Using Pocket Science to Learn Together on the Uncompahgre Plateau

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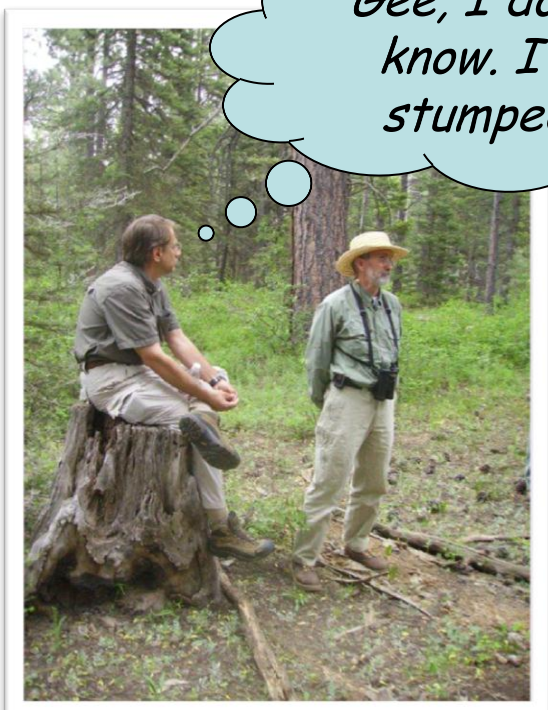
CCC Seminar
Apr 22, 2014

• • • Guiding questions • • •

- What's up with the research-implementation gap?
- How can pocket science inspire collaborators to jump the divide?



- What outcomes are possible when people learn together?
- Can managers base decisions on pocket science discoveries?
- What are your thoughts and experiences?

Research-implementation gap: Consequences

Much of modern conservation relies on "anecdotes and myths" (Sutherland et al. 2004)

Table 1. Sources of information used by practitioners in Broadland, UK

Source of information	Number	%
Common sense	55	32.4
Personal experience	37	21.8
Speaking to other managers in region	34	20.0
Other managers outside region	4	2.4
Expert advisers	17	10.0
Secondary publications	19	11.2
Primary scientific literature	4	2.4

Sutherland et al. (2004)

Pullin et al. (2004)

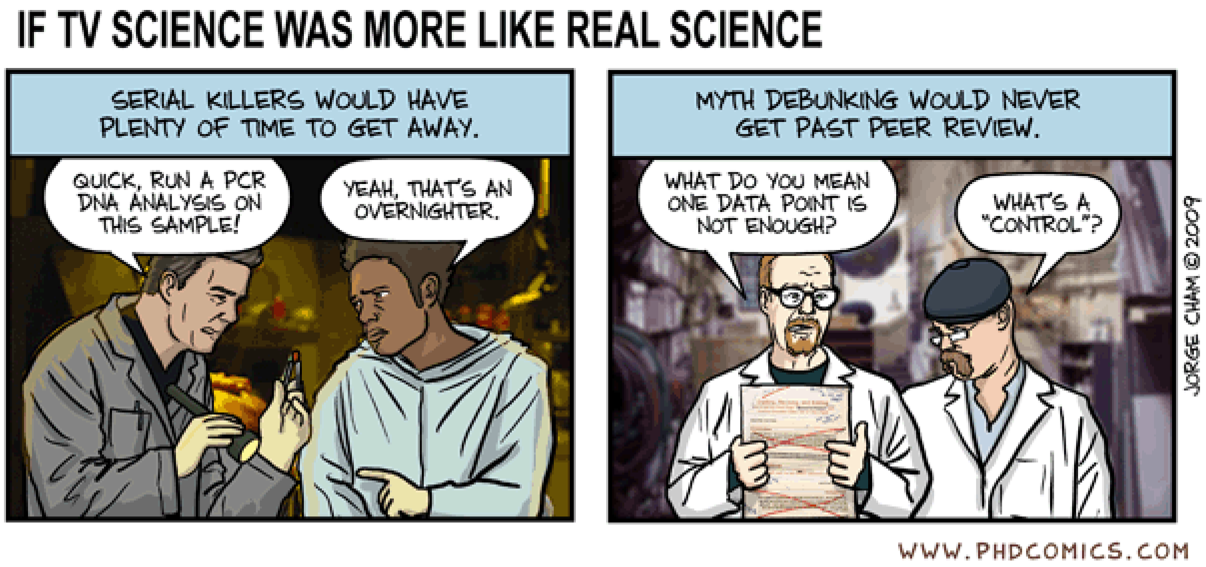
Table 1
Percentage of management plans in which proposed actions were justified by reference to the listed information sources

Information source type	(%)
Primary scientific literature	11
Secondary reviews of literature	16
Habitat management handbooks	29
Biodiversity action plans	29
Accounts of traditional management	71

Research-implementation gap: Consequences

General misunderstanding of science

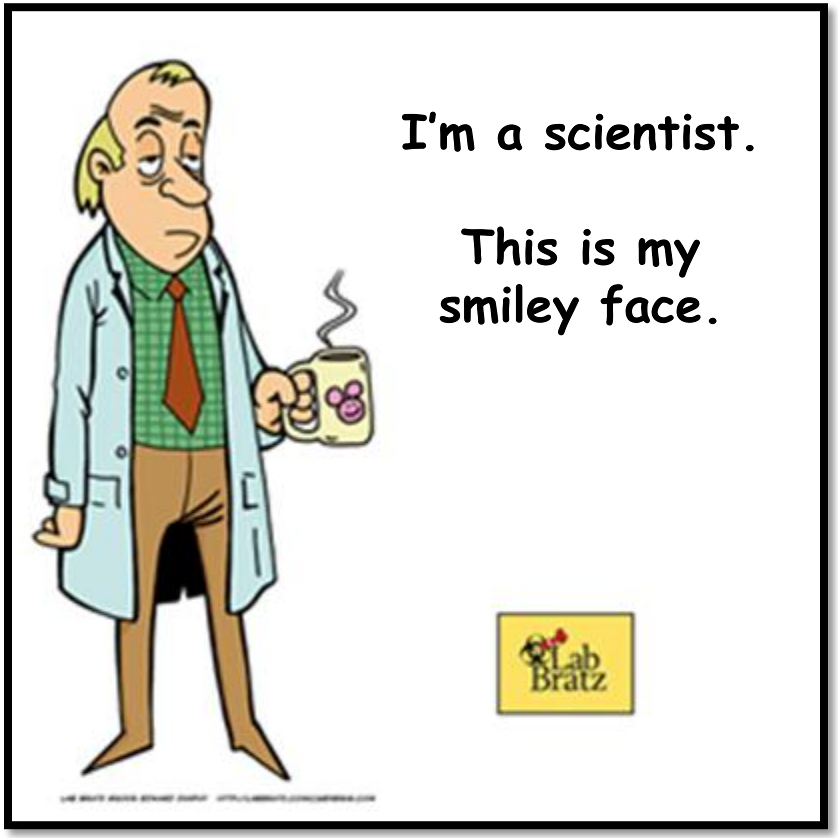
Criticism of R&D: *"FS R&D places greater emphasis on peer-reviewed journals as a means of science delivery than on other types of science delivery efforts, such as workshops, that are often more useful to end users"* (GAO 2010)



Causes: Mistrust / misunderstanding between managers and scientists

Managers' views of scientists:

- Science is an inward-looking, self-serving culture
- Scientists are arrogant
- Scientists seldom addressed "real" problems
- Scientists have little regard for application contexts
- Scientists do not communicate effectively to non-scientists
- Scientists are unable to contribute to value-based debate



Roux et al. (2006)

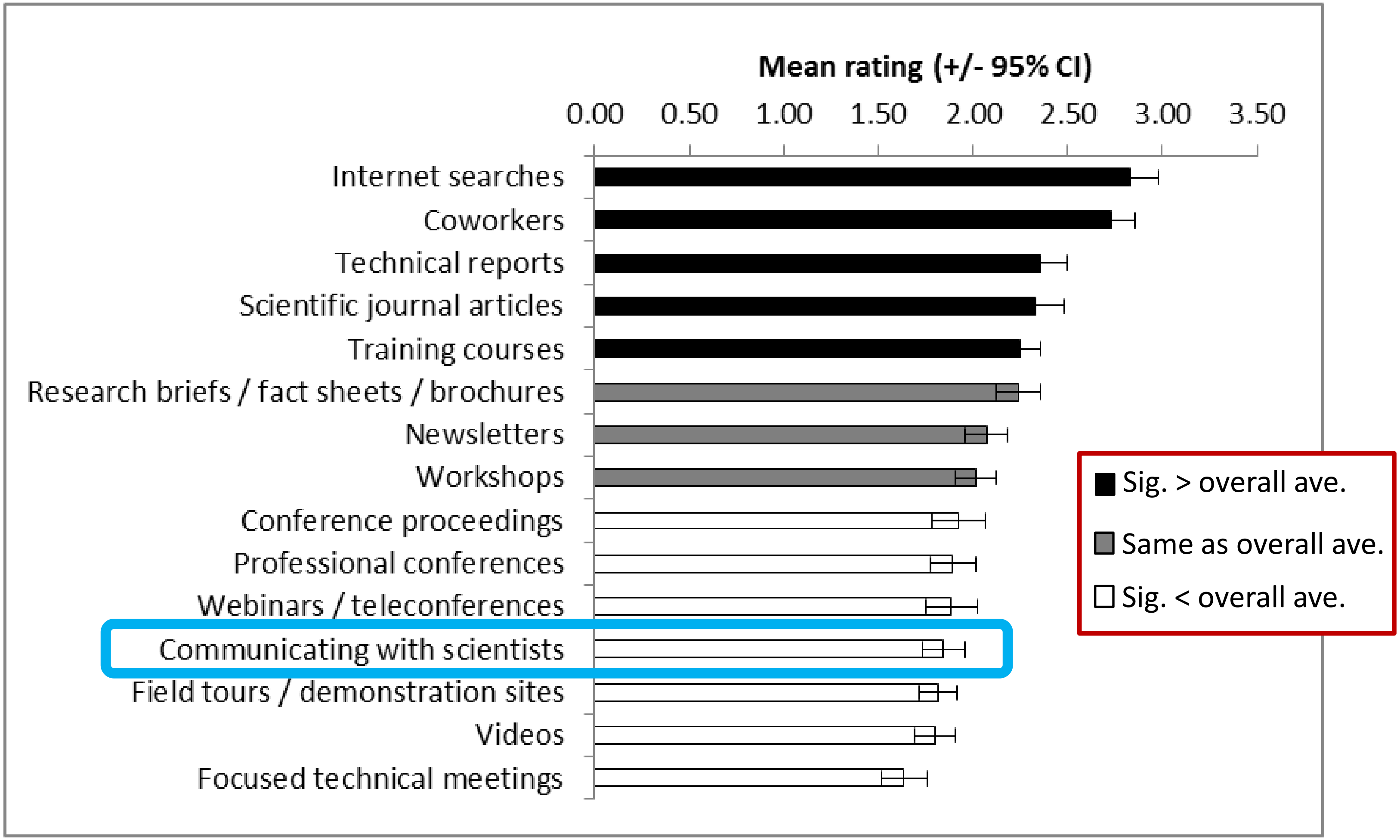
Causes: Mistrust / misunderstanding between managers and scientists

