Fire and Invasive Plants

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and the FEIS writers & editors

USDA FS, Rocky Mountain Research Station
Missoula Fire Sciences Lab

Objectives

1. Understand relationships among fire, site, & invasions
2. Understand scientific knowledge about fire & invasives– and its limitations
3. Minimize potential for introducing and increasing invasives through prescribed fire
4. Understand strategies for using prescribed fire to reduce invasives

1. ***Understand relationships*** ***among fire, site, & invasions***

Invasive: A species that establishes, persists, spreads, and *causes ecological harm* (Westbrooks 1998, Randall 1997)

Examples of *ecological harm*?

Invasive ≠ necessarily noxious

Exotic ≠ necessarily invasive

Native ≠ necessarily <u>non</u>invasive

Albany pitch pine bush

… invaded by black locust

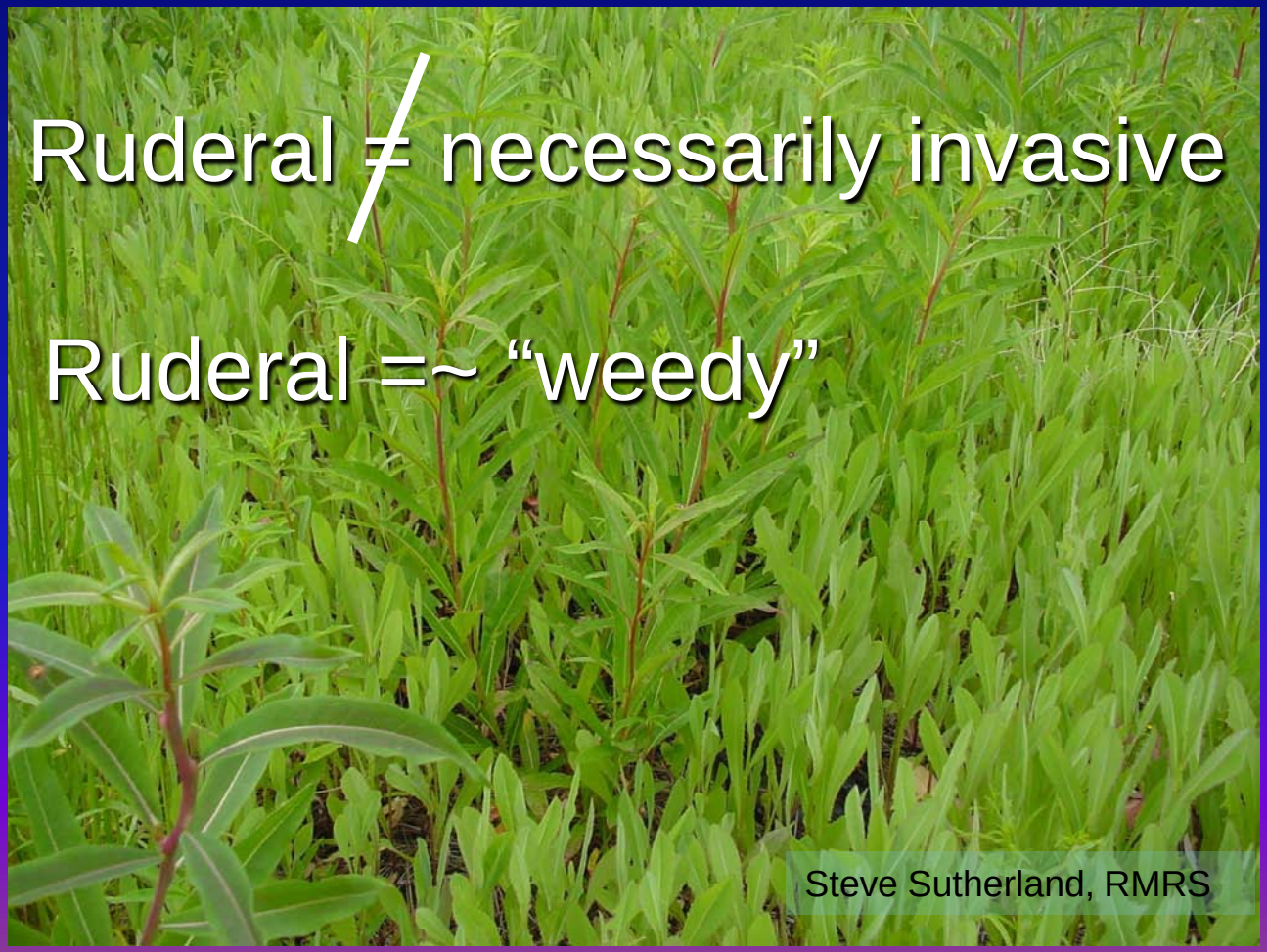
USFWS, Digital Library System

Neil Gifford, Tom Dooley

ALBANY PINE BUSH PRESERVE COMMISSION

Albany Pine Bush Preserve Commission

Ruderal: growing where vegetation cover has been disturbed… Watch for massive seed production, seedling establishment, and rapid growth.



