2. Role of Fire in Promoting Invasions by Nonnative Plant Species

Jane Kapler Smith, USDA FS

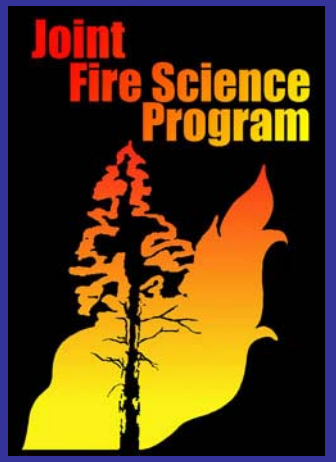
Kris Zouhar, USDA FS

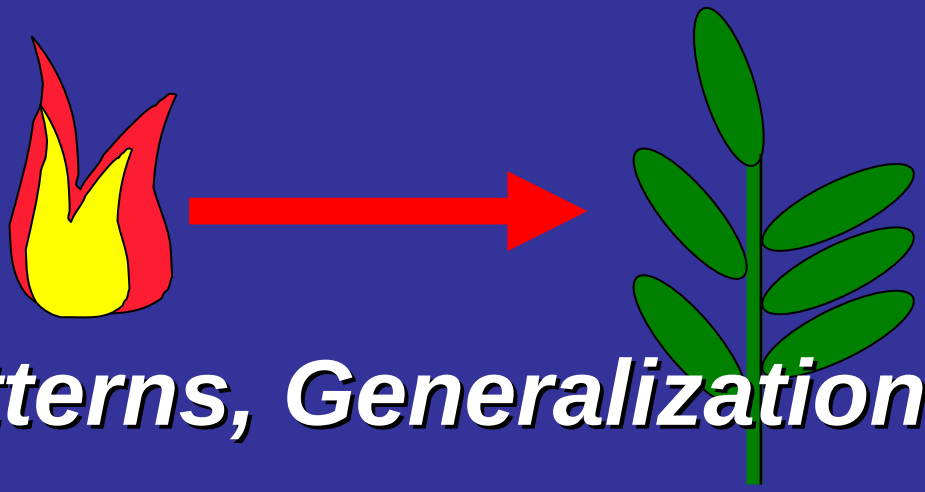
Steve Sutherland, USDA FS

Thank you:

Joint Fire Science Program

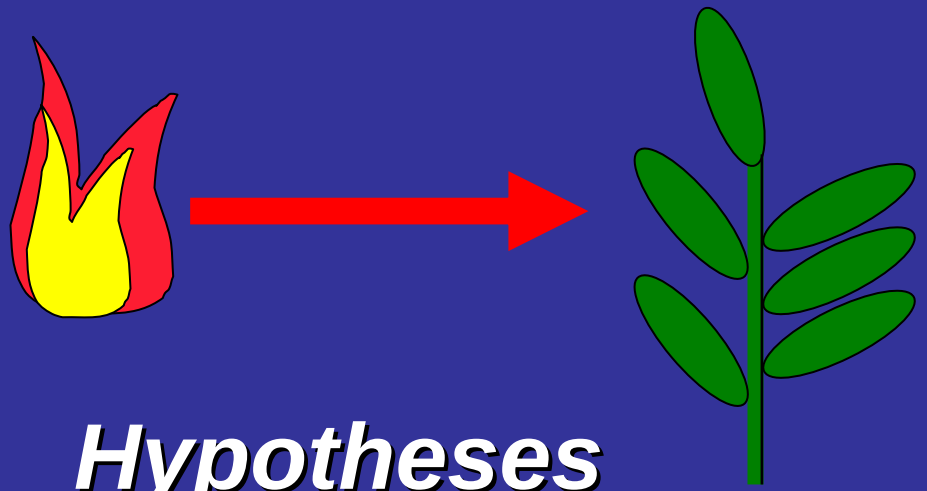
Everyone who's publishing research





Patterns, Generalizations

1. Fire increases invasions
2. Additional disturbances increase invasion rate
3. Invasions become less severe with time after fire
4. Invasions decrease with increasing elevation, latitude



Hypotheses

H1. Fire increases invasions

H2. Additional disturbances increase invasion rate

H3. Invasions become less severe with time after fire

H4. Invasions decrease with increasing elevation, latitude

H1. Fire increases invasions

S. Sutherland, USDA FS

H1. Fire increases invasions

How widespread is this pattern?

