

Integrating the Conservation of Plant Species of Concern in the New Jersey State Wildlife Action Plan



Prepared by

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Cover Photographs:

Top Row: Spreading globeflower (*Trollius laxus* spp. *Laxus*) in calcareous fen habitat; Appalachian Mountain boltonia (*Boltonia montana*) in calcareous sinkhole pond habitat of the Skylands Landscape Regional Landscape (photographs by Kathleen Strakosch Walz)

Bottom Row: Bog asphodel (*Narthecium americanum*) in Pine Barren riverside savanna habitat; Reversed bladderwort (*Utricularia resupinata*) in coastal plain intermittent pond habitat of the Pinelands Regional Landscape (photographs by Renee Brecht)

PROJECT SUMMARY

Overall purpose/intent:

- New Jersey is the first state projected to reach build-out, and pressure from competing land use interests and associated threats is high on the remaining open space. Therefore it is imperative to strategically protect and manage these natural areas for resiliency, as it is on these lands where the future of conservation lies for plants, animals and their critical habitats. Strengthening New Jersey's State Wildlife Action Plan (SWAP) will help address the growing need for guided protection and integrated management for species of greatest conservation need (SGCN).
- While broad habitat categories based on vegetation communities are referenced in the New Jersey SWAP, plant species of conservation concern are not addressed. The purpose of this project is to develop rare plant conservation strategies that complement conservation actions for animal species in the context of biodiversity protection and climate change in New Jersey. The project focused on two high-priority regions of the state with the development of a spatial framework and conservation strategy prototype that can be used in other regions of the state. Integrated rare plant and wildlife SGCN management guidelines will be incorporated into New Jersey's SWAP and implemented, as practicable, with state and NGO conservation partners.

Approach/methods

1. The New Jersey Department of Environmental Protection, Division of State Forestry Services, Office of Natural Lands Management, Natural Heritage Program (NHP) will cooperate with the NJDEP, Division of Fish & Wildlife, Endangered and Nongame Species Program (ENSP) to produce supplemental information on rare plants for inclusion in the State Wildlife Action Plan (SWAP).
2. Conduct a spatial analysis of the distribution of high priority rare plant and animal species in New Jersey and use this to guide the development of habitat-specific integrated management plans for plant species of conservation concern and wildlife Species of Greatest Conservation Need (SGCN).
3. Develop integrated management guidelines for four habitats within the SWAP Skylands and Pinelands Landscape Conservation Zones in New Jersey. These hotspots for biodiversity support rare ecological communities, plants and animals of greatest conservation concern in the state. The four habitats include calcareous fens and sinkhole ponds in the Kittatinny Valley of northern New Jersey and coastal plain intermittent ponds and riverside savannas in the Pine Barrens of southern New Jersey. A total of 70 State Endangered Plant species and 30 wildlife SGCN were selected for the analysis.
4. Using the NatureServe Climate Change Vulnerability Index, conduct an analysis of 70 State Endangered plant species and incorporate this information on vulnerability to changes in regional groundwater hydrology, precipitation periodicity/quantity and fire frequency/intensity due to global climate change into species-habitat guidelines for the SWAP.

5. Work collaboratively with ENSP to integrate rare plant conservation information products into the SWAP. Use these plans and the results of the spatial analysis to inform and develop a conservation strategy prototype for future areas and habitats of conservation concern in New Jersey.

