2015-2016 Webinar Series
March 17, 2016

Fire history, climate, and Ojibwe land use over the past 400 years in the Boundary Waters Canoe Area Wilderness of Northern Minnesota

Evan Larson, University of Wisconsin-Platteville
Kurt Kipfmueller, University of Minnesota
Lane Johnson, National Park Service

Audio will start at top of the hour.
This webinar is listen only – to ask questions please use the chat box in lower right of screen.

@LSFireScience

LakeStatesFireSci.net

NSF

UNIVERSITY OF WISCONSIN PLATTEVILLE

TREE-RING, EARTH, AND ENVIRONMENTAL SCIENCES LABORATORY

Center for Dendrochronology

UNIVERSITY OF MINNESOTA

Driven to Discover℠


Minnesota


Ontario
Minnesota


Border
Lakes
Region
Ontario
Minnesota


Border Lakes Region
Ontario
BWCAW
Minnesota


JIM BRANDENBURG
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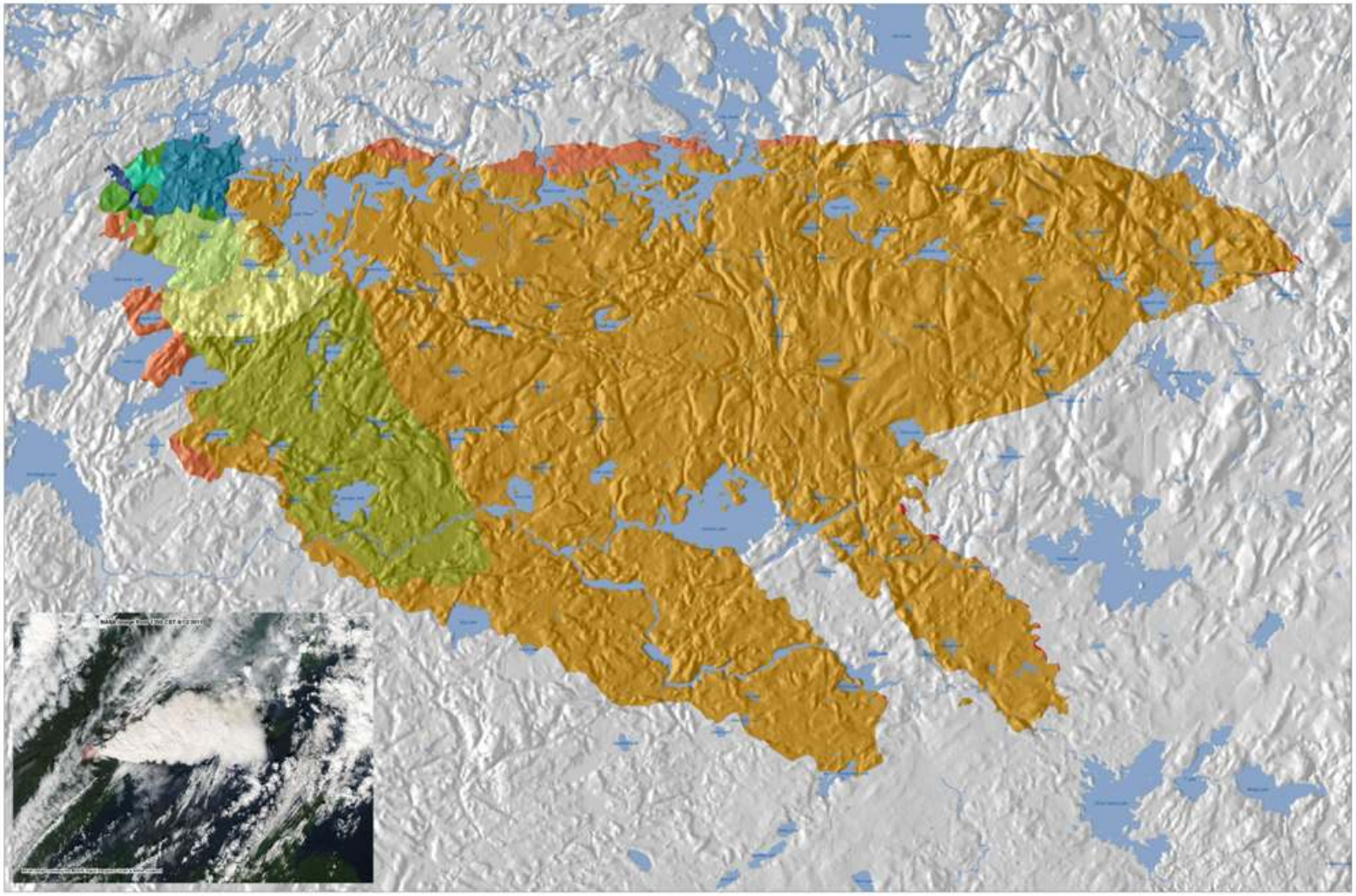
Ham Lake Fire, BWCAW,
May 2007
~30,300 ha (75,000 acres)
Photo credit: Star Tribune


Pagami Creek Fire, BWCAW,
September 2011
~37,600 ha (93,000 acres)
Photo credit: Greg Lindberg via MPRnews.org



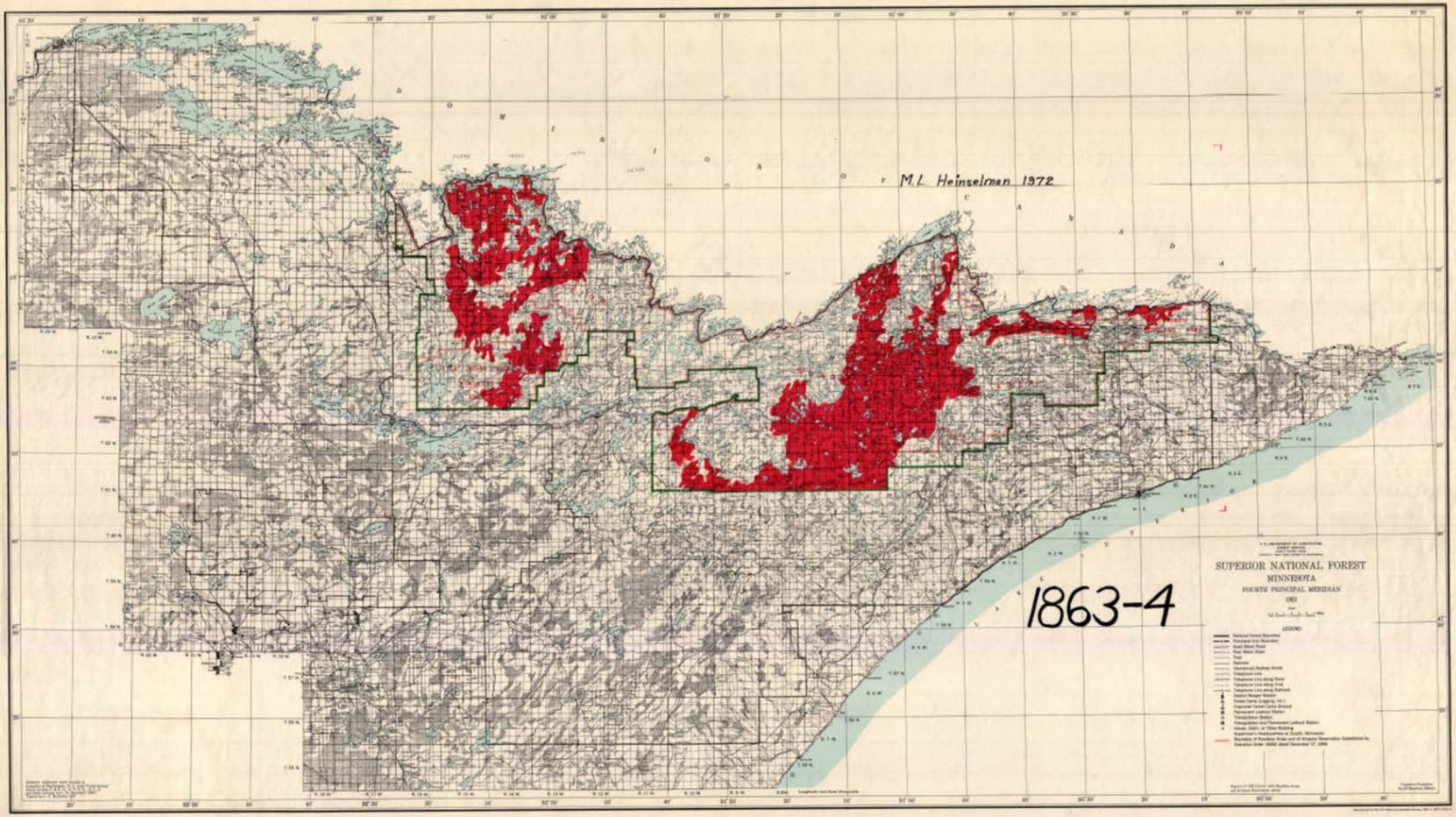
Pagami Creek
MN-SUF-110159
Fire Progression
9/26/2011 0800
Nad83 UTMz15

20110831 20110906 20110909 20110911 20110913
20110905 20110907 20110910 20110912 20110916

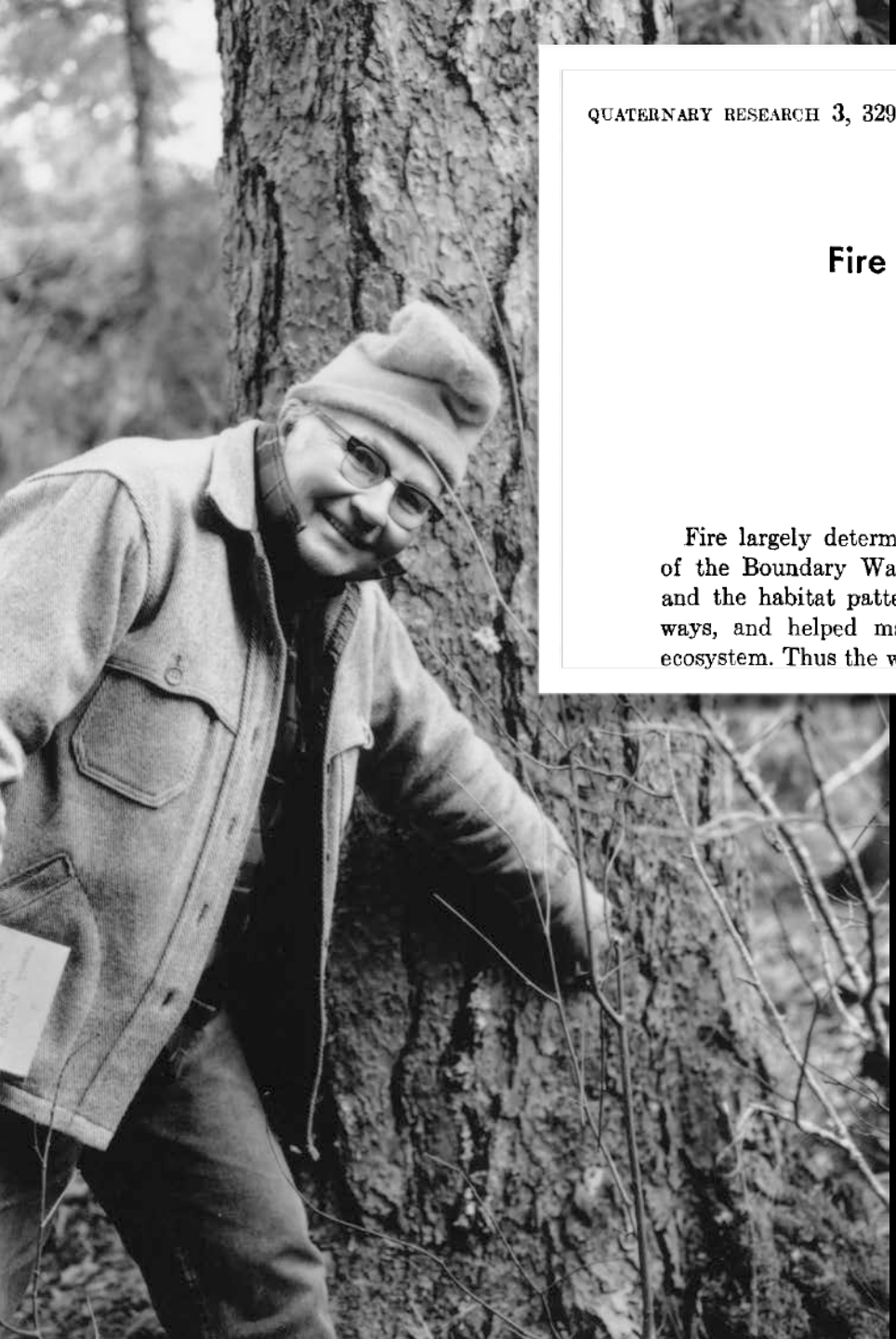
0 0.5 1 2 Miles

Northern Rockies National Incident Management Team

Fire Perimeter as of 9/25/2011


M.L. Heinselman 1972
1863-4
SUPERIOR NATIONAL FOREST
MINNESOTA
FOURTH PRINCIPAL MERIDIAN
1961
LEGEND

Miron “Bud” Heinselman
1920–1993



QUATERNARY RESEARCH 3, 329–382 (1973)

Fire in the Virgin Forests of the Boundary Waters Canoe Area, Minnesota

MIRON L. HEINSELMAN[1]

Received July 11, 1973

Fire largely determined the composition and structure of the presettlement vegetation of the Boundary Waters Canoe Area as well as the vegetation mosaic on the landscape and the habitat patterns for wildlife. It also influenced nutrient cycles, and energy pathways, and helped maintain the diversity, productivity, and long-term stability of the ecosystem. Thus the whole ecosystem was fire-dependent.

Miron “Bud” Heinselman
1920–1993

Virginia Forest Dist
Counts
March 7, 1973
(ea. Dot. 16 acres)

Interior Zone

1967 - 8
1894 - 100
1864 - 484
1803 - 11
1784 - 27
1755-9 = 54
1739 - 5
1755-9 / 1864 - 10
1681 - 3
1681 / 1864 - 5
1681 / 1784 - 7
1681 / 1755-9 - 72
1692 / 1864 - 2
1681 / 1894 - 2
1766 / 1864 - 1
1739 / 1803 / 1864 / 1894 - 6
1681 / 1796 - 4

Sec. 21
Fire
June 2 to 22
1987

entire
island
burned - heavy understory
with
burn
50-60% kill of
overstory

Book 1

1

YEAR OF ORIGIN
RECORDS &
and related Stand
- History Data
BWCA
ECOLOGY
M. L. Hemmelman

Book 1

7530-222-3521
FEDERAL SUPPLY SERVICE
(GPO)

MLH, CJB
6-1-66

Angleworm L.O. Tower Pine Stands

Site 15

Location: Mixed white pine - red pine stand on high granite cliff above W. Shore of Angleworm L. - containing a very few old remnant Jack Pine, Stand aged was open and surrounded the Angleworm Tower. This whole ridge seems to bear pine of this age class. The stands are open, with an understory of Calliergonella Schreberi, Vacc. angustifolium, lichens, and bare rock. Some balsam and spruce also.

Age Class Data:

Tree No.	Species	DBH	Rings	Ht. Boring	Add Yr.	Tot Age
1.	J.P.	19"	134	12"	3	137 yr.
2.	R.P.	14"	135	10"	4	139 yr.
3.	W.P.	(unable to reach heart with (12" incr. borer)				

(Probably 1822 Fire - MLH 1-9-69)

There are a few old fire snags still standing in this area witnessing the fire (which probably burned about 1826?) (1-9-69 - Prob should be 1822 - same age as Hegman L, Ed Shore L, Hook L, Echo Trail stands see H 522!)

1965
140
1825 may really be 1822!

6-1-66
MLH

Comments on Forest Surrounding Angleworm Lake:

This area bears a complex mosaic of pine, spruce-fir, birch, considerable red maple (up to 10" dbh!) and aspen (both quaking and bigtooth). The spruce budworm has recently (1958-62) killed most of the balsam and severely set back many white spruce. Some balsam saplings and seedlings escaped - especially where balsam was a minor stand component.

The undervegetation beneath budworm-ravaged spruce - fir - birch stands consists of Corylus cornuta, Alnus rugosa, Acer spicatum, Maianthemum, Aster macrophyllus, Calliergonella Schreberi, Lycopodium (lucidulum?), Cornus canadensis.

Just W. of the 2 small islands in Angleworm L. is an older pine stand - white and Red pine. The largest W. Pine meas. was 39" dbh! Budworm-killed balsam understory beneath all of this area. (see notes)

“We need to understand more thoroughly the **relative roles of lightning and man as fire factors** in the primeval system. The key question is **whether lightning alone is an adequate source of ignition** to account for the observed extent of burning in given ecosystems.”

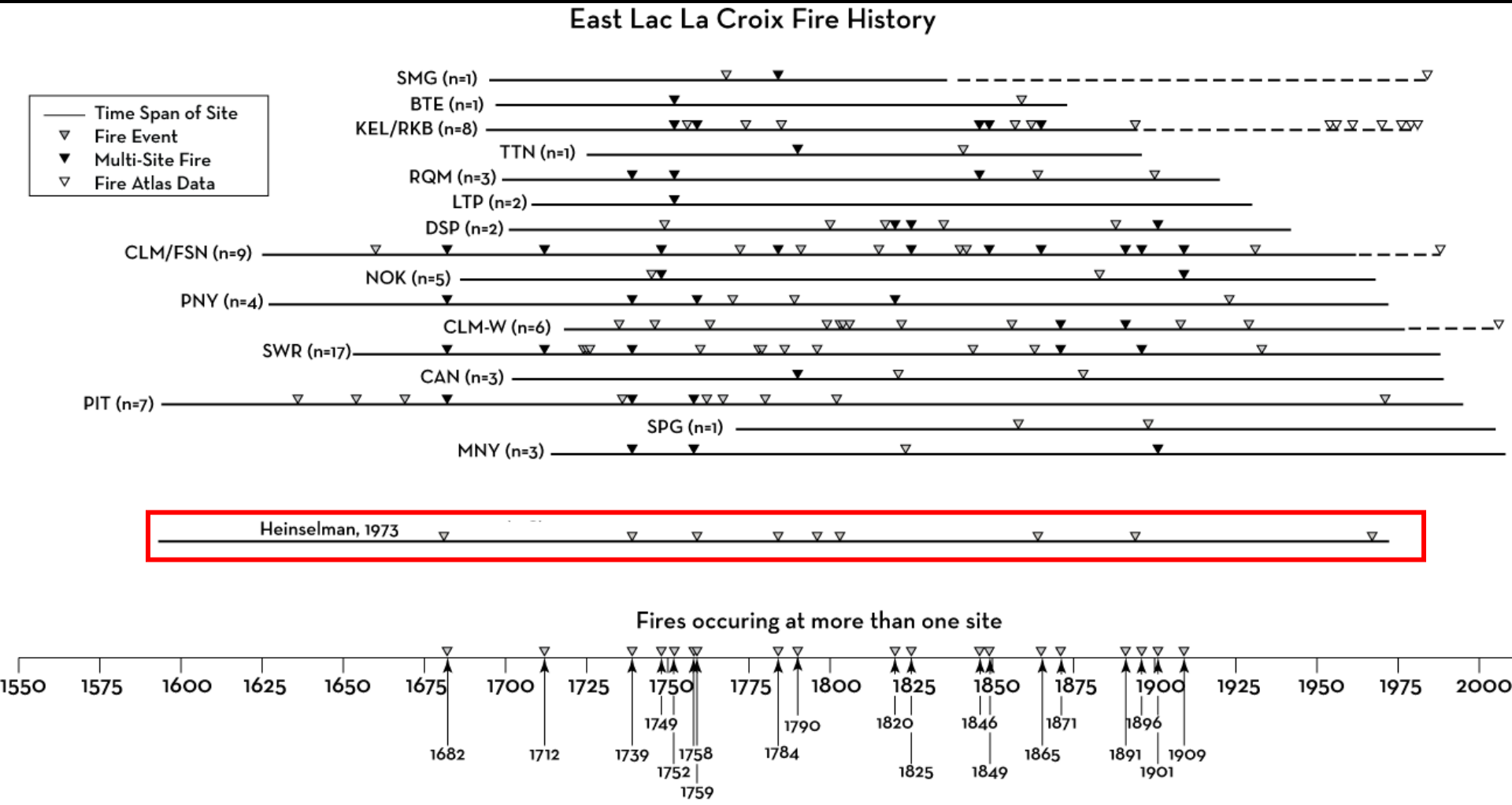
–Wright and Heinselman, 1973


UofM

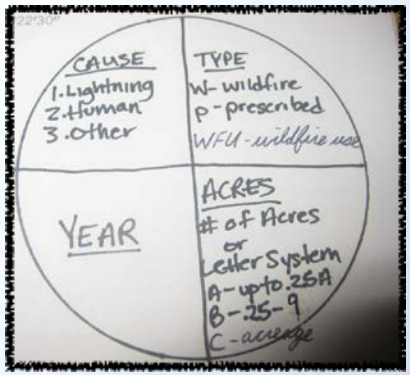
1864
1894
1864
1755-9
1864
ONTARIO
MINNESOTA
1894
1967
1864
1803
1894
1681/1796
1755-9
1681/1894
S U P E R I O R
1755-9/1864
Narrows
1681
1784
1681/1784
N A T I O N A L F O R E S T
1894
1864
1784
1784
Kelsey Lake
1864
1864
1755-9/1784
1784
Tor Lake
1784
1681/1739/1796
1864
Lady Boot Bay
1784
1864
1681/1755-9
1864
1755-9
1864
1681/1755-9
L A C C R O I X

1894
1864
1864
1864
1803
1864
1864
1755-9
1784
1681
1784
1864
1894
1967

1894
1864
1864
1803
1759
1796
1784
1894
1967
1987
1924



Johnson, L. B., and K. F. Kipfmueller. In press. A fire history derived from *Pinus resinosa* Ait. for the islands of eastern Lac La Croix, Minnesota, USA. *Ecological Application*.


CAUSE
1. Lightning
2. Human
3. Other
TYPE
W - wildfire
P - prescribed
WFU - wildfire use
YEAR
ACRES
# of Acres
or
Letter System
A - up to .25A
B - .25 - 9
C - acreage

COLEMAN ISLAND 116 ACRES
MC
Campsite
Fish Stake Narrows
7
8
MC
Campsite
8
Campsite
589
479
587
18
17
Kelsey Lake
1202
16
Campsite
590
591
480
E S T
W I L D E R N E S S
Toe Lake
MC

1. Fire History

Build a crossdated fire history and compare to Heinselman dates

1. Fire History

Build a crossdated fire history and compare to Heinselman dates

2. Fire-Climate

Identify influence of interannual climate on past fire activity

1. Fire History

Build a crossdated fire history and compare to Heinselman dates

2. Fire-Climate

Identify influence of interannual climate on past fire activity

3. Age Structure

Determine effects of fire regimes on forest age structure

1. Fire History

Build a crossdated fire history and compare to Heinselman dates

2. Fire-Climate

Identify influence of interannual climate on past fire activity

3. Age Structure

Determine effects of fire regimes on forest age structure

4. People

What influence, if any, did people have on the fire regimes of the BWCAW?

