Invasive plants are a distinct group of weeds that occur in natural habitats. The purpose of this Pest Notes is to clarify how invasive plants differ from common garden and agricultural weeds, to describe the occurrence and impact of invasives in California, to discuss how invasives can be spread through sales or movement of ornamental plants, and to identify approaches for managing invasive plants.

DEFINITIONS AND CLASSIFICATION

In most cases we think of weeds as native and non-native plants that impact crop production, either in commercial settings or in home fruit and vegetable gardens. Weeds may cause health problems in livestock, pets, and humans and are aesthetically unpleasing in turf and urban landscapes.

In contrast, invasive plants are generally non-natives that infest natural ecosystems, including wildlands, rangelands, and pastures. Table 1 shows the differences between agricultural or garden weeds and invasive plants.

The important biological difference between invasive plants and garden or agricultural weeds is the ability of invasive plants to disperse, establish, and spread without human assistance or disturbance. Because of this, they are much more problematic in natural environments than are typical weeds.

Naturalized and Invasive Defined

“Invasive” and “naturalized” are terms used frequently in reference for both non-native plants in wildland areas and garden plants. The term “naturalized” is used to describe a non-native plant that is capable of surviving and reproducing without human intervention for an indefinite period. Naturalized plants that do not spread away from where they were introduced and are not generally a significant problem either in a garden or in a natural habitat. However, naturalized

| Table 1. Difference between designation of a plant as a general weed or an invasive. |
|-----------------|-----------------|
| **Introduction** | Usually accidental by people, animals, equipment, or seed contamination. |
| Disturbance | Require human disturbance to establish and persist. |
| Persistence | Will not persist without human disturbance, usually soil tillage, fertilization, or irrigation. |
| Life form | Primarily terrestrial annuals or herbaceous perennial species. |

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species that do spread and survive in new areas are called invasive plants.

Invasive plants often cause ecological disruption to natural ecosystems, but the severity of the impact varies considerably based upon the plant species and the area being invaded. The worst invasive species, such as saltcedar, *Tamarix ramosissima*, (Figure 1) and yellow starthistle, *Centaurea solstitialis*, (Figure 2), have caused substantial changes to the character, condition, form, and nature of the invaded habitat. In scientific literature, these species are sometimes referred to as landscape transformers.

**Noxious Defined**

“Noxious” is a legal term used by regulatory agencies, such as the California Department of Food and Agriculture (CDFA) and the U. S. Department of Agriculture Animal Plant Health Inspection Service (USDA-APHIS). To be considered noxious, a plant has to be listed on a noxious weed list maintained by one or both of these agencies. Listing is typically based upon the threat of this weed to agriculture or non-crop areas and allows these agencies, along with the county agricultural commissioner, to ban, quarantine, or eradicate these plants. In California, CDFA has more recently listed invasive plants based on their threat to or impact on wildlands.

### INVASIVE PLANTS OF CALIFORNIA

California boasts the greatest natural botanical diversity of any state in the United States, with nearly 5,000 native plant species. In addition to native species, there are about 1,500 non-native species that have become established in the state. About 250 to 300 of these are weeds of agricultural crops, turf, or gardens. The remaining 1,200 or so are naturalized plants of wildlands or disturbed non-crop areas, some of which are important invasive plants.

The California Invasive Plant Council (Cal-IPC), a nonprofit organization, has produced a useful inventory of invasive plants. Using a process based upon 13 criteria or questions, they have listed about 215 species as threats to California’s wildlands (see www.cal-ipc.org). These 13 criteria fall into three groups:

- Ecological impact
- Invasive potential
- Current distribution

This list does not have legal standing but is based upon the best available published literature and knowledge of invasive plant experts from California. It is a good guide to the invasive plants that can cause the greatest amount of damage to the environment and provides a wealth of background information on each plant on the list.

