BIOLOGY AND CONTROL OF GERMAN IVY

David H. Chipping
Physics Dept. California Polytechnic State University
San Luis Obispo

German Ivy was introduced to the United States from South Africa as an ornamental plant. The plant was well established as an escaped exotic plant thirty to forty years ago. It is generally known in California as Senecio mikanoides Otto, although in Australia it has been called Delairea odorata Lemaire. It is likely that Delairea will become the accepted name. Common names include Cape Ivy and Ivy Groundsel.

The plant is generating an ecological crisis in California through almost total displacement of other plants. This is achieved mainly by smothering competitors and cutting off light, but also through stem breakage of shrubs and vines generated by the biomass of the German Ivy. It appears to have no natural enemies, and is not grazed animals due to the presence of alkaloids. Migrating Monarch butterflies feed on the nectar in order to utilize the alkaloids as a body defense.

The plant is a self climbing, perennial of the Asteraceae Family. The inflorescence is yellow, lacks ray flowers and blooms in the late fall and winter. The flowers are strongly scented. The leaves are ivy-like, being palmately 5-9 lobed, glabrous, and luxuriantly green.

The plant appears to have increased its range in three phases. The plant first appeared in central California within relatively frost-free, coastal riparian corridors, mainly where the water table was high and there was a shady overstory. The plant is described in the early 1960's from scattered coastal watersheds of central California, and in some of the cooler inland valleys of the Coast Range. This is still the most abundant habitat, where it has completely replaced the understory of many coastal streams. In the second phase it has been seen to expand its range into non riparian habitats. These include Monterey Pine forests at Cambria and Monterey, eucalyptus plantations such as the Presidio in San Francisco and other areas that offer some shade and are usually within the coastal summer fog belt. It has become a serious threat to the redwood ecosystems of the Big Sur Coast, such as Julia Pfeiffer State Park. The third phase is just now beginning to be reported, in which the plant occupies extensive areas on unshaded slopes, and even sunny, exposed sunny slopes close to the coast. It has been seen occupying coastal dunes at Ragged Point, in northern San Luis Obispo County and at San Simeon State Park. In Morro Bay State Park it grows into the margins of coastal salt marsh.

Until recently it was though that the plant did not set viable seeds in California, and that the remarkable rates of occupation were achieved vegetatively. Many sites in Central California appear to be associated with road work or vehicles, with the plant presumably being carried on dirty equipment. The plant starts from a small, rooting fragment which sends lateral rhizomes distances of up to 3 meters. Multiple stems grow from the root mass, extending as vines across the ground surface. The vines lack tendrils, but will wrap around any hanging object and climb any available surface such as the bole of a tree, shrubs, wires etc., but they do not establish any adhesive attachments such as English Ivy. The vines crossing the ground can develop roots at any of the leaf nodes, which are commonly 10-15 centimeters apart. Each rooting can become a separate plant clone, and the original vine can either continue to act as a connector between plants or can be established as part of the root system for the new clone. In areas where the lower canopy is covered by German Ivy or other plants, the vines may extend very rapidly but without leaves, running for several meters in darkness below the canopy before breaking through to

the light and leafing. In this manner a plant surrounded by shaded ground unsuitable for clone development can extend its influence beyond the shade. In areas where the plant roots can easily be removed for examination, as in the humus of an oak woodland, the rooting masses are very dense, and will develop a mat below the population. There is little quantitative data on the growth rate of individual plants, although rates of at least 30 centimeters a month is recorded for a dry year by Steven Hillis in the San Francisco area. Rates of 1 meter per month were measured in a high water table area of Los Osos by David Chipping.

If the plant is broken up by mechanical disturbance, the fragments may easily reroot. Carla Brossard had 100% success in rooting fragments of green stem 1.5 inches long, and 50% success in rooting more woody stem materials. These developed from 10-42 leaves in seven week, although conditions were cold. Steven Hillis reports that fragments remain viable for at least 6 weeks.