Community types in bioregional section	48
No info reported on postfire weed response	8
Postfire weed increases	40
Postfire decreases or no change	20

Why "should" it be so?

Resource availability increases

There's something special about nonnative species

There's something special about nonnative species

H1A. Fire survivors & seed bankers expand after fire

Scotch broom, Barry Rice, TNC

Gorse, Sherry Ballard, CA Acad. of Sciences

There's something special about nonnative species

H1A. Fire survivors & seed bankers expand after fire

Depends on fire severity

South FL Sun Sentinel

Survival & persistence depend on …

~ Heating pattern produced by fire (time, duration)

~ Surface organic material (duff)

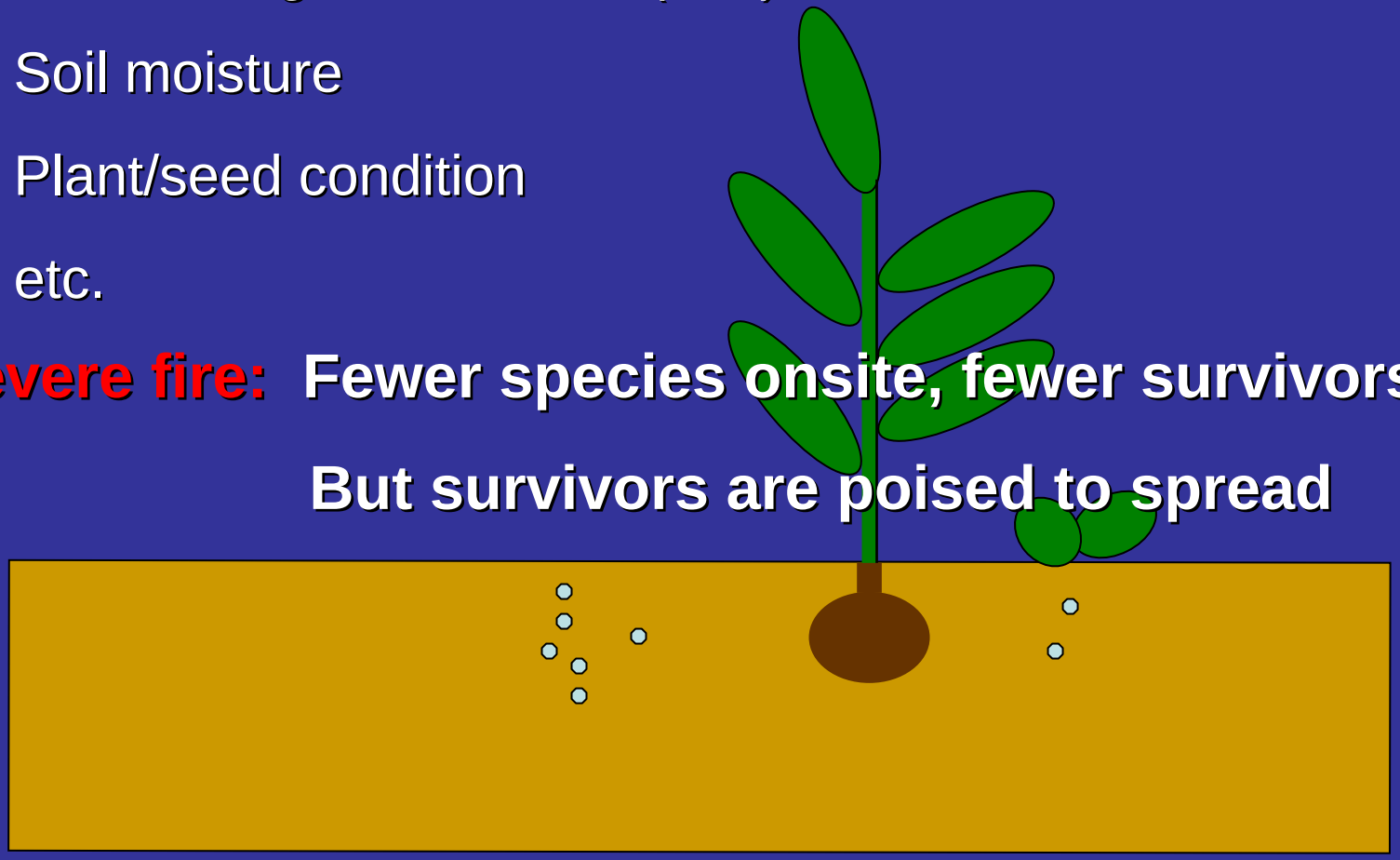
~ Soil moisture

~ Plant/seed condition

~ etc.

More severe fire: **Fewer species onsite, fewer survivors**

But survivors are poised to spread



There’s something special about nonnative species

H1B. Good seed dispersers expand after fire

S. Sutherland, USDA FS

There's something special about nonnative species

H1B. Good seed dispersers expand after fire

Varies with uniformity of burn

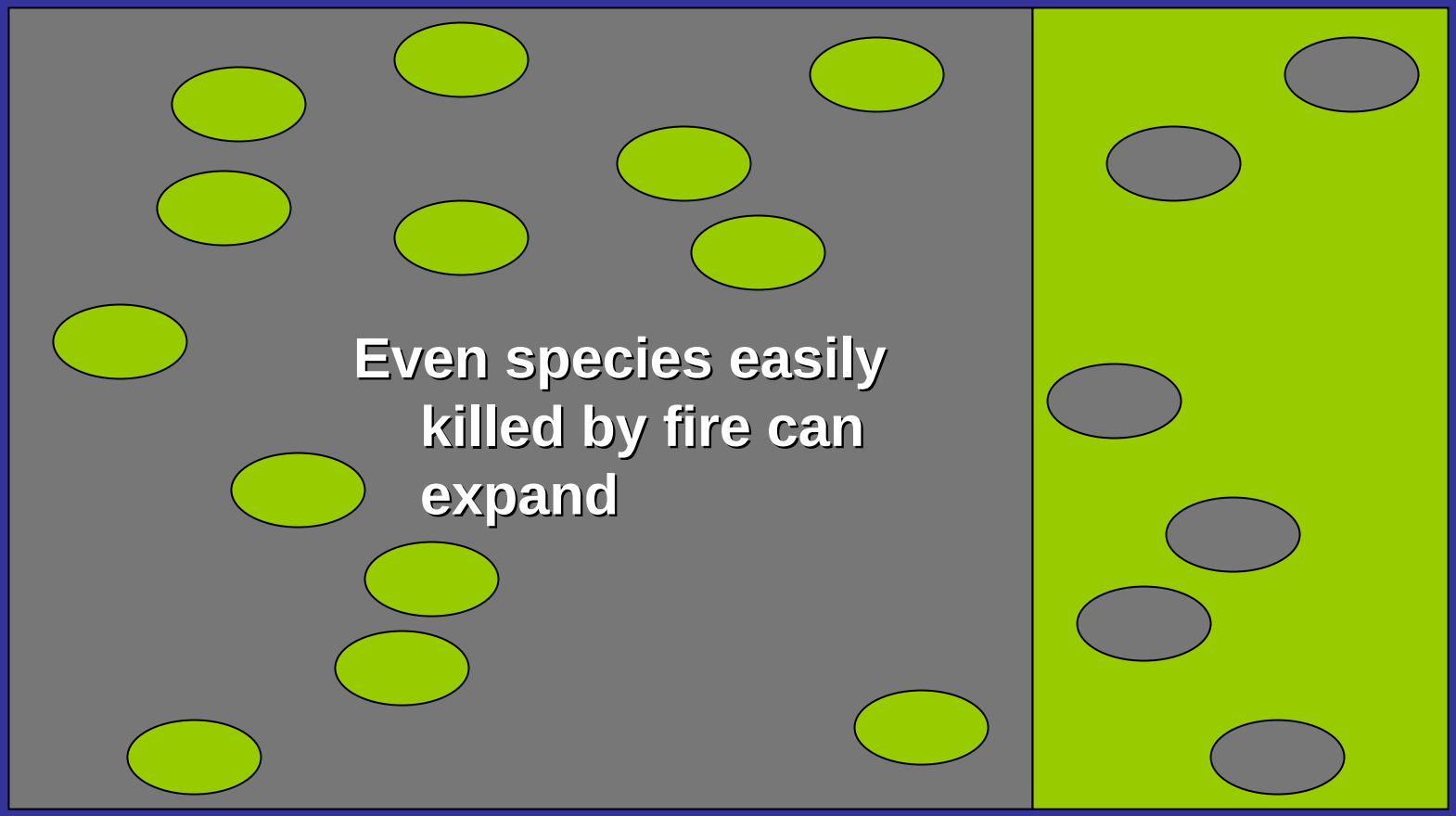
Uniformly severe fire favors plants that survive or reproduce onsite…