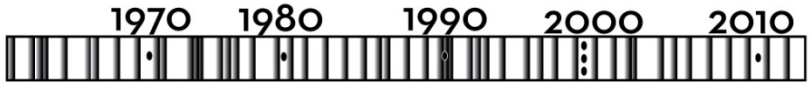

We-no-nah

A
B
C

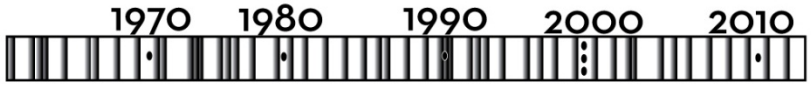
N-tree sampling


We-no-nah

Living Tree
Known Sampling Date

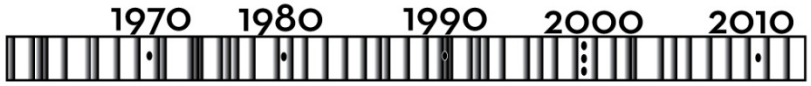


Living Tree
Known Sampling Date



Recently Dead Tree
Unknown Death Date

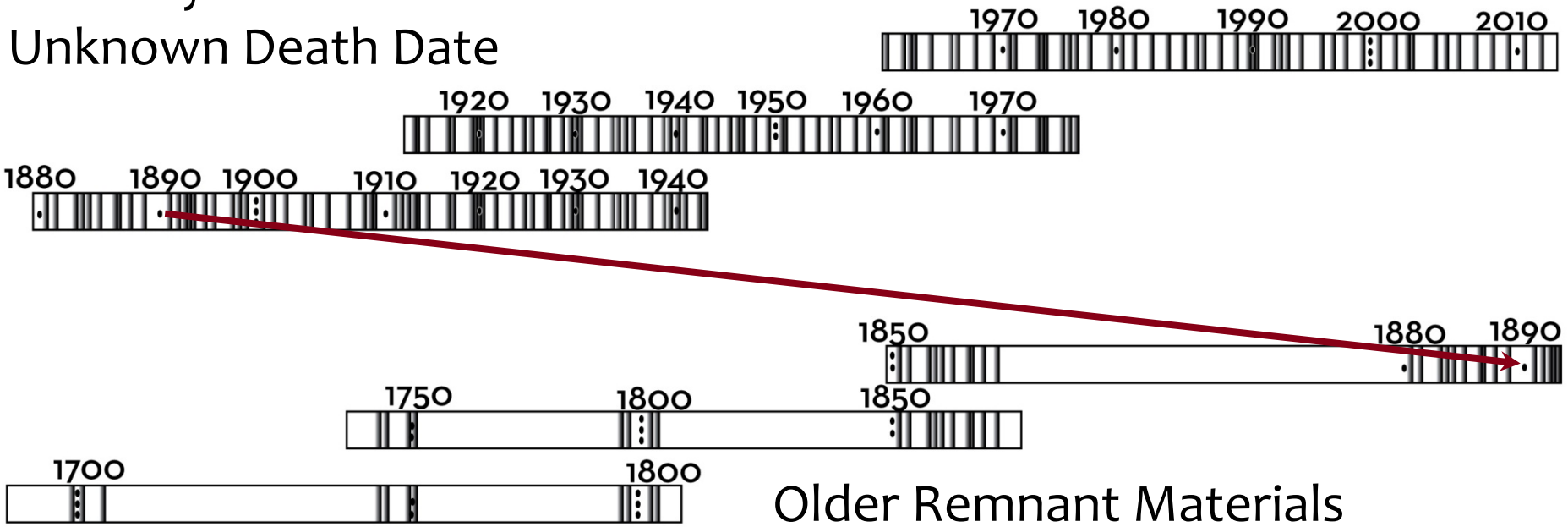
Living Tree
Known Sampling Date



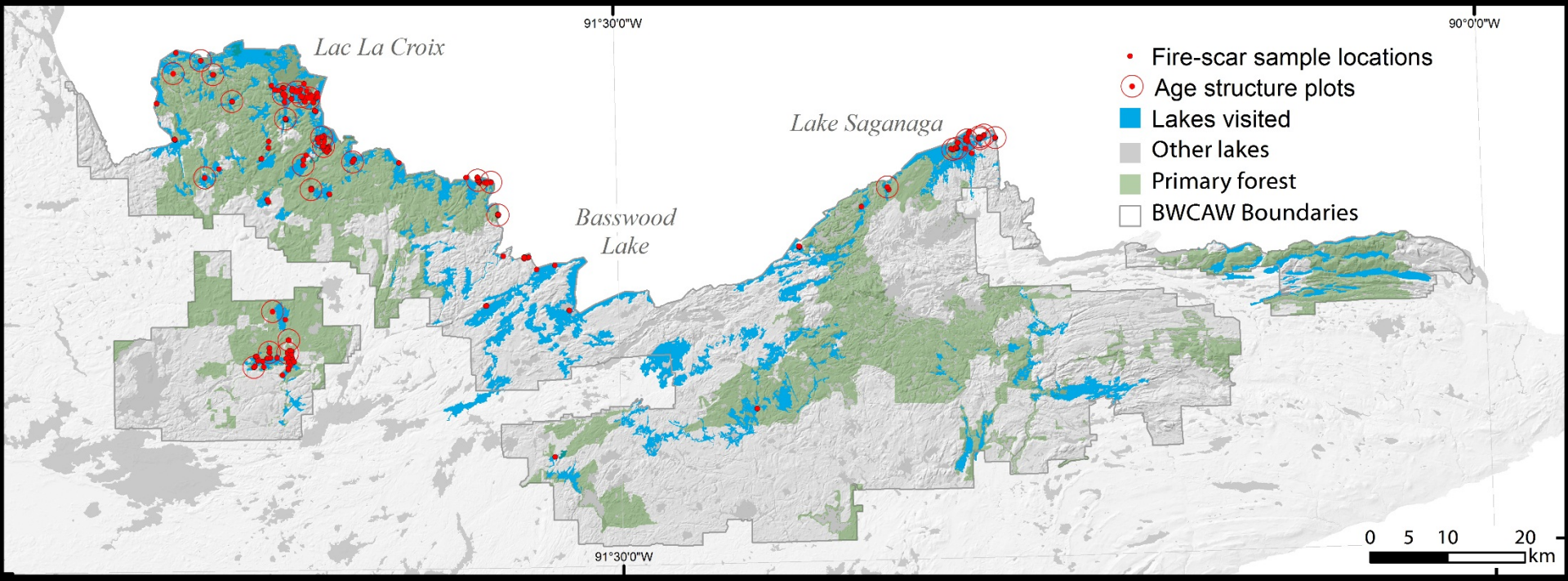
Recently Dead Tree
Unknown Death Date

Living Tree
Known Sampling Date

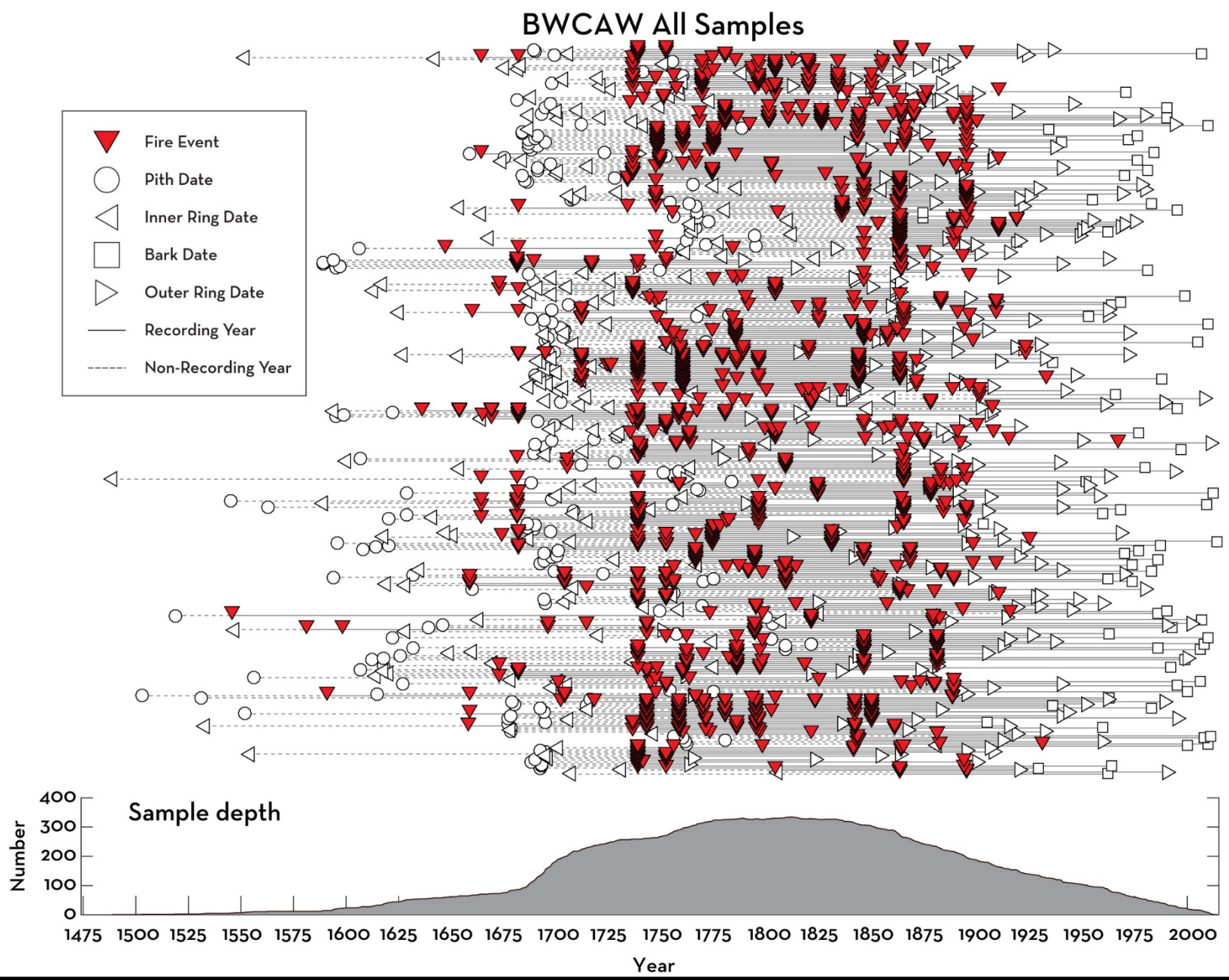
Recently Dead Tree
Unknown Death Date



Older Remnant Materials


91°30'0"W
90°0'0"W
Lac La Croix
Basswood Lake
Lake Saganaga
Fire-scar sample locations
Age structure plots
Lakes visited
Other lakes
Primary forest
BWCAW Boundaries
0 5 10 20
km

1. Fire history


BWCAW All Samples
Fire Event
Pith Date
Inner Ring Date
Bark Date
Outer Ring Date
Recording Year
Non-Recording Year
Sample depth
Number
400
300
200
100
0
1475
1500
1525
1550
1575
1600
1625
1650
1675
1700
1725
1750
1775
1800
1825
1850
1875
1900
1925
1950
1975
2000
Year

By sample

Aggregating fire histories to larger spatial scales can serve to uncover potential causal mechanisms

Aggregation of Samples

Aggregating fire histories to larger spatial scales can serve to uncover potential causal mechanisms

Aggregation of Samples

Individual Samples

n = 362

e.g., Spatial arrangement of fuels

Aggregating fire histories to larger spatial scales can serve to uncover potential causal mechanisms

