Breeding Bird Response to Riparian Buffer Width

10 years post-harvest

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Weyerhaeuser NR

Drivers?

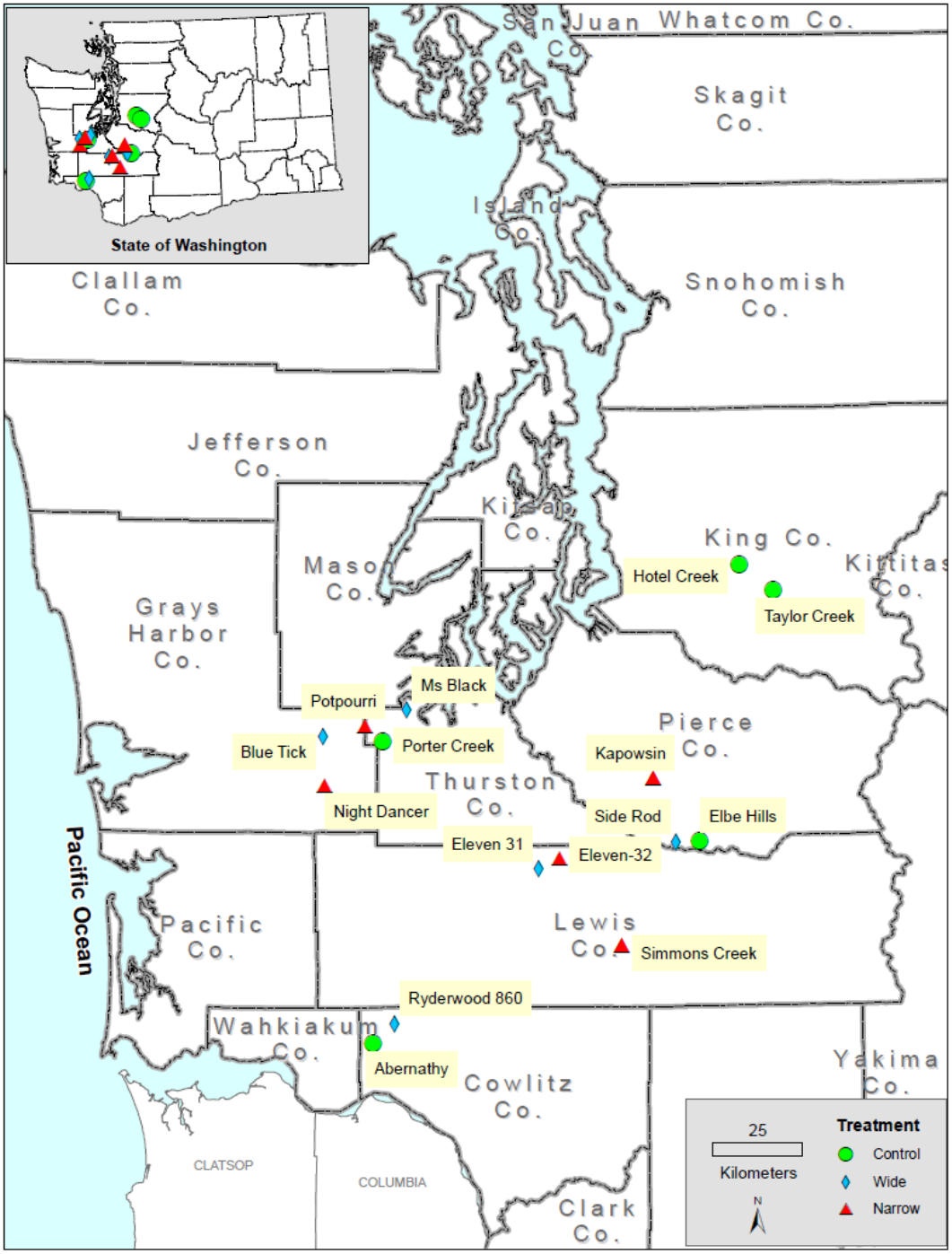
- Intense societal interest in PNW riparian systems
- Variation in buffer prescriptions on private, state, and Federal lands
- Poorly defined outcomes for terrestrial elements
- Lack of long-term studies
  - Marczak et al. 2010. *Ecological Applications* 20: 126-134.

Process

- Original study design and report - University of (TFW-LWAG1-00-001)
- Bird portion of the study published in peer review literature
- Re-sampling 10 years post-harvest - V. Hawkes LGL
- 10 year post-harvest bird data – WDFW/Weyerhaeuser
- Report reviewed by LWAG and then revised
- ISPR review (SRC 13-14-01) - Dr. John Richardson synthesized the reviews
  - "There are exceedingly few studies that revisit such experiments…"
  - "report provides new insights into the use of riparian area buffers by birds as adjacent forests regrow."
  - "the reviewers are very positive…., but also have some suggestions for how it can be improved."
- Comment and response matrix – response and revisions
- The revised final report was approved by CMER
- Next step = manuscript submission to Ecological Applications

Washington Forest Practice Rules - Riparian Buffer

What roles do RMZs, UMAs, and other forest patches play in maintaining species and providing structural and vegetative characteristics thought to be important to wildlife?



