

CALIFORNIA COASTAL COMMISSION

South Coast Area Office
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Long Beach, CA 90802-4302
(562) 590-5071

**Th7c****ADDENDUM**

April 4, 2008

TO: Coastal Commissioners and Interested Parties

FROM: South Coast District Staff

SUBJECT: ADDENDUM TO **ITEM Th7c**, LOCAL COASTAL PROGRAM AMENDMENT NO. 1-07C, COASTAL COMMISSION MEETING OF **April 10, 2008**.

Addition of Exhibits to Staff Report

Commission staff recommends addition of the attached exhibit numbers 32a and 32b.

Exhibit 32a shows the urban-wildland boundary surrounding the City of Laguna Beach. The exhibit was originally prepared by the County of Orange to show the general boundary of fuel breaks desired and/or implemented by the City to protect existing development and the relationship to surrounding public parks and open spaces, as well as showing those areas that are in the NCCP Reserve (the NCCP hasn't been certified by the Commission). The fuel breaks noted are not part of the City's LCP amendment request. However, the graphic shows the extensive fuel breaks the City believes are necessary just to protect existing development. Further divisions of land should not be allowed if development on the resultant lots would require fuel modification or expanded fuel breaks that have impacts on ESHA or on public lands.

Exhibit 32b shows examples of privately owned lots at the urban-wildland interface where fuel modification would have additional adverse impacts upon known ESHA and public open spaces if lots were allowed to be divided.



- County Parks
- NCCP Reserve
- Proposed Fuel Breaks As Identified on City of Laguna Beach Fuel Modification Map 8/22/05
- Maximum Limit of Permit No. 2005-01892 Dated 12/29/05 (Fuel Break Varies From 100 to 250 Feet Wide)
- County Open Space Easement (Open Space Easement Allows Fuel Modification Within 100 Feet of Residential Development)

Fuel Breaks Depicted on This Exhibit are Illustrative Only and Are Not Part of the Proposed LCP Amendment

EXHIBIT#32a

Page 1

Application Number:

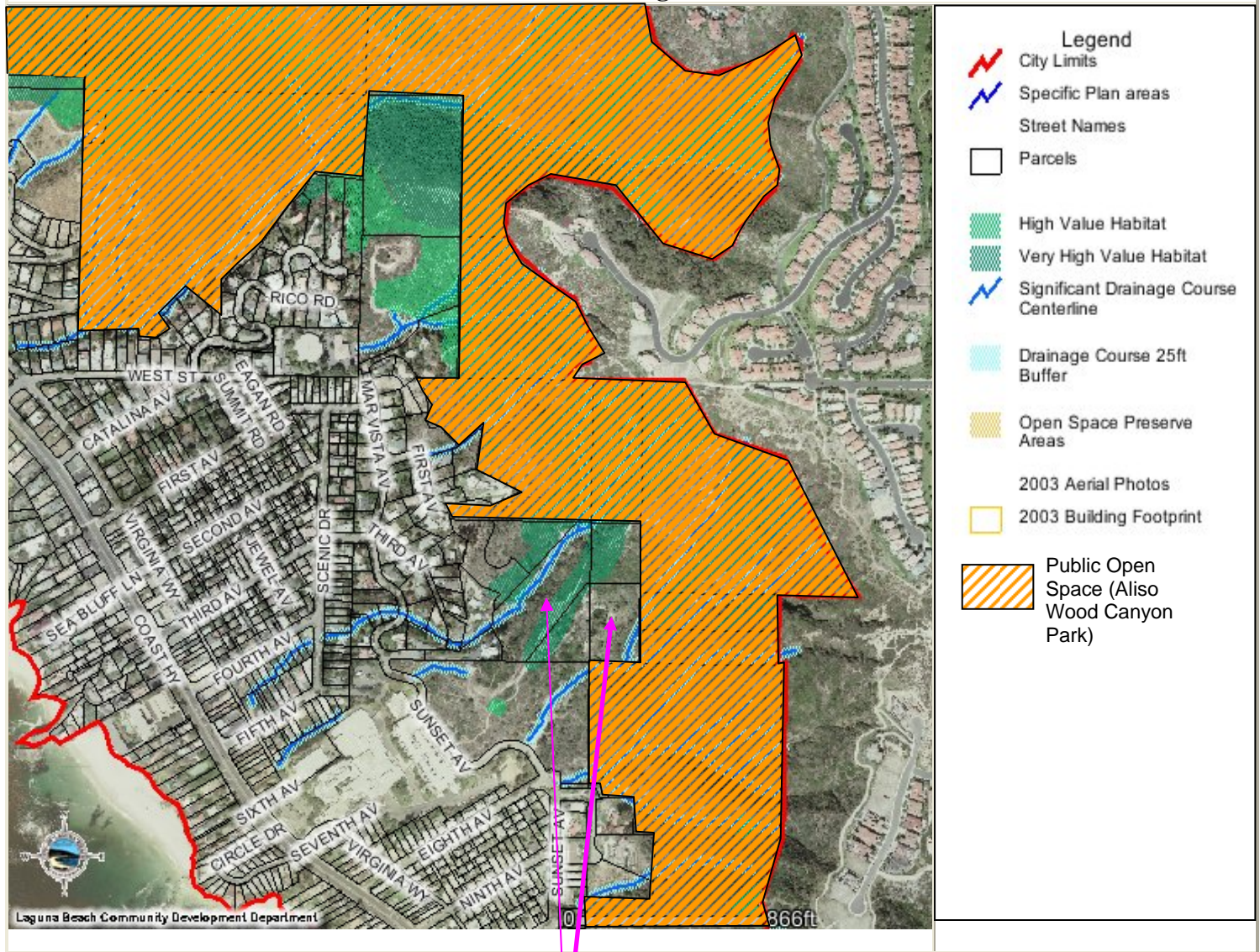
LGB-MAJ-1-07C



California Coastal
Commission

Exhibit Depicting Urban/Wildland Interface in Laguna Beach

South Laguna



Examples of Privately Owned Lots at the Urban-Wildland Interface Where Fuel Modification Would Have Additional Adverse Impacts Upon Known ESHA and Public Open Spaces if Lots Were Allowed to be Divided

EXHIBIT#32b

Page 1 of 1

Application Number:

LGB-MAJ-1-07C



California Coastal
Commission



P.O. BOX 9668
SOUTH LAGUNA, CA 92652-7639

RECEIVED
South Coast Region

APR 2 2008

CALIFORNIA
COASTAL COMMISSION

Th 7C

April 2, 2008

Dear Honorable Commissioners:

Over the years, members of our organization and our board of directors have observed gross mismanagement of fuel modification practices in Laguna Beach. The South Laguna Civic Association supports the staff recommended changes to the LCP amendment.

The attached papers by university biologists, including a preliminary study sponsored by N.R.O.C. entitled "The Preliminary Effects of Goat Grazing in Laguna Beach," demonstrate lack of balance and sensitivity toward hillside natural resources.

The proposed expansion of fuel modification zones to up to 300 feet is not grounded in analysis. The state and county suggest 100 feet of thinning. Furthermore, the city does not actually treat the zones as zones, but allows goat grazing to occur uninhibited throughout and beyond. This creates fuel brakes which result in the conversion of coastal sage scrub to invasive grasses.

This amendment is not consistent with other portions of our LCP, such as Open Space Conservation Element policy 8N which says: Prohibit intrusion of fuel mod programs into environmentally sensitive areas, including chaparral and coastal sage scrub.

A further comment on the LCP amendment process: Over the last fifteen years, the City has passed numerous ordinances which were not put through the CCC certification process. The City is attempting to certify now, but is doing so in a piecemeal fashion. Ordinances have been passed subsequent to the ones you are reviewing today which bear on these same topics and policies.

Thank you very much for your consideration.

Sincerely,

Lisa Marks
Director, S.L.C.A.

Th 7c

19 June 2007

To whom it may concern:

I am writing this to register my disapproval of the goat grazing program in Laguna Beach.

I am an ecology professor and an author. One of my books, *Natural History of the Islands of California* (UC Press 1999), documents in detail the devastation wrought by goats on native vegetation. In 1994 when the concept of fuel reduction by goats was first raised I spoke out against the proposal citing a number of reasons why it was ecologically irresponsible. I was even interviewed for a documentary on the subject that was aired on public television.

At this time all my fears have been realized. I refer the city council to the report by C. J. Fotheringham of 24 January 2006, entitled: *Preliminary Observations of City of Laguna Beach Goat-mediated Fuel Modification Program and the Impacts to Aliso and Wood Canyons Wilderness Park and the NCCP Reserve*. Ms. Fotheringham eloquently describes what is wrong with the program. I need not reiterate those points.

From the beginning I thought it was ridiculous to pay someone to feed his goats, particularly considering the negative aspects of the program. I understand now that a major portion of the cost is labor, and it seems to me that, for approximately the same price, the City of Laguna Beach could establish a fuel break around habitation by using hand labor. This procedure has been used in other locations throughout the state in accordance with recommendations made by various "Fire Safe Councils." Thinning native vegetation without removing it all and replacing it with flammable weeds would be the goal of the procedure.

