RipStream project status

5 December 2014

Presentation to EPA

Publication

Submitted 2-year post harvest effects MS in April 2011

Published late August 2011

Groom, J. D., L. Dent, L. J. Madsen, and J. Fleuret. 2011. *Response of western Oregon (USA) stream temperatures to contemporary forest management*. Forest Ecology and Management 262:1618–1629.

Data

- Provided all RipStream data in June 2011
- Included data for temperature (hourly, daily), plot overstory, understory, and woody debris, channel metrics, and in-stream downed wood tallies.
- Included supporting files (modified SLI guide, files to assist in understanding Access database tables & queries, etc.)
- All files = 207 MB (temperature = 154 MB)

What's going on with buffer width?

- Stated results (Groom et al. 2011b):

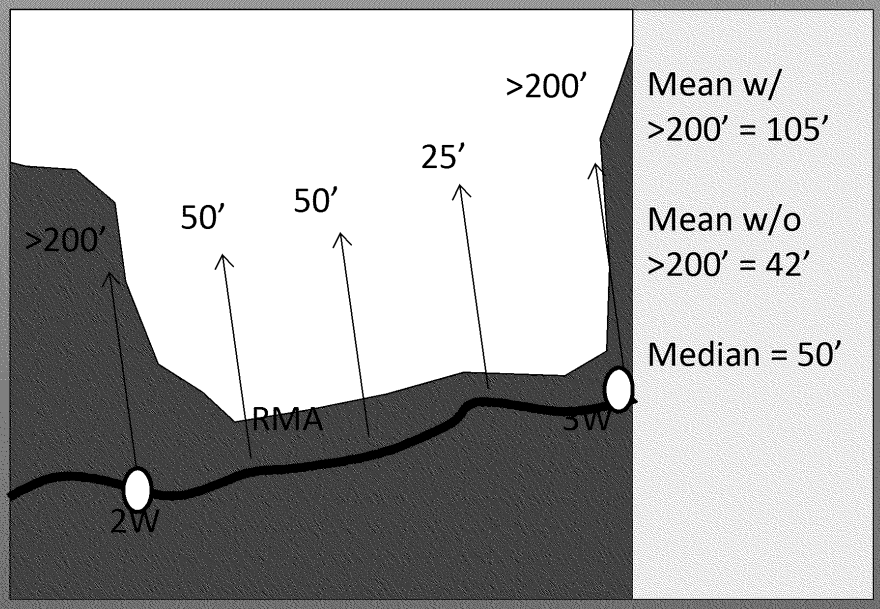
Variable	State- mean	State- range	Private- mean	Private- range
Buffer Width (m)	51.8	25-61	31	19-41

- But a small F buffer for private = 50 ft (15 m) max!

- … And Jeremy keeps saying "harvested to minimum FPA!"

What's going on with buffer width

- Mean vs. Median



What's going on with buffer width

- Could have left out 2W & 3W buffer measures
- See 5204 (Ice Box: 107' to 56')
- 5503 (Siletz Creek) – strong meander, alders
- Summary:
  - We rigorously followed protocol
  - Buffer width can be a nasty thing to quantify…
  - Medians would have been better
  - Even better yet, begin measurements 50' or 100' away from probe, more measurements.
  - Disseminate excel file

