Seney National Wildlife Refuge

Characterizing Wildlife Communities of Fire-Dependent Ecosystems of the Northern Lake States and Exchanging Research, Inventory, and Monitoring Knowledge and Ideas

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Presentation Outline

- **Examples of fire-dependent ecosystems of the northern Lake States?**
- **Need, goals and objectives of this work: which vertebrate species are fire-dependent?**
- **Potential applications and next steps.**

Lake States Fire Science Consortium

A JFSP KNOWLEDGE EXCHANGE CONSORTIUM

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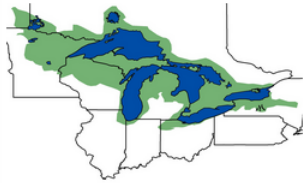
Fire-Dependent Ecosystems



The focus of the Lake States Fire Science Consortium is on the fire-dependent ecosystems that occur across the Lake States region, from western New York and Ontario in the east to central Minnesota in the west. The boundaries of the Consortium follow those of The Nature Conservancy's Great Lakes (47) and Superior Mixed-Forest (48) Ecoregions.

There are few ecosystems within the region that were not influenced in some way by fire, and as result we classify those ecosystems that were maintained in some way by fire as fire-dependent. In both ecoregions there are a variety of openland-savanna, forest, and wetland ecosystems that are influenced by wildfire and/or are managed using prescribed burning. Nomenclature for these ecosystems varies widely depending on the state or province, or by organization.

Quick links to different ecosystem types:

Woodlands-Savannas Forests Wetlands

Woodlands - Savannas

Below is a list of fire-dependent woodland-savanna and forest ecosystems within the Consortium boundaries using the LANDFIRE Rapid Assessment Vegetation Models:

Great Lakes Pine Barrens

Jack Pine-Openlands

Northern Oak Savannas

Forests

Below is a list of fire-dependent woodland-savanna and forest ecosystems within the Consortium boundaries using the LANDFIRE Rapid Assessment Vegetation Models:

Conifer Lowland Forests (embedded in fire-prone ecosystem)

Conifer Lowlands Forests (embedded in fire-resistant ecosystem)

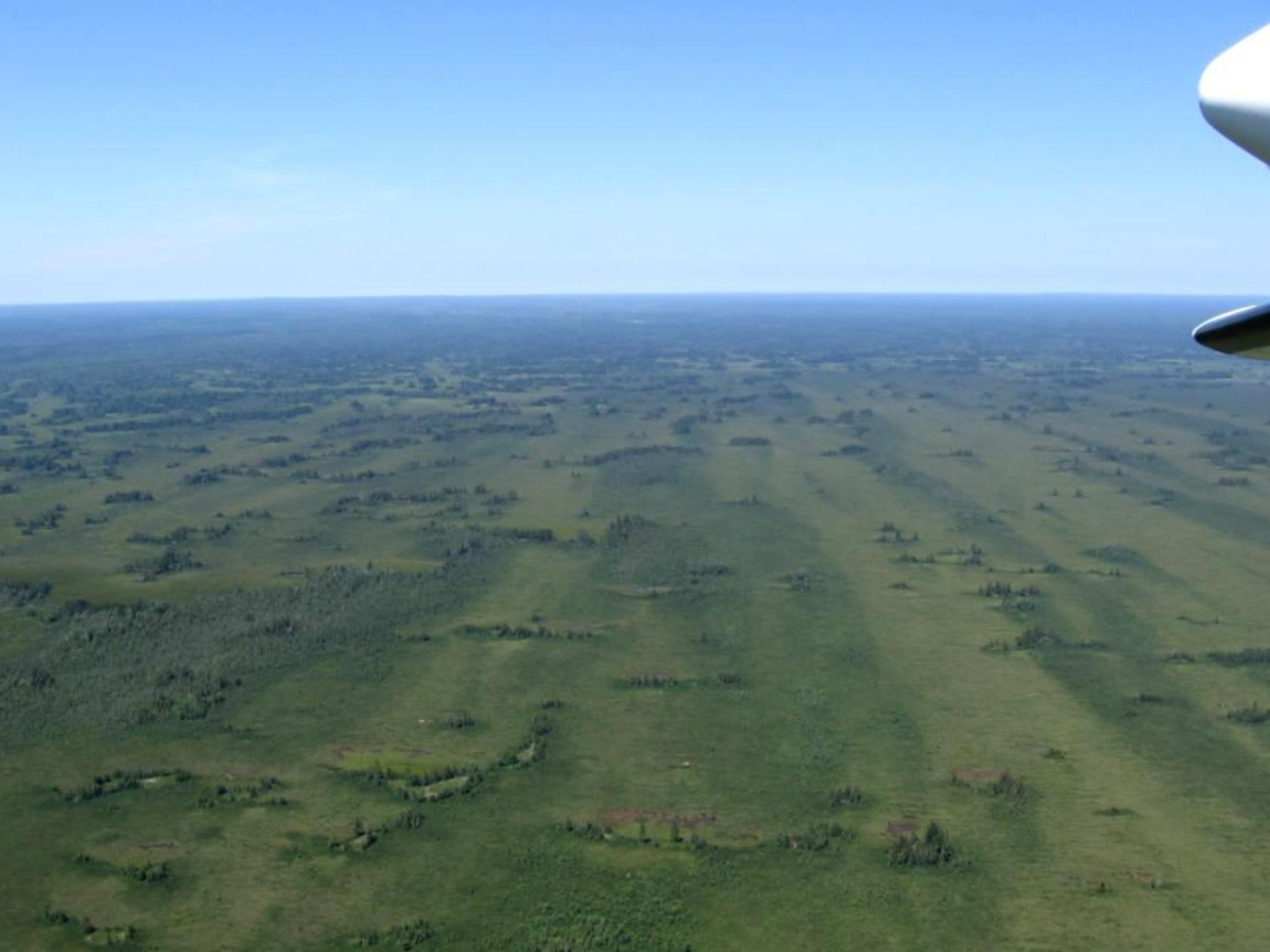
Eastern White Pine-Eastern Hemlock Forests

Upcoming Events

See home page right side

Newsletter Archive

View Archived Newsletters



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Fire-Dependent Ecosystems Differ In:

- **Composition of plant and animal species and ecosystem function;**
- **Fire regime characteristics such as FRI, rotation, seasonality, severity, intensity, etc. (Whitney 1986/1987; Frelich 2002; Cleland et al. 2004)**

Important linkages exist with fire and other ecological processes (e.g., hydrology in wetlands, insect herbivory in forests, etc.).

Relative to much of the U.S. few studies have described fire effects on wildlife in the northern Lake States (J. Miesel MSU *In Prep.*).

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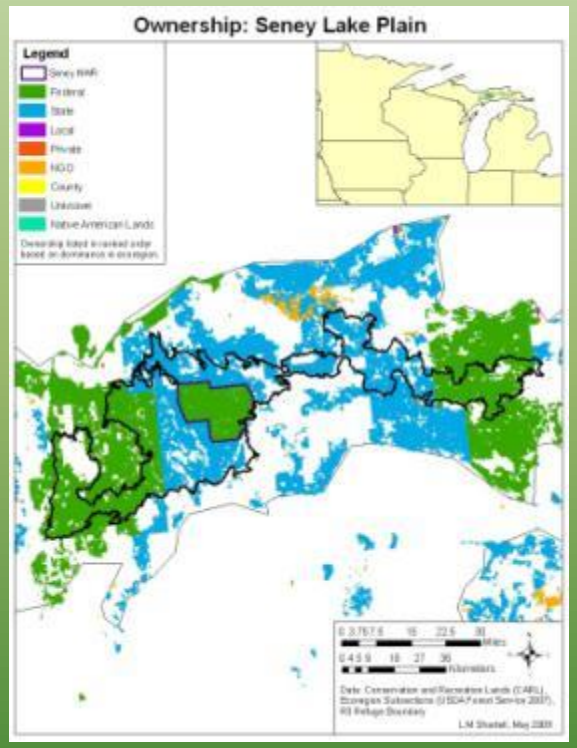
Refuge Land Management

Refuge System Policy- Refuge Legislation

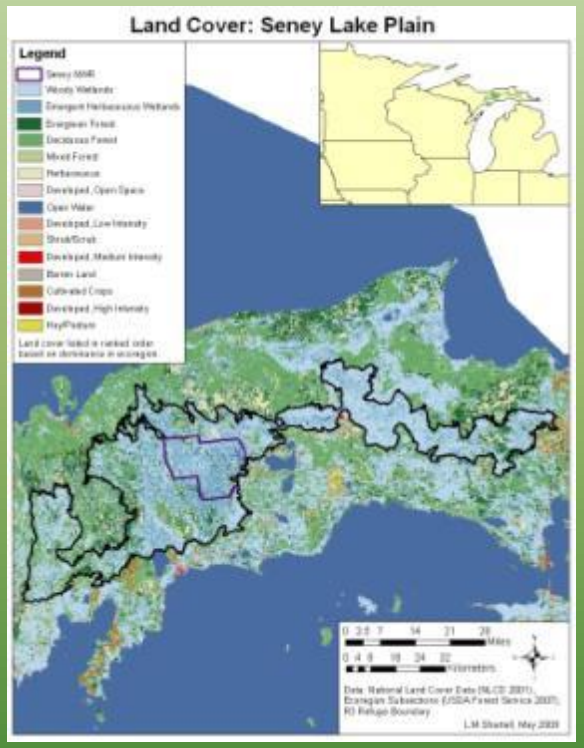
Ownership



Corace et al. 2012. *EnvMgmt.*

Planning & Mgmt.

