

# Gaps in Scientific Knowledge About Fire & Nonnative Invasive Plants

Kris Zouhar, Greg Munger, Jane Kapler Smith

**Thank you!**

Joint Fire Science Program  
Forest Service Fire & Aviation Management  
The Nature Conservancy

## Also thank you:

Janet Howard  
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Steve Sutherland  
Helen Smith



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"The issue I am attempting to deal with ... is not knowledge but ignorance. In ignorance I believe I may pronounce myself a fair expert."

Wendell Berry (2000)



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Ignorance:

Context

Methods

Results:

Biology & Ecology

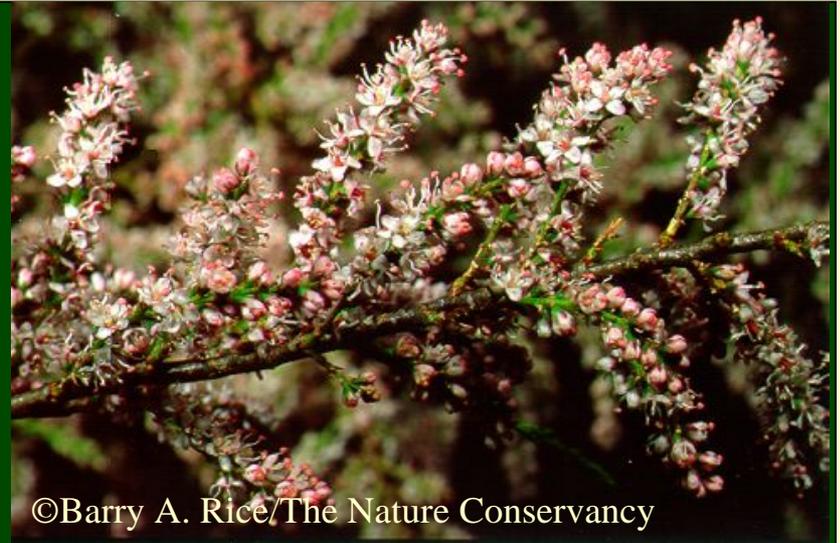
Fire Ecology & Fire Regimes

Conclusions & Recommendations



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# Context



4-year project to:

- Write literature reviews, covering 60 nonnative species for FEIS  
[www.fs.fed.us/database/feis/](http://www.fs.fed.us/database/feis/)
- Identify “knowledge gaps” about these species and fire

Ignorance:

Context

Methods

Results:

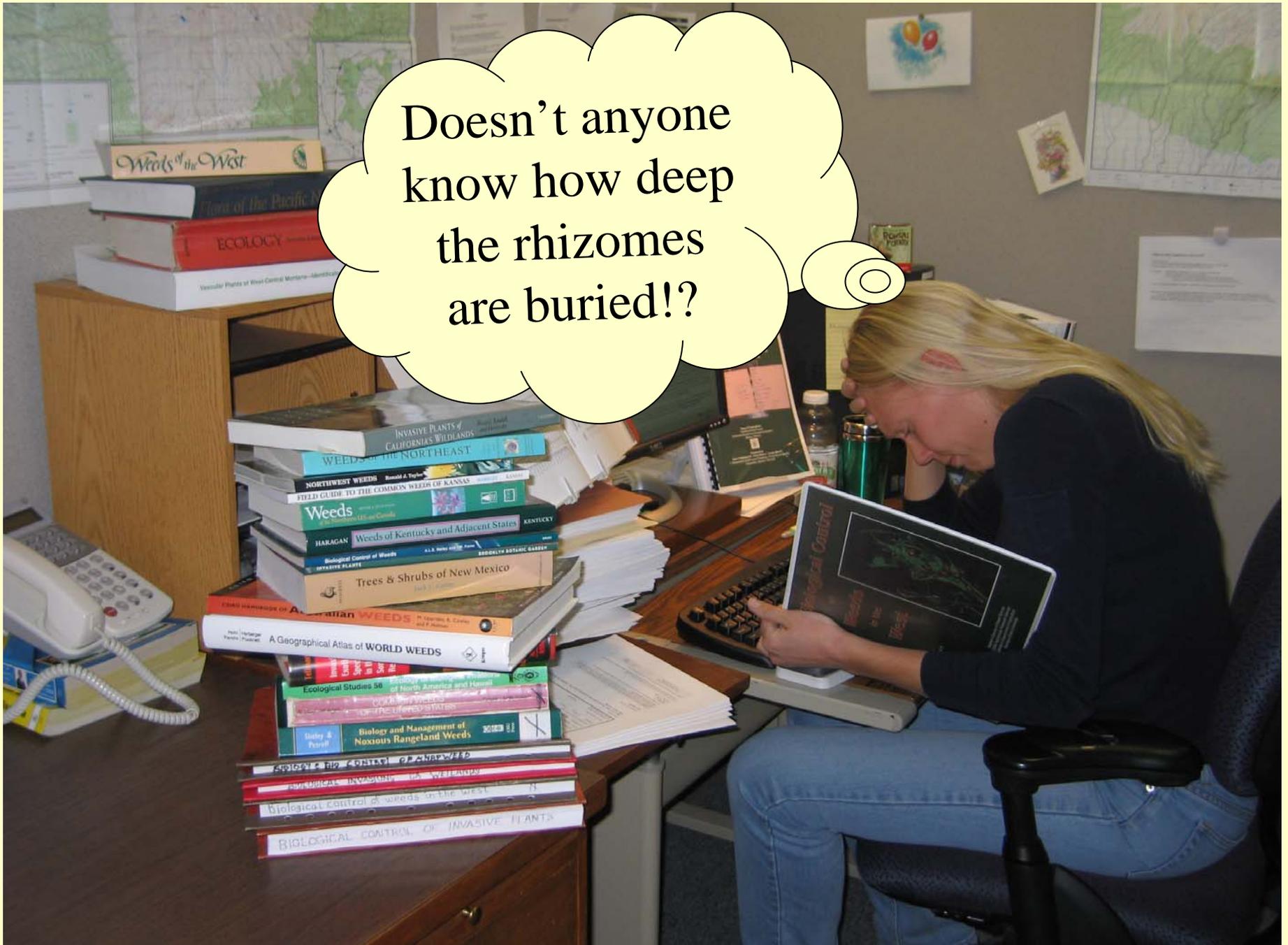
Biology & Ecology

Fire Ecology & Fire Regimes

Conclusions & Recommendations



Doesn't anyone  
know how deep  
the rhizomes  
are buried!?



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### INTRODUCTORY

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#### **AUTHORSHIP AND CITATION :**

Zouhar, Kris. 2005. *Ulex europaeus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> (2006, April 21).

FEIS section	Topics covered
Distribution and Occurrence	
Botanical and Ecological Characteristics	Regeneration (includes seed production, seed dispersal, seed banking, germination/establishment/seedbed requirements, and asexual regeneration)
	Site characteristics
	Successional information (includes longevity, response to disturbance, and competitive interactions)
	Seasonal patterns (aboveground phenology, belowground phenology)
Fire Ecology and Fire effects	Fire adaptations (including heat tolerance of tissues and seed, and postfire regeneration strategies)
	Fire regimes

Knowledge gaps

Knowledge

vs.



No knowledge

# "Continuum of knowledge"



1° research,  
peer reviewed  
journal

1° research, agency pub

Monitoring results

Extension literature

Observations

Personal Communication

No replication or no controls

No  
knowledge

# "Continuum of knowledge"



4: 1° research, peer rev. journal

3: 1° research, non-anonymous peer review

2: Unpublished experiments or observations

1: No experiments or observations

0: No knowledge

"high quality" info

# FIRE EFFECTS

## SPECIES: *Hypericum perforatum*

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- [IMMEDIATE FIRE EFFECT ON PLANT](#)
- [DISCUSSION AND QUALIFICATION OF FIRE EFFECT](#)
- [PLANT RESPONSE TO FIRE](#)
- [DISCUSSION AND QUALIFICATION OF PLANT RESPONSE](#)
- [FIRE MANAGEMENT CONSIDERATIONS](#)

### IMMEDIATE FIRE EFFECT ON PLANT:

Little information is available regarding the immediate effects of fire on St. Johnswort stems, roots, and seeds. Fire is likely to top-kill St. Johnswort; however, fire may or may not damage St. Johnswort root crowns and lateral roots. One author reports that St. Johnswort lateral roots occur 0.5 to 3 inches (1-8 cm) below the soil surface [41], a depth at which they may be damaged by severe fire. Evidence presented by Sampson and Parker [154] and field observations by other researchers [20,189] suggest that fire may stimulate sprouting from undamaged St. Johnswort roots and root crowns, and germination in St. Johnswort seeds. According to observations presented by Agee [1], even high-severity fire may stimulate sprouting and/or seed germination in St. Johnswort.

