



Testing the Influence of Willow Proximity on Feeding Rate in a Keystone Species: The Red-naped Sapsucker

Mitchell Banach¹, Tom Anderson², and Chris Floyd³

Department of Biology, University of Wisconsin-Eau Claire,
Eau Claire, WI 54701

¹banachmc@uwec.edu; ²anderstl@gmail.com ³floydch@uwec.edu

Abstract

Woodpeckers are ecologically important because they excavate nest cavities that eventually become available to many other species that require cavities but cannot create their own. In the aspen woodlands of western North America, red-naped sapsuckers (*Sphyrapicus nuchalis*) are the dominant woodpecker, providing essential nesting habitat for several other bird species. Sapsuckers also create sap wells in willows (*Salix* spp.), providing a nutritious resource for > 40 species, including hummingbirds, chipmunks, and bees. Previous work by Gretchen Daily and colleagues suggested that sapsuckers avoid nesting in aspen (*Populus tremuloides*) groves located > 800 m from willows, indicating that reproductive success is limited by travel distance to and from food. This hypothesis was supported by our study of sapsuckers in Gunnison County, Colorado in June-August 2005, which found that nestlings in aspens located further from willows were fed significantly less often than those closer to willows. However, in 2006, when we repeated our study with a larger sample size we found no relationship. Our conflicting results cast doubt on the importance of willows to sapsucker nest site choice.

Background

- A keystone species is an organism that exerts such a disproportionately large effect on community structure that its removal would lead to substantial changes in species diversity
- Some keystone species are ecosystem engineers, which modify the environment in a way that creates habitat for other species.
- The red-naped sapsucker (a woodpecker) is an ideal example of an ecosystem engineer because each year it excavates new cavities in aspen trees (*Populus tremuloides*) that ultimately provide nesting sites for other cavity-nesting species, including tree swallows, violet-green swallows, nuthatches, chickadees and bluebirds.
- Sapsuckers also create and maintain sap wells in willows (*Salix* spp.), providing a nutrient-rich resource for > 40 other species of birds, mammals and insects (Figure 1).
- Previous work by Daily et al. (1993) found that aspen groves further from willows had fewer sapsuckers and, thus, fewer secondary cavity nesting birds. The investigators concluded that willow proximity was a key factor in determining where sapsuckers chose to nest. Thus, the loss of willows might precipitate the local extinction of the sapsucker-associated community.
- During the summers of 2005 and 2006, we tested the conclusions of Daily et al. (1993) by measuring the effect of willow proximity (distance from nearest willows) on the rate at which sapsucker parents fed their nestlings. We predicted that nestlings at sites further from willows would be fed less frequently due to increased travel distance for the parents.

