

Vegetation
Management
Almanac
for the
East Bay Hills

Vegetation Management Almanac for the East Bay Hills

A document designed to promote native plant and wildlife habitat when conducting vegetation management for fire hazard reduction in the urban-wildland intermix zone

A Joint Project of

Danielsen Consulting, Inc.

East Bay Regional Park District

Ernest Orlando Lawrence Berkeley National Laboratory

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Authors' Perspectives

CHARLI DANIELSEN is a long-time advocate of local native plants. She is convinced that escaped exotics and weeds are a threat to the future of native plant communities in our East Bay Hills. She feels that inappropriate work can set natives back further, but to allow no action against exotic plant invaders dooms our hill landscapes and the creatures that depend on them. Her goal is to help people doing the work to know what plants they are dealing with, to do the work when it will have the most success at reducing exotics, and to protect native plant and animal species.

RICH MCCLURE is a planner at Berkeley Lab and has been involved with land planning, wildland fire, and environmental issues for many years. Berkeley Lab is working to minimize the risk of wildland fire damage in a manner that reinforces and supports the natural successional plant communities of the area. This program involves very fine and finely negotiated partnerships that include native plants and other environmental factors. Rich has enthusiastically supported the gathering and communication of the management and environmental information in this document.

ED LEONG has supervised the East Bay Regional Park District's fuel break operation since 1987. His job is to reduce vegetation fuels on more than 400 acres of urban intermix along the boundary of seven ridgeline parks in the East Bay Hills. Although Ed prefers to use selective vegetation removal methods, he must often rely on blunter, less selective tools that can treat large areas relatively cheaply. By getting involved in this project, Ed hopes to improve decision-making with respect to seasonal timing, to more thoroughly assess impacts of the work, and to provide a handy visual reference for workers in the field.

MARGARET KELLEY, supervising Naturalist, Tilden Nature Area, prepared the information about animals and the plants they use. Her perspective in working on this almanac project is that of a professional naturalist for over twenty-nine years. She subscribes to the adage, "Nature is a friend, not an opponent." She is wary of "management"—as if humans can "manhandle" nature more wisely than nature takes care of herself. Neatness (management) often causes a destruction which can appear superficially as order. Only in the wild, untamed world is there a true natural order. She favors the term "stewardship," which often means not doing certain things. Her priority is that maintenance decisions must enhance habitat diversity, as well as preserve educational values. All vegetation—even exotic—supports wildlife; many native animals have adapted to naturalized plants. She recognizes that animals are key indicators of an area's overall well-being and considers interventions that endanger or harm wildlife not acceptable. Therefore, she cannot support wholesale removal or devastation of non-native plants. Instead, she advocates a selective, sensitive, studied, careful, slow, low-impact, long-term approach to fuel reduction in the East Bay Hills—an approach that does not disturb fauna—and cautions that such a holistic approach must adopt a planning strategy that includes awareness of flood, fire, earthquake, erosion, and wildlife preservation all at once.

CAROL RICE is a fire management consultant with background in ecology and wildland fire behavior. Her goal is to add the perspective of the fire manager who wishes to see hazard reduction done, but done sensitively, with minimum environmental insult. Her contribution includes which methods will not result in any compromise in fire safety and would require a tradeoff between environmental concerns and fire safety.

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Introduction

A group of Bay Area people interested in vegetation management from a variety of perspectives met to prepare this almanac. Our wish is to provide information from our own knowledge, study and experience to guide the reader to understand the sites on which they plan to work and their options. Many people are involved in vegetation management around homes, neighborhoods, schools, parks, open spaces and watersheds. We encourage everyone involved in this work—policy-makers, planners, managers, supervisors, equipment operators, and hand laborers, whether professionals, homeowners or volunteers—to explore different methods or timing when the results of existing practices do not achieve long term progress toward shaping fire-safe vegetation, are aesthetically unacceptable, or diminish wildlife values. The payoff and ultimate goal is to have vegetation that requires fewer resources being spent to achieve an acceptable level of fire safety, is visually appealing most of the year, and provides habitat that supports the diverse flora and fauna of the region.

An urban-wildlife intermix is found at the edge of urban expansion where homes and other buildings are in contact with undeveloped areas. Most people agree that these zones require some management of vegetation to reduce the danger of wildfire spreading to homes.



Urban-wildland intermix

One of the objections that is often raised to managing vegetation for fire control is that wildlife habitat and native plant communities may be disrupted or destroyed. One of the reasons many homes were built and parks established in the East Bay Hills is the area's natural beauty. The grasslands, north coastal scrub and oak/bay woodlands are home to a rich fauna that includes mammals, resident and migratory birds, reptiles, amphibians, insects and other invertebrates. The native plants not only belong to the area and make up the resident landscape and plant communities, but are also well adapted to the local climate and growing conditions. We believe that it is important to encourage native plant communities where possible, thereby retaining the character of the landscape, and providing the food and shelter that our native wildlife are most accustomed to using.

Vegetation management that progresses toward converting areas to stable plant communities with favorable fire behavior characteristics, such as native perennial grasslands or native oak/bay forests, is ideal. Generally, we favor removing non-native plants, especially those that are weedy or fire-prone, and allowing native plants to move in and take their place. Many native plants are present on properties throughout the East Bay Hills, often with non-native weeds growing among them. The natives can be

encouraged if vegetation management for fire suppression is timed carefully and performed selectively. Areas of native vegetation can be left standing while less valuable vegetation is removed to achieve fire safety. We have found that native plants require less attention and incur lower maintenance costs than plants adapted to other climates, and they can provide a low maintenance complement to ornamental plantings in yards and gardens.

HOW TO USE THIS BOOK

Use the questions in Making Decisions to clarify your project goals, site constraints, and available resources to best integrate fire protection with protection of native plant and wildlife habitat values.

Use Vegetation Management Techniques to determine the approach best suited to your site and situation. Techniques are described in order of selectivity.

Use Vegetation Management Timing to understand the effects of work at a given time. Information is included for three generalized native plant communities of the East Bay Hills. Charts of pest plants indicate the most effective times to manage each species typically found in those plant communities. Record your own observations. Use the lists of protected species that use each plant community to find out what must be preserved there. Use the animal charts to determine when creatures are likely to be most affected by your activities and modify the timing and/or techniques accordingly. Charts are also included for three non-native plant communities: eucalyptus plantations, Monterey pine plantations, and disturbed places. Use Blooming and Fruiting Periods for Selected Plants to determine when management around some desirable plants should be avoided to preserve wildlife habitat.

Use Plant Illustrations to identify what plants are growing on your sites and to verify whether they are desirable or not.

Study the records from ongoing projects in the Case Studies/Site Histories. Visit the projects to get an idea of what a site looks like after treatment.

Make your own observations. Use or modify the blank forms for your own projects. Put down the information you remember or can reconstruct. Write down when you do things. Look at the record to see what is working.

Share the information with others. Use your information to back up decisions with neighbors, fire officials, and landowners.

Consult the references listed, and develop your own.

Adjust, refine, and expand the information provided here. Share any new information you develop with us by e-mail <cwd@wli.net>.

Making Decisions

Any vegetation management will change conditions and can be looked upon as disturbance with potentially destabilizing environmental effects. Vegetation management actions change how sunlight penetrates an area, physically compact or disturb the soil, alter moisture availability to the plants that remain, stir the seed bed, etc. By removing a plant, space is created. The process of replacement largely depends on what seeds are present and which germinate. Removal of a perceived weed or overgrowth may result in a different weed problem, even within one growing season. In short, vegetation management will affect plant and animal habitats, in some cases improving them, in others having unintended, undesirable, and sometimes irreversible consequences. Planners must therefore be thoughtful. They must also be flexible and plan to have resources available to deal with the consequences of vegetation management.

Before embarking on any vegetation management project, decision-makers should have knowledge of the site based on observation and a firm idea of the goals of the project.

Asking the right questions can lead to desired solutions. Finding answers to the following questions can prevent making mistakes and wasting time and money. The materials in this book will help answer some of the questions.

What native plants grow in the area? What birds, butterflies, and other wildlife are present or could be attracted to the area? What features or characteristics of the area do you value most? Are there rare or endangered species on the site? Are they ones that are legally protected? What weeds are present?

Is a goal to reduce fire risks? Are there problems with the height or density of vegetation? What is the desired result in terms of fuels, physical separation of fuel elements (such as removal of ladder fuels), live-to-dead ratio of remaining plants, and species composition? What will be done with any cut material—will it be hauled off the site, made into piles, or cut into small pieces and scattered?

Is a goal to be rid of a particular weed species, or weeds in general? Is the goal primarily horticultural, to satisfy a landscaping or aesthetic need? Is it to attack a plant that is recognized as a noxious weed, which is currently or has the potential for becoming a big problem locally or regionally? Is the goal short-term removal, suppression to an acceptable level, or eradication?

What public review and planning is required by the agencies involved? What planning has already been done? Are permits required and, if so, have they been granted?

Are there labor, equipment, or financial constraints? Is the situation an emergency requiring treatment of large areas immediately? Is it possible for the project to be worked on in phases? What repetition interval for maintenance is anticipated? Will labor be available at the optimal times in the growing season? Is funding adequate to cover subsequent maintenance as well as the initial treatment?

Vegetation Management Techniques

Vegetation management for fire protection or exotic plant control can respect the landscape and continue to provide habitat for our native plants and wildlife if vegetation managers use ecological judgment and exercise restraint. For example, grasslands mowed or grazed to leave four to six inches of height, allow insects, reptiles, amphibians, and small mammals shelter, food, and reproduction opportunities. Leaving four to six inches standing also provides some erosion protection and shades out some of the weeds that follow disturbance. Moreover, with the selective methods described below, desirable stands of native plants, or places animals are known to be using, may be protected.

The following explanation of treatments provides a broad description of the operations involved, timing constraints, safety precautions needed, and types of impacts and efficiencies to be expected. Traditionally, Integrated Pest Management first considers mechanical and physical methods, then cultural, biological and finally chemical in reviewing practices. The descriptions in this almanac are ordered from most selective to least as is most appropriate for local vegetational management. These are all tools that may be incorporated in an integrated pest management program.

Vegetation removal techniques with higher selectivity, aimed at cutting or removing specific plants or plant species and limiting damage to other plants, are favored. Such techniques disturb the environment less, and provide fewer opportunities for annual weeds to invade, but also tend to be slower, more costly, and, in large areas, may not remove enough plant material to meet fire hazard reduction goals. In these instances, a less selective technique may be appropriate.

