Do Hardwood Conversion Buffers Affect Water Temperature?

Final Presentation

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WDFW

Background:

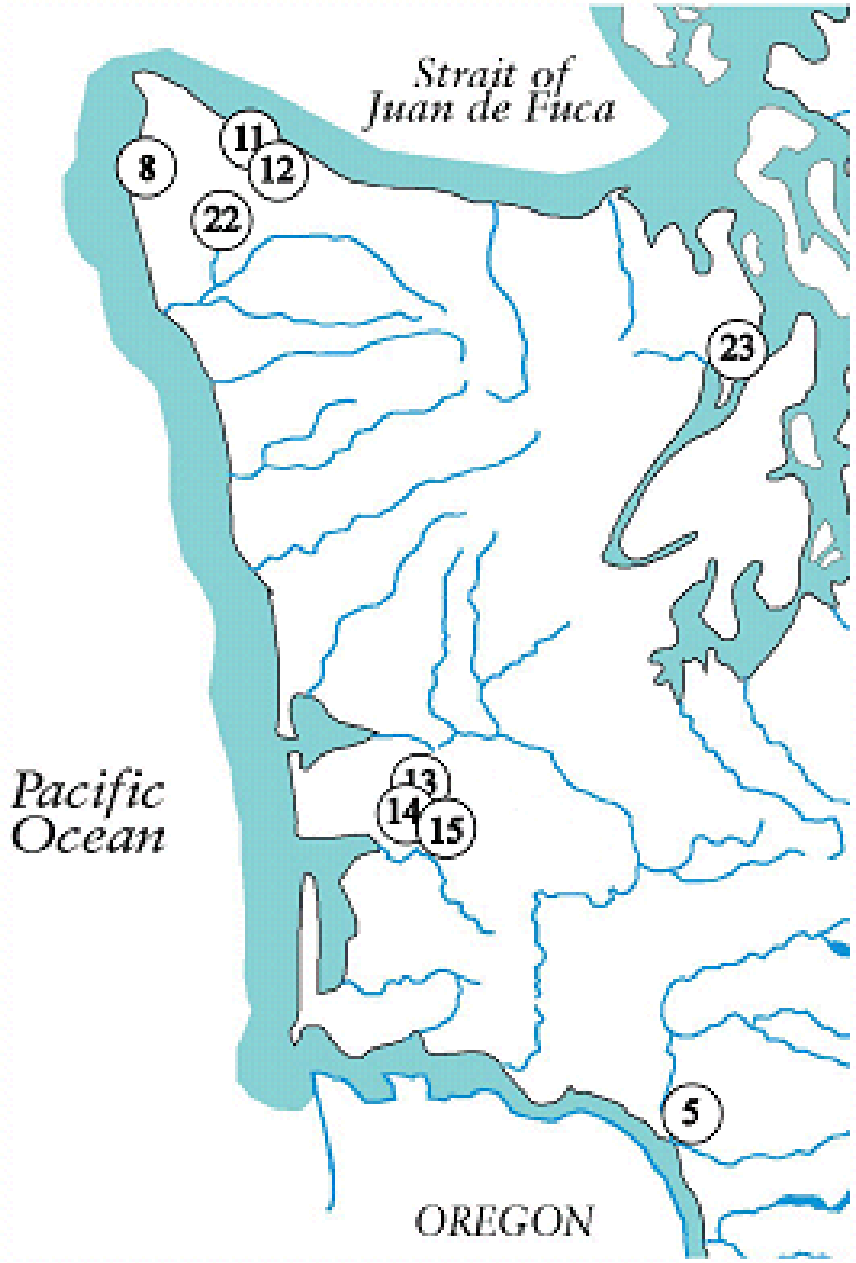
- 2000: The Forest & Fish agreement allowed for narrower buffers in hardwood dominated Riparian Areas.
- 2000: The Policy Group determined that Hardwood Conversion Research was a high priority for CMER activity.
- 2000-2: Riparian Scientific Advisory Group (RSAG) developed a study plan.

Background (continued):

- June 2003: Several stakeholders expressed the desire for a more comprehensive temperature component to the study plan. WDFW was contracted to do this.
- July 2003: Pre-treatment temperature field work started.
- September 2006: Post-treatment field work completed.

