FINAL

HABITAT MITIGATION AND MONITORING PLAN
for the
Salton Sea Species Conservation Habitat Project
Imperial County, California

Prepared for:

Natural Resources Agency
(Department of Fish and Game and
Department of Water Resources)
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1.0 INTRODUCTION

This Habitat Mitigation and Monitoring Plan (HMMP) addresses impacts to wetlands and riparian resources resulting from implementation of the Salton Sea Species Conservation Habitat Project (SCH Project or Project) (Figures 1 and 2). In accordance with the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the SCH Project, no Project-specific compensatory mitigation for impacts to jurisdictional features, including vegetated habitat, located within the boundary of the ponds is required due to the beneficial nature of the Project for water quality, wildlife habitat, and special-status wildlife species (i.e., the Project is considered to be self-mitigating). This HMMP is focused primarily on providing guidance for replacement of wildlife habitat that will be impacted by non-pond features of the SCH Project, in accordance with mitigation measure BIO-5 from the EIS/EIR.

The SCH Project is intended to serve as a proof-of-concept model for the restoration of shallow water habitat that currently supports fish and wildlife dependent upon the Salton Sea (the Sea); this habitat is being lost due to salinity increases and the declining Sea elevation. The overall goals of the SCH Project are two-fold: (1) develop a range of aquatic habitats that will support fish and wildlife species dependent on the Salton Sea; and (2) develop and refine information needed to successfully manage the SCH Project habitat through an adaptive management process (Corps and Natural Resources Agency 2011). The applicant's objectives include the following:

- Provide appropriate foraging habitat for piscivorous bird species;
- Develop habitats required to support piscivorous bird species;
- Support a sustainable, productive aquatic community;
- Provide suitable water quality for fish;
- Minimize adverse effects on desert pupfish (*Cyprinodon macularius*);
- Minimize risk of selenium bioaccumulation;
- Minimize risk of disease/toxicity impacts to plants and wildlife;
- Develop and implement a monitoring plan;
- Develop a decision-making framework;
- Provide proof of concept for future restoration.

1.1 Applicant/Permittee

The applicant for the proposed Project is the Natural Resources Agency. The Department of Water Resources (DWR) is submitting this application on behalf of the Natural Resources Agency. Below is the contact information for the Natural Resources Agency and DWR.

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1.2 Roles and Responsibilities

This HMMP complies with the conditions of the EIS/EIR and supports permit applications to the U.S. Army Corps of Engineers (Corps), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Game (DFG). If the permits are granted by these resource agencies, the Natural Resources Agency will be financially responsible for the costs associated with the implementation, monitoring, maintenance, and protection of mitigation areas as defined in this HMMP.

1.2.1 Responsible Parties

The Natural Resources Agency is the applicant/permittee. The DWR is an acting and official representative of the Natural Resources Agency. The Project is being jointly planned by DWR and DFG on behalf of the Natural Resources Agency. The resource agency permit applications and this HMMP were prepared with assistance from Dudek.

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FIGURE 1

Regional Map

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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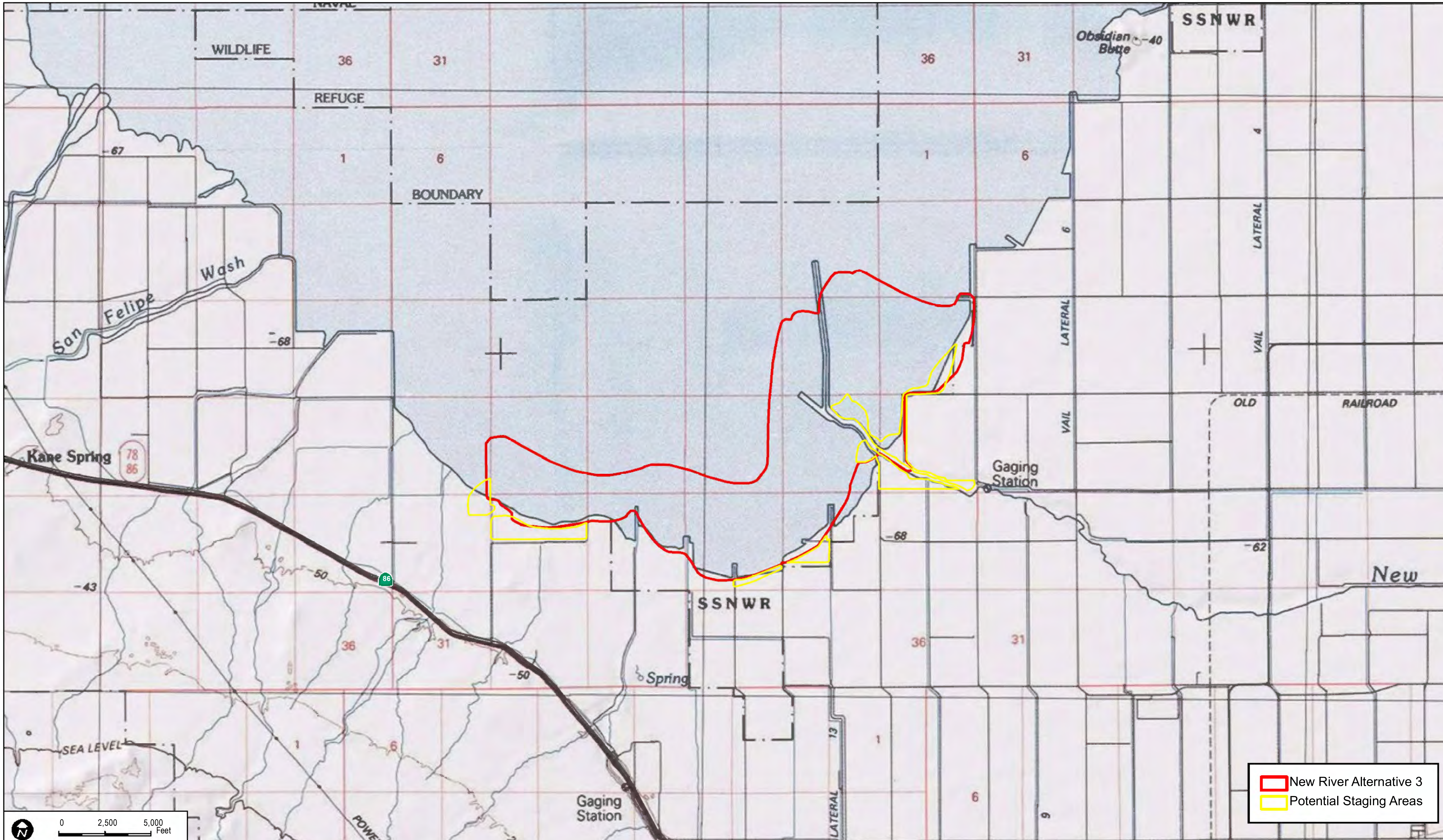

SOURCE: USGS 7.5-Minute Series Obsidian Butte, Calipatria SW, and Niland Quadrangles.

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FIGURE 2

Vicinity Map

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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1.2.2 Habitat Restoration Specialist

The Natural Resources Agency will select a qualified Habitat Restoration Specialist to oversee the implementation, monitoring, and long-term maintenance of the re-establishment areas. The Habitat Restoration Specialist and Natural Resources Agency will review all aspects of the pertinent contract documents, including, but not limited to, site protection, submittal of status reports, scheduling of formal site observations, lines of communication, and persons with stop-work authority prior to Project implementation. The Habitat Restoration Specialist will oversee and coordinate implementation of this HMMP, including final construction drawings (if prepared), and will conduct or oversee fieldwork for Project installation and monitoring during the 120-day initial maintenance period and biological monitoring throughout the 5-year maintenance and monitoring period. The Habitat Restoration Specialist will possess specific knowledge and Project-level experience with wetlands restoration and enhancement projects.

The Habitat Restoration Specialist will also be required to provide environmental training for all Project personnel covering the on-site construction restrictions resulting from the proposed implementation of this plan, the presence or potential presence of special-status species and sensitive vegetation communities within or adjacent to the re-establishment areas, and potential biological dangers on site (e.g., rattlesnakes, bee hives). Information about Federal, state, and local laws relating to these biological resources will be discussed as part of the personnel education. Project installation monitoring will occur throughout the re-establishment site construction period. Monitoring time may increase or decrease as required by field conditions and construction activities.

1.2.3 Restoration Contractor

The Natural Resources Agency will hire a Project installation contractor and/or maintenance contractor (Restoration Contractor). The Restoration Contractor will be a qualified, licensed company, preferably with experience in wetland restoration, creation, and maintenance. During the implementation phase, the Restoration Contractor will be responsible for performing Project installation and other tasks as recommended by the Habitat Restoration Specialist and as described in this HMMP. During the long-term monitoring phase, the Restoration Contractor will be responsible for weed control, trash removal, and other tasks as directed by the Habitat Restoration Specialist and as described in this HMMP.

1.2.4 Biological Monitor

The SCH Project is designed as a "proof-of-concept" project in which several Project features, characteristics, and operations could be tested under an adaptive management framework. The proof-of-concept period would last for approximately 10 years after completion of construction. By that time, managers would have had time to identify those management practices that best meet the Project goals. After the proof-of-concept period, the Project would be operated until the end of the 75-year period covered by the Quantification Settlement Agreement (2078) or until funding were no longer available.

Since the SCH Project is a proof-of-concept project, a monitoring plan will be created to guide evaluation and management of the newly created habitat as well as to inform future restoration. The biological monitor will oversee the following key elements associated with the ponds that will be included in the SCH monitoring plan:

- Physical habitat: Flow rate, depth, wetted area, islands, snags, submerged vegetation, and other habitat elements;
- Water quality: Salinity, temperature, dissolved oxygen, nutrients;
- Aquatic biota: Algae and submerged plants, plankton, invertebrates, non-native fish community (species, distribution, abundance), desert pupfish;
- Birds: Species, abundance and distribution, use of habitat features, roosting and nesting, sick or dead birds; and
- Contaminants: Selenium concentrations in water, sediment, bird eggs, and other biota (invertebrates, fish).

1.3 Proposed Project

SCH Project Overview

The Salton Sea currently supports a wide variety of bird species and a limited aquatic community. Over past decades, the components of the aquatic-dependent community have shifted in response to receding water levels and increasing salinity. The Salton Sea is currently a hypersaline ecosystem (Corps and Natural Resources Agency 2011). Without restoration, declining water inflows in future years will result in the Salton Sea's ecosystem collapse due to increasing salinity (expected to exceed 60 parts per thousand [ppt] by 2018, which is too saline to support fish) and other water quality stresses, such as temperature extremes, eutrophication, and related anoxia and algal productivity. The most serious and immediate threat to the Salton Sea ecosystem is the loss of fishery resources that support piscivorous (fish-eating) birds. The birds that feed on invertebrates have more options and resources than piscivorous birds because the invertebrate fauna has a wider range of salinity tolerances.

To address this immediate need, the California Legislature appropriated funds for the purpose of implementing "conservation measures necessary to protect the fish and wildlife species dependent on the Salton Sea, including adaptive management measurements" (California Fish and Game Code, Section 2932(b)). Therefore, under the California Environmental Quality Act (CEQA), the SCH Project's goals are two-fold: (1) develop a range of aquatic habitats that will support fish and wildlife species dependent on the Salton Sea; and (2) develop and refine information needed to successfully manage the SCH Project habitat through an adaptive management process.

The Natural Resources Agency's preferred alternative, as outlined in the EIS/EIR, would create a total of up to 3,770 acres of shallow ponds, contained within low berms, on both sides of the New River at elevations less than -228 feet mean sea level (Figure 3). The ponds would be supplied with a combination of brackish and saline water. This water would be pumped from both the New River and Salton Sea, and blended to maintain an appropriate salinity range suitable for fish species that are currently adapted to living in the Sea's saline environment. The following describes the maximum amount of Project features that could be built.

Specific Project Features

Operations. Proposed SCH operations are based on a proof-of-concept model. With this model, each pond or set of ponds would be operated under different conditions to test the success of the habitat with different pond characteristics. The final operations would be decided at the end of the proof-of-concept period, expected to occur in 2025. Appendix D of the EIS/EIR and Section 5.0 of this document provide examples of the range of operations for the SCH Project (Corps and Natural Resources Agency 2011).

The main parameters subject to change include salinity, residence time, and depth. They can be controlled by changing the amount and salinity of water delivered to the SCH ponds, the outflow to the Salton Sea, and the total storage in the ponds. The potential range of these parameters includes the following:

- Salinity: Typical range of 20 to 40 ppt, occasionally up to 50 ppt;
- Residence time: 2 to 32 weeks;
- Depth: 4 to 6 feet at the exterior berm.

The biotic community (e.g., plankton, invertebrates, fish, and birds) would respond in varying ways to these operations and other environmental conditions. These operations, ecological responses to the operations, and other key indicators or events at the ponds (e.g., water temperature, bird die-offs), would be monitored, and any necessary adjustments to operations would be made through a monitoring and adaptive management program (Appendix E of the EIS/EIR).

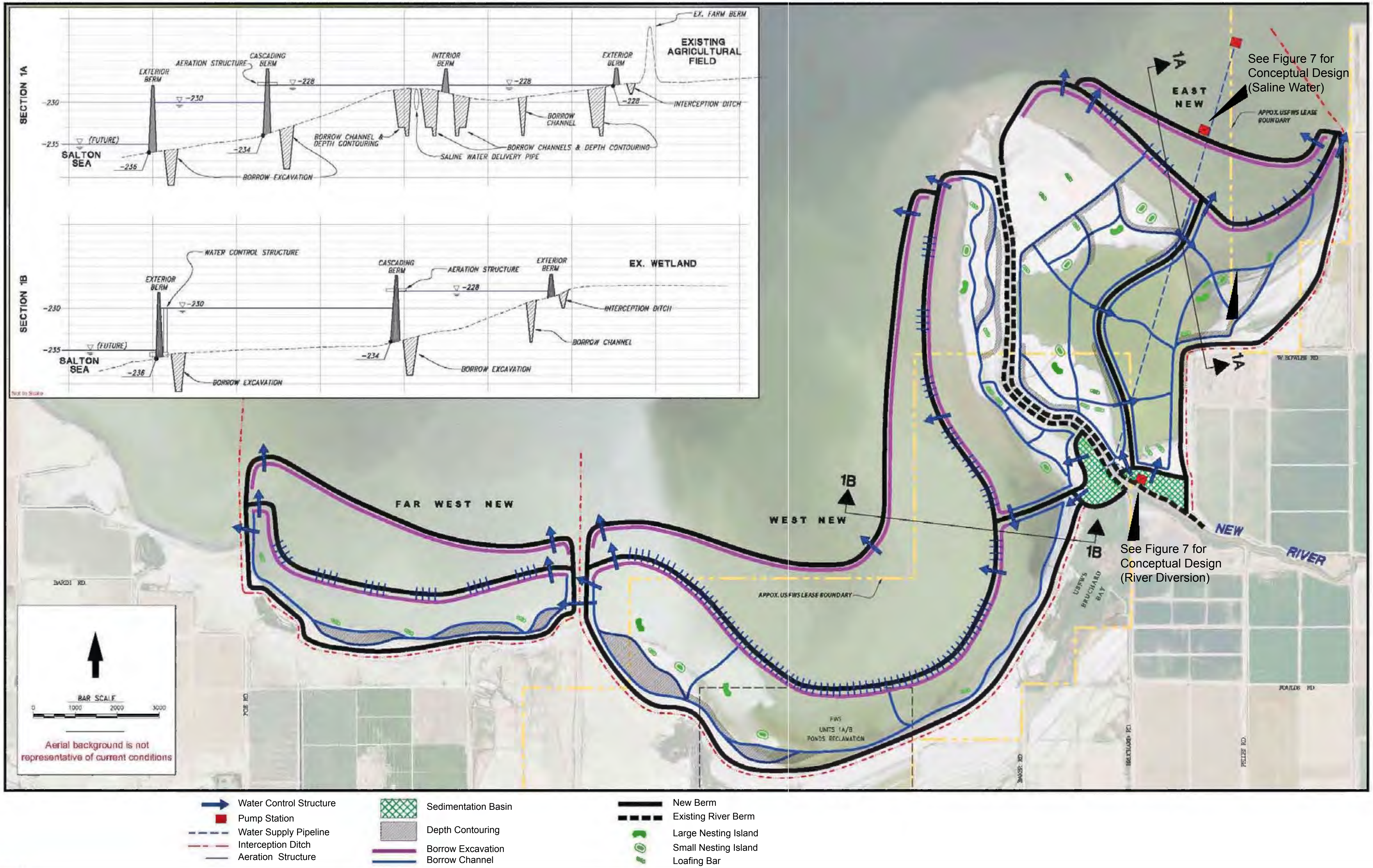
Fish and bird die-offs could occur periodically during pond operations; if dead birds were detected, they would be removed by DFG staff, in keeping with current practices at the Salton Sea (Corps and Natural Resources Agency 2011).

Pond Layout. The conceptual layout for the SCH Project includes three independent pond units: Far West New, West New, and East New (Figure 3). The final pond layouts are being further refined in the later planning and engineering phases, but they will retain the general concepts provided in the conceptual layout. The Far West New pond will be constructed along the western shoreline of the proposed SCH Project area, the West New pond will be along the shoreline between the Far West New and the New River, and the East New pond will be located along the large bay to the northeast of the New River. Within some pond units, interior berms would form individual ponds. The ponds at Far West New would receive their water supply from a pipeline from West New. Cascading ponds would be connected to each of the pond units. These cascading ponds would drain to the Sea.

Berm Configuration. Berms would be situated throughout the Project area in order to create the necessary pond size, shape, bottom configuration, and orientation (Figure 3). Exterior berms would be placed at an elevation of -236 feet mean sea level to separate the ponds from the Sea. These berms would also separate the ponds from the interception ditch and adjacent land uses and would be placed at an elevation of -228 feet. The interception ditch would be constructed along the shoreline to intercept the agricultural drainage and divert it around the ponds to the Sea. The cascading berms would be placed at elevations of -234 feet depending on the pond location, site conditions, and the Sea elevation at the time of construction. Cascading berms would separate the cascading pond from the independent pond and would contain facilities to cascade the water from one pond to another (Corps and Natural Resources Agency 2011).

Berms would be constructed of suitable earthfill materials excavated from the Seabed. The final berm dimensions will vary depending on location. The general approach is to provide an approximately 20-foot-wide gravel road on top of each berm to allow vehicular access for maintenance. Rock slope protection or other materials may be placed on the water side of the berms for erosion protection.

Depending upon the placement of the berm, either within exposed playa or within the Sea, two construction methods would be implemented. Berm construction located within the playa is considered “in the dry,” while construction activities within the Sea are termed “in the wet.” In-the-wet construction would require implementing protective measures to ensure that the Sea, and associated wave activity, would not erode the berm. These measures are discussed in detail in the EIS/EIR and may include the following: sacrificial soil barrier, rubble rock mound, sheet pile barrier, timber breakwater, Geotube®, large sand bags, water-filled bladder, and floating tire breakwater (Corps and Natural Resources Agency 2011).



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SOURCE: Corps and Natural Resources Agency 2011, Figure 2-8

FIGURE 3
Conceptual Layout of Alternative 3 (NR3)

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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Borrow Source. The borrow source for berm material would be from excavated trenches along the exterior berm, shallow excavations, and borrow swales. The borrow swales would create deeper channels within an individual pond.

Pond Connectivity. Interior berms would subdivide the independent pond units, and gated control structures would be present in the interior berms to allow controlled flow between individual ponds. Each individual pond would have an ungated overflow structure that connects directly to the Sea with an overflow pipe that would be sized to handle the overflow from a 100-year rainfall on the pond. Aeration drop structures would be placed in the cascading berm allowing water to flow from one pond to another.

Sedimentation Basin. In order to remove sediment from the river water prior to pumping the water in to the ponds, two sedimentation basins would be created within the SCH Project area (Figure 3). These basins would serve the pond units east and west of the New River. One basin will serve as the active basin while the other will be used as a maintenance basin. The active basin will receive water from the river, the water will sit in the basin for approximately 1 day allowing the sediments to fall to the bottom of the basin, and then the water will be pumped into the ponds. The active basin will become the maintenance basin as the sediments are left to dry and then removed and vice versa. The sediments will be excavated and used to maintain berms and construct new habitat features, or stockpiled for later use. Both basins would be constructed with steep slopes in order to minimize the establishment of emergent vegetation. The basins would total 39 acres and would be fenced to prevent unauthorized access.

Pump Stations. The purpose of the ponds is to create a mixture of saline and brackish water that can be sustained, and achieving this goal requires that the appropriate mixture of saline and brackish water is pumped from both New River and the Salton Sea. For the proposed Project, brackish water would be pumped from the New River at the SCH Project's southern edge using a low-lift pump to a sedimentation basin on each side of the river (Figures 3 and 4). A metal bridge structure would support the diversion pipes across the river. The saline water source would be derived from the Sea. The saline pump would be located to the north of East New on a structure in the Salton Sea (Figures 3 and 4). Water would be delivered to the pond intakes through a pressurized pipeline. As the Sea recedes, the pumping station may need to be relocated. In addition, as the Sea decreases in size, the salinity will rise to a point where the seawater may not need to be used and the proper salinity can be achieved through a tailwater return system. A tailwater return pump located at the end closest to the Sea would be installed to recycle the water through the ponds (Corps and Natural Resources Agency 2011).

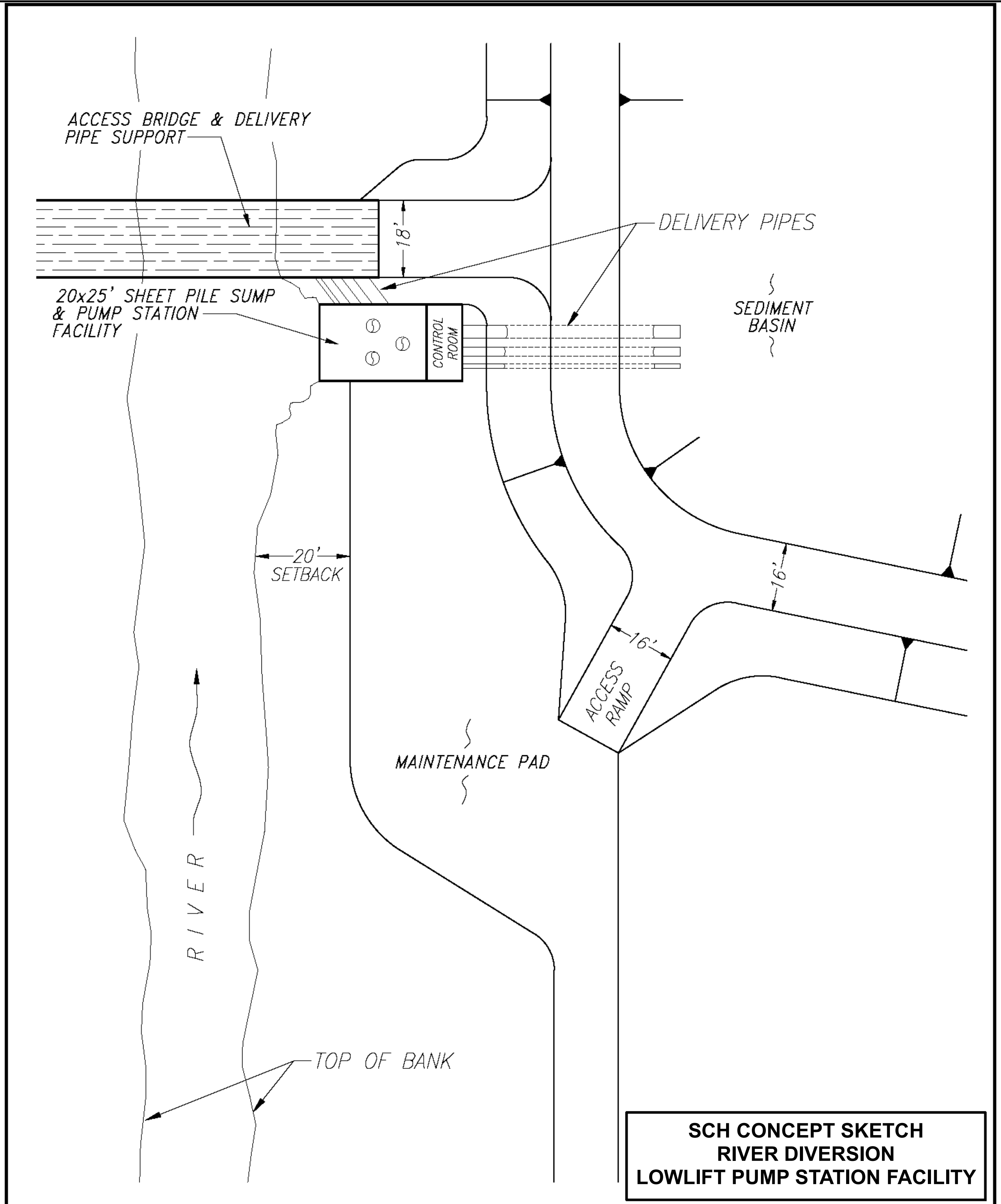
Water Diversion. Factors such as time of year, pond size and depth, residence time in the ponds, and salinity would influence the diversion from the river and the Sea. For the proposed Project, Alternative 3, assuming a salinity of 20 ppt and a 2-week residence time, the average total diversion would be up to 475 cubic feet per second (cfs), with 313 cfs from the New River and 162 cfs from the Sea. In the peak evaporation period (June), the total diversion would be 494 cfs, with 333 cfs from the New River and 161 cfs from the Sea. The diverted water would cycle through the SCH ponds with a 2- to 32-week residence time before it was returned to the Sea. During the holding time, the only loss of water would be to evaporation (Corps and Natural Resources Agency 2011). Table 3.11-7 of the EIS/EIR shows the total diversions needed from the Sea and the river based on residence time. For a total SCH pond surface area of up to 3,770 acres, about 22,460 acre-feet (af) of water would be lost from the ponds per year. In the absence of the Project, this volume of water would otherwise flow to the Sea where it would be subjected to a similar evaporation rate (Corps and Natural Resources Agency 2011).

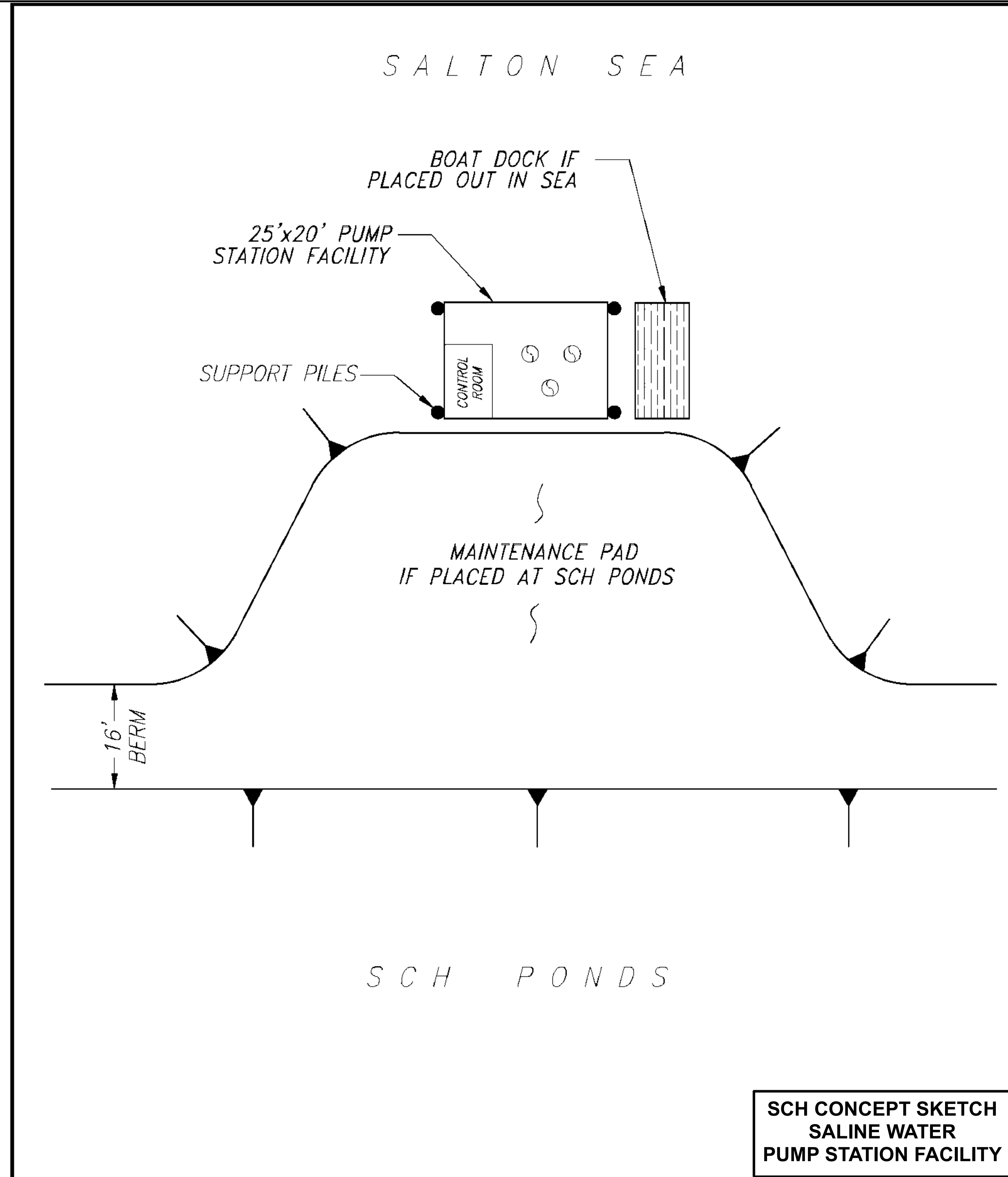
Water Surface Elevation. The water surface elevation in the ponds would be a maximum of -228 feet mean sea level. The maximum depth from the water surface in each pond unit to the downstream toe of the confining berm would be 6 feet. The water surface elevation in the cascading ponds would be from 2 to 4 feet lower than the elevation in the independent ponds.

Agricultural Drainage and Natural Runoff. Agricultural drains operated by Imperial Irrigation District (IID) terminate at the beach along the southern side of the independent pond units. In order to prevent the agricultural runoff from entering the ponds, these drainages would be collected in an interception ditch. Natural runoff from watersheds to the southwest of the SCH Project is also present in two drains that intersect the Project. The exterior berms would be aligned so as to not interrupt the flowpath of the occasional stormflows from these watersheds to the Sea.