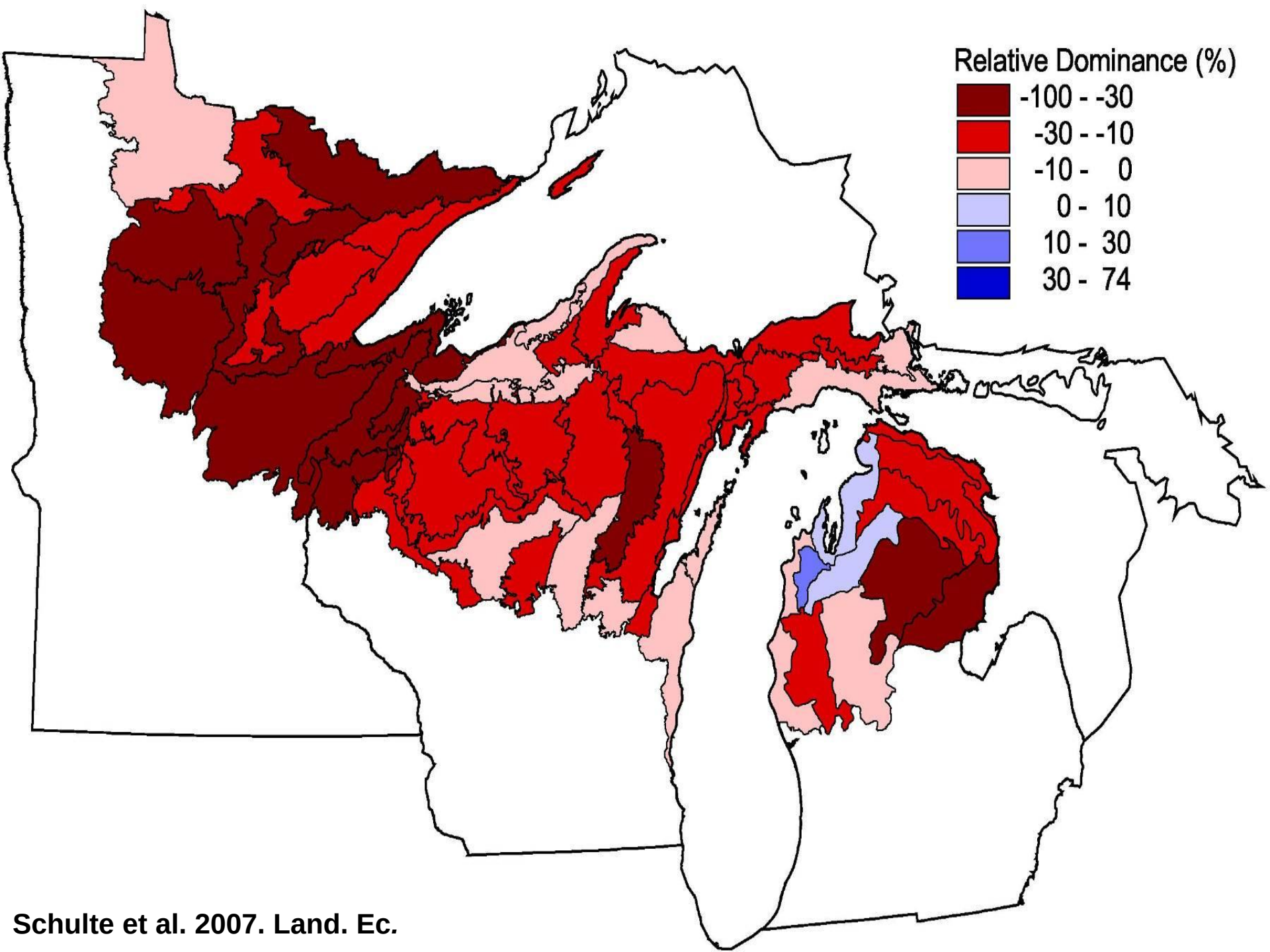
Land Cover



Corace et al. 2012. *EnvMgmt.*

Ecosystem Capabilities-Disturbance Patterns-Function

Drobyshev et al. 2008a,b *CJFR* and *FEM*



Schulte et al. 2007. Land. Ec.


Northern Rockies
Great Plains
Tallgrass
Northwest
Lake States
Great Basin
Southern Rockies
Appalachians
Oak Woodlands
California
Southwest
South
Alaska
Pacific

Objectives Wildlife-Fire Project:

1. Improve our publically accessible wildlife-fire literature citation database, especially theses and dissertations;
2. Evaluate documents as appropriate and consult with state-level experts to identify vertebrate species with high affinity for fire-dependent ecosystem;
3. Identify individuals and organizations that are conducting related inventory, monitoring, research and management and communicate this information with other interested parties;
4. Promote information exchange related to the above at one or more professional events (webinar and/or conference and/or field trips); and
5. Use all the above to draft a research needs statement that will be presented to JFSP through the LSFSC.

Lake States Fire Science Consortium

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Science Library

The Lake States Fire Science Library provides web features, summaries, syntheses, and links to important publications from key scientists for our region. Among those links, sources for tools and models that apply that fire science are included to help managers explore ways to integrate the science into their practices. Practitioners can use these resources when evaluating current methods and considering new approaches to wildland fire management in the region.

See our Ecosystems page for a description of fire-dependent ecosystems that are the focus of the Lake States Fire Science Consortium.

Fire Ecology & Landscape Classification
Ecosystem classification, fire chronology, history, and succession

Fire Use & Fuels Management
Resource objectives, prescription parameters, and cost/benefit analyses

Fire Effects
Burn severity, vegetative responses, and impacts on animal populations, water, and soil

Fire Danger & Fire Behavior
Fire potential analysis, assessment and projection

Weather, Climate, & Air Quality
Historic trends and forecasting models and tools, smoke management plans and resources

The Human Dimension
How we respond to risk, communicate with others, and make decisions

LSFSC Publication Database
For peer-reviewed scientific literature and agency publications addressing fire science topics focused on the Lake States region

Fire Science Databases

- Fire Research Institute
- Joint Fire Science Program Research, Digests, Briefs, and Syntheses
- Tall Timbers Fire Ecology
- FRAMES
- USFS Treesearch
- National Forest Service Library
- USFS Fire Effects Information System
- Regional Resources

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Fire Dependent Birds (Examples)

- Open Wetlands: Yellow Rail, American Bittern, King Rail, LeConte's Sparrow
- Conifer Swamps: Connecticut Warbler, Spruce Grouse
- Dry Coniferous Forest: Kirtland's Warbler, Pine Warbler, Eastern Bluebird
- Barrens: Upland Sandpiper, Sharp-tailed Grouse, Short-eared Owl

For many species, multiple fire-dependent ecosystem types are used, but fire effects knowledge and other literature lacking.

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Fire Dependent Mammals (Examples)

- Open Wetlands: moose, American beaver
- Conifer Swamps: snowshoe hare, bobcat, Canada lynx
- Dry Coniferous Forest/Barrens: American badger, elk, pygmy shrew

For many species, multiple fire-dependent ecosystem types are used, but fire effects knowledge and other literature lacking.

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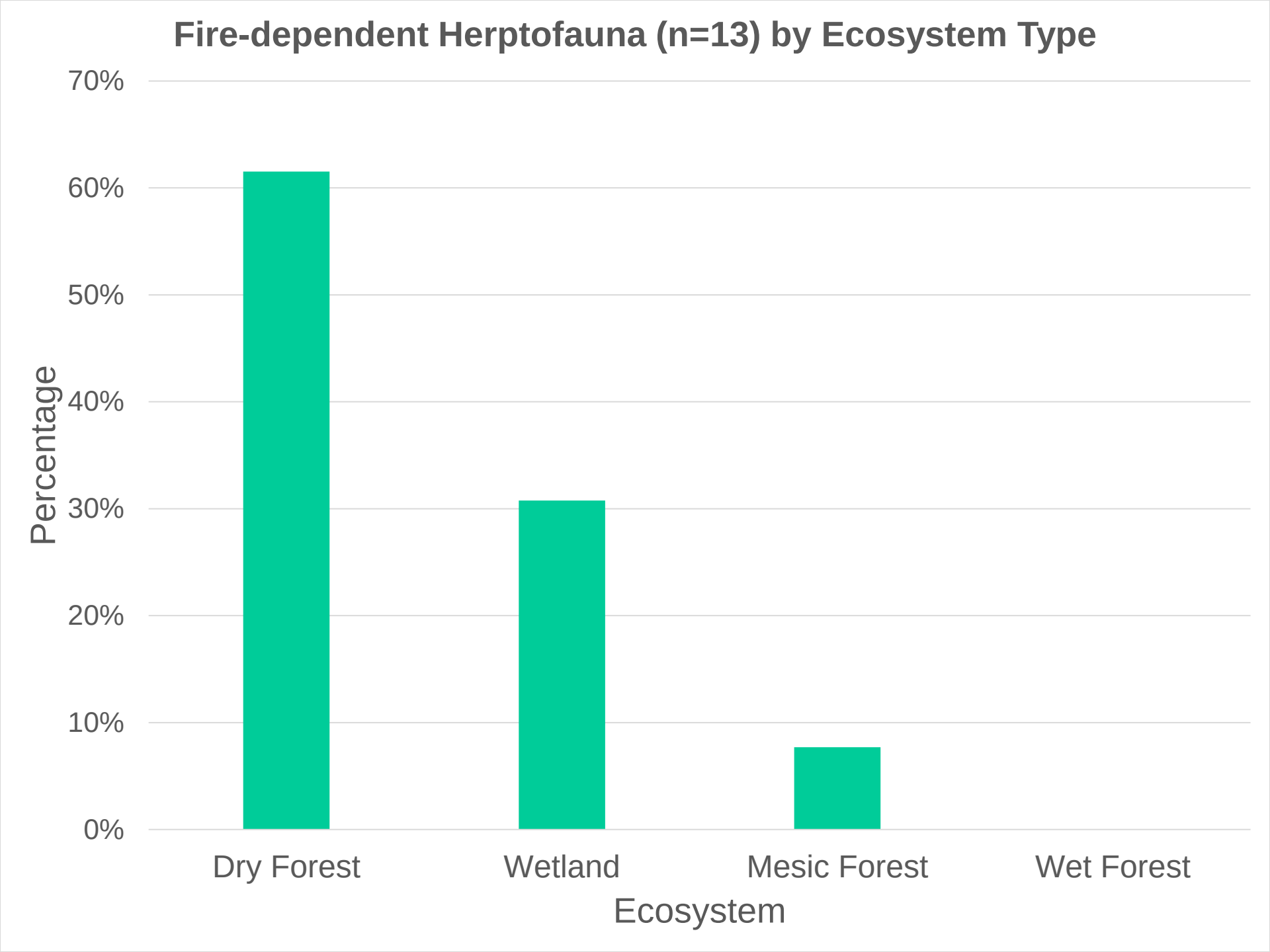
Fire Dependent Herps (Examples)