The list notes the types of ecosystems invaded, the regions of the state invaded, and a general ranking (High, Moderate, or Limited) of the plants according to their statewide ecological impact. This ranking is a useful guide to the overall severity of a species, but it does not mean that a plant listed as “Limited” is not a significant problem in only one area of the state, or that a “High” ranking means the plant is present everywhere in California. Within the inventory, there are currently 42 plants listed as highly invasive, 93 as moderately invasive, and 80 as limited invasiveness. Of these invasive plants, the majority are biennial or perennials (46%), winter annuals (25%), or woody plants (22%) (Figure 3).

**Impacts**

Invasive plants can cause significant economic and ecological damage in natural areas. From an economic standpoint, invasive species can reduce livestock forage quality and quantity, jeopardize animal and human health, increase the threat of fire or flooding, interfere with recreational activities, or lower land value. In addition, aquatic weeds can also impact the movement and navigation of private and commercial vessels, block irrigation systems, and impede livestock access to water.

**Ecological Change**. Invasive plants can cause dramatic ecological changes that impact both plant and...
animal communities. This is often due to landscape transformations that reduce the adaptability and competitiveness of more desired native species. Such transformations can be caused by the excessive use of resources by invasive plants.

These include an increased ability to capture light, consume water or nutrients, or deplete gases (oxygen and carbon dioxide) in aquatic systems. For example, a 10,000-acre infestation of giant reed, *Arundo donax*, on the Santa Ana River in Orange County is estimated to use 57,000 acre feet more water per year than native vegetation.

- Invasive plants can transform environments in many ways:
  - Changing the soil fertility of the ecosystem.
  - Promoting a shorter (or in some cases longer) interval between fires that is not conducive to the survival of native species.
  - Stabilizing sand dunes in areas adapted to constant fluxes.
  - Promoting soil erosion by increasing water runoff down slopes.
  - Colonizing intertidal mudflats used for shorebird feeding grounds.
  - Accumulating leaf litter that acts as a suppressive mulch, which prevents the establishment of more desirable species.
  - Creating a saline environment as roots absorb salts from deep in the soil and redistribute them from the foliage to the soil surface.

These mechanisms create a more suitable environment for invasive species, at the expense of native plants, leading to a reduction in desirable plant diversity. Such impacts change the biological structure and relationships with other organisms in an area.

For example, insects are often the source of nutrition for birds and reptiles. Many native insects are able to feed only on specific native plant species. If their preferred plants are crowded out by invasive plants, insect numbers can be dramatically reduced by the lack of sufficient food. This can subsequently cause a decrease in the animals that feed on them.

It has been reported that sections of rivers heavily infested with giant reed plants are nearly devoid of songbirds due to a lack of food. Often native birds do not nest in the branching pattern that is characteristic of many invasive plants.

In addition, dense stands of invading saltcedar near desert rivers and oases cause another situation with unforeseen consequences, creating ideal cover for large carnivores such as cougars and coyotes. This makes it very risky for deer, bighorn sheep, and other prey animals to approach these water sources.

California has limited and diminishing untouched natural habitats, especially in regions of the state highly populated by humans. Infestations of invasive plants severely degrade the value of these sensitive sites.

Many of these remaining natural areas are home to plants and animals listed as “Threatened and Endangered” by the U.S. Fish and Wildlife Service or the California Department of Fish and Wildlife. The U.S. Fish and Wildlife Service reports that more than 400 of the over 1,300 species currently protected under the Endangered Species Act are considered to be at risk at least partly due to displacement by, competition with, and predation by invasive species, including plants.

**Invasive Plants Originating from the Horticultural Industry**

Of the species listed on the California Invasive Plant Council Inventory, about 37% were accidentally introduced to the state as contaminants of seed, clothing, equipment, vehicles, soil, ballast, animals, or packing materials (Figure 4). The remaining 63%, however, were intentionally introduced as landscape, pond or indoor
ornamentals, aquarium plants, soil stabilization species, animal forage species, or human food, fiber, or medicinal plants.

Almost 80% of these intentionally introduced plant species came through the nursery industry as ornamental landscape species. Twenty-nine of these plants are listed on the California Department of Food and Agriculture noxious weed list, allowing them to be regulated by this agency and the local agricultural commissioner. The rest of the invasive plants that came from nursery introductions can still be imported and traded in California without restriction.