Potential Staging Areas. Six potential staging areas may be included as a Project component. Two are located at the western end of the Project, two are located more centrally along the shoreline east of Vendel Road, and two are located farther east—one on either side of the New River (Figure 5).

Power Supply. Electrical power to the pumps would be provided by extending the current aboveground power lines to the pumping station located at the ponds and installing a new underwater conduit system to the pump located at the Sea. Three electric distribution lines are identified and included in this study area: one that extends approximately 1 mile north to the New River along Bruchard Road, another that extends south from the New River along Pellet Road, and a third that extends west along the river to the pump station.





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SOURCE: Ducks Unlimited Inc., January 2012

FIGURE 4

Conceptual Pump Station Facilities

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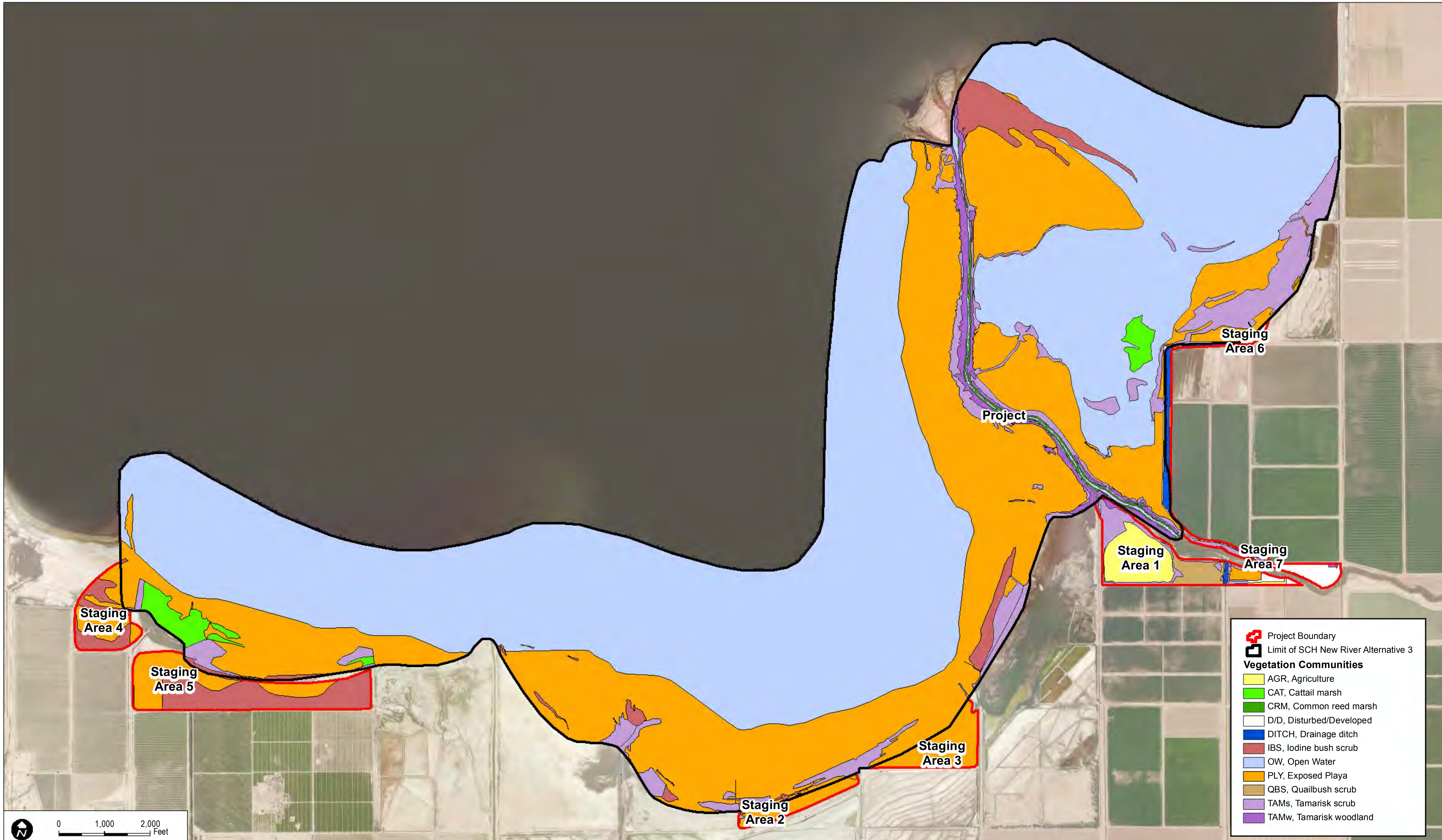

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SOURCE: Bing Maps, Imperial County 2008; Cardo 2011

FIGURE 5

Vegetation Communities Overview

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Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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Bird and Fish Habitat Features. Sediment excavated during creation of the ponds would be used to create habitat islands for birds. These islands will be designed to promote nesting and roosting and will be relatively protected from land-based predators. All islands will be surrounded by water that is 2.5 feet deep and will be constructed a distance from shore, to the extent practicable, to minimize predation. More detail about the construction of the islands is provided in Section 2.4.1.19 of the EIS/EIR (Corps and Natural Resources Agency 2011).

Each pond will include features that not only provide suitable water habitat for fish but also increase microhabitat diversity and provide cover and attachment sites for a variety of invertebrate species. Section 2.4.1.20 and Appendix D of the EIS/EIR provide a more detailed description of the potential habitat features that may be constructed in the ponds, including swales or channels, hard substrate on berms, bottom hard substrate, floating islands, and submerged aquatic vegetation (Corps and Natural Resources Agency 2011).

Maintenance and Emergency Repairs. Ongoing maintenance would be an integral part of SCH operations. Activities would include maintaining the sedimentation basins, interior and exterior berms, protective riprap (if used), pumping plants, and diversion structure. Material excavated from the sedimentation basins would be used to construct habitat features or add to the berms. The diversion would be maintained to minimize sediment in the diversion facilities and also monitor the river bed elevation to be aware of any downcutting that may occur as the Salton Sea's water level drops. The saline pumping facilities would be maintained to reduce fouling and corrosion caused by the hypersaline water flowing through the pumps.

The potential for biological fouling at pipes and pumps exists and would be addressed in maintenance plans. Typically, clogging of pipes would be reduced by periodic cleaning and flushing of the pipes. However, if the buildup of organisms in pipelines became excessive, pipe replacement may be required. Draining the ponds would not be a routine maintenance activity, but may be required if a berm were damaged or under another type of emergency situation (Corps and Natural Resources Agency 2011).

1.4 Description of Pre- and Post-Project Jurisdictional and Non-Jurisdictional Vegetated Areas

1.4.1 Pre-Project Jurisdictional Areas

The *Salton Sea Ecosystem Restoration Program Final Programmatic Environmental Impact Report* (Natural Resources Agency 2007) provides general information about vegetation around the Salton Sea. Additional data sources for the Project area included geographic information system (GIS) files from the Redlands Institute at the University of Redlands (1999), vegetation mapping completed for IID (2007), 6-inch resolution aerial photographs (Southern California Association of Governments and California Department of Transportation 2008), and site visits conducted on April 29 and November 16 through 18, 2011. The biological resources section of the EIS/EIR (Section 3.4) describes the vegetation within all of the alternatives considered. The vegetation communities located within Alternative 3, the SCH Project area, include agriculture, common reed marsh, disturbed/developed, drainage ditch, mudflat, open water, tamarisk scrub, and tamarisk woodland. Additional observations of existing vegetation communities were recorded by Chambers Group during the initial wetlands delineation of the SCH Project area, including identification of iodine bush scrub, and no new vegetation communities were observed during the updated jurisdictional delineation conducted by USACE, CDFG, Cardno ENTRIX, and Dudek (Dudek and Chambers Group 2012). During the California Rapid Assessment Method (CRAM) investigation, vegetation mapping within Alternative 3 was refined and one additional vegetation community, quailbush scrub, was identified (DWR and DFG 2012; also included as Appendix A). The locations of vegetation communities within the SCH Project are provided in Figures 5 and 6a through 6c, and representative photographs of existing conditions are provided in Figure 7.

1.4.1.1 Vegetated Wetlands

Common Reed Marsh

Common Reed Marshes are dominated by common reed (*Phragmites australis*). Herbs are less than 13 feet in height with a continuous canopy. This community is found in semi-permanently flooded and slightly brackish marshes, ditches, impoundments. Soils have high organic content and are poorly aerated (Sawyer and Keeler-Wolf 2009). Common reed marshes occurred much less frequently throughout the Project area. The community was well established in association with the New River in the Project area. Other areas of common reed marshes were observed at a lesser extent than the tamarisk scrub or iodine bush scrub throughout the Project area above the -231-foot below sea level elevation, primarily associated with the agricultural drainage portions of the Project area.

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SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 6a

Vegetation Communities

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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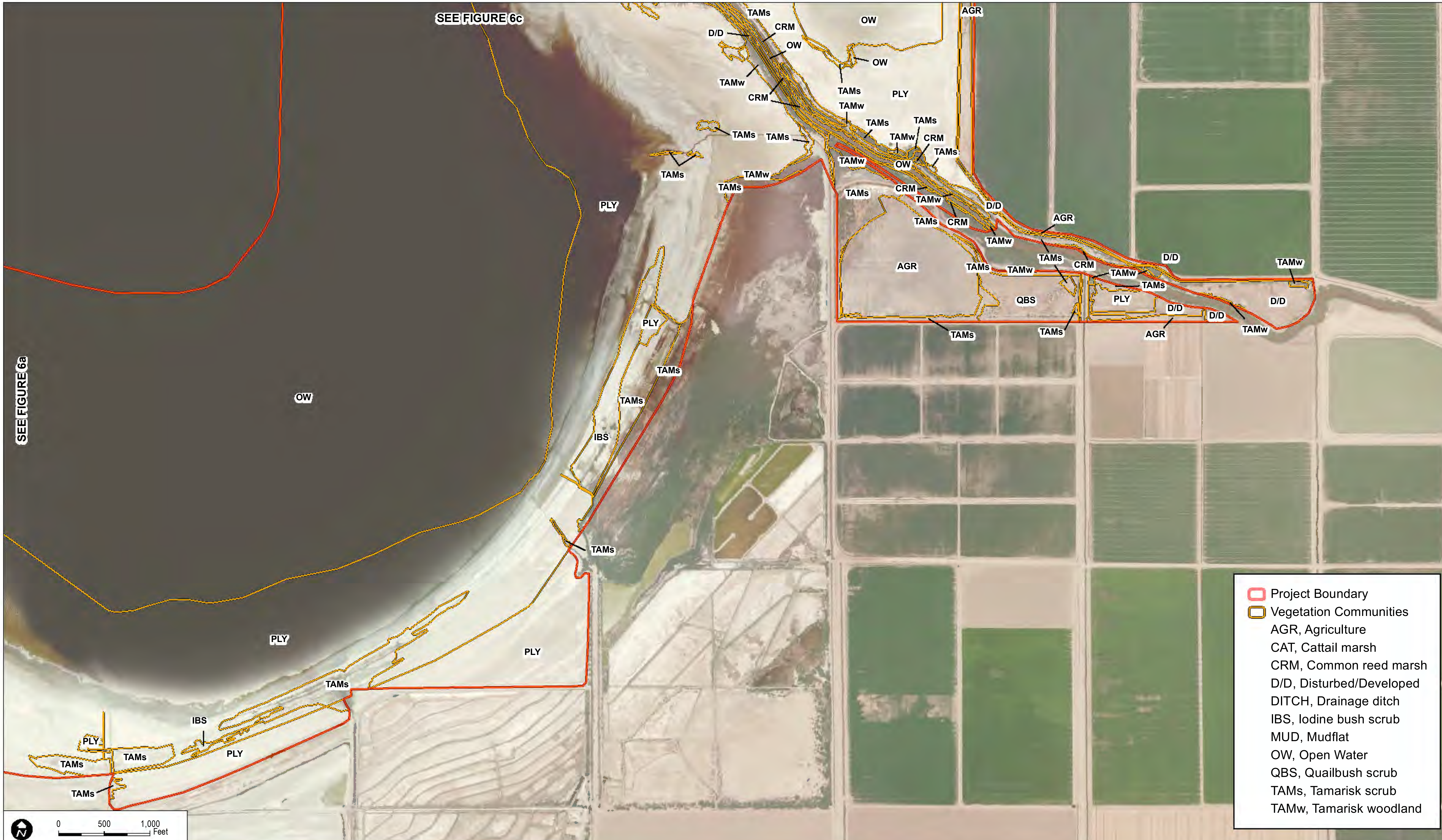

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SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 6b

Vegetation Communities

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 6c

Vegetation Communities

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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Photo 1: Representative view of the New River. Note Tamarisk Woodland habitat lining the banks (8-18-11).

Photo 2: Representative view of the mud flat conditions on the shore of the Salton Sea (8-18-11).

Photo 3: Representative view of conditions where an agricultural drain enters the Salton Sea (8-18-11).

Photo 4: Representative view of the shoreline of the Salton Sea (8-18-11).

Photo 5: Representative view of iodine bush scrub on the shore of the Salton Sea (11-17-11).

Photo 6: Representative view of an ephemeral, immature habitat on the shore of the Salton Sea near the New River outlet. Note the dead tamarisk seedlings and the young iodine bush (8-18-11).

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Tamarisk Scrub and Tamarisk Woodland

Tamarisk Scrub is characterized as a weedy monoculture of any of several Tamarisk species (*Tamarix* spp.) usually replacing native vegetation following major disturbance. This vegetation community can be found on sandy or gravelly braided washes or intermittent streams, often in areas where high evaporation increases the stream's salinity. Tamarisk is a prolific seeder and strong long-rooted plant that absorbs water from the water table or the soil above it. These characteristics make this species an aggressive competitor in disturbed riparian corridors (Holland 1986). Tamarisk scrub was the predominant vegetation community observed throughout much of the wetland portion of the Project area. This vegetation community was observed within the exposed playa and upper extent of the shoreline of the Salton Sea, above the -231-foot below sea level elevation. Tamarisk scrub was also closely associated with the drainages within the Project area, and the riparian vegetation of the New River.

Iodine Bush Scrub

Iodine bush scrub is dominated by iodine bush (*Allenrolfea occidentalis*). Shrubs in this community are typically less than 7 feet in height with an open to continuous canopy. The herbaceous layer is variable and may include salt grass (*Distichlis spicata*) and alkali sacaton (*Sporobolus airoides*). This community can be found on dry lakebed margins, hummocks, playas perched above current drainages, and seeps (Sawyer et al. 2009, cited in Dudek and Chambers Group 2012). Iodine bush scrub was also a common vegetation community throughout the Project area but to a lesser extent than that of Tamarisk Scrub. Similar to what was reported in the DEIS/EIR, iodine bush scrub was observed in relatively open stands on the shores and exposed playa of the Salton Sea, and primarily above the -231-foot below sea level elevation (USACE 2011). This community was observed along some of the agricultural drainages, within former agricultural fields, and at the outlet/mouth of the New River.

Cismontane Alkali Marsh

Cismontane Alkali Marsh is dominated by perennial, emergent, herbaceous monocots up to 7 feet in height. Cover is often complete and dense. This community is characterized by standing water or saturated soil present during most of all of the year. High evaporation and low input of fresh water render these marshes somewhat salty, especially during the summer. Cismontane Alkali Marshes can be found on margins of lakebeds and occasionally near the Colorado River in eastern Riverside and Imperial Counties. This community is now much reduced in area by drainage and cultivation. There was one area of this vegetation community observed within the Project area along the upper extent of the Salton Sea shoreline.

Functions and Services of Vegetated Wetlands

The functions and services of the vegetated habitats within the Project area were evaluated with the CRAM. The purpose of the conditional assessment was to determine the functional condition of vegetated resources within the SCH Project Area prior to implementation of the proposed SCH Project relative to anticipated functional condition of restored vegetated resources. Details of the assessment and evaluation of the baseline functions and services of the vegetated habitats can be found in the *California Rapid Assessment Method Report for the Salton Sea Species Conservation Habitat Project* (CRAM Report) (DWR and DFG 2012; also included as Appendix A).

In summary, the vegetated areas within the SCH Project area were analyzed for a suite of variables that pertain to common attributes that riverine and lacustrine systems are expected to perform. The conditional assessment revealed that both the riverine and the lacustrine functional conditions are very similar throughout the Project area, with only minor variations in functions and services between study sites within the same wetland types. The vegetated areas generally had high buffer and landscape context scores (between 55.9 and 93.4 for riverine and 72.9 and 93.4 for lacustrine), moderate hydrology scores (between 50.0 and 83.4 for riverine and 66.7 for three lacustrine and 75.0 for the fourth), and lower physical (between 25.0 and 37.5 for riverine and between 25.0 and 37.5 for lacustrine) and biotic structure scores (between 27.8 to 55.6 for riverine and between 44.5 to 61.2 for lacustrine). The relatively high functional condition of the buffer and landscape connectivity is not surprising considering the lack of buffer interruptions (paved roads, fences, developments, etc.) within study areas. The functional condition of the hydrologic features was more variable than other attributes because of the substantially distinct hydrologic characteristics between the New River, the agricultural drainages, and the Sea. However, in general, the hydrologic condition was relatively low for water source because of the hydromodifications associated with irrigated agriculture being so closely tied to the drainage systems; and it was relatively high for hydrologic connectivity and hydroperiod stability, particularly in the agricultural drainages as they occur on the shore of the Sea. Physical and biotic structure conditions were relatively low due to lack of topographic complexity, low patch diversity, low dominant plant species diversity, substantial invasive species presence, and poorly developed vertical structure and habitat interspersion.

Additional functions and services of vegetated wetlands not evaluated with CRAM include dissipation of energy, cycling of nutrients, uptake of elements and compounds, retention of particulates, export of organic carbon, and maintenance of plant and animal communities (e.g., nesting, feeding, and breeding opportunities for various aquatic, terrestrial, and avian animals).

1.4.1.2 Unvegetated Wetlands

Unvegetated wetlands include a few specific areas that have recent indicators of hydric soils and hydrology (similar to those listed above for vegetated wetlands) but may not support vegetation due to historical or current disturbance, including high salinity. A bay-like area is present north of the New River where a gate control structure has been placed by the USFWS in the north bank of the New River allowing a drainage to form and water to be conveyed into an area that would otherwise likely be an exposed playa. The lack of hydrophytic vegetation in this area is likely due to high salinity. The extent of unvegetated wetlands in this area was determined through interpretation of a 2012 aerial photograph (Bing Maps 2012). Additional areas along the Salton Sea include exposed playas surrounded by wetland vegetation and proximate to agricultural drains. In the potential staging areas, unvegetated wetlands include a wide drainage ditch and portions of agricultural fields that support hydric soils and are proximate to the New River, thus providing a potential source of hydrology.

Unvegetated wetlands occupy 196 acres of the Project area.

Functions and Services of Unvegetated Wetlands

The biotic functions of unvegetated wetlands include foraging, breeding, and loafing for avian species. Wintering birds loaf on sandbars and mudflats, and forage in shallow water that is associated with unvegetated wetlands on site. Thousands of American white pelicans (*Pelecanus erythrorhynchos*) use mudflats and sandbars for loafing during the fall and winter months. Snowy plovers (*Charadrius alexandrines*) have been documented to use exposed playa associated with unvegetated wetlands for nesting. Other shorebirds, gulls, and terns attempt to nest on the exposed playa but frequently fail due to predation. Unvegetated wetlands do provide some limited hydrologic and geochemical functions, such as short-term surface water storage and nutrient cycling, although these functions are likely depressed due to the hypersaline soil conditions.

1.4.1.3 Open Water

The majority of the Project area, 2,230 acres, falls within the Salton Sea proper (Figures 8 and 9a through 9c). Under the No Action Alternative, the depth of the water in the Salton Sea will decrease and the Sea's salinity will continue to increase. Without the SCH Project the water will become too saline for any fish and most invertebrate species, which will in turn no longer support the population of fish-eating birds.

Agricultural Drainages

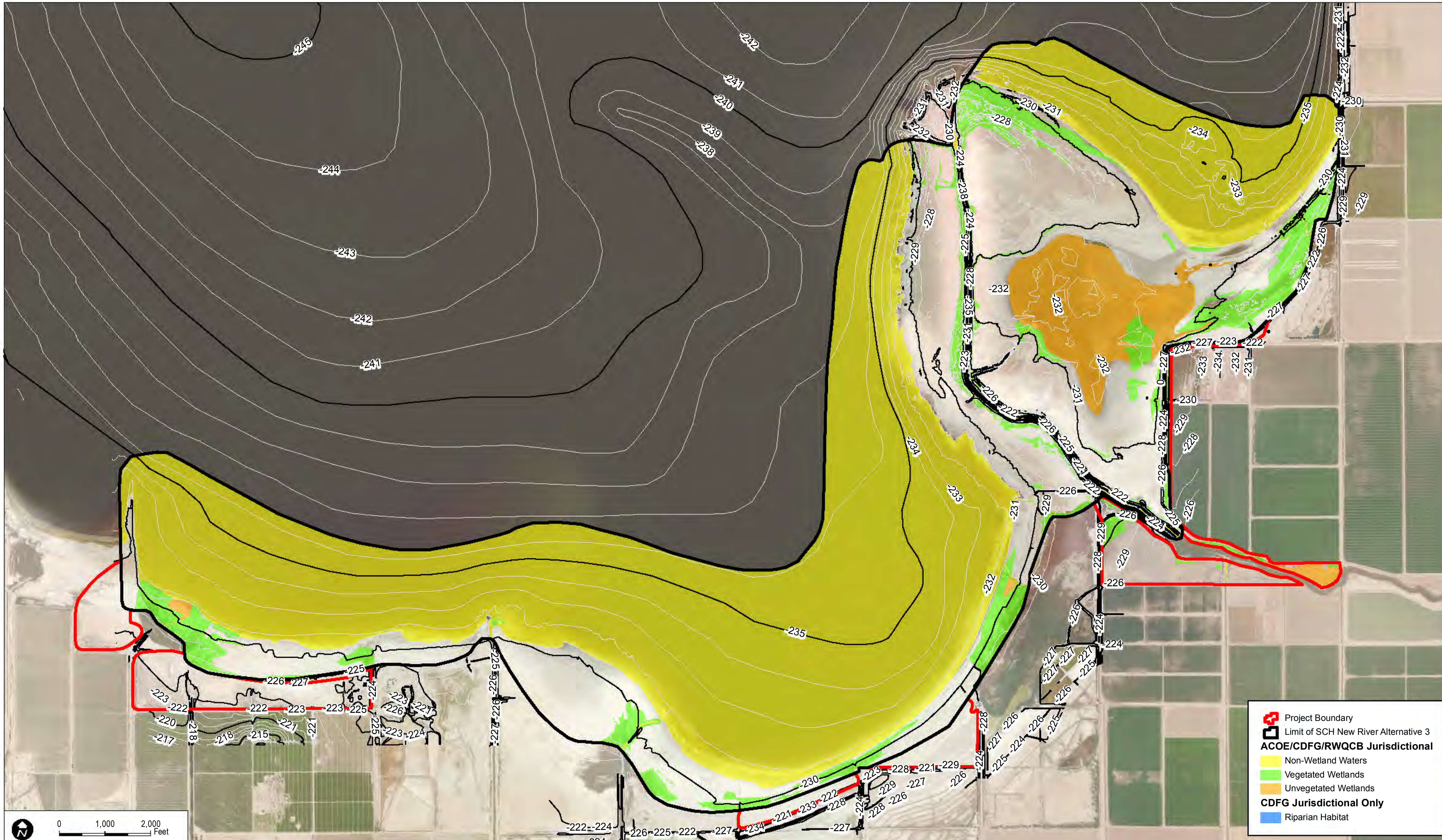
Agricultural drainages include both drains taking water away from the fields and water supply canals bringing water to the fields. Ditches may include both earthen and concrete-lined channels. The jurisdictional delineation identified 24 drainage channels, 7 of which were concrete-lined (Dudek and Chambers Group 2012). The 24 ephemeral drainages total approximately 12,820 linear feet and encompass approximately 4 acres with the Project area. Vegetation associated with the ditches often changes over time based on use of an individual ditch, level of salinity, and frequency and timing of vegetation clearing by the landowner. The jurisdictional delineation report (Dudek and Chambers Group 2012) provides the locations and descriptions of all 24 drainages.

The New River

The New River is a perennial waterway with an ordinary high water mark of approximately 30 feet in width that was unvegetated and appeared to have a mud bottom. The banks of the river contained associated wetland and riparian vegetation that was dominated by southern cattail (*Typha domingensis*) and common reed. The river is separated from the Sea by a berm that has been constructed for access purposes. The berm is approximately 5 to 7 feet in height and an access road runs along the top of the berm. The river flows north through the Project area and discharges into the Salton Sea. Prior to discharging into the Sea, the New River crosses through mixed-use agricultural lands and runoff from the agricultural lands contributes hydrology to the system. Direct precipitation and local stormwater runoff also contribute hydrology to the New River system. The New River is approximately 11,480 linear feet in length and encompasses approximately 11 acres within the Project area.

Functions and Services of Open Water

Open water provides habitat that supports fish and invertebrate populations with the highest concentration of fish populations along the nearshore areas of the Salton Sea. One of the current functions of the Salton Sea is the provision of habitat for resident and migratory wildlife species. The Salton Sea attracts thousands of pelicans, cormorants, and other fish-eating birds, while other habitat features (the mere presence of water in the desert) contribute to an incredibly high overall bird diversity of some 400 species. In addition to the diversity of birds, studies have indicated that the large number of individual birds using the Salton Sea is even more ecologically relevant than the number of species due to its importance as a migratory stopover and wintering area for hundreds of thousands of birds (Natural Resources Agency 2007). Over 100 species of waterbirds (grebes, ducks, geese, coots) have been recorded at the Salton Seas as residents, visitors, and migrants.



