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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Fine scale assessment of cross boundary wildfire events in the Western US" *by* Palaiologos Palaiologou et al.

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The manuscript entitled "Fine scale assessment of cross boundary wildfire events in the Western US" aims to analyze cross-boundary wildfire exchange among major land tenures on public and private lands in western US by using fire simulation modeling. The authors also evaluated how ignition types and land tenure characteristics affect wildfire transmission and exposure patterns, and estimated wildfire exposure in terms of incoming or self-burning fires at the community level. Overall, the work is interesting and the subject addressed in this manuscript is worthy of investigation. The manuscript provides an interesting methodology to inform wildfire risk assessment and to prioritize fuel management in areas at high-risk. The manuscript is well written and clear. Methods and results are adequately described and presented, and the discus-

sion and conclusions are justified by the data presented. A few points should be better addressed or improved by the authors and can improve the quality of the manuscript.

I recommend a minor revision before publication.

Reply: Many thanks for the comments. We have revised the manuscript carefully to address all your comments/suggestions. Please check the file named "NHESS_ALL_LANDS_Revised_track_changes.pdf" to see the edits with track changes, and the "NHESS_ALL_LANDS_Revised_no_track.docx" to see the clean version of the manuscript.

Specific Comments

Pag. 2 – L3-4 (and others): Please order the references following chronological and alphabetical order

Reply: Corrected throughout the manuscript. References have been listed alphabetically at the end of the manuscript under the first author's name. In-text citations were ordered chronologically and for the cases of same year, alphabetically.

Pag. 2 – L26: I suggest replacing "to predict future levels" with "to analyze" Reply: Corrected as suggested by the reviewer.

Pag. 3 – L22: Please define the meaning of "fire regimes 1 and 3"

Reply: We rephrased the sentence as "Approximately 115 million ha are fire adapted with low and mixed severity fires, as defined by fire regimes 1 ($\leq$35-year fire return interval) and 3 (>35 - 200 year fire return interval)..."

Pag. 4 – L9-11: Even if the FSim modeling approach proposed in this work was covered in previous works, I recommend to provide more information (e.g.: resolution of input and output data; settings of the simulated spot fires; etc.)

Reply: We edited the whole section to provide more information on FSim fire behavior modelling, including details on the evaluation process, resolution, and crown/spotting.

Pag. 6 – L5: Please replace “define” with “defines”

Reply: Corrected as suggested by the reviewer.

Pag. 11 – L27: Please add space between “2012)” and “Human”

Reply: Corrected as suggested by the reviewer.

Pag. 12 – L13: Do the author mean “extent”?

Reply: Corrected to “extent”.

Pag. 14 – L12: Do the authors mean “fuel model”?

Reply: Corrected to “fuel model”.

Figure 2b: In the upper graph, please modify the y-axis adopting the same scale (0-300) used in Figure 2a.

Reply: Corrected as suggested by the reviewer.

Figure 3: Please specify the acronyms of the land tenures in the Figure legend. In addition, make uniform the size of the graphs (for example, OR graph is larger than WA graph size), so that the graph size will not be different depending on the State

Reply: Acronyms were added, and graph size has been standardized across all states.

Figure 4: Please replace “By” with “by”

Reply: Rephrased as: “(a) Average percentage of incoming fire across the western US; (b) by state, calculated for its entire area and for all land tenures; (c) by land tenure, across all the 11 western US states.”

Figure 5: The color used for National Forests (grey) is too light and does not help readers: please use a darker grey.

Reply: Corrected.

Figure 6: In the x-axis, please use thousand ha, rather than ha

Reply: Corrected.

Figure 7: Again, the grey is too light. Moreover, please replace “to show” with “show”

Reply: Corrected.

Figure 8: Please specify the acronyms of the land tenures in the Figure legend.

Reply: Acronyms were added as suggested by the reviewer.

Figure 9c: Considering that the percentage area covered by slash/burn seems very limited, the authors could remove it from both Figure and legend.

Reply: We removed the fuel model class “slash/burn” as suggested by the reviewer.