Sites

- Sites were voluntarily offered by landowners, and screened for potential use by this study.
- 9 sites were selected.
- One site was dropped from the study because the entire treatment reach went dry in the first two years.
- Of the 8 remaining sites, 3 sites received Option 2 buffers rather than Hardwood Conversion buffers.


Strait of
Juan de Fuca
11
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OREGON

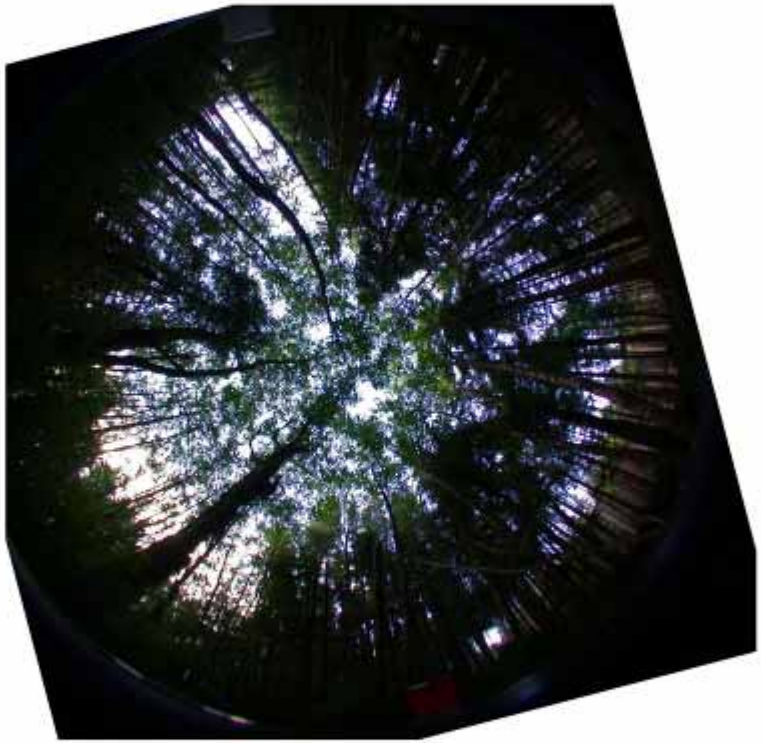
Field Methods

- Transects were monumented every 25 m in the harvest treatment reach and 50 m upstream and, where possible, 400 m downstream.
- Digital canopy images were taken every 25 m at least once a year.
- Temperature dataloggers were placed every 75 m during 4 summer seasons. Temperature was recorded hourly.

Results: Canopy Images

- A Digital Camera with a fish-eyed lens were used to measure sky exposure
- At least one canopy image was taken at each transect every year.
- The best pre-harvest and post-harvest images oriented side-by-side for each transect
- A computer program (HemiView) was used to estimate Global Site Factor, an index of total solar input.

