










Fungal conservation in the USA

















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Supplement 1. The raw data and sources for all information used to create Figure 1 are listed below. The essential values for creating the map are listed in the column labelled # of Listed Fungi.

			Population (2013 est)	Total area mi (km)	Total Land	Total Water	# of Listed Fungi	Source	Notes
	Alabama	AL	4,833,722	52,420 (135,767)	50,645 (131,170)	1,775 (4,597)	0	http://www.alnhp.org/track_2014.pdf	
	Alaska	AK	735,132	665,384 (1,723,337)	570,641 (1,477,950)	94,743 (245,383)	64	http://aknhp.uaa.alaska.edu/botany/rare-plants-species-lists/rare-lichen-list/#content	all lichens
	Arizona	AZ	6,626,624	113,990 (295,233)	113,594 (294,207)	396 (1,026)	0	http://www.aznps.com/rareplants/Rare_Plant_Scientific_Name_and_Rank.pdf	
	Arkansas	AR	2,959,373	53,179 (137,733)	52,035 (134,770)	1,143 (2,960)	0	http://www.naturalheritage.com/research-data/rare-species-search.aspx	
	California	CA	38,332,521	163,695 (423,968)	155,779 (403,466)	7,916 (20,502)	14	https://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPP_lants.pdf	all lichens
	Colorado	CO	5,268,367	104,094 (269,602)	103,642 (268,432)	452 (1,171)	29	http://www.cnhp.colostate.edu/download/list/nonvascular.asp	all lichens
	Connecticut	CT	3,596,080	5,543 (14,356)	4,842 (12,541)	701 (1,816)	0	http://www.ct.gov/deep/cwp/view.asp?a=2702&q=323482&deepNav_GID=1628	
	Delaware	DE	925,749	2,489 (6,446)	1,949 (5,048)	540 (1,399)	0	http://www.dnrec.delaware.gov/fw/NHESP/Documents/RARE%20PLANTS%20OF%20DELAWARE%202013.pdf	
	Florida	FL	19,552,860	65,758 (170,312)	53,625 (138,888)	12,133 (31,424)	1	http://fnai.org/PDF/Element_tracking_summary_201403.pdf	all lichens

	Georgia	GA	9,992,167	59,425 (153,910)	57,513 (148,958)	1,912 (4,950)	0	http://www.georgiawildlife.com/protected_species_lists	
	Hawaii	HI	1,404,054	10,932 (28,314)	6,423 (16,635)	4,509 (11,678)	0	http://dlnr.hawaii.gov/ecosystems/rare-plants/	
	Idaho	ID	1,612,136	83,569 (216,443)	82,643 (214,044)	926 (2,398)	28	https://fishandgame.idaho.gov/ifwis/portal/sites/ifwis/files/user/idfg-jstrickland/INHP_Tracked_Plant_Species--2014.pdf	all lichens
	Illinois	IL	12,882,135	57,914 (149,997)	55,519 (143,794)	2,395 (6,203)	1	http://www.dnr.illinois.gov/ESPB/Documents/ETC_hecklist2011.pdf	all lichens
	Indiana	IN	6,570,902	36,420 (94,327)	35,826 (92,789)	593 (1,536)	0	http://www.in.gov/dnr/naturepreserve/files/np-etrplants042513.pdf	
	Iowa	IA	3,090,416	56,273 (145,746)	55,857 (144,669)	416 (1,077)	0	https://www.legis.iowa.gov/docs/ACO/chapter/571.77.pdf	
	Kansas	KS	2,893,957	82,278 (213,099)	81,759 (211,755)	520 (1,347)	0	http://ksnhi.ku.edu/media/ksnhi/public-data-resources/Protected_species_09Jan2014.pdf	
	Kentucky^[C]	KY	4,395,295	40,408 (104,656)	39,486 (102,268)	921 (2,385)	1	http://naturepreserves.ky.gov/pubs/publications/ksn_pc_ets.pdf	all lichens
	Louisiana	LA	4,625,470	52,378 (135,658)	43,204 (111,898)	9,174 (23,761)	0	http://www.wlf.louisiana.gov/wildlife/rare-plants-fact-sheets	
	Maine	ME	1,328,302	35,380 (91,634)	30,843 (79,883)	4,537 (11,751)	0	http://www.maine.gov/dacf/mnap/features/plantlist.pdf	
	Maryland	MD	5,928,814	12,406 (32,131)	9,707 (25,141)	2,699 (6,990)	0	http://www.dnr.state.md.us/wildlife/Plants_Wildlife/rte/pdfs/rte_Plant_List.pdf	
	Massachusetts^[D]	MA	6,692,824	10,554 (27,335)	7,800 (20,202)	2,754 (7,133)	0	http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation/esa-list/list-of-rare-species-in-massachusetts.html	
	Michigan	MI	9,895,622	96,714 (250,488)	56,539 (146,435)	40,175 (104,053)	0	http://mnfi.anr.msu.edu/data/specialplants.cfm	
	Minnesota	MN	5,420,380	86,936 (225,163)	79,627 (206,233)	7,309 (18,930)	45	http://files.dnr.state.mn.us/natural_resources/ets/endlist.pdf	37 lichens; 5 fungi
	Mississippi	MS	2,991,207	48,432 (125,438)	46,923 (121,530)	1,509 (3,908)	0	http://www.mdwfp.com/media/128359/planttrackinglist.pdf	
	Missouri	MO	6,021,988	69,707	68,742	965 (2,499)	25	http://mdc.mo.gov/sites/default/files/resources/2010	all lichens

