

RECLAMATION

Managing Water in the West

Phragmites Control Study

Blacklock Restoration Site, California

Environmental Assessment



Photo Credit: Krista Hoffmann (California Department of Water Resources)

Mission Statements

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The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

**Phragmites Control Study
Environmental Assessment
Blacklock Restoration, California
Solano County**

Bureau of Reclamation
United States Department of the Interior
Interior Region 10 California-Great Basin
Bay-Delta Office

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List of Acronyms and Abbreviations

BMP	Best Management Practices
BO	Biological Opinion
CA	California
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCAA	California Clean Air Act
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CO	Carbon monoxide
Corps	US Army Corps of Engineers
CWA	Clean Water Act
dB	decibel
DBW	Department of Boating and Waterways
DWR	Department of Water Resources
EA	Environmental Assessment
EFH	Essential Fish Habitat
ESU	Evolutionarily Significant Unit
FWS	Fish and Wildlife Service
GHG	Greenhouse Gas

HAPC	Habitat Areas of Particular Concern
iPac	Information for Planning and Consultation
L _{eq}	Equivalent sound level
L _{max}	Maximum sound level
MBTA	Migratory Bird Treaty Act
mph	Miles per hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NO ₂	Nitrogen dioxide
NPPA	Native Plant Protection Act
O ₃	Ozone
PBFs	Physical or Biological Features
PCE	Primary Constituent Elements
PM	Particulate matter
Quad	Quadrangle
Reclamation	Bureau of Reclamation
RWQCB	Regional Water Quality Control Board
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO ₂	Sulfur dioxide
SPCCP	Spill Prevention Control and Countermeasures Plan
SWRCB	State Water Resources Control Board
USDA	US Department of Agricultural
USGS	US Geological Survey

Section 1 Introduction

In conformance with the National Environmental Policy Act, 42 U.S.C. § 4431 et seq. (NEPA), as amended, the Bureau of Reclamation (Reclamation) has prepared this Environmental Assessment (EA) to evaluate and disclose potential environmental impacts associated with implementation of the Blacklock Restoration: Phragmites Control Study (Proposed Action).

This EA describes the existing environmental resources in the restoration site, evaluates the impacts of the No Action and Proposed Action alternative on the resources, and proposes measures to avoid, minimize, or mitigate any potential negative impacts. This EA was prepared in accordance with NEPA, Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations (CFR) 1500-1508), and Department of the Interior Regulations (43 CFR Part 46).

Background

Suisun Marsh, about 35 miles northeast of San Francisco in southern Solano County, currently provides habitat for numerous species of plants, fish, and wildlife. Historically, the Suisun Bay and Marsh included about 68,000 acres of tidal wetlands. From the mid-1880s to the early 1900s, over 90 percent of these wetlands were reclaimed for agriculture. Agricultural production was limited due to increased salinity in the Suisun Bay/Marsh region. In 1987, the California's Department of Water Resources (DWR), the California's Department of Fish and Wildlife (CDFW), United States Bureau of Reclamation (Reclamation) and the Suisun Resource Conservation District (SRCD) signed the Suisun Marsh Preservation Agreement (SMPA) to mitigate for salinity impacts on the marsh resulting from operation of the State Water Project and Central Valley Project, and a portion of upstream diversions. The mitigation actions included construction of large-scale facilities and management actions to provide channel water salinity of adequate quality for waterfowl food plant production. The principal agencies revised the SMPA and its companion Mitigation and Monitoring Agreements in 2015. The SMPA identified that Phase C funds of the Suisun Marsh Mitigation Agreement, a companion agreement to the SMPA, was to be used for multi-species management in the Suisun Marsh.

DWR acquired the Blacklock property in December 2003 using CALFED Ecosystem Restoration Program grant funds and Suisun Marsh Mitigation Agreement Phase C Mitigation funds. The property is approximately 70 acres, which includes 67 acres of previously diked, now restored tidal wetland, and 3 acres of remnant levees. The property had been managed for livestock grazing and waterfowl hunting from 1946 until it was purchased by DWR in 2003. Prior to restoration, wetland management was minimal, consisting primarily of flooding and circulation during waterfowl hunting season from

October to February or March (DWR 2007). Since acquisition, and through restoration planning, DWR has maintained the property as a managed wetland and followed an “interim management” strategy.

The Blacklock property has been tidally flooded since late December 2005 due to an unplanned breach, during the planning phase of the restoration project. Weather and Delta outflows during winter 2005-2006 resulted in higher than normal tides throughout Suisun Marsh, sometimes 1-2 feet above predicted levels.

A subsequent breach was then constructed as planned on the levee bordering Little Honker Bay in 2006. Restoration of the Blacklock site was considered complete in 2007 by the USWFS and achieved the 2,500 acre Conservation Area (see Table 6, Salt Marsh Harvest Mouse [SMHM] Conservation Areas) goal for preferred SMHM habitat distributed throughout the marsh (1,000 acres specifically set aside on CDFW properties) along with other mitigation and preservation requirements.

The invasive Eurasian lineage of *Phragmites (australis)* has invaded the San Francisco Estuary and Suisun Marsh, and has negative impacts in tidal ecosystems (Chambers et al. 1999, Crooks 2002). *Phragmites australis* has been documented within the Blacklock Restoration site since 2003. The spatial extent of *Phragmites* was monitored and analyzed every year that CDFW performed vegetation mapping (2006-2015). Currently, *Phragmites* is outcompeting adjacent emergent vegetation (as determined by the loss of all mapped *Phragmites*-mixed communities) and expanding. The invasive species comprised over 60% of the total vegetated cover as of 2015 (Blacklock Vegetation Monitoring years 6-10).

Reclamation and DWR aims to assess the feasibility, efficacy, and environmental impacts of *Phragmites* control methods, alone and in combination, on a small scale within the tidal wetlands of Blacklock Restoration Site within Suisun Marsh. The outcomes of this study will inform future management actions in this site, in addition to helping to fill data gaps by investigating integrated pest management approaches and expanding on methods already evaluated in literature to provide tools to project managers for the Fish Restoration Program and other programs. A variety of studies have investigated methods for *Phragmites* control across regions of the U.S. (Reviewed by Hazelton et al. 2014; also, Cheshier et al. 2012; Derr 2008a; Kay 1995; Monteiro et al. 1999). However, no control method is currently permitted in tidal marshes, as there is concern for negative impacts on sensitive species with the potential to occur within the Bay-Delta environment.

Need for the Project

The need for the action derives from colonization of the Blacklock Restoration site post-construction by non-native invasive plant species that reduce the likelihood of successfully meeting objectives identified in the Blacklock Restoration Plan. Colonization by invasive non-native plant species prevents the ability for native tidal marsh vegetation to successfully establish in the site. Therefore, this *Phragmites* Control

Study is being proposed as a series of test plots to assess the feasibility, efficacy, and environmental impacts of control methods used on the invasive common reed, *Phragmites australis*, using herbicides and mowing treatments alone and in combination, on a small scale within the tidal wetlands. The outcomes of this study will inform future management action for other restoration projects in the Suisun Marsh.

Section 2 Alternatives Including the Proposed Action

This EA considers two possible alternatives: the No Action Alternative and the Proposed Action. The No Action Alternative reflects future conditions without the Proposed Action and serves as a basis of comparison for determining potential impacts to the human environment that would result from implementation of the Proposed Action.

Identification of the Proposed Action for this EA was based upon consideration of the purpose and need. Additional alternatives were considered but eliminated due to them being substantially similar in design but had greater potential for negative impacts than the Proposed Action (40 C.F.R. § 1502.14(a)). The designs consisted of different control methods including solely mowing or application of Rodeo.

No Action Alternative

Under the No Action Alternative, Reclamation would not assess the feasibility, efficacy, and environmental impacts of control methods within the tidal wetlands of Blacklock in Suisun Marsh. Reclamation would not implement invasive plant species eradication methods at the Blacklock Restoration Site.

Proposed Action Alternative

Reclamation and DWR propose to study and employ several *Phragmites* control methods individually and in combination, including mowing and application of two herbicides, glyphosate (as the aquatic formulation, Rodeo) and imazapyr (as the aquatic formulation, Habitat). Mowing and herbicide applications will occur by an authorized and certified aquatic pest control applicator with experience in the Bay-Delta. An amphibious mower, mounted with an herbicide applicator, will be used to mow and apply herbicides to the designated 10-meter x 10-meter treatment plots. For herbicide application the amphibious vehicle will navigate around the perimeter of the plot in order to access all sides for even pesticide treatment.

During mowing, the 12 mowed plots will be mowed in straight lines from the edge closest to the water, inward.

Of the 24 plots, 20 plots will be treated with herbicides and 12 plots will be mowed (some plots will be both sprayed and mowed) once per year during the summer between August and December.

Herbicide applications will occur first when the plants are mature and beginning to reallocate resources from above ground to below ground tissues, between August and October, and mowing will occur two weeks or more later, to allow the herbicide time to take effect. Mowed waste will be removed from the site the same day that mowing occurs using a backhoe attachment to the amphibious mower. The amphibious vehicle will be operated on the site four days or less per year, one day for mowing, and three days (or fewer) to apply herbicides across 20 plots. The amphibious mower will use the shortest route possible traveling between plots and will use open water channels where possible for navigation, in order to minimize disturbance within the emergent vegetation. All project activities will take place one hour after sunrise to one hour before sunset.

Methods will be tested in a randomized design of five treatments (refer to Table 1) and a control, replicated four times, totaling 24 plots (Figure 1).

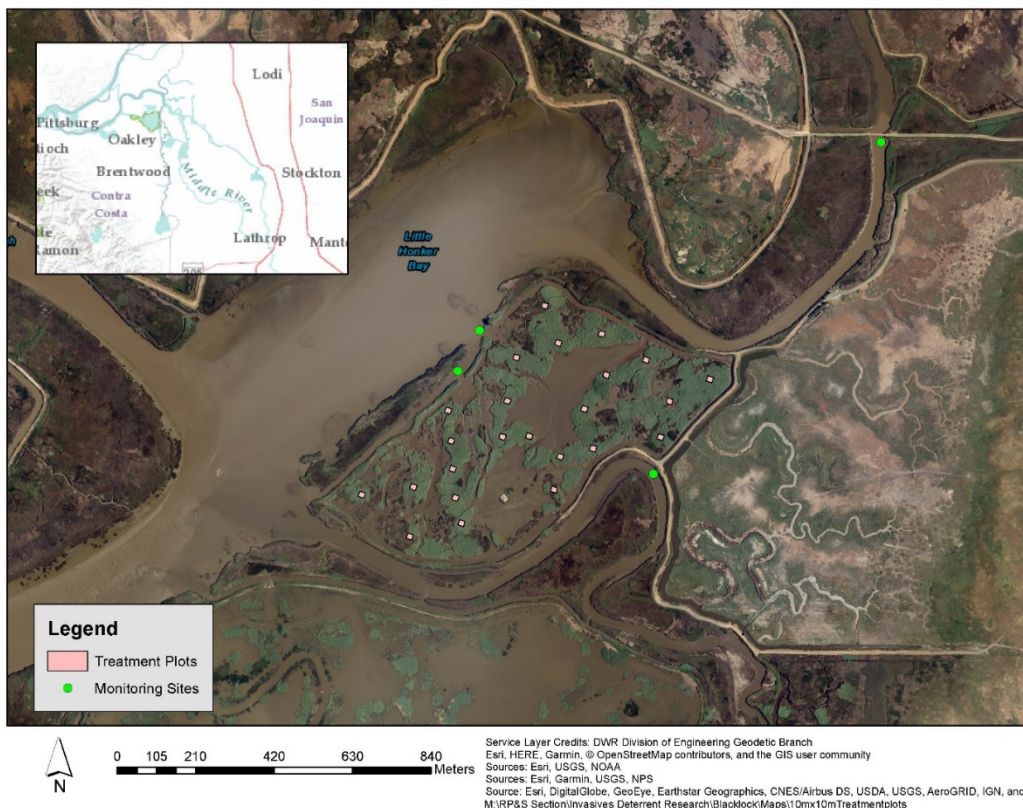


Figure 1. Study site showing an example of 24 10-meter x 10-meter treatment plots on the Blacklock site, as well as the four additional monitoring locations. Actual treatment plot locations are to be determined.

