

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE #620615 C27 LANDSCAPING

Glenn Jones, Chairman

Mark A. Heath, President, Riparian Specialist and Project Manager

Noah David Booker, Vice President and California Native Plant Specialist

William J. McClung, Wildfire Specialist and Project Manager

3088 Claremont Avenue, Berkeley, California 94705

Telephone 510-841-0911 Fax 510-601-6896

13 February 2006

TO: Mr. John Roberts, John Northmore Roberts & Associates

FROM: Rolland J. Mathers, Field Operations Specialist and Project Manager

COPIES: Mark Heath and William McClung

RE: Recommendations for Open Land Management at Crocker Lake, Hillsborough, CA

Introduction

The aim of the open land management plan presented here is to enhance Crocker Lake Park by creating healthy ecosystems, composed largely of native plants that present a low and manageable fire danger and prevent erosion. A majority of this work involves reducing ecologically destructive (invasive) plants and maintaining native plants. This reduces fuel that would be available to a forest fire while preserving and rehabilitating the integrity of the forest ecosystem. The work will have ecologically restorative effects primarily by yielding habitat from invasive plants back to native plants. This management work can decrease the severity of a wildfire at Crocker Lake, thereby protecting people, homes, and natural and cultural resources. Crocker Lake represents a wonderful opportunity to restore forest habitat through wildfire safety work.

Open Land Management Recommendations

This report is presented to describe land management practices that will be practical in increasing wildfire safety and forest health at Crocker Lake. Additionally, this report suggests

cost estimates and timing for the land management work necessary to bring Crocker Lake to a level where only routine park maintenance, such as grass mowing and tree trimming, are necessary.

Based on observations and discussions during our site visit on January 25, 2006 the potential land management hazards include: heavy fuels, invasive plants, and erosion. Our areas of highest concern represent approximately twenty acres of Crocker Lake. These areas are primarily near homes and service roads which circle the park.

Heavy fuels are also an ecological concern. Invasive shrubs and trees including Bailey acacia (*Acacia baileyana*), French broom (*Genista monspessulana*) are high priority. Their dense growth has crowded into native oak and bay forests. These woody plants have infested stretches of service roads near homes. Service roads with heavy fuels at their sides can slow or prevent emergency response in the event of a wild fire. Homes near heavy fuels are more likely to suffer fire damage. Acting as ladder fuels for wildfire, the acacia and broom have potential to carry fire into the forest canopy. Canopy fires are difficult to extinguish and have far greater potential to cause harm than a fire that burns low-growing vegetation.

Fuel reduction (vegetation management) is highly recommended. Reduction should be focused around service roads and structures. Fuel reduction in the form of cutting and mulching the woody plant material will act four-fold. Cutting the material down brings the fuel to the ground and farther from the mature canopy of the forest. Mulching the material, meaning chipping or chopping the material and leaving it on-site, covers bare soils, reducing erosion and suppressing weed growth. On-site mulching reduces the costs of disposal and future maintenance.

Wood chippers can be used where vehicular access is available. Wood chippers can blow the chips back onto the clearing or the chips can be transported to desired location in a truck. In more remote areas dragging debris to the chipper on the road would slow progress and increase expense. Dragging invasive vegetation through a site can spread unwanted seeds into uninfected areas. Care should also be taken not to compact soils when dragging vegetation repeatedly over the same path. When practical hand crews can pile the debris in three to five foot tall rows then,

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

Rolland J. Mathers

Field Operations Specialist and Project Manager

with chainsaws, chop the debris down into one-foot-tall piles. These rows can be placed on contour to slow erosion. Where appropriate larger trunks can be striped of limbs and left on-site, valued as habitat. Suitable trunks may also be used in trail construction as steps. Wood can be collected as firewood, but should be taken off-site to dry.

Fuel management work must be practiced skillfully with care taken to avoid damaging native plants, steep slopes, and structures. Preserving the native plants and soils of the site will speed rehabilitation. Decadent native vegetation should be selectively thinned and pruned to remove dead wood, preserving natural growth forms. The finished project should resemble the surrounding forest, given time to recover.

