Managing fire in Sierra Nevada mixed-conifer forests

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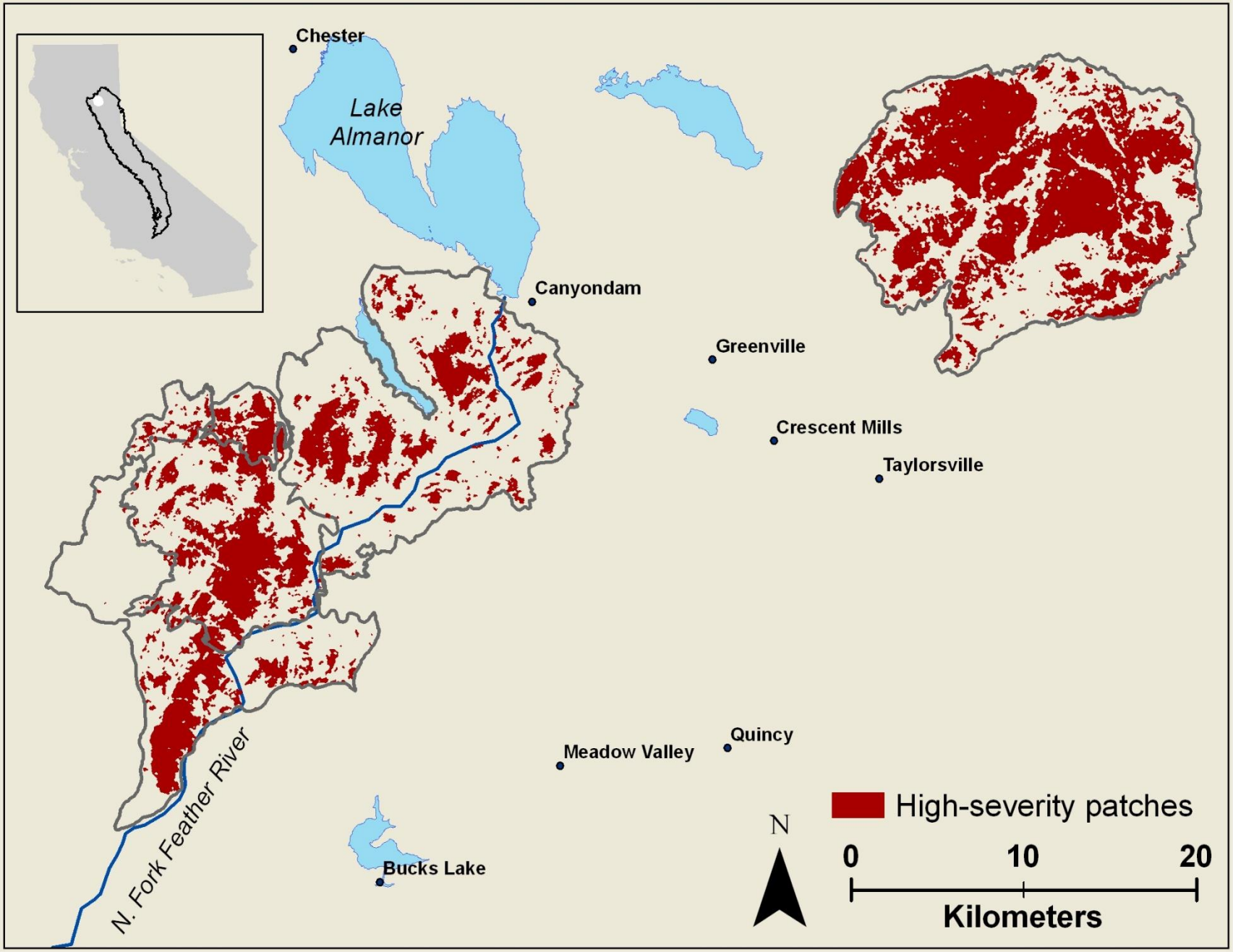
Outline:

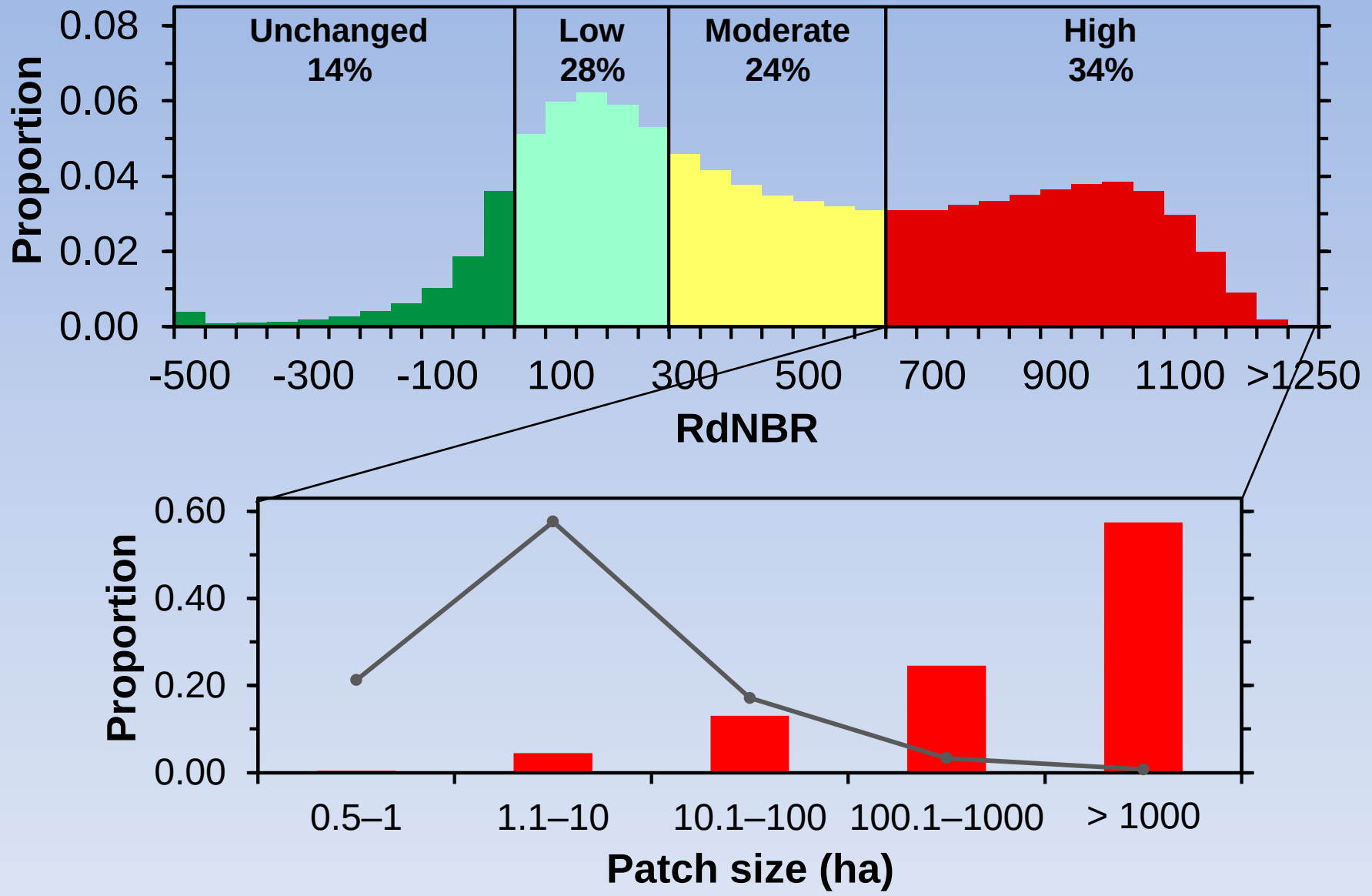
1. Contemporary fire patterns
2. Factors driving contemporary fire patterns

