Streptopus lanceolatus

Rosy Twisted-Stalk
Liliaceae


Streptopus lanceolatus by Rob Routledge (CC BY 3.0)

***Streptopus lanceolatus* Rare Plant Profile**

New Jersey Department of Environmental Protection
Division of Parks and Forestry
New Jersey Forest Service
Office of Natural Lands Management
New Jersey Natural Heritage Program

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August 21, 2019

This report should be cited as follows: Buczynski, Rebekah. 2019. *Streptopus lanceolatus* Rare Plant Profile. New Jersey Department of Environmental Protection, Division of Parks and Forestry, New Jersey Forest Service, Office of Natural Lands Management, New Jersey Natural Heritage Program, Trenton, NJ. 15 pp.

Introduction

Rosy Twisted-stalk is a NJ state endangered plant whose name can arguably be attributed to either its zigzag stem (Peterson and McKenny 1968 and Lady Bird Johnson Wildflower Center 2019 [hereafter, "LBJWC"]) or perhaps more accurately the arching angle of the flowering stalks (LBJWC 2019; Minnesota Wildflowers 2019 [hereafter, "MNWF"]). The translation of the Latin genus *Streptopus* is literally "Twisted foot" (USDA U.S. Forest Service 2019). One of the common names, "Scootberry" possibly refers to the purgative effect of consuming too much of the fruit (Flowering Plants in Voyageur Country 2007). Another point of taxonomic contention with this species is that *Streptopus lanceolatus* may be divided into several subordinate taxa depending upon where it exists in its range (MNWF 2019) but for the purposes of this profile we will simply refer to all variations as *Streptopus lanceolatus.*

Close up of the ciliated leaf edge and stem of Rosy Twisted-stalk

Fruits by Flore du Québec

Streptopus lanceolatus by NL Britton

Comparison of Solomon's Seal (Left) to Rosy Twisted-stalk (Right)

Life History

Streptopus lanceolatus is described by Rhoads and Block (2008) as a rhizomatous herb sometimes branching up to two feet in height with stalkless alternating cauline leaves that range in shape from ovate to lanceolate with short hairs along the margins. The prominently parallel-veined leaves of this perennial plant are 2 to 4 inches long, 0.75-1.75" wide, and hairless on the upper and lower surfaces (MNWF 2019). The 6 parted, whitish to pink to deeply maroon 1/4inch-long flowers bloom from May through June (sometimes April to July [Connecticut Botanical Society 2019, Rhoads and Block 2019, Peterson and McKenny 1968]) growing singly and occasionally in pairs from the axils of the leaves (MNWF 2019). These bell-shaped flowers point downward from a hairy recurved stalk, eventually forming a red to purplish-red, nearly round berry (efloras 2019) containing many seeds (Burns 1982).

In the field, Rosy Twisted-stalk can initially be confused with similar looking species like Soloman's Seal which upon closer inspection has smooth leaf margins, 2 or more dangling greenish white flowers per axil, and blue-black fruit. The close relative *Streptopus amplexifolius* is larger, hairless, producing greenish yellow flowers (MNWF 2019), and with leaves clasping to nearly perfoliate (Northern Ontario Plant Database 2019). Like *S. amplexifolius, S. lanceolatus* can reproduce vegetatively through its rhizomes or reproductively by seed if successfully pollinated (Chafin 2010).

Pollinator Dynamics

No known recent studies have been published regarding the pollination of *S. lanceolatus*. Graenicher (Bulletin of the Wisconsin Natural History Society 1907) conducted a comprehensive study of the spring-flowering plants of Wisconsin in the family Liliaceae and found that Rosy Twisted-stalk, which produces abundant nectar and a sweet odor, was exclusively visited by the pollinator *Andrena milwaukensis*. This is a species of short-tongued bees in the family Andrenidae, distributed over much of North America including New Jersey (Discover Life 2019).