HAND LABOR WITH UNMECHANIZED TOOLS

Pulling and prying - Pulling weeds by hand offers the most selectivity of any management technique, and is the most time-consuming. Pulling requires no special equipment or preparation. The authors have observed that most weed species pulled three years in a row are generally controlled with limited attention in subsequent years. Because of its selectivity, hand-pulling weeds offers the least environmental insult, provided the pullers are knowledgeable regarding which plants are targeted species. Targeting one to three weeds can generally be accomplished by individuals with limited training (See Plant Illustrations). Pulling by hand is not theoretically limited by slope steepness; however, heavy foot traffic will also cause surface soil erosion in steeper areas. Pulling and prying (using simple tools for leverage) are most effective when the ground is soft enough that stems do not break off at the soil surface.

Grubbing and hoeing - Hoeing cuts the roots off at or beneath the soil surface with the sharp edge of a hoe or McLeod. Some plants regrow, unless the worker pulls up the entire root and therefore eliminates sprouting. Grubbing uses heavier tools such as mattocks, Pulaskis, or picks to reach underground parts capable of growing

new shoots. Grubbing and hoeing are faster operations than hand pulling. Both have nearly the selectivity of hand pulling. Grubbing and hoeing can be done when ground is damp, but also after ground hardens.

Turbo saws - Small, curved, folding saws that are easily carried, efficient, and easy to use because they cut on the pull **stroke**. A 7-inch blade cuts saplings cleanly at the base and most branches. Blades can be sharpened, but rarely need it.

Scythe, and lively lad - Tools such as scythes, and "lively lads" make horizontal, sweeping cuts appropriate for small, fine, herbaceous material, including grasses. Cutting green material is most efficient when the plants are turgid, but not wet. When cutting after the plants have started to dry (cure), it is more efficient to cut when the material is brittle and dry, such as in the late afternoon. Sharpness of the cutting blade is critical to efficiency. A proficient operator with a sharp blade can mow quite quickly. Untrained operators will have difficulty regulating height and may leave ragged-looking material. The selectivity of this treatment is high, but less than hand-pulling and grubbing or hoeing, as nearby plants are likely to get cut in a swath. Like any operation other than pulling or herbicide use, plants that sprout will only temporarily be affected.

Machete - Machetes are best used with green material; they don't work well with dead material. Machetes are most often used for general clearing, for pruning lower branches and cutting up shrubs rather than cutting the brush at the base. The operator needs to observe safety precautions, including keeping a safe distance from others, and to avoid hitting dirt, which dulls the blade.

Loppers - Loppers are used to prune lower branches of trees and to cut brush stems that are smaller than 2–3 inches in diameter (depending on type of lopper). Loppers are very specific, on a par with hand-pulling. Loppers are also used to cut larger material into more manageable pieces, or for assembling piles, or to perform the "lop-and-scatter" operation. Work **may** go slowly because of the large amount of handling necessary for each piece cut.

HAND LABOR WITH MECHANIZED TOOLS

Mowing with weed-whips - Weed-whips, also known as weedeaters, have cutting heads that are flat and cylindrical in shape, and hold two or more monofilament nylon lines that radiate out from the head and cut the weeds as the head spins. Weed-whips are gas- or electric-powered and hang from a shoulder strap or harness at the **balance point** on a shaft, usually at hip level. Weed-whipping using such a string cutter is suitable for cutting grass or herbaceous material, and provides a great deal of control over which areas are cut. The height to which plants are cut may be difficult to control unless the operator is experienced. It is tempting to mow too close to the ground **instead of** leaving grass four to six inches high. Mowing with a string cutter is an effective way to reduce **fire hazard** in grassy areas, but has mixed effectiveness in controlling weeds, depending on species, timing of treatment, operators, and height of mowing. It is usually employed in areas too steep for wheeled mechanical equipment. It is also normally used for areas

less than two acres in size. Large woody stems are not cut by string cutters, but tree seedlings may be severely damaged. Ear and face protection are essential when operating these machines.

Variations of weed-whips include hard plastic blades instead of or in conjunction with the nylon line, making it possible to cut thicker or tougher materials.

Brush blades - Brush cutters and some brush-clearing saws use the same basic design as weed-whips, but have a steel-bladed cutting head. These are well suited to cut fibrous or small woody plants at the base, and for cutting debris into mulch.

Chain saws - Brush cutters are better adapted than chain saws for cutting small-diameter and brushy growth. Chain saw teeth tend to grab rather than cut through small, springy branches, causing the saw to be jerked toward or pushed away from the work, or kicked back toward the operator. Sticks often get caught between the saw chain and guide bar, causing the chain to derail.

Chain saws are best suited for cutting through solid wood, and are used for pruning, felling, limbing, and bucking operations. Green wood is softer and easier to cut than dead wood; some hardwoods such as eucalyptus are especially difficult to cut when seasoned. **Chain saws are dangerous. Proper training and appropriate safety gear are essential.** Since chain-sawing involves cutting individual trees and shrubs, selectivity is very high, but work goes slowly. Slash can accumulate rapidly, and may need to be chipped, cut more finely to make piles for animal habitat, piled for later burning, scattered, or hauled off site. Chain-sawing sometimes involves changes in habitats and micro-environments, loss of nesting sites for birds, loud noise during the cutting operation, and impacts of equipment used if the material is hauled off site.

Pole chain saws have the cutting bar located at the end of a telescoping pole, and are useful for cutting branches and limbs under three inches in diameter above the head of the operator (ladder fuels).

BLACK PLASTIC AND ORGANIC MULCH

The installation of sheets of black plastic can be used as an alternative to herbicide application to prevent sprouting. A 5-mil or thicker sheet of plastic is fixed to the top and sides of cut stumps to prevent photosynthesis after cutting. This treatment eliminates the impacts of herbicide; however, some hand management of resprouts may be required. Plan for the removal of the plastic before it decomposes in approximately two years. Some reinstallation or other repair and maintenance may be necessary. Black or clear plastic can also be placed over piles of cut eucalyptus or pine wood to kill wood-boring beetles if well sealed. The treatment is highly selective and has no side-effects other than a visual impact. Clear plastic allows solar radiation to penetrate, causing a greenhouse effect. Black plastic contains UV inhibitors that resist photodegradation. Black plastic may also be placed on the ground to prevent germination of weeds. This treatment prevents germination of native vegetation as well. To prevent weed

growth, apply plastic prior to active growth, either before or after germination. Remove ground-placed plastic in the summer. Plastic left out all year shreds and becomes a litter problem.

Organic mulches such as wood chips retard the sprouting of weeds for as long as one season. Fungus is usually present as the chips break down, so protective masks are important safety gear. Wood chips may also spread fungus to oaks and shrubs. Wood chip mulches burn slowly with low flame lengths, but for a long time. One way to increase a population of a tree species is to chip branches that have ripening seed and spread the mulch. Using chips of weedy tree species as mulch is not recommended as that tends to spread their seeds.

MOWING WITH WALK-BEHIND AND SMALL RIDING MOWERS

Mowers designed for cutting lawns and turf can, with varying success, also cut weedy growth. Reel mowers are the least suitable for cutting weedy growth as they are designed for manicured lawn areas. The height of cut is generally lower than is desired for maintaining wildlife habitat. The precision adjustment and sharpness of the reels are difficult to maintain when cutting coarser, more fibrous material, if they can cut the material at all.

Rotary walk-behind and rotary riding mowers both come in a wide range of sizes, and larger mowers may have two or more blades. The cutting height of rotary mowers may be adjustable. The blades follow the terrain at a set height relative to the wheels, but depending on the mower, height setting, and unevenness of the terrain, scalping can occur. Because of the scalping and general instability, use of these mowers is not recommended on slopes or rocky areas. Cut material passes through the blades more than once with each pass of the mower, leaving a fine mulch behind. Rotary mowers may be capable of cutting small, woody stems, but usually have difficulty cutting growth of any type that is especially dense, tall, or fibrous. For efficient cutting, sharp blades are essential. **It is important to wear appropriate safety gear and inspect an area for rocks and other debris before mowing** as objects can be ejected by the blades at blinding speeds for several dozen feet. After working in weed-infested areas, the mower undercarriage and parts need to be cleaned to avoid spreading weed seeds. Fires have been known to ignite from mower sparks in dry grass.

The smaller the mower, the greater the degree of selectivity because the operator can see what will be mowed and can avoid desirable plants and wildlife.

BIOLOGICAL CONTROL

Research on specific biological agents, usually insects, has resulted in the release of some very specific management tools. Consult the University of California Cooperative Agricultural Extension for recommendations.

SELECTIVE HERBICIDE APPLICATION

Herbicide use must be carefully considered: herbicides are poisons that may kill or harm desirable plants nearby, or have other negative effects in the environment beyond their intended use. Herbicide-treated plants or project areas often have an unsightly, blighted appearance, and the dead material may still need to be removed for fire hazard reduction or for aesthetic reasons. In their proper setting, however, herbicides are often the most effective method of control, for example, killing plants that resprout repeatedly and are hard to pull from the soil.

There are many herbicides on the market, and it is important to select the best herbicide for a particular use. Herbicide labels list susceptible target plant species, give directions for proper application, and contain other important information. It is almost always possible to find a herbicide of low ("caution") or moderate ("warning") toxicity for a particular use: those of high toxicity ("danger" or "poison") should be avoided altogether, in favor of less toxic or non-chemical methods. In California, herbicide recommendations can be obtained from the University of California Cooperative Agricultural Extension Agent. Licensed Pest Control Advisors or County Agricultural Commissioners office may be contacted for advice.

The timing of herbicide application varies with the chemical used. Usually weed control is done during the time of active growth, which coincides with active growth of native species as well. Stump control may need to be applied within minutes after the tree is cut, or can be applied within weeks, depending on the chemical used. When a glyphosate-based herbicide is used, better control of resprouting is often achieved by immediate application in summer or fall. Other herbicides may be equally effective regardless of season.

The most selective use of herbicides involve spot applications, i.e., applying the material directly on the plants to be killed. Depending on the target plant and herbicide being used, spot application may take the form of foliar spraying on individual plants, applying to the cambium layer of cut stumps, or applying on the basal bark area of woody plants. Selectivity is high with manual spot application; however, drift can occur on windy days. Equipment used includes daubers, backpack sprayers, and/or hand-pump sprayers.

Broadcast spraying is not selective because it sprays herbicide over an area (such as roadsides) as opposed to spraying specific plants. Prescribed fire, grazing and/or heavy machinery may have less environmental impacts than broadcast spraying in many situations. Hand-pump sprayers, backpack sprayers, spray rigs with motorized pumps, and boom sprayers for spraying wide swaths are tools used in broadcast spraying.