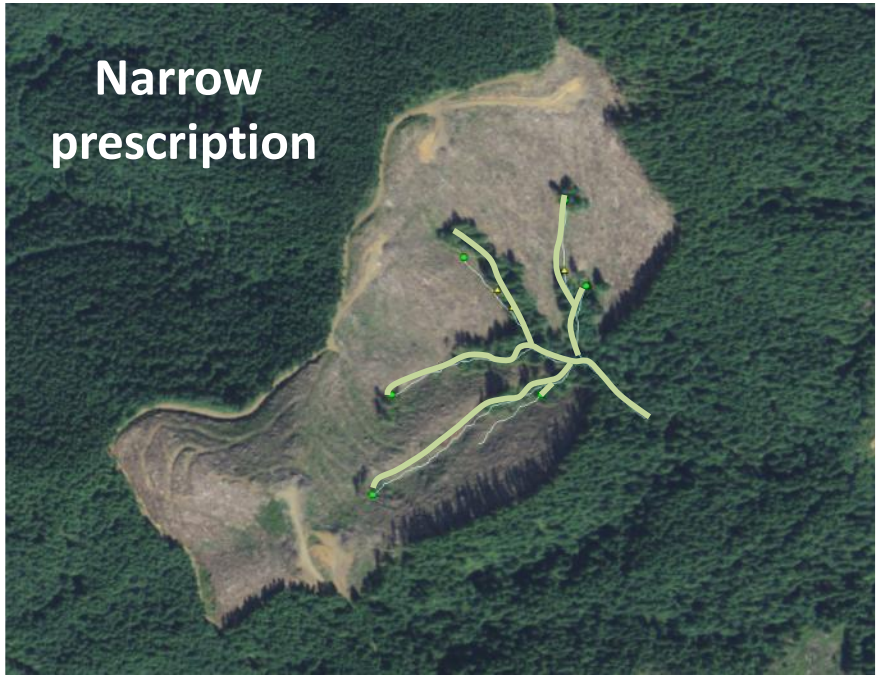
PRESCRIPTIONS

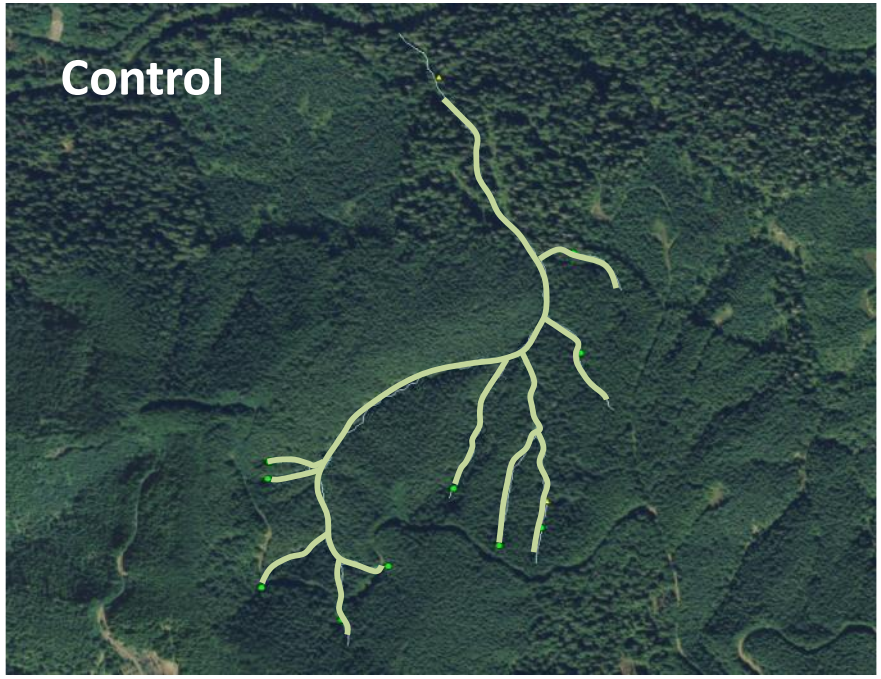
- Random selection and prescription application
- CONTROL: No harvest
- NARROW: 13 m (SD=9.1)
- WIDE: 30 m (SD=15.5)

BACKGROUND

- 1993 -> sampling
- 1994 -> harvesting
- 1995-1996 -> sampling
  - Pearson and Manuwal 2001
- 2003-2004 -> sampling
  - Pearson, Giovanini, Jones, and Kroll