Seed Dispersal

Little research has been done specifically regarding the dispersal mechanisms of *Streptopus lanceolatus* yet fleshy fruit, in general, are known to be dispersed by black bears and birds (Auger, Meyer, and Black 2002; Harrer and Levi 2018; Garcia, Zamora, and Amico 2010). Willson and Gende (2004) found significant amounts of seed from *Streptopus amplexifolius,* a close relative of Rosy Twisted-stalk that also produces a red berry, in the scat of brown bears in Alaska.

Habitat

Rosy Twisted-stalk exists in moist rich coniferous and deciduous woods from 50 to 2000 meters above sea level (efloras 2019) throughout its range in North America. NatureServe Explorer (2019) describes the general habitat as moist woods and thickets in mountains; often occurring in Eastern hemlock stands. According to Lutz (1930) and Space for Life (Ville de Montréal 2019), *S. lanceolatus* is more abundant in mixed (deciduous and coniferous) woods, and in cool, moist parts of maple-yellow birch stands. The soil type it is found on is generally acidic (borealforest.org 2019) although in New Jersey it can be found in regions of limestone bedrock (New Jersey Natural Heritage Program Biotics database 2019).

The New Jersey Natural Heritage Program (2019) has on record three extant occurrences of *S. lanceolatus.* All three occurrences are in or around forested wetlands and are in association with *Maianthemum canadense* (Canada mayflower) and obligate wetland species *Symplocarpus foetidus* (skunk cabbage). One occurrence is in a mature hemlock-hardwood forest in moist, almost flat bottomland near a small stream in Sussex County. Associated species according to the state Biotics database (NJNHP 2019) are *Tsuga canadensis* (eastern hemlock), *Betula alleghaniensis* (yellow birch), *Fagus grandifolia* (beech) *Acer rubrum* (red maple), *Liriodendron tulipifera* (tulip poplar), *Lindera benzoin* (spicebush), *Arisaema triphyllum* (jack in the pulpit), and *Brachyelytrum erectum* (bearded short-husk).

A second hemlock forest in Sussex county containing the species finds the occurrence in a wet area with a high-water table. Many plants were noted to be growing in association with or on sphagnum and rotted logs. Associated species include: *Tsuga canadensis* (hemlock), *Acer rubrum* (red maple), *Liriodendron tulipifera* (tulip poplar), *Ostrya virginiana* (hophornbeam), *Juglans nigra* (black walnut), *Sphagnum sp*. (peat moss), *Equisetum sylvaticum* (woodland horsetail), *Coptis trifolia* (goldthread), *Viola sp.* (violets), *Phegopteris connectilis* (northern beech fern), *Veratrum viride* (green false hellebore), *Caltha palustris* (marsh marigold), *Trientalis borealis* (starflower), *Dryopteris intermedia* (interrupted fern), *Laportea canadensis* (wood nettle), *Rubus allegheniensis* (blackberry), *Medeola virginiana* (Indian cucumber root), *Uvularia perfoliata* (bellwort), *Viola conspersa* (dog violet), *Hepatica americana* (roundlobe hepatica), *Arisaema triphyllum* (jack in the pulpit), *Thelypteris simulata* (bog fern), *Toxicodendron radicans* (poison-ivy), and *Dennstaedtia punctilobula* (hay-scented fern).

A third population was documented in Morris County growing atop a moss-covered rock in a rich floodplain at the end of a narrow pond. The habitat is a sugar maple canopy with an understory of spicebush (*Lindera benzoin*), witchhazel (*Hamamelis virginiana*), and *Carpinus caroliniana* (hornbeam) with associated species of hickories (*Carya sp.)*, *Betula allegheniensis* (yellow birch), *Osmunda cinnamomea* (cinnamon fern), moss spp., *Polystichum acrostichoides* (Christmas fern), *Anemone quinquefolia* (wood anemone), *Toxicodendron radicans* (poison ivy), *Veratrum viride* (green false hellebore), *Parthenocissus quinquefolia* (Virginia creeper), *Lobelia cardinalis* (cardinal flower), *Aralia nudicaulis* (wild sarsaparilla), *Athyrium felix-femina*,(lady fern) *Impatiens sp*. (jewelweed), *Uvularia sessilifolia* (wild oats), *Viola cucullaria* (marsh violet), *Deparia acrostichoides* (silvery glade fern), and *Trillium erectum* (red trillium). Rare plants nearby include *Clintonia borealis* (bluebead lily) and *Platanthera psycodes* (lesser purple fringed orchis).