All a person needs to do to examine an example of unacceptable vegetation replacement is to examine the slope directly behind the City Hall.

Sincerely,

Allan A. Schoenherr, PhD
414 Bluebird Canyon Drive
Laguna Beach, CA 92651

th 7c

June 19, 2007

"A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise."

Aldo Leopold, *A Sand County Almanac*

City of Laguna Beach Council Members:

Thank you for providing the public with an opportunity for comment upon the use of goats as a fuel modification zone "tool." From its outset, this controversial concept has been discussed in many forums, and C.J. Fotheringham conducted an excellent and thorough review in 2006. The City of Laguna Beach has employed goats in fuel modification for over a decade, and there have been unfortunate consequences. One of the most profound is the documented loss of coastal sage scrub through habitat conversion (to non-natives) in the fuel modification zone and "takes" beyond that zone into the NROC Reserve - and the destruction of California gnatcatcher habitat. Frankly, had this happened at the hands of local developers such as The Irvine Company, natural heritage advocate groups such as the Laguna Greenbelt and others - likely including the City - would have sued the developer and demanded fines and mitigation for the loss. It is probable that the City violated both state and Federal law in these habitat takes, particularly when they extended beyond designated fuel modification zone boundaries. Fuel modification zones have been viewed as habitat sacrifice areas, and the irony is that the public pays a substantive price for feeding the commercial animals that do the damage. There are alternatives to the use of goats, and it is highly unlikely that habitat conversion, nitrogen pollution loads on the landscape, or the take of gnatcatcher habitat would have occurred had any of these been used.

Goat critics cite many reasons for recommending the use of other ways to thin sage scrub, when fire marshals require it, and have a long list of issues with this practice, including (among many others):

- Goats eliminate CSS habitat and convert it to introduced species
- Goats blanket the habitat with feces and their attendant pollution
- Goats increase erosion potential
- Goats can conduct disease to wildlife and humans
- Goats can "take" the habitat of Federally threatened species

C. J. Fotheringham (2006) lists the following criticisms of Laguna's use of goats:

- The City of Laguna Beach has been conducting fuel management by goat grazing for 12 years. Five of the proposed (in 2006) fuel modification zones (1,2,5,6,7) are within the boundaries of the NCCP reserve.
- At establishment of the NCCP reserve, a buffer of less than 125 feet was established between the reserve boundary and adjacent legacy developments, probably to allow for fuel modification. This boundary is

sufficient to meet the outer two fuel modification zones of CLB fuel modification code.

- The use of reserve property for further fuel modification appears to violate State of California Government Code Section 51184(a)(b).
- Goat grazing has been allowed to type-convert extensive areas, including substantial coastal sage scrub within the reserve and outside all of the CLB proposed fuel modification ones that abut the reserve.
- Type-conversion appears to have led to a loss of designated critical habitat for Coastal California Gnatcatcher. Because goats were grazed year round, there is a possibility of unauthorized take in the form of damaged or destroyed nests.
- Goats pose a disease risk to humans and wildlife.
- The potential for both surface erosion and gullyng are increased as a result of type-conversion and pose a risk to both private residences above the reserve and resources in the reserve.

The City needs to reconsider its use of goats – and, candidly, should restore the equivalent of the habitat the City's goats have converted (particularly within the NROC). Standard CSS mitigation ratios would suggest doing this at a ratio of at least 2:1. Even if more costly, less environmentally damaging methods of fuel modification should be used. I have lived in Laguna for over three decades and am proud of our greenbelt and the City's environmental ethos. We need to live up to our own cultural and heritage commitments – and find means that are ethically better, and that do not violate the very laws and habitats we cherish the most.

Respectfully,

Peter A. Bowler
414 Bluebird Canyon
Laguna Beach, California
92651

Professional address:
Dr. Peter A. Bowler
Department of Ecology and Evolutionary Biology and
Director, UCI Arboretum
University of California, Irvine
Irvine, California 92697-2525

Preliminary Observations of City of
Laguna Beach Goat-mediated Fuel
Modification Program and the Impacts to
Aliso and Wood Canyons Wilderness Park
and the NCCP Reserve

By:

CJ Fotheringham
seajay@ucla.edu
24 January, 2006

Executive Summary

- ! The City of Laguna Beach (CLB) has been conducting fuel management by goat grazing for 12 years. Five of the proposed fuel modification zones (1,2,5,6,7) are within the boundary of the NCCP reserve (Figure 1).
- ! At establishment of the NCCP reserve, a buffer of ≥ 125 feet was established between the reserve boundary and adjacent legacy developments, probably to allow for fuel modification (see figure 5 for example). This boundary is sufficient to meet the outer 2 fuel modification zones of CLB fuel modification code.
- ! Fuel management (goat grazing) has type-converted hundreds of feet either side of Aswut trail/fire access road which is wholly within the reserve (Figure 6). Code requires 10' on each side.
- ! The use of reserve property for further fuel modification appears to violate State of California Government Code Section 51184(a)(b).
- ! Goat grazing has been allowed to type-converted extensive areas, including substantial coastal sage scrub within the reserve and outside all of the CLB proposed fuel modification. zones that abut the reserve.
- ! Type-conversion appears to have led to a loss of designated critical habitat for Coastal California Gnatcatcher. Because goats were grazed year round, there is a possibility of unauthorized take in the form of damaged or destroyed nests.
- ! Goats pose a disease risk to humans and wildlife.
- ! The potential for both surface erosion and gullyng are increased as result of type-conversion and pose a risk to both private residences above the reserve and resources in the reserve.

Background

Fuel modification at the wildland/urban interface (WUI)

California's mediterranean climate of winter rains and summer drought leads to frequent recurring wildfires. Southern California's increasingly urbanized landscape with extensive juxtaposition of communities with wildland areas creates a challenge to fire and land management entities to minimize losses of human life and property while maintaining resources such as wildlife habitat, watershed integrity and erosion control.

The past decade has seen a shift in fire management practices from trying to control fires by fuel manipulations across the landscape, such as mosaic burning of wildlands, to focusing fuel manipulations efforts at the wildland/urban interface (WUI). The justification for this shift in policies is the realization that the largest and most destructive fires are predictively wind driven and primarily occur during Santa Ana events. Under these conditions fire brands can be blown two miles ahead of the fire front and fuel-breaks distant from urban communities offer no protection. At the WUI focus is now on creation of defensible space around communities in conjunction with improving fire resistance of the urban environment and structures by improved zoning measures in order to decrease losses from wildfires.

While new construction requires fuel management areas to be within the footprint of the development, there is a legacy of older developments that are immediately adjacent to wildland areas without sufficient private land to construct fuel modification zones to comply with newly enacted codes. This has led to a number of public and private entities through public pressure to act the part of 'good

Preliminary Observations of Goat Impacts

neighbors' and allow these legacy developments to use bordering areas as fuel modification zones. As these areas are frequently reserves, parks or other wildeness areas, this is apparently a violation of State of California Government Code Section 51184(a)(b), which states

51184. (a) Section 51182¹ shall not apply to any land or water area acquired or managed for one or more of the following purposes or uses:

- (1) Habitat for endangered or threatened species, or any species that is a candidate for listing as an endangered or threatened species by the state or federal government.
 - (2) Lands kept in a predominantly natural state as habitat for wildlife, plant, or animal communities.
 - (3) Open space lands that are environmentally sensitive parklands.
 - (4) Other lands having scenic values, as declared by the local agency, or by state or federal law.
- (b) This exemption applies whether the land or water area is held in fee title or any lesser interest. This exemption applies to any public agency, any private entity that has dedicated the land or water areas to one or more of those purposes or uses, or any combination of public agencies and private entities making that dedication.

In addition to state and county fire codes, many communities have enacted their own requirements for fuel modification. The City of Laguna Beach (hereafter CLB) has enacted codes (Appendix II) in regards to vegetation representing four modification zones whose widths depend on incline of the slope. These zones are a 20' setback (Zone A), a 50'-75' irrigated area (Zone B), a 50'-75' non irrigated area requiring 50% thinning of native vegetation (Zone C) and a further non-irrigated 75'-130' area requiring 30% thinning (Zone D). All zones require proper maintenance with removal of all dead and dying plant material as well as removal of all undesirable species. Further, vegetation management activities are to be conducted in a manner that maintains sufficient cover to prevent erosion (Appendix II, p.14-15).

Fuel Management Treatments

A number of terms are frequently utilized interchangeably but have very different meanings in application. Particularly fuel break, fire break and fuel modification zone tend to be used

¹ Code Section 51182 states, among other things, specifics of fuel management radii, see Appendix I for specific details

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interchangeably. These terms are individually defined by CLB (Appendix II, p.11), as well as other agencies, as follows:

FIRE BREAK - Removal of growth, usually in strips, around housing developments to prevent a fire from spreading to the structures from open land or vice versa.

