



Making Wildland Fire Research Useful at the Installation Level: A Case for Co-Production from a Manager's Perspective

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SERDP • ESTCP
SYMPOSIUM
2018 | Enhancing DoD's Mission Effectiveness

A Case for Fire Research Co-Production

*“Knowledge **co-production** involves stakeholders from diverse knowledge systems working iteratively toward common vision and action.” (Nel et al 2015)*

“...establishing long-term relationships between scientists and stakeholders, ensuring two-way communication between both groups, and keeping the focus on the production of usable science...” (Meadow et al 2015)

From Kevin Hiers: *“deliberate efforts to produce scientific knowledge with end-users (e.g., fire managers) as active participants to improve applications and transfer of research results.”*



2



Legal Drivers for Fire on AF Lands

Endangered Species Act of 1973 (ESA; 16 U.S.C. § 1531 et seq.)

AFI 32-7064 Integrated Natural Resources Management

Sikes Act (16 USC 670a-670o, 74 Stat. 1052)

➤ Requires Integrated Natural Resources Management Plan (**INRMP**)

INRMP signed by **Wing Commander**

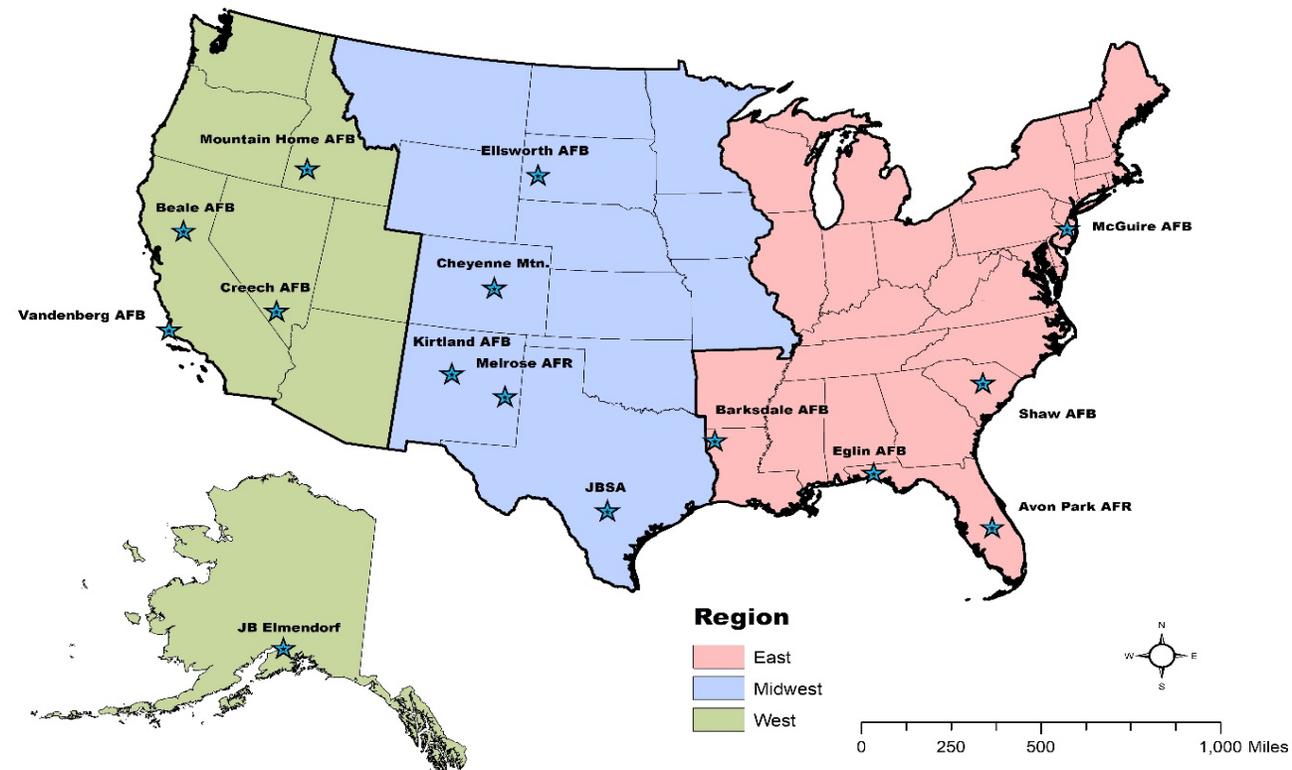
U.S. Fish and Wildlife Service is the regulatory agency

