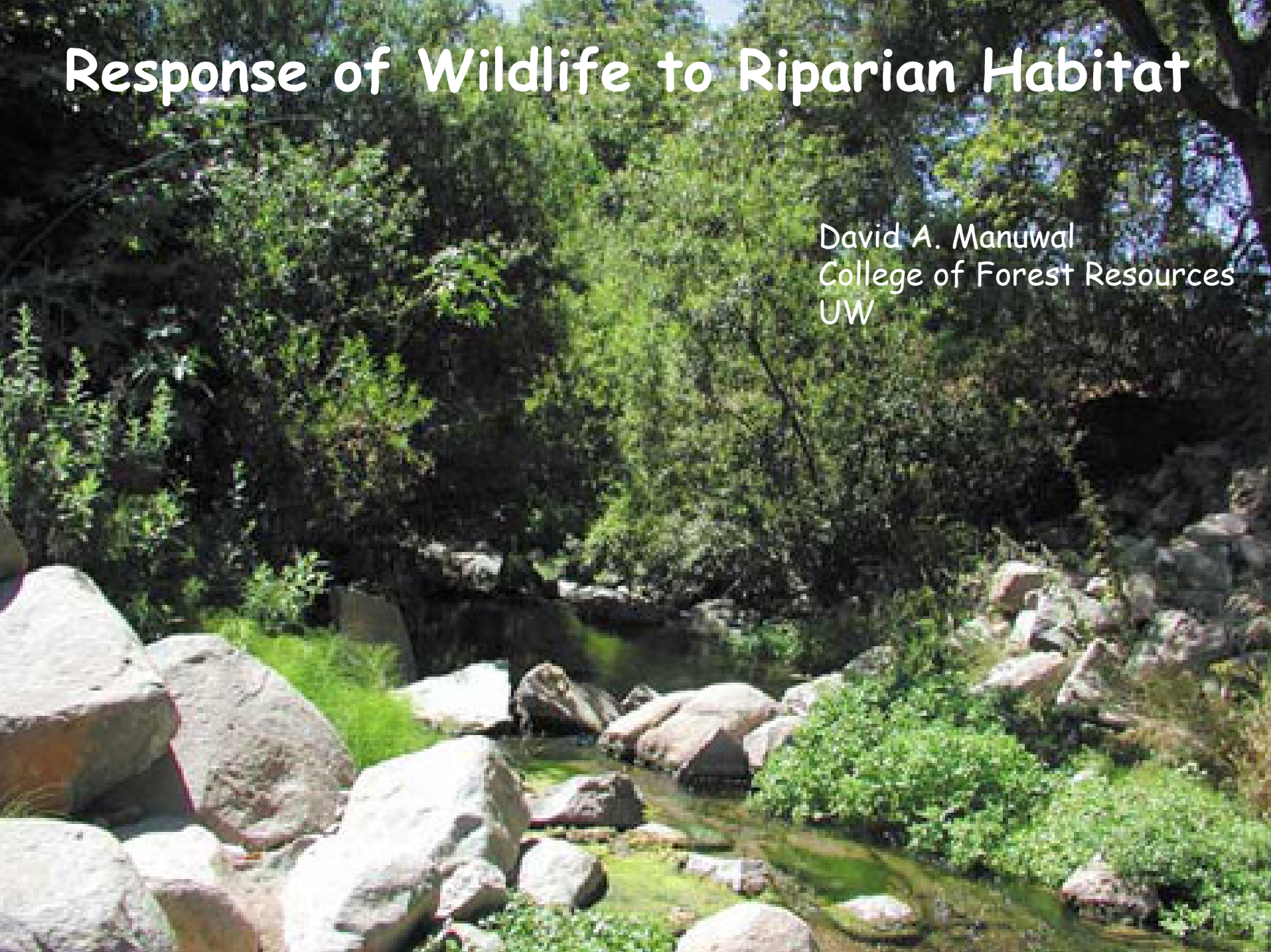


Response of Wildlife to Riparian Habitat

David A. Manuwal
College of Forest Resources
UW



What Does "Riparian" Mean?

- Habitat adjacent to or along streams, rivers, (lakes, ponds, reservoirs and tidewater)
- “A riparian habitat area is defined as the area adjacent to aquatic systems with flowing water (e.g. rivers, perennial or intermittent streams, seeps, springs) that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other”. (Knutson & Naef, 1997)

- Riparian habitat is geographically very limited
- Since European colonization of Washington, 50-90% of riparian habitat has been lost or extensively modified



River



Stream

Table 2—Number of wildlife species using riparian zone or freshwater wetland habitats ^{1/}

Class	Number of westside wildlife species	Number of species using riparian or wetland plant communities	Number of species using riparian zones or wetlands as a specialized habitat but not using plant communities	Total number of species using riparian zones or wetlands
Amphibians & Reptiles	44	35	2	37
Birds	267	192	38	230
Mammals	103	91	1	92
Total	414	318	41	359

Habitat Functions

- Foraging and Watering
- Breeding and Rearing
- Hiding and Resting
- Thermal Cover
- Travel Corridors

Foraging and Watering



Osprey



Coyote



Common Merganser



Painted Turtle



Mule Deer

Breeding and Rearing



Harlequin Ducks



Beaver



Yellow Warbler



Water Shrew



Tailed frog



Black-headed Grosbeak

Hiding and Resting



White-tailed Deer



Cougar



Frogs

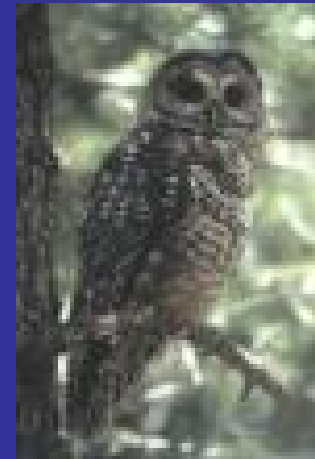


Grizzly Bear

Thermal Cover



Elk



Northern Spotted Owl

Travel Corridor



Mule Deer

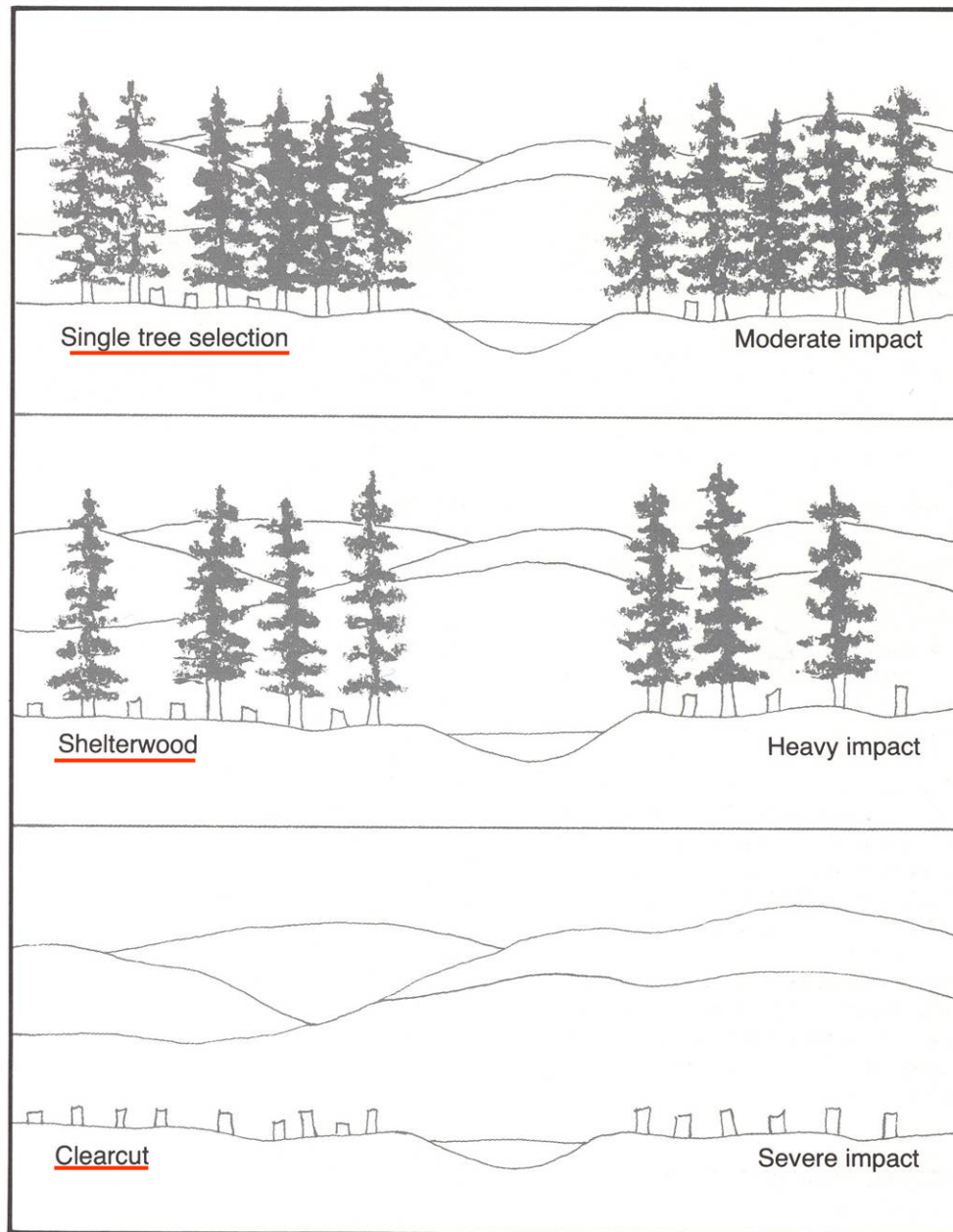


Bald Eagle



River Otter

*Riparian areas in
production forest
lands*



Impacts of different levels of harvesting

Habitat Contrast

- Riparian areas are usually quite different than adjacent habitat
- In drier climates, the differences are greater



Major Concerns over Effects of Grazing on Riparian Areas → Restoration Efforts



Poor condition - Grass/Shrub riparian environment; Bear Creek, Bureau of Land Management, Prineville, Oregon. Management: May through September grazing.