… and plants with long distance seed dispersal

There's something special about nonnative species

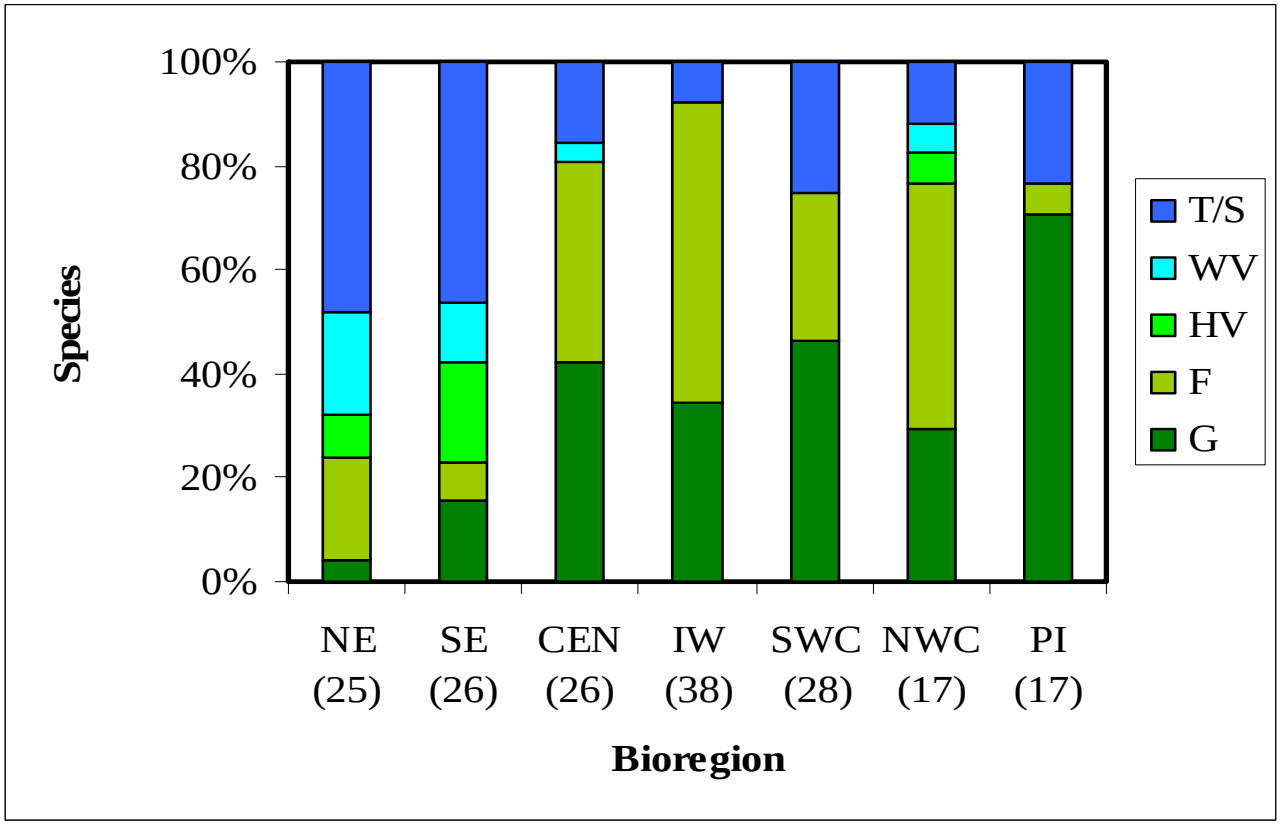
H1B. Good seed dispersers expand after fire