INRMP defines **prescribed fire and wildfire goals and objectives.**

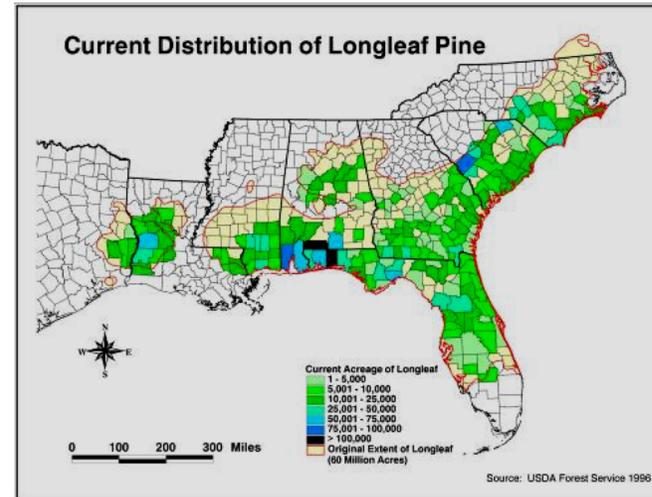
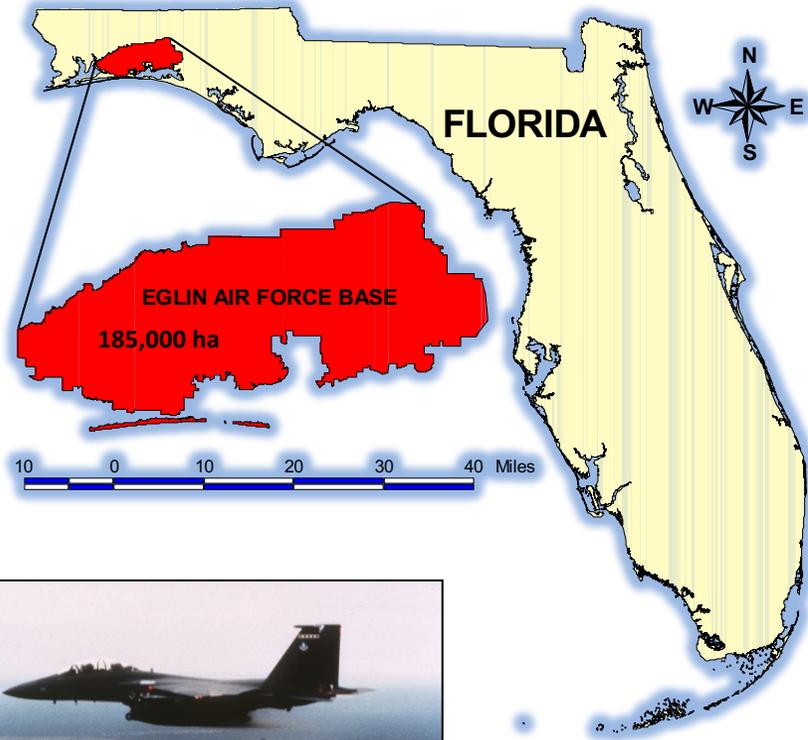


Air Force Wildland Fire Branch (AFCEC/CZOF)

Air Force Wildland Fire Branch



Eglin AFB





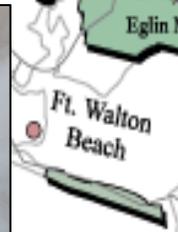
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Smoke Testing