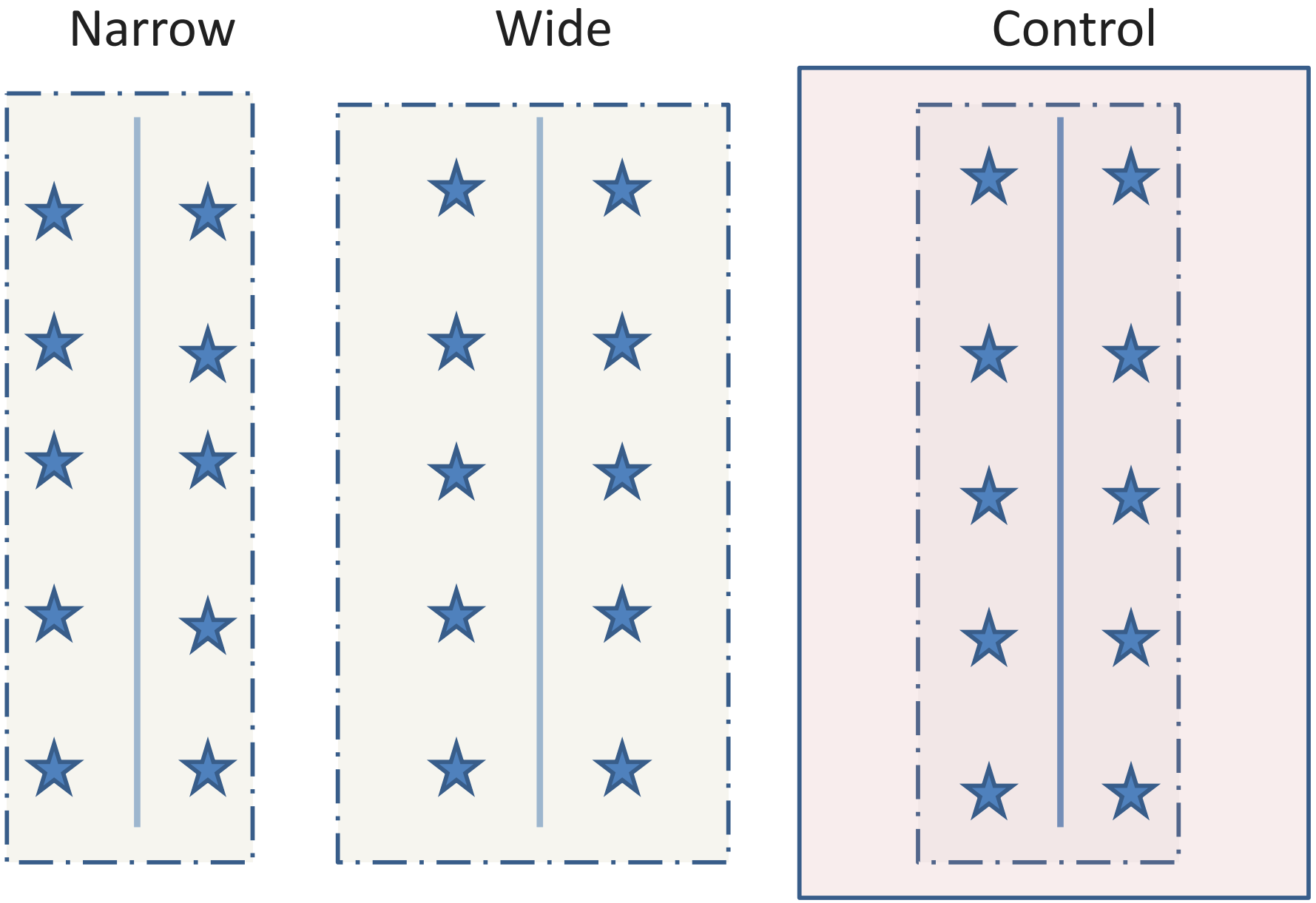
EXAMPLES





DATA

- 15 harvest units (through 2003-2004)
  - 18 harvest units (1993-1996)
- Point count sampling
  - 10 sub-samples per stand (15 m radius)
  - 6 visits per season
  - Samples pooled within each harvest unit for analysis
- ~30 species of breeding birds
  - ≥ 10 detections


Narrow
Wide
Control

Pearson and Manuwal (2001)

- Species richness and turnover increased on narrow buffer treatments relative to controls
- Total bird abundance did not differ between treatments and controls
- Some evidence that species associated with riparian habitats declined on treatments

New Study

- Revisited our study sites (~ 10 years post-harvest)
- Used the same Before-After-Control-Impact (BACI) experimental approach
  - buffer treatment effects on (species and community)
    - occupancy, abundance and richness
    - local extinction (site-level species loss) and turnover
  - relative influence of riparian buffer width on species occupancy and abundance.
- We incorporate contemporary statistical methods to account for potential influence of detectability on apparent treatment effects