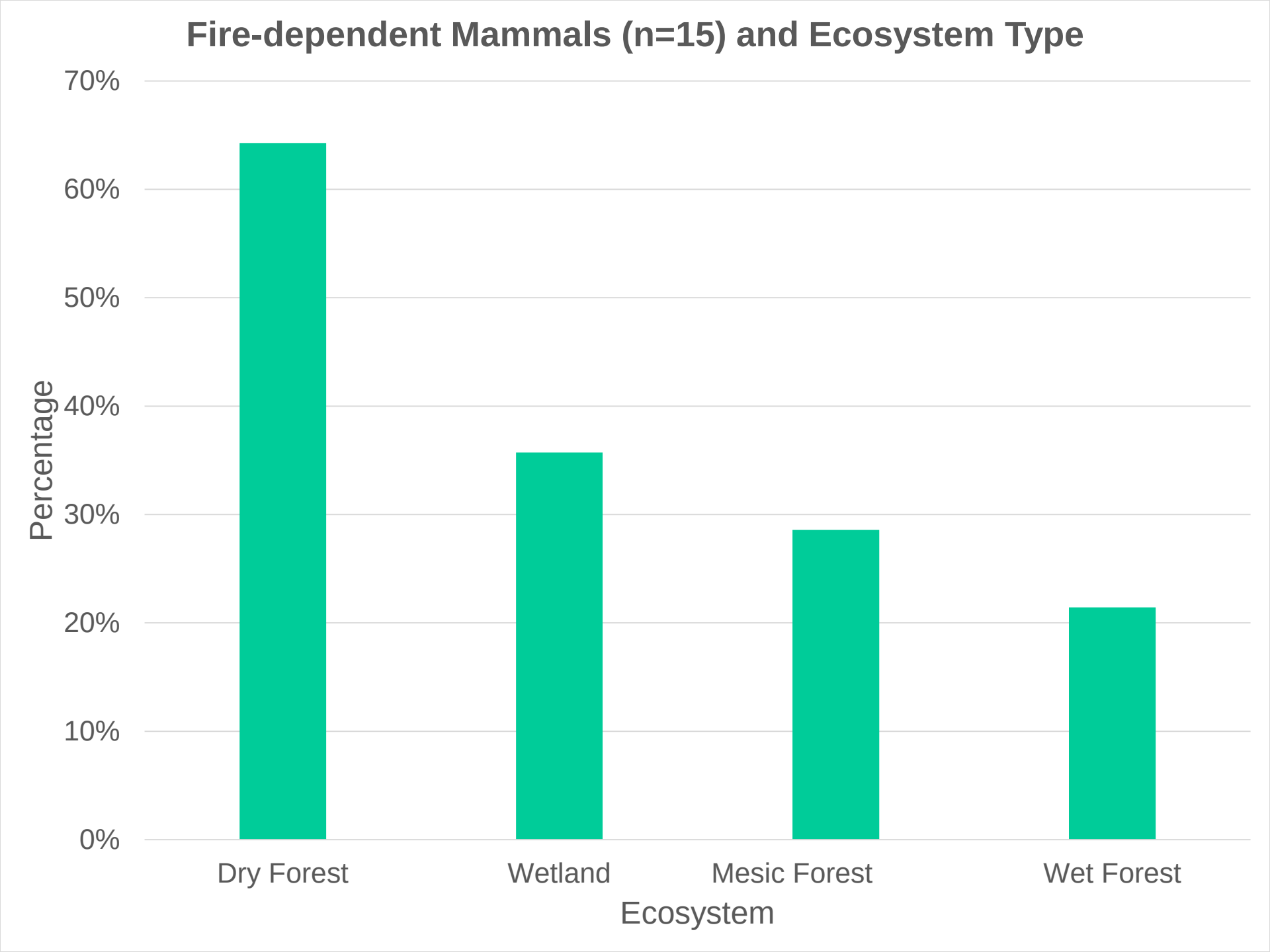
Open Wetlands: Eastern massasauga, Blanding's turtle