Outcomes/results

- A list of all 812 New Jersey State Endangered, Threatened and Special Concern (S1-S3) plant species with their rarity ranks and associated habitats was incorporated into the SWAP.
- A conservation strategy prototype for two SWAP Landscape Conservation Zones and four habitats of conservation concern in New Jersey was developed using a spatial analysis of existing high-priority geographic areas identified for the protection of both rare plant and animal species of greatest conservation concern. The prototype strategy will facilitate the analysis of other priority regions for biodiversity.
- Integrated management guidelines were developed for State Endangered plants and wildlife SGCN using a habitat approach. The four habitats include calcareous fens and sinkhole ponds in the Kittatinny Valley of northern New Jersey and coastal plain intermittent ponds and riverside savannas in the Pine Barrens of southern New Jersey.
- Climate Change Vulnerability Assessments based on NatureServe's Climate Change Vulnerability Index (CCVI) was completed for 70 State Endangered plant species in New Jersey.
- Tables with State Endangered plant species phenology and habitat niche were created for and used in determining guidelines for integrated management of plants and wildlife.
- Tables with Wildlife CMP Threats and Stresses were created for all 70 State Endangered plant species and 30 wildlife SGCN.
- Supplemental sidebars were created for the SWAP featuring integrated management recommendations for relevant rare plant and wildlife SGCN/guilds by habitat within the SWAP Landscape Conservation Zones.
- The project opened a constructive dialogue between ENSP and NHP on integrated management issues with respect to rare plants, animals and their habitats.
- A significant outcome of the project was an awareness of the gap that exists in coordinating the management of natural resources in a state reaching build-out with limited areas left for habitat and species protection. We have realized that multiple projects occur on private or NGO lands that are not necessarily coordinated with other state efforts to integrate management of all elements of biodiversity. Knowing this will enable us to reach out to landowners and incentive programs in the future to educate them about rare plant conservation.

Next steps/future

- To incorporate products developed in this project (plant species list, habitat classification revisions, habitat-based integrated management guidelines) into the next iteration of the New Jersey SWAP.

- Implement agreed-upon approach to integrated management of plants and wildlife as planning gets underway for the next SWAP update.
- Incorporate standard format using Wildlife Conservation Measures Partnership (CMP) lexicon of Threats and TRACS Actions in future integrated guidelines for rare plants and wildlife SGCN.
- Develop outreach about the importance of incorporating plants into wildlife management plans especially to federal and state partners and NGO's. Education is the critical next step.

Challenges/lessons learned

- Finding a common habitat definition at a meaningful scale for species was a challenge and required using a crosswalk between the Landscape Project and Natural Heritage ecological community classification and National Vegetation Classification System (NVC) ecological systems to update the SWAP habitat classification.
- A HCCVI model for all four habitats was not completed as hoped for during the study. However, guilds of keystone species served as surrogates, and were used to create draft habitat CCVI's.
- Unfortunately wildlife CCVI's for all 30 wildlife SGCN were not available for inclusion in the integrated management guidelines in this study.
- Fine tuning the criteria for the animal species to be included in the four habitats selected took more time than expected. It took more research and additional communication with experts.

Usefulness/applicability

- The NJ habitat-based approach worked well for incorporating rare plants into WAPs, as well as linking rare plants and wildlife SGCN by habitat for protection and integrated management. Habitat became an essential component of conducting the CCVI for 70 state endangered plant species – many assessments of species could not be done without an understanding of specific habitat responses to projected climate change. This worked mainly because the state endangered species chosen for the study had a high fidelity to the rare habitats chosen (calcareous fen, calcareous sinkhole pond, coastal plain intermittent pond, Pine Barren riverside savanna). In fact, the habitat focus for integrated management was crucial for more than climate change – it drove the entire assessment in the context of Wildlife TRACS Threats and Actions framework (unified lexicon being used in WAPs).
- The focus on four rare habitats and associated rare species in two hot spots of diversity in NJ – Skylands in northern NJ and Pinelands in southern NJ – provided a broader assessment platform for approaching conservation of wildlife species as well as giving specific guidelines for integrating management of rare plants and animal species within these habitats. The NJ habitat-based approach worked well, especially in the context of climate change and understanding how to foster resiliency in species populations and their habitats.

- The addition of plants and revisions to habitat classification using finer scales from the National Vegetation Classification System has broadened the scope of the NJ WAP.
- The model was most useful for habitats most vulnerable to human encroachment (e.g. calcareous fens) than the habitats with fewer threats or that were imbedded within larger conservation landscapes (e.g. Pine Barrens).
- The approach validated the importance of protecting species and habitats within larger protected landscape units, migration corridors, especially in the context of resilience to climate change.