Sub-Munitions and Munitions Testing

Deep Space Tracking Station



Development
convention
units and

ir-to-Air Combat
roficiency Training



Drone targets 1-4

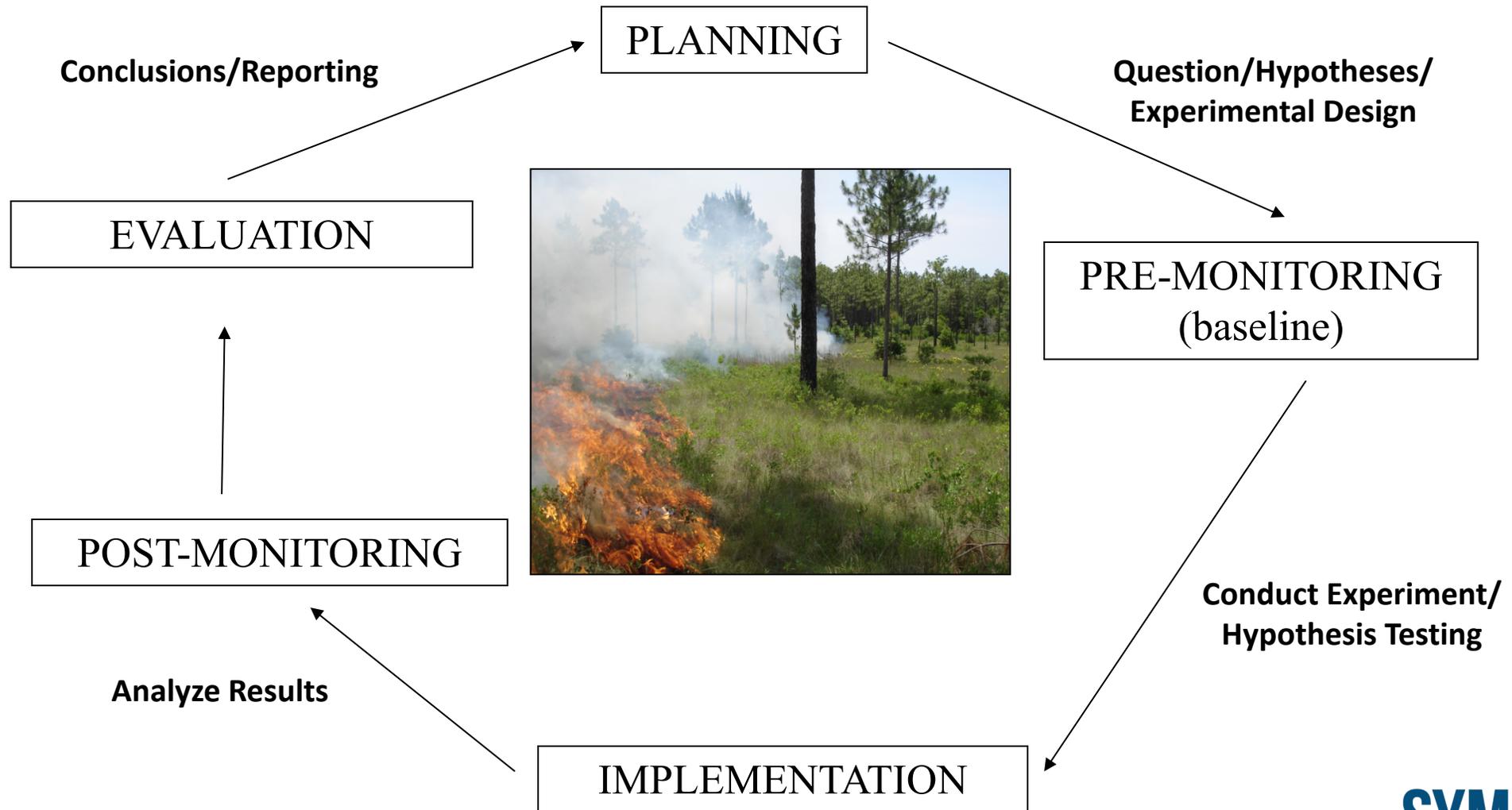
Testing

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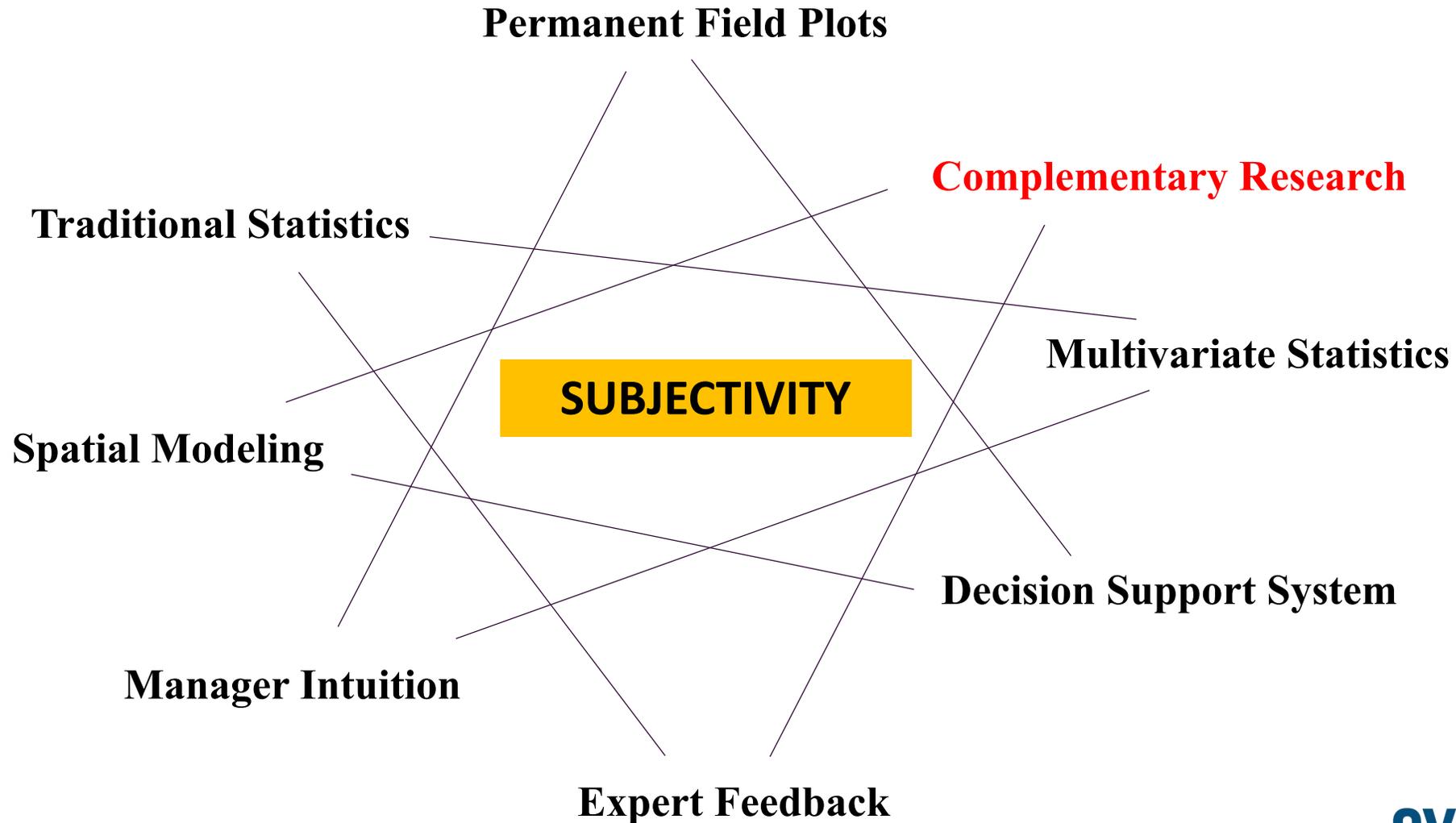
Uncertainty and No-Analogue Future