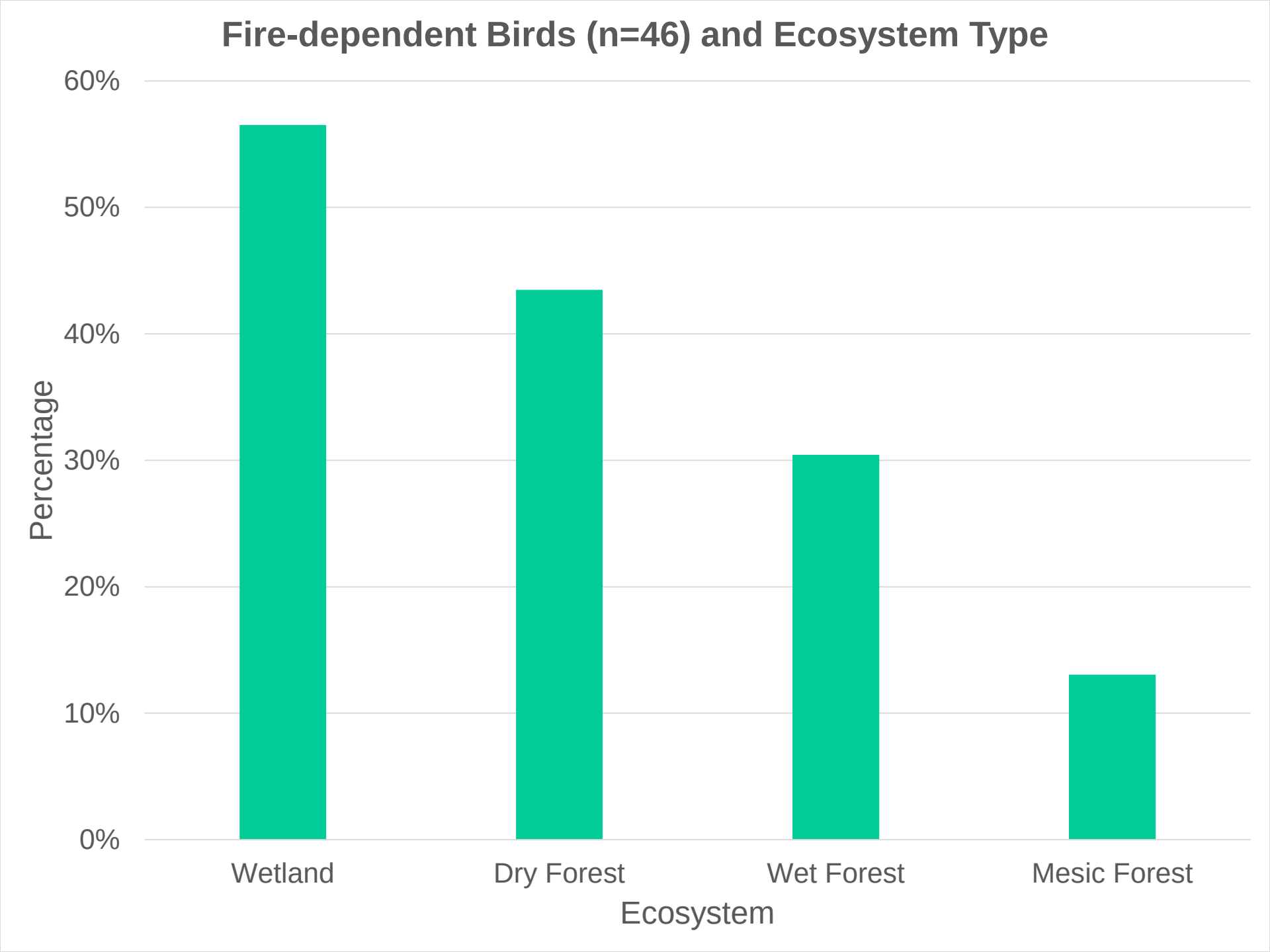
Conifer Swamps: five-lined skink

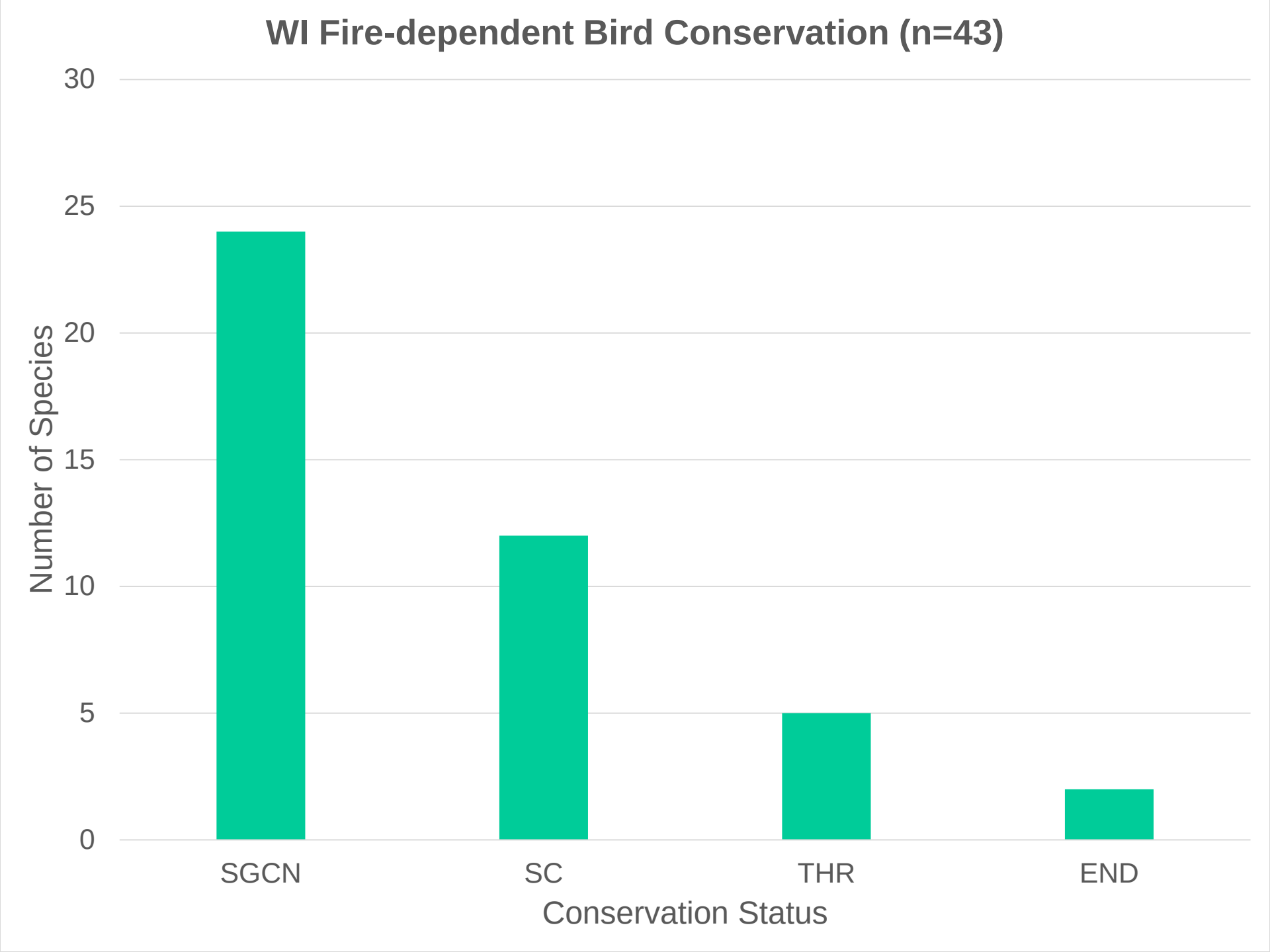
Dry Coniferous Forest/Barrens: gopher snake

For many species, relatively few fire-dependent ecosystem types are used, but fire effects knowledge and other literature still lacking.


Fire-dependent Herptofauna (n=13) by Ecosystem Type
70%
60%
50%
40%
30%
20%
10%
0%
Percentage
Dry Forest
Wetland
Mesic Forest
Wet Forest
Ecosystem


Fire-dependent Mammals (n=15) and Ecosystem Type
70%
60%
50%
40%
30%
20%
10%
0%
Percentage
Dry Forest
Wetland
Mesic Forest
Wet Forest
Ecosystem


Fire-dependent Birds (n=46) and Ecosystem Type
60%
50%
40%
30%
20%
10%
0%
Percentage
Wetland
Dry Forest
Wet Forest
Mesic Forest
Ecosystem


WI Fire-dependent Bird Conservation (n=43)
30
25
20
15
10
5
0
Number of Species
SGCN
SC
THR
END
Conservation Status

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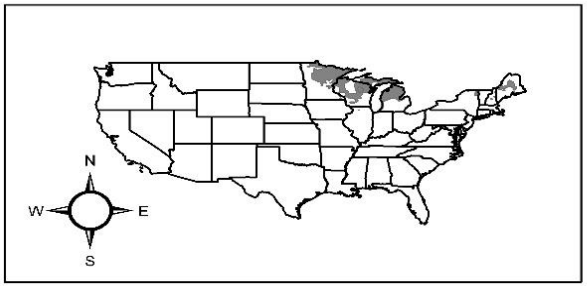
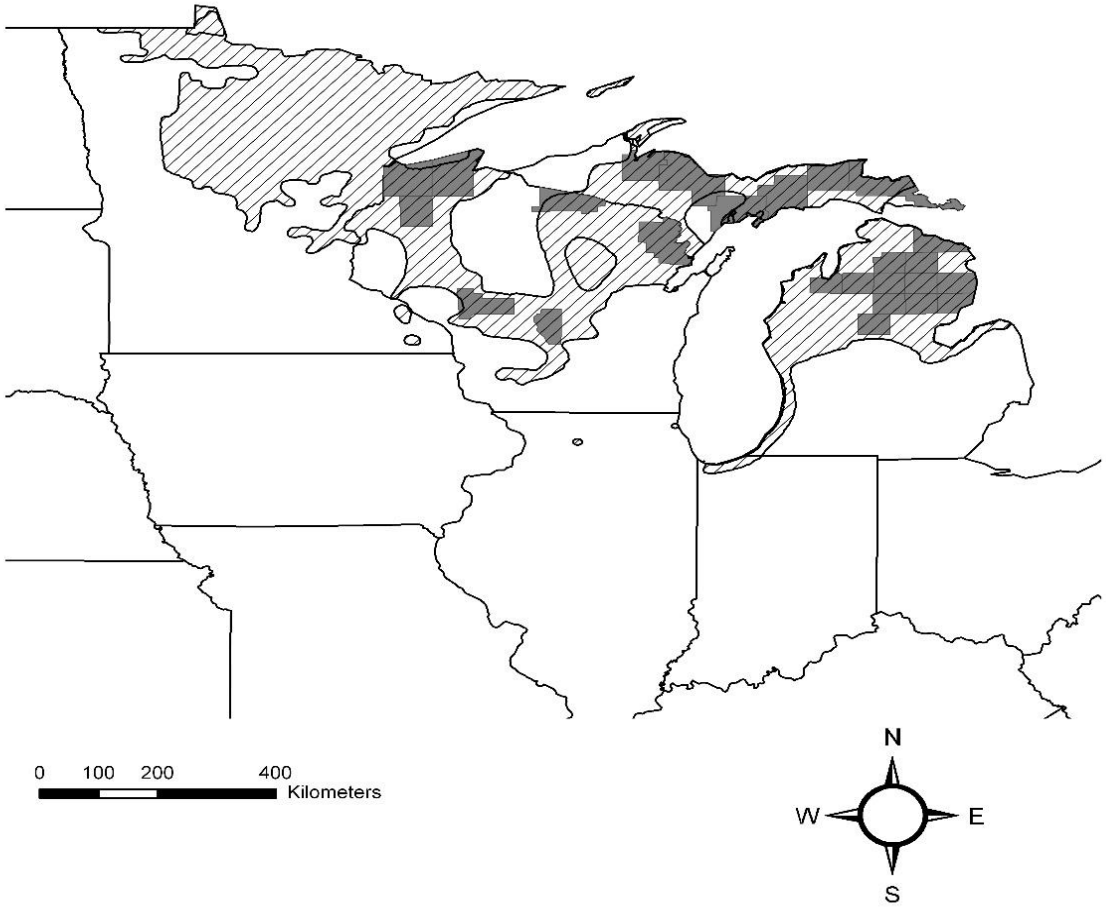




US Distribution of Jack Pine (*Pinus banksiana*)

World Distribution of Kirtland's Warbler (*Setophaga kirtlandii*)