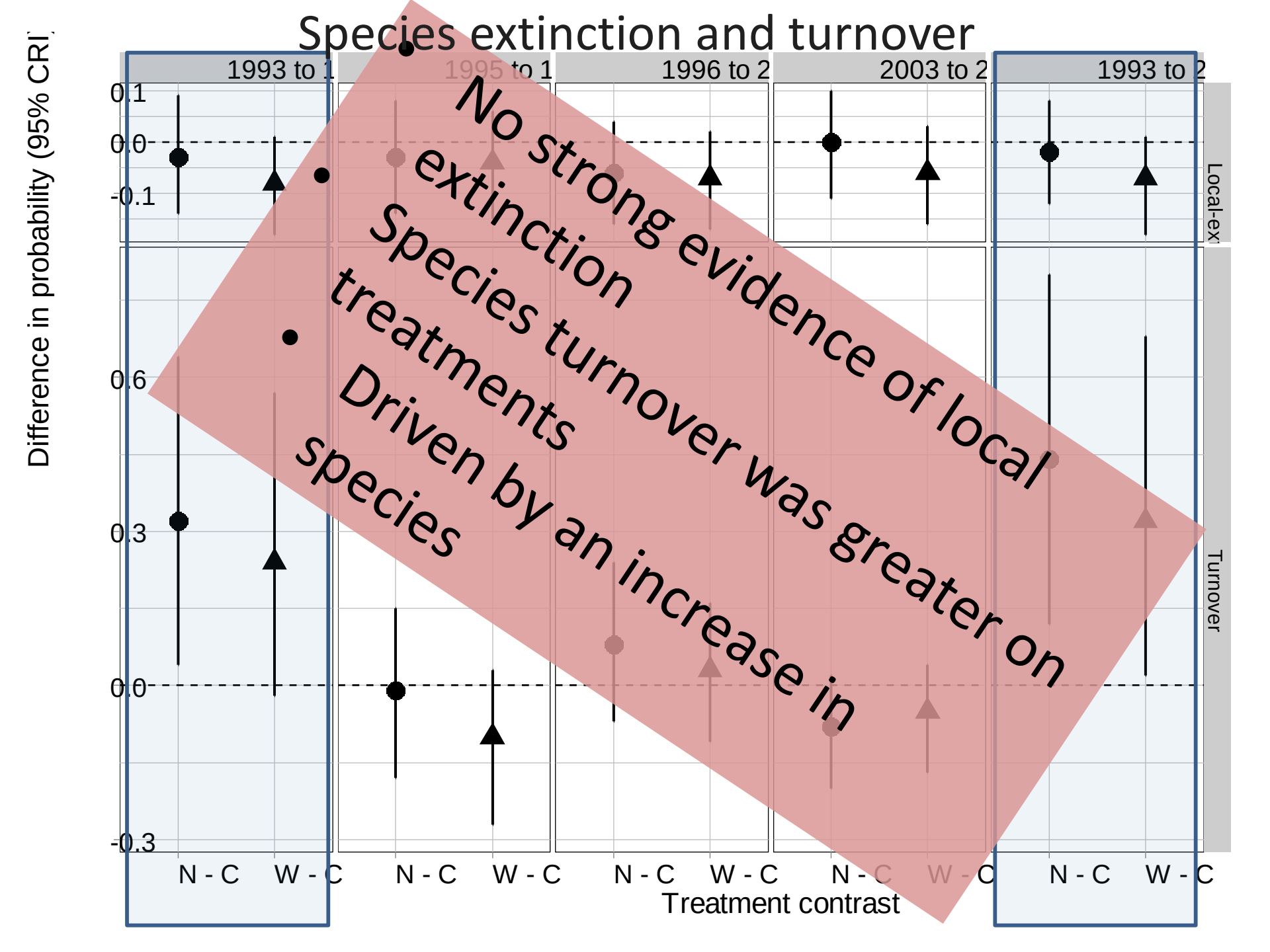
INFERENCE

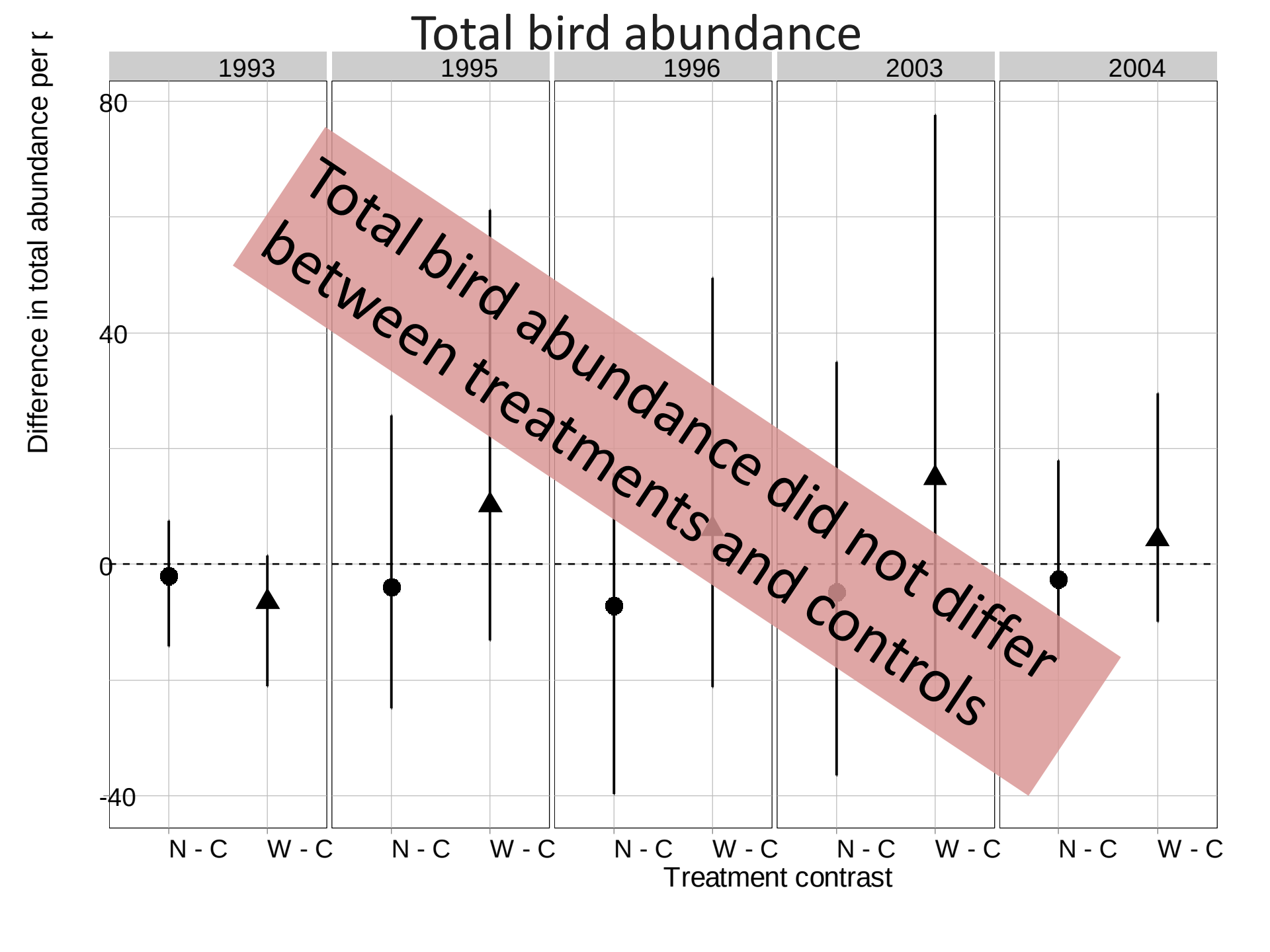
- Multi-level models for both *occupancy* and *abundance*
  - Design model (included a quadratic effect of date on detection)
  - 'Random' effects of species and site
  - Fit within a Bayesian framework

- Linear contrasts to evaluate *treatment* × *year* effects

- 2nd model with a random effect for *harvest unit*
  - Evaluate buffer width as a continuous covariate
  - Responses of 'riparian species'
  - 2003-2004 data only


Species Richness
1993
1995
1996
2003
2004
10
5
0
Difference in species richness (
Species richness increased on both treatments
N - C
W - C
Treatment contrast


Species extinction and turnover
1993 to 1
1995 to 1
1996 to 2
2003 to 2
1993 to 2
Local-ex
Turnover
Difference in probability (95% CRI
0.1
0.0
-0.1
0.6
0.3
0.0
-0.3
N - C
W - C
Treatment contrast
No strong evidence of local extinction
Species turnover was greater on treatments
Driven by an increase in species


Total bird abundance
1993
1995
1996
2003
2004
80
40
0
-40
Difference in total abundance per p
N - C
W - C
Treatment contrast
Total bird abundance did not differ between treatments and controls