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SOURCE: Bing Maps, Imperial County 2008
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FIGURE 8

Jurisdictional Resources

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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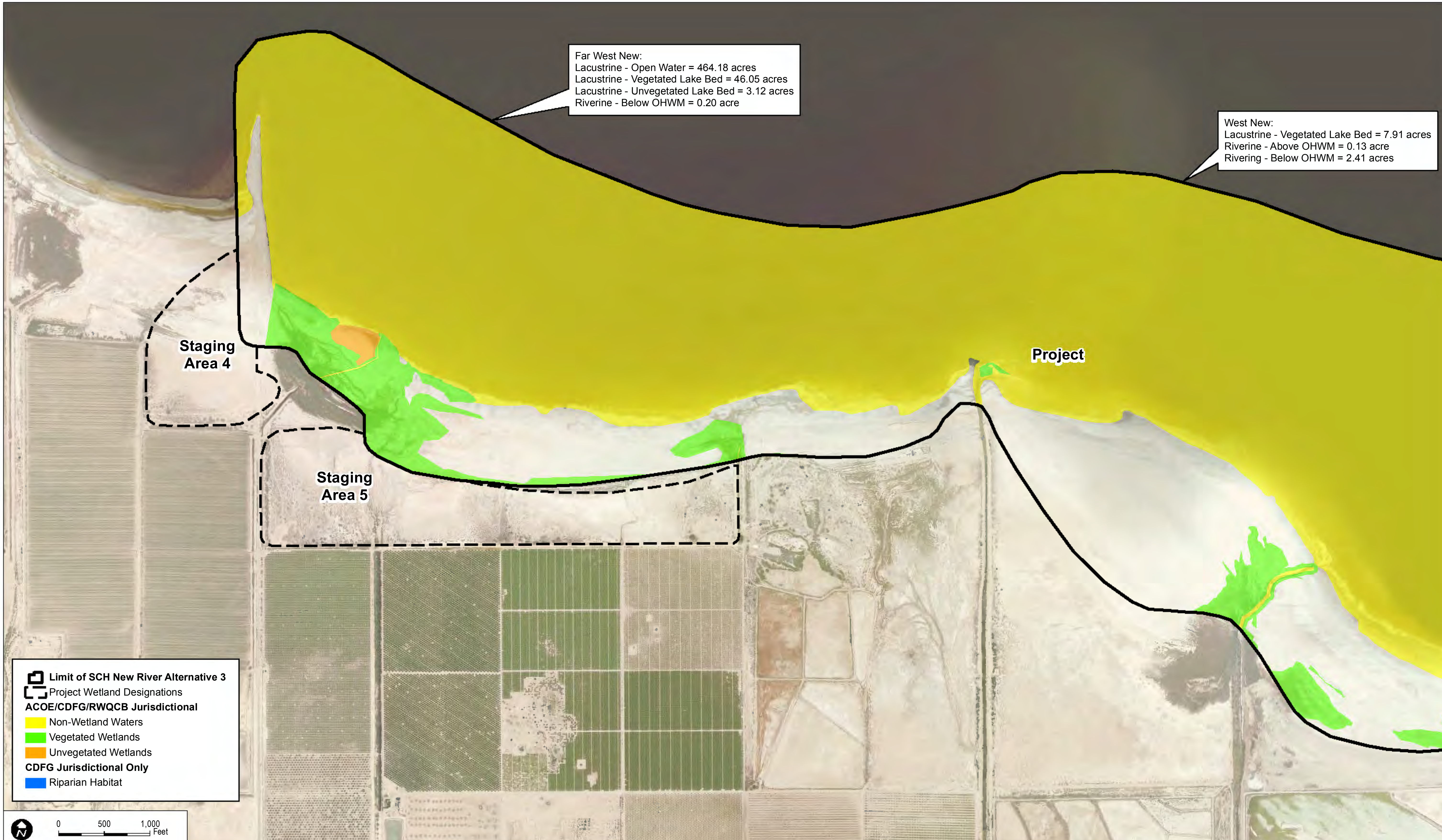

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SOURCE: Bing Maps, Imperial County 2008
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FIGURE 9a

Jurisdictional Resources Affected by the Project

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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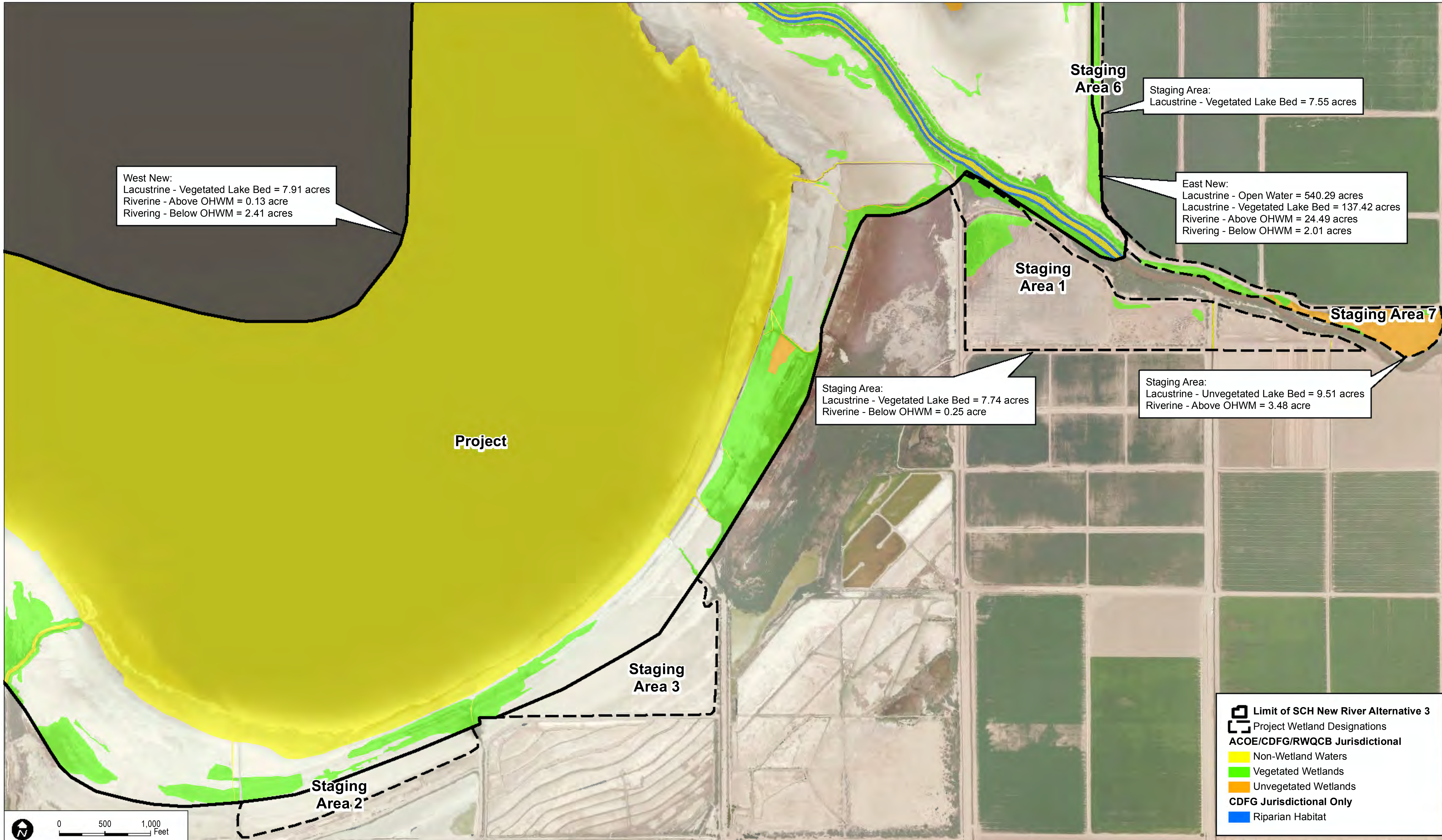

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SOURCE: Bing Maps, Imperial County 2008
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FIGURE 9b

Jurisdictional Resources Affected by the Project

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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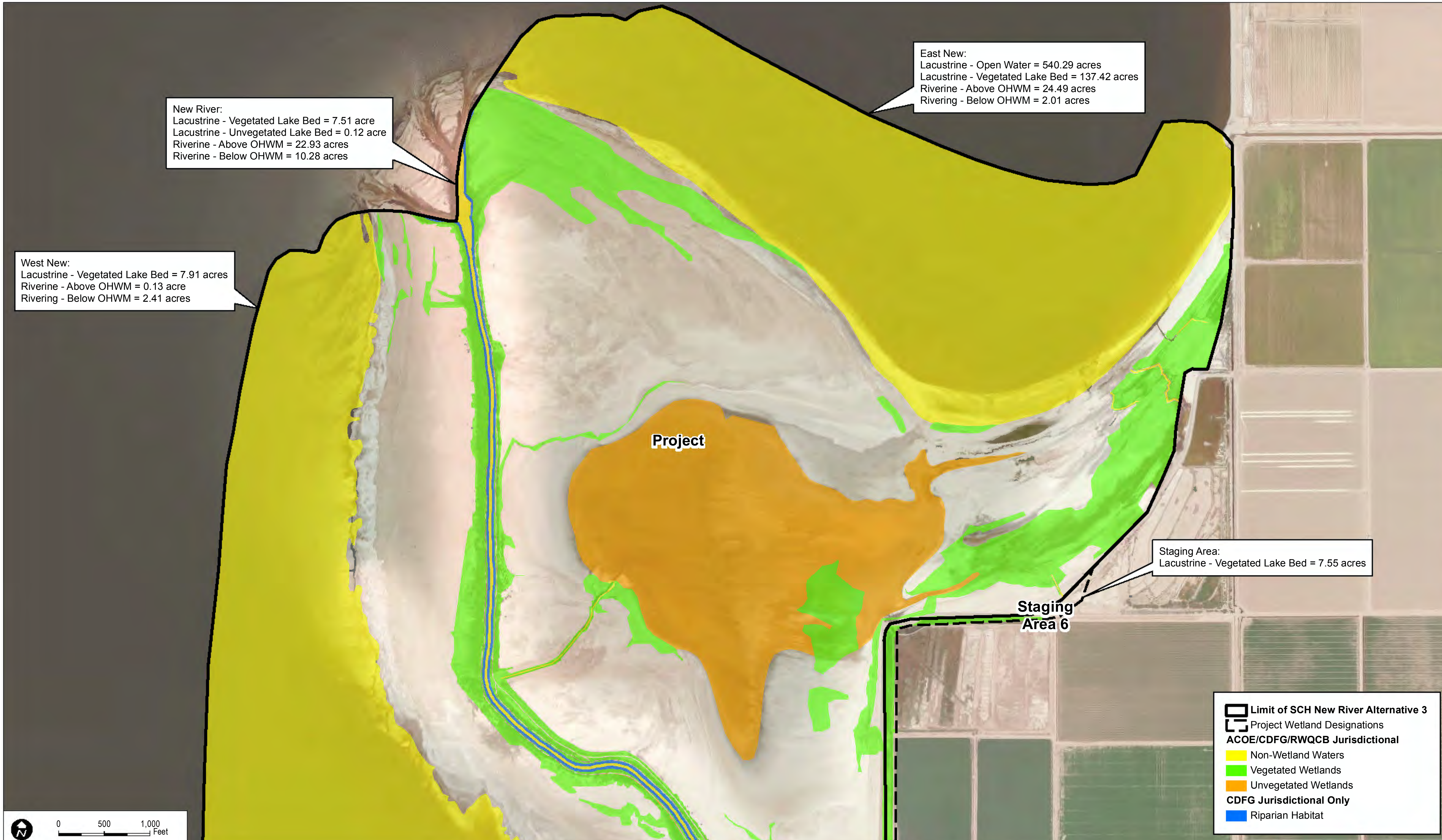

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SOURCE: Bing Maps, Imperial County 2008
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FIGURE 9c

Jurisdictional Resources Affected by the Project

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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The shallow shoreline along the Salton Sea also provides habitat for desert pupfish as well as other fish and invertebrates. It also provides important spawning and nursery habitat for tilapia. The shallow shoreline areas contain algal material important for foraging for fish and shorebirds. Wintering birds forage in shallow water and American white pelicans have been observed foraging in the shallow water of the shoreline in rafts of several hundred. The shallow shoreline provides foraging habitat for wading birds such as herons and egrets and shorebirds such as black-bellied plover (*Pluvialis squatarola*), black-necked stilt (*Himantopus mexicanus*), willet (*Tringa semipalmata*), and a variety of sandpipers.

The deeper waters of the Sea provide minimal functions and services related to wildlife, but still provide some depleted functions and services for hypersaline-tolerant fish species, such as tilapia. The water surface of the deeper water areas also provides a resting place for large numbers of birds. Hydrologic functions of open water include long-term surface water storage, subsurface water storage, retention of sediment and organic particulates, and moderation of groundwater flow or discharge.

1.4.1.4 Pre-Project Non-Jurisdictional Vegetated Areas

Mitigation measure BIO-5 requires mitigation for impacts to potential wildlife habitat, as represented by vegetated areas, even though some areas may no longer meet the Corps requirements for jurisdiction. Since these areas no longer receive hydrology from the Sea, primarily due to the loss of hydrology from the receding Sea, and are not associated with agricultural drainages, their functions are diminished in comparison to vegetated wetlands found within the Project area. The majority of these non-jurisdictional areas are associated with staging areas. The staging areas also include unvegetated non-jurisdictional areas (disturbed/developed and agricultural) that do not require mitigation under BIO-5 and therefore are not discussed in this report.

1.4.2 Effects of the Project

1.4.2.1 Avoidance and Minimization

The proposed Project has been designed in a manner that minimizes indirect effects on waters of the state and waters of the United States. Water control structures and sedimentation basins will ensure that sedimentation, erosion, scour, and other potential adverse effects on the Sea and adjacent wetlands will be minimized. Furthermore, the interception ditch shall be designed and operated in a manner that balances local surface and subsurface water movement so that the amount of water in adjacent marshes is not affected.

The proposed Project was designed to avoid impacts to the New River to the greatest extent practicable. The New River is bermed along both margins to prevent flood waters from reaching the adjacent lands. An additional berm will be constructed parallel to the existing New River berm to further reduce the risk of the New River from breaching the berms and spilling into the ponds. Although mostly avoided, impacts to the New River will occur at three places for temporary crossings and for pump and pipeline infrastructure.

Six potential staging areas may be included as a Project component and total 295 acres of the Project area. Two of the staging areas are located at the western end of the Project, two are located more centrally along the shoreline east of Vendel Road, and two are located farther east—one on either side of the New River. Of the 295 acres of staging areas available for construction of the Project, 11 acres are vegetated and will require re-establishment if impacted. The staging areas will be constructed in a manner that reduces the amount of impacts to jurisdictional features to the extent practicable.

1.4.2.2 Establishment of Aquatic Habitat

The purpose of the SCH Project is to develop a range of aquatic habitats that will support fish and wildlife species dependent on the Salton Sea through the creation of shallow ponds and associated infrastructure at the southern end of the Sea. In order to accomplish this task, existing vegetated and non-vegetated jurisdictional areas will be reconfigured into unvegetated, aquatic habitat condition (i.e., ponds) and associated shoreline. In addition, non-jurisdictional disturbed habitat will be converted into unvegetated aquatic habitat.

1.4.2.3 Permanent Impacts – Loss of Waters of the United States

SCH Project components that are categorized as permanent impacts resulting in a loss of waters of the United States (i.e., berms, sedimentation basins, water diversion at the New River, and creation of an interception ditch) and permanent impacts resulting in no loss of waters of the United States (i.e., SCH pond areas).

Creation of the ponds requires construction of both exterior and interior berms within and adjacent to the Sea. The base of the berms will be 110 feet wide, but will become partially submerged upon filling the ponds. The top of the berms will be approximately 26 feet wide, which includes an approximately 20-foot-wide driving surface, and a short section of bank (3 feet on either side) to support the road surface above the water in the ponds.

In order to remove sediment from the water before pumping it into the ponds, two sedimentation basins will be created on either side of the New River. Each basin will be divided into two parts: the active basin and the maintenance basin. Since the water within the basins will fluctuate according to operational requirements and accumulated sediments will be excavated to maintain the berms, these basins are categorized as a permanent impact and will result in a loss of 2.7 acres of vegetated jurisdictional habitat and 0.6 acres of non-jurisdictional vegetated habitat (Table 1). The New River pump station will be placed within the analyzed impact footprint of one of the sedimentation basins and therefore does not constitute an additional permanent impact.

Permanent impacts to the New River will occur at the river diversion located adjacent to the sedimentation basins. The diversion will feed water to the proposed sediment basins. Creation of this diversion will impact approximately 1.0 acre of existing river berms and associated habitat of which 0.9 are jurisdictional vegetation (Table 1).

A 30-foot-wide earthen interception ditch will be created along the southern perimeter of the ponds to capture agricultural runoff before it enters the ponds. Expected establishment of vegetation within the ditch will require routine dredging to ensure that water is able to flow from the agricultural areas to the Sea. This maintenance dredging is expected to occur every 1 to 2 years, and therefore this Project component was categorized as a permanent impact. Initial construction of the interception ditch would impact 4.2 acres of jurisdictional vegetated habitat only (Table 1).

In total, construction of Project components that will result in a loss of waters of the U.S. occupy a maximum area of approximately 20.5 acres of vegetated jurisdictional habitat, including 9.5 acres of tamarisk woodland, 8.1 acres of tamarisk scrub, 1.9 acres of cattail marsh, and 0.1 acre of common reed marsh (Table 1; Figures 10a through 10c). An additional 9.4 acres of vegetated non-jurisdictional habitat may also be impacted from construction of these component (Table 1). This impact does not affect waters of the U.S. but does result in a reduction of habitat and thus requires mitigation under BIO-5.

1.4.2.4 Permanent Impacts – No Loss of Waters of the United States

The ponds themselves and the pond shoreline will be considered jurisdictional waters, but construction will permanently alter existing conditions and therefore these areas are also considered permanently impacted. The pond shoreline, located between the berms and the water surface of the ponds, which will vary in width from 6 to 25 feet wide. Construction of the SCH ponds and pond shoreline will result in permanent impacts, but no loss of waters of the United States, on up to 53.6 acres of vegetated jurisdictional resources (Table 1). An additional 7.4 acres of non-jurisdictional vegetated habitat would also be permanently loss from construction of the SCH ponds and pond shoreline; however, these impacts are considered offset by habitat provided by the ponds and pond shoreline and no mitigation is required.

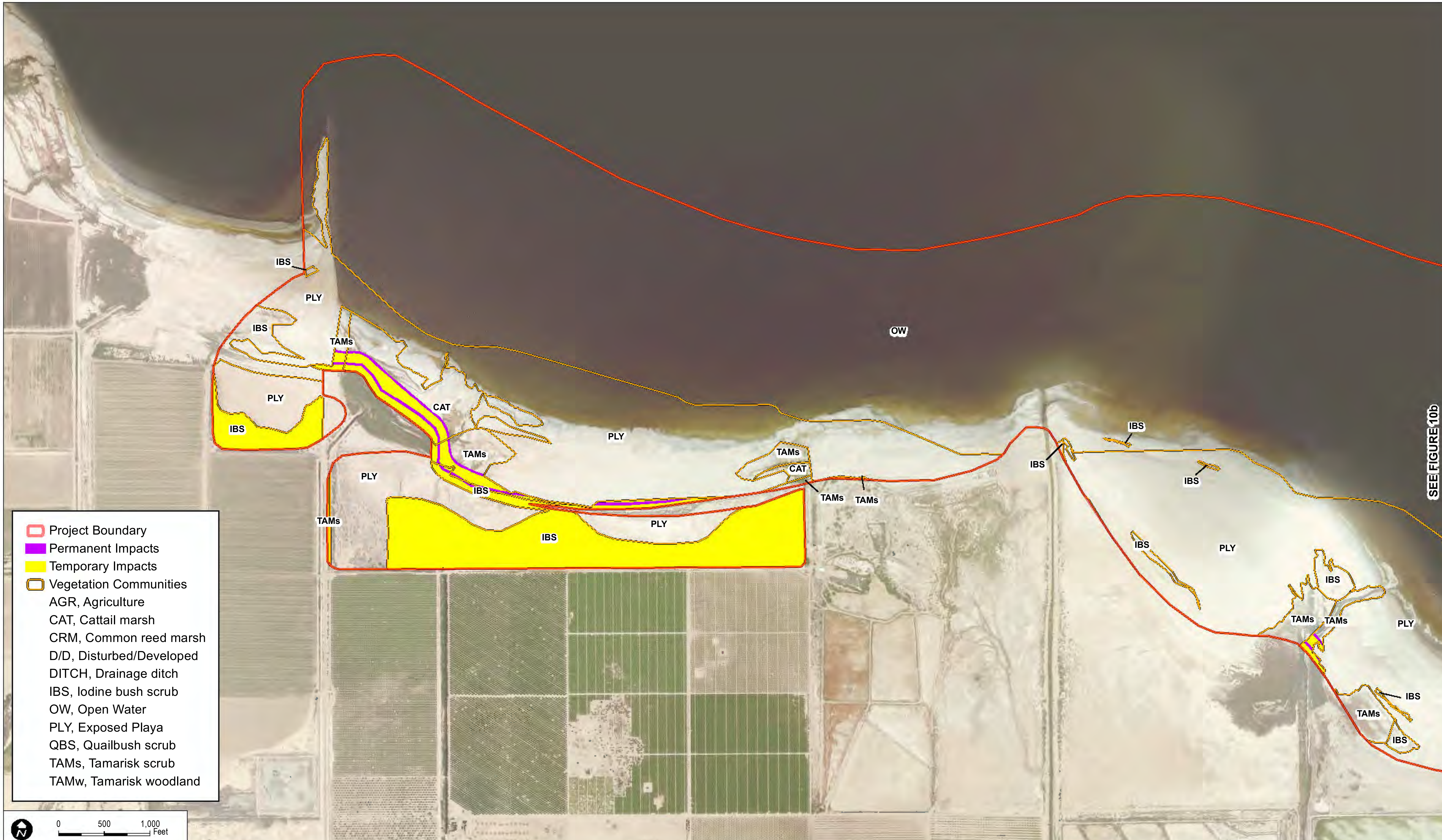
Table 1
Permanent Impacts to Vegetated Resources*

Impact Type	Habitat Type	Jurisdictional Vegetation Impacts (Acres)[1]	Non-Jurisdictional Vegetation Impacts (Acres)
Pond	Cattail Marsh	16.8	--
	Tamarisk Scrub	30.5	7.3
	Tamarisk Woodland	6.3	0.1
	Subtotal	53.6	7.4
Berms	Cattail Marsh	0.9	--
	Common Reed Marsh	0.1	--
	Tamarisk Scrub	4.5	1.0
	Tamarisk Woodland	7.2	0.2
	Subtotal	12.7	1.2
Sedimentation Basins	Tamarisk Scrub	1.0	0.1
	Tamarisk Woodland	1.7	0.5
	Subtotal	2.7	0.6
Interception Ditch	Cattail Marsh	1.0	--
	Tamarisk Scrub	2.3	--
	Iodine Bush Scrub	0.9	--
	Subtotal	4.2	--
New River Crossings	Common Reed	0.2	--
	Tamarisk Scrub	0.2	0.1
	Tamarisk Woodland	0.4	--
	Subtotal	0.9	0.1
	Grand Total	74.1	9.4

*Note that the impact acreages listed in this table are the maximum possible under the proposed Project design and assume that the entire Project would be built. Impact acreages would likely be less than this because the entire Project area would likely not be utilized for the Project.
[1] Numbers may not total due to rounding.

1.4.2.5 Temporary Impacts

Temporary SCH Project impacts include staging areas, two temporary river crossings, and interstitial areas (areas between the berms and the outer exterior or the Project area, and between the interception ditch and the berms and exterior or the Project area). These three Project components would temporarily impact a maximum of 37.3 acres of jurisdictional vegetated habitat, including 5.7 acres of cattail marsh, 0.7 acre of common reed marsh, 4.1 acres of iodine bush scrub, 0.5 acres of quailbush scrub, 21.4 acres of tamarisk scrub, and 4.8 acres of tamarisk woodland (Table 2; Figure 10a through 10c). An additional 85.6 acres of non-jurisdictional vegetated habitat, which includes 65 acres of iodine bush scrub, 11.4 acres of quailbush scrub, 7.8 acres of tamarisk scrub and 1.3 acres of tamarisk woodland, will also be temporarily impacted. The majority of the impacts will result from staging areas.



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SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 10a

Habitat Areas Impacted by the SCH Project

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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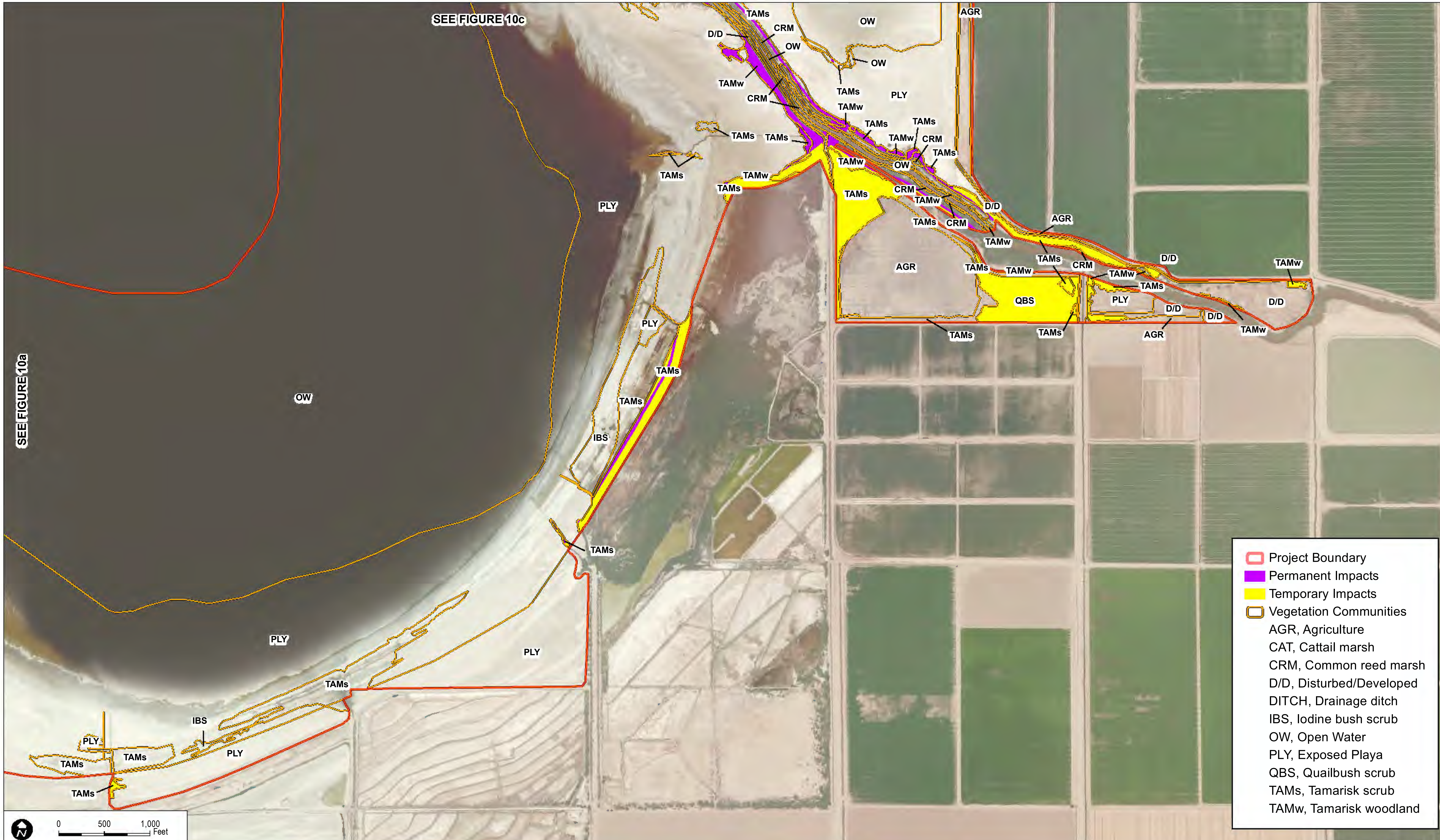

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SOURCE: Bing Maps, Imperial County 2008
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FIGURE 10b

Habitat Areas Impacted by the SCH Project

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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SOURCE: Bing Maps, Imperial County 2008
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FIGURE 10c

Habitat Areas Impacted by the SCH Project

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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The final location of the staging areas has not been determined; however, this analysis assumes that all six staging areas, in their entirety, will be temporarily impacted. The staging areas will be constructed in a manner that reduces the amount of impacts on vegetation to the furthest extent possible. Once the staging areas are chosen, and the full extent of impacts calculated, restoration acreage will be adjusted accordingly. The staging areas would temporarily impact up to 11 acres of vegetated jurisdictional habitat and 84.2 acres of vegetated non-jurisdictional habitat (Table 2).

Two temporary river crossings, at the middle and the north end of the New River, will be used to transport rock, gravel, and other materials across the river during construction. The exact placement of the temporary crossings has not been identified, but one is planned at the north end of the New River and the second is planned approximately halfway between the north and south borders of the Project area. The crossings are expected to impact a total of 0.4 acre of jurisdictional vegetation along the river and will be removed after the ponds have been constructed (Table 2). The crossings will not impact any non-jurisdictional vegetation.

Interstitial areas are those areas between the berms and Project boundary, the berms and the interception ditch, and the Project boundary and interception ditch. Although no specific impact is scheduled to occur in the interstitial areas, these areas will likely be temporarily disturbed as construction of the ponds and associated facilities occur. Approximately 25.9 acres of jurisdictional and 1.3 acres of non-jurisdictional vegetated habitat occur within the interstitial areas (Table 2).

Table 2
Temporary Impacts to Vegetated Resources*

Impact Type	Habitat Type	Jurisdictional Vegetation Impacts (Acres)	Non-Jurisdictional Vegetation Impacts (Acres)
Staging Areas	Common Reed Marsh	0.5	--
	Iodine Bush Scrub		65.0
	Quailbush Scrub	0.5	11.4
	Tamarisk Scrub	8.4	7.0
	Tamarisk Woodland	1.6	0.8
	Subtotal	11.0	84.2
New River Crossings	Common Reed	0.1	--
	Tamarisk Scrub	0.1	--
	Tamarisk Woodland	0.2	--
	Subtotal	0.4	0.0
Interstitial Areas (between perimeter berms and outer edge of Project)	Cattail Marsh	5.7	--
	Common Reed Marsh	0.1	--

Table 2
Temporary Impacts to Vegetated Resources*

Impact Type	Habitat Type	Jurisdictional Vegetation Impacts (Acres)	Non-Jurisdictional Vegetation Impacts (Acres)
	Iodine Bush Scrub	4.1	--
	Tamarisk Scrub	12.9	0.8
	Tamarisk Woodland	3.1	0.5
	Subtotal	25.9	1.3
	Grand Total	37.3	85.6

*Note that the impact acreages listed in this table are the maximum possible under the proposed Project design and assume that the entire Project would be built. Impact acreages would likely be less than this because the entire Project area would likely not be utilized for the Project.

Impacts

1.4.3 Post-Project Jurisdictional Areas

1.4.3.1 Aquatic Habitat Areas (SCH Ponds)

With implementation of the SCH Project, existing mostly unvegetated uplands (i.e., exposed playa) as well as both vegetated and unvegetated waters of the U.S. would converted to aquatic habitat within the created ponds. The aquatic habitat is intended to provide greater ecological functions and services for aquatic species compared to the current condition of the shoreline resources..

The pre-Project area was evaluated using CRAM to quantitatively assess the ecological conditions relative to the anticipated post-Project conditions. CRAM was used to evaluate agricultural drainages, the New River, and some vegetated areas along the southern shoreline of the Salton Sea. These areas would be subject to direct impacts due to construction of the Project and resulting conversion of these areas to either ponds or pond-associated infrastructure, such as berms, sedimentation basins, and interception ditches. For the majority of the Project area, the Project represents a conversion of existing waters of the United States and unvegetated playa to aquatic habitat (waters of the United States) with no vegetation. CRAM is not currently designed to assess unvegetated, aquatic habitats such as would be created through the Salton Sea SCH Project. Therefore, the typical Corps practice of predicting CRAM scores for post-project conditions within the unvegetated aquatic areas cannot be applied to the majority of the Salton Sea SCH Project. Instead, the following qualitative evaluation has been compiled based on predicted functional conditions within the Project area.

Buffer and landscape context condition is expected to remain relatively unchanged. Project features, such as sediment basins, berms, and associated access roads, may have a negative effect on buffer condition but would not constitute a break in buffers since these features could be used by wildlife. Overall, however, the Project is not expected to have a large effect on buffer and landscape conditions because the Project goal is to develop habitat, and the interruption of habitat conditions caused by infrastructure is small in comparison with the aquatic habitat areas to be developed.

The hydrology of the Project area will be highly altered by the Project. The purpose of the Project is to develop hydrologic conditions that can support aquatic habitat because these conditions are currently under threat. As with current conditions, hydrology will be largely dependent on artificial conditions and will have limited lateral movement of flood waters due to constructed berms and water control structures. These predicted future conditions represent low functions but are similar to existing conditions.

The physical structure of the Project area will be altered through Project construction activities (excavation and filling) required to create ponds and berms. The Project is designed to provide stable, relatively uniform slopes, and thus the typical functional measures for topographic complexity are expected to be low, similar to existing conditions.

Biotic structure, under CRAM, is focused on vegetative cover. The Salton Sea SCH Project is not intended to provide vegetated habitat areas, although some habitat areas will be developed as mitigation for permanent and temporary impacts to vegetated areas. The majority of the Project is instead intended to be developed as aquatic habitat with relatively minimal vegetative cover. Thus biotic structure is expected to be low.

Additional biotic functions beyond those associated with vegetated features are expected to increase with implementation of the SCH Project. In addition to the aquatic habitat provided by the ponds themselves, new shallow shoreline will be created inside the berms on the fringes of the ponds that will provide foraging opportunities for shorebirds since an invertebrate population will be supported by the lower salinity conditions. Breeding functions for nesting birds, such as snowy plover, gull-billed tern (*Gelochelidon nilotica*), and Caspian tern (*Hydroprogne caspia*), would be supported along the shoreline of the SCH ponds, and predator-free nesting areas on islands within the ponds would be provided. Loafing opportunities for species such as white pelican will continue to be available along the shoreline within the berms as well as outside of the berms and on the berms themselves.

1.4.3.2 Riparian Habitat Areas

A post-Project analysis of functional condition was prepared to evaluate the anticipated ecological functions that could be expected within the vegetated areas of the SCH Project.

