

More than 50% of Marin's flora THE GOALS is found in the watershed (only 12% THE SITE of the area of Marin County) 15% of California's flora is found on watershed lands (0.01% of the area of Mt. Tamalpais in Marin County is biodiversity hotspot, the state) with over 1000 plants and hundreds of animals **Tagged Shrubs** recorded from the area. Marin Municipal Water Marin Municipal Water District Mt. Tamalpais Watershed 5 and 8 months post-grazing District stewards nearly 19,000 acres of watershed 0 2 4 8 Miles N **French Broon** lands around the mountain, and manages for The Mt Tamalpais watershed s part of a 300,000 acre complex biodiversity and fire risk reduction as well as water of publicly accessible wild lands. Grazing 0.70 quality concerns. 0.60 Part of an internationally recognized biodiversity hot spot: **č** 0.50 the UNESCO Golden Gate Biosphere **2** 0.40 0.30 Reserve May-15 Jan-15 Open Space Preserve, managed by Marin County 0.20 Scotch Broom 0.10 Parks. Both agencies work to manage weeds, maintain 0.00 a network of fuel breaks, and increase native species Mt. Tamalpais Watershed Marin Municipal Water District Grazing 1.00 Study site Jan-15 Marin Count **Coyote Brush** 0.60 0.20 0.00 **%** 40% THE METHODS Two pens were constructed from -----average metal posts and electrified wire; a Jan-15 May-15 Point-intercept transects were photographed and read ... trough was brought on-site and filled about twice a week. Goats grazed 10-hour fuel (shrub) reduction each pen for a month. 1-2-year reduction High Brushing Grazing 1-2-year reduction Medium Medium Mature broom Professional crew reduction; not pulling feasible for coyote brush Volunteer/School-Mature broom Low 1 and 5 months post-grazing, and 8 months post-grazing. pre-grazing, reduction; not children pulling feasible for coyote brush 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. 28 shrubs were tagged in January, In areas that steep, we have used a rope crew on Spanish and their height, % foliated, and broom at a cost similar to goats, but results (broom removal) alive/dead status were measured were permanent, not temporary.

The study site straddles the border with the Bald Hill diversity while allowing passive recreation.



ACKNOWLEDGEMENTS: Many thanks to Eric Carlsen from Marin County Parks, MMWD Watershed Aides Grifin Anderson, Kevin Dick, Ben Schleifer, and John Doyle, and interns Jes Lahti, and Tessa Wardle.

Square Pupils Goats as alternative fuel and weed reduction workers

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



•Schoolchildren costs based on staff supervision costs at measured production rate of 0.1 acre/day; costs are similar for other volunteers



Low

Low

Medium

Medium

Non-target effects in the first trial consisted mainly of goats wrapping the trunks of individual trees to protect them, which drove costs up.



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 grownups with tools

FIGURE 1.1. Diagram of a successful adaptive management cycle. objectives and adaptive (alternative) management.

From "Measuring and Monitoring Plant Populations" BLM Technical Reference available FREE ONLINE girdling Pacific madrone (Arbutus menziesii)—staff ended up http://www.blm.gov/nstc/library/pdf/MeasAndMon.pdf



Supervision Costs

the Do need