FUEL BREAK - A wide strip or block of land on which the native or pre-existing vegetation has been permanently modified so that fires burning into it can be more readily extinguished.

FUEL MODIFICATION ZONE - A strip of land where combustible native or ornamental vegetation has been modified and partially or totally replaced with drought tolerant, fire retardant, plants.

Both fuel breaks and fire breaks are landscape features instituted by management agencies and not particularly applicable to individual properties. Fuel breaks and fire breaks differ in the time that they are placed on the landscape; fire breaks are placed during the course of fighting a fire where fuel breaks are planned and maintained between fires. In both cases these modifications are extreme and cause significant ecological damage in that they generally remove all vegetation. However, fire breaks are generally not permanently maintained and may recover eventually.

The placement of fuel breaks requires thoughtful planning so that they are carefully placed (usually on ridgelines separating watersheds) so as not to have negative impacts on adjacent properties or affect down hill resources by erosion. Also, during the most catastrophic Santa Ana wind driven fire events, fuel breaks are most effective when they are aligned parallel to the directions these winds blow. Parallel placement allows some potential control of the fire at the flanks, since direct attack of the fire front is not possible with Santa Ana wind driven fires. Fuel breaks that are perpendicular to these winds are largely ineffective as wind-born fire brands simply blow over fuel breaks hundreds of feet wide

(including eight-lane freeways).

Fuel modification zones are primarily the responsibility of individual owners or home owners associations (HOA), although local agencies may take on this responsibility. These areas are designed to reduce flame length and radiant heat and allow firefighters to safely protect structures from approaching fires.

The areas indicated by the CLB are interchangeably referred to as 'fuel modification zones' and 'fuel breaks'. However, the location (on slopes below private homes and adjacent to a reserve) and perpendicular to the direction of Santa Ana winds would indicate that most of the indicated areas would be most appropriate as a fuel modification zone, using the above definitions. However, the complete modification of the vegetation (type-conversion to annual grasslands) and extensive width in most areas would make 'fuel breaks' an applicable descriptor.

Fuel management tools

There are various methods used for fuel management available in coastal sage scrub and chaparral. For construction of fuel breaks, mechanical crushing or bulldozing, control burning, hand thinning, heavy grazing by goats or application of herbicides is common. Sometimes more than one treatment may be used in succession (*e.g.* hand thinning followed by application of herbicides or mechanical crushing followed by control burning or grazing). Fire breaks, because they are constructed as fires approach, are usually constructed by bulldozing but if equipment access is limited, hand crews may be used.

Construction and maintenance of fuel modification zones offers few choices in methodology. Hand thinning is the primary method but recently a number of entities have attempted using goat grazing.

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Hand thinning by crews is potentially the least damaging to native shrublands provided adequate training and supervision is provided. Crews can be trained to avoid and minimize impacts to desirable and special status species as well as to avoid removing fire resistant species. It is also one of the most expensive methods of fuel modification, at least initially. With hand crews, dead material in shrubs and flash fuels such as annual grasses can be removed while leaving green canopy intact that, in the absence of dead branches, will resist fires. Hand pruning of dead material while leaving as much of the canopy cover as is safe helps minimize colonization by alien species, which form flash fuels and act to increase the probability of ignition and the rate of fire spread. Chipping of removed woody materials and dispersing on the site in any openings created will inhibit aliens and also protect soils from erosion. Sites treated thoroughly do not typically need to be treated again for several growing seasons until sufficient quantities of dead material accumulate again, depending on site productivity.

Probably the biggest reason managers choose goats for fuel management is the initial low cost. Other reasons given for choosing goats are wide public acceptance, quiet (no chain saws) and the perception that it is more “natural” and thus will cause less environmental damage. This latter factor is largely not true and unsupported by the available science.

Ecological Impacts of domestic stock herbivory in the Western United States

Historically, grazing² by domestic animals has caused substantial damage and degradation to ecosystems in the western United States (Fleishner, 1994). Impacts include alteration of vertebrate, invertebrate and flora species composition. Changes in composition take the form of a decline of native vertebrate and invertebrate biomass and diversity. These declines are attributed to direct competition for resources, alteration of forage species composition, effects of trampling on small

² Grazing is used as a general term for domestic stock herbivory and also specifically in regards to goats. This is somewhat inappropriate as, technically, goats are browser.

Preliminary Observations of Goat Impacts

species and destruction of nests and burrows. Flora compositional changes also manifest as decreased diversity and biomass of natives, most notably palatable species, and increase of alien “weedy” species.