Invasion process

1
Not here (yet)

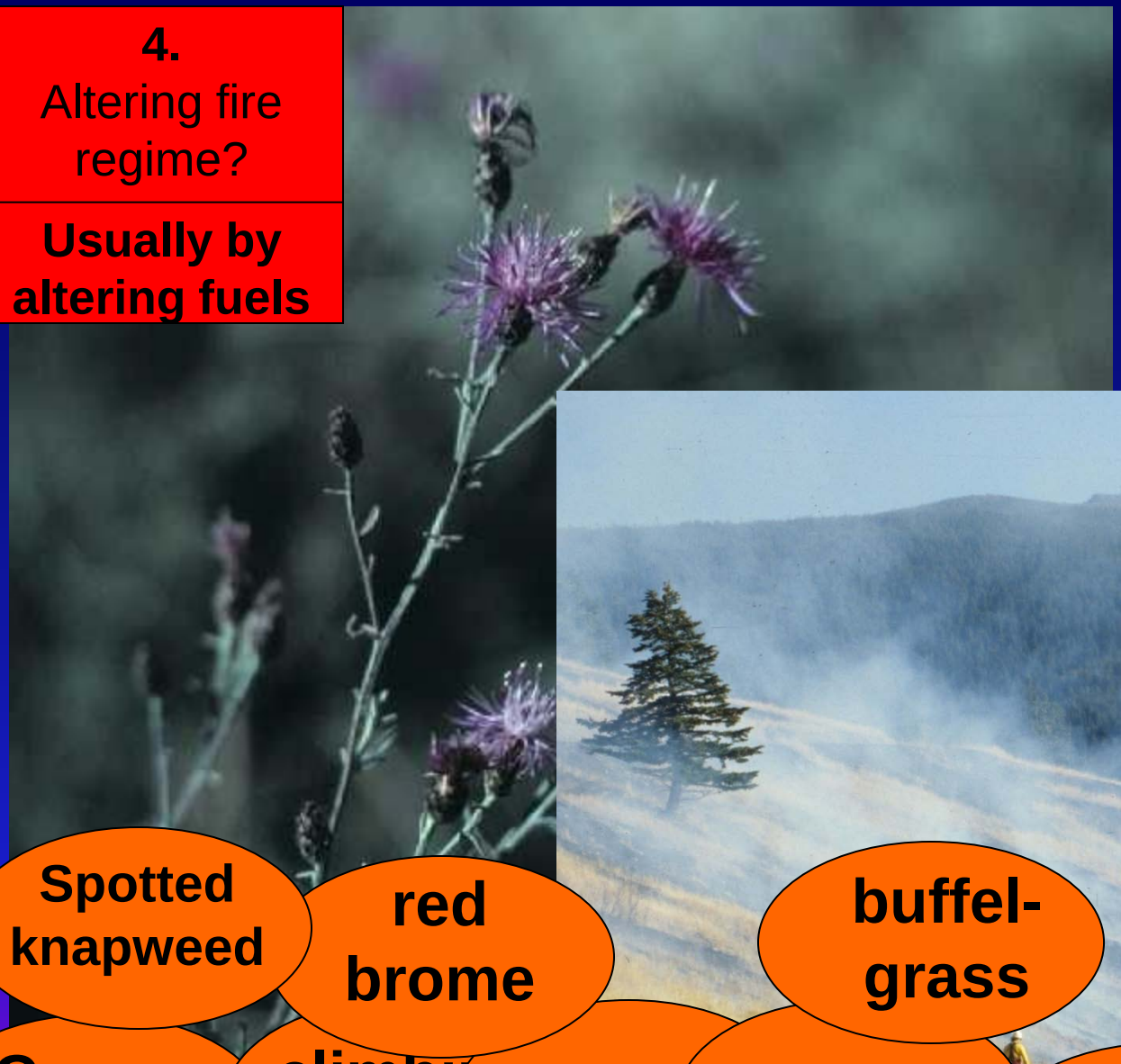
2
Established, not harming

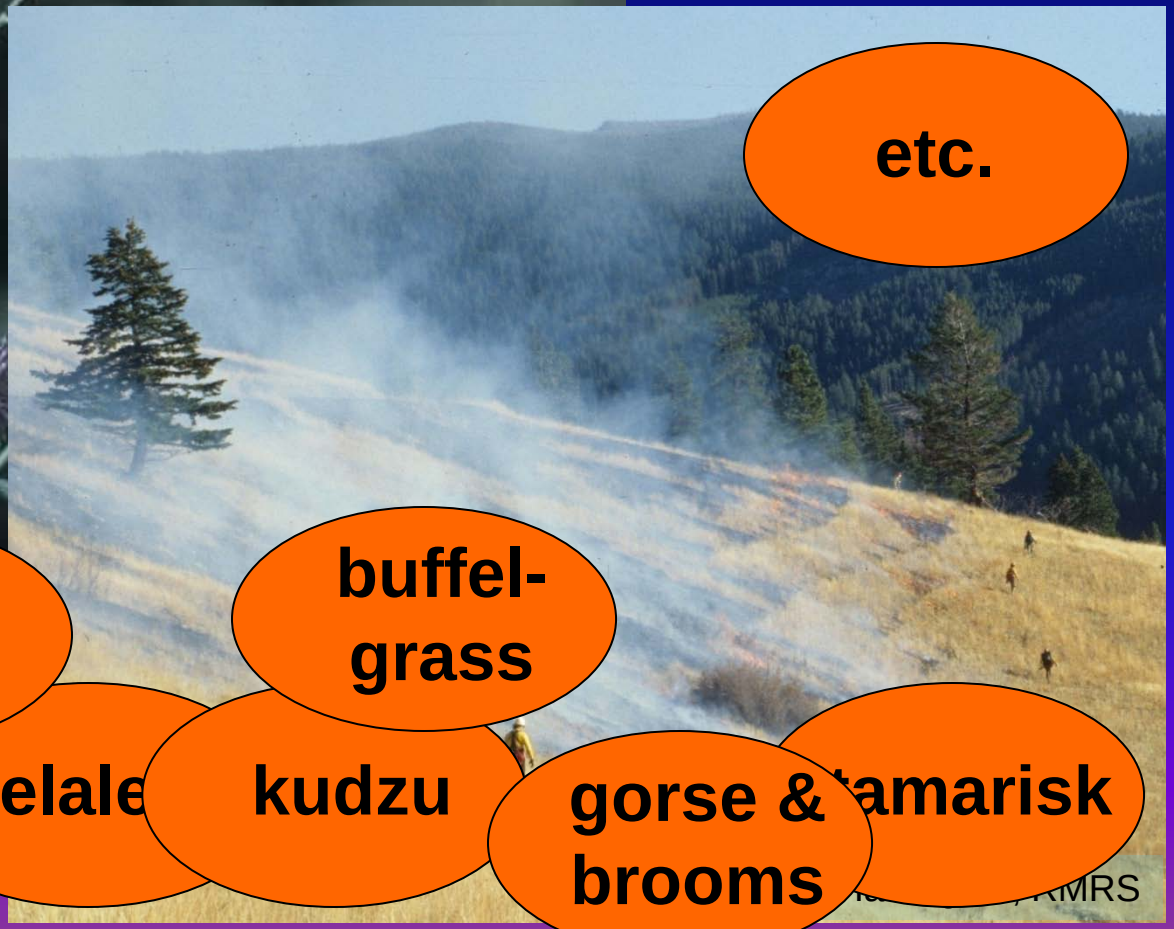
3
Spreading, causing harm

4
Altering ecological process

4.
Altering fire regime?

Usually by altering fuels





etc.