Bailey acacia trees form dense thickets by sprouting root suckers. Acacia can also reproduce readily from seed. An individual plant may produce up to 100,000 seeds per year. Acacias produce large amounts of leaf litter which can pose a fire hazard when dry. Acacias compete with native plants for nutrients and water and prevent the germination of native seedlings.

Bailey acacia removal is most effectively accomplished by cutting the tree and applying concentrated herbicide directly to the remaining stump. Without herbicide treatment, the tree will easily sprout from the stump. Chipping the acacia trees and spreading the mulch over the clearings will help prevent acacia seedling germination in the following years. The best time of year to remove Bailey acacia is in the spring. During the spring the acacia are easily recognized by their bright yellow flowers. Cutting the trees before they set seed will also help prevent re-establishment. The trees are also actively growing in the spring, making herbicide treatments more effective.

After initial removal, follow-up maintenance will be necessary to control acacia seedlings. Acacia seedlings can be pulled from the ground or sprayed with herbicide. Acacia clearings should be checked at least twice a year for new seedlings. Follow-up maintenance can take as long as eight years.

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

Rolland J. Mathers

Field Operations Specialist and Project Manager

French broom spreads readily by seed. A single plant can make thousands of viable seed each year. Broom forms dense monocultures that can prevent the growth of native plants. Broom patches are considered ladder fuels.

French broom is effectively removed two ways. Pulling the plant from the ground is very effective in soft soils. Uprooting plants should be avoided on steep slopes. Larger patches and those on steep slope are more effectively treated by cutting the shrub and applying herbicide directly to the stump. French broom debris can be chipped or piled and chopped with a chainsaw. Spring is the best time to remove broom. Its bright yellow flowers alert its presence. Ideally broom is removed before it forms seeds. During the spring the plant is actively growing, making herbicide treatment more effective.

After initial removal, follow-up maintenance will be necessary to control broom seedlings. Broom seeds remain viable for approximately five years. They often grow densely and form a carpet over the site. Broom seedlings can be pulled from the ground in reasonable numbers and sprayed with herbicide or flamed with a propane torch in large populations. Flaming broom is most effective during the first stages of seed germination when the plant has formed its first leaves. Flaming involves applying heat from a specialized propane torch that wilts the plant to death. Flaming is best practiced during the rainy season or in moist areas to reduce the potential for starting a fire. Broom clearings should be checked for new seedlings at least twice a year for a period of five to ten years.

Other invasive plants of concern include, but are not limited to, English ivy (*Hedera helix*), pampas grass (*Cortaderia spp.*), Himalayan blackberry (*Rubus discolor*), cotoneaster (*Cotoneaster spp.*), bamboo (*Bambusa spp.*), periwinkle (*Vinca spp.*), and Harding grass (*Phalaris aquatica*). A majority of these plants are present within fuel reduction zones. These plants should be removed to prevent further encroachment into native habitat. Generally these plants exist within the roadside areas and their removal would go hand-in-hand with fuel reduction. These plants should be treated for removal and control with the most effective means, typically cutting and applying herbicide to the remaining stump.

Shelterbelt Builders INC
An Open Land Management and Restoration Company

Rolland J. Mathers
Field Operations Specialist and Project Manager

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

English ivy and pampas grass are the primary plants of concern. These plants have demonstrated their ability to spread through the park. They are present both in fuel management areas as well as within natural areas of the park. Their populations will continue to grow if they are left unchecked. Their presence has negative ecological effects and should be controlled.

Pampas grass was observed throughout the site, in both low and high elevations. Pampas grass will take over sunny gaps in the forest and prevent the growth of native saplings by robbing nutrients and water. Pampas grass can also invade places with disturbed soils such as flood plains, road cuts, and land slides. Pampas grass populations can easily expand with wind-dispersed seeds. These giant grasses can also pose a fire danger when their leaves dry out.

