

2009 Invasive Plant Work Plan

Overview

The 2008 Yosemite National Park Invasive Plant Management Plan (IPMP; www.nps.gov/yose/parkmgmt/invasive.htm) outlines prioritization of invasive plant species treatment. The 2009 work plan emphasizes treatment of species ranked as high-priority, followed by those of medium-high priority. Among high-priority species, much of the 2009 treatment efforts will be spent on species that currently have large populations and a widespread distribution in the park: Himalayan blackberry (*Rubus discolor*), velvet grass (*Holcus lanatus*), bull-thistle (*Cirsium vulgare*), yellow star-thistle (*Centaurea solstitialis*). In addition to manual control methods that have been used for several decades in the park, two herbicides, glyphosate and aminopyralid, will now be used to control invasive plant infestations.

The treatment method used in a particular locality depends on the invasive species, plant phenology, and a number of site specific considerations:

Location	Treatment
Within the bed and banks of a designated Wild and Scenic River	manual methods only
Wetland ecosystems	In consultation with Branch of Wildlife Management No herbicide use within 6 feet of standing or flowing water
Terrestrial ecosystems	Herbicide for Himalayan blackberry, other species herbicide if population size exceeds threshold in IPMP
Archeological sites	In consultation with Branch of Anthropology and Archeology
Traditional-use areas	In consultation with tribes
Wilderness areas	Manual methods, or herbicide if ecosystem is threatened
Private in-holdings	No treatment

Consistent with Yosemite's Invasive Plant Management Plan, there will be ongoing internal consultation with other branches in the Division of Resources Management and Science as well as external consultation with American Indian tribes. With the input of these parties, an appropriate treatment plan is selected.

In addition to the site specific considerations mentioned above, the treatment plan is also dependent on the plant species, the availability of methods known to be effective and permitted under the IPMP, as well as the plant phenology (timing of plant growth, flowering, and senescence). The work plan by definition addresses Yosemite's most serious, known invasive plant populations. Through ongoing survey efforts, new invasive plant locations are found frequently. We will continue to conduct early detection and rapid response work throughout Yosemite, consistent with the IPMP, to minimize the risk of further spread.

Treatment Plan by General Location

El Portal to Pohono Bridge

Species	Timing	Treatments
Yellow star-thistle	April-June May-June	Spray (Milestone or glyphosate) Grid survey/hand-pull
Himalayan blackberry	August-October	Spray (glyphosate)
Velvet grass	May-July	Map infestations
Yellow sweet clover	April-June	Hand-pull, mow
Rose clover	April-June	Hand-pull
Black, field and shortpod mustards	April-June	Hand-pull
Giant reed	June-Sept	Mow or spray (glyphosate)
Tree-of-heaven	September	Spray/Frill or stump cut (glyphosate)

Invasive Plant Management Program (IPMP) 2009 season goals for this work zone:

- Yellow star-thistle is the IPMP's greatest management concern in El Portal. We plan to spray remaining dense stands with herbicide (see early spring work plan posting for details), rigorously grid search and handpull where in low density, and remap the current extent of infestation.
- The other high priority invasive species in this work zone is Himalayan blackberry. Since there is so much Himalayan blackberry upstream from El Portal, it is uncertain whether or not our crews will have time to initiate control of blackberry in El Portal. They will likely initiate mowing of some dense patches to increase access.
- The tree of heaven population near the Vegetation and Restoration offices will be eradicated using a so called frill cut method. A small frill cut is made near the base that receives a glyphosate application.
- As time permits, National Park Service (NPS) crews will remove lower priority species (e.g. yellow sweet clover, rose clover and black mustard) with manual and mechanical methods as in the past. Crews will survey for new populations of non-native invasive plants.

Foresta

Species	Timing	Treatments
Spotted knapweed	June-July	Grid survey/hand-pull
Yellow star-thistle	May-June	Grid survey/hand-pull
Himalayan blackberry	August-October	Spray (glyphosate)
Velvet grass	May-July	Pilot herbicide study (glyphosate)
Perennial pepperweed	June-July	Grid survey/hand-pull
Everlasting pea	April-July	Spray (glyphosate, aminopyralid)

Invasive Plant Management Program 2009 season goals for this work zone:

- In Foresta, NPS crews and volunteers have treated spotted knapweed, perennial pepperweed and yellow star-thistle to an extent that they have been nearly eradicated. We will continue surveying for these species and will document and hand-pull any plants encountered.
- Himalayan blackberry will be mapped and sprayed.
- Repeated manual control of velvet grass in Yosemite has not been particularly effective. We will be conducting a pilot spray study in Big Meadow.
- As in past years, we will hand-pull or shovel-shear bull-thistle.
- Crews will survey for new populations of non-native invasive plants.