Spotted knapweed

red brome

buffel-grass

Cogon-grass

climbi ferns

melale

kudzu

gorse & brooms

tamarisk

RMRS

4
Altering fire regime

Mike Pellant, BLM

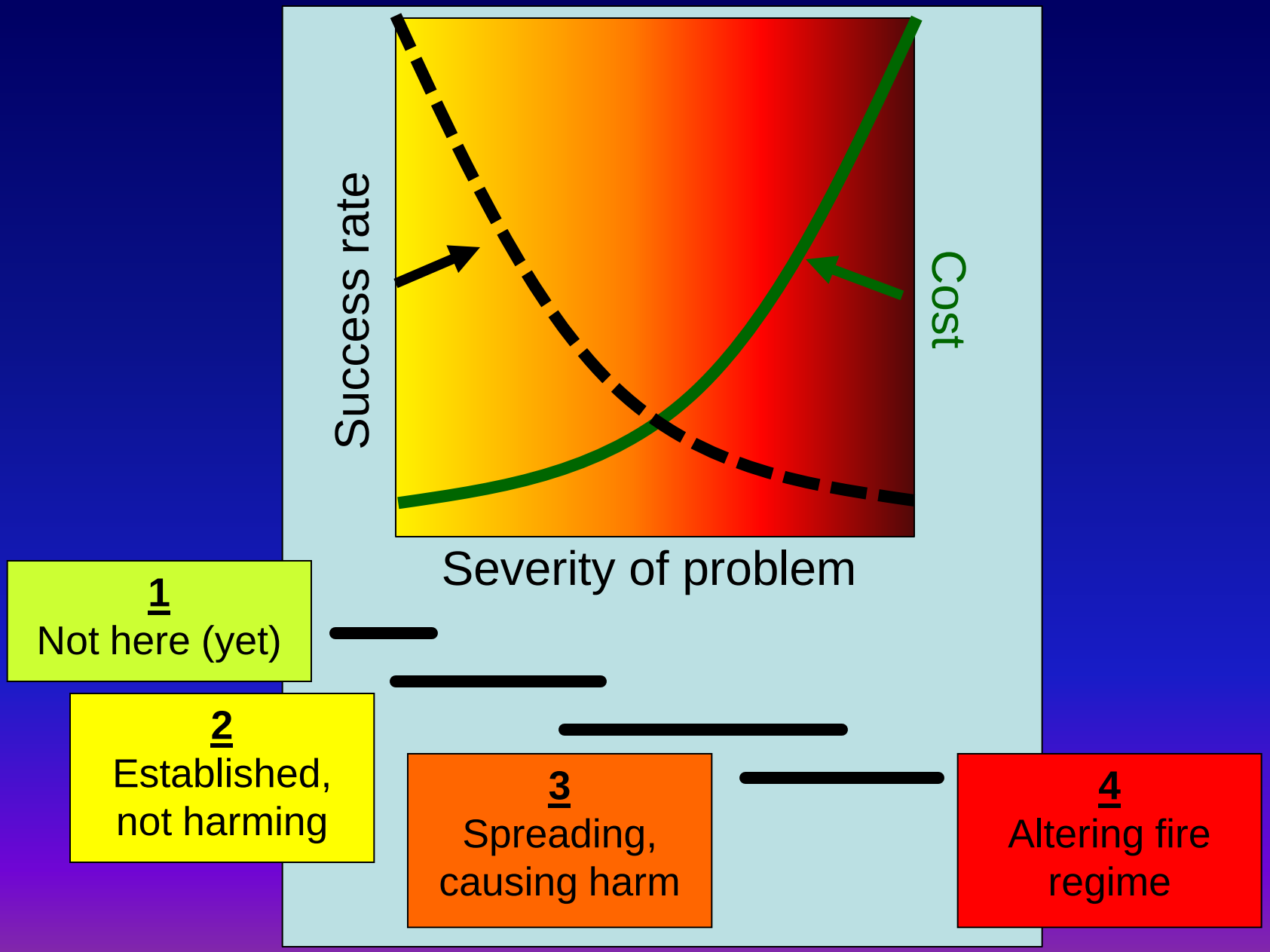
Mike Pellant, BLM

J.R. Matchett, USGS, Wetlands Ecol. Res. Ctr.

Mike Pellant, BLM

4
Altering fire regime???

Photos: Larry Allain, USGS, Nat. Wetlands Res. Center


Success rate
Cost
Severity of problem
1
Not here (yet)
2
Established, not harming
3
Spreading, causing harm
4
Altering fire regime

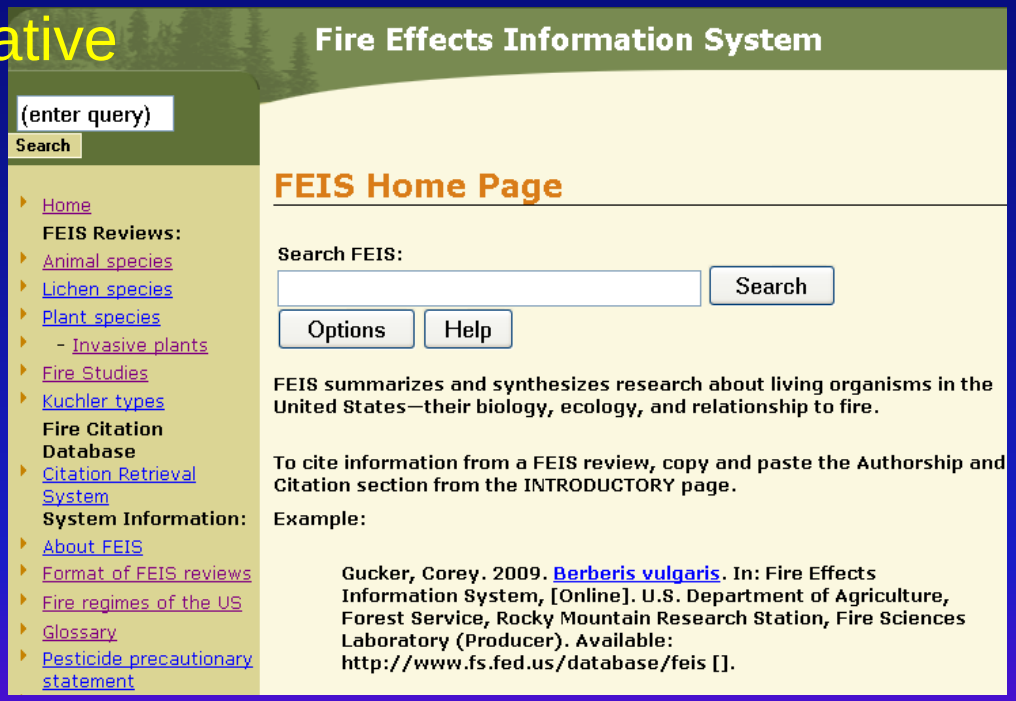
2. Understand scientific knowledge about fire & invasives– and its limitations

Fire Effects Information System (FEIS)

www.fs.fed.us/database/feis

~1200 taxa, native & nonnative

- 150 animal spp
- 1050 plant spp
  - Including 160 invasive plants



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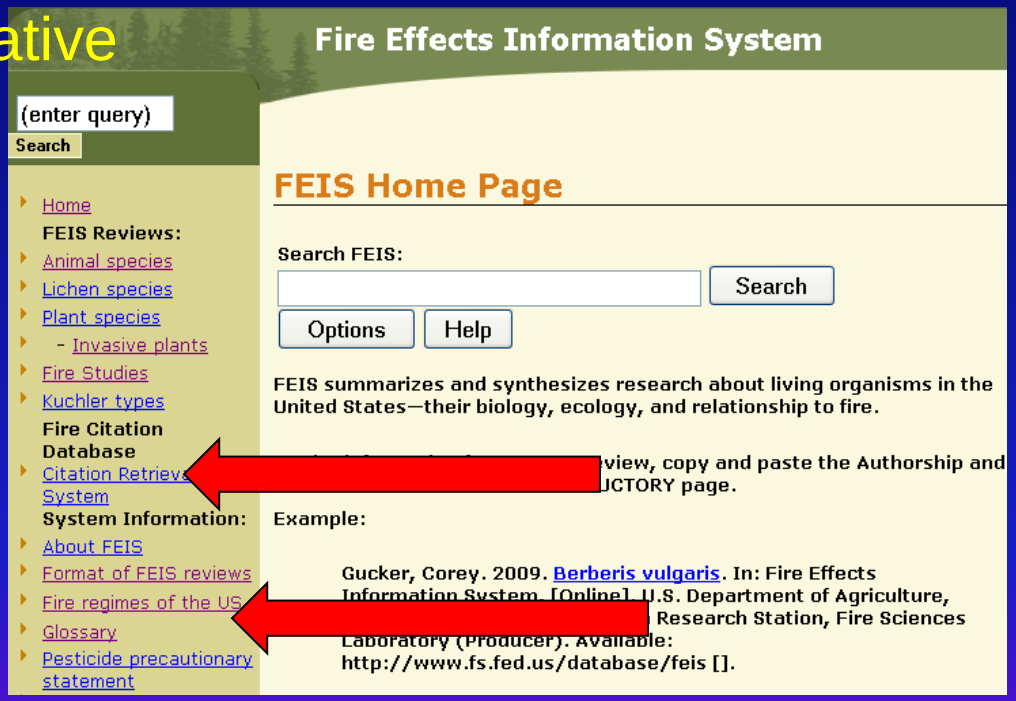
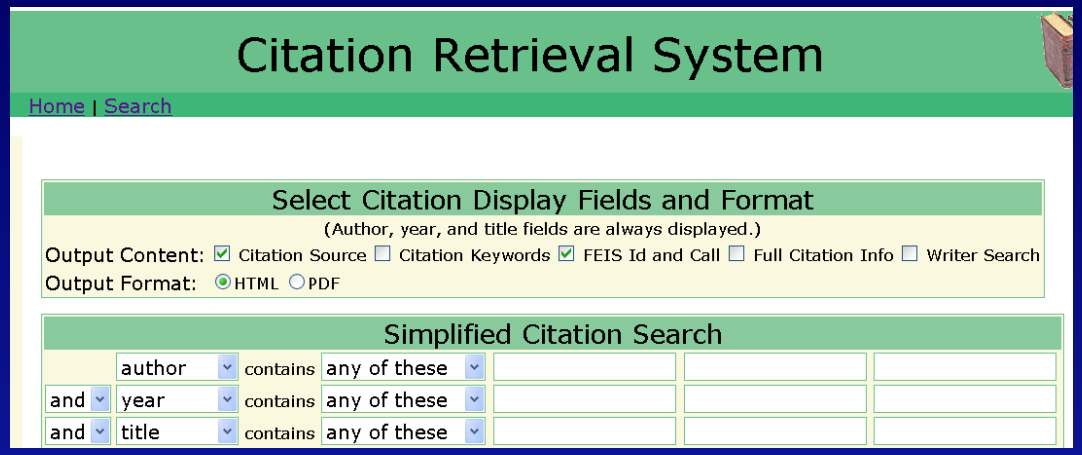


