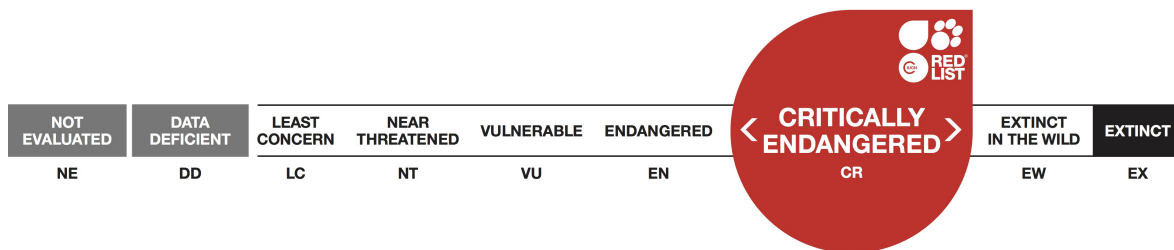


Rinodina chrysomelaena, Muhlenberg's Smile

Assessment by: Lendemer, J., Allen, J., McMullin, T. & Tripp, E.



View on www.iucnredlist.org

Citation: Lendemer, J., Allen, J., McMullin, T. & Tripp, E. 2018. *Rinodina chrysomelaena*. The IUCN Red List of Threatened Species 2018: e.T80703073A80703076.

<http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T80703073A80703076.en>

Copyright: © 2018 International Union for Conservation of Nature and Natural Resources

Reproduction of this publication for educational or other non-commercial purposes is authorized without prior written permission from the copyright holder provided the source is fully acknowledged.

Reproduction of this publication for resale, reposting or other commercial purposes is prohibited without prior written permission from the copyright holder. For further details see [Terms of Use](#).

The IUCN Red List of Threatened Species™ is produced and managed by the [IUCN Global Species Programme](#), the [IUCN Species Survival Commission \(SSC\)](#) and [The IUCN Red List Partnership](#). The IUCN Red List Partners are: [Arizona State University](#); [BirdLife International](#); [Botanic Gardens Conservation International](#); [Conservation International](#); [NatureServe](#); [Royal Botanic Gardens, Kew](#); [Sapienza University of Rome](#); [Texas A&M University](#); and [Zoological Society of London](#).

If you see any errors or have any questions or suggestions on what is shown in this document, please provide us with [feedback](#) so that we can correct or extend the information provided.

Taxonomy

Kingdom	Phylum	Class	Order	Family
Fungi	Ascomycota	Lecanoromycetes	Teloschistales	Physciaceae

Taxon Name: *Rinodina chrysomelaena* Tuck.

Common Name(s):

- English: Muhlenberg's Smile

Identification Information:

The species can be recognized by its occurrence on non-calcareous rocks and bright yellow thallus with rounded dark purple-black disc-like fruiting bodies.

Assessment Information

Red List Category & Criteria: Critically Endangered A2c; B1ab(i,ii,iv)+2ab(i,ii,iv) [ver 3.1](#)

Year Published: 2018

Date Assessed: August 13, 2015

Justification:

Rinodina chrysomelaena is a bright yellow crustose lichen occurring on non-calcareous rocks at scattered locations in the Appalachian Mountains of eastern North America and Mexican Highlands of Oaxaca, Mexico. The species can be recognised by its occurrence on non-calcareous rocks and bright yellow thallus with rounded dark purple-black disc-like fruiting bodies. This is an easily recognised lichen endemic to North America (including Mexico) that is considered to be extirpated from more than 95% of its historical range. Extensive efforts to relocate historical populations have failed and only two extant populations are known, both occurring in a highly limited geographic area. This species has been assessed as Critically Endangered, based on the pre-1990 vs. post-1990 reduction of extent of occurrence (EOO) to <100 km², this reduction has resulted in a population decline of 77% over the past three generations, and the total range of species has reduced by 95%. Area of occupancy (AOO) (8 km² post-1990), and the extirpation of all known historical populations (balanced by discovery of two extant populations). In both cases the ranking is supported by 1) the extensive fragmentation of natural habitats and populations (both historical and modern), 2) severely fragmented, small number of extant populations (2), 3) decline in EOO, AOO, and total number of populations inferred from documented occurrences, and 4) historical and ongoing habitat degradation. The species also meets the criteria for Critically Endangered C2a(i,ii) based on the small number of mature individuals, the continuing decline in the number of locations, and the small number of mature individuals in the sole remaining subpopulation together with the fact that 100% of the remaining individuals exist within one subpopulation.