Before



Good condition - Grass/shrub riparian environment.
Management: Following five years of rest from grazing, Feb.-Mar. grazing use was initiated. Livestock use has increased from 72 A.U.M.'s to 313 A.U.M.'s in just 10 years.

After

Major Concerns over Effects of Grazing on Riparian Areas → Restoration Efforts



Poor condition - Riparian habitat; private land, Fifteen Mile Creek near Dufur, Oregon. Management: Continual use by livestock and farming along with periodic channelization work following flood events.

Before



Good, but still an improving riparian condition. Management: Four years of rest from grazing and farming practices along with limited rock riprap where severe bank erosion had occurred. Improved riparian condition eliminated need for annual rechannelization.

After

Major Concerns over Effects of Grazing on Riparian Areas → Restoration Efforts



Poor condition - Mountain riparian environment; McKay Creek, Ochoco National Forest, Prineville, Oregon. Management: Logs were skidded downstream during the 1930's and stream was channelized following the 1964 flood. Cattle were grazed June through September, prior to 1969. With a change in grazing, 1969-1980, only minor riparian recovery occurred.

Before



Riparian recovery in progress. Management: Four years of rest from grazing. Planned future management, after riparian recovery has occurred, includes specifically designed systems of timber harvest and livestock use to maintain desired riparian condition.

After

Streamside Buffers and Wildlife

What are Streamside (Riparian) Buffers?



Before Buffer



After Buffer



Forested Riparian Buffer



Grass Buffer



Thank You Agriculture!

Riparian forest and grass buffers on agricultural land provide cover, clean water, nesting sites, and travel paths for aquatic and land animals. They make great places for bird watching, wildlife viewing, and photography.

Look Out Crop Pests!

Riparian buffers provide excellent habitat for these and other crop pest predators

- 150 big brown bats can eat 50,000 leaf hoppers, 38,000 cucumber beetles and prevent the hatching of 18 million corn root worms by devouring the adult beetles.
- Parasite wasps are natural enemies of the corn borer.
- Downy Woodpeckers and Northern Flickers are important predators of overwintering corn borers.



Outdoors, Hunting, & Fishing!

Riparian buffers provide wildlife habitat and serve as travel corridors that link natural areas across your land. Healthy wildlife populations mean better hunting and fishing and potential income from hunting lease fees.

Streamside (or Riparian) Buffers Improve Water Quality



Riparian Buffers are used with a combination of practices tailored for each agricultural situation. They reduce non-point source pollution and improve both ground and surface water quality.

What can YOU do?



Contact your local NRCS, NRD, NE Game and Parks Commission, UNL Cooperative Extension office or the Nebraska Department of Agriculture for more information about riparian buffer conservation programs.



Timber Fish & Wildlife Riparian
Management Zone Study:
an experimental investigation

University of Washington
Washington State University

Research Goals

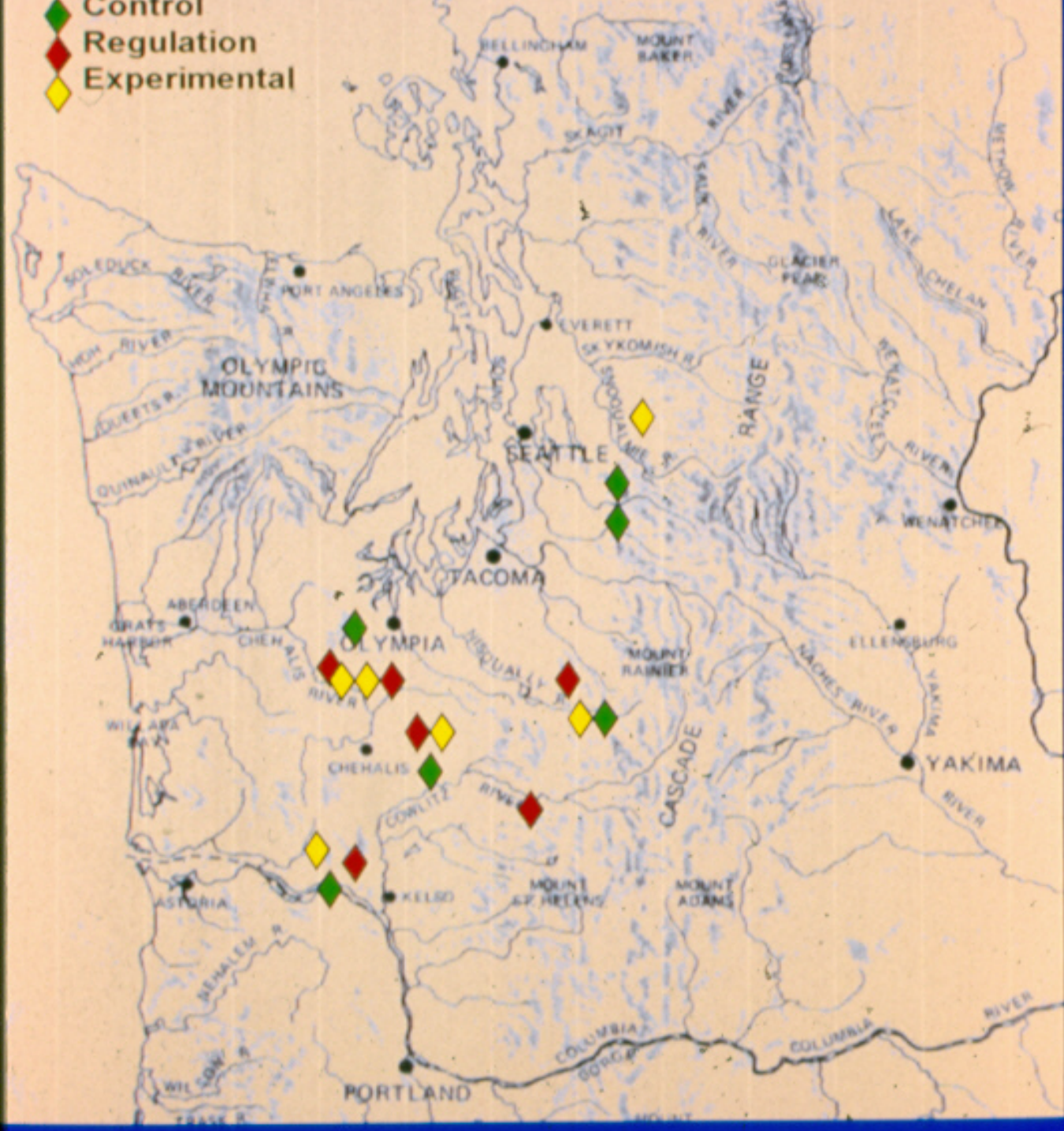
- 1) compare species richness, diversity and abundance between riparian habitats and the adjacent upland habitats
- 2) examine the effects of buffer width on species richness, diversity and abundance by comparing the currently required buffer strips to modified buffer strips and controls
- 3) examine the habitat correlates that may provide insights into the observed patterns of species richness, diversity and abundance

Site Selection

1. Low elevation (<620m)
2. Second-growth forest (55-65 yr old)
Dominated by Douglas-fir
3. Type 3 water by forest regulations, Type 4 if salmonids present
4. Predominately coniferous riparian canopy with deciduous tree component
5. > 500 m in stream length
6. Road access within 0.5 km
7. Could be harvested according to the project's specifications and time lines

- Control
- Regulation
- Experimental

Location of
TFW-RMZ
study sites



Study Design

Total of 18 sites (6 replicates in each of 3 Buffer widths)

- Control (no harvest)
- State regulations (7-23m wide buffers)
- Modified buffers (21-48m wide buffers)

RMZ control site



Harvested at the state-regulated
narrow buffer width (8m)



Harvested at the state-regulated
narrow buffer width (8m)