Citation Retrieval System

Fire regimes of the United States

FEIS~~~~~~~~~~~

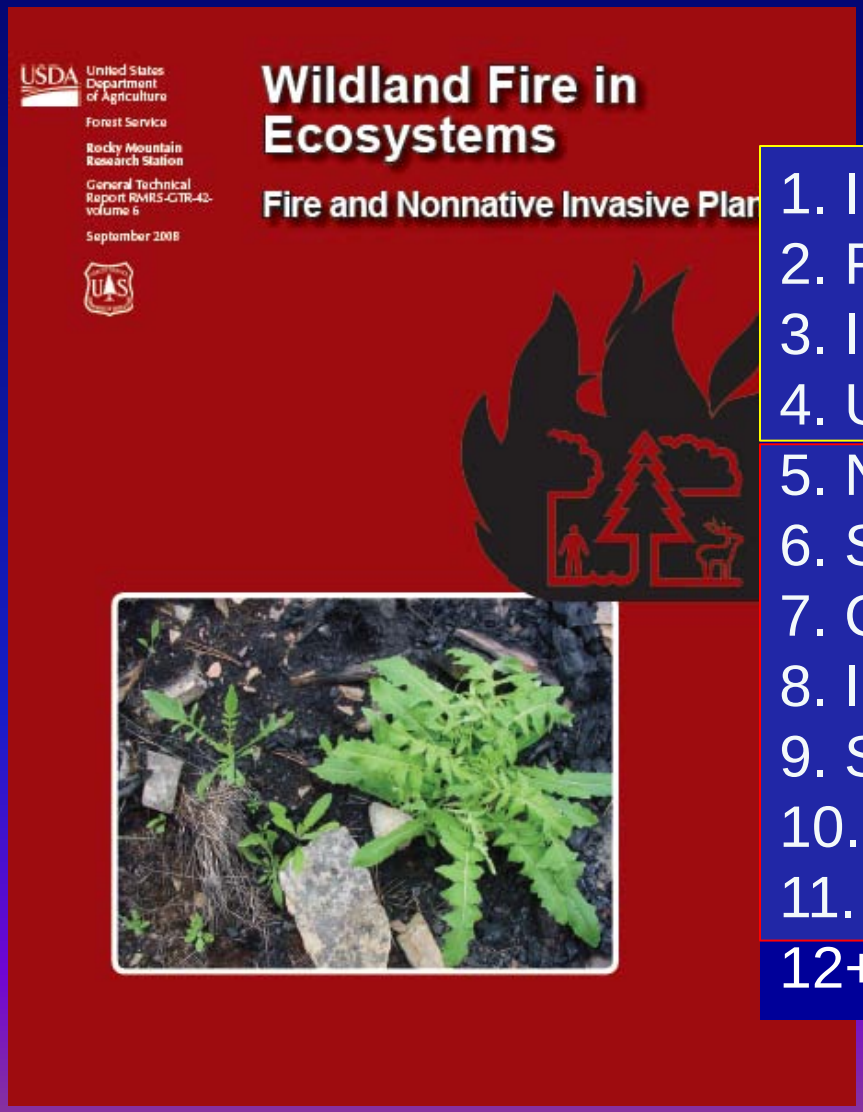


- Fire regimes of the United States

E.V. Komarek Fire Ecology Database:

www.talltimbers.org/fedb-intro.html

Wildland Fire in Ecosystems (“Rainbow”) Series, vol. 6– *Fire Nonnative Invasive Plants* (2008)



1. Intro
2. Fire Effects on Invasions
3. Invasions & Fire Regimes
4. Use of Fire to Manage Invasions
5. Northeast
6. Southeast
7. Central
8. Interior West
9. Southwest
10. Northwest Coastal (incl. AK)
11. Hawaii

12+. More….

USDA United States Department of Agriculture
Forest Service
Rocky Mountain Research Station
General Technical Report RMRS-GTR-42-volume 1
January 2000
Wildland Fire in Ecosystems
Effects of Fire on Fl
General Technical Report RMRS-GTR-42-volume 2
December 2000
General Technical Report RMRS-GTR-42-volume 4
September 2005
Wildland Fire in Ecosystems
Effects of Fire on Air
General Technical Report RMRS-GTR-42-volume 5
December 2002
Wildland Fire in Ecosystems
Effects of Fire on Cultural Resources
General Technical Report RMRS-GTR-42-volume 3
In press–
due out by fall 2011–
request from rschneider@fs.fed.us

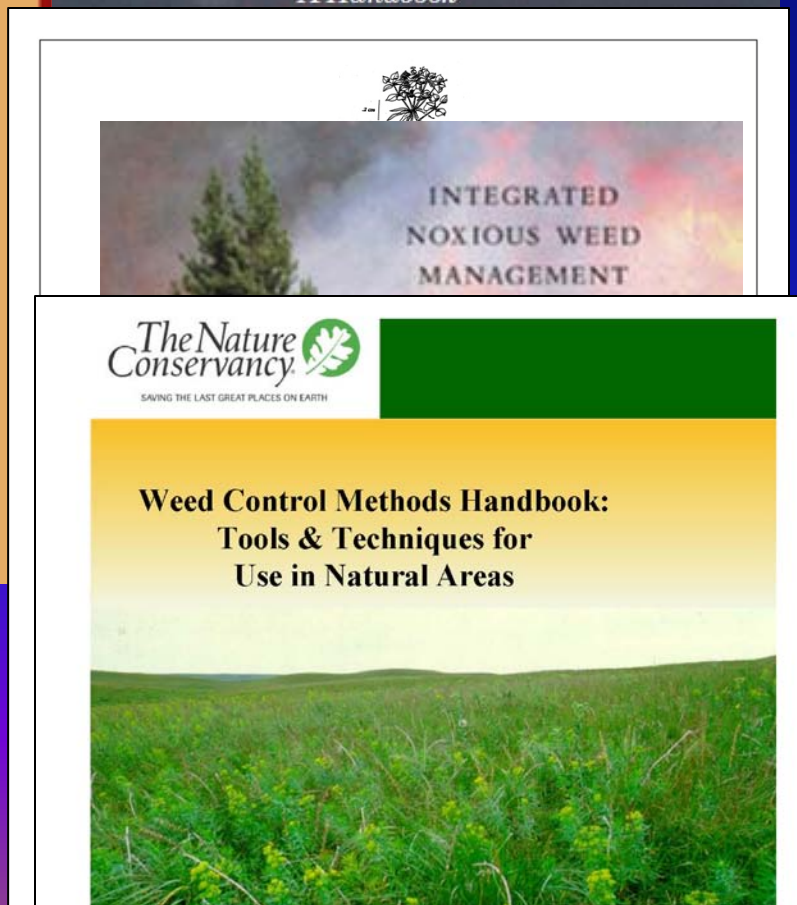
The Use of Fire as a Tool for Controlling Invasive Plants (2006)

Fire Management & Invasive Plants, a handbook (2008)

USDA Guide to Noxious Weed Prevention Practices (2001)

Integrated Noxious Weed Management after Wildfires (2002)

