau of Freshwater & Biological Monitoring | | | X | Water quality | Water chemistry | 2005- |
| Barnegat Bay Water Quality Monitoring | NJDEP Water Quality & Standards | | | X | Water quality | Water chemistry | 2011- |
| Ocean and Coastal Acidification Monitoring | Barnegat Bay Partnership | | | X | Water quality | Water chemistry | 2016- |
| Long-term Environmental-monitoring Programs in Pinelands Region | NJ Pinelands Commission | | X | X | Water quality, vegetation, fish and anuran communities | Water chemistry; number of fish; number of frogs | 1992- |
| Submerged Aquatic Vegetation Monitoring in Barnegat Bay | Barnegat Bay Partnership/Stockton University | X | X | X | Habitat quality, eelgrass, widgeon grass, other | Biomass/meter and condition | 2015- |
| Submerged Aquatic Vegetation Monitoring in Barnegat Bay and Little Egg Harbor | Rutgers University | X | X | X | Habitat quality | Acreage | 2001-2011 |
| **BIRDS** | | | | | | | |
| Christmas Bird Count | National Audubon Society | X | X | | Wintering birds | Number of birds by species | 1920- |
| Winter waterfowl survey | DFW | X | | | Black duck, Canada goose, Atlantic brant | Number of birds by species | 1955-2015 |
| American woodcock survey | DFW | X | | | American woodcock | Number of birds | 1965- |
| Breeding Bird Survey | USGS | X | X | | Breeding birds | Number of birds by species | 1966- |
| Northern bobwhite survey | DFW | X | | | Northern bobwhite | Number of birds | 1970- |
| Black skimmer nesting survey | DFW | X | | | Black skimmer | Number of birds; Number of colonies; Productivity | 1976 |
| Colonial waterbird survey | DFW | X | X | | Gulls, terns, herons, egrets | Number of birds; Number of colonies | 1976- |
| Osprey nest survey | DFW; Conserve Wildlife Foundation of NJ | X | | X | Ospreys | Number of nests; Productivity | 1977- |

| Monitoring Program or Action | Implementation Lead | Monitoring Level | | | Monitoring Target | Metrics | Start Year |
|---|---|---|---|---|---|---|---|
| | | Species | Guild | Habitat | | | |
| **HABITATS (*continued*)** | | | | | | | |
| Bald eagle nest survey | DFW | X | | | Bald eagle | Number of nests; Productivity | 1978- |
| Peregrine falcon survey | DFW | X | | | Peregrine falcon | Number of nests; Productivity | 1980- |
| Grassland bird survey | DFW | X | X | X | Grasshopper sparrow, vesper sparrow, Henslow's sparrow | Number of birds by species | 1980-2014 |
| Piping plover productivity survey | DFW | X | | | Piping plover | Number of nests; Productivity | 1983- |
| Migratory shorebird survey | DFW | X | | | Red knot, ruddy turnstone, sanderling | Number of birds | 1986- |
| Breeding waterfowl survey | DFW | X | | | Black duck, mallard | Number of birds by species | 1990- |
| Monitoring Avian Productivity and Survivorship Program | USGS; DFW | X | | | Forest interior songbirds | Number of birds by species; Productivity | 1994-2012 |
| Neotropical Migrant Survey | DFW | | X | | Breeding birds | Number of birds by species | 1994-2007 |
| Golden-winged warbler monitoring | DFW | X | | X | Golden-winged warbler | Number of birds; Productivity | 2000- |
| International Piping Plover Census | DFW | X | | | Piping plover | Number of birds | 1991- |
| American oystercatcher productivity survey | DFW | X | | | American oystercatcher | Number of birds; Productivity | 2003- |
| Saltmarsh Habitat and Avian Research Program | DFW | X | | | Clapper rail, willet, salt marsh sparrow, seaside sparrow, coastal plain swamp sparrow, Nelson's sparrow | Number of birds by species | 2011-2012 |
| Secretive marshbird survey | DFW | X | | | Black rail, Virginia rail, clapper rail | Number of birds by species | 2015-2016 |
| Winter Atlantic brant/tundra swan survey | DFW | X | | | Atlantic brant, tundra swan | Number of birds by species | 2016- |
| **REPTILES & AMPHIBIANS** | | | | | | | |
| Herp Atlas | DFW | X | X | | Reptiles and amphibians | Number of animals by species | 1992-2014 |