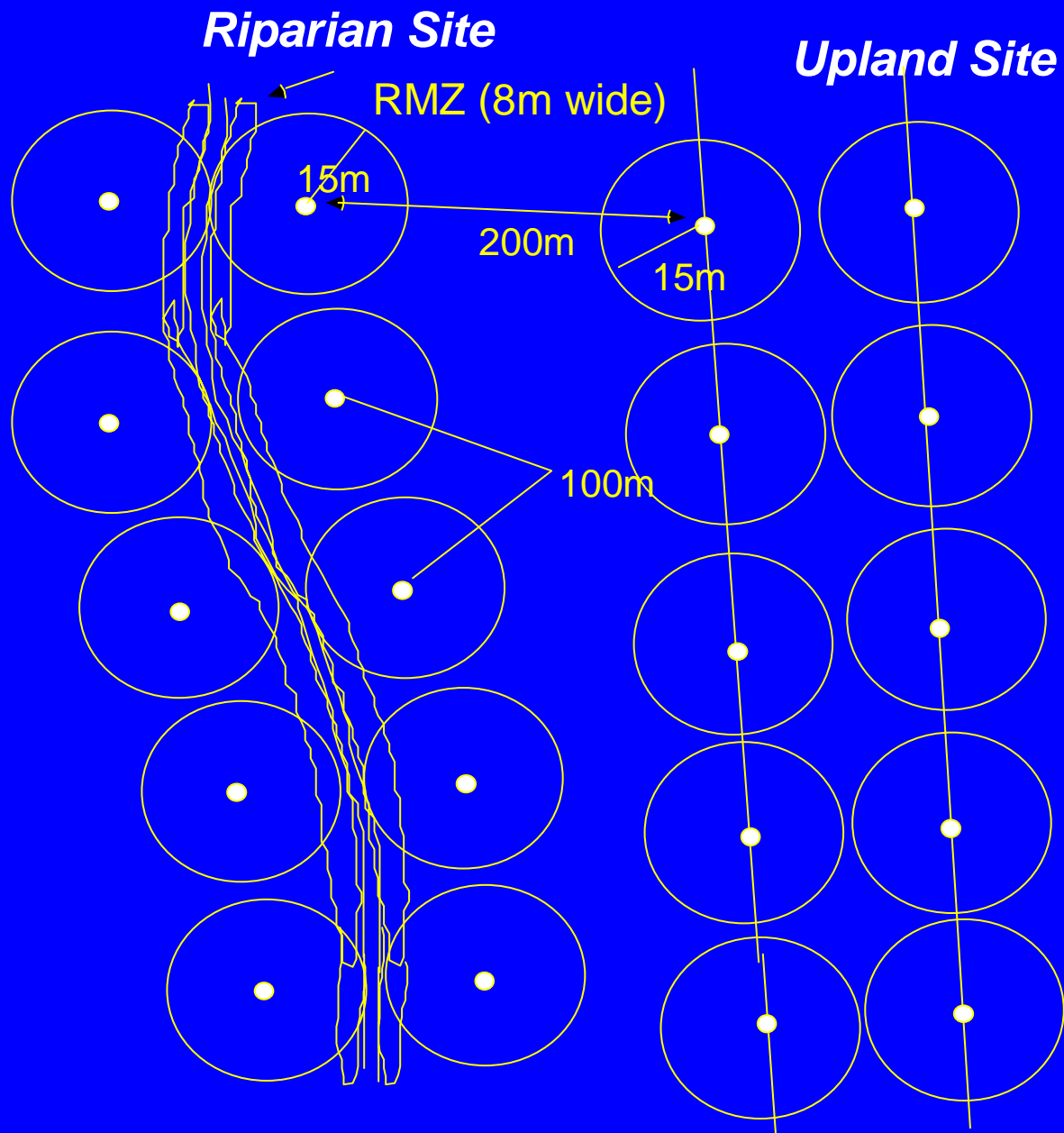


RMZ modified
buffer width harvest



Timing of Vertebrate Sampling

- Pre-harvest: one season (1993)
- Post-harvest: two seasons (1995 and 1996)



Array of bird sampling points in the riparian and upland sampling areas.

Table 1. Mean (SE) numbers of detections (abundance) of common species (>25 total detections) along riparian and upland transects in 1993.

Species	Riparian	Upland¹
American Robin	0.18 (0.07)a	0.02 (0.02)b
Black-throated gray warbler	0.25 (0.06)a	0.09 (0.03)b
Pacific-slope flycatcher	1.94 (0.13)a	1.21 (0.16)b
Winter wren	3.05 (0.24)a	1.26 (0.15)b
Brown creeper	0.16 (0.04)a	0.24 (0.05)a
Chestnut-backed chickadee	3.21 (0.31)a	3.20 (0.29)a
Golden-crowned kinglet	1.03 (0.17)a	1.37 (0.23)a
Swainson's thrush	0.21 (0.07)a	0.23 (0.08)a
Wilson's warbler	0.57 (0.17)a	0.43 (0.14)a

¹Means sharing the same letters do not differ (t-test, P > 0.05) in red).

Table 6. Mean¹ (SE) numbers of detections (abundance) of common (>15 total detections in a year) along the riparian management zone with no treatment (control), modified cut (modified), or cut according to state forest practices regulations (state). Values are standardized by the pre-harvest year (the pre-harvest year is subtracted from the mean of the two post-harvest years). Positive values indicate an increase in abundance post-harvest and negative values indicate a decrease.

Species	Treatment²		
	Control	Modified	State
Dark-eyed junco	0.00 (0.00)a	0.03 (0.02)a	0.33 (0.15)b
American robin	-0.07 (0.16)a	0.14 (0.09)ab	0.48 (0.08)b
Pacific-slope flycatcher	0.45 (0.17)a	0.73 (0.16)ab	1.13 (0.18)b
Song sparrow	0.00 (0.00)a	0.16 (0.09)ab	0.29 (0.12)b

¹No differences (P 's > 1.0) were detected in abundance of each species between years. Thus, abundance was pooled between the two post-harvest years.

²Means sharing the same letters do not differ (ANOVA, Tukey's HSD-test, $P > 0.10$).

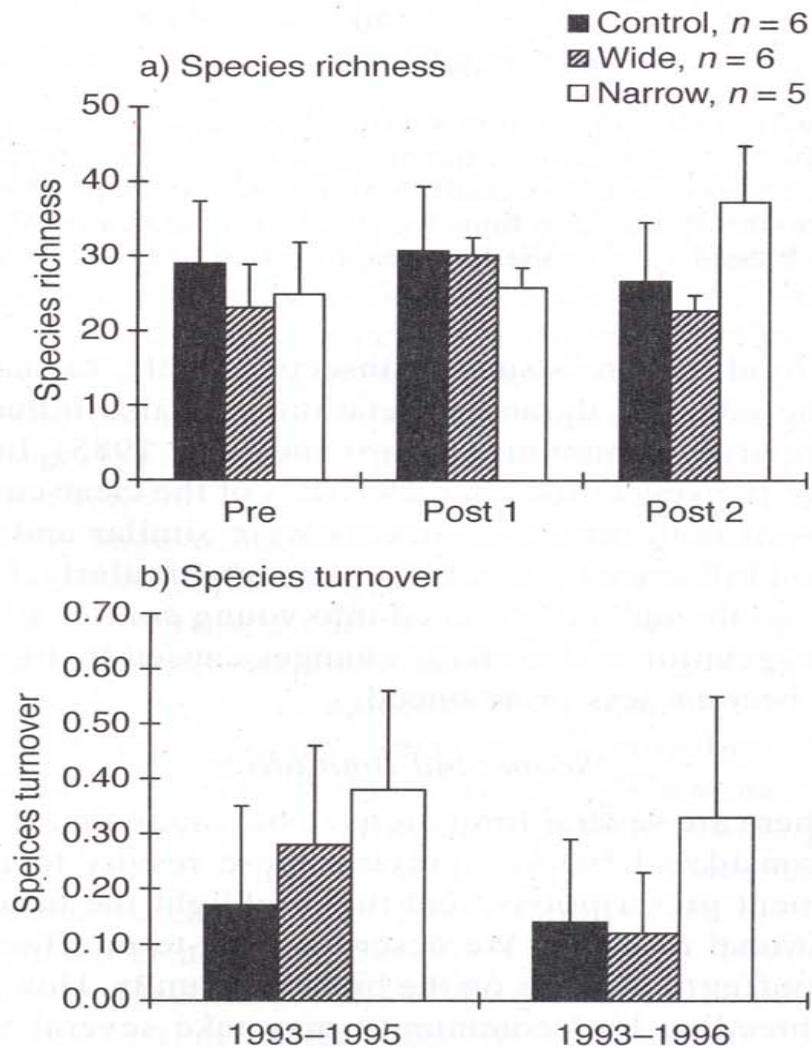


FIG. 1. (a) Bird species richness in the preharvest year (Pre) and the first (Post 1) and second (Post 2) years after harvest in three types of riparian habitat: not harvested (control), harvested with a wide riparian buffer (wide), or harvested with a narrow riparian buffer (narrow). (b) Species turnover between the preharvest year and the first year after harvest (1993–1995) and between the preharvest year and the second year after harvest (1993–1996) in the control and buffer treatments. Values are depicted as means ± 1 SE.