Wetland Indicator Status

Rosy Twisted-stalk is classified as a Facultative (FAC) species in the state of New Jersey (NJFQA 2019) meaning that the probability of the species occurring in a wetland is equal to it occurring in non-wetlands. (USDA NRCS 2019)

USDA Plants Code

STLA16

Coefficient of Conservatism (Walz et al., 2018)

CoC = 9; Criteria: Native with a narrow range of ecological tolerances, high fidelity to particular habitat conditions, and sensitive to anthropogenic disturbance. (Faber-Langendoen 2018).

Distribution and Range

The map below (Figure 1) shows a general view of the range & state rarity status of *Streptopus lanceolatus.*

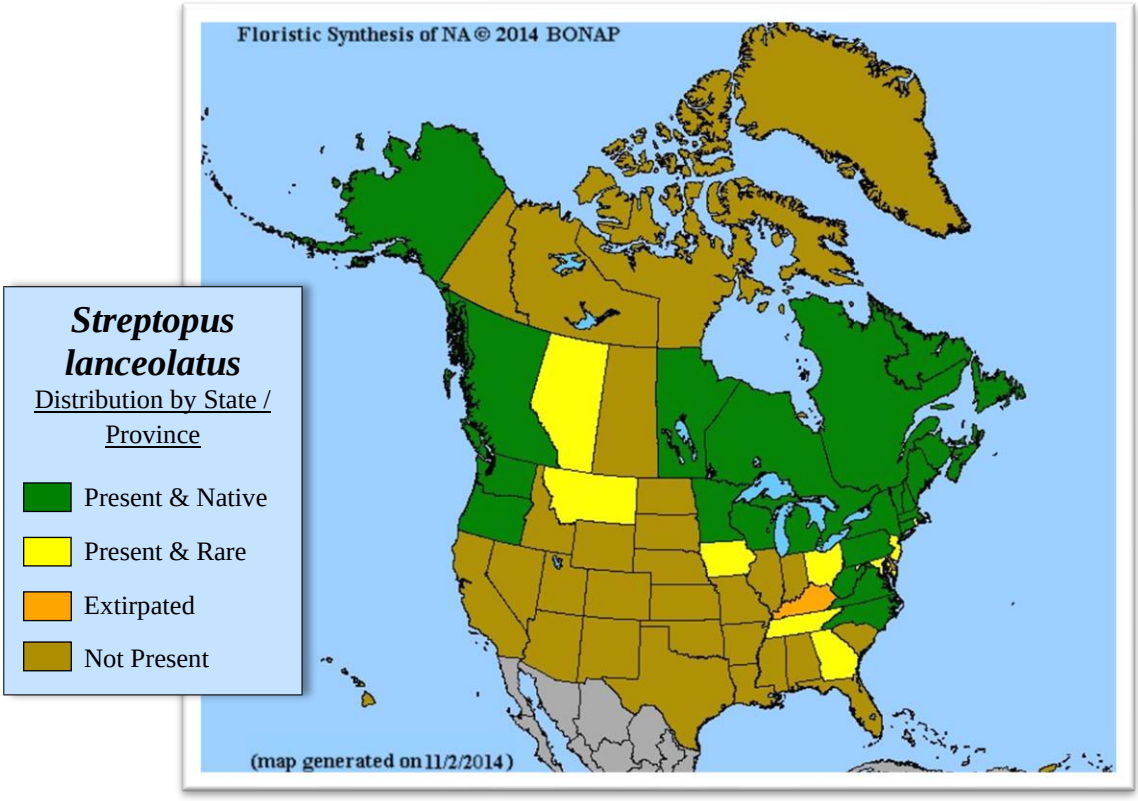

FIGURE 1 NORTH AMERICAN STATE DISTRIBUTION OF ROSY TWISTED-STALK; ADAPTED FROM BONAP

Below (Figure 2) is a county level distribution map focusing on New Jersey and contiguous counties of the surrounding states. This map is compiled from herbarium data and state literature but fails to reflect the confirmed presence of *S. lanceolatus* in Morris County recorded as one extant occurrence observed in 2015 (New Jersey Natural Heritage Program Biotics database 2019 [hereafter, "NJNHPB"]). At this time the NJNHPB (2019) also does not have extant occurrences documented for Passaic County. One known population that was first observed in 1914 was not relocated during the most recent survey in 1987; although the habitat remained suitable, it is now considered historic according to the NJNHPB (2019).