*Table 6 (monitoring programs) continued*

| Monitoring Program or Action | Implementation Lead | Monitoring Level | | | Monitoring Target | Metrics | Start Year |
|---|---|---|---|---|---|---|---|
| | | Species | Guild | Habitat | | | |
| **REPTILES & AMPHIBIANS (*continued*)** | | | | | | | |
| North American Amphibian Monitoring Program | USGS; DFW | X | X | | Amphibian SGCN | Number of animals by species | 1996-2015 |
| **MAMMALS** | | | | | | | |
| Winter bat hibernacula survey | DFW | X | | X | All 6 cave bat species | Number of bats by species | 1995- |
| Summer bat maternity surveys | DFW | X | | | Little brown bat, big brown bat, Indiana bat | Number of bats by species; Productivity | 2009- |
| Summer bat acoustic surveys | DFW | X | | | All 9 bat species | Number of bats by species | 2011- |
| **FRESHWATER AQUATICS** | | | | | | | |
| Trout production stream monitoring and Surface Water Classification | DFW | X | X | X | Brook trout, slimy sculpin, all fish | Number of fish by species and age class; Water chemistry | 1969- |
| AMNET Macroinvertebrate Monitoring | NJDEP Bureau of Freshwater & Biological Monitoring | X | X | X | Mayflies, stoneflies, caddisflies and other macroinvertebrates | Number and species by CPUE*; EPT (presence-absence) | 1992- |
| Freshwater mussel monitoring | DFW | X | | | Native mussels | Number and species by CPUE*; Rare species presence-absence | 1995- |
| Native/Rare fish monitoring | DFW | X | X | | 10 E/T/SC species (plus data deficient waters) | Number and species by CPUE* | 2000- |
| Anadromous fisheries monitoring | DFW | X | | | American shad and other Clupeids | Number and species by CPUE* | 1972-2012 |
| Anadromous fisheries monitoring-Raritan River | Rutgers | X | | | American shad and other Clupeids | Number and species by CPUE* | 2013- |
| Anadromous fisheries monitoring-Delaware River | PA Game Comm. | X | | | American shad | Number and species by CPUE | 2007- |
| Fish Index of Biotic Integrity | NJDEP Bureau of Freshwater & Biological Monitoring; Fish & Wildlife | X | X | X | Fish | Number of fish by species by CPUE*; Water chemistry | 2000- |
| Invasive freshwater mussel monitoring | DFW | X | | | Chinese pond mussel | Presence/ absence | 2011- |

| Monitoring Program or Action | Implementation Lead | Monitoring Level | | | Monitoring Target | Metrics | Start Year |
|---|---|---|---|---|---|---|---|
| | | Species | Guild | Habitat | | | |
| **FRESHWATER AQUATICS (*continued*)** | | | | | | | |
| Stream temperature monitoring for fisheries | DFW | X | X | X | Stream fishes and water temperature | Number and species by CPUE*; Water temperature | 2014- |
| Warmwater fisheries monitoring | DFW | X | X | | Freshwater fish species | Number and species by CPUE*; Fish length, weight, age | 1950- |
| Potentially dangerous fish monitoring | DFW | X | | | Snakehead, Asian swamp eel, flathead catfish, and 7 other species | Presence/ absence | 2005- |
| **MARINE AQUATICS** | | | | | | | |
| Oyster Inventory | DFW | X | | | Eastern oysters | Proportion live oysters, spat set, and size of adults | 1953- |
| Striped Bass Young of Year, Delaware River | DFW | | | | Striped bass | Number of juvenile fish by CPUE* | 1980- |
| Hard clam stock assessment | DFW | X | | | Hard clams | Number, density of clams | 1983- |
| Surf clam inventory | DFW | X | | | Surf clams | Number, density of clams | 1988- |
| Ocean trawl survey | DFW | X | | | Marine fish | Number and species by CPUE* | 1988- |
| Juvenile finfish trawl survey in Delaware Bay | DFW | X | | | Finfish | Number and species by CPUE* | 1991- |
| Horseshoe crab spawning survey | DFW | X | | | Horseshoe crabs | Number of crabs by meter shoreline | 1999- |
| Horseshoe crab egg density survey | DFW | X | | | Horseshoe crabs | Density of eggs in sand | 1999- |
| River herring survey | DFW | X | X | | Alewife, blueback herring | Number and species by CPUE* | 2012- |
| Artificial reef trap surveys | DFW | X | X | | Structure-associated species | Number and species by CPUE* | 2016- |
| Juvenile Fish and Nekton Seining in Barnegat Bay | Barnegat Bay Partnership | X | X | | Fish | Number and species by CPUE* | 2011- |