3. Strategies for mitigating fire effects across landscapes

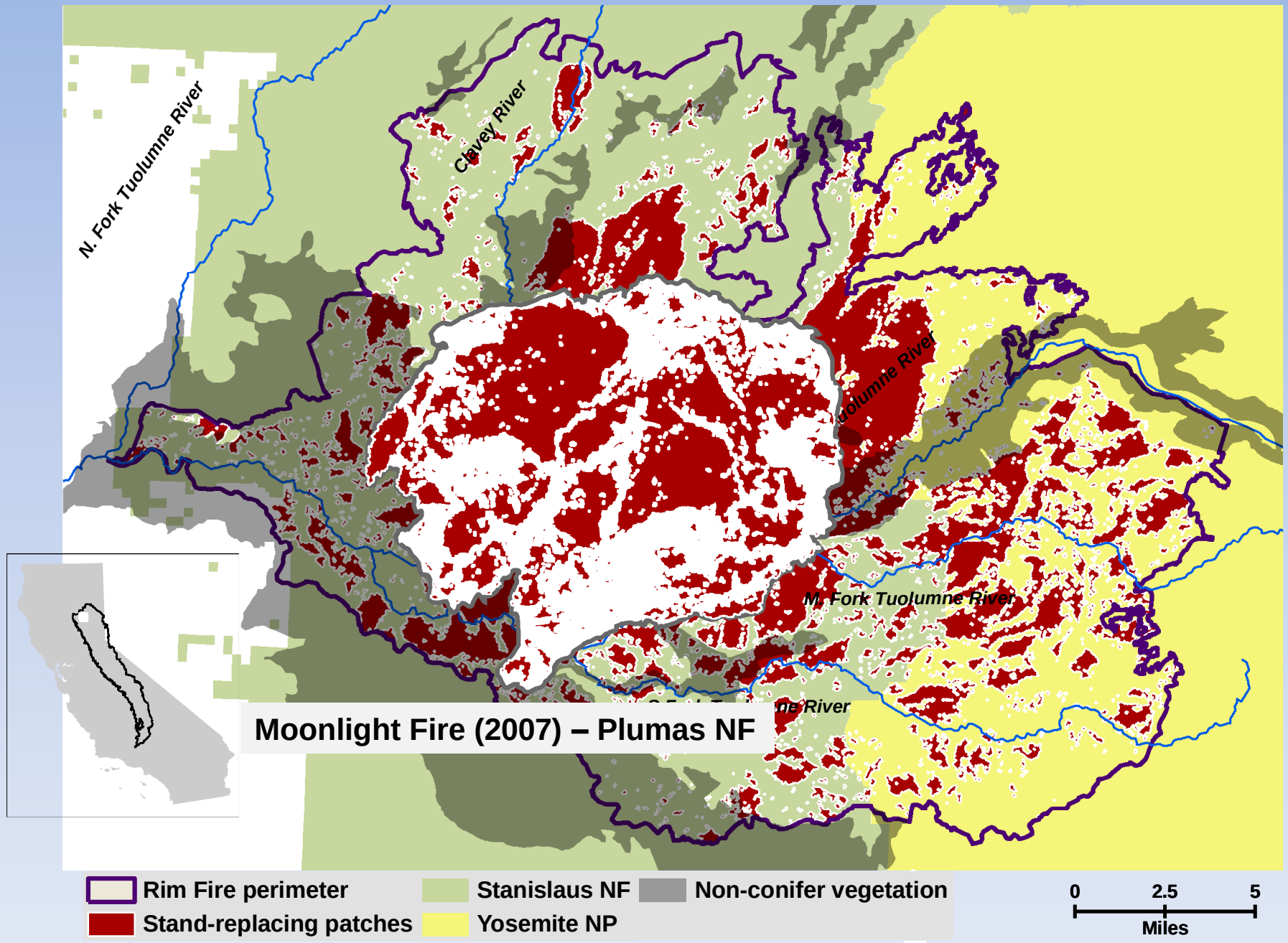
1. Contemporary fire patterns



Fire severity in large N. Sierra fires

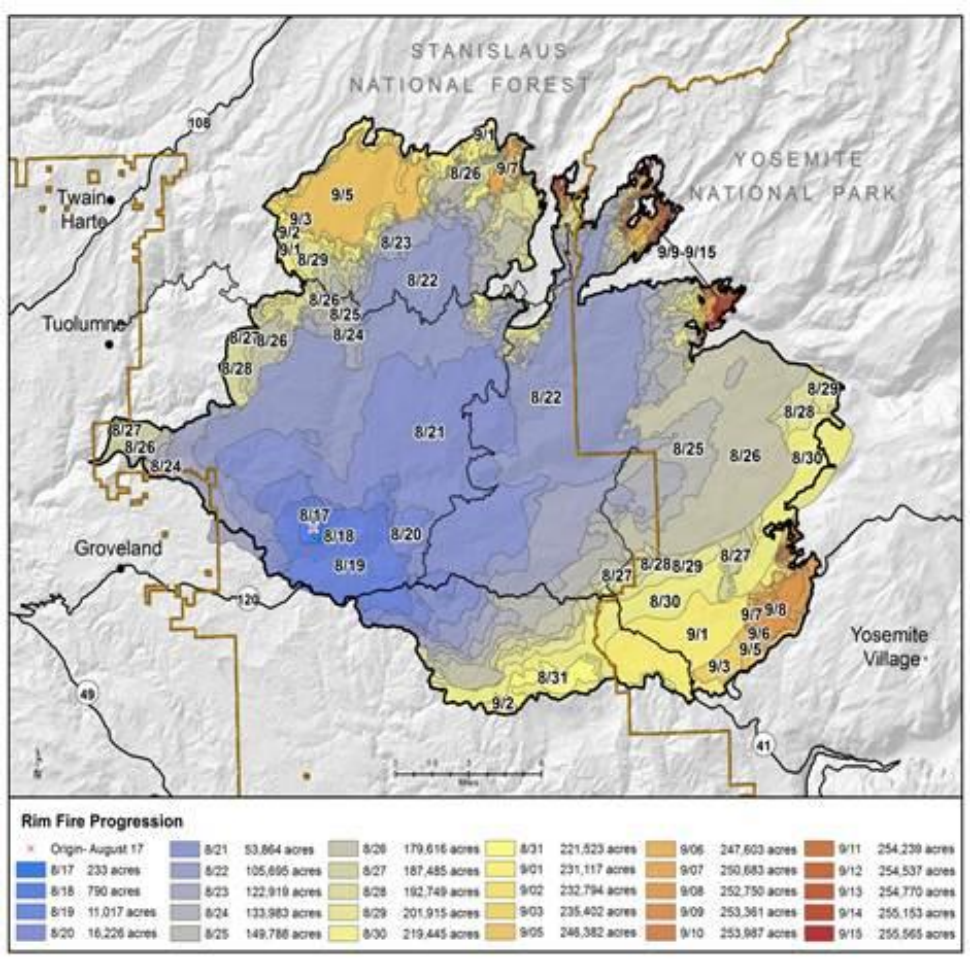


Rim fire stand-replacing patches

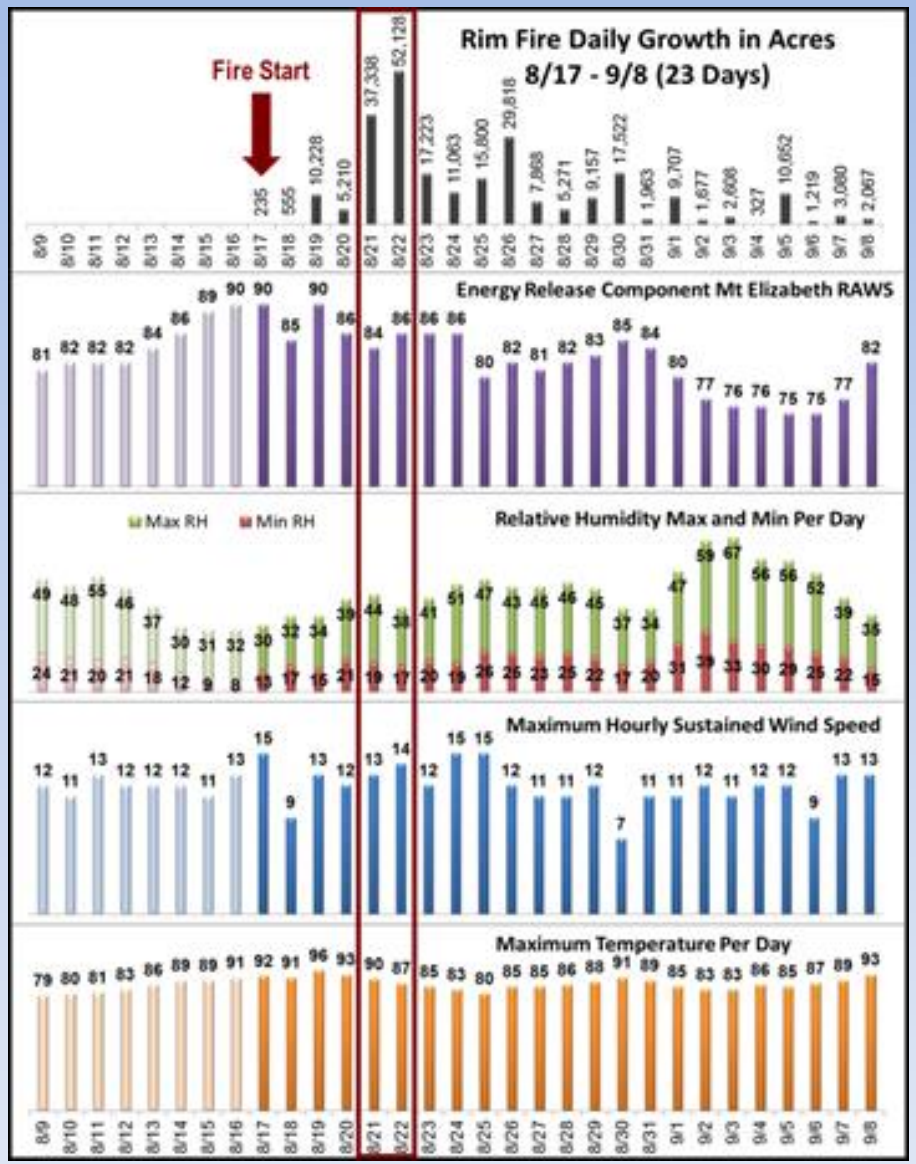


Extreme fire growth in the Rim Fire