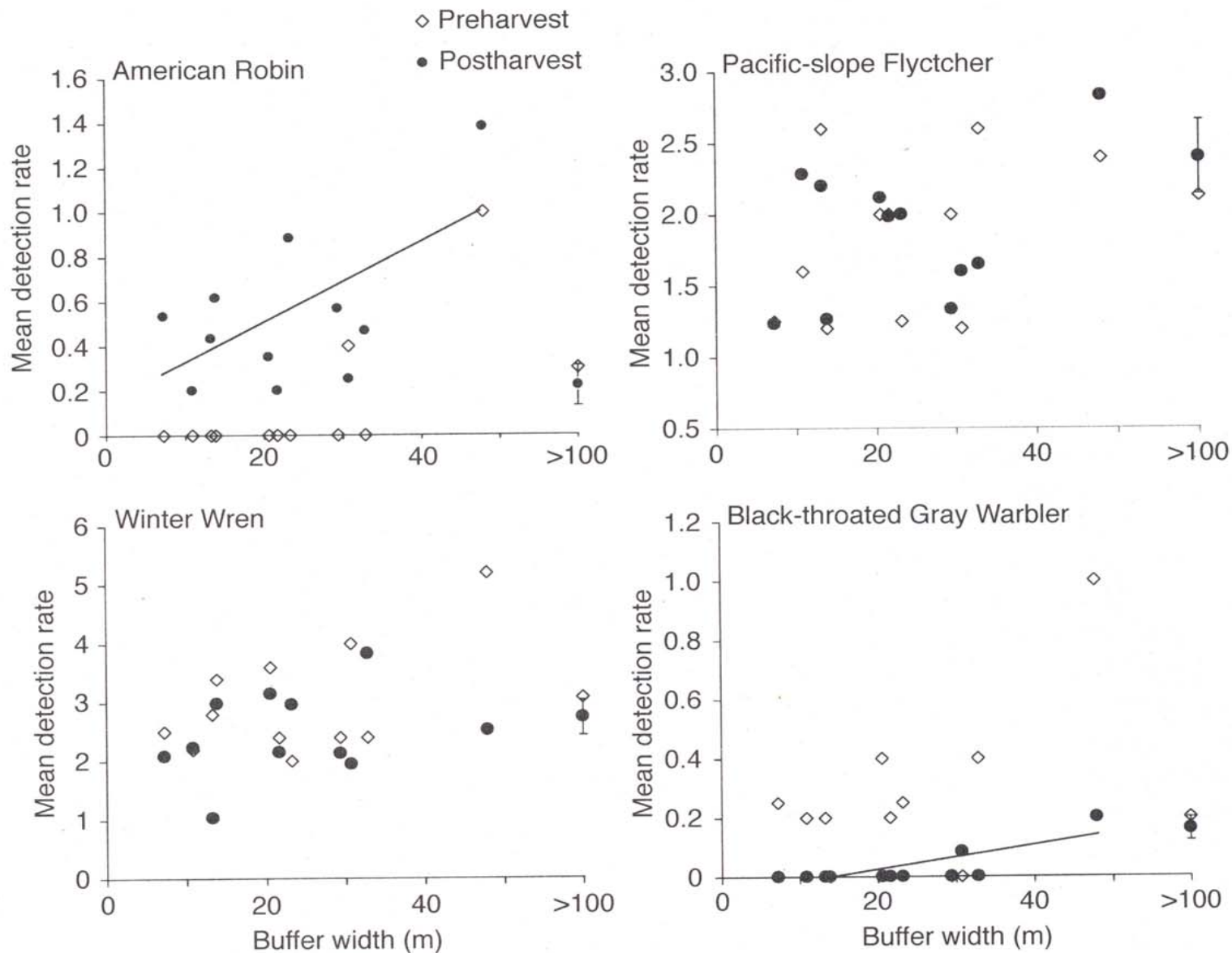


FIG. 2. Relationship between riparian buffer width and mean detection rate for the four riparian-associated species in the preharvest year and in the two postharvest years combined. The two points directly above the buffer width “>100” represent the mean (± 1 SE) detection rate for all six controls in the preharvest year and all six controls in the two years postharvest combined. All other data points represent the mean detection rate per site. Regression lines for Black-throated Gray Warbler and American Robin were derived using the mean detection rate on logged sites in the two years postharvest.

Conclusions about bird response

- Bird species richness higher in narrow buffer sites
- Total bird abundance was higher in riparian areas than in uplands
- Species turnover highest in narrow buffers and did not maintain pre-harvest levels
- Little difference in species turnover between controls and wide buffers

Mammal Response



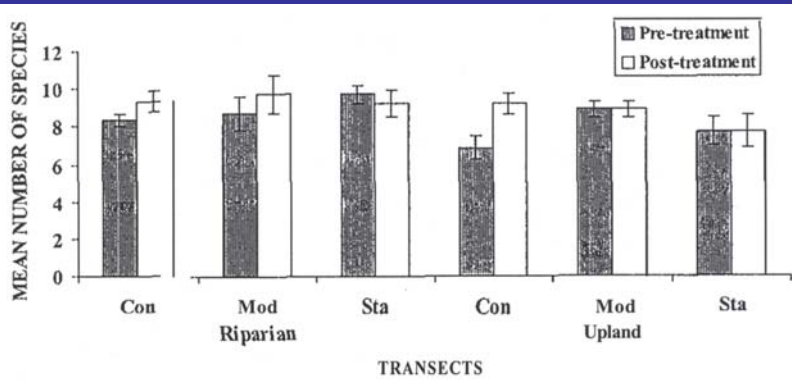


Figure 5. Species richness (mean \pm SE) before and after harvest on riparian and upland transects by treatment. Richness calculated from combined pitfall and snap trap data. Mean richness was tested separately for riparian and upland transects and found to be not statistically different among treatments.

Mammal species richness

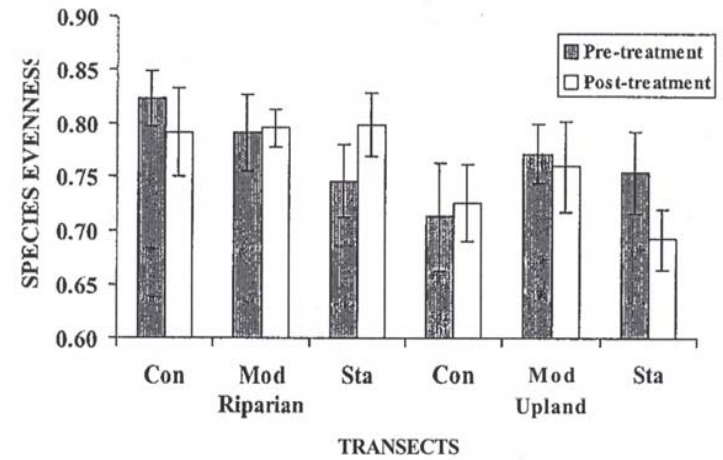


Figure 6. Species evenness (mean H' \pm SE) before and after harvest on riparian and upland transects by treatment. Evenness calculated from combined pitfall and snap trap data. Mean evenness was tested separately for riparian and upland transects and found to be not statistically different among treatments.

Mammal species diversity



So. Red-backed vole
(*Clethrionomys gapperi*)

Southern Red-backed Vole (*Clethrionomys gapperi*)

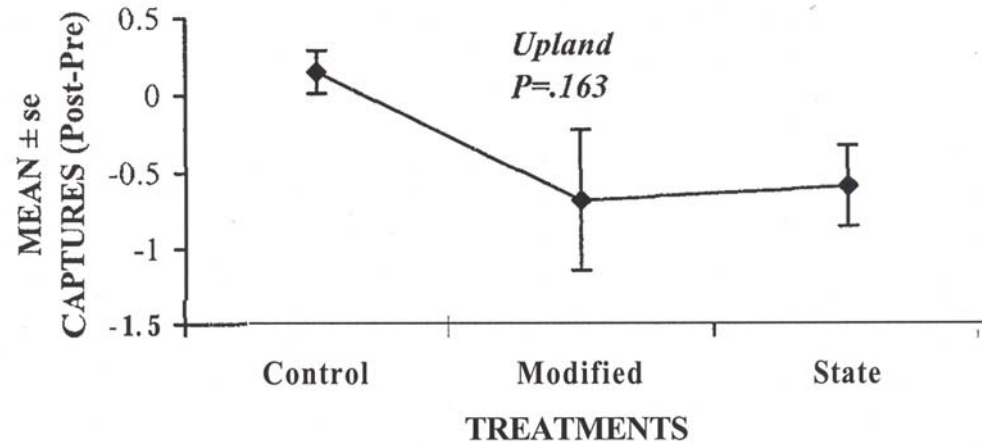
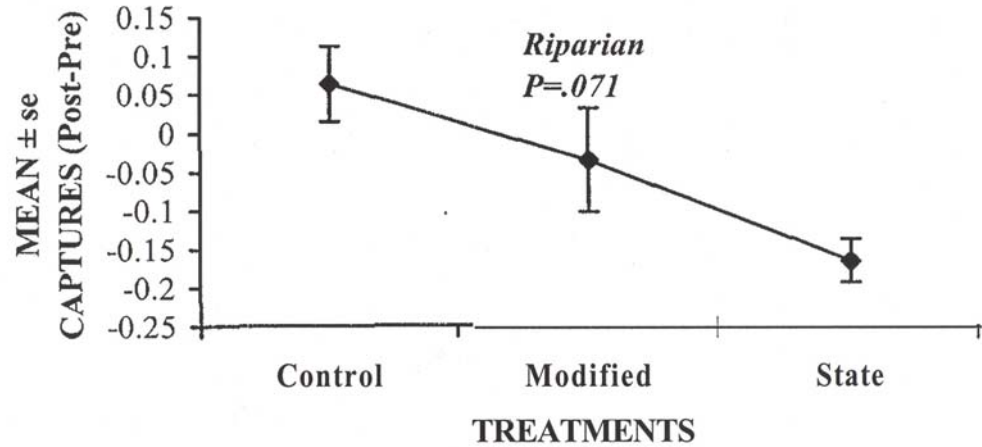


Figure 9. Differences by treatment in mean (\pm SE) capture rates (number caught per 100 trap nights) for the southern red-backed vole before and after harvest for riparian (above) and upland transects (below). Indices are derived from mean capture rates before and after harvest. Charted values are $\bar{x}_{\text{Post}} - \bar{x}_{\text{Pre}}$. Indices combine pitfall and corrected snap trap data.



