ADDENDUM 2

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North Carolina Protected Plant Species and Plant SGCN Evaluation Methodology

White Paper

North Carolina Protected Plant Species Evaluation Methodology

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The North Carolina Plant Conservation Board (PCP Board) is tasked with listing endangered, threatened, and special concern species of plants under the authority of the North Carolina Plant Protection and Conservation Act of 1979. The PCP Board directs their appointed Scientific Committee to assess the rare native plants of North Carolina to determine which species warrant listing, and in what category. In 2007-2008, the North Carolina Plant Conservation Program (PCP) and North Carolina Natural Heritage Program (NHP) launched a comprehensive review of North Carolina's rare plants with the goal of identifying and assessing rarity, threats, and trends associated with all the vascular and non-vascular plant taxa tracked by the NHP. The results of this assessment were used by the PCP Scientific Committee during their 2008 review of the *North Carolina Protected Plant Species List* to determine which species warrant listing and to create a list that is scientifically defensible, consistent, and intuitive. Following the update to the evaluation methodology in 2008-2009, the Scientific Committee and PCP Board set an intention to update the *North Carolina Protected Plant Species List* every five years to account for new data records, changes in taxonomy, and increased knowledge of emerging trends and threats.

In 2008-2009, PCP staff held meetings with the Scientific Committee and botanists around the state to review criteria and assess rarity, threats, and trends for 900 plant taxa tracked by NHP. Botanists who contributed to these assessments were associated with NHP and PCP as well as US Fish and Wildlife Service, National Park Service, USDA Forest Service, NC Botanical Garden, NC Museum of Natural Sciences, University of North Carolina Herbarium (NCU), North Carolina State University Herbarium (NCSC), Appalachian State University Herbarium (BOON), and private botanists and consultants. A final proposed list was published in the state register for a 60-day public comment period to allow for additional public input. After addressing all comments, a significantly updated *North Carolina Protected Plant Species List* was published December 1, 2010.

Historically in North Carolina, protected plant lists have emphasized rarity as the primary factor determining extinction risk, while the current assessment methodology recognizes rarity as one of three factors (rarity, trends, and threats). The criteria for this assessment were modified from guidelines developed by NatureServe (Master et al. 2003) and the World Conservation Union (IUCN) (Standards and Petitions Working Group 2006). The data on rarity, threats, and trends are based on data from NHP as well as expertise from more than two dozen botanists and biologists who participated in the 2008-2009 review. NHP began collecting data in 1975 and has more than 12,911 records of rare plant occurrences (NC NHP 2021). In special cases, taxa specialists were contacted directly for their input into the evaluation process.

NC Protected Plant Species Evaluation Methodology. Version date 5/19/2021.

Rarity

Measures of rarity take into account the number of occurrences in the state and the viability of each occurrence (population size, habitat condition, and landscape context). NHP data are used to determine occurrence viability according to Element Occurrence Ranking Specifications developed by the NatureServe network (NatureServe 2002). The number of occurrences was determined using the NatureServe Element Occurrence Data Standard (NatureServe 2002). For the assessment, taxa were categorized according to the number of populations ranked as having good to excellent estimated viability (A-ranked or excellent viability, B-ranked or good viability, or E-ranked or verified extant) as defined by NatureServe (2002).

Trends

Each taxon was evaluated for short–term trends (including extent of occurrences, number of occurrences, and/or condition of occurrences). Short–term trends refer to fluctuations in the size and viability of an occurrence over the past 10-20 years. The number of populations known or believed to be recently extirpated was determined by NHP data and observations from experts who attended assessment meetings. Each taxon was assigned an alphabetical value based on its ranked trend assessment following the NatureServe Conservation Status Assessment Criteria (Master et al. 2003) (Table 1).

Table 1. Ranked trend categories

Rank	Change	Description
A	>70% decline	Severely declining (decline in population, range, area occupied, and/or number or condition of occurrences)
B	50-70% decline	Very rapidly declining
C	30-50% decline	Rapidly declining
D	10-30% decline	Declining
E	±10% fluctuation	Stable
F	>10% increase	Increasing
U	Unknown	Unknown

Threats

NHP data and other observations collected from experts were used to rate up to three threats for each species according to the severity, scope, and immediacy of each threat. If more than three threats exist for a species, the three most severe were used in the threat assessment. This evaluation includes indirect and direct threats that are observed, inferred, or suspected to have an impact on the species. During each threat assessment, the severity, scope, and immediacy were also assigned a ranked value of high,

NC Protected Plant Species Evaluation Methodology. Version date 5/19/2021.

2015 NC Wildlife Action Plan

2022 Addendum 2

medium, or low as described below. This evaluation also allows for the possibility of species to have no or insignificant threats.

Threat Severity

- High: Loss of species population (all individuals) or destruction of species habitat in area affected, irreversible or requiring long–term recovery (>100 yr).