Progression map



Observed weather



Rim Fire plume

Field plot within Rim Fire

Pre-fire (15-Jul-2013)

Post-fire (25-Sep-2013)

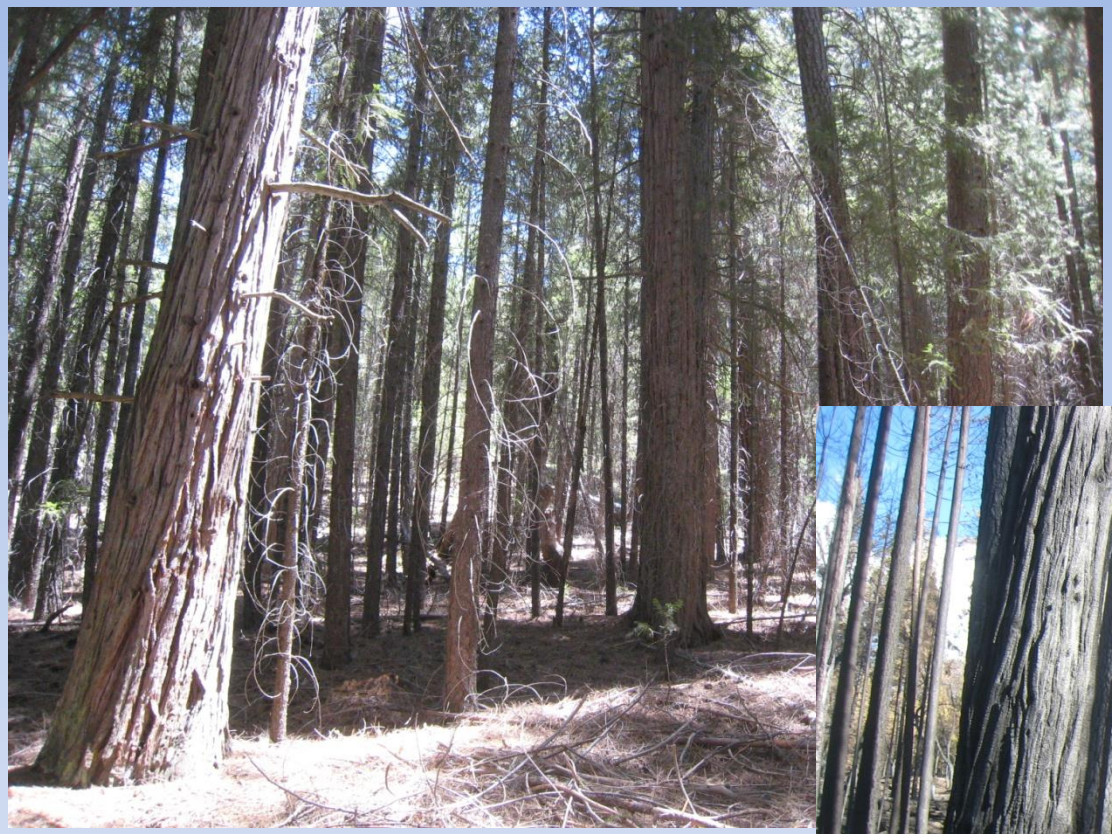
Field plot within Rim Fire

Pre-fire (15-Jul-2013)

Post-fire (25-Sep-2013)

Field plot within Rim Fire

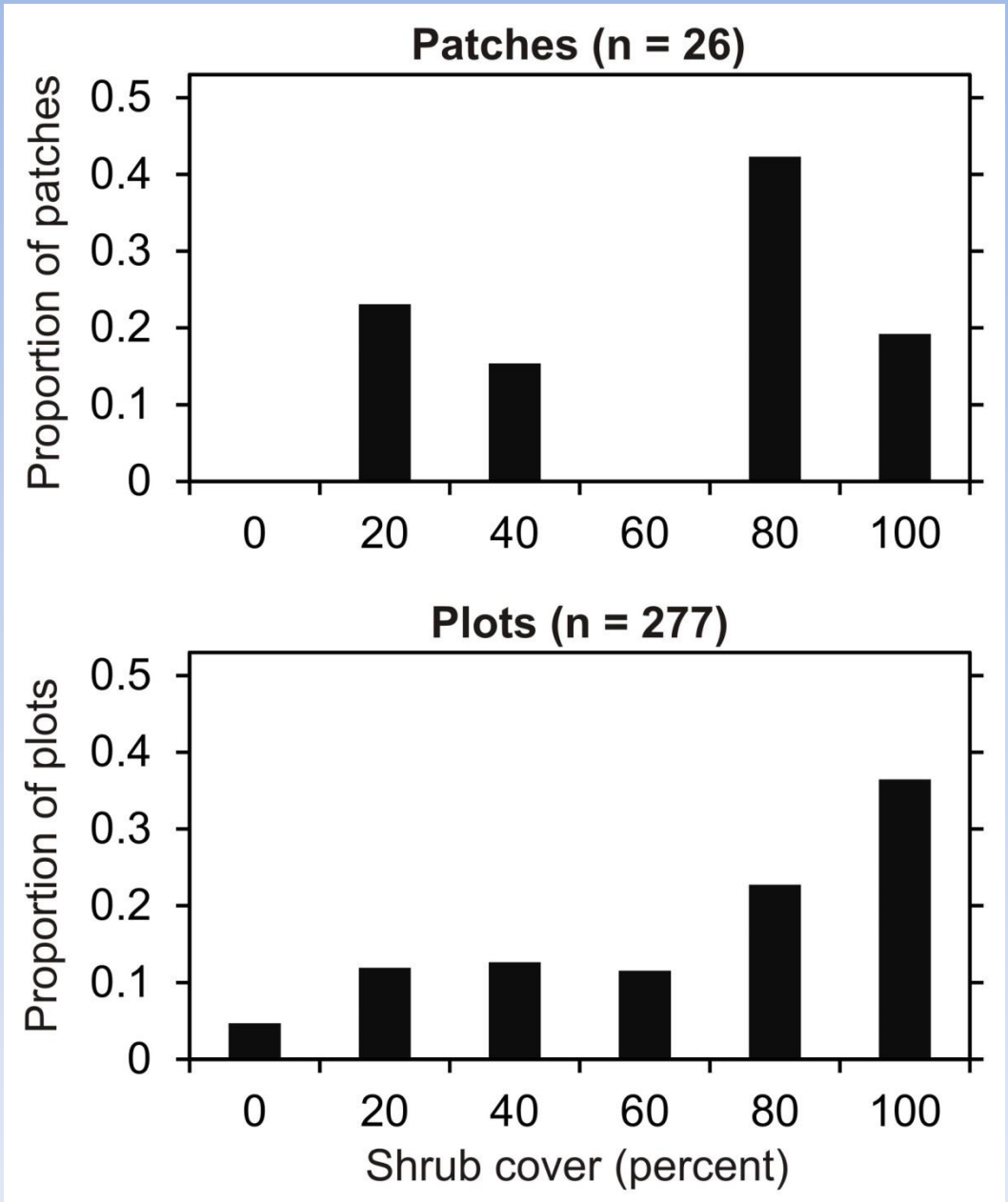
Pre-fire (15-Jul-2013)