Adaptive Management Cycle Scientific Method



Adaptive Management Tools and Isolating Subjectivity



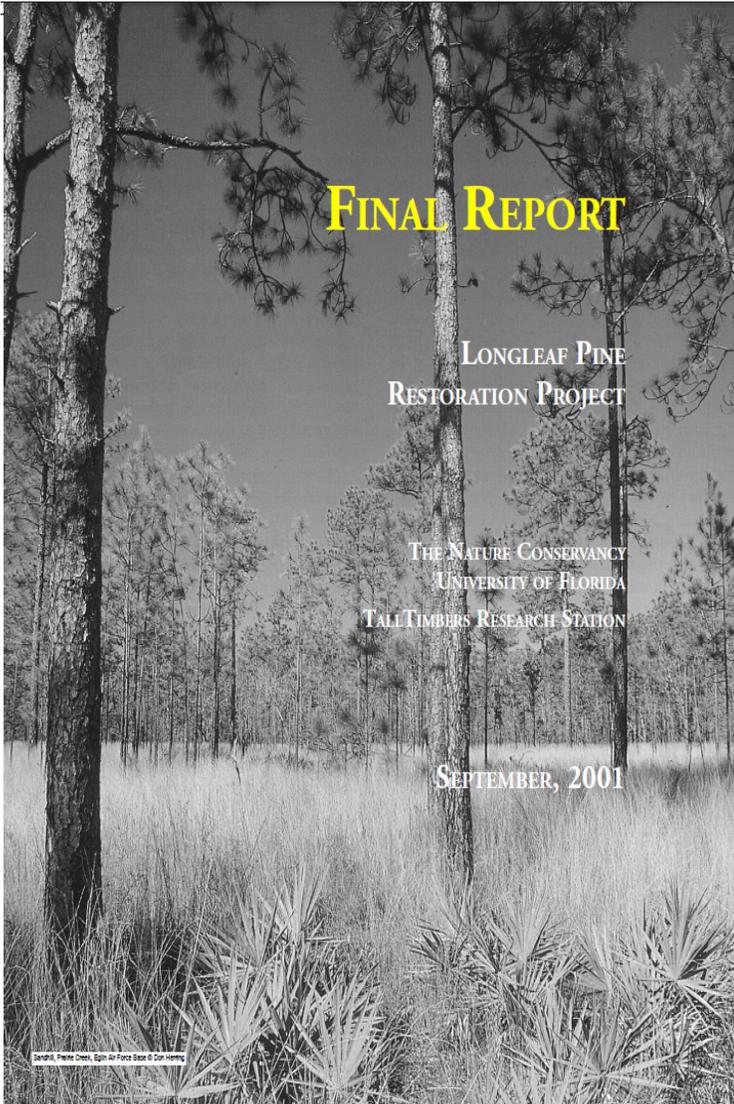
AF Fire Research Case Studies



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Developing Dynamic Reference Models and a Decision Support Framework for Southeastern Ecosystems: An Integrated Approach (SERDP Project RC – 1696)



A. Approved for



Technical Approach



Spring Burn



Herbicide + Fire



Felling + Fire

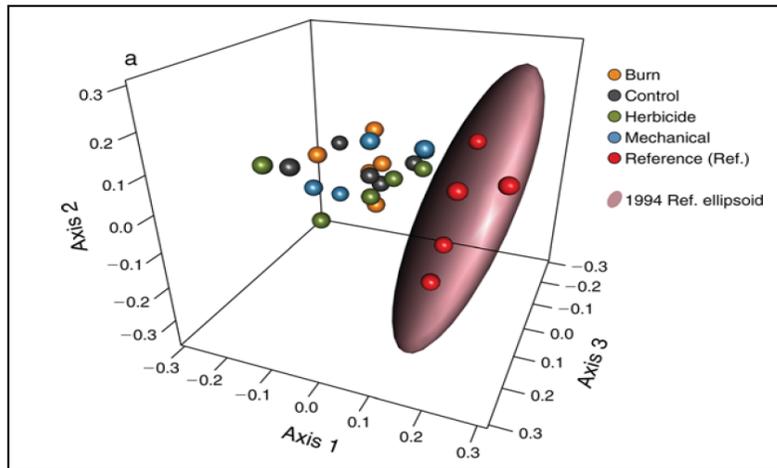


Randomized block design with 6 blocks of three treatments and paired control. Sampling methods consistent with Field Study #1.

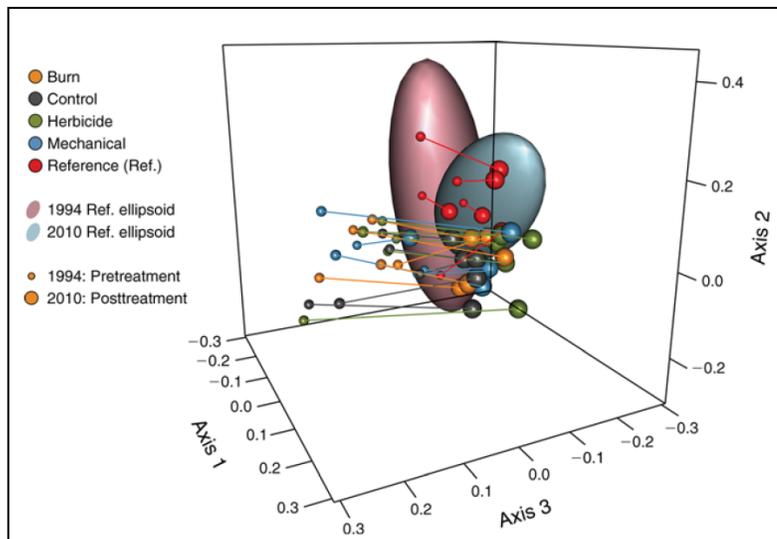
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Dynamic Reference Condition

Multivariate Ordination Using Vegetation Data Only Pre-Treatment (1994)



Late Post-Treatment 2010



Kirkman et al. 2013. *Ecological Applications*

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Proportional Similarity to Reference