Between 2011 and 2016, UC Master Gardener volunteers visited between 223 and 265 nurseries in 35 to 38 California counties to conduct a

Figure 4. Origin of invasive plants introduced into California.

Table 2. Results of University of California Master Gardener survey of invasive plants for sale in California nurseries. Hyphens indicate that plant was not (or is no longer) surveyed.

<table>
<thead>
<tr>
<th>Common name</th>
<th>Species</th>
<th>Percent of nurseries where plant was for sale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species rarely or no longer sold in California nurseries</td>
<td>Retama monosperma</td>
<td>0</td>
</tr>
<tr>
<td>Capeweed</td>
<td>Arctotheca calendula</td>
<td>0</td>
</tr>
<tr>
<td>Crystalline iceplant</td>
<td>Mesembryanthemum crystallinum</td>
<td>0</td>
</tr>
<tr>
<td>French broom</td>
<td>Genista monspessulana</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Giant reed</td>
<td>Arundo donax</td>
<td>0</td>
</tr>
<tr>
<td>Jubatagrass</td>
<td>Cortaderia jubata</td>
<td>0</td>
</tr>
<tr>
<td>Myoporum</td>
<td>Myoporum laetum</td>
<td>1</td>
</tr>
<tr>
<td>Portuguese broom</td>
<td>Cytisus scoparius</td>
<td>0</td>
</tr>
<tr>
<td>Red sesbania</td>
<td>Sesbania punicea</td>
<td>0</td>
</tr>
<tr>
<td>Russian-olive</td>
<td>Elaeagnus angustifolia</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Saltcedar</td>
<td>Tamarix spp.</td>
<td>0</td>
</tr>
<tr>
<td>Spanish broom</td>
<td>Spartium junceum</td>
<td>1</td>
</tr>
<tr>
<td>Tasmanian blue gum</td>
<td>Eucalyptus globulus</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Species declining or removed from sale or new to survey

<table>
<thead>
<tr>
<th>Common name</th>
<th>Species</th>
<th>Percent of nurseries where plant was for sale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big periwinkle</td>
<td>Vinca major</td>
<td>16</td>
</tr>
<tr>
<td>Chinese tallowtree</td>
<td>Triadica sebifera (=Sapio sebifera)</td>
<td>2</td>
</tr>
<tr>
<td>Green fountaingrass</td>
<td>Pennisetum setaceum</td>
<td>8</td>
</tr>
<tr>
<td>Hottentot fig, highway iceplant</td>
<td>Carpobrotus edulis</td>
<td>3</td>
</tr>
<tr>
<td>Mexican feathergrass</td>
<td>Nassella tenuissima (=Stipa tenuissima)</td>
<td>-</td>
</tr>
<tr>
<td>Pampasgrass</td>
<td>Cortaderia selloana</td>
<td>9</td>
</tr>
<tr>
<td>Scotch broom</td>
<td>Cytisus scoparius</td>
<td>2</td>
</tr>
<tr>
<td>Water hyacinth</td>
<td>Eichhornia crassipes</td>
<td>-</td>
</tr>
</tbody>
</table>

Photos of these plants are available in the online version of this publication at ucanr.edu/PMG/menu.weeds.html.
survey of the retail availability of a selection of landscape ornamentals that are also described as invasive species (Table 2). The results indicate that a few invasive species are available in the majority of garden centers and other retail outlets, some are readily available, and some are uncommon.

In addition, many invasive species that are widespread in California and were introduced through the nursery industry are no longer being sold or are rarely for sale. This includes bridal broom, capeweed, crystalline iceplant, giant reed, jubatagras, myoporum, red sesbania, Russian-olive, saltcedar, Tasmanian blue gum, and bridal, French, Portuguese, and Spanish broom.

Most encouraging is that the sales of many invasive plants, such as big periwinkle (Figure 5), Chinese tallowtree, green fountaingrass, and Scotch broom have begun to decrease over the period of these surveys. Only the most recently surveyed invasive plants, including Mexican feathergrass and water hyacinth, have not shown reduction over the past three years of the survey.