Details of the post-Project analysis can be found in the CRAM Report (DWR and DFG 2012; also included as Appendix A). The forecast shows high buffer and landscape context scores (73.3 to 93.4), moderate hydrology scores (50.0 to 83.4), and lower physical and biotic structure scores (25.0 to 37.5 and 36.2 to 47.3), which are the same scoring trends of the baseline CRAM assessment. With the exception of the locations of the four assessment areas on the New River, which remain unchanged, all the assessment area locations had to be relocated and reconfigured due to Project construction that will significantly alter the landscape. The locations of future assessment areas were placed in areas thought to be appropriate based on the anticipated Project design.

Based on this analysis, the post-Project functional condition of the vegetated areas is expected to remain approximately the same relative to the pre-Project condition. For riverine wetland types, including the New River, and the created interception ditch, functional conditions are expected to increase slightly, with slightly higher buffer and landscape context, hydrology, and physical structure attribute scores. For lacustrine wetland types, including the pond shorelines, functional conditions are expected to decline slightly, with slightly lower attribute scores. However, the decline is negligible and within the error precision tolerance for CRAM (e.g., 10 percent for overall index scores and 5 percent for individual attribute scores).

Buffer and landscape context conditions are expected to remain mostly the same because buffers will be present with little to no buffer interruptions (e.g., paved roads, developments). Within all of the assessment areas, the buffer and landscape connectivity is presumed to be suitable for wildlife movement. Similar to the pre-Project condition, each of the assessment areas is assumed to contain a large assemblage of non-native vegetation, primarily salt cedar, which results in a low to moderate Buffer Condition score.

The agricultural drainages and interceptor ditches, when compared to the New River, are distinct from each other in their hydrologic characteristics. The functions and services of the wetlands habitats associated with the New River will remain essentially unchanged. However, the interception ditch will be a new feature that functionally replaces the former agricultural drainages that cross the exposed Sea bed. The interception ditch will convey agricultural runoff around the ponds and into the Sea. It is anticipated that the hydrological characteristics of the interception ditch will be similar to the agricultural drainages, with fluctuating, perennial flow that varies depending on the agricultural uses of the season.

The physical structure of the assessment areas are based on physical features (e.g., structural patch types) and the topographic complexity (e.g., variety of elevational gradients) within the waterways and Sea shore. Within all of the assessment areas, the physical structure is predicted to consist of mostly uniform slopes with little micro topography resulting in low scores for topographic complexity. Likewise, the drainages are predicted to exhibit minimal structural patch richness. Overall, the Physical Structure attribute receives the lowest scores of any of the CRAM attributes, as is the case with the existing conditions, which is indicative of the extensive management of the New River, as well as unnatural conditions of the agricultural drainages and interceptor ditches.

Similar to the baseline conditions, the vegetation communities are predicted to have little biotic structural diversity, both in different types and distribution of vegetation communities and in overlap of tall, medium, and short plant layers. Also, the majority of the assessment areas are expected to either be dominated or co-dominated by non-native vegetation. These features are representative of a highly disturbed ecosystem, which is reflected in the low Biotic Structure attribute scores predicted for both the New River and the agricultural drainages.

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2.0 GOALS AND OBJECTIVES

The goals and objectives of this HMMP are to provide guidance for the re-establishment of vegetated habitat that will be impacted by the SCH Project. The HMMP is being prepared in accordance with mitigation measure BIO-5 from the EIS/EIR. The following sections outline the mitigation and restoration activities proposed for both permanent and temporary impacts to vegetated habitat. The goal of the proposed mitigation and restoration project is to re-establish the area of pre-project habitat within the Project area so that the project may continue to provide wildlife habitat while meeting the objectives of the proposed project.

2.1 Mitigation for Impacts within the Footprint of the Proposed Aquatic Ponds

Although creation of the SCH Project will affect up to 4,064 acres (including 295 acres of potential staging acres) of existing and former Sea areas, the outcome of the proposed Project is an increase of 1,986 acres of waters of the United States by inundating areas that have been exposed by the receding Sea and providing a stable environment for wildlife species (Corps and Natural Resources Agency 2011). Under the No Project Alternative, the receding Sea would eventually convert much of the Project lands (approximately 1,784 acres) to non-jurisdictional uplands. The Project will be subject to the best management practices outlined in Section 2.4.7 of the EIS/EIR, and no Project-specific mitigation for impacts to vegetated and non-vegetated areas within the boundary of the ponds will occur. Due to the beneficial nature of the Project for water quality, wildlife habitat, and special-status wildlife species, the Project is considered to be self-mitigating.

2.2 Restoration of Impacts to Habitats within the Footprint of Associated Infrastructure Improvements

Vegetated portions of the staging areas and other areas within the Project footprint that would not be part of the SCH ponds would be restored on site in accordance with mitigation measure BIO-5 of the EIS/EIR, which addresses effects of the proposed Project on sensitive and riparian habitats. The mitigation measure specifically states:

> Restoration at a minimum rate of 1:1 for nonnative plant communities (i.e., tamarisk woodland or scrub) and 3:1 for native plant communities temporarily removed during Project construction, or as required in Project permits. Habitats restored at 1:1 will be preferentially restored where they were removed, unless it is infeasible or a more desirable off-site location is identified. Species to be used in restoration may include either those that were removed or native species that occur or occurred naturally in the Project area and are suitable to the site. If native species are used to replace

> nonnative species, mitigation ratios can be reduced. For restoration of tamarisk temporarily removed, natural colonization of the disturbed area is likely to occur and no planting may be needed. The area would still be monitored to document restoration. (Corps and Natural Resources Agency 2011, p. 3.4-45)

The restoration requirement will be applied to both temporary and permanent vegetation impacts with the exception that temporary impacts will be restored at a 1:1 ratio for both native and non-native plant communities, in accordance with Corps definition of temporary impacts. The focus of the restoration effort will be to restore habitat for wildlife in accordance with mitigation measure BIO-5. Areas with undeveloped ephemeral vegetation that fluctuates with the changing Sea level are not the focus of the re-establishment. It is anticipated that these types of conditions will continue to be present with future fluctuations of the Sea, as well as water level adjustments within the ponds. Therefore, immature, ephemerally vegetated areas will not be actively restored as part of this HMMP.

In the portions of the staging areas and other temporary impacts areas that lack vegetation but are still regulated by the Corps, RWQCB, and/or DFG, the areas will be restored to pre-construction conditions (i.e., contours will be restored).

The maximum Project impacts and proposed re-establishment are provided in Table 3. Up to approximately 26.3 acres of habitat will be restored to replace impacts from permanent features, and 122.8 acres of habitat will be restored in place for temporary impacts.

Table 3
Summary of Vegetation Impacts and Revegetation*

Habitat Type	Jurisdictional Vegetation Impacts (Acres)		Non-Jurisdictional Vegetation Impacts (Acres)		Revegetation of Permanent Vegetation Impacts		Revegetation of Temporary Vegetation Impacts	
	Permanent	*Temporary*	*Permanent*	*Temporary*	*Replacement Ratio*	*Revegetation (Acres)*	*Replacement Ratio*	*Restoration (Acres)*
Berms								
Cattail Marsh	0.9	—	—	—	3:1	2.7	—	—
Common Reed Marsh	0.1	—	—	—	1:1	0.1	—	—
Tamarisk Scrub	4.5	—	1.0	—	1:1	5.5	—	—
Tamarisk Woodland	7.2	—	0.2	—	1:1	7.4	—	—
Subtotal	*12.7*	—	*1.2*	—	—	*15.7*	—	—

Table 3
Summary of Vegetation Impacts and Revegetation*

Habitat Type	Jurisdictional Vegetation Impacts (Acres)		Non-Jurisdictional Vegetation Impacts (Acres)		Revegetation of Permanent Vegetation Impacts		Revegetation of Temporary Vegetation Impacts	
	Permanent	*Temporary*	*Permanent*	*Temporary*	*Replacement Ratio*	*Revegetation (Acres)*	*Replacement Ratio*	*Restoration (Acres)*
Sedimentation Basins								
Tamarisk Scrub	1.0	—	0.1	—	1:1	1.1	—	—
Tamarisk Woodland	1.7	—	0.5	—	1:1	2.3	—	—
Subtotal	*2.7*	—	*0.6*	—	—	*3.4*	—	—
Interception Ditch								
Cattail Marsh	1.0	—	—	—	3:1	3.0	—	—
Tamarisk Scrub	2.3	—	—	—	1:1	2.3	—	—
Iodine Bush Scrub	0.9	—	—	—	1:1	0.9	—	—
Subtotal	4.2	—	—	—	—	6.2	—	—
New River Crossings								
Common Reed	0.3	0.1	—	—	1:1	0.3	1:1	0.1
Tamarisk Scrub	0.2	0.1	0.1	—	1:1	0.3	1:1	0.1
Tamarisk Woodland	0.4	0.2	—	—	1:1	0.4	1:1	0.2
Subtotal	0.9	0.4	0.1	—	—	1.0	—	0.4
Interstitial Areas (between perimeter berms and outer edge of Project)								
Cattail Marsh	—	5.7	—	—	—	—	1:1	5.7
Common Reed Marsh	—	0.1	—	—	—	—	1:1	0.1
Iodine Bush Scrub	—	4.1	—	—	—	—	11	4.1
Tamarisk Scrub	—	12.9	—	0.8	—	—	1:1	13.7
Tamarisk Woodland	—	3.1	—	0.5	—	—	1:1	3.6
Subtotal	—	25.9	—	1.3	—	—	1:1	27.2
Staging Areas								

Table 3
Summary of Vegetation Impacts and Revegetation*

Habitat Type	Jurisdictional Vegetation Impacts (Acres)		Non-Jurisdictional Vegetation Impacts (Acres)		Revegetation of Permanent Vegetation Impacts		Revegetation of Temporary Vegetation Impacts	
	Permanent	*Temporary*	*Permanent*	*Temporary*	*Replacement Ratio*	*Revegetation (Acres)*	*Replacement Ratio*	*Restoration (Acres)*
Common Reed Marsh	—	0.5	—	—	—	—	1:1	0.5
Iodine Bush Scrub	—	—	—	65.0	—	—	1:1	65.0
Quailbush Scrub	—	0.5	—	11.4	—	—	1:1	11.9
Tamarisk Scrub	—	8.4	—	7.0	—	—	1:1	15.5
Tamarisk Woodland	—	1.6	—	0.8	—	—	1:1	2.3
Subtotal	—	11.0	—	84.2	—	—	1:1	95.3
Grand Total	20.5	37.3	1.9	85.5	—	26.3	—	122.8

*Note that the impact acreages listed in this table are the maximum possible under the proposed Project design and assume that the entire Project would be built. Impact acreages would likely be less than this because the entire Project area would likely not be utilized for the Project.

3.0 SITE SELECTION FOR RE-ESTABLISHMENT AREAS

For areas temporarily impacted during the construction of the ponds, restoration is planned to occur in place. These areas are located within the staging areas and the interstitial areas between the pond berms and Project perimeter (Figures 11a through 11c).

For areas permanently impacted, restoration is planned to occur within the staging areas. Five areas within the staging areas were selected as potential locations for restoring habitat (Figure 12). These five areas were selected based on several factors pertinent to restoring the target habitat types. The factors evaluated included the following:

(1) Hydrology and potential hydrologic connections were based on a number of factors, including location in the watershed, presence and/or persistence of surface water, source of water, and the amount of surface water. Based on field observations, it was determined that potential sites with existing water sources, or sites adjacent to a perennial water source, would provide greater restoration opportunities. Both of the staging areas selected either have some existing water sources or are adjacent to a perennial water source.

(2) Soil conditions were evaluated based on the type of soils present at each potential restoration site and soil characteristics, including erosive potential, permeability, and water-holding capacity. Soils with lower erosion potential, greater water-holding capacity, higher presence of organic matter, and less soil disturbance were considered most suitable for re-establishment.

(3) Existing vegetation communities were evaluated based on the vegetation communities present at each potential restoration site. However, the sites being considered are currently unvegetated or only very sparsely vegetated. Factors considered included the plant community constituents, structure or seral stage of the community, and presence of invasive species.

(4) Habitat connectivity was evaluated to determine the extent of potential connectivity with adjacent vegetation communities. Sites with adjacent vegetated communities were prioritized in the site selection.

(5) Construction/maintenance access to the potential restoration areas was evaluated to determine if construction and/or maintenance access would be feasible. Because access would be necessary to establish and maintain the restoration areas, sites that are adjacent to or that could be easily accessed from existing roads were considered to be more suitable restoration locations than sites that would be less accessible.

(6) Potential grading requirements were considered at each site. The amount of grading (depth and surface area) that would be required to construct potential restoration sites was evaluated at each location. Potential sites where minimal grading would be required were preferred.

(7) Size available for re-establishment was evaluated to determine the acreage that could be achieved at each location. Sites with adequate area to restore the total amount of habitat required were preferred.

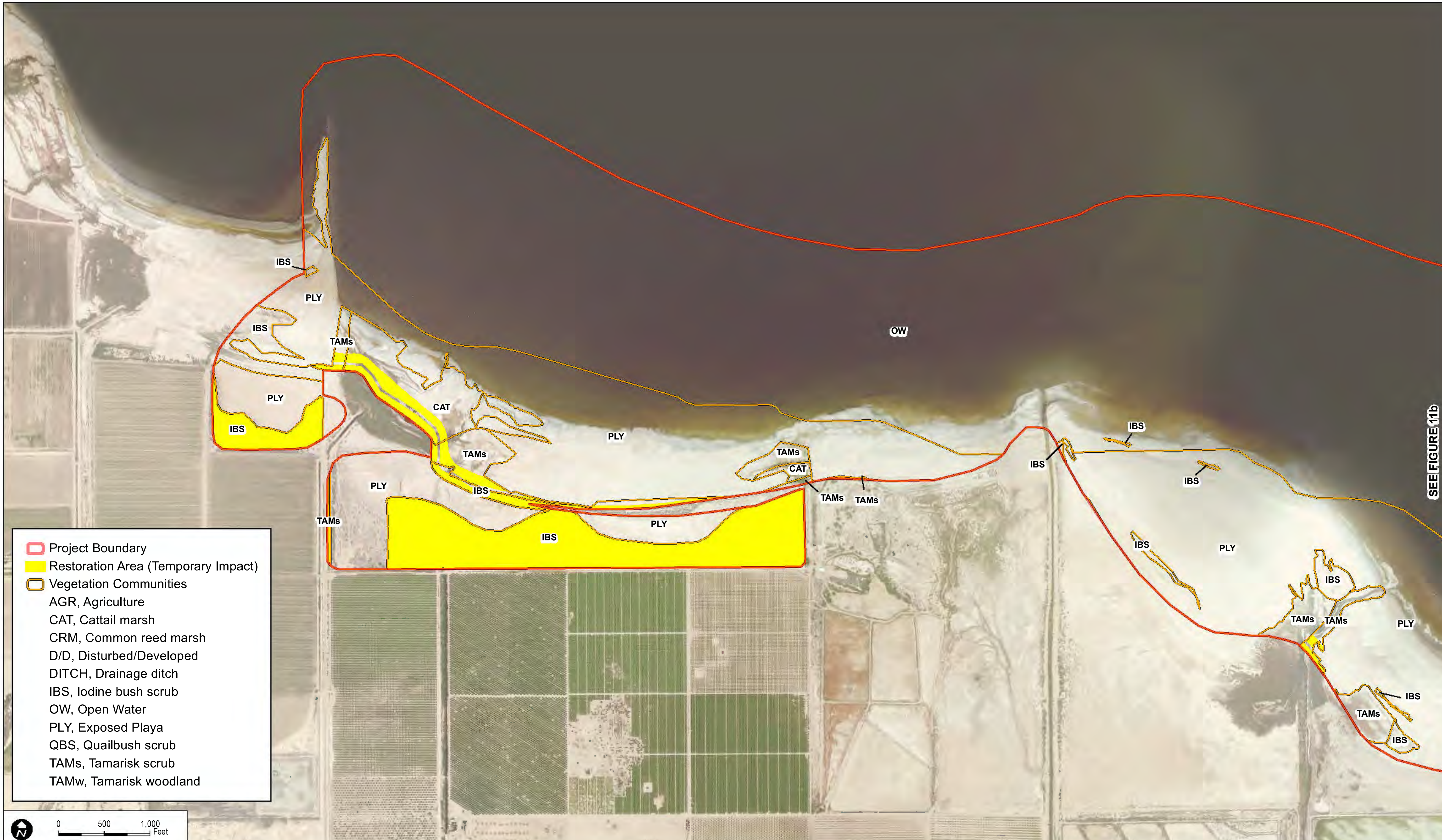
(8) Long-term management considerations, including the degree to which a site would be self-sustaining, future access constraints, and stability of long-term hydrologic connections, were evaluated for each potential restoration site. Sites that would be self-sustaining, provide long-term access, and retain greater stability of hydrologic connections were preferred.

Dudek prepared a simple additive ranking system to evaluate the criteria. Each criterion described above was ranked from "high" suitability (assigned a score of 3) to "low" suitability (assigned a score of 1) at each potential restoration location. Table 4 summarizes the ranking results for the locations considered in the assessment. Based on this ranking, Site 4 scored the highest, followed by Sites 3, 1, 5, and 2. While this ranking is somewhat informative about which sites may be preferred, it does not determine final site selection. Final site selection will be based on all of the factors evaluated herein, along with Project refinements and coordination with IID regarding future land use priorities. Site 4 is the preferred site; however, this site may not be available for restoration pending a potential lease agreement of the property for alternative uses. If restoration cannot be accommodated at Site 4, the next most favorable site would be used (i.e., Site 3).

Table 4
Potential Restoration Site Location Criteria Ranking Results by Site Identification Number

Site Identification Number	Hydrology	Soil Conditions	Existing Vegetation	Habitat Connectivity	Construction and Maintenance Access	Grading Requirements	Available Acreage	Long-Term Management Considerations	Total Score
1	2	2	2	2	3	2	2	3	18
2	1	2	2	1	2	1	1	2	12
3	2	2	2	2	3	2	3	3	19
4	2	2	2	3	3	2	3	3	20
5	2	2	2	2	2	2	1	2	15

Criteria Ranking: 1 = Low; 2 = Medium; 3 = High



DUDEK

6575-01

SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 11a

Re-Establishment Areas for Temporary Impacts

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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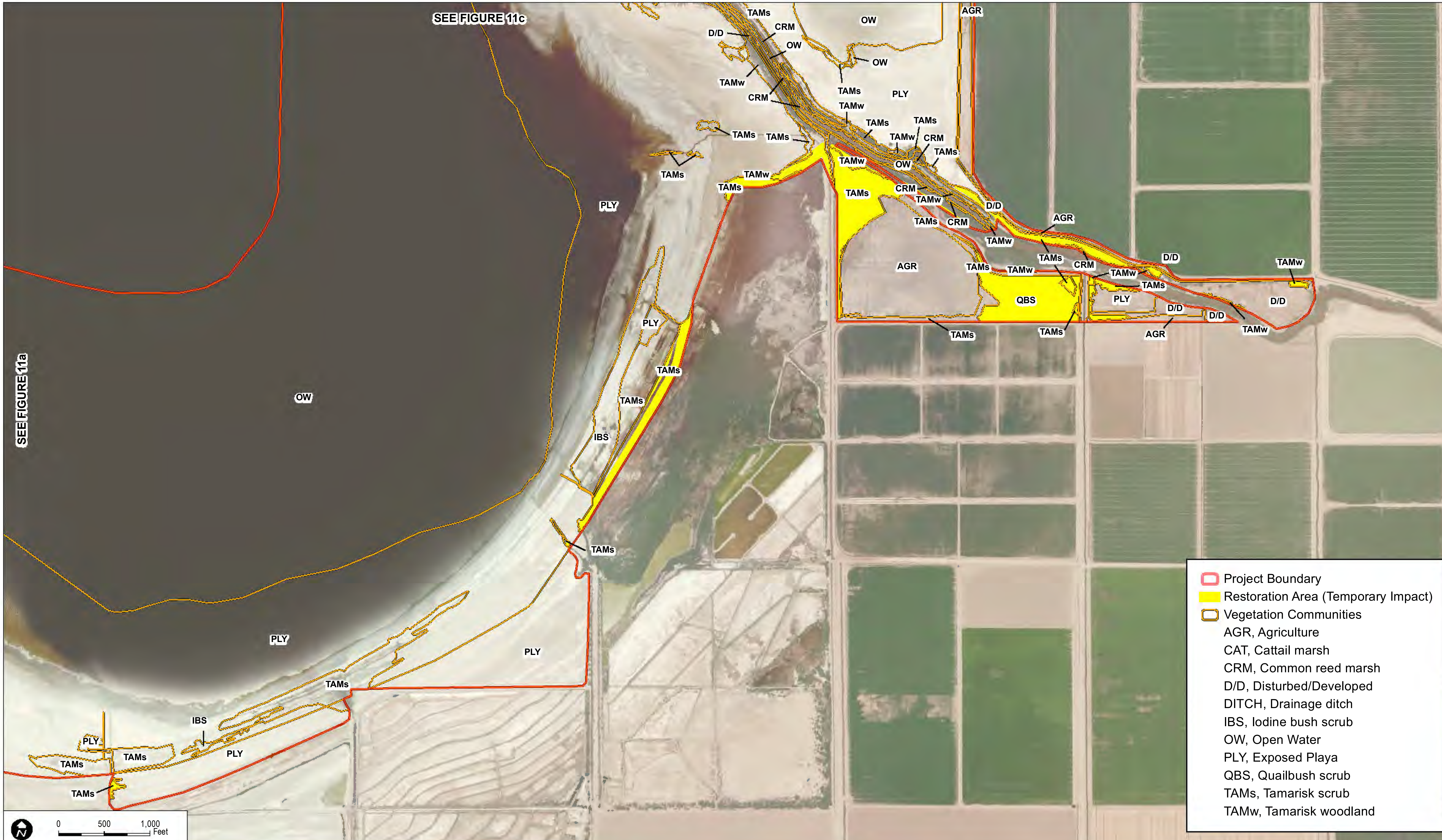

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SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 11b

Re-Establishment Areas for Temporary Impacts

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 11c

Re-Establishment Areas for Temporary Impacts

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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SOURCE: Bing Maps, Imperial County 2008
Cardo 2011

FIGURE 12

Potential Re-Establishment Areas for Permanent Impacts

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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3.1 Rationale for Expecting Project Success

For the re-establishment described in this HMMP, Project success is centered around replacing habitats that will be either temporarily or permanently affected by implementation of the Project. The success will be judged by whether or not the restored habitats replace the functions and services that were provided by the habitats that will be affected.

The restoration sites are all located on site, and the vegetation communities to be established will be located in hydrologically compatible locations. The vegetation communities proposed for restoration are the same as those that already occur in the vicinity. Where feasible, vegetation communities are designed to occur adjacent to similar or identical vegetation communities already present to provide contiguity of habitat. Planting palettes for each of the vegetation communities include species that are adapted to the site conditions. Contiguity of habitats and use of species tolerant of the harsh soil conditions will improve the likelihood of successful vegetation establishment.

Restoration sites will be maintained for the duration of a 5-year maintenance and monitoring period, so multiple follow-up visits will occur to address species composition and non-target plant species control. The suppression of non-target plant species over the extended maintenance period will allow the target vegetation to become better established throughout the area because there will be less competition for water and nutrients. Improved establishment of the target vegetation will increase resistance to future pressure from non-target species and will improve the long-term stability of the intended communities established on site.

These factors—including a suitable location in and adjacent to existing habitat, appropriately designed locations of target vegetation communities, the use of appropriate species and regionally appropriate vegetation communities, and the maintenance and monitoring program—combine to provide sufficient rationale to expect Project success.

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4.0 IMPLEMENTATION WORK PLAN

4.1 Implementation Schedule

The entire Project area would likely not be utilized for construction of the ponds. There is a possibility that additional portions of the described Alternative 3 Project could be built at a later date if funding becomes available beyond that needed for monitoring and maintenance of the actual portion initially built. Also, because there is a possibility that portions of the Project may be constructed separately at a later date, the restoration components may also be implemented coincidently with pond construction.

The re-establishment areas for temporary impacts are planned to occur in place and will be recontoured to final grade upon completion of the pond construction. It is anticipated that the temporary habitat impact areas will be restored within 9 months of project construction. The re-establishment area for permanent habitat impacts is planned for one of the staging areas, and installation will not be implemented until the use of the staging area is complete, which is expected to be immediately following construction.

4.2 Re-establishment Area Installation

The re-establishment approach will include both passive and active techniques. Passive restoration techniques will mostly be used for temporary impact areas. Passive restoration relies on the fact that similar biogeochemical and hydrologic conditions will be present post-construction after the areas have been recontoured to pre-existing conditions. A passive restoration approach will rely primarily on natural recruitment of vegetation, but it may involve application of seed and control of non-target plant species to guide reestablishment of recruiting vegetation in a trajectory toward the target habitat types. In contrast, active restoration requires a more intensive approach, and it may involve site preparation, potentially involving surface contour manipulations to promote the hydrologic conditions necessary to achieve the target replacement habitats. Active restoration involves seeding and planting, coupled with supplemental watering (if necessary) and non-target plant species control. An active restoration approach would be applied to the re-establishment areas for permanently impacted habitats. A conceptual design example of the proposed re-establishment areas to compensate for the permanent impacts to vegetation communities is provided as Figure 13.

Construction Plans and Specifications for Re-establishment Areas

Construction drawings and specifications will conform to all aspects of this HMMP and permit conditions required by the permitting agencies. Construction documents will incorporate the most current site condition information available. The plan package will include a site plan showing proposed work areas and final site facilities, any additional grading, construction details, and planting plans. These final plans shall be submitted to the Corps for approval prior to impacts to waters of the U.S.

4.2.1 Topography Modifications

No topography modifications are anticipated for restoring temporary habitat areas other than recontouring to approximate pre-impact conditions. The re-establishment area may require grading and contouring in order to create appropriate hydrologic conditions for establishment of the target vegetation communities. The grading work will result in greater topographic heterogeneity than what is currently present at the staging areas. Swales and channels will be formed with primary and secondary benches for establishing the proposed vegetation communities (Figure 14).

According to soil maps for the area, it appears that the soils may be suitable for establishment of the target vegetation communities. However, upon completion of grading and contouring, additional soil samples may be collected to determine if amendments will be necessary to improve the soils for plant growth and establishment.

4.2.2 Recommended Plant Palettes

Restoration of temporary impact areas will rely in part on natural recruitment of plant species. It is assumed that the natural seed bank will be mostly intact following temporary disturbance. However, an appropriate planting palette has been generated to assist with the reestablishment of vegetation, particularly within the larger, more accessible areas.

The re-establishment area will be more reliant on seed application of the target species because these areas do not currently support vegetation and thus are likely have a depauperate seed bank. Additionally, they will have undergone greater soil surface and hydrology modifications to create the conditions suitable for the target plant communities.

Many of the existing vegetation communities are composed of non-native plant species, including common reed marsh, tamarisk scrub, and tamarisk woodland. While the intent of the HMMP is to replace habitat types in-kind, the plant palettes designed for these vegetation communities will consist of native species and will not include common reed or tamarisk. Nevertheless, it is anticipated that these species will establish in conditions that favor their growth requirements, regardless of whether or not they are included in the planting palettes.

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FIGURE 13
Conceptual Site Plan

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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Representative photos of anticipated site conditions after implementation of the mitigation for direct impacts.

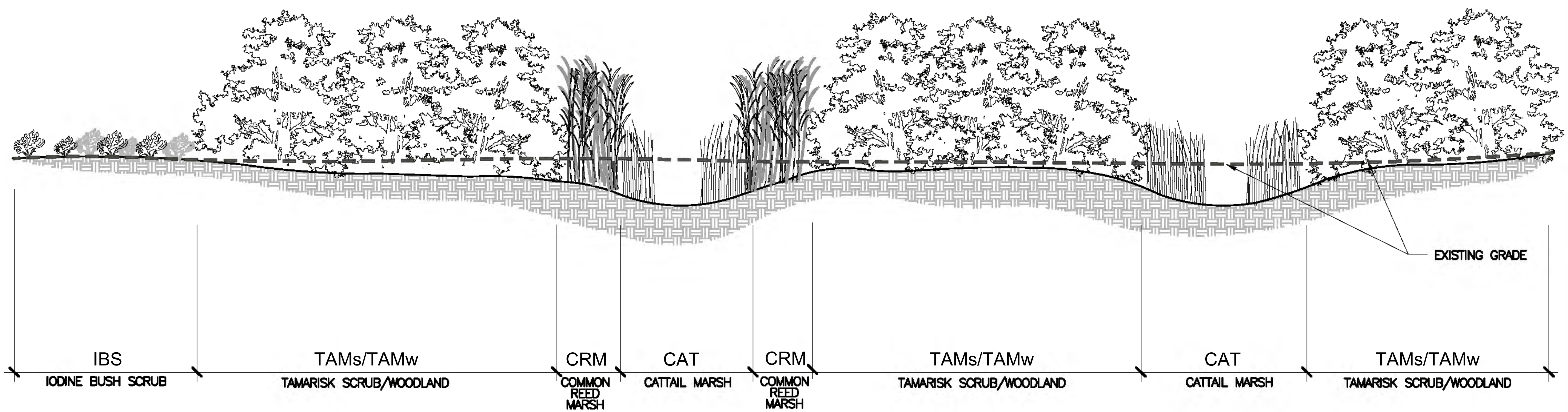

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FIGURE 14

Conceptual Plan - Cross-Section

Salton Sea Species Conservation Habitat (SCH) Project - Habitat Mitigation and Monitoring Plan (HMMP)

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Six vegetation communities could be impacted by the Project: cattail marsh, common reed marsh, tamarisk scrub, tamarisk woodland, iodine bush scrub, and quailbush scrub. Cattail marsh and common reed marsh, which both occur at the wettest fringe of perennially moist areas, will generally not require seed application because the species that occur in these habitats have airborne or waterborne seed that will readily recruit in appropriate conditions. However, an optional plant palette has been provided in the event that the appropriate species do not readily recruit and active restoration is necessary (Table 5). Tamarisk scrub and tamarisk woodland are composed of the same dominant species and will be planted with a native plant palette (Table 6). Iodine bush scrub and quailbush scrub are native plant communities dominated by iodine bush and quailbush, respectively. Individual planting palettes were designed for each of these communities (Tables 7 and 8).

