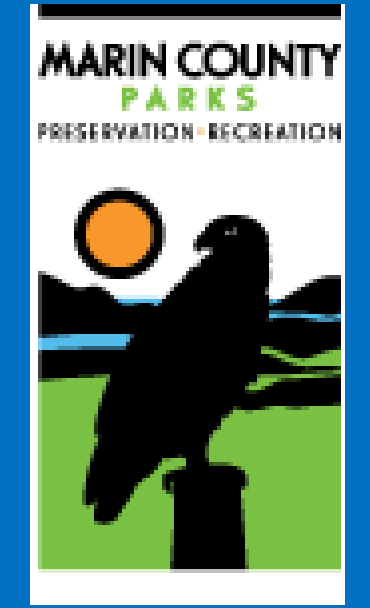




# Square Pupils

## Goats as alternative fuel and weed reduction workers



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### THE SITE

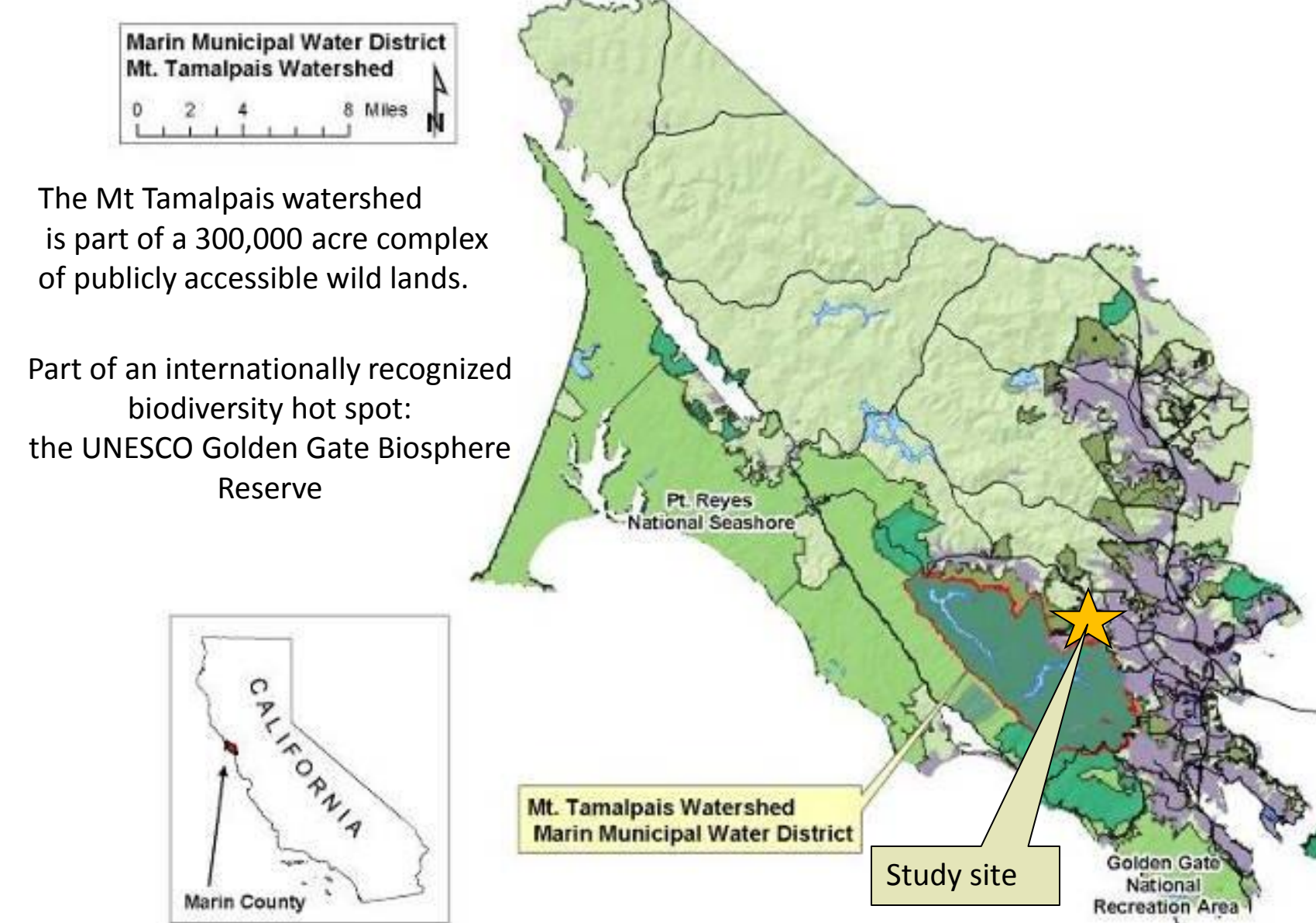
**Mt. Tamalpais** in Marin County is biodiversity hotspot, with over 1000 plants and hundreds of animals recorded from the area. Marin Municipal Water District stewards nearly 19,000 acres of watershed lands around the mountain, and manages for biodiversity and fire risk reduction as well as water quality concerns.