Table 1. Experimental treatments.

1	2	3	4	5	6
Control	Habitat	Rodeo + Habitat	Rodeo + mowing	Habitat + mowing	Rodeo + Habitat + mowing

Water quality monitoring will occur adjacent to each treatment plot, as well as four additional monitoring sites as shown. Two of the additional monitoring sites are located at the Blacklock breaches to measure concentrations of herbicides leaving the site, or other water quality parameters (e.g. turbidity) that could impact habitat in Little Honker Bay. The other two monitoring sites are located along nearby inlets to Little Honker Bay, to measure background water quality parameters, including herbicide concentrations from other sources in the area. Efficacy monitoring of *Phragmites* health before and after treatments will occur within the center of each plot (Figure 2).

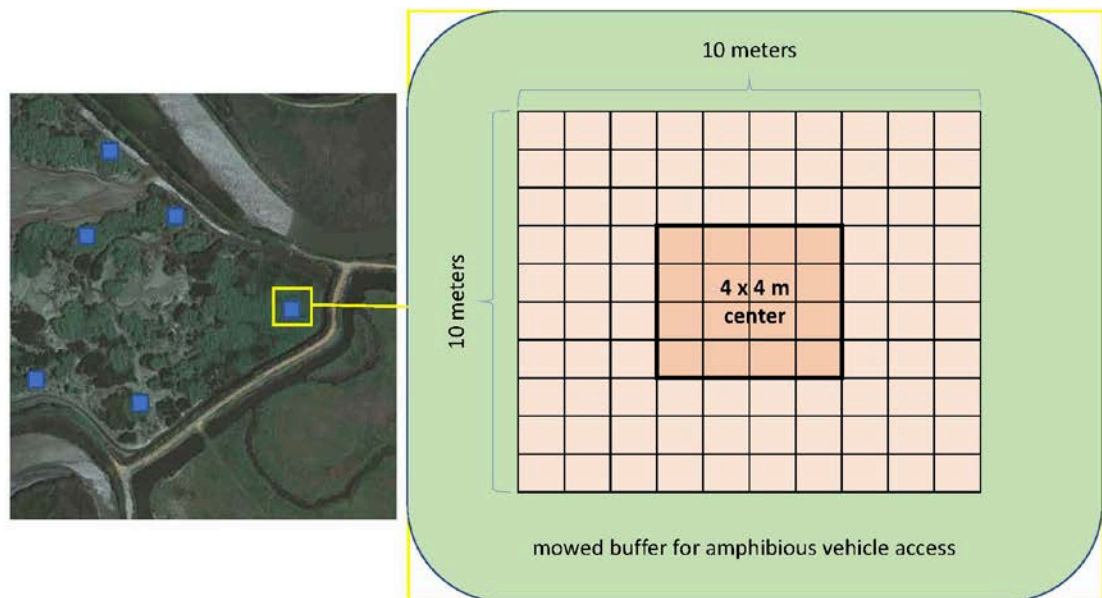


Figure 2. Treatment plot zoomed in, also showing the 4-meter x 4-meter square monitoring centre

Herbicide treatments will be tested alone and in combination with mowing to test whether efficacy is improved by mowing (refer to Table 1, Experimental treatments, above). See Table 6 for an example of how a year of study actions could look given example dates for mowing and herbicide application, as well as all monitoring actions.

Phragmites responses to the treatments will be measured in the 4-meter x 4-meter centre of each plot, hereafter referred to as the “monitoring centre.” The monitoring centre, rather than the whole plot, will be measured, because effects are expected to be more uniform in the centre of the plot, as it is buffered from any effects from neighbouring vegetation. Efficacy monitoring will occur regularly over the course of the three-year study, while water quality monitoring will be strategically timed to capture pesticide overspray and fate/transport over several tidal cycles after each control method is applied.

Monitoring results will be used to characterize the efficacy of treatments tested, water quality impacts, and non-target impacts on nearby vegetation and the aquatic food web.

The Study will evaluate efficacy by measuring *Phragmites* health over time, before and after mowing and herbicide applications, within each plot (see Figure 2, above) via aerial imagery. Drones equipped with multispectral or hyperspectral cameras will capture images for analysis. Vegetation health will be quantified using a standardized index, such as the Normalized Difference Vegetation Index (NDVI), which measures photosynthetic capacity (Lowman et al. 2016; Majahan and Bundel 2017). Changes in proximal non-target vegetation will be monitored using the same technique in designated reference locations.

The Study will assess water quality impacts prior to and after each control action. Grab water samples will be collected to identify herbicide analytical chemistry within the immediate vicinity of each plot. One sample will be collected prior to herbicide application, within 24-hours before applications occur, as well as during the subsequent high slack tide after herbicide application, with a goal to quantify overspray or pesticide runoff. Samples will be collected at all locations again, on the outgoing tide two and four tidal cycles later, to assess the fate and transport of herbicides.

Standard water quality parameters will be monitored in concert with water sample collection. Impacts on primary productivity will be measured in receiving waters as chlorophyll-a via handheld YSI. Turbidity, dissolved oxygen, pH, salinity, and temperature will also be measured. Environmental conditions will also be recorded (e.g. wind speed, weather, recent precipitation, tidal stage, presence of species of concern).

Section 3 Affected Environmental Consequences

This section describes the affected environment and evaluates the environmental consequences that may occur with implementation of the Proposed Action and the No Action Alternative. Potential impacts on several environmental resources were examined and found to be nonexistent. These resources include: Groundwater, Energy, Geology and Soils and Agriculture.

Indian Trust Assets (ITAs)

ITAs are legal interests in assets that are held in trust by the U.S. for federally recognized Indian tribes or individuals. There are no ITAs in the vicinity of the proposed restoration site. The nearest ITA to the restoration site is the Lytton Rancheria located 28 miles (southeast) away from the restoration site in San Pablo, California. Based on the nature of the planned work it does not appear to be in area that will impact Indian hunting or fishing resources or water rights nor is the proposed activity on actual Indian lands. It is reasonable to assume that the Proposed Action will not have impacts to ITAs.

Indian Sacred Sites

Sacred sites are defined in Executive Order 13007 (May 24, 1996) as “any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, and Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.” There are no identified Indian Sacred Sites within the Proposed Action area; therefore this project would not inhibit use or access to any Indian Sacred Sites.

Environmental Justice

Executive Order 12898 requires each Federal agency to identify and address disproportionately high and adverse human health or environmental impacts, including social and economic effects of its program, policies, and activities on minority populations and low-income populations. The Proposed Action would not result in adverse human health or environmental impacts to minority or low-income populations.

Air Quality

Section 176 (c) of the Clean Air Act (CAA) (42 USC 7506 (c)) requires that any entity of the Federal government must conform to the applicable State Implementation Plan (SIP) required under Section 110 (a) of the CAA (42 USC 7401 (a)) before an action is otherwise approved. The action must be consistent with a SIP’s purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of those standards.

Affected Environment

The restoration site is within the Bay Area Air Quality Management District (BAAQMD). The District’s jurisdiction encompasses southwestern Solano and southern Sonoma counties and all of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara and Napa counties. All rules and regulations of the district would be followed. Air quality is generally good as the wind blows nearly every day in Suisun Marsh (Suisun- the Native American name for “west wind”). BAAQMD reports for Fairfield indicate that the average ozone for the area, for the past three years, is 60 parts per billion (2019 BAAQMD). Criteria air pollutants are prevalent pollutants in the air that are known to be deleterious to human health. Criteria air pollutants are designated as nonattainment, attainment, and unclassified and include ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter (PM₁₀ and PM_{2.5}), and lead. There are no data available from the Fairfield station on carbon monoxide, nitrogen dioxide, sulfur dioxide and particulate matter (2019 BAAQMD).

Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no anticipated impacts to air quality since invasive species plant eradication would not occur.

Proposed Action

The Proposed Action would involve the use of motorized mower and worker commutes that would result an increase in temporary emissions. For the purpose of this analysis, it was assumed that the mower would be used 4-days per year for 3 years, averaging 5-hours per day. It is anticipated the mower would be used for total of 60 hours. The Proposed Action would result in diesel exhaust emissions from on-site mower equipment. The diesel exhaust emissions would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. According to the Internal Combustion Engines Air Emissions Calculator, the potential emissions are 0.03 ton per year of NO₂ and 0.01 ton per year of CO. The total potential Greenhouse gas emission is anticipated to be 0.95 tons per year of carbon dioxide (CO₂). Air quality impacts from the motorized mower is expected to be insignificant and will not exceed federal and state standards. Emissions from worker trips made to the site and back are not expected to exceed baseline conditions, as emission resulting would be discountable.

The Proposed Action would involve temporary minor emissions. However, implementation of the Proposed Action would not result in an increase of long-term emissions from mobile, stationary, or area sources. Total emissions would be temporary and would not result in a cumulatively considerable net increase.

Biological Resources

Affected Environment

Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America and is a critical part of the San Francisco Bay/Sacramento-San Joaquin River Delta (Delta) estuary ecosystem (Moyle *et al.* 2014). It encompasses more than 10% of California's remaining natural wetlands and serves as the resting and feeding ground for thousands of birds migrating on the Pacific Flyway. In addition, the Suisun Marsh consists of several habitat types that provide essential habitat for more than 221 bird species, 45 animal species, 16 reptilian and amphibian species, and the salmon fishery by providing important tidal rearing area for juvenile fish.

Managed wetlands are the most common land cover type in the Suisun Marsh, accounting for approximately 51,416 acres, or 66.5% of the Marsh. Managed wetlands in the study area provide valuable nesting, foraging, and wintering habitat for waterfowl and shorebirds. Managed wetlands also provide nesting and foraging area for several special status species, such as salt marsh harvest mouse, Suisun shrew, California black rail, California clapper rail, western pond turtle, Suisun song sparrow, and salt marsh common yellowthroat. Managed wetlands also provide habitat for raptors, songbirds, and numerous wildlife species.

The Proposed Action would be located at the Blacklock Restoration Site within Suisun Marsh, and centered on these coordinates 38.179347 degrees Latitude, 121.910942 degrees Longitude. Habitat within the restoration site consists of tidal marsh and upland habitats. There is 67-acres of previously diked, now restored tidal wetland. Upland habitat is limited to 3-acres of exterior berms and remnant levees. Most of this upland habitat is of poor quality. The habitat consists primarily of fragmented non-native weeds along the levee crown. There is no connection to the nearby contiguous grassland habitat.

