

INVASIVE PLANT MANAGEMENT PROGRAM 2011 WORK PLAN

Invasive plant management in Yosemite National Park is based upon Integrated Pest Management, practical experience and the best available science. This work plan summarizes 2010 invasive plant management efforts and describes control actions proposed for 2011.

Comments are welcome. Please address comments to:

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For more information about invasive plants in Yosemite, please visit:
<http://www.nps.gov/yose/naturescience/invasive-plants.htm>

INTRODUCTION

The purpose of the Invasive Plant Program (IPP) is to protect Yosemite National Park's natural and cultural resources from displacement by non-native invasive plants. Yosemite's large size, just over three quarters of a million acres, can make surveying for and treating invasive plants logistically difficult. This is especially true in remote wilderness. The threat from invasive species is growing and new invasive plant species and populations are found and treated each year. Limited operational resources for invasive plant control make it critical that treatments are efficient and effective and guided by a strategically sound plan.

Invasive plant management in Yosemite National Park is directed by the 2008 Invasive Plant Management Plan (2008 IPMP), which can be found at: http://www.nps.gov/yose/parkmgmt/invasive_docs.htm. Management actions are based upon integrated pest management (IPM), elements of which include prevention, inventory, prioritization, treatment, monitoring, research, education, and outreach. The IPM process includes manual, mechanical, biological, herbicide and cultural (altering management to discourage invasives) methods to ensure that the most effective treatment tools and are used to protect resources, while posing the least possible impact to people and the environment.

This work plan addresses Yosemite's most serious invasive plant species. These species are prioritized for control based on the risk that they pose relative to the program's ability to obtain the monetary and personnel resources necessary to mitigate their threat. "High priority" species pose the greatest risk to Yosemite's natural and cultural resources and are treated before medium or low priority invasive species. *Early detection and rapid response* allows populations to be efficiently controlled while they are still small, and minimizes the risk of further spread. Newly discovered invasive plant species and populations may receive elevated priority for control.

Resource managers conduct ongoing internal consultation with other branches in the Division of Resources Management and Science as well as external consultation with American Indian tribes and groups during the invasive plant management process. Managers then derive an appropriate treatment strategy by location for invasive plant infestations. The treatment method for a particular locality depends on the invasive species, plant phenology (timing of plant growth, flowering, and senescence [aging]), and the availability of methods known to be effective and permitted under the IPMP. A range of site-specific considerations is taken into account when selecting the appropriate treatment methods. These may include:

Location	Treatment
Within the bed and banks of a designated Wild and Scenic Rivers	Manual methods only
Wetland and riparian ecosystems	In consultation with Branch of Wildlife Management where necessary. No herbicide use within 10 feet of standing or moving water.
Terrestrial ecosystems	Herbicide for Himalayan blackberry. Herbicide for certain other species if population size or density exceeds thresholds described in 2008 IPMP
Archeological sites	Control near archaeological resources would be conducted in consultation with Branch of Anthropology and Archeology.
Traditional-use areas	In consultation with American Indian tribes
Designated Wilderness	The minimum appropriate tool will be used to control invasive species. Herbicide use is allowed if ecosystem is threatened and population size and density exceeds thresholds described in 2008 IPMP. Otherwise, manual methods used.
Private in-holdings	Outreach, assistance and treatment with landowner's permission
DNC land assignments	DNC is responsible for treatment of invasive plants. NPS staff will cooperate, advise and assist where necessary.
Special status plant habitat	Consultation with botanists in the Branch of Vegetation and Ecological Restoration during planning stage for work that would occur near special status plant populations.
Wildlife species of concern and critical habitat	Consultation with wildlife ecologists during planning stage for work that would occur in critical habitat for species of concern.

SUMMARY OF 2010 WORK

Yellow Star-thistle (*Centaurea solstitialis*). Each field season begins with the program's most ambitious and challenging project—the treatment of yellow star-thistle in El Portal. Some slopes in this area are steep enough to require the use of fall protection. In 2010, crews treated 26 canopy acres of yellow star-thistle, almost double what they treated in 2009. Crews surveyed 629 gross-infested acres. Because the seedbank only lasts for two to three years, a major reduction in the El Portal star-thistle density is expected to begin in 2011.