Scientists' views of managers:

- Management culture rewards organizational / individual interest above ecosystem interests
- Managers have a poor understanding of science
- Managers do not articulate their needs effectively, and often do not know what they want
- Managers are caught up in day-to-day operations and spend little time in intellectual reflection
- Managers do not appreciate ecosystem complexity

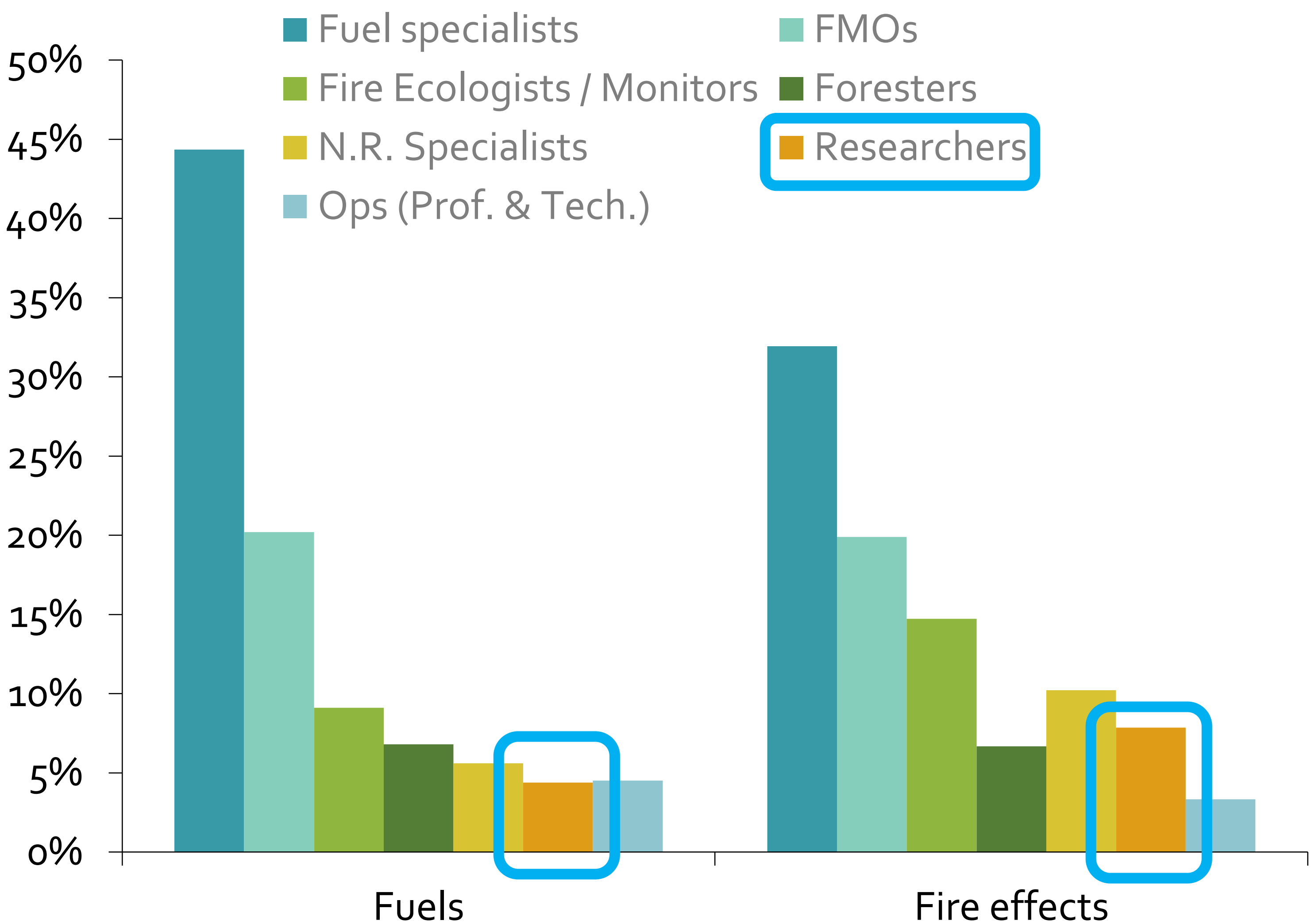
Roux et al. (2006)
Roux et al. (2006)

Causes: Infrequent interactions among scientists and managers



Vita Wright (*unpublished data*)

Causes: Infrequent interactions among scientists and managers



Vita Wright (*unpublished data*)

Causes: Lack of relevant research

Research rarely relevant to managers and policymakers (Fazey et al. 2005)

Relevance	Percentage of papers
High relevance to managers	37%
High relevance to policy-makers	20%
Most relevant (testing / reviewing conservation actions)	13%

"Very little evidence is collected on the consequences of current practices so that future decisions can be based upon the experience of what does or does not work" (Sutherland et al 2004)

Causes: Lack of time / resources

Managers	Researchers
Pressure to "do"	Pressure to publish
Fast past of decision-making	Slow pace of research / publication
No time to read peer-reviewed journals	No time to work in the field with managers
Lack of experience with scientific method	Lack of experience with collaborative learning
Limited training in framing research questions	Limited training in science communication

Fazey et al. (2005); Roux et al. (2006); Knight et al. (2008)

Top 3 limitations to applying science to management (Vita Wright, *unpublished research*):

1. Lack of time to find and use research
2. Lack of communication between scientists and managers
3. Lack of funding to implement research findings

Causes: Philosophical debate

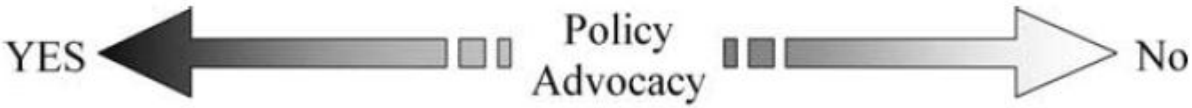
Scientific credibility is threatened by engagement with managers / politicians

- Scientists "should inform the public about issues while avoiding direct involvement in policy development and the political considerations this necessarily entails" (Ruggiero 2010)
- Deteriorates the ability of science to inform decision-making (Scott et al. 2007)

Imperative for scientists to engage

- Conservation biology and other environmental fields demand advocacy in order to make a global difference (Whitten et al. 2001)
- Need to recognize the "social nature of scientific knowledge" Barry and Oelschlaeger 1996)

Causes: Philosophical debate



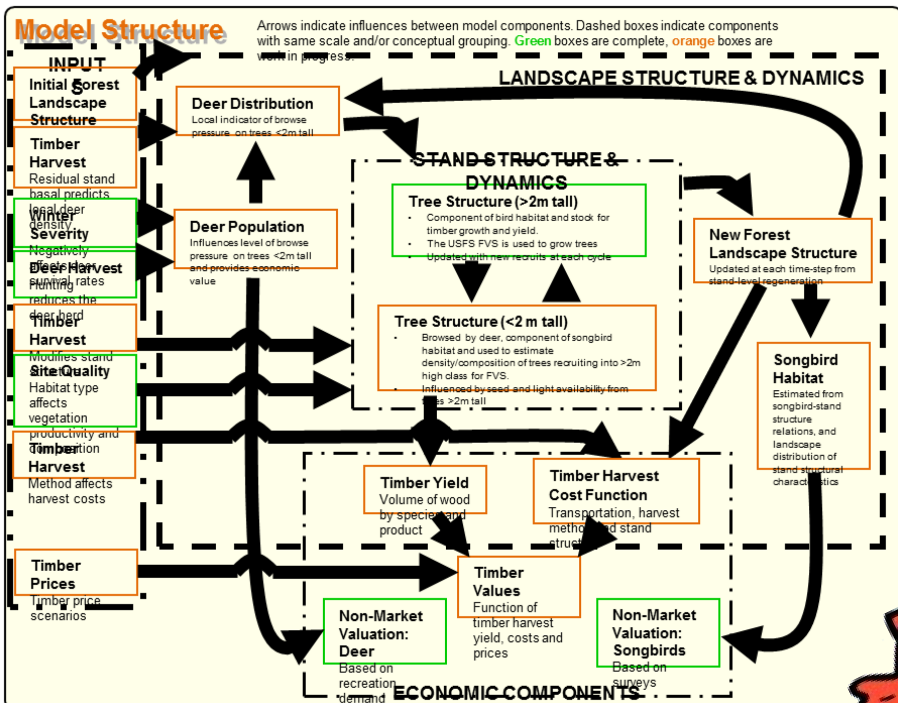
- Stipulating preferred policy decisions
- Supporting a class of policies based on general beliefs or values
- Conducting normative science
- Lobbying for specific policies or management outcomes
- Framing research questions or choosing study areas such that the outcome will support preferred policies