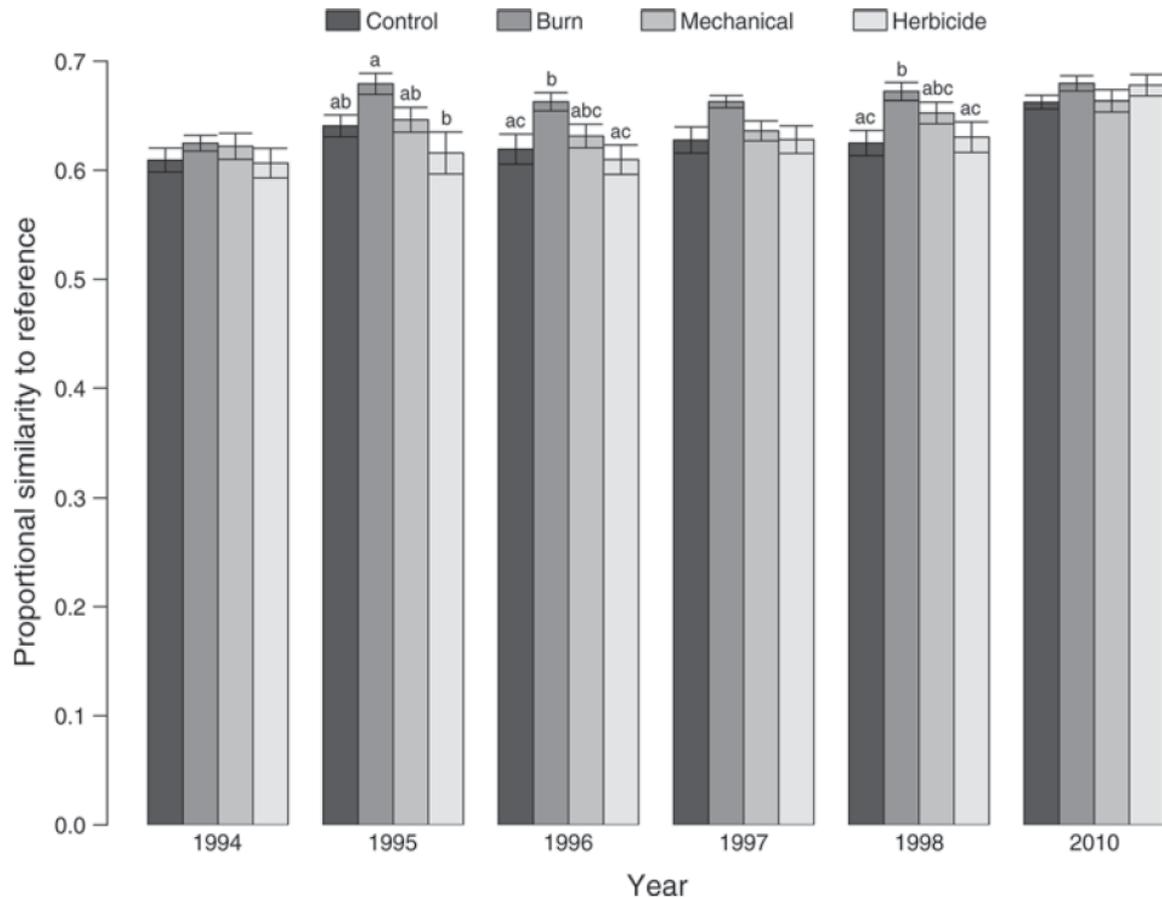


FIG. 4. Proportional similarity to reference conditions (mean \pm SE) by treatment from 1994 to 2010 using log-transformed understory species abundance after removing rare species. Means with different letters above the bar are significantly different (Tukey's HSD, $P < 0.05$).

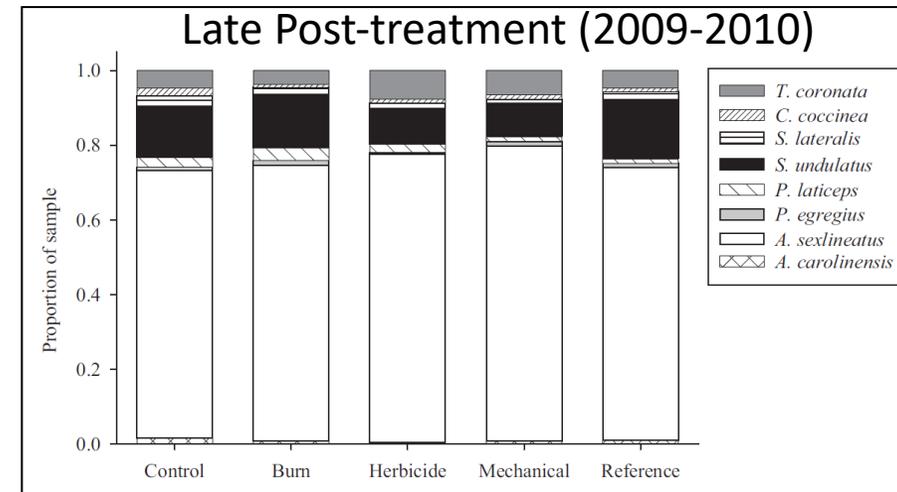
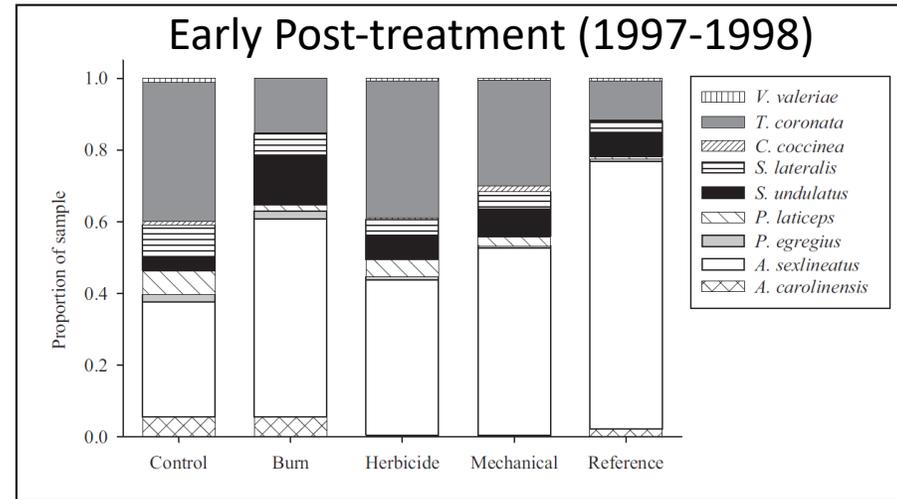
Kirkman et al. 2013.
Ecological Applications