PRESCRIBED FIRE

Prescribed fire is a treatment to which many native plants are adapted. Burning is cumbersome and includes notification of neighbors, local fire departments, media, and air quality districts. Fire departments must be involved in planning and conducting prescribed burns of any type (including pile burning or broadcast burning). Appropriate weather is critical; conditions must foster both control and adequate combustion. Burning may take place only on days permitted by the local air quality district. Burns may be conducted in the summer in grass. For brushy and treed areas, spring and fall are usual burn seasons, because control is usually more difficult in these vegetation types. Burning can also consume piles produced by previous fuel reduction efforts; these piles are often burned in the winter. One way to avoid sterilizing the soil under burn piles is to start a fire near the pile and feed the material into the fire, a little at a time.

Broadcast burning is generally suitable for larger areas because the amount of preparation required is approximately the same regardless of the burn size. To reduce potential erosion from bare control lines, broadcast burning is best used in areas where treatment boundaries are already prepared in the form of roads. Post-burn invasion of weeds and surface erosion from areas bared by the fire can be a concern. To burn safely, pretreatment is often necessary. Pretreatment most often consists of pruning lower branches of trees and cutting understory shrubs. Prescribed fire is the only technique that can reduce the number of weed seeds in the soil and simultaneously foster germination of native species. Prescribed fire may burn slow-moving animals, but burrows do not normally reach lethal temperatures. Prescribed fire is not very selective, and the manager has little control over which plants are affected, or to what degree, in the burn area.

GRAZING

Grazing with goats is sometimes used to reduce fire hazard and to remove weeds since they eat the material and flatten the remaining grass by trampling. Goats are best used in areas that do not have a large number of plants desired to be retained since all plants other than large trees will be damaged or killed unless they are protected. Goats can be fed clean feed for three days before moving them to the site to avoid spread of weed seeds. A herd of 200–300 goats can graze up to one acre per day, but the rate varies. Goats can be placed on all but the steepest slopes, and can graze generally any shape or size of parcel because the fencing is portable. Goat-grazing often is used to reduce coyote bush cover. Goat-grazing also performs low pruning within the effective reach of a goat—up to three and a half feet. Desired shrubs and trees must be protected for 3 1/2 feet. Goat treatments need to be repeated; their effectiveness can be extended by following up or alternating with a different, complementary technique.

Grazing with cattle may be appropriate in large grassy areas that are not steeper than 35% slope. Management of a strict grazing lease (which controls the season of grazing and number of cattle on the site) is critical for environmental sensitivity. Adequate fencing, wide distribution of water sources, and enclosure fencing of sensitive areas may reduce the negative impacts of cattle-grazing. Grazing with cattle is not

selective because the animals will affect almost any herbaceous plant by consuming or trampling the material. Like mowing, grazing with cattle effectively reduces fire hazard in grassy areas. The effects on weeds are mixed, depending on timing of grazing, species of plants involved, and amount of material left after the cattle are gone. Grazing with other animals such as sheep is not normally done in the East Bay Hills; however, the processes and impacts are similar to grazing with other types of livestock.

MOWING WITH HEAVY MACHINERY

Sickle bar mowers and flail mowers are typically mounted on heavy tractors and cut grasses and weeds. More heavily constructed mowers and other equipment are suited for cutting woody material such as brush and small trees. Cutting heads are of the rotary or drum (flail) type; they may be mounted on an articulated arm or boom and be placed at the front of the tractor (brush hog) or side of the tractor. Some cutting head attachments are available that are mounted on the arm of an excavator. Tractors can be either the rubber-tired or track variety. One design has a rotary cutting head mounted on a boom at the front of an articulated 4-track vehicle.

Large brush-cutting machinery is best suited to open brush fields in isolated areas. Depending on the type of equipment and how it is used, sticks of cut brush and other objects can be hurled from the machine several dozens of yards, causing a safety hazard to bystanders, vehicles, windows, etc. Selectivity of large equipment is generally low, and depends largely on the skill and attentiveness of the operator to recognize, maneuver around, and avoid cutting trees and other desirable plants.

Manufacturer's safety precautions must be followed. In general, work with any heavy equipment on slopes over 25% should be avoided because of operator safety, soil erosion, and slope stability issues. Soil disturbance can be considerable with track and even rubber-tired equipment, depending on slope, weight and size of the machinery, the height and design of cleats or lugs digging into the soil, and the frequency and tightness of turns. Machinery may also destroy burrows and nests and crush slow-moving animals.

Brush mowers have some ability to mulch the cut material, but larger machinery tends to fling the cut pieces some distance away from the cutting head without cutting them more finely. Some control over mulching and fineness of cut can be achieved by making repeat passes; indeed, smaller equipment may need several passes to get through denser material. Rearrangement of fuels by even larger equipment—reducing tall, decadent stands of brush to a coarse mulch of sticks on the ground—is often sufficient fire hazard reduction in wildland areas.

Vegetation Management Timing

Generalized plant community or habitat classifications are used to reflect what is found in the East Bay Hills:

- Grassland
- North Coastal Scrub
- Oak/Bay Woodland
- Eucalyptus Plantations
- Pine Plantations
- Disturbed Places

Within each classification, the tables in this section show the typical optimum time to attack pest plants based on their flowering times. In general, actions performed on an annual or biennial plant during bloom (and before seeds are set) will be most effective in halting its spread. Actions performed when the plant is in fruit (the seeds are formed and ripening) are likely to spread seeds. California weather and East Bay microclimates are extremely variable, so plants may not perform on schedule. Observing what is in bloom will help to time vegetation management most effectively, avoiding activities during times that encourage spread of seeds of weeds or prevent desirable annuals from going to seed.

A list of species legally protected or proposed for protection (as of May, 1999) is included for each natural community classification. If species that are state or federally protected are present, or other significant environmental issues are involved, applicable California Environmental Quality Act (CEQA) or National Environmental Policy Act (NEPA) guidelines must be followed.

The analysis approach suggested in this book is a tested and proven project planning and evaluation method, meant to supplement, not replace, any CEQA or NEPA process.

Tables on animal breeding seasons and a chart of blooming and fruiting periods for selected plants that provide food and shelter for wildlife are based on observations made at Tilden Nature Area. These are a representative suite of sensitive species for the East Bay Hills and serve as a guide for researching and recording observations elsewhere. They do not include all the species living in the East Bay Hills.

Rarely will an effective treatment time coincide with a period that is perfectly safe for the desirable species using a habitat. Methods chosen need to be tailored to minimize risk to sensitive species. The most specific treatment methods, such as hand-pulling and pruning, may impact sensitive species least. More broad-scale methods such as burning or animal grazing are not suitable when native plants are emerging or blooming, or when sensitive animals are using the plant cover, so must be carefully timed.

Grasslands

Grasslands in the East Bay Hills are characterized by grass and forb species. Dominant species vary according to disturbance, soil type, etc.

The native grasses blue wildrye and California brome are often found in the area. Purple needle grass may be found in quantity near serpentine soils or on steep slopes where competition from annual grasses is slight and cattle have not overgrazed. California oat grass, pine bluegrass and native fescues may also be found in small patches throughout the area. Blue-eyed grass, yarrow, tarplants, farewell-to-spring, lupines, and California poppy are native wildflowers found in bay area grassland. Coyote bush, while native, invades grassland, especially with fire suppression, affecting size, richness, and habitat structure.

Non-native annual grasses and forbs include wild oats and slender oats, ripgut brome, soft chess, foxtail barley, plantain, "velcro" seeds, bristly ox-tongue, star thistle.

Non-native perennials and woody invaders include Italian ryegrass, other *Lolium*, tall fescue, thistles, poison hemlock.

Timing of Management to Reduce Pest Plants of Grasslands

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Slender wild oats	<i>Avena barbata</i>			❖	❖	◆	◆	◆					
Wild oats	<i>Avena fatua</i>		❖	❖	❖	◆	◆						
Coyote bush	<i>Baccharis pilularis</i>								❖	❖	❖		◆
Field mustard, turnip	<i>Brassica rapa</i>			❖	❖	❖	◆	◆					
Mustard	<i>Brassica nigra</i>				❖	❖	❖	◆	◆				
Ripgut brome	<i>Bromus diandrus</i>				❖	❖	◆						
Italian thistle	<i>Carduus pycnocephalus</i>					❖	❖	◆	◆	◆			
Yellow star thistle	<i>Centaurea solstitialis</i>					❖	❖	❖	◆	◆	◆		
Bull thistle	<i>Cirsium vulgare</i>						❖	❖	◆	◆	◆		

- ❖ Management at this time avoids spread of seeds of the plant
- ◆ Use caution, management may spread seed
- ◆ Use extreme caution, or avoid management-seed spread is highly likely

Timing of Management to Reduce Pest Plants of Grasslands (continued)

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Poison hemlock	<i>Conium maculatum</i>				❖	❖	◆	◆	◆	◆			
Pampas grass	<i>Cortaderia jubata</i>			❖	❖	❖	❖	◆	◆	◆	◆		
Artichoke thistle	<i>Cynara cardunculus</i>					❖	❖	◆	◆	◆	◆		
Spiny dog's tail	<i>Cynosurus cebinatus</i>					❖	❖	◆	◆	◆			
Fennel	<i>Foeniculum vulgare</i>					❖	❖	❖	❖	◆	◆		
French broom	<i>Genista monspessulana</i>		❖	❖	❖	◆	◆	◆	◆	◆			
Foxtails	<i>Hordeum murinum</i> ssp. <i>leporinum</i>				❖	❖	◆	◆	◆	◆			
Ryegrass	<i>Lolium</i> spp.					❖	❖	❖	◆	◆			
Bur-clover	<i>Medicago polymorpha</i>			❖	❖	◆	◆	◆					
Bristly ox-tongue	<i>Picris ecbioides</i>						❖	◆	◆	◆	◆	◆	◆
Plantain	<i>Plantago lanceolata</i>				❖	❖	❖	◆	◆	◆			
Himalayan blackberry	<i>Rubus discolor</i>			❖	❖	❖	❖	◆	◆	◆			
Milk thistle	<i>Silybum marianum</i>					❖	❖	◆	◆	◆			
"Velcro" seeds	<i>Torilis</i> spp.				❖	❖	◆	◆	◆	◆			

- ❖ Management at this time avoids spread of seeds of the plant
- ◆ Use caution, management may spread seed
- ◆ Use extreme caution, or avoid management-seed spread is highly likely

Species Legally Protected or Proposed for Protection in East Bay Hills Grasslands