Depends on uniformity of burn



There's something special about nonnative species

H1C. Some life forms are more invasive than others



H2. Additional disturbances increase invasion rate

Why “should” it be so?

Prefire propagule pressure may be higher

Propagules delivered to the site during or after fire

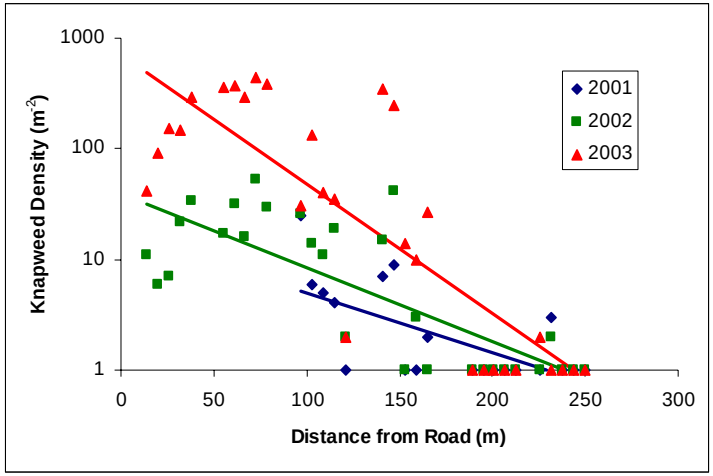
S. Sutherland, USDA FS

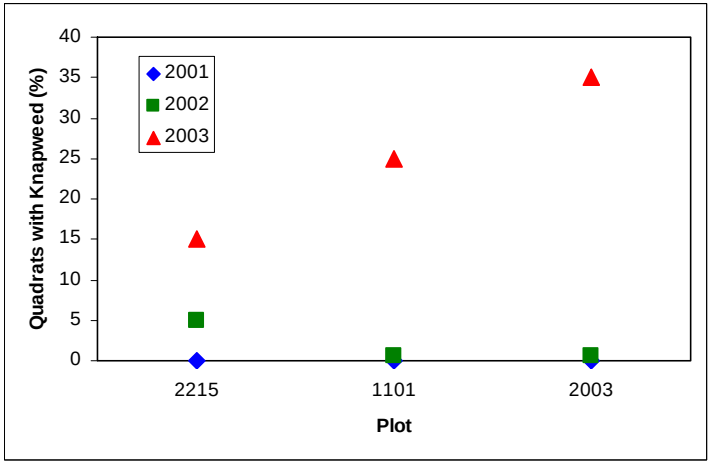
H2. Additional disturbances increase invasion rate

Why "should" it be so?