Overall, there has been a significant reduction in the percentage of nurseries selling invasive plants. In 2012, 30% of nurseries sold at least one invasive plant; but in 2015 only 13% of nurseries sold the same invasive plants surveyed in 2012. Thus, it appears that the efforts to reduce the sale of invasive plants in California are succeeding, although not yet completely successful.

Additional species that were introduced to California through the nursery industry and are on the California Invasive Plant Council Inventory are listed in Table 3. Some of these species are also common in the nursery trade, while others may be hard to find. However, even though some of these species may be difficult to find locally, virtually any plant can be purchased interstate via catalogs and the Internet.

What makes nursery species more invasive than other introduced species?

Many of the characteristics required for a plant species to be successful as a landscape ornamental are also qualities that can lead to invasiveness in natural settings (Table 4). These shared characteristics are the reason that 48% of the invasive plant species had their origins in the horticultural trade.

MANAGEMENT

There are three basic aspects of weed control that also apply to invasive plants: prevention, eradication, and management. Each of these is discussed below.

The control of invasive plants uses many of the same tools and tactics used for control of other weeds, including mechanical, chemical, cultural, and biological controls. Some management options used to control invasive species in rangelands or wildlands are not generally available in urban or agricultural landscapes. Examples are prescribed burning, grazing, revegetation programs, and much more extensive use of biological control agents.

In most cases, integrated approaches using combinations of these methods are more effective for long-term suppression of invasive species and for recovery of the land to a more functional and productive ecosystem.

Prevention

Rather than waiting for an invasive plant to become a problem, it is always better to prevent potential invasives from entering an area and becoming established or naturalized.

With accidentally introduced invasive plants, such as yellow starthistle, prevention includes many familiar principles used to avoid weed introduction or to manage agricultural weeds. Yellow starthistle seed, for example, typically arrives in a new area as a contaminant in soil or crop seed (particularly alfalfa forage or hay), on or in a grazing animal, or on a vehicle or piece of equipment.

When leaving an area where there are invasive plants, it is important not to transport any reproductive parts, such as fruit, seed, or root pieces, to areas where that plant has not established.

Sale of invasive plants in nurseries.

Managing the spread of invasive plants introduced through the
### Table 3. Other invasive plant species of horticultural origin in the Cal-IPC Invasive Plant Inventory. Species listed include their ranking on the Cal-IPC inventory.