Himalayan and cut-leaf Blackberry (*Rubus armeniacus* and *R. laciniatus*, collectively referred to as "blackberry"). In Yosemite Valley, crews and volunteers treated 78 gross-infested acres of blackberry. After several decades of limited success using manual methods, the 2009 herbicide treatments reduced blackberry cover enough to permit crews to extend control efforts down the Merced River corridor. While extensive follow-up treatments are planned, the anticipated decrease in workload resulting from successful control of blackberry using herbicide in 2011 should permit crews to begin blackberry

treatment efforts in the Tuolumne River corridor. Due to the success of the 2009 treatments, the total amount of herbicide applied to blackberry in 2010 declined significantly, despite an increase in the overall area under treatment.

Wall Hawkweed (*Hieracium murorum*). Crews controlled an infestation of wall hawkweed at the Tacoma housing area in Yosemite Valley. This invasive plant is new to California and has the potential to spread rapidly in the park. The infestation site will be monitored and retreated if needed in 2011.

Bull Thistle (*Cirsium vulgare*). Staff and volunteers treated 152 gross-infested acres of bull thistle, the most widespread high-priority species in Yosemite. Bull thistle is found in Yosemite Valley, Wawona, designated Wilderness, and in some recently burned areas.

Spotted Knapweed (*Centaurea maculosa*). Crews conducted follow up surveys in an ongoing effort to remove an invasive spotted knapweed population in Foresta. Thirty-three plants were found and removed in 2010, thus keeping Yosemite's most noxious and insidious non-native plant under control. The California Department of Food and Agriculture participated in this effort.

Oxeye Daisy (*Leucanthemum vulgare*). The IPP began intensive management of Oxeye daisy, an aggressive meadow invader. Crews treated 40 gross-infested acres in the Big Meadow burn area.

Velvet Grass and Cheatgrass. Velvet grass infests hundreds of acres of Yosemite meadows and cheatgrass heavily infests the foothill woodlands and is spreading into new areas within the park. Effective control methods are not yet available for these two high-priority species. Park staff is collaborating with the U.S. Geologic Survey (USGS) on effectiveness studies for velvet grass and cheatgrass control. The goal is to aid in the development of a management strategy through learning more about the biology and potential treatment tactics for these species.

OVERVIEW OF 2011 WORK PLAN

This plan describes the methods and locations of control actions for high priority invasive species and medium-high priority species. New invasive plant species or new populations of high priority species are found each year. Because the most effective way to protect the park from new invasions is through rapid response to these early detections, it is very likely that, on a limited basis, crews would apply treatments that are not explicitly described in this document and on the maps. Because some plants survive treatment, crews will monitor previously treated sites and retreated as needed. Also this year, USGS and Park scientists will initiate an herbicide effectiveness study focused on cheatgrass.

Detailed Planning Maps

This plan includes a set of 40 maps that provide site-specific treatment details to park staff and the public. The maps also act as guide for field crews' decision-making. The maps, which include a total of 8,849 mapped features (individual points, lines or polygons), display invasive plant infestations based on data field collected since 1995. Large infestations are shown to scale as polygons. Small patches and individual plants are shown as points.

The maps have some limitations. Infestation locations are only as accurate as the equipment used to map them; a patch mapped using GPS could actually be located up to 20-40 feet from where it appears. Therefore, an infestation may appear to be located in a river or middle of the road. Invasive plant infestations may have expanded or may no longer exist as shown due to effective control. Invasive species often co-occur, showing up on a map as a feature within a feature. The treated area of an infestation can overlay the larger, full infestation.

WEED FACT:



The 2009 photos to the right and below show velvet grass, a plant with a high priority for treatment, towering over the rare yellow-lip pansy monkeyflower (*Mimulus pulchellus*) in Big Meadow.

Velvet grass forms a thick thatch that, if left untreated, displaces the open mineral soil habitat needed by the pansy monkey flower and other plants.