Aggregation of Samples

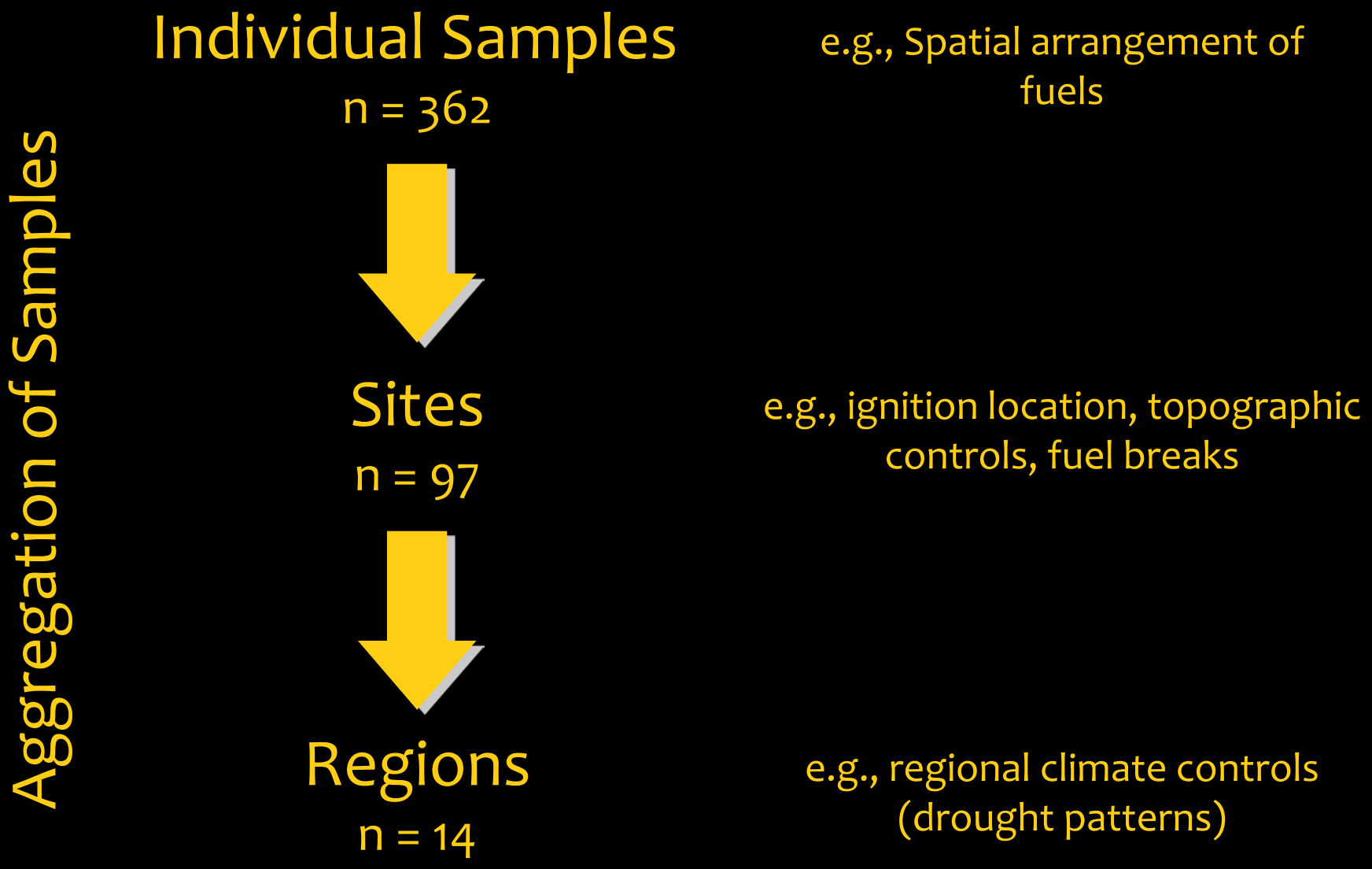
Individual Samples
n = 362

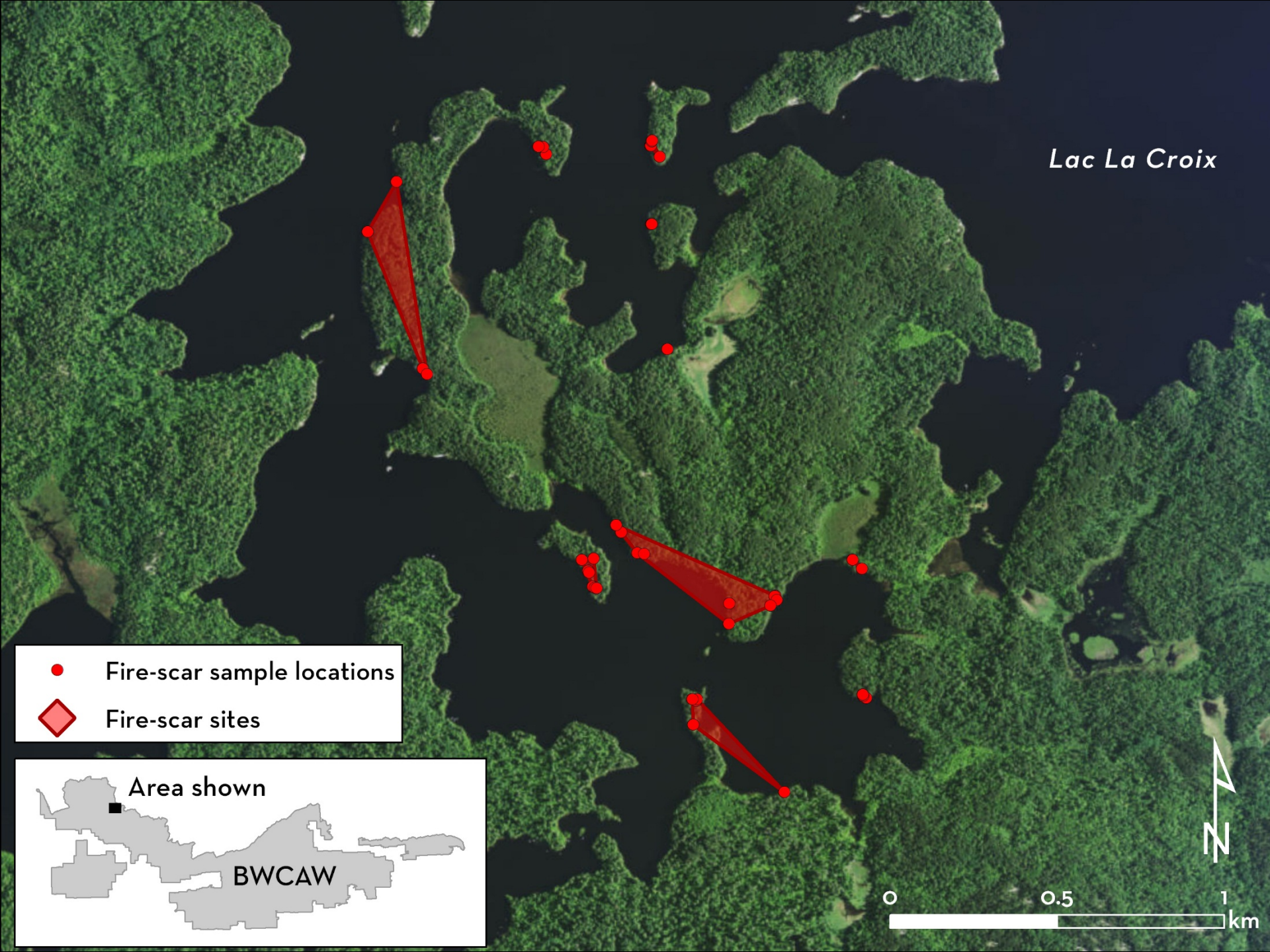
e.g., Spatial arrangement of fuels

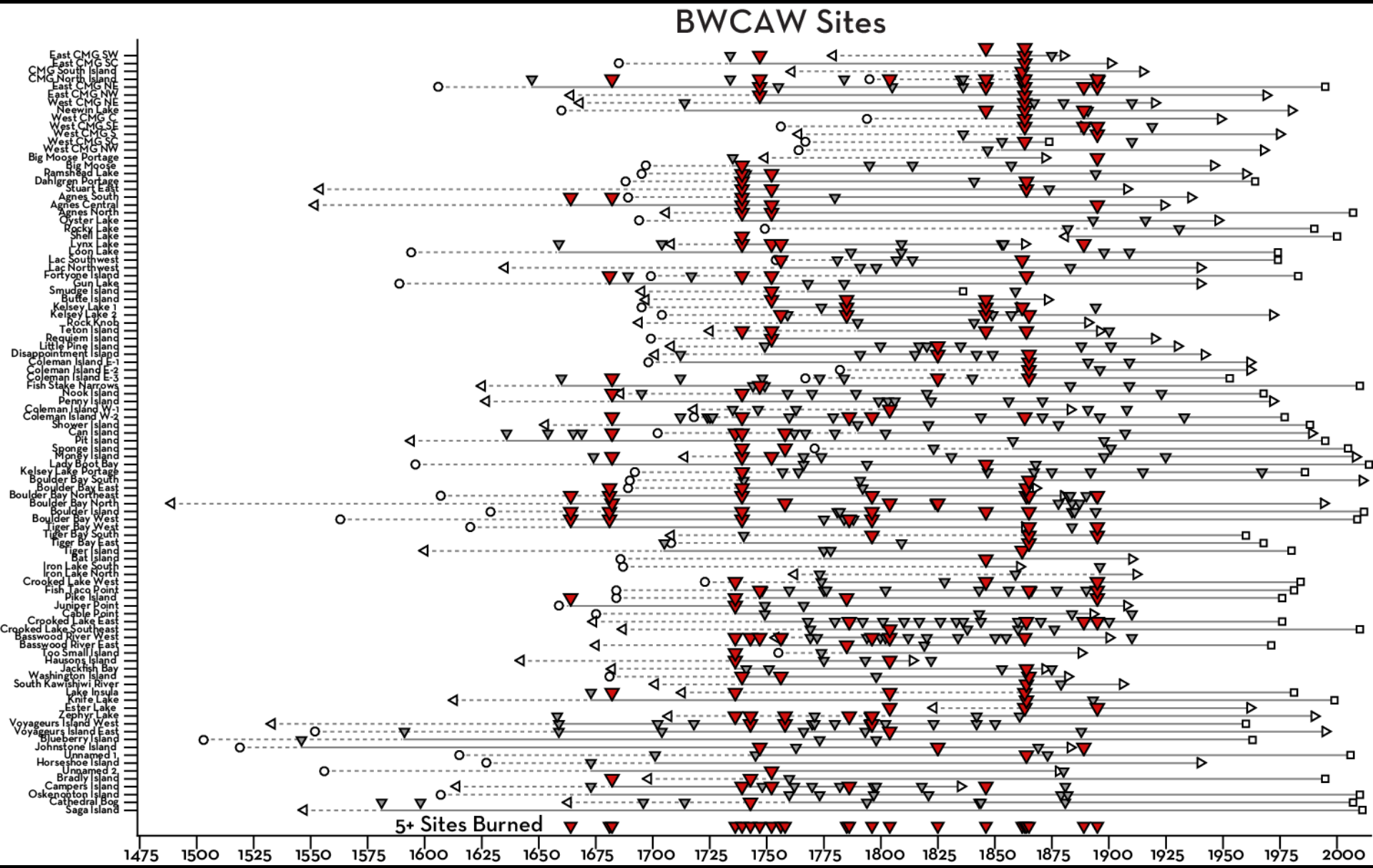
Sites
n = 97

e.g., ignition location, topographic controls, fuel breaks

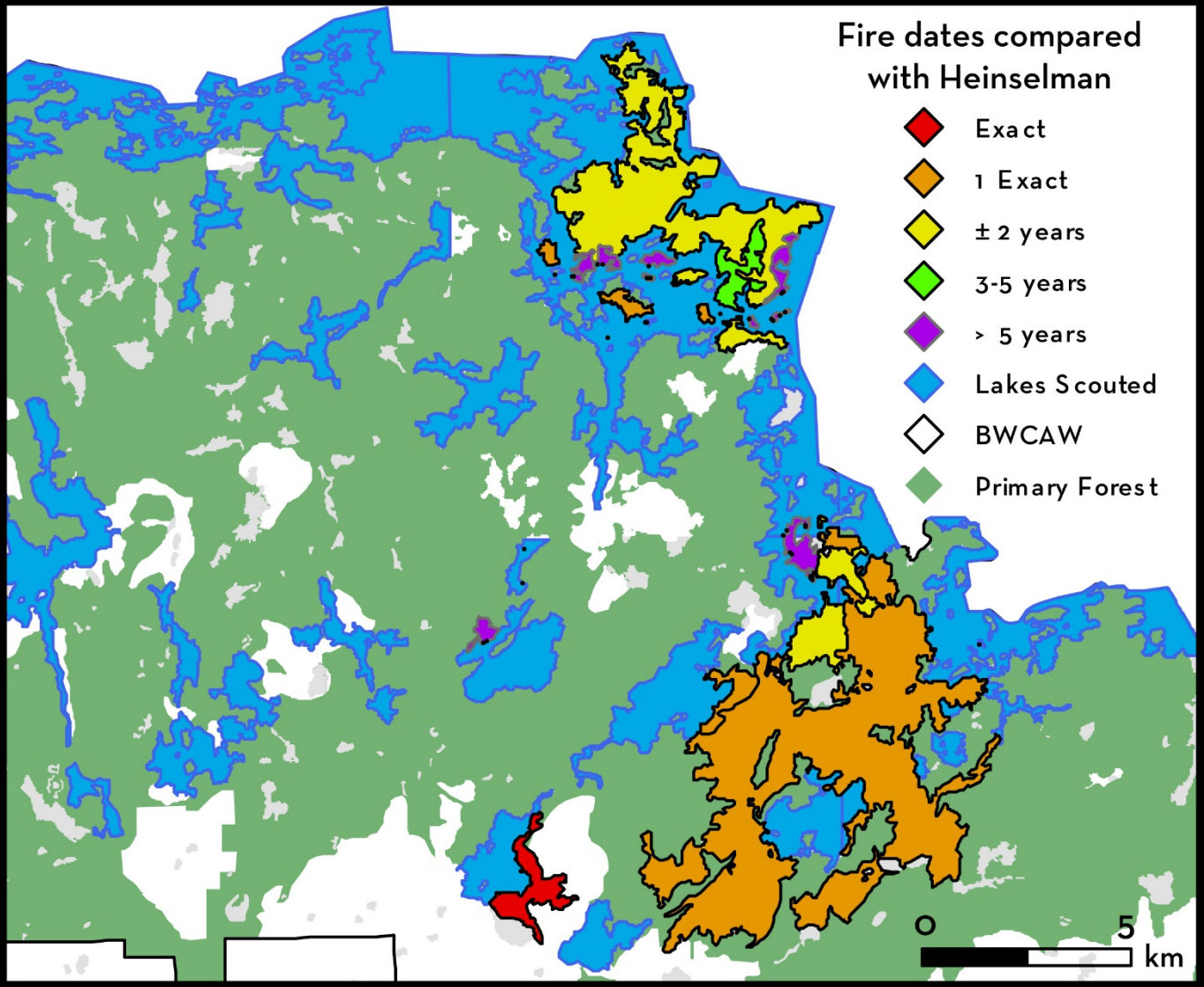
Aggregating fire histories to larger spatial scales can serve to uncover potential causal mechanisms

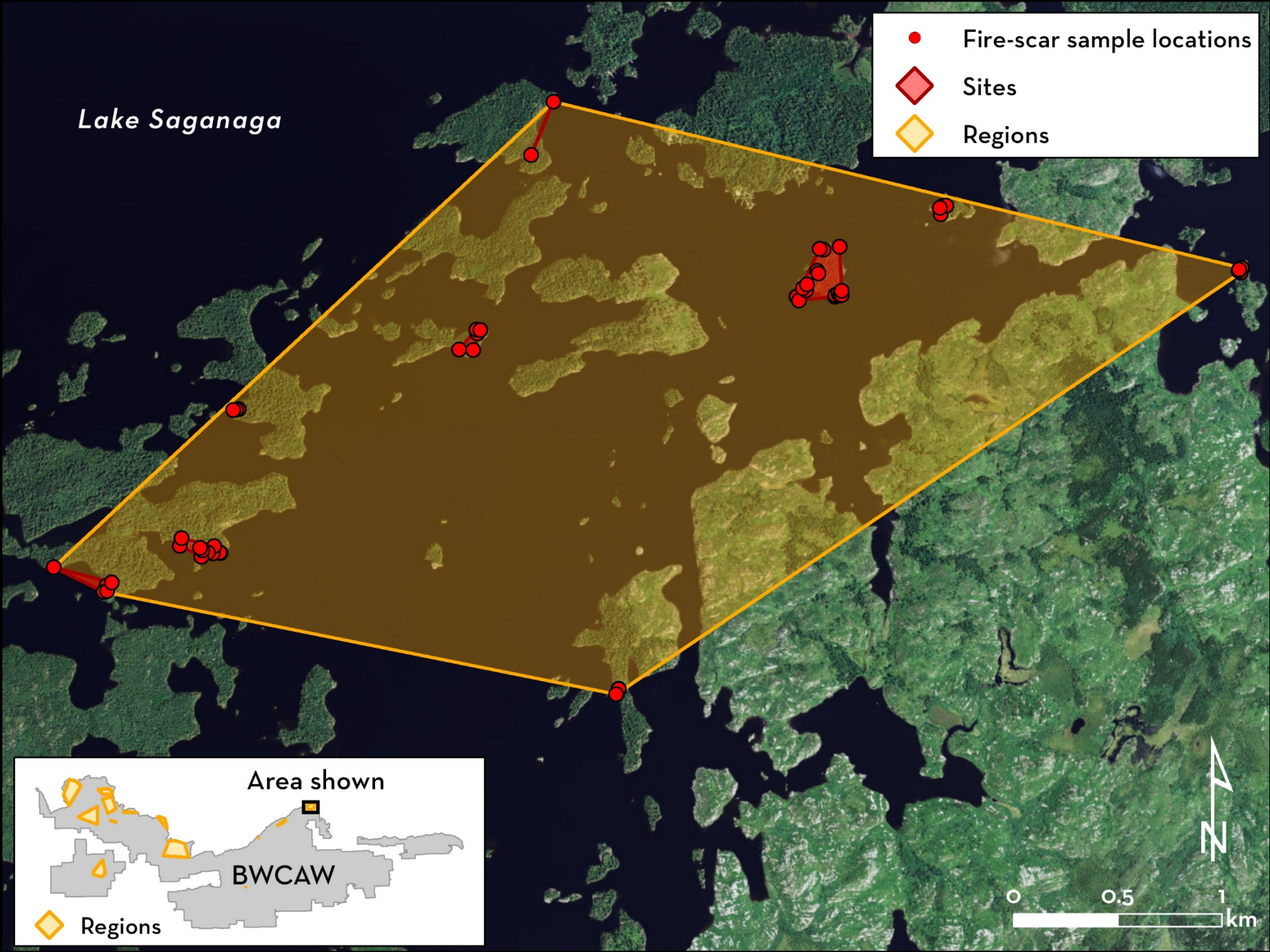


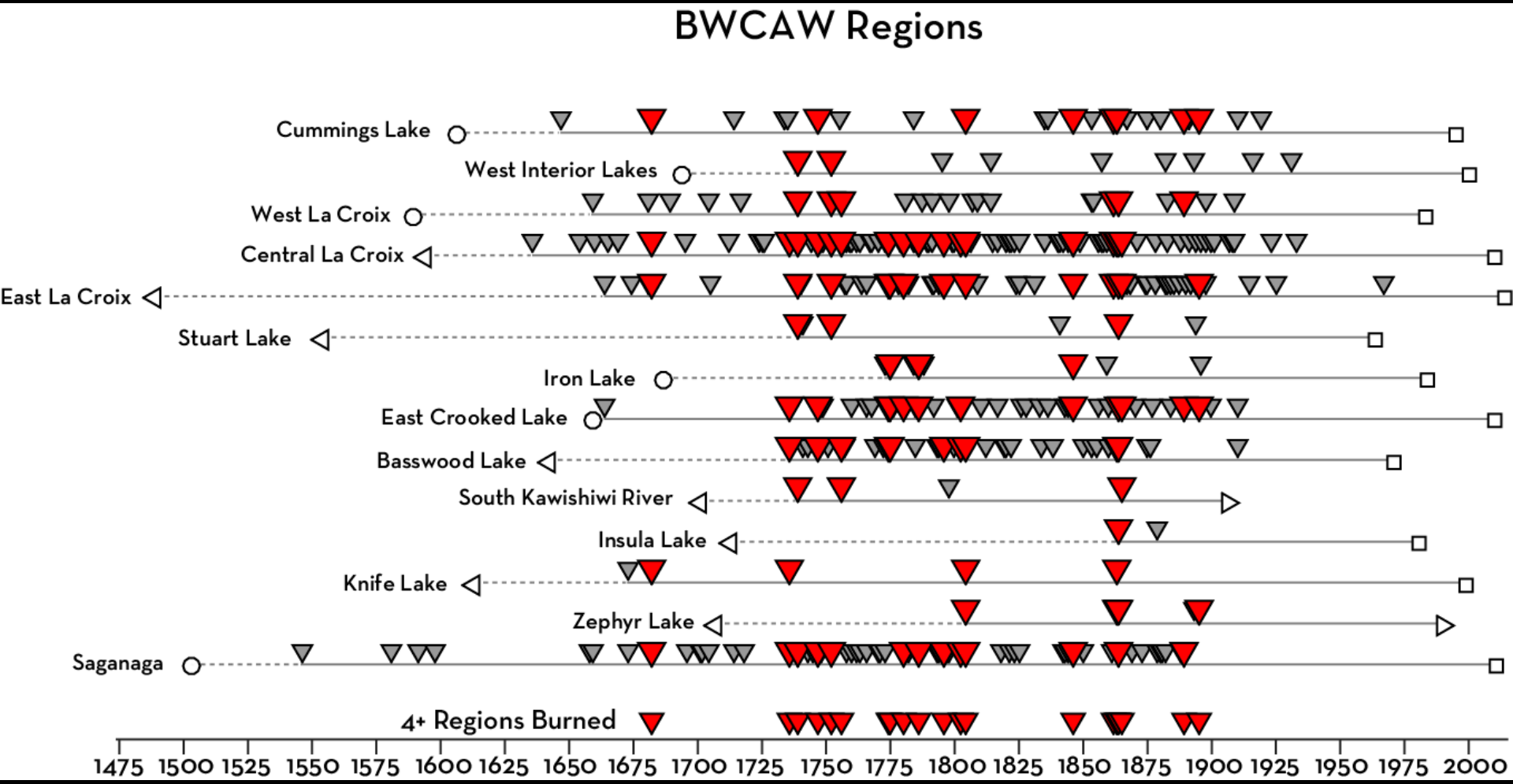

Lac La Croix
Fire-scar sample locations
Fire-scar sites
Area shown
BWCAW
N
0
0.5
1
km


BWCAW Sites
East CMG SW
East CMG SC
CMG South Island
CMG North Island
East CMG NE
East CMG NW
West CMG NE
Neewin Lake
West CMG C
West CMG SE
West CMG S
West CMG SW
West CMG NW
Big Moose Portage
Big Moose
Ramshead Lake
Dahlgren Portage
Stuart East
Agnes South
Agnes Central
Agnes North
Oyster Lake
Rocky Lake
Shell Lake
Lynx Lake
Loon Lake
Lac Southwest
Lac Northwest
Fortyone Island
Gun Lake
Smudge Island
Butte Island
Kelsey Lake 1
Kelsey Lake 2
Rock Knob
Teton Island
Requiem Island
Little Pine Island
Disappointment Island
Coleman Island E-1
Coleman Island E-2
Coleman Island E-3
Fish Stake Narrows
Nook Island
Penny Island
Coleman Island W-1
Coleman Island W-2
Shower Island
Can Island
Pit Island
Sponge Island
Honey Island
Lady Boot Bay
Kelsey Lake Portage
Boulder Bay South
Boulder Bay East
Boulder Bay Northeast
Boulder Bay North
Boulder Island
Boulder Bay West
Tiger Bay West
Tiger Bay South
Tiger Bay East
Tiger Island
Bat Island
Iron Lake South
Iron Lake North
Crooked Lake West
Fish Hacq Point
Pike Island
Juniper Point
Cable Point
Crooked Lake East
Crooked Lake Southeast
Basswood River West
Basswood River East
Too Small Island
Hausons Island
Jackfish Bay
Washington Island
South Kawishiwi River
Lake Insula
Knife Lake
Ester Lake
Zephyr Lake
Voyageurs Island West
Voyageurs Island East
Blueberry Island
Johnstone Island
Unnamed 1
Horseshoe Island
Unnamed 2
Bradly Island
Campers Island
Oskenonton Island
Cathedral Bog
Saga Island
5+ Sites Burned
1475
1500
1525
1550
1575
1600
1625
1650
1675
1700
1725
1750
1775
1800
1825
1850
1875
1900
1925
1950
1975
2000

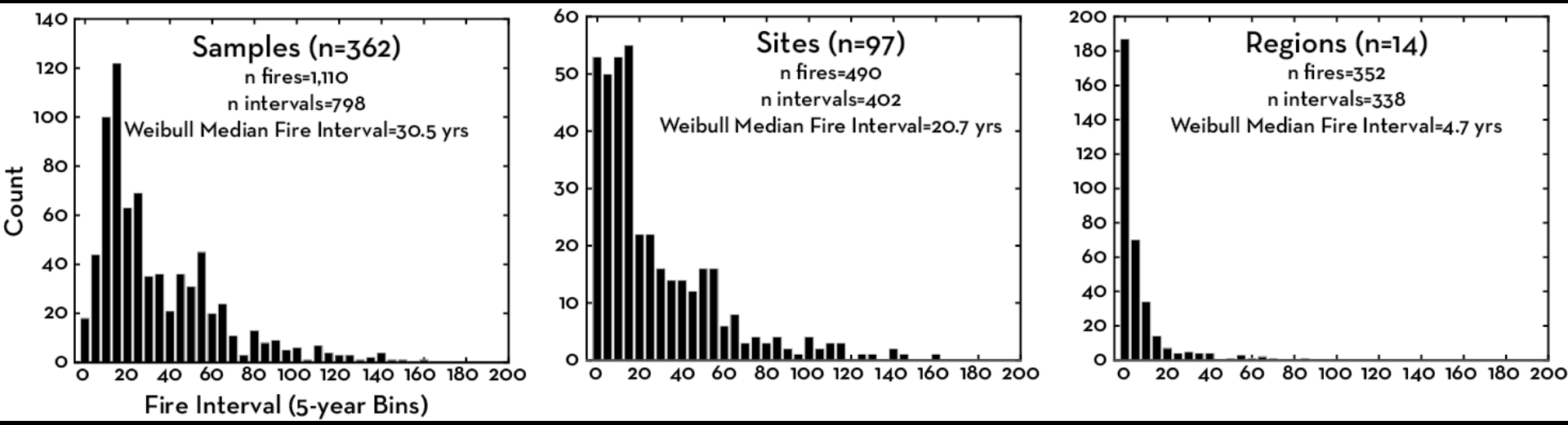
By *site*


Fire dates compared with Heinselman
Exact
1 Exact
± 2 years
3-5 years
> 5 years
Lakes Scouted
BWCAW
Primary Forest
0
5
km

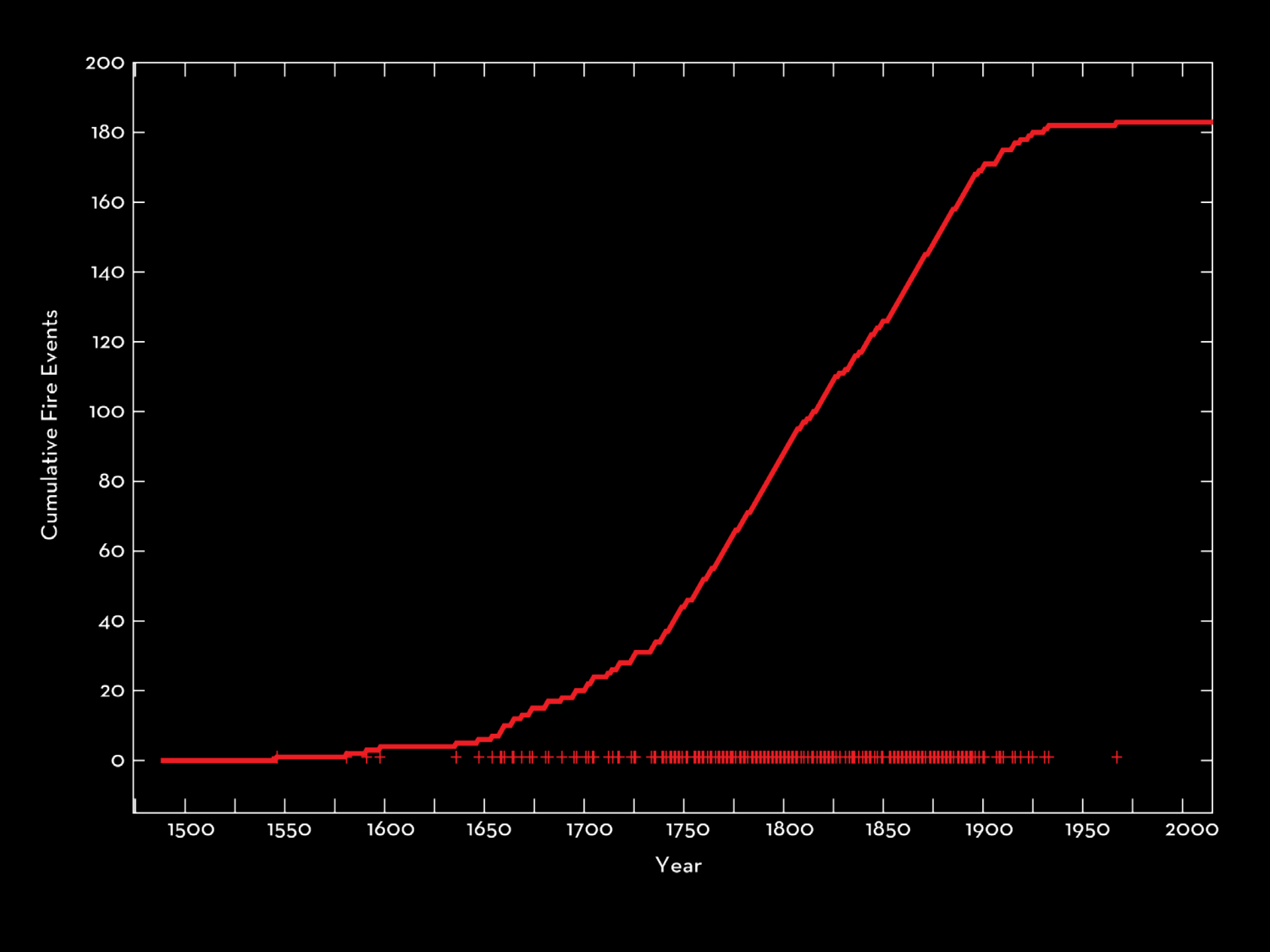

Lake Saganaga
Fire-scar sample locations
Sites
Regions
Area shown
BWCAW
Regions
N
0
0.5
1
km


BWCAW Regions
Cummings Lake
West Interior Lakes
West La Croix
Central La Croix
East La Croix
Stuart Lake
Iron Lake
East Crooked Lake
Basswood Lake
South Kawishiwi River
Insula Lake
Knife Lake
Zephyr Lake
Saganaga
4+ Regions Burned
1475 1500 1525 1550 1575 1600 1625 1650 1675 1700 1725 1750 1775 1800 1825 1850 1875 1900 1925 1950 1975 2000

By region



Fire Interval Distributions at Multiple Spatial Scales


Cumulative Fire Events
200
180
160
140
120
100
80
60
40
20
0
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
Year

1. Fire history conclusions

1. Fire history conclusions

- Fire-scarred material is out there

1. Fire history conclusions

- Fire-scarred material is out there
- Frequent fires, particularly from 1700–1900

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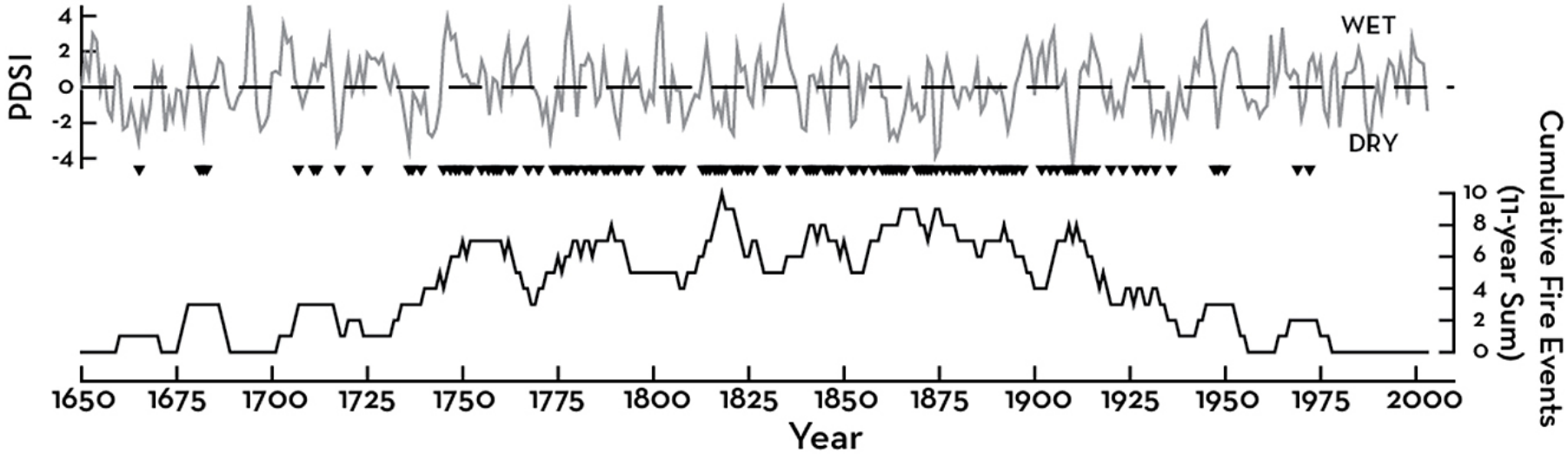
- Frequent fires, particularly from 1700–1900
- Improved precision and accuracy compared to Heinselman dates

