Manual Removal of Cape Ivy at Audubon Canyon Ranch's Bolinas Lagoon Preserve

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Introduction

Cape ivy *(Delairea odorata)*, an invasive vine from South Africa, has invaded many riparian areas of coastal California, and threatens thousands of acres of valuable habitat. This poster presents our 6 year experience in removing Cape ivy (CI) along a coastal creek and floodplain, using volunteer labor and a "modified scorched earth" approach.

The Project – Audubon Canyon Ranch manages a system of nature preserves. Cape ivy appeared in ACR's Bolinas Lagoon Preserve before 1960 and by 1994 had invaded 6 acres in the flood plain of Volunteer Canyon (VC). In 1994 CI was identified as the highest priority invasive plant on the preserve. Encouraged by a successful CI removal pilot project in 1995, we set out to completely remove CI from Volunteer Canyon.

The Site – The creek in Volunteer Canyon drops steeply through a mixed evergreen forest, flattens out as it enters the flood plain, then empties into Bolinas Lagoon. The canyon was logged from 1850 to 1875, supported ranching, farming and residential uses until the 1960s, and since 1968 has been used as an environmental education center and for ACR staff housing. While the preserve supports rich biodiversity and the canyon's slopes have few exotic plants other than non-native grasses, the flood plain is invaded by Cape ivy, *Vinca major*, and other non-indigenous plants listed in Table 1.

Cape Ivy growth – By the mid 1970's the core Cape ivy population had covered 6.5 acres, as shown on the map. A dozen smaller non-contiguous satellite stands of CI were also identified. CI was especially dominant where it was able to drape over fallen bays and alders. Some native plants excluded by CI invasion are listed in Table 2.

Strategies In Cape Ivy Removal

Physical Demarcation – Mark perimeter of all CI growth with PVC stakes.

Pilot project – Assess feasibility of CI removal and refine manual removal techniques.

Mapping – Map area with a topographic survey, showing the extent of the core CI growth, CI satellites and the location of major canyon features and landmarks.

CI Satellites – Remove satellite areas first to lessen further CI dispersal

Perimeter Control –. Establish perimeter control where CI growth is not constrained by existing barriers, beginning "up canyon" and proceeding downstream toward the lagoon.

Sequential Removal – Remove CI from the perimeter inward, toward the canyon's stream, starting upstream and proceeding down the flood plain.

Site Monitoring – Monitor treated areas at 8-12 week intervals to remove CI sprouts.

Weed Control – Monitor "weed succession" and address opportunistic invaders on an *ad hoc* basis, based on the invasive potential of each weed.

Permit Process –Obtain a permit from the California Department of Fish and Game for aspects of the project directly impacting the stream and its banks.

Funding – The project was primarily volunteer-driven. Initial success mobilized additional support by ACR for paid labor, and outside grants were obtained to provide added funds.

Materials And Methods

Modified Scorched Earth Approach – We elected to use a modified scorched earth approach in the hope of preserving native vegetation whenever possible. Most of the work was done by volunteers using simple hand tools. We minimized work in sensitive areas during nesting season for birds (February-June).

Satellite Areas – Fallen branches and logs were moved temporarily. Understory branches were cut when required for access to the CI root zone. Poison oak (*Toxicodendron diversilobium*) stolons often had to be removed completely, as they were interwoven with the CI runners. Proceeding from the perimeter of each area inward, workers teased out the rooted CI stolons from the moist duff. In general the CI could be carefully removed without harming understory shrubs and herbs.

Main CI Site. **–** Large native plants were preserved whenever possible, and efforts were made to spare native understory herbs. Stinging nettle often required complete removal. Some ferns and Juncus sp. posed special problems, as removal of CI from their basal structure proved tedious. Blackberry (*Rubus ursinus*) was pruned back to ground level. We removed large quantities of woody debris, as CI runners invariably rooted under logs and branches. Larger work crews were used for brute force removal of the CI carpets. Aggressive follow-up was attempted within a 6-8 week period.

Perennial Wet Areas provided unique challenges and needed altered techniques. The thick thatch around sedges had to be raked away. Workers sometimes needed boots and heavy rakes. In many areas *Vinca major* proved more invasive than the CI, and more troublesome to remove. Paid crews were used as the budget allowed.