Riparian Associates

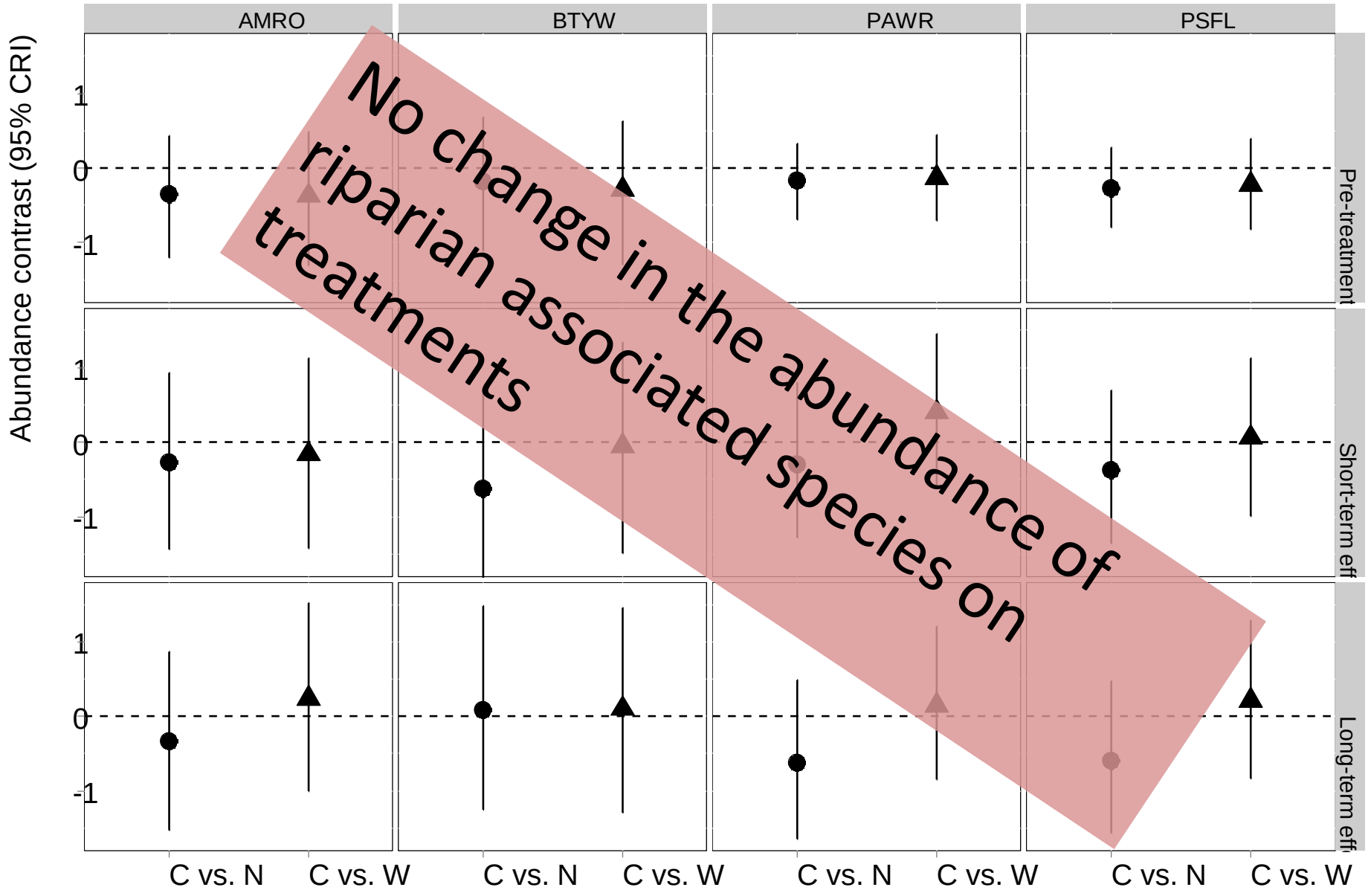
Pacific wren

Black-throated gray warbler

Pacific-slope flycatcher

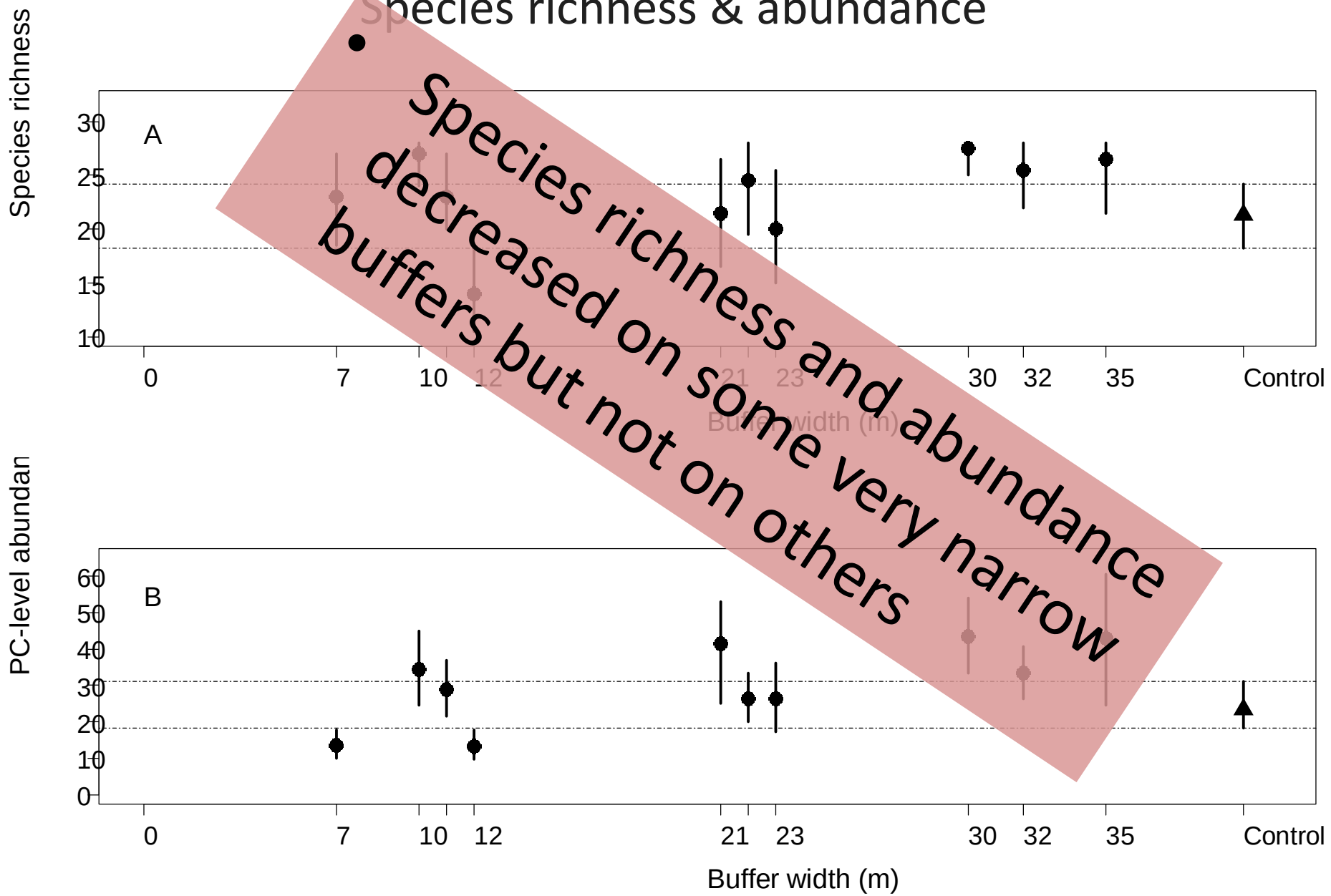
American robin

Abundance of riparian associates