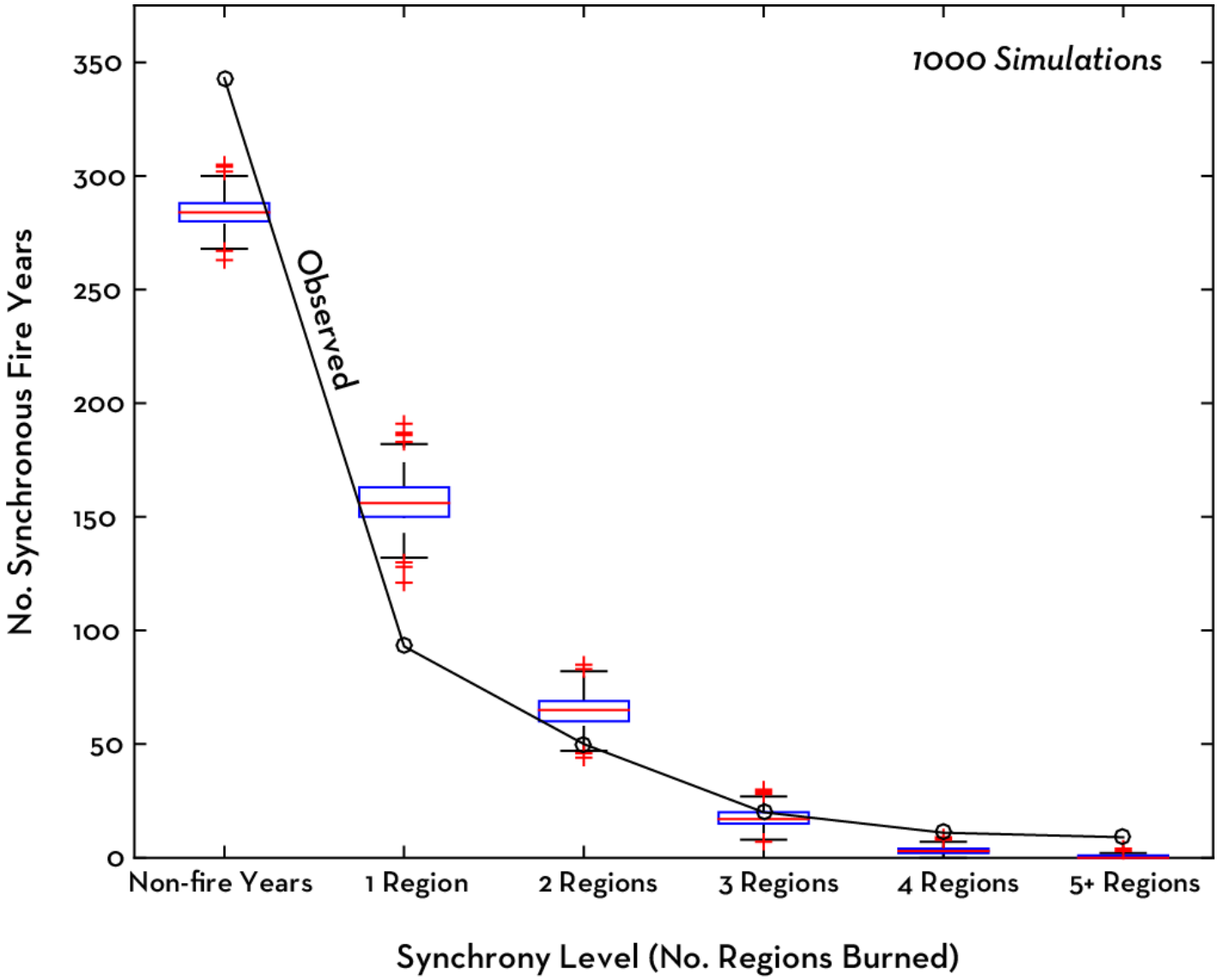
1. Fire history conclusions

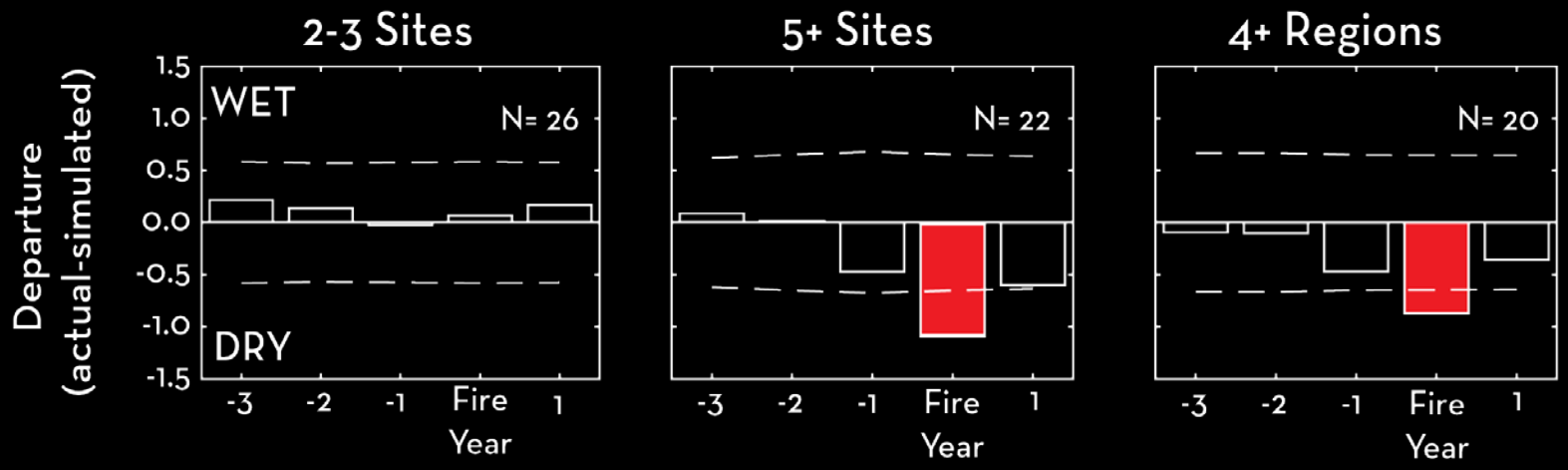
- Fire-scarred material is out there
- Frequent fires, particularly from 1700–1900
- Improved precision and accuracy compared to Heinselman dates
- A more complete and nuanced fire history for red pine stands of the BWCAW

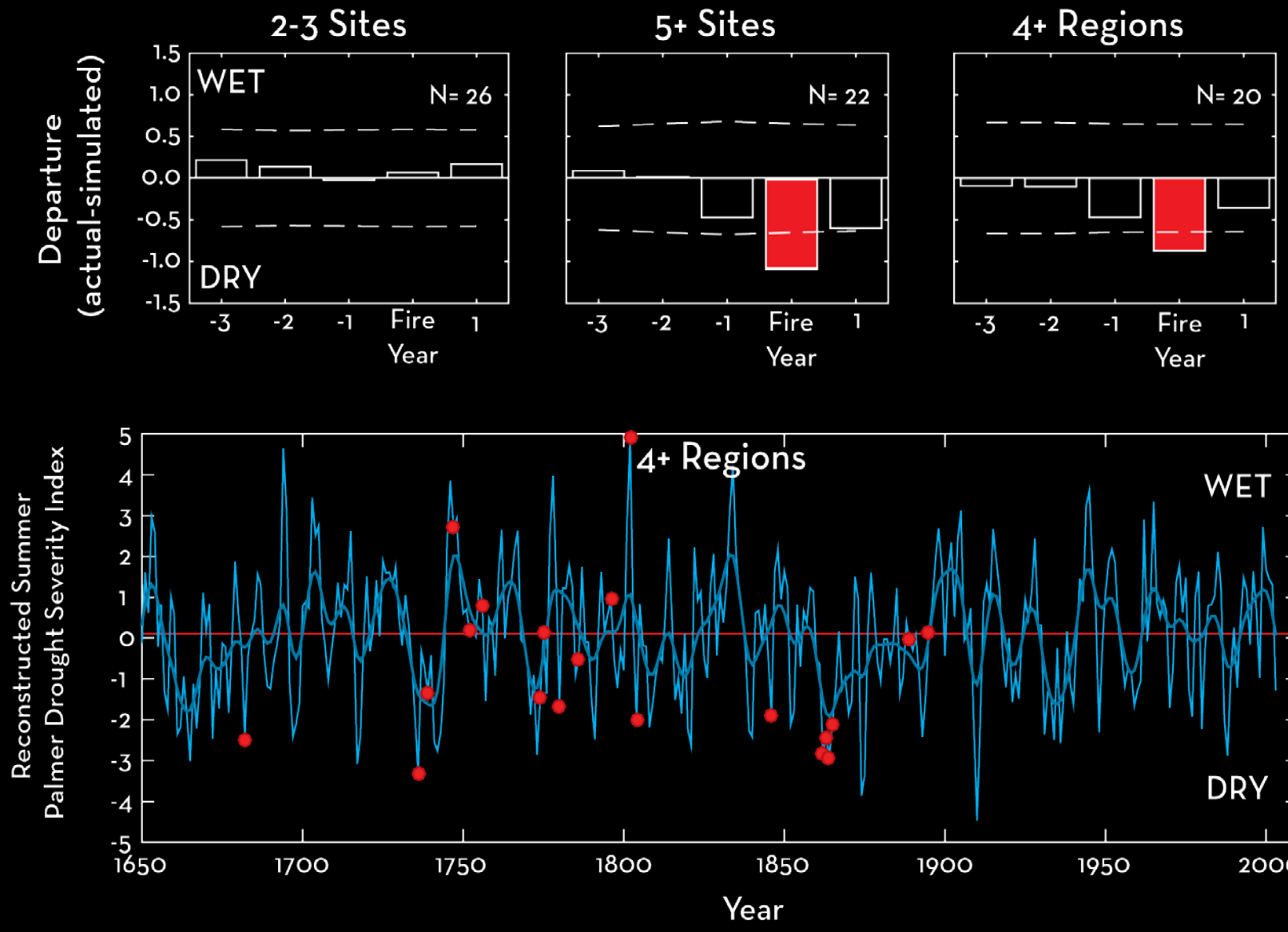
2. Fire-climate


PDSI
4
2
0
-2
-4
WET
DRY
Cumulative Fire Events
(11-year Sum)
10
8
6
4
2
0
1650
1675
1700
1725
1750
1775
1800
1825
1850
1875
1900
1925
1950
1975
2000
Year

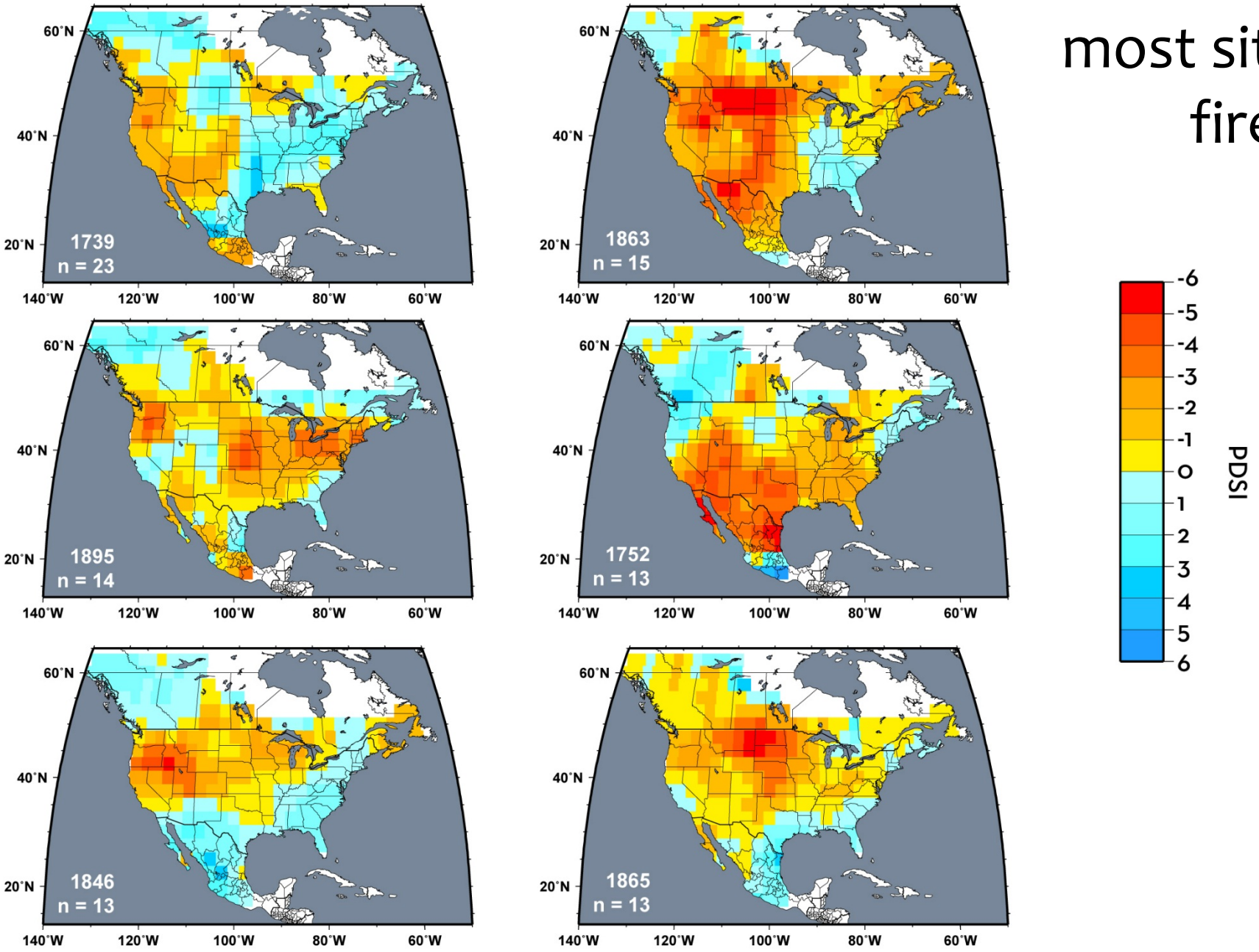
How many places need to burn to have “synchrony”?



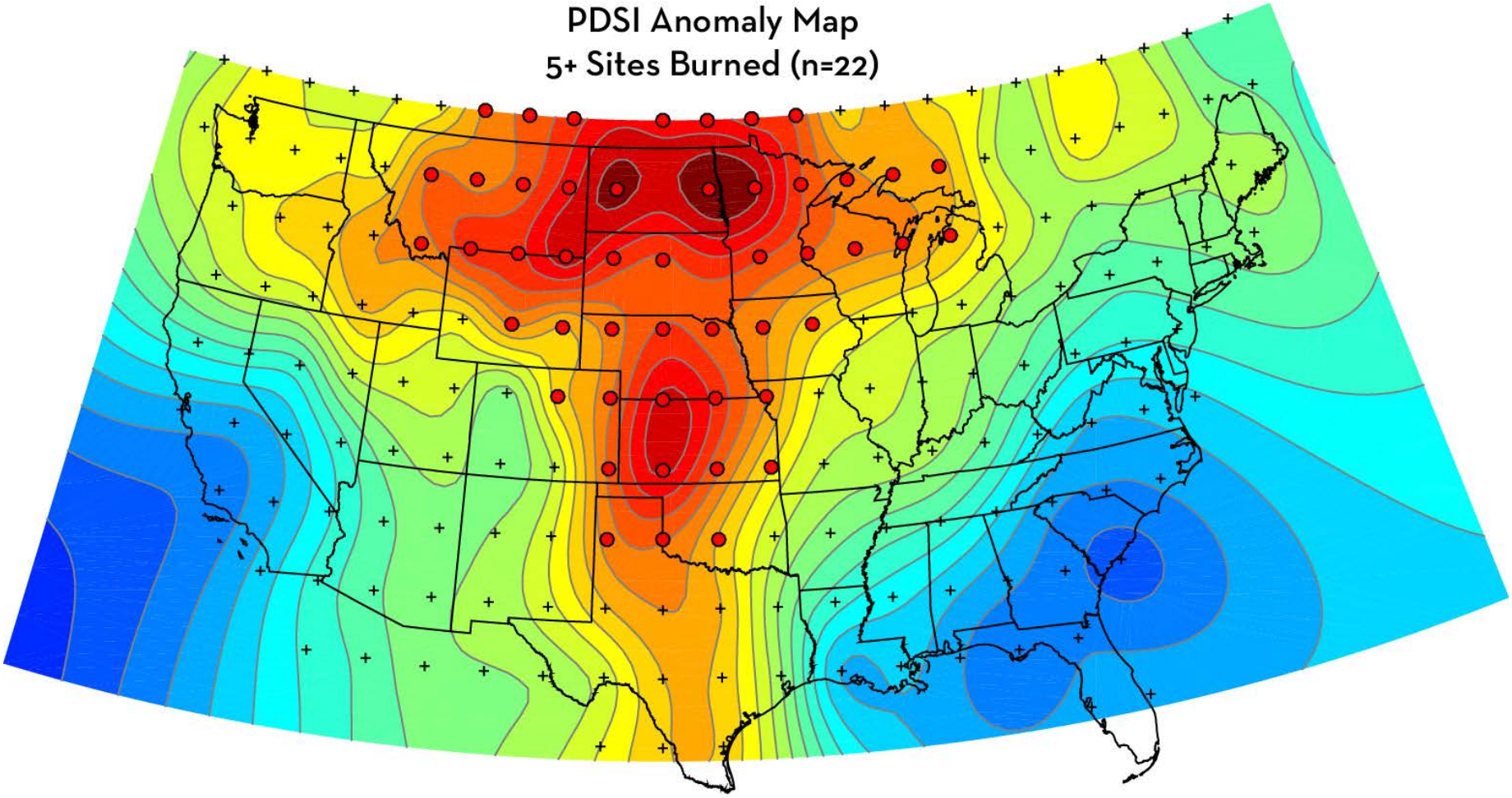

2-3 Sites
5+ Sites
4+ Regions
Departure
(actual-simulated)
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
WET
DRY
N= 26
N= 22
N= 20
-3
-2
-1
Fire
1
Year


2-3 Sites
5+ Sites
4+ Regions
Departure
(actual-simulated)
WET
DRY
N= 26
N= 22
N= 20
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-3
-2
-1
Fire
1
Year
Reconstructed Summer
Palmer Drought Severity Index
4+ Regions
WET
DRY
5
4
3
2
1
0
-1
-2
-3
-4
-5
1650
1700
1750
1800
1850
1900
1950
2000
Year

Years of most site fires



PDSI Anomaly Map
5+ Sites Burned (n=22)



2. Fire-climate conclusions

2. Fire-climate conclusions

- Drought during year of fires that burned multiple sites/regions

2. Fire-climate conclusions

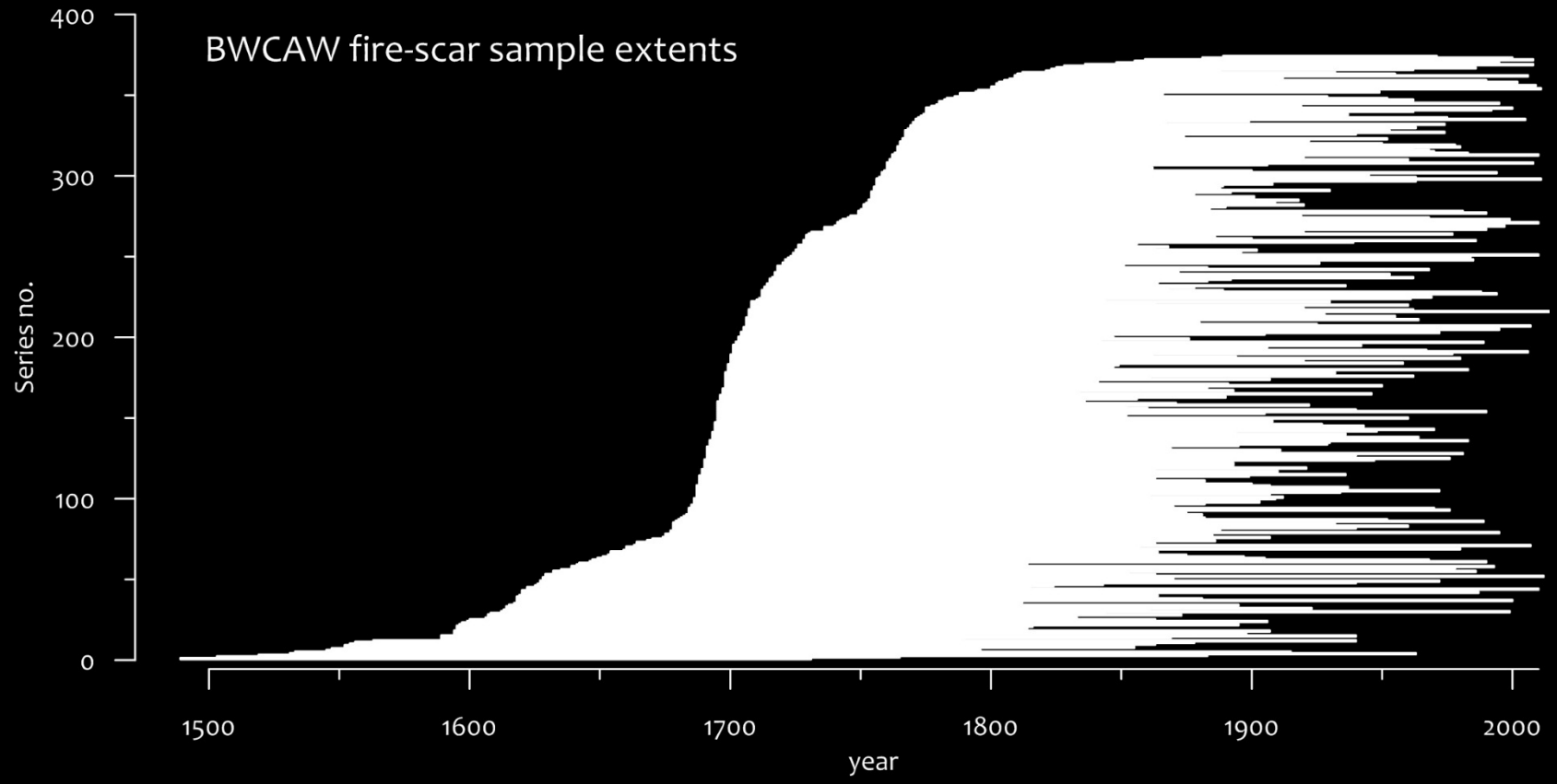
- Drought during year of fires that burned multiple sites/regions