Table 1: Please explicit the full name of each land tenure, before or after the acronym

Reply: We added the full names of each land tenure before each acronym.

Table B1: This supplementary table is not mentioned in the text.

Reply: It was mentioned on Page 3, Line 23, in the part where we explain the extent of fire adapted lands, mentioning that the differences among States and land tenures can be found in Table B1.

Table B2: Please consider to replace “0” with “N/A.”, as you did in Table B1

Reply: Zeros were replaced with “n/a” as suggested by the reviewer.

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-56/nhess-2019-56-AC1-supplement.zip

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2019-56, 2019.

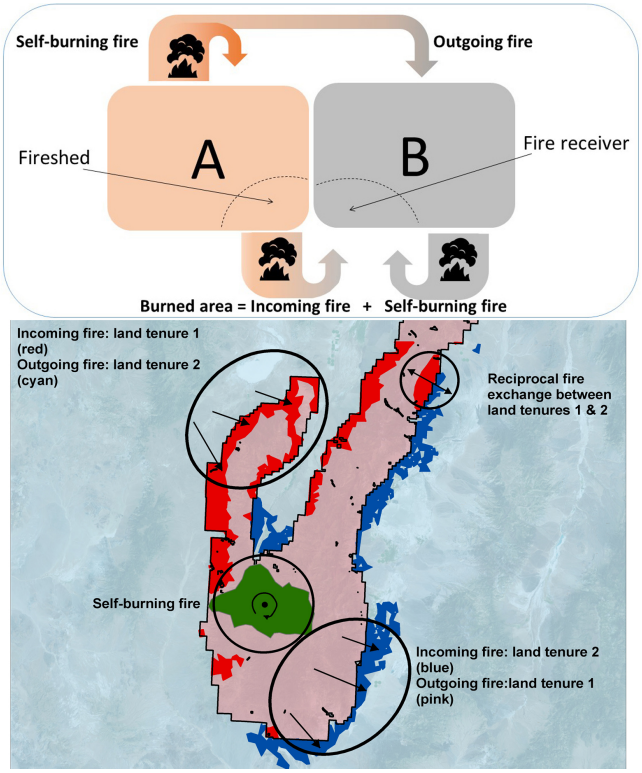
Self-burning fire
Outgoing fire
Fireshed
A
B
Fire receiver
Burned area = Incoming fire + Self-burning fire
Incoming fire: land tenure 1 (red)
Outgoing fire: land tenure 2 (cyan)
Reciprocal fire exchange between land tenures 1 & 2
Self-burning fire
Incoming fire: land tenure 2 (blue)
Outgoing fire:land tenure 1 (pink)

Fig. 1.

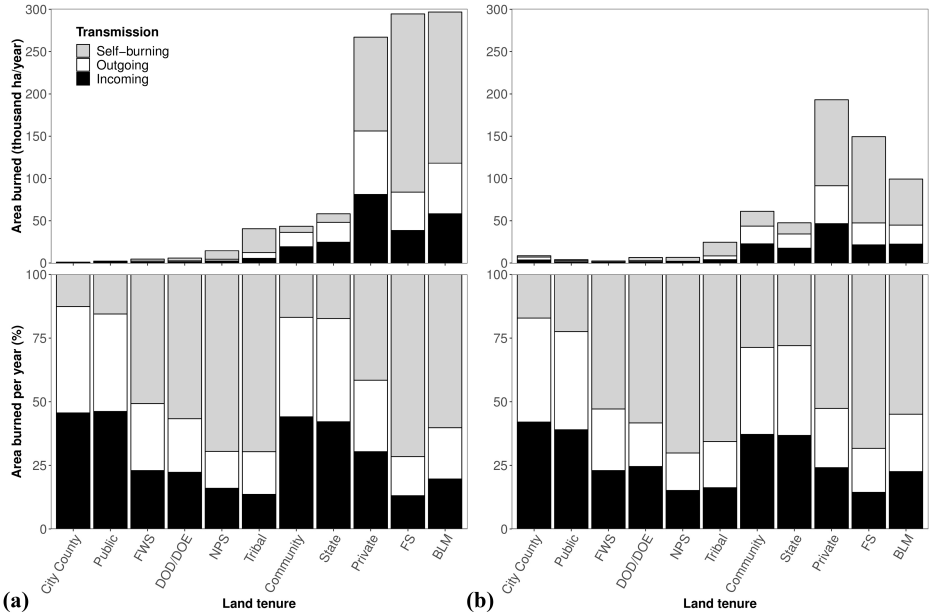
Transmission
Self–burning
Outgoing
Incoming
Area burned (thousand ha/year)
Area burned per year (%)
City County
Public
FWS
DOD/DOE
NPS
Tribal
Community
State
Private
FS
BLM
Land tenure
(a)
(b)