Post-fire (25-Sep-2013)

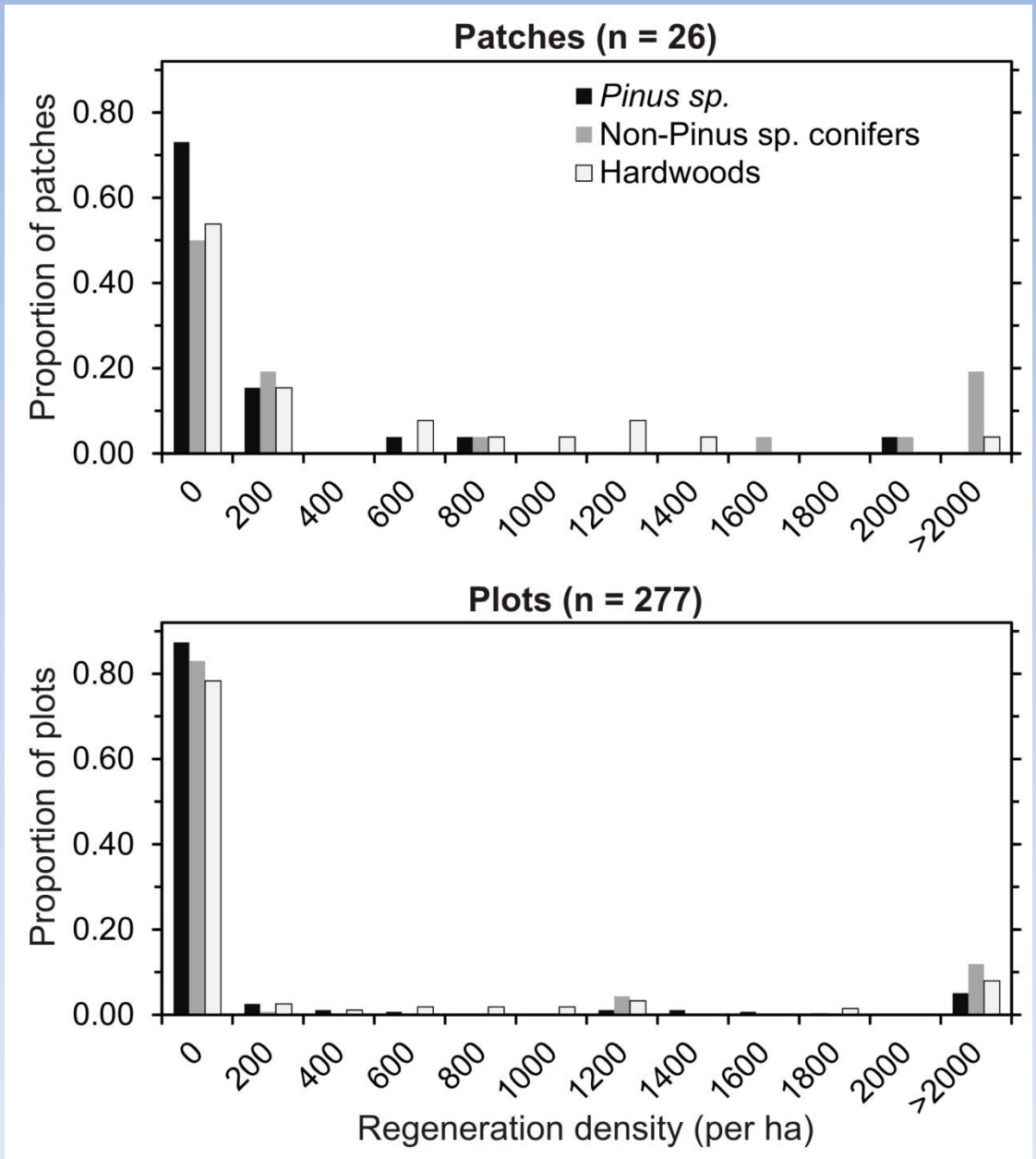
Stand-replacing patch, Lookout Fire (1999) – Taken in 2010

Shrub cover in 2010:
Five Plumas NF fires from 1999-2008



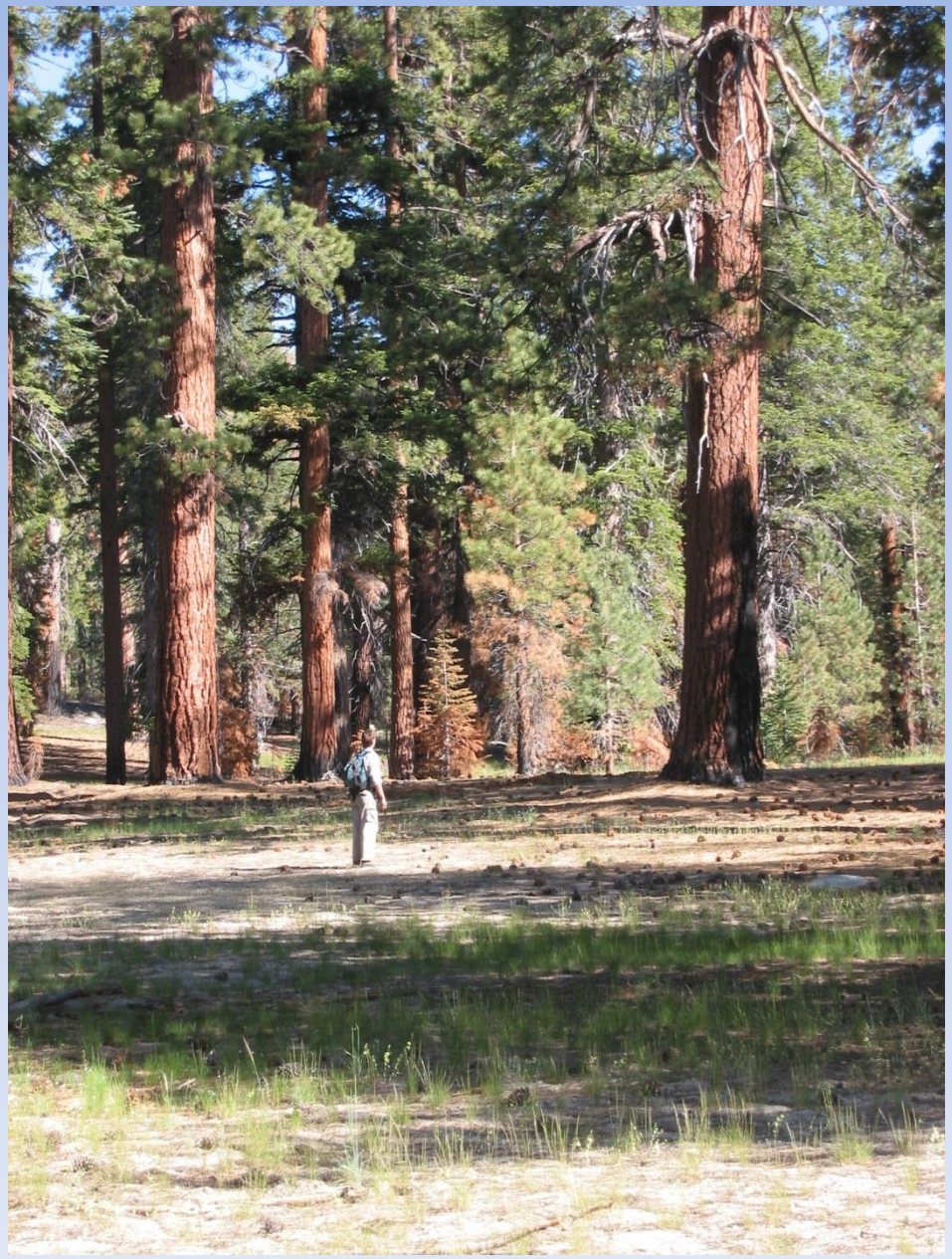
Collins and Roller, 2013
Landsc. Ecol.