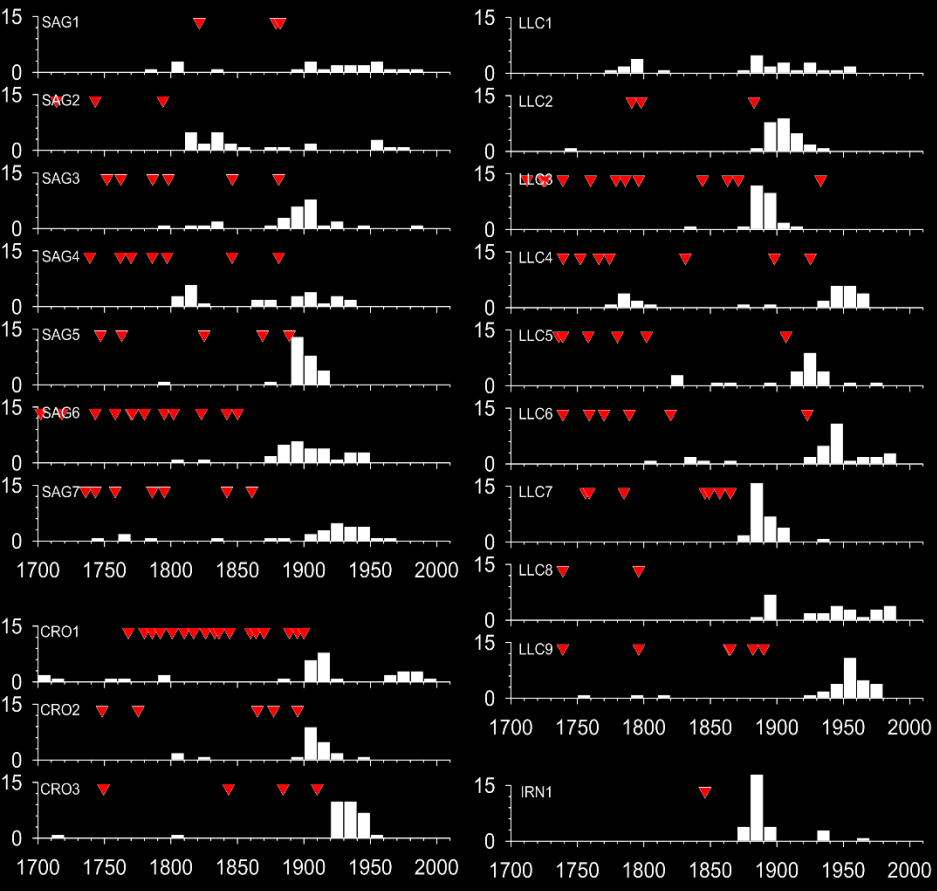
- Relationship increases at broader spatial scales

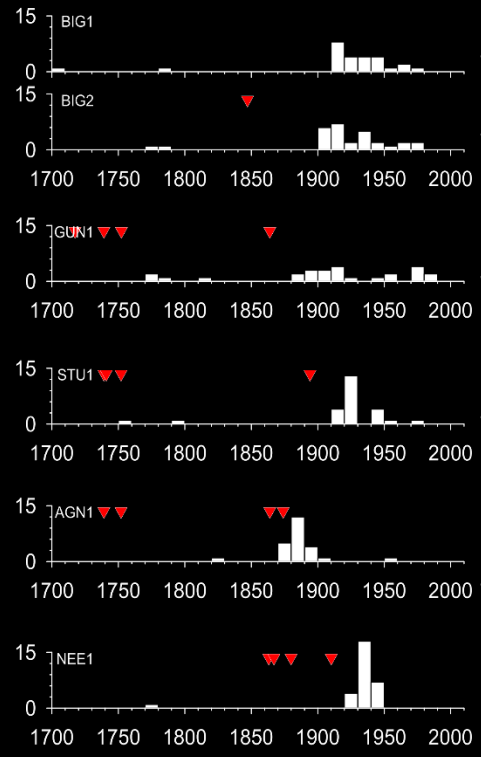
2. Fire-climate conclusions

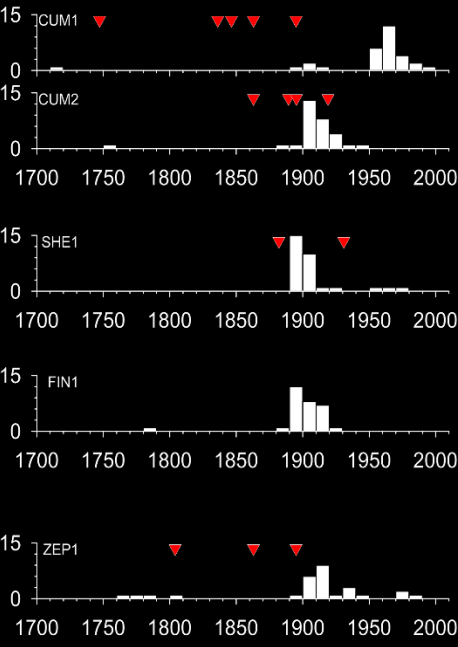
- Drought during year of fires that burned multiple sites/regions
- Relationship increases at broader spatial scales
- Regional fires burned during years of subcontinental-scale drought across the Great Plains

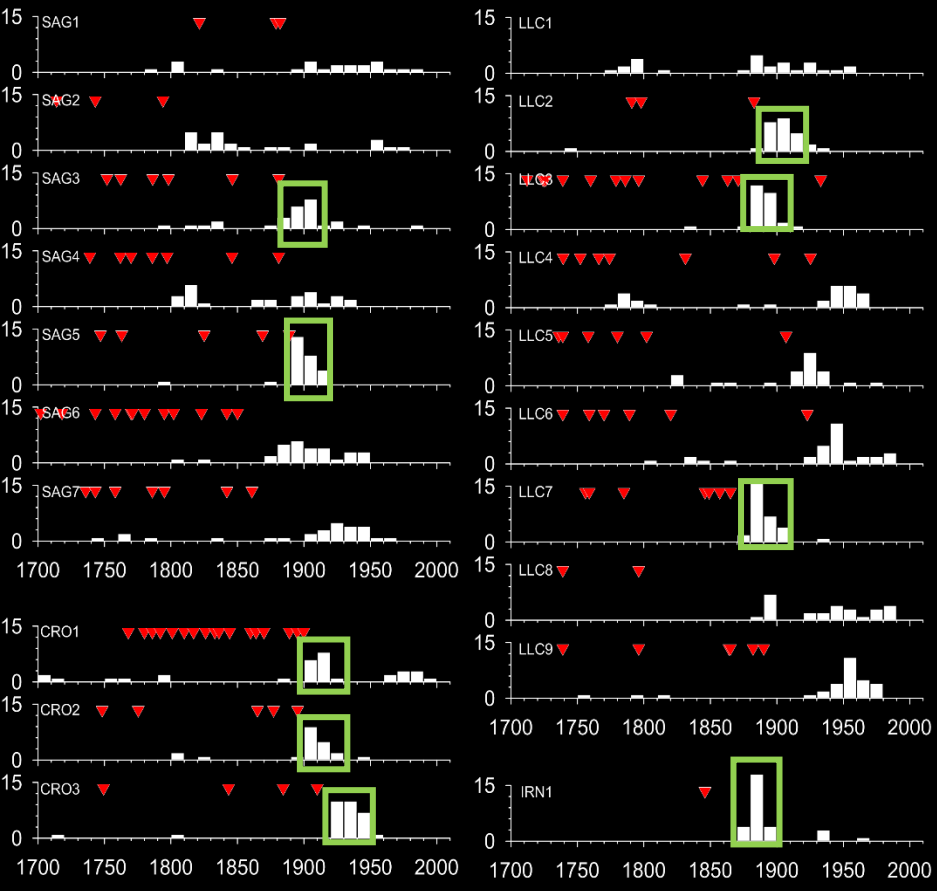
3. Age structure

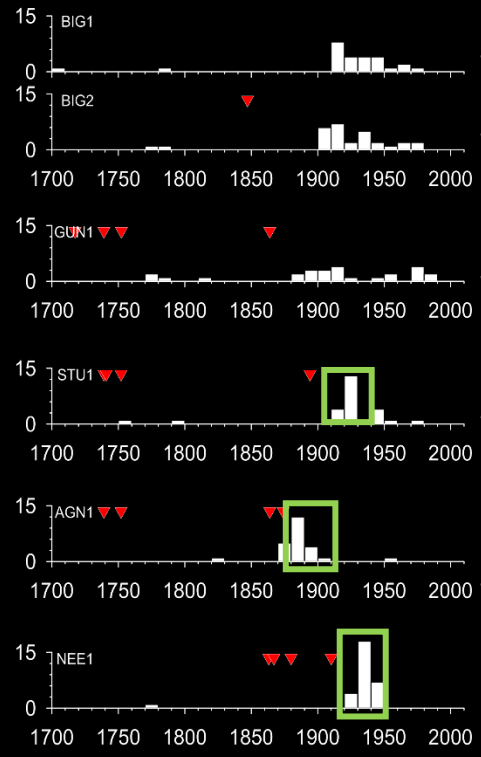

BWCAW fire-scar sample extents
Series no.
0
100
200
300
400
1500
1600
1700
1800
1900
2000
year

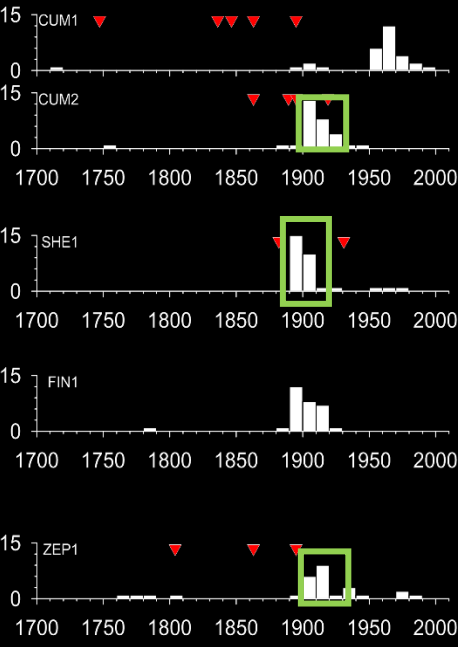

SAG1
SAG2
SAG3
SAG4
SAG5
SAG6
SAG7
CRO1
CRO2
CRO3
LLC1
LLC2
LLC3
LLC4
LLC5
LLC6
LLC7
LLC8
LLC9
IRN1
15
0
1700
1750
1800
1850
1900
1950
2000

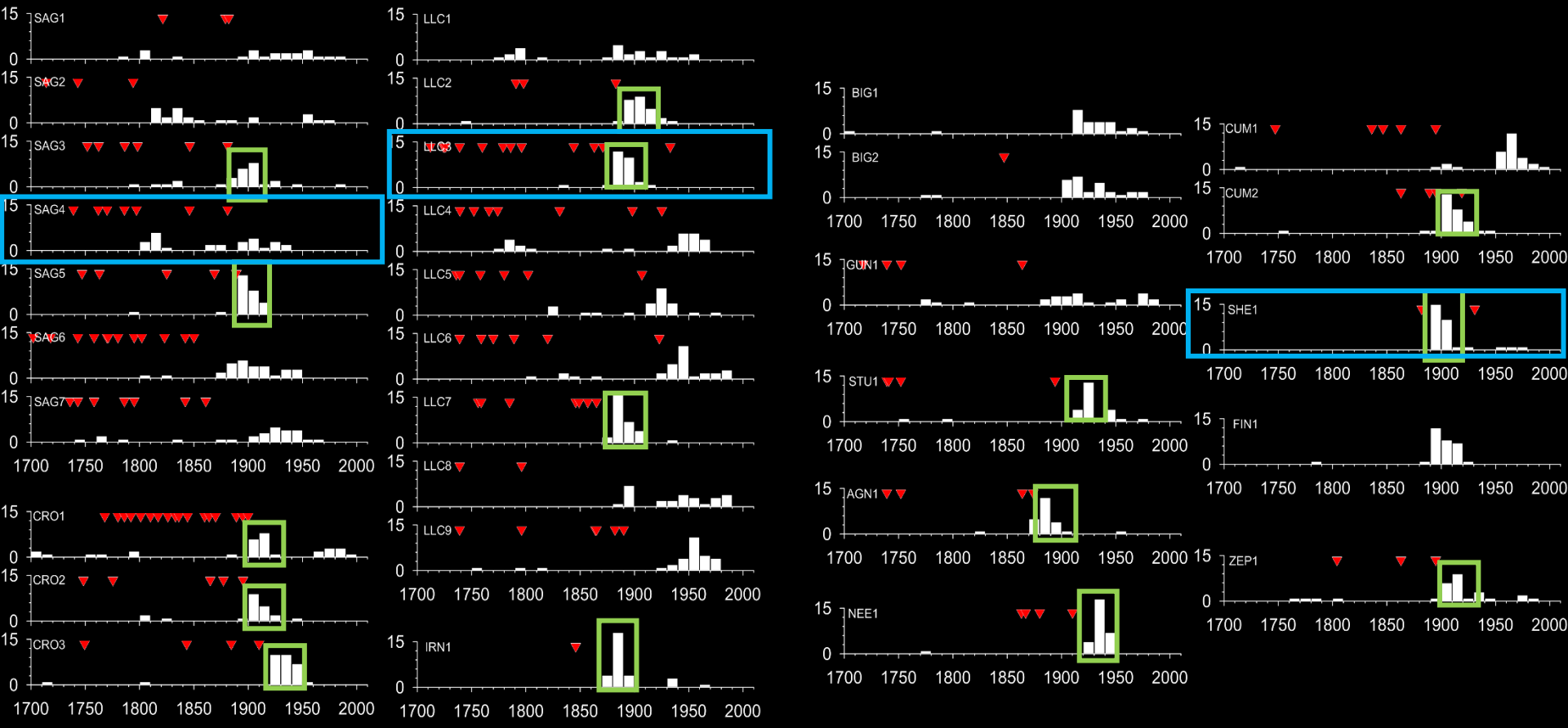

BIG1
BIG2
GUN1
STU1
AGN1
NEE1
15
0
1700
1750
1800
1850
1900
1950
2000

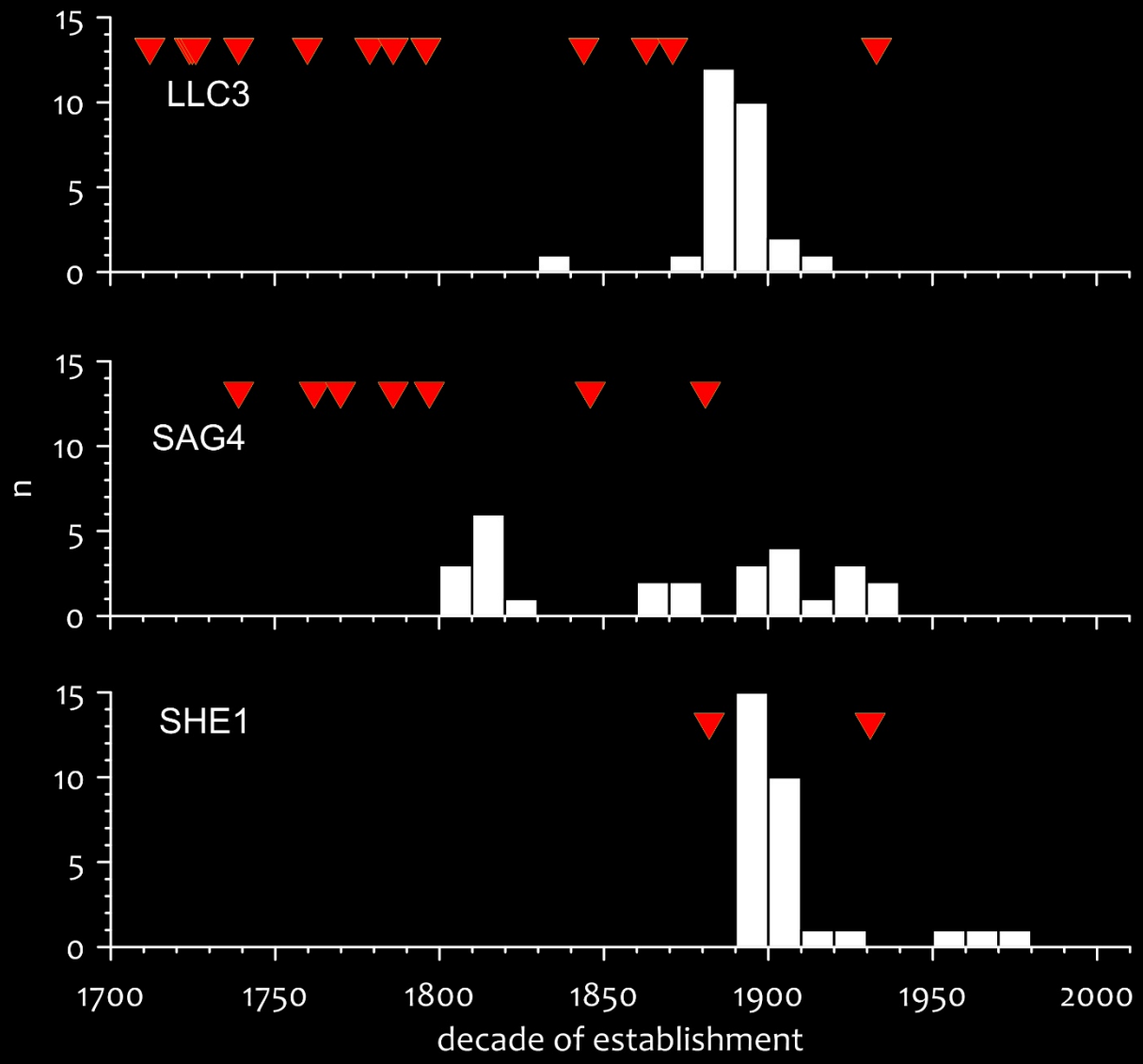

CUM1
CUM2
SHE1
FIN1
ZEP1
15
0
1700
1750
1800
1850
1900
1950
2000

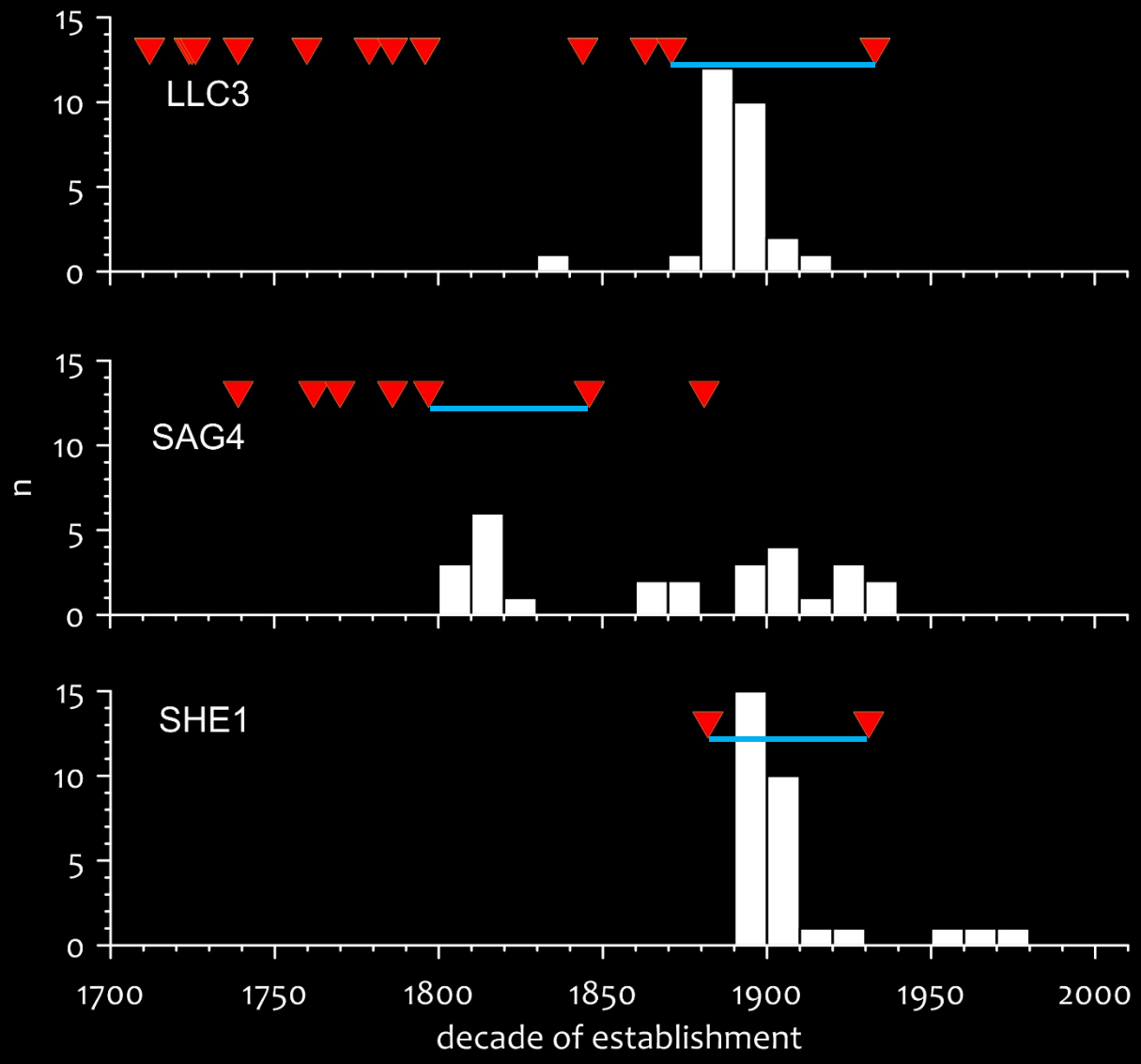

SAG1
SAG2
SAG3
SAG4
SAG5
SAG6
SAG7
CRO1
CRO2
CRO3
LLC1
LLC2
LLC3
LLC4
LLC5
LLC6
LLC7
LLC8
LLC9
IRN1
15
0
1700 1750 1800 1850 1900 1950 2000