*Table 6 (monitoring programs) continued*

| Monitoring Program or Action | Implementation Lead | Monitoring Level | | | Monitoring Target | Metrics | Start Year |
|---|---|---|---|---|---|---|---|
| | | Species | Guild | Habitat | | | |
| **MARINE AQUATICS (*continued*)** | | | | | | | |
| Juvenile Eel Monitoring in Barnegat Bay | Barnegat Bay Partnership | X | | | American eel | Number and species by CPUE* | 2012- |
| Anadromous Fish Monitoring | Barnegat Bay Partnership | X | X | | Alewife and Blueback herring | Number and species by CPUE* | 2014 |

* CPUE means catch per unit effort

## B. Strengthening Monitoring through Results Chains

The DFW will use results chains to help show how conservation actions will lead to the desired results. Results chains are simply diagrams that show the connections between threats, actions, and conservation outcomes. Results chains are not only useful for thinking through and selecting conservation actions, they are powerful tools for identifying monitoring strategies. Two sample scenarios using results chains are shown below for bog turtles and scrub-shrub and young forest habitat management.

### *Scenario 1: Bog Turtle*

The following scenario presents a model framework for monitoring and measuring the effectiveness of conservation actions for the bog turtle.

Once abundant throughout New Jersey, bog turtles are now primarily restricted to the remaining rural portions of the state, particularly Sussex, Warren, and Salem counties. Although listed as endangered in the state and as threatened at the federal level, New Jersey is a stronghold for the species in the Northeastern U.S. As of 2015, there were 99 core bog turtle habitats in New Jersey, 54 of which were considered to be metapopulations (which are defined as one or more populations that are close enough for bog turtles to occasionally move between them and for genetic exchange).

Bog turtles inhabit fens, bogs, and wet meadows with mucky, organic soils that are kept saturated by groundwater discharge. Plant communities associated with bog turtle habitats vary, but most are dominated by low-growing grasses, rushes, mosses, and other herbaceous species with little shrub or tree cover. Notable physical features include spring-derived rivulets, shallow, mucky pools, and abundant hummocks of tussock-forming sedges and raised mounds of moss.

Bog turtles are habitat specialists that rely on abundant groundwater resources, organic soils, diverse herbaceous vegetation, and contiguous tracts of land for dispersal. Intense land-uses such as urbanization and industrial farming destroy bog turtle habitats through direct wetland alteration and secondary impacts such as stormwater runoff, local draw down of water tables, and nutrient enrichment.

In partnership with the U.S. Fish & Wildlife Service (USFWS) and other bog turtle recovery partners, New Jersey is currently assessing its 54 known metapopulations. Over the next several

years, the USFWS Northeast Region (Region Five) will develop new protocols for assessing bog turtle status and update the current recovery plan. These revisions will be informed by intensive efforts over the last five years to standardize data collection across the Northeastern states, new datasets that are emerging from the standardized procedures, and legacy data. A likely focus for recovery will be larger wetland complexes composed of several core bog turtle habitats because they can support key biological dynamics (such as dispersal, colonization, and gene flow) that are necessary to keep populations functionally viable. Fragmented or isolated populations, while still important to protect, are vulnerable to random events such as severe floods, disease, and collection, and are also potentially at risk of becoming genetically impoverished over time.

In the 1990s, the ENSP launched a comprehensive management approach to guide conservation of important bog turtle populations in New Jersey. The management initiative consists of four main actions:

1. developing relationships with private landowners that have bog turtles on their land;
2. facilitating the acquisition of core bog turtle habitats threatened by adjacent land use activities;
3. undertaking and improving habitat management techniques to control and reverse habitat succession and invasive exotic plant proliferation; and
4. working with partners to develop and implement land-use planning that considers bog turtle.

More than half of bog turtle habitats in New Jersey are in need of management or restoration. Succession from open-canopy habitat to woody species and proliferation of invasive plants (e.g., purple loosestrife, Phragmites, multiflora rose, Japanese stiltgrass, and reed canary grass) are the primary threats to habitat quality, and most of these plants are extremely difficult to control. However, as aggressively as these plants invade, the ENSP is combating these floristic invaders with equivalent ferocity through several methods.