The study site straddles the border with the Bald Hill Open Space Preserve, managed by Marin County Parks. Both agencies work to manage weeds, maintain a network of fuel breaks, and increase native species diversity while allowing passive recreation.



More than 50% of Marin's flora is found in the watershed (only 12% of the area of Marin County)

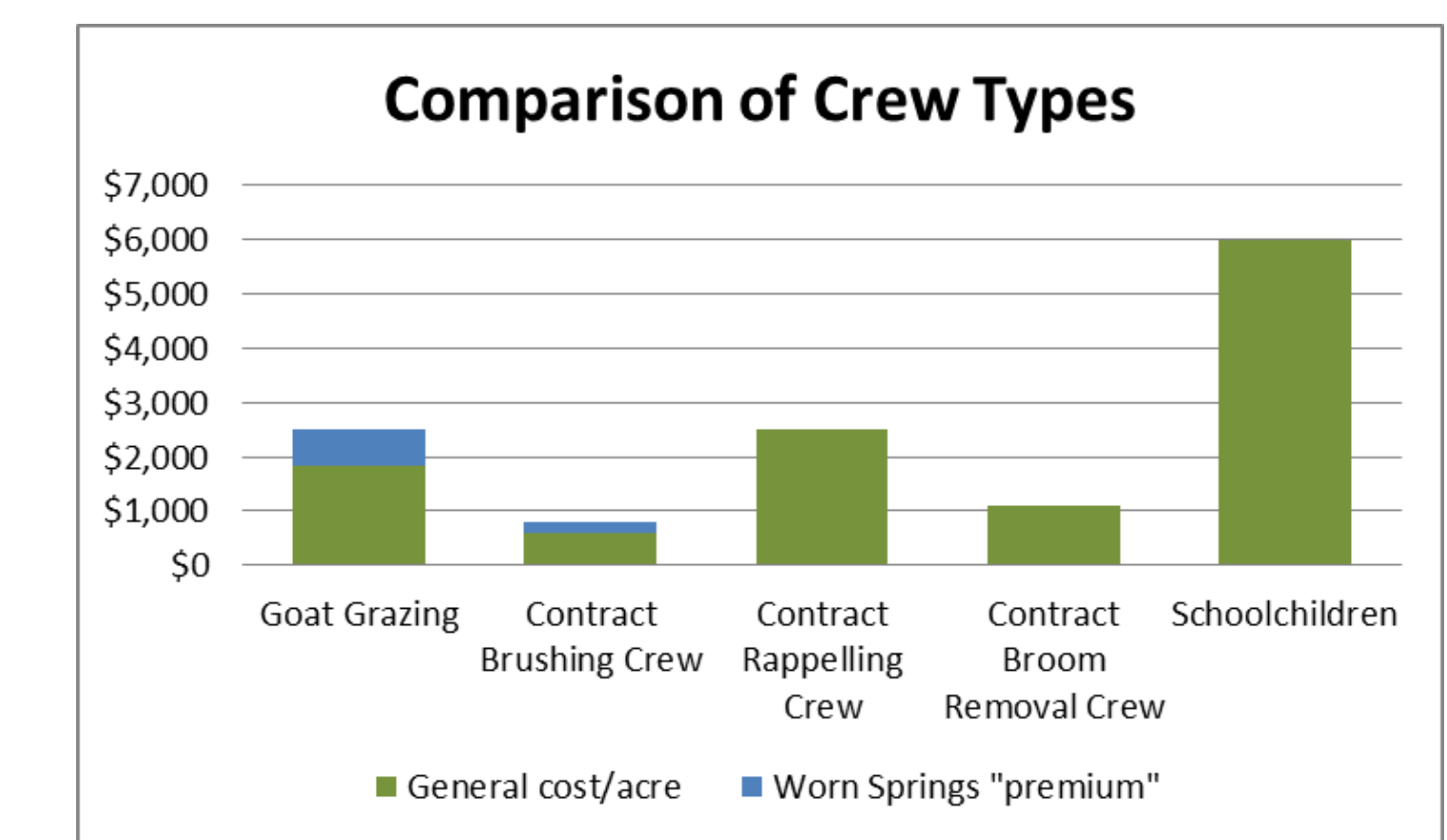
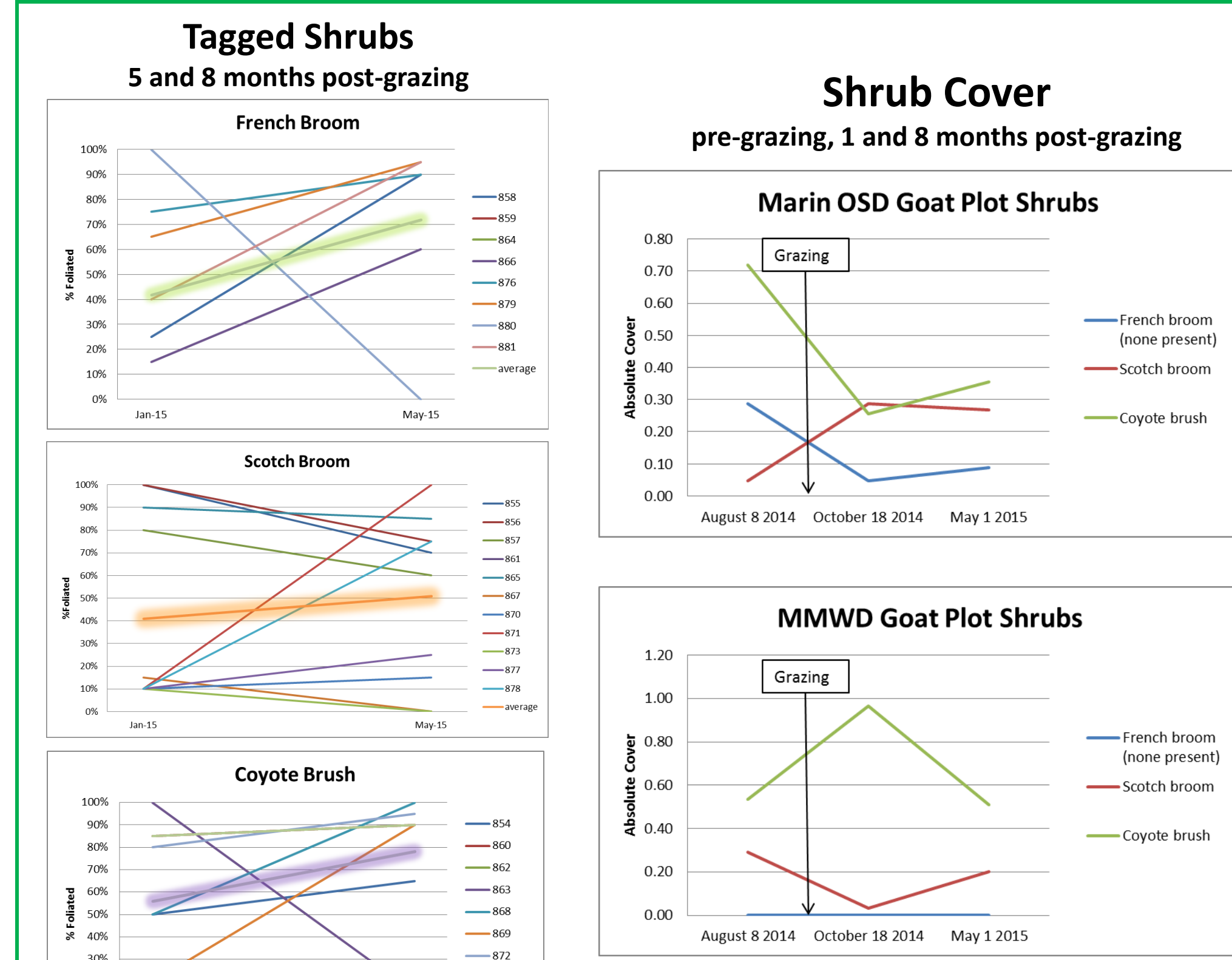
15% of California's flora is found on watershed lands (0.01% of the area of the state)