Common name	Scientific name
Bent-flowered fiddleneck	<i>Amsinckia lamaris</i>
Balsamroot	<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>
Oakland star-tulip	<i>Calochortus umbellatus</i>
Presidio clarkia	<i>Clarkia franciscana</i>
Tiburon buckwheat	<i>Eriogonum luteolum</i> var. <i>caninum</i>
Fragrant fritillary	<i>Fritillaria liliacea</i>
Santa Cruz tarplant	<i>Holocarpha macradenia</i>
Globe coyote mint	<i>Monardella villosa</i> ssp. <i>globosa</i>
Bay checkerspot butterfly	<i>Euphydryas editha bayensis</i>
Bridge's coast range shoulder-band snail	<i>Helminthoglypta nicklinii bridgesii</i>
California tiger salamander	<i>Ambystoma californiense</i>
Alameda whipsnake	<i>Masticophis lateralis</i>
Golden eagle	<i>Aquila chrysaetos</i>
Aleutian Canada goose	<i>Branta canadensis leucopareia</i>
Ferruginous hawk	<i>Buteo regalis</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Burrowing owl	<i>Atene cunicularia</i>
American badger	<i>Taxidea taxus</i>

Plants

Animals

Peak Breeding Seasons and Other Sensitive Periods for Selected Animals Using Tilden Nature Area Grassland

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sharp-tailed snake	<i>Contia tenuis</i>			◆	◆	◆	◆						
Gopher snake	<i>Pituophis melanoleucus</i>			◆	◆	◆	◆	◆	◆				
Western skink	<i>Eumeces skiltonianus</i>				◆	◆	◆	◆					
Southern alligator lizard	<i>Gerrhonotus multicarinatus</i>			◆	◆	◆	◆						
Rainbeetles	<i>Pleocoma bebbrensi</i>	◆	◆	◆								◆	◆
Gray fox	<i>Urocyon cinereoargenteus</i>				◆	◆							
Coyote	<i>Canis latrans</i>				◆	◆							
Bobcat	<i>Lynx rufus</i>				◆	◆							
Red-tailed hawk	<i>Buteo jamaicensis</i>				◆	◆							
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	◆	◆				◆	◆	◆	◆	◆	◆	◆
American goldfinch	<i>Carduelis tristis</i>					◆	◆	◆	◆	◆			

◆ Use caution

◆ Use extreme caution, or avoid this time period

North Coastal Scrub

Scrub communities of the East Bay Hills are not well described in the literature, and vary in composition. Soft, open scrub dominated equally by coyote bush, old man sagebrush, and sticky monkey-flower may coexist with grasses or with bracken fern and oaks.

Shrublands with manzanita, silktassel, coffeeberry, cream bush, chinquapin, hazel, gooseberry, and currant are usually confined to north or east facing slopes.

Riparian shrubland is characterized by willows or creek dogwood, *Rubus* species, twinberry, hazel, ferns and blackberry. The shade-loving weeds of Oak/Bay woodland may also be found in riparian shrubland.

Poison oak and coyote bush are likely to be present with other shrubs. Coyote bush dominates many acres of the East Bay Hills, sometimes replacing grasslands. Poison oak may grow in large thickets by itself. Although both are native plants, they grow aggressively and displace other native plants in the absence of control mechanisms.

Timing of Management to Reduce Pest Plants of North Coastal Scrub

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Coyote bush	<i>Baccharis pilularis</i>								❖	❖	❖	❖	◆
Italian thistle	<i>Carduus pycnocephalus</i>					❖	❖	◆	◆	◆			
Bull thistle	<i>Cirsium vulgare</i>						❖	❖	◆	◆			
Poison hemlock	<i>Conium maculatum</i>				❖	❖	◆	◆					
Pampas grass	<i>Cortaderia jubata</i>												
Golden spurge	<i>Euphorbia oblongata</i>			❖	❖	❖	❖	◆	◆				
French broom	<i>Genista monspessulana</i>	❖	❖	❖	❖	◆	◆	◆	◆				
Chilean mayten	<i>Maytenus boaria</i>	❖	❖	❖	❖	◆	◆	◆	◆	◆		◆	
Pyracantha	<i>Pyracantha</i> spp.					❖	❖	◆	◆	◆	◆		
Himalayan blackberry	<i>Rubus discolor</i>				❖	❖	◆	◆	◆	◆			
Poison oak*	<i>Toxicodendron diversilobum</i>	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆
Spanish broom	<i>Spartium junceum</i>				❖	❖		◆	◆				

❖ Management at this time avoids spread of seeds of the plant

◆ Use caution, management may spread seed

◆ Use extreme caution, or avoid management—seed spread is highly likely

Species Legally Protected or Proposed for Protection in North Coastal Scrub or Chaparral

Common name	Scientific name
Alameda manzanita (Pallid manzanita)	<i>Arctostaphylos pallida</i>
Oakland star-tulip	<i>Calochortus umbellatus</i>
Franciscan thistle	<i>Cirsium andrewsii</i>
Presidio clarkia	<i>Clarkia franciscana</i>
Western leatherwood	<i>Dirca occidentalis</i>
Tiburon buckwheat	<i>Eriogonum luteolum</i> var. <i>carinatum</i>
Diablo sunflower, Diablo helianthella	<i>Helianthella casiana</i>
Uncommon jewelflower	<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>
Alameda whipsnake	<i>Masticophis lateralis</i>

Plants

Animals

Peak Breeding Seasons and Other Sensitive Periods for Selected Animals Using Tilden Nature Area North Coastal Scrub

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Slender salamander	<i>Batrachoseps attenuatus</i>	◆	◆	◆	◆	◆						◆	◆
California newt	<i>Taricha torosa</i>				◆	◆	◆	◆	◆	◆			
Southern alligator lizard	<i>Crotaphytus multicarinatus</i>			◆	◆	◆	◆						
Gopher snake	<i>Pituophis melanoleucus</i>			◆	◆	◆	◆						
Coyote	<i>Canis latrans</i>				◆	◆							
Bobcat	<i>Lynx rufus</i>				◆	◆							
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	◆	◆								◆	◆	◆
Gray fox	<i>Urocyon cinereoargenteus</i>				◆	◆							
Woodrat	<i>Neotoma fuscipes</i>				◆	◆	◆						
Brush rabbit	<i>Sylvilagus bachmani</i>	◆	◆	◆	◆	◆	◆						
Anna's hummingbird	<i>Calypte anna</i>	◆	◆										◆
Allen's hummingbird	<i>Selasphorus sasin</i>			◆	◆	◆	◆						
Scrub jay	<i>Aphelocoma coerulescens</i>			◆	◆	◆							
Wrentit	<i>Chamoca fasciata</i>				◆	◆	◆	◆	◆				
Orange-crowned warbler	<i>Vermivora celata</i>				◆	◆	◆	◆	◆				
Bewick's wren	<i>Thryomanes bewickii</i>				◆	◆	◆	◆	◆				
Cedar waxwing	<i>Bombycilla cedrorum</i>										◆	◆	◆
American goldfinch	<i>Carduelis tristis</i>					◆	◆	◆	◆	◆			
Lazuli bunting	<i>Passerina amoena</i>					◆	◆	◆	◆	◆			
Western bluebird	<i>Sialia mexicana</i>		◆	◆	◆	◆	◆	◆	◆				

◆ Use caution

◆ Use extreme caution, or avoid this time period

Oak/Bay Woodland

Coast live oak and California bay dominate. Buckeye, maple, madrone, and alder may also be present. Native shrubs, flowers, ferns, and grasses grow with the trees. Dead wood, overgrowth of aggressive native poison oak and coyote bush, and pest plants can be removed to increase fire safety. Oaks and bays combine with shrubs in riparian areas, so many of the same weedy pests occur in riparian woodland/scrub

Timing of Management to Reduce Pest Plants of Oak/Bay Woodland													
Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Acacia	<i>Acacia melanoxylon</i>		❖	❖	❖	❖		◆	◆	◆			
Coyote bush	<i>Baccharis pilularis</i>								❖	❖	❖	❖	◆
Hawthorn	<i>Crataegus monogyna</i>								❖	❖	◆	◆	◆
Stebbin's grass	<i>Ehrharta erecta</i>			❖	❖	◆	◆	◆	◆				
Blue or red gum	<i>Eucalyptus</i> spp.	❖	❖	◆	◆	◆	◆	◆	◆	◆	◆		❖
Golden spurge	<i>Euphorbia oblongata</i>			❖	❖	❖			◆				
Ivy	<i>Hedera</i> spp.												
Holly	<i>Ilex aquifolium</i>								❖		◆	◆	◆
Pine	<i>Pinus</i> spp.				◆	◆	◆	◆	◆	◆	◆		
Pyracantha	<i>Pyracantha</i> spp.					❖	❖	◆	◆	◆	◆		
Himalayan blackberry	<i>Rubus discolor</i>				❖	❖	❖	◆	◆	◆			
German ivy	<i>Senecio mikanioides</i>	❖	❖	❖									❖
Poison oak*	<i>Toxicodendron diversilobum</i>	◆	◆	◆	◆	◆	❖	❖	❖	❖	◆	◆	◆
Periwinkle	<i>Viola major</i>			❖	❖	❖	❖	◆	◆	◆	◆		

- ❖ Management at this time avoids spread of seeds of the plant
- ◆ Use caution, management may spread seed
- ◆ Use extreme caution, or avoid management-seed spread is highly likely

Species Legally Protected or Proposed for Protection in East Bay Woodland	
Common name	Scientific name
Bent-flowered fiddleneck	<i>Amsinckia lunaris</i>
Balsamroot	<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>
Oakland star-tulip	<i>Calochortus umbellatus</i>
Franciscan thistle	<i>Cirsium andrewsii</i>
Western leatherwood	<i>Dirca occidentalis</i>
Diablo sunflower, Diablo helianthella	<i>Helianthella castanea</i>
Northern California black walnut	<i>Juglans californica</i> var. <i>birdsii</i>
California tiger salamander	<i>Ambystoma californense</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Mountain lion	<i>Felis concolor</i>

Plants

Animals

Peak Breeding Seasons and Other Sensitive Periods for Selected Animals Using Tilden Nature Area Oak/Bay Woodland