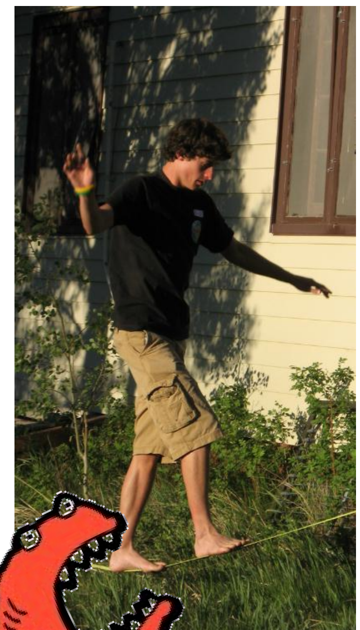
- Using language and words in ways that can be interpreted differently by different groups or stakeholders
- Failing to acknowledge the full range of potential consequences of scientific uncertainty on interpretation of research
- Sharing research results with one or a limited range of special-interest groups
- Providing advice to one stakeholder about a controversial issue

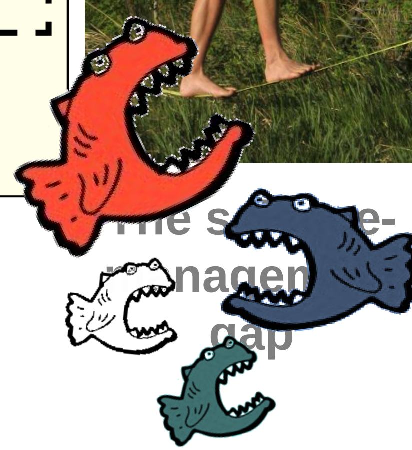
- Conducting research on policy-relevant issues
- Publishing results in scientific journals
- Publishing results in non-technical outlets
- Bringing relevant science to the attention of managers and policy makers
- Providing results of research to all stakeholders and the public
- Supporting use of the best available science in decision making
- Testifying before congressional committees
- Giving interviews to the press about research results
- Discussing conservation science on radio or television shows

Scott et al. (2007)

Causes: It's hard and I don't wanna







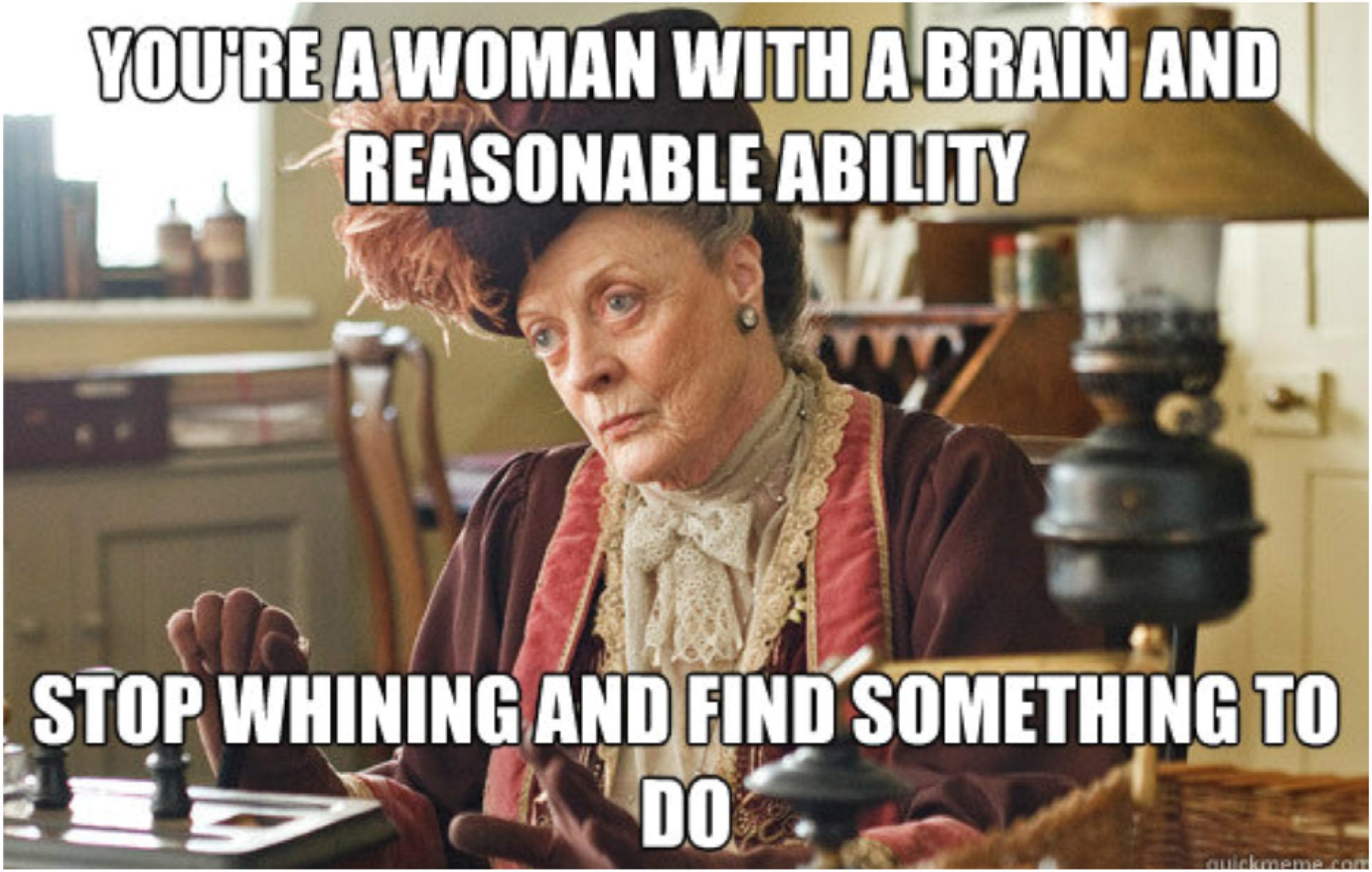
Identify 30-70 crop trees per acre with particular value for timber and wildlife.

Release crop trees from competing vegetation.

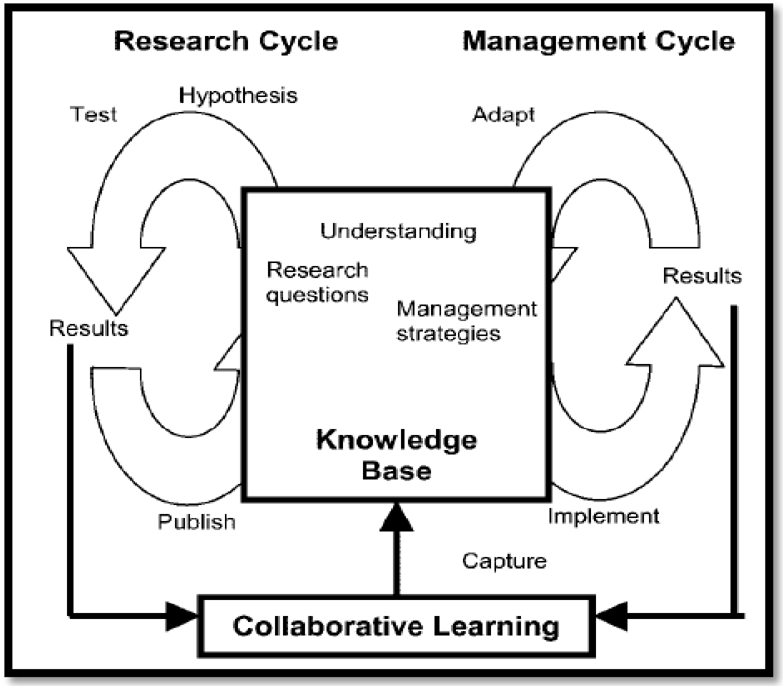
- Pole-sized crop trees should receive a 2-3-sided, 5-10-foot crown release.
- Sawtimber-sized crop trees should receive a 1-3-sided crown release.

Between crop trees, create circular canopy gaps ranging from 30 -75 feet in diameter on 5-15% of the area at each entry. Within gaps, all poor-quality stems >1 inch DBH should be cut.