The categorisation as Critically Endangered is based on the documented losses in number of populations as well as reductions of EOO and AOO. The causes of this reduction are unknown, but inferred to be the large scale degradation and loss of habitats throughout the range of the species. These losses have

occurred in the past, are ongoing at present at smaller scales, and will likely continue in the future.

Geographic Range

Range Description:

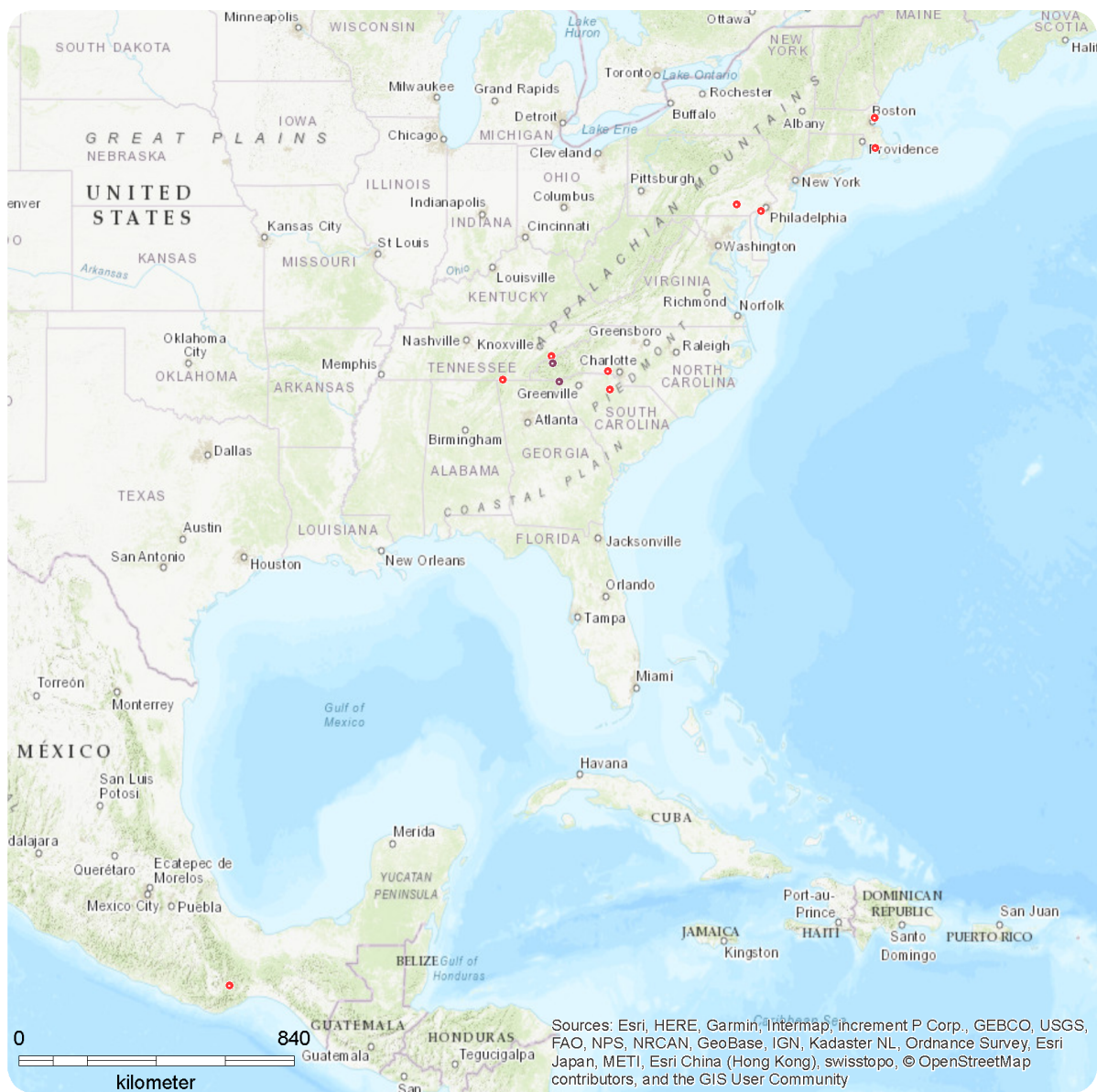
Rinodina chrysomelaena is restricted to the Appalachian Mountains of eastern North America (Massachusetts south to Georgia) and Mexican Highlands of Oaxaca, Mexico. It was historically known from a small number of scattered locations where it grew on non-calcareous rocks. Online databases (CNALH) report a voucher from “mountains of western” North Carolina and from Colorado Springs, Colorado. The former voucher lacks precise locality data, was not included in modern treatments of the species (Lendemer and Sheard 2006, Sheard 2010) and is considered to be questionable. The record from Colorado is well outside the accepted geographic range of the species, includes an “?” indicating the identification was not certain, and was not annotated or cited by relevant taxonomic authorities. It is treated as an erroneous report and excluded from the estimates of extent of occurrence and area of occupancy used for this assessment.