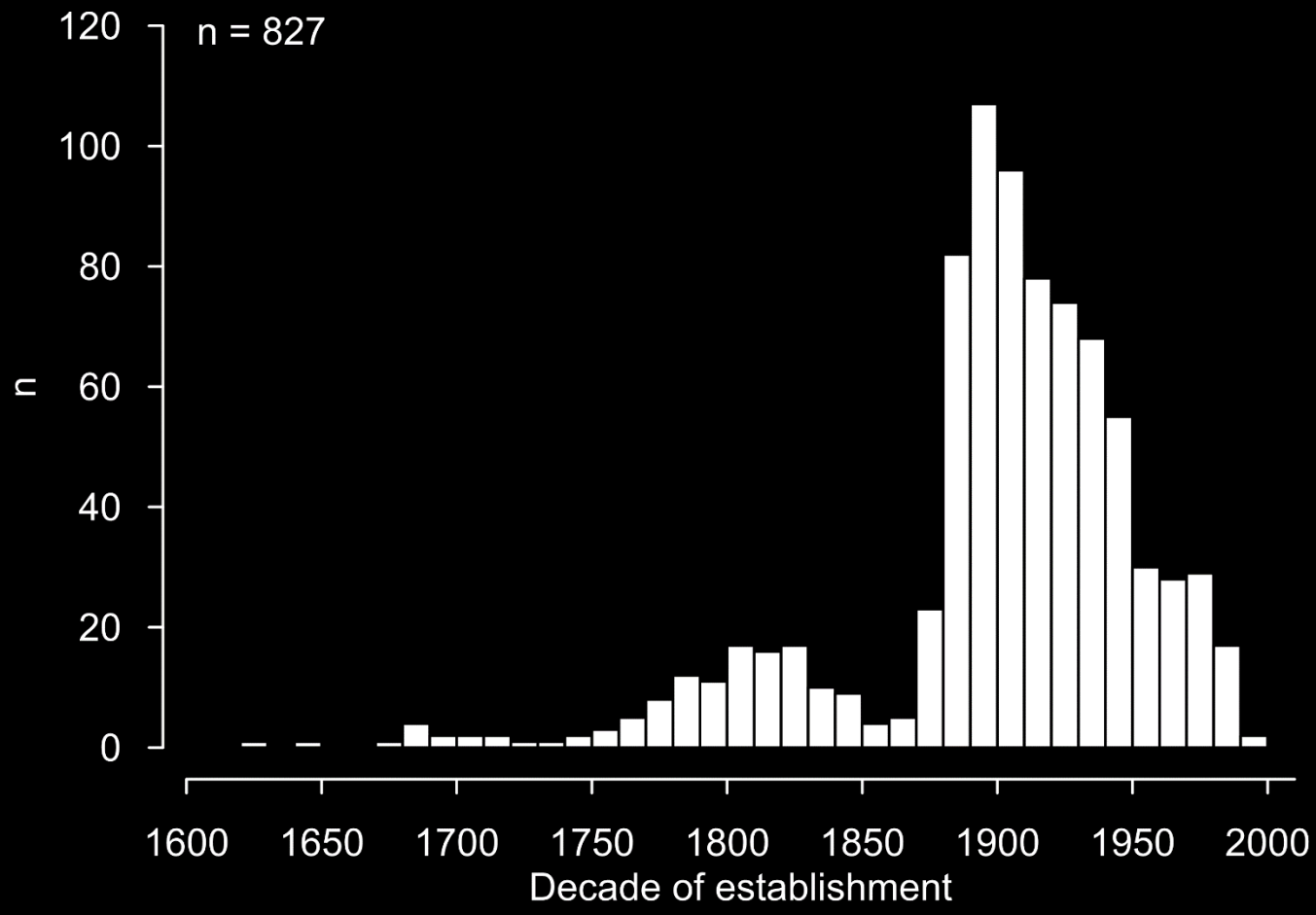

BIG1
BIG2
GUN1
STU1
AGN1
NEE1
15
0
1700 1750 1800 1850 1900 1950 2000

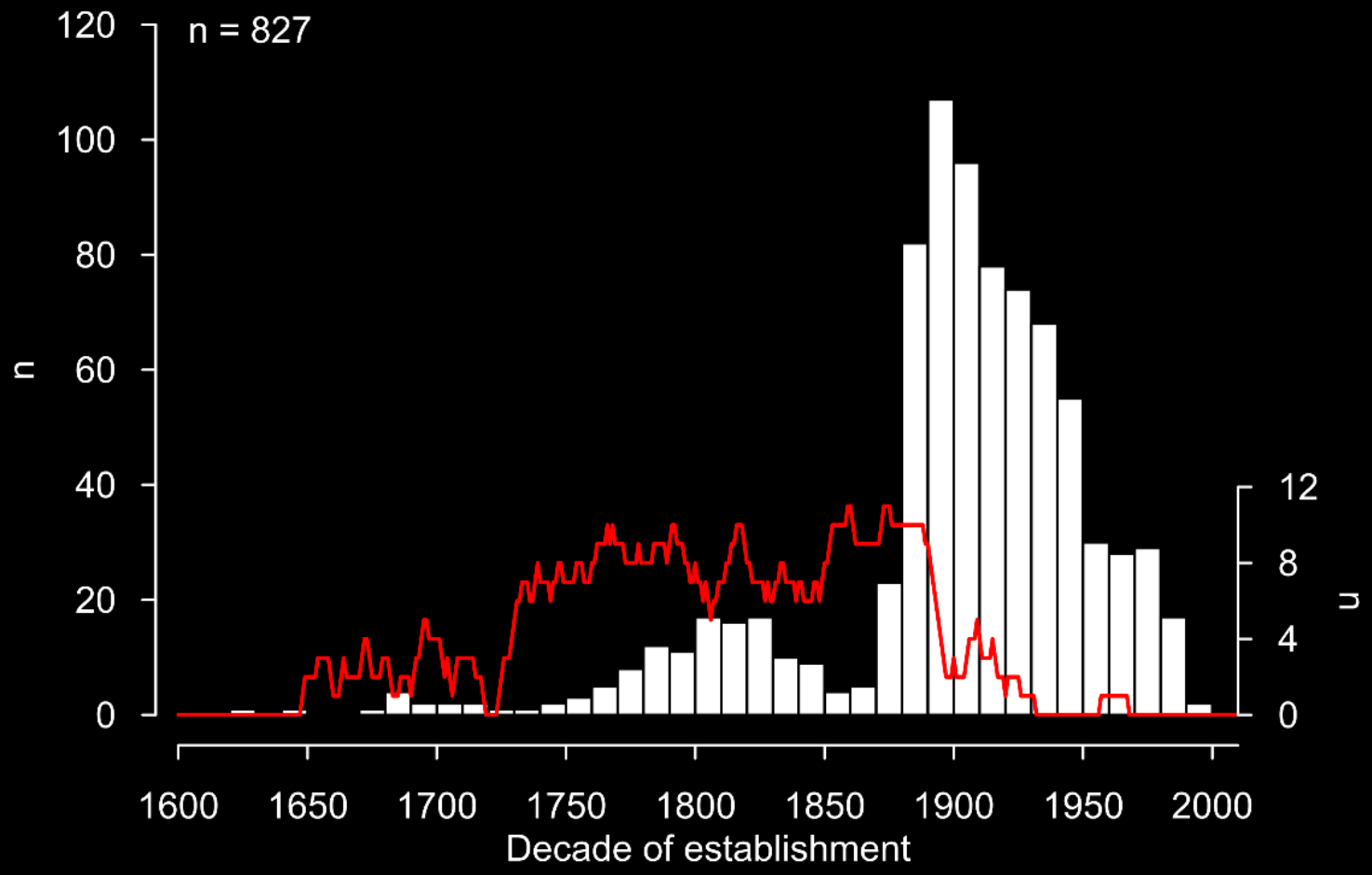

CUM1
CUM2
SHE1
FIN1
ZEP1
15
0
1700 1750 1800 1850 1900 1950 2000


SAG1
SAG2
SAG3
SAG4
SAG5
SAG6
SAG7
CRO1
CRO2
CRO3
LLC1
LLC2
LLC3
LLC4
LLC5
LLC6
LLC7
LLC8
LLC9
IRN1
BIG1
BIG2
GUN1
STU1
AGN1
NEE1
CUM1
CUM2
SHE1
FIN1
ZEP1
0
15
1700
1750
1800
1850
1900
1950
2000


LLC3
SAG4
SHE1
n
0
5
10
15
1700
1750
1800
1850
1900
1950
2000
decade of establishment


LLC3
SAG4
SHE1
n
0
5
10
15
1700
1750
1800
1850
1900
1950
2000
decade of establishment


n = 827
120
100
80
60
40
20
0
n
1600
1650
1700
1750
1800
1850
1900
1950
2000
Decade of establishment


n = 827
120
100
80
60
40
20
0
n
12
8
4
0
n
1600
1650
1700
1750
1800
1850
1900
1950
2000
Decade of establishment

3. Age structure conclusions

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- Fire-scar sample depth illustrates establishment in late 1600s and mid 1700s

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- Post-fire cohorts after 40+ year intervals

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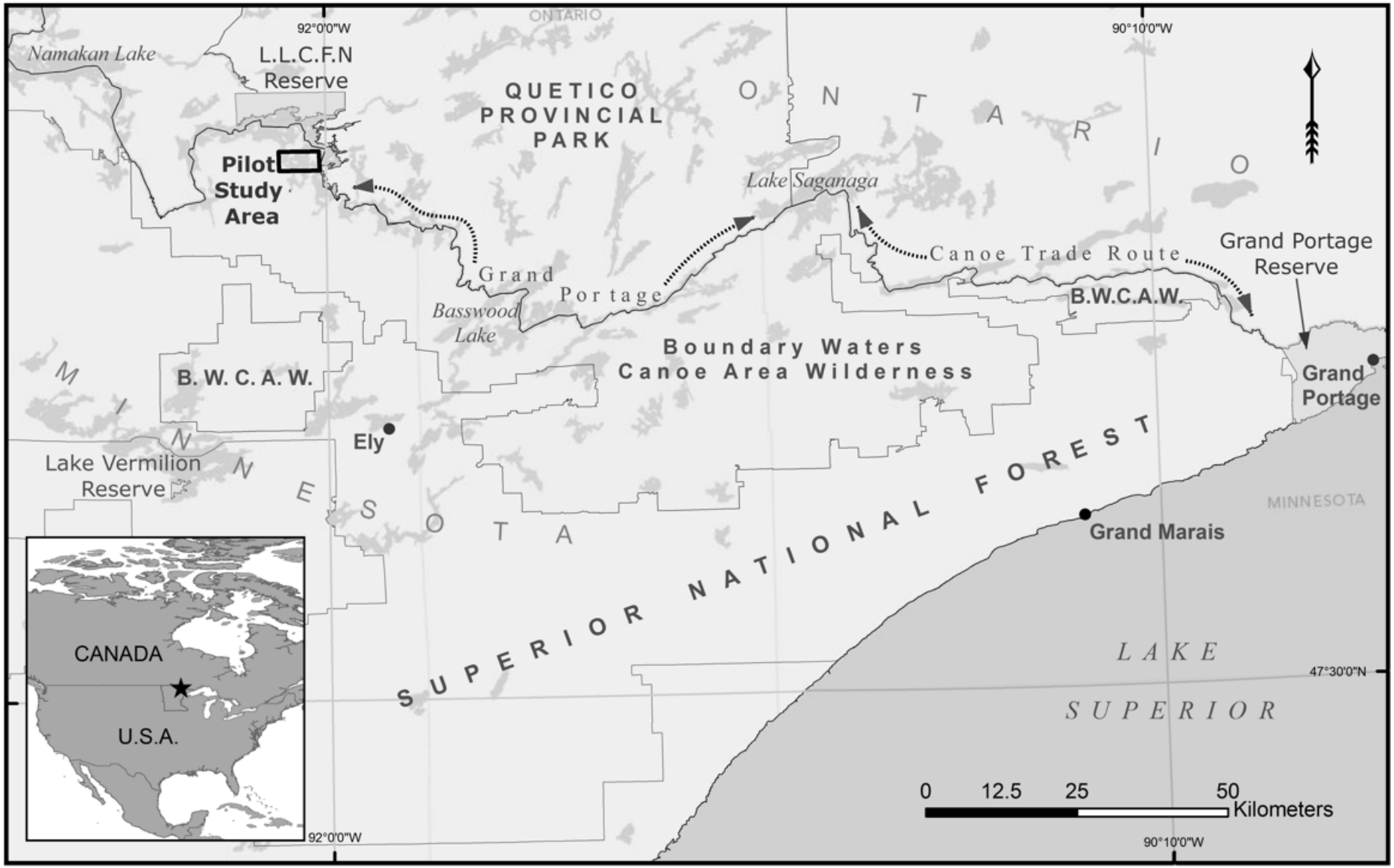
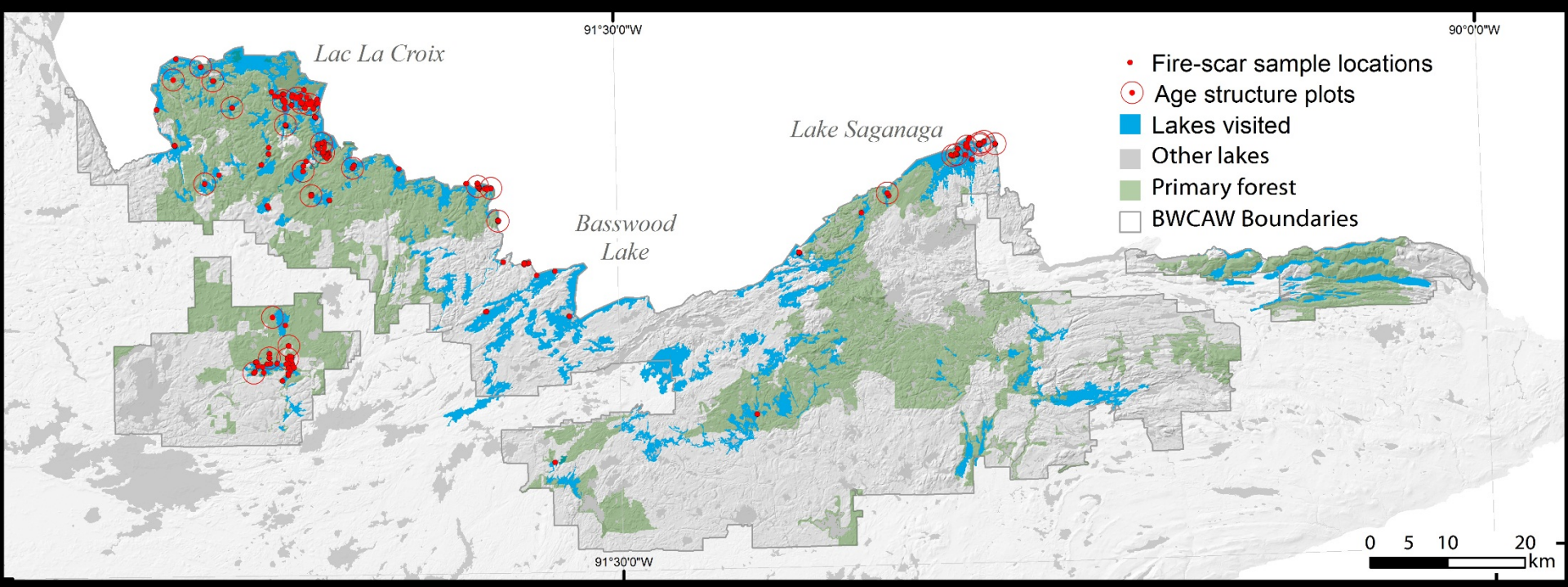
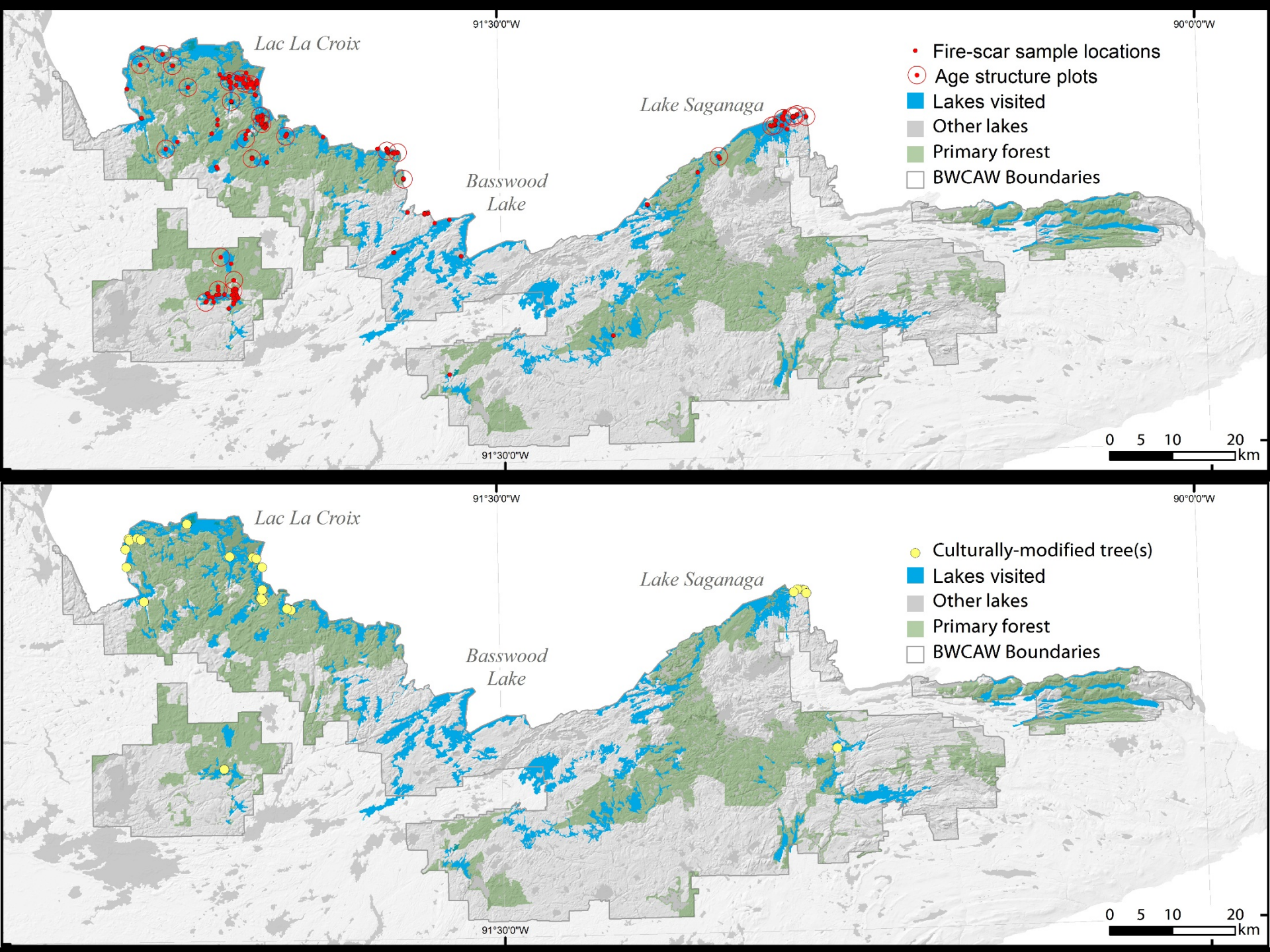
- Fire-scar sample depth illustrates establishment in late 1600s and mid 1700s
- Post-fire cohorts after 40+ year intervals
- Pulse of regeneration in early 1800s
- Regeneration epoch in the 1900s and stand density

4. Role of People

Frances Anne Hopkins, Voyageurs Passing a Waterfall, 1869


92°0'0"W
ONTARIO
90°10'0"W
Namakan Lake
L.L.C.F.N Reserve
QUETICO PROVINCIAL PARK
ONTARIO
Pilot Study Area
Lake Saganaga
Canoe Trade Route
Grand Portage Reserve
Grand Portage
Basswood Lake
B.W.C.A.W.
Boundary Waters Canoe Area Wilderness
B. W. C. A. W.
MINNESOTA
Ely
Lake Vermilion Reserve
SUPERIOR NATIONAL FOREST
Grand Portage
Grand Marais
MINNESOTA
CANADA
U.S.A.
LAKE SUPERIOR
47°30'0"N
0 12.5 25 50
Kilometers
92°0'0"W
90°10'0"W

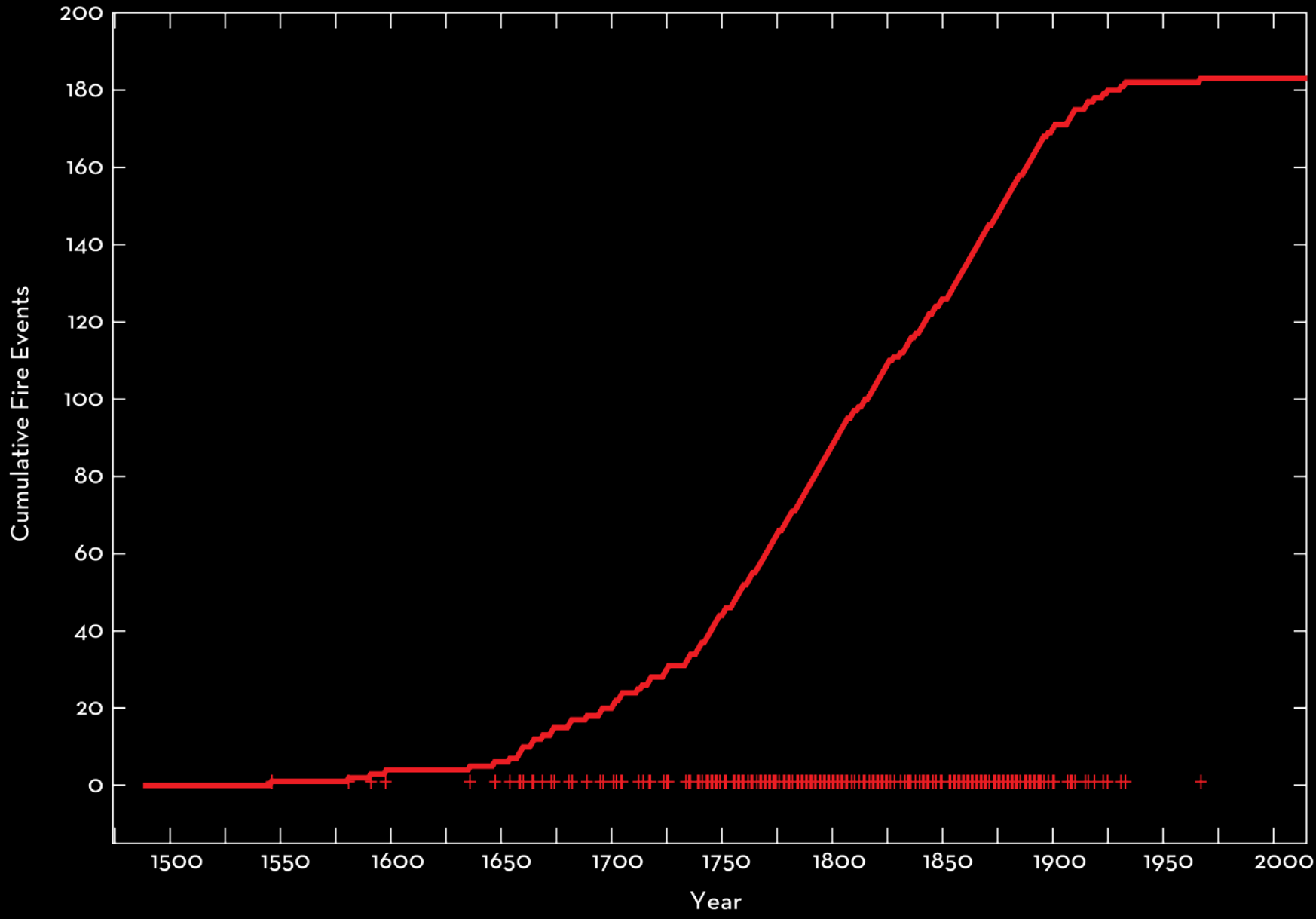

91°30'0"W
90°0'0"W
Lac La Croix
Lake Saganaga
Basswood Lake
Fire-scar sample locations
Age structure plots
Lakes visited
Other lakes
Primary forest
BWCAW Boundaries
0 5 10 20
km