- Moderate: Major reduction of species population or long–term degradation or reduction of habitat in area affected, requiring 50–100 yr for recovery.

- Low: Low but nontrivial reduction of species population or reversible degradation or reduction of habitat in area affected, with recovery expected in 10–50 yr.

- Insignificant: Essentially no reduction of population or degradation of habitat due to threats, or populations or habitats able to recover quickly (within 10 yr) from minor temporary loss. Note that effects of locally sustainable levels of hunting, fishing, logging, collecting, or other harvest from wild populations are generally considered Insignificant as defined here.

Threat Scope

- High: >60% of total population, occurrences, or area affected.

- Moderate: 20–60% of total population, occurrences, or area affected.

- Low: 5–20% of total population, occurrences, or area affected.

- Insignificant: <5% of total population or area affected.

Threat Immediacy

- High: Threat is operational (happening now) or imminent (within a year).

- Moderate: Threat is likely to be operational within 2–5 yr.

- Low: Threat is likely to be operational within 5–20 yr.

- Insignificant: Threat not likely to be operational within 20 yr.

The values assigned for the severity, scope, and immediacy of each threat were incorporated into a matrix that generated a single, consolidated threat category value for that threat (Table 2). The highest-ranking threat value among the three threats per species was recorded as the overall threat value for that species. For example, the top three threats recorded for Venus Flytrap (*Dionaea muscipula*) are Development (Threat value=B), Fire Suppression (Threat value=F), and Poaching (Threat value=E); therefore, the overall threat value for this species is B. If these values could not be determined for a species, then the species was categorized as data deficient and was not further evaluated for potential listing. One exception to this procedure occurred for species that are limited to 1-2 populations in North Carolina. These species

NC Protected Plant Species Evaluation Methodology. Version date 5/19/2021.

are considered inherently susceptible to stochastic (unpredictable) threats and were therefore assigned to the highest threat category.

Once the rarity, trend, and threats were identified or assigned for a species, the trend and overall threat values were incorporated into a listing criteria matrix associated with the number of viable populations recorded for that species. There are three protected plant listing criteria matrices and each species is assigned to one of them based on the number of populations of good viability recorded in North Carolina for that species: (A) 1-5, (B) 6-19, or (C) ≥20 populations of good to excellent viability.

The possible outcomes from the listing criteria matrices are Endangered, Threatened, Special Concern-Vulnerable, or Significantly Rare. Only Endangered, Threatened, and Special Concern categories warrant listing on the *North Carolina Protected Plant Species List*. Species evaluated as Significantly Rare through this process are not added to the state list of protected species; however, they remain on the NHP *Rare Plant List* which does not have any regulatory authority. The Scientific Committee determined through this process that any tracked species with extant populations in North Carolina, but none of good to excellent viability (A-, B-, or E-ranked populations) would be listed as Endangered. Further, any tracked species with only extirpated (X-), historical (H-), and failed to find (F-) ranked populations in North Carolina would be listed as Special Concern-Historical.

Table 2. Threat matrix with threat parameters and ranked threat values.

Threat Severity	Threat Scope	Threat Immediacy	Value	Threat Description
High	High	High	A	Moderate to severe, imminent threat for most (>60%) of population, occurrences, or area
High	High	Moderate		
Moderate	High	High		
Moderate	High	Moderate		
High	Moderate	High	B	Moderate to severe, imminent threat for a significant portion (20-60%) of population, occurrences or area
High	Moderate	Moderate		
Moderate	Moderate	High		
Moderate	Moderate	Moderate		
High	High	Low	C	Moderate to severe, non-imminent threat for most of population, occurrences, or area
Moderate	High	Low		
High	Moderate	Low	D	Moderate to severe, non-imminent threat for a significant proportion of population, occurrences or area
Moderate	Moderate	Low		
High	Low	High	E	
High	Low	Moderate		

NC Protected Plant Species Evaluation Methodology. Version date 5/19/2021.

2015 NC Wildlife Action Plan   **2022 Addendum 2**

High	Low	Low		Moderate to severe threat for small proportion of population, occurrences, or area
Moderate	Low	High		
Moderate	Low	Moderate		
Moderate	Low	Low		
Low	High	High	F	Low severity threat for most or significant proportion of population, occurrences, or area
Low	High	Moderate		
Low	High	Low		
Low	Moderate	High		
Low	Moderate	Moderate		
Low	Moderate	Low		
Low	Low	High	G	Low severity threat for a small proportion of population, occurrences, or area
Low	Low	Moderate		
Low	Low	Low		

Protected Plant Listing Criteria Matrices

E=Endangered, T=Threatened, SC-V=Special Concern-Vulnerable, SR=Significantly Rare

(A) 1-5 populations of good to excellent viability

		Short-term trend							
		A	**B**	**C**	**D**	**E**	**F**	**U**	**Null**
Threat	**A**	E	E	E	E	E	E	E	E
	B	E	E	E	E	E	T	T	T
	C	E	E	E	T	T	T	T	T
	D	E	E	T	T	T	T	SC-V	SC-V
	E	E	E	T	T	SC-V	SC-V	SC-V	SC-V
	F	E	T	T	SC-V	SC-V	SC-V	SC-V	SC-V
	G	E	T	T	SC-V	SC-V	SC-V	SC-V	SC-V

NC Protected Plant Species Evaluation Methodology. Version date 5/19/2021.