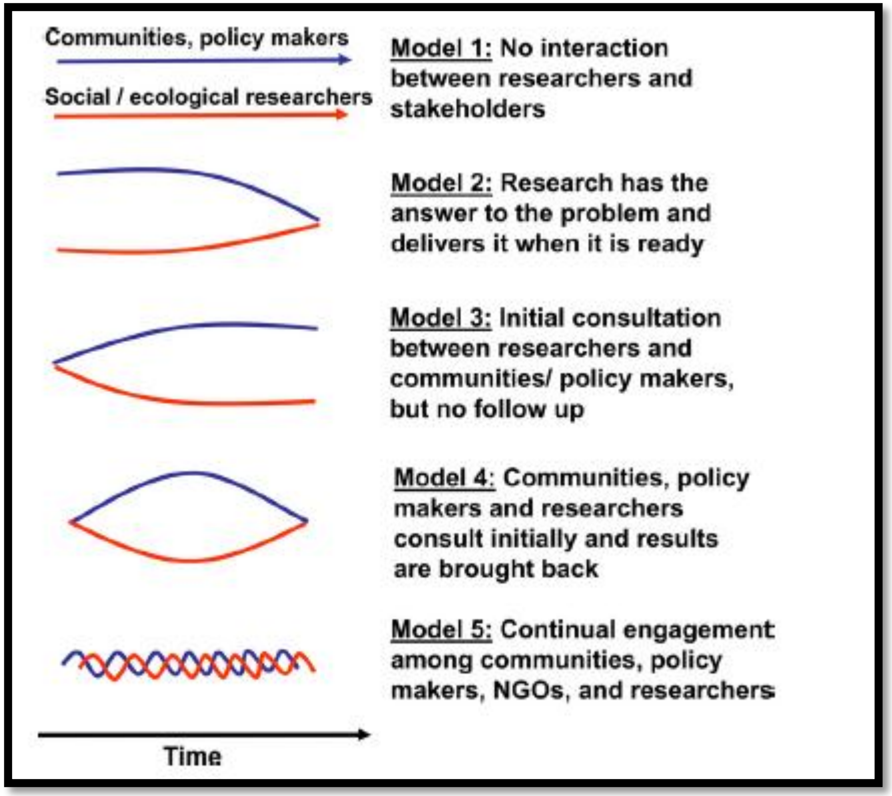
CANOPY GAPS BETWEEN CROP TREES SHOULD RANGE IN DIAMETER FROM 30-75 FEET.


YOU'RE A WOMAN WITH A BRAIN AND REASONABLE ABILITY
STOP WHINING AND FIND SOMETHING TO DO

Connecting the lab and the field

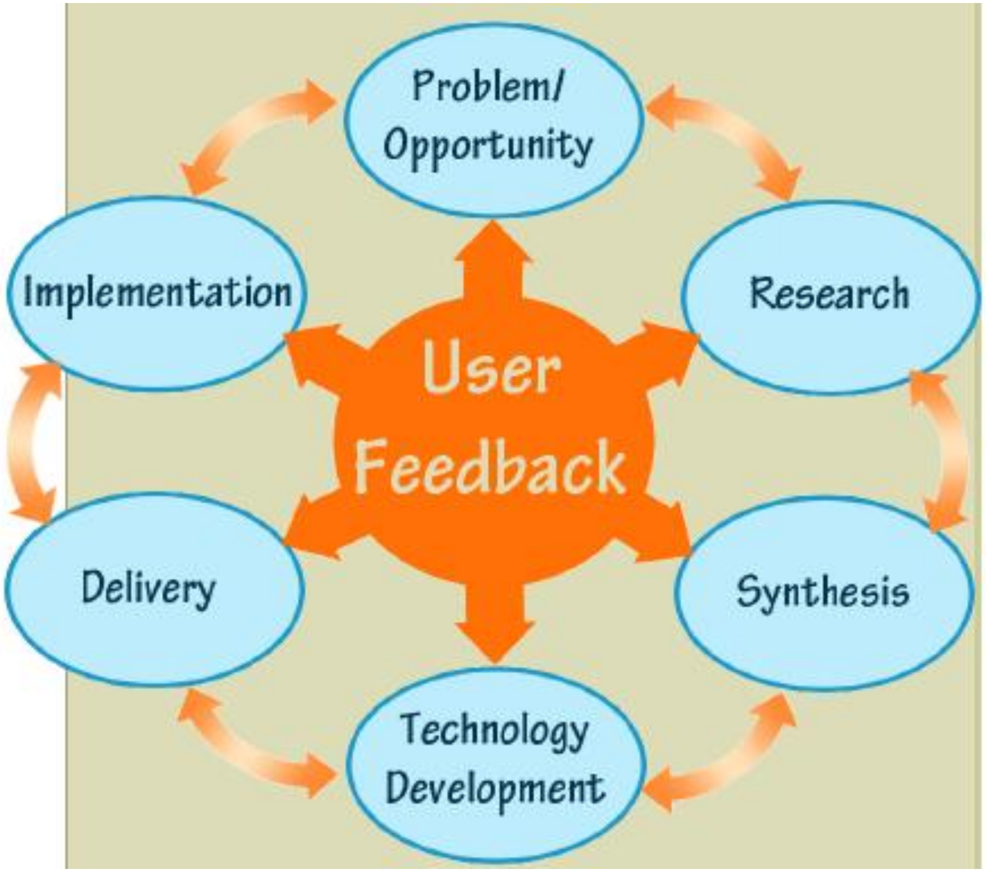


Bosch et al. (2003)



Reid et al. (2009)

Connecting the lab and the field



Involve the user THROUGHOUT the process

Enter Pocket Science!

- Pocket science doesn't take a rocket scientist!
- Using simple and smart observations to learn from management activities
- Also known as citizen science, participatory learning, collaborative learning, etc.

"Pocket Science" can provide a link between general knowledge ("book learning") and case-specific implementation

"Pocket science won't get you to the moon, but it can keep you from making the same old mistakes."

Enter Pocket Science!

Bona fide pocket scientists use the following tips to help them L.E.A.R.N.

- **L**et management questions guide your methods.
- **E**ngage partners in collecting data, interpreting results, and discussing implications.
- **A**lways take photos and GPS waypoints of your plots.
- **R**epeat measurements over time using consistent methods.
- **N**ever treat an entire unit the same. Always leave a portion untreated (i.e., a control plot).

Enter Pocket Science!

What are pitfalls to avoid?

- **Losing control!** Untreated and representative control plots are crucial for assessing the impacts of management activities.

- **Forgetting about it.** What good is a photo point if you never revisit the location? Dedicate at least one day a year to pocket science.

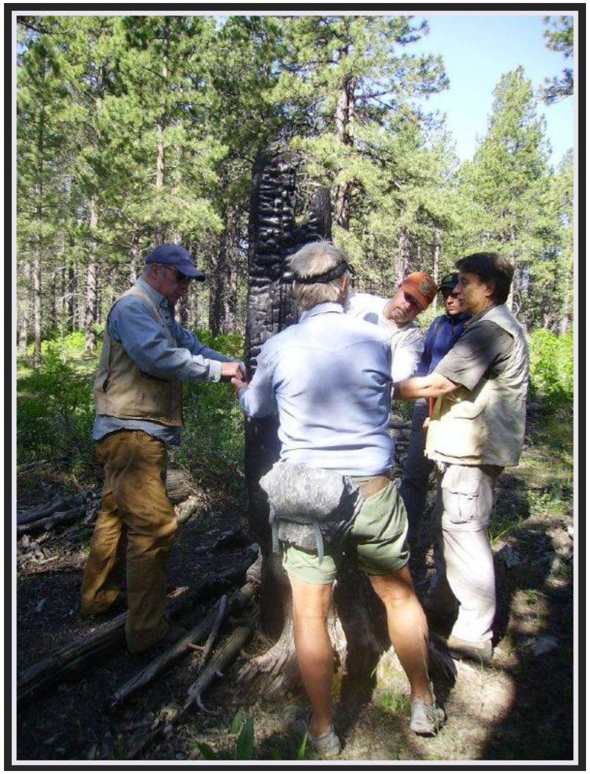
- **Doing it all yourself.** Engage volunteers, school groups, etc.

- **Making it too complicated.** Pocket science is about taking simple and smart observations, not about measuring everything, everywhere, all the time.