Fig. 2.

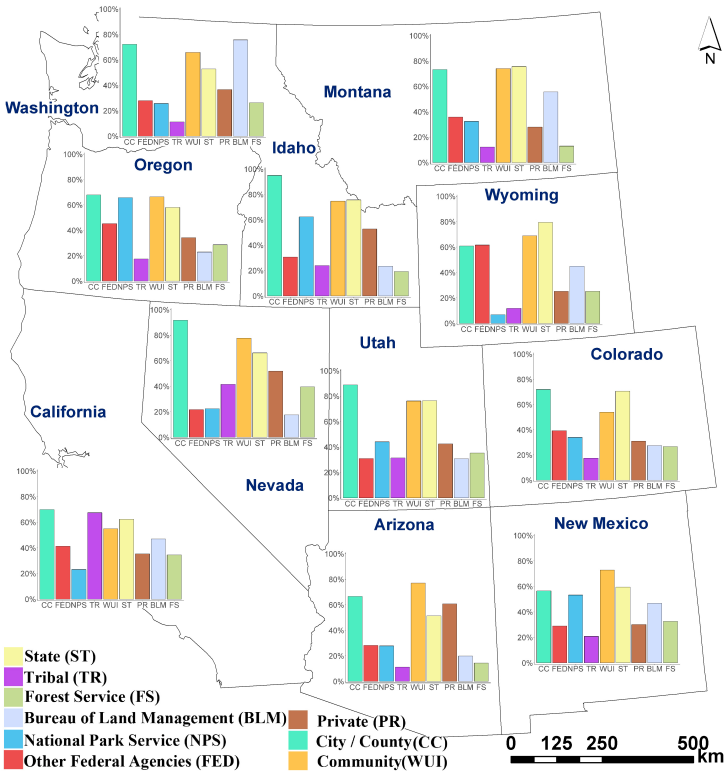
Washington
Oregon
California
Idaho
Nevada
Montana
Wyoming
Utah
Arizona
Colorado
New Mexico
CC FEDNPS TR WUI ST PR BLM FS
State (ST)
Tribal (TR)
Forest Service (FS)
Bureau of Land Management (BLM)
National Park Service (NPS)
Other Federal Agencies (FED)
Private (PR)
City / County(CC)
Community(WUI)
0 125 250 500
km
N

Fig. 3.