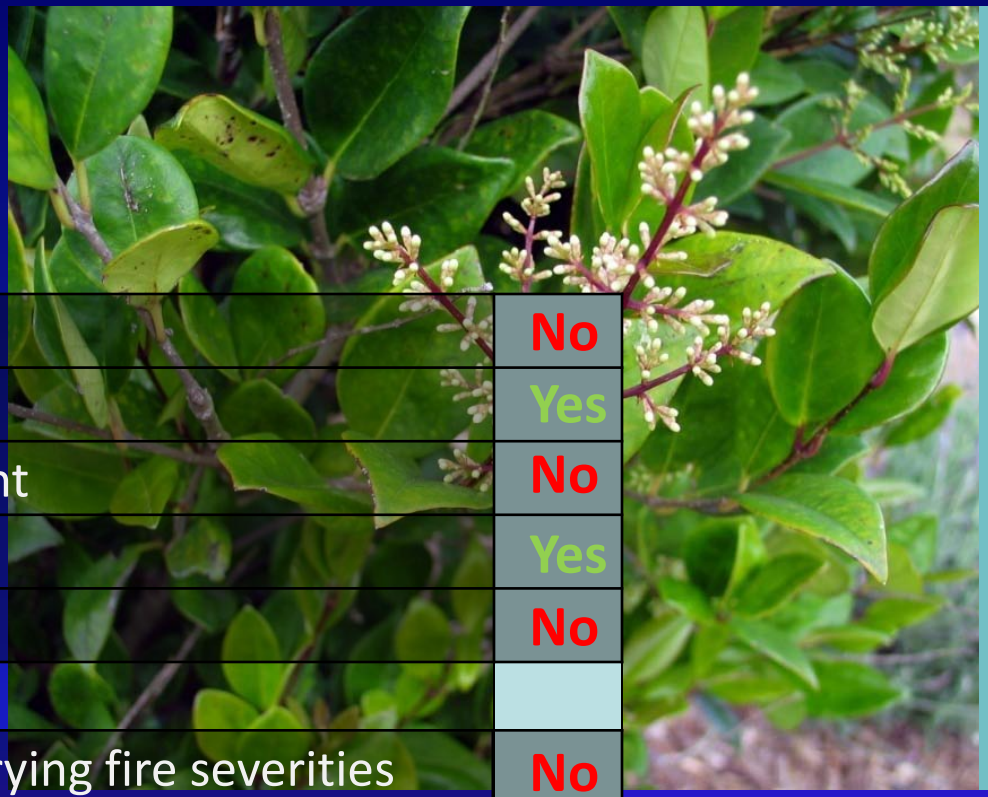
Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas (2001)



2. *Understand scientific knowledge* *about fire & invasives–* ***and its limitations***

Topics covered in lit as of ~2003

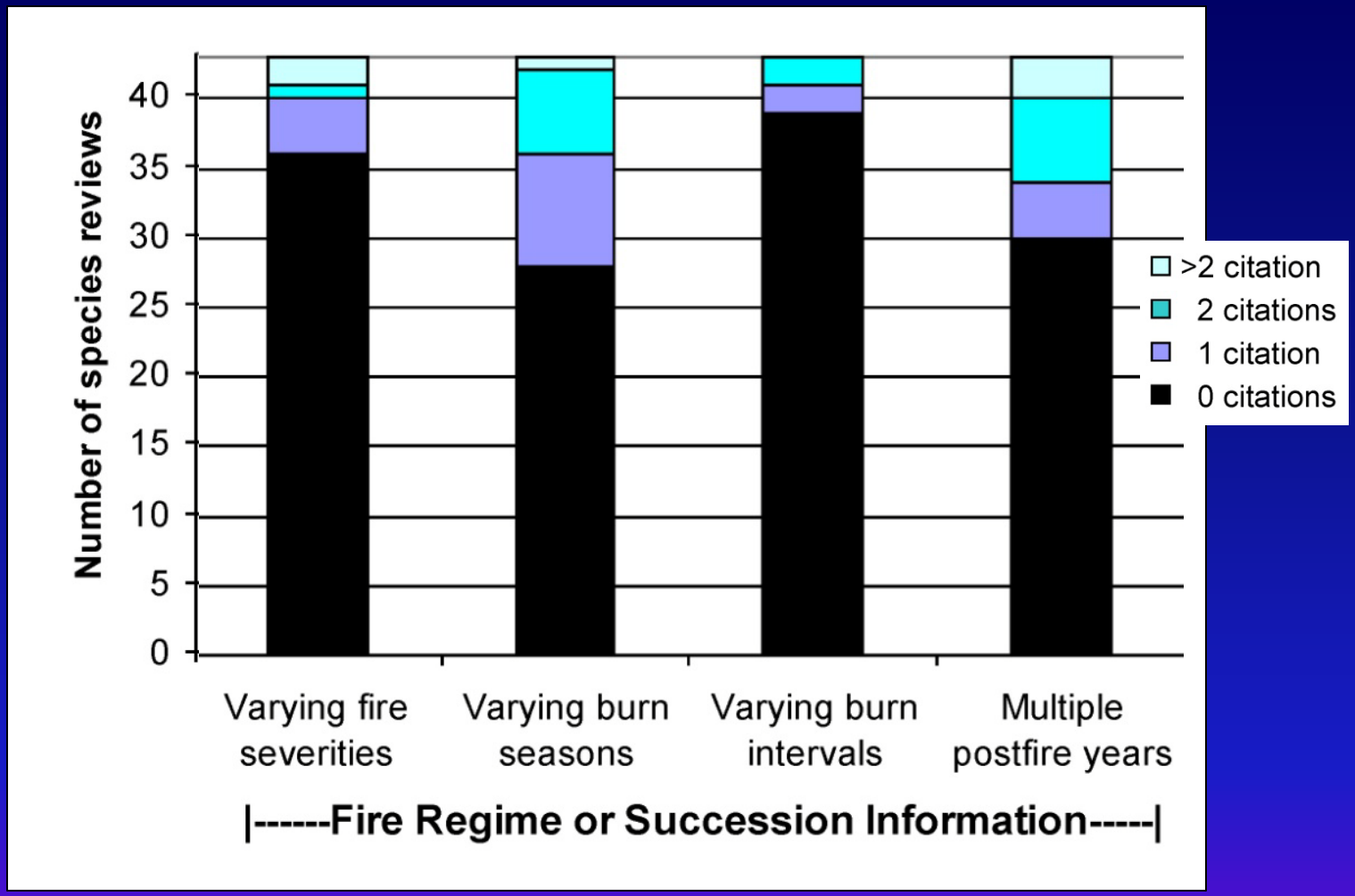
Four Privet spp.



J. S. Peterson, USDA, NRCS PLANTS Database

Heat tolerance of seed	No
Immediate fire effects	Yes
Postfire seedling establishment	No
Postfire vegetative response	Yes
Fuel properties, loads	No

Experimental info on fire regime characteristics	Varying fire severities	No
	Varying burn seasons	No
	Varying burn intervals	No
	Multiple postfire years	No


Number of species reviews
0
5
10
15
20
25
30
35
40
>2 citation
2 citations
1 citation
0 citations
Varying fire severities
Varying burn seasons
Varying burn intervals
Multiple postfire years
|------Fire Regime or Succession Information-----|

What's to be done?

... or ...

Do It Yourself:

- Find & read the science

Using sparse science appropriately for <u>your</u> management questions:

- **Based on observations?**
- **Relevant to <u>your</u> plant community?**
- **Details about treatments, conditions?**
- **How many years' followup?**
- **Check source!**

Do It Yourself:

- Find & read the science
- Network!
- Learn local invasives & disturbance history
- Are there maps, GIS layers? Models of spread of invasives? Weed Risk Assessments?
- Are invasives in old burned areas? proposed burns? Nearby?