The pansy monkey flower is endemic to California and found only in three Sierra Nevada counties (Calaveras, Mariposa and Tuolumne). It is a Yosemite National Park special status species. It is also listed by the California Native Plant Society as category 1B.2: "plants rare, threatened or endangered in California with a moderate immediacy of threat."



List of terms

Treatment techniques

Spray	targeted application of herbicide is applied to foliage of priority plant species using a backpacker sprayer or a truck-mounted sprayer. Targeted applications result in minimal impact to non-target plants.
Frill cut	used on trees or large shrubs, a diagonal cut into the bark is made prior to herbicide application to aid delivery into the target plant
Stump cut	used on trees, a tree is cut near ground level before herbicide is applied directly to the stump of the target plant
Hand-pull	removal of target plant biomass, including the roots, by hand
Lop and grub	above ground plant is cut with loppers and then the (often deeper) root system is dug out; very time intensive
Shovel-shear	plant is severed a couple inches under the ground surface using a shovel; some root material remains
Inflorescence removal	reproductive parts are removed to prevent spread by seed
Cut and dab	plant is lopped a few inches from ground and a paint brush is used to apply herbicide to the stump

Monitoring activities

Survey	a systematic search for target plants
Grid survey	a line of people collectively search for target plants resulting in a very thorough survey
Map	to document infestations; most often using GPS units
GPS	Global Positioning System; use of satellite technology to pinpoint location; used to map infestations
Monitor	a general term to describe all activities that examine results of management actions; for example, observation of a site after treatment to document outcome of that treatment
Pilot study	a quantitative study to assess effectiveness of a treatment new to Yosemite

TREATMENT PLAN BY GENERAL LOCATION

El Portal to Pohono Bridge (Maps 1.0-1.2, and 2.0)

A comprehensive inventory of high priority invasive plants is necessary to guide treatment plans and actions. Such an inventory has not yet been conducted in Old El Portal. Crews will begin to document the presence of high priority invasive plants just as they have in the NPS residences in Rancheria, Abbeville, and the trailer court. The IPP will notify the Old EP community and will ask for permission prior to entering backyard areas. Crews will be able to advise residents on treatment methods and can offer help in removing undesirable exotic plants such as tree of heaven and invasive blackberry.

Species	Timing	Treatments
Yellow star-thistle	February-June May-June	Spray (aminopyralid or glyphosate) Grid survey/hand-pull
Invasive blackberry	August-October	Spray (glyphosate)
French broom	June-July	Spray (aminopyralid)
Giant Reed	July-	Spray (glyphosate)
Tree-of-heaven	September	Spray/Frill or stump cut (glyphosate)
Perennial sweet pea	June	Spray (aminopyralid or glyphosate)
Rose clover	May-July	Spray (aminopyralid)
Tocolote	February-June	Spray (aminopyralid or glyphosate)

Yellow star-thistle is the greatest management concern in El Portal. By the end of the 2010 star-thistle season, crews had sprayed all remaining large, dense stands. It is expected that yellow star-thistle cover in 2011 will be drastically reduced. Yellow star-thistle habitat will be rigorously grid searched. Previously mapped and new stands will be retreated with herbicide. Low density stands will be hand pulled. **Tocolote** (*Centaurea melitensis*, inset) will be also be treated as time allows.



The two invasive blackberry species are also a high priority. In 2010, crews treated areas of El Portal west of El Portal Road. In 2011, crews will retreat these areas, and will extend treatments from El Portal Road to the Yosemite View Lodge.

Tree-of-heaven (*Alianthus altissima*) is common in El Portal, much of it near homes. Crews will treat with cut-stump and glyphosate application.

French broom (*Genista monspessulana*), which is part of a genus notorious for increasing fire hazard, occurs in several yards and has escaped to natural areas. At homeowner's request, NPS will treat these and other high-priority species in the residential area.

Rose clover (*Trifolium hirtum*) will be treated along Highway 140 starting with the eastern-most population located at the Cascades Dam.