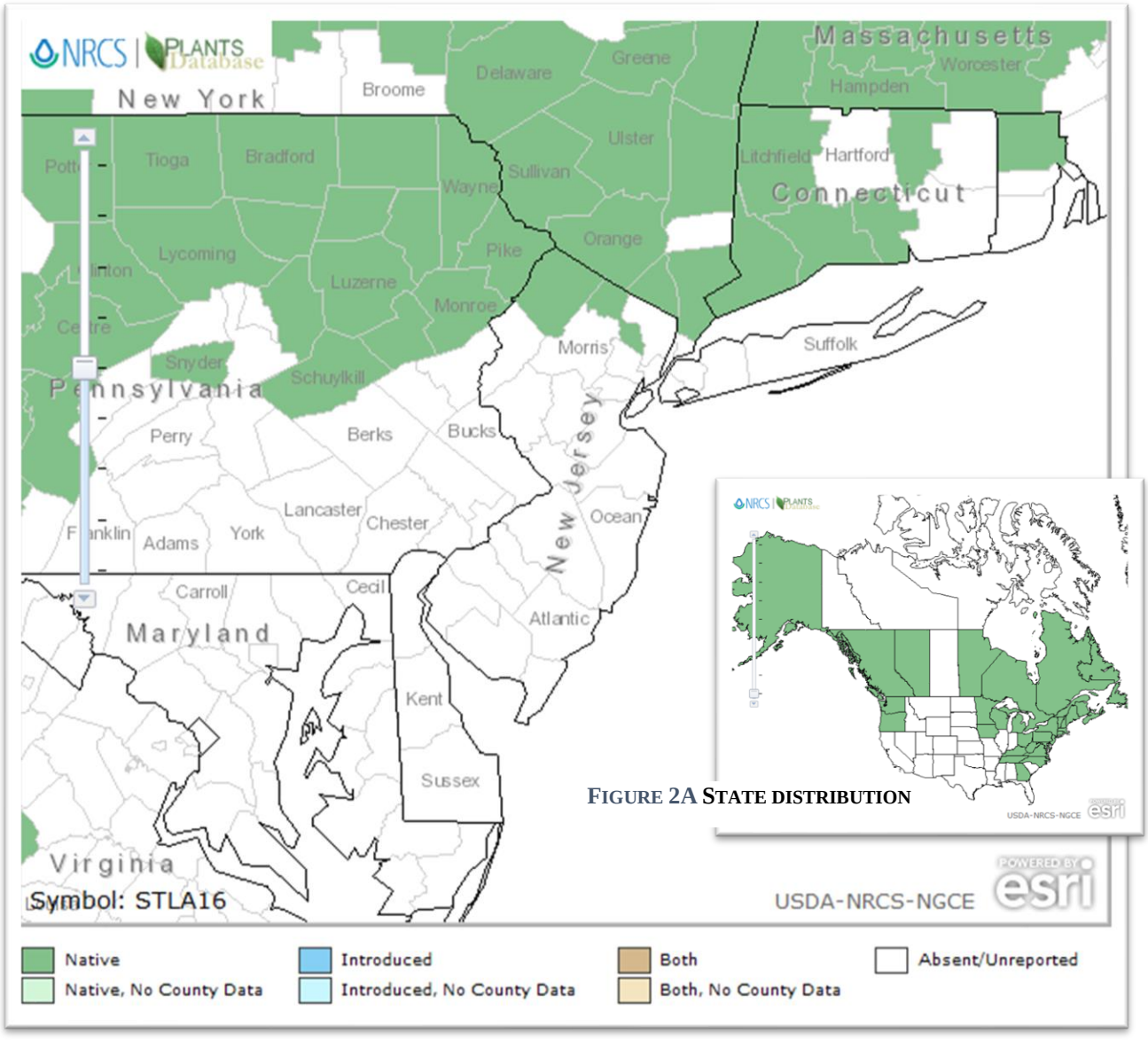

FIGURE 2A STATE DISTRIBUTION

FIGURE 2 COUNTY DISTRIBUTION OF *S. LANCEOLATUS* ADAPTED FROM USDA NRCS PLANTS DATABASE

Conservation Status

The map below (Figure 3) from NatureServe Explorer (2019) illustrates a synthesis of data from individual natural heritage programs with each state's conservation rank and status.