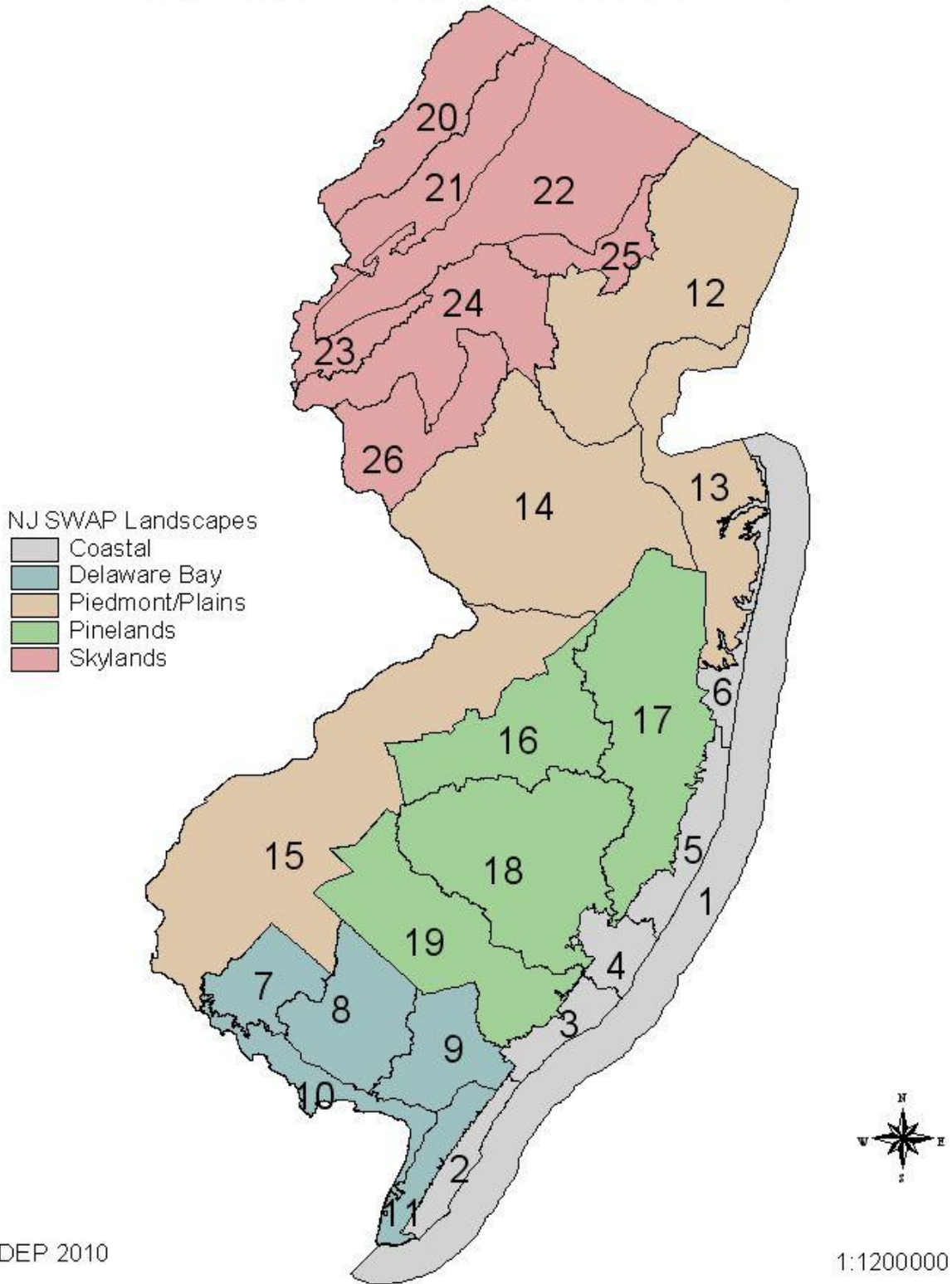
APPENDIX

New Jersey State Wildlife Action Plan Landscape and Conservation Zones Map & Legend

