

APPENDIX B

Bradmoor Island and Arnold Slough Restoration Projects
Invasive Vegetation Management Plan

B INVASIVE VEGETATION MANAGEMENT PLAN

B.1 CURRENT CONDITIONS AND INVASIVE SPECIES MANAGEMENT STRATEGIES

As part of ongoing managed wetlands operations, undesirable invasive plants are managed at Bradmoor and Arnold in the managed wetland portions of the properties. Currently, two species of invasive plant species are being managed at Bradmoor and Arnold: common reed (*Phragmites australis*) and perennial pepperweed (*Lepidium latifolium*).

The properties typically are flooded in early October and drained in early February, following waterfowl season. Flooding and draining occurs tidally through existing water control structures (pipes and gates), which are maintained to ensure operability and accessibility. Drainage through the water control structures is slow and ineffective at two of the ponds at Bradmoor, and thus drainage to dry out the managed wetland areas is supplemented by pumping.

After the sites are dry in the spring, common reed patches are sprayed with aquatic-labeled glyphosate (e.g., Rodeo), and dead standing vegetation is mowed. This treatment is repeated as new *P. australis* regrows, typically up to three times during the spring and summer, before the fall flood-up (Saltonstall 2005).

If any new *Lepidium latifolium* patches are identified on site, they are sprayed in late spring with Chlorsulfuron (e.g., Telar). Chlorsulfuron is effective at controlling *Lepidium* but currently is not labeled for application below mean high water (Boelk 2005). All infestations of *Lepidium* on site have been high on levee slopes and/or treated in dry conditions.

These activities, which are typical of managed wetlands in Suisun Marsh, have been completed at Bradmoor and Arnold by the California Department of Water Resources (DWR) in cooperation with the lessees since DWR purchased the properties, and the total coverage of invasive plants has been decreasing annually because of these actions. All application of herbicides has been done in consultation with a certified chemical applicator and following standard best management practices (BMPs), as recommended by the Suisun Resource Conservation District to avoid impacts on sensitive resources.

DWR would continue treating the sites following initiation of restoration construction and would expand on the current management program. to provide better long-term control and re-establishment of more desirable native wetland plant assemblages.

B.2 ONGOING MANAGEMENT

Following the start of construction activities, the flood and drain cycle would continue to promote desirable vegetation and only be dewatered to facilitate treatment of invasive plants (if needed).

Vegetation management on the levees and roads (before completion of tidal restoration) would be necessary to maintain access for site maintenance activities. Access roads and levee crowns would be mowed and sprayed as needed, up to 6 times per year, to keep tall vegetation from growing.

To facilitate vegetation management, managed wetland areas would be drained using existing water control structures and pumped dry using portable pumps as needed. Herbicides labeled for aquatic use would be used to control nuisance vegetation in tidal areas. These herbicides would be mixed with appropriate surfactant/activator, in accordance with the manufacturer's recommendations.

B.2.1 HERBICIDE AND GENERAL BMPs

The following herbicide and general BMPs will be implemented to avoid and minimize impacts:

- ▶ Herbicides will be mixed off-site or in designated upland staging areas, to prevent spills in wetland areas, and tanks will be rinsed offsite following application.
- ▶ Equipment will be fueled in designated staging areas or off-site, and will be equipped with spill prevention materials.
- ▶ Equipment will be checked for leaks daily before use in wetland areas.
- ▶ Spill prevention and response measures will be identified before application of herbicides and identified in a Hazardous Materials Management Plan for the activity.
- ▶ No herbicide will be discharged directly into surface waters during application.
- ▶ All herbicides will be used in accordance with manufacturer's recommendations.
- ▶ Herbicide use in tidal areas will be done in accordance with the General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges for Algae and Aquatic Weed Control Applications (Order No. 2013-0002-DWQ, NPDES No. CAG990005), including receiving water monitoring, to ensure that the receiving waters are below listed limitations.
- ▶ Herbicides would not be used when wind exceeds 10 miles per hour, during gusty conditions, or during potential inversions.
- ▶ Herbicides will not be used when local rainfall greater than 0.5 inches is forecasted within a 24-hour period from planned application events. All herbicides are registered with the California Department of Pesticide Regulation and U.S. Environmental Protection Agency (EPA).

B.2.2 MANAGED WETLANDS BMPs

The following managed wetlands BMP will be implemented to avoid and minimize impacts:

- ▶ Invasive vegetation management activities within managed wetlands will be performed when conditions are dry.

B.2.3 TIDAL WETLANDS BMPs

The following tidal wetlands BMPs will be implemented to avoid and minimize impacts:

- ▶ Herbicides used in tidal wetland areas below mean high water will be labeled for aquatic use.

- ▶ Any herbicide application in tidal areas will occur at low tide and will be applied by hand to minimize overspray.

