

# Species Status Assessment

<b>Common Name</b>	Indian paintbrush	<b>Date Updated:</b>	2023-12-21
<b>Scientific Name</b>	<i>Castilleja coccinea</i>	<b>Updated By:</b>	Kyle J. Webster
<b>Family</b>	Orobanchaceae		

## Species Synopsis

Indian paintbrush, *Castilleja coccinea*, also known as scarlet paintbrush, is a hemi-parasitic biennial forb in the Broomrape Family (Orobanchaceae). The genus *Castilleja* occurs in North America, Mexico, Central America, South America, northern Eurasia and has been introduced in the West Indies and Pacific Islands (FNA 2023). The genus contains around 200 species worldwide and is most diverse in North America with 119 species (FNA 2023). *Castilleja coccinea* is the only representative of the *Castilleja* genus in New York (Werier et. al. 2023).

In New York, *Castilleja coccinea* occurs primarily in alvar pavement grasslands, though historically it was known from a broader range of habitats such as barrens, oak savannas, and alkaline wetlands (NYNHP 2023, Werier et. al. 2023). It is currently only known from four populations in three counties, though it historically had a much broader range in the state (NYNHP 2023). At least one population has been recently extirpated due to succession (NYNHP 2023).

The major threat to this species is succession and the lack of fire. Other threats include aggressive non-native plant species, such as pale and black swallow-wort (*Vincetoxicum rossicum* and *V. nigrum*). At least one population occurs along a roadside and could be impacted by road improvements or maintenance activities (NYNHP 2023).

*Castilleja coccinea* has declined substantially in New York since the turn of the 19th century (NYNHP 2023). In the short-term it appears to be declining as succession from open habitats to forested habitats continues around the state, but trends are difficult to assess due to lack of data.

## I. Status

### a. Current legal protected Status

<b>i. Federal:</b>	Not Listed	<b>Candidate:</b>
<b>ii. New York:</b>	<u>Endangered</u>	

### b. Natural Heritage Program

<b>i. Global:</b>	<u>G5</u>		
<b>ii. New York:</b>	<u>S1</u>	Tracked by NYNHP?	On Active Tracking List

### Other Ranks:

COSEWIC: Not listed in Canada

IUCN Red List: Not assessed by IUCN Red List

### Status Discussion:

*Castilleja coccinea* is Endangered in New York (Ring 2023). There are four extant, eight historical, and one recently extirpated population in New York. Historically the range included western New York, northwestern New York, and southeastern New York. Most of the historical occurrences were documented between 1880 and 1920.

The extant populations are known from only three counties. Two populations are large and in excellent habitat, while two are small and in poor habitat. All the populations are threatened by invasive species, habitat succession, and lack of fire.

## II. Abundance and Distribution

Region	Present?	Abundance	Distribution	Time Frame	Listing status or S-Rank	SGCN?
North America	Yes	Unknown	Unknown	Unknown		
Northeastern US	Yes	Unknown	Unknown	Unknown		
New York	Yes	Unknown	Unknown	Unknown	E	
Connecticut	Yes	Unknown	Unknown	Unknown	S1	
Massachusetts	Yes	Unknown	Unknown	Unknown	SH	
New Jersey	Yes	Unknown	Unknown	Unknown	S1	
Pennsylvania	Yes	Unknown	Unknown	Unknown	S2	
Vermont	No					
Ontario	Yes	Unknown	Unknown	Unknown	S4	
Quebec	No					