Marsh shrew
(*Sorex bendirii*)

Marsh Shrew (*Sorex bendirii*)

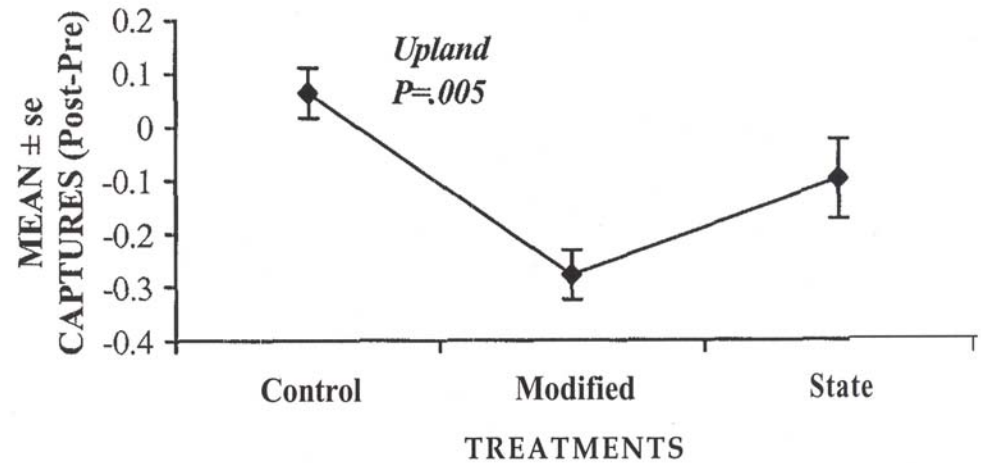
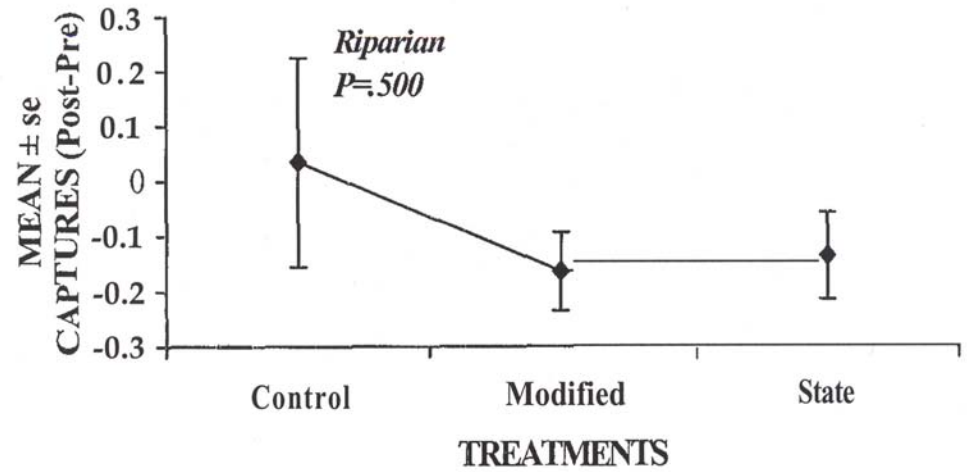


Figure 12. Differences by treatment in mean (SE) capture rates (number caught per 100 trap nights) for the marsh shrew before and after harvest for riparian (above) and upland transects (below). Indices are derived from mean capture rates before and after harvest. Charted values are $\bar{x}_{\text{Post}} - \bar{x}_{\text{Pre}}$. Indices combine pitfall and corrected snap trap data.



Trowbridge shrew
(*Sorex trowbridgii*)

Trowbridge's Shrew (*Sorex trowbridgii*)

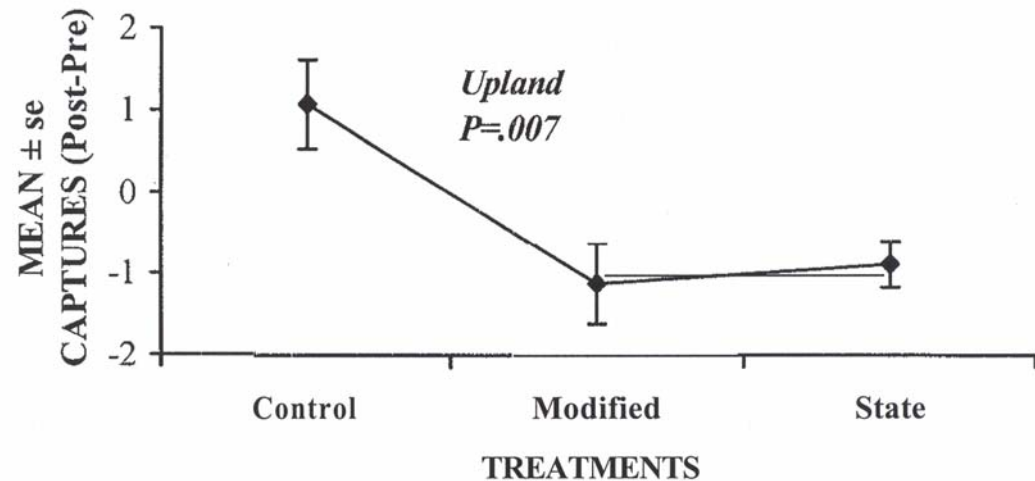
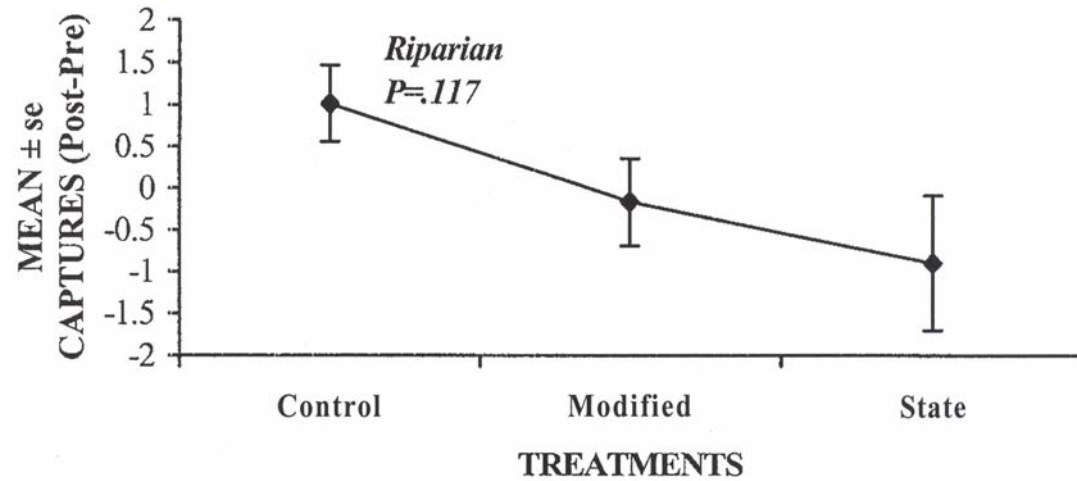


Figure 13. Differences by treatment in mean (se) capture rates (number caught per 100 trap nights) for the marsh shrew before and after harvest for riparian (above) and upland transects (below). Indices are derived from mean capture rates before and after harvest. Charted values are $\bar{x}_{\text{Post}} - \bar{x}_{\text{Pre}}$. Indices combine pitfall and corrected snap trap data.