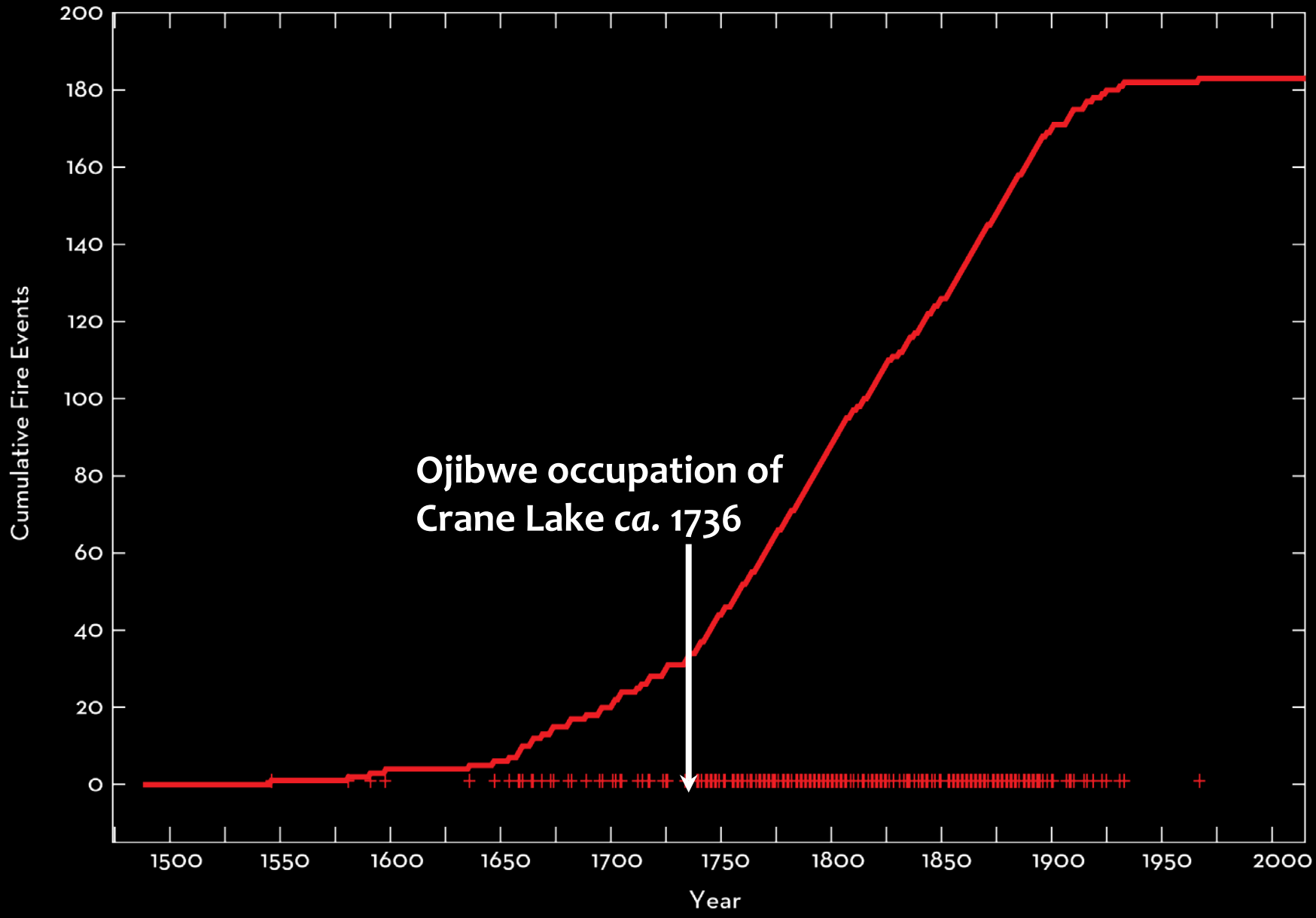

91°30'0"W
90°0'0"W
Lac La Croix
Lake Saganaga
Basswood Lake
Fire-scar sample locations
Age structure plots
Lakes visited
Other lakes
Primary forest
BWCAW Boundaries
0 5 10 20
km
91°30'0"W
91°30'0"W
90°0'0"W
Lac La Croix
Lake Saganaga
Basswood Lake
Culturally-modified tree(s)
Lakes visited
Other lakes
Primary forest
BWCAW Boundaries
0 5 10 20
km
91°30'0"W

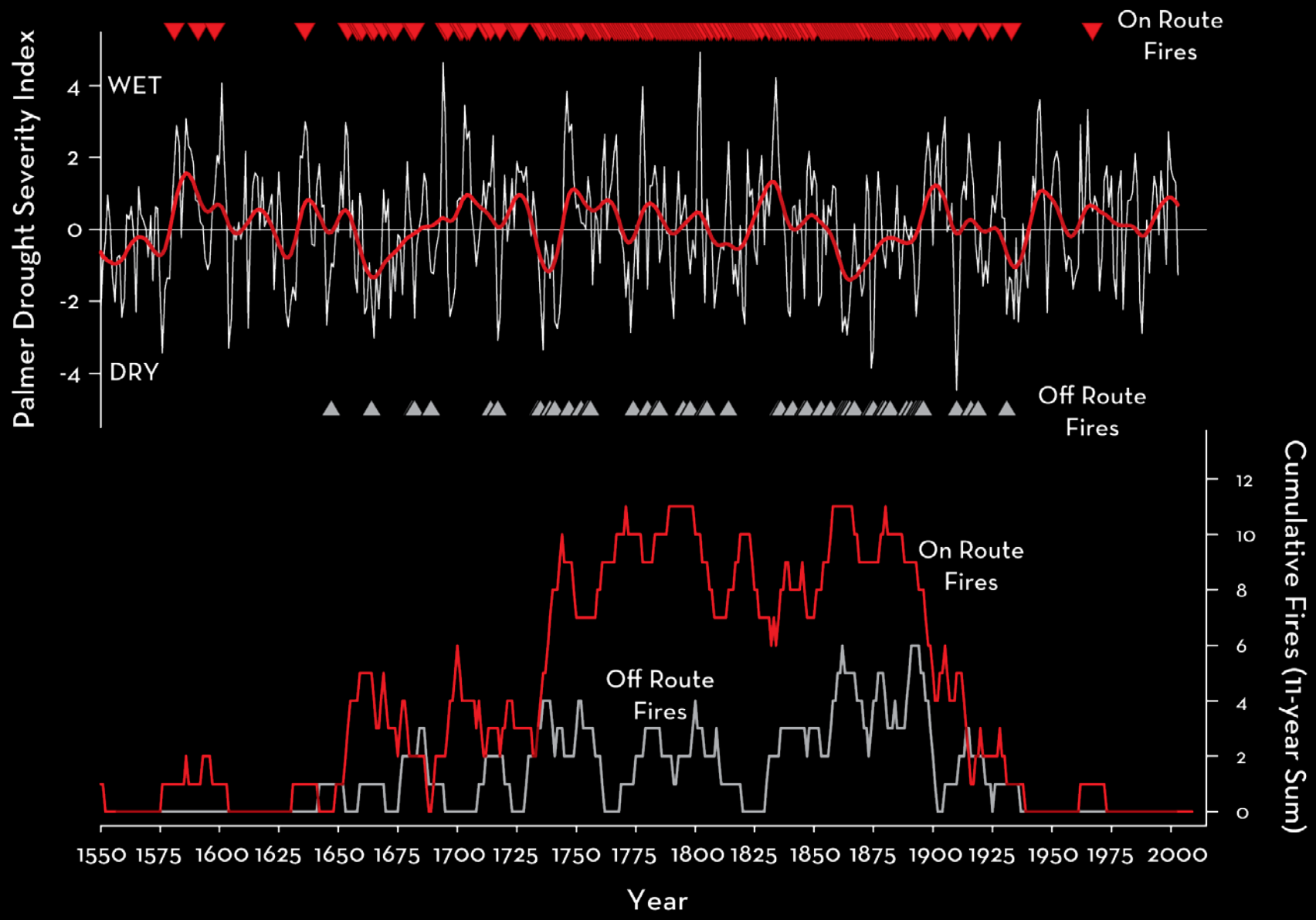
Culturally-modified trees

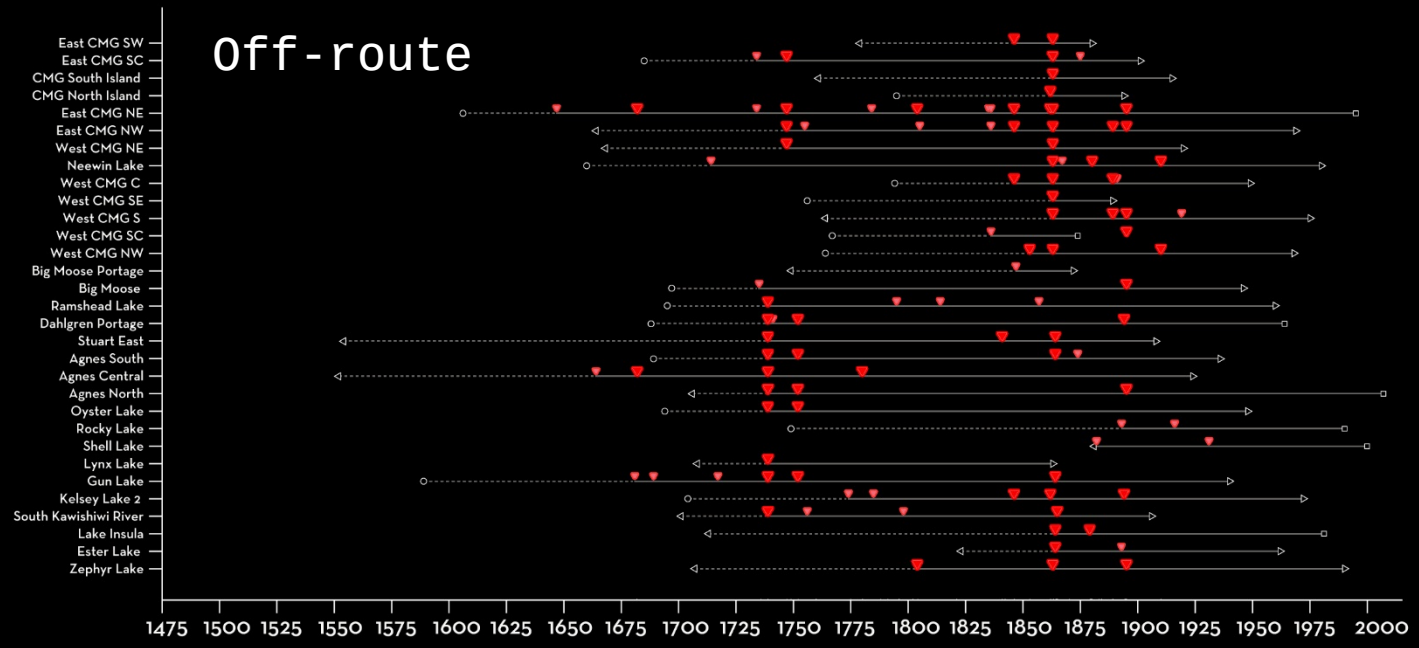
“...the Indians [Ojibwe] burn large tracts of pine barrens in order to favour the growth of very useful autumnal fruits.”

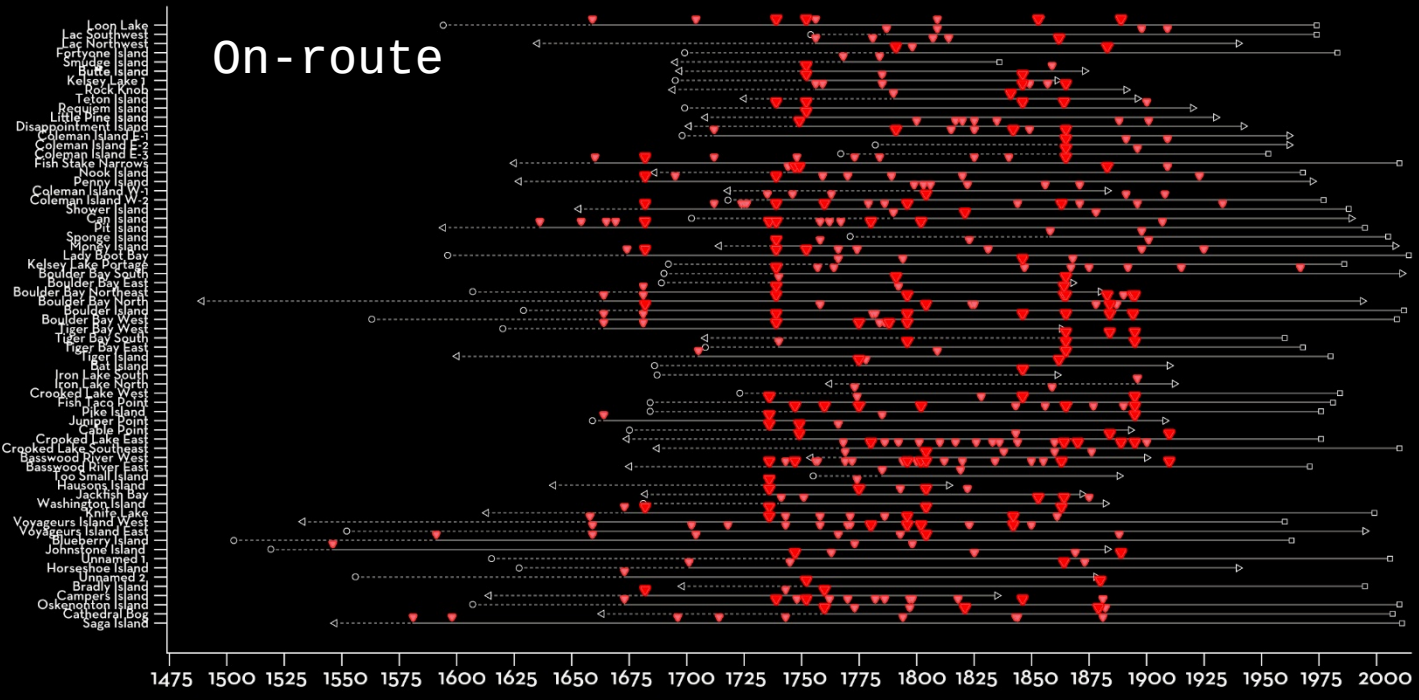
–Dr. John Bigsby, 1850

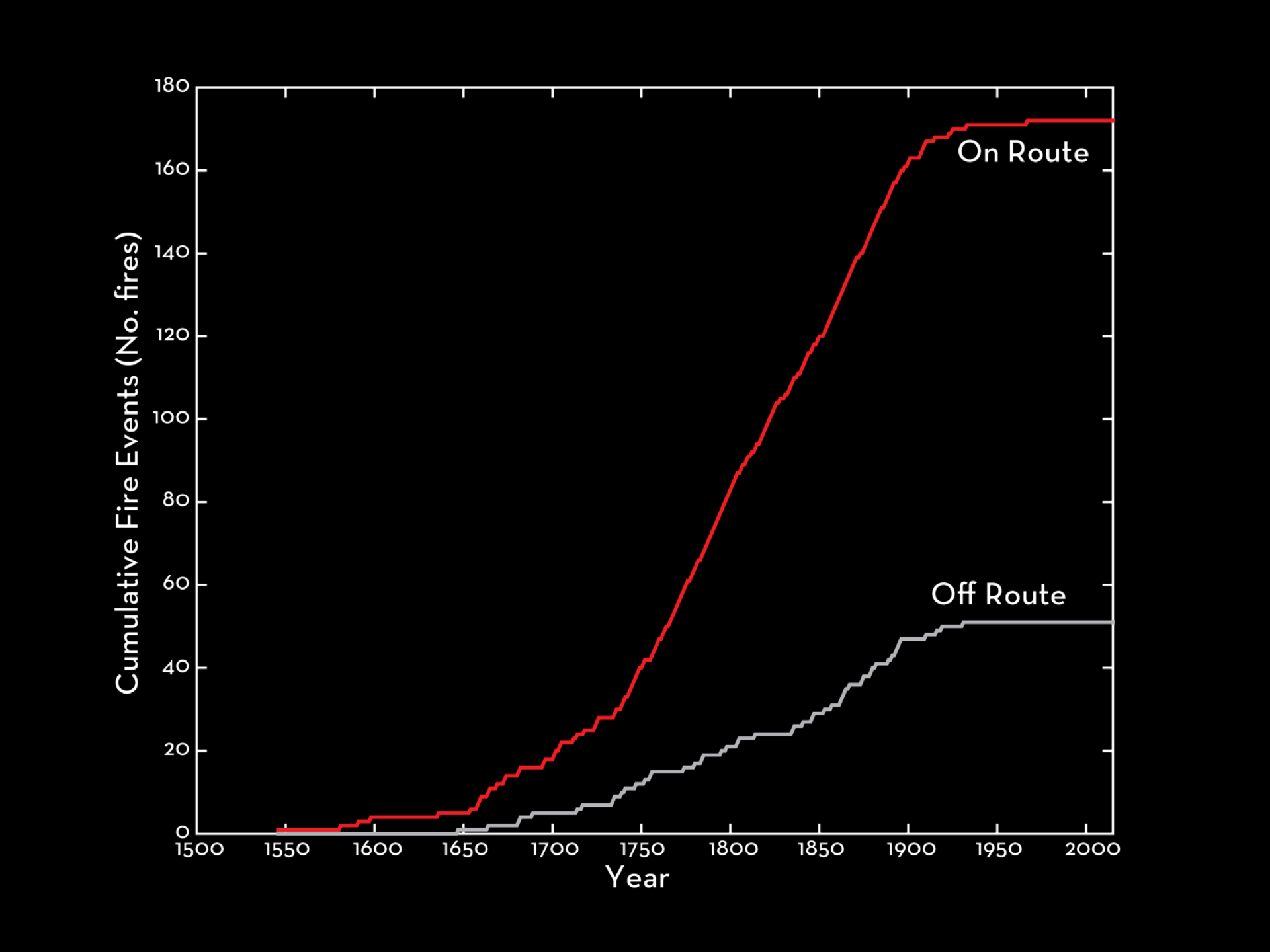

Cumulative Fire Events
200
180
160
140
120
100
80
60
40
20
0
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
Year

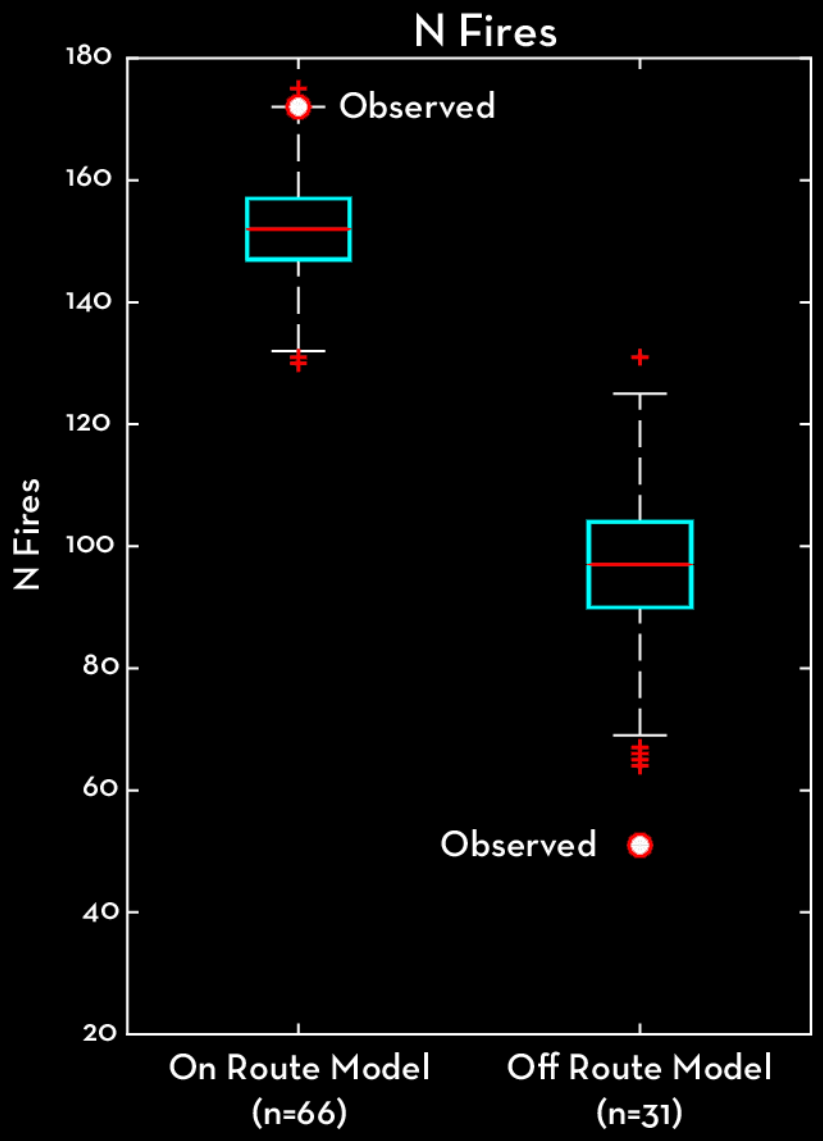

Ojibwe occupation of
Crane Lake *ca.* 1736
Cumulative Fire Events
Year
0
20
40
60
80
100
120
140
160
180
200
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000