Reptile Assemblage Response

Relative proportion of capture:

- Eastern fence lizard
- Broad-headed skink
- Little brown skink
- Six-lined racerunner
- Southeastern crowned snake
- Ring-necked snake
- Scarlet snake
- Smooth earth snake
- Green anole



Steen et al. 2013. *Ecological Applications*

Duff Consumption and Southern Pine Mortality

Part 1: Duff Consumption and Southern Pine Mortality

J. Kevin Hiers, Eglin AFB

Morgan Varner, University of Florida

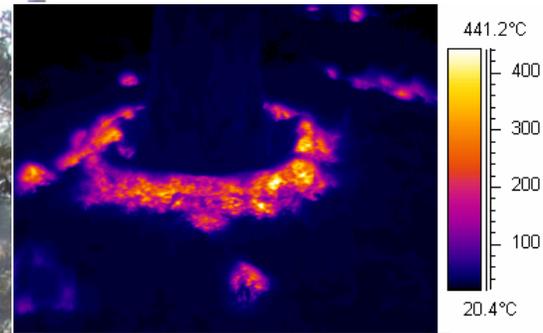
Roger Ottmar, USDA Forest Service PNW Research Station

Joseph J. O'Brien, USDA Forest Service, SRS

Dale Wade, USDA Forest Service, SRS (retired)

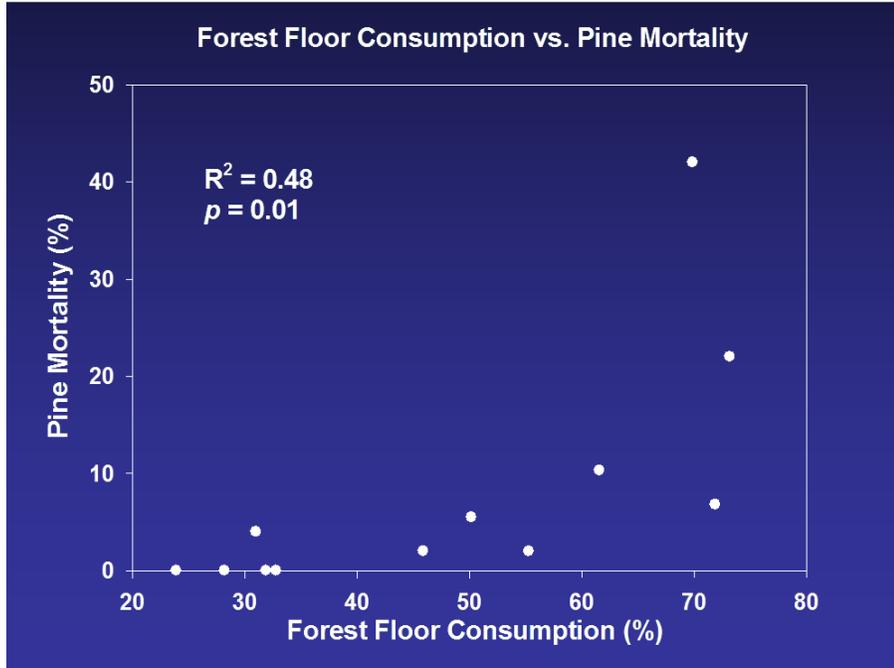
Sue Ferguson, USDA Forest Service PNW Research Station