RipStream Data Review
Full pre & post-harvest analysis results

Jeremy Groom

5 December 2012

OREGON HEADWATERS RESEARCH COOPERATIVE

DEQ

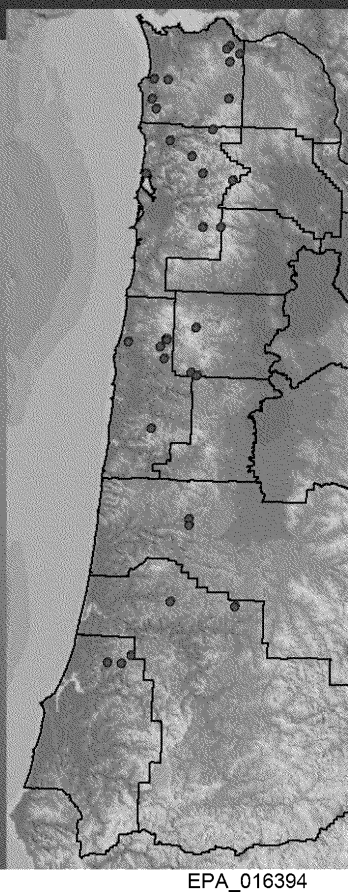
EPA

OSU Oregon State University

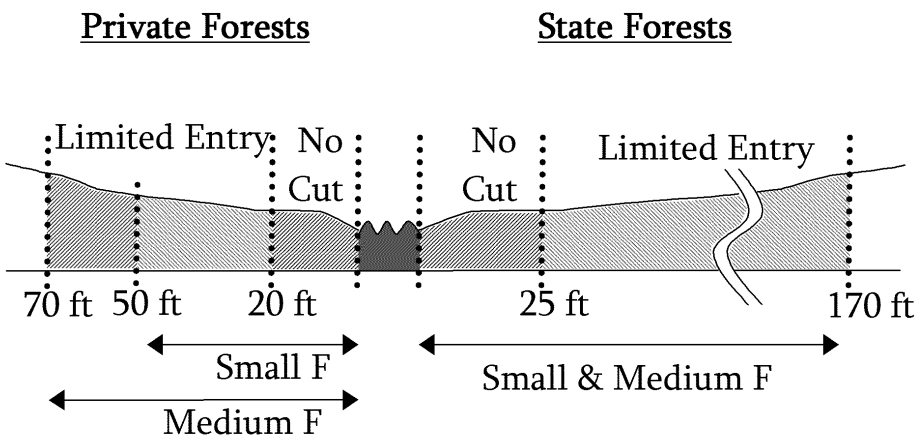
RipStream – Riparian Function and Stream Temperature

State and Private Forests joint effort

- Objective: Evaluate effectiveness of forest practices rules & strategies at protecting stream temperature, promoting riparian structure
- 33 Sites (18 Private, 15 State, Medium and Small F)