Site 22+900



pre-harvest Aug 2003

GSF = 0.14

post-harvest 8/11/05

GSF = 0.10

Site 12+1000

pre-harvest 6/8/05

GSF =0.09

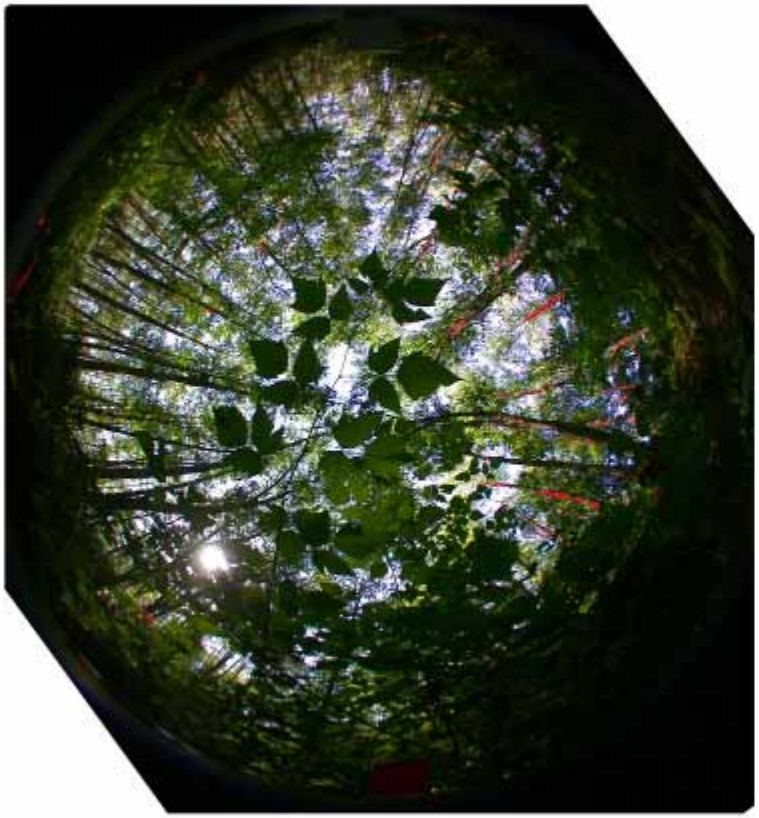
buffer width 16.3 m

buffer width 19.4 m

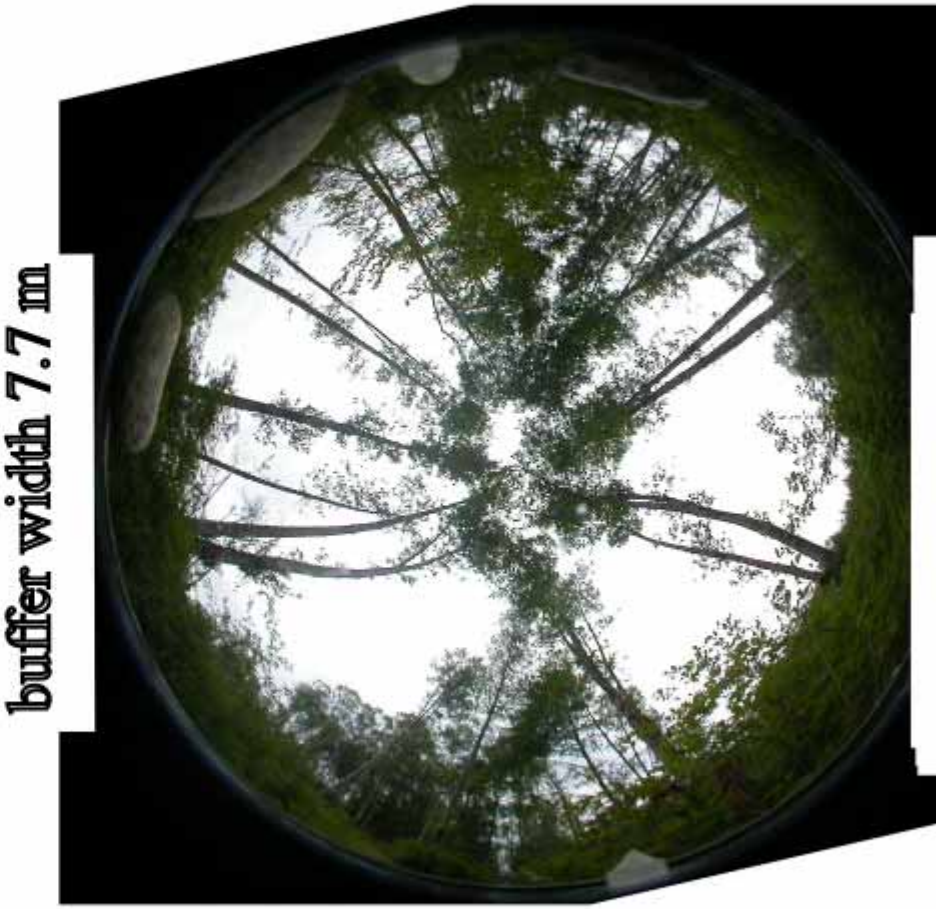
post-harvest 9/7/05

GSF = 0.19

Site 23+400



pre-harvest Aug 2003
GSF = 0.09