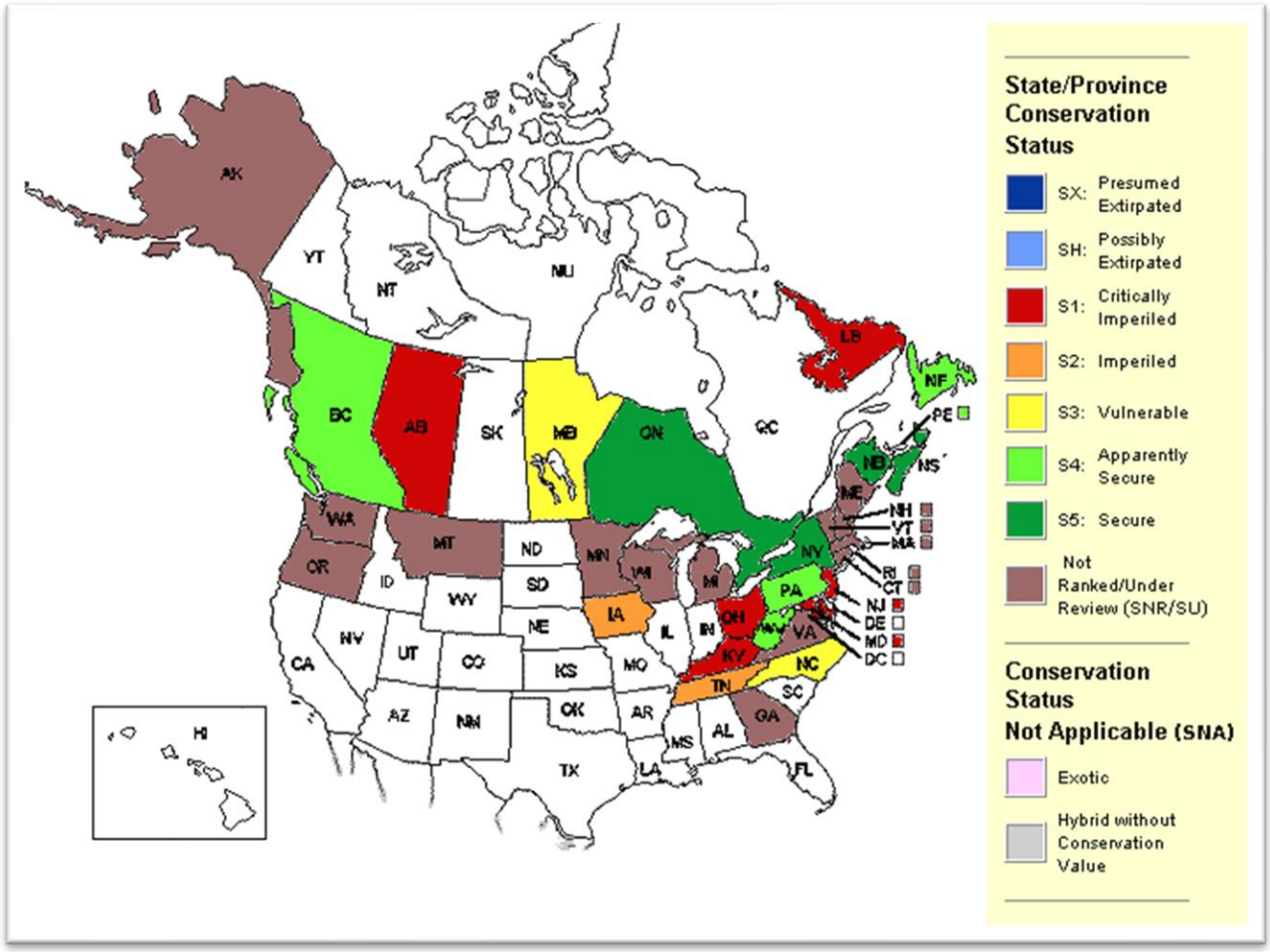

FIGURE 3 CONSERVATION STATUS OF *STREPTOPUS LANCEOLATUS*

Streptopus lanceolatus is considered globally stable (G5) meaning that worldwide, the species is "secure: common; widespread and abundant" (NatureServe 2019) but is critically imperiled in many states throughout its range. Rosy Twisted-stalk is considered endangered (E) in New Jersey and according to the state's Natural Heritage Program that status indicates a "Native New Jersey plant species whose survival in the State or nation is in jeopardy". The state rank of S1, in accordance with the element ranks used by the New Jersey Natural Heritage Program (2010) defines the species as "Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching,

sizable additional occurrences are unlikely to be discovered."

The other status codes indicate that the species is "HL" or "protected by the Highlands Water Protection and Planning Act within the jurisdiction of the Highlands Preservation Area" and "LP" meaning that the "taxa [is] listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan" (NJNHP 2010).

Threats

In a comparative study on population changes in forest plants in the state of Wisconsin, Wiegmann and Waller (2005) found that populations of Rosy Twisted-stalk decreased from a once abundant understory herb fifty years ago by 42%. Their study found that human disturbances in and around forests create an avenue of entry for more tolerant and ubiquitous plant species to invade or take over if already established. These "winning" species utilize abiotic methods of pollination and seed dispersal where "losing" species like *Streptopus* depend on mutualistic associations with certain insects and frugivores that may also be in decline due to anthropogenic influence on the landscape.