Table 5
Cattail Marsh and Common Reed Marsh Plant Palette

Scientific Name	Common Name	Material Type*	Min PLS**	Pounds/Acre
Cyperus erythrorhizos	Redroot flatsedge	Seed/Pots	70	0.25
Distichlis spicata	Salt grass	Seed	70	2
Pluchea odorata	Salt marsh fleabane	Seed	15	0.25
Schoenoplectus californicus	California bulrush	Seed/Pots	60	2
Schoenoplectus americanus	Three-square bulrush	Seed/Pots	60	2
Bolboschoenus maritimus ssp. *paludosus*	Saltmarsh bulrush	Seed/Pots	60	4
Typha domingensis	Southern cattail	Seed	30	0.5
Typha latifolia	Broad-leaved cattail	Seed	40	0.5

*Depending on availability of plant material
**Minimum Pure Live Seed (product of purity and germination)

Table 6
Scrub and Woodland Plant Palette

Scientific Name	Common Name	Material Type*	Min PLS**	Pounds/Acre
Allenrolfea occidentalis	Iodine bush	Seed/Pots	10	2
Atriplex canescens	Four-wing saltbush	Seed/Pots	35	4
Atriplex lentiformis	Quailbush	Seed/Pots	50	1
Distichlis spicata	Salt grass	Seed	70	2
Pluchea odorata	Salt marsh fleabane	Seed	15	0.25
Pluchea sericea	Arrow weed	Pots	NA	NA
Salix exigua	Narrow-leaf willow	Pots	NA	NA
Suaeda nigra	Bush seepweed	Seed/Pots	10	4

*Depending on availability of plant material
**Minimum Pure Live Seed (product of purity and germination)

Table 7
Iodine Bush Scrub Plant Palette

Scientific Name	Common Name	Material Type*	Min PLS**	Pounds/Acre
Allenrolfea occidentalis	Iodine bush	Seed/Pots	10	6
Distichlis spicata	Salt grass	Seed	70	1
Pluchea odorata	Salt marsh fleabane	Seed	15	0.25
Prosopis pubescens	Screwbean mesquite	Seed/Pots	50	5
Sesuvium verrucosum	Western sea-purslane	Seed	5	1
Sporobolus airoides	Alkali sacaton	Seed	80	1
Suaeda nigra	Bush seepweed	Seed/Pots	10	2

*Depending on availability of plant material
**Minimum Pure Live Seed (product of purity and germination)

Table 8
Quailbush Scrub Plant Palette

Scientific Name	Common Name	Material Type*	Min PLS**	Pounds/Acre
Atriplex hymenelytra	Desert holly	Seed/Pots	30	2
Atriplex canescens	Four-wing saltbush	Seed/Pots	35	3
Atriplex lentiformis	Quailbush	Seed/Pots	50	5
Atriplex polycarpa	Allscale	Seed/Pots	35	1
Distichlis spicata	Salt grass	Seed	70	1
Isocoma menziesii var. *vernonioides*	Menzies' goldenbush	Seed/Pots	15	1
Prosopis pubescens	Screwbean mesquite	Seed/Pots	50	10
Sesuvium verrucosum	Western sea-purslane	Seed	5	1
Sporobolus airoides	Alkali sacaton	Seed	80	1
Suaeda nigra	Bush seepweed	Seed/Pots	10	2

*Depending on availability of plant material
**Minimum Pure Live Seed (product of purity and germination)

4.2.3 Seed Application and Plant Installation

Plant materials for the planting plan will include container stock, mulch, and native seed mixes as indicated. Plant materials should be from local sources within Imperial County to maintain genetic integrity of the plant communities in the vicinity.

The restoration areas will be seeded with the specified seed mixes for each vegetation community. The Habitat Restoration Specialist will inspect and approve labels for each mixture prior to application. Seed may be applied by hand (raked into the soil) where machinery access is not available. However, where feasible, the priority method for seed application will be imprinting. A seed imprinter is ideal for seeding dry, unirrigated restoration sites because it creates small, wind-protected depressions (micro-catchments) in the soil surface for seed to fall into, and for water to collect during rain events (Bainbridge 2007). The small depressions are created by pulling a large, heavy drum with triangular teeth on it across the prepared soil surface. Seed application is typically conducted simultaneously with imprinting, using an imprinter with a seeding box attached above the drum. However, the seed can also be broadcast over the imprinted area following imprinting.

Container plant installation may be conducted to help establish species that are difficult to establish from seed and to improve diversity. Container plants perform much better in irrigated settings. An irrigation system is not planned for the re-establishment areas; however, supplemental watering may be used to improve survival and establishment where container plants are installed.

The Habitat Restoration Specialist will check container plants for viability and general health upon their arrival at the restoration site. Plant materials not meeting acceptable standards will be rejected. The Habitat Restoration Specialist will confirm plant species and quantities after delivery, and locations for installation will be marked on site temporarily with pin flags.

Standard planting procedures will be employed for installing container plants. Holes will be dug at three times the diameter of the root ball of the plant and the same depth as the container. Holes will be filled with water and allowed to drain immediately prior to planting. Backfill soil containing amendments (as directed by the Habitat Restoration Specialist) will be placed in every planting hole following soaking; container plants will be installed so that the root ball is entirely below grade. Following plant installation, mulch will be applied around container plants in a diameter of 2 feet or 1.5 times the drip line, whichever is greater. Mulch will be 3 to 4 inches deep.

4.2.4 As-Built Report

Construction of the Project may not require the use of all of the staging areas, or result in disturbance to every area within the Project boundaries. It is likely that some vegetated areas may be avoided during construction and therefore may not require restoration. Therefore, an as-built report will be prepared to document the final established locations of all of the restoration areas. The as-built report will compare the final restoration locations with the conceptual restoration locations and discuss the Project changes or modifications that led to the final locations. If plans and specifications are prepared for the restoration area for permanent impacts, the plans will be revised to accurately represent the final design. The as-built report will include photographs of the restoration areas and quantify final acreages of area restored.

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5.0 MAINTENANCE PLAN

- The maintenance activities described below pertain to the habitat revegetation presented in this document. Maintenance of the SCH ponds themselves is discussed in a Project Operations plan included as Appendix D of the DEIS/EIR.

5.1 Habitat Maintenance Activities

Because the goal of this HMMP is to reestablish vegetation communities that can support themselves with little or no maintenance, the primary effort of the maintenance plan is concentrated in the first few seasons of plant growth following the restoration efforts to ensure that the restoration sites are developing in a trajectory toward the intended habitats. The intensity of the maintenance activity is expected to subside each year as the plant materials become more established. Habitat maintenance would extend for 5 years, or until the performance standards are met.

5.1.1 Non-Native Invasive Plant Species

In general, little or no pest control, other than non-native plant species control, is anticipated for the Restoration Project. The Habitat Restoration Specialist will advise the Restoration Contractor as to which pest species to control. This Project has a unique condition wherein several of the vegetation communities are entirely dominated by non-native invasive plant species. Tamarisk scrub and woodland, for instance, are dominated by tamarisk almost to the exclusion of any other plant species. But tamarisk is the only tree species that survives the saline conditions within the Project area, and it therefore provides a valuable resource for special-status wildlife species. For instance, southwestern willow flycatcher (*Empidonax traillii extimus*) uses tamarisk habitat for a migratory stopover, and was observed in the tamarisk habitat within the Project area (Dudek 2010). Similarly, double-crested cormorant (*Phalacrocorax auritus*), one of the piscivorous species that is a target species for the SCH Project, nests in tamarisk habitat (Corps and Natural Resources Agency 2011). Common reed marsh habitat is similar in that the dominant species, common reed, although native in some parts of California, is considered non-native within the Project area. Yuma clapper rail (*Rallus longirostris yumanensis*) may occur in dense stands of common reed where it forages primarily for crayfish (Shuford et al. 2000). Therefore, in areas where tamarisk scrub, tamarisk woodland, or common reed marsh are the target plant communities, tamarisk and common reed will not be targeted for control, but will be allowed to reestablish.

Generally, target weed species include those on the California Invasive Plant Council's *California Invasive Plant Inventory* (Cal-IPC 2006). However, as described previously, tamarisk and common reed are primary components of target vegetation communities and will be allowed to establish. Other species included in the *California Invasive Plant Inventory* will be controlled as necessary (e.g., tree tobacco (*Nicotiana glauca*), curly dock (*Rumex crispus*), Russian thistle (*Salsola tragus*), Asian mustard (*Brassica tournefortii*)). Based on the discretion of the Habitat Restoration Specialist, some innocuous, naturalized annual weeds that are common to the area but do not normally out-compete or invade native habitats may be tolerated.

Physical removal of non-native plants, including the roots, may be the best method for those species for which the root system can readily be pulled out with the aboveground portions of the plant. These species will be physically removed before seed-set. If hand removal is possible only after seed-set, then seed heads will be cut off, bagged, and removed from the site prior to the weed removal.

Herbicides may be used for the invasive plant species that have root systems that are impractical to remove or that regenerate from small root fragments. Any herbicide use should be conducted using methods that minimize effects to adjacent/desirable native species, such as brush application or spot spraying. Only herbicides registered for aquatic use can legally be used in locations where they might come in contact with open water.

Follow-up control measures will likely be necessary for invasive plant species with extensive root systems that cannot usually be killed with one herbicide application. Follow-up herbicide treatment should be done at the biologically appropriate time when the recovering plants are still relatively small and before they have time to regain strength and vigor.

Herbicide applications shall be conducted following all applicable laws, regulations, label directions, and safety precautions. Should the Restoration Contractor require specific weed control recommendations, he or she shall consult a licensed pest control adviser. The Restoration Contractor shall provide reports of all weed control measures implemented at the site, including details of method used, including any herbicide applications. Copies of any written recommendations shall also be provided. The Restoration Contractor shall provide copies of all herbicide use reports to the appropriate entity to document herbicide use and reporting.

5.1.2 Pest Management

Invertebrate pests, such as snails, slugs, insects, mites, spiders, etc., are not expected to be a problem in the Project area but will be controlled by the Restoration Contractor, if necessary. Similarly, vertebrate pests, such as gophers, ground squirrels, rabbits, rats, voles, etc., are not expected to be a problem in the Project area. Whether or not to implement control of invertebrate and/or vertebrate pests will be determined by the Habitat Restoration Specialist on a case-by-case basis, and will be based on an assessment of levels of plant damage and mortality. Plant diseases could become a problem during the plant establishment period but can generally be prevented or controlled by cultural measures.

5.1.3 Trash Removal

Trash will be removed from the restoration areas by hand during maintenance visits. Trash consists of all man-made materials, equipment, or debris dumped, thrown, washed, blown, and left within the restoration areas. Trash and inorganic debris washed or blown onto the restoration sites will be removed regularly. Deadwood and leaf litter of trees and shrubs will not be removed. Downed logs and leaf litter provide valuable micro-habitats for invertebrates, reptiles, small mammals, and birds. In addition, the decomposition of deadwood and leaf litter is essential for the replenishment of soil nutrients and minerals.

5.1.4 Supplemental Watering

The restoration areas will not be irrigated. However, supplemental watering via a water truck or other form may be necessary to promote plant survival during the drier parts of the year, primarily the summer months, as plants are becoming established. The need for supplemental watering is not expected to extend beyond the first year of the restoration program. Supplemental watering, if necessary, will be recommended by the Habitat Restoration Specialist.

5.1.5 Fencing and Signage

No public access will be allowed to the restoration sites. The sites will be fenced at high-visibility locations near access roads and posted with signage indicating the presence of sensitive resource areas. Temporary fencing will remain in place and be maintained by the Restoration Contractor through the first growing season. The temporary fencing and signage would be removed after the first growing season, or when the sites are adequately established as judged by the Habitat Restoration Specialist.

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6.0 PERFORMANCE STANDARDS AND MONITORING REQUIREMENTS

6.1 Performance Standards

6.1.1 Re-establishment Areas

Performance standards for the re-establishment areas (temporary and permanent) include plant species cover and composition, as well as a conditional assessment used to evaluate if the functions and services have been fully restored. Specific performance goals are described below.

6.1.1.1 Vegetative Cover and Composition Performance Goals

Performance goals will be used to help assess the annual progress of the restoration areas and are regarded as interim project objectives designed to achieve the final goals. Fulfillment of these criteria will indicate that the restoration areas are progressing toward achievement of the long-term goals of the HMMP. If restoration efforts fail to meet the performance goals listed in any one year, the Habitat Restoration Specialist will recommend remedial actions to be implemented (supplemental planting, seeding, transplanting, changes to cultural practices, etc.) that will enhance the vegetation communities to a level in conformance with these standards.

Vegetative cover goals are based on the existing vegetation communities in similar habitat types on the Project site, which were mapped according to the Manual of California Vegetation classification membership rules during the CRAM assessment fieldwork. Target percent cover criteria for each vegetation community have been established and are included in Table 9. Beyond that, the performance goals for vegetative cover will be based on reference data from nearby vegetation communities of the same types. Average vegetative cover of the target vegetative communities on site has not been measured, but will be measured either prior to implementation of the Project or concurrently during monitoring within nearby vegetation communities of the same types. The performance goals for vegetative cover will be to achieve the target percentages of the average percent vegetative cover of the target vegetation communities (Table 9).

Table 9
Target Percent Vegetative Cover Criteria

Vegetation Community		Target Percent Vegetative Cover*	
Classification	*Classification Membership Rules***	*Year 3*	*Year 5*
Cattail Marsh	Cattails ≥50% relative cover	≥60%	≥90%
Common Reed Marsh	Common reed ≥2% absolute cover; ≥50% relative cover	≥50%	≥80%
Iodine Bush Scrub	Iodine bush ≥2% absolute cover	≥40%	≥70%

Table 9
Target Percent Vegetative Cover Criteria

Vegetation Community		Target Percent Vegetative Cover*	
Classification	*Classification Membership Rules***	*Year 3*	*Year 5*
Quailbush Scrub	Quailbush >50% relative cover	≥40%	≥70%
Tamarisk Scrub	Tamarisk ≥3% absolute cover; ≥60% relative cover	≥50%	≥80%
Tamarisk Woodland	Tamarisk ≥60% relative cover	≥50%	≥80%

*Target percent vegetative cover goals will be based on reference data from on site or adjacent vegetation communities of the same types and will be calculated by multiplying the average cover by the percentage goals. For example, if on-site cattail marsh has an average vegetative cover of 95 percent as measured with reference transects, the target percent vegetative cover goal will be to achieve at least 90 percent of this value, or 85.5 percent vegetative cover.
**Classification membership rules are taken from the *Manual of California Vegetation* (Sawyer et al. 2009), which was used to classify vegetation communities within the Project area.

For tamarisk woodland, the performance goal also includes development of a tree canopy that exceeds 6 feet in height, which is how tamarisk scrub was distinguished from tamarisk woodland during the vegetation mapping of the Project area.

6.1.1.2 Functions and Services Goals

A conditional assessment using CRAM was conducted at the site prior to Project implementation to measure baseline conditions, and an attempt to forecast anticipated CRAM score changes resulting from the implementation of the Project was outlined in the CRAM Report (DWR and DFG 2012; also included as Appendix A). The goal of the HMMP is to replace impacted habitat with similar habitat having equivalent or greater functions and services. Based on a comparison of the baseline CRAM and the forecast CRAM, target CRAM scores were established and are included in Tables 10 and 11. These scores represent the predicted conditions for the site and location in the watershed after implementation of the SCH Project. In terms of ecological functions of the restoration areas for the riverine class of jurisdictional areas, success of the restoration program will be based on achieving attribute scores at least equivalent to the existing scores by the end of the 5-year maintenance and monitoring period (Table 10). For the lacustrine class of jurisdictional areas, success of the restoration program will be based on achieving attribute scores at least equivalent to the predicted scores by the end of the 5-year maintenance and monitoring period (Table 11). The justification for tolerating slightly lower attribute scores for the lacustrine class is that the ponds and associated shorelines are anticipated to provide much higher biologic functions and services (including functions and services specific to wildlife not measured by CRAM) for the common and special-status wildlife species discussed in Section 3.4 of the DEIR/EIS compared to the current condition or future condition absent the SCH Project.

Table 10
Predicted and Target CRAM Attribute Scores of the Re-establishment Areas for the Riverine Wetland Class

Attribute	Metric/Submetric	CRAM Scores Based on Re-establishment Design		
		Existing Attribute Score	*Predicted Attribute Score*	*Target Attribute Score*
Buffer and Landscape Context	Landscape Connectivity	82.5	84.3	≥82.5
	Buffer Submetric A: Percent of AA with Buffer			
	Buffer Submetric B: Average Buffer Width			
	Buffer Submetric C: Buffer Condition			
Hydrology	Water Source	66.7	71.4	≥66.7
	Hydroperiod or Channel Stability			
	Hydrologic Connectivity			
Physical Structure	Structural Patch Richness	32.8	33.3	≥32.8
	Topographic Complexity			
Biotic Structure	Plant Community Submetric A: Number of Plant Layers Present	40.3	39.6	≥39.6
	Plant Community Submetric B: Number of Co-dominant Species			
	Plant Community Submetric C: Percent Invasion			
	Horizontal Interspersion and Zonation			
	Vertical Biotic Structure			
	Overall AA Score	56.0	57.2	≥56.0

Table 11
Predicted and Target CRAM Attribute Scores of the Re-establishment Areas for the Lacustrine Wetland Class

Attribute	Metric/Submetric	CRAM Scores Based on Re-establishment Design		
		Existing Attribute Score	*Predicted Attribute Score*	*Target Attribute Score*
Buffer and Landscape Context	Landscape Connectivity	84.3	82.3	≥82.3
	Buffer Submetric A: Percent of AA with Buffer			
	Buffer Submetric B: Average Buffer Width			
	Buffer Submetric C: Buffer Condition			

Table 11
Predicted and Target CRAM Attribute Scores of the Re-establishment Areas for the Lacustrine Wetland Class

Attribute	Metric/Submetric	CRAM Scores Based on Re-establishment Design		
		Existing Attribute Score	*Predicted Attribute Score*	*Target Attribute Score*
Hydrology	Water Source	68.8	66.7	≥66.7
	Hydroperiod or Channel Stability			
	Hydrologic Connectivity			
Physical Structure	Structural Patch Richness	31.3	25.0	≥25.0
	Topographic Complexity			
Biotic Structure	Plant Community Submetric A: Number of Plant Layers Present	50.8	44.5	≥44.5
	Plant Community Submetric B: Number of Co-dominant Species			
	Plant Community Submetric C: Percent Invasion			
	Horizontal Interspersion and Zonation			
	Vertical Biotic Structure			
	Overall AA Score	60.0	55.0	≥55.0

6.2 Monitoring Plan

To ensure that the Restoration Project meets Project goals, a 5-year monitoring period will be implemented. A combination of monitoring methods are important to ensure that the Project reaches the Project goals. Monitoring will consist of construction/installation monitoring, monitoring during the establishment period, and monitoring during the 5-year maintenance period. The Project site will be monitored by the Habitat Restoration Specialist, who will then make recommendations to the Restoration Contractor to perform maintenance tasks necessary to keep the Project site in compliance with Project goals.

6.2.1 Construction/Installation Monitoring

The Habitat Restoration Specialist will make regular site visits during Project implementation of re-establishment work. The Habitat Restoration Specialist will also review activities for conformance to this plan, environmental permit conditions, and the requirements of contract plans and specifications. Each site observation visit will be documented in an observation report. Photo-documentation of site conditions will be conducted during each site visit.

6.2.2 120-Day Plant Establishment Period and Monitoring

Upon successful completion of installation (e.g., completion of plant and seed installation), the 5-year long-term monitoring phase will begin. During the first 120 days of the long-term monitoring period, plants and seedlings will be monitored for health and vigor. Should any of the container plants die during the 120-day plant establishment period, they should be replaced in-kind at the expense of the Restoration Contractor to 100 percent of the original quantities, at the recommendation of the Habitat Restoration Specialist. If the Habitat Restoration Specialist determines that some species are dying because they are not suitable for site conditions, substitute species may be recommended.

The Habitat Restoration Specialist will perform monthly monitoring during the 120-day plant establishment period and will make recommendations to the Restoration Contractor to ensure conformance with the 120-day plant establishment requirements.

6.2.3 5-Year Monitoring Period and Methods

The Habitat Restoration Specialist will perform monitoring of the restoration areas regularly throughout the duration of the Project. Frequency of monitoring after the 120-day establishment period shall be at least bimonthly during years one and two and at least quarterly thereafter. Both horticultural (qualitative) monitoring and biological (quantitative) monitoring will be conducted at the re-establishment areas. Additionally, functions and services will be evaluated with a conditional assessment. On an annual basis, the Habitat Restoration Specialist will provide a complete summary of results of the monitoring activities completed in the prior year period.

After each site visit by the Habitat Restoration Specialist, a site observation report will be provided to the involved parties. The site observation report will include a description of the Project status, site conditions, and any maintenance recommendations or remedial actions. In addition, fixed photo points, with the location to be determined in the 120-day installation report, will be documented annually and will be included in the site observation report.

6.2.3.1 Qualitative Monitoring

Data on native vegetation cover, weed presence, and site progress will be collected during monitoring visits to be used in the annual monitoring report. Qualitative monitoring will be conducted to assess plant vigor and development, seedling recruitment from native seed application and natural sources, soil moisture content, presence/absence of plant pests or diseases, erosion and/or drainage conditions on site, presence/absence of non-target plant species, trash or debris accumulation, wildlife presence/absence, and Project fencing. All qualitative monitoring visits to the restoration areas will be documented with a monitoring report, which will be forwarded to the Restoration Contractor and other involved parties. Any Project deficiencies will be noted in the monitoring report, with accompanying recommendations for maintenance or remedial actions.

6.2.3.2 Quantitative Monitoring

Quantitative monitoring will be conducted to determine cover and composition of the developing plant communities.

Quantitative monitoring will be conducted by establishing permanent vegetation transects within the restoration areas at random locations at the end of year one. These transects will be used to help determine achievement of the yearly performance standards and compliance with Project goals, and a permanent photo-documentation station will be established along each transect to record the progress of the restoration site and graphically record plant establishment over the 5-year period.

Transects will be sampled using the point-intercept method. A transect tape will be run between two posts, and vegetative intercept line will be visually projected above and below the tape at every half-meter mark. Transects may vary in length based on location and size of the individual restoration area, but they will generally be 25 or 50 meters in length. Transects will be placed in each vegetation community that is being restored at a ratio of approximately one transect per 5 acres of restoration area. Transect data collection should occur in the spring or early summer during the growing season for the majority of the target species. Each herb, shrub, or tree that intercepts the projected line will be recorded by species. In addition, all plant species present within the 5-meter-wide "species richness" portion of each transect will be recorded by species. All data will be used to determine total percent plant cover, percent native cover, percent non-native cover, and overall species richness. Quantitative monitoring will be conducted once annually beginning in year one and extending through year five of the Restoration Project. The Habitat Restoration Specialist will establish transect locations.

6.2.3.3 Conditional Assessment Monitoring

The Habitat Restoration Specialist will evaluate the restoration area functions and services using a standardized CRAM analysis (or comparable approved method). A CRAM analysis of the restoration areas will be conducted twice: once in the third year, and again at the end of the 5-year maintenance and monitoring program. The purpose of the CRAM assessment in the second or third year is to determine if any remedial measures need to be implemented, and the purpose of the assessment in year five is to determine if the Project met the goals.

A CRAM analysis was conducted at the site prior to Project implementation, and an attempt to forecast anticipated CRAM score changes resulting from the Project implementation was described in the CRAM Report (DWR and DFG 2012; also included as Appendix A). The locations of future assessment areas were placed in areas thought to be appropriate based on the anticipated Project design. However, these assessment area locations my need to be relocated to vegetated areas based on actual post-Project conditions.

6.2.4 Monitoring Schedule

A preliminary monitoring schedule is shown in Table 12.

Table 12
Preliminary Monitoring Schedule

Year	Frequency	Annual Report
1	Monthly during 120-day plant establishment period; every other month thereafter	November
2	Every other month	November
3	Quarterly	November
4	Quarterly	November
5	Quarterly	November

6.2.5 Reporting

Reporting will be conducted on a regular and milestone basis to document the status and condition of the restoration areas.

6.2.5.1 Annual Monitoring Reports

Annual monitoring reports will be submitted to the involved parties (i.e. Applicant and regulatory agencies) during the 5-year maintenance and monitoring period of the Restoration Project. Annual reports outlining the results of the vegetation community monitoring will be submitted in the first month of each calendar year. The monitoring reports will describe the existing conditions of the project areas derived from qualitative field observations and quantitative vegetation data collection. The reports will provide a comparison of annual success criteria with field conditions, identify all shortcomings of the Project, and recommend remedial measures necessary for the successful completion of the Restoration Project. Each yearly report will provide a summary of the accumulated data. Annual reports will also include the following:

- A list of names, titles, and companies of persons who prepared the annual report and participated in monitoring activities;
- A copy of the resource agency permits, special conditions, and subsequent letters of modification;
- Photographs from fixed locations and map showing location of photo points;
- Quantitative data from transect measurements within the restoration areas;
- Results of the CRAM analysis in the years that a functional assessment is conducted (e.g., year three and year five).

6.2.5.2 Agency Notification at End of Monitoring Period

Notification will be submitted to the regulatory agencies upon submitting the annual report for the final year that the 5-year monitoring period is complete. If the Restoration Project is meeting established performance goals, the Project proponent will request acceptance of the site and release from the permit conditions.

6.2.5.3 Restoration Completion

6.2.6 Remedial Measures

If the Restoration Project is not meeting established performance goals, an analysis of the shortcomings will be provided in the final, fifth year monitoring report and a resolution will be proposed. Measures to improve the conditions of the restored habitat could include additional planting, seeding, weed control, and/or maintenance and monitoring until the performance standards have been met or the regulatory agencies have agreed that the restoration program is complete.

6.2.6.1 Regulatory Agency Confirmation

Following receipt of the notification of completion, the regulatory agencies may request a site visit to confirm completion of the restoration effort. Maintenance and monitoring of the restoration sites will not cease until written (via letter or e-mail) concurrence from the regulatory agencies is received.

7.0 LONG-TERM MANAGEMENT

7.1 Site Protection Instrument

Construction Staging Areas (Restoration of Temporary Impacts) – The DFG will execute a short-term lease agreement with the land owner (IID) for the use of specific parcels for construction staging. This short-term lease agreement will include a description of all planned construction activity, including storage of materials and equipment and a list/description of activities that would be prohibited from occurring due to the potential of jeopardizing the on-site or nearby environment, agricultural operations, or infrastructure. This lease agreement would also include provisions for removing construction staging operations and returning the land to its pre-staging area state, including stipulations for revegatation of previously vegetated areas as spelled out in this HMMP. If Project components are staggered during construction, the construction staging lease may be written in a stepwise manner, or individual short-term leases could be executed coincidently with the planning of each construction area. Regardless of the ultimate format, the lease will include a provision that any vegetated areas (whether they've been revegetated as a result of previous construction activity or have yet to be impacted by construction activity) that are impacted by construction staging would be revegetated per the guidance in this HMMP.

Re-establishment Area (Habitat Replacement for Permanent Impacts) – The parcel identified for habitat replacement for permanent impacts to habitat (see Figure 12) would be the subject of a long-term lease agreement between the DFG and IID (the land owner). This lease agreement would also be signed by the U.S. Fish and Wildlife Service because their existing National Wildlife Refuge management agreement with IID includes management obligations on this parcel. This long-term lease agreement will include a description of planned revegetation (consistent with the stipulations of this HMMP), the intended operation and maintenance that would occur once revegetated, and a list/description of activities that would be prohibited from occurring due to the potential of jeopardizing the habitat functions intended for this restoration site. The term of this lease agreement would extend to 2077, which mirrors the estimated design life of the proposed pond complex. After the termination of the lease agreement, restrictions of use, maintenance, and prohibited activities would be lifted and similar to the decommissioned pond areas, the habitat that has been established would be left in place but no longer formally managed/protected.

7.2 Long-Term Management

The primary focus of this HMMP is on the successful re-establishment of comparable habitat that will be impacted by the Project. Overall management goals of the mitigation program are designed to manage the mitigation sites such that none of the intended functions and values of the sites are lost over time, and so that the presence of habitats and native wildlife species are conserved. The Project Applicant is a government entity, and will be responsible for ensuring long-term management of the re-establishment areas. It is unlikely that the mitigation areas will require extensive management, as the target communities are consistent with the surrounding environment. However, the sites may require periodic management activities to ensure they continue to provide the intended wildlife function.

Long-term management activities will be determined by annual qualitative monitoring to ensure habitat remains viable as wildlife habitat and generally consistent with the goals of this HMMP. Management activities would occur on an as-needed basis and would include items such as trash removal, potential replanting/reseeding, signage repairs and/or minor hydrological manipulations to retain flow patterns.

7.3 Adaptive Management

Adaptive management will be implemented in the event of unforeseen or unpredictable circumstances. Due to the complexity and dynamic nature of ecosystems, and anticipation of unexpected events or outcomes, a flexible resource management plan is desirable.

For purposes of this HMMP, adaptive management is defined as a flexible, iterative approach to the long-term management of biological resources that is directed over time by the results of ongoing monitoring activities and direct observation of environmental stressors that are producing adverse results within the mitigation areas. Adaptive management will include the utilization of regular qualitative assessments and rapid qualitative assessment data gathered in the field prior to and during the mitigation effort to assess the health and vigor of vegetation communities within the mitigation areas. Rigorous and consistent monitoring is key to effective adaptive management to ensure that the decisions regarding future management are based on accurate assessments of the status of the resources being managed. Following an event that causes damage to all or part of a mitigation area, the data will be used in part to drive management considerations for repair of the damaged areas.

It is the intent of the adaptive management strategy in this HMMP to intervene only as necessary to help ensure the conservation of the functions and values of the mitigation sites and the conservation of target vegetation communities and individual species within the mitigation sites. Remedial measures will only be implemented if it is determined, in consultation between the Applicant, the Habitat Restoration Specialist, and the resource agency personnel, that there is a risk to the persistence of the functions and values, vegetation, or native species on site. Achieving the key goals of mitigation completion and establishment of self-sustaining target vegetation communities will be the focus of adaptive management decisions. Individual environmental stressors are discussed below, along with an anticipated range of management responses to correct damage that may occur to the mitigation areas.