Map of New Jersey State Wildlife Action Plan Regional Landscapes and Conservation Zones with State Endangered Plant Species Occurrences and Natural Heritage Priority Sites

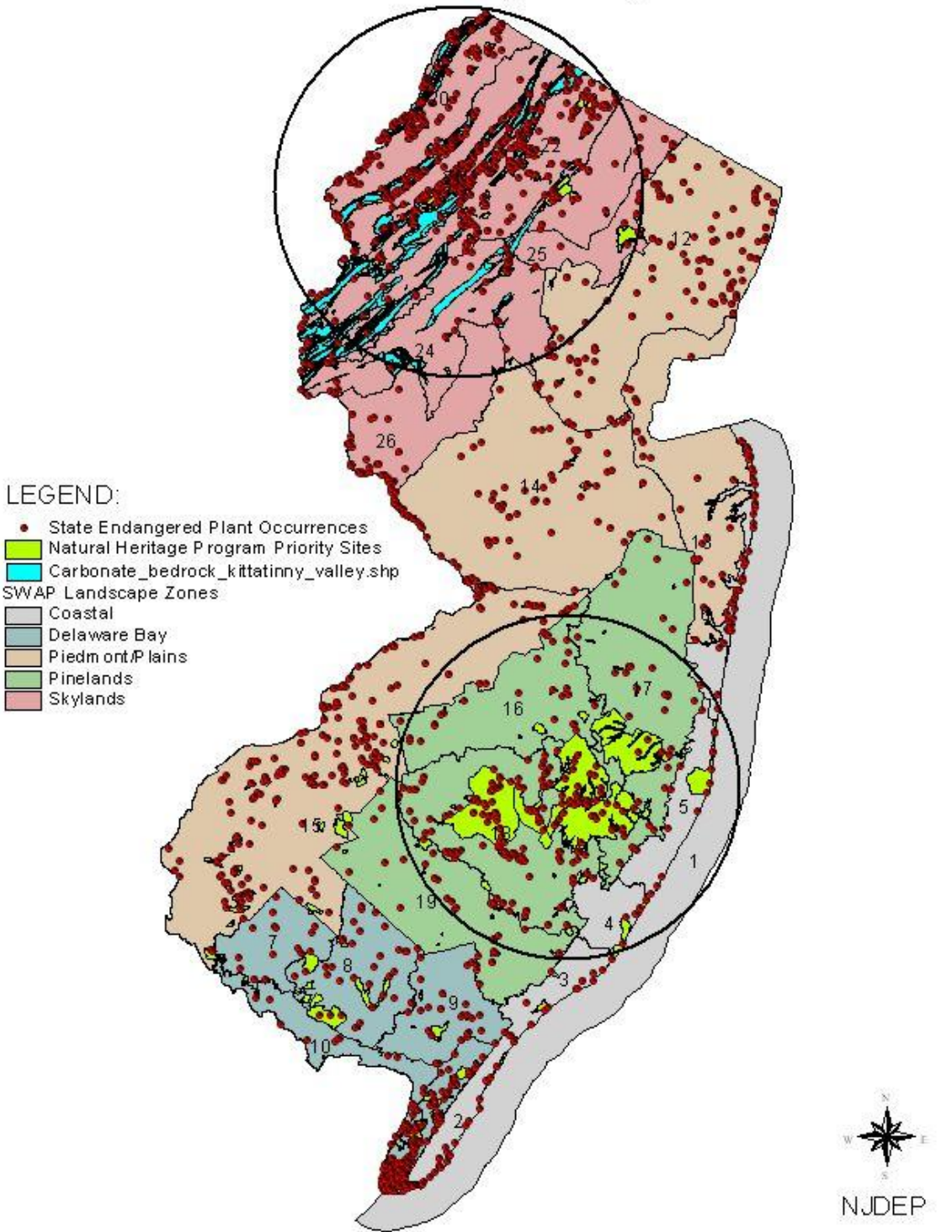
State Endangered Plant Species and Animal Species of Greatest Conservation Need by NJ SWAP Landscape Region and Habitat