Treatment plots

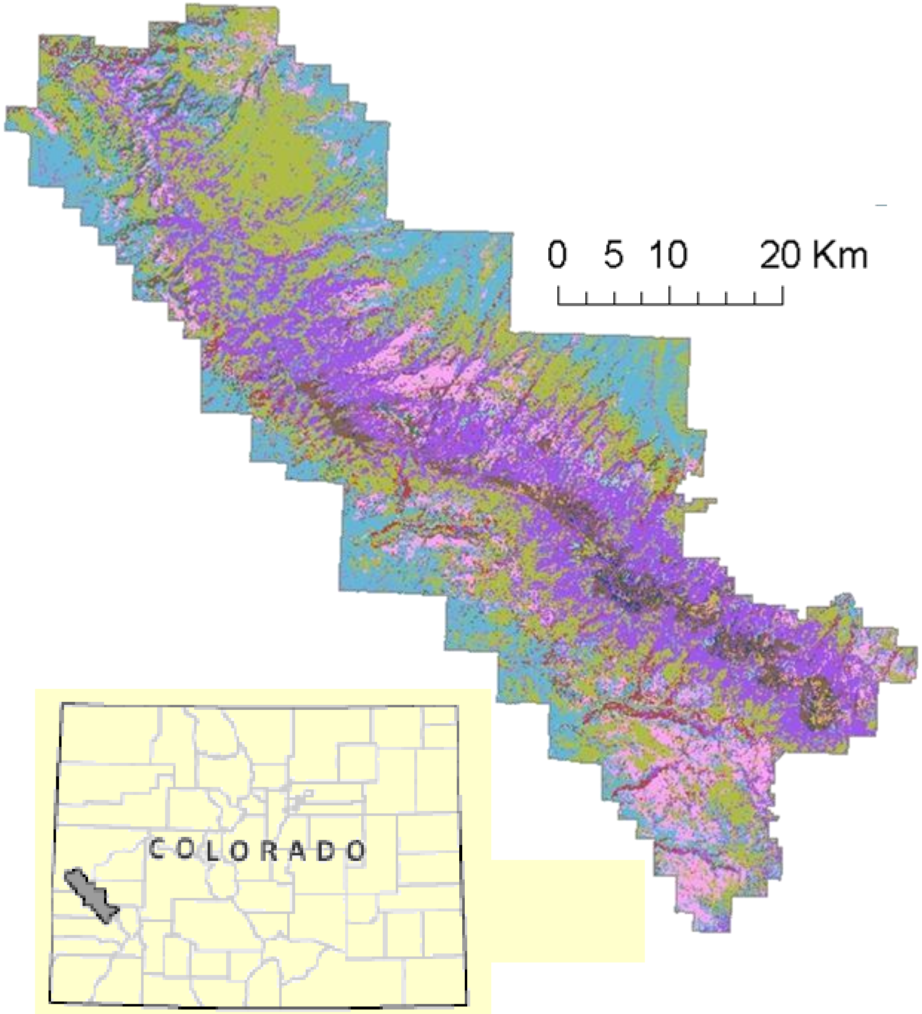
Control plots

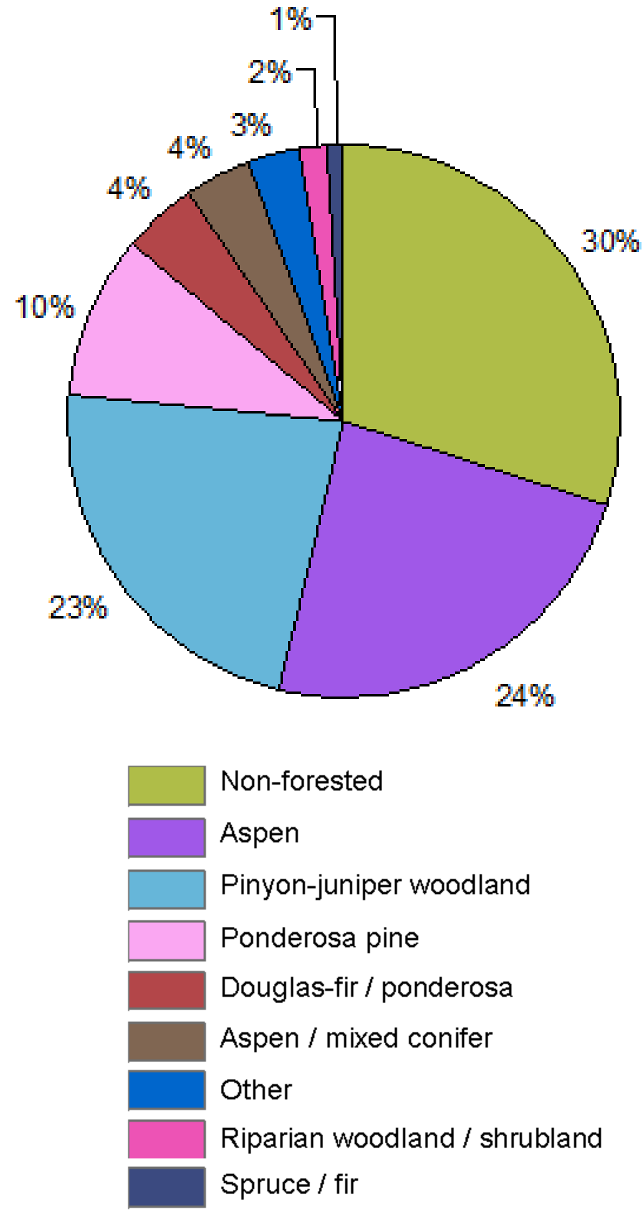
Forestry Forensics



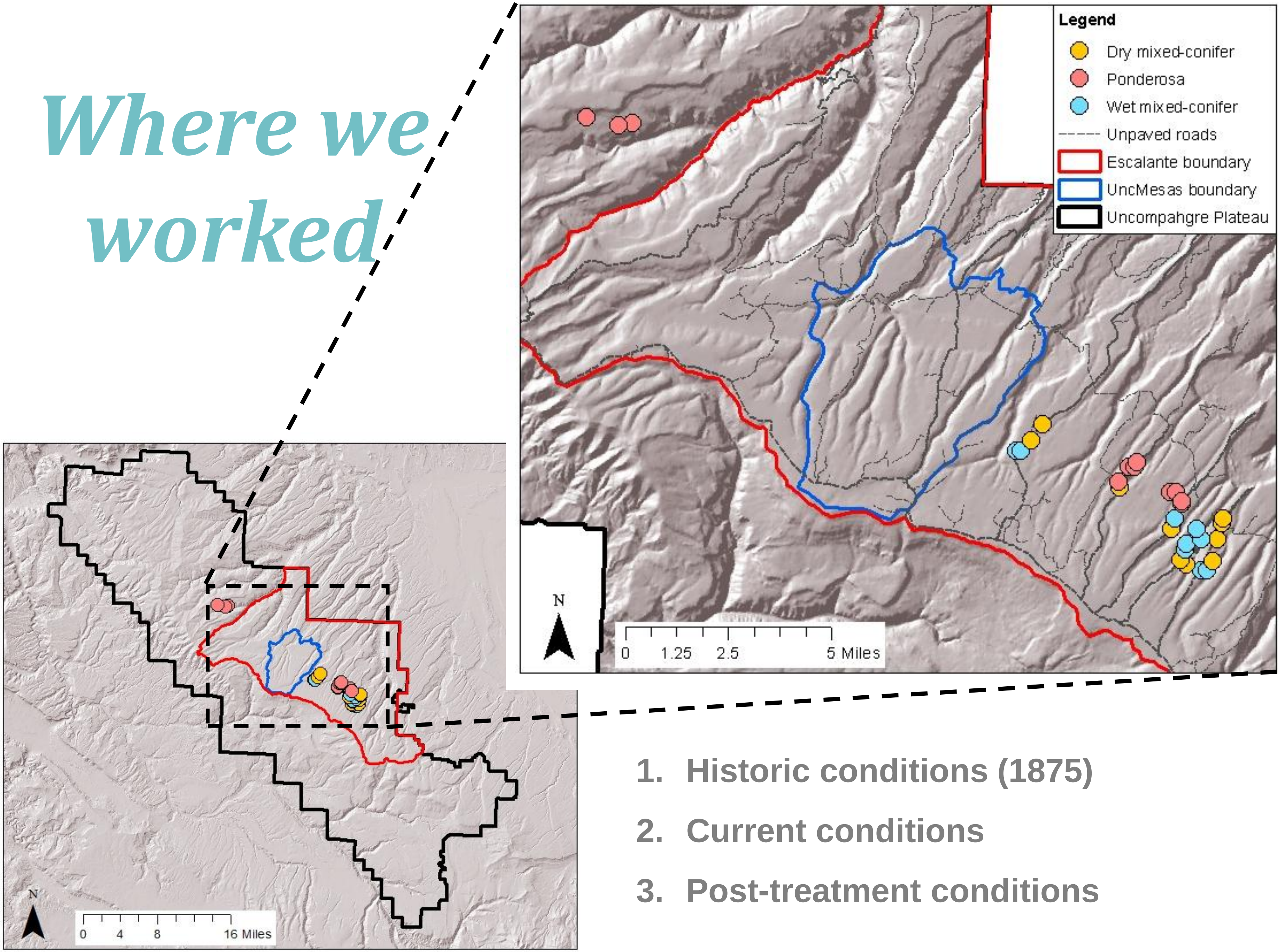
The Uncompahgre Plateau

~2,300 km^2 area ranging in elevation from 1,800 to 3,000 m



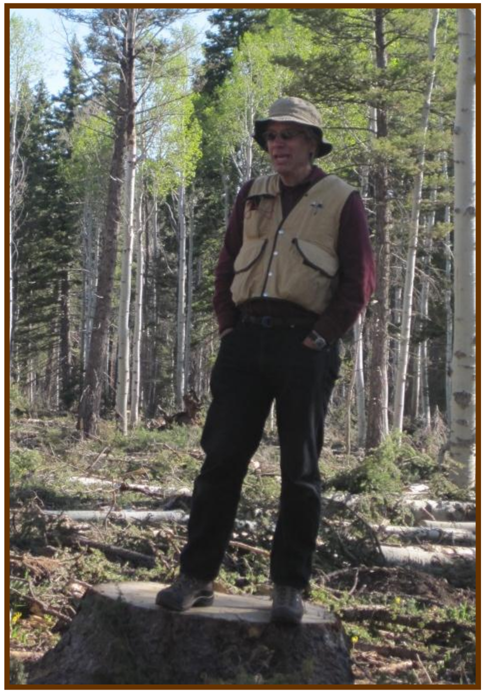
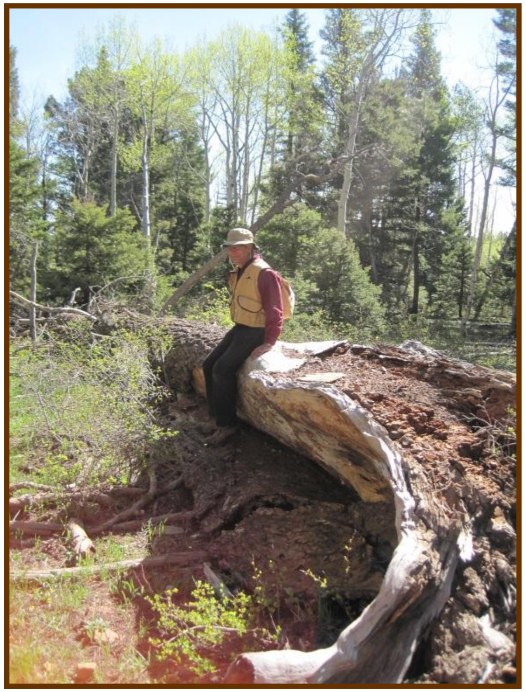