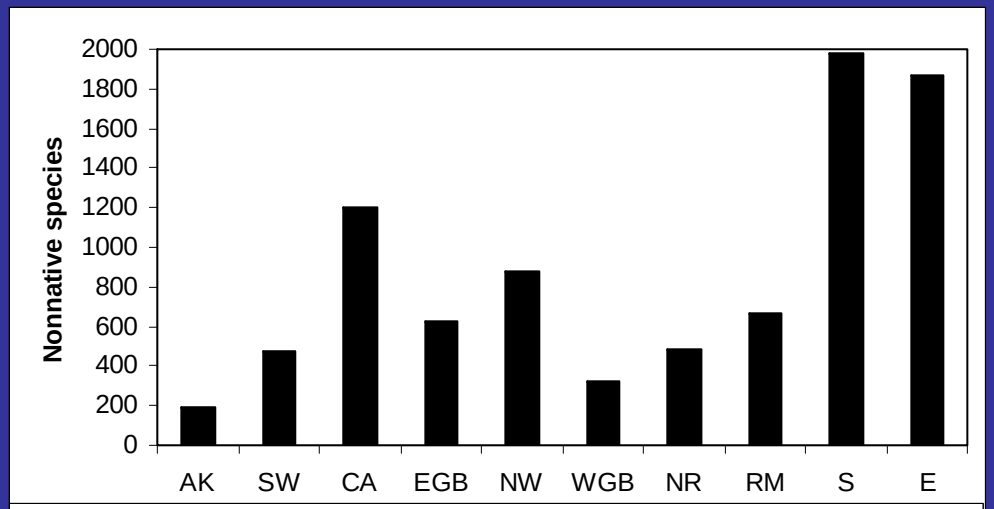
Prefire propagule pressure may be higher

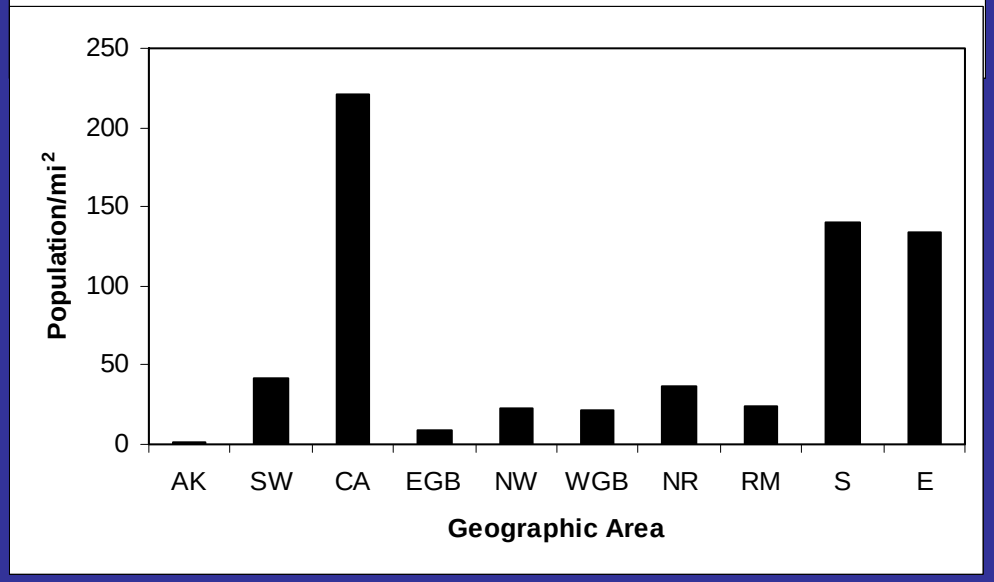
Propagules delivered to the site during or after fire