New Jersey SWAP Landscapes and Conservation Zones



MAP LEGEND: NJ SWAP Landscape Regions and Conservation Zones		
MAP ID	LANDSCAPE REGION	CONSERVATION ZONE
1	Coastal	The Atlantic Ocean
2	Coastal	Atlantic Coastal Cape May
3	Coastal	Atlantic City Area
4	Coastal	Brigantine - Great Bay
5	Coastal	Barnegat Bay - Little Egg Harbor
6	Coastal	Northern Atlantic Coastal
7	Delaware Bay	Cohansey
8	Delaware Bay	Maurice
9	Delaware Bay	Tuckahoe
10	Delaware Bay	Shoreline
11	Delaware Bay	Peninsula
12	Piedmont/Plains	Northern Piedmont Plains
13	Piedmont/Plains	Raritan Bay
14	Piedmont/Plains	Central Piedmont Plains
15	Piedmont/Plains	Southern Piedmont Plains
16	Pinelands	Western Pinelands
17	Pinelands	Northern Pinelands
18	Pinelands	Mullica River Watershed
19	Pinelands	Southern Pinelands
20	Skylands	Upper Delaware River Valley & Kittatinny Ridge
21	Skylands	Kittatinny Valley
22	Skylands	Northern Highlands
23	Skylands	Upper Delaware/Musconetcong River Valleys
24	Skylands	Central Highlands
25	Skylands	Urban Highlands
26	Skylands	Southern Highlands

Map of New Jersey State Wildlife Action Plan Regional Landscapes and Conservation Zones with State Endangered Plant Occurrences and Natural Heritage Priority Sites



State Endangered Plant Species and Animal Species of Greatest Conservation Need by NJ SWAP Landscape Region and Habitat

NJ SWAP LANDSCAPE REGION	HABITAT TYPE	NUMBER OF ENDANGERED PLANT SPECIES	NUMBER OF ANIMAL SPECIES OF GREATEST CONSERVATION NEED
Pinelands	Pine Barren Savannas	14	6
Pinelands	Coastal Plain Intermittent Pond	17	5
Skylands	Calcareous Fen	28	17
Skylands	Calcareous Sinkhole Pond	13	3
2 REGIONS	4 HABITATS	70 PLANTS*	30 ANIMALS*

* Note that 2 plant species and 1 animal species occur in 2 different habitats but are counted only once in the total number of species by habitat