In addition to the dynamic nature of ecosystems discussed above, the area surrounding the mitigation sites will be subject to changes associated with the proposed pond development and anticipated receding sea. These changes may result in unanticipated consequences that may need to be addressed. Therefore, the approach of the mitigation program may be altered to respond to changed conditions and to better ensure the persistence of the intended functions and values of the habitats within the mitigation site. Any substantial deviations from the approved CWMMP shall be approved by the resource agencies prior to implementation of new programs.

7.3.1 Herbivory

Some grazing and browsing by native mammals is expected to occur within the mitigation areas. The plant palettes for each vegetation community have been designed to accommodate a moderate level of plant browsing. If browse levels should become elevated (i.e., if significant plant mortality and cover reduction occurs) as indicated by qualitative or quantitative monitoring of the mitigation site, remedial measures may be recommended. Remedial planting or seeding may be necessary depending upon the stage of the mitigation effort.

7.3.2 Flooding

Flooding is anticipated to occur annually within mitigation areas. Flooding may periodically reduce overall plant cover within active stream channels, and may cause a change in flow patterns resulting from scour and sedimentation during flood events. If monitoring of the mitigation sites indicates that alterations resulting from floods may threaten achievement of the goals of the HMMP, sediment control and flow manipulations may be recommended, as approved by the resource agencies. Remedial recommendations may also include additional planting or seeding. Additional mulch, cuttings, or container plants may be placed in strategic areas to address changed flow characteristics of the stream channels.

7.3.3 Drought

Seasonal drought is a normal annual cycle in southern California, and all plant palettes have been designed with drought-tolerant plant species that are capable of withstanding seasonal fluctuations in available moisture. However, an extended drought could potentially occur, including low seasonal rainfall and prolonged high temperatures that may negatively affect the mitigation areas (e.g., lower vegetative cover, higher plant mortality, increased potential for pest infestations on site, etc.). While established plants are expected to tolerate typical drought cycles, supplemental watering may be necessary to address drought stress during the early phases of the mitigation program while plants are still young.

7.4 Financial Assurances

The Applicant is a government entity, and the financial assurance (FA) for the mitigation efforts can be waived at the discretion of the Project Manager. The restoration efforts described above are conservation measures proposed by the Applicant to be implemented as part of the project, and is not compensatory mitigation, therefore no financial assurance is required.

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APPENDIX A

California Rapid Assessment Method Report for the Salton Sea Species Conservation Habitat Project

DRAFT

CALIFORNIA RAPID ASSESSMENT METHOD REPORT
for the
Salton Sea Species Conservation Habitat Project
Imperial County, California

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1.0 INTRODUCTION

This document presents the results of an assessment of the baseline ecological conditions and the predicted post-project conditions of the vegetated wetland and riparian resources at the proposed Salton Sea Species Conservation Habitat Project (SCH Project or Project) (Figures 1 and 2). The State of California and Federal agencies that comprise the California Wetlands Monitoring Workgroup[1] are promoting the use of rapid assessment methods as a core tool to evaluate wetland resource condition. Dudek evaluated the ecological condition of the Project area utilizing the California Rapid Assessment Method (CRAM; Collins et. al. 2008), which is the most widely used wetland rapid assessment method in the state (www.cramwetlands.org).

The proposed SCH Project, including staging areas, will alter up to approximately 3,991 acres of waters of the United States/state and up to approximately 14 acres of California Department of Fish and Game (DFG)-only jurisdictional areas (total of 4,005 acres combined).The purpose of the SCH Project is to develop a range of aquatic habitats that will support fish and wildlife species dependent on the Salton Sea through the creation of shallow ponds and associated infrastructure at the southern end of the sea. A complete description of the proposed Project is included in the applications to the DFG, Section 1602 Streambed Alteration Agreement (Dudek 2012a); U.S. Army Corps of Engineers (Corps), Individual Permit (Dudek 2012b); and Regional Water Quality Control Board (RWQCB), 401 Water Quality Certification; as well as the SCH Project's Environmental Impact Statement/Environmental Impact Report (EIS/EIR) as prepared by the Corps and the Natural Resources Agency dated August 2011 (Corps and Natural Resources Agency 2011). Although the proposed Project would impact waters and wetlands under the jurisdiction of the RWQCB, Corps, and DFG, the outcome of the Project is the maintenance and preservation of 1,784 acres of waters of the United States/state that under the No Project Alternative would be converted into non-jurisdictional uplands as the Sea recedes.

Creation of the proposed Project is necessary to provide a measure against the loss of fish and wildlife habitat. The Project will be subject to the best management practices outlined in Section 2.4.7 of the EIS/EIR that avoid and minimize impacts to special-status species. The ponds created by the Project would have substantial benefits to water quality, wildlife habitat, and special-status wildlife species, within jurisdictional areas, and therefore are considered self-mitigating. The Project will also include restoration of plant communities removed in order to establish berms, sedimentation basins, and other non-jurisdictional features; restoration will be completed at a minimum ratio of 1:1 for temporary impacts and permanent impacts to non-native

[1] The California Wetlands Monitoring Workgroup is a subcommittee of the California Water Quality Monitoring Council (Senate Bill 1070).

plant communities (i.e., tamarisk woodland or scrub) and 3:1 for permanent impacts to native plant communities.

To evaluate the ecological condition of the vegetated resources that would be affected by the proposed Project, Dudek conducted assessments within agricultural drainages leading to the Sea, the New River, and along the southern shore line of the Salton Sea. A total of 12 Assessment Areas (AAs) were evaluated, including 8 riverine and 4 lacustrine. The functional assessment was completed using the most recent version of CRAM, version 5.0.2 (Collins et al. 2008). Upon completion of the proposed SCH Project, the baseline data collected during this assessment will be used as comparative data to evaluate the habitat restoration areas associated with the SCH Project relative to Project goals.

1.1 California Rapid Assessment Method (CRAM)

The CRAM was developed as a rapid, scientifically defensible, and repeatable assessment methodology that can be used routinely to assess and monitor the condition of wetlands and riparian habitats. The assessment method is a diagnostic tool that can be used to assess the condition of a wetland or riparian site using visual indicators in the field. CRAM identifies six major wetland classes (or types), four of which have sub-types: riverine (confined and non-confined); depressional (individual vernal pools, vernal pool systems, and other depressional wetlands); estuarine (perennial saline, perennial non-saline, and seasonal); playas; slope wetland (seeps and springs, and wet meadows); and lacustrine. AAs are established within each wetland class separately and can represent a portion or encompass the entire wetland community. Each wetland class has a particular set of narrative descriptions that are used to assist in scoring an established AA. Visual indicators are used to choose the best-fit description of habitat condition for a variety of metrics/submetrics within four universal attributes: Buffer and Landscape Context, Hydrology, Physical Structure, and Biotic Structure. Table 1 presents the attributes and metrics/submetrics developed for CRAM that reflect the common, visible characteristics of all wetlands in all regions of California, based on the conceptual models of wetland form and function (Collins et al. 2008). Appendix A contains descriptions of each metric/submetric.

Table 1
CRAM Attributes and Metrics

Attributes		Metrics	
Buffer and Landscape Context		Landscape Connectivity	
		Buffer	Submetric A: Percent of AA with Buffer
			Submetric B: Average Buffer Width
			Submetric C: Buffer Condition
Hydrology		Water Source	
		Hydroperiod or Channel Stability	
		Hydrologic Connectivity	
Structure	Physical	Structural Patch Richness	
		Topographic Complexity	
	Biotic	Plant Community	Submetric A: Number of Plant Layers Present or Native Species Richness (vernal pools only)
			Submetric B: Number of Co-Dominant Species
			Submetric C: Percent Invasion
		Horizontal Interspersion and Zonation	
		Vertical Biotic Structure	

Source: Collins et al. 2008.

Letter scores ranging from A to D are assigned to each metric/submetric to reflect alternative states of function. For each metric/submetric, the letter score is converted into the corresponding numeric score: A=12, B=9, C=6, and D=3. The metric/submetric scores are combined to calculate an attribute score, and the attribute scores are combined to calculate an overall AA score. The attribute scores and overall AA scores have a maximum value of 100 and a minimum value of 25. The scores are intended to represent the condition of an AA relative to its best possible condition. CRAM also provides guidelines for identifying the stressors that might account for any low site scores.

CRAM is supported by a website (www.cramwetlands.org) that provides access to an electronic version of the entire manual and training materials. The website also contains downloadable CRAM software and access to the CRAM database, which can be used to upload, view, and retrieve statewide CRAM results.

1.2 Goals of the Assessment

The purpose of the SCH Project is to restore shallow water habitat lost due to the Salton Sea's increasing salinity and reduced surface area as the Sea recedes. The purpose of this assessment is to determine the functional condition of vegetated resources within the SCH Project area prior to implementation of the proposed Project relative to anticipated functional condition of restored vegetated resources. This assessment will be used as a tool to compare the ecological baseline conditions of the vegetated resources with the post-Project conditions during the monitoring program for the habitat restoration areas.

The three primary goals of this assessment include:

- Assess vegetated jurisdictional resources conditions and identify related stressors;
- Compare existing vegetated jurisdictional resources conditions within the SCH Project area to post-Project conditions; and
- Support the development of a Project-specific restoration and monitoring plan.

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FIGURE 1

Regional Map

DRAFT CALIFORNIA RAPID ASSESSMENT METHOD REPORT FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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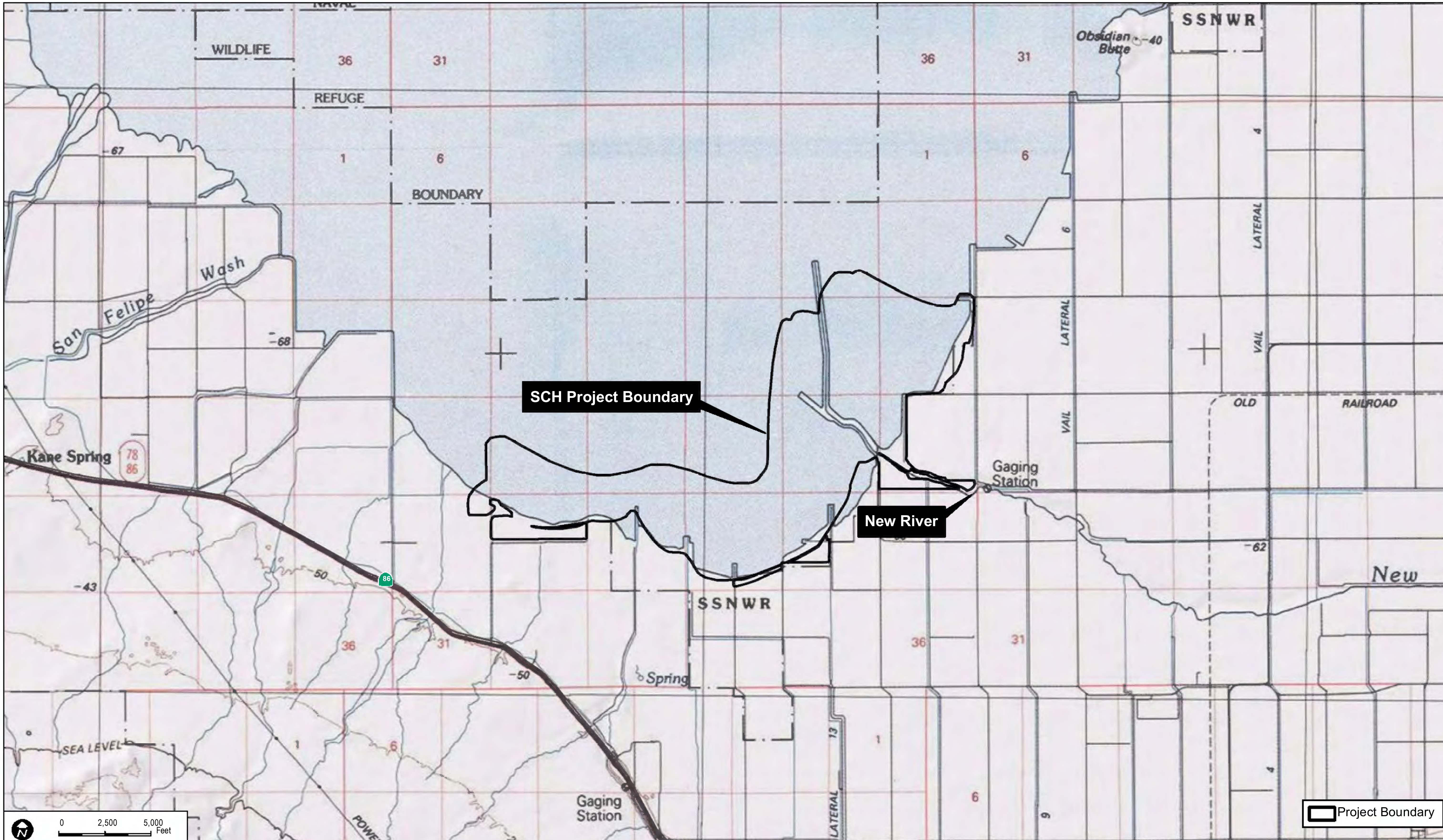

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SOURCE: USGS 7.5-Minute Series Obsidian Butte, Calipatria SW, and Niland Quadrangles.

FIGURE 2

Vicinity Map

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2.0 PROJECT AREA DESCRIPTION

2.1 Project Location

The Project site is located at the southern end of the Salton Sea, near the mouth of the New River, in Imperial County, California (Figures 1 and 2). The Project is partially located within the Sonny Bono Salton Sea National Wildlife Refuge. The SCH Project is approximately 4,064 acres, which includes 295 acres for six potential staging areas. The study area lies within the Westmorland West and Obsidian Butte 7.5-minute quadrangles. The SCH Project site is located within Township 12 South, Range 12 East, and Sections 13 and 14 and 23 to 29 as mapped by the U.S. Geological Survey (USGS).

2.2 Watersheds

The SCH Project is located within the Salton Sea and Imperial Hydrologic Units, which are part of the Colorado River Basin Hydrologic Region. The majority of water that flows into the Salton Sea is runoff from the Whitewater, New, and Alamo rivers, as well as several small tributaries. The proposed Project includes a portion of the Salton Sea, the New River, and 24 agricultural drainages that carry Colorado River water.

2.3 Soils

The U.S. Department of Agriculture–Natural Resources Conservation Service Web Soil Survey indicates 10 soil types within the Project site (USDA-NRCS 2009). A substantial portion of the study area is mapped as water. The soil types indicated in the soil survey include:

- Fluvaquents, saline;
- Holtville silty clay, wet;
- Imperial silty clay, wet;
- Imperial-Glenbar silty clay loams, wet, 0 to 2 percent slopes;
- Indio lam, wet;
- Indio-vint complex;
- Meloland very fine sandy loam, wet;
- Meloland and Holtville loams, wet;
- Rositas fine sand, wet, 0 to 2 percent slopes; and
- Vint loamy very fine sand, wet.

2.4 Vegetation

The *Salton Sea Ecosystem Restoration Program Final Programmatic Environmental Impact Report* (Natural Resources Agency 2007) provides general information about vegetation around the Salton Sea. Additional data sources for the Project area included geographic information system (GIS) files from the Redlands Institute at the University of Redlands (1999), vegetation mapping completed for Imperial Irrigation District (2007), 6-inch resolution aerial photographs (Southern California Association of Governments and California Department of Transportation 2008), and site visits conducted on April 29 and November 16 through 18, 2011. The biological resources section of the EIS/EIR (Section 3.4) describes the vegetation within all of the alternatives considered. The vegetation communities located within Alternative 3, the SCH Project area, include agriculture, common reed marsh, disturbed/developed, drainage ditch, mudflat, open water, tamarisk scrub, and tamarisk woodland. Additional observations of existing vegetation communities were recorded by Chambers Group (2012) during the wetlands delineation of the SCH Project area and Dudek during the CRAM in November 2011, including identification of cattail marsh, iodine bush scrub, and quailbush scrub. Due to fluctuations of the sea level within the SCH Project area, the vegetation communities on the sea shore and associated acreages may change drastically within a year's time. Therefore, acreages included in Table 2 provide a description of the relative extent and distribution for each community during the time when the latest surveys were conducted.

Table 2
Vegetation Communities and Land Cover Types within the SCH Project Site

Vegetation/ Habitat Type	Subtype	Acres in the Study Area	Characteristics
Marsh	Common Reed Marsh	12	Dominated by *Phragmites australis.* Cover is generally at least 80 percent but can be as low as 20 percent. Typically occurs along waterline of major rivers.
	Cattail Marsh	38	Dominated by *Typha* spp. Cover is typically greater than 90 percent, but can be as low as about 20 percent. Occurs in areas with some freshwater influence.
Riparian	Tamarisk Woodland	42	Dominated by *Tamarix* spp. Vegetation is generally over 6 feet and forms a continuous stand. Width or individually mapped areas of at least 20 feet. Cover is generally 90 percent or greater.
	Tamarisk Scrub	213	Dominated by *Tamarix* spp. Vegetation is less than 6 feet tall or made up of widely spaced individual trees. Cover is generally less than 90 percent or less than 20 feet wide.
	Drainage Ditch	13	Drainage ditches and irrigation canals that are at least 12 feet wide and have earthen sides; concrete-lined ditches are mapped with corresponding adjacent type, generally agriculture or disturbed.
	Mudflat	1,296	Unvegetated recently flooded areas.
	Open Water	2,230	Areas of standing water.
	Disturbed/Developed	23	Roads and development, including feedlots.
	Agriculture	40	Any type of irrigated agriculture. Common types in study area include spinach, grass hay, and alfalfa.
	Iodine Bush Scrub	146	Relatively open stands of iodine bush (*Allenrolfea occidentalis*) that typically occur at the margins of ponds and the Salton Sea's shore. Iodine bush scrub is generally sparse on site. This vegetation community was mapped according to the California Manual of Vegetation's membership rules, which state greater than 2 percent absolute cover of iodine bush, and no other species with greater or equal cover.
	Quailbush Scrub	12	Recovering disturbed upland areas around facilities and roads dominated by quail bush (*Atriplex lentiformis*). Quailbush scrub is generally sparse on site, with cover usually between 10 and 50 percent.

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3.0 METHODOLOGY

Prior to visiting the Project area, Dudek assembled background information about the management and history of the Project area's wetlands and waters. Background information gathered included USGS topographic maps, National Wetland Inventory maps, road maps, soil maps, aerial photography, and Project-specific information from the *Jurisdictional Delineation Report for the Salton Sea Species Conservation Habitat Project* (Chambers Group Inc. 2012).

The CRAM methodology allows for assessment of vegetated areas with at least 5 percent plant cover. Thus, much of the Project area composed of open water and mud flats could not be assessed using CRAM. The functions and services of areas not assessed using CRAM will be evaluated qualitatively in the Habitat Mitigation and Monitoring Plan (HMMP; DWR and DFG 2012). The vegetated portion of the study area that could be assessed using CRAM is approximately 462 acres of the total Project area (11 percent).

Each AA and associated wetlands or waters were classified according to the definitions presented in the CRAM User's Manual, version 5.0.2 (Collins et al. 2008; see Section 1.1). The wetlands or waters were classified based on their general ecological character and first-hand knowledge of biologists who previously assessed the property. Dudek determined the boundary and estimated size of each AA. The AAs included the appropriate portion of each wetlands or waters for assessment using CRAM. Each AA consisted of only one wetland class with enough hydrologic and ecological integrity that could allow detection of changes in the condition of the AA due to identified stressors or management actions apart from natural disturbances or other sources of variability in wetland condition.

During the initial office assessment, background information was collected for each potential AA location and base maps were prepared to evaluate the AAs relative to the surrounding land cover/use. Preliminary scores were developed for some metrics based on the information gathered and recorded in the appropriate datasheets (Appendices B through D).

Following the background analysis, site visits were conducted on August 18 and November 15 through 17, 2011, by Dudek biologists Andrew Thomson, Stu Fraser, Chris Oesch, Doug Gettinger, Katie Dayton, and Patricia Schuyler. The field portion of the CRAM assessment consisted of finding and confirming the boundaries of the AAs, and scoring the AAs based on the condition metrics and stressor checklist. All relevant CRAM datasheets were completed according to the CRAM User's Manual (Collins et al. 2008).

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4.0 RESULTS

4.1 Classification of AAs within the SCH Project Area

Three wetland classification sub-types as defined in CRAM were identified within the Project area: riverine (confined), riverine (non-confined), and lacustrine.

Riverine wetlands consist of a channel and its active floodplain plus any portion of the adjacent riparian areas that are likely to be strongly linked to the channel or floodplain through bank stabilization and allochthanous[2] inputs. Riverine wetlands can be further classified as confined or non-confined based on the ratio of valley width to channel width. Non-confined riverine systems are characterized by valley widths that are at least twice the average bankfull width of the channel before encountering a hillside, terrace, or other feature that prevents further migration. For this Project, riverine wetlands that were classified as confined were done so because of the presence of levees along the riverine system margins.

Riverine AAs extend landward from the backshore of the floodplain,[3] as defined by CRAM, to include the adjacent riparian area that probably accounts for bank stabilization and most of the direct allochthanous inputs of leaves, limbs, insects, etc. into the channel including its CRAM-defined floodplain.

Lacustrine systems are lentic water bodies that usually exceed 8 hectares in total area during the dry season and that usually have a maximum dry season depth of at least 2 meters. They are deeper and larger than depressional wetlands or vernal pools or playas. Some lacustrine systems are separated from estuarine or marine systems by barrier beaches, dunes, or other natural or artificial barriers that are occasionally but irregularly breached. Some of these coastal lacustrine systems are locally referred to as lagoons. Here they are regarded as lacustrine systems because they resemble other lacustrine systems based on CRAM attributes and metrics.

A total of eight riverine AAs and four lacustrine AAs were established for assessment. Figure 3A provides an index and legend for the locations of the AAs throughout the Project area. Figures 3B through 3M show individual AAs and vegetation communities associated with each area. Representative photos are contained in Figures 4 through 15. The quantity of AAs established for assessment was determined during fieldwork data collection using the CRAM guidelines for projects with multiple AAs. The process involved averaging the first two overall AA scores and then comparing the average to the overall AA score of the third AA. If the third AA was less than 15 percent different from the average of the first two, then the wetland type was considered to be adequately sampled. For riverine AAs, the third AA was within 15 percent, but a fourth AA was added to ensure that the full range of conditions was sampled. For lacustrine AAs, the third AA

[2] External source of energy for a stream.
[3] The bench or broader flat area of a fluvial channel that corresponds to the height of the bankfull flow.

was close to 15 percent different from the average of the first two. Thus, a fourth lacustrine AA was added to the assessment, which was within the 15-percent range of the average of the first three AAs.

All riverine areas within the Project area were assigned an AA boundary based on the AA parameters in CRAM. Two sampling frames were developed, including one for riverine wetlands along the New River and another for riverine wetlands along agricultural drainages. Four AAs were selected randomly from each of the two sampling frames for field assessment. The same process was developed for lacustrine; however, upon field analysis, it was determined that much of the lacustrine Sea shore was not vegetated and could not be evaluated with CRAM. Therefore, AAs for lacustrine were reestablished based on the vegetated portions of the Sea shore in a stratified random procedure. These lacustrine AAs were spread geographically across the Project area in order to ensure that the range of conditions was evaluated.

4.2 CRAM Scores

The AAs within the SCH Project area were analyzed for a suite of variables that pertain to common attributes that riverine and lacustrine systems are expected to perform. The fieldwork consisted of locating and confirming the boundaries of each AA, and scoring the AAs based on the condition metrics and stressor checklist contained in Volume 2 of the CRAM v.5.

As previously introduced, each of the 14 metrics/submetrics evaluates a specific indicator of functional condition. Comparisons can be made at the metric/submetric score level where distinctions among the scores are the clearest. Appendix B presents a summary of the scores for all 14 metrics/submetrics used in the assessment for the AAs. The remainder of this section presents a summary of the results contained in the CRAM data sheets (Appendices C and D).

4.2.1 Riverine

The New River AAs are numbered 1 to 4 and the agricultural drainages are numbered 5 to 8. In general, the riverine AAs trended toward higher CRAM scores in the Buffer and Landscape Context, medium scores in the Hydrology categories, and low to medium scores in the Physical Structure and Biotic Structure.

Buffer and Landscape Connectivity: The riverine AAs scored between 55.9 and 93.4 for buffer and landscape connectivity. The lowest score was associated with RIV-08 and the highest score was associated with RIV-05, both associated with agricultural drainages. The remainder of the AAs scored between 73.3 and 93.4, with a combined average of 82.5 (average of 81.0 for the New River and 84.0 for the agricultural drainages).

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3A

Assessment Areas Overview Map

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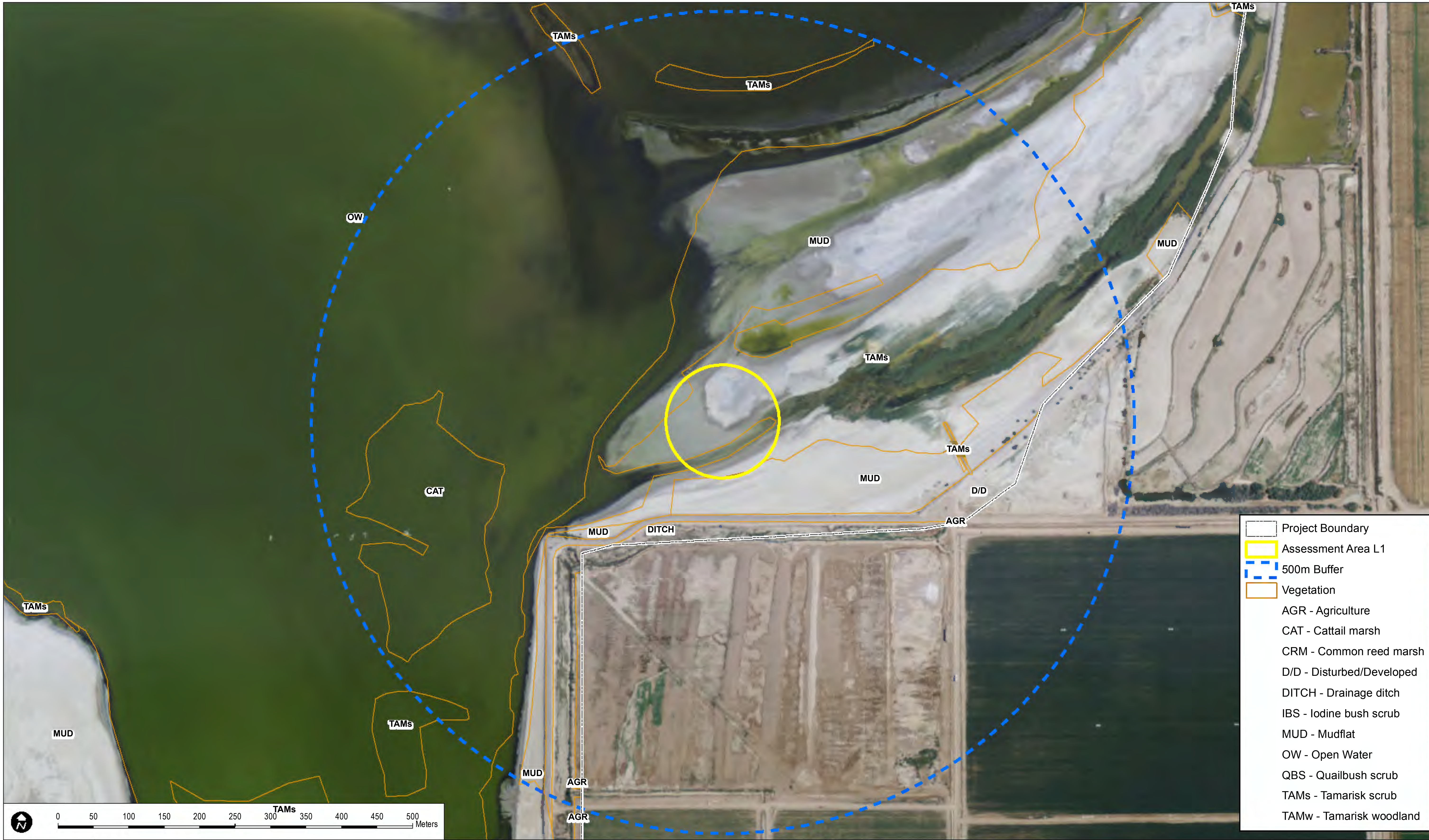

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3B

Lacustrine Assessment Area L1

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3C

Lacustrine Assessment Area L2

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3D

Lacustrine Assessment Area L3

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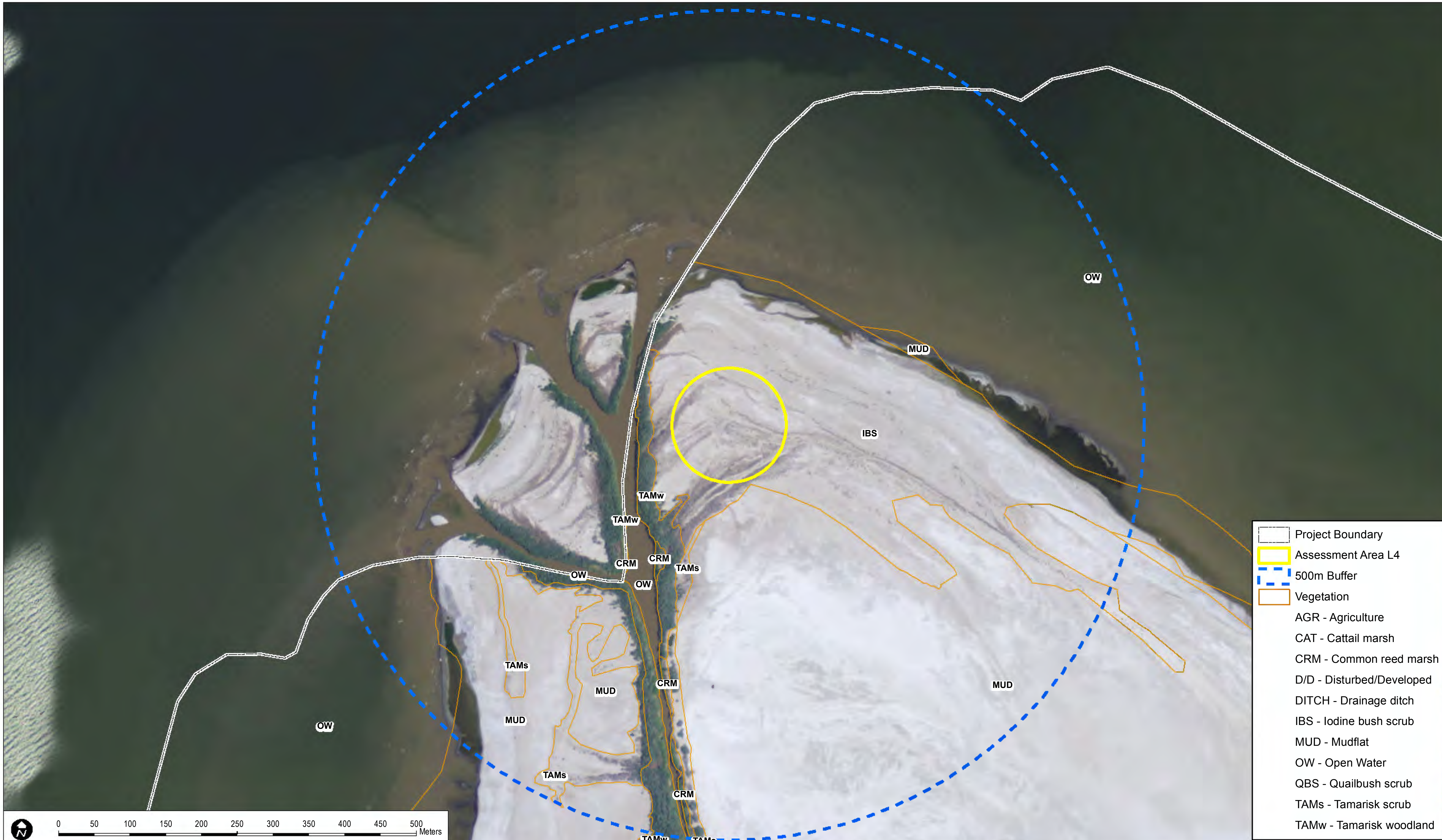