As time permits, National Park Service (NPS) crews will also treat medium-high priority species such as **perennial sweet pea** (*Lathyrus latifolia*), **yellow sweet clover** (*Melilotus officinale*), **purple vetch** (*Vicia benghalensis*) and **black mustard** (*Brassica nigra*). Crews will survey for new populations of non-native invasive plants.

Foresta (Maps 2.0-2.2)

Species	Timing	Treatments
Spotted knapweed	June-July	Grid survey/hand-pull
Yellow star-thistle	May-June	Grid survey/hand-pull
Invasive blackberry	August-October	Spray (glyphosate)
Velvet grass	May-July	Herbicide study (glyphosate)
	Spring-fall	Test timing of application (glyphosate)
Perennial pepperweed	June-August	Monitor
Perennial sweet pea	April-July	Map; spray (glyphosate, aminopyralid)
Ox-eye daisy	May-July	Spray (aminopyralid)
St. John's wort	June-August	Spray (glyphosate, aminopyralid)
Cheatgrass	Feb-Oct	Pilot herbicide study (glyphosate, aminopyralid)

NPS crews and volunteers have almost extirpated **spotted knapweed** (inset), **perennial pepperweed** (*Lepidium latifolium*) and **yellow star-thistle** from the Foresta area. Crews will continue surveying for these species and will document and hand-pull any plants encountered. Crews will remap and spray invasive **blackberry**, most of which is at McCauley Ranch. Field staff will survey for new populations of non-native invasive plants.



As in past years, crews and volunteers will hand-pull or shovel-shear **bull thistle**. Where populations are dense and not controlled with manual techniques, crews will treat them with aminopyralid. Additionally, crews will survey for and treat high and med-high priority species found in the Big Meadow burn area and areas impacted by fire suppression activity. Last year, field staff identified two highly invasive species *not yet known in Yosemite*, **Italian thistle** (*Carduus pycnocephalus*) and **milk thistle** (*Silybum marianum*) within the burn perimeter.

A study has begun in collaboration with USGS to test the effectiveness of herbicide control on **velvet grass**. If early results are promising, crews will treat velvet grass in Big Meadow and in adjacent areas of the 2009 Big Meadow burn. Park and USGS scientists will also

initiate a **cheatgrass** control study. This study will test glyphosate in the spring and aminopyralid as a pre-emergent herbicide in the fall.

Yosemite Valley (Maps 3.0-3.9)

Species	Timing	Treatments
Invasive blackberry	August-October	Spray (glyphosate)
Velvet grass	May-July Spring-Fall	Herbicide study (glyphosate) Test timing of application (glyphosate)
Bull thistle	May-August	Shovel-shear, spray (aminopyralid)
Oxeye daisy	June-July	Map; spray with aminopyralid
St. John's wort	July-August	Map; spray with aminopyralid
Black locust	August-October	Herbicide (glyphosate)
Hops	June-August	Spray (glyphosate)
Perennial sweet pea	June-July	Map new populations; spray with aminopyralid
Wall hawkweed	June-August	Retreat with aminopyralid
Cheatgrass	March-April ; October- December	Map; spray with glyphosate at select sites

The extent of **invasive blackberry** and **bull thistle** in the Yosemite Valley was mapped in 2009. Most populations were treated with herbicide, although volunteer crews used manual methods to control some populations. Regrowth will be treated with glyphosate until infestations are eradicated. Cheatgrass will be treated with glyphosate along the Valley Loop Road to mitigate spread from construction activities.

Velvet grass (photo to right) is abundant in Yosemite Valley and is a high priority for treatment but has not yet been accurately mapped. The IPP hopes to find volunteer help with this task. Park scientists will be continuing a study initiated last year in collaboration with USGS in Stoneman Meadow to test the effects of glyphosate on velvet grass. If study results are encouraging, crews will proceed to treat outlying velvet grass populations and where cover is less than 50%.



As in 2010, some medium-high priority species will be mapped and controlled. **Black locust** (*Robinia pseudoacacia*) will be mapped and treated using the cut-stump method. **Hops** (*Humulus lupulus*) was treated using with glyphosate last year. Regrowth will be retreated in 2011. Botanists will also conduct plant surveys to detect new non-native species entering the park.