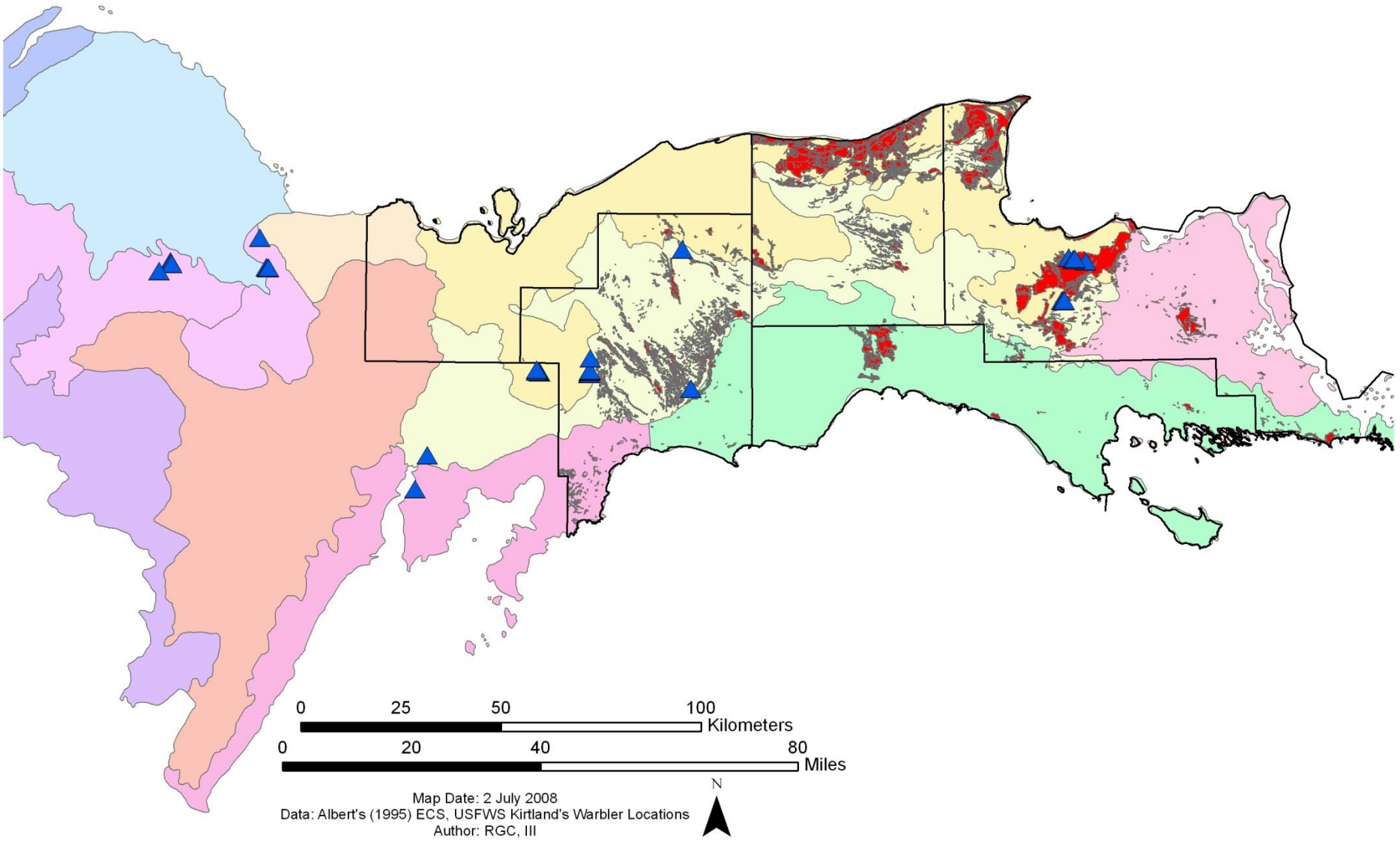
~98% of <u>all</u> Kirtland's Warbler found in xeric, outwash plains of nLP of Michigan

Table 1. Indicator species for young (< 5 years), KW (5-23 years), and old (> 23 years) jack pine stands at KWWMA.

YOUNG	KW	OLD
Indigo Bunting*** (*Passerina cyanea*)	Kirtland's Warbler*** (*Dendroica kirtlandii)*	Eastern Wood-Pewee*** (*Sayornis phoebe)*
Eastern Bluebird*** *(Sialia sialis)*	Nashville Warbler*** (*Vermivora ruficapilla)*	Hermit Thrush*** (*Catharus guttatus)*
Field Sparrow*** *(Spizella pusilla)*	Eastern Towhee*** (*Pipilo erythrophthalmus*)	Ovenbird*** (*Seiurus aurocapilla)*
Lincoln's Sparrow*** *(Melospiza lincolnii*)	Brown Thrasher** (*Toxostoma rufum)*	Rose-breasted Grosbeak*** (*Pheucticus ludovicianus)*
Black-billed Cuckoo* *(Coccyzus erythropthalmus)*	Alder Flycatcher** (*Empidonax alnorum)*	Red-breasted Nuthatch*** (*Sitta vireo)*
		Red-eyed Vireo*** (*Vireo olivaceus)*
		Black-capped Chickadee** (*Poecile atricapillus)*
		Chipping Sparrow** (*Spizella passerina)*

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P < 0.001$.

Kirtland's Warbler Distribution Across Eastern UP Ecoregions (Albert 1995) and Habitat Types (Burger & Kotar 2003)



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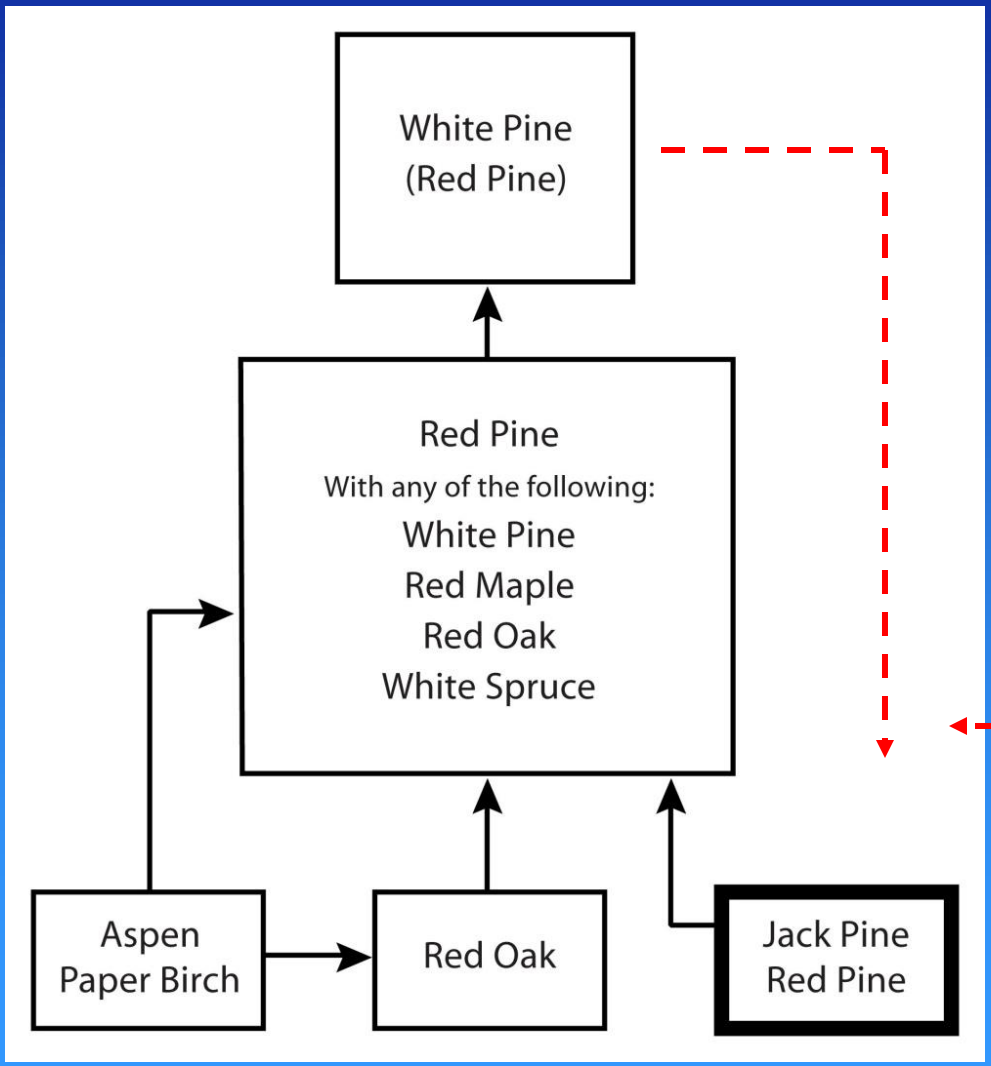


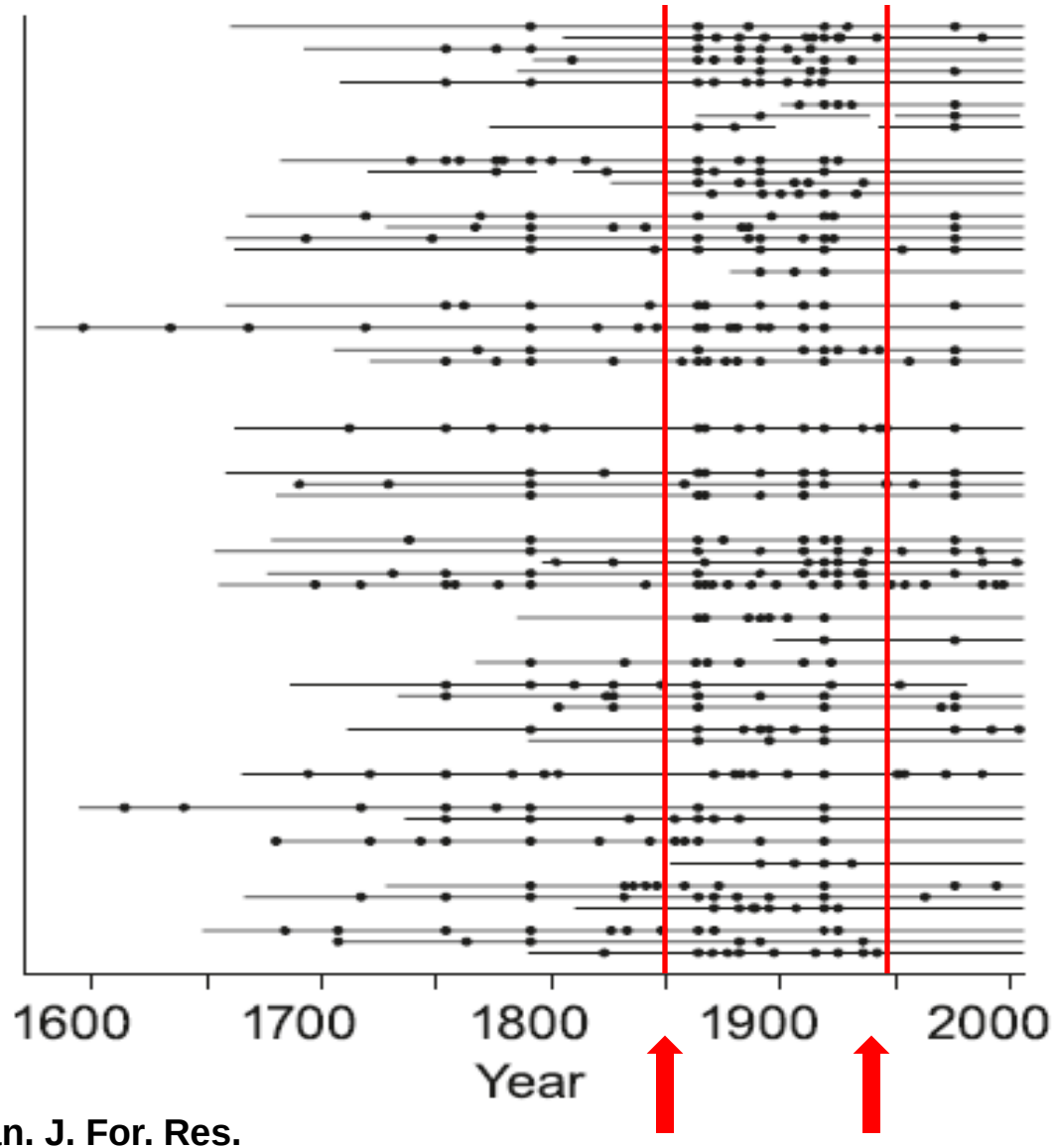
Ecological Considerations for Forest Restoration Based on Soils, Disturbances, and Resulting Composition and Structure