<table>
<thead>
<tr>
<th>Species</th>
<th>Common name</th>
<th>Regions invaded</th>
<th>Cal-IPC rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia dealbata</td>
<td>Silver wattle</td>
<td>NC, CC, SC</td>
<td>M</td>
</tr>
<tr>
<td>Acacia melanoxylon</td>
<td>Black acacia</td>
<td>NC, CC, SC</td>
<td>L</td>
</tr>
<tr>
<td>Ageratina adenophora</td>
<td>Croton weed, thoroughwort</td>
<td>CC, SC</td>
<td>M</td>
</tr>
<tr>
<td>Agrostis stolonifera</td>
<td>Creeping bentgrass</td>
<td>NC, SC, GV, SN</td>
<td>L</td>
</tr>
<tr>
<td>Ailanthus altissima</td>
<td>Tree-of-heaven</td>
<td>CAL</td>
<td>M</td>
</tr>
<tr>
<td>Asparagus asparagoides</td>
<td>Bridal creeper</td>
<td>CC, SC</td>
<td>M Alert*</td>
</tr>
<tr>
<td>Asphodelus fistulosus</td>
<td>Onionweed</td>
<td>SC</td>
<td>M Alert*</td>
</tr>
<tr>
<td>Carpobrotus chilensis</td>
<td>Sea-fig, iceplant</td>
<td>CC, SC</td>
<td>M</td>
</tr>
<tr>
<td>Centaurea debeauxii</td>
<td>Meadow knapweed</td>
<td>NC</td>
<td>M Alert*</td>
</tr>
<tr>
<td>Chrysanthemum coronarium</td>
<td>Crown daisy</td>
<td>CC, SC</td>
<td>M</td>
</tr>
<tr>
<td>Conicosia pugioniformis</td>
<td>Narrowleaf iceplant</td>
<td>CC</td>
<td>L</td>
</tr>
<tr>
<td>Cordyline austrii</td>
<td>Giant dracaena</td>
<td>NC, CC</td>
<td>L</td>
</tr>
<tr>
<td>Cotoneaster franchetii, C. cappanicosus</td>
<td>Cotoneasters</td>
<td>CC</td>
<td>M</td>
</tr>
<tr>
<td>Crateagus monogynyn</td>
<td>English hawthorn</td>
<td>NC, CC, SC</td>
<td>L</td>
</tr>
<tr>
<td>Cynodon dactylon</td>
<td>Bermudagrass</td>
<td>SC, D</td>
<td>M</td>
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<tr>
<td>Delairea odorata</td>
<td>Cape-ivy</td>
<td>CC, SC</td>
<td>H</td>
</tr>
<tr>
<td>Digitalis purpurea</td>
<td>Foxglove</td>
<td>NC, CC, SN</td>
<td>L</td>
</tr>
<tr>
<td>Echium candicans</td>
<td>Pride-of-Madeira</td>
<td>NC, CC, SC</td>
<td>L</td>
</tr>
<tr>
<td>Erica lusitanica</td>
<td>Spanish heath</td>
<td>NC</td>
<td>L</td>
</tr>
<tr>
<td>Eucalyptus camaldulensis</td>
<td>Red gum</td>
<td>NC, CC, SC, GV</td>
<td>L</td>
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<tr>
<td>Festuca arundinacea</td>
<td>Tall fescue</td>
<td>CAL</td>
<td>M</td>
</tr>
<tr>
<td>Ficus carica</td>
<td>Edible fig</td>
<td>CC, SC, CV</td>
<td>M</td>
</tr>
<tr>
<td>Foeniculum vulgare</td>
<td>Fennel</td>
<td>CAL</td>
<td>H</td>
</tr>
<tr>
<td>Gazzania linearis</td>
<td>Gazzania</td>
<td>CC</td>
<td>M Alert*</td>
</tr>
<tr>
<td>Hedera canariensis, H. helix</td>
<td>Algerian and English ivy</td>
<td>CAL</td>
<td>H</td>
</tr>
<tr>
<td>Helichrysum petiolare</td>
<td>Licorice plant</td>
<td>NC, CC</td>
<td>L</td>
</tr>
<tr>
<td>Hypericum canariense</td>
<td>Canary Island hypericum</td>
<td>CC, SC</td>
<td>M Alert*</td>
</tr>
<tr>
<td>Ilex aquifolium</td>
<td>English holly</td>
<td>NC, CC</td>
<td>M Alert*</td>
</tr>
<tr>
<td>Leucanthemum vulgare</td>
<td>Ox-eye daisy</td>
<td>NC, CC, SC, SN</td>
<td>M</td>
</tr>
<tr>
<td>Limonium ramosissimum</td>
<td>Sea lavender</td>
<td>CC, SC</td>
<td>L</td>
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</tbody>
</table>

**Key to regions invaded**
- CAL — all of state except the deserts
- NC — North Coast
- CC — Central Coast
- SN — Sierra Nevada and Cascade Mtns
- SC — South Coast
- GV — Great Basin and Sonoran Deserts

* Information for regions invaded adapted from the Cal-IPC inventory. These designsations are simplified versions of the designations used in the Cal-IPC inventory.

* An Alert is listed on species with High or Moderate impacts that have moderate distribution in California, but may have the potential to spread much further.