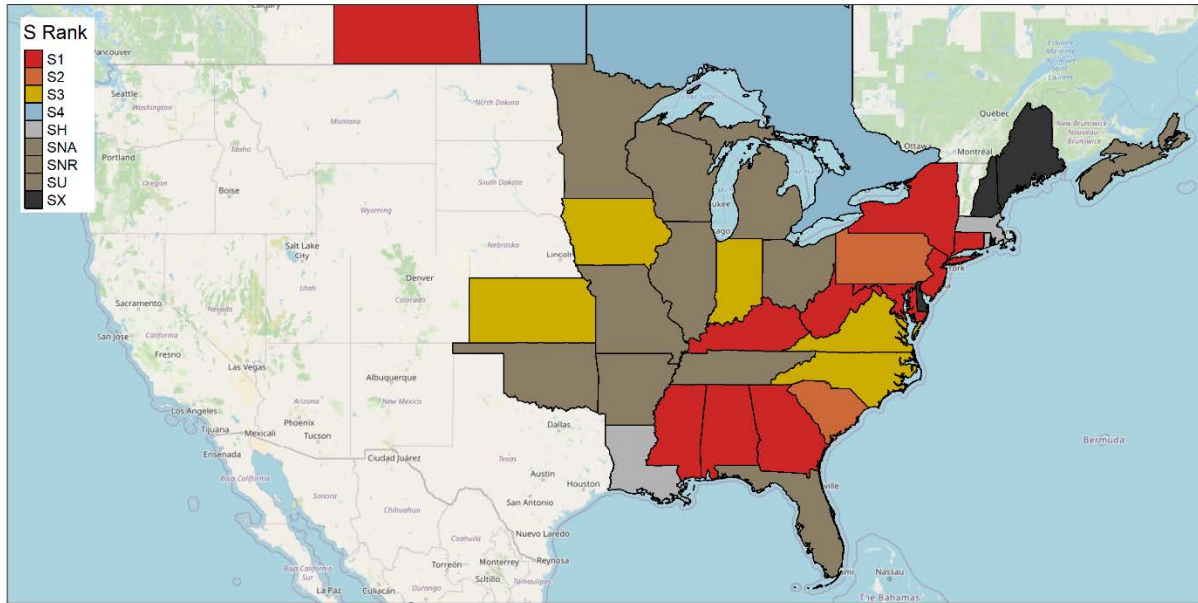


Figure 1: *Castilleja coccinea* North American distribution (NatureServe 2024).

Percent of North American Range in NY	Classification of NY Range	Distance to core population, if not in NY
1-25%	Peripheral	Unknown

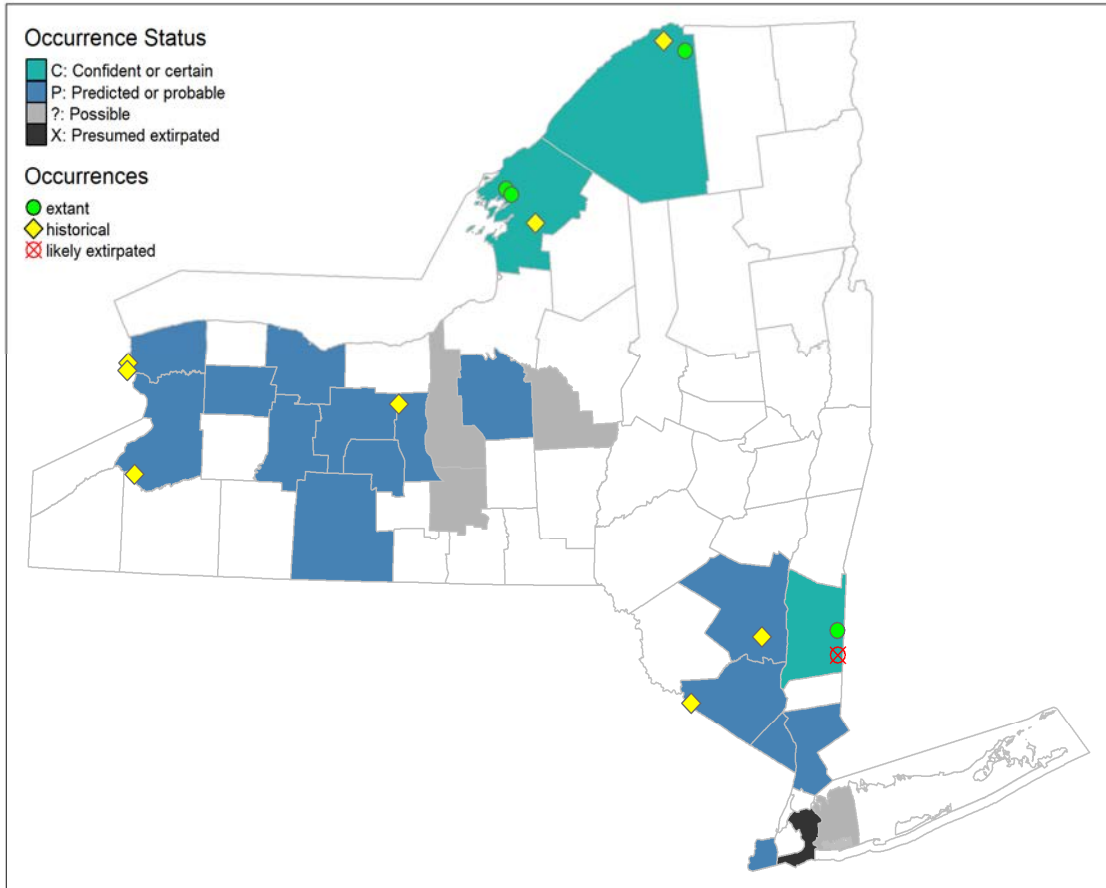
### III. New York Rarity and Trends

#### Trends Discussion

More data is needed to understand the trends among, and population dynamics within, *Castilleja coccinea* populations. The two largest populations in the state appear to be stable, though populations fluctuate drastically from year to year. Of the two smaller populations, one has not been resurveyed and its status is unknown, while the other has declined over the last 10-20 years (NYNHP 2023). This species was most common in New York from the 1880s through the 1920s when there was much more open prairie-like habitat (NYNHP 2023). Large areas of these habitats have since succeeded to forest or been developed. The number of populations in New York have declined substantially since that time and will likely remain at low numbers. At least one population has been confirmed as extirpated as (NYNHP 2023).