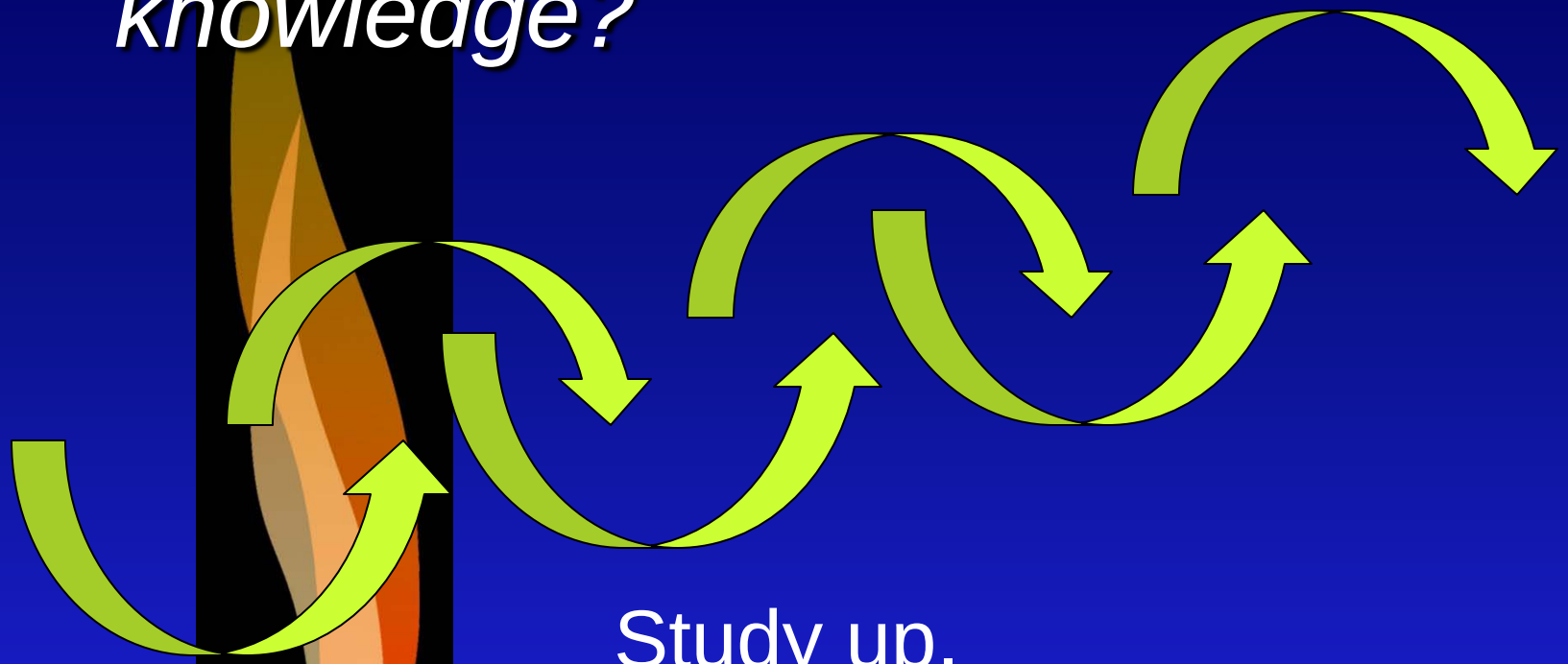
Study up!

DIY:

- Find & read the science
- Network!
- Learn local invasives & disturbance history
- Are there maps, GIS layers? Models of spread of invasives? Weed Risk Assessments?
- Are invasives in old burned areas? proposed burns? Nearby?
- And finally…

Study up!

Obj. 2. How to obtain needed knowledge?



Study up.
Try.
Monitor.
Adapt.

3. ***<u>Minimize potential</u> for introducing and increasing invasives through prescribed fire***

~~~~Don’t invite the dragon home

= Eliminate or minimize propagules

Prevention is best!

- Which weeds?
- Where are they?
- Hygiene
- If you’re going to use seed, make it REALLY WEED FREE

~~~~Don’t wake the sleeping dragon

= Know invasives’ reproduction patterns

1. Fire can create a seedbed for wind-dispersed seed:

climbing ferns

swallow-worts

common reed

thistle

mimosa

Norway maple

salsify

molasses grass

perennial sowthistle

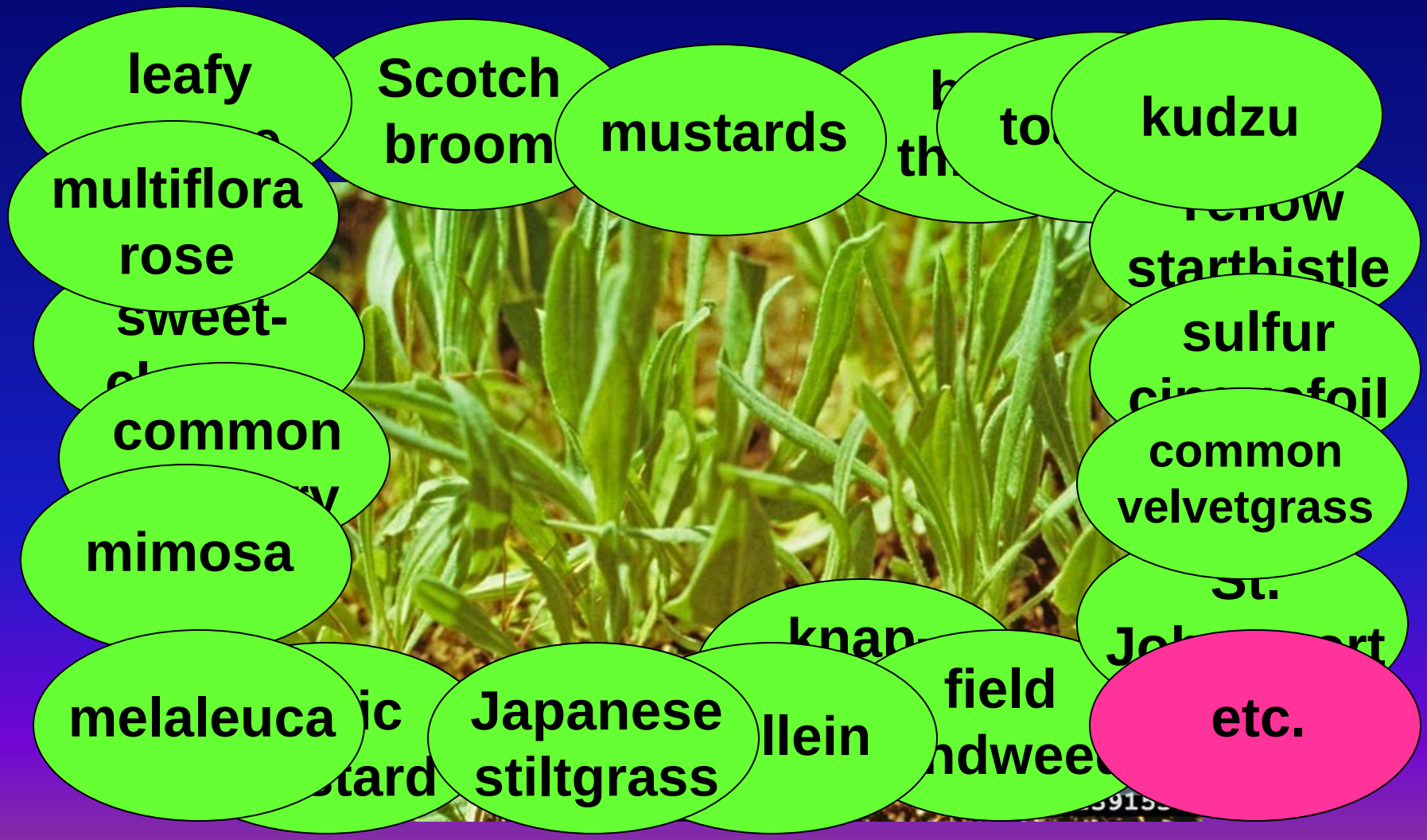
cogon grass

princess tree

etc.

~~~~Don’t wake the sleeping dragon

2. Species may survive fire in soil seed bank