2015 NC Wildlife Action Plan   2022 Addendum 2

(B) 6-19 populations of good to excellent viability

		Short-term trend							
		A	**B**	**C**	**D**	**E**	**F**	**U**	**Null**
Threat	**A**	E	E	E	E	T	T	T	T
	B	E	E	T	T	T	SC-V	SC-V	SC-V
	C	E	T	T	SC-V	SC-V	SC-V	SC-V	SC-V
	D	E	T	SC-V	SC-V	SC-V	SC-V	SR	SR
	E	T	T	SC-V	SC-V	SR	SR	SR	SR
	F	T	SC-V	SC-V	SR	SR	SR	SR	SR
	G	T	SC-V	SC-V	SR	SR	SR	SR	SR

(C) ≥20 populations of good to excellent viability

		Short-term trend							
		A	**B**	**C**	**D**	**E**	**F**	**U**	**Null**
Threat	**A**	T	T	T	T	SC-V	SC-V	SC-V	SC-V
	B	T	T	SC-V	SC-V	SC-V	SR	SR	SR
	C	T	SC-V	SC-V	SR	SR	SR	SR	SR
	D	T	SC-V	SR	SR	SR	SR	SR	SR
	E	SC-V	SC-V	SR	SR	SR	SR	SR	SR
	F	SC-V	SR	SR	SR	SR	SR	SR	SR
	G	SC-V	SR	SR	SR	SR	SR	SR	SR

Updating the List

The first five-year update was delayed for unforeseen circumstances. In 2017-2019, the PCP staff worked with the Scientific Committee to propose systematic updates the *North Carolina Protected Plant Species List*. Keeping the evaluation methodology the same, the committee decided that rather than including all ~900 tracked plant taxa, only a subset would be evaluated during this and future list updates. First, all newly named or newly documented species (in North Carolina) that were not included in previous review processes would be evaluated. Second, Special Concern-Historical species that had been rediscovered in the state would be evaluated. Lastly, a set of thresholds was established that would identify those species for which NHP had received sufficient updates since the prior evaluation period to justify reevaluation.

6

NC Protected Plant Species Evaluation Methodology. Version date 5/19/2021.

2015 NC Wildlife Action Plan　　　　　　2022 Addendum 2

These thresholds refer to changes in available data from the time of the previous update to the next update period:

(1) Species with ≤20 viable occurrences and 2+ changes in the number of viable element occurrences,

(2) species with >20 viable occurrences and a 20% change in the number of viable occurrences, and

(3) species with ≤6 viable occurrences and 1+ change in the number of viable occurrences.

During the review of this subset of plant species, the trends and threats for each species were reassessed as well. The Scientific Committee may review the trends and threats of any tracked species with the NHP at any time between listing updates and determine with the PCP Board case by case if additional rule changes are warranted in between scheduled updates. The proposed updates resulting from the 2017-2019 reevaluation process were reviewed during a 60-day public comment period October 1-November 30, 2020. The updates were approved by the PCP Board in January 2021 and published in the NC Administrative Code on May 1, 2021.

In between listing updates, a special emphasis is placed on data deficient species and the intent to update the NHP database records for these species to facilitate listing evaluation. Fifty-seven of the 74 additions to the list between 2010 and 2021 were species that had been data deficient at the time of the 2008-2009 review, showcasing how important the influx of new data to NHP was to this process.

The most up to date list of protected plants, laws, and regulations can be found at the Plant Conservation Program website, www.ncplant.com. For details on how the assessment was performed or specific results, contact the PCP Program Manager (Lesley Starke).

Next Steps

This evaluation process reveals where there are knowledge gaps regarding rare plant taxa in North Carolina, in particular with short-term trends that require repeat monitoring data and other site-specific knowledge. Although the 2017-2019 reevaluation included many previously data-deficient species, we note that nearly half of the tracked species that remain data deficient are non-vascular taxa and are generally less well studied relative to vascular plant taxa. Future evaluations of these taxa will require a dedicated effort to increase the knowledge and data recording within the NHP database and herbaria records. PCP intends to assemble a non-vascular species review task force to facilitate the literature review, data collation, and data evaluation process ahead of future list reevaluations.

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NC Protected Plant Species Evaluation Methodology. Version date 5/19/2021.