Where we worked



1. Historic conditions (1875)
2. Current conditions
3. Post-treatment conditions

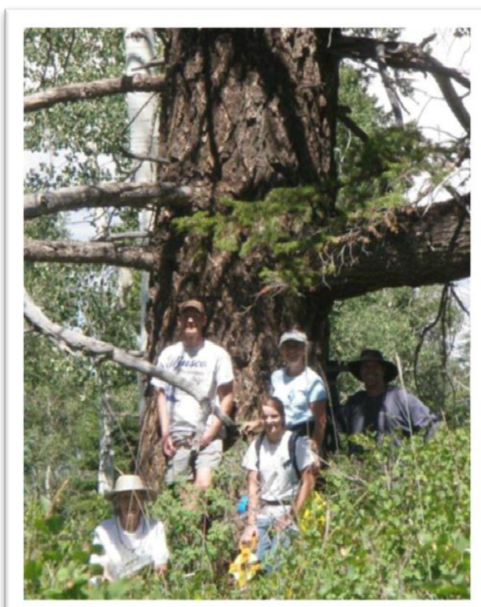
• • • Clues in the forest • • •

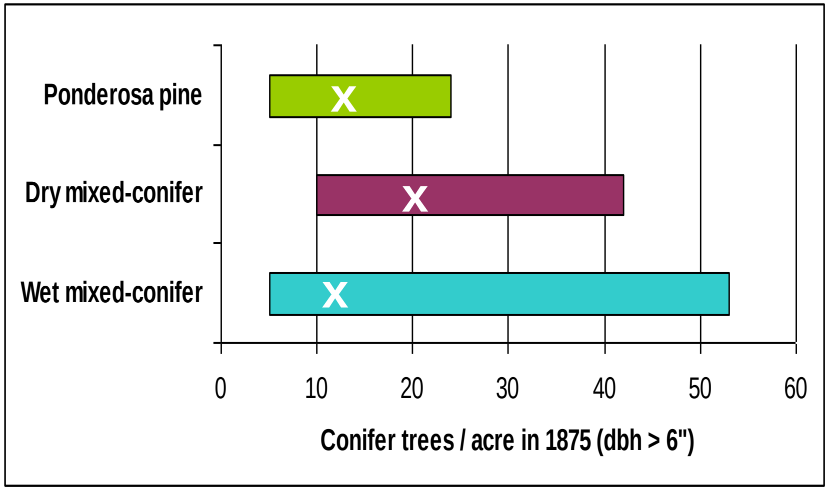


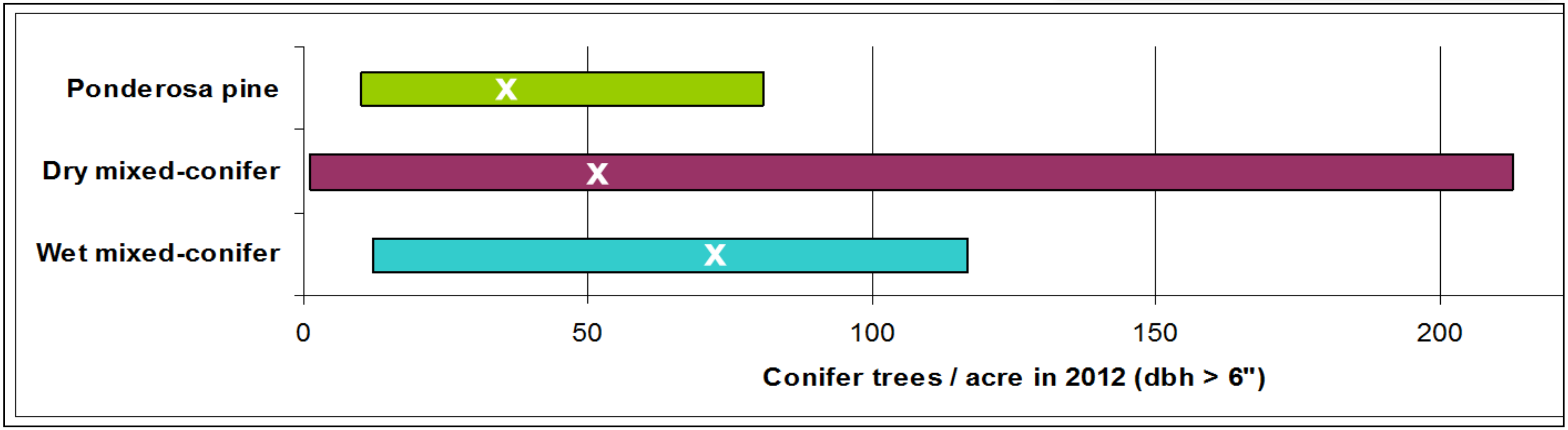
Which of these trees was also standing in 1875?