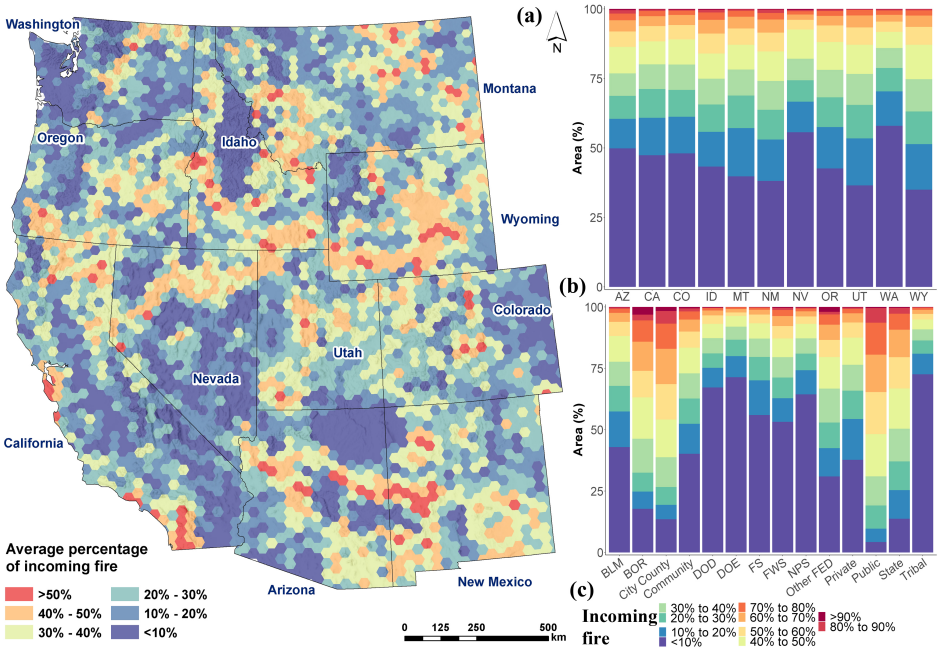
(a)
(b)
(c)
Washington
Oregon
California
Idaho
Nevada
Montana
Wyoming
Utah
Arizona
Colorado
New Mexico
Average percentage of incoming fire
>50%
40% - 50%
30% - 40%
20% - 30%
10% - 20%
<10%
0 125 250 500
km
Area (%)
AZ CA CO ID MT NM NV OR UT WA WY
BLM BOR City County Community DOD DOE FS FWS NPS Other FED Private Public State Tribal
Incoming fire
30% to 40%
20% to 30%
10% to 20%
<10%
70% to 80%
60% to 70%
50% to 60%
40% to 50%
>90%
80% to 90%

Fig. 4.

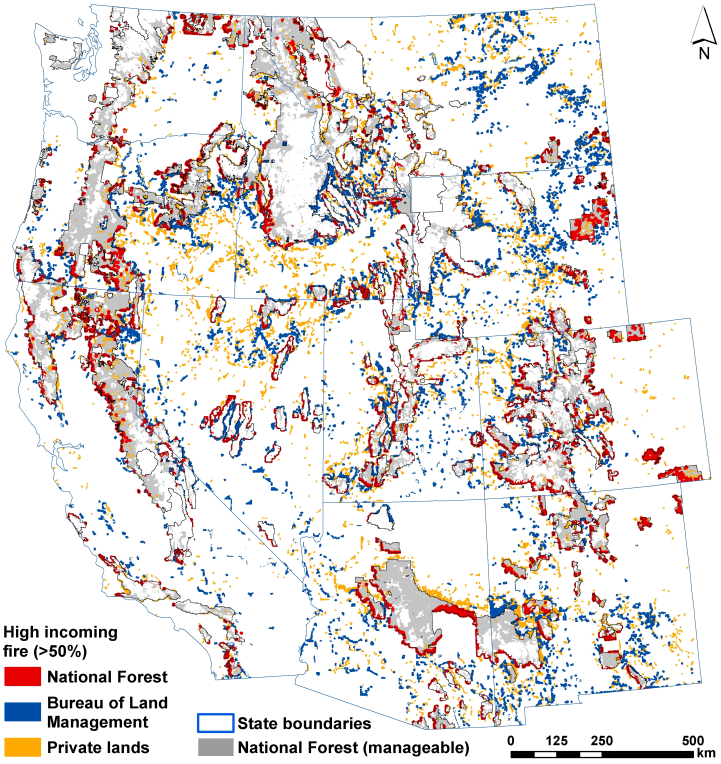
N
High incoming fire (>50%)
National Forest
Bureau of Land Management
Private lands
State boundaries
National Forest (manageable)
0 125 250 500
km

Fig. 5.