Country Occurrence:

Native: Mexico (Oaxaca); United States (North Carolina)

Distribution Map

Rinodina chrysomelaena



Range

- Possibly Extant (resident)
- Possibly Extinct

Compiled by:
IUCN



Population

The rarity of *Rinodina chrysomelaena* appears to be a modern phenomenon, as it was noted to be common at one locality where it occurred in 1932 but is no longer found (Degelius 1941, Sheard 2010). The species was collected by many 19th and early 20th century lichenologists, but is rarely collected now, illustrating that it was once widespread but has now been extirpated (Lendemer and Sheard 2006, Sheard 2010). None of the nine populations documented prior to 1990 have been relocated, and of the two populations discovered post-1990 (both in 2010) only one is located within a protected area (Great Smoky Mountains National Park). The majority of locations where the species was found historically are now developed (e.g., the metro-regions of Boston, Chattanooga and Philadelphia). The two known extant locations are small in size and isolated within a relatively small geographic area, each with fewer than 50 individuals. Extensive post-1990 fieldwork has been conducted within the range of the species by multiple experts (Massachusetts: E. Lay, E. Kneiper, P. May); Georgia: S.Q. Beeching and M. Hodges; Pennsylvania: J.C. Lendemer; southern Appalachians: J. Allen, J.C. Lendemer, T. Tønsberg, E. Tripp).

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Habitat and ecological data from historical collections are limited, however, the extant populations occurs on non-calcareous rocks in shaded forests in high humidity microhabitats especially near waterfalls.

Systems: Terrestrial

Threats (see Appendix for additional information)

The cause of the large scale extirpation of *Rinodina chrysomelaena* was not documented at the time it occurred, however, it is likely attributable to the large scale loss and degradation of suitable habitat throughout its range historically (Drummond and Loveland 2010, Napton *et al.* 2010). This species is threatened by transportation corridors increasing air pollution, and climatically suitable habitats shifting with climate change. Recreation may be an additional threat. The lack of protection of the species by state, federal, and international legislation is a further threat to the species.

Conservation Actions (see Appendix for additional information)

Monitoring of all extant populations is required to determine whether the species has stabilised or is still in decline. Increased acquisition of suitable habitat, and increased protections for suitable habitat already within management units is also needed. Study of the potential reintroduction into formally occupied areas should also be considered, but balanced by the extreme rarity of the species and the small size of extant populations to serve as source material. Increased education about the species, its ecology, and how it could be conserved would also be highly beneficial. Demographic studies of extant populations are needed to assess and monitor populations sizes. Species is presumed extirpated from much of its range, remaining extant populations small in size and number of individuals.

Credits

Assessor(s): Lendemer, J., Allen, J., McMullin, T. & Tripp, E.

Reviewer(s): Scheidegger, C.

Bibliography

Degelius, G N. 1941. Contributions to the Lichen flora of North America II. The lichen flora of the Great Smoky Mountains. *Arkiv för Botanik* 30A: 1-80.

Drummond, M.A., Loveland T.R. 2010. Land-use pressure and a transition to forest-cover loss in the eastern United States. *Bioscience* 60(4): 286-298.

IUCN. 2018. The IUCN Red List of Threatened Species. Version 2018-2. Available at: www.iucnredlist.org. (Accessed: 15 November 2018).

Lendemer, J. C. and Sheard, J. W. 2006. The typification and distribution of *Rinodina chrysomelaena* (Physciaceae), a rare eastern North American lichen. *The Bryologist* 109(4): 562-565.