### DISCUSSION AND QUALIFICATION OF FIRE EFFECT:

Field observations [20,154,189] and laboratory tests [154] suggest that fire stimulates germination in St. Johnswort seed, although it is unclear how fire severity and season of burning may affect germination response in St. Johnswort.

In fall 1996, more than 1,000 acres (400 ha) of land planted to hard fescue (*Festuca trachyphylla*), tall wheatgrass (*Thinopyrum ponticum*), and alfalfa (*Medicago sativa*) were burned under prescription at the Kilby Ranch in Oregon. Before the burn, isolated patches of St. Johnswort occurred around the perimeter of the ranch, with the largest patches south of the burn area. Within 7 months of the fire, immature St. Johnswort plants (presumably seedlings, although this is not clearly stated) established across the burn area. The following season (1998), St. Johnswort plants had matured and the St. Johnswort infestation was very dense. By the 3rd postfire year (1999), St. Johnswort had spread beyond the boundary of the burn area. The author suggests that an extensive St. Johnswort seed bank

	Fire Adaptations				Fire Regimes			
Species review	Heat tolerance, tissue	Heat tolerance, seed	Postfire estab.	Postfire veg. response	Varying fire severities	Varying burn seasons	Varying burn intervals	Multiple postfire years
<i>Acer platanoides</i>	0	0	0	(1)1	0	0	0	0
<i>Acroptilon repens</i>	0	0	0	0	0	0	0	0
<i>Ailanthus altissima</i>	0	0	0	(2)1	0	0	0	0
<i>Alliaria petiolata</i>	0	0	0	(3)3	(1)4	(2)4	(1)4	(3)4
<i>Arundo donax</i>	0	0	0	(3)2	0	0	0	0
<i>Bromus tectorum</i>	n/a	(10)4	(29)4	n/a	(3)4	(2)4	0	(15)4
<i>Cardaria spp.</i>	0	0	0	0	0	0	0	0
<i>Carduus nutans</i>	0	0	(4)3	0	(2)3	(1)2	0	(3)2
<i>Celastrus orbiculatus</i>	0	0	0	0	0	0	0	0
<i>Centaurea diffusa</i>	0	0	(1)2	(1)1	0	0	0	0
<i>Centaurea maculosa</i>	0	(1)4	(1)3	(2)2	(2)3	(1)3	0	(5)3
<i>Centaurea solstitialis</i>	n/a	0	(1)4	(1)3	0	0	0	(1)4
<i>Chondrilla juncea</i>	0	0	0	0	0	0	0	0
<i>Cirsium arvense</i>	0	0	(13)4	(7)4	(5)4	(4)4	0	(5)4
<i>Cirsium vulgare</i>	0	(1)4	(6)3	0	0	0	0	0
<i>Convolvulus arvensis</i>	0	(3)4	0	0	0	0	0	0
<i>Cynoglossum officinale</i>	0	0	0	0	0	0	0	0
<i>Cytisus scoparius</i>	0	(4)4	(6)4	(3)4	(1)4	(2)4	(1)3	0
<i>Elaeagnus angustifolia</i>	0	0	(1)2	(2)2	0	0	0	0
<i>Elaeagnus umbellata</i>	0	0	0	(3)1	0	0	0	0
<i>Genista monspessulana</i>	0	(5)4	(5)4	(2)4	(2)3	(1)2	0	(3)4
<i>Hypericum perforatum</i>	0	(1)3	(6)4	(8)4	(1)4	(1)4	0	(1)4
<i>Imperata spp.</i>	0	0	(2/3)4	(3/14)4	0	(0/1)2	0	(0/5)4
<i>Lepidium latifolium</i>	0	0	0	(3)3	0	0	0	0

Ignorance:

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# Surviving fire or reproducing after fire

Fire-related topic	% reviews with ZERO citations	% reviews with only 1 citation	% reviews with at least 1 high quality citation
Heat tolerance, seed	68	16	29
Postfire establishment	51	19	41
Postfire vegetative response	32	16	44

