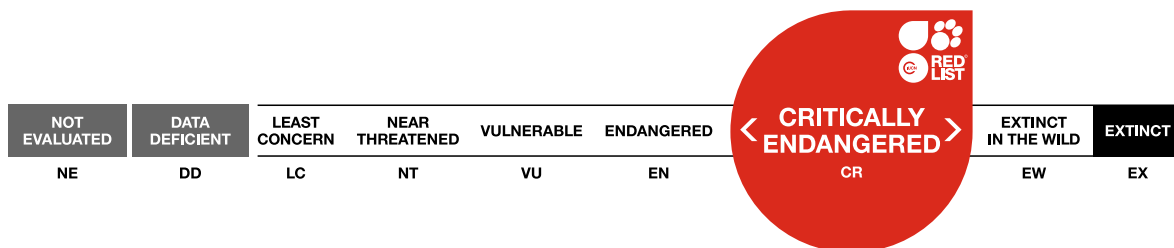


Arthopyrenia betulicola, Old Birch Spots

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



View on www.iucnredlist.org

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Fungi	Ascomycota	Dothideomycetes	Pleosporales	Arthopyreniaceae

Scientific Name: *Arthopyrenia betulicola* R.C.Harris, E.Tripp & Lendemer

Common Name(s):

- English: Old Birch Spots

Assessment Information

Red List Category & Criteria: Critically Endangered C2a(i) [ver 3.1](#)

Year Published: 2020

Date Assessed: October 6, 2019

Justification:

This southern Appalachian endemic species has a restricted range, split into 10 subpopulations. The overall population size is extremely small (c.100 mature individuals), with a maximum subpopulation size of 10 mature individuals. Ongoing declines are projected to occur as a result of the impacts of climate change, and invasive pests impacting the species' habitat. Therefore, it is listed as Critically Endangered C2a(i).

Geographic Range

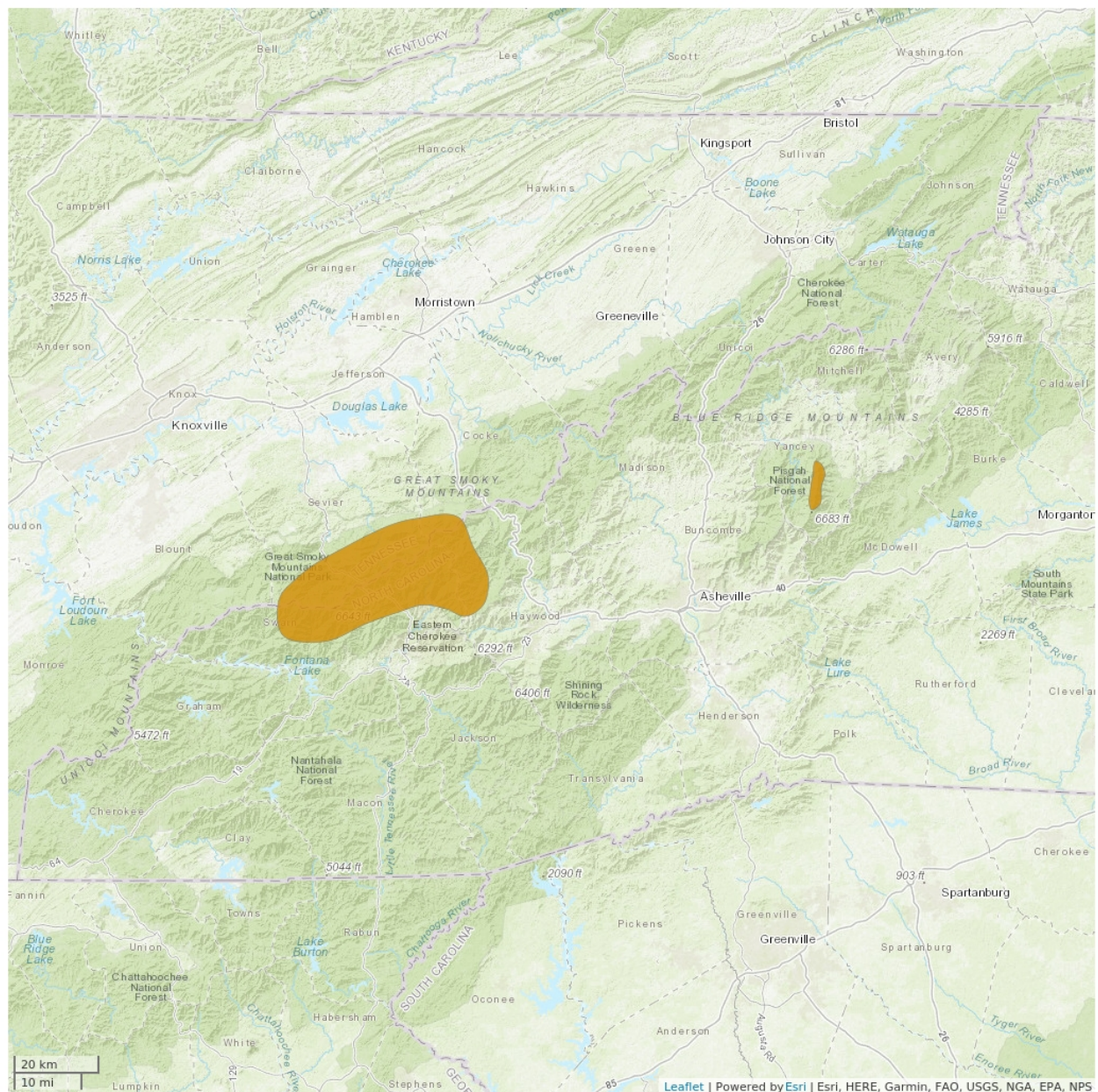
Range Description:

Arthopyrenia betulicola is narrowly endemic to the southern Appalachians and grows only on the bases of large, mature individuals of Yellow Birch (*Betula alleghaniensis*). It is currently known only from two mountain ranges, the Great Smoky Mountains, where most documented subpopulations occur, and the Black Mountains, where only two subpopulations have been documented.

Country Occurrence:

Native, Extant (resident): United States (North Carolina, Tennessee)

Distribution Map

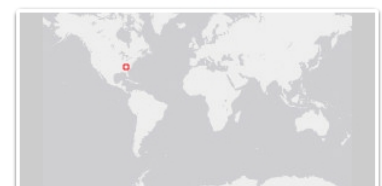
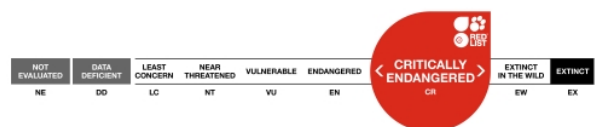


Legend

■ EXTANT (RESIDENT)

Compiled by:

IUCN (International Union for Conservation of Nature) 2020



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There are currently 10 documented subpopulations of this species. Nine of the subpopulations are well protected in the Great Smoky Mountains National Park, and one subpopulation occurs in the Pisgah National Forest in the Black Mountains. All documented populations are small, consisting of 1-10 mature individuals. Widespread clear-cutting of forest in the Appalachian Mountains in the 19th and 20th century likely extirpated most populations of this species, leaving just the few that survive today. More recently, the drastic impacts of the invasive Balsam Woolly Adelgid (*Adelges piceae*) on *Abies fraseri* has substantially reduced the habitat quality.

Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

The only known host for this species is Yellow Birch (*Betula alleghaniensis*), and it is ecologically restricted to the bases and sheltered faces of large, mature individuals (Harris *et al.* 2013). It has not been observed on young individuals of the tree, on trees in marginal habitats, or on other species of *Betula*.

Systems: Terrestrial

Threats (see Appendix for additional information)

The greatest current threats to this species are habitat degradation due to invasive pests (e.g. Balsam Woolly Adelgid, *Adelges piceae*) and climate change. Currently, all known populations are found on National Park, State Park and National Forest lands. As all known populations occur within management units protected from logging, road building, utility right-of-ways, development, and other changes in land use, the species is not considered to be threatened by these factors at this time, although logging may have impacted the species in the past. Pollution (acid rain) may also be having an impact on the species. Climate change impacts are based on projected species distribution models projected to 2050 and 2070 using two different climate change models (CCSM4 and HadGEM2-AO) at the lowest and highest carbon dioxide concentration (2.6 and 8.5 rcp) were recently built in Maxent for this species (Allen and Lendemer, in review). The results of the modelling predict an average suitable habitat loss of 99.7% with a minimum loss of 97.4% and a maximum loss of 100% (*ibid.*). This would represent a significant decrease in the Area of Occupancy and Extent of Occurrence for the species.