Grazing also disrupts ecosystem function by altering nutrient cycling and succession. Microbiotic, or cryptogamic, crusts (layers of moss, lichen, and algae which grow on the soil surface) are ubiquitous throughout aridland systems and play important roles in both soil chemistry and erosion prevention. Microbiotic crusts can experience loss of species diversity, decreased functionality in nitrogen fixation or extirpation when subjected to grazing. Other aspects of nutrient cycling are also affected by decreased litter, altered soil pH, and altered soil water properties.

Plant community succession is frequently halted under grazing pressure as a result of consumption of reproductive parts (flowers and seeds) as well as seedlings, alteration in the soil structure and decreased availability of water in the upper profile due to competition with shallow-rooted alien grasses.

Specific impacts of goats

Unmanaged (feral) or poorly managed domestic goats (*Capra hircus*) have caused significant damage to ecosystems, particularly shrublands, throughout the world. This is due to a number of physiological and behavioral traits that increase their impact on ecological communities relative to other herbivores. In particular, feeding habits are more destructive than most other herbivores. Physiologically, goats have a higher tolerance of bitter and oily vegetation. This means that goats can subsist on a poorer quality of vegetation and will consume all vegetation in an area. Behaviorally, goats will eat herbaceous flora when available but will readily switch to browsing woody vegetation and even stripping bark during drier seasons or as a result decreased forage availability. Tree and shrub mortality often result

Preliminary Observations of Goat Impacts

from bark-stripping by goats. Goats will also feed beyond an area of easy reach by knocking down thin stemmed shrubs and trees to get at canopy foliage or even climbing trees with low hanging branches (Coblentz, 1980).

Exposure of bare ground leads to erosional problems, especially in southern California's coastal mountains that have a high degree of topographic heterogeneity and are frequently composed of loosely consolidated marine uplift. Goat grazing removes cryptogamic crusts as well as both herbaceous and woody canopy and exposes surface soil to rain-drop impact which leads to surface erosion. Erosion is further exasperated by ongoing trampling which compacts the soil and decreases water filtration and can lead to rilling, sheeting and mass-wasting. Also, because goats are browsers and also have propensity to bark-stripping, woody species can be heavily impacted with the eventual loss of the deep rooted vegetation that is necessary to stabilize deeper soil layers. Shrubs typically die after 2-4 years of grazing from the reduction of carbon stores. The consequent de-stabilization of deeper soil levels can lead to serious erosional problems such as gullying and debris flows.

Goats as a fuel reduction tool

Using goats to browse for fuel reduction is not a new idea. In 1915 the Angeles Forest Reserve hired a 750 head goat herd for \$20 a month. Goats have never been widely used and on a local basis their use has waxed and waned over the years. Currently using goat herds as a fuel management tool is experiencing another renaissance with infrequent but widespread use in a number of western states.

The recent boom in the goat fuel modification industry has seen some improvements in practices in response to public concerns. In the past goats have resulted in public outcries because as natural vegetation dried during summer droughts the goats would enter private property and consume prized garden plants. Today goats are penned to prevent escape rather than just herded, which restricts

Preliminary Observations of Goat Impacts

impacts to a designated area and minimizes potential of release of feral animals. Penning however often results in total decimation of plant biomass and further vegetation is destroyed to construct fences and by the goats propensity to trampling trails around the fence line.

Some goat herd owners do not view their herds as livestock *per se* but rather as tools or workers to accomplish a specific job. This attitude helps mitigate the potential for overgrazing in order to 'grow the herd'. If requested, goat herd owners will limit access to certain species and also remove livestock prior to complete consumption of vegetation available. However, these are voluntary on the proprietors' part and there are apparently no standards specific to minimizing damage beyond general livestock ordinances. It is still necessary to have oversight by land managers with ecological training to minimize negative impacts.

The amount of damage caused by goats will depend on the interaction of landscape characteristics and a number of management decisions.

1. Net Primary Productivity (NPP) of the site. NPP is the amount of plant biomass produced on a site. NPP is dependent on intrinsic and extrinsic site characteristics such as climate/weather, aspect, soil productivity and site disturbance history. Increases in moisture, northern aspect, and fertile soils all increase NPP in southern California. History of disturbance, particularly to the point of type-conversion to alien grasslands, decreases NPP.
2. Stocking rate. The number of animals grazed per acre is positively correlated with the amount of damage. The greater the number of goats the more consumption and trampling will occur on the site.
3. Residence time of herds. The amount of time herds are isolated in a given area. Even small herds can cause huge amounts of damage if left long enough in one place.
4. Season of grazing. Late winter and spring grazing will cause the greater impacts due to plant

Preliminary Observations of Goat Impacts

recruitment failure because of consumption of seedlings, seeds and/or flowers³. Browsing shrubs in the fall and winter leads to high mortality because of decreased root carbon stores at this time of year.