Wawona and Highway 41 (Maps 4.0-4.6)

Species	Timing	Treatments
Blackberry	August-October	Spray (glyphosate)
Velvet grass	May-July	Herbicide study (glyphosate)
	Spring-fall	Test timing of application (glyphosate)
St. John's Wort	June-August	Spray (aminopyralid)
Bull thistle	May-August	Shovel-shear, spray (aminopyralid)
Cheatgrass	April-June	Control (glyphosate) of isolated populations (incl. Henness Ridge)
Foxglove	June-July	Hand-pull
Perennial sweet pea	June-July	Map; spray (aminopyralid)
Rose campion	May-July	Hand-pull

In 2010, the Wawona work crew successfully treated 23 gross-infested acres of **bull thistle** as well as seven other species. Bull thistle treatment will be continued in 2011, targeting drainages where invasive ornamental plants such perennial sweet pea and foxglove escaped cultivation.

The crew monitored and, where necessary, retreated **blackberry**. Invasive blackberry was observed to be spreading from established patches along the South Fork of the Merced River into burned areas. The IPP will also work with DNC to address the invasive plants adjacent to the golf course.

Velvet grass persists around the perimeter of Wawona Meadow and has a wide distribution in the area. The IPP is awaiting results of an herbicide study for effective velvet grass control. If results point to an effective treatment method, crews will treat velvet grass in key areas to reduce the risk of further spread, such as populations along the Chilnualna Falls trail and along the South Fork of the Merced River. Field staff will survey for new infestations in the newly disturbed Wawona Meadow restoration site and other areas.

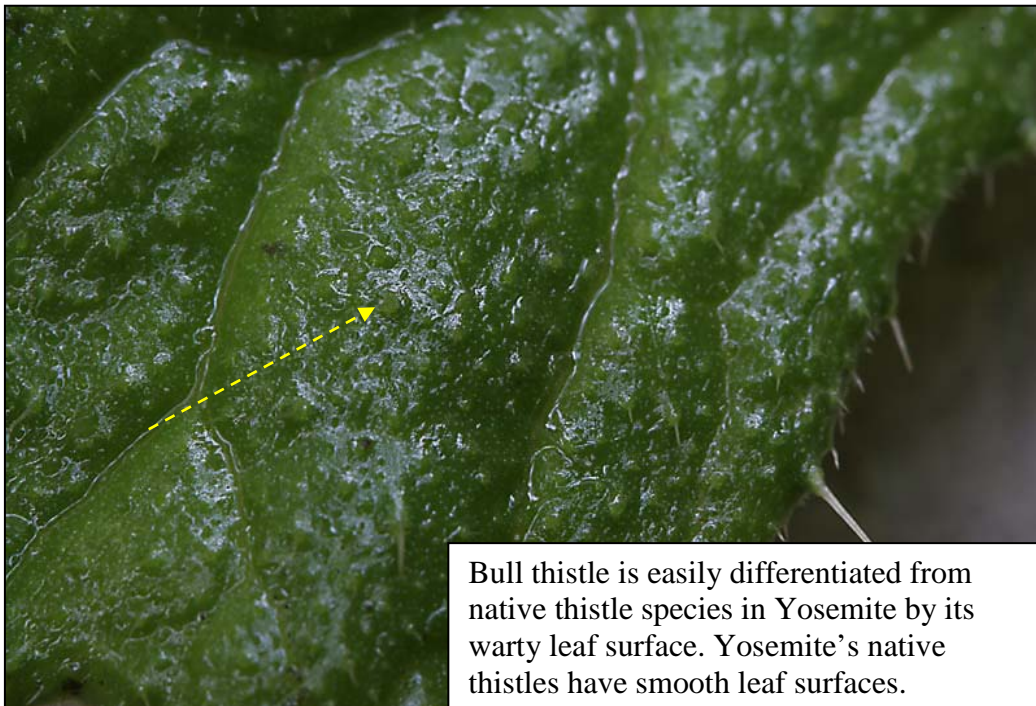
Field staff will document the distribution of **cheatgrass** and remap **perennial sweet pea** and **foxglove** (*Digitalis purpurea*). To address the invasive plants on private property, the IPP will continue outreach efforts, seeking cooperation and agreements to treat plants on private land.