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Ensatina	<i>Ensatina eschscholtzi</i>	◆	◆	◆	◆							◆	◆
Slender salamander	<i>Batrachoseps attenuatus</i>	◆	◆	◆	◆	◆						◆	◆
California newt	<i>Taricha torosa</i>	◆	◆	◆								◆	◆
Sharp-tailed snake	<i>Contia tenuis</i>			◆	◆	◆	◆						
California brown bat	<i>Myotis californicus</i>				◆	◆	◆						
Woodrat	<i>Neotoma fuscipes</i>				◆	◆	◆						
Mule deer	<i>Odocoileus hemionus</i>						◆	◆					
Allen's hummingbird	<i>Selasphorus sasin</i>			◆	◆	◆							
Great horned owl	<i>Bubo virginianus</i>		◆	◆									
Great blue heron	<i>Ardea herodias</i>		◆	◆									
Yellow warbler	<i>Dendroica petechia</i>					◆	◆	◆					
Red-shouldered hawk	<i>Buteo lineatus</i>			◆	◆	◆							
Western flycatcher	<i>Empidonax difficilis</i>						◆	◆	◆	◆			
Sharp-shinned hawk	<i>Accipiter striatus</i>			◆	◆	◆	◆	◆					
Chickadee	<i>Parus rufescens</i>				◆	◆	◆	◆	◆	◆			
Titmouse	<i>Parus inornatus</i>				◆	◆	◆	◆	◆	◆			
Bush-tit	<i>Psaltriparus minimus</i>				◆	◆	◆	◆	◆	◆			
Orange-crowned warbler	<i>Vermivora celata</i>				◆	◆	◆	◆	◆	◆			
Red-breasted sapsucker	<i>Sphyrapicus ruber</i>	◆	◆	◆						◆	◆	◆	◆
Wilson's warbler	<i>Wilsonia pusilla</i>			◆	◆	◆	◆	◆	◆				
Northern oriole	<i>Icterus bullockii</i>			◆	◆	◆	◆	◆	◆				
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>			◆	◆	◆	◆	◆	◆	◆			
Western tanager	<i>Piranga ludoviciana</i>					◆	◆	◆	◆	◆			
Warbling vireo	<i>Vireo gilvus</i>					◆	◆	◆	◆	◆			
Lazuli bunting	<i>Passerina amoena</i>					◆	◆	◆	◆	◆			
Yellow-rumped warbler	<i>Dendroica coronata</i>					◆	◆	◆	◆	◆			

◆ Use caution

◆ Use extreme caution, or avoid this time period

Eucalyptus Plantations

Blue gum, *Eucalyptus globulus*, was extensively planted in the East Bay Hills. Plantations have spread by seed since the original plantings. Over the years, these plantations have become habitat for some native plants and animals. The *Eucalyptus* longhorn borer has become a threat to the health of living trees in these plantations, creating safety hazards that are costly to remove. Spread of the beetle is to be avoided in management activities. *Eucalyptus camaldulensis*, red gum, was less extensively planted, but large plantations and occasional seedlings may be found in the East Bay Hills. *Eucalyptus* bloom and fruit January–July.

Primary Peak Breeding Seasons and Other Sensitive Periods for Selected Animals Using Tilden Nature Area Eucalyptus Plantations													
Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Ensatina	<i>Ensatina eschscholzi</i>	◆	◆	◆	◆							◆	◆
Slender salamander	<i>Batrachoseps attenuatus</i>	◆	◆	◆	◆	◆						◆	◆
California newt	<i>Taricha torosa</i>	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
California brown bat	<i>Myotis californicus</i>					◆	◆	◆					
Eastern fox squirrel	<i>Sciurus niger (non-native)</i>		◆	◆	◆								
Mule deer	<i>Odocoileus hemionus</i>						◆	◆					
Great horned owl	<i>Bubo virginianus</i>		◆	◆									
Red-tailed hawk	<i>Buteo jamaicensis</i>			◆	◆	◆							
Northern oriole	<i>Icterus galbula</i>				◆	◆	◆	◆	◆				
Sharp-shinned hawk	<i>Accipiter striatus</i>			◆	◆	◆	◆						
Hermit thrush	<i>Catharus guttatus</i>	◆	◆	◆							◆	◆	◆
Anna's hummingbird	<i>Calypte anna</i>	◆	◆										◆
Eucalyptus longhorn borer, (E. livewood boring beetle)	<i>Phoracantha semipunctata</i>			◆	◆	◆	◆	◆	◆	◆	◆		

Cutting Eucalyptus when the longhorn borer is active spreads the pest.

- ◆ Use caution
- ◆ Use extreme caution, or avoid this time period

Pine Plantations

Monterey pine, *Pinus radiata*, is not native to the East Bay Hills but was planted extensively and sprouts easily from seeds that drop on the ground or are moved by birds and other animals. Monterey pine drops needles and branches so that fire danger builds up as the trees age. Pines burn quickly because of their resinous content. Ips beetle causes branches to die off, increasing fire and public safety hazards. Spread of the ips beetle is to be avoided in managing pines. Over the years, these plantations have become habitat for native and non-native animals and plants.

Peak Breeding Seasons and Other Sensitive Periods for Selected Animals Using Tilden Nature Area Pine Plantations													
Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Slender salamander	<i>Batrachoseps attenuatus</i>	◆	◆	◆	◆	◆						◆	◆
Ensatina	<i>Ensatina eschscholtzi</i>	◆	◆	◆	◆							◆	◆
Eastern fox squirrel	<i>Sciurus niger</i>		◆	◆	◆								
Mule deer	<i>Odocoileus hemionus</i>						◆	◆					
Hermit thrush	<i>Catharus guttatus</i>	◆	◆	◆							◆	◆	◆
Hermit warbler	<i>Dendroica occidentalis</i>						◆	◆	◆	◆			
Red-breasted nuthatch	<i>Sitta canadensis</i>				◆	◆	◆	◆	◆				
Brown creeper	<i>Certhia americana</i>				◆	◆	◆	◆	◆	◆			
Yellow-rumped warbler	<i>Dendroica coronata</i>					◆	◆	◆	◆	◆			
Olive-sided flycatcher	<i>Contopus borealis</i>					◆	◆	◆	◆	◆			
Chickadee	<i>Parus rufescens</i>				◆	◆	◆	◆	◆				
Titmouse	<i>Parus inornatus</i>				◆	◆	◆	◆	◆				
Ips beetle (active)	<i>Ips</i> spp.			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Cutting pine when Ips beetle is active spreads the pest.

- ◆ Use caution
- ◆ Use extreme caution, or avoid this time period

Disturbed Places

Many weeds occur wherever there is disturbance. Disturbance can be from natural or human-assisted causes. Erosion, landslides, foot or vehicular traffic, heavy equipment, animal tracks in wet weather, even mowing and hiking can disturb the soil by changing the depth, compaction, and moisture of soils. Plant pests do not fit the natural community categories well, but may invade any of them if the ground is sufficiently altered and a seed source is nearby. If a suite of these plants gain entrance following vegetation management activities, it indicates that the management methods or timing need adjusting. It is important to eradicate such weeds with minimum disturbance of soil or seed heads.

Timing of Management to Reduce Pest Plants of Disturbed Places

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Bur chervil	<i>Anthriscus caucalis</i>				❖	❖	◆	◆	◆				
Wild oats	<i>Avena</i> spp.			❖	❖	◆	◆	◆					
Mustard	<i>Brassica nigra</i>				❖	❖	❖	◆	◆				
Field mustard, turnip	<i>Brassica rapa</i>			❖	❖	❖	◆	◆					
Italian thistle	<i>Carduus pycnocephalus</i>					❖	❖	◆	◆	◆			
Yellow star thistle	<i>Centaurea solstitialis</i>					❖	❖	❖	◆	◆	◆		
Bull thistle	<i>Cirsium vulgare</i>						❖	❖	◆	◆			
Poison hemlock	<i>Conium maculatum</i>				❖	❖	◆	◆					
Pampas grass	<i>Cortaderia jubata</i>			❖	❖	❖	❖	◆	◆	◆	◆		
Artichoke thistle	<i>Cynara cardunculus</i>					❖	❖	◆	◆	◆			
Spiny dog's tail	<i>Cynosaurus echinatus</i>					❖	❖	◆	◆				

- ❖ Management at this time avoids spread of seeds of the plant
- ◆ Use caution, management may spread seed
- ◆ Use extreme caution, or avoid management-seed spread is highly likely

Timing of Management to Reduce Pest Plants of Disturbed Places (continued)

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Fennel	<i>Foeniculum vulgare</i>					❖	❖	❖	❖	◆	◆		
French broom	<i>Genista monspessulana</i>	❖	❖	❖	❖	◆	◆	◆	◆	◆			
Foxtails	<i>Hordeum murinum</i> ssp. <i>leporinum</i>				❖	❖	◆	◆	◆	◆			
Bermuda buttercup, Sour-grass	<i>Oxalis pes-caprae</i>	❖	❖	❖								❖	❖
Bristly ox-tongue	<i>Picris echioides</i>						❖	◆	◆	◆	◆	◆	◆
Plantain	<i>Plantago</i> spp.				❖	❖	❖	◆	◆	◆			
Himalayan blackberry	<i>Rubus discolor</i>			❖	❖	❖	❖	◆	◆	◆			
German ivy	<i>Senecio mikanioides</i>	❖	❖	❖									❖
Milk thistle	<i>Silybum marianum</i>					❖	❖	◆	◆	◆			
"Velcro" seeds	<i>Torilis</i> spp.				❖	❖	◆	◆					
Periwinkle	<i>Vinca major</i>			❖	❖	❖	◆	◆	◆	◆	◆		

- ❖ Management at this time avoids spread of seeds of the plant
- ◆ Use caution, management may spread seed
- ◆ Use extreme caution, or avoid management-seed spread is highly likely

Blooming and Fruiting Periods for Selected Plants in Tilden Nature Area

Native plants (and some non-native plants) are used by sensitive animals for food at certain times of the year. Interfering with such plants during these periods may deprive animals of important food sources.

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Big leaf maple	<i>Acer macrophyllum</i>				◆	◆	◆	◆	◆	◆	◆		
Box elder	<i>Acer negundo californicum</i>				◆	◆	◆	◆	◆	◆	◆		
Buckeye	<i>Aesculus californica</i>					◆	◆	◆	◆	◆			
Alder *	<i>Alnus rhombifolia, A. rubra</i>	◆	◆	◆	◆	◆							
Columbine *	<i>Aquilegia formosa</i>					◆	◆	◆	◆				
Madrone	<i>Arbutus menziesii</i>			◆	◆	◆	◆	◆	◆	◆	◆		
Coyote bush	<i>Baccharis pilularis</i>								◆	◆	◆	◆	◆
Morning glory *	<i>Calystegia purpurata, C. subacaulis</i>			◆	◆	◆	◆						
Soap plant	<i>Chlorogalum pomeridianum</i>					◆	◆	◆					
Miner's lettuce	<i>Claytonia parviflora (Montia perfoliata)</i>		◆	◆	◆	◆							
Dogwood *	<i>Cornus sericea</i>				◆	◆	◆	◆					
Hazelnut	<i>Corylus cornuta californica</i>	◆	◆	◆									

* Avoid damaging these plants at any time.