Goat Herbivory was employed on a trial basis in a .6 acre area of native blackberries and willow that had been invaded by CI and Vinca. A herd of 60 small female goats were confined in the area for a one week period.

CI Disposal was accomplished on site for the initial 5 years. We used tarps and located the waste piles in the sun whenever possible. Desiccation and decomposition of CI biomass occurred most efficiently when the CI was separated from other material such as the blackberry and nettle, which were either left on site or composted separately. Since woody slash piles were inevitably invaded by residual CI, woody debris was piled separately and later chipped and mulched.

Results

Clearing Cape ivy – Detailed weekly logs were kept. We cleared about 5 acres of Cape Ivy during the 5 year period 1997-2001, or 1 acre per year. This was accomplished utilizing 2375 volunteer hours (Table 3), an average of only 9 hours per week, plus a lesser amount of paid crew labor. Since pulling CI involves prolonged bending at the waist, we found that physical problems were minimized by limiting a worker to 5 hours in a day, and 2 days in a week.

Return of the natives –In forest understory with a thick duff layer the CI was easily removed, even by second grade school children. Within months the duff was covered by natives (Table 2). In more moist upstream areas removal of the draped CI carpet left broad expanses of bare soil and duff, soon re-populated with native flora. Work in the marsh was slower, but the re-growth of natives even more impressive, so much so that monitoring efforts for CI sprouts were impeded. The more open sunny areas experienced substantial invasion by weeds, including poison hemlock (*Conium maculatum*) and a variety of non-native grasses. We have recently locally native planted trees and shrubs in the sunny areas to provide more cover for the stream and to shade out the exotics.

Local fauna – Personal observations suggest that mule deer abundance has remained stable or increased. Loss of cover (they loved to hang out under the draped CI) seems more than compensated for by increased foraging opportunities. The winter wrens (*Troglodytes troglodytes*), song sparrows (*Melospiza melodia*), and other birds tolerated the disruptions with equanimity, as the area disturbed in any given year is a small percentage of the locally available nesting sites. These results agree with those of recent studies conducted by the Point Reyes Bird Observatory on nearby CI removal projects[1],[2].

Weed management – Other exotic plants that are pulled in the course of searching and removing the CI re-sprouts are listed in Table 1. Many of these species also colonized habitat disturbed during CI removal, and so time spent each year managing other exotics increased roughly in proportion to the total area cleared to date (Table 3).

Goats succeeded in devouring all visible CI, blackberry and Vinca, leaving the blackberry canes behind, as well as CI and Vinca stolons. The area was subsequently cleared to ground level and the residual CI and Vinca removed with the usual manual methods. 6 vigorous yellow starthistle (*Centaurea solstitialis*) plants that appeared in this area were probably brought in accidentally by the goats.

Current Status – Approximately 5 acres of the 6.5 acre site have been subject to "primary clearing" of CI. 4 of those 5 acres are now largely CI free, although biannual monitoring is still required. The most recently cleared acre still requires intensive follow-up. The pace of work (area cleared per month) has slowed, due to more difficult conditions (boggy substrate/dense undergrowth) and the presence of a vigorous *Vinca major* invasion. We anticipate the likely need for herbicide to help eradicate the Vinca.

[1] S.E.Scroggin et.al., "Assessment of Songbird Response To Cape-Ivy Removal In The Redwood Creek Watershed", PRBO Report to the GGNRA (unpublished), March 2000

[2] T.Gardali et.al, "Songbird Monitoring in the Golden Gate National Recreation Area: A Multi-faceted Tool For Guiding the Restoration of Redwood Creek", Park Science, 21:1, Fall/Winter 2001.

Summary & Conclusions

We have finished the fifth year of work removing Cape ivy from a coastal riparian area in central California. The manual methods employed have brought qualified success, although it is clear that full restoration of the area will take at least an additional 5 years. Ongoing work will also be needed to protect cleared areas from recolonization; this preventative work benefits from Cape ivy eradication projects currently underway on neighboring Park Service lands, and will be vastly simplified if successful biocontrol agents are developed.

One person can do it! Cape ivy invasions of moderate size (less than 10 acres) can be successfully removed by a *single dedicated volunteer working part time*, with a modicum of support from the managing organization, and a little help from his or her friends.