Cheatgrass occurs at Henness Ridge (not shown in maps) where few non-natives are present. Crews will treat cheatgrass with glyphosate early season at this site before construction activities occur to prevent its spread.

Mariposa Grove (Map 4.7)

Species	Timing	Treatments
Invasive blackberry	August-October	Spray (glyphosate)
Bull thistle	May-August	Hand-pull, shovel-shear, spray (aminopyralid)
Common mullein	May-September	Hand-pull
Foxglove	May-September	Hand-pull

Invasive plant populations in the Mariposa Grove are a concern because of their potential to spread into more remote wilderness locations. Crews remapped priority species in Mariposa Grove in 2009 and treated nearly all populations. These populations were monitored and retreated in 2010 and will be treated again in 2011. Invasive **blackberry** and dense patches of **bull thistle** (large populations found outside of wilderness areas) will be sprayed with herbicide. In Wilderness, volunteers and staff will shovel-shear less dense infestations. NPS crews and volunteers will hand-pull **common mullein** (*Verbascum thapsus*).



WEED FACT:

Native animals are adapted to feed on native plants—with some animals very selective in the plants they eat—and to occupy well-defined plant habitats. Non-native plants can infest an area to the degree that food sources are displaced, resulting in adverse effects on wildlife. Conversely, some non-native plants can provide unnatural food abundance, affecting the distribution and behavior of animals. Thickets of Himalayan blackberry, for example, cover about 80 acres of Yosemite Valley. The berries attract black bears into areas where they are more likely to have confrontations with humans, which can be dangerous for both species.



Wilderness Areas (Maps 4.5, 4.7, 5.0-5.7, 6.3, 6.4)

Species	Timing	Treatments
Invasive blackberry	June-September	Hand-pull, spray or cut-and-dab (glyphosate)
Velvet grass	June-September	Hand-pull, inflorescence removal, mow, spray (glyphosate)
Bull thistle	June-September	Hand-pull, shovel-shear
Hops	June-August	Spray (glyphosate)
Yellow salsify	June-September	Inflorescence removal
Common mullein	June-September	Hand-pull
Prickly lettuce	June-September	Hand-pull
Cheatgrass	June-September	Map, hand-pull
Common dandelion	June-September	Map, hand-pull

Control of invasive plant populations in designated wilderness areas is a high priority. Crews will manage most invasive **blackberry** populations in remote locations by hand-pulling. However, where infestations are not under control with manual methods, crews will treat using glyphosate. If sensitive resources coincide with the infestation, crews may employ a cut-and-dab method.

Bull thistle is the most abundant invasive species in Wilderness and has been removed manually or mechanically for decades. Crews will continue to use such methods for diffuse populations.

Velvet grass treatments will focus on preventing further spread into remote areas. Additionally, park scientists are exploring options for managing large **velvet grass** and other species infestations in Pate Valley. New methods will not be used in Wilderness until proven effective in front-country settings.

As part of the 2010 implementation of the Carlon Restoration Project (outside of the mapped range), one field technician treated a single, large patch of **hops** with glyphosate. If the treatment was effective in controlling this infestation, field staff will retreat the regrowth, which would be a fraction of the initial infestation size.

NPS crews and volunteers will continue to manually treat several other invasive species such as **yellow salsify** (*Tragopogon dubius*), **common dandelion** (*Taraxacum officinale*), **common mullein** and **prickly lettuce** (*Lactuca serriola*). Field staff and volunteers will continue to map **cheatgrass** in Yosemite’s remote areas, most of which are wilderness. Isolated populations that threaten Yosemite’s pristine wilderness areas will be hand pulled.

O’Shaughnessy Dam to Poopenaut Valley (5.4-5.6)

Species	Timing	Treatments
Invasive blackberry	August-October	Survey and map; herbicide (glyphosate)
Velvet grass	May-July	Survey and map
Bull thistle	April-October	Hand-pull, shovel-shear

Invasive **blackberry** is ubiquitous along the Tuolumne River below Hetch-Hetchy with the source population growing out of O’Shaughnessy Dam (see photo, right). Although blackberry distribution was recently documented, additional surveying will be needed to complete the mapping in the most remote sections.