Pampas grass removal is recommended. Pampas grass is effectively controlled by either digging the plant entirely from the ground or applying herbicide to the foliage. Digging is most effective in sites where the population is not overwhelming. Digging plants from steep slopes is not recommended, because the disturbance may cause soil erosion. Foliar spray should be used on large populations and on steep slopes. Foliar spray will lead to dead leaves which should be cut to the ground and removed if necessary and practical. Spring is the best time of year to remove this plant, prior to seed formation. Moist spring soils make digging out the plant far easier than in dry summer soils. Also spring is a time of active growth which helps the effectiveness of herbicide applications.

Follow-up maintenance should occur at least twice per year. Follow-up may take as long as five years to ensure successful removal. Pampas grass seedling can be pulled from the ground or sprayed with herbicide.

English ivy is primarily located at the lower elevations of the site, particularly near the lake and its tributary. These plants, in their moist habitats, pose little fire danger. They are, however, an ecological nuisance.

English ivy grows to form thick mats that smother vegetation. English ivy has the potential to kill large trees in this way. When on the ground, it acts as a dense ground cover stealing nutrients and water from native plants and preventing seedling germination. Ivy can present a fire danger when it smothers shrubs and trees by creating standing dead wood.

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

Rolland J. Mathers

Field Operations Specialist and Project Manager

English ivy control is recommended. Ivy was most predominant in the tributary to Crocker Lake. Some trees were already being consumed by ivy. Ivy, in this situation, is best treated by severing the stem from the roots. The ivy remaining in the tree will die off without connection to its roots. The stump remaining in the ground should be treated with herbicide to prevent regrowth.

Ivy on the forest floor was patchy and appeared to have been buried with sediment. This ivy is best treated with frequent spot treatments of herbicide combined with hand digging where necessary and practical. Ivy on the forest floor was found growing mixed with native plants like California blackberry (*Rubus ursinus*) and snowberry (*Symphoricarpos albus*). Particular care must be taken not to affect native plants when applying herbicide to English ivy. English ivy can be treated any time of year, but digging is generally easier when the soil is moist. The removal sites will require follow-up maintenance in the form of pulling and spraying three to four times per year for a period of five to ten years.

The forests at Crocker Lake are also comprised of exotic species that are not necessarily invasive to the site. Some conspicuous exotic species that inhabit the site are bound to have historical significance. These include Italian stone pine (*Pinus pinea*), Monterey pine (*Pinus radiata*), blue gum eucalyptus (*Eucalyptus globulus*), Chilean mayten (*Maytenus boaria*), and Canary Island date palm (*Phoenix canariensis*). These species, though not particularly invasive to Crocker Lake, are invasive in other parts of California and should be periodically monitored to prevent a future infestation. Monitoring and controlling these species should be part of an annual maintenance routine.

Following vegetation removal work, some particularly large clearings of broom and acacia would benefit from revegetation planting. Revegetation planting will speed the recovery of the site to native forest or grassland. Native tree species such as coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), toyon (*Heteromeles arbutifolia*), and California buckeye (*Aesculus californica*) can be grown in nursery containers with seed harvested from the site or purchased from wholesale nurseries. Other natives including perennial bunchgrasses and wildflowers can likewise be grown in containers or purchased from nurseries.

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

Rolland J. Mathers

Field Operations Specialist and Project Manager

Other means of revegetation include direct seeding. Direct seeding is typically less expensive than planting. However, plants grown in containers are typically more successful than those that are seeded in. Planting from containers also has a more immediate visual appearance on the site than does seeding. Direct seeding works best given the appropriate conditions. Direct seeding works best on bare soils with appropriate moisture and sun light. Seeding steep slopes can be difficult without appropriate measures taken to prevent the seeds from rolling down the hill. On steep slopes seeds can be applied with hydroseeding (a mixture of seed, mulch and glue material sprayed onto the hill) or by drill seeding (creating small holes filled with seed). Revegetation is best performed during the rainy season. Moist soils help the plants establish in their new surroundings.