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3E

Lacustrine Assessment Area L4

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3F

Riverine Assessment Area R1

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3G

Riverine Assessment Area R2

DRAFT CALIFORNIA RAPID ASSESSMENT METHOD REPORT FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3H

Riverine Assessment Area R3

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3I

Riverine Assessment Area R4

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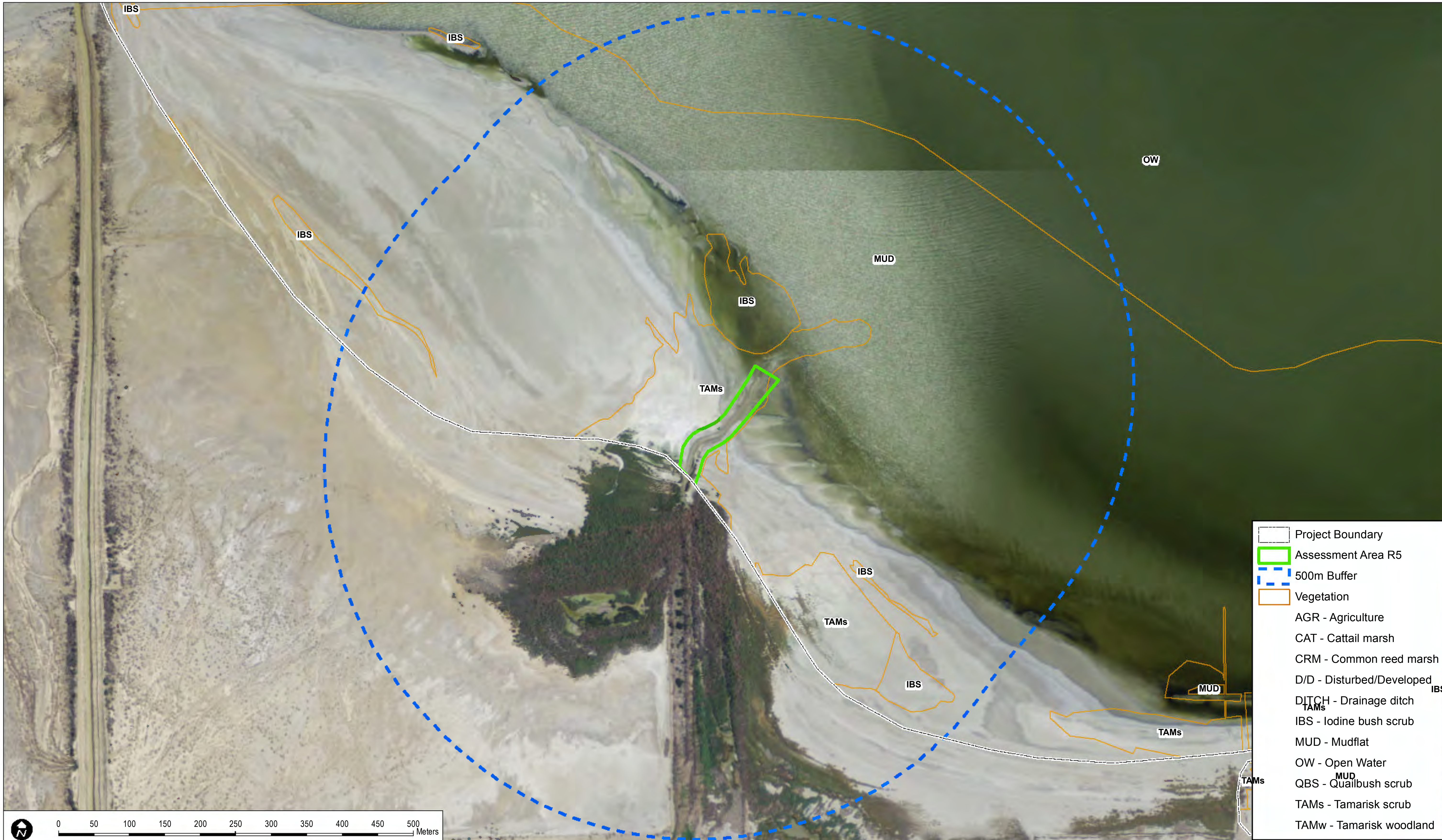

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3J

Riverine Assessment Area R5

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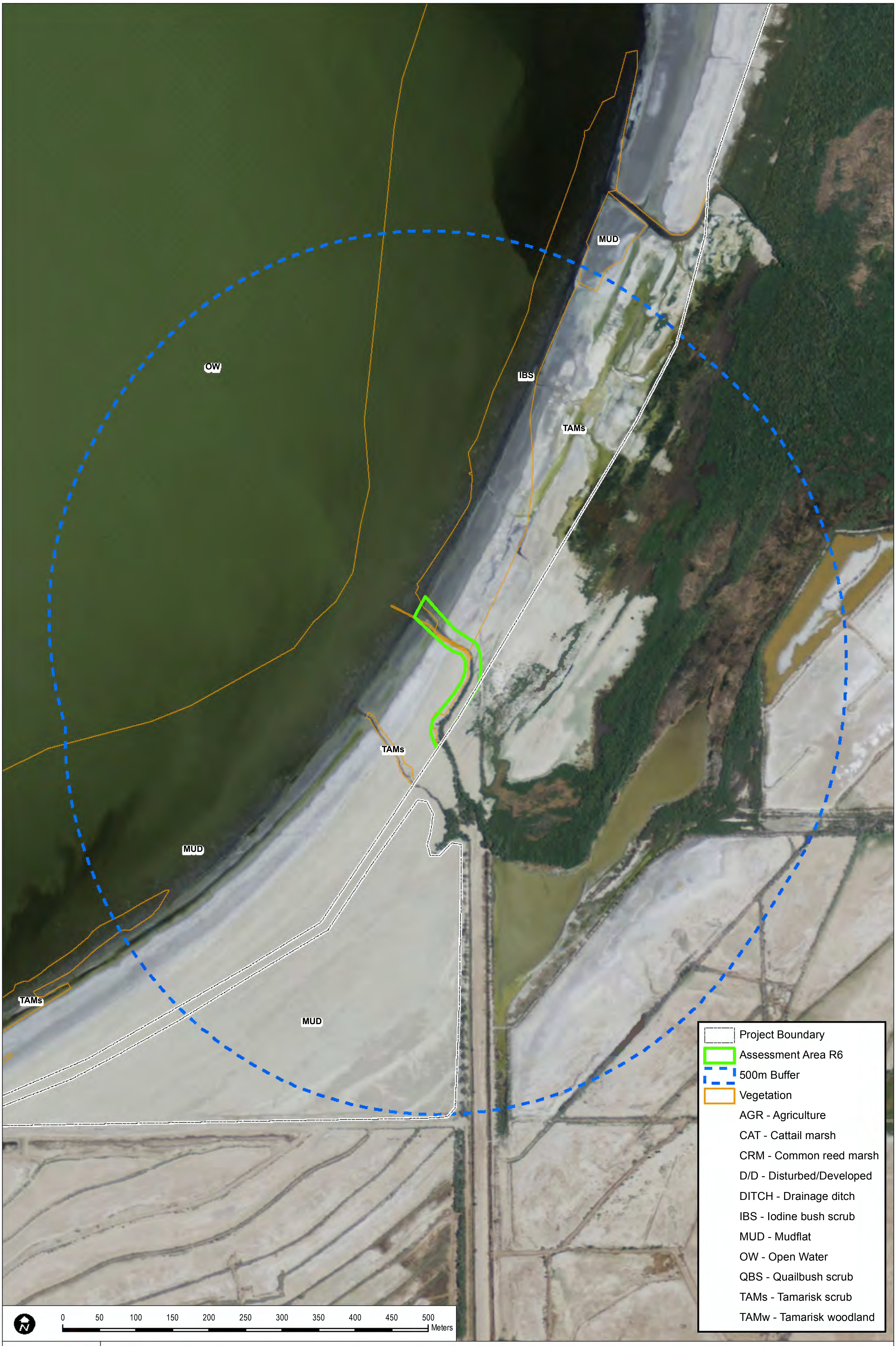

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3K

Riverine Assessment Area R6 - 500m Field Map

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3L

Riverine Assessment Area R7

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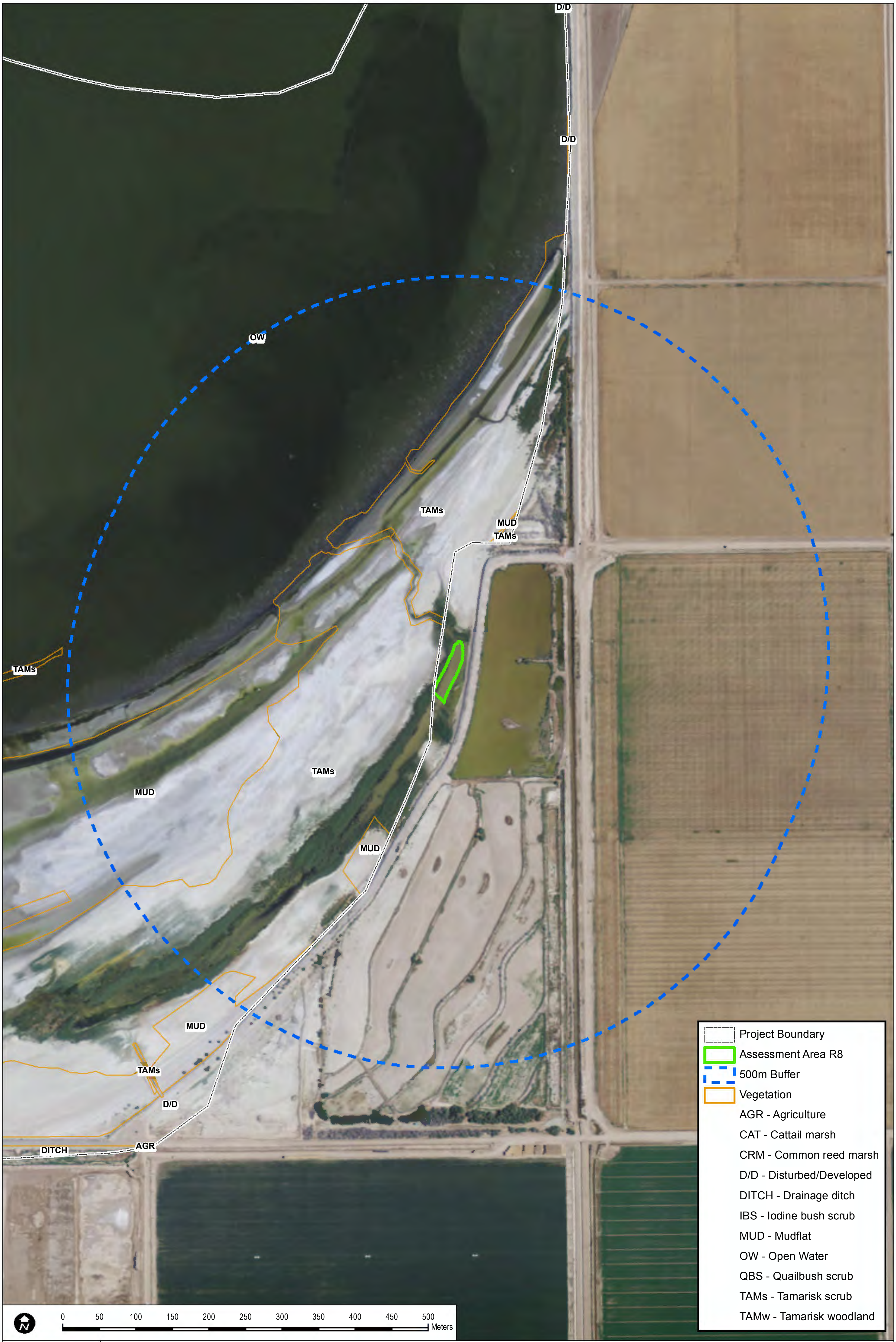

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 3M

Riverine Assessment Area R8

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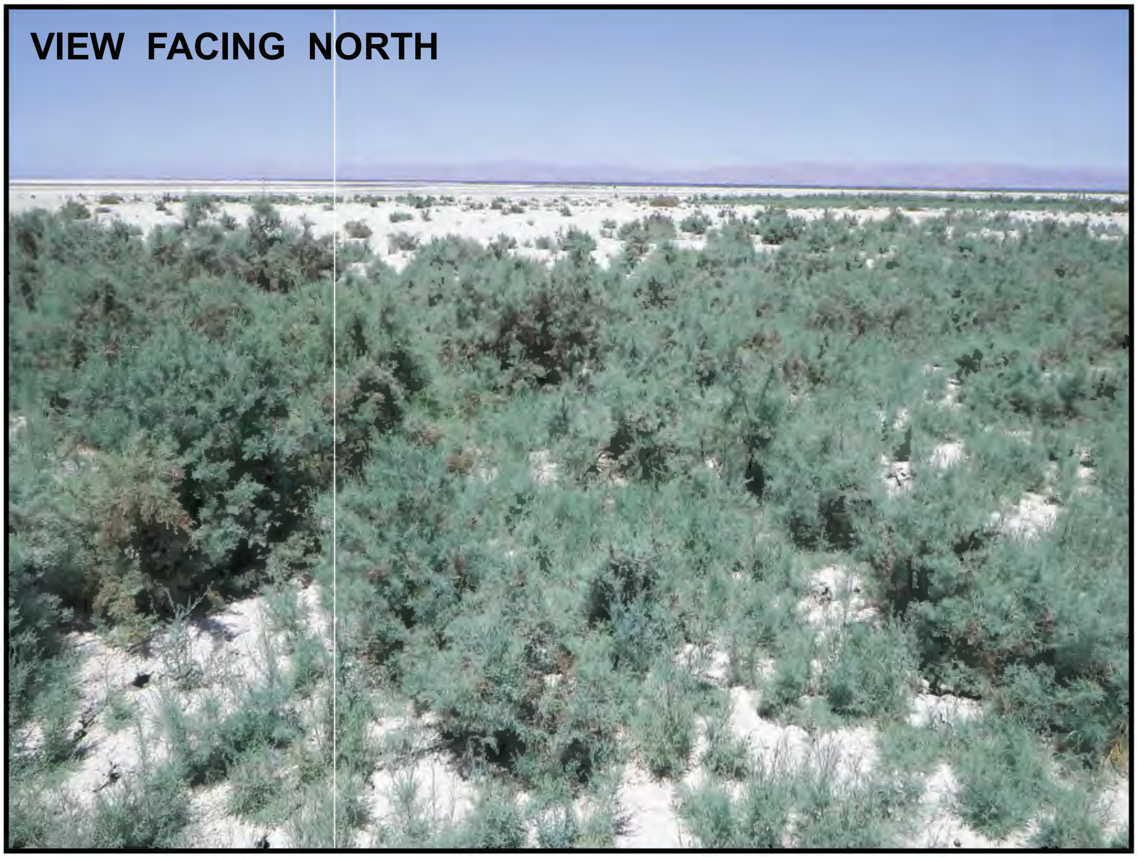

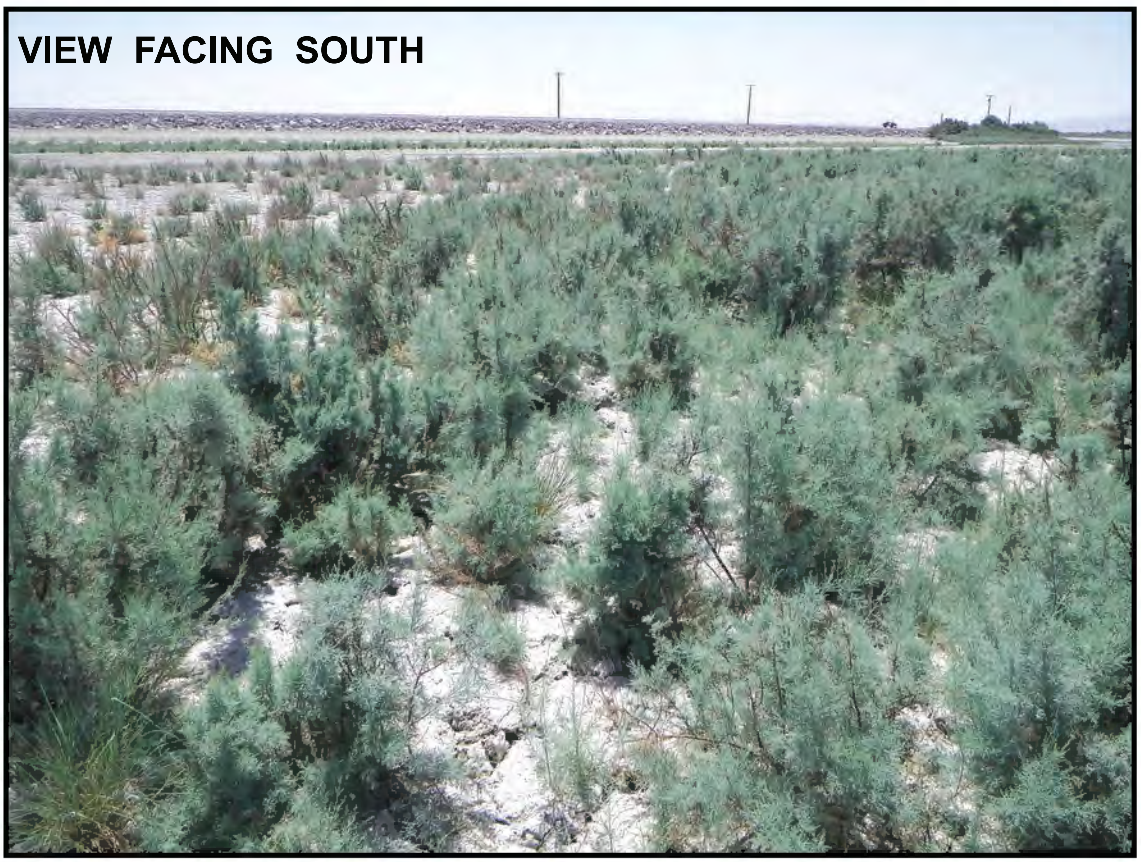

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FIGURE 4

Lacustrine Assessment Area L1 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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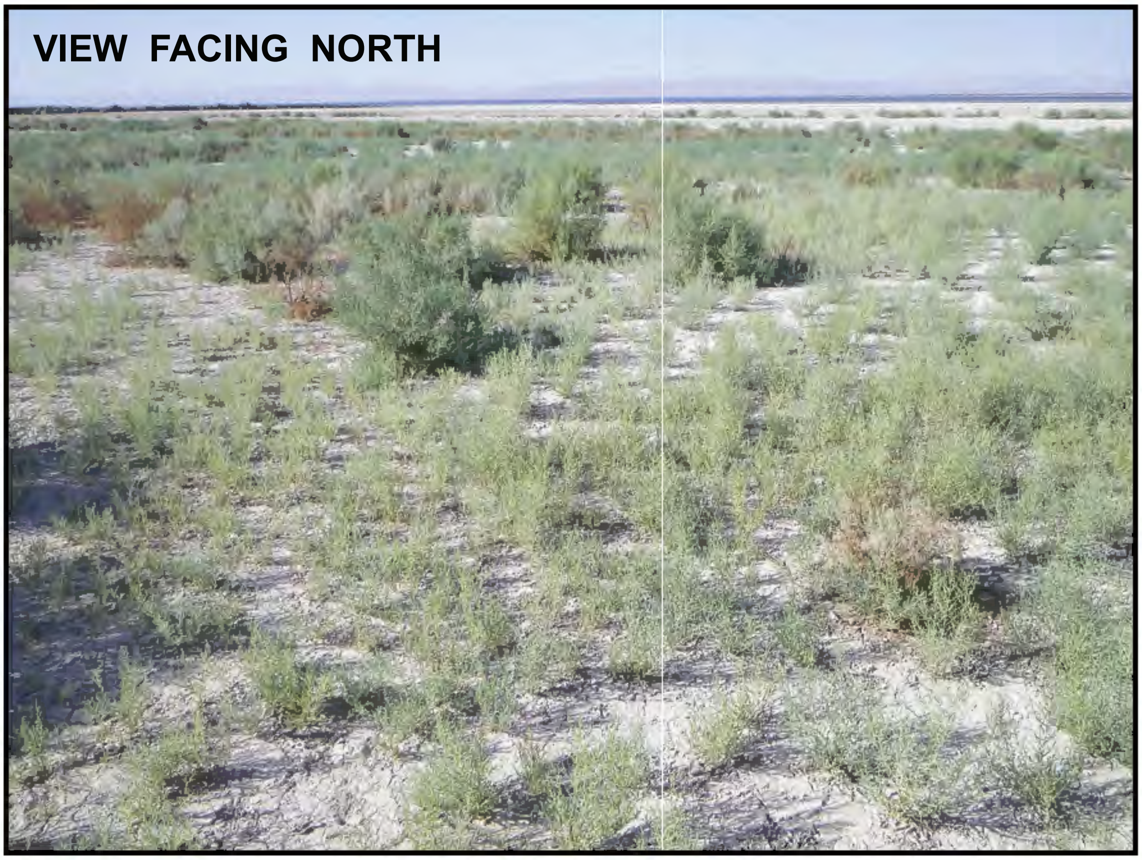

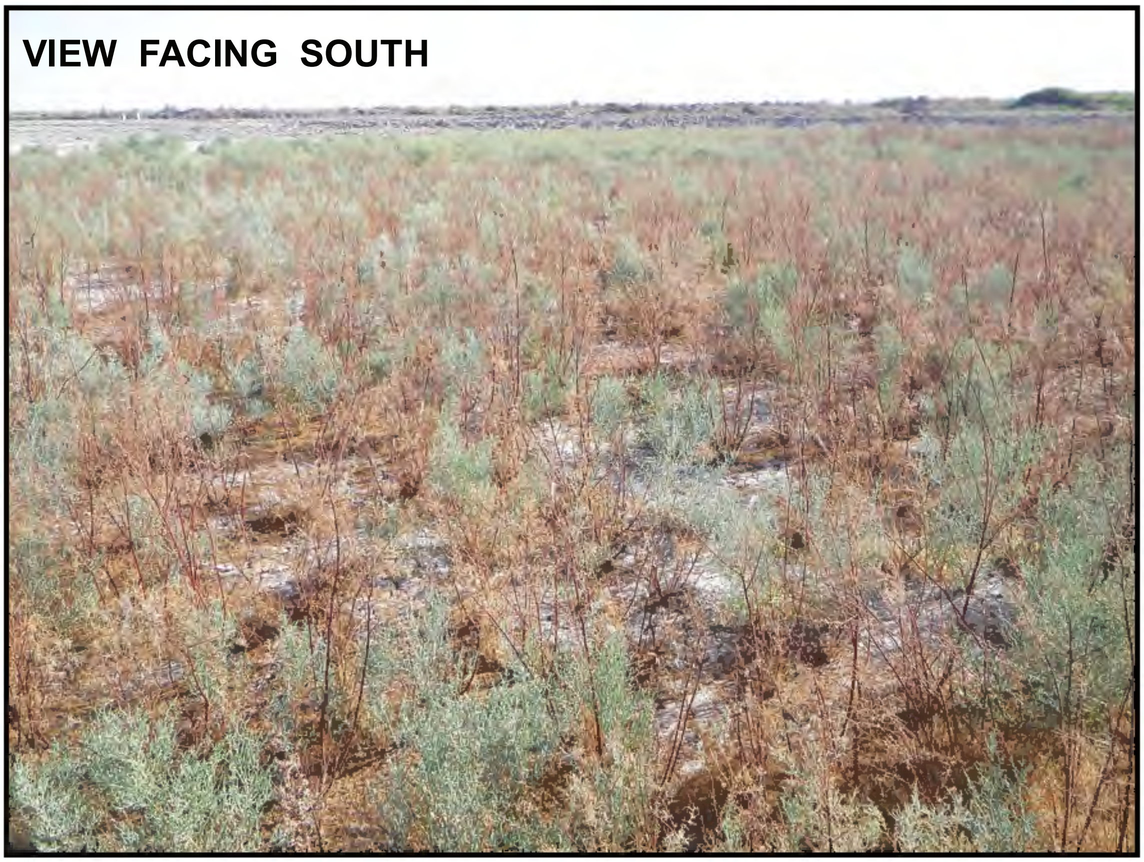

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FIGURE 5

Lacustrine Assessment Area L2 - Photos

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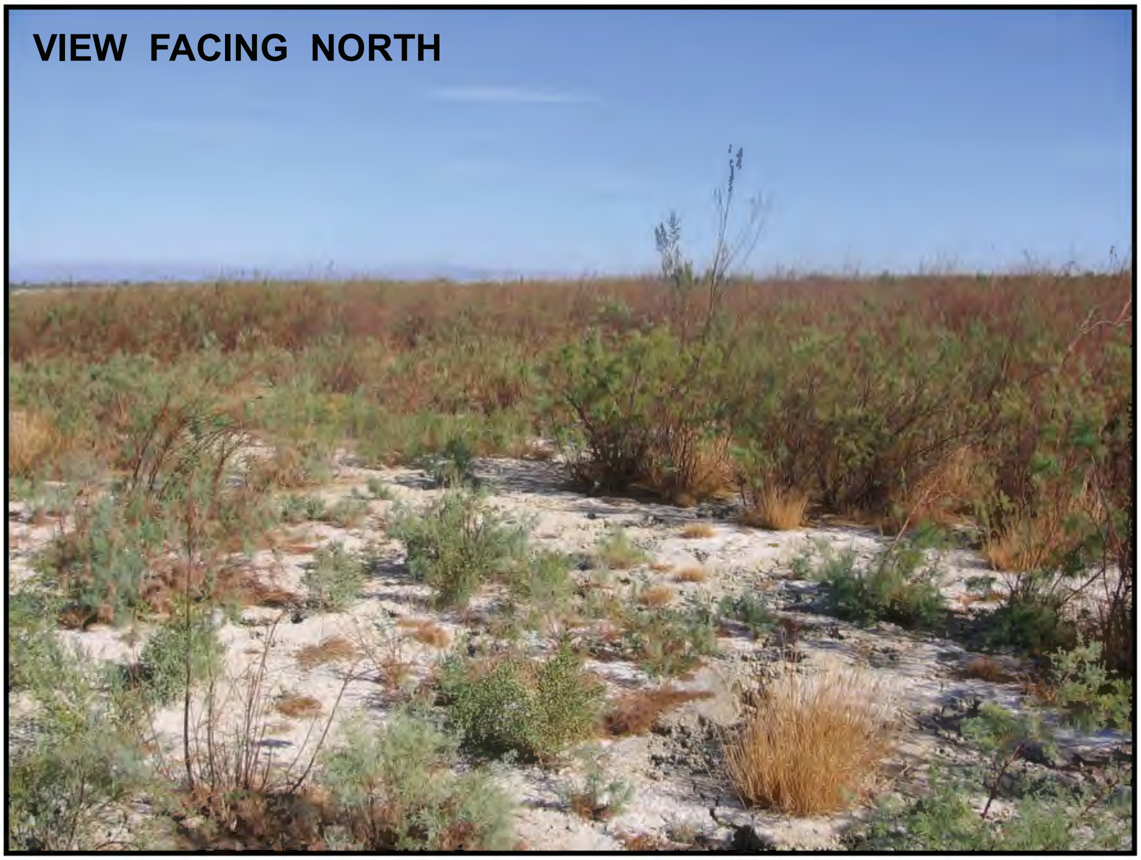