STATE ENDANGERED PLANT SPECIES LIST BY SWAP LANDSCAPE REGION AND HABITAT		
REGION: SKYLANDS	Common name	Scientific name
Habitat type: Calcareous Fen (28 species)		
	Bog Rosemary	<i>Andromeda glaucophylla</i>
	Rush Aster	<i>Aster borealis</i>
	Foxtail Sedge	<i>Carex alopecoidea</i>
	Water Sedge	<i>Carex aquatilis</i>
	Lesser Panicked Sedge	<i>Carex diandra</i>
	Handsome Sedge	<i>Carex formosa</i>
	Cyperus-like Sedge	<i>Carex pseudocyperus</i>
	Tuckerman's Sedge	<i>Carex tuckermanii</i>
	Wood's Sedge	<i>Carex woodii</i>
	Marsh Cinquefoil	<i>Comarum palustris</i>
	Hemlock-parsley	<i>Conioselinum chinense</i>
	Small White Lady's-slipper	<i>Cypripedium candidum</i>
	Showy Lady's-slipper	<i>Cypripedium reginae</i>
	Few-flower Spike-rush	<i>Eleocharis quinqueflora</i>
	Variegated Horsetail	<i>Equisetum variegatum var. variegatum</i>
	Queen-of-the-prairie	<i>Filipendula rubra</i>
	Labrador Marsh Bedstraw	<i>Galium labradoricum</i>
	Small Bedstraw	<i>Galium trifidum var. trifidum</i>
	Northern Panic Grass	<i>Panicum boreale</i>
	Capillary Beaked-rush	<i>Rhynchospora capillacea</i>
	Orange Coneflower	<i>Rudbeckia fulgida var. fulgida</i>
	Shining Willow	<i>Salix lucida ssp. lucida</i>
	Bog Willow	<i>Salix pedicellaris</i>
	Strict Blue-eyed Grass	<i>Sisyrinchium montanum var. crebrum</i>
	Arborvitae	<i>Thuja occidentalis</i>
	Seaside Arrow-grass	<i>Triglochin maritima</i>
	Spreading Globe Flower	<i>Trollius laxus ssp. laxus</i>
	Sessile Water-speedwell	<i>Veronica catenata</i>
Habitat type: Calcareous Sinkhole Pond (13 species)		
	Large Water-plantain	<i>Alisma triviale</i>
	Appalachian Mountain Boltonia	<i>Boltonia montana</i>
	Cloud Sedge	<i>Carex haydenii</i>
	Hop-like Sedge	<i>Carex lupuliformis</i>
	Small Floating Manna Grass	<i>Glyceria borealis</i>

	Larger Canadian St. John's Wort	<i>Hypericum majus</i>
	Water-marigold	<i>Megalodonta beckii</i>
	Lake Water-cress	<i>Neobeckia aquatica</i>
	Wiry Panic Grass	<i>Panicum flexile</i>
	Arum-leaf Arrowhead	<i>Sagittaria cuneata</i>
	Torrey's Bulrush *	<i>Schoenoplectus torreyi</i>
	Small Burr-reed	<i>Sparganium natans</i>
	Lesser Bladderwort	<i>Utricularia minor</i>
REGION: PINELANDS	Common name	Scientific name
Habitat type: Pine Barren Savanna (14 species)		
	Pickering's Reed Grass	<i>Calamagrostis pickeringii</i>
	Spreading Pogonia	<i>Cleistes divaricata</i>
	Rough Cotton-grass	<i>Eriophorum tenellum</i>
	Pine Barren Boneset	<i>Eupatorium resinosum</i>
	New Jersey Rush	<i>Juncus caesariensis</i>
	Bog Asphodel	<i>Narthecium americanum</i>
	Yellow Fringeless Orchid	<i>Platanthera integra</i>
	Knieskern's Beaked-rush	<i>Rhynchospora knieskernii</i>
	Long's Woolgrass	<i>Scirpus longii</i>
	Lace-lip Ladies'-tresses	<i>Spiranthes laciniata</i>
	False Asphodel	<i>Tofieldia racemosa</i>
	Reversed Bladderwort *	<i>Utricularia resupinata</i>
	Fringed Yellow-eyed-grass	<i>Xyris fimbriata</i>
	Death-camus	<i>Zigadenus leimanthoides</i>
Habitat type: Coastal Plain Intermittent Pond (17 species)		
	Southern Boltonia	<i>Boltonia asteroides var. glastifolia</i>
	Wrinkled Jointgrass	<i>Coelorachis rugosa</i>
	Marsh Flat Sedge	<i>Cyperus pseudovegetus</i>
	Hirst Brothers' Panic Grass	<i>Dichantherium hirstii (Panicum hirstii)</i>
	Larger Buttonweed	<i>Diodia virginiana var. virginiana</i>
	Knotted Spike-rush	<i>Eleocharis equisetoides</i>
	Featherfoil	<i>Hottonia inflata</i>
	Barton's St. John's-wort	<i>Hypericum adpressum</i>
	Clasping-leaf St. John's-wort	<i>Hypericum gymnanthum</i>
	Boykin's Lobelia	<i>Lobelia boykinii</i>
	Narrow-leaf Primrose-willow	<i>Ludwigia linearis</i>
	Awed Meadow-beauty	<i>Rhexia aristosa</i>
	Small-head Beaked-rush	<i>Rhynchospora microcephala</i>
	Slender Arrowhead	<i>Sagittaria teres</i>
	Torrey's Bulrush *	<i>Schoenoplectus torreyi</i>
	Dwarf White Bladderwort	<i>Utricularia olivacea</i>
	Reversed Bladderwort *	<i>Utricularia resupinata</i>