# Fire regime information

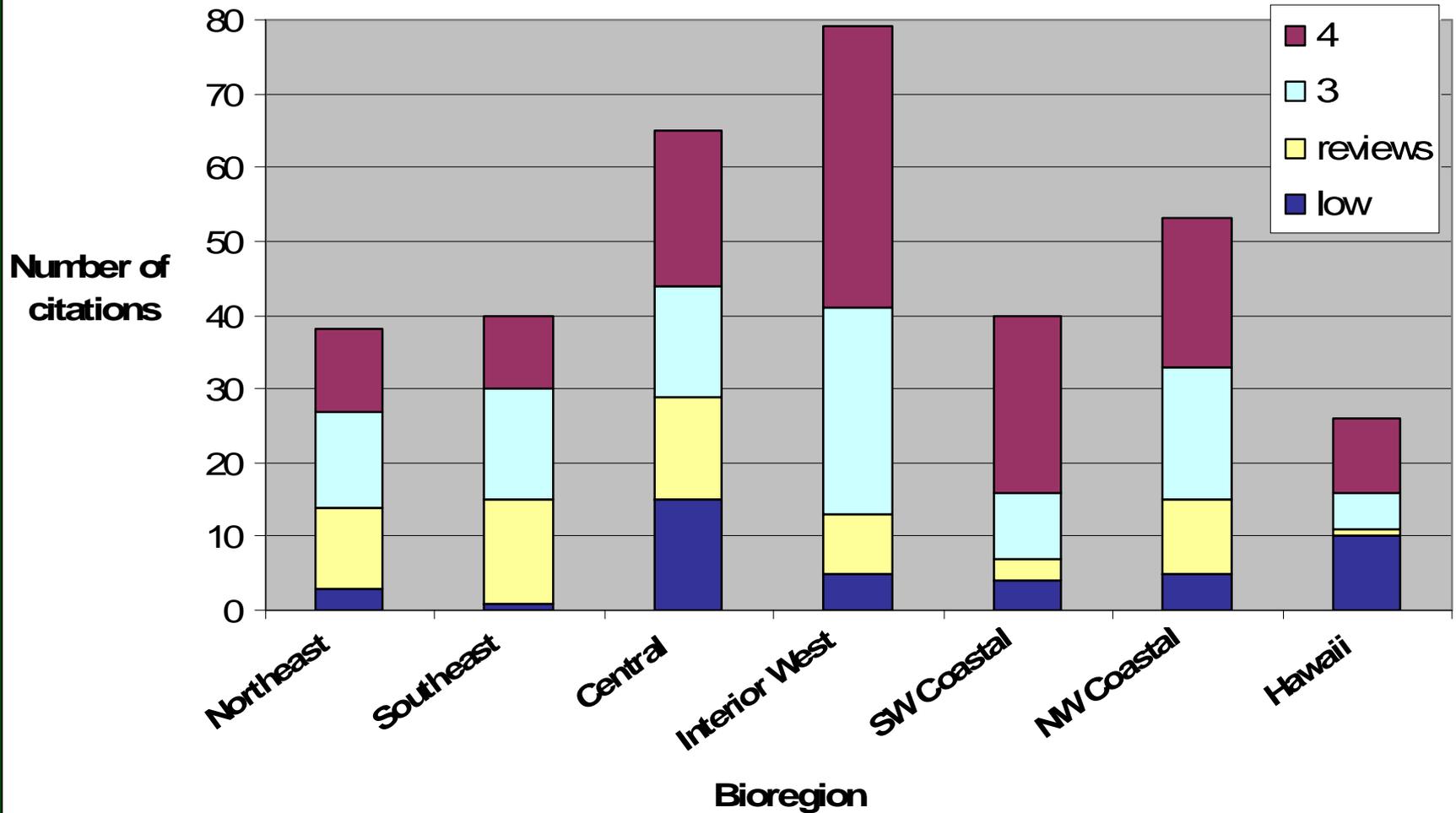
Studies including...	% reviews with ZERO citations	% reviews with only 1 citation	% reviews with at least 1 high quality citation
varied fire severities	84	9	16
varied burn seasons	65	21	33
varied burn intervals	91	9	7
multiple postfire years	70	9	30

# Fire regime information

Topic	% reviews with ZERO citations	% reviews with only 1 citation	% reviews with at least 1 high quality citation
Changes in fuel characteristics with invasion	60	7	21
Changes in fire regimes with invasion	70	7	14