A number of studies give recommendations for stocking rates for shrub-removal treatments (Table 1). These studies were all on fuel breaks or on cattle ranches where elimination of woody vegetation was the goal. There are no studies where only thinning of vegetation, as in modification zones, was desired.

Author	Location	Duration	Initial stocking rate (acre/goat)	Subsequent stocking rate (acre/goat)
Huss, 1972	Mexico	all year	0.9-1.8	N/A
Merril, 1975	Edwards Plateau, Tx	all year	2.0-3.0	N/A
Naveh, 1972	Israel	all year	1.6-1.8	N/A
Batten, 1979	New Zealand	all year	0.167	0.333
Sampson, 1944	N. California (high productivity site)	all year	0.333	'reduced' after second year
Sampson, 1944	N. California (low productivity site)	all year	1.0	'reduced' after second year
Spurlock <i>et al</i> , 1978	Amador County, CA	all year	2	1 (1 st year) 0.5 (2 nd year)
Merril and Taylor, 1976	Edwards Plateau, Tx	30 days/yr	0.125-0.200	
Davis <i>et al</i> , 1975	Colorado	25 days/yr	0.125	'reduced'
Green <i>et al</i> , 1978	S. California	2 days	.006	N/A

Table 1. Stocking rates of domestic goats effective for shrub removal.

³Phenology (flowering and seed set time) varies widely so impacts to individual species would need to be determined individually.

Preliminary Observations of Goat Impacts

Another way to assess what impact goats may have is to look at the carrying capacity of an area relative to goats. This can be done by using estimates of NPP and forage consumption rates by goats.

The amount of forage goats consume varies between animals and is dependent on the nutritional quality of forage. There are no studies available specifically looking at coastal sage scrub but in a study conducted on goat grazing in forest understory fuel and fuel break maintenance in coastal California, goats consumed ~4 kg (8.8 lbs) of native vegetation per goat per day (Tsiouvaras *et al*, 1989). If we assume that a goat will eat roughly the same amount throughout the year on average then the annual forage need is ~1580 kg (3746 lbs) forage/goat/ yr.

No studies are available for the NPP of the coastal sage scrub in the Laguna area but one study does give values for coastal sage scrub in the Santa Monica Mountains (Gray, 1982). In the Santa Monica Mountains, NPP averaged 1437 kg/ac/yr (3161 lbs/ac/yr). These values are likely to be higher than those at Laguna, which receives less rain on average, but will be used as a high estimate of coastal sage scrub carrying capacity. Total live biomass in this study was ~3743 kg/ac. This would translate to a carrying capacity of less than <1 goat/ac/yr based on NPP while 2.3 goats/ac/yr could be expected to consume all live plant material on the site and lead to type conversion.

While an interesting baseline, these numbers should be viewed cautiously and are potentially misleading. Type conversion could still occur on sites where stocking rates were below the carrying capacity due to a low productivity year, too long of residence time, grazing in the wrong season, or damage from trampling. NPP for annual grasslands varies from coastal sage scrub and shows a greater response to rainfall so different values would be applicable.

It is unknown exactly how many goats are in the herd but 700 has been cited by rangers. This number corresponds with 600-800 cited elsewhere (Harris and Nagy, 2000; Voth, 2003). This is over 2.1

Preliminary Observations of Goat Impacts

goats per acre (700 goats/329 ac). This stocking rate far exceeds carrying capacity based on NPP and approaches the number that could consume all available vegetation. It is also higher than all of the studies, except Merrill (1975), in Table 1. This is probably sufficient to explain the type-conversion that has occurred and the ongoing expansion into ungrazed areas outside the fuel modification zone (see below). However, CLB is unique in that it has goats grazing throughout the year. Other entities that have utilized goats as fuel modification tools typically have herds brought in as needed for short periods during summer months. Grazing in the winter and spring when plants are flowering and setting seed, as well as low on root carbohydrate stores, probably accelerated the decline and type conversion of the coastal sage scrub.

Another aspect of using goats in urban environment and wilderness areas is the fact that goats carry and can transmit diseases to humans (zoonoses, Appendix III), domestic pets as well as wildlife. In addition, local populations of ectoparasites such as ticks, fleas, and lice may increase due to the increase 'habitat' available with large herds. This latter will be more of an issue the larger the herd and the longer the goats are maintained in one area. Goats transported from one area to another may act as vectors for both disease and ectoparasites.