Vegetation monitoring of the restoration site has identified the presence of communities and special status plants. Common plant species growing at the restoration site include the following: tules (*Schoenoplectus [Scirpus] acutus*, *S. californicus*), California rose (*Rosa californica*), cattails (*Typha latifolia*, *T. angustifolia*), wild radish (*Raphanus sativus*), blackberry (*Rubus discolor*), saltgrass (*Distichlis spicata*). No sensitive plant species were found in the restoration site. While native vegetation has expanded, the growth of the invasive plant *Phragmites australis* is has been exceeding it, at more than double the rate of tule expansion.

Special Status Species

Special-status species addressed in this section include plants and animals that are legally protected or are otherwise considered sensitive by Federal, State, or local resource conservation agencies and organizations. These include species that are State listed and/or Federally listed as rare, threatened, or endangered; those considered as candidates or proposed for listing as threatened or endangered; and plants considered by the California Native Plant Society (CNPS) to be rare, threatened, or endangered.

California Native Plant Protection Act

The Native Plant Protection Act (NPPA) of 1977 protects rare and endangered plants in California and prohibits take of endangered or rare native plants. Based on a review of California Natural Diversity Database (CNDDB) and CNPS database searches for rare and endangered plant species was conducted for the surrounding USGS Quad (Denverton), federally endangered Soft bird's-beak (*Chloropyron molle ssp. Molle*), Suisun thistle (*Cirsium hydrophilum var. hydrophilum*), Contra Costa goldfields (*Lasthenia conjugens*) and the Keck's Checker-mallow (*Sidalcea keckii*) returned occurrences. Under the California Rare Plant Rank they are listed as 1B (Plants Rare, Threatened, or Endangered in California or Elsewhere). CNPS further designates the level of endangerment with a Threat Rank, with .1 meaning a plant is seriously threatened, a rank of .2 means fairly threatened, and a rank of .3 means not very threatened in California. The threat ranking for Soft bird's-beak is currently .2, and the threat ranking for Suisun thistle, Contra Costa goldfields and Keck's Checker-mallow is .1.

Threatened or Endangered Species

The U.S. Fish and Wildlife Service (Service) and National Marine Fisheries Service (NMFS) have jurisdiction over federally listed threatened and endangered species. An endangered species is defined as "...any species which is in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as

“...any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 USC Section 1532). Section 9 of the Endangered Species Act of 1973 (ESA) makes it illegal to “take” (defined as to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct”) endangered and threatened species (16 USC 1538).

A special-status species list was generated from the Service Information for Planning and Conservation (IPaC) website for the surrounding area on June 10, 2019 (USFWS 2019). The following Table 2 includes those federally listed species with recorded occurrences within the surrounding USGS 7.5-minute Quad based on the CNDDDB (2019). The table also includes the species’ status, determination of impacts from the Proposed Action, and a summary of the rationale supporting the determination.

Migratory Bird Treaty Act

A list of bird species with recorded occurrences within the surrounding quad was also obtained from the CNDDDB (2019). The list was compared to the Service’s list of protected species under the Migratory Bird Treaty Act (MBTA) of 1918 (2015a). Protected migratory bird species with recorded occurrences in the Proposed Action restoration site are included in Table 2, also.

Table 2 – Special Status Species List				
Common Name	Scientific Name	Status ¹	Effect ²	Summary of Effects Determination ³
Plants				
Contra Costa Goldfields	<i>Lasthenia conjugens</i>	FE	NE	The restoration site is outside the current range of the species and no occurrences were documented during botanical surveys.
Soft Bird's-beak	<i>Cordylanthus mollis</i> ssp. <i>mollis</i>	FE	NE	While the restoration site is within the current range of the species, no occurrences were documented during botanical surveys.
Suisun Thistle	<i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	FE	NE	While the restoration site is within the current range of the species, no occurrences were documented during botanical surveys.
Mason’s lilaepsis	<i>Lilaeopsis masoinii</i>	R	NLAA	The restoration site is within the current range of the species, and occurrences were documented onsite during botanical surveys.
Delta tule pea	<i>Lathyrus jepsonii</i> subsp. <i>jepsonii</i>	R	NE	The restoration site is within the current range of the species, and occurrences were documented 4 feet above the high tideline during botanical surveys on adjacent levee to restoration site. However, the evaluation of the mudflat subject to project activities is not suitable habitat and herbicide drift is not anticipated.
Invertebrates				
Delta Green Ground Beetle	<i>Elaphrus viridis</i>	FT	NE	While the restoration site is within the current range of the species, the species occurrences are associated with the vernal lake habitat type, which is not present within the

				restoration site. Currently, the only known occurrences are near Jepson Prairie, over 7 miles northwest of the restoration site.
San Bruno Elfin Butterfly	<i>Callophrys mossii bayensis</i>	FE	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site, and no known occurrences. Typical habitat for mission blue butterfly is coastal scrubland and grassland vegetation that contains at least one of the three larval hostplants: silver lupine (<i>Lupinus albifrons</i>), manycolored lupine (<i>L. varicolor</i>), and summer lupine (<i>L. formosus</i>).
Valley Elderberry Longhorn Beetle	<i>Desmocerus californicus dimorphus</i>	FT	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site, and no known occurrences. The valley elderberry longhorn beetle only occurs on elderberry plants.
Birds				
California Clapper Rail	<i>Rallus longirostris obsoletus</i>	FE	LAA	See special-status and migratory bird analysis below
California Least Tern	<i>Sterna antillarum browni</i>	FE	LAA	See special-status and migratory bird analysis below
California Black Rail	<i>Laterallus jamaicensis coturniculus</i>	FP	NLAA	See special-status and migratory bird analysis below
Mammals				
Salt Marsh Harvest Mouse	<i>Reithrodontomys raviventris</i>	FE, FP	LAA	See salt marsh harvest mouse analysis below
Amphibians				
California Red-legged Frog	<i>Rana draytonii</i>	FT	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site due to high salinities
California Tiger Salamander	<i>Ambystoma californiense</i>	FT	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site. The species primarily inhabits annual grasslands and open woodlands and are adapted to breeding in natural vernal pools and ponds.
Crustaceans				
Conservancy Fairy Shrimp	<i>Branchinecta conservatio</i>	FE	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site. The species primarily inhabits vernal pools.
Vernal Pool Fairy Shrimp	<i>Branchinecta lynchi</i>	FT	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site. The species primarily inhabits vernal pools.

Vernal Pool Tadpole Shrimp	<i>Lepidurus packardii</i>	FE	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site. The species primarily inhabits vernal pools.
Reptiles				
Giant Garter Snake	<i>Thamnophis gigas</i>	FT, ST	NE	While the restoration site is within the current range of the species, there is no habitat available within restoration site. The species inhabits the remaining high-quality fragmented wetlands that include fresh water marshes, ponds, small lakes, low-gradient streams with silt substrates, and managed waterways.
Fish				
Delta Smelt	<i>Hypomesus transpacificus</i>	FT, SE	NLAA	See Aquatic Biological Resources analysis below
Sacramento River winter-run Chinook salmon	<i>(Oncorhynchus tshawytscha)</i>	FE, SE	NLAA	See Aquatic Biological Resources analysis below
Central-Valley spring-run Chinook salmon	<i>(Oncorhynchus tshawytscha)</i>	FT, ST	NLAA	See Aquatic Biological Resources analysis below
Central Valley steelhead Distinct Population Segment (DPS)	<i>(Oncorhynchus mykiss)</i>	FT	NLAA	See Aquatic Biological Resources analysis below
North American Green Sturgeon southern DPS	<i>(Acipenser medirostris)</i>	FT	NLAA	See Aquatic Biological Resources analysis below

¹ Status: Federal Listing (**FE**: Endangered; **FT**: Threatened; **X**: Critical Habitat)

State Listing (**SE**: Endangered; **ST**: Threatened; **FP**: Fully Protected; **R**: Rare)

MBTA: Migratory Bird Treaty Act

² Effects determination

NE: No Effect to federally listed species anticipated from the Proposed Action.

NLAA: Not Likely to Adversely Affect with Environmental Protection Measures

LAA: May Affect, and Likely to Adversely Affect

³ Summary of rationale supporting determination

⁴ California Natural Diversity Database recorded occurrences in selected Denverton Quad.

Critical Habitat and Primary Constituent Elements

The federal ESA requires that the Service and NMFS designate critical habitat for species listed as federally endangered or threatened. “Critical habitat” is defined in ESA as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to a species’ conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation (16 USC 1531 et seq).

Primary Constituent Elements (PCEs) are specific elements of physical and biological features that are essential to the conservation of the species and which may require special management considerations or protection. Recent guidance has been issued by the

Service to move towards physical and biological features (PBFs) in relation to critical habitat; however, the term Primary Constituent Elements (PCEs) was used, and PCEs were evaluated, in several relevant and current BOs, including the 2008 FWS BO and the 2009 NMFS BO.

Critical habitat has been designated for the following located within the restoration site:

Delta Smelt (*Hypomesus transpacificus*)

Critical habitat was designated on December 19, 1994 (59 FR 65256 65279). Primary Constituent Elements of delta smelt critical habitat includes physical habitat, water of suitable quality to support various delta smelt life stages that allow for survival and reproduction including turbidity, water temperature and food availability, river flow to facilitate spawning migrations and transport offspring to low-salinity zone rearing habitats and adequate salinity level in nursery habitat. Laboratory research suggests that delta smelt have an upper acute salinity tolerance of about 20 ppt (Swanson et al. 2000) which is about 60% of seawater's salt concentration of 32-33 ppt.. However, in the wild, delta smelt are nearly always collected at very low salinities (Komoroske et al. 2016). Few individuals are collected at salinities higher than 6 ppt (about 20% of seawater salt concentration) and very few are collected at salinities higher than 10 ppt (about 30% of seawater salt concentration) (Bennett 2005).

Sacramento River winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*)

Critical habitat was designated on June 16, 1993 (58 FR 33212). Critical habitat for winter-run Chinook salmon is composed of physical or biological features that are essential for the conservation of winter-run Chinook salmon, including upstream and downstream access, and the availability of certain habitat conditions necessary to meet the biological requirements of the species. Winter-run Chinook salmon critical habitat PBFs include access from the Pacific Ocean to appropriate spawning areas in the upper Sacramento River. Adult winter-run Chinook salmon generally migrate to spawning areas during the winter and spring. Winter-run Chinook salmon critical habitat PBFs also include the availability of clean gravel for spawning substrate; adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles; habitat areas and adequate prey that are not contaminated; riparian habitat that provides for successful juvenile development and survival and access downstream so that juveniles can migrate from the spawning grounds to San Francisco Bay and the Pacific Ocean.

Central Valley spring-run Chinook salmon ESU (*Oncorhynchus tshawytscha*)

Critical habitat was designated on September 2, 2005 (70 FR 52488). The PBFs for CV spring-run Chinook salmon critical habitat include freshwater spawning sites with sufficient water quantity and quality conditions and substrate supporting spawning, incubation, and larval development; rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions that support juvenile growth and mobility; and migration corridors free of obstruction and excess predation with water quantity and quality conditions and natural cover. The PBFs for CV spring-run Chinook salmon critical habitat also include estuarine areas free of obstruction and excessive predation with water quality, water quantity, and salinity conditions supporting

juvenile and adult physiological transitions between fresh and saltwater and natural cover supporting growth and maturation.