***Pinus strobus/Vaccinium angustifolium-Epigaea repens* (PVE) Habitat Type[1]**

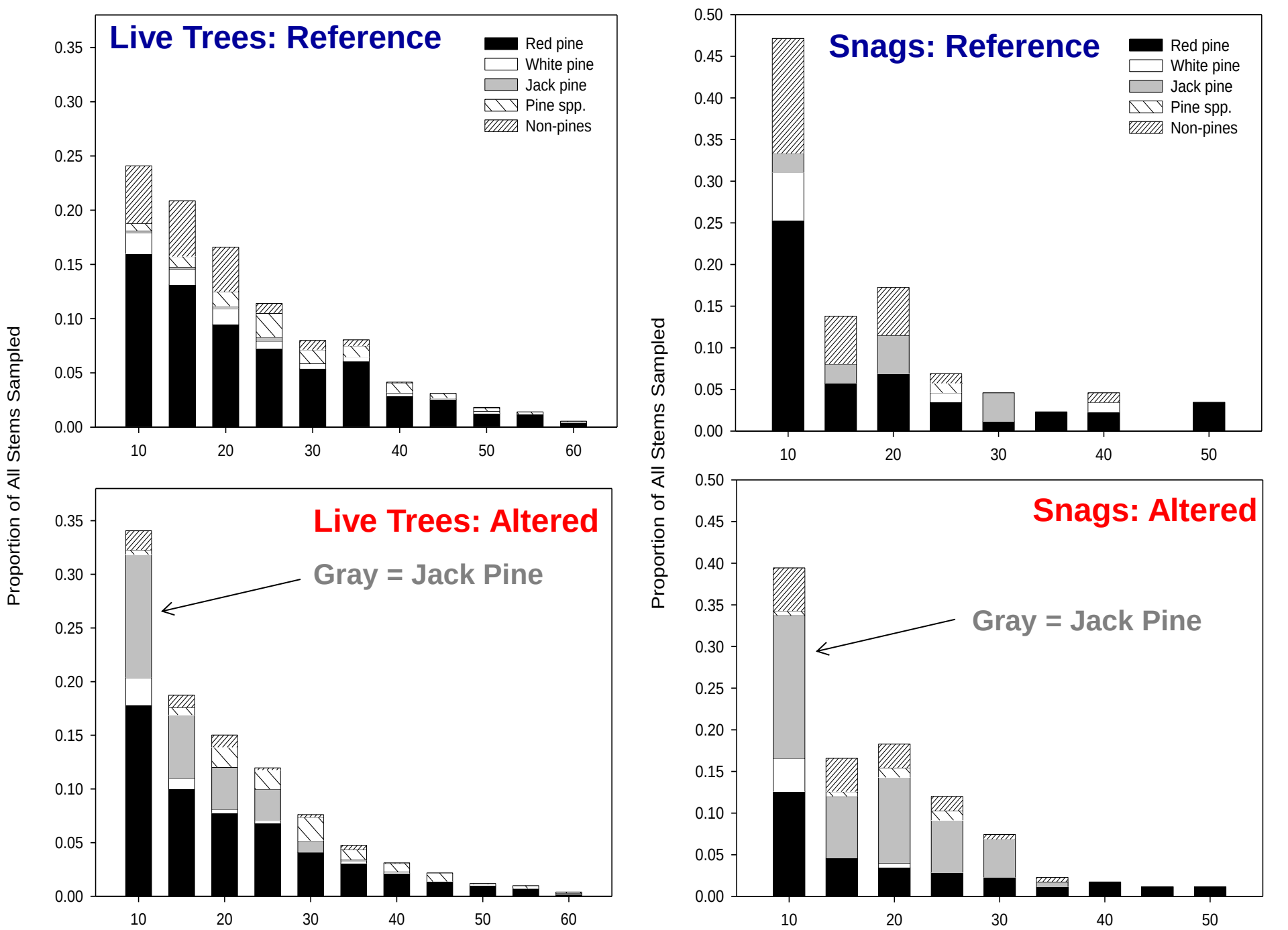
Major and/or frequent ecological disturbances (e.g., crown fire) push stands to earlier seral stages, minor and/or infrequent disturbances (e.g., surface fire) to later seral stages.

[1]Burger and Kotar. 2003. Forest community and habitat types of Michigan.

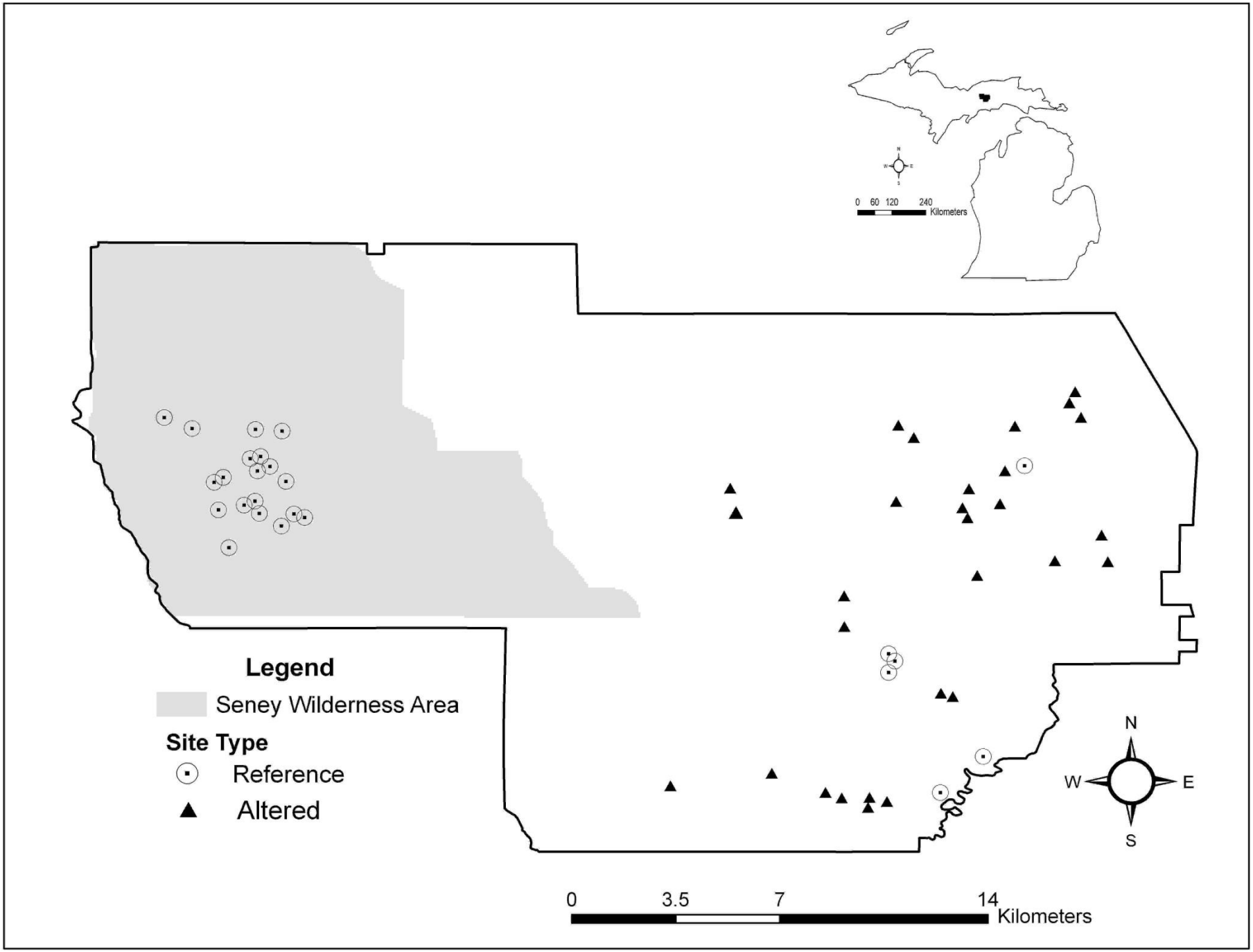
Fig. 2. Time span of each of the 49 fire history sites within SNWR. Each chronology is based on a mean of five samples. Fires are recorded as "points" and blank spaces indicate a hiatus in a chronology (i.e., stand was not recording during that period).