Wawona

Species	Timing	Treatments
Himalayan blackberry	August-October	Spray (glyphosate)
Velvet grass	May-July	Pilot herbicide study (glyphosate)
Bull-thistle	May-August	Hand-pull, shovel-shear, spray (glyphosate)
Rose clover	April-June	Hand-pull
Foxglove	June-July	Hand-pull

Invasive Plant Management Program 2009 season goals for this work zone: Himalayan blackberry, velvet grass and bull-thistle all occur widely in Wawona.

- Our treatments will focus on spraying Himalayan blackberry with herbicide where appropriate.
- Velvet grass is present around the perimeter of Wawona meadow and is likely continuing its spread. Considerable manual control efforts have been conducted in previous years, but with limited success. This year velvet grass control methods will be augmented by a herbicide pilot study. We will use a glyphosate spray to kill outlying velvet grass clumps surrounded by native vegetation, and monitor whether native plants can regain lost ground. This technique is intended as a ‘stop-gap’ approach to slow or stop the spread of velvet grass. At present, we do not know how to restore heavily infested segments of the meadows. Manual treatments of velvet grass may continue to reduce the risk of further spread, such as those along the Chilnualna Falls trail.
- Bull-thistle will be hand-pulled and shovel-sheared as in past years but the IPM plan permits spraying of dense patches if found.

Mariposa Grove

Species	Timing	Treatments
Himalayan blackberry	August-October	Spray (glyphosate)
Velvet grass	May-July	Survey and map
Bull-thistle	May-August	Hand-pull, shovel-shear, spray (glyphosate)

Common mullein May-September Hand-pull

Invasive Plant Management Program 2009 season goals for this work zone: Invasive plant populations in the Mariposa Grove are priority because of their potential to spread into more remote wilderness locations.

- We will be treating Himalayan blackberry and dense patches of bull-thistle with herbicide.
- We will map the current extent of these species and of velvet grass.
- NPS crews and volunteers will hand-pull common mullein and bull-thistle as in past years.

Yosemite Valley

<u>Species</u>	<u>Timing</u>	<u>Treatments</u>
Himalayan blackberry	June-July	Pilot herbicide study (glyphosate, aminopyralid)
	August-October	Spray (glyphosate)
Velvet grass	May-July	Pilot herbicide study (glyphosate)
Bull-thistle	May-August	Hand-pull, shovel-shear, spray (glyphosate)
White clover	April-June	Hand-pull
Black locust	August-October	Herbicide (glyphosate)
Klamath weed	July-August	Hand-pull
Virginia creeper	July-September	Hand-pull
Hops	April-October	Hand-pull (volunteers)

Invasive Plant Management Program 2009 season goals for this work zone:

- Himalayan blackberry has been the most heavily treated species in Yosemite in the past couple decades. We will now be treating the majority of the blackberry-infested areas with herbicide. Although most spraying will take place in the fall, some pilot studies may occur during the summer.
- Repeated manual control of velvet grass in Yosemite has not been particularly effective. We will be conducting a pilot spray study in Yosemite Valley.
- We will remap the current extent of Himalayan blackberry and velvet grass.
- NPS crews and volunteer groups will hand-pull and shovel-shear bull-thistle as in previous seasons but the IPM plan permits spraying of dense patches if found.
- Black locust populations will be mapped and treated with a cut-stump approach.
- Volunteer groups that have traditionally helped pull Himalayan blackberry will now be able to focus attention on areas in which herbicide use is not permitted and on other invasive plant species such as hops, common mullein and bull-thistle.
- Experienced botanists will conduct plant surveys to detect any new non-native species entering the park.

Wilderness Areas

<u>Species</u>	<u>Timing</u>	<u>Treatments</u>
Himalayan blackberry	June-September	Hand-pull, cut and dab (glyphosate)
Velvet grass	June-September	Map, spray (glyphosate), hand-pull, inflorescence removal
Bull-thistle	June-September	Hand-pull, shovel-shear
Yellow salsify	June-September	Inflorescence removal
Common mullein	June-September	Hand-pull
Prickly lettuce	June-September	Hand-pull

Invasive Plant Management Program 2009 season goals for this work zone: Control of current invasive populations in designated wilderness areas is a very high priority for the IPMP.