Central Valley steelhead DPS (*Oncorhynchus mykiss*)

Critical habitat was designated on September 2, 2005 (70 FR 52488) Similar to spring-run Chinook salmon, the PBFs of CCV steelhead critical habitat include freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, egg incubation, and larval development; rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; and migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover supporting juvenile and adult mobility and survival. The PBFs for CCV steelhead critical habitat include estuarine areas free of obstruction and excessive predation with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater; natural cover supporting growth and maturation.

North American Green Sturgeon southern DPS (*Acipenser medirostris*)

Critical habitat was designated on October 9, 2009 (74 FR 52300) The PBFs of sDPS green sturgeon critical habitat in freshwater riverine and estuarine systems include food resources for all lifestages. Green sturgeon food resources likely include drifting and benthic invertebrates, forage fish, and fish eggs. The PBFs of sDPS green sturgeon critical habitat in freshwater riverine systems include substrates suitable for egg deposition and development (e.g., bedrock sills and shelves, cobble and gravel, or hard clean sand, with interstices or irregular surfaces to “collect” eggs and provide protection from predators, and free of excessive silt and debris that could smother eggs during incubation), larval development (e.g., substrates with interstices or voids providing refuge from predators and from high flow conditions), and subadults and adults (e.g., substrates for holding and spawning). The PBFs also include a migratory corridor necessary for the safe and timely passage within riverine habitats and between riverine and estuarine habitats. The PBFs of sDPS green sturgeon critical habitat in estuarine habitats include water flow within bays and estuaries of the Sacramento-San Joaquin, sufficient flow into the bay and estuary to allow adults to successfully orient to the incoming flow and migrate upstream to spawning grounds. Water flows in the estuary have been altered by channel control structures, impoundments, and upstream diversions, which have changed flow patterns, channel morphology, and water depth/presence and salinity in certain areas. Sediment quality (i.e., chemical characteristics) is necessary for normal behavior, growth, and viability of all life stages. This includes sediments free of contaminants (e.g., elevated levels of heavy metals such as mercury, copper, zinc, cadmium, and chromium; selenium; polycyclic aromatic hydrocarbons [PAHs]; and organochlorine pesticides) that can result in negative effects on any life stage of green sturgeon and/or their prey.

Environmental Consequences

Impacts on federal and state listed species and their habitats may occur as a result of study activities. An analysis of potential impacts of project alternatives on biological resources considers presence of species and potential effects.

No Action Alternative

Under the No Action Alternative, Reclamation would not implement the proposed *Phragmites* study including all invasive vegetation control activities. *Phragmites* will not be controlled in the Blacklock Restoration Site and the invasive species would likely to continue to propagate throughout Suisun Marsh. Uncontrolled *Phragmites* growth at the Blacklock Restoration Site would prevent native tidal marsh species from colonizing and establishing at the site. The restoration goal of total native vegetation percentage cover shall be at least 50% would not be achieved.

Proposed Action

The Proposed Action would involve herbicide applications and mowing within 10 meter x 10 meter square plots located in dense *Phragmites* stands within the interior of Blacklock. Herbicide treatments will include the aquatic formulation of imazapyr (Habitat) individually, and a combined treatment of the aquatic formulation of glyphosate (Rodeo). Treatment will begin in summer/ fall, between September and October. Herbicides will be mixed with water and a non-ionic or crop oil concentrate adjuvant, per label instructions, and will be applied using precision methods by foliar spray with a backpack sprayer or small boom sprayer, mounted to the amphibious vehicle.

Aquatic organisms could be affected by the application of herbicides, however avoidance and minimization measures will be implemented to reduce the likelihood of effects on species to insignificant. Water quality monitoring will confirm that impacts have not occurred. In the long term, it is expected that the conversion of habitat to native emergent vegetation species will be beneficial to native species.

Aquatic Biological Resources

Potential toxicity to aquatic organisms from application of aquatic herbicides

Application of aquatic herbicides for invasive plant species control is proposed over an area of approximately 67 acre, of which herbicides will be applied on a sum total of < 0.6 acre.

Herbicides will be mixed with water and a non-ionic or crop oil concentrate adjuvant, per label instructions, and will be applied using precision methods by foliar spray with a backpack sprayer or small boom sprayer, mounted to the amphibious vehicle. All herbicide applications will occur during low tide to maximize plant coverage and minimize water contamination. Maximum expected water concentrations are summarized in Table 3, assuming dilution in one meter and two meters of water. The amount to be applied corresponds to the maximum allowable rate per ac for aquatic applications, as published on product labels, and represents the worst case scenario for comparison. However, actual application concentrations could be lower than product labels.

Table 3: Aquatic-approved herbicides, application rate, and maximum expected water concentrations.

Chemical	Application rate ¹	Overspray assumption	Dilution depth	Expected water concentration
Glyphosate (as Rodeo)	3.75 lbs ae/acre	20%	1 m	84 ppb
Glyphosate (as Rodeo)	3.75 lbs ae/acre	20%	2 m	42 ppb
Imazapyr (as Habitat)	1.5 lbs ae/acre	20%	1 m	34 ppb
Imazapyr (as Habitat)	1.5 lbs ae/acre	20%	2 m	17 ppb
Agridex	2% (v/v)	20%	1 m	1 ppb
Agridex	2% (v/v)	20%	2 m	0.5 ppb
Competitor	1% (v/v)	20%	1 m	0.5 ppb
Competitor	1% (v/v)	20%	2 m	0.25 ppb
LI - 700	0.5% (v/v)	20%	1 m	0.25 ppb
LI - 700	0.5% (v/v)	20%	2 m	0.125 ppb

¹ Maximum allowable rate per ac for aquatic applications as published on the product labels and recommended proportion of adjuvant per volume of pesticide.

There is a low likelihood of direct toxicity effects or other and indirect water quality effects due to aquatic herbicide application within the Blacklock Restoration Site. Overspray and wind drift are unlikely to occur due to the precision methods used, the spray nozzle size, and wind speed restrictions on application. If overspray occurs, water-safe dye will inform the certified applicator to reduce the amount or direction of the spray. The USEPA has classified both glyphosate (tradename Rodeo®) and imazapyr (tradename Habitat®) as “slightly to practically non-toxic” to fish and aquatic invertebrates (US EPA 1993 and US EPA 2003). Further, expected concentrations in water (Table 3) are far below the NPDES maximum limitation 0.700 ppm for glyphosate and there is no NPDES maximum limitation for Imazapyr (11.2 ppm is the designated NPDES monitoring trigger). Implementation of the following avoidance and minimization measures ensures potential impacts of herbicides are less than significant.

Avoidance and minimization measures

Best Management Practices (BMPs) shall be employed to minimize potential effects to water quality from overspray and accidental spills. All contractors working shall receive training regarding the need to minimize effects. Contractors would be experienced and compliant in the environmentally-safe application of herbicides. BMPs would include, but not be limited to, the following:

1. Herbicides will not be stored on site, and areas for mixing and loading of herbicides would be located where accidental spills to nearby waterbodies cannot occur.
2. The project proponents and/or their contractor(s) will develop and implement a Spill Prevention and Control Plan (SCPC) to minimize effects of spills of hazardous, toxic, or petroleum substances during study activities. The SPCP will be kept on site during *Phragmites* control and monitoring activities and will be made available upon request.
3. Herbicide applications will occur by an authorized and certified aquatic pest control applicator with experience in the Bay-Delta.

4. Herbicides will be applied using precision methods by foliar spray with a backpack sprayer or small boom sprayer.
5. Herbicide label recommendations will be followed regarding tank mixture, application rate, and spray nozzle adjustments. Spray nozzles will be adjusted to the coarsest setting possible while maintaining efficacy, to minimize overspray.
6. Herbicide treatment will not occur when wind speeds are greater than 10 mph.
7. All herbicide applications will occur during low tide to maximize plant coverage and the non-wetted portion of the plant will be targeted to minimize water contamination.
8. A water-safe dye will be added to the pesticide formulations to enhance the precision and evenness of pesticide applications.

Potential for impacts to aquatic species from operation of amphibious mower

Phragmites will be mowed using an amphibious vehicle equipped with a mower and herbicide sprayer (example shown in Figure 3, below). This approach has the potential for direct effects on listed species due to the footprint of the amphibious vehicle in the marsh, and the mechanics of the cutting equipment.



Figure 3. Example of a type of amphibious mower that could be used for the Proposed Action. The specific mower/sprayer combination that will be used is to be determined based on contracting components and needs. Source: <https://www.marshmaster.com/>

The broad footprint of the vehicle spreads out the weight of the vehicle and minimizes the impact on the marsh or mudflat. Operators indicate that these amphibious vehicles can navigate over groomed golf courses without impacting the terrain (personal communication, Aquatic Environments, Inc., 2018). There is the potential for aquatic species to be trapped beneath the amphibious mower during operation. However, mowers will be operated at slow speeds (active mowing at approximately 3 miles per hour) to

allow for mobile species to disperse upon approach. The following avoidance and minimization measures will be implemented to ensure no adverse impacts would occur on aquatic species due to the operation of amphibious vehicles within the site.

Avoidance and minimization measures

1. Mower rotors will not operate while travelling over water, and mowing will only occur within the *Phragmites*-vegetated plots
2. Removal of vegetation in wetland habitat will be conducted with a biological monitor present. This monitor will watch for special status wildlife species and temporarily stop work if special status species are encountered. Wildlife will be allowed to escape before work is resumed. A biological monitor will be allowed to move special status species to safe locations as permitted by the terms of their credentials.
3. Areas will be “flushed” prior to mowing, by use of physical sweepers immediately ahead of the mower, such as brooms or people, flushing any sentient animals from the area
4. Vegetation will be cut in a line pattern (rather than in a circular pattern) starting at the outside edge (channel-side) working toward the interior of the vegetation to allow wildlife opportunity to escape toward appropriate cover.
5. Mowing will occur at approximately 3 miles per hour, or slower, to allow fish or wildlife to leave the area in time to avoid contact with the equipment.

Wetland and Terrestrial Biological Resources

Potential loss of sensitive plant habitat

A special status plant survey was conducted on May 15, 2018, and no special status species were identified within the interior of Blacklock, where study actions will occur. Special status plants with the potential to occur within Blacklock are primarily limited to shallow water from 1-foot in depth to perennially moist soils. Drift of herbicides could affect sensitive plant species in nearby habitats, however implementation of following avoidance and minimization measure would identify special-status plants prior to disturbance and avoid or minimize adverse consequences. These include measures to avoid and minimize off-target spray, drift and effects to water quality from herbicide application.

In the long-term, controlling the monoculture of invasive *Phragmites* on Blacklock may indirectly benefit special-status plant species which currently exist in and around surrounding waterways, by freeing-up suitable habitat in the interior of the island.

Avoidance and minimization measures

1. A special status plant survey was conducted on May 15, 2018, and no special status species were identified within the interior of Blacklock. The next survey will be conducted after study activities are initiated in the Spring of 2020, and each subsequent year, during correct blooming season for special status plant species with the potential to occur within Blacklock. Special status plants will be pointed out to the contractor and workers for avoidance.

2. If surveys identify special status plant species to be directly or indirectly affected by the project, the study plot locations will be adjusted to avoid impacts.