### THE GOALS

- Reduce fuel load of 10-hour fuels.
- Maximize efficiency in treatment time and cost.
- Maintain native species where possible.

### THE RESULTS



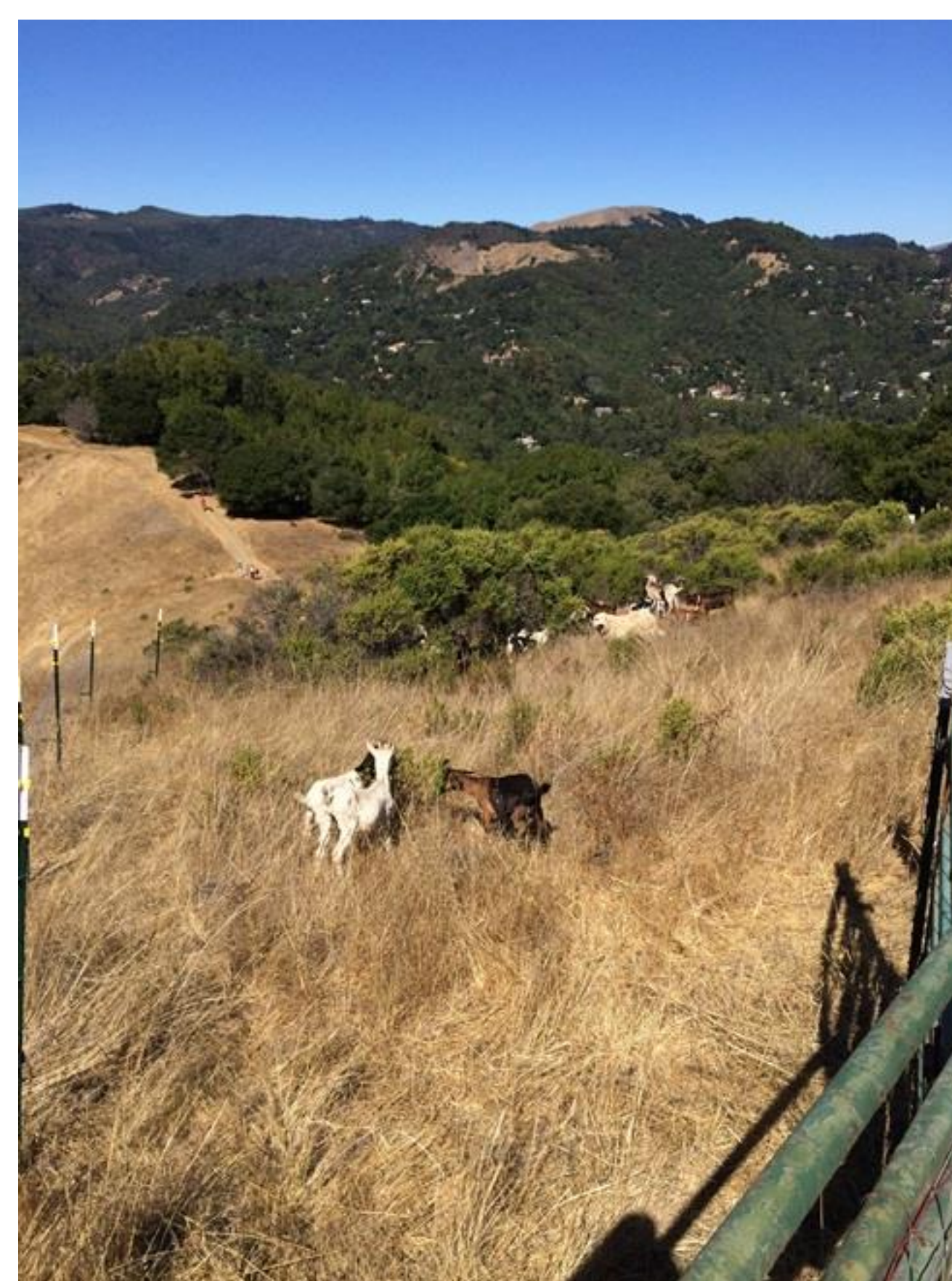
### THE METHODS

Point-intercept transects were photographed and read ...



pre-grazing, 1 and 5 months post-grazing, and 8 months post-grazing.

Two pens were constructed from metal posts and electrified wire; a trough was brought on-site and filled about twice a week. Goats grazed each pen for a month.



28 shrubs were tagged in January, and their height, % foliated, and alive/dead status were measured and estimated. In May, 23 of these were re-read.

### THE DISCUSSION

**Terrain and Vegetation**  
Goats are often used in areas that are steep and/or weedy. Much of the watershed and its fuel breaks are steep, but not so steep as to be inaccessible to humans with brushcutters. In areas that steep, we have used a rope crew on Spanish broom at a cost