Rules and Strategies

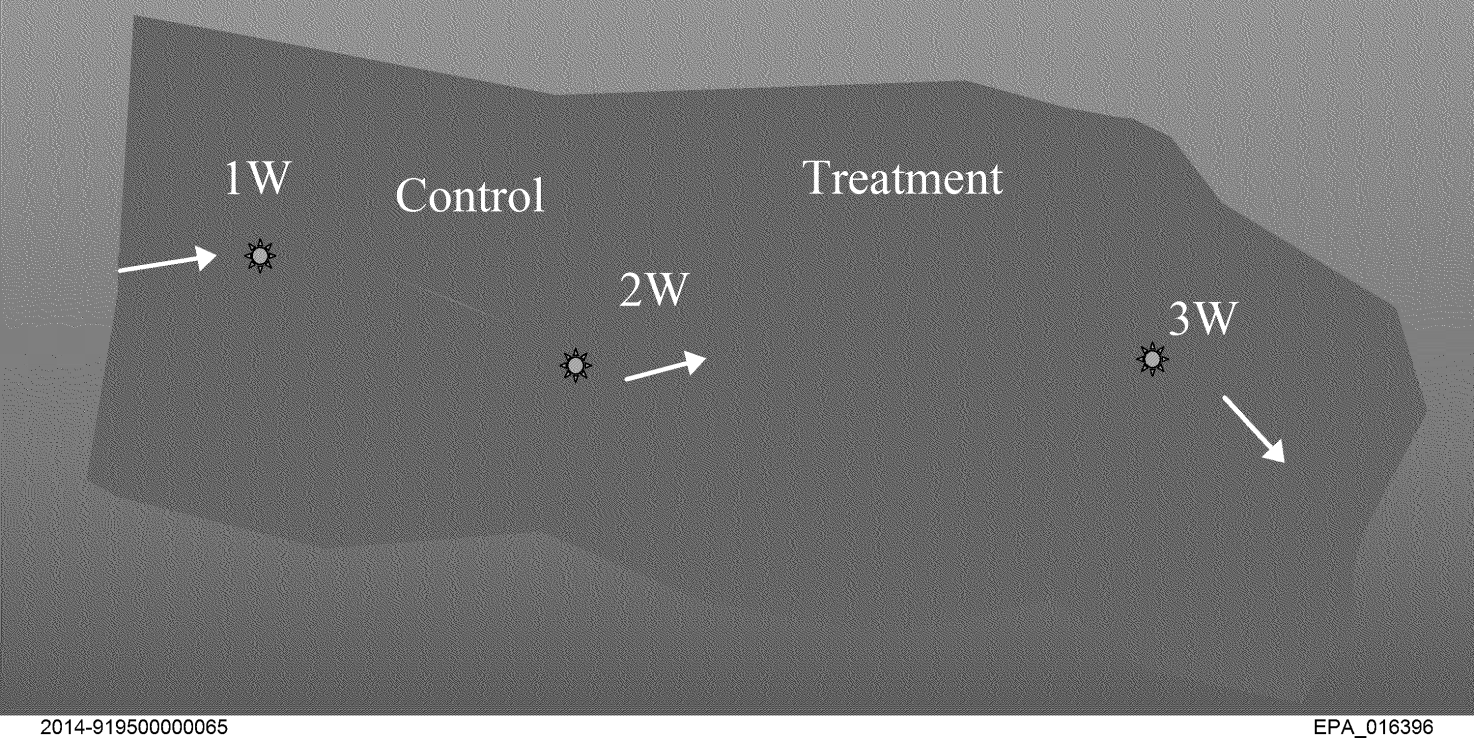


Private: Forest Practices Act

State: Northwest Oregon State Forest Management Plan

RipStream Study Design

Design: 2 years pre-harvest, 5 years post harvest



Findings so far: 2 years postharvest

Effects analysis:

To what degree did temperatures change? Why?

- Private sites: temperature increased + 0.7 °C (2.5, -0.9)

- Temperature increases related to declines in shade

- Shade related to riparian basal area (+), tree height

Five years post-harvest

- What happened to stream temperatures & shade levels?

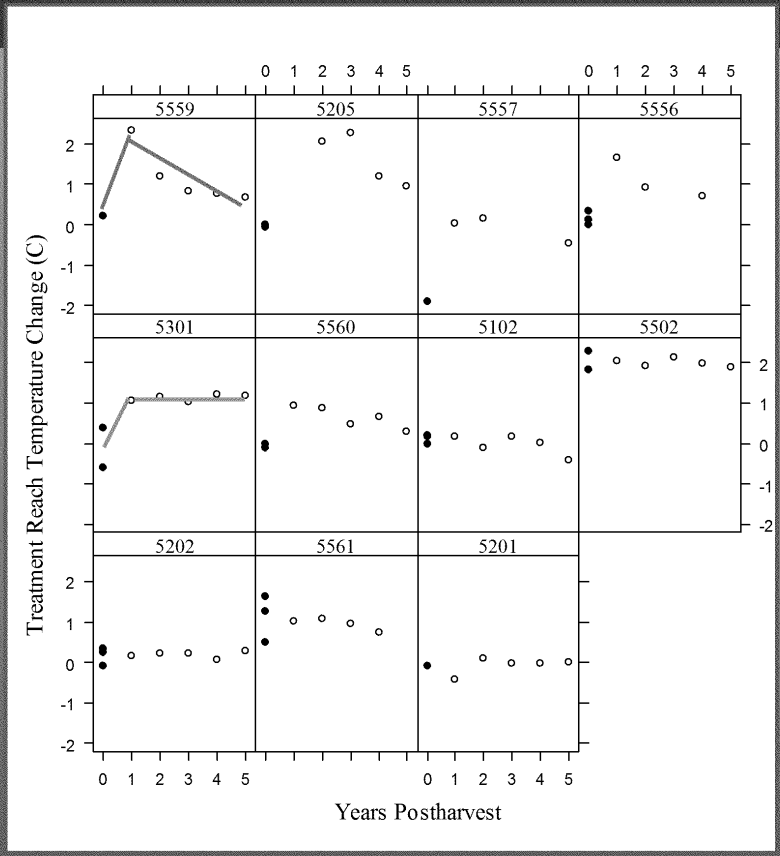
- 2 analysis types:
  - 7 years pre & post harvest
    - What best predicts temperature & shade?
  - 5 years post-harvest
    - Given a degree of change pre- to post-harvest, how did sites respond?