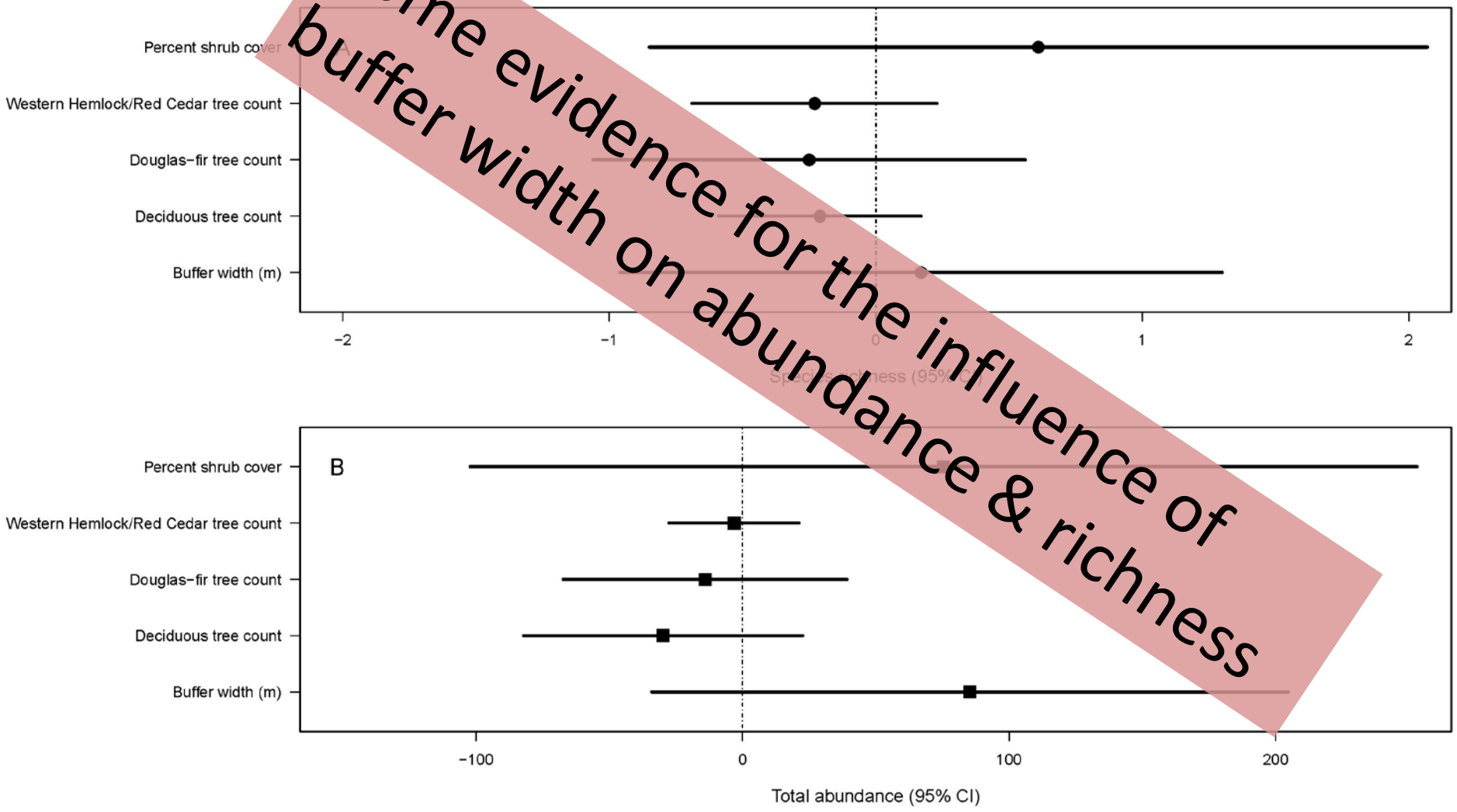
RESPONSES AS A FUNCTION OF BUFFER WIDTH

Species richness & abundance



Species richness and abundance decreased on some very narrow buffers but not on others