Several human-made disturbances directly affect population sizes of Rosy Twisted-stalk, while others may be less obvious and cause delayed changes. Some of these changes include intentional and accidental introduction of exotic species of plants and wildlife, landscape development, native game management, and forestry activities. These disturbances combined create a synergistic effect against certain native species, including *S. lanceolatus* (Wiegmann and Waller 2005; Frerker, Sabo, and Waller 2014).

Invasive species, such as *Alliaria petiolata* (garlic mustard) pose a threat to Rosy Twisted-stalk. Garlic mustard is known to be widespread and can quickly and easily take over habitat suitable for *S. lanceolatus* as it has in Taylor Creek Park in Ontario, Canada (Bream 2012). An invasive insect known as the Lily leaf beetle (*Lilioceris lilii*) has been confirmed to negatively affect Rosy Twisted-stalk with its multiple life stages all relying on herbivory of plants in the family Liliaceae (Blackman, Cappucino, and Mason 2016).

Concentrated mammalian herbivory is detrimental to *S. lanceolatus* (Negoita et al 2016) with white-tail deer being particularly problematic due to their fast growth in population size and range over the past 5 decades (Frerker, Sabo, and Waller 2014; Buckles 2017). Deer have become the keystone species in many food chains across the United States due to human management of their natural predators and have proliferated across the continent with the help of hunting restrictions and land development that creates more of their preferred habitat (Frerker, Sabo, and Waller 2014).