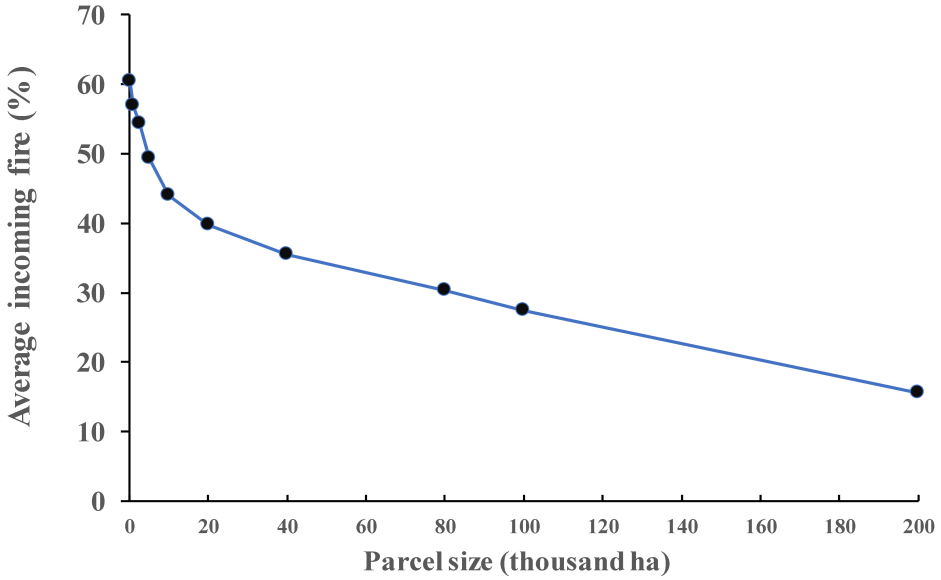
Average incoming fire (%)
0
10
20
30
40
50
60
70
0
20
40
60
80
100
120
140
160
180
200
Parcel size (thousand ha)

Fig. 6.

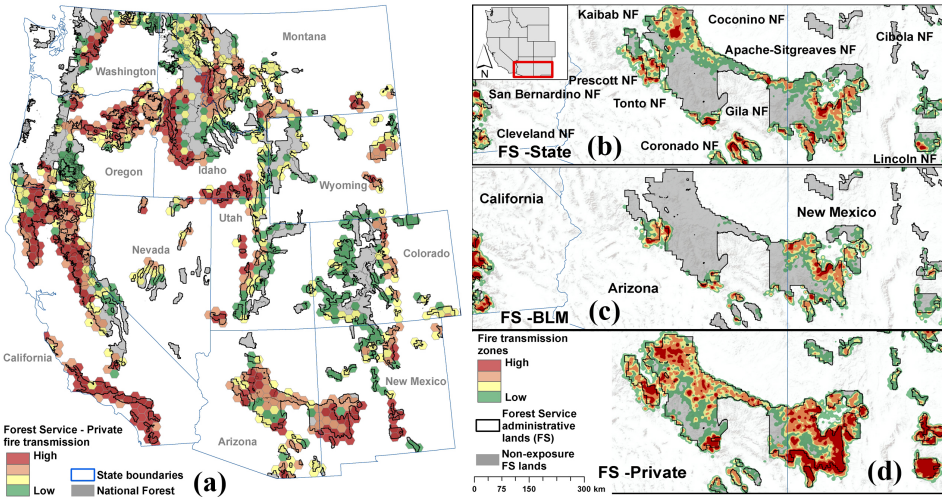
Montana
Washington
Oregon
Idaho
Wyoming
Utah
Nevada
Colorado
California
New Mexico
Arizona
Forest Service - Private fire transmission
High
Low
State boundaries
National Forest
(a)
Kaibab NF
Coconino NF
Cibola NF
Apache-Sitgreaves NF
Prescott NF
San Bernardino NF
Tonto NF
Gila NF
Cleveland NF
FS -State
(b)
Coronado NF
Lincoln NF
California
New Mexico
Arizona
FS -BLM
(c)
Fire transmission zones
High
Low
Forest Service administrative lands (FS)
Non-exposure FS lands
0 75 150 300 km
FS -Private
(d)

Fig. 7.