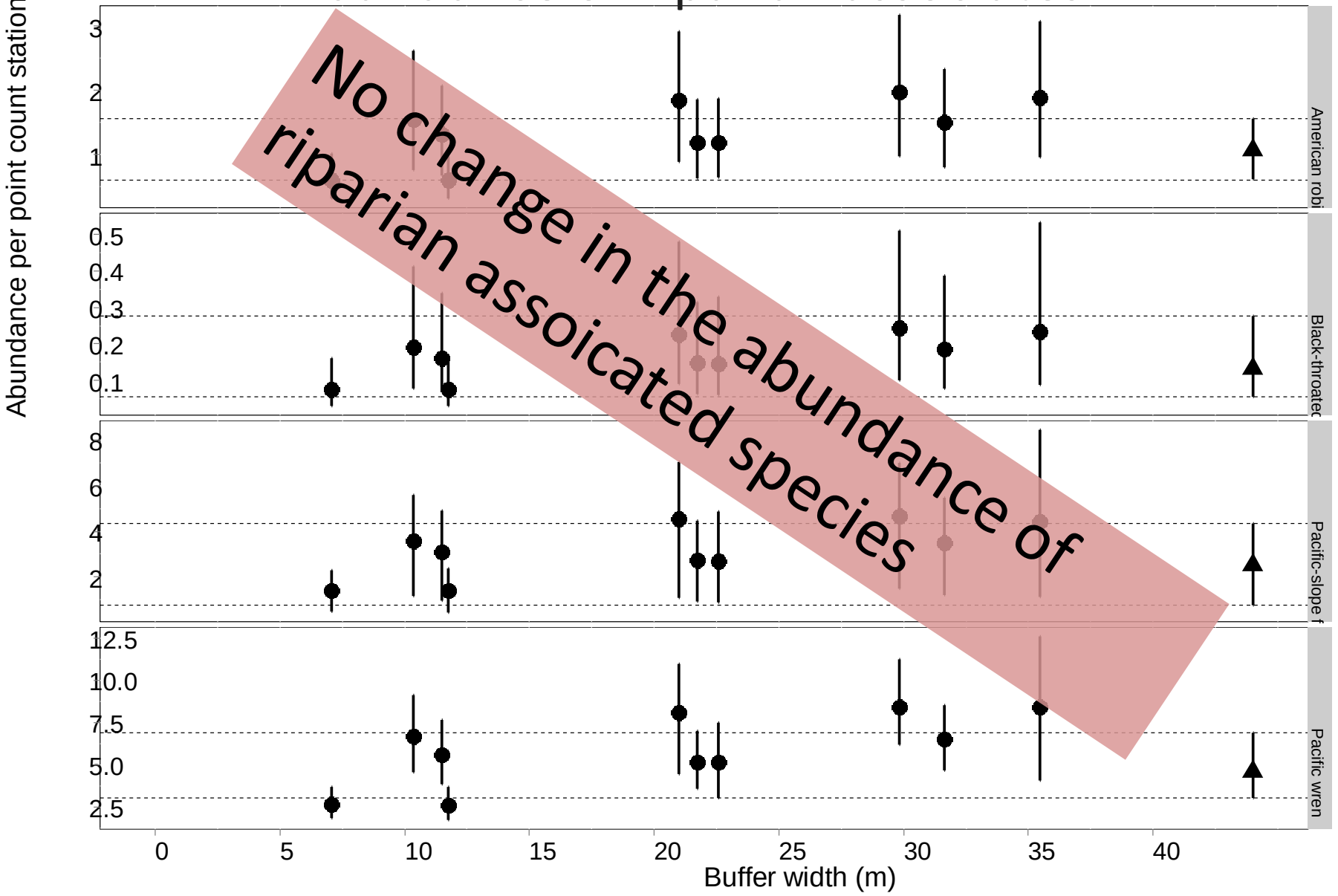
Influence of buffer width and habitat variables on species richness & total abundance



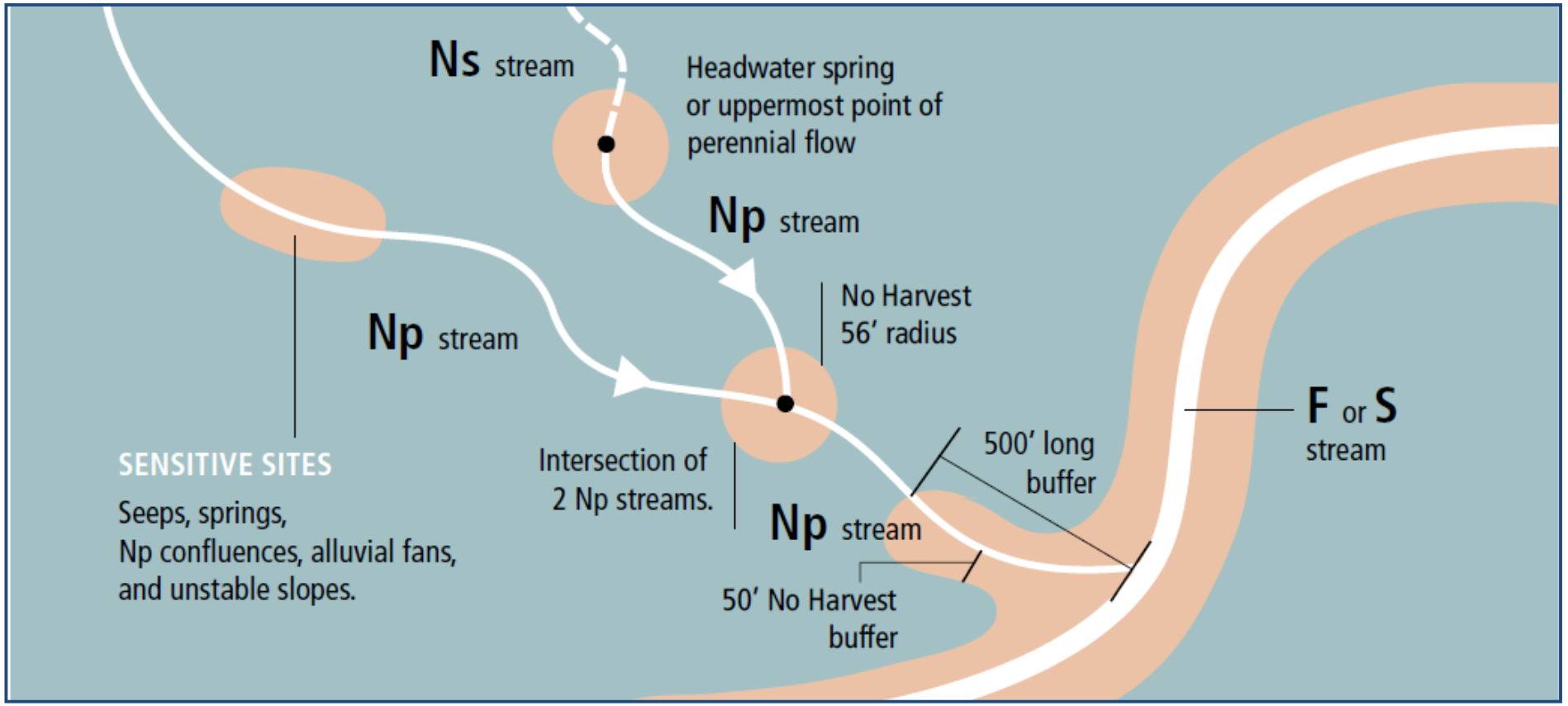
Some evidence for the influence of buffer width on abundance & richness