Analysis Approach

- Mixed-effects linear models
- Multiple model comparisons – AIC
- Select best model
- Examine behavior

Maximum Temperature: full 7 years

- Response: $\Delta_{\text{treatment temperature}}$
- Incorporating years post-harvest did not improve model fit
- Best-supported predictors:
  - Treatment reach length (+)
  - Control temp change (-)
  - Shade (-)
  - Private Site Post-Harvest (+)
- The variable Private Site Post-Harvest = not all effect due to Shade
- Same result for mean, range



Imputation - making it up

Year	Pre/Post	ΔT_{max}	Shade	Gradient
2002	Pre1	0.5	0.85	4.20%
2003	Pre2	0.6	???	4.20%
2004	Post1	1.1	0.65	4.20%
2005	Post2	1.2	???	4.20%
2006	Post3	0.8	0.71	4.20%
2007	Post4	0.6	???	4.20%
2008	Post5	0.7	0.79	4.20%

- Modeled shade as function of other variables
- Incorporated shade model variability
- 1000 simulations, each with estimates
- Estimate average error + SE of error
- Didn't affect results much – slight SE inflation

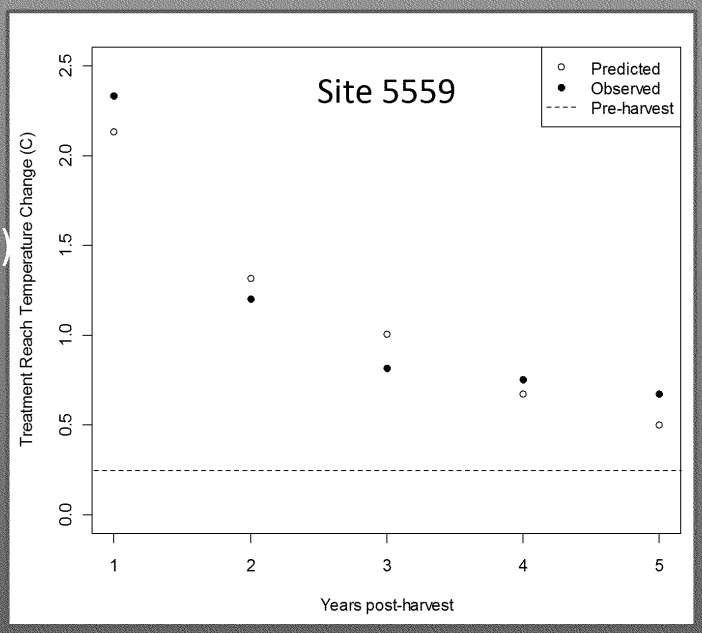
Max Temperature: Post-1 thru Post-5

Variable: Pre-Post difference = change pre-harvest to post-1.

- Response: $\Delta_{\text{treatment temperature}}$
- Predictors:

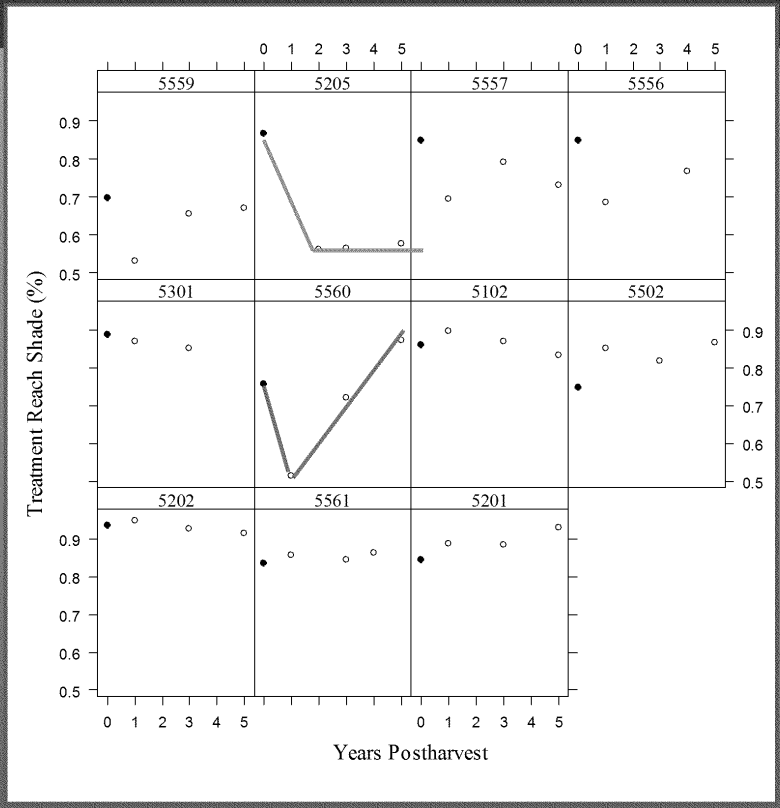
Treatment reach length (+)
Control temp change (-)
Pre-Post difference (+)
Years Postharvest (-)
Pre-Post*Years interaction (-)