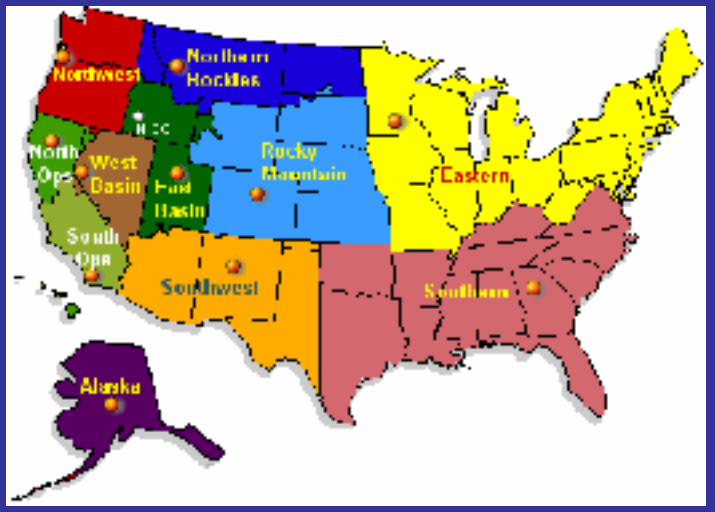




Sutherland, unpublished data


Nonnative species
2000
1800
1600
1400
1200
1000
800
600
400
200
0
AK
SW
CA
EGB
NW
WGB
NR
RM
S
E

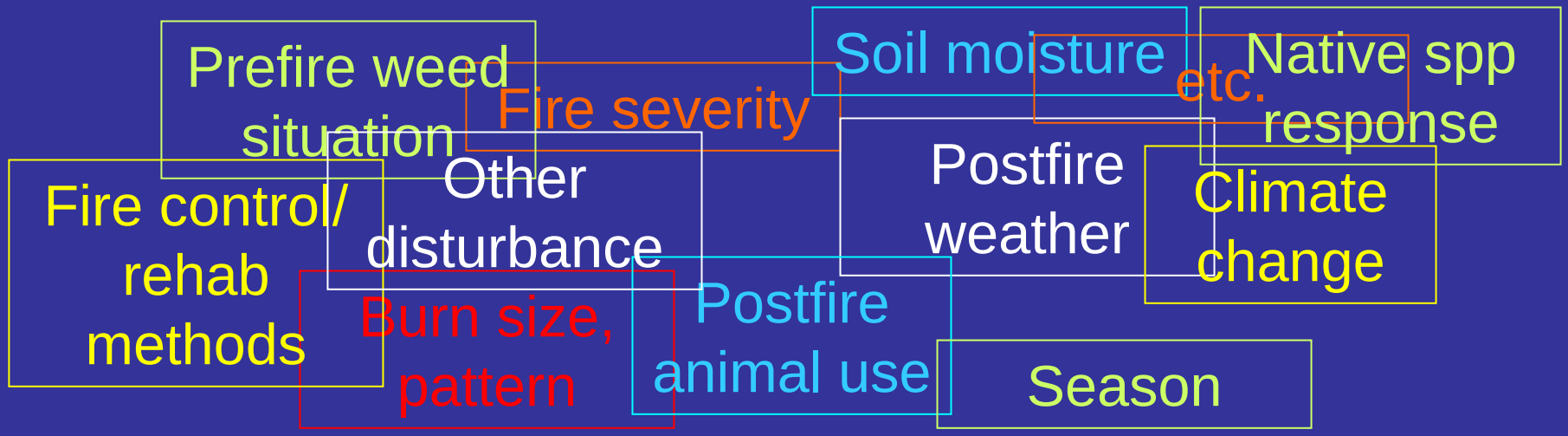

Population/mi2
250
200
150
100
50
0
AK
SW
CA
EGB
NW
WGB
NR
RM
S
E
Geographic Area


Northwest
Northern Rockies
Rocky Mountain
Eastern
West Basin
Great Basin
Southwest
Southern
Alaska

Hypotheses

H1. Fire increases invasions

H2. Additional disturbances increase invasion rate



H3. Invasions become less severe with time after fire… **… except when they don't…**

H4. Invasive spp decrease with increasing elevation, latitude **… at least for now.**

There are patterns

But there are exceptions

Scientists, do research & publish it!

Managers, know your weed situation & pay attention!