Grazing by sheep, goats, cattle, and other domestic livestock in bog turtle habitats has been demonstrated to slow natural succession, control expansion of fast-growing invasive species, augment hydrological regimes by reducing surface vegetative matter and breaking up peat accumulation, create microhabitats for bog turtles in the form of footprints, and encourage the growth of hummocky vegetation that bog turtles use for nesting. Over the last 20 years, the ENSP has coordinated and implemented prescribed grazing at more than 20 wetlands across the bog turtle's range in New Jersey. In addition to grazing, the ENSP has coordinated with many partners to cut and remove woody vegetation and treat invasive or exotic vegetation with targeted herbicidal applications. Habitat restoration or maintenance has been carried out at nearly half of New Jersey's core habitat areas.

Bog turtles are often found in wetlands that also support rare plant species. Some habitat management practices (such as invasive species control and grazing) and monitoring practices (such as drift fence arrays) can be harmful to rare plant populations, depending on how the practices are implemented. Attachment IV provides guidance on vegetation management practices that minimize or avoid negative impacts to rare plants in bog turtle habitats. There is a similar risk of unintended consequences for rare plants in other wildlife habitats.

To restore degraded bog turtle habitats in New Jersey, the ENSP is pursuing the following restoration action: use woody vegetation control and prescribed grazing to reduce invasive plant species cover and slow succession.

A results chain for this restoration action shows the connections between the conservation elements:

**Action**: Use woody vegetation control and prescribed grazing to reduce invasive plant species cover and slow succession at four core habitats per year. Monitor turtle population size and structure at core habitats once every five years.

**Objective**: Increase the number of documented bog turtle occurrences at restored wetlands. Through habitat improvements, increase core habitat population size to at least 15 female turtles. Increase the number of known populations through assessments and surveys of new habitats.

**Threat**: Dense cover of invasive plant species or excessive woody vegetation makes wetlands unsuitable for bog turtles.

**Target**: Bog turtles

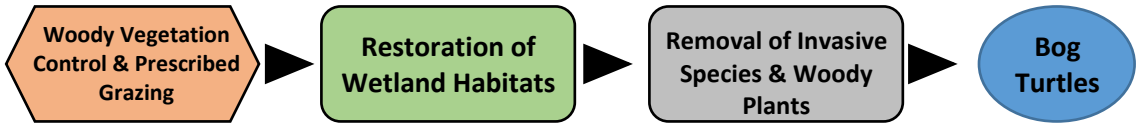


**Figure 9**. Results chain for restoration of wetland habitats to support bog turtles.

To assess the effectiveness of this direct management action, the DFW will follow the regional habitat monitoring protocols developed in coordination with the USFWS and state wildlife agencies across the bog turtle's range in the Northeast, as follows.

A. Quantify and track changes in vegetation structure.
B. Quantify and track changes in wetland-specific plant community distribution.
C. Evaluate the effect of the restoration on bog turtles through supplemental population monitoring protocols.

The data collected from these monitoring efforts will be used to track the effects of the management activities and thereby inform adaptive management of sites in New Jersey and regionally.

***Scenario 2: Scrub-shrub & Young Forest Habitat Management***

Mosaics of scrub-shrub and young forest habitats are vital for a variety of SGCN, notably golden-winged warbler, northern bobwhite, and wood thrush. Scrub-shrub and young forest habitats are rare in New Jersey in part because they are transitional stages between field and forest, so are always changing.

There are, however, opportunities to maintain and create these important habitats along powerline rights-of-way, at fallow agricultural sites, and on some public lands. With partners such as New Jersey Audubon and the Conserve Wildlife Foundation of New Jersey, the DFW is

undertaking vegetative management projects and developing best management practices for use by other conservation partners.

To create and retain scrub-shrub and young forest habitats in northern New Jersey, the ENSP is pursuing the following restoration action: In large contiguous forest blocks (>2,500 acres) with >70% mature forest cover, use prescribed forest thinning in mature forests to create a mosaic of early successional forest habitat (not to exceed 20% of entire forest block at a time) that consists of more than 50% native shrubs/saplings and 10-15 trees per acre over 9 inches in diameter at breast height, or an approximate basal area of 30 $ft^2$ per acre with 10-40% canopy cover.