Same model selected for mean, minimum, and range



Shade: full 7 years

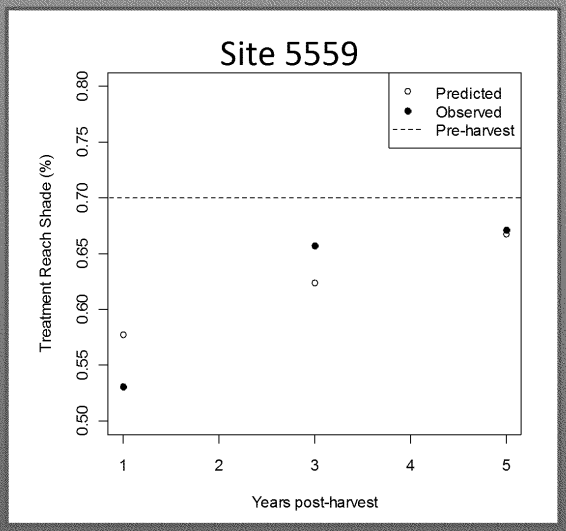
- Vegetation data limited: Pre-1 and post-1
- Dependent: logit(Shade)
- Best-supported predictors:
  - Basal area per ha (+)
  - Plot Blowdown (-)
  - Post-harvest (NS)



Shade: Post-1 thru Post-5

- Variable: Pre-Post difference = change pre-harvest to post-1

- Response: logit(Shade)
- Predictors:
  - Post-1 basal area (+)
  - Pre-Post difference (-)
  - Years Postharvest (NS)
  - Pre-Post*Years interaction (+)



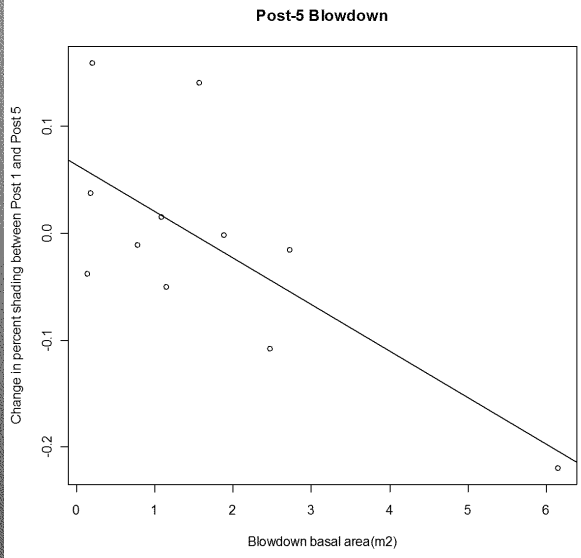
Blowdown

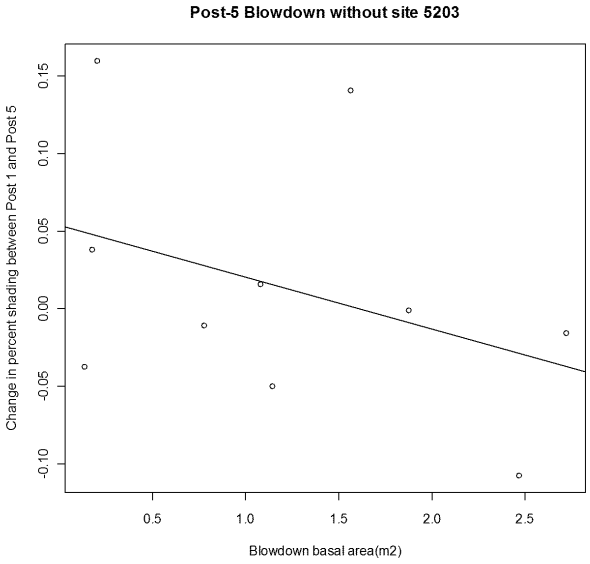
- Blowdown is tough to measure
  - In-stream quantification: observer variance
  - Plot quantification: whole picture?