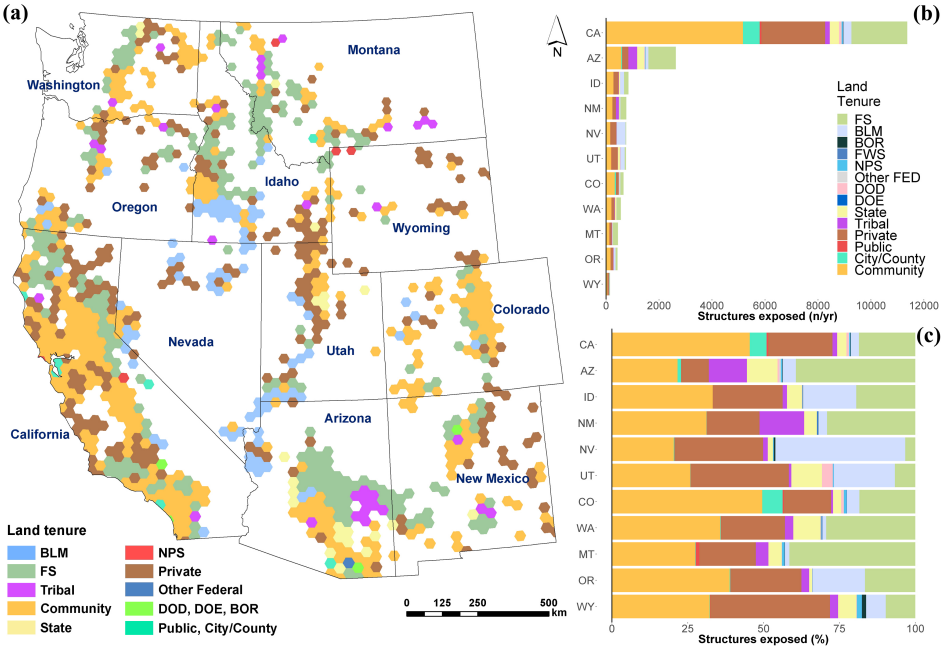
(a)
Montana
Washington
Idaho
Oregon
Wyoming
Colorado
Nevada
Utah
California
Arizona
New Mexico
Land tenure
BLM
FS
Tribal
Community
State
NPS
Private
Other Federal
DOD, DOE, BOR
Public, City/County
0 125 250 500 km
(b)
CA
AZ
ID
NM
NV
UT
CO
WA
MT
OR
WY
Land Tenure
FS
BLM
BOR
FWS
NPS
Other FED
DOD
DOE
State
Tribal
Private
Public
City/County
Community
0 2000 4000 6000 8000 10000 12000
Structures exposed (n/yr)
(c)
0 25 50 75 100
Structures exposed (%)

Fig. 8.

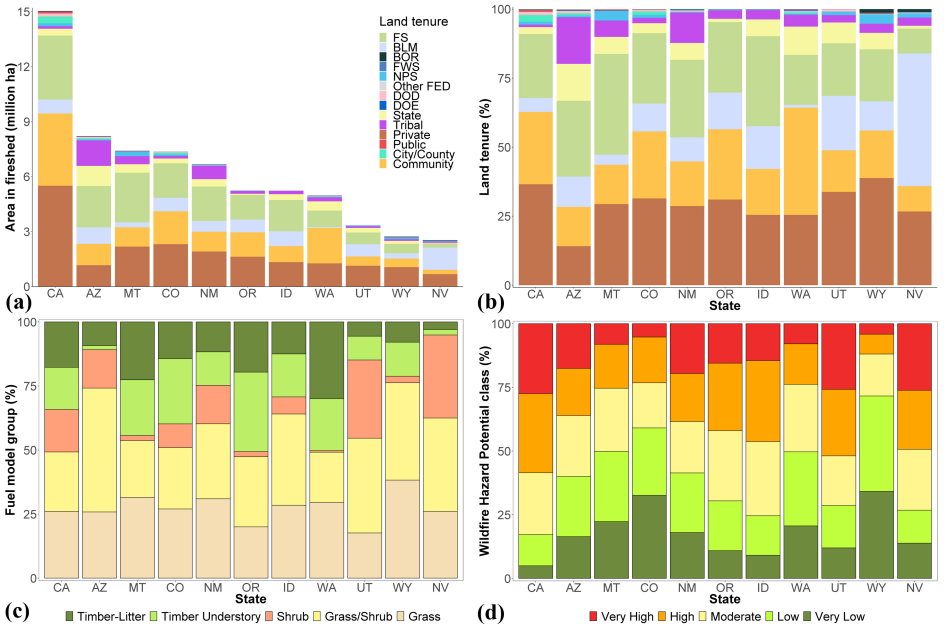
Land tenure
FS
BLM
BOR
FWS
NPS
Other FED
DOD
DOE
State
Tribal
Private
Public
City/County
Community
Area in fireshed (million ha)
Land tenure (%)
Fuel model group (%)
Wildfire Hazard Potential class (%)
CA AZ MT CO NM OR ID WA UT WY NV
State
(a)
(b)
(c)
(d)
Timber-Litter Timber Understory Shrub Grass/Shrub Grass
Very High High Moderate Low Very Low