Robert Mitchell, Joseph W. Jones Ecological Center

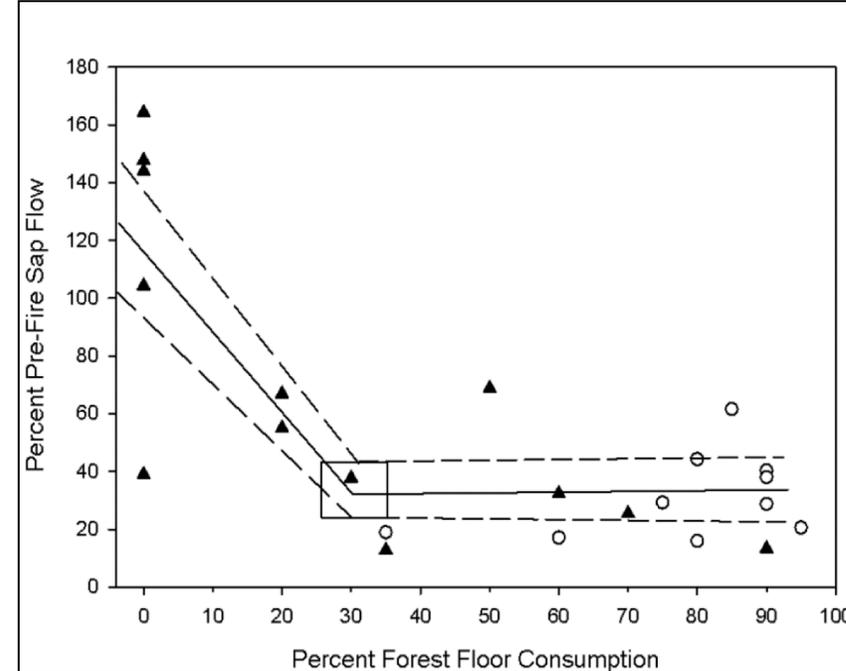


JFSP Project # 01-1-3-11

Duff Consumption and Southern Pine Mortality



40% duff consumption breakpoint for increased pine mortality (Varner et al. 2009. *Forest Ecology and Management*)

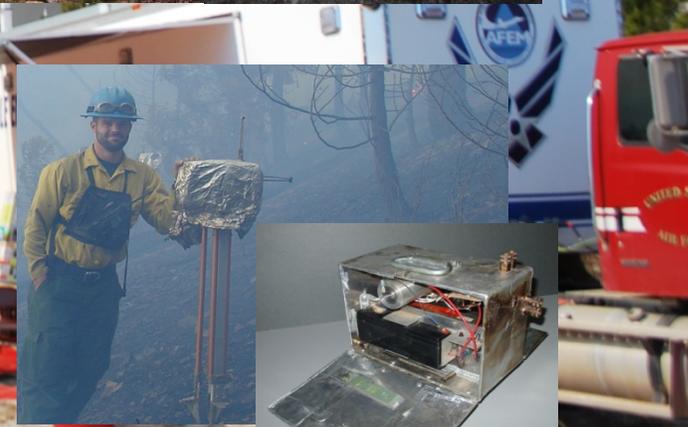
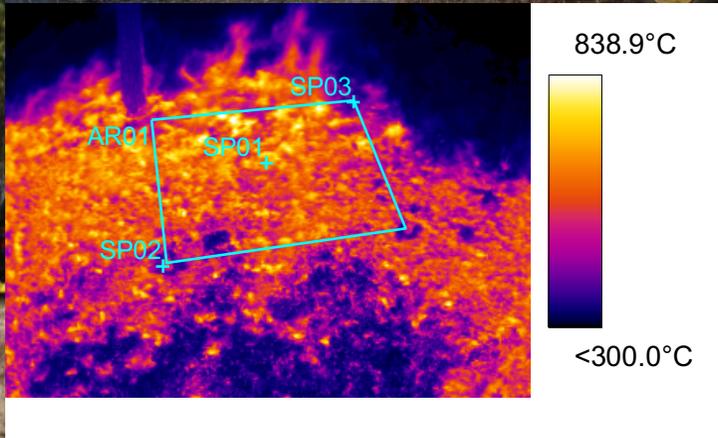


31.3% duff consumption breakpoint for significant decrease in % pre-fire sap flow (O'Brien et al. 2010. *Fire Ecology*)

Rule of Thumb: > 40% duff consumption = increased pine mortality

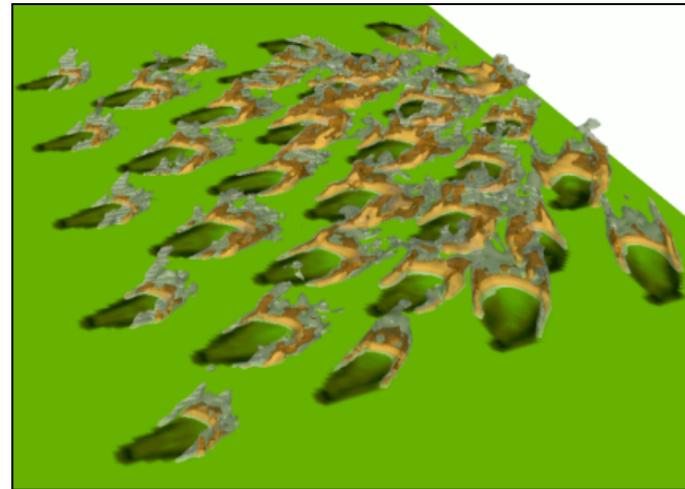
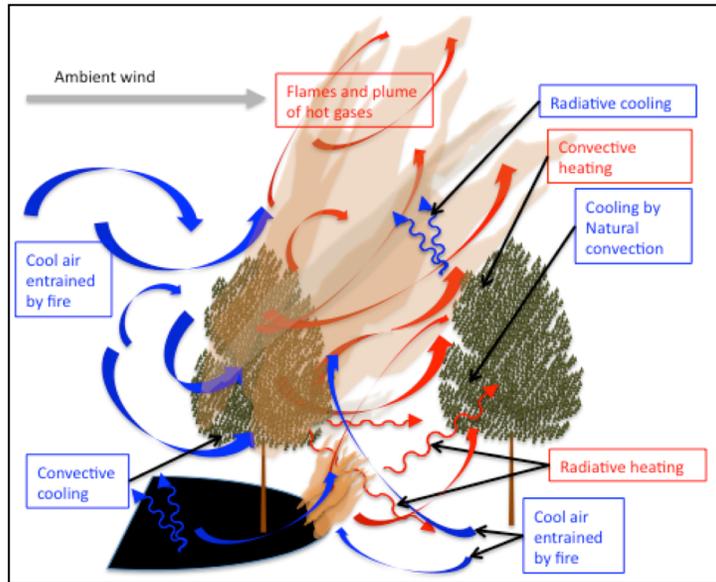