Tree regeneration in 2010:
Five Plumas NF fires from 1999-2008



Collins and Roller, 2013
Landsc. Ecol.

2. Factors driving fire patterns: forest change



Form 321 a. ✓

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOREST SERVICE.

"Forty" Estimate Sheet.

Slope SW

Tp. 1 S, R. 20 E, MD M. Sec. 19, Forty 3 NE¼ NW Course Due N

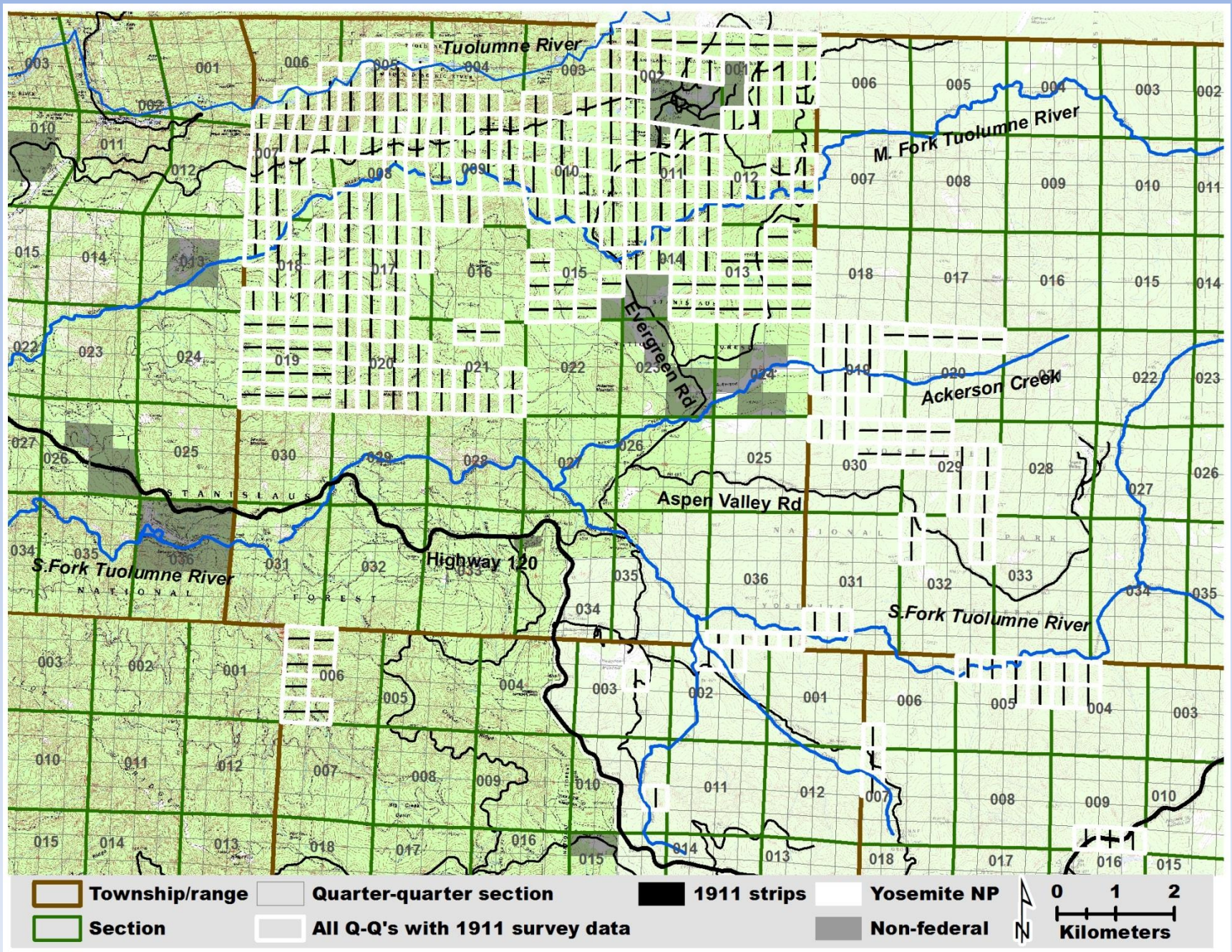
Examiners { Estimator E H Coulson
Compassman J R Beatty