• • • *Collaborative work-days* • • •

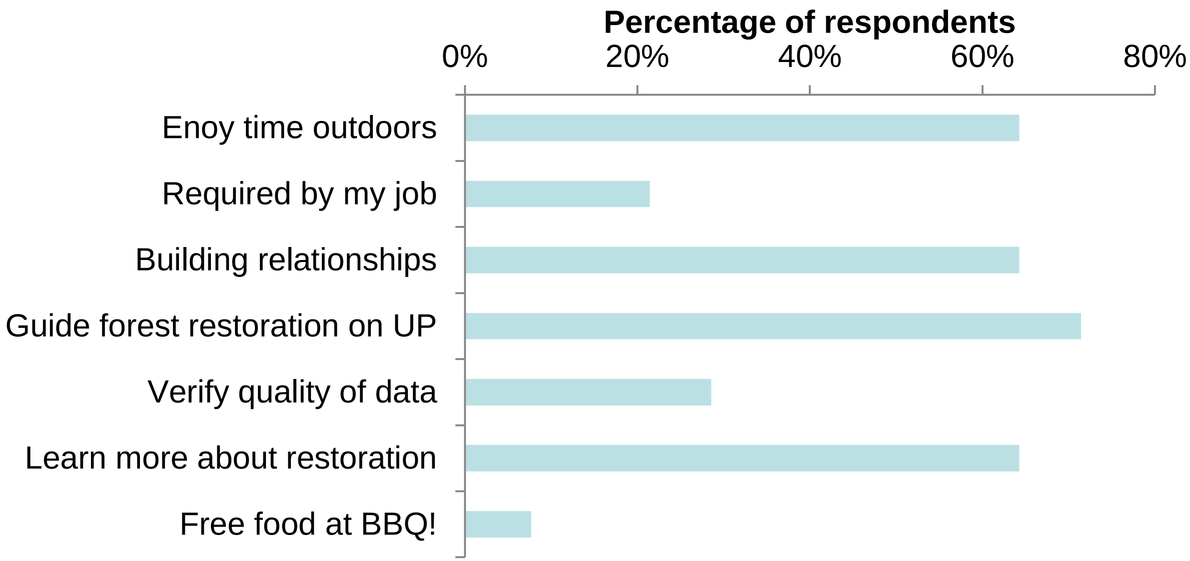


• • • Stand density data • • •

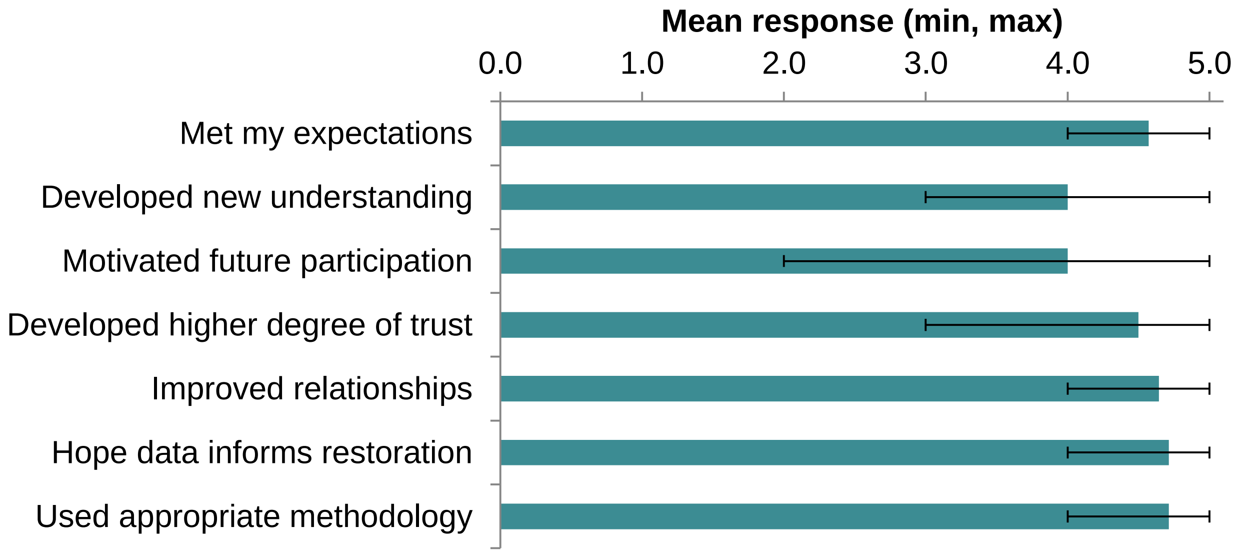




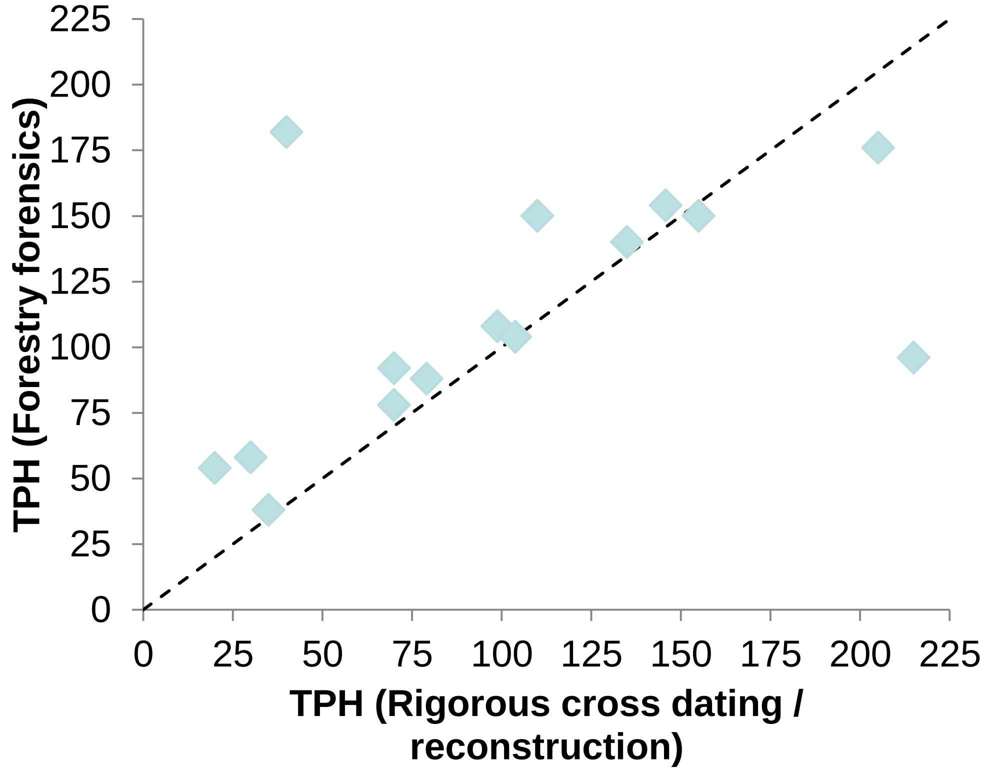
Building social capital



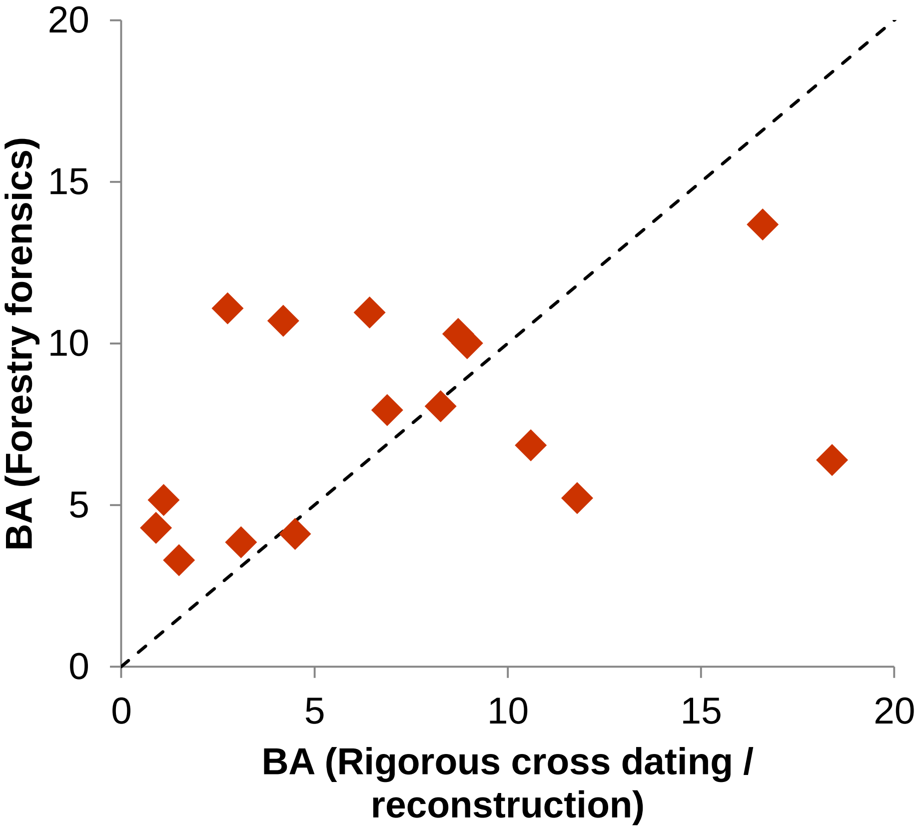
N= 14 (of 40)
Stakeholders: Recreationists, Universities, Agencies, Enviro. Groups, Retirees, Citizen



• • • Validity of approach • • •



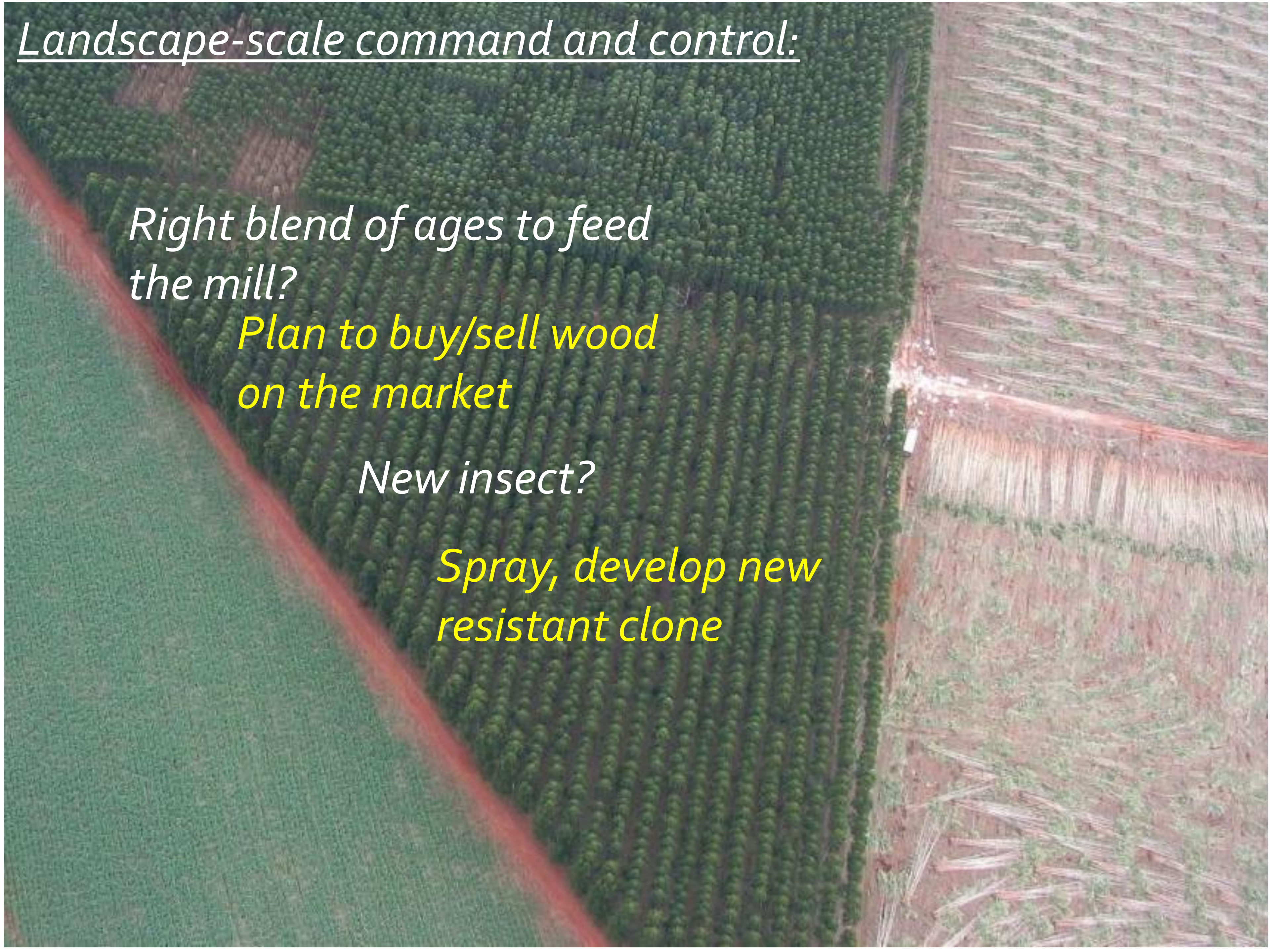
• • • Validity of approach • • •



Interpreting and applying data: UFCs

***Un**desirable future conditions*

Turning our thinking upside down to get it right.