Photo: Kevin Campbell

Shrew-mole
(*Neurotrichus gibbsii*)

Shrew-mole (*Neurotrichus gibbsii*)

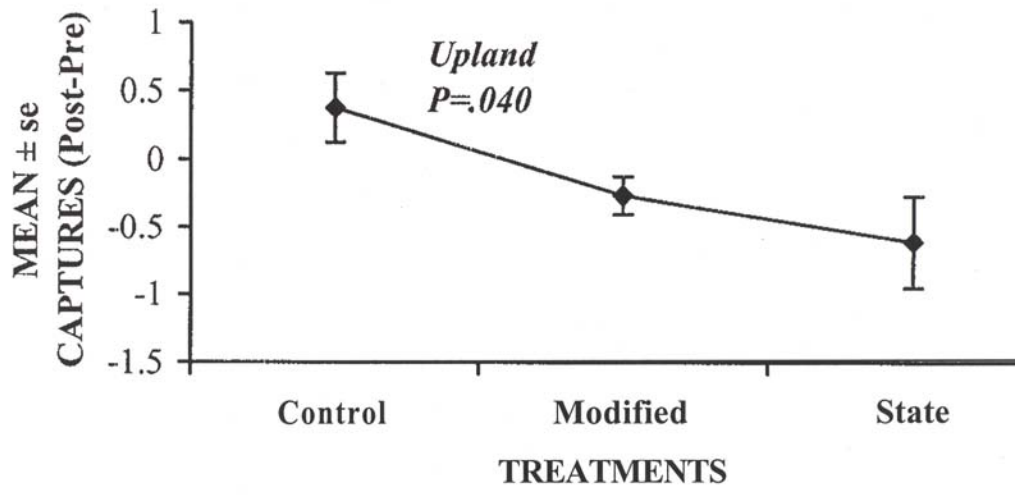
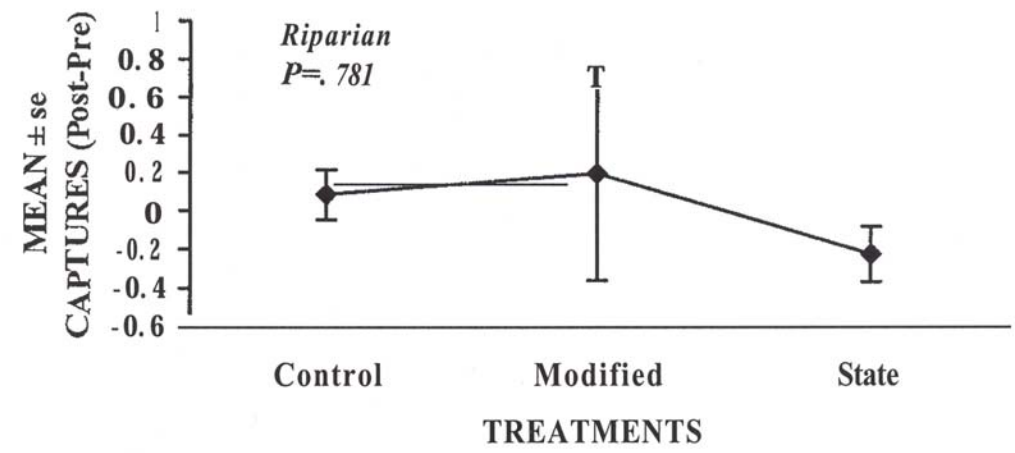


Figure 14. Differences by treatment in mean (se) capture rates (number caught per 100 trap nights) for the shrew mole before and after harvest for riparian (above) and upland transects (below). Indices are derived from mean capture rates before and after harvest. Charted values are $\bar{x}_{Post} - \bar{x}_{Pre}$. Indices combine pitfall and corrected snap trap data.



Creeping vole
(*Microtus oregoni*)

Creeping Vole (*Microtus oregoni*)

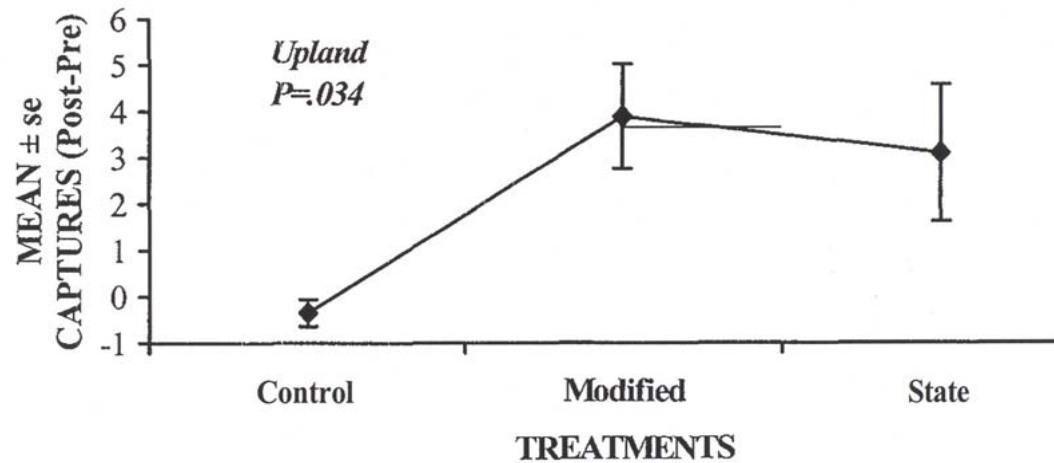
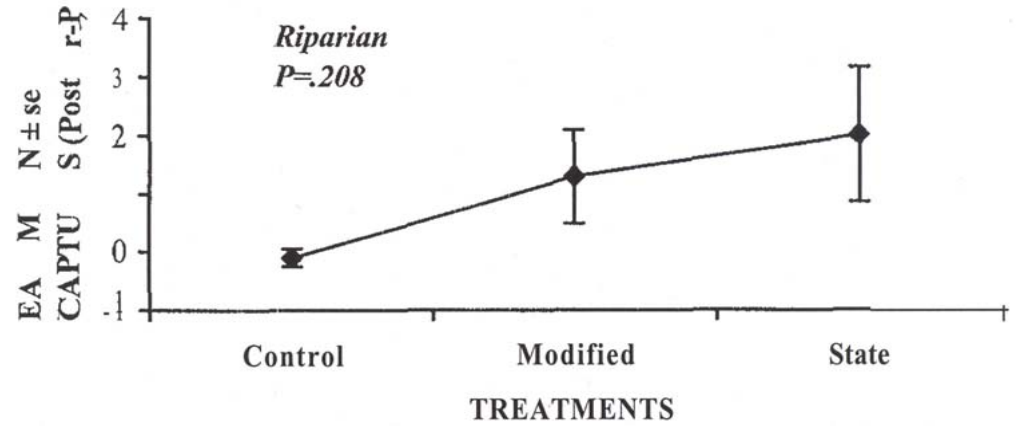


Figure 16. Differences by treatment in mean (se) capture rates (number caught per 100 trap nights) for the creeping vole before and after harvest for riparian (above) and upland transects (below). Indices are derived from mean capture rates before and after harvest. Charted values are $\bar{x}_{\text{Post}} - \bar{x}_{\text{Pre}}$. Indices combine pitfall and corrected snap trap



Forest deer mouse
(*Peromyscus keeni*)

Forest: Deer Mouse (*Peromyscus keeni*)

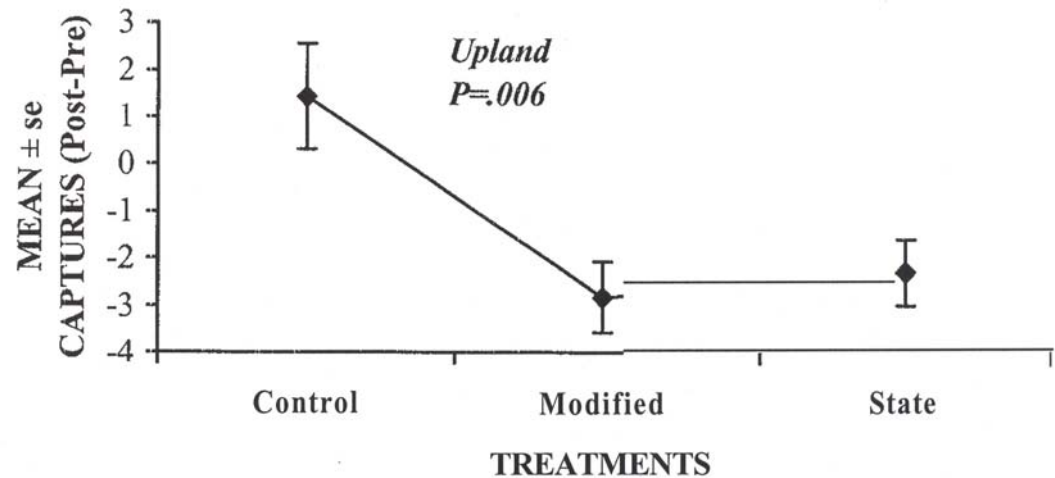
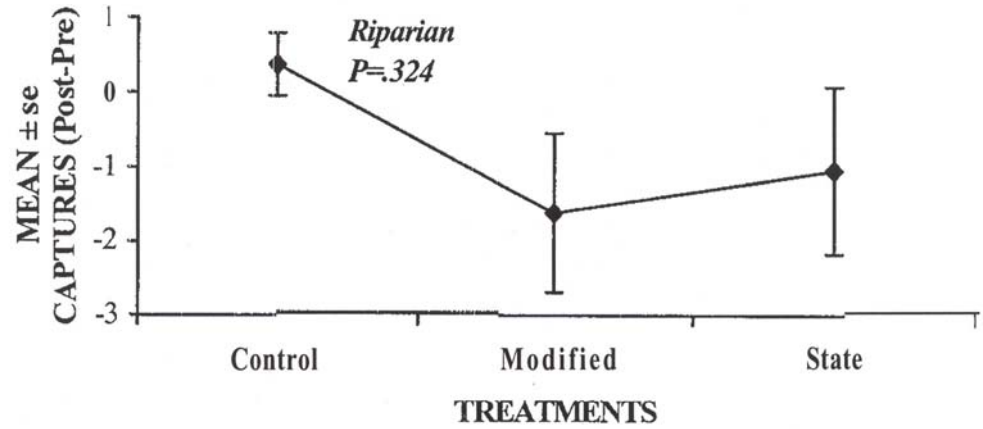


Figure 15. Differences by treatment in mean (se) capture rates (number caught per 100 trap nights) for the forest deer mouse before and after harvest for riparian (above) and upland transects (below). Indices are derived from mean capture rates before and after harvest. Charted values are $\bar{x}_{Post} - \bar{x}_{Pre}$. Indices combine pitfall and corrected snap trap data.