Recent observations and tests suggest that viable seed is produced. Seed viability of 6% was seen in Oakwood Valley by Jennifer O'Connell and Dr. Carla Brossard at St.Mary's College, although seed from other sites was not viable. It has been suggested that climbing may be a strategy to maximize seed dispersal, as flowering is sometimes confined to the parts of stems that have climbed well above the ground surface. On plants confined to ground level or to covering low shrubs, flowering appears to be dominantly on the outer edge of the patch.

The genetic variability of German Ivy is currently being studied by Eva Grotkopp at Golden Gate National Recreation Area, where severe infestations are present. Observation of the morphology of the plant by David Chipping suggests that populations are genetically very similar, but that there can be a small range of leaf size and shape within a single complex of clones.

German Ivy control can be divided into mechanical, chemical, and biological methods. Mechanical methods are not likely to work if the full root network is not accessible. If roots are entwined with those of other plants, they cannot be removed, and root masses will quickly resprout. Mechanical removal has been successful in Los Osos, where the plant occupied bare, leaf mulch floor of a Coast Live Oak forest where the roots could be pulled out. An initial weed pull and clearance had to be followed up in a couple of months by a repull of the now leafy remaining root masses, and this in turn needed to be followed by a third revisit to the site. It is possible that some fragments may remain dormant in the soil for several months, and will only become obvious after a rain.

At two mechanical removal experiments which cleared a site in Morro Bay State Park down to the bare ground, lack of followup resulted in a complete reoccupation of the site within a year at a greater than original density. Thus mechanical removal should be only attempted when all of the roots can be accessed and where several revisits can be guaranteed.

Most removal experiments use herbicides. Nelroy Jackson has applied Roundup and other Monsanto chemicals in an ongoing experiment in Morro Bay State Park in a eucalyptus forest. Carri Benefield has experimented with mixtures of Glyphosate, Triclopyr and surfactants in a eucalyptus forest at the San Francisco Presidio. Woody Elliot has used a mix of Garlon and Roundup at San Simeon State Park. Nearly all report that, although spraying effectiveness can appear 100% successful in the first few weeks, resprouts may occur within a few months. Herbicides are translocated to the nearest root nodes, but may only kill one side of the root mass and does not necessarily move into the adjacent stem segment in sufficient quantities to kill the plant. A single pass with herbicide over a multilayer ground canopy of German Ivy cannot hope to contact all stem segments. It is

almost impossible to avoid killing any other species intermixed with the German Ivy. Greater success might be achieved through a preliminary mechanical clearance of the site, eliminating much of the biomass, and then spraying the resprouting root nodes. Benefield found that weed-whipping prior to spraying increased the efficiency of the herbicide, cut this should be used with caution as most of the weed whipped plant fragments have the potential to reroot. It appears that, if the areas to be treated are sizable and labor is in short supply or expensive, a 'scorched earth' policy will have to be applied to infected areas, as there will be little opportunity to save non-target plants.

Biological controls on German Ivy have not been attempted. As the plant contains alkaloids, it is unlikely that grazing could be used as a management tool. Although small leaves appear on the leaves, there has been no significant predation by insects that offer hope of a native biological control. Several populations died back for unknown reasons during a frosty period at Morro Bay, but they all rebounded.

The prognosis for German Ivy is depressing. Control is expensive, requiring several site visits and manipulation of large masses of vegetation. 'Scorched earth' control is also destructive of the original plant populations, and likely to be resisted by land managers. The potential range for the plant is immense. Populations can survive frost, and thus occupation of the Sacramento- San Joachin Delta and the low elevation foothills of the Central Valley is possible. It is also likely that it will be able to survive in the coastal redwood forests on the North Coast. The newly appeared ability for the plant to occupy open coastal sage scrub communities suggest that it could become a major element within a few decades.

An as-yet poorly comprehended impact of German Ivy infestations along rivers is the loss of hydraulic cross section generated by the masses of the plant and the trees downed by the mass of the plant.

Much of the above information is unpublished, and was provided by members of the German Ivy Working Group of the California Exotic Pest Plant Council and by members of the California Plant Society.