Sheet Number 243 Series, Date 7-8, 1911

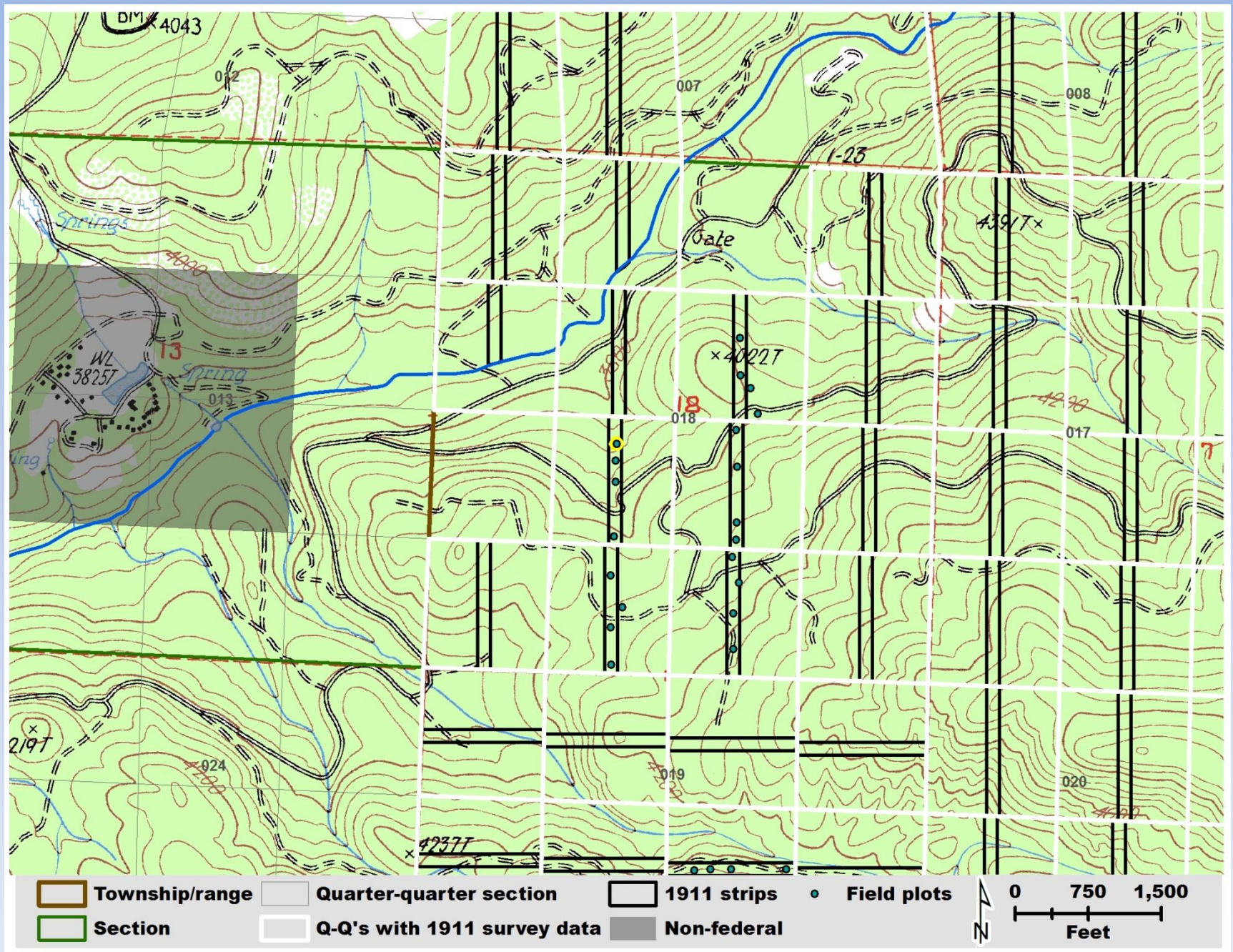
D. B. H.	YP Species				SP Species				WF Species				IC Species				Miscellaneous Green; Dead (All Species)			
INS.	1	2 Number	3 of logs	4	1	2 Number	3 of logs	4	1	2 Number	3 of logs	4	1	2 Number	3 of logs	4	YP	SP Number	WF of logs	IC
Poles	⊠																Seedlings			
12	∴			✓									∴				15			20
14	∴														✓		Saplings			
16		∴		✓													10			8
18		∴											∴				Dead			
	4	5 Number	6 of logs	7	4	5 Number	6 of logs	7	4	5 Number	6 of logs	7	3	4 Number	5 of logs	6	4	Number	of logs	3
20	∴ ✓	∴ ✓																		
22		∴ ✓																		
24	∴ ✓	∴ ✓											∴ ✓							
26		∴ ✓	∴ ✓																	∴
28			∴ ✓	∴ ✓													∴			
30			∴ ✓	∴ ✓													6 log			
32			∴ ✓										∴ ✓							
34			∴ ✓	∴ ✓									∴ ✓				∴			
36			∴	∴ ✓									∴ ✓	∴ ✓						
38				∴ ✓										∴ ✓						
	6	7 Number	8 of logs	9	6	7 Number	8 of logs	9	6	7 Number	8 of logs	9	5	6 Number	7 of logs	8	8	Number	of logs	
40			∴ ✓																	
42				∴ ✓																
44							∴ ✓													
46																				
48																				
50	∴			∴ ✓																
52				∴ ✓																