Conclusions about mammal response

- Mammal species richness was higher in the riparian area than uplands before harvest
- Overall abundance was not different between riparian and uplands before harvest
- Species richness and diversity were not different among treatments
- No species showed a significant difference in capture rate among treatments
- There were non-significant treatment effects on some species

Aquatic amphibians





Tailed frog
(*Ascaphus truei*)

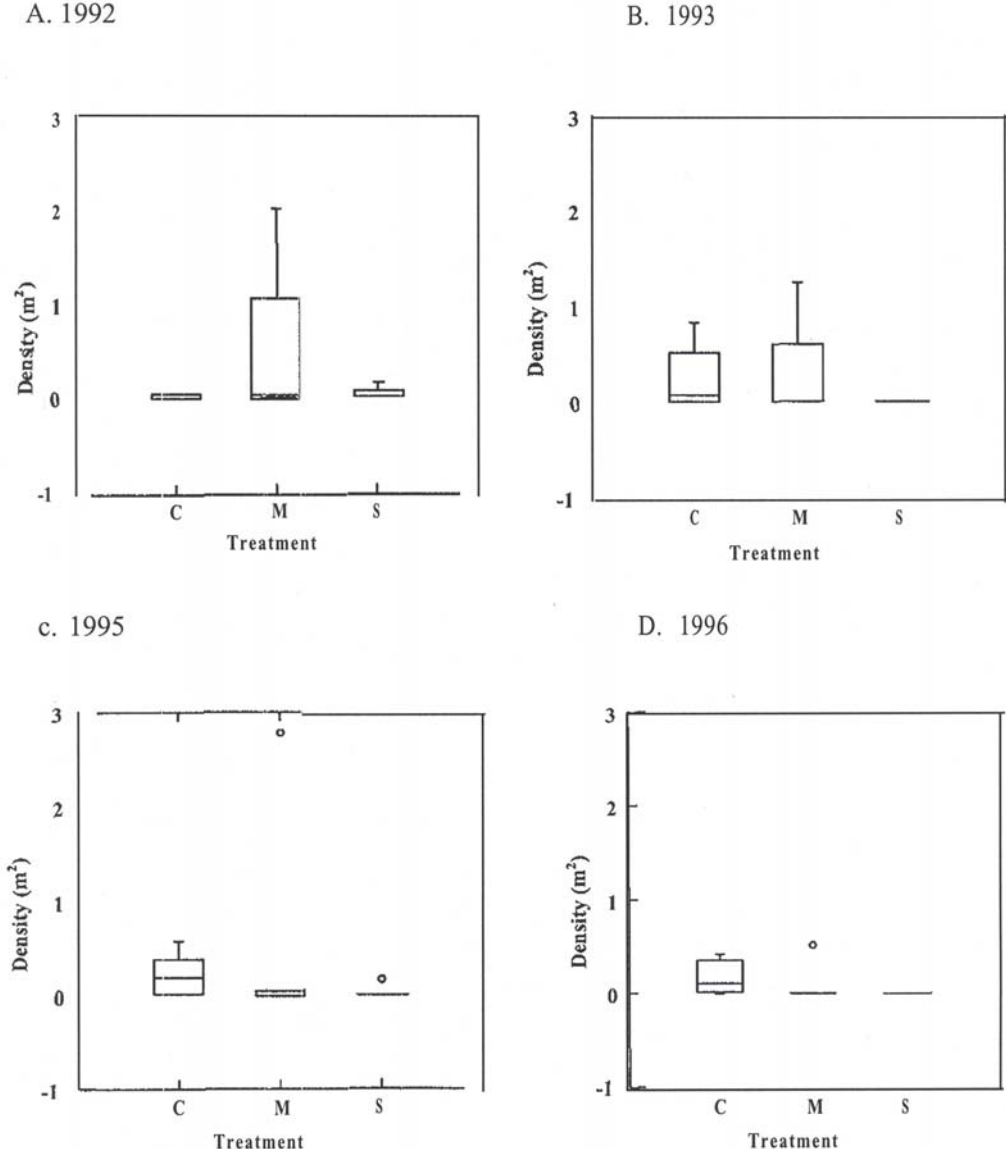


Figure 2. Density of second year tailed hog tadpoles in streams on Control (C), Modified (M), and State (S) sites. Surveys in 1992 and 1993 occurred before timber harvest; 1995 and 1996 sampling occurred after timber harvest. Six sites were sampled in each treatment type. Box plots show median (center horizontal line), 2nd and 3rd quartiles around the median, and whiskers that extend to 1.5 times the 2nd and 3rd quartile range. Outliers are shown as an asterisk or open circle.



Pacific giant salamander
(*Dicamptodon tenebrosus*)

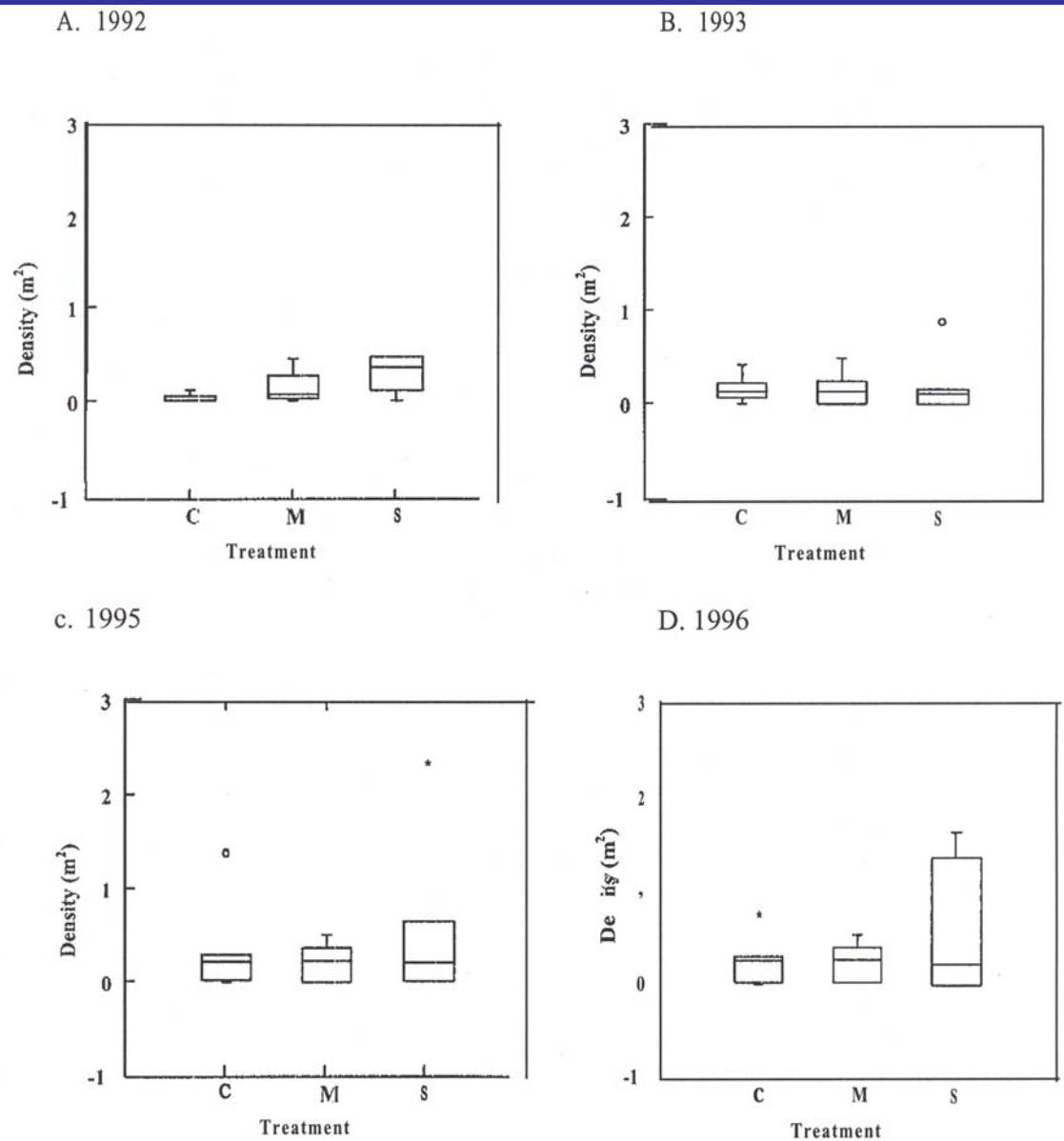
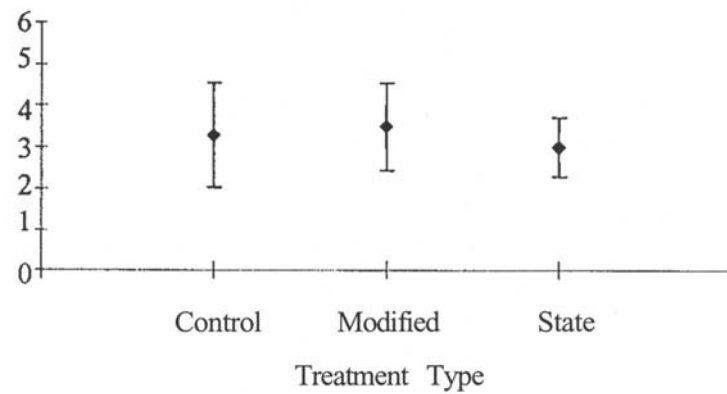