A prominent and potentially devasting human activity for sensitive species like *S. lanceolatus* is the practice of timber harvesting. Overlogging and clearing in areas of suitable habitat disrupt the

ecosystem in which this plant could thrive by compacting the soil, allowing disturbance-tolerant native and exotic species a space to move in and take over, and providing edge habitat that already over-abundant herbivores such as white-tail deer find more suitable compared to that of dense forest interior (Wiegmann and Waller 2005; Frerker, Sabo, and Waller 2014; Burns 1982; Chafin 2010; Buckles 2017).

Management Summary and Recommendations

Human disturbance should and can be kept in check in order to preserve the integrity of rare plants within New Jersey. With careful planning and knowledge of habitat considerations it may be possible to prevent further decline of Rosy Twisted-stalk and many other imperiled plant species in this state. Regular monitoring of the species is necessary in order to provide baseline data and show population changes over time (Wiegmann and Waller 2005).

Implementation of rules regarding the introduction of new exotic plant and wildlife species and strategic management of what has already established in forests and other ecosystems are necessary to restore suitable habitat. This may entail regulating what is imported and sold in plant nurseries and closer monitoring of biological agents at geopolitical borders to ensure less accidental transfer of potentially invasive species. Strike teams are a useful tool currently utilized across the state to control populations of invasive plants.

Deer exclosures provide a small-scale comparison of the differences between an over browsed and a non-browsed forest, yet they are not a solution to the problem of New Jersey's continuous growth of white-tail deer populations. New rules in hunting and management must be instated in order to counteract this man-made dilemma that is quickly changing the composition of all forested land in the state. At this time, although it may not be in the public interest to reintroduce natural predators of deer, other safer measures can take place. Incentives for hunting can be applied along with law and rule changes throughout the region making deer hunting a lucrative state commodity rather than a pastime.

While Chafin (2010) recommends logging and mechanical clearing be avoided where *S. lanceolatus* occurs, the author neglects to define any measurable distance to delineate a specific area of protection needed. Such a measurement and readily accessible knowledge of where habitat of concern occurs would be helpful to foresters and prevent logging too close to sensitive species. In states where Rosy Twisted-stalk is not considered threatened, studies could be conducted to quantify how much disturbance can occur within specified boundaries around the plant populations and their communities, providing an accurate and efficient buffer area.

Selective harvesting may improve the numbers of this species as partial removal of the woodland canopy appears to be beneficial (Burns 1982). Thorough studies should be done in order to calculate the precise amount of canopy cover that *S. lanceolatus* requires before utilizing this practice in New Jersey where the populations are dangerously low.

Synonyms

According to the ITIS (Integrated Taxonomic Information System 2019) there are currently no accepted synonyms for *Streptopus lanceolatus*, however, the Kew Plant List (2019) provides a list of all former synonyms shown below.

Botanical Name	**Common Names**
Streptopus lanceolatus (Aiton) Reveal	Rosy Twisted-stalk
	Rose Twisted stalk
Botanical Synonyms	Rosybells
	Rose Mandarin
Uvularia lanceolata Aiton	Rose-Bellwort
Hekorima atropurpurea Fisch. ex Regel & Tiling	Liverberry
Streptopus curvipes Vail	Scootberry
Hekorima dichotoma Kunth	
Hexorima dichotoma Raf.	
Streptopus lanceolatus var. *roseus* (Michx.) Reveal	
Streptopus lanceolatus var. *longipes* (Fernald) Reveal	
Streptopus lanceolatus var. *curvipes* (Vail) Reveal	
Streptopus longipes Fernald	
Uvularia rosea (Michx.) Pers.	
Streptopus roseus Michx.	
Streptopus roseus f. *indivisus* Lepage	
Streptopus roseus var. *typicus* Fassett	
Streptopus roseus f. *giganteus* Fassett	
Streptopus roseus var. *perspectus* Fassett	
Streptopus roseus var. *longipes* (Fernald) Fassett	
Streptopus roseus var. *curvipes* (Vail) Fassett	
Streptopus roseus subsp. *longipes* (Fernald) Á. Löve & D. Löve	
Streptopus roseus subsp. *curvipes* (Vail) Hultén	
Streptopus roseus f. *simplex* Vict.	

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