Landscape-scale command and control:
Right blend of ages to feed the mill?
Plan to buy/sell wood on the market
New insect?
Spray, develop new resistant clone

But forests aren't tree farms – there are no precise structures or functions for "success"

Uncertainty is unavoidable for forests –
the future of a forest always remains largely unwritten

(Why would we imagine otherwise?)

A tree-farm vs. forest analogy:

What should her career be?

1960-1980: **Command and Control**

"You should be an accountant like your father was"

1980-2000: **Desired Future Condition**

"You can choose to be a bean counter in *any* financial sector you want"

2010-future: **Avoiding undesirable futures**

"I hope you're NOT unhealthy, unhappy, unkind, or poor – the rest is unforeseeable, and up to you"

"Wait a minute – aren't 'desired conditions' and 'undesired conditions' pointing to the same thing?"

Desired condition:

"Choose curtain #2"

Undesirable condition:

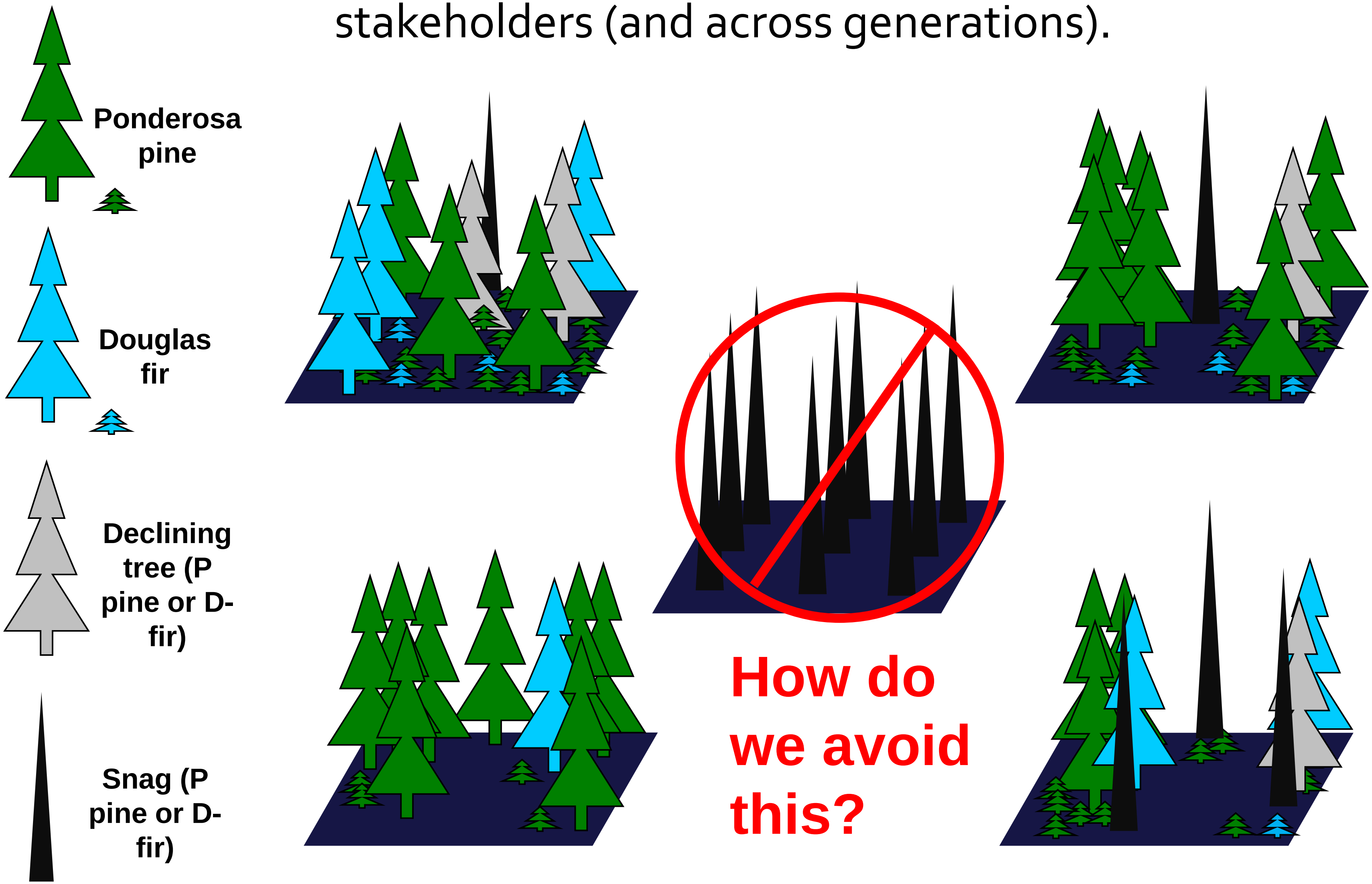
"Don't choose Curtain #1 or #3"

But forest decisions have dozens, (hundreds?) of possibilities, about dozens (hundreds?) of features: which species, how many trees, what arrangement, what fire, how often…

and then Nature does something else anyway!

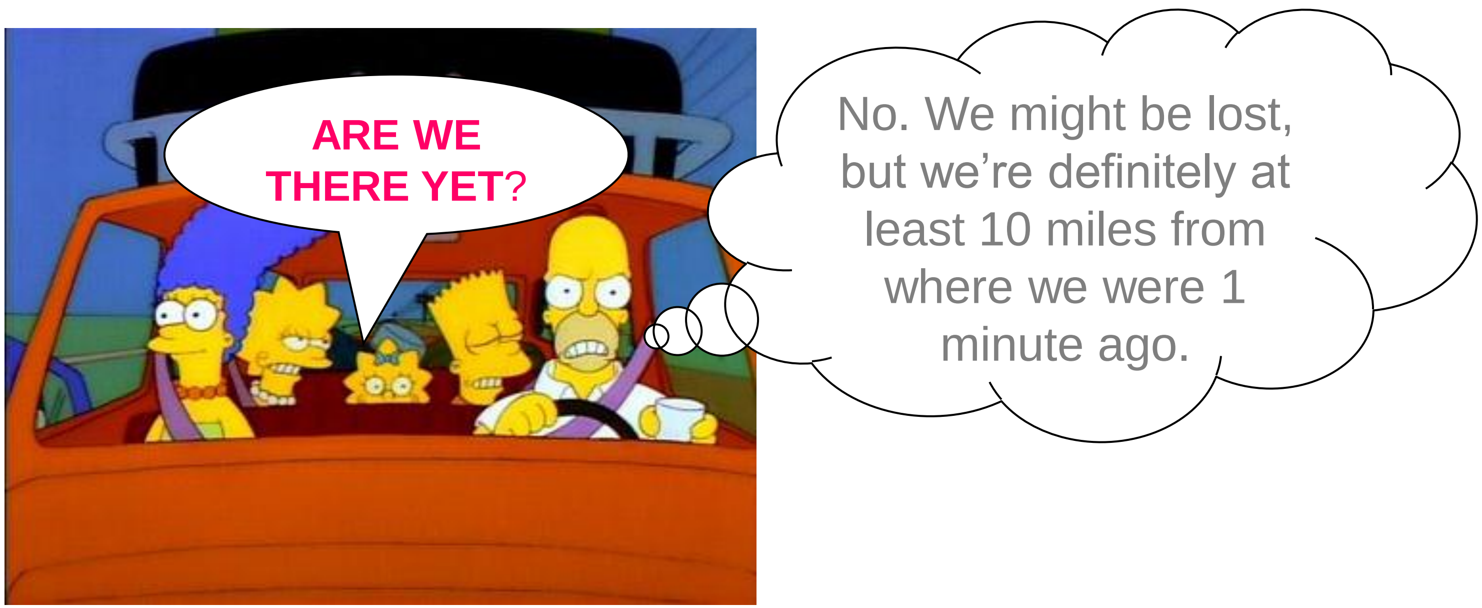
Potential benefits of UFCs

More consensus about undesirable conditions among diverse stakeholders (and across generations).



Potential benefits of UFCs

1. More consensus about undesirable conditions among diverse stakeholders (and across generations).
2. Easier to monitor progress away from a known baseline than progress towards a shifting future.



3. Celebrates the exciting, dynamic nature of landscapes.
4. Allows for more flexible and creative management.

Lessons learned connecting lab to field

- Focus on end-user and involve them in entire process
  - *Learn in the field together*
  - *Use accessible language and methods—pocket science*
  - *"Teach a man to fish"*

- Maintaining credibility of research
  - *Validate methods for reasonableness*
  - *Remember difference between statistical significance vs. social and management significance*

- Bi-directional learning
  - *"I would remind you and all of your staff who work on these projects to be eternally curious when somebody challenges a professional assumption or a conclusion you've made. When they challenge it, ask, 'Tell me why you have a different view? Help me to understand. Describe more.'"* Allen Rowley (Forest Supervisor, Fish Lake National Forest)

Questions for you

- What misadventures and/or grand successes have you had with knowledge transfer? What lessons have you learned?
- What "best practices" have you learned for pocket science / citizen science?
- How can graduate students balance the need to kick-start our career with the desire to be useful outside academia?
- Are there pitfalls / dangers to knowledge transfer that we need to be aware of? Advocacy vs. objective outsider?

• • • Thank you!!! • • •