SPECIES RESPONSES AS A FUNCTION OF BUFFER WIDTH

Abundance or riparian associates



Putting our results in context



NARROW < Current Prescription < WIDE

CONCLUSIONS

- Strong evidence for high turnover on the treatments
  - The treatments contained more species post-harvest
- Weak evidence for species loss and strong evidence for species gain on treatments
- Species occupancy increased over time
- Little evidence for treatment effects on total abundance
- Little evidence for treatment effects on abundance of 'riparian specialists'
- Buffer width ('Random effects' model) results:
  - Evidence for reduced total abundance and richness on some very narrow buffers but not others
  - No reduction in abundance of riparian associates

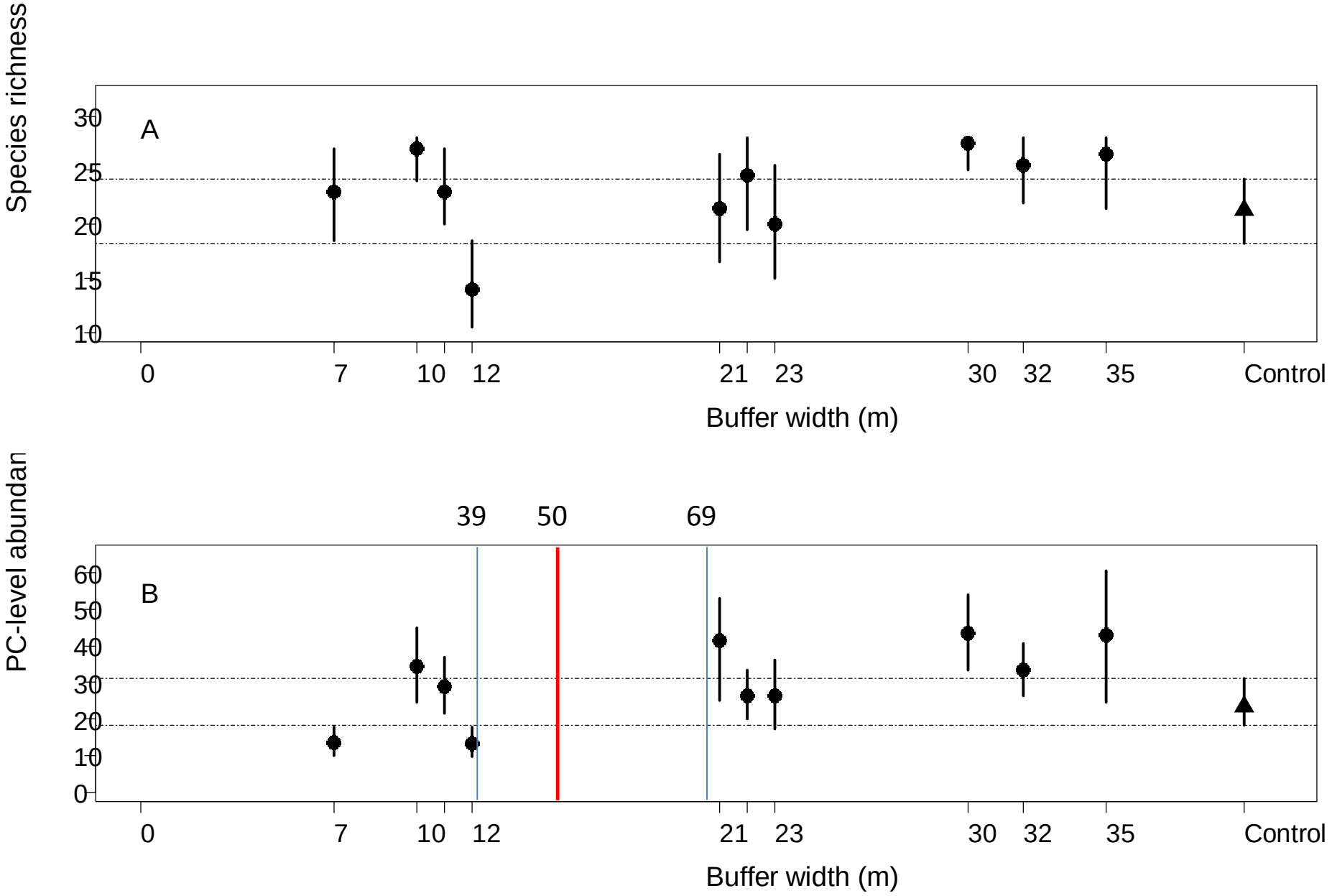
Cautions

- Does not tell us if birds within narrow buffers are successfully reproducing.

Treat buffer as a continuous variable

- Some loss of species and some decrease in total bird abundance occurred on two very narrow buffer stands (40’ ≤) but not on others, suggesting that stand-level differences exist in bird response.
- No loss of species or decrease in bird abundance occurred on stands with buffers greater than the current 50’ buffer for non-fish bearing streams.

RESPONSES AS A FUNCTION OF BUFFER WIDTH



Acknowledgments

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Treatment comparison and evidence for effect
Narrow vs. Control
Narrow vs. Control, 95% CRI does not include 0
Wide vs. Control
Wide vs. Control, 95% CRI does not include 0
RUHU
RBSA
HAWO
NOFL
OSFL
HAFL
PSFL
HUVI
WAVI
STJA
CBCH
BRCR
PAWR
GCKI
VATH
SWTH
AMRO
CEWA
HETO
BTYW
MGWA
WIWA
WETA
SPTO
SOSP
DEJU
BHGR
EVGR
Pre-treatment
Short-term effect
Long-term effect
Occupancy contrast (95% CRI)
Abundance contrast (95% CRI)
4
2
0
-2
Treatment comparison