~~~~Don’t wake the sleeping dragon

3. Germination may be stimulated by fire

Scotch

melaleuca

gorse

kudzu

Johnswort

yellow starthistle

Yellow starthistle

etc.

~~~~Don’t wake the sleeping dragon

4. May sprout following top-kill by fire

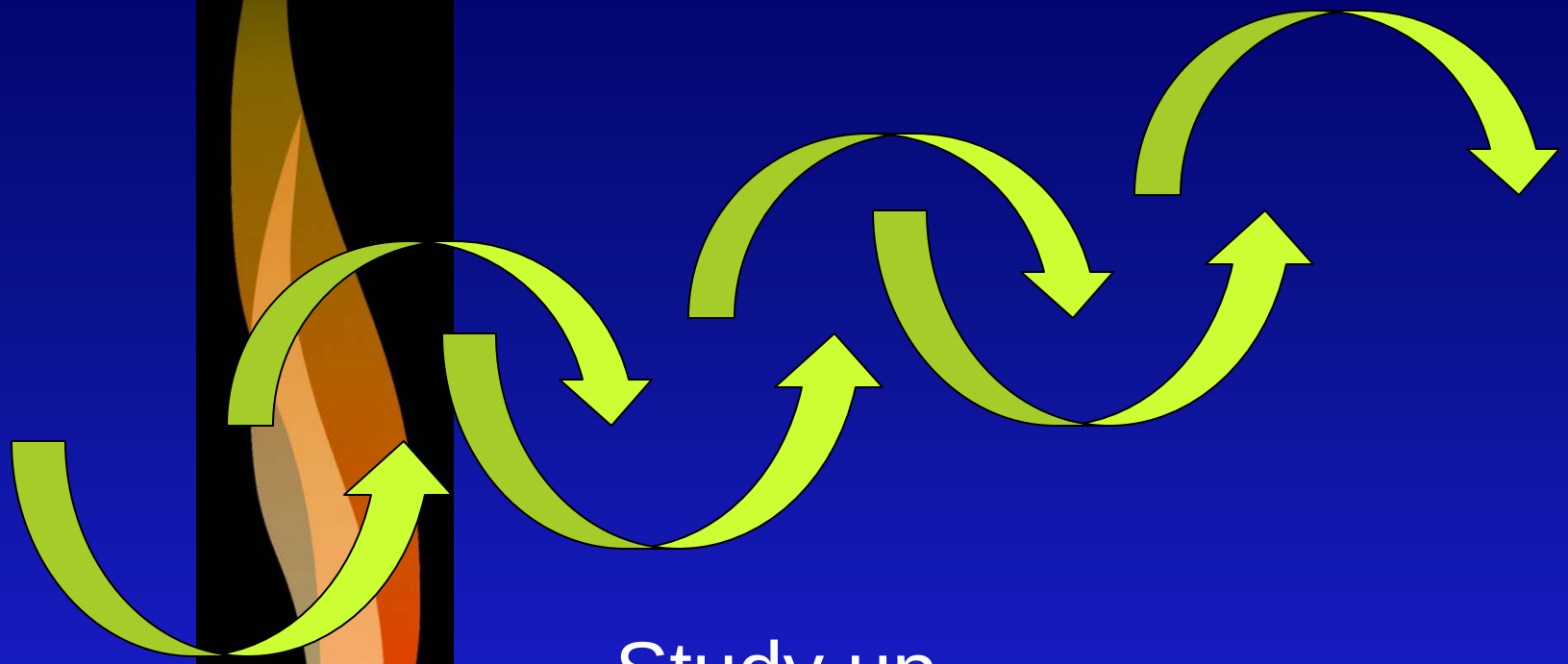
~~~~If the dragon is already there, don't make it comfy

Five ways to increase invasibility:

1. Remove litter
2. Remove canopy
3. Reduce cover of native vegetation
4. Increase resource availability
5. Disturb soil

Prescribed fire <u>manages</u> <u>& mitigates</u> impacts

Obj. 3. How to <u>not</u> make invasions worse with fire?



Study up.
Try.
Monitor.
Adapt.

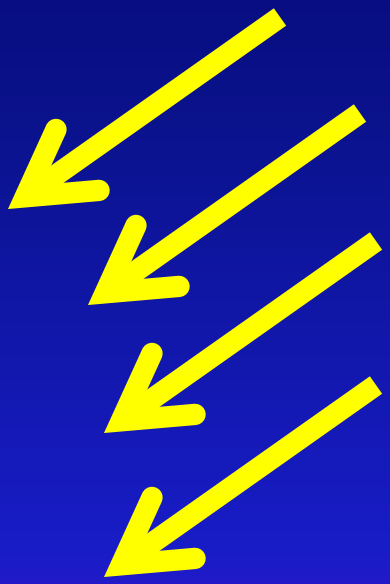
4. <u>Understand strategies</u> for using prescribed fire to reduce invasives

If the invasive responds to fire as well as or better than the desired species, you can’t control it with fire alone.

Native species

Invasive species

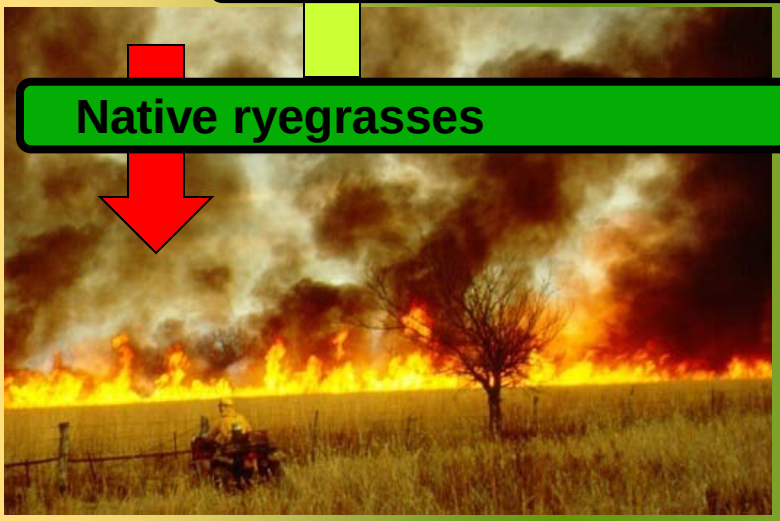
Manipulate fire regime characteristics?