- Full shade model: Post1 plot blowdown entered model
- Post-5 model: blowdown not useful

Blowdown at year post-5

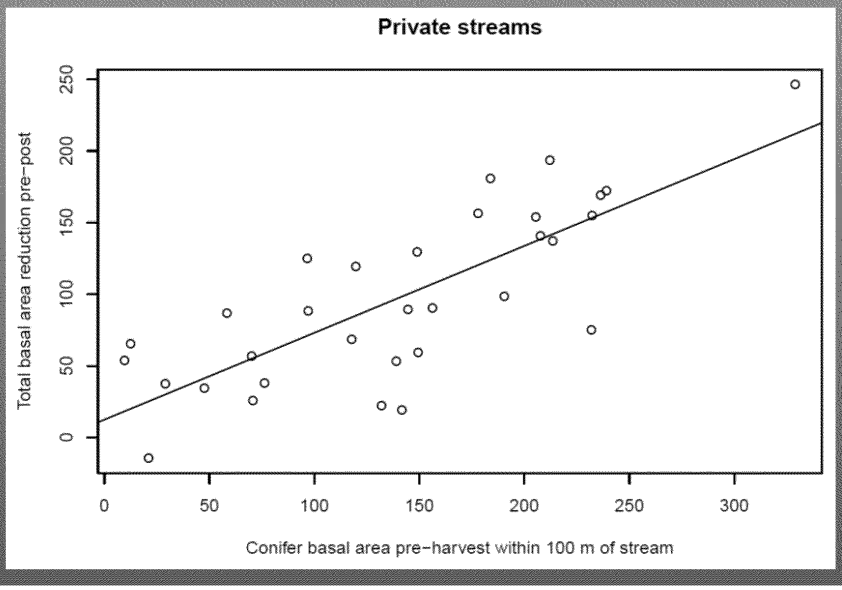
Relationship between plot blowdown by post-5 and change in shading Post1-Post5





