

The Use of Goats for 'Natural' Vegetation Management

A close-up photograph of a goat with brown and white fur and long, curved horns, eating green leaves from a plant in a forest. The goat's mouth is open, showing its teeth as it chews. The background is a dense, out-of-focus green forest.

Abstract

Human settlement changes site ecology, affecting plants directly and indirectly, intentionally and unintentionally. Vegetation management involves the intentional selection, growth, and reduction of certain types of plants on specific sites for human safety, infrastructure and building security, resource extraction, aesthetic value, ecological health, or livestock or wildlife habitat.

Conventionally, two methods are used: physical and chemical. Physical management involves gas-powered motorized equipment. Chemical management involves sprays which may cause defoliation or prevent seed germination. The use of goats as an alternative or complimentary management method is rapidly growing. Goats have a much smaller carbon footprint, numerous environmental benefits and technical advantages. They are charismatic and welcoming.

The research identifies advantages and disadvantages of capric vegetation management. It also identifies two settings of optimal value: the reduction of fuel loads in the wildland urban interface in the Western United States and the reduction of invasive plants in the East U.S. for faunal diversity. Both settings share steep topography.



Goats are widely used, both by region and entity



- Department of Defense
- National Park Service
- Educational Institutions
- Municipal Governments
- Transit Agencies
- Aviation Departments
- Google
- Yahoo
- National Fire Protection Association



Conventional Vegetation Management

Mechanical Methods: human operation of mower, wheeled whacker, skid steer, wood chipper

Advantages: speed, scale, predictability, year-round efficacy, moderate targeting

Disadvantages: high capital, high collateral soil damage, high carbon footprint, noise, limited topographical range

Chemical Methods: spraying defoliant, herbicide

Advantages: speed, effectiveness

Disadvantages: broad toxicity, risk of run-off

Chemical Method: prescribed burning

Advantages: low-cost, ecosystem benefit

Disadvantages: perceived and real risk of loss of control/property damage, air pollution, climate and weather dependent



Capric Vegetation Management/Prescribed Browsing

Herbivore Method: goats released on site typically above 1 acre with electric fence water and mineral supplements. May require a guard dog or herder.

Advantages: topographical and geographical range
positive environmental impact
“opportunistic generalist” browsing of goats
on-site processing
low cost
quiet and without air quality impact
educational possibility
meat production

Disadvantages: slow-speed
susceptibility to parasitic infection, thereby limiting range
inability to differentiate native and non-native species
seasonality
herd knowledge and management



Advantage: Topographical and Geographical Range

Goats handle steep and uneven ground very easily. This ability makes them useful in sites that otherwise present a risk of injury to equipment or workers. Ron Search, owner of Wells Farm, describes the competitive advantage of his business, “our main focus is in areas that you can’t get equipment to because it’s too steep or covered so you can’t see ditches and pitfalls.”

The ability of goats to climb means that they have great accessibility to vegetation even in roadless areas.



Source: Dave Behmer, Co-Founder,
Goats of Progress, Personal
Communication



Advantage: Positive Environmental Impact, Browsing

Goats are particularly useful for vegetation management when one of the goals is the reduction of the competitive advantage of invasive plants, especially vines or shrubs. Goats browse, meaning they eat leaves and soft shoots of woody plants and shrubs. They will also eat bark when more palatable forage is unavailable. Goats stand on their hind legs to pull down vines and branches. One study found that the average height of defoliation was 6.7 feet. Sheep and cows cannot reach that height and prefer grazing the herbaceous weeds and grasses of open rangeland. With dexterous tongues and lips and a strong mouth, goats are the most effective family of livestock for dense and varied vegetation that we might call in lay terms “overgrown.”



Source: Kathy Voth, Livestock for Landscapes, LLC,
www.firescience.gov/projects/briefs/99-1-3-02_FSBrief34.pdf



Advantage: Opportunistic Generalists

The caricature of goats as omnivorous belies preferences based on breed, physiology, experience, age, sex, morphology, social hierarchy, and time of season. Yet there is also evidence for goats' opportunism. One study found that goats adapted to a diet anywhere between 80% browse fodder and 80% graze fodder.

One reason for their flexibility seems to be physiological. Many plants have a variety of protective chemical compounds like tannins, terpenes, and saponins which are toxic or anti-nutritive (poison ivy and poison oak are the most common to us). For livestock, the compounds may present themselves as anti-digestive and unpalatable. Goats have a large liver for their size, relative to other ruminants, so they may be less susceptible to toxicity. One study of ruminants in Mexico found a high quantity of "tannin binding salivary proteins."



Advantage: On-Site Processing, Varia

On-Site Processing: Goats seem to display a preference for seeding stems. Consumption of seeds in immature stages means that digestion is more likely to result in making seeds unviable, thereby decreasing the competitive advantage of heavily-seeding invasives. Digestion also reduces over-all biomass. There is no removal process of material as compared with mechanical management.

Most proponents of prescribed browsing describe the nutrient-rich goat faeces as contributing to soil health and never in high enough concentrations to present a problem. Trampling may help work the faeces into soil.