Potential disturbance to special-status and migratory bird nesting habitat

The proposed project could result in disturbance to nesting special-status and migratory birds at the site. Ongoing surveys by CDFW and USGS have not detected California clapper rails or California least tern in close vicinity to Blacklock, therefore, it is not likely these special-status species forage, nest, or reside on site. Still, potential exists for rails or terns to pass over the site during migration or while searching for suitable habitat, therefore presence is assumed for the project.

Effects to individuals

Individual rails or terns are not expected to be killed as a result of project actions, but individuals may be disturbed and their normal behaviors disrupted by their encounter with equipment used during project implementation. From the time *Phragmites* is cleared from marsh areas and until vegetation becomes fully reestablished those cleared areas may serve as a predator corridor, potentially increasing predator access to the marsh and potentially a depredation threat to rails, if present. Drones in the air may distract or disturb rails in flight, or otherwise disturb them from their normal flight or foraging behavior.

Effects to nesting birds

Project activities, including vegetation removal, presence of personnel, and operation of equipment, may injure individual adults or nestlings, reduce the prey base, or cause abandonment of active nests. Herbicides applications and mowing will occur outside of the breeding season for Ridgway's rail, between September and December, therefore the project will not affect breeding activity in the unlikely event of rails using the restoration site for breeding or nesting. If herbicide application or mowing needs to occur within the breeding season in any year of the study, then rail surveys will be conducted prior to project activities to determine Ridgway's rail locations and Ridgway's rail territories so that they can be avoided. The following avoidance and minimization measures will be implemented to reduce adverse effects on special status and migratory nesting birds.

Effects from chemical treatment

Project actions will occur during work windows, or nesting bird surveys will occur prior to project activities, in order to avoid nesting birds, therefore chemical exposure would only occur in the form of dietary intake. Herbicides and adjuvants used for this project do not bioaccumulate or persist, therefore dietary consumption is not anticipated.

Avoidance and minimization measure (California Clapper Rail)

1. To avoid or minimize the loss of individual California clapper rails, activities within or adjacent to rail habitat will not occur within 2 hours before or after extreme high tides (6.5 ft or above, as measured at the Golden Gate Bridge), when the marsh plain is inundated, because protective cover for rails is limited and activities could prevent them from reaching available cover.
2. To minimize or avoid the loss of individual California clapper rails, activities within or adjacent to tidal marsh areas will be avoided during the rail breeding

season from February 1 through August 31 each year, unless surveys are conducted to determine rail locations and territories can be avoided.

3. If breeding California clapper rails are determined to be present, activities will not occur within 700 ft of an identified calling center. If the intervening distance across a major slough channel or across a substantial barrier between the California clapper rail calling center and any activity area is greater than 200 ft, it may proceed at that location within the breeding season.
4. A service-approved biologist will be on site during study activities occurring in wetlands. The biologist will document compliance with this biological opinion, including conservation measures. The biologist will have the authority to stop project activities to comply with the conservation measures.

Avoidance and minimization measure (California Least Tern)

1. No activities will be performed within 300 ft of an active California least tern nest during the California least tern breeding season, April 15th to August 15th (or as determined through surveys).
2. A service-approved biologist will be on site during study activities occurring in wetlands. The biologist will document compliance with this biological opinion, including conservation measures. The biologist will have the authority to stop project activities to comply with the conservation measures.

Effect to the Salt Marsh Harvest Mouse

Habitat within the Blacklock site is of low quality, however suitable habitat does exist on remnant levees and mice can utilize *Phragmites* stands; therefore, presence is assumed within the restoration site. Avoidance and minimization measures will be taken to reduce negative impacts to mice due to project activities. Vehicles will drive at speeds 15 mph or less on ingress and egress routes to access the site and all drivers will be advised to look out for mice that may occur on roadways. Within the treatment area, where mowing will take place, mowing will occur at approximately 3 miles per hour, to allow mice to leave the area in time to avoid contact with the equipment. Vegetation will be cut in a line pattern (rather than in a circular pattern) starting at the outside edge (channel-side) working toward interior of the vegetation to allow wildlife opportunity to escape toward appropriate cover. Areas will be “flushed” prior to mowing, by use of physical sweepers immediately ahead of the mower, such as brooms or people, flushing any sentient animals from the area. It is not possible for ground nesting to occur, because the site is tidally inundated. Vegetation waste (mowed clippings) will be removed from all areas (driving roads, action area, or anywhere else that vegetation could be stepped on) the same day that mowing occurs. Based on salt marsh harvest mouse (SMHM) expert advice, exclusion fencing would not likely be practical or effective at keeping SMHM out of the work area in a tidal wetland (Laureen Thompson, personal communication, February 2019), therefore will not be used in this study. Rather, all project activities will take place one hour after sunrise to one hour before sunset. This time period is when mice are the least active and thus are unlikely to be moving through the area. Disturbance to wetland vegetation outside of the study plots will be avoided to the extent feasible in order to reduce potential impacts on SMHM. The amphibious mower will use the shortest route possible traveling between plots and will use open water channels where possible for navigation, in order to minimize disturbance within the emergent vegetation. An

SMHM biologist will be present to ensure harm is not done to mice that could occur on site during project activities. Suitable adjacent levee areas will continue to provide habitat for SMHM during the project.

The following avoidance and minimization measure will be implemented:

Avoidance and minimization measures

1. All project activities will take place one hour after sunrise to one hour before sunset, when mice are least likely to be moving through the work areas.
2. Areas will be “flushed” prior to mowing, by use of physical sweepers immediately ahead of the mower, such as brooms or people, flushing any sentient animals from the area.
3. Disturbance to wetland vegetation outside of the study plots will be avoided to the extent feasible in order to reduce potential impacts on salt marsh harvest mice. The amphibious mower will use the shortest route possible traveling between plots and will use open water channels where possible for navigation, in order to minimize disturbance within the emergent vegetation. The biological monitor will be on-site to monitor all wetland vegetation removal and herbicide application activities.
4. Vegetation will be cut in a line pattern (rather than in a circular pattern) starting at the outside edge (channel-side) working toward interior of the vegetation to allow wildlife opportunity to escape toward appropriate cover.
5. Mowing will occur at approximately 3 mph, to allow mice to leave the area in time to avoid contact with the equipment.
6. Vegetation waste (mowed clippings) will be removed from all areas (driving roads, work areas, or anywhere else that vegetation could be stepped on in the Action Area) the same day that mowing occurs.
7. Work will be scheduled to avoid extreme high tides when there is potential for salt marsh harvest mouse to move higher in the vegetation. All equipment will be staged on existing roadways away from the study site when not in use.
8. If a suspected salt marsh harvest mouse is discovered, project activities will cease in the immediate vicinity of the individual until the individual has been allowed to leave the area where work is occurring.
9. A qualified service-approved biologist will be on site during study activities occurring in wetlands. The biologist will document compliance with this biological opinion, including conservation measures. The biologist will have the authority to stop project activities to comply with the conservation measures.

Effects to Delta Smelt Critical Habitat

Delta smelt are in their sub-adult to adult life stage during the proposed timing of the study and may use open water sloughs adjacent to the restoration site for rearing habitat, within the action area concurrent with study activities. Data indicate that most phytoplankton species are not affected at the maximum concentration predicted from study actions, therefore effects on primary productivity amount to an insignificant effect on the habitat conditions suitable for rearing Delta smelt. Maximum concentrations of herbicide and adjuvants expected in waterways due to project activities are several orders of magnitude less than concentrations needed to effect aquatic invertebrates. Some

phytoplankton species are sensitive to herbicides at low concentrations within range of those expected in waterways, however effects on primary productivity would be temporary in nature, as the concentrations of herbicides dilute over time with tidal flows, adsorb to sediment, and undergo natural degradation. Impacts would thus be temporary and narrow in extent among phytoplankton species.

The action area is within the designated critical habitat for Delta smelt, however study actions including herbicide applications, the operation of amphibious mowers, kayaking/water sampling, and drone monitoring will not affect physical habitat required; will not affect river flow required to maintain Delta smelt habitat for spawning, larval and juvenile transport, rearing and adult migration; and will not affect salinity concentrations, required to maintain Delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration.

Implementation of the Proposed Action would likely have a long-term positive effect by promoting the establishment of diverse native species in tidal marsh habitat that may ultimately benefit the food web for Delta smelt.

Effects to Salmonids Critical Habitat

Salmonid critical habitat includes freshwater spawning sites, freshwater migration corridors and estuarine areas. The effects of the Proposed Action are reasonably likely to include degraded water quality and tidal marsh habitat disturbance. Operation of the amphibious vehicle during mowing and herbicide application activities may disturb sediments and elevate levels of suspended sediment that can enter tidal channels that drain to adjacent sloughs (Little Honker Bay and Nurse Slough). If sediment loads remain high for an extended period of time, the primary productivity of an aquatic area may be reduced (Cloern 1987) and fish may suffer reduced feeding ability and be prone to fish gill injury (Benfield and Minello 1996; Nightingale and Simenstad 2001). However, the levels of elevated suspended sediment levels associated with these activities are expected to be minor, localized, and short-term. Conservation measures will be implemented during the operation of the amphibious vehicle to minimize disturbance to marsh vegetation and substrate. Therefore critical habitat is not likely to be negatively impacted by the Proposed Action.

Green Surgeon Critical Habitat

The effects of the Proposed Action to DPS green sturgeon designated critical habitat could include tidal marsh disturbance to 0.79 acres during operation of the amphibious vehicle. Tidal marsh habitat can provide foraging and refuge PBFs for green sturgeon critical habitat. Detrital input from marsh habitat supports invertebrate productivity within the marsh and on adjacent channels and mudflats (Warwick and Price 1975). As the tide recedes, fish can retreat to subtidal areas in adjacent channels and shoreline areas (Levy and Northcote 1982; Hering *et al.* 2010). There may be a short-term reduction in PBFs that support foraging and refuge for green sturgeon until the marsh recovers from disturbance and begins to re-colonize with native marsh vegetation. However, the total area that will be temporarily affected by Project activities is very small and distributed amongst multiple sites (24 sites), which will allow for rapid recovery of marsh vegetation.

The non-native invasive species *P. australis* is the dominant plant that will be disturbed during Project activities, which currently does not provide the same foraging and refuge benefits to green sturgeon compared with native marsh vegetation. Based on the above, the effects of tidal marsh disturbance that may result from Project activities is not expected to significantly reduce PBFs that support foraging or refuge availability for green sturgeon in the action area.

Hazards and Hazardous Materials

Affected Environment

A hazardous material is defined as “a substance or material... capable of posing an unreasonable risk to health, safety, and property when transported in commerce” (49 CFR 171.8). California Health and Safety Code Section 25501 defines a hazardous material as “any material that... poses a significant present or potential hazard to human health and safety or to the environment if released.” Hazardous materials may include fuel, lubricants, and hydraulic fluid. A discussion of water quality and potential hazards to water quality associated with the project is presented in Section 3.7 Hydrology and Water Quality.

Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no impacts from hazards and/ or hazardous materials, since invasive species plant eradication would not occur. Therefore, impacts would not be anticipated.

Proposed Action

Reclamation expects that adherence to BMPs that dictate the use, containment, and cleanup of contaminants would minimize the risk of introducing such products to the waterway because the prevention and contingency measures would require frequent equipment checks to prevent leaks, would keep stockpiled materials away from the water, and would require that absorbent booms are kept on-site to prevent petroleum products from entering the river in the event of a spill or leak.