	Montana	MT	1,015,165	(180,540) 147,040 (380,832)	(178,041) 145,546 (376,962)	1,494 (3,869)	32	/04/2014_species_concern.pdf http://mtnhp.org/speciesofconcern/?AorP=p	all lichens
	Nebraska	NE	1,868,516	77,348 (200,330)	76,824 (198,973)	524 (1,357)	0	http://outdoornebraska.ne.gov/wildlife/programs/nogame/pdf/E_T_Species_List.pdf	
	Nevada	NV	2,790,136	110,572 (286,380)	109,781 (284,331)	791 (2,049)	3	http://heritage.nv.gov/sites/default/files/library/track.pdf	all lichens
	New Hampshire	NH	1,323,459	9,349 (24,214)	8,953 (23,188)	397 (1,028)	0	http://www.nhdf.org/library/pdf/Natural%20Heritage/TrackingList-PlantGeneral.pdf	
	New Jersey	NJ	8,899,339	8,723 (22,592)	7,354 (19,047)	1,368 (3,543)	0	http://www.nj.gov/dep/parksandforests/natural/heritage/njplantlist.pdf	
	New Mexico	NM	2,085,287	121,590 (314,917)	121,298 (314,160)	292 (756)	0	http://www.emnrd.state.nm.us/SFD/ForestMgt/Endangered.html	
	New York	NY	19,651,127	54,555 (141,297)	47,126 (122,056)	7,429 (19,241)	0	http://www.dec.ny.gov/docs/fish_marine_pdf/2010rareplantstatus.pdf	
	North Carolina	NC	9,848,060	53,819 (139,391)	48,618 (125,920)	5,201 (13,471)	22	http://digital.ncdcr.gov/cdm/ref/collection/p249901coll22/id/25869	all lichens
	North Dakota	ND	723,393	70,698 (183,107)	69,001 (178,712)	1,698 (4,398)	0	???	there isn't even really a website, but no federally listed lichens
	Ohio	OH	11,570,808	44,826 (116,099)	40,861 (105,830)	3,965 (10,269)	18	http://www.dot.state.oh.us/Divisions/Planning/Environment/Ecological_Resources/Permits/Ecology/Ecological%20Manual/Appendix%20B-plants.pdf?Mobile=1&Source=%2FDivisions%2FPlanning%2FEnvironment%2FEcological_Resources_Permits%2FEcology%2F_layouts%2Fmobile%2Fview.aspx%3FList%3D53c88b4b-6953-436b-b0b6-7985d245a1d7%26View%3Da3d29357-c848-4972-8f12-b0a8d4c1f511%26CurrentPage%3D1	all lichens
	Oklahoma	OK	3,850,568	69,899 (181,038)	68,595 (177,660)	1,304 (3,377)	0	http://www.oknaturalheritage.ou.edu/plants_rare_vulnerable.htm	
	Oregon	OR	3,930,065	98,379 (254,800)	95,988 (248,608)	2,391 (6,193)	205	http://orbic.pdx.edu/documents/2013-rte-book.pdf	70 lichens;
	Pennsylvania ^[E]	PA	12,773,801	46,054 (119,279)	44,743 (115,884)	1,312 (3,398)	7	http://www.naturalheritage.state.pa.us/species.aspx	all lichens