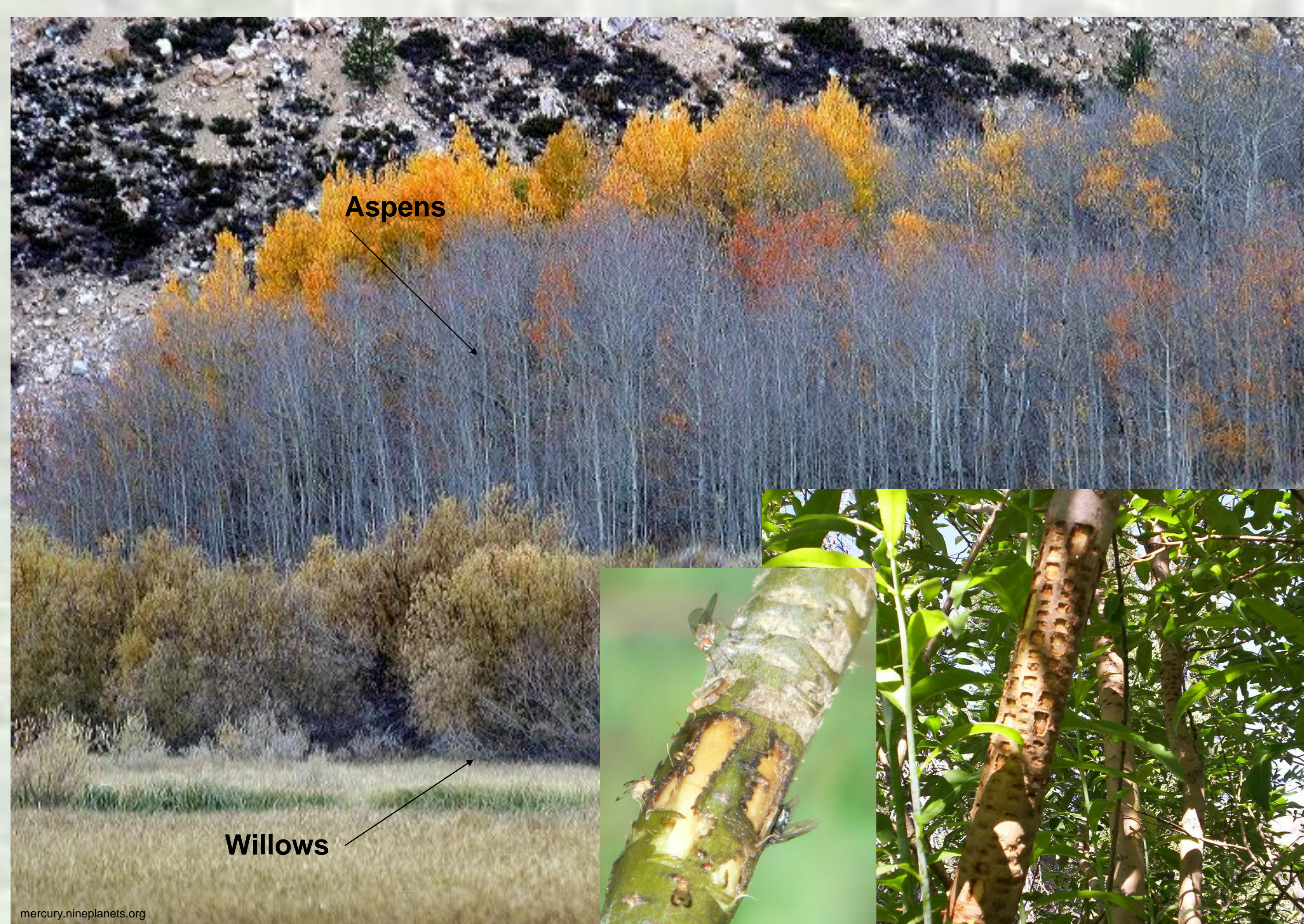


Figure 1. Aspen (*Populus tremuloides*) woodlands in close proximity to willows (*Salix* spp.); sap wells, and sap well visitors.