The Proposed Action would not be located at a site on the Hazardous Waste And Substances Site List, known as the Cortese List, pursuant to Government Code Section 65962.5 (DTSC 2015). No site listed in the Proposed Action is within one-quarter mile of an existing or proposed school.

Avoidance and Minimization

1. Develop and implement Spill Prevention and Control Plan (SCPC) to minimize effects of spills of hazardous, toxic, or petroleum substances during study activities. The SPCP will be kept on site during *Phragmites* control and monitoring activities and will be made available upon request (See appendix A).

Hydrology and Water Quality

Affected Environment

Because of the location and relative isolation of the parcel, there are no watershed inflows that would affect the hydrology and water quality of the site except under extreme tidal/flooding scenarios. Tidal inundation, as described below, along with site elevation, has the greatest influence on the development of a fully functioning tidal marsh. The interior of the Blacklock Restoration site became tidally connected in 2006. During the time the site was formerly maintained as a managed wetland, the hydrology of the site was primarily controlled by one 36-inch water control structure located along Arnold Slough; however, the water control structure is no longer operated.

Water Quality and Tidal Datum

A water quality monitoring station was installed at the northeast corner of the Blacklock property (Figure 1). This station monitors tide stage, electrical conductivity (EC) and temperature in Denverton /Little Honker Slough. The station also monitors precipitation, wind speed and direction. This station is identified as BLL on the California Data Exchange Center and real time data for the site can be queried via their website (<https://cdec.water.ca.gov/>). The station currently records a limited set of parameters (river stage, precipitation, wind speed/direction, and barometric pressure), and is scheduled to be relocated to the adjacent Arnold Slough Restoration Site prior the end of the proposed action.

DWR contracted with the National Oceanographic and Atmospheric Administration's Ocean Service / Center for Operational Oceanographic Products and Services (NOS/CO-OPS) to install a water level observation gauge on Bradmoor Island in 2004 where it had previously operated a station in the 1970's (Station ID NOS 941-4811). The purpose of the gauge is to determine the tidal datum (heights and range of the tides) for the Nurse Slough/Denverton Slough complex in the northeast Marsh, in the vicinity of the Blacklock property. Tidal datum from this station (Bradmoor Island) is presented in Table 4.

Table 4. Tidal datums near Blacklock

Tidal Datum	Elevation (ft NAVD88)
Mean Higher High Water (MHHW)	5.48
Mean High Water (MHW)	4.96
Mean Tide Level (MTL)	2.85
Mean Low Water (MLW)	0.75
Mean Lower Low Water (MLLW)	0.00

Existing Slough Network

There are remnants of the historic tidal marsh slough network on the site. DWR surveyed slough topography as part of its August 2002 survey. To supplement the original survey, additional surveys of the slough bottoms were conducted in March 2005. At that time remnant sloughs ranged in width from 5 to 15 feet and in depth from ½ to 2 feet across

the site. Vegetation establishment and turnover, sediment scour, and deposition have likely altered the topography to some extent since that time.

There is a perimeter borrow ditch around the property along the interior toe of the exterior levee. Over the years, material has been removed from this ditch and used to maintain the levees. An elevation survey of this ditch was conducted in 2005. The width of the borrow ditch varies from approximately 10 feet to 35 feet wide and extends into ponded areas at several locations throughout the parcel.

Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no anticipated impacts to hydrology and/ or water quality, since invasive species plant eradication would not occur.

Proposed Action

The Proposed Action would involve herbicide applications and mowing within 10 meter x 10 meter square plots located in dense *Phragmites* stands within the interior of Blacklock. Treatment will begin in summer (or fall), between September and October via amphibious vehicle. Total treated area will be < 0.6 ac. Disturbance from amphibious vehicle operation, mowing, and application of herbicides has the potential to affect water quality within the Blacklock Restoration Site, including contamination from herbicides, turbidity affects from sediment disturbance, and effects on dissolved oxygen from decomposing vegetation.

Potential for water contamination from the application of herbicides

The fate and transport of the herbicides and adjuvants used in this study depends on their physicochemical properties as well as environmental conditions. Table 3, above, provides maximum expected concentrations of each herbicide and adjuvant in receiving waters. These calculations represent conservative and instantaneous concentrations, though mixing of any herbicide that reaches the water will occur over time. Tidal flows through the action area, with typical water fluctuations of four to six feet in each cycle, will likely dilute herbicide inputs in a short period of time.

A particle tracking model was developed for Blacklock, prior to its planned and natural breaches in 2006. An animation of the model was run using randomly selected insertion points throughout the site, to demonstrate the hypothetical movement of herbicides if they were to enter waterways. Figures 4 and 5 show the movement of particles on the site after 6 and 24 hours, respectively. The modelled hydrology is not perfectly representative of the present conditions on Blacklock. For example, the model assumes only one breach while there are presently two, and sediment accretion and vegetation establishment has occurred since the time the model was developed, all of which is likely to impact the hydrology of the site and the resulting tidal transport of particles. Model results shown below should, therefore, be considered qualitative and approximate.

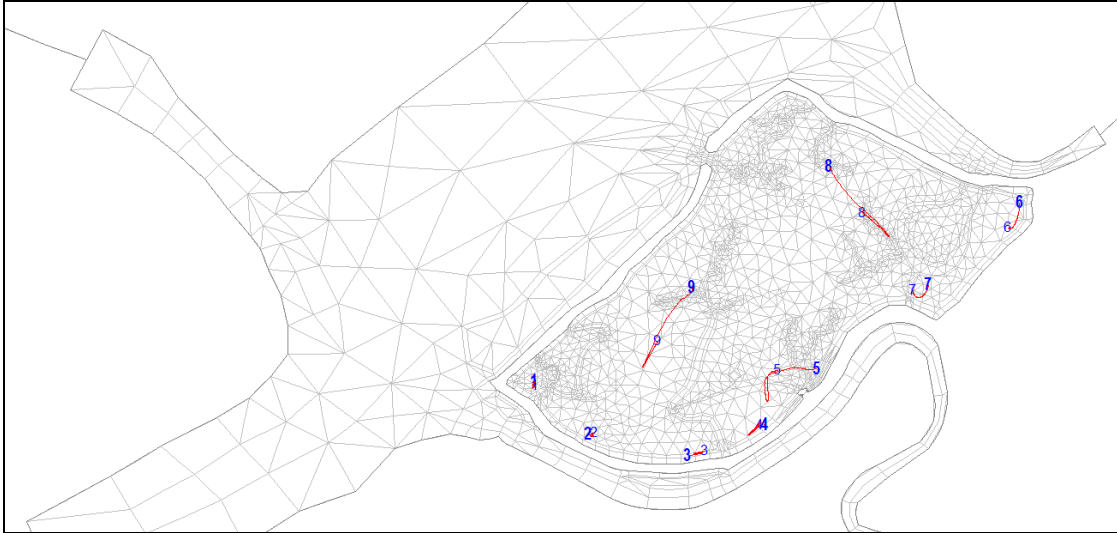


Figure 4. Particle tracking model showing the total range of movement of particles over 6 hours, originating from 9 randomly selected insertion points across the action area.

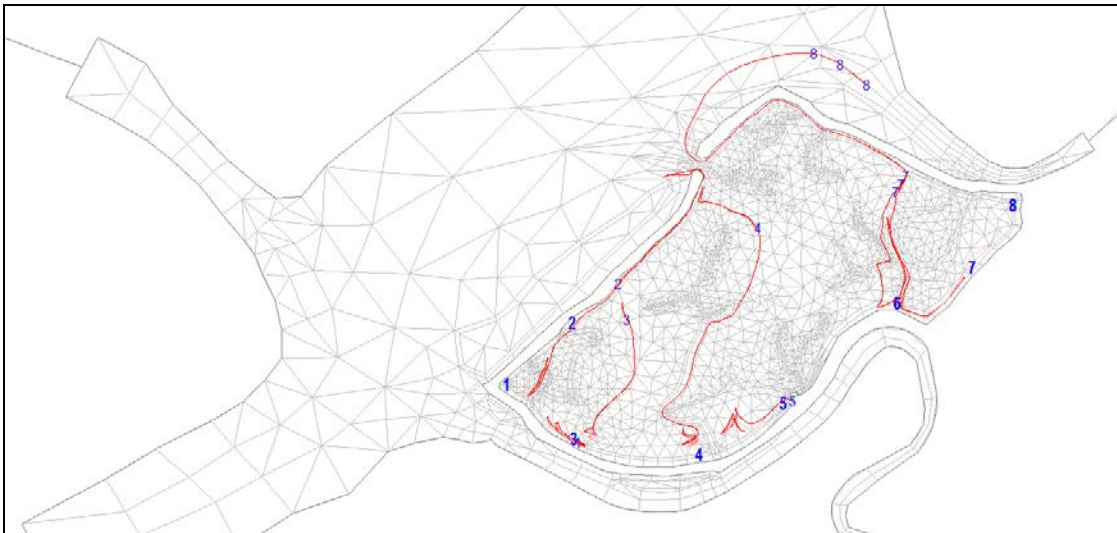


Figure 5. Particle tracking model showing the total range of movement of particles over 24 hours, originating from 8 randomly selected insertion points across the action area.

Results from the particle tracking model animation indicate that residence time is variable within the restoration site, but that particles from at least some parts of the site are likely to be exported off the site within 24 hours. Not accounted for in the calculated concentration in Table 3 or the particle tracking models shown above, is chemical loss due to sediment adsorption and degradation. These processes depend on the condition of the site and the herbicide's physicochemical properties. Historical water quality monitoring data from Department of Boating and Waterways (DBW)'s Water Hyacinth Control Program demonstrates that actual herbicide concentrations decrease rapidly in waterways following treatment to aquatic plants (DBW and USDA 2012). Water samples taken downstream of their treatment site, at two to three feet depth one-hour post

treatment, show actual herbicide levels that are at least an order of magnitude below the calculated concentrations in 1-meter of water, indicated in Table 3. The discrepancy between modelled and actual concentrations, is likely due to dilution, sediment adsorption, and degradation. The organic carbon sorption coefficient (K_{oc}) represents the soil sorption affinity of a chemical, and pesticides typically range from 5 to 30,000. The K_{oc} of imazapyr is between 8 and 150, depending on the type of soil, indicating weak adsorption (AMEC Geomatrix, Inc. 2009; SERA 2004). In water, imazapyr degrades by photolysis, with a half-life of three to five days (USEPA 2006). Glyphosate has one of the highest adsorption coefficients of all herbicides, with a K_{oc} of 24,000, indicating it binds tightly to sediment, removing the active ingredient from water. Studies conducted in a forest ecosystem found that glyphosate dissipates rapidly from surface water ponds high in suspended sediment, with first order half-lives ranging from 1.5-11.2 days (Feng et al., 1990; Newton et al., 1994), and in streams, residue was undetectable in 3-14 days (DPR 1998).

Avoidance and minimization measures will be taken to reduce the potential for water contamination that could have impacts on aquatic species see previous avoidance and minimization measures.

Potential for increased turbidity

Increased water turbidity from sediment disturbance will occur within the designated plots where mowing will take place, however because actions will occur at low tide when the mudflat is minimally inundated, there will be little overlying water to be impacted, and sediment is anticipated to be settled again by the time the area is rewetted. Turbidity will be measured periodically over the course of the project period, including prior to the study, and directly prior to and directly after herbicide application or mowing at the site. All water quality monitoring results will be documented, maintained, and made available upon request. Implementation of the following avoidance and minimization measures will reduce the potential for adverse effects on turbidity at the Blacklock site.