WILDLIFE SGCN SPECIES LIST BY SWAP LANDSCAPE REGION AND HABITAT		
REGION: SKYLANDS	Common name	Scientific name
Habitat type: Calcareous Fen (17 species)		
Bird	Veery	<i>Catharus fuscescens</i>
Bird	Sedge wren	<i>Cistothorus platensis</i>
Bird	Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Bird	Least flycatcher	<i>Empidonax minimus</i>
Bird	Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Bird	Northern parula *	<i>Setophaga (Parula) americana</i>
Bird	American woodcock	<i>Scolopax minor</i>
Bird	Winter wren	<i>Troglodytes hiemalis</i>
Bird	Golden-winged warbler	<i>Vermivora chrysoptera</i>
Bird	Canada warbler	<i>Cardellina (Wilsonia) canadensis</i>
Butterfly	Silver-bordered Fritillary	<i>Boloria selene myrina</i>
Butterfly	Mitchell's Satyr	<i>Neonympha mitchellii mitchellii</i>
Moth	Schweitzer's buckmoth	<i>Hemileuca nevadensis ssp. 2</i>
Dragonfly	Kennedy's Emerald	<i>Somatochlora kennedyi</i>
Dragonfly	Brush-tipped Emerald	<i>Somatochlora walshii</i>
Reptile	Spotted turtle	<i>Clemmys guttata</i>
Reptile	Bog turtle	<i>Glyptemys (Clemmys) muhlenbergii</i>
Habitat type: Calcareous Sinkhole Pond (3 species)		
Amphibian	Jefferson salamander	<i>Ambystoma jeffersonianum</i>
Amphibian	Marbled salamander	<i>Ambystoma opacum</i>
Amphibian	Long-tailed salamander	<i>Eurycea longicauda longicauda</i>
REGION: PINELANDS	Common name	Scientific name
Habitat type: Pine Barren Savanna (6 species)		
Bird	Northern parula*	<i>Setophaga (Parula) americana</i>
Butterfly	Arogos skipper	<i>Atrytone arogos arogos</i>
Butterfly	Helicta Satyr (Georgia Satyr)	<i>Neonympha helicta (Neonympha areolata septentrionalis)</i>
Mammal	Southern bog lemming	<i>Synaptomys cooperi</i>
Moth	Moth	<i>Dichagyris reliqua</i>
Moth	Carter's noctuid moth	<i>Photodes (Spartiniphaga) carterae</i>
Habitat type: Coastal Plain Intermittent Pond (5 species)		
Amphibian	Pine Barrens treefrog	<i>Hyla andersonii</i>
Amphibian	Carpenter frog	<i>Lithobates virgatipes</i>
Dragonfly	Scarlet Bluet	<i>Enallagma pictum</i>
Dragonfly	Pine Barrens Bluet	<i>Enallagma recurvatum</i>
Dragonfly	Golden-winged skimmer	<i>Libellula auripennis</i>

* Note that 2 plant species (*Schoenoplectus torreyi* and *Utricularia resupinata*) and 1 animal species (*Setophaga americana*) occur in 2 different habitats but are counted only once in the total number of species addressed in this report.

We identified key threats to plants and animals in each habitat using the Conservation Measures Partnership (CMP) THREATS classification (see Salafsky et al. 2008 for the lexicon). The Threats categories are listed below. See Appendix C for the table of CMP Threats for each of the state endangered plant species and wildlife SGCN by habitat addressed in this study.