#### Details of Historic and Current Occurrence

Historically, *Castilleja coccinea* was widely distributed in New York with populations on the Lake Erie and Lake Ontario plains, on the St. Lawrence River plain, and in the Lower Hudson Valley. It is now restricted to four populations in Clinton, Dutchess, Jefferson, and St. Lawrence County. Most of the historical occurrences were documented between 1880 and 1920. There may be between 2000-3000 individuals present in the state, though population sizes fluctuate greatly from year to year.



**Figure 2:** NYS distribution of *Castilleja coccinea*.

**Table 1.** Number of records (element occurrences) of *Castilleja coccinea* grouped by the dates known to be extant (the years spanning first observation to last observation) and the number and percent of total of USGS 7.5 minute map quadrangles these observations fall within for New York State (NYNHP 2023).

Years	# of Records	# of distinct quads	% of quads in State
Pre-1995	13	17	1.7
1995-2004	2	2	0.2
2005-2014	2	2	0.2
2015-2023	1	1	0.1

### Monitoring in New York

There are 13 populations known statewide, of which four are extant and eight are historical. None of the populations have been regularly monitored. The four extant populations were last surveyed in 1986, 1991, 2016, and 2022 respectively (NYNHP 2023, 2024).

## IV. Primary Habitat or Community Type

New York Habitat Type: Native Barrens and Savanna, Open alkaline peatlands.

NatureServe broad habitat types: Barrens, Grassland/herbaceous

New York Natural Heritage Communities: Alvar pavement grassland Alvar pavement grassland, Alvar shrubland, Alvar woodland, Rich graminoid fen, Sedge meadow

### Habitat or Community Type Trend in New York

<b>Declining:</b>	<b>Stable:</b>	<b>Increasing:</b>	<b>Unknown:</b> ✓
<b>Time frame of decline/increase:</b>			
<b>Habitat Specialist</b>	<b>Yes:</b> ✓	<b>No:</b>	

### Habitat Discussion:

In New York, *Castilleja coccinea* is found on open, usually calcareous sites, including alvar pavement grasslands, alvar shrublands, rich graminoid fens, and sedge meadows (Edinger et al. 2014, NYNHP 2024). Two populations in New York occur in an old field at the edge of a fen and a mowed right-of-way on a sandy logging road (NYNHP 2023). Mitchell and Tucker (1997) note it as a rare native on the barrens of the northern Lake Plains only, as well as escaping cultivation widely elsewhere in New York.

Meadows, moist prairies, and damp sandy soil (Gleason and Cronquist 1991). Peaty meadows, prairies and damp sands and gravels (Fernald 1970).

## V. Species Demographics and Life History

*Castilleja coccinea* is a hemi-parasitic biennial forb species (Malcom 1966, Werier et al. 2023). Unlike other root parasites, it does not require secretions from host plants to initiate germination (Malcom 1966). Seeds can germinate directly after dispersal in spring and basal rosettes can fully mature within one growing season. However, newly dispersed seeds often lack the needed moisture to initiate germination until the following spring (Malcom 1966).

*Castilleja coccinea* requires a host plant for survival and reproduction (Malcom 1966). Its roots produce tiny projections (haustoria) that penetrate the roots of adjacent host plants (Malcom 1966). Known host species include, but are likely not limited to, *Achillea millefolium*, *Alnus rugosa*, *Antennaria neglecta*, *Chrysanthemum leucanthemum* var. *pinnatifidum*, *Danthonia spicata*, *Fragaria virginiana*, *Hieracium aruntiacum*, *Krigia biflora*, *Lactuca canadensis*, *Lobelia spicata*, *Panicum sphaeroides*, *Populus deltoides*, *Rubus hispidus*, *Rudbeckia hirta*, *Solidago graminifolia*, *Solidago juncea*, *Solidago rugosa* (Malcom 1966).

Individuals that do not make contact with a host-plant can survive up to 4 months, but do not reproduce and eventually die (Malcom 1966). After a plant makes contact with a host, the basal leaves often double in length over the course of 24 hours (Malcom 1966).