Lendemer, J.C., E. Tripp and J.W. Sheard. 2014. A review of *Rinodina* (Physciaceae) in Great Smoky Mountains National Park highlights the growing significance of this “island of biodiversity” in eastern North America. *The Bryologist* 117(3): 259-281.

Lendemer, J.C., R.C. Harris and E.A. Tripp. 2013. *The lichens and allied fungi of Great Smoky Mountains National Park: an annotated checklist with comprehensive keys*. The New York Botanical Garden Press, Bronx, New York.

Napton, D.E., Auch, R.F., Headley, R., Taylor, J.L. 2101. Land changes and their driving forces in the Southeastern United States. *Regional Environmental Change* 10(1): 37-53.

Sheard, J.W. 2010. *The Lichen Genus Rinodina (Lecanoromycetidae, Physciaceae) in North America, North of Mexico*. National Research Council of Canada, NRC Research Press, Ottawa.

Citation

Lendemer, J., Allen, J., McMullin, T. & Tripp, E. 2018. *Rinodina chrysomelaena*. The IUCN Red List of Threatened Species 2018: e.T80703073A80703076. <http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T80703073A80703076.en>

Disclaimer

To make use of this information, please check the [Terms of Use](#).

External Resources

For [Images and External Links to Additional Information](#), please see the Red List website.

Appendix

Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	Resident	Suitable	Yes

Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
11. Climate change & severe weather -> 11.1. Habitat shifting & alteration	Future	Majority (50-90%)	Causing/could cause fluctuations	Low impact: 4
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
11. Climate change & severe weather -> 11.2. Droughts	Future	Majority (50-90%)	Causing/could cause fluctuations	Low impact: 4
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
11. Climate change & severe weather -> 11.4. Storms & flooding	Future	Majority (50-90%)	Causing/could cause fluctuations	Low impact: 4
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
4. Transportation & service corridors -> 4.1. Roads & railroads	Ongoing	Majority (50-90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
4. Transportation & service corridors -> 4.2. Utility & service lines	Ongoing	Majority (50-90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		

6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Majority (50-90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.11. Dams (size unknown)	Ongoing	Majority (50-90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 2. Species Stresses -> 2.1. Species mortality		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.4. Abstraction of surface water (unknown use)	Ongoing	Majority (50-90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: No
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: No
Occur in at least one PA: Yes
Percentage of population protected by PAs (0-100): 41-50
Area based regional management plan: No
In-Place Species Management
Harvest management plan: No
Successfully reintroduced or introduced benignly: No
Subject to ex-situ conservation: No
In-Place Education
Subject to recent education and awareness programmes: No
Included in international legislation: No
Subject to any international management/trade controls: No

Conservation Actions Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
2. Land/water management -> 2.1. Site/area management
2. Land/water management -> 2.3. Habitat & natural process restoration
3. Species management -> 3.2. Species recovery
4. Education & awareness -> 4.1. Formal education
4. Education & awareness -> 4.2. Training
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level
5. Law & policy -> 5.2. Policies and regulations

Research Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.5. Threats
1. Research -> 1.6. Actions
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
2. Conservation Planning -> 2.2. Area-based Management Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km ²): 8
Continuing decline in area of occupancy (AOO): Yes
Extreme fluctuations in area of occupancy (AOO): No
Estimated extent of occurrence (EOO) (km ²): 99
Continuing decline in extent of occurrence (EOO): Yes
Number of Locations: 2
Continuing decline in number of locations: Yes

Distribution
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 300
Upper elevation limit (m): 2000
Population
Number of mature individuals: 100
Continuing decline of mature individuals: No
Extreme fluctuations: No
Population severely fragmented: Yes
No. of subpopulations: 2
Continuing decline in subpopulations: Yes
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
Habitats and Ecology
Generation Length (years): 33

The IUCN Red List Partnership



The IUCN Red List of Threatened Species™ is produced and managed by the [IUCN Global Species Programme](#), the [IUCN Species Survival Commission \(SSC\)](#) and [The IUCN Red List Partnership](#).

The IUCN Red List Partners are: [Arizona State University](#); [BirdLife International](#); [Botanic Gardens Conservation International](#); [Conservation International](#); [NatureServe](#); [Royal Botanic Gardens, Kew](#); [Sapienza University of Rome](#); [Texas A&M University](#); and [Zoological Society of London](#).