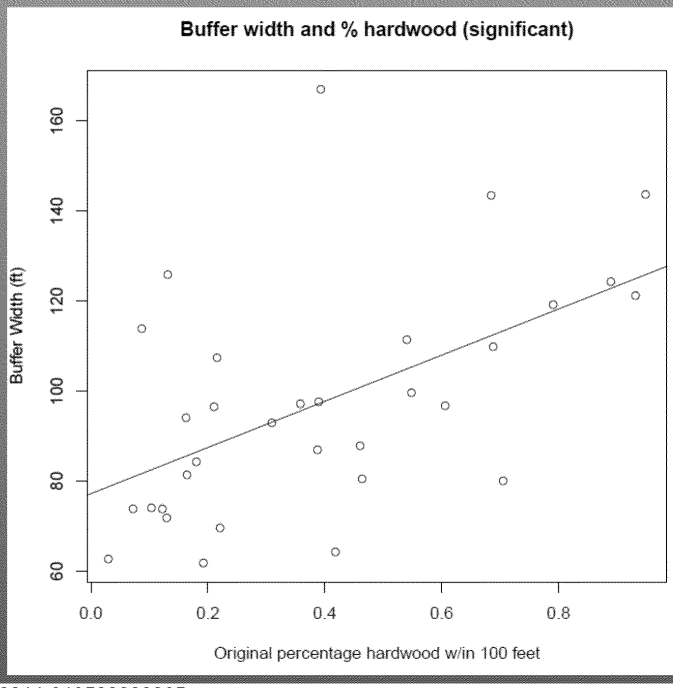
Basal Area and Species Composition

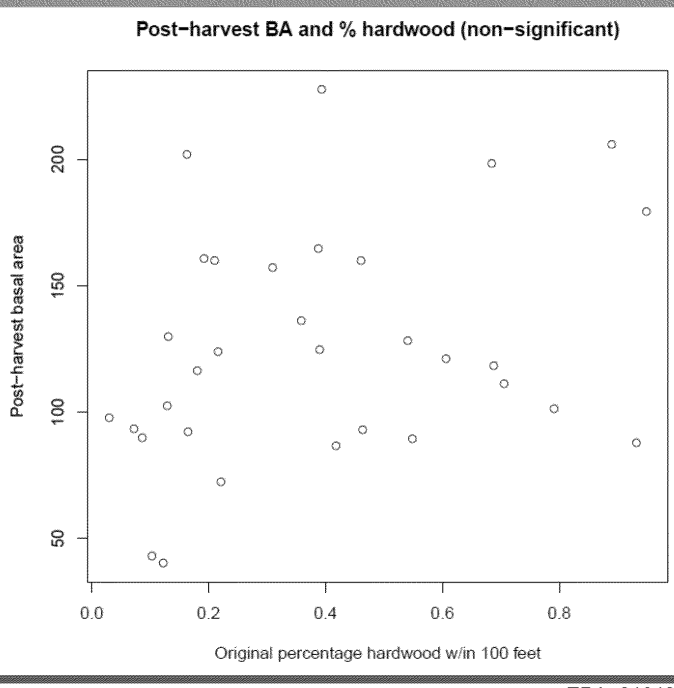
- More conifer near stream, more conifer can be removed
- So, less basal area where more conifer originally?



Basal Area and Species Composition

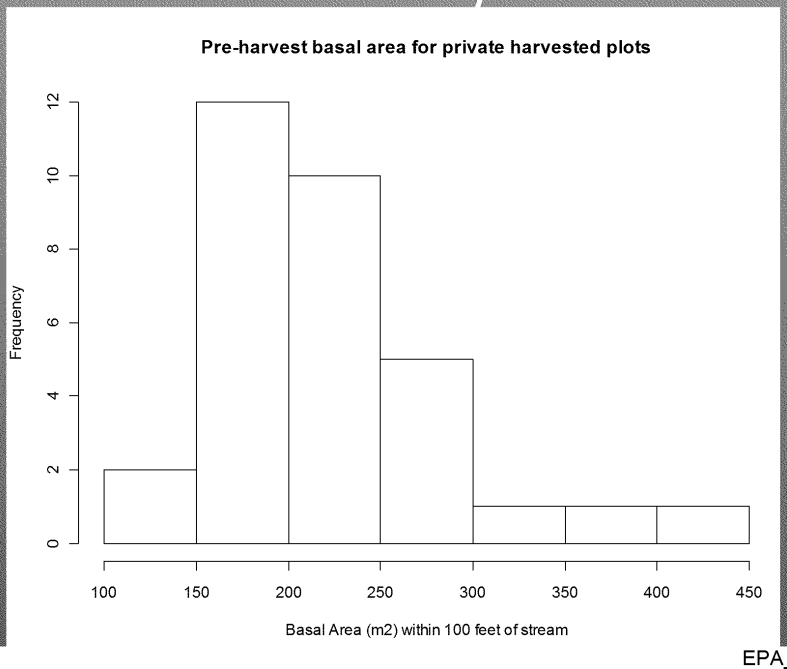
- If we know composition, will we know basal area?





Basal Area and Species Composition

- We are not seeing a link between % conifer & post-harvest basal area
  - May be issue of basal area variability



Site disturbance

5101 – Landslide in 2007. Potentially due to this event, we are missing the last 2 years of data