post-harvest 7/5/05
GSF = 0.56

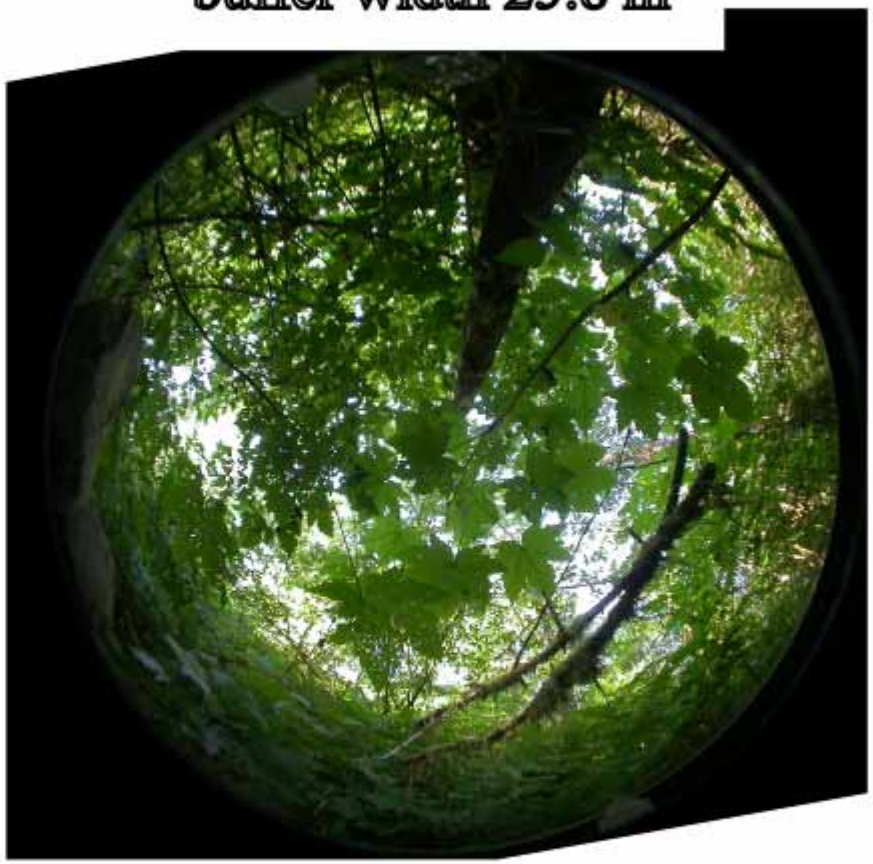
Site 14+100

pre-harvest Aug 2003
GSF = 0.09

buffer width 13.8 m

post-harvest 6/14/05
GSF = 0.15

buffer width 25.8 m



pre-harvest Aug 2003

GSF = 0.06

post-harvest 8/28/06

GSF = 0.11

Conclusions: Canopy Images

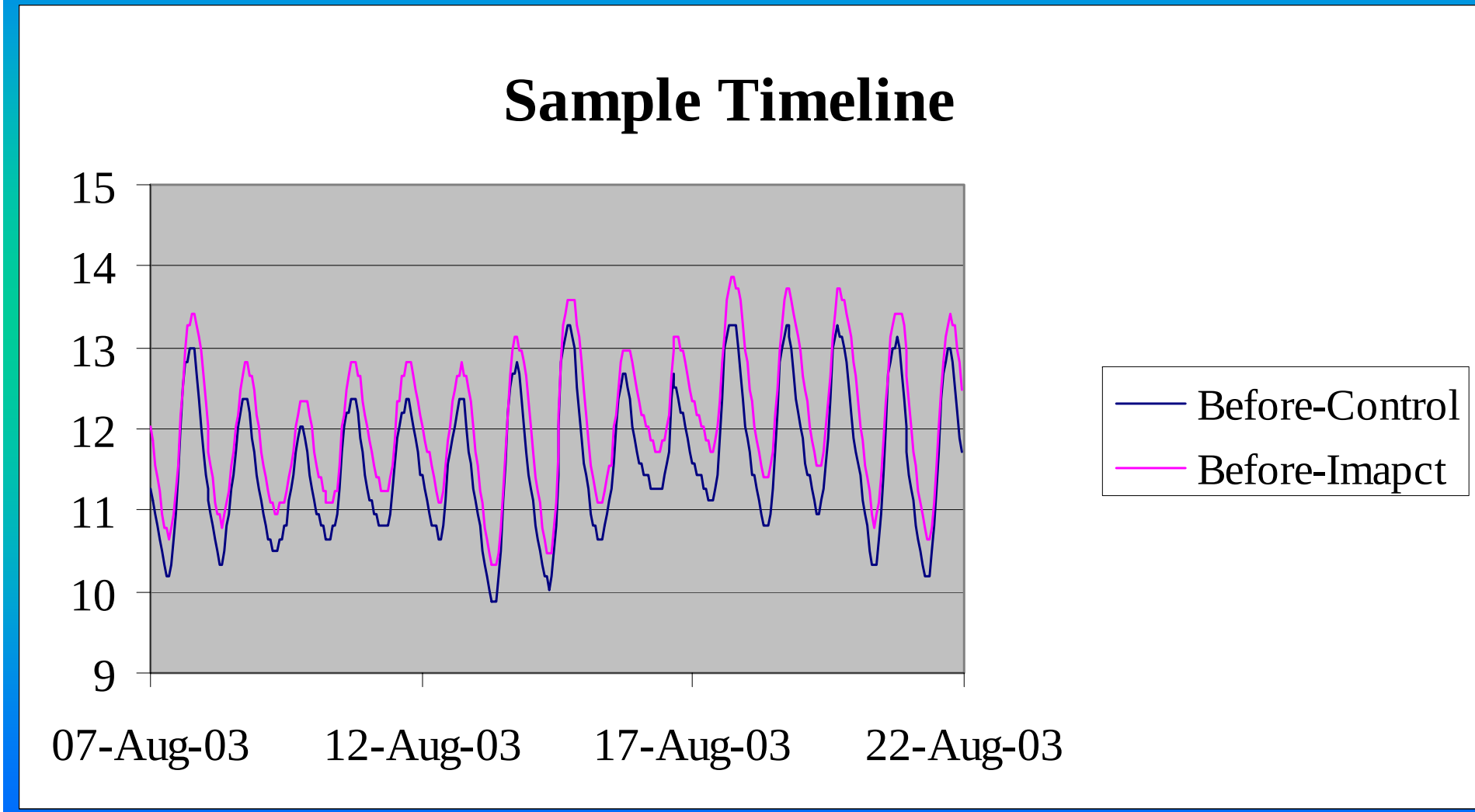
- Distortion-free paired canopy images are difficult to acquire, and likely beyond the resources of most researchers.
- By averaging GSF estimates over multiple transects, differences between pre- and post-harvest images are significant.
- Digital images provide a permanent visual record, whereas densiometer readings must assume the accuracy of the field staff.