Revegetation areas will require some follow-up maintenance. Most successful revegetation plantings receive periodic watering during the first two years of plant establishment. Water can be delivered to the plants via truck and hose. A water source, in the form of residential hose bibb, fire hydrant, or water body, is necessary to fill the watering truck. Alternatively, revegetation areas near water can be watered by hand crews using buckets.

Open Land Management Planning

These recommendations should be acted upon in phases: phase one -- initial reduction of hazardous fuels; phase two -- initial treatments for controlling invasive species; phase three -- follow-up maintenance on initial work; phase four -- routine park maintenance. If necessary, phases one and two can be broken into chunks, where certain areas receive highest priority. Phase three should then subsequently follow each chunk of phases one or two. The project, as a whole, should aim to complete all phases.

Approximately fifteen acres will require treatment in the first phase (hazardous fuel reduction). Shelterbelt has performed jobs similar to this and feels that a budget of at least \$60,000 will be necessary to perform this work. This work may take between one and three

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

Rolland J. Mathers

Field Operations Specialist and Project Manager

months to complete. Completing this work before September will ensure the area is safe for fire season.

The treatment area for phase two (invasive plant control) is approximately five acres. Similar Shelterbelt projects have cost \$15,000. This work could be completed in approximately one month.

Phase three would last at least five years. Phase three would include follow-up maintenance on vegetation management zones and revegetation planting. During the first five years an annual budget of \$20,000 should be available for follow-up maintenance. This phase should begin six months after the initial work of phases one or two.

Revegetation planting should occur as needed as part of phase three; approximately five acres may require revegetation. Revegetation in the fall and winter months is recommended for highest survival. Initial revegetation planting will typically cost \$5-10 per plant depending on container size and nursery pricing. An entire acre could accept between 2,000 and 10,000 plants depending on variable such as spacing of plantings and existing vegetation. Direct seeding can cost between \$2,000 and \$6,000 per acre, depending on variable such as slope, access, and species required.

Additionally, as part of phase three, revegetation watering will be necessary for any plantings from nursery containers. Certain plants, trees particularly, grown from direct seeding will benefit from watering as well. Watering should occur during the first two years. Water should be provided on a routine schedule, with more frequent visits during hot and dry seasons. Watering is not typically necessary during the winter. One year of watering (ten to twelve visits) may cost up to \$10,000 per acre. However, the costs are variable and depend on the conditions of the site.

Phase four would last into perpetuity. This routine maintenance phase would include tasks such as mowing grass and trimming shrubs and trees for safety and aesthetics as well as monitoring the site for potential hazards. Phase four could include special projects as the need arises. Phase four should have an annual budget around \$8,000. An annual special projects budget of \$2000 would benefit the site.

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

Rolland J. Mathers

Field Operations Specialist and Project Manager

Shelterbelt Services

Shelterbelt is a fully licensed contracting company that specializes in open land management and restoration work. Our services include project design and implementation. We have performed projects similar to what is needed at Crocker Lake. Some of our clients include The National Park Service, California State Parks, East Bay Regional Parks, San Mateo County Parks, and The University of California.

Shelterbelt work crews are made up of well-trained staff who are familiar with native plants and sensitive to ecological factors. Our crews work together with supervisors and project managers to ensure the job is done right, the first time. Shelterbelt is well equipped with all the appropriate tools and equipment to perform this work efficiently.

All cost estimates here are approximations and will require more specific evaluations of projects before Shelterbelt can contract to do the work. Actual costs depend highly on site conditions and are more practically accessed on a site-by-site basis. Please consider these recommendations and feel free to contact me with any questions at (510) 841-0911.

Best Regards,

Rolland J. Mathers

Field Operations Specialist and Project Manager

Shelterbelt Builders INC

An Open Land Management and Restoration Company

CALIFORNIA LICENSE # 620615 C27 LANDSCAPING
3088 Claremont Avenue, Berkeley, California 94705

Telephone: 510-841-0911 Fax 510-601-6896

Rolland J. Mathers

Field Operations Specialist and Project Manager