A results chain for this restoration action shows the connections between the conservation elements:

**Action**: Use prescribed forest thinning to create early successional forest habitat that consists of more than 50% native shrubs/saplings and 10-15 trees per acre over 9 inches in diameter at breast height, or an approximate basal area of 30 $ft^2$ per acre with 10-40% canopy cover

**Objective**: Create scrub-shrub and young forest habitat to support viable populations of early successional species

**Threat**: Natural succession that transitions scrub-shrub and young forest habitats into closed-canopy forests eliminates important habitats for a variety of SGCN

**Target**: Young forest dependent species including golden-winged warbler, northern bobwhite, and wood thrush

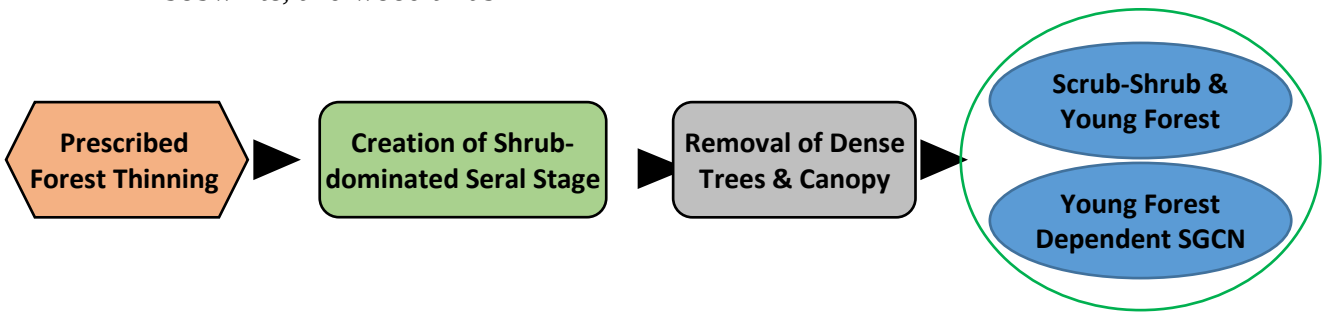


**Figure 10**. Results chain for creation of scrub-shrub habitats to support young forest dependent species.

To assess the effectiveness of this direct management action, the DFW will undertake strategic monitoring, as follows.

A. Number of individuals and species (including Focal SGCN) occurring in managed areas annually following management actions.
B. Vegetative structure as measured in May and June of each year following management actions.

The results of these monitoring efforts will be shown graphically (Figure 11), potentially in the formats shown below.