- NPS crews will manage most Himalayan blackberry populations in remote locations by hand-pulling while some locations may be treated with herbicide.
- We will focus our velvet grass treatments on preventing further spread into remote areas. Invasive plant biologists will be visiting areas of heavy infestation, such as in Pate Valley, to determine management actions.
- NPS crews and volunteers will continue to manually treat several other invasive species such as yellow salsify, common mullein and prickly lettuce as they have been in previous years.

O'Shaughnessy Dam to Poopenaut Valley

<u>Species</u>	<u>Timing</u>	<u>Treatments</u>
Himalayan blackberry	August-October	Survey and map; herbicide (glyphosate)
Velvet grass	May-July	Survey and map
Bull-thistle	April-October	Hand-pull, shovel-shear, spray (glyphosate)

Invasive Plant Management Program 2009 season goals for this work zone: The distribution of high priority invasive plant species in the Tuolumne River corridor is not well known because the work zone has received few visits from invasive plant specialists. Therefore, our first objective is to survey and map invasive species.

- After mapping, Himalayan blackberry may be treated using a cut – dab technique with glyphosate.
- We will treat bull-thistle as in past years by hand-pulling and shovel-shearing as well as with herbicide in dense patches.
- Other treatments will be considered after the survey data has been accumulated.

Treatment plan for High-Priority species

Cheat grass (*Bromus tectorum*)

This plant is so widespread in Yosemite, and is so difficult to control, that treatment is limited to slowing spread farther into the wilderness.

Italian thistle (*Carduus pycnocephalus*)

This California State listed noxious weed has been found a few times in Yosemite and it is effectively treated with manual methods wherever it is found. Active monitoring is conducted in April and May in El Portal.

Spotted knapweed (*Centaurea maculosa*)

Since accidental introduction to Foresta in 1990, park staff has repeatedly hand-pulled spotted knapweed with the goal of eradicating it from Yosemite. Crews will search previously infested areas; individual plants will be hand-pulled. Large patches are not known or expected, but will be sprayed with aminopyralid if necessary.

Yellow star-thistle (*Centaurea solstitialis*)

In El Portal, aminopyralid will be used Mar-Apr to treat populations larger than 10 square meters. If needed, glyphosate may be used to spot spray plants with backpack sprayers later in the season (Apr-June), or in case new populations are discovered. Three large populations of yellow star-thistle and tocalote (*C. melitensis*) remain in El Portal on steep hillsides. In Foresta, aminopyralid will be used between Apr-May. Elsewhere in El Portal, extensive grid surveys have been conducted in El Portal, and have been maintained and will continue to be maintained using manual and mechanical methods.

Bull-thistle (*Cirsium vulgare*)

Bull-thistle is wind dispersed and quickly invades wet sites after disturbance. After prescribed and wildland fires, crew often find many new locations and bull-thistle is presently our most widespread high priority invasive plant. It is unlikely that all populations can be treated in 2009. NPS crew will remove bull-thistle where encountered with manual and mechanical methods, unless populations are denser than 10 individuals per square meter. In such cases crews will spray with the herbicide glyphosate.

French broom (*Genista monspessulana*)

This plant was introduced to Foresta as an ornamental and is spreading quickly. It is treated where encountered on NPS land, but it is present in several yards in El Portal. Other broom species (*Genista* and *Cytisus*) are present in inholdings within Yosemite and some of them may be invasive. Public outreach materials and activities are being developed to reach these landowners.

Velvet grass (*Holcus lanatus*)

Herbicide treatment will focus on small populations that are surrounded by intact native plant communities to halt further impact to the native vegetation. The surrounding community will be deemed an intact native plant community when the assemblage of plants is mostly native and is representative of that habitat. Additionally, small populations found along roads and trails with a high likelihood of dispersal into natural habitats will be a main target.

Perennial pepperweed (*Lepidium latifolium*)

This species was documented and eradicated in Foresta but monitoring is ongoing.

Himalayan blackberry (*Rubus discolor*) and Cutleaf blackberry (*Rubus laciniatus*)

Himalayan blackberry constitutes the majority of invasive blackberry; cutleaf blackberry will be treated the same. NPS crews will treat with aminopyralid and glyphosate. Early season treatments have not yielded encouraging results elsewhere, and experimental June-July treatments are needed to narrow down the optimal treatment window to begin treatments in Yosemite specifically. Treatment will be spot sprays applied with backpack sprayers or with a hand wand from a truck mounted sprayer. In the Poopenaut Valley we will try a cut – dab technique with glyphosate.