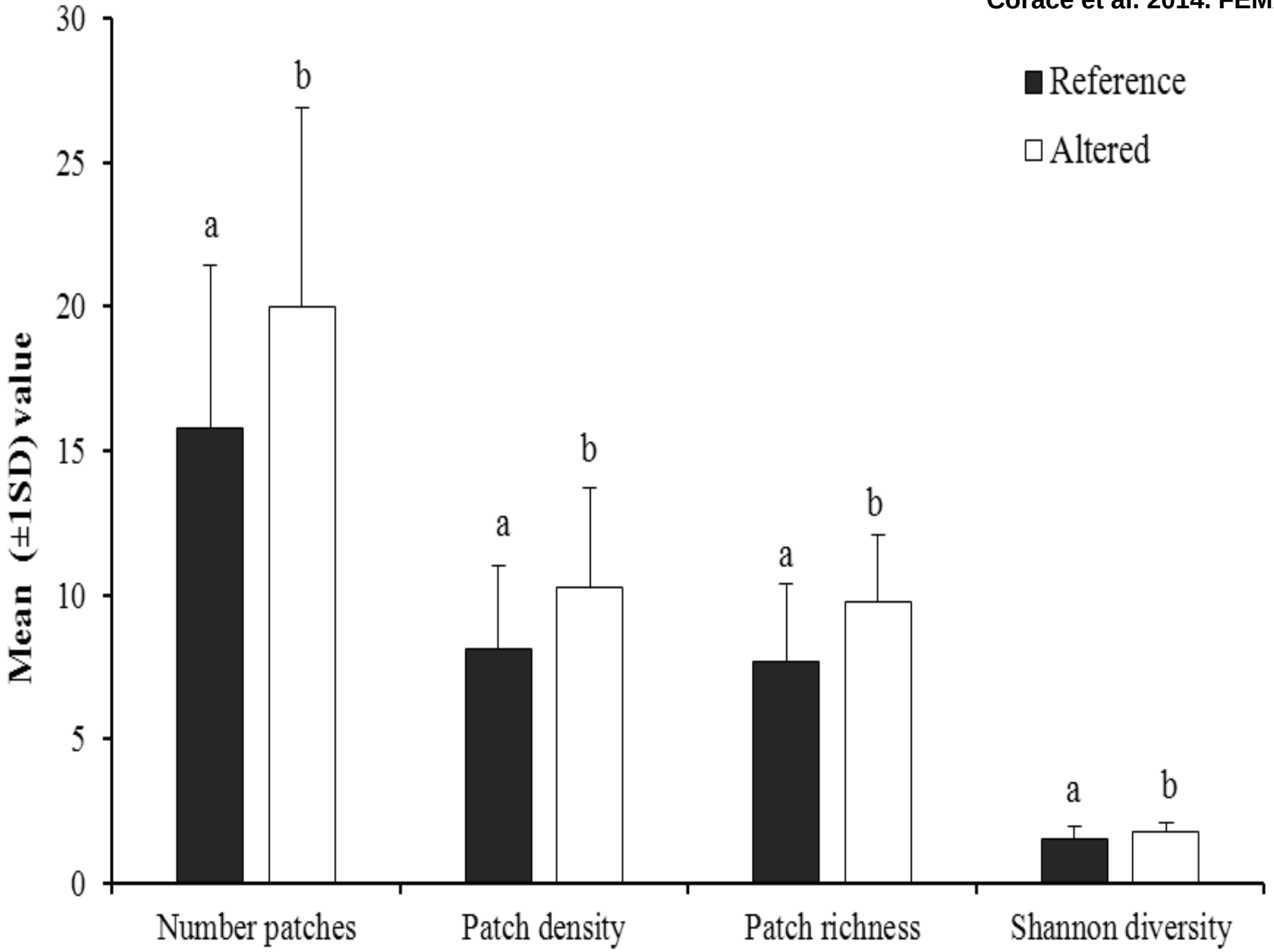
Drobyshev et al. 2008. Can. J. For. Res.



Corace et al. 2013. *Res. Ec.*


0 60 120 240
Kilometers
Legend
Seney Wilderness Area
Site Type
Reference
Altered
N
W
E
S
0 3.5 7 14
Kilometers

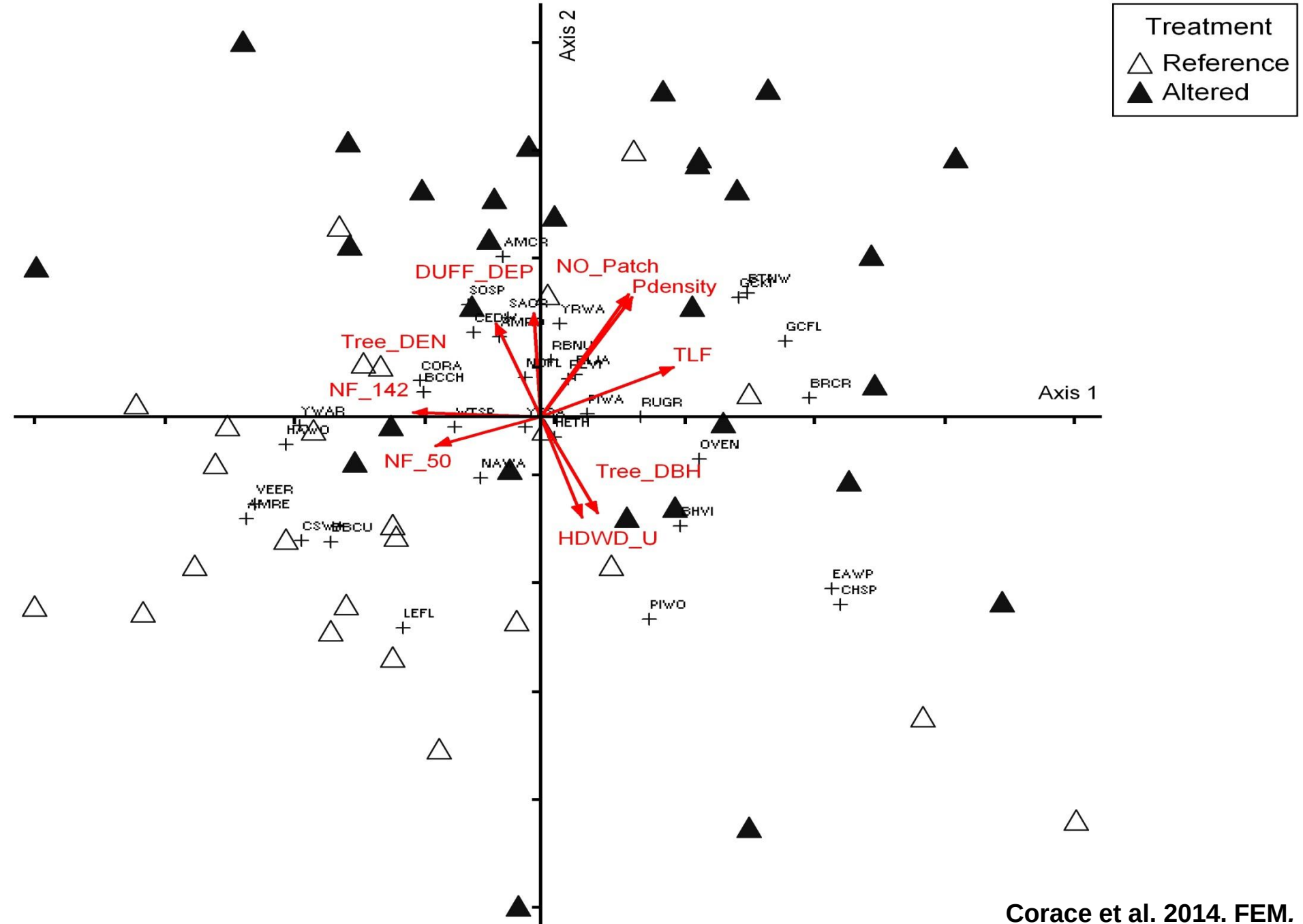
Corace et al. 2014. FEM.