Fig. 9.

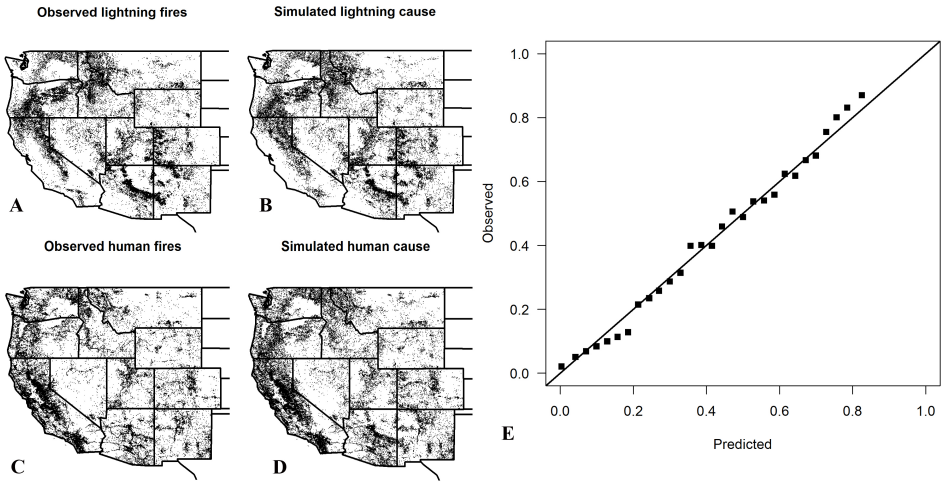
Observed lightning fires
Simulated lightning cause
Observed human fires
Simulated human cause
A
B
C
D
E
Observed
Predicted

Fig. 10.

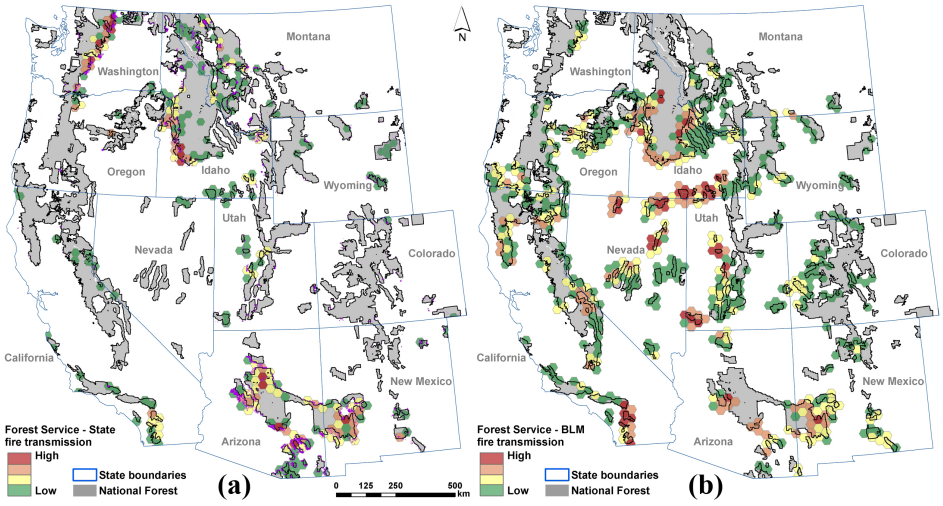
Montana
Washington
Oregon
Idaho
Wyoming
Utah
Nevada
Colorado
California
New Mexico
Arizona
N
Forest Service - State
fire transmission
High
Low
State boundaries
National Forest
(a)
0 125 250 500
km
Forest Service - BLM
fire transmission
High
Low
State boundaries
National Forest
(b)

Fig. 11.