Treatment plan for Medium-High priority species

Tree-of-heaven (*Ailanthus altissima*)

Tree-of-Heaven's known distribution in Yosemite is confined to El Portal and Yosemite Valley (Ansel Adams Gallery). This species is particularly difficult to control through manual and mechanical methods because it easily resprouts from remaining underground fragments. Therefore, we will frill-cut and apply herbicide to eliminate plants located at the Vegetation and Restoration offices in Old El Portal. We hope to eradicate this species from Yosemite.

Prostrate pigweed (*Amaranthus albus*)

Scattered prostrate pigweed individuals are documented in El Portal, Wawona and Yosemite Valley. Crews may hand-pull prostrate pigweed when encountered.

Giant reed (*Arundo donax*)

The giant reed is a widespread problem in California but populations in Yosemite are limited to residential areas in El Portal. We plan to eradicate this species with herbicide treatment if manual and mechanical methods do not work.

Black, field, and shortpod mustards (*Brassica nigra*, *B. rapa*, and *Hirshfeldia incana*)

Several mustard species are located along roadsides. Crews will hand-pull these species as in past years.

Bermuda grass (*Cynodon dactylon*)

In Yosemite Valley, Bermuda grass is present only near Ahwahnee cabins, and along the roadside west of the Rangers' Club. We will survey these locations and then determine best treatment options.

Foxglove (*Digitalis purpurea*)

This invasive has been and will continue to be controlled by hand-pulling in Wawona, Yosemite Valley and Hodgdon.

English ivy (*Hedera helix*)

English ivy is known in the park but not well documented. We will map all known sites in Yosemite Valley and El Portal.

Hops (*Humulus lupulus*)

Hops is present in Carlon and several sites in Yosemite Valley. We will continue to hand-pull as we have in past and will use the help of volunteer groups in Yosemite Valley.

Klamath weed (*Hypericum perforatum*)

Yosemite National Park has controlled Klamath weed by hand-pulling and by means of a biocontrol in the past. Mapping and hand-pulling will continue.

Perennial sweet pea (*Lathyrus latifolius*)

Perennial sweet pea (or everlasting pea) escaped cultivation and now grows in El Portal, Yosemite Valley and Foresta. It is very difficult to control through manual or mechanical methods therefore we will treat with herbicide.

Ox-eye daisy (*Leucanthemum vulgare*)

Oxeye daisy is widely established along roadsides in El Portal, Foresta, Yosemite Valley, and Wawona. Its distribution needs to be documented first. Following this, effectiveness of manual control methods needs to be established. Disturbance due to fuel reduction treatment sites in Foresta may increase the population and, if so, herbicide treatments may be necessary.

Rose champion (*Lychnis coronaria*)

We will map known locations of rose champion and survey for new populations.

White sweetclover (*Melilotus alba*), yellow sweetclover (*M. officinalis*) and sourclover (*M. indica*)

Invasive *Melilotus* species are currently known from Hodgdon, El Portal road, Big Oak Flat Road, Hetch Hetchy (sourclover), Camp 6 (white), and El Portal (yellow). These invasive plants have been and will continue to be controlled by hand-pulling.

Spearmint (*Mentha spicata* var. *spicata*)

Known populations of spearmint exist in Wawona and a couple sites in Yosemite Valley. Populations may be hand-pulled.

Many flower tobacco (*Nicotiana acuminata* var. *multiflora*)

Many flower tobacco is found in Wawona, the Mariposa Grove and Yosemite Valley. Plants may be hand-pulled.

Woodbine (Virginia creeper, *Parthenocissus vitacea*)

Park and volunteer crews will hand-pull Virginia creeper populations in Yosemite Valley. We will survey for other populations.

Black Locust (*Robinia pseudoacacia*)

Yosemite Valley black locust populations are spreading and have been found as far downriver as the Rostrum. Populations will be mapped and treated with a cut-stump approach in consultation with Branch of History, Architecture & Landscapes.

London Rocket (*Sisymbrium irio*)

We will map known populations of London rocket and survey for new populations.

Rose Clover (*Trifolium hirtum*)

We will map the rose clover population above Cascades Fall (Route 140), those in Wawona and survey for additional populations. Crews will continue to hand-pull as in past years.

Common mullein (*Verbascum thapsus*)

This invasive plant has been controlled throughout Yosemite by means of manual methods, which will be continued.

Vetch (*Vicia benghalensis*)

We will map known locations of vetch and survey for new populations.

Areas in which herbicide application is taking place will be signed conforming to herbicide label requirements. Signage will include: the type of herbicide in use, target species, time of application, scope of treated area, re-entry time if applicable, and contact information.

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