Results: Temperature Data

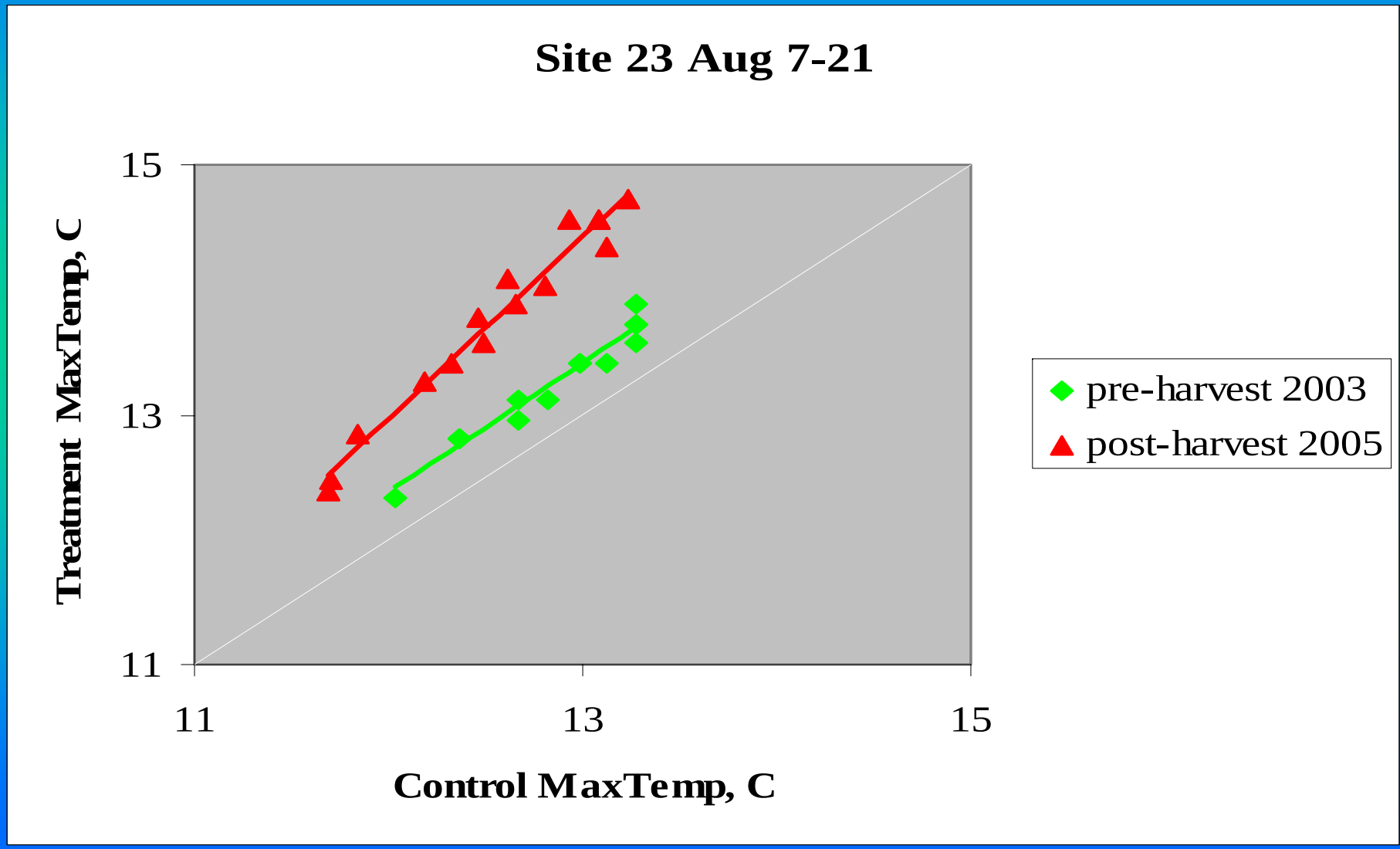
BACI- A high standard for field measurements

- 'BACI' stands for 'Before-After-Control-Impact'
- datasets require temperature data from four dataloggers:
  - Pre-harvest and upstream of harvest unit
  - Pre-harvest and downstream of harvest unit
  - Post-harvest and upstream of harvest unit
  - Post-harvest and downstream of harvest unit

Temperature Timeline Graph



BACI Temperature Graphs



Statistical Testing

- The ‘Gomi’ method is applied to determine statistical significance.
  - Corrects for autocorrelation
  - Corrects for seasonal trends in temperature
  - Requires long time series
  - Does not correct for effects of flow changes on temperature
- See Gomi, Moore and Dhakal (2006).

Temperature response to Harvest

- Statistically significant maximum water temperature responses to the hardwood harvest treatment were detected at 4 of 5 sites where hardwood conversion prescriptions were applied at or close to prescriptive minimums.
- Three sites with ‘Option 2’ buffers did not show a significant response.

Downstream Recovery of Temperature

- Downstream maximum water temperatures recovered towards pre-harvest temperature conditions after harvest at 4 of 5 hardwood conversion sites

The Contribution of This Study

- Despite the small sample size, the BACI study results will contribute to future meta-analysis on temperature studies.
- Field methods were developed for canopy digital imaging and temperature measurements.

Contributions- continued

- Flow was found to be a significant variable affecting water temperature at some sites.
- Graphic and analytical tools were developed for future application to CMER temperature research.

THE END