Crews will treat small populations of **bull thistle** as in past years by hand-pulling and shovel-shearing.



This upstream-most blackberry patch will be difficult to control!

TREATMENT PLAN FOR HIGH-PRIORITY SPECIES

Cheat grass. This plant is widespread in Yosemite and difficult to control. The IPP has not focused control efforts toward cheatgrass in the past but this year park scientists are initiating an herbicide effectiveness study in collaboration with USGS. Field staff and volunteers will also continue to document its distribution in the park and target some treatments to slow its spread in Wilderness.

Italian thistle (photo to right). This California-listed noxious weed has been found a few times in Yosemite and effectively treated with manual methods. Last year, populations were discovered within ¼ mile of the park borders in El Portal and Foresta. These areas will be resurveyed and treated if necessary in May.



Spotted knapweed. Since its accidental introduction to Foresta in 1990, crews have repeatedly hand-pulled spotted knapweed with the goal of eradicating it from Yosemite. Previously infested areas will be resurveyed in 2011 and individual plants will be hand-pulled. Large patches, while not known or expected, will be sprayed with aminopyralid.

Yellow star-thistle. Extensive grid surveys have been conducted in El Portal. Manual and mechanical methods have and will continue to be used to treat small populations. Aminopyralid will be used in March and April to treat populations larger than 10 square meters. Plants may be spot sprayed with glyphosate later in the season (April through June). Historic populations of yellow star-thistle in Foresta will be monitored. If plants are discovered, they will be hand pulled or sprayed with aminopyralid in April and May.

Bull thistle. Bull thistle is presently our most widespread, high-priority invasive plant. It is wind dispersed and quickly invades wet sites after disturbance. New infestations are often observed after prescribed and wildland fires. NPS crews will remove bull thistle where encountered with aminopyralid treatment, hand-pulling or shovel-shearing. It will not be feasible to treat all populations in 2011.

French broom. This plant was introduced to El Portal as an ornamental and is spreading quickly. Crews will treat French broom when they encounter it on NPS land. However, it and other ornamental broom species (*Genista* and *Cytisus*) are present on in-holdings within Yosemite and some of them may be invasive. Public outreach materials and

activities are being developed to encourage cooperative resource protection between these landowners and Yosemite National Park.

Velvet grass. Although velvet grass is widespread and abundant in Yosemite's meadows; the IPP does not yet have a highly effective treatment prescription. Hand-pulling can enhance the infestation by activating the robust seed bank, and initial herbicide trials did not yield promising results. New treatment prescriptions using glyphosate are being tested through a collaborative research effort with USGS. If study results indicate a viable treatment prescription, crews will begin treatment. Herbicide treatment will focus on small populations within intact native plant communities to halt further displacement of native vegetation. Additionally, small populations found along roads and trails with a high likelihood of dispersal into natural habitats will be a main target. Crews will also test efficacy of applying glyphosate at various times of year, from spring through fall.

Perennial pepperweed. A population found in Foresta was removed. Although no plants have been found for several years, monitoring is ongoing to ensure eradication.

Himalayan and cut-leaf blackberry. Himalayan blackberry constitutes the majority of invasive blackberry; cut-leaf blackberry will be treated the same as Himalayan blackberry. NPS crews will treat with glyphosate from July-November. Treatment will be spot-sprays applied with backpack sprayers or with a hand wand from a truck mounted sprayer. Cut-and-dab application trials, conducted in 2009 and 2010, yielded promising results. Crews may choose this method for remote populations or populations located near special status plants.

TREATMENT PLAN FOR MEDIUM-HIGH PRIORITY SPECIES

Tree-of-heaven. Known populations exist in El Portal and Yosemite Valley (Ansel Adams Gallery). This species is particularly difficult to control using manual and mechanical methods because it easily resprouts from remaining underground fragments. Therefore, crews will frill-cut, stump-treat, or spray foliage of small plants as appropriate. In El Portal, many plants are located near homes. Public outreach materials and activities are being developed to encourage cooperative resource protection between El Portal residents and Yosemite National Park. NPS crew will be available to help homeowners eradicate this species.