◆ Use caution

◆ Use extreme caution, or avoid this time period

Blooming and Fruiting Periods for Selected Plants in Tilden Nature Area, continued

Common name	Scientific name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Leatherwood *	<i>Dirca occidentalis</i>		◆	◆	◆								
Douglas iris *	<i>Iris douglasiana</i>			◆	◆	◆							
Twinberry	<i>Lonicera involucrata</i>			◆	◆	◆							
Manroot	<i>Marah fabaceus</i>			◆	◆	◆							
Monkeyflower	<i>Mimulus aurantiacus</i>							◆	◆	◆	◆		
Monkeyflower	<i>Mimulus guttatus</i>			◆	◆	◆	◆	◆					
Coffeeberry	<i>Rhamnus californica</i>					◆	◆	◆					
Flowering currant	<i>Ribes sanguineum glutinosum</i>	◆		◆	◆	◆	◆						
Thimbleberry	<i>Rubus parviflorus</i>			◆	◆	◆	◆	◆					
Wild blackberry	<i>Rubus ursinus, R. discolor</i>			◆	◆	◆	◆	◆	◆				
Willow	<i>Salix lasiolepis, S. lucida lasiandra, S. laevigata, S. scouleriana</i>		◆	◆	◆	◆							
Elderberry	<i>Sambucus mexicana</i>			◆	◆	◆	◆	◆	◆	◆	◆		
Snowberry	<i>Symphoricarpos albus laevigatus, S. mollis</i>					◆	◆	◆	◆				
Trillium *	<i>Trillium chloropetalum, T. ovatum</i>				◆	◆							
California bay	<i>Umbellularia californica</i>	◆	◆	◆							◆	◆	◆

* Avoid damaging these plants at any time.

◆ Use caution

◆ Use extreme caution, or avoid this time period

Plant Illustrations

These plant illustrations are computer-scanned samples of actual plants. The captions give:

- scientific name
- common name
- form — tree, shrub, vine, herb, or grass
- management category
 - Weed = not woody, non-native, aggressive plant or escapee from agriculture
 - Invasive exotic = non-native plant with invasive habits when it has escaped from horticulture
 - Native = grows naturally in the locality
- habitat corresponding to the six descriptions in the preceding section
- plants with similar appearance (to identify which plant to manage)

Facing the illustrations are the authors' notes for the plant illustrated. Please feel free to add your observations.

Plant Illustrations not available in sample document.
Please see web site for information regarding purchase of the Almanac.
www.diablofiresafe.org

Case Studies/Project Histories

This section contains write-ups of sites that have been managed in various ways. Much of the information is historical, reconstructed from other records. Sites are identified so that they may be visited. These studies also serve as a model for keeping a record of actions taken to manage a site. If a record is kept of timing and method, the results of those actions can be evaluated by further observation of the site, and decisions to continue or modify the treatment will be based on evidence rather than vague memories or suppositions.

The form provided may serve as a guide to the sort of record-keeping required to make informed decisions on vegetation management. Writing down what is observed, what actions are taken, the "cue" event or condition that prompted action, then adding information each year will yield a clearer understanding of the effects of our efforts, and add to the body of knowledge regarding how best to control certain weedy pests.

All FBRPD Site photographs were taken by Ed Leong in February, 1999.

LBNL site photographs were taken by Rich McClure and Bill McClung in 1994 and 1998, respectively.

Rifle Range Road



From this perspective, vegetation appears unbroken above the trail clearing. The next photo shows that there is indeed a mowed grassy area below the homes.



Note height reduction below homes and beside the path. Vegetation left at mature height between these breaks provides some, albeit interrupted, habitat.

Case Study: Rifle Range Road, Wildcat Canyon Regional Park

Location: Rifle Range Road at the entrance to Villa Mira Vista, Wildcat Canyon Regional Park

Agency: East Bay Regional Park District

Land Manager: Ed Leong

Description of location, objective: Urban/wildland interface near riparian woodland. Fuel reduction strip near habitation.

Species present: Bracken, coffeeberry, elderberry, nettle, native blackberry, coast live oak, poison oak.

Weedy material included Italian thistle, black mustard, orchard grass, bull thistle, French broom, artichoke thistle, bristly ox tongue, fennel, and poison hemlock.

Goldfinches were present, August, 1997.

ACTION: (Actions 1987-1998)

1992—broom removal, brush cutting by EBCC, March, and brush hog operation. August

1994—brush cutting, March

1996—broom pulling and brush cutting by EBCC, May-June

1997—broom pulling, February

1998—broom pulling by EBCC, January

TIMING: Spring, (April or May); February or March would avoid most bird nesting except hummingbirds.

CUE: broom infestation, need to clear before seed set.

(Desired) **SPECIES PROMOTED:**

PEST SPECIES SET BACK: French broom has been reduced.

PEST SPECIES PROMOTED:

DESIRABLE SPECIES SET BACK:

FAUNAL CONSEQUENCES:

FIRE HAZARD REDUCTION: growth of broom, hemlock and thistle will need to be addressed to maintain lower potential flame lengths.

OTHER OBSERVATIONS:

PRESCRIPTION FOR 1998: Cut or pull broom in early March. Mow herbaceous mid-June through July to reduce seed supply of fennel and poison hemlock.

Terrace Drive



Before management, foreground was covered with brush at least as tall as that in center of photo.



Grass here has been mowed lower than we recommend. Fire safety was achieved at the expense of habitat and encouragement of noxious weeds. Pruning of lower tree branches is sufficient in the grassy area.

Case Study: Terrace Drive, Wildcat Canyon Regional Park

Location: Terrace Drive, Wildcat Canyon Regional Park

Agency: East Bay Regional Park District

Land Manager: Ed Leong

Description of location, objective: End of Terrace Drive in El Cerrito, very near octagonal house. Dry North Coastal Scrub with open grassy areas. Objective is to reduce dry fuels, control broom.

Species present: Coffeeberry, coyote bush, califonia oat grass, mugwort, bluegrass, asters, rushes. Weedy species include broom, bristly ox-tongue, pampas grass, bull thistle, poison hemlock and Mayten (10'x10' patch). *Echium candicans* is spreading.

ACTION: (Actions 1987-1998)

1990—handcutting of brush to begin fuelbreak, October-November

1992—Brush hog-February and August.

1994—prescribed burn, limited success, May

1995—broom pulling, partly by EBCC, March

since 1995, neighbor mows grassy area several times a year.

1996—Broom pulling, March

1997—Mayten pulled

1998—Herbicide applied to mayten and pampas grass, July

TIMING: broom pulling in winter.

CUE: before seed set

(Desired) SPECIES PROMOTED: California oatgrass, mugwort. Coffeeberry is resprouting. In area that has not been repeatedly mowed, other grassland natives such as *Nassella* sp. are found.:

PEST SPECIES SET BACK: broom

PEST SPECIES PROMOTED: late emerging herbaceous—poison hemlock, bull thistle, bristly ox-tongue.

DESIRABLE SPECIES SET BACK: overmowing excludes *Poa*, *Aster*.

FAUNAL CONSEQUENCES: are snakes increasing? Peregrine falcon?

FIRE HAZARD REDUCTION: excellent.

OTHER OBSERVATIONS: neighbor mowing could be less often, timed to hit thistle (early summer) and hemlock (by June).

Memory Trail



A stand of native wildrye is left, other grassy areas have been mowed, deadwood and litter reduced so no ladder effect exists.



Even with leaf litter on the ground, fine fuels have been reduced sufficiently.

Case Study: Memory Trail, Tilden Nature Area off Cañon Drive

Location: Memory Trail, Tilden Nature Area off Canon Drive

Agency: East Bay Regional Park District

Land Manager: Ed Leong

Description of location, objective: Oak woodland with some open and brushy areas, some exotic incursions. Objective is to reduce fire danger while allowing native forest and understory to persist. Remove broom, other invasive exotics.

Species present: Oak woodland, coyote bush, wildrye, poison oak, native blackberry, many understory plants. Invasive exotics are *Euphorbia oblongata*, broom in fairly discrete stands, and eucalyptus.

ACTION: (Actions 1987–1998)

1992—brush clearing, broom pulling and slash removal by EBCC, April–May.

1994—broom pulling, April

1995—brush cutting by EBCC, July

1998—Broom pulled, *Euphorbia* cut by EBCC, January

TIMING: Suggest winter and spring. Possibility of trying a two-year cycle, winter one year, spring the next, or winter and spring every other year. Bird breeding is February–July, migration September–June.

CUE: before broom seed set, by end April.

(Desired) SPECIES PROMOTED: wildrye

PEST SPECIES SET BACK: broom

PEST SPECIES PROMOTED:

DESIRABLE SPECIES SET BACK:

FAUNAL CONSEQUENCES:

FIRE HAZARD REDUCTION: incremental progress, but not yet achieved.

OTHER OBSERVATIONS: spurge is in fairly defined areas and could be wiped out just as it flowers in early spring.

Upper Gwin Canyon



Dead wood is mayten. Once these are removed in the spring, brush will be lower, and less continuous. The green plants beneath the brush are native herbs and shrubs.



Volunteers flagged mayten for a follow-up herbicide treatment by EBRPD staff.

Case Study: Upper Gwin Canyon, Claremont Canyon Regional Preserve

Location: Upper Gwin Canyon, Claremont Canyon Regional Preserve

Agency: East Bay Regional Park District

Land Manager: Ed Leong

Description of location, objective: West-facing slope at the end of Norfolk Road adjacent to three burned-out properties that have not been rebuilt. Fire trail clearing and work on pine and eucalyptus has been the primary action from the 1991 fire until the mayten was identified in 1997.

Species present: *Maytenus boaria*, a landscape tree from Chile. Site also has coast live oak, bay, resprouting madrone, native blackberry, snowberry, elderberry, and understory natives such as *Aster radulinus*, bracken, blue witch, blue wild rye, cow parsnip, bromegrass, sticky monkey flower, phacelia and beeplant. Lower down the slope willows are present. A patch of *Baccharis douglasii* is growing in the slumped area below the gate.

Weed species include bull thistle, hemlock, pines, and *Lactuca* spp. Near the house sites, Kikuyu grass is abundant, but does not seem to be spreading away from the wetter area. Mayten seedlings and root sprouts extend several hundred feet into the canyon. A stand of about 12 trunks of mature mayten are on park property near one of the private lots at the canyon rim. This plant flowers in the spring, seeds ripen in fall, and apparently were stimulated to germinate by the fire.

ACTION: (Actions 1987-1998)

1991—firestorm burned the entire canyon of approximately 60 acres, October, erosion control work included helicopter and hydroseeding, and straw checkdams, November–December.

1992— pines removed at the end of Norfolk Rd.

1993—dead eucalyptus removed below Grizzly Peak Blvd., March–April; coast live oak seedlings planted at the top of the canyon, with drip irrigation, November–December.

1994—new trail construction from Norfolk Road to UC boundary, September–November, preparation work for Carlon 4 herbicide test on eucalyptus below Grizzly Peak Blvd., September–December; herbicide application to eucalyptus, October.