Avoidance and minimization measures

1. Mower rotors will not operate while travelling over water, and mowing will only occur within the *Phragmites*-vegetated plots.
2. Mowing will occur at approximately 3 miles per hour, or slower, to avoid excessive disturbance of sediment.
3. The amphibious mower will use the shortest route possible traveling between plots and will use open water channels where possible for navigation, in order to minimize sediment disturbance.

Potential for decreased dissolved oxygen

Vegetative waste resulting from mowing that remains in the waterways for decomposition could have long term impacts on water quality, especially dissolved oxygen levels. For this reason, mowed biomass will be removed immediately from the site to reduce the potential for dissolved oxygen decreases due to plant decomposition. Vegetative waste will be disposed of properly to avoid spreading, including bagging and disposal at a county landfill. Implementation of the following avoidance and

minimization measure will reduce the potential for decreased dissolved oxygen to less than significant.

Avoidance and minimization measure

1. Vegetation waste (mowed clippings) will be removed from waterways after mowing occurs in order to avoid impacts on water quality, dissolved oxygen levels.

Noise

The loudness of sound perceived by the human ear is dependent primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. There is a strong correlation between the way humans perceive sound and A-weighted sound levels (abbreviated dBA). A-weighted sound levels are a standard tool to predict community response to environmental and transportation noise. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise. Because of the ability of the human ear to detect a wide range of sound, noise levels are expressed in logarithmic units called decibels (dB) to avoid a very large and awkward range in numbers. The audible range of hearing in humans is 0 dB to 130 dB. Above 130 dB damage may occur to the ear.

Because the human ear is not equally sensitive to all audible frequencies, a frequency-dependent rating scale was devised to relate noise to human sensitivity. An A-weighted dB (dBA) scale performs this compensation by discriminating against frequencies that are more sensitive to humans. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been chosen by most authorities for the purpose of regulating environmental noise. With respect to how humans perceive and react to changes in noise levels, a 1 dBA increase is imperceptible, a 3 dBA increase is barely perceptible, a 6 dBA increase is clearly noticeable, and a 10 dBA increase is subjectively perceived as approximately twice as loud.

Affected Environment

The existing noise environment within the restoration site is typical of an open-space area within a rural environment. The existing noise environment is primarily influenced by vehicular traffic noise on local and regional roadway network. Noise from outdoor activities (e.g., people talking, dogs barking, and operation of landscaping and agricultural equipment), contribute to the existing noise environment to a lesser extent.

Noise-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as uses where quiet is an essential element of the intended purpose. In the vicinity of the restoration site, sensitive land uses include habitat for waterfowl and listed species. These land uses could potentially experience noise

impacts associated with project activities and/or increased traffic from associated project vehicles. Ambient background noise levels are assumed to 45 dBA.

Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no anticipated impacts to noise, since invasive species plant eradication would not occur.

Proposed Action

Construction equipment noise levels listed in Table 5 are the maximum levels at 50 feet to 3200 ft.

	50 feet (ft)	100 ft	200 ft	400 ft	800 ft	1600 ft	3200 ft
Mower	84	77.25	70.5	63.75	57	50.25	43.5
Dump Truck	76	69.25	62.5	55.75	49	42.25	35.5
3/4 Ton Pickup	75	68.25	61.5	54.75	48	41.25	34.5
3/4 Ton Pickup	78	71.25	64.5	57.75	51	44.25	37.5
Drone	80	74	68	62	56	50	44

Table 5: Noise estimates from proposed equipment

The noise levels resulting from the Proposed Action is expected to be greater than baseline conditions. The Proposed Action would incorporate BMPs for the minimization of generated noise levels, which generally result in a reduction. Additionally, sound from outdoor construction activities typically dissipates at a rate of 4.5 dBA to 6.0 dBA for each doubling of distance (FHWA 1980). The Solano County General Plan identifies dBA levels for new construction or development in the county (Table 6). While the table is intended to determine the level of acceptability for development projects, it provides a comparison point for anticipated noise increases.

Land Use Category	Community Noise Exposure (Ldn or CNEL, dBA)			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable ⁴
	<75	70–80	75+	

Table 6: Land Use Noise Compatibility Guidelines

Best Management Practices

1. Associated activities shall comply with the operational hours between the hours of 7 am and 5 pm.
2. Provide and maintain noise control devices for construction equipment. Construction equipment shall be properly maintained per manufacturers' specifications and fitted with the best available noise suppression devices (i.e., mufflers, silencers, wraps, etc).
3. Coordinate routes and arrange equipment to minimize disturbance to noise-sensitive uses. Construction equipment usage shall be arranged to minimize travel

adjacent to occupied residences and turned off during prolonged periods of non-use.

4. Designate a disturbance coordinator to respond to all public complaints.

Based on equipment noise emission levels and the incorporation of the above BMPs, implementation of the Proposed Action would result in noise greater than baseline conditions. Within 50 feet of the Proposed Action noise levels would exceed the normally unacceptable range for Agriculture set by the county's plan. The only sensitive group near the restoration site that could be impacted by the noise increase are listed wildlife, see Biological Resources. There are sensitive human communities, such as schools, hospitals or residential areas that could be impacted by the increase in noise.

Noise impacts would be temporary and localized and there would be no long-term operational noise sources. Equipment associated with the project would include the use of mower, dump truck, 3/4 ton pickup and a drone. The Proposed Action would not generate high levels of ground vibration, such as that from blasting, pile driving, or pavement breaking.

Recreation

Affected Environment

Suisun Marsh's proximity to major urban areas makes the Marsh accessible to many recreational enthusiasts. Duck hunting is the major recreational activity in the Marsh occurring from late October until January. Fishing accounts for nearly as much recreational use in the Marsh as duck hunting. In addition, several other forms of recreation such as water sports, upland game hunting, hiking, and wildlife observation are popular in the Marsh. Much of the recreation associated with Suisun Marsh is water-dependent (boating and fishing) or water-enhanced (picnicking, hiking, hunting, and scenic/wildlife viewing). Most of the Marsh is navigable by small boats, and some channels, such as Montezuma and Suisun Sloughs, are navigable by much larger boats. A major navigation channel, the Suisun Bay channel, connects to the Carquinez Strait. Ability to navigate or access smaller channels and outer edges of the bay is influenced by the tides and type of watercraft used.

Currently, the Blacklock restoration site has no public access. Vehicular access to the site requires driving through private property. DWR has an easement to access the site for scientific or management purposes, but this easement is not for public access. A private boat launch is located along Denverton Slough, north of the restoration site. Little Honker Bay and the adjacent sloughs are used year-around for boating and fishing. However, several "No Trespassing" signs have been installed along the exterior levee to discourage the public from accessing the site by boat.

Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no anticipated impacts to recreation in the area, since invasive species plant eradication would not occur.

Proposed Action

The Proposed Action is not anticipated to impact recreation activities, since Blacklock is not publicly accessible and overspray or drift to adjacent sloughs is not anticipated. The Proposed Action will not preclude the use of surrounding water ways for recreation. Any disturbance from noise (see resource section above) produced from the Proposed Action activities is expected to be short in duration and will attenuate to acceptable levels upon reaching publicly accessible areas.

Cumulative Effects

The cumulative effects of implementation of reasonably foreseeable projects and the alternatives as compared to conditions under the No Action Alternative and the Proposed Action are discussed below. Cumulative effects are impacts on the environment that result from the incremental impacts of an alternative when added to other past, present, and reasonably foreseeable future actions of Federal, state, or local agencies or individual entities or persons (40 CFR 1508.7). Such impacts can result from individually minor, but collectively significant, actions taking place over time (40 CFR 1508.8). Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the restoration site.

There are no cumulative effects anticipated due to the short term nature of the Proposed Action and no other activities are occurring at the restoration site.

Section 4 Consultation & Coordination

Several Federal laws, permits, licenses and policy requirements have directed or guided the NEPA analysis and decision making process included in this EA.

Public Review

This EA is available for public review on Reclamation's NEPA website.

Federal Laws, Regulations, and Policies

National Historic Preservation Act (54 USC § 300101 et seq.)

54 U.S.C. § 304108, commonly known as Section 106 of the NHPA, requires that Federal agencies take into consideration the effects of their undertakings on historic properties. Historic properties are cultural resources that are included in, or eligible for

inclusion in, the National Register. The 36 CFR Part 800 regulations implement Section 106 of the NHPA and outline the procedures necessary for compliance with the NHPA. Compliance with the Section 106 process follows a series of steps that are designed to identify if significant cultural resources are present in the proposed action restoration site and to what level they would be affected by the proposed Federal undertaking.

Reclamation's Regional Cultural Resources Office (MP-153), Ms. Melissa Ivie, has reviewed the Proposed Action (Tracking Number: 19-SCAO-200). The Proposed Action does not have the potential to cause effects to historic properties, should such properties be present, pursuant to the Title 54 U.S.C. § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA) regulations codified at 36 CFR § 800.3(a)(1). Reclamation has no further obligations under NHPA Section 106, pursuant to 36 CFR § 800.3(a)(1).

Section 7 of the Endangered Species Act (16 USC § 1531 et seq.)

Section 7 of the Endangered Species Act requires Federal agencies to ensure that discretionary federal actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of the critical habitat of these species. Reclamation consulted with the Service and the NMFS pursuant to Section 7 of the ESA.

The Service issued a biological opinion (Service file number: 08FBDT00-2019-F-0249) for the Proposed Action on August 27, 2019. The Service determined that Proposed Action would not jeopardize the continued existence or result in the destruction or adverse modification of its designated critical habitat, of the Salt Marsh Harvest Mouse, California Clapper Rail, and the California Least Tern. The Service also concurred with Reclamation's determination that the Proposed Action is not likely to adversely affect Delta Smelt or its designated critical habitat.

NMFS sent a letter (NMFS file number: WCRO-2019-01948) to Reclamation documenting Section 7 compliance on September 5, 2019. In the letter, NMFS concurs with Reclamation's determination that Proposed Action may affect but is not likely to adverse effect the Sacramento River winter-run Chinook salmon, Central-Valley spring-run Chinook salmon, Central Valley steelhead Distinct Population Segment (DPS), North American Green Sturgeon southern DPS or their designated critical habitats.

Magnuson- Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) as amended by the Sustainable Fisheries Act (Public Law 104 to 297), establishes a management system for national marine and estuarine fishery resources. This legislation requires all federal agencies to consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect essential fish habitat (EFH). EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The legislation states that migratory routes to and from anadromous fish spawning grounds should also be considered EFH. The phrase "adversely affect" refers to the creation of any effects that reduce the quality or quantity of EFH. Federal activities that occur outside an EFH but that may, nonetheless, have an

effect on EFH waters and substrate must also be considered in the consultation process. Under the MSA, effects on habitat managed under the Pacific Salmon Fishery Management Plan must also be considered. Consultation under the MSA is intended to promote the protection, conservation and enhancement of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem.

EFH for Pacific Salmon in the California Central Valley includes waters currently or historically accessible to salmon within the Central Valley ecosystem as described in Myers et al. (1998). EFH includes not only the watersheds of the Sacramento and San Joaquin River basins but also the San Joaquin Delta (Delta), Suisun Bay, and the Lower Sacramento River. The restoration site occurs in habitats designated EFH for Pacific salmon, which includes Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley fall-/late fall-run Chinook salmon. The habitat is estuarine waters with an inland extent of ocean-derived salts measuring less than 0.5 parts per thousand (ppt) during the period of average annual low freshwater flow.