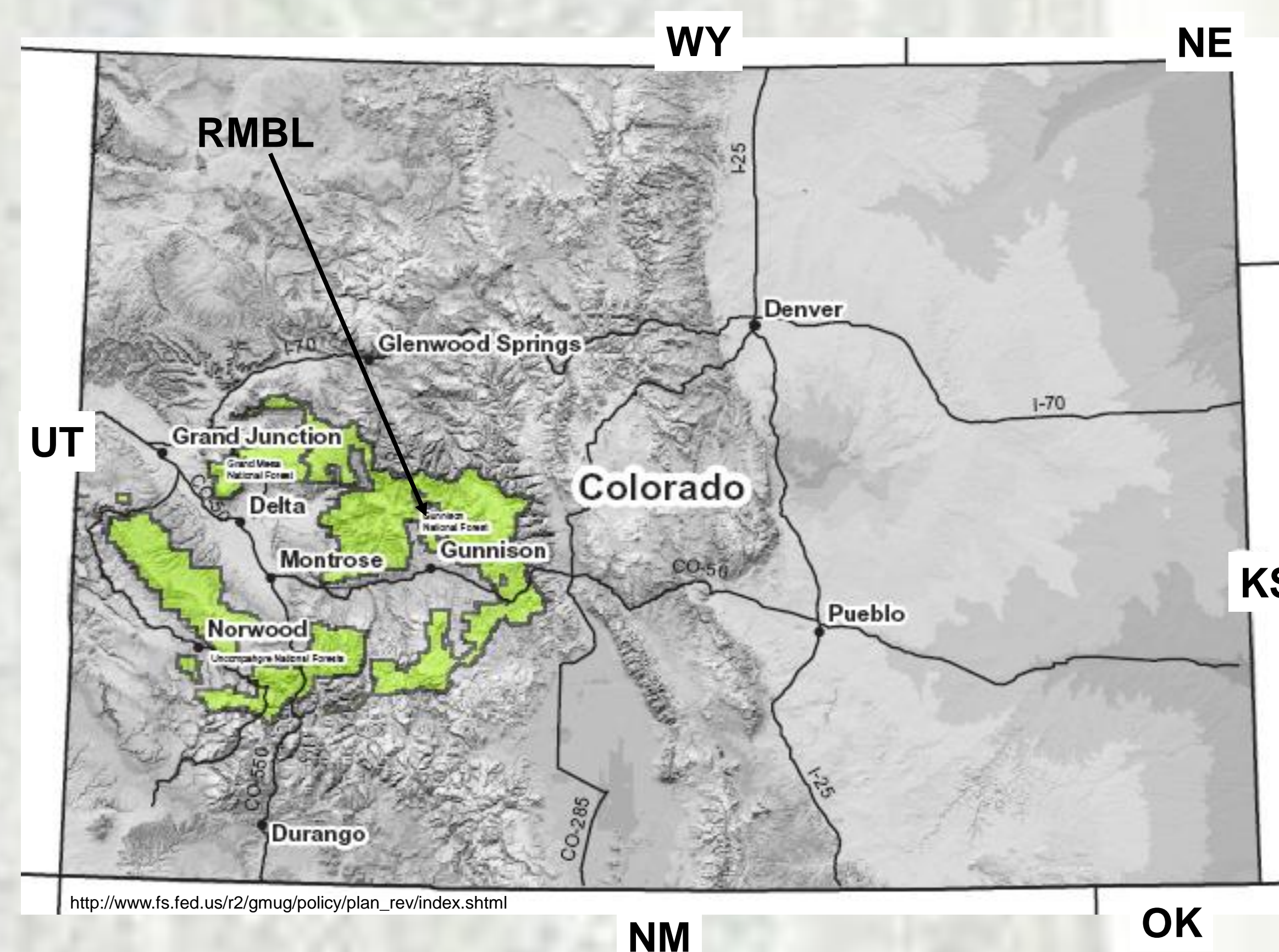


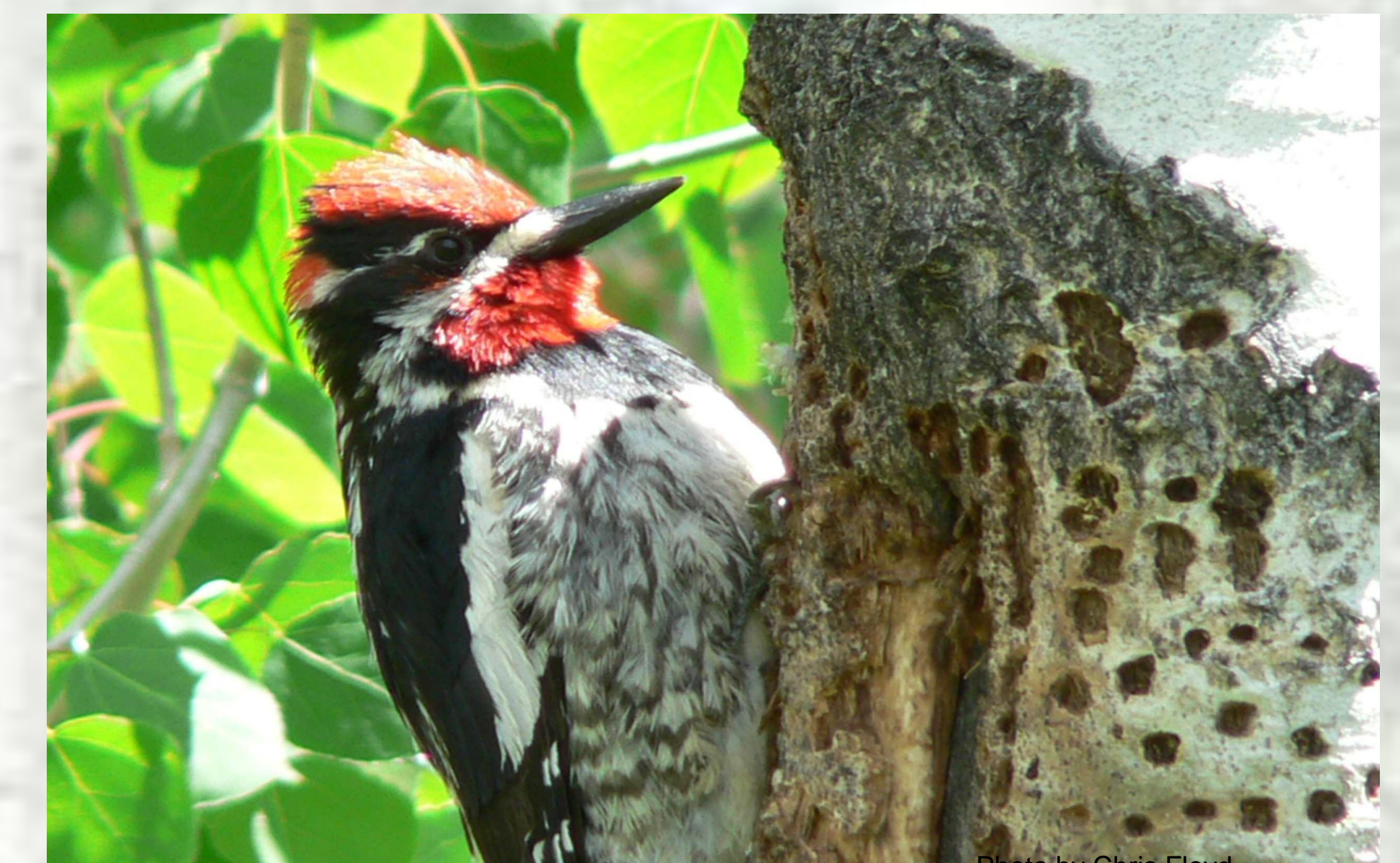
Figure 2. Location of Rocky Mountain Biological Laboratory (RMBL), Gunnison County, Colorado. All study sites (red-naped sapsucker nests) were within 5 km of RMBL. Elevations ranged 2700-3000m.

Methods

- We conducted our study in the aspen woodlands of the upper East River Valley (ERV), in the vicinity of the Rocky Mountain Biological Laboratory (RMBL) in Gothic, Colorado (Figure 2).
- We found sapsucker nests by traversing the slopes of the ERV and listening for sapsucker drumming and calls.
- Willow proximity was measured as distance from sapsucker cavity tree to nearest stand of mature willows. Distances to nearest water and mature conifers were also recorded.
- Nest observations began 0.5 h after sunrise, with 0.5 h between observations (different nest-sites). During 2005, nest sites ($n = 14$) were observed for two-hour periods. In 2006, in order to increase sample size, nest sites ($n = 28$) were observed for one-hour periods.
- Each nest site was observed at least four times (two early morning and two late morning) throughout the nesting season (June-July).
- Feeding rate at the nest was measured as the number of times the parents visited the nest to feed their nestlings per one-hr period.
- The relationship between feeding rate and willow proximity was tested using linear regression.

Results

- In 2005, the rate at which nestlings were fed decreased with distance to willow ($r^2 = 0.37$, $P = 0.02$; Fig 3). However, in 2006, there was no relationship ($r^2 = 0.09$, $P = 0.12$; Fig 3). There also was no significant relationship between feeding rate and distance to water or conifers in either year.