Cost: One of the main reasons for the use of prescribed browsing by governments has been the low cost compared to other methods of vegetation management. At the same time, many herders have dual incomes from their grazing and meat production. Goat meat is in high demand because of its health properties and use in Caribbean and Middle Eastern cuisines.

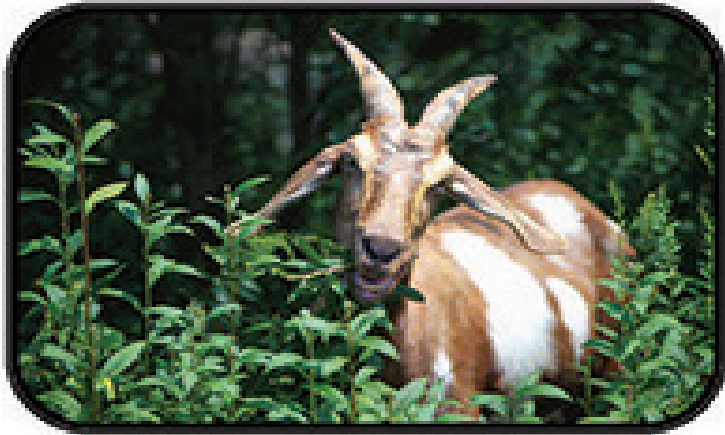
Noise and Air Pollution: The bleat of a goat is very quiet compared to the hum of a lawn mower or roar and whirr of a skid steer. Nor do goats produce soot or particulate matter.



Advantage: Environmental Education

City of Wilsonville's 6th Annual

Goat Day



Thursday, August 23, 2012
5:30-7:30 PM

Memorial Park Forest Shelter
8100 SW Memorial Drive
Wilsonville, OR

MEET THE GOATS

Learn about how goats are used to control invasive plant species, and the City's efforts to restore native habitat.

For more information contact Kerry Rappold (503) 570-1570

“They are, quite literally, a warm and fuzzy way to talk about invasive plants and our approach in dealing with them.”

-Kirsten Werner, Spokeswoman,
Natural Lands Trust

“I think the learning experience for them [children], what they’re getting away [sic] is hopefully not only can animals do something beside look cute and fuzzy, but that they can also serve a purpose in our society by helping keeping the environment clean.”