Conservation Actions (see Appendix for additional information)

Any changes in land use or alterations of currently documented populations are likely to result in the extirpation of this species, particularly if large individuals of Yellow Birch are removed from the forest. Thus, all areas where this species is known to occur should continue to be protected following existing, or more robust, regulations. Because climate change is the greatest threat to this species, global and regional reduction of greenhouse gasses is essential. Monitoring and planning for the conservation of the species would also be beneficial.

Credits

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

Reviewer(s): Yahr, R.

**Facilitator(s) and
Compiler(s):** Scheidegger, C.

Bibliography

Allen, J.L. and Lendemer, J.C. 2016. Climate change impacts on endemic, high-elevation lichens in a biodiversity hotspot. *Biodiversity and Conservation* 25(3): 555-568.

Harris, R. C., Tripp E. A., and Lendemer, J. C. 2013. *Arthopyrenia betulicola* (Arthopyreniaceae, Dothidiomycetes), and unusual new lichenized fungus from high elevations of the southern Appalachian Mountains. *Aliso* 31: 77-81.

IUCN. 2020. The IUCN Red List of Threatened Species. Version 2020-3. Available at: www.iucnredlist.org. (Accessed: 10 December 2020).

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Allen, J., Lendemer, J., McMullin, T. & Tripp, E. 2020. *Arthopyrenia betulicola*. *The IUCN Red List of Threatened Species* 2020: e.T80702824A80702827. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T80702824A80702827.en>

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External Resources

For [Supplementary Material](#), and 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

Plant Growth Forms

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

Plant Growth Form
M. Fungus
LC. Lichen

Threats

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

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.3. Unintentional effects: (subsistence/small scale) [harvest]	Past, unlikely to return	Unknown	Unknown	Past impact
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects		
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Majority (50-90%)	Causing/could cause fluctuations	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.2. Species disturbance		
8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.2. Named species (Adelges piceae)	Ongoing	Unknown	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects		
9. Pollution -> 9.5. Air-borne pollutants -> 9.5.1. Acid rain	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
11. Climate change & severe weather -> 11.1. Habitat shifting & alteration	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		
11. Climate change & severe weather -> 11.2. Droughts	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7

	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		
11. Climate change & severe weather -> 11.3. Temperature extremes	Ongoing	Whole (>90%)	Slow, significant declines	Medium impact: 7
	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 Action in Place
In-place research and monitoring
Action Recovery Plan: No
Systematic monitoring scheme: No
In-place land/water protection
Conservation sites identified: Yes, over entire range
Percentage of population protected by PAs: 91-100
Area based regional management plan: No
Occurs in at least one protected area: Yes
Invasive species control or prevention: 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 Action Needed
1. Land/water protection -> 1.1. Site/area protection
3. Species management -> 3.3. Species re-introduction -> 3.3.1. Reintroduction

Conservation Action Needed
3. Species management -> 3.4. Ex-situ conservation -> 3.4.2. Genome resource bank
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 -> 5.1. Legislation -> 5.1.3. Sub-national level

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

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km ²): 52
Continuing decline in area of occupancy (AOO): No
Extreme fluctuations in area of occupancy (AOO): No
Estimated extent of occurrence (EOO) (km ²): 1026
Continuing decline in extent of occurrence (EOO): No
Extreme fluctuations in extent of occurrence (EOO): No
Number of Locations: 10
Continuing decline in number of locations: No
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 1,200
Upper elevation limit (m): 1,850

Population
Number of mature individuals: 100
Continuing decline of mature individuals: Yes
Extreme fluctuations: No
Population severely fragmented: No
No. of subpopulations: 10
Continuing decline in subpopulations: No
Extreme fluctuations in subpopulations: No
All individuals in one subpopulation: No
No. of individuals in largest subpopulation: 10
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 30
Movement patterns: Not a Migrant

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