The Prescribed Fire Combustion and Atmospheric Dynamics Research Experiment (Rx-CADRE): 2008, 2011, 2012



Next Generation Fire Modeling for Advanced Wildland Fire Training

Compare relative fire line intensities among combinations of vegetation structure, wind speeds, and ignition patterns using FIRETEC CFD model



FIRETEC / HIGRAD



Project Team

James Furman, U.S. Forest Service

Brett Williams, Air Force Wildland Fire Branch, Eglin AFB

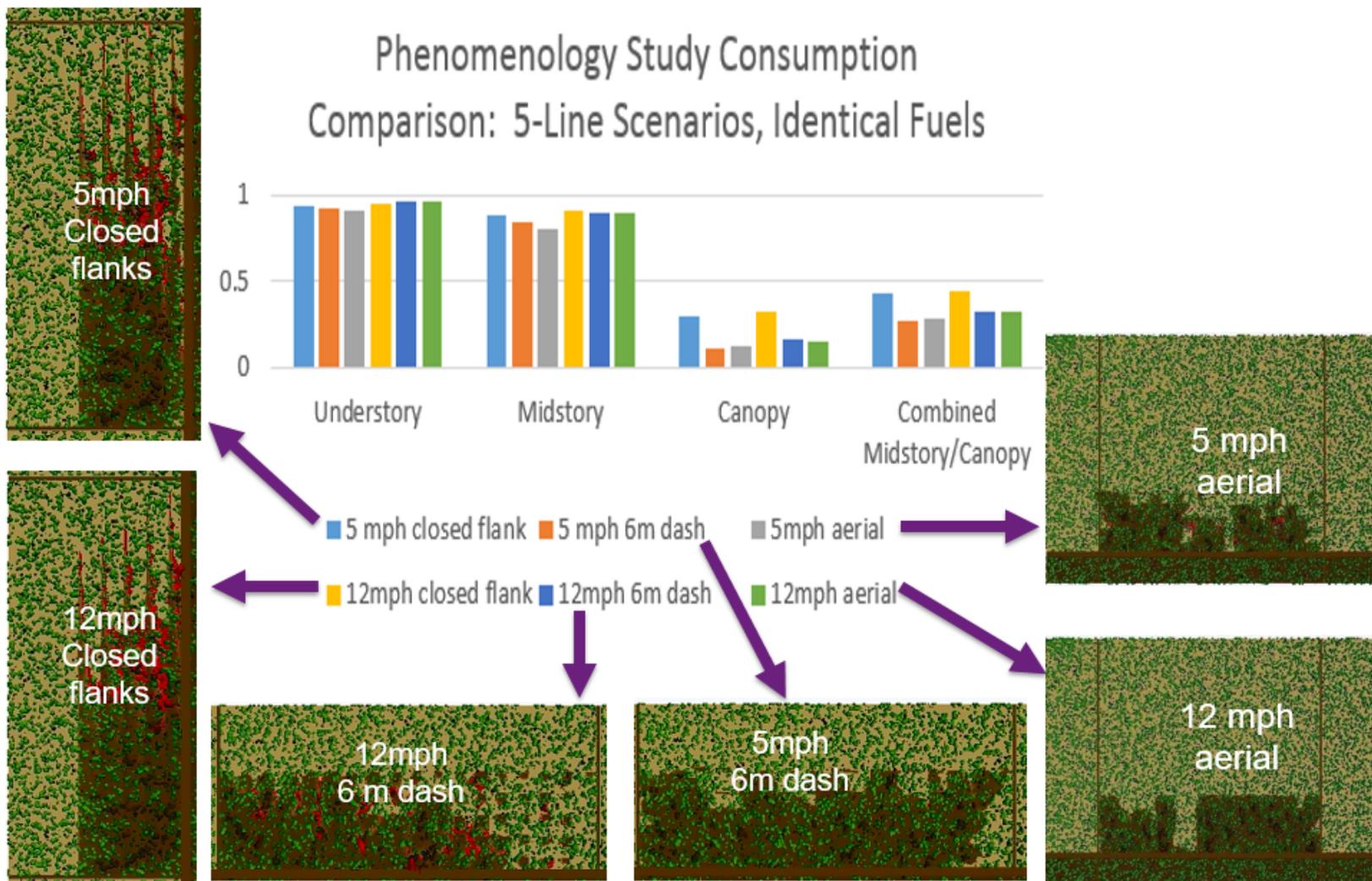
Dr. Rodman Linn, Los Alamos National Laboratory

Dr. Judith Wintercamp, Los Alamos National Laboratory

J. Kevin Hiers, Tall Timbers Research Station



Comparing Canopy Consumption Among Firing Strategies



CFD Models as Management Relevant Tools

- Lack of case studies for prescribed fires
- Challenge training young and mobile firefighters
- FIRETEC, WFDS, CAWFE
- CFD models may be more useful for identifying *patterns* and *phenomenology* than for absolute fire behavior values
- Relative fireline intensities for comparing firing patterns, topography, weather, and vegetation structure
- Potential as powerful fire behavior training aid
- Back-casting for After Action Reviews



Tips for Successful Co-Production

- Form relationships and begin dialogue early
- Co-production: brainstorm mutually beneficial research questions
- Provide plenty of time for planning/logistics
- Recommend researchers seek basic fire line training and red card
- Ancillary benefits to research/manager relationship
- Rules of thumb and tools



Questions?