8—1198

Full extent of 1911 data – Stanislaus NF, YNP



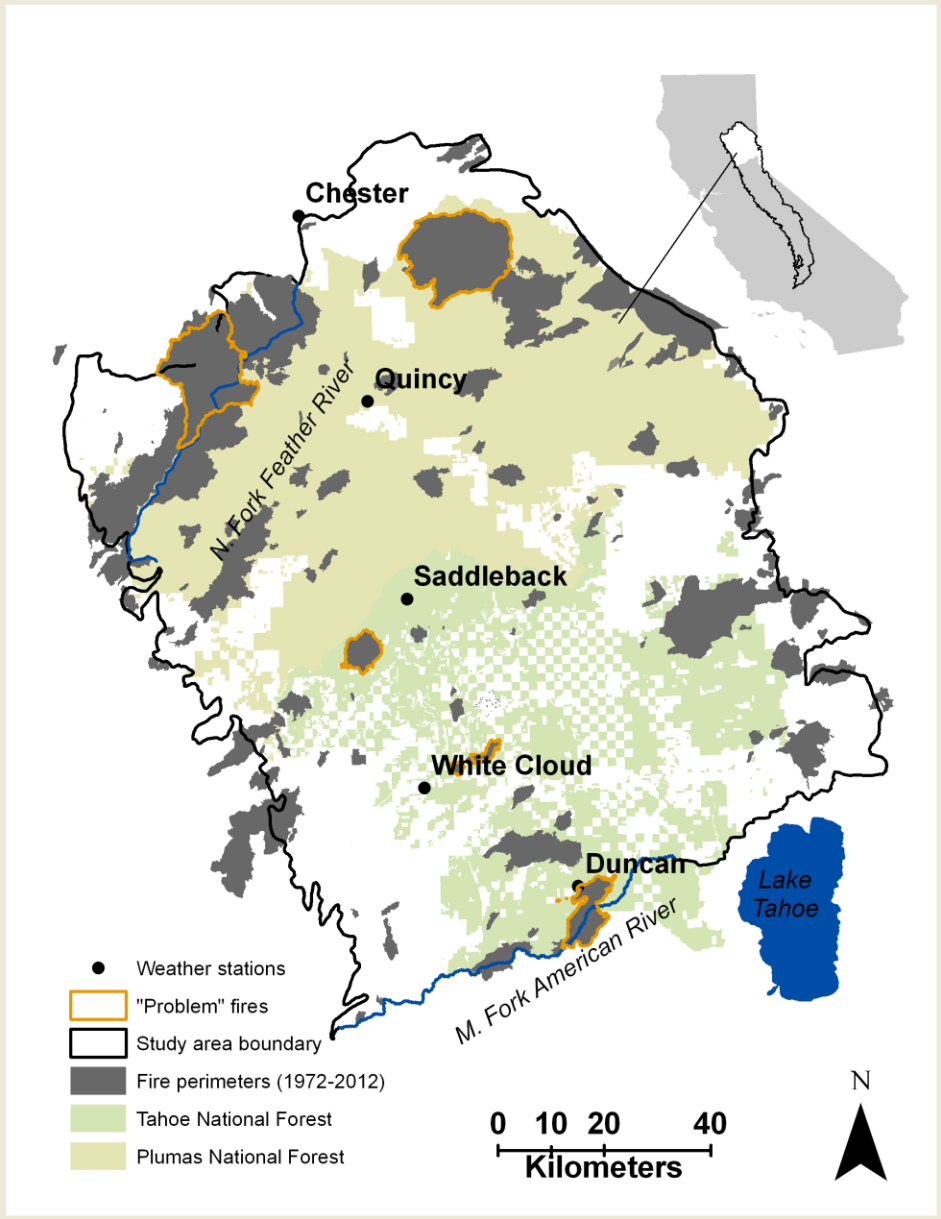
Re-measure of 1911 timber survey strips



Historical vs. current stand conditions: re-measurement of 1911 timber surveys

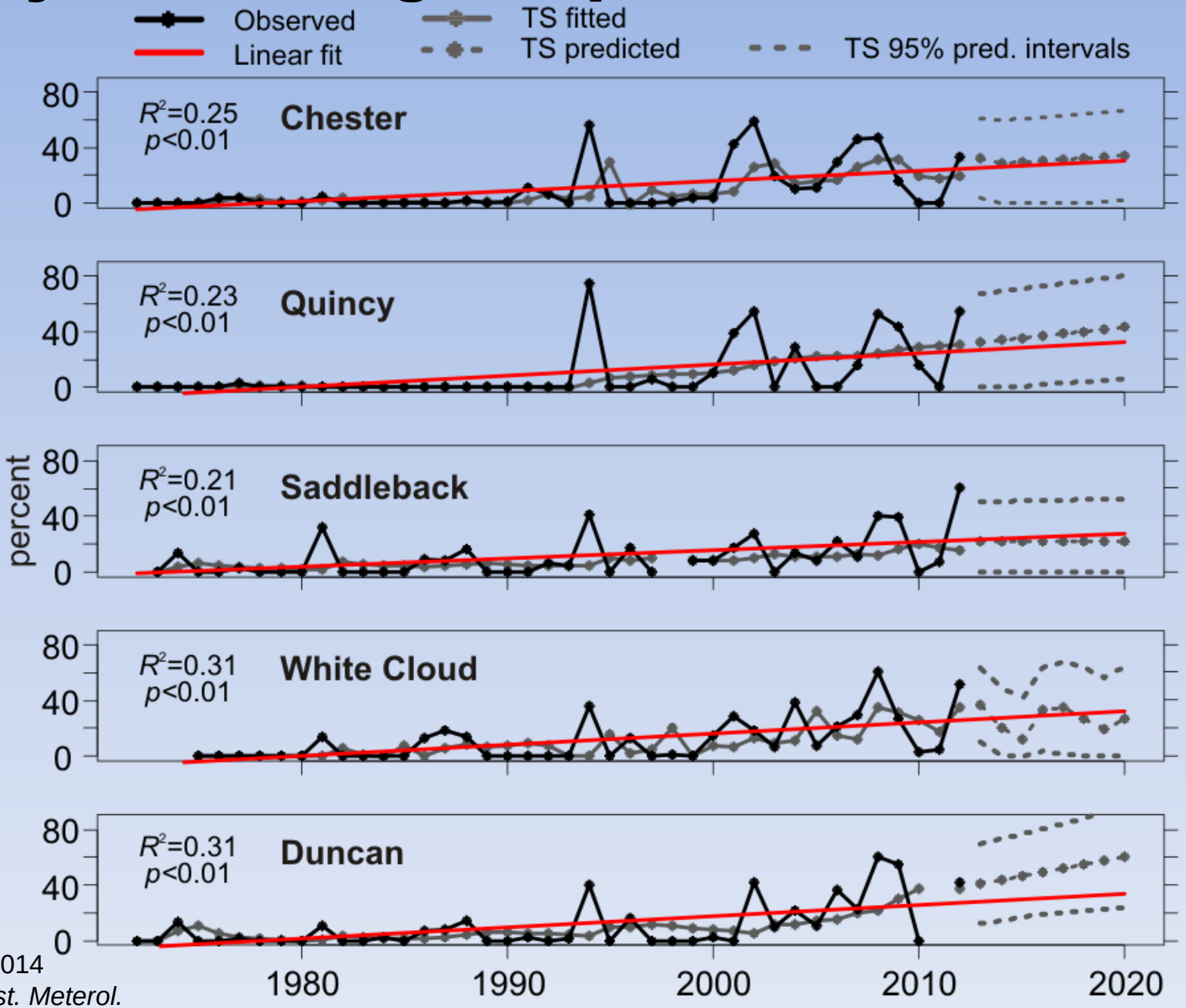
Year	Total basal area ($ft^2\ ac^{-1}$)	Number of trees > 6" (ac^{-1})	Shrubs (% cover)
1911	70	19	65 (ARPA, CEIN, QUCH, CHFO)
2013	248	225	30