Based on information provided by Reclamation and DWR, proposed Project activities could include effects of degraded water quality and disturbance to tidal marsh habitat. NMFS determined the proposed action would adversely affect EFH designated under the Pacific Groundfish and Coastal Pelagic Species FMPs. However, as presented above, effects resulting from elevated suspended sediment levels, herbicide application, and disturbance to tidal habitat during Proposed Action activities are short-term, minimal and localized. Therefore, NMFS had no EFH Conservation Recommendations to provide.

Executive Order 11312: Invasive Species

EO 11312 (February 3, 1999) directs all federal agencies to prevent and control introductions of invasive nonnative species in a cost-effective and environmentally sound manner to minimize their economic, ecological, and human health impacts. The Proposed Action complies with EO 11312, since it will (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them. The Proposed Action involves the removal of invasive plants by herbicide application along with mowing and allowing natural recruitment of native riparian vegetation.

Executive Order 11312: Safeguarding the Nation from the Impacts of Invasive Species

EO 11312 (December 5, 2016) order amends Executive Order 13112 and directs actions to continue coordinated Federal prevention and control efforts related to invasive species. The order maintains the National Invasive Species Council (Council) and the Invasive Species Advisory Committee; expands the membership of the Council; clarifies the operations of the Council; incorporates considerations of human and environmental

health, climate change, technological innovation, and other emerging priorities into Federal efforts to address invasive species; and strengthens coordinated, cost-efficient Federal action. The Proposed Action is complies with EO 11312.

Nonnative Invasive Species Prevention Measures:

- 1) *Assess the site:*
 - a) Conduct a site assessment to identify invasive plant species in route to and within worksites.
 - b) Provide prevention training to staff, contractors, and volunteers prior to starting work, including identification and potential impacts.
 - c) Monitor the site for invasive plant after control study activities. Remove new non-native invasive plant species where feasible.
- 2) *Clean equipment prior to mobilization on site:*
 - a) Designate cleaning areas for tools, equipment, and vehicles.
 - b) Inspect tools, equipment, and vehicles before entering and leaving the worksite.
 - c) Clean soils and plant materials from tools, equipment, and vehicles before entering and leaving the worksite.
 - d) Wear clothing, boots, and gear that do not retain soil or plant material.
- 3) *Designate waste disposal areas:*
 - a) Contain invasive plant material when transporting to off-site disposal.
- 4) *Minimize soil disturbance, which favors invasive plant establishment.*

State and Local Laws, Regulations, and Policies

California Environmental Quality Act (CEQA)

The California Environmental Quality Act generally requires state and local government agencies to inform decision makers and the public about the potential environmental impacts of proposed projects, and to reduce those environmental impacts to the extent feasible. The Secretary of the California Resources Agency has determined that the projects in these classes do not have significant effect on the environment, and therefore are categorically exempt from CEQA.

A Notice of Exemption (Class 6, Section 15306) was submitted to the State Clearinghouse on December 18, 2018 (SCH #2018128397).

Clean Water Act Section 401: State Certification of Water Quality

Section 401 of the Clean Water Act requires that any person applying for a federal permit or license, which may result in a discharge of pollutants into waters of the United States, must obtain a state water quality certification that the activity complies with all applicable water quality standards, limitations, and restrictions. If you discharge from a point source into the waters of the United States, you need a National Pollutant Discharge Elimination System permit.

A Notice of Intent to Apply and Aquatic Pesticide Application Plan was submitted on June 11, 2019. No comments were received from the Public. A final permit is expected to be received by August 31, 2019.

References

- AMEC Geomatrix, Inc. 2009. Human Health and Ecological Effects Risk Assessment, Imazapyr Risk Assessment Washington State. Prepared by AMEC Geomatrix, Inc., Lynwood, WA for Washington State Department of Agriculture, Olympia, WA.
- Bennett, W.A. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. *San Francisco Estuary and Watershed Science*:3(2).
<http://repositories.cdlib.org/jmie/sfews/vol3/iss2/art1>
- Bay Area Air Quality Management District. 2017. <http://www.baaqmd.gov/about-air-quality/research-and-data/emission-inventory>
- California Department of Parks and Recreation Division of Boating and Waterways (DBW) and United States Department of Agriculture (USDA). 2012. Water Hyacinth Control Program - Biological Assessment. October 25, 2012.
- California Department of Water Resources (DWR). 2006. Blacklock Restoration Project Monitoring Plan.
- CalEEMOD [California Emissions Estimator Model]. 2013. Windows Version 2013.2.2. 2015.
- Chambers, R. M., L. A. Meyerson, and K. Saltonstall. 1999. Expansion of *Phragmites australis* into tidal wetlands of North America. *Aquatic Botany* 64: 261-273
- Cheshier JC, Madsen JD, Wersal RM, Gerard PD, Welch ME. Evaluating the potential for differential susceptibility of common reed (*Phragmites australis*) haplotypes I and M to aquatic herbicides. *Invasive Plant Science and Management*. 2012;5:101–105.
- CNPS, Rare Plant Program. 2015. Inventory of Rare and Endangered Plants v8-02. California Native Plant Society, Sacramento, California. Website <http://www.rareplants.cnps.org> Accessed 04 February 2015.
- CNDDDB [California Natural Diversity Database]. _____. California Department of Fish and Wildlife's Natural Diversity Database, RareFind Version 5. Accessed _____
- Crooks, J. A. 2002. Characterizing ecosystem-level consequences of biological invasions: the role of ecosystem engineers. *Oikos*, 97: 153-166.
- Derr JF. 2008. Common reed (*Phragmites australis*) response to mowing and herbicide application. *Invasive Plant Science and Management* 1:12–16
- DTSC [Department of Toxic Substances Control], EnviroStor. 2015. Hazardous Waste and Substances List. Website <http://www.envirostor.dtsc.ca.gov>. [accessed March 3, 2015]

- Feng, J.C., D.G. Thompson, and P.E. Reynolds. 1990. Fate of Glyphosate in a Canadian Forest Watershed. 1. Aquatic Residues and Off Target Deposit Assessment. *J. Agric. Food Chem.* Vol. 38. pp. 1110-1118
- FHWA [Federal Highway Administration]. 1980. Highway Noise Fundamentals. Springfield, Virginia. September 1980.
- FHWA. Highway Noise Fundamentals. Springfield, Virginia. September 1980. p. 97.
- Hazelton, E.L.G, Thomas J. Mozdzer, David M. Burdick, Karin M. Kettenring, Dennis F. Whigham; *Phragmites australis* management in the United States: 40 years of methods and outcomes, *AoB PLANTS*, Volume 6, 1 January 2014, plu001
- Kay SH. 1995. Efficacy of wipe-on applications of glyphosate and imazapyr on common reed in aquatic sites. *Journal of Aquatic Plant Management* 33:25–26.
- Komoroske, L. M., Jeffries, K. M., Connon, R. E., Dexter, J. , Hasenbein, M. , Verhille, C. and Fangue, N. A. (2016), Sublethal salinity stress contributes to habitat limitation in an endangered estuarine fish. *Evol Appl*, 9: 963-981. doi:10.1111/eva.12385
- Levy, D.A., and T.G. Northcote. 1982. Juvenile salmon residency in a marsh area of the Fraser River estuary. *Canadian Journal of Fisheries and Aquatic Sciences* 39:270-276.
- Lowman, M., Voirin, B. 2016. Drones – our eyes on the environment. *Front Ecol Environ* 2016; 14(5): 231–231, doi: 10.1002/fee.1290
- Mahajan, U., Bundel, B.R. Conference Paper: Drones for Normalized Difference Vegetation Index (NDVI), to Estimate Crop Health for Precision Agriculture: A Cheaper Alternative for Spatial Satellite Sensors. October 2016. International Conference on Innovative Research in Agriculture, Food Science, Forestry, Horticulture, Aquaculture, Animal Sciences, Biodiversity, Ecological Sciences and Climate Change (AFHABEC-2016), Jawaharlal Nehru University
- Monteiro, A., Moreira, I., and Sousa, E. 1999. Effect of prior common reed (*Phragmites australis*) cutting on herbicide efficacy. *Hydrobiologia*. 415. 305-308. 10.1023/A:10038
- Moyle, P., Manfree, A., & Fiedler, P. (Eds.). (2014). *Suisun Marsh: Ecological History and Possible Futures*. University of California Press. Retrieved from <http://www.jstor.org/stable/10.1525/j.ctt5vjz9n>
- Myers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, WS. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, -Oregon, and California. US. Dept. Commer., NOAA Tech, Memo. NMFS-NWFSC-35, 443 p.

- Newton, M., L.M. Homer, J.E. Cowell, D.E. White, and E.C. Cole. 1994. Dissipation of Glyphosate and Aminomethylphosphonic Acid in North American Forests. *J. Agric. Food Chem.* Vol. 42. pp. 1795-1802
- Personal Communications 2018. Aquatic Environments, Inc. Conversation between Krista Hoffman and Lance Dohman on 7/18/18
- Swanson C, Reid T, Young PS, Cech JJ., Jr (2000) Comparative environmental tolerances of threatened Delta Smelt (*Hypomesus transpacificus*) and introduced Wakasagi (*Hypomesus nipponensis*) in an altered California estuary. *Oecologia* 123: 384–390. [PubMed] [Google Scholar]
- Syracuse Environmental Research Associates, Inc. (SERA). 2004. Imazapyr - Human Health and Ecological Risk Assessment – Final Report. SERA TR 04-43-17-05b. December 18, 2004. Syracuse Environmental Research Assoc., Inc. Fayetteville, New York
- USEPA [U.S. Environmental Protection Agency]. 1993. Reregistration Eligibility Decision (RED): Glyphosate; EPA-738-R-93-014; U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 1993.
- USEPA [U.S. Environmental Protection Agency]. 2003. Environmental Fate and Ecological Risk Assessment for the Registration of Imazapyr Use on Aquatic Non-Crop Sites. PC Code 128821. September 3, 2003.
- U.S. Environmental Protection Agency (USEPA). June 2006. Reregistration Eligibility Decision for Imazapyr. EPA 738-R-06-007 2006 OPP-2005-0495.
- USFWS [U.S. Fish and Wildlife Service]. 1998. Draft Recovery Plan for the Least Bell's Vireo (*Vireo bellii pusillus*). Portland, Oregon. May 1998.
- USFWS. 1999. Conservation Guidelines for the Valley Elderberry Longhorn Beetle. Sacramento, California. July 1999.
- USFWS. 2002. Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*). September 12, 2002.
- USFWS. 2005a. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Portland, Oregon. 606 pages.
- USFWS. 2005b. Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog. August 2005
- USFWS. 2006. Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) 5-Year Review: Summary and Evaluation. September 2006.
- USFWS. 2007. National Bald Eagle Management Guidelines. May 2007.

USFWS. 2015a. Fish and Wildlife Service. Birds Protected by the Migratory Bird Treaty Act.
<http://www.fws.gov/migratorybirds/>. Accessed: _____

USFWS. 2015b. Sacramento Fish and Wildlife Office. Endangered Species List.
<http://www.fws.gov/sacramento> Accessed: 2015