After making contact with host roots the plants may bolt from May to September, flowering indeterminately and producing 5-20 flowers per stem (Malcom 1966, NYNHP 2023, NYNHP 2024). Though primarily biennial some individuals may behave as annuals, germinating and flowering in the same season (Malcom 1966).

The flowers are reported to be pollinated by hummingbirds (Pennell 1935). Fruit matures after pollination with dispersal taking place from late July through August (NYNHP 2024). Each fruit produces approximately 300 tiny seeds (Malcom 1966), dispersed by wind or simple gravity.

**Table 2.** Phenology of *Castilleja coccinea* in New York State (NYNHP 2023).

Phenology	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering												
Fruiting												

## VI. Threats

There are no immediate threats to the larger populations but in the long-term pale and black swallow-wort may threaten their open limestone habitats. The smaller populations in St. Lawrence County may be threatened by succession of their open habitats or by destruction by ATVs.

### Are there regulatory mechanisms that protect the species or its habitat in New York?

Yes:      No:       Unknown:

If yes, describe mechanism and whether adequate to protect species/habitat: N/A

### Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Prevent the establishment and spread of pale and black swallow-wort within *Castilleja coccinea* habitats. Work with landowners and right-of-way managers to implement disturbance regimes that support the populations.

Complete Conservation Actions table using IUCN conservation actions taxonomy at link below. Use headings 1-6 for Action Category (e.g., Land/Water Protection) and associated subcategories for Action (e.g., Site/Area Protection) - <https://www.iucnredlist.org/resources/conservation-actions-classification-scheme>

**Table 5.** Recommended conservation actions for *Castilleja coccinea*.

Conservation Actions	
Action Category	Action
Land/water protection	1.1. Site/area protection
Land/water protection	1.2. Resource & habitat protection
Land/water management	2.1. Site/area management
Land/water management	2.2. Invasive/problematic species control

Conservation Actions	
Action Category	Action
Land/water management	2.3. Habitat & natural process restoration

## VII. References

### This SSA drew heavily from these resources:

NatureServe. 2023. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. [Accessed 12/14/2023].

New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry. 2023. Element Occurrence and Element Dataset. Albany, New York. [Exported 12/14/2023].

New York Natural Heritage Program. 2024. Online Conservation Guide for *Castilleja coccinea*. Available from: <https://guides.nynhp.org/scarlet-indian-paintbrush/>. [Accessed 01/30/2024].

Werier, David, Kyle Webster, Troy Weldy, Andrew Nelson, Richard Mitchell, and Robert Ingalls. 2023 New York Flora Atlas. [S. M. Landry and K. N. Campbell (original application development), USF Water Institute. University of South Florida]. New York Flora Association, Albany, New York. [Accessed 11/21/2023].

Additional references:

Clemants, Steven and Carol Gracie. 2006. Wildflowers in the Field and Forest. A Field Guide to the Northeastern United States. Oxford University Press, New York, New York. 445 pp.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero (editors). 2014. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, New York.

Fernald, M.L. 1950. Gray's manual of botany. 8th edition. D. Van Nostrand, New York. 1632 pp.

Gleason, Henry A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. The New York Botanical Garden, Bronx, New York. 910 pp.

Holmgren, Noel. 1998. The Illustrated Companion to Gleason and Cronquist's Manual. Illustrations of the Vascular Plants of Northeastern United States and Adjacent Canada. The New York Botanical Garden, Bronx, New York.

Malcolm, W. M. 1966. Root parasitism of *Castilleja coccinea*. Ecology 47:179- 186.

Newcomb, Lawrence. 1977. Newcomb's Wildflower Guide: An Ingenious New Key System for Quick, Positive Field Identification of the Wildflowers, Flowering Shrubs, and Vines of Northeastern and North-Central North America. Little, Brown and Company. Boston.

Pennell, F. W. 1935. The Scrophulariaceae of eastern temperate North America. Monograph of the Academy of Natural Sciences of Philadelphia. Philadelphia, Pennsylvania, USA.

Rhoads, Ann F. and Timothy A. Block. 2000. *The Plants of Pennsylvania, an Illustrated Manual*. University of Pennsylvania Press, Philadelphia, PA.

Ring, Richard M. 2023. *New York Rare Plant Status Lists*. New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry, Albany, NY. December 2023. 108 pp.

Shenk, Gregory and Kent Holsinger. 2001. *Castilleja coccinea* (L.) Sprengel (*Castilleja coccinea*) Conservation and Research Plan. New England Wild Flower Society, Framingham, Massachusetts, USA.

Voss, Edward G. 1996. *Michigan Flora Part III. Dicots Concluded (Pyrolaceae - Compositae)*. Cranbrook Institute of Science Bulletin 61 and University of Michigan Herbarium. 622 pp.