	Rhode Island ^[F]	RI	1,051,511	1,545 (4,002)	1,034 (2,678)	511 (1,320)	0	http://www.rinhs.org/wp-content/uploads/ri_rare_plants_2007.pdf	
	South Carolina	SC	4,774,839	32,020 (82,931)	30,061 (77,858)	1,960 (5,076)	1	https://www.dnr.sc.gov:4443/species/pdf/SC_state_wide2014.pdf	all lichens
	South Dakota	SD	844,877	77,116 (199,730)	75,811 (196,350)	1,305 (3,380)	0	http://gfp.sd.gov/wildlife/threatened-endangered/threatened-species.aspx	
	Tennessee	TN	6,495,978	42,144 (109,152)	41,235 (106,798)	909 (2,354)	2	https://www.tn.gov/environment/natural-areas/docs/plant_list.pdf	all lichens
	Texas	TX	26,448,193	268,596 (695,660)	261,232 (676,588)	7,365 (19,075)	0	https://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/txndd/documents/Rare_Plant_List_2010.pdf	
	Utah	UT	2,900,872	84,897 (219,882)	82,170 (212,819)	2,727 (7,063)	0	http://dwrcdc.nr.utah.gov/ucdc/viewreports/plantprt.pdf	
	Vermont	VT	626,630	9,616 (24,905)	9,217 (23,872)	400 (1,036)	0	http://www.vtfishandwildlife.com/library/Reports_and_Documents/NonGame_and_Natural_Heritage/Rare_Threatened_and_Endangered_Species%20%20%20%20lists/Endangered%20and%20Threatened%20Plants%20of%20Vermont.pdf	
	Virginia ^[G]	VA	8,260,405	42,775 (110,787)	39,490 (102,279)	3,285 (8,508)	18	http://www.dcr.virginia.gov/natural_heritage/documents/plantlist12.pdf	all lichens
	Washington	WA	6,971,406	71,298 (184,661)	66,456 (172,120)	4,842 (12,541)	133	http://www1.dnr.wa.gov/nhp/refdesk/lists/lichens.html ; http://www1.dnr.wa.gov/nhp/refdesk/lists/macrotungi.html	75 lichens; 58 fungi
	West Virginia	WV	1,854,304	24,230 (62,755)	24,038 (62,258)	192 (497)	1	http://www.wvdnr.gov/Wildlife/PDFFiles/RTE_Plants_2012.pdf	all lichens
	Wisconsin	WI	5,742,713	65,496 (169,634)	54,158 (140,269)	11,339 (29,368)	0	http://dnr.wi.gov/files/PDF/pubs/er/ER001.pdf	
	Wyoming	WY	582,658	97,813 (253,335)	97,093 (251,470)	720 (1,865)	0	http://www.uwyo.edu/wyndd/_files/docs/soc-plants/2012_plant_soc.pdf	stated to be "updated in 2012" but no data!

Supplement 2. Below is the completed Micheli Guide evaluation form for the USA Endangered Species Act. The resulting rank is “totally deficient”.



MICHELI GUIDE TO FUNGAL CONSERVATION CBD EVALUATION FORM



Name of country: United States of America

Title of report: Endangered Species Act

Date on report: 24 November 2003

Date of receipt:

URL of report: <http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf>

Language of report: English

Date of evaluation: 10 November 2014

Key questions

- | | Yes / no |
|---|----------|
| 1. Were fungi mentioned? Note. If fungi are mentioned only as an exploitable resource, or as threats to other organisms, for example by reference to fungicides etc. the answer should be “No”. | NO |
| 2. Were fungi (including lichen-forming fungi) clearly, consistently and explicitly recognized as different from animals, plants and other biological kingdoms? Note. A check that the basic science is correct. | NO |
| 3. Was strategic consideration explicitly given to fungal conservation? Note. An assumption that fungi will be protected if other organisms are conserved is not enough. There must be plans to deal with the issues raised by fungal conservation. Example indicators: separate texts devoted to fungal conservation; lists of important fungus areas / fungal biodiversity hotspots; deficiencies in legal protection for fungi identified and plans present to rectify those deficiencies; threats to fungi identified; fungal red lists mentioned. | NO |
| 4. Were principal fungal habitats and roles taken into account? Note. Fungal habitats are different from animal or plant habitats, and need separate consideration. Example habitats and roles: decomposers, dung fungi, endobionts, freshwater fungi, fungi on man-made products, fungi on naturally occurring inanimate substrata, lichen-forming fungi, marine fungi, mycorrhizal fungi, parasitic fungi. | NO |
| 5. Was the knowledge gap for fungi recognized with plans to address the problem? Note. Pretending this problem does not exist is no solution. Both parts of the question need to be “yes” to get a positive score. Recognizing a knowledge gap and then failing to deal with it is not enough. | NO |

Scoring: five “Yes” answers = adequate; four “Yes” answers = nearly adequate; three “Yes” answers = poor; two “Yes” answers = deficient; one “Yes” answer = seriously deficient; **no “Yes” answers = totally deficient.**

Evaluation.

Relative frequency of words relating to different biological kingdoms (from following page)

Animals	96.5%
Fungi	0%
Plants	3.5%

Does this report qualify for gold star rating? NO

Evaluator’s comments (optional).

Guidance notes. The Rio Convention on Biological Diversity [CBD] requires participating countries to submit national action plans and reports. In these documents, openly available on the Internet [www.cbd.int/nbsap/search/default.shtml], governments describe their policies and activities to protect biodiversity. In the past they have focused on animals and plants, almost totally overlooking fungi, so we monitor these documents as part of the campaign to conserve fungi. This form, a standardized and objective way to evaluate CBD documents in respect of fungi, can be downloaded from the Internet at www.fungal-conservation.org/micheli/cbd-report-form.doc. Please e-mail completed forms as an attachment to the *Micheli Guide to Fungal Conservation* [micheli@fungal-conservation.org]. The evaluator’s name, and postal and e-mail addresses must be supplied, but will not be published. Evaluations are checked and then, if suitable, published on the *Micheli Guide to Fungal Conservation* website [www.fungal-conservation.org/micheli]. If you would like to comment on coverage of fungi in an individual national action plan or report, the national focus point for the CBD’s *Subsidiary Body on Scientific, Technical and Technological Advice* is a good place to start. It is possible to find the name and e-mail address of each of these national focus points from the following web page: <http://www.cbd.int/doc/lists/nfp-sbsta.pdf>.

Frequency of fungus words in document

Word	Frequency
fung (as in “fungal”, “fungi” and “fungus”)	0
lichen (but excluding German words like “wissenschaftlichen”)	0
myc	0
mould	0
mushroom	0
toadstool	0
truffle	0
yeast	0
other (please specify)	0
Fungi total	0

Frequency of animal words in document

There are many possible animals words to check, please as a minimum check those which are in *italics*.

Word	Frequency	Word	Frequency
<i>amphibian</i>	1	<i>insect</i>	0
<i>animal</i>	7	lynx	0
arthropod	1	<i>mammal</i>	3
bat	0	mollusc	0
bear	0	moth	0
bee	0	owl	0
beetle	0	porpoise	0
<i>bird</i>	7	raptor	5
bryozoan	0	<i>reptile</i>	1
butterfly	0	rodent	0
cattle	0	seal	0
coral	0	snail	0
crustacean	1	snake	0
dolphin	0	tortoise	0
dragonfly	0	turtle	0
duck	0	<i>vertebrate</i>	1
falcon	0	wader	0
<i>fauna</i>	2	wasp	0
<i>fish</i>	80	whale	1
frog	0	wolf	0
goose	0	worm	0
other (please specify) wildlife	83		
Animals total	193		

Frequency of plant words in document

Word	Frequency
Bryophyte	0
conifer	0
fern	0
flora	0
flower	0
moss	0
plant (excluding phrases like “sewage treatment plant”)	7
other (please specify)	
Plants total	7