<table>
<thead>
<tr>
<th>Species</th>
<th>Common name</th>
<th>Regions invaded</th>
<th>Cal-IPC rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linaria genistifolia ssp. dalmatica</td>
<td>Dalmatian toadflax</td>
<td>CAL</td>
<td>M</td>
</tr>
<tr>
<td>Linaria vulgaris</td>
<td>Yellow toadflax</td>
<td>NC</td>
<td>M</td>
</tr>
<tr>
<td>Lobularia maritima</td>
<td>Sweet alyssum</td>
<td>NC, CC, SC</td>
<td>M</td>
</tr>
<tr>
<td>Lythrum salicaria</td>
<td>Purple loosestrife</td>
<td>NC, GV, D</td>
<td>H</td>
</tr>
<tr>
<td>Mentha pulegium</td>
<td>Pennyroyal</td>
<td>CAL</td>
<td>M</td>
</tr>
<tr>
<td>Myosotis latifolia</td>
<td>Common forget-me-not</td>
<td>CAL</td>
<td>L</td>
</tr>
<tr>
<td>Myriophyllum aquaticum</td>
<td>Parrotfeather</td>
<td>NC, CC, SC, SN</td>
<td>H Alert*</td>
</tr>
<tr>
<td>Olea europaea</td>
<td>Olive</td>
<td>NC, CC, SC</td>
<td>L</td>
</tr>
<tr>
<td>Oxalis pes-caprae</td>
<td>Buttercup oxalis</td>
<td>NC, CC, SC</td>
<td>M</td>
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<td>Pennisetum clandestinum</td>
<td>Kikuyugrass</td>
<td>NC, CC, SC</td>
<td>L</td>
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<td>Phoenix canariensis</td>
<td>Canary Island date palm</td>
<td>CC, SC</td>
<td>L</td>
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<tr>
<td>Poa pratensis</td>
<td>Kentucky bluegrass</td>
<td>CAL, D</td>
<td>L</td>
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<tr>
<td>Polygonum cuspidatum, P. socallhinense</td>
<td>Japanese and giant knotweed</td>
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<td>Prunus cerasifera</td>
<td>Cherry plum</td>
<td>NC, CC</td>
<td>L</td>
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<td>Pyracantha spp.</td>
<td>Pyracantha</td>
<td>NC, CC, SC</td>
<td>L</td>
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<td>Ricinus communis</td>
<td>Castorbean</td>
<td>CC, SC, CV</td>
<td>L</td>
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<tr>
<td>Robinia pseudoacacia</td>
<td>Black locust</td>
<td>CAL, D</td>
<td>L</td>
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<tr>
<td>Saccharum ravennae</td>
<td>Ravennagrass</td>
<td>GV</td>
<td>M Alert*</td>
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<tr>
<td>Salvia aethiopis</td>
<td>Mediterranean sage</td>
<td>SN</td>
<td>L</td>
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<tr>
<td>Salvinia auriculata complex</td>
<td>Giant salvinia</td>
<td>CC, D</td>
<td>H Alert*</td>
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<tr>
<td>Saponaria officinalis</td>
<td>Bouncingbet</td>
<td>NC, CC, SC, GV, D</td>
<td>L</td>
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<tr>
<td>Schinus molle</td>
<td>Peruvian peppertree</td>
<td>CC, SC, GV, SN</td>
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<td>Schinus terebinthifolius</td>
<td>Brazilian peppertree</td>
<td>SC</td>
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<td>Tamarix aphylla</td>
<td>Athel tamarix</td>
<td>GV, SC, D</td>
<td>L</td>
</tr>
<tr>
<td>Tanacetum vulgare</td>
<td>Common tansy</td>
<td>NC, SN</td>
<td>M</td>
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<tr>
<td>Tetragonia tetratomonioides</td>
<td>New Zealand spinach</td>
<td>CC, SC</td>
<td>L</td>
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<tr>
<td>Ulex europaeus</td>
<td>Gorse</td>
<td>NC, SC</td>
<td>H</td>
</tr>
<tr>
<td>Washingtonia robusta</td>
<td>Mexican fan palm</td>
<td>SC</td>
<td>M Alert*</td>
</tr>
<tr>
<td>Watsonia meriana</td>
<td>Bulbil watsonia</td>
<td>NC</td>
<td>L</td>
</tr>
<tr>
<td>Zantedeschia aethiopica</td>
<td>Calla lily</td>
<td>NC, CC, SC</td>
<td>L</td>
</tr>
</tbody>
</table>
Pest Notes: Invasive Plants

Invasive in an area merely because it sometimes the plant is not listed as safe to use in other regions, but locations near natural areas. It may be safe to use in other regions, but sometimes the plant is not listed as invasive in an area merely because it has not yet become a presence.