7801 – Beaver dam 2005 to 2007, Post 1 through 3

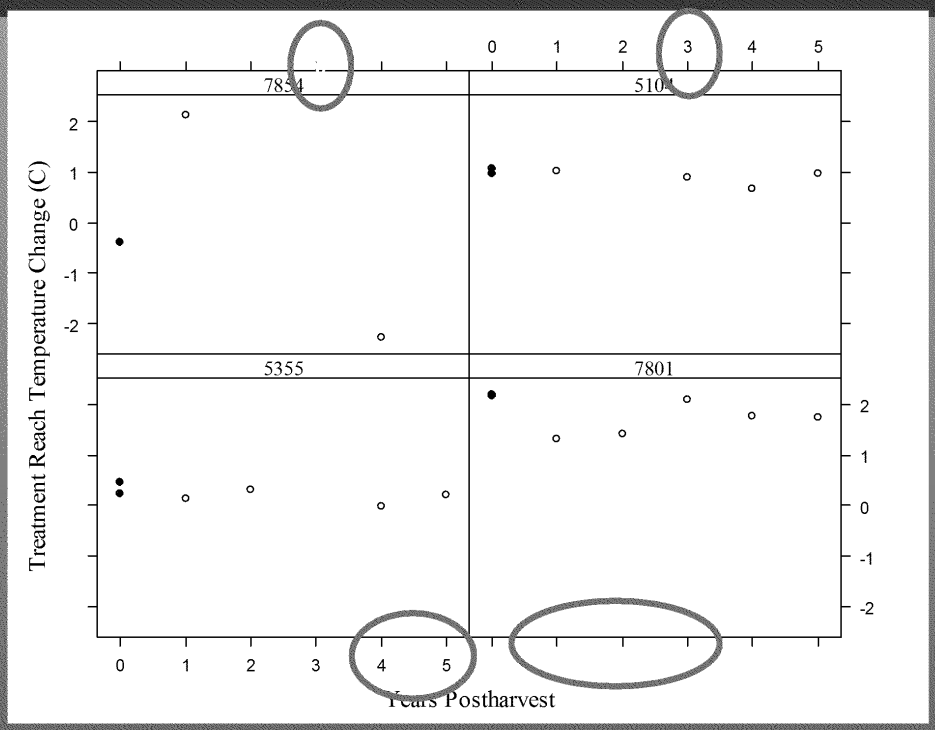
5104 – Slides in 2007. Affected 400 out of 1200 feet of treatment reach

5355 – Beaver dam in treatment reach in 2009 (post 4 & 5). Affected 30 m (100 ft) of stream

5503 – Beavers potentially influencing stream. No specific instances recorded.

7854 – Major debris flow in 2007. Portion of treatment reach ran sub-surface

Effects on Sites



Effects on Analysis

Removal of 4 sites did not affect model selection

Did affect estimates (to an extent):

Maximum Temps

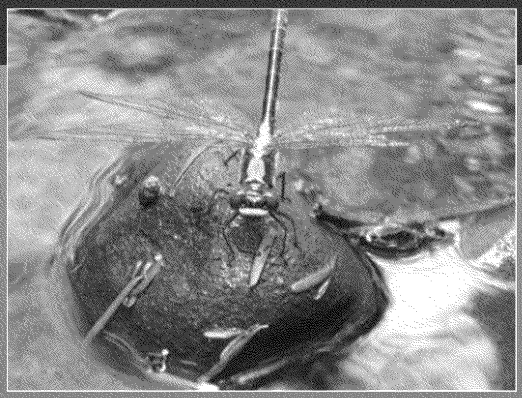
Pre- and post-harvest

Fixed	Value	Value
Intercept	0.364	0.296
CT	-0.121	-0.122
TL	0.873	0.835
SHi	-3.452	-3.125
PvP	0.299	0.334

Post-harvest

Fixed	Original Value	Altered Value
(Intercept)	0.954	0.836
CT	-0.095	-0.087
TL	0.682	0.556
PPdiff	0.685	0.660
YP	-0.076	-0.056
PPdiff*YrsPost	-0.150	-0.091

Summary



Initial response:

- Private sites = temperature increase, shade decrease
- State sites = no signal
- Shade related to basal area, height

5-year response:

- Similar important factors
- Temperature: initial increase followed by decrease
- Shade: initial decrease followed by increase
- Blowdown initially a factor, unknown for post-5 (results suggest no)

Management:

- Stand composition not necessarily related to basal area

Next Steps

- Submit final report to a peer-reviewed journal (not selected target journal yet – thinking JAWRA) Spring 2013
- RipStream rule analysis, other manuscripts not related to grant

Board of Forestry & Rule Revision

- Presentations to BOF (2009, 2010, 2011)
- January 2012: degradation of resources (Cold Water), began rule revision process
  - ORS 527.714
- June 2012: Presented range of alternatives
- Next: Develop science review approach
- Analysis of alternative effectiveness, economic impact, ability to implement

Soon: Downstream Analysis

- What happens to stream temperature post-warming?
- 4W probes
- Work underway

Soon: Large Wood Inputs to Streams

- Desired future conditions
- Modeled approach (STREAMWOOD)
- Examine range of expected values
- Finalizing approach