-Mary Sessom, Mayor of Lemon Grove, CA

East Coast Example

High Point, NC

Population - 104,371 Area - 95.1 Square Miles

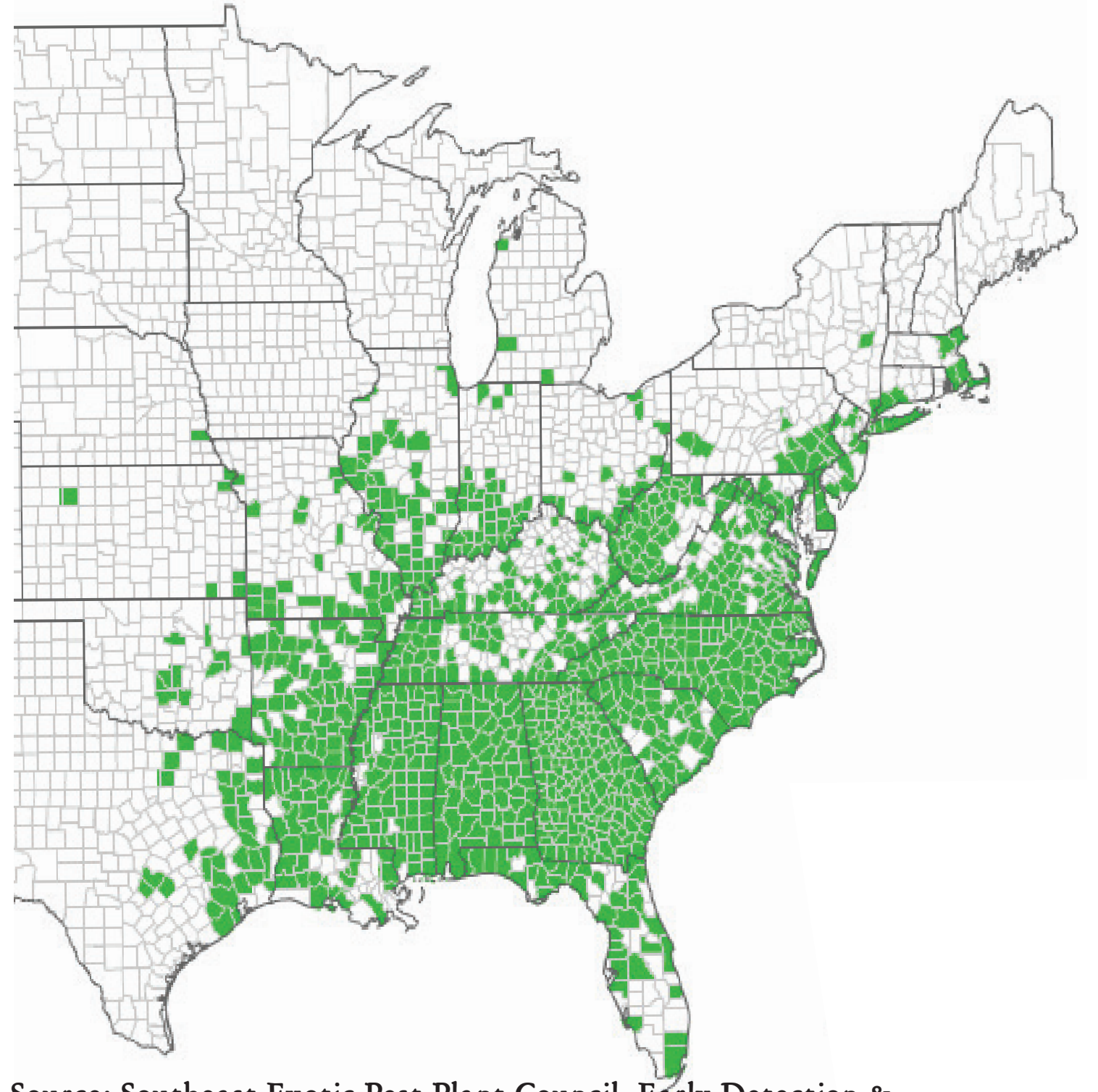
Climate - Humid Subtropical

Site - 4 acres of Subdivision Highway Interface



Source: Bing Maps, <http://www.bing.com/maps/#>

Kudzu Presence by County, East. U.S.



Source: Southeast Exotic Pest Plant Council, Early Detection & Distribution Mapping System
<http://www.eddmaps.org/distribution/uscounty.cfm?sub=2425>

East Coast Example



GOATS CLEANING UP HIGH POINT

Source: Brandon Jones, Fox 8 WGPH,
<http://myfox8.com/2012/10/26/goats-deployed-to-clean-up-brush-in-high-point/>



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Herd Size - 50

Compostion - does and wethers

Cost - \$1,200/acre vs. \$30,000/acre*

Client - Southwest Renewal Foundation

Vendor - Wells Farm Goats

Rate - 8-10 goats/acre/month.

Narrative: Goats will have made two visits, Fall 2012 and Spring 2013. Reduction of kudzu leaves and stems in preparation for localized herbicide application. Area is part of riparian corridor leading to local reservoir.

West Coast Example:

Laguna Beach, CA

Population - 22,723 - 19 Square Miles

Climate - Mediterranean

Site - 640 acres wildland urban interface

Herd Size - 330, variable from 75 to 600.

Cost - \$125,000

Client - City of Laguna Beach, Goat

Vegetation Management Program

Vendor - Indacochea Sheep Ranch

Rate - 1 goat/1-2 acres/month.



West Coast Example:

Narrative: The Laguna Beach Fire Department started the program in 1992. It was strengthened in 1995 by a FEMA Hazard Mitigation Grant following a destructive fire. There are 11 “fuel modification zones” for grazing. In 2010, the city hired 300 additional goats to manage extra vegetation from a particularly wet winter. Agotilio Moreno and his brother Barney are the goat herders. The goats provide a sense of protection and of effective government.



Disadvantages/Constraints: Worms

Goats are susceptible to infection by parasitic nematodes called helminths. The effects are diminished nutrient absorption, morbidity and mortality. Goats require frequent inspection and treatment. Yet, overtreatment can create anthelmintic resistance. Herd managers must distinguish between simple presence of worms and a health and production problem. Extended confinement increases the possibility of inter-animal infection.

Hot, humid environments are more conducive to worm growth and reproduction. Low brush and grass put goats in the path of worms.

However, there is evidence that tannins and similar polyphenolic compounds found in plants have anthelmintic properties at stages throughout the lifecycle of the worm.



Disadvantages/Constraints: Varia

speed: Depending on the source of the information and the type and density of vegetation, 10 goats clear an acre in three days to one month.

seasonality: The effectiveness of goats is limited by the time of the season. In the fall and winter when plants are dormant, vegetative biomass will be relatively unpalatable. While goats are not adverse to cold temperatures per se, they are prone to ear infections from a combination of low temperatures and strong wind. Goats mate in the Fall and birth in the Spring, meaning foraging happens in the Spring and Summer.

indiscrimination: Goats cannot distinguish between desirable and undesirable plants as humans conceive them.. Hypothetically, kids may be trained, however any training is sure to be less successful than careful human intervention.

ecological knowledge: Because prescribed browsing is broadly less destructive than other methods, herders or buyers of browsing services need to know during what conditions target species are most vulnerable to defoliation.



Lessons and Recommendations

The use of goats for vegetation management is the preferable method on sites along the suburban rural gradient based on cost and environmental benefit.

Their success on vacant urban lots seems to depend upon several as of yet little-tested factors:
-the costs on properties smaller than one acre and/or private contracts. Goats might have to be brought to and removed from a site on the same day, in contrast to conventional strategy.

-full adaptability to urban plants

-interactions with urban domesticated, semi-wild, and feral wildlife. Disease transfer is a large concern.

-biological accumulation of heavy metals affecting goat health and saleability of meat.

The educational and amusement co-benefits of goats is an element which could be more greatly capitalized upon in urban areas.



Endnotes

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