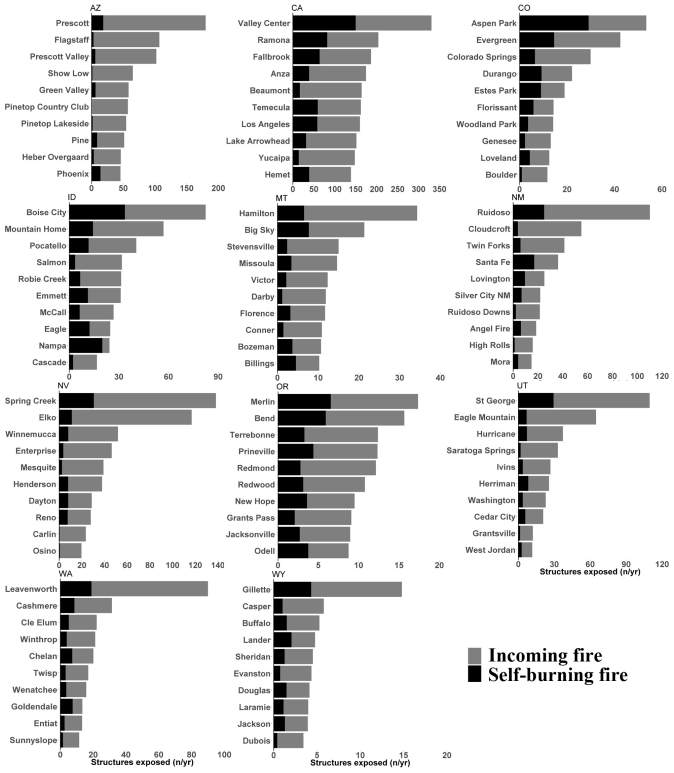
AZ
Prescott
Flagstaff
Prescott Valley
Show Low
Green Valley
Pinetop Country Club
Pinetop Lakeside
Pine
Heber Overgaard
Phoenix
CA
Valley Center
Ramona
Fallbrook
Anza
Beaumont
Temecula
Los Angeles
Lake Arrowhead
Yucaipa
Hemet
CO
Aspen Park
Evergreen
Colorado Springs
Durango
Estes Park
Florissant
Woodland Park
Genesee
Loveland
Boulder
ID
Boise City
Mountain Home
Pocatello
Salmon
Robie Creek
Emmett
McCall
Eagle
Nampa
Cascade
MT
Hamilton
Big Sky
Stevensville
Missoula
Victor
Darby
Florence
Conner
Bozeman
Billings
NM
Ruidoso
Cloudcroft
Twin Forks
Santa Fe
Lovington
Silver City NM
Ruidoso Downs
Angel Fire
High Rolls
Mora
NV
Spring Creek
Elko
Winnemucca
Enterprise
Mesquite
Henderson
Dayton
Reno
Carlin
Osino
OR
Merlin
Bend
Terrebonne
Prineville
Redmond
Redwood
New Hope
Grants Pass
Jacksonville
Odell
UT
St George
Eagle Mountain
Hurricane
Saratoga Springs
Ivins
Herriman
Washington
Cedar City
Grantsville
West Jordan
Structures exposed (n/yr)
WA
Leavenworth
Cashmere
Cle Elum
Winthrop
Chelan
Twisp
Wenatchee
Goldendale
Entiat
Sunnyslope
WY
Gillette
Casper
Buffalo
Lander
Sheridan
Evanston
Douglas
Laramie
Jackson
Dubois
Structures exposed (n/yr)
Incoming fire
Self-burning fire

Fig. 12.