similar to goats, but results (broom removal) were permanent, not temporary. Non-target effects in the first trial consisted mainly of goats girdling Pacific madrone (*Arbutus menziesii*)—staff ended up wrapping the trunks of individual trees to protect them, which drove costs up.

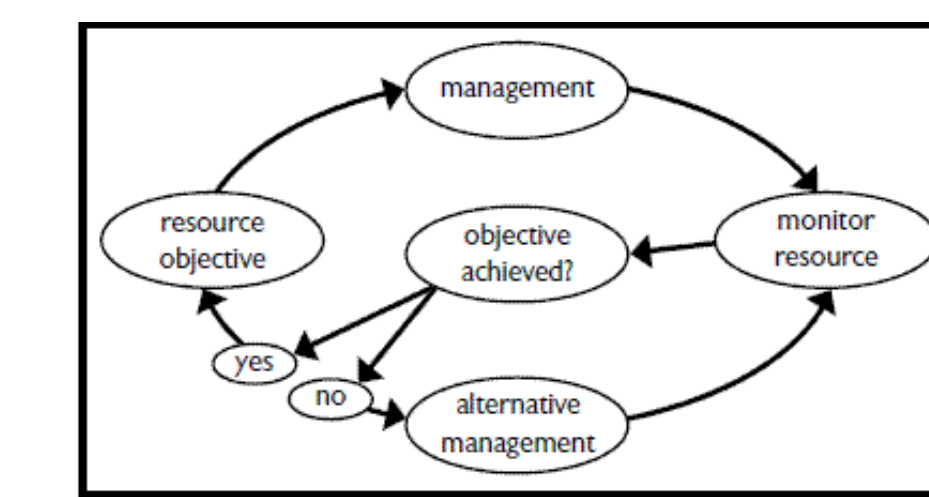


FIGURE 1.1. Diagram of a successful adaptive management cycle. Note that monitoring provides the critical link between objectives and adaptive (alternative) management.

From "Measuring and Monitoring Plant Populations" BLM Technical Reference available FREE ONLINE <http://www.blm.gov/nstc/library/pdf/MeasAndMon.pdf>

#### Supervision Costs

Ancillary costs—protecting native species, fencing areas, feeding guard animals—can be thought of as "supervision" costs for the goats. Supervision needs make seemingly low-cost crews such as animals and small children much more expensive than grown-ups with tools.



Danny the Dog needs kibble daily.