2. Factors driving con't: Fire weather

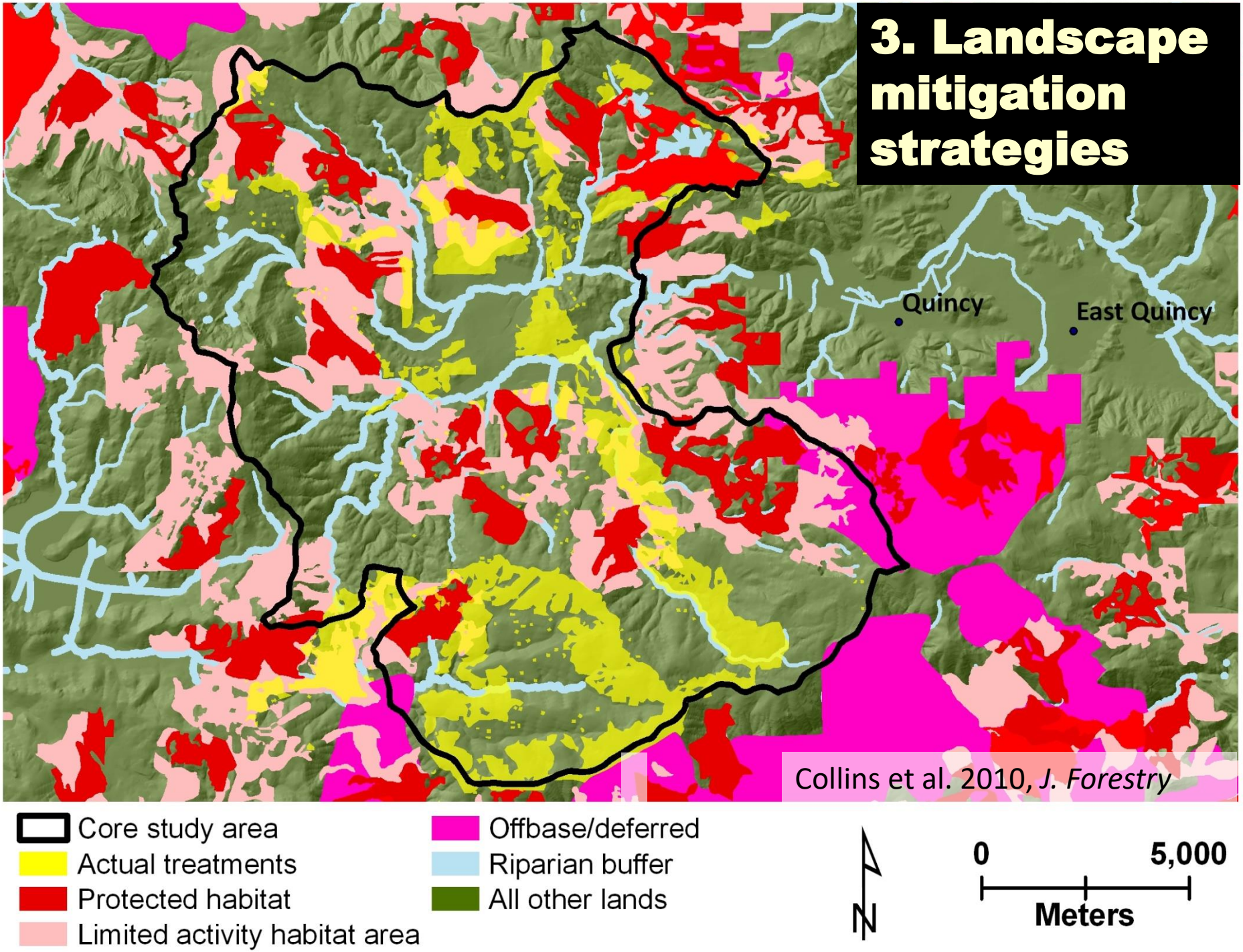


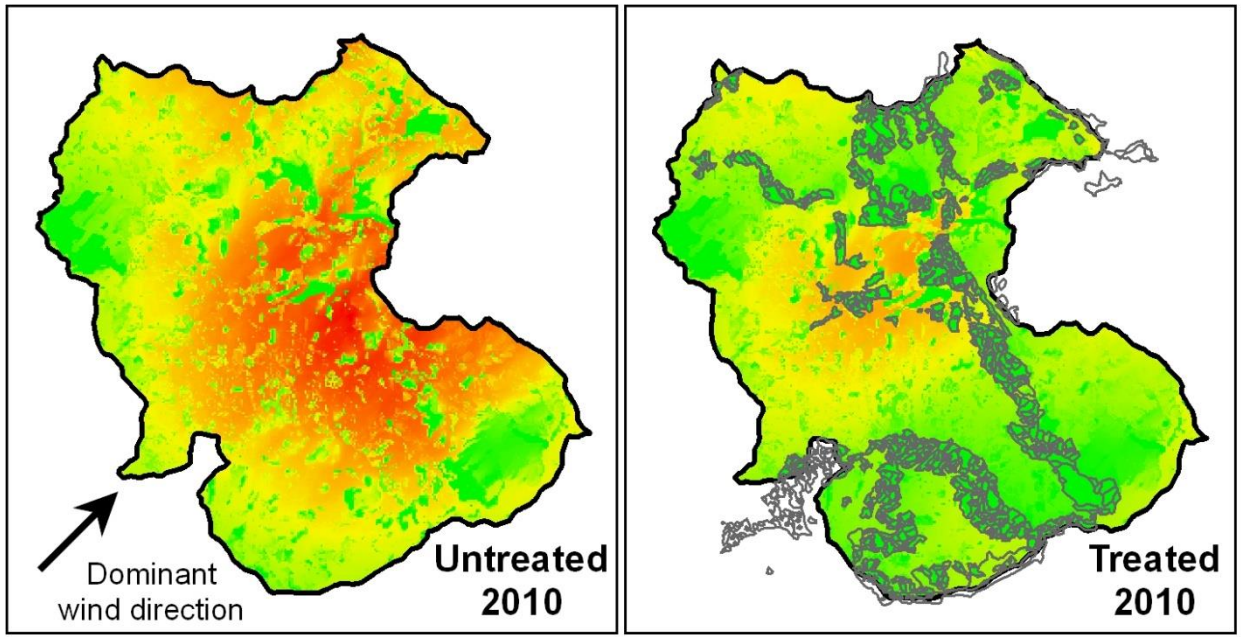
Collins, 2014
Ag. Forest. Meterol.

Days exceeding 90th percentile ERC values



Collins, 2014
Ag. Forest. Meterol.


3. Landscape mitigation strategies
Quincy
East Quincy
Collins et al. 2010, *J. Forestry*
Core study area
Actual treatments
Protected habitat
Limited activity habitat area
Offbase/deferred
Riparian buffer
All other lands
N
0
5,000
Meters



Conditional burn probability
High : 0.16
Low : 0

Fuel treatment network
Core study area

0 5,000 10,000
Meters

N

Collins et al., 2013 *For. Ecol. Manage.*

Landscape restoration strategy in mixed-conifer forests : incorporate heterogeneity

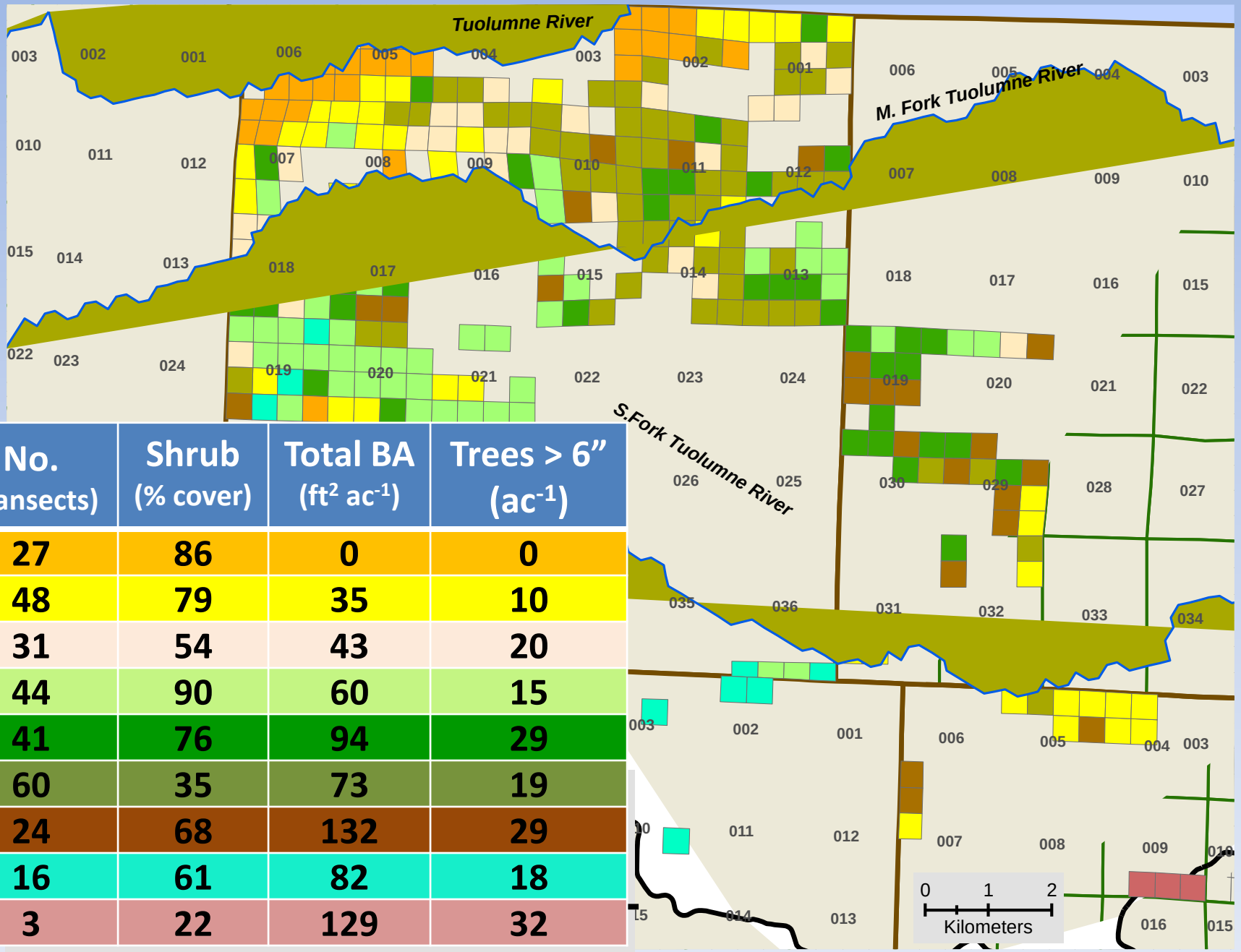
- Historically open, patchy stands likely did not occur *ubiquitously*
- Evidence of small proportions of stand-replacing fire (5-15%)

TOPOGRAPHY was likely a driver:

Show and Kotok (1924):

> "…no large fires occur without a certain amount of heat-killing"
>
> "This loss, it should be noted, represents the complete or nearly complete wiping out of small patches of the stand rather than a uniformly distributed loss over the entire area"

1911 forest type groups – Stan. NF, Yose. NP



No. (transects)	Shrub (% cover)	Total BA ($ft^2\ ac^{-1}$)	Trees > 6" (ac^{-1})
27	86	0	0
48	79	35	10
31	54	43	20
44	90	60	15
41	76	94	29
60	35	73	19
24	68	132	29
16	61	82	18
3	22	129	32

Forest management implications:

- **Current forests are substantially altered from historical conditions**
  - **Stand- and landscape-scale**
- **Contemporary stand-replacing fire is outside historical range of variability, and likely increasing**
  - **Not only proportions, patch sizes as well**
- **Landscape-scale restoration strategies are needed**
  - **Strategic treatments AND matrix area should be addressed**
  - **Cannot continue to use treatments to STOP fire**
  - **Fire will need to be incorporated**

Acknowledgements:

- **Field work:**
  Eve Gasarch, Chris Caruso, Gary Roller, Jon Dvorak, Bridget Tracy, Keith Arnold, Carmen Tubbesing, Sasha Berkowitz

- **Data Analysis:**
  Jim Baldwin

- **Funding:**

Pacific West Region & Pacific Southwest Research Station