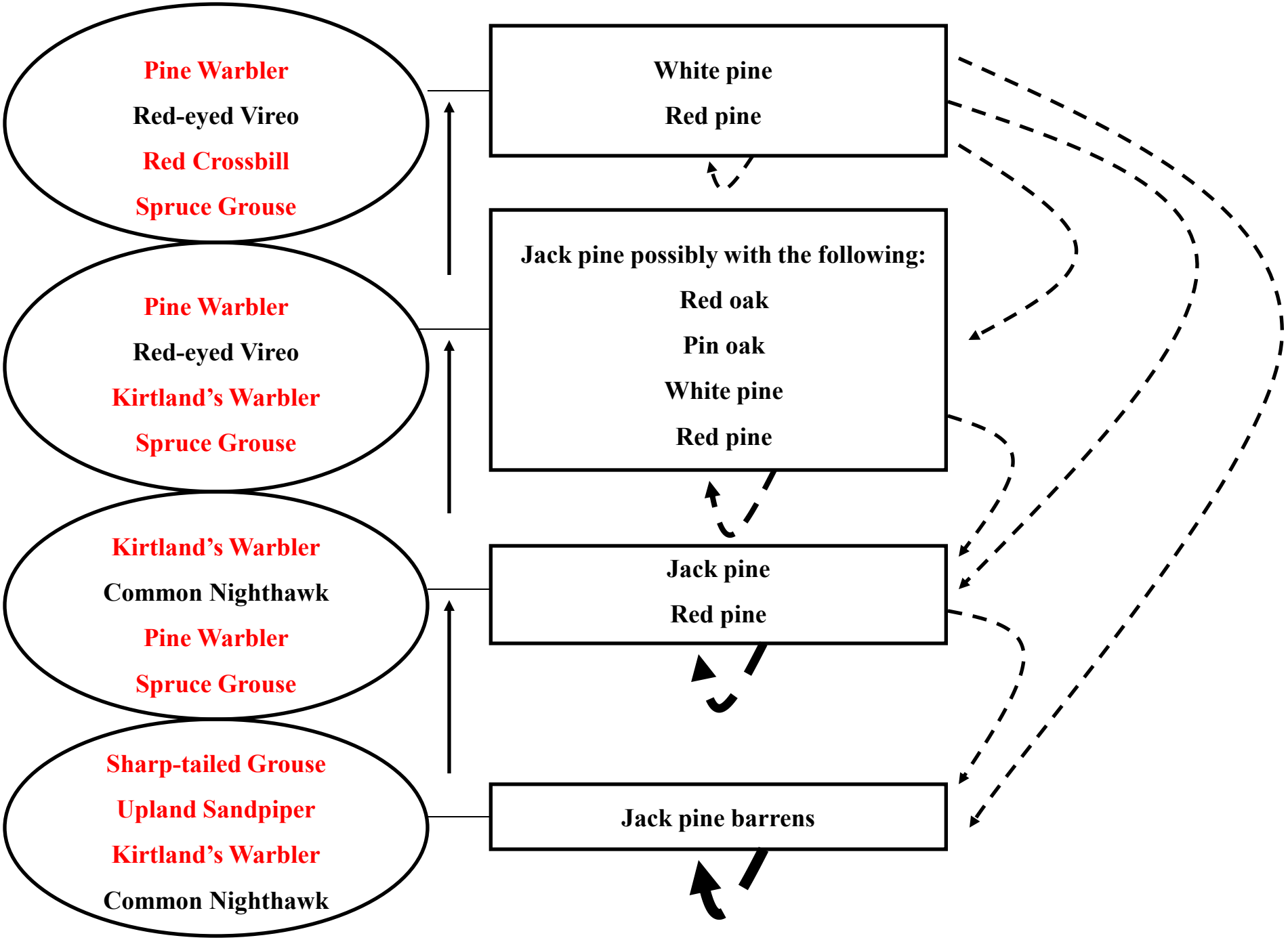
Diversity Metric	Mean (±1SD)		T	P-value[a]
	Reference	Altered		
Overall Species Richness	16.08 (2.86)	15.66 (2.65)	-0.56	0.58
Forest Species Richness	7.40 (2.48)	6.14 (2.28)	-1.93	0.06*
Generalist Species Richness	4.56 (1.16)	4.86 (1.73)	0.76	0.45
Forest-Generalist Richness	11.96 (2.84)	11.00 (2.51)	-1.31	0.20
Wetland Species Richness	4.12 (2.03)	4.66 (3.27)	0.73	0.47
Overall H’	1.16 (0.08)	1.15 (0.08)	-0.52	0.61
Forest H'	0.81 (0.19)	0.73 (0.18)	-1.63	0.11
Generalist H'	0.62 (0.13)	0.64 (0.17)	0.36	0.72
Forest-Generalist H'	1.03 (0.12)	1.00 (0.11)	-1.17	0.25
Wetland H'	0.53 (0.24)	0.53 (0.32)	-0.09	0.93
Habitat Class Forest-Generalist H'	0.43 (0.06)	0.40 (0.07)	-1.51	0.14
Nest Location Forest-Generalist H'	0.41 (0.08)	0.39 (0.07)	-0.87	0.39
Nest Type Forest-Generalist H'	0.32 (0.14)	0.39 (0.12)	2.07	0.04*
Forage Type Forest-Generalist H'	0.55 (0.08)	0.52 (0.10)	-1.42	0.16

Reference (PIF Score)	*p*-value	Altered (PIF Score)	*p*-value
Hairy Woodpecker (11)	0.07	American Robin (9)	0.03
Yellow Warbler (11)	0.01	Pileated Woodpecker (11)	0.06
American Redstart (12)	0.00	Song Sparrow (12)	0.07
White-throated Sparrow (12)	0.02	Ruffed Grouse (14)	0.06
Least Flycatcher (13)	0.02	None are considered fire-dependent! Fire-dependent species are found, but at too low an abundance for analysis: BBWO, SPGR, RECR, etc. Still little resolution on fire relationships.	
Nashville Warbler (13)	0.04		
Chestnut-sided Warbler (14)	0.00		
Veery (16)	0.02		

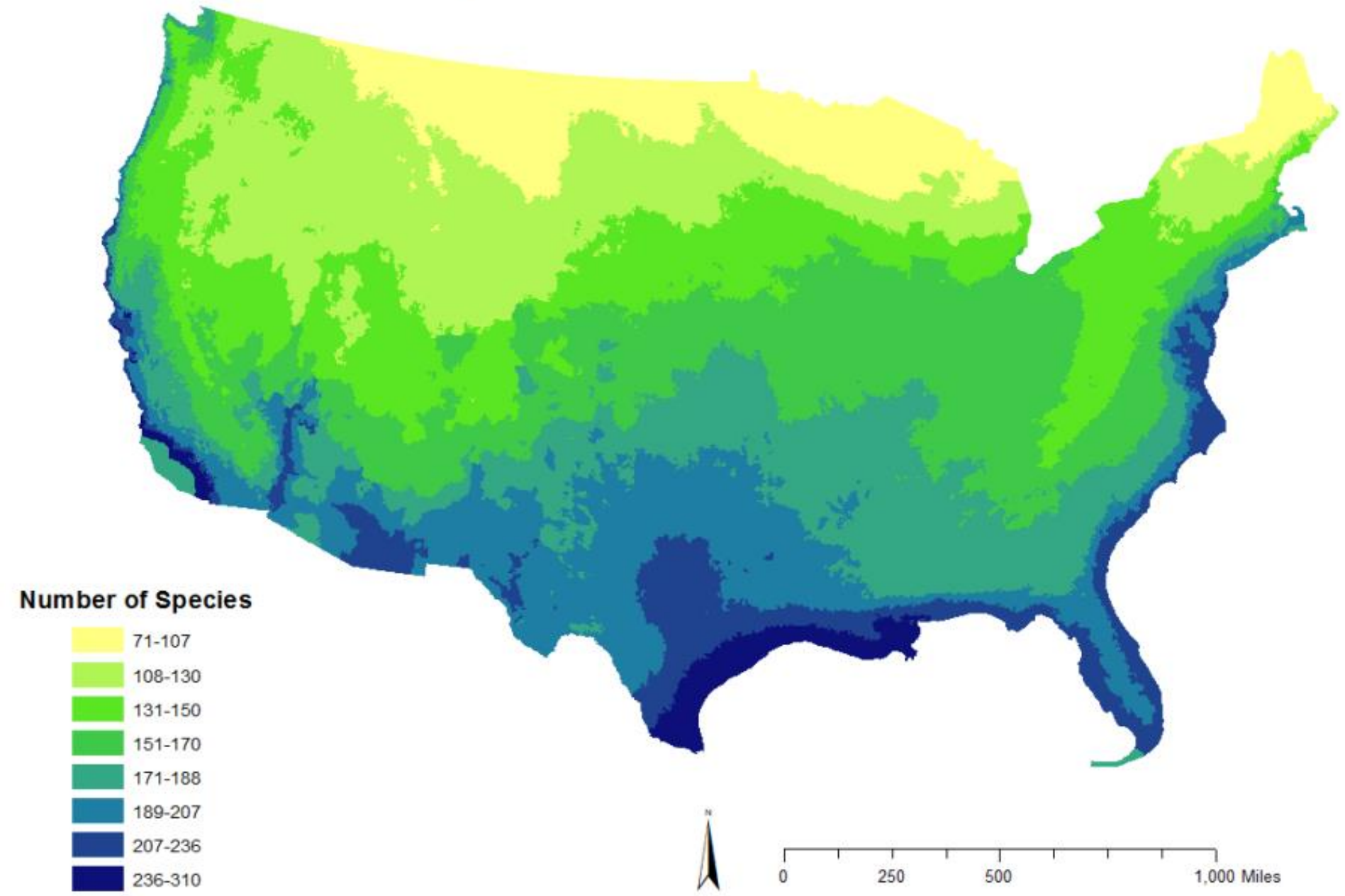
Corace et al. 2014. FEM.



Corace et al. 2014. FEM.


Pine Warbler
Red-eyed Vireo
Red Crossbill
Spruce Grouse
White pine
Red pine
Pine Warbler
Red-eyed Vireo
Kirtland's Warbler
Spruce Grouse
Jack pine possibly with the following:
Red oak
Pin oak
White pine
Red pine
Kirtland's Warbler
Common Nighthawk
Pine Warbler
Spruce Grouse
Jack pine
Red pine
Sharp-tailed Grouse
Upland Sandpiper
Kirtland's Warbler
Common Nighthawk
Jack pine barrens

Total Bird Species Richness in the United States



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Lindsey Shartell
(Minnesota DNR)

Dawn Marsh
(Seney NWR)

Next Webinar:

April 17, 2014 at 2:00 PM Eastern (1:00 PM Central)

Incorporating Principals of Natural Disturbance into Development and Evaluation of Forest Management Guides for the Boreal Forest Region of Ontario

Rob Rempel (Ontario Ministry of Natural Resources)