Herbicides labeled for aquatic use (Table B-1) would be sprayed with a backpack sprayer, a spray rig attached to a truck, boat, or all-terrain vehicle, or by a drone-mounted sprayer, depending on patch size and accessibility. After the herbicide begins to take effect, the vegetation would be mowed without disturbing rhizomes or scarifying soil. Spraying and mowing would be repeated as necessary.

No more than 50 acres total per year would be sprayed with herbicide at Bradmoor and no more than 15 acres per year would be sprayed at Arnold (but multiple treatments of the same patch may occur). This would not be considered additive acreage. Herbicides would be applied up to four times per year.

Table B-1 Herbicides that Could Be Used for Future Invasive Vegetation Management¹

Habitat Type	Herbicide	IUPAC Name
Terrestrial (above mean high water)	Chlorsulfuron ^b	2-Chloro-N-[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) aminocarbonyl] benzenesulfonamide
Aquatic ²	Imazapyr ^a	(RS)-2-(4-Methyl-5-oxo-4-propan-2-yl-1H-imidazol-2-yl) pyridine-3-carboxylic acid
Aquatic ²	2,4 D ^b	(2,4-Dichlorophenoxy) acetic acid
Aquatic ²	Glyphosate ^a	N-(phosphonomethyl) glycine
Aquatic ²	Triclopyr ^b	[(3,5,6-Trichloro-2-pyridinyl)oxy] acetic acid

Notes:

1. Chemicals not listed here may be substituted for these chemicals if analysis is provided that demonstrates that effects similar or less than was analyzed for the listed chemicals.
2. Herbicides are included in the General NPDES Permit for Residual Aquatic Pesticide Discharges for Algae and Aquatic Weed Control Applications (Order No. 2013-0002-DWQ, NPDES No. CAG990005)

Sources: (a) DiTomaso et al. 2013; (b) CDFA 2019

B.3 POST-CONSTRUCTION MANAGEMENT

DWR expects that new colonization of undesirable plants would be ongoing, following restoration construction. DWR would continue to monitor the sites for undesirable invasive vegetation for 5 years after tidal restoration is completed, as part of the Proposed Project. When invasive vegetation is found at the sites, DWR would assess the invasive species, and appropriate management actions would be taken to attempt to control it. Methods could include hand removal, mowing using a tracked amphibious vehicle, and spraying herbicides (Table B-1). Pest control methods would be implemented on detection of known invasive species. When possible, plants would be removed by hand or other mechanical methods. Herbicides would be used if mechanical methods are infeasible or ineffective. Currently, no approved, effective, biological control agents exist for the expected invasive plants in Suisun Marsh. Plant management methods would be informed by the best available information. Five years after tidal restoration, the site would be monitored in accordance with the long-term monitoring and management plan, which would include ongoing management of invasive species.

B.3.1 MECHANICAL

Mechanical control could include hand removal (e.g., pulling or cutting) or mowing. Mowing would be done with conventional tools and equipment where possible and using specialized amphibious tracked equipment where

necessary. Mowing would be done at low tide, and residual vegetation material would be hauled off-site for disposal.

B.3.2 CHEMICAL

The herbicides listed above and potentially others would be selected to target specific invasive plant species, minimize off-target effects, and limit the potential for herbicide resistance. Herbicide application in tidal areas would be applied during low tide to minimize the potential for any chemicals to be discharged into surface waters and would be applied following the manufacturer's recommendations, including tank mixes or surfactants. Table B-1 shows the herbicides that may be used to control invasive plants during and after restoration construction. With the exception of Chlorsulfuron, all herbicides would be aquatic formulations. Chlorsulfuron would be used only above mean high water (6.4 feet NAVD88), in accordance with the manufacturer's recommendations.

B.3.3 POST DISTURBANCE RESTORATION

Following removal of invasive plants, native plants would be planted where necessary to reduce further establishment of invasive plants. Appropriate planting species and methods would be determined based on elevation and surrounding plant types. Plantings would include bulrush (*Schoenoplectus* sp.), cattails (*Typha* sp.), or other appropriate mid to high-marsh species. Native vegetation may be broadcast via seeds, rhizomes, or adult plugs, and may include bundles of rhizomes and vegetation.

B.4 REFERENCES

- Boelk, D. A., 2005. *Fact Sheet: Perennial Pepperweed*. Plant Conservation Alliance, Alien Plant Working Group. Available: <https://www.invasive.org/alien/fact/pdf/lela1.pdf>.
- California Department of Food and Agriculture (CDFA). 2019. *Encyclopedica: Russianthistle*. Available: https://www.cdfa.ca.gov/plant/IPC/encyclopedica/weedinfo/wininfo_table-sciname.html.
- DiTomaso, J. M., G. B Kyser, et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California.
- Saltonstall, K. 2005. *Fact Sheet: Giant Reed*. Plant Conservation Alliance, Alien Plant Working Group. Available: <https://www.invasive.org/weedcd/pdfs/wgw/commonreed.pdf>.