Disposing of invasive plant material. If the plant already exists in your garden, what is the best thing to do? Again, if your garden is near natural habitat areas, or near roads, flood channels, or waterways that might be corridors these plants can use to get to open space, then removal should be considered. At the very least, the plant should be kept in a vegetative state so it does not reproduce.

If you choose to remove these plants, it is important to dispose of them carefully. Make sure any reproductive parts do not escape during the removal process. In locations that have mandatory green waste programs, cut off any reproductive parts and bag them separately for disposal, then send or take the rest of the green waste to the compost system.

Eradication: Early Detection & Rapid Response

Eradication refers to the complete elimination of a pest. The principle behind eradication is to kill the plant before it reproduces or spreads. After prevention, eradicating a small population of an invasive plant is the most cost-effective pest control tactic. The California Department of Food and Agriculture, assisted locally by the county agriculture commissioner, has a long history of eradicating noxious weeds throughout the state. Many of their eradication efforts have been very successful and have kept small weed incursions from becoming widespread problems.

Eradication has two components: early detection and rapid response (often referred to as EDRR). The gardening public can assist by learning to recognize when a new plant is expanding beyond where it was planted and either remove it right away or report it to the local county agriculture commissioner.

Management in Natural Areas

Invasive plants can invade natural areas, particularly when those areas are surrounded by or adjacent to urban environments. These natural areas are typically owned by a public entity, including parks and open-space districts, or privately by a non-profit organization, such as The Nature Conservancy. It is the responsibility of these organizations to manage invasive plants on their property.

Many of these organizations have volunteer programs to remove invasive plants and can always use more help. Often these agencies or non-profit organizations have information on their invasive plant programs at their visitor centers or on their websites. Most state and federal agencies that manage land, such as the California Department of Food and Agriculture, assisted locally by the county agriculture commissioner, has a long history of eradicating noxious weeds throughout the state. Many of their eradication efforts have been very successful and have kept small weed incursions from becoming widespread problems.

Table 4. Characteristics that make horticultural and invasive species successful.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Horticultural plants</th>
<th>Invasive plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germination and planting</td>
<td>Easy to propagate and establish</td>
<td>Few germination requirements and easy to establish</td>
</tr>
<tr>
<td>Growth</td>
<td>Grow rapidly</td>
<td>Grow rapidly</td>
</tr>
<tr>
<td>Reproduction</td>
<td>Produce abundant flowers</td>
<td>Prolific seed producer with successful dispersal mechanism</td>
</tr>
<tr>
<td>Environmental fitness</td>
<td>Ability to grow in many regions and remain hardy</td>
<td>Ability to adapt to a variety of environmental conditions, including drought and salt stress, and able to spread to many regions in the state</td>
</tr>
<tr>
<td>Pest resistance</td>
<td>Free of insect pests and diseases</td>
<td>Free of natural enemies and diseases</td>
</tr>
</tbody>
</table>
of Fish and Wildlife, State Parks, the National Park Service, and the U.S. Bureau of Land Management, have extensive information on invasive plants and animals on their websites. A good place to start is at the USDA Agricultural Library National Invasive Species Information Center [invasivespeciesinfo.gov](http://invasivespeciesinfo.gov). It is also important to recognize that management of invasive plants needs to consider sensitive plants and animals. For example, in Southern California, public agencies that manage or regulate rivers and streams restrict invasive plant control activities from spring to fall because threatened and endangered birds, such as the Least Bell’s Vireo or Southwestern Willow Flycatcher, nest during this period. There are often rare species of native plants that also need to be protected in many of these infested sites.

**REFERENCES**


**WARNING ON THE USE OF CHEMICALS**

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original, labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down the sink or toilet. Either use the pesticide according to the label, or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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For more information, contact the University of California Cooperative Extension office in your county. See your telephone directory for addresses and phone numbers, or visit: [ucanr.edu/County.Offices](http://ucanr.edu/County.Offices). University of California scientists and other qualified professionals have anonymously peer reviewed this publication for technical accuracy. The ANR Associate Editor for Urban Pest Management managed this process.

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