Red-naped Sapsucker
(*Sphyrapicus nuchalis*)

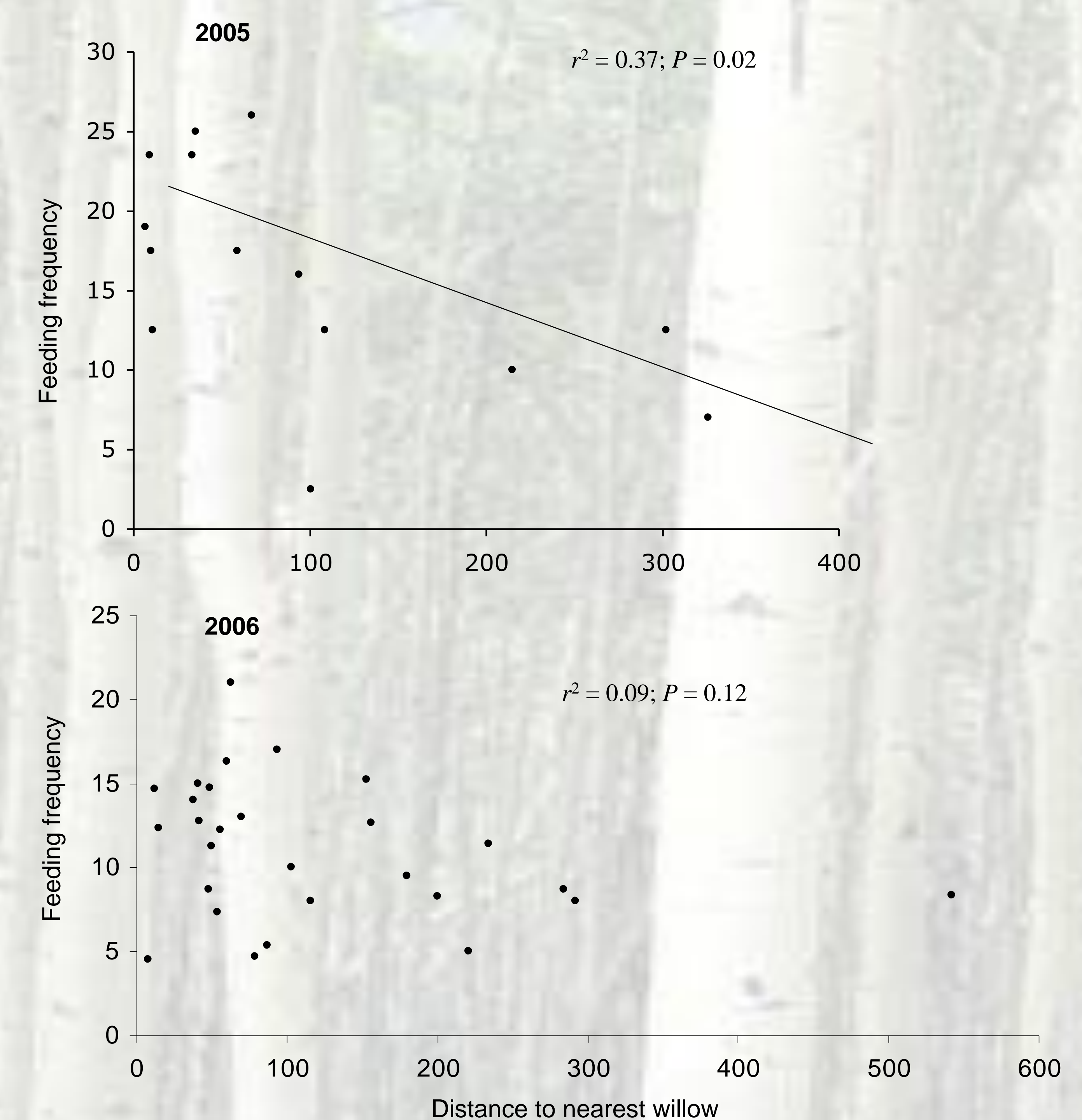


Figure 3. Relationship between willow (*Salix* spp.) proximity and nestling feeding frequency (average number of times per hr the parent sapsuckers fed their nestlings) for red-naped sapsucker (*S. nuchalis*) nests sampled in western Colorado during June-July, 2005 ($n = 14$ nests) and 2006 ($n = 28$ nests). Proximity to willows is measured as distance (m) between sapsucker nest and nearest willow.

Conclusions

We found no consistent relationship between willow proximity and nestling feeding success. Our results cast doubt on the importance of willow proximity to sapsucker nest site selection.

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