Prostrate pigweed (*Amaranthus albus*). Scattered prostrate pigweed individuals have been documented in El Portal, Wawona and Yosemite Valley. Crews may hand-pull prostrate pigweed when encountered and consider herbicide if populations are dense.

Giant reed (*Arundo donax*). Although giant reed is a widespread problem in California, there is only one known population in Yosemite at El Portal. Crews treated this population

with glyphosate in 2010. This population will be monitored and retreated if necessary in 2011.

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 and consider herbicide if populations are dense.

Bermuda grass (*Cynodon dactylon*). In Yosemite Valley, Bermuda grass is only known near Ahwahnee cabins, along the roadside west of the Rangers' Club and near Stoneman Meadow. Crews will survey these locations and then the IPP will determine the best treatment options.

Foxglove. 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. Field staff will map all known sites in Yosemite Valley and El Portal.

Hops. Hops is present at Carlon and several sites in Yosemite Valley. Crews treated Yosemite Valley and Carlon populations with glyphosate in 2010 and will apply follow-up treatments as needed in 2011.

St. John's Wort (*Hypericum perforatum*). USFS and Mariposa County officials report it is spreading quickly. Therefore, Yosemite is elevating this plant to high priority, and is initiating systematic mapping and removal operations park-wide. St.-John's wort is very similar to the native *H. formosum*, but the native species lacks the characteristic translucent glandular dots when held up to the light (see photo).



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

Oxeye daisy. This plant was rated as a medium priority plant in the 2008 IPMP, but Yosemite Invasive Plant managers have noted a dramatic spread in the Big Meadow area in Foresta. Yosemite is elevating this plant to high priority, and is initiating systematic mapping and removal operations park-wide. It will be treated with aminopyralid pre-flower.

Rose champion (*Lychnis coronaria*). Field staff will map known locations of rose champion and survey for new populations. If time allows, crews will treat with hand pulling.

White sweetclover (*Melilotus alba*), yellow sweetclover and sourclover (*M. indica*). Invasive *Melilotus* populations have been documented at Hodgdon, El Portal road, Big Oak Flat Road, Hetch Hetchy (sourclover), Camp 6 (white clover), and El Portal (yellow clover). Populations will be hand-pulled as time allows.

Spearmint (*Mentha spicata* var. *spicata*). Known populations of spearmint exist in Wawona and several sites in Yosemite Valley. Populations will be hand-pulled as time allows.

Many-flowered tobacco (*Nicotiana acuminata* var. *multiflora*). Many-flowered tobacco is found in Wawona, the Mariposa Grove and Yosemite Valley. Plants will be hand-pulled as time allows.

Woodbine (Virginia creeper, *Parthenocissus vitacea*). Park and volunteer crews will begin comprehensive mapping of the plant species in Yosemite as there is some evidence it is spreading from landscaped areas in Yosemite Valley. The use of this plant within Yosemite should be discouraged and hand pulling will begin where appropriate to document manual treatment success. Other populations are also known from El Portal.

Black locust. Yosemite Valley black locust populations are spreading and have been found as far downriver as the Rostrum. These populations were mapped and then treated using the cut-stump method. These populations will be monitored in 2011 and retreated as needed. Newly discovered populations located outside the bed and banks of Wild and Scenic Rivers will be treated according the 2008 IPMP.

London Rocket (*Sisymbrium irio*). Field staff will map known populations of London rocket and survey for new populations.

Rose clover. Field staff will map the rose clover population above Cascades Fall (Route 140), those in Wawona and survey for additional populations. Crews will treat rose clover on Route 140 with aminopyralid starting with the eastern-most patches and work westward as time permits.

Common mullein. This invasive plant will continue to be controlled throughout Yosemite using manual methods.

Purple vetch. Crews will map known locations of purple vetch and survey for new populations. If time allows, crews will treat with aminopyralid in late spring-early summer.