Impacts CLB fuel modification program on Aliso and Wood Canyons Wilderness Park and the NCCP Reserve

Realized Impacts

In the establishment of the NCCP reserve, a buffer of county property was left between private property and the NCCP reserve border. This buffer varies in width but is equal or greater than non-irrigated Zone C (50% thinning) and Zone D (30% thinning) required by the City of Laguna Beach's fuel modification guidelines (Appendix II). This buffer zone was likely intended to permit homeowners

Preliminary Observations of Goat Impacts

to meet fuel modification codes while minimizing conflicts with State of California Government Code Section 51184(a)(b) (Appendix I).

The CLB proposed fuel modification areas are adjacent to the Aliso and Wood Canyons Wilderness Park (AWCWP) and the NCCP reserve in Zones 1, 2, 5, 6, 7. Examination of aerial photographs (see Figures 2-7) from 2004 indicate that grazing has progressed away from the buffer zone and intruded into the reserve in all areas where the fuel zones abut reserve property. In some zones the intruded area appears relatively small (Zone 1 & 7, photos 2 & 7) but other areas of the reserve have been heavily impacted, particularly in Zone 2, 5 and 6 (Figures 3-6). There is an obvious gradient of decreasing shrub cover and increasing alien grasses. Progressive fence lines are also apparent. A logical hypothesis for the observed pattern would be that as forage deteriorated in the buffer zone (was type-converted to alien grasses) the herders expanded the goat enclosures to include better forage down slope (in the reserve). In all these areas grazing has been allowed beyond the original buffer established for fuel modification. Grazing appears to have been poorly managed for the goal of fuel modification on the part of the herders with apparently little or no oversight by city managers or fire personnel.

Zones 5 & 6 (Figure 6) adjacent to the Aswut trail/fire access roads are particularly confounding. The grazing appears to have been very intense in this area and there is extensive type-conversion. It is unclear why such intense treatment is necessary when the road is paved, there are no structures to defend and the code calls for only 10' clearance on either side of the road to maintain adequate equipment access.

A previous report (Glenn Lukos, 2005) ascribed deterioration of "high quality habitat" in zone 5 (Figure 5) to recreational activity. While it is likely that increased traffic in this area may have contributed to decline, this area was likely only utilized recreationally after fence lines were cut, which

Preliminary Observations of Goat Impacts

can be used as trails, and goats opened it up by grazing. The illegal use in this area is not likely to stop without some effort now that trails are established.

The loss of designated critical habitat for Coastal California Gnatcatchers is significant and there may have been unauthorized take through destruction of nests during breeding season. It is unlikely that the latter can be verified.

The amount of area and degree of impacts to reserve property has not been calculated and requires a ground assessment as well as review of historical aerial photographs to determine what level of disturbance was present prior to the initiation of goat grazing.

Potential Impacts

Erosion is likely to be an ongoing issue in the areas denuded of woody vegetation, particularly if grazing continues. Exposure of bare ground both in the buffer zone area and on the reserve will continue to experience loss of surface soils and potentially even sizeable debris flows with heavy rain.

Sedimentation may impact resources and habitat down slope, for example through siltation in Aliso creek.

Woody coverage plays an important role in preventing gully formation. However, if a gully is initiated in denuded upslope areas it can readily propagate through shrub covered slopes downhill. Based on examination of 2004 aerial photos there does not appear to be any gullying in the overgrazed areas on, and adjacent to, the reserve. Assessment of gully formation should be made by site visits and monitored periodically. This process appears to have already begun in other grazed areas not adjacent to the reserve (Figure 7).

Preliminary Observations of Goat Impacts

Some species may have experienced direct negative impacts as a result of grazing, such as burrowing rodents (e.g. *Dipodomys sp.*) and birds that nest in coastal sage scrub or on the ground. Other foraging and browsing species would experience indirect negative impact as a result of competition.

Ruminant-specific diseases carried by goats can spread to mule deer in the reserve as well as some of more the general diseases that can spread to other species. If goat grazing is continued then reports of the goat herd health from a qualified veterinarian should be supplied to the rangers on a regular basis as well as notification of any communicable diseases found in the herd. The possibility that diseases could spread outside the herd seems very real considering the amount of goat feces that are in the grazing area (figure 8).

Conclusion

The background and preliminary findings of this report indicate that CLB fuel modification program is having significant negative impacts on AWCWP and the NCCP reserve and should not be continued within the reserve boundaries.

Both the extent of the area impacted and the degree of impact requires field verification and analysis.

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