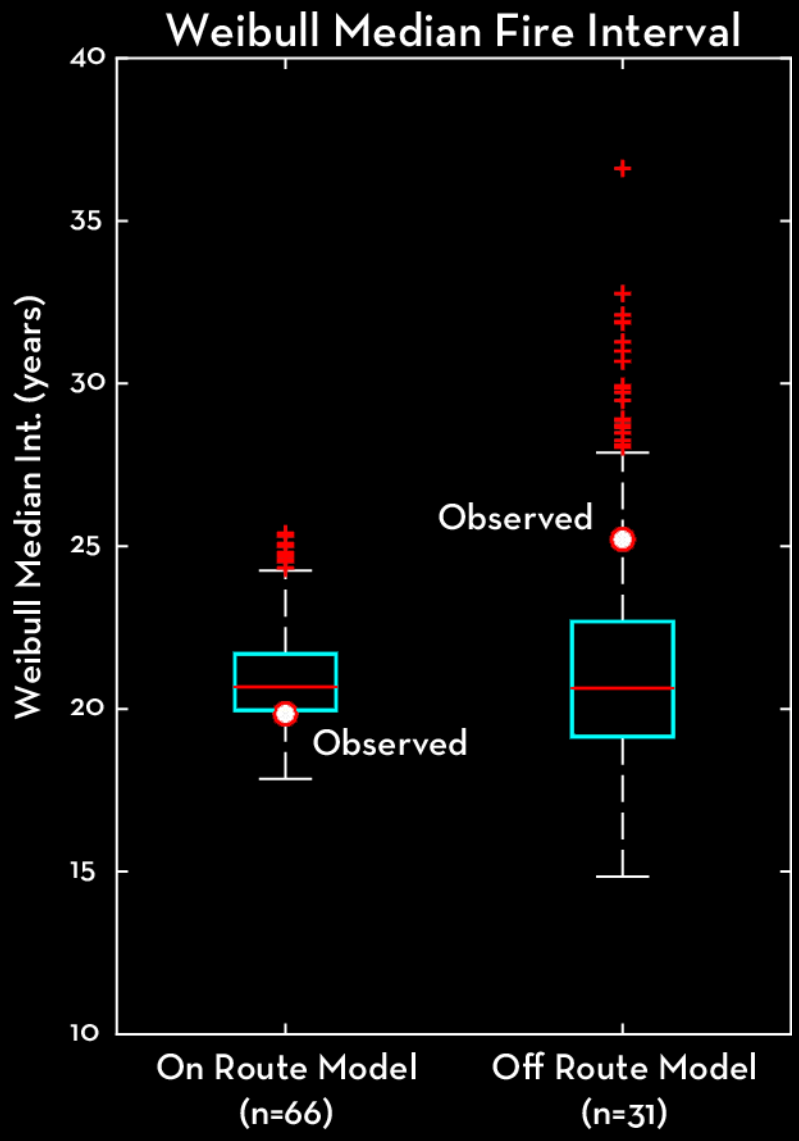

On Route Fires
Palmer Drought Severity Index
WET
DRY
4
2
0
-2
-4
Off Route Fires
On Route Fires
Off Route Fires
Cumulative Fires (11-year Sum)
12
10
8
6
4
2
0
1550 1575 1600 1625 1650 1675 1700 1725 1750 1775 1800 1825 1850 1875 1900 1925 1950 1975 2000
Year

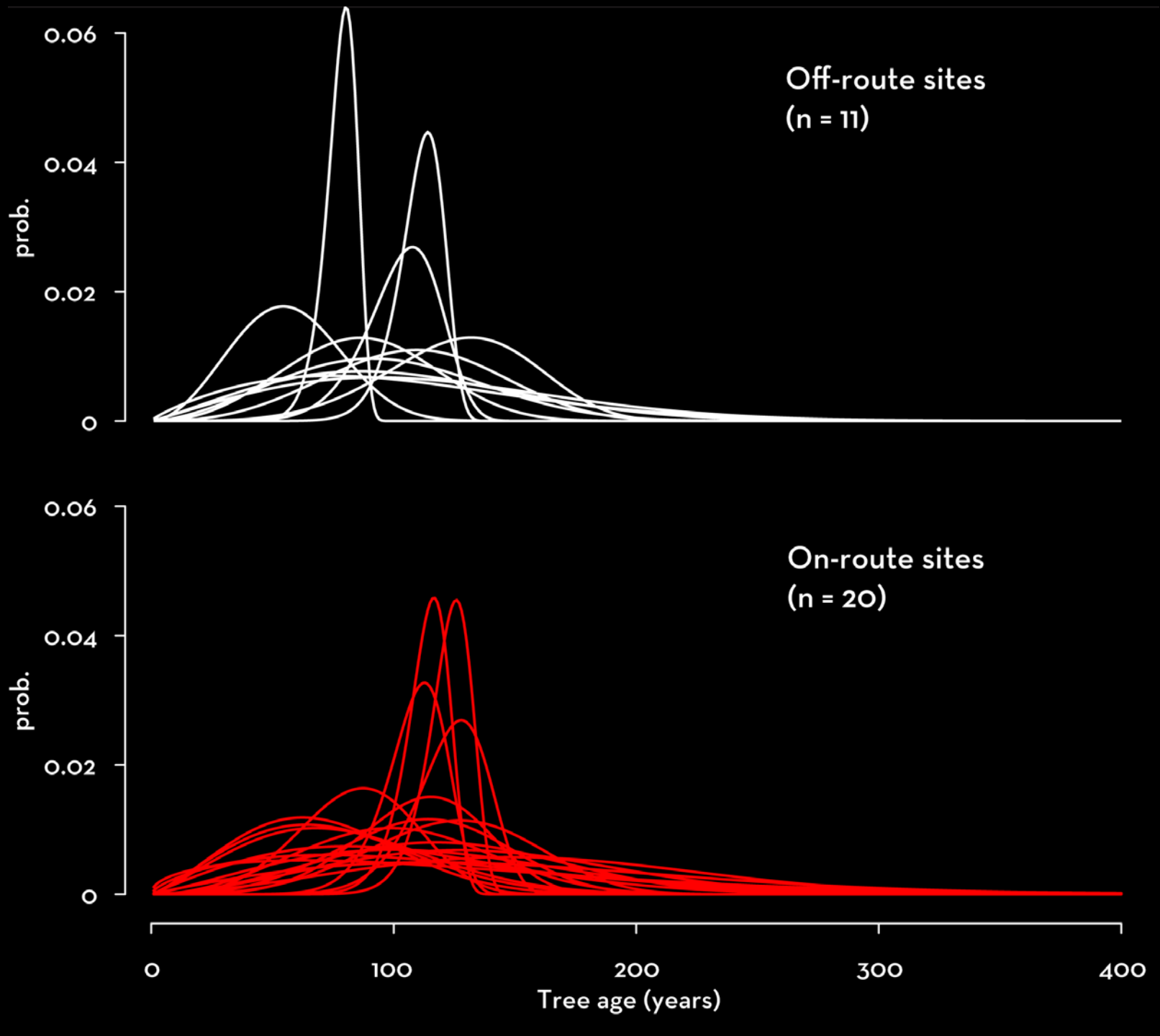

Off-route
East CMG SW
East CMG SC
CMG South Island
CMG North Island
East CMG NE
East CMG NW
West CMG NE
Neewin Lake
West CMG C
West CMG SE
West CMG S
West CMG SC
West CMG NW
Big Moose Portage
Big Moose
Ramshead Lake
Dahlgren Portage
Stuart East
Agnes South
Agnes Central
Agnes North
Oyster Lake
Rocky Lake
Shell Lake
Lynx Lake
Gun Lake
Kelsey Lake 2
South Kawishiwi River
Lake Insula
Ester Lake
Zephyr Lake
1475 1500 1525 1550 1575 1600 1625 1650 1675 1700 1725 1750 1775 1800 1825 1850 1875 1900 1925 1950 1975 2000

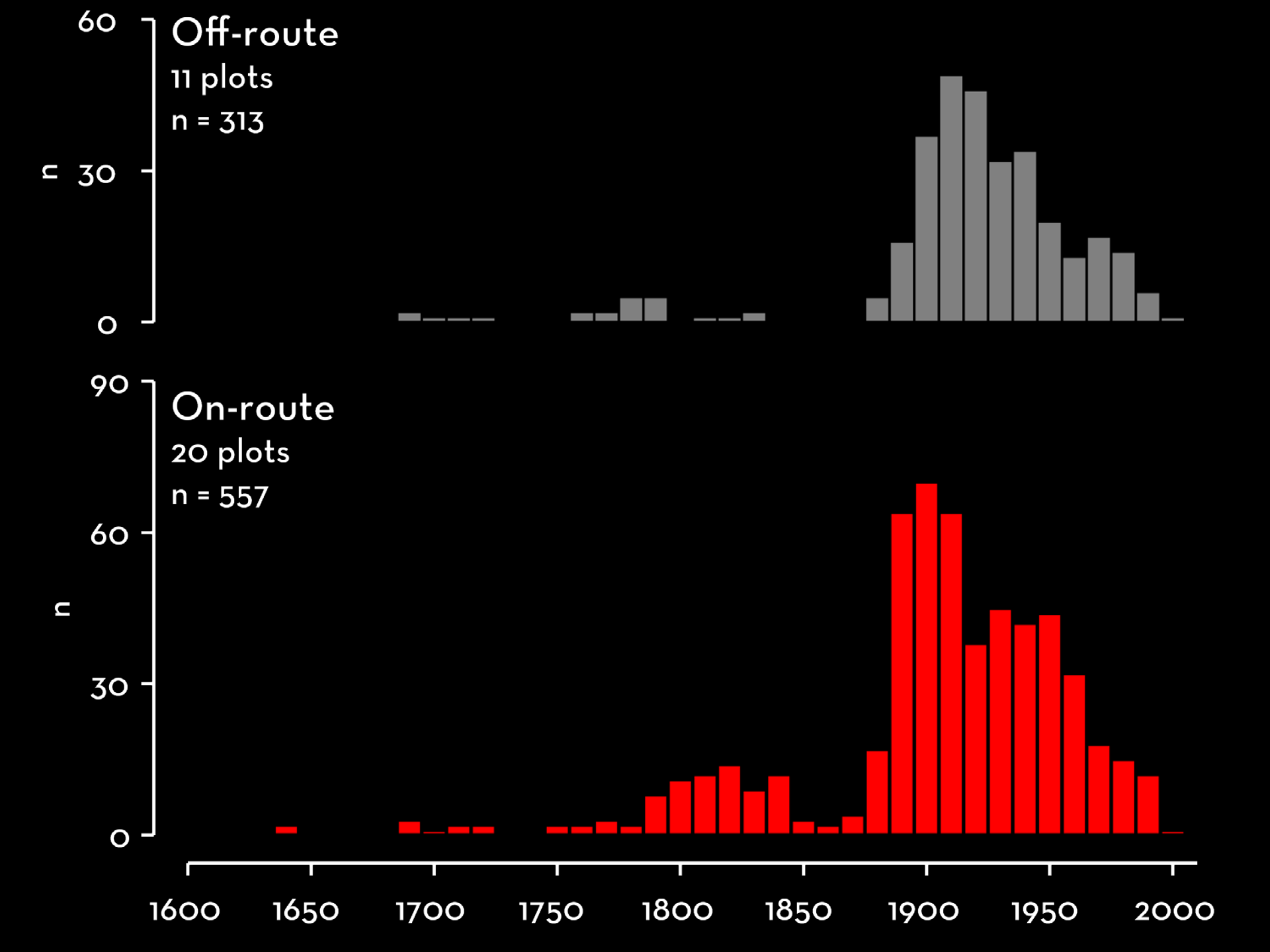

On-route
Loon Lake
Lac Southwest
Lac Northwest
Fortrygne Island
Smudge Island
Butte Island
Kelsey Lake 1
Rock Knob
Teton Island
Requiem Island
Little Pine Island
Disappointment Island
Coleman Island E-1
Coleman Island E-2
Coleman Island E-3
Fish Stake Narrows
Nook Island
Penny Island
Coleman Island W-1
Coleman Island W-2
Shower Island
Can Island
Pit Island
Sponge Island
Money Island
Lady Boot Bay
Kelsey Lake Portage
Boulder Bay South
Boulder Bay East
Boulder Bay Northeast
Boulder Bay North
Boulder Island
Boulder Bay West
Tiger Bay West
Tiger Bay South
Tiger Bay East
Tiger Island
Bat Island
Iron Lake South
Iron Lake North
Crooked Lake West
Fish Taco Point
Pike Island
Juniper Point
Gable Point
Crooked Lake East
Crooked Lake Southeast
Basswood River West
Basswood River East
Too Small Island
Hausons Island
Jackfish Bay
Washington Island
Knife Lake
Voyageurs Island West
Voyageurs Island East
Blueberry Island
Johnstone Island
Unnamed 1
Horseshoe Island
Unnamed 2
Bradly Island
Campers Island
Oskenoptton Island
Cathedral Bog
Saga Island
1475 1500 1525 1550 1575 1600 1625 1650 1675 1700 1725 1750 1775 1800 1825 1850 1875 1900 1925 1950 1975 2000

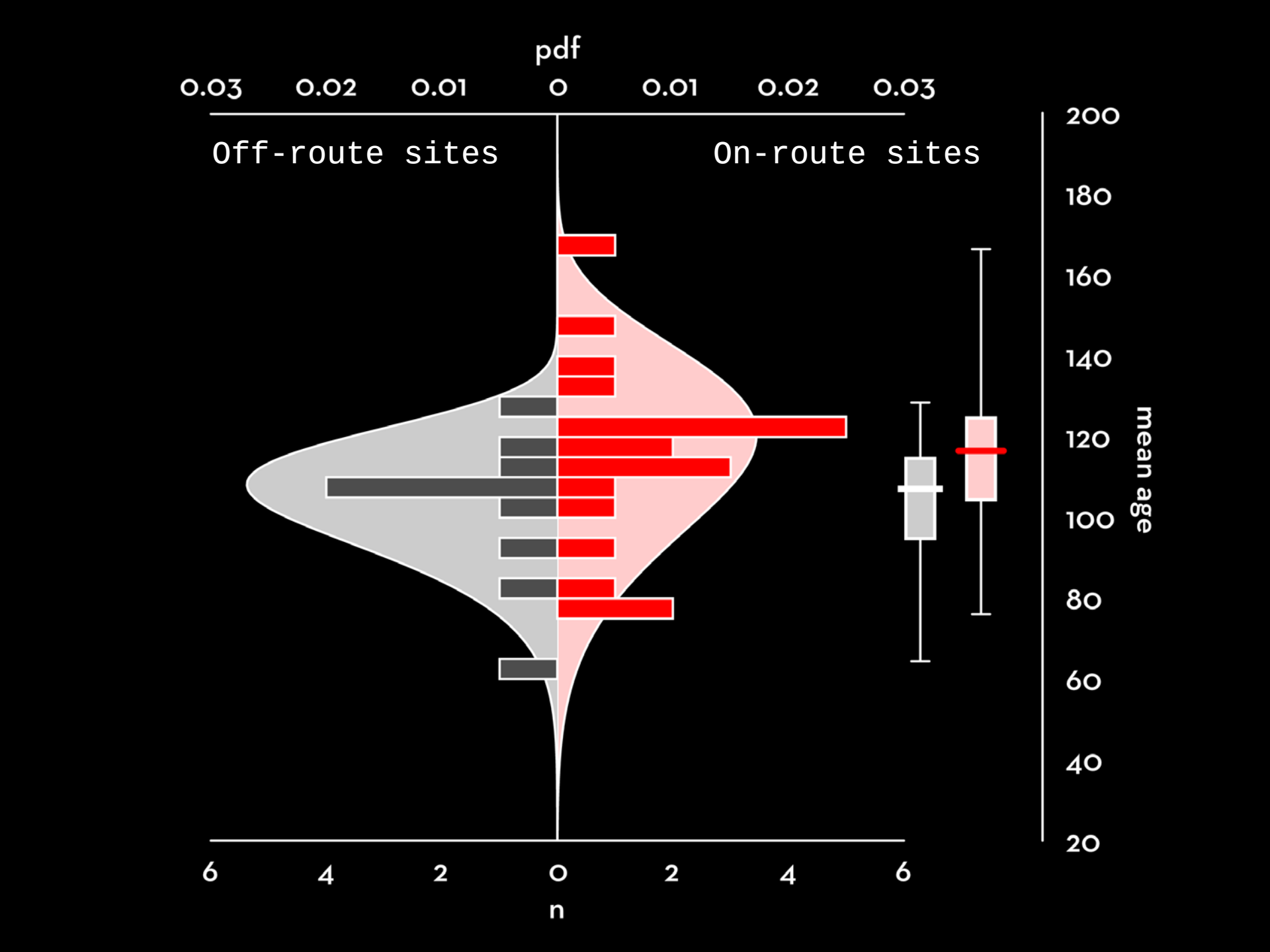

Cumulative Fire Events (No. fires)
180
160
140
120
100
80
60
40
20
0
1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000
Year
On Route
Off Route


N Fires
N Fires
180
160
140
120
100
80
60
40
20
Observed
Observed
On Route Model
(n=66)
Off Route Model
(n=31)


Weibull Median Fire Interval
Weibull Median Int. (years)
40
35
30
25
20
15
10
Observed
Observed
On Route Model
(n=66)
Off Route Model
(n=31)


Off-route sites
(n = 11)
On-route sites
(n = 20)
prob.
0.06
0.04
0.02
0
0
100
200
300
400
Tree age (years)


Off-route
11 plots
n = 313
n
60
30
0
On-route
20 plots
n = 557
n
90
60
30
0
1600
1650
1700
1750
1800
1850
1900
1950
2000


pdf
0.03
0.02
0.01
0
0.01
0.02
0.03
Off-route sites
On-route sites
200
180
160
140
120
100
80
60
40
20
mean age
6
4
2
0
2
4
6
n

4. Role of People conclusions

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- Distinct differences between sites on and off the Border Route

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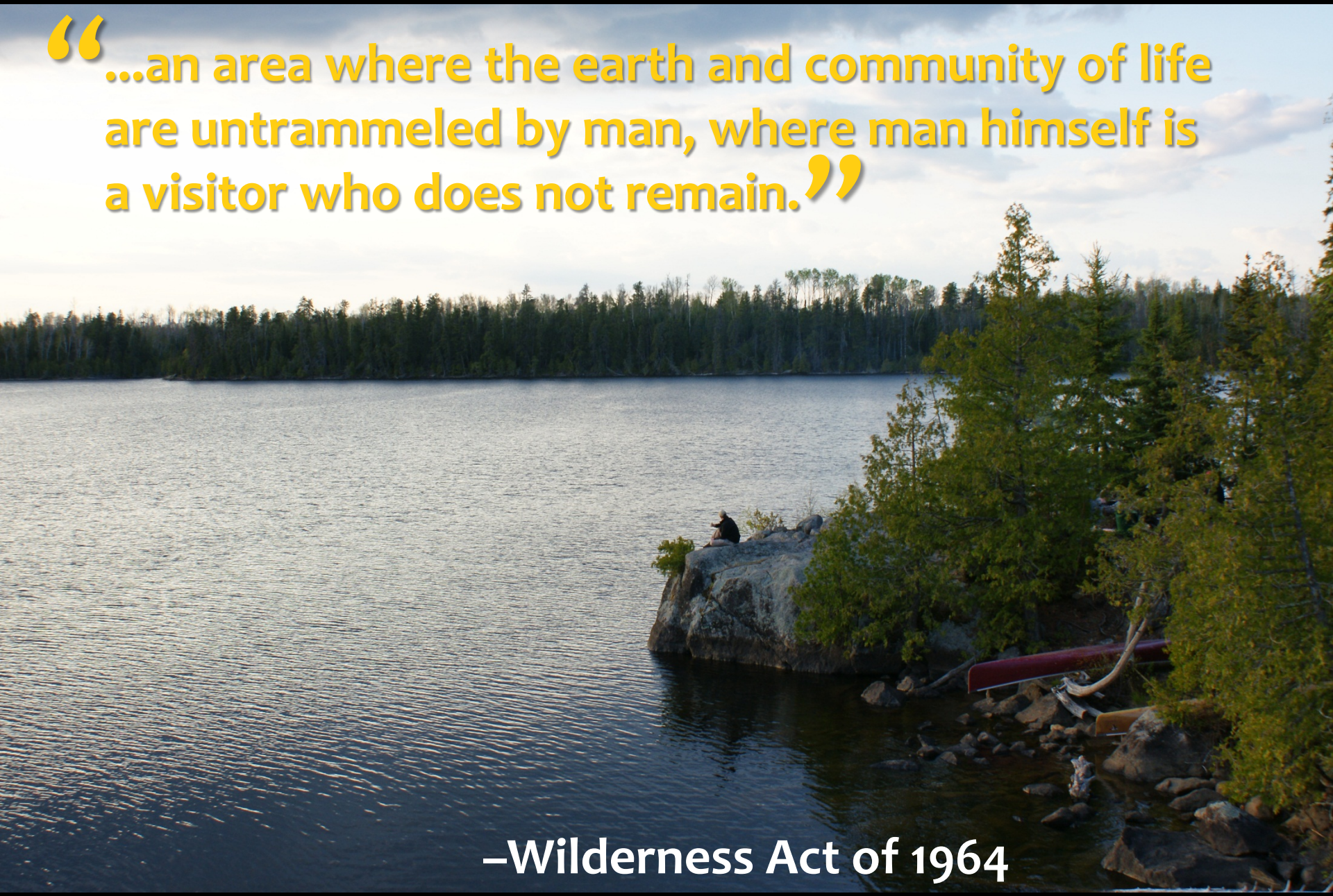
- Fire frequency likely augmented at *certain places* at *certain times*

4. Role of People conclusions

- Distinct differences between sites on and off the Border Route
- Fire frequency likely augmented at *certain places* at *certain times*
- Forest age structure reflects human influences at a landscape scale


“...an area where the earth and community of life are untrammeled by man, where man himself is a visitor who does not remain.”
–Wilderness Act of 1964


Would overstory red pine forests be present in the Border Lakes without frequent fires?

Are **natural ignitions** enough to maintain the wilderness character of the landscape, sustain resilient forests, and mitigate the impacts of climate change?


Heritage Stands

Next Steps

Next Steps

- Expand the spatial perspective
  - Do these patterns hold outside the BWCAW?

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- Refine temporal perspective
  - Date peel trees across the Border Lakes Region

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  - What is the ‘natural’ fire regime?
  - What is wilderness?

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- Advance the conversation
  - What is the ‘natural’ fire regime?
  - What is wilderness?
- We need your help!

Contact Information:

Evan Larson: 608-342-6139
larsonev@uwplatt.edu

Kurt Kipfmueller: 612-625-9668
kurt@umn.edu

Funding provided by the
NSF Geography and Spatial Sciences Program

UNIVERSITY OF WISCONSIN
PLATTEVILLE
TREE-RING, EARTH, AND ENVIRONMENTAL SCIENCES LABORATORY

CENTER FOR DENDROCHRONOLOGY
UNIVERSITY OF MINNESOTA
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2015-2016 Webinar Series
April 21, 2016

Ontario's New Wildland Fire Management Strategy: First Year of Appropriate Response Implementation

Dave Heaman
Fire Science and Planning Specialist
Ontario Ministry of Natural Resources