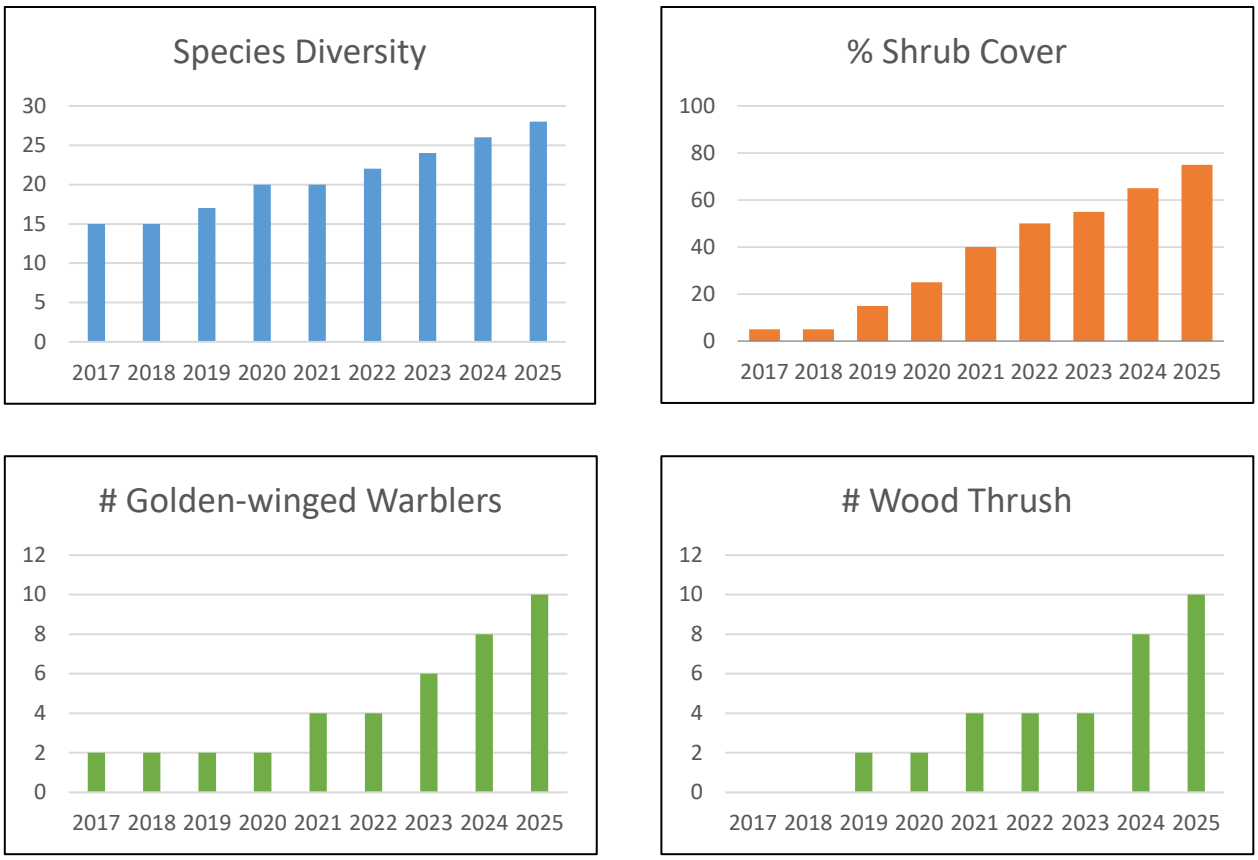


**Figure 11**. Example of how the results of future monitoring efforts for scrub shrub and young forest species could be depicted.

# *II. Adaptive Management*

Adaptive management is the process through which conservation actions are undertaken, assessed through careful monitoring, and then modified as necessary based on the monitoring results. Successful adaptive management requires the completion of six interrelated steps.

1. Assessing a problem with the recognition that there is uncertainty about what policy or action is best for addressing it.
2. Designing a strategy based on a careful selection of policies and management actions.
3. Implementing a policy or action that is likely to show where additional information is needed.
4. Monitoring key indicators to get insights into responses to the policy or management action.
5. Analyzing the outcomes in relation to the original objectives to determine the effectiveness of the applied policy or action.
6. Adjusting the policy or action based on the analysis, and incorporating the new information into future decisions.

Adaptive management is necessary because there is still so much that is unknown about wildlife, their habitats, and the complex interactions of these with the surrounding world. In addition to

gaining insights into wildlife management from conservation and monitoring efforts in New Jersey, the DFW is also committed to learning from, and contributing to, work on SGCN in other states.

In the next three years, DFW staff will consult with conservation stakeholders to identify the highest priority conservation actions and projects to improve the status of SGCN in the state. Prioritization of actions and projects should highlight the 107 focal SGCN species as well as Conservation Focal Areas that are important for all SGCN. Conservation projects and jobs that result from the prioritization process will incorporate appropriate monitoring approaches that provide measures of success of steps necessary toward achieving the goal of improving species' status. Monitoring efforts should be explored that leverage the assistance of a variety of qualified conservation partners. Descriptions or graphics identifying the results-chain(s) for projects are helpful for focusing actions, monitoring, and results. Adaptive management can then be applied to ongoing management projects that continue or shift actions as necessary.

# *III. Coordinating State & Regional Monitoring*

While it is simple to state monitoring goals, it is much more challenging to implement them. Monitoring can be extremely time and resource intensive. Further, it can be difficult to connect conservation actions to observed population conditions because so many factors and influences are continually at play in nature.

To help overcome these challenges, the Association of Fish & Wildlife Agencies in 2012 proposed a set of best management practices to help states establish monitoring programs that both met their specific goals and integrated smoothly into monitoring programs regionally. A key component of these recommendations was the use of the U.S. Fish & Wildlife Service's Tracking and Reporting on Actions for Conservation of Species (TRACS) system to allow information gathered on SGCN in New Jersey to be integrated with information gathered in other states. This collaborative approach of using the same metrics to track progress toward goals will allow managers to better target their SGCN management actions to achieve the greatest conservation benefits, both in New Jersey and throughout each species' range. We include the table of TRACS indicators in Appendix M.