Figure 3. Density of giant salamander larvae in streams on Control (C), Modified (M), and State (S) sites. Surveys in 1992 and 1993 occurred before timber harvesting; 1995 and 1996 occurred after timber harvest. Six sites were sampled in each treatment type. Box plots show median (center horizontal line), 2nd and 3rd quartiles around the median, and whiskers that extend to 1.5 times the 2nd and 3rd quartile range. Outliers are shown as an asterisk or open circle.

Terrestrial Amphibians



Terrestrial amphibian species richness



Upland

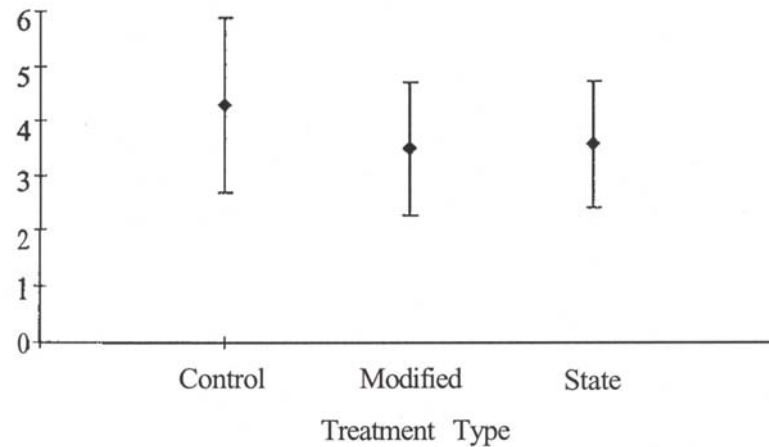


Figure 4. Number of amphibian species (mean \pm SD) caught at all treatment types during the two post-harvest sampling years. Nine total species were caught on riparian transects on control sites, 8 on modified buffers, and 7 on state regulation buffer sites. Ten total species were caught on upland transects (lower graph) on control sites, 6 on modified buffers, and 9 on state buffers. Differences among treatment types were not significant ($P > 0.50$).



Western red-backed salamander
(*Plethodon vehiculum*)

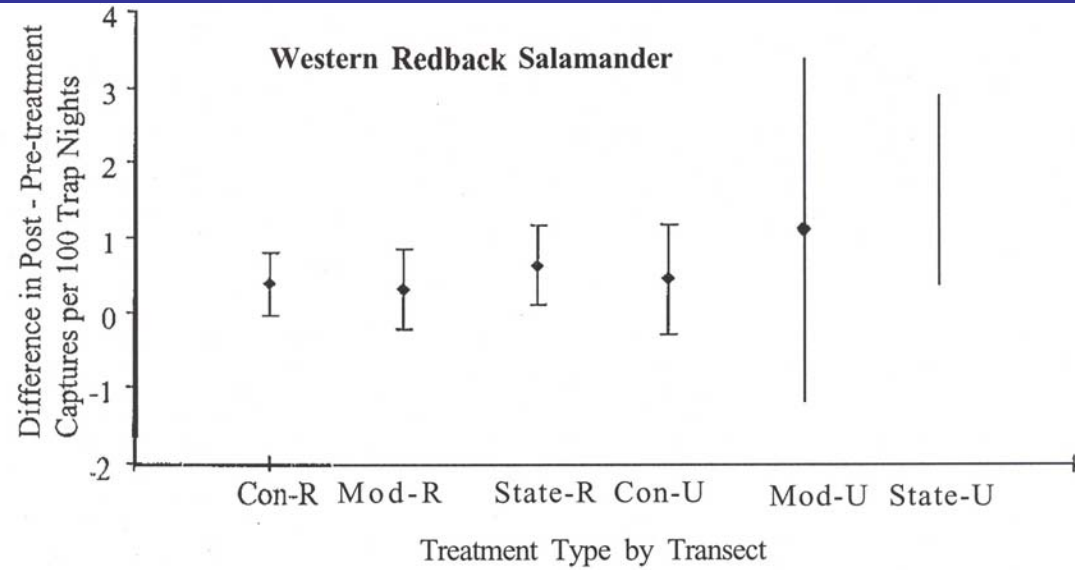


Figure 7. Overall change in abundance from pre-treatment to post-treatment sampling of western redback (*Plethodon vehiculum*) salamanders at riparian (R) and upland (U) transects at all treatment types. Change was calculated by subtracting the mean pre-treatment captures from mean post-treatment captures. Positive values indicate that post-treatment abundance was higher than pretreatment abundance, Negative values indicate that abundance decreased following timber harvest. Vertical bars show standard deviation.



Ensatina
(*Ensatina eschscholtzii*)

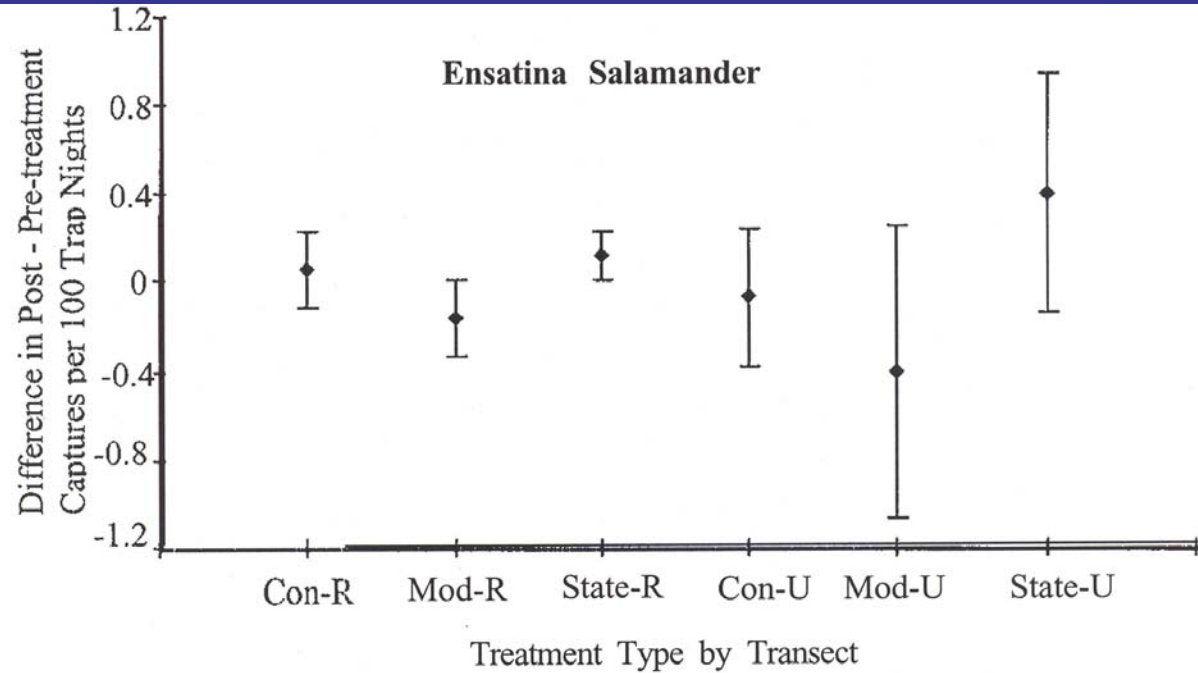


Figure 8. Overall change in abundance from pre-treatment to post-treatment sampling of *Ensatina* (*Ensatina eschscholtzii*) salamanders at riparian (R) and upland (U) transects at all treatment types. Change was calculated by subtracting the mean pre-treatment captures from mean post-treatment captures. Positive values indicate that post-treatment abundance was higher than pre-treatment abundance. Negative values indicate that abundance decreased following timber harvest. Vertical bars show standard deviation.

Conclusions about amphibian response

- Species richness did not differ between riparian and upland habitat
- Only 6 species were common enough for statistical analysis
- *Ensatina* was significantly less common on modified sites than the others
- Riparian buffers of about 8 m can support amphibians in the short-term after clearcut harvests

General Conclusions

- This study showed trends in response for some groups of wildlife
- Edge-related birds and mammals generally did well with the state-mandated buffer zones
- Riparian specialists did better in wider buffers
- Must be cautious in interpretations because of the limited post-harvest response time involved