1995—Herbicide application to *Eucalyptus*, February–April.

1996—herbicide application to *Eucalyptus*, September–November.

1997—Action to stop the spread of mayten commenced December 1997 with a work party of EBRPD staff and members of the East Bay Chapter, California Native Plant Society Native Plant Restoration Team removing mayten trunks up to 2" in diameter from approximately a quarter acre. Herbicide application to mayten, December.

1998—Mayten cleared for basal bark herbicide treatment by EBCC, March. Herbicide application to mayten, June, July, August, December; herbicide application to Kikuyu grass, July. Young Monterey pine regeneration cut by EBCC, October.

TIMING: Winter through summer

CUE: when *Mayten* is not in fruit.

(Desired) SPECIES PROMOTED:

PEST SPECIES SET BACK:

PEST SPECIES PROMOTED: Mayten promoted by the timing of the fire, some Monterey pine regeneration.

DESIRABLE SPECIES SET BACK: Few *Eucalyptus* seedlings present.

FAUNAL CONSEQUENCES:

FIRE HAZARD REDUCTION: Not yet at hazardous level, but will need management to delay hazardous condition.

OTHER OBSERVATIONS: Spring cutting, herbicide application, or burning may address mayten invasion.

Roundtop Road Area



Brush and eucalyptus encroaching on native grassland.



Management is for native plant and habitat restoration and to create an area of lower vegetation separating the trees near the homes from a red-gum plantation within the park below the area in the photo.

Case Study: Roundtop Road Area, Sibley Volcanic Regional Preserve

Location: Roundtop Road Area, Sibley Volcanic Regional Preserve

Agency: East Bay Regional Park District

Land Manager: Ed Leong

Description of location, objective: Grassland where eucalyptus was removed in mid 1970s. Maintain as grassland by discouraging scrub, removing eucalyptus resprouts.

ACTION: (Actions 1987–1998)

1990—freeze damaged eucalyptus, December.

1991—removal of freeze-damaged trees, August–October.

1992—Red-gum removal using horse-logger, November–December,

1993—goat grazing on west half of area, June, herbicide application on eucalyptus, July and October, brush hog limited area, August.

1995—herbicide application to eucalyptus, September, brush cutting, September–October.

1996—herbicide applications to eucalyptus, August.

1997—herbicide applications to eucalyptus, August.

1998—herbicide applications to artichoke thistle, August.

TIMING:

CUE:

(Desired) **SPECIES PROMOTED:** Purple and foothill needlegrass, blue wildrye, soaproot, bay.

PEST SPECIES SET BACK:

PEST SPECIES PROMOTED: patches of Italian thistle, some bull thistle.

DESIRABLE SPECIES SET BACK:

FAUNAL CONSEQUENCES:

FIRE HAZARD REDUCTION:

OTHER OBSERVATIONS:

POSSIBLE ACTIONS: Reduce coyote bush, poison oak, eliminate eucalyptus sprouts. Burn old coyote bush in fall? Spot mowing for Italian thistle control in May–June.

Lawrence Berkeley National Laboratory



1994 — Broom stand from above, note height and density of plants.



1998 — After broom removal, native grasses restored.

Case Study: Lawrence Berkeley National Laboratory

Location: Lawrence Berkeley National Laboratory, east of Building 46

Agency & Land Manager: Lawrence Berkeley National Laboratory

Description of location, objective: The project site is a west facing slope (approx. 30-degree slope) and approximately five acres in size. Wood frame buildings are located immediately downslope of the site, a road defines the upper boundary. At the beginning of this project the vegetation was well-established French and Spanish Broom (including apparent hybrids). The Broom was a monocultural stand and the plants typically six to fifteen feet in height. The project was undertaken with two objectives. 1) Reduce risk of fire damage from firebrands distributed to this site by a wildland fire in the general vicinity. Firebrands are generally produced by wildland fires in the East Bay Hills, they can ignite new fires a mile or more in advance of a the primary fire front. Such firebrands would have easily ignited this Broom stand and the resulting fire would have been extremely difficult to control (a fact that was demonstrated at similar sites during the 1991 East Bay Hills fire).

2) Establish control of the invasive Broom.

ACTION: A four-step process has been implemented:

1) In 1995 the Broom plants were hand cut by the California Conservation Corps. The cut plants were stacked in piles. A controlled burn (pile burn) was conducted on the site after all material had dried.

2) The burn site was hydro-seeded with native grass seed before the winter of 1995/96.

3) Broom plants that resprouted, or which grew from the seed stock, were hand pulled annually in 1996-1999.

4) In order to further encourage the native grasses, a selective mow program was initiated in 1999. Annual grasses and thistles are hand mowed before they can produce seed, the native perennial grasses are allowed to produce seed.

TIMING: By early 1999, the Broom has been largely eliminated from this site. Native grasses have grown to comprise approximately 60 percent of the mix, with a number of common Mediterranean grasses and thistles comprising the balance of the mix. Each spring, a field survey is conducted before any emerging Broom seedlings can produce seed (typically in April or May) and all identified Broom plants are hand pulled. It is anticipated that the addition of springtime selective mowing will further encourage the native grasses on this slope. It is also anticipated that future management will include a rotation of prescribed burns, hand mowing and grazing in order to minimize impacts on any particular native species.

CUE: Broom plants have a distinctive yellow flower, they can be identified when they bloom. A transect was established prior to the first selective mow, this transect will be used to record results of future activities and offer new insights into cues regarding native grasses.

(Desired) SPECIES PROMOTED: Most significantly *Elymus glaucus*, *Nassella pulchra*, and *Bromus carinatus*

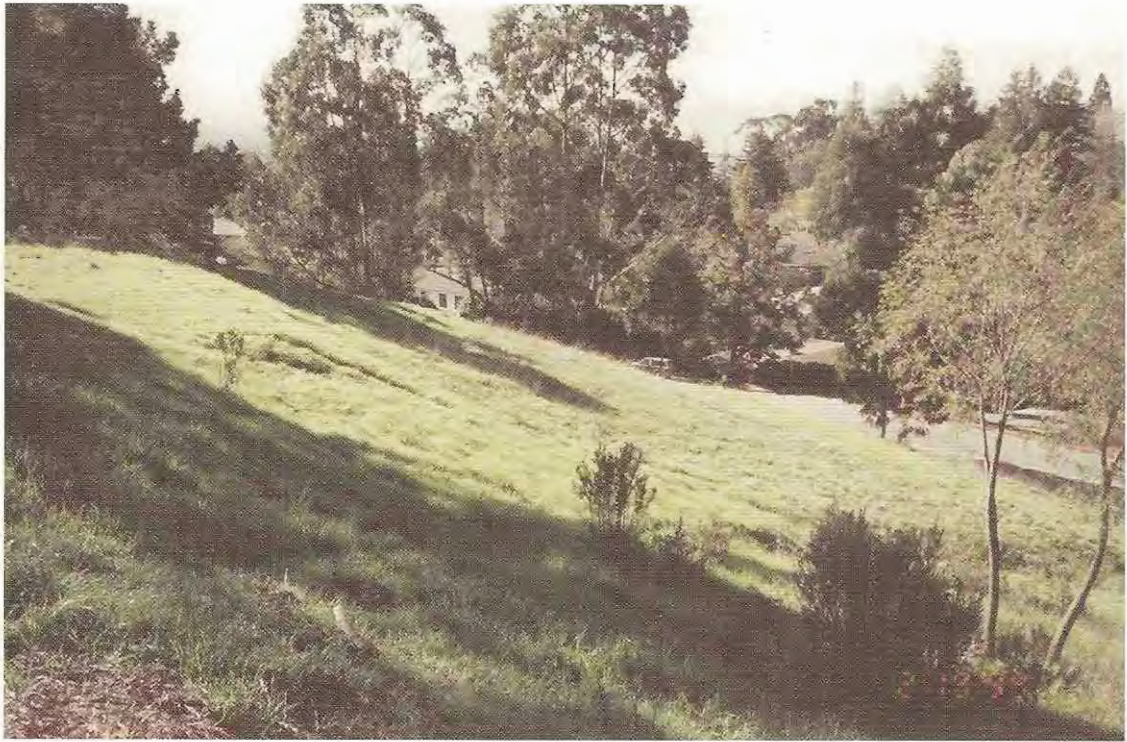
PEST SPECIES SET BACK: *Genista monopessulana* and *Spartium junceum*.

PEST SPECIES PROMOTED: The regional hillside mix is emerging among the native grasses, primary pests are, *Bromus diandrus*, *Lolium*, *Carduus pycnocephalus* and *Cirsium vulgare*.

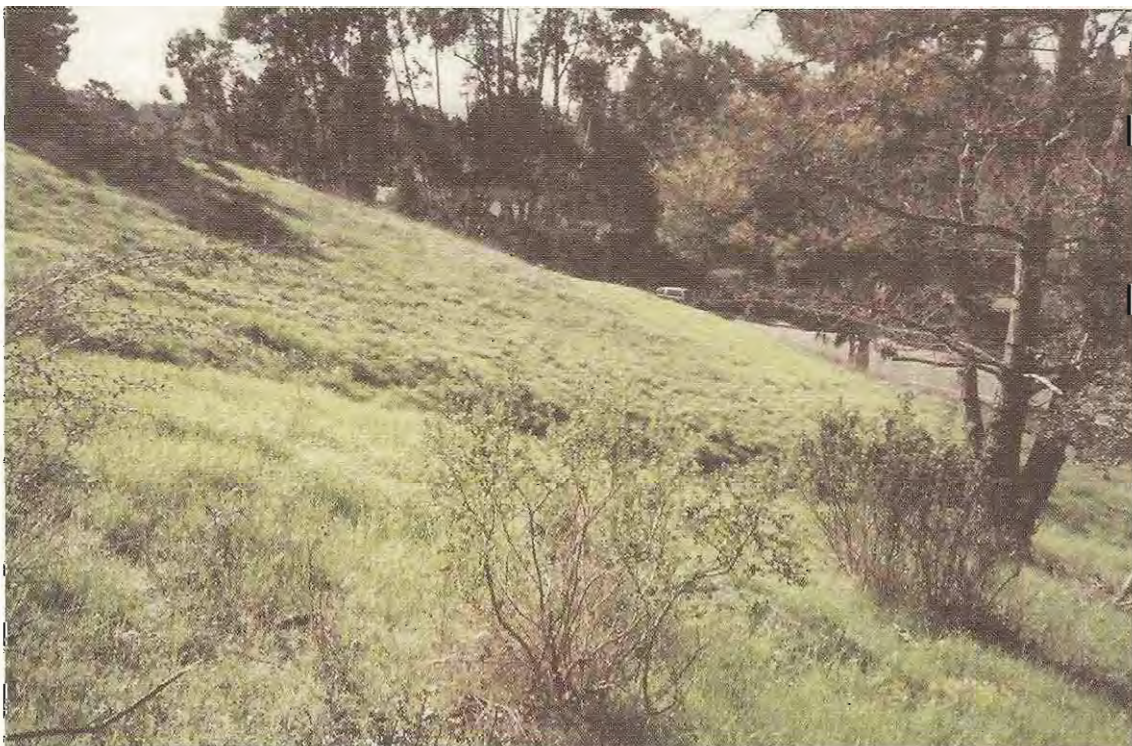
DESIRABLE SPECIES SET BACK AND FAUNAL CONSEQUENCES: None noted.