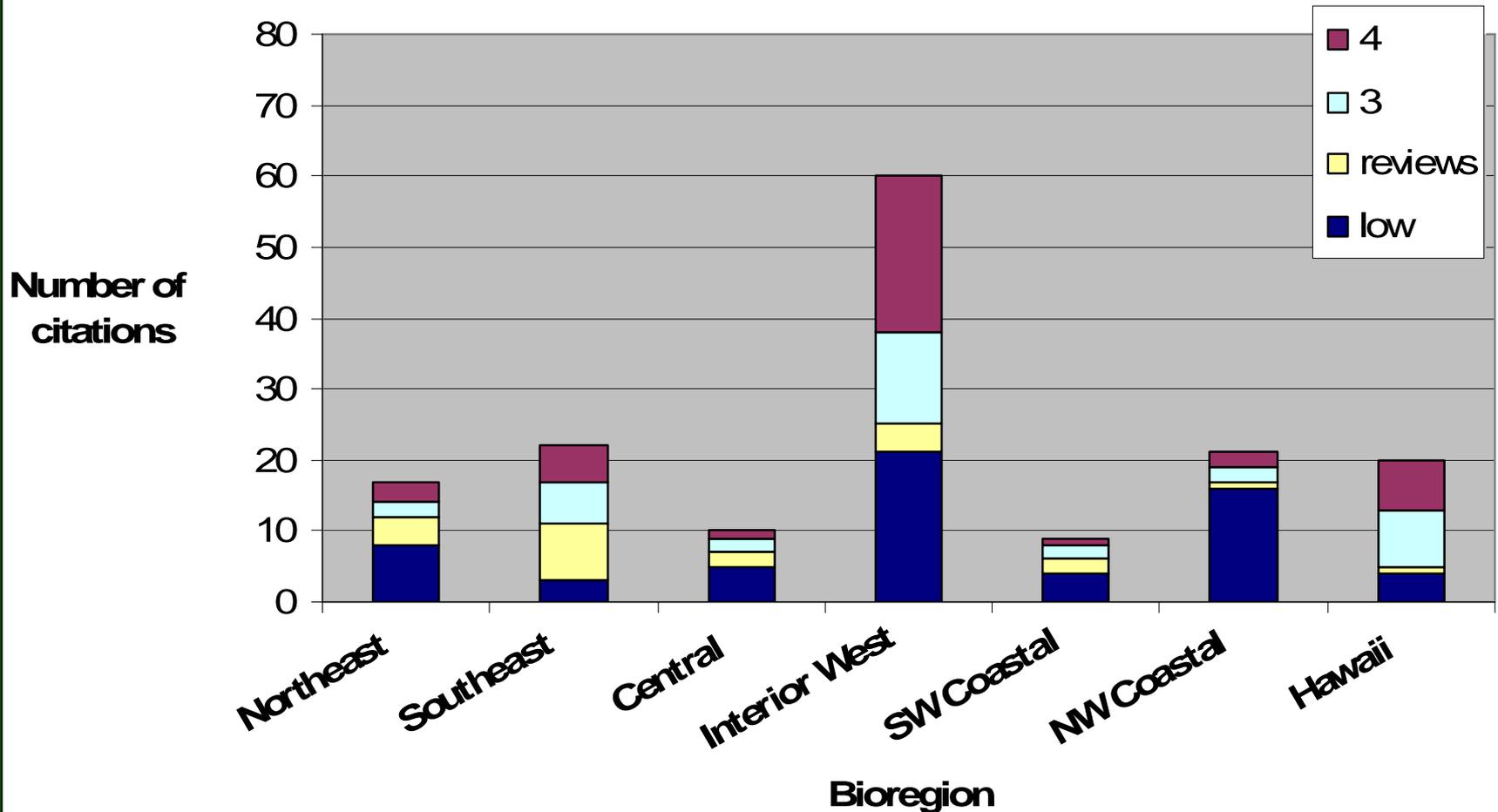
# "Rainbow series" bioregional literature reviews

Fire effects (survival/regeneration)



# "Rainbow series" bioregional literature reviews

## Fuels and fire regimes



# Implications:

- Primary research needed on
  - Basic biology
  - Relationships with fire
  - Scope of inference described
  - Details about fire treatments provided
- Literature review- report scope of inference
- Reader- apply appropriately
  - Beware of "Illusions of Knowledge"



"The mystery surrounding our life is probably not significantly reducible. And so the question of how to act in ignorance is paramount."

**Wendell Berry (2000)**