Seasonality Frequency

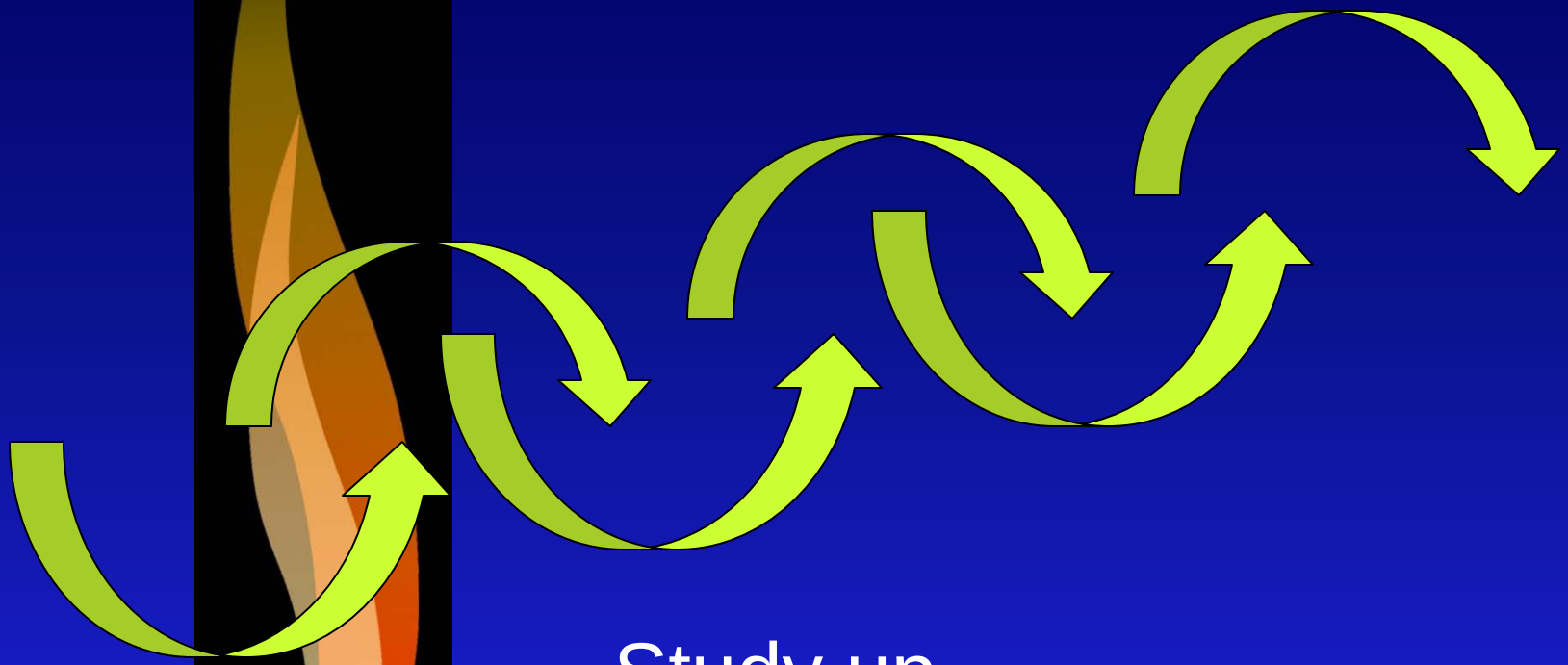
Nonnative bluegrasses

Native bluestems, Indiangrass



Native ryegrasses

…. Spring …. **…. Summer ….** **…. Fall ….**



Study up.
Try.
Monitor.
Adapt.

Seasonality
Size & uniformity

Integrated Management--biocontrol

Integrated Management

Herbicide before fire…
Herbicide after fire…
Mowing…
Grazing…
Flooding before fire…
Flooding after fire…

Burning before herbicide invasive:

Macartney ros

Lehmann s

tamarisk

Ripgut brome

gorse

kudzu

pepper-weed

Dalmatian toadflax

French br

nel

tall fescue

Sahara tard

leafy spurge

apanese oneysuckle

St. Johnswort

kudzu

Scotch broom

spotted knapweed

Burning before herbicide ↓ invasive:

Macartney ros

Lehmann s

tamarisk

Ripgut brome

gorse

kudzu

pepper-weed

French br

nel

Sahara tard

tall fescue

apanese oneysuckle

kudzu

Scotch broom

... but failed in W. MT for:

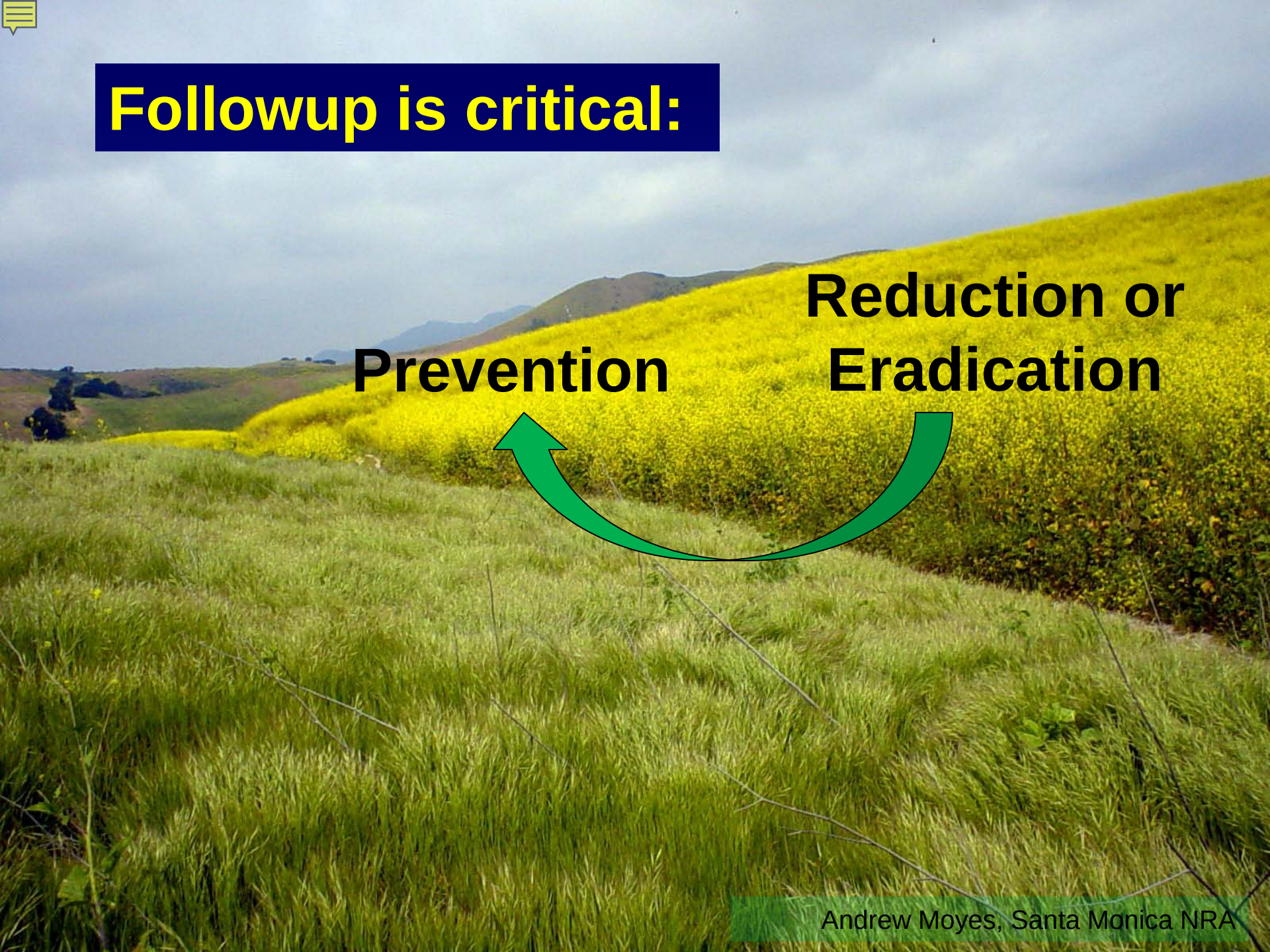
Dalmatian toadflax

eafy spurge

St. Johnswort

spotted knapweed

Followup is critical:



Andrew Moyes, Santa Monica NRA

Obj. 4. How to use prescribed fire to reduce invasives?

Exploit facets of the fire regime
Use integrated management
Follow up

Study up.
Try.
Monitor.
Adapt.

Thanks!

Let FEIS know what you learn:

jsmith09@fs.fed.us