FIRE HAZARD REDUCTION: The risk of wildland fire spread and of damage to adjacent buildings has been significantly reduced.

Arlington Avenue, Kensington



Looking toward the grassy area selectively mowed the previous summer.



Yampah was left unmowed in order to set and drop seed. The foreground shows unmanaged area with young coyote brush, planted pine, and cotoneaster.

Case Study: Arlington Avenue, Kensington

Location: Arlington Avenue, Kensington, south of Library

Agency: Kensington Community Service District

Land Manager: currently Kensington Police Chief contracts to lowest bidder. Observations by Charl Danielsen as a Kensington resident, without benefit of official records, reconstructed from memory and correspondence files.

Description of location, objective: fire hazard reduction is agency's main focus.

Neglected native grassland on a slope including serpentine outcrops. Native plant species include: *Acaena pinnatifida californica*, Yarrow; *Aster chilensis*, Aster; *Baccharis pilularis*, Coyote brush; *Brodiaea elegans* ssp. *elegans*, Harvest brodiaea; *Calochortus superbus*, Mariposa lily; *Chlorogalum pomeridianum*, Soaproot; *Clarkia* sp., Farewell-to-spring; *Dichelostemma capitatum*, Blue dicks; *Elymus glaucus* ssp. *glaucus*, Blue wildrye; *Eschscholzia californica*, California poppy; *Gnaphalium* spp., Cudweed; *Grindelia hirsutula* var. *hirsutula*, Gumplant; *Hemizonia congesta* var. *luzuifolia*, Tarweed; *Heterotheca sessiliflora* ssp. *bolanderi*, Bolander's golden aster; *Hordeum brachyantherum*, Meadow barley; *Lathyrus vestitus vestitus*, Wild pea; *Lepidium* sp., Peppergrass; *Lotus* sp., Lotus; *Lupinus albifrons* var. *collinus*, Bush lupine; *Lupinus succulentus*, Nassella lepida, Foothill needle grass; *Nassella pulchra*, Purple needle grass; *Plantago erecta*, Serpentine plantain; *Perideridia kelloggii*, Yampah; *Ranunculus californicus*, Buttercup; *Sisyrinchium bellum*, Blue-eyed-grass; *Triphysaria eriantha*, Butter and eggs; *Triteleia laxa*, Ithuriel's spear; and *Wyethia angustifolia*, Narrow-leaf mule's ears. Weeds and introduced species include: *Anagallis arvensis*, Scarlet pimpernel; *Avena barbata*, Wild oats; *Bellardia trixago*, Black mustard; *Bromus diandrus*, Ripgut brome; *Bromus mollis*, Soft chess; *Cortaderia jubata*, Pampas grass; *Cotoneaster* sp., Cotoneaster; *Cynara cardunculus*, Artichoke thistle; *Eucalyptus globulus*, Bluegum eucalyptus; *Erodium* sp., Flaree, Cranesbill; *Foeniculum vulgare*, Fennel; *Genista monspessulana*, French broom; *Hordeum murinum leporinum*, Foxtail; *Lolium multiflorum*, Ryegrass; *Maytenus boarea*, Mayten; *Medicago polymorpha*, Burclover; *Plantago lanceolata*, Common plantain; *Pinus* sp., Pine; *Raphanus sativa*, Radish; *Rumex crispus*, Curly dock; and *Silybum marianum*, Milk thistle. Recently Bermuda buttercup has appeared where mulch and garden wastes were dumped, and narcissis and daffodils have been planted.

ACTION: From 1979 through 1984 the area's periphery was mowed more or less annually, usually after the weeds had dropped their seeds. In 1985 herbicide was sprayed around the periphery and some distance up the swale from the road. There may have been a second herbicide treatment the next year, but mowing continued. One year the mowing was done when the *Triphysaria* (butter and eggs) was in bloom. In 1996 and 1997, the fuel reduction contract was intense goat grazing. In 1997, a patch containing *Triteleia laxa* and *Elymus glaucus* was fenced to exclude the goats. In 1998, the contract went to Shelterbelt Builders, who performed selective mowing of the grassland and pruning of the shrubs and trees. Native Plant Society volunteers removed cotoneaster, weeded by hand, raked pine needles from the serpentine "bald," collected seeds of native grasses, and did supplemental pruning.

TIMING: Timing through 1997 was usually by mid to late June, herbicide was applied in February of 1985; 1998 mowing began in May and work continued into summer.

CUE: Over the years, work was usually cued by issuance of abatement notices. Ideally, the cue for mowing would be when Wild oats and Rippgut are in flower but have not set seed, usually by mid-May. Shrub and tree work could be performed later. Later mowing should be postponed until after the native grasses and wildflower drop seed.

(Desired) SPECIES PROMOTED: *Perideridia kelloggii* has flourished even under goat grazing. It and *Triteleia laxa* were allowed to seed in 1998. *Elymus* and *Nassella* have flourished, also.

PEST SPECIES SET BACK: observation later in spring of 1999 will indicate.

PEST SPECIES PROMOTED: Following goat grazing, very tall wild oats, possibly *Avena fatua*, and artichoke thistle were present, although they had not been observed on the property before. Bermuda buttercup has been introduced but probably due to dumping, not the maintenance regime. Pines have grown, drop needles which have affected the serpentine ecosystem, now covered with weedy grasses.

DESIRABLE SPECIES SET BACK: Serpentine outcrop endemics are disappearing. Butter and eggs disappeared after being mowed during bloom and have not reappeared during grazed years. *Calochortus* is present in fewer numbers than the mid-1970s.

FAUNAL CONSEQUENCES: no observations made to date.

FIRE HAZARD REDUCTION: fire hazard reduction has been adequate with each method of treatment. Pines will create more hazards as they age.

POSSIBLE ACTIONS: Consider removing some of the pines which now shade the serpentine area. Consider removing Pampas grass clump. Consider burning grassland to stimulate germination of latent wildflowers, reduce thatch. Use goats earlier in the growing season (April or May) alternating years with selective mowing. Once wild oats and rippgut brome are less prevalent, mowing could be done later in the year. Observe effects of each treatment in terms of what wildflowers are present each year.

Last recorded, February, 1999

(Please make copies as needed)

Project History

Location: _____

Agency: _____

Land Manager : _____

Description of location, objective:

ACTION: _____

TIMING: _____

CUE: _____

(Desired) SPECIES PROMOTED: _____

PEST SPECIES SET BACK: _____

PEST SPECIES PROMOTED: _____

DESIRABLE SPECIES SET BACK: _____

FAUNAL CONSEQUENCES: _____

FIRE HAZARD REDUCTION: _____

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Project History

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PEST SPECIES PROMOTED: _____

DESIRABLE SPECIES SET BACK: _____

FAUNAL CONSEQUENCES: _____

FIRE HAZARD REDUCTION: _____

Additional Resources

PUBLICATIONS

- Amphion Environmental, Inc., et al. 1995. *Technical Appendices. Fire Hazard Program and Fuel Management Plan for the East Bay Hills*. Oakland Hills Emergency Forum, East Bay Hills Vegetation Management Consortium.
- Beidleman, L., and Kozloff, E.N. *Plants of the San Francisco Bay Region*. Pacific Grove: Sagen Press.
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- Dunn, J. L. and Blom, E. A. 1987. *Field Guide to the Birds of North America*. Second Edition. Washington, D.C.: National Geographic Society.
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- Stebbins, R. C. 1980. *A Field Guide to Western Reptiles and Amphibians*. Second Edition, Revised. The Peterson Field Guide Series. Boston: Houghton Mifflin.
- Stein, S. 1993. *Noah's Garden*. Boston, New York: Houghton Mifflin.

Udvardy, M. D. F. 1977. *The Audubon Society Field Guide to North American Birds. Western Edition.*
New York: Alfred A. Knopf.

University of California Cooperative Extension, rev. 1996. *The Growers Weed Identification Handbook*, Publication 4030.

Whitson, Tom D., ed. 1992. *Weeds of the West*, Newark, California: The Western Society of Weed Science.

LOCAL RESOURCES

- East Bay Regional Parks Botanic Garden: spring plant sale, plant identification and care consultation, lectures. <http://www.ebparks.org>
- University of California Botanical Garden: plant sales, identification and care consultation, book store. <http://www.mip.berkeley.edu/garden/>
- California Native Plant Society, East Bay Chapter: field trips, lectures, fall plant sale, Native Here Nursery in Tilden Park. <http://www.ebcnps.org>
- University and Jepson Herbaria, University of California. <http://ucjeps.berkeley.edu/>
- Museum of Vertebrate Zoology, University of California. <http://www.mip.berkeley.edu/mvz/>
- East Bay Regional Parks naturalists, Environmental Education Center, Tilden Park. <http://www.ebparks.org>

WEB REFERENCES

PEARS/Common and Scientific Names of Weeds (with photos)
<http://axp.ipm.ucdavis.edu/PMG/r603700999.html>

California Exotic Pest Plant Council, links to exotic pest plant control resources
<http://caleppe.org/links/links.html>

California Native Plant Society rare and endangered plant program
<http://cnps.org/rpp/index.html>

Defensible Space landscaping in the Urban/Wildlife Interface
<http://www.prefire.ucfpl.ucop.edu/vegetati.htm>

Weed Science Society of America, includes weed information and photo herbarium
<http://ext.agn.uius.edu/wssa/>

Fire Effects Information System
<http://www.fs.fed.us/database/feis>

Hills Emergency Forum
<http://www.ehs.lbl.gov/hills/main>

APHIS noxious weeds home page, with links
<http://www.aphis.usda.gov/ppq/wees>

Federal Interagency Weed Committee, "Pulling together-National Strategy for Invasive Plant Management"
<http://bluegoose.arw.r9.fws.gov/FICMNEWFiles/NatlWeedStrategy TOC.html>

Noxious Weeds and Exotic and Invasive Plant Management Resources Index
<http://refuges.fws.gov/NWRSFiles/InternetResources/weeds.html>

National Plants Data Base Project
<http://plants.usda.gov/plants/>