Long term commitment is essential. We cleared about **1 acre per year** using dedicated part-time volunteers. In addition, we estimate follow-up efforts increase proportionally to the size of the area cleared, adding perhaps one year to the project for each acre cleared.

"Modified Scorched Earth" policy works, depending on local conditions. Such an approach may be more palatable than complete vegetation removal at sites heavily used by the public, and may have less impact on resident wildlife.

Habitat Restoration. In many cases **CI removal will be only the first step** in a successful habitat restoration. Land managers undertaking such efforts must consider the need for managing opportunistic weeds that will no doubt invade the disturbed site.

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Table 1: Partial List of non-native plants invasive in Volunteer Canyon.

Species	Common Name	Comment
Carduus pycnocephalus	Italian thistle	Prolific seed production. Prefers dry substrate.
Centaurea solstitialis	yellow starthistle	Recently detected. Highest removal priority.
Cirsium vulgare	bull thistle	Blooms in summer, occupies moist areas.
Conium maculatum	poison hemlock	Rapid invasion of disturbed areas. Prolific.
Crocosmia x crocosmiflora	crocosmia, montebretia	Moist areas. Easily removed, but persistent.
Delairea odorata	Cape ivy	Vegetative propagation. Prefers moist areas.
Digitalis purpurea	foxglove	Potentially prolific along the creek.
Dipsacus sativus	Fuller's teasel	Occupies sites with dry substrates.
Erechitites glomerata	Australian fireweed	Prolific seed production.
Foeniculum vulgare	fennel	Dryer substrates. Deer help to control.
Genista monspessulana	French broom	Potential problem, present only at periphery,
Holcus lanatus	velvet grass	Most worrisome of invasive grasses in VC.
Myosotis latifolia	forget-me-not	Prolific in shady areas
Rubus discolor	Himalayan blackberry	Minimal to date. Potentially problematic
Solanum nigrum	black nightshade	Appears after disturbance, and persistent.
Vinca major	greater periwinkle	Invasive in moist areas. Difficult to remove.
Zantedeschia aethiopica	calla lilly	Boggy areas. Manual removal likely to fail.

Table 2: Partial list of native plants impacted by Cape ivy in Volunteer Canyon. Asterisk (*) indicates species actively being reintroduced in treated areas.

Species	Common Name	Species Response to Cape ivy
Acer macrophyllum	*big-leaf maple	Seedlings greatly reduced to absent
Alnus rubra	*red alder, Oregon alder	Seedlings reduced.
Aralia californica	*elk clover	Reduced, but able to penetrate CI
Athryium filix-femina	common lady fern	Reduced, but able to penetrate CI
Carex sp.	sedges	Reduced, but able to compete
Corylus cornuta	California hazel	Seedlings possibly reduced
Heracleum lanatum	cow parsnip	Greatly reduced by CI carpet
Juncus sp.	rushes	Compete effectively, but reduced
Mimulus spp.	monkey flowers	Greatly reduced
Polystichum munitum	western swordfern	Reduced, but competes
Rhamnus californica	*coffeeberry	Seedlings greatly reduced, adults stunted
Ribes sanguineum	flowering currant	Greatly reduced. Also browsed by deer.
Rubus parviflorus	thimbleberry	Reduced. Also browsed by deer.
Rubus ursinus	*California blackberry	Reduced. Thickets shaded out and killed.
Salix spp.	*willows	Seedlings reduced.
Sambucus callicarpa	*red elderberry	Reduced. Browsed by deer.
Sequoia sempervirens	*coast redwood	Seedlings reduced.
Stachys chamissonis	coast hedge nettle	Greatly reduced. Dramatic recovery later
Toxicodendron diversilobium	poison oak	Reduced. Covered and shaded by CI
Umbellularia californica	California bay laurel	Seedlings reduced
Urtica dioica	stinging nettle	Moderately reduced

Table 3: Summary of work hours for the Cape ivy Project in Volunteer Canyon. Includes hours for propagation and planting of trees and shrubs, plus biomass removal from sites.

Year	Total Hours	Volunteer Hours	Paid Labor	Cape Ivy Removal	Other Weeds & Misc.
1997	250	250	-0-	200	50
1998	730	600	130	580	150
1999	800	450	350	600	200
2000	475	475	-0-	225	250
2001	1000	600	400	330	670*
Totals	3255	2375	880	1935	1320