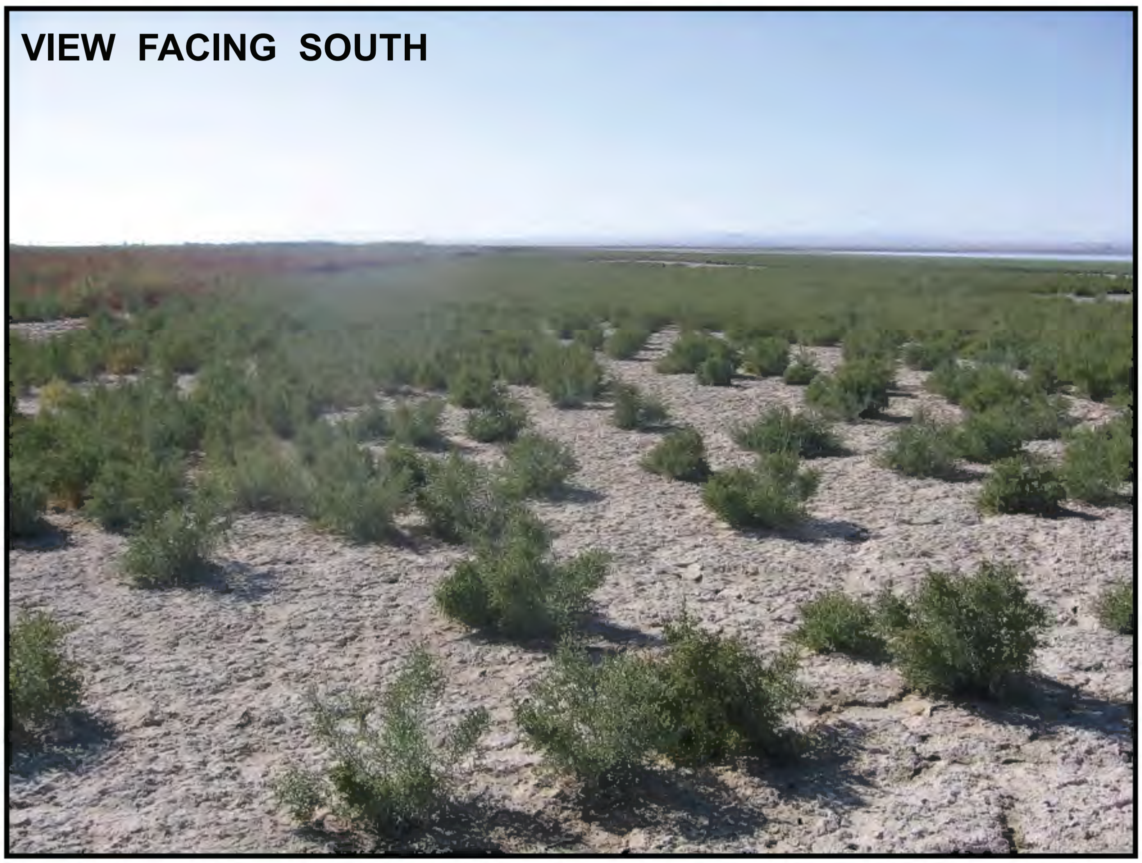

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FIGURE 6

Lacustrine Assessment Area L3 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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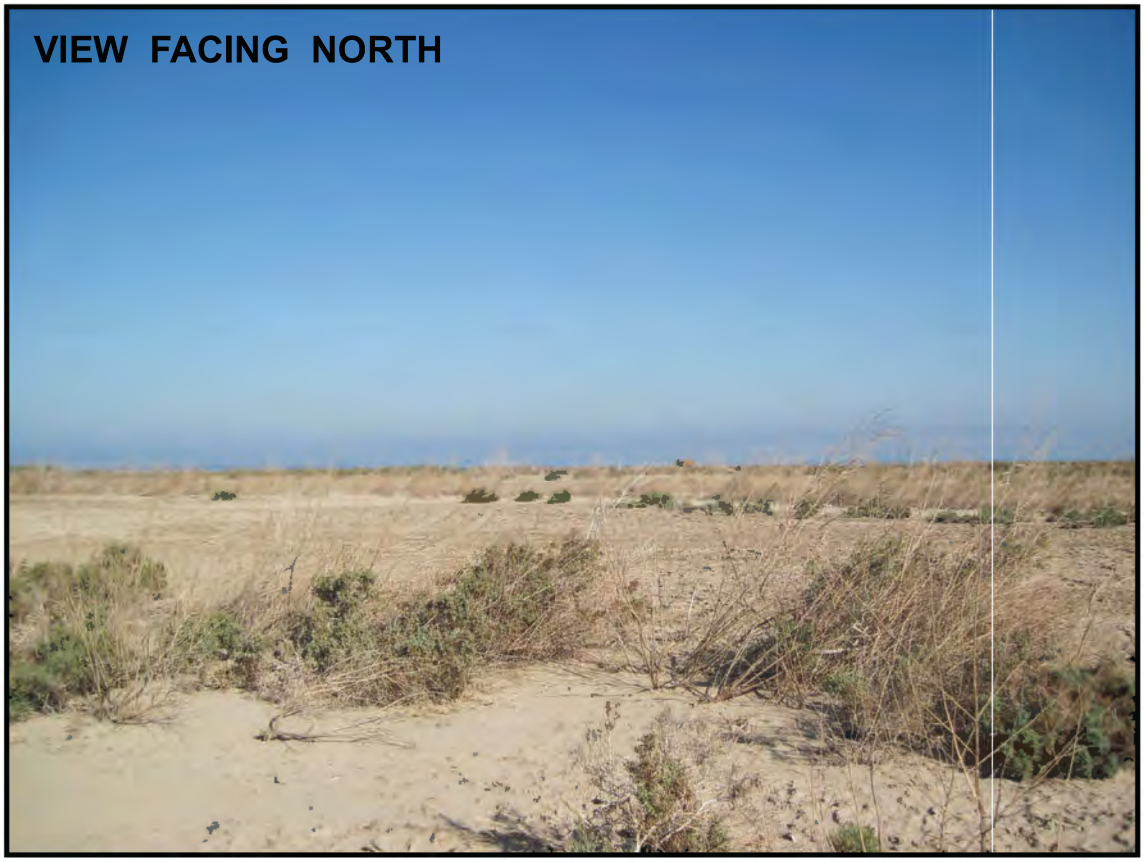

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FIGURE 7

Lacustrine Assessment Area L4 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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FIGURE 8

Riverine Assessment Area R1 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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FIGURE 9

Riverine Assessment Area R2 - Photos

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FIGURE 10

Riverine Assessment Area R3 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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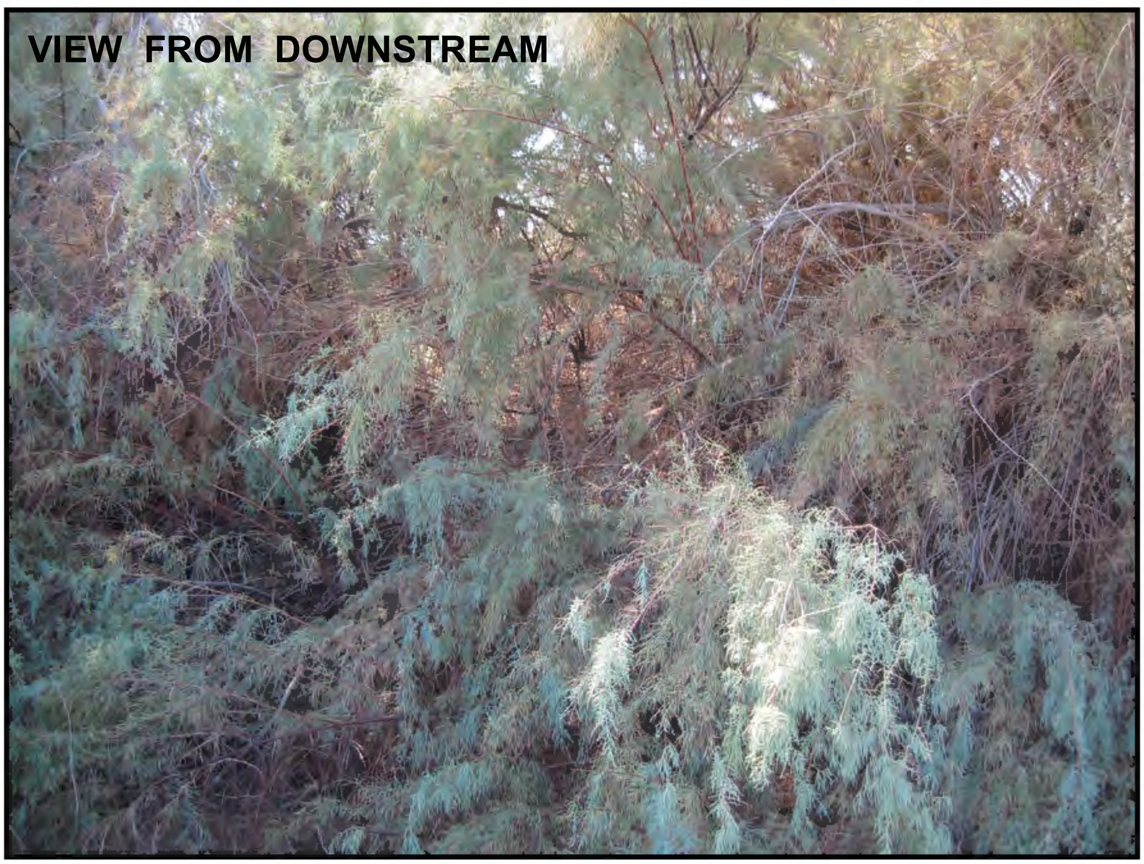

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FIGURE 11

Riverine Assessment Area R4 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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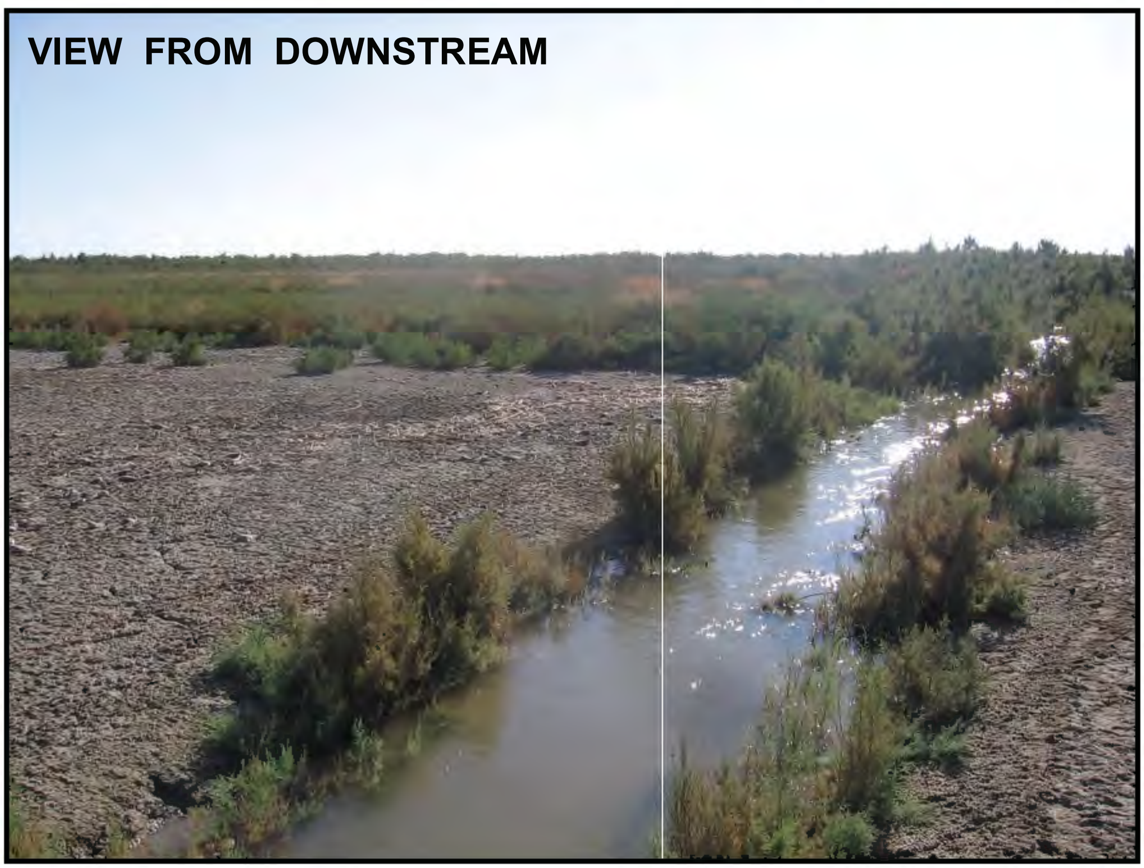

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FIGURE 12

Riverine Assessment Area R5 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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FIGURE 13

Riverine Assessment Area R6 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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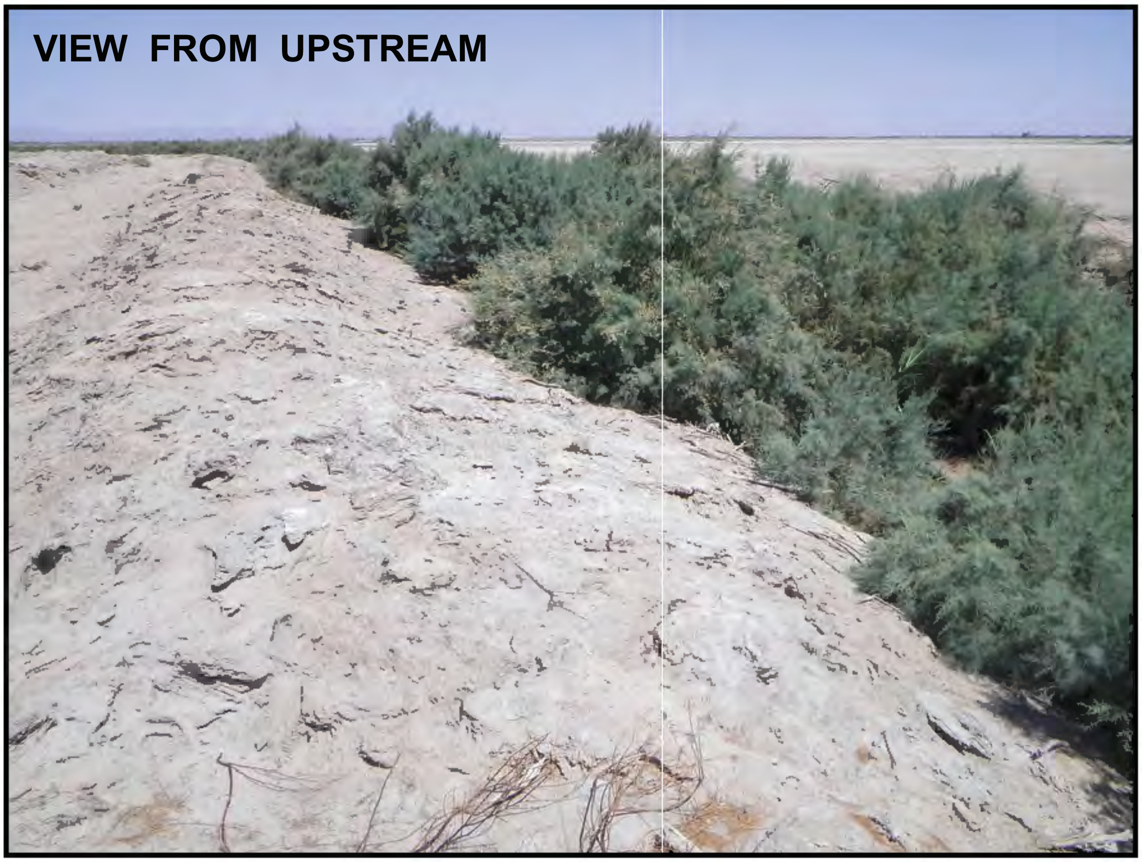

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FIGURE 14

Riverine Assessment Area R7 - Photos

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FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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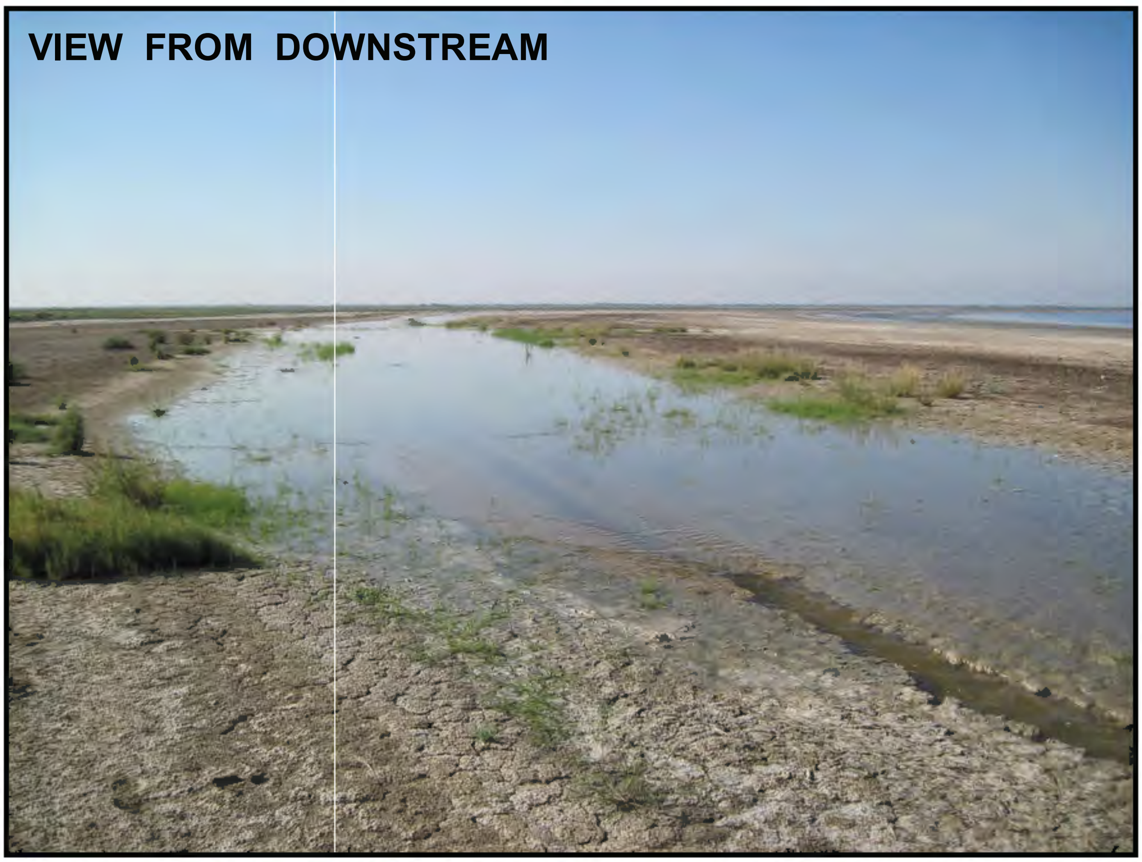

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FIGURE 15

Riverine Assessment Area R8 - Photos

DRAFT CALIFORNIA RAPID ASSESSMENT METHOD REPORT
FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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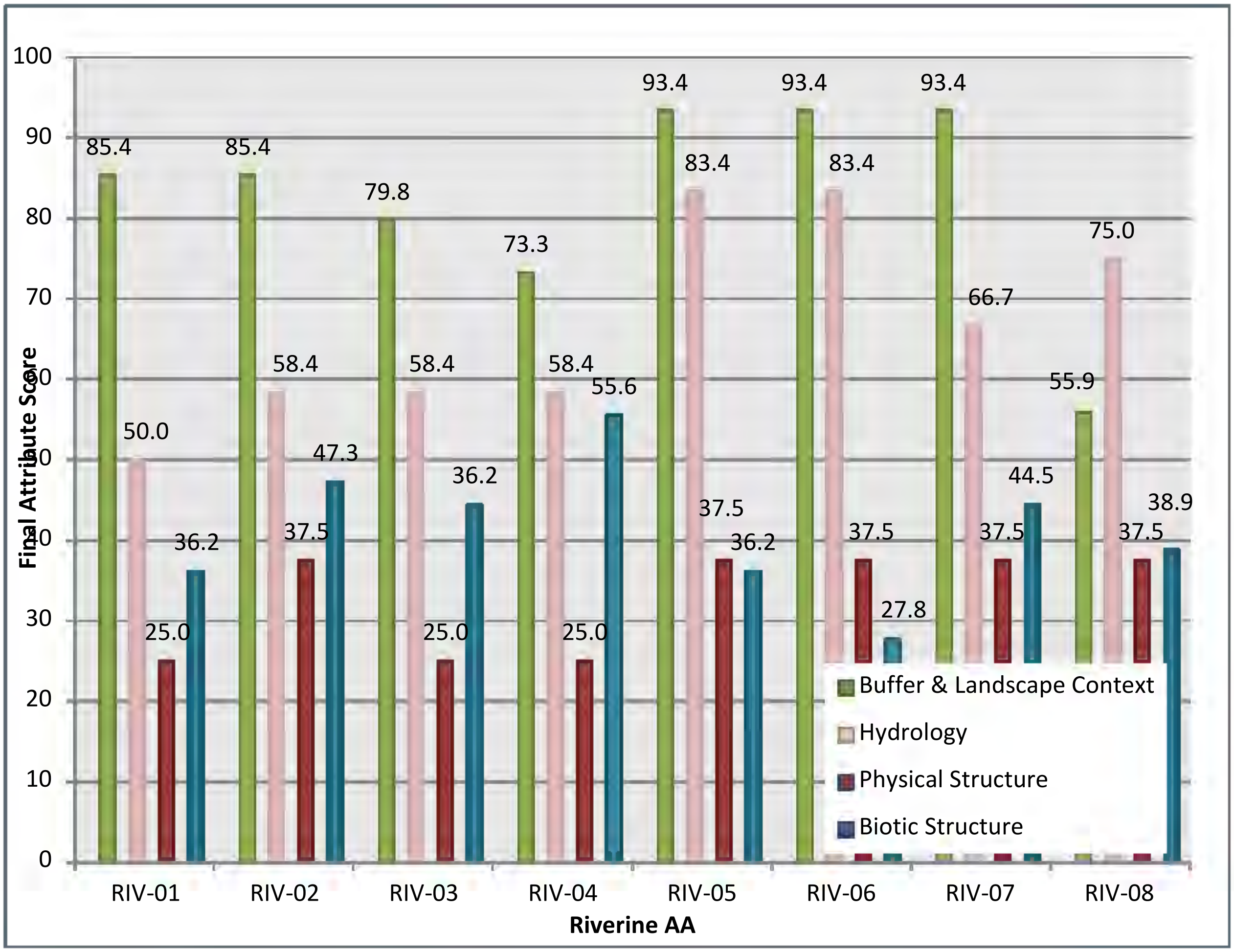
Hydrology: The riverine AAs scored between 50.0 and 83.4 in the Hydrology category, with a combined average of 66.7 (average of 56.3 for the New River and 77.1 for the agricultural drainages). The AAs associated with the New River scored lower than those associated with the agricultural drainages primarily due to lower scores within the hydrologic connectivity metric for the New River AAs.

Physical Structure: The riverine AAs scored low in the Physical Structure category, between 25.0 and 37.5, with a combined average of 32.8 (average of 28.1 for the New River and 37.5 for the agricultural drainages). All of the AAs were similar in structure and lacked patch richness and topographic complexity.

Biotic Structure: The Project is primarily dominated by non-native vegetation with little biotic structural diversity, which is reflected in the scores for this category, which ranged between 27.8 to 55.6. The AAs had a combined average of 40.3 (average of 43.8 for the New River and 36.9 for the agricultural drainages). The highest score is associated with RIV-04 and that is directly related to the higher score recorded for vertical structure. Although the plant species within this AA was composed of 100 percent tamarisk, it was present in three layers: medium, tall, and very tall.

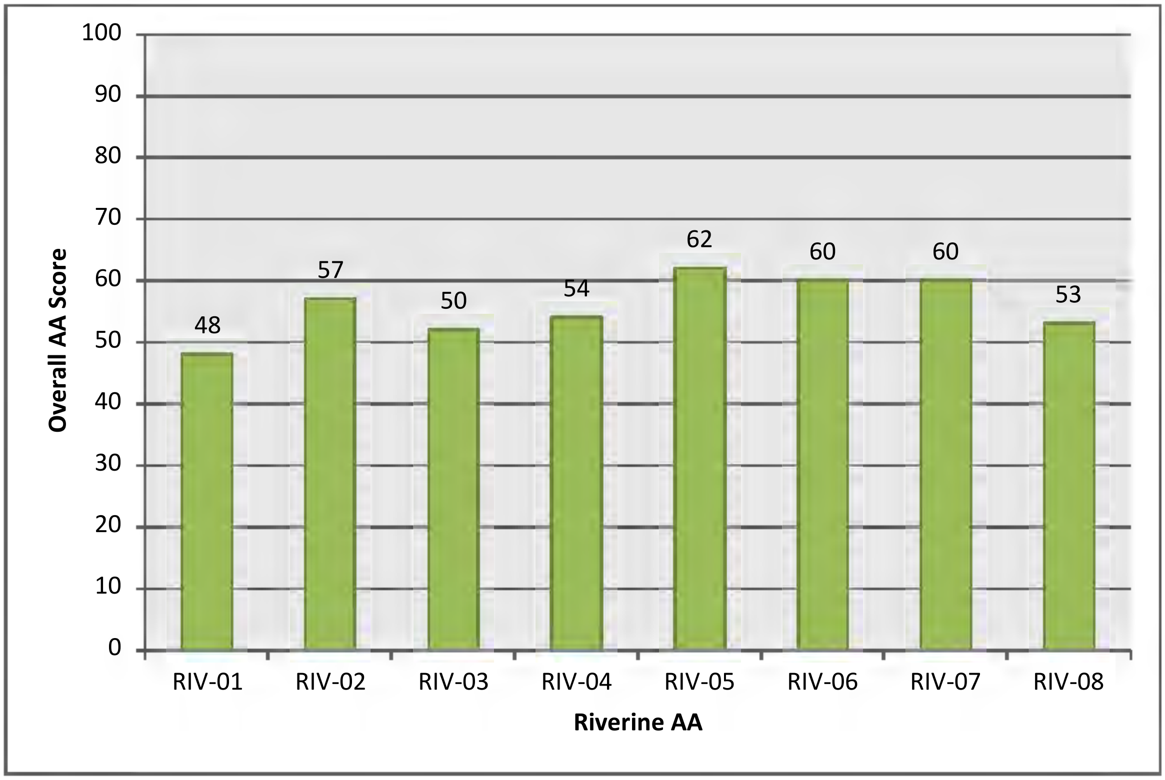
Chart 1 illustrates the final attribute scores for each riverine AA investigated within the Project area.

Chart 1
SCH Riverine Final Attribute Scores



Overall CRAM scores varied from 48 to 62, with RIV05 receiving the highest overall CRAM score and RIV-01 receiving the lowest. Chart 2 illustrates the distribution of overall AA scores for the riverine wetlands investigated within the Project area.

Chart 2
SCH Riverine Overall AA Scores



4.2.2 Lacustrine

The lacustrine AAs follow the same trends as the riverine AAs, scoring higher in Buffer and Landscape Context and Hydrology attributes than the Physical and Biotic Structure attributes.

Buffer and Landscape Connectivity: The lacustrine AAs scored between 72.9 and 93.4 for buffer and landscape connectivity, with a combined average of 84.3. The lowest score was associated with LAC-01 and the highest score was associated with LAC-03.

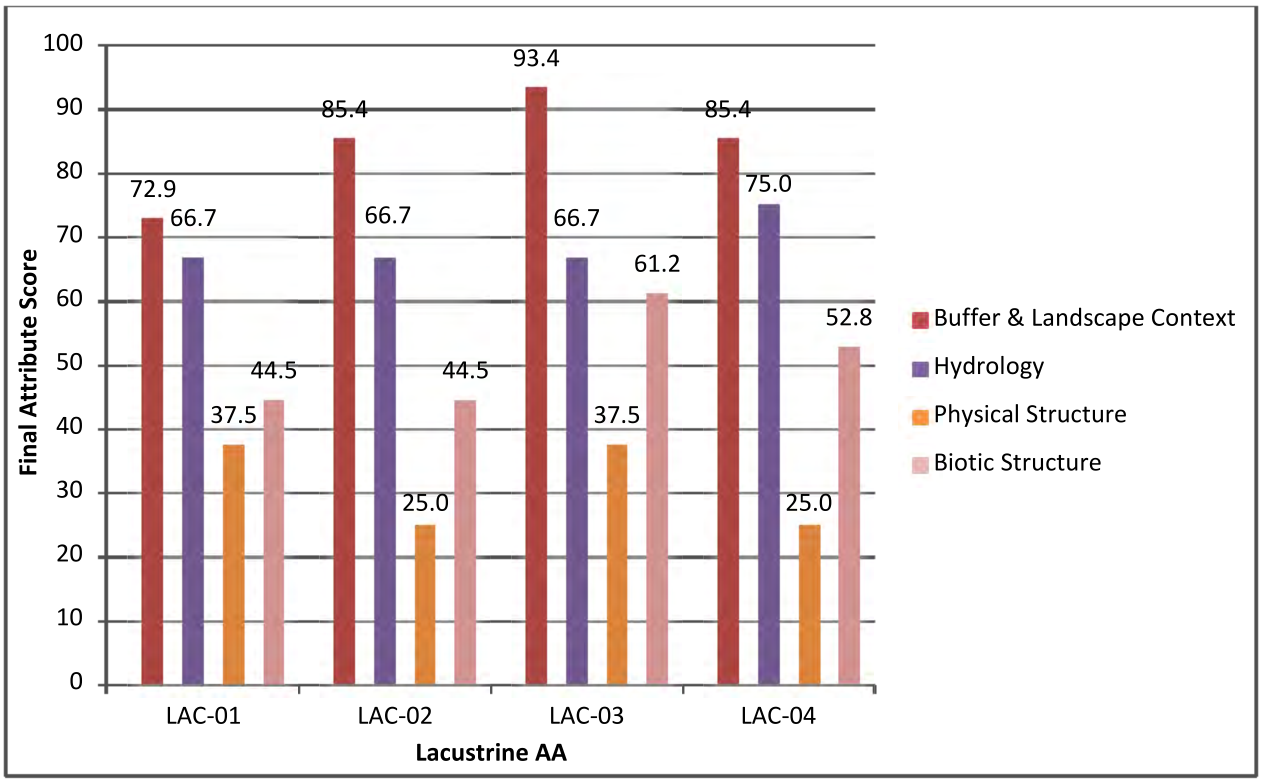
Hydrology: Three of the lacustrine AAs scored 66.7 in the Hydrology category while one, LAC-04, scored 75.0. The hydrologic connectivity metric for LAC-04 scored higher that the other lacustrine AAs, thus resulting in a higher overall score. The combined average Hydrology attribute score was 68.8.

Physical Structure: The lacustrine AAs scored low in the Physical Structure category, 37.5 for LAC-01 and LAC-03 and 25.0 for LAC-02 and LAC-04. All of the AAs were similar in structure and lacked patch richness and topographic complexity. The combined average Physical Structure attribute score was 31.3.

Biotic Structure: The Project area is primarily dominated by non-native vegetation with little biotic structural diversity, which is reflected in the scores for this category, which ranged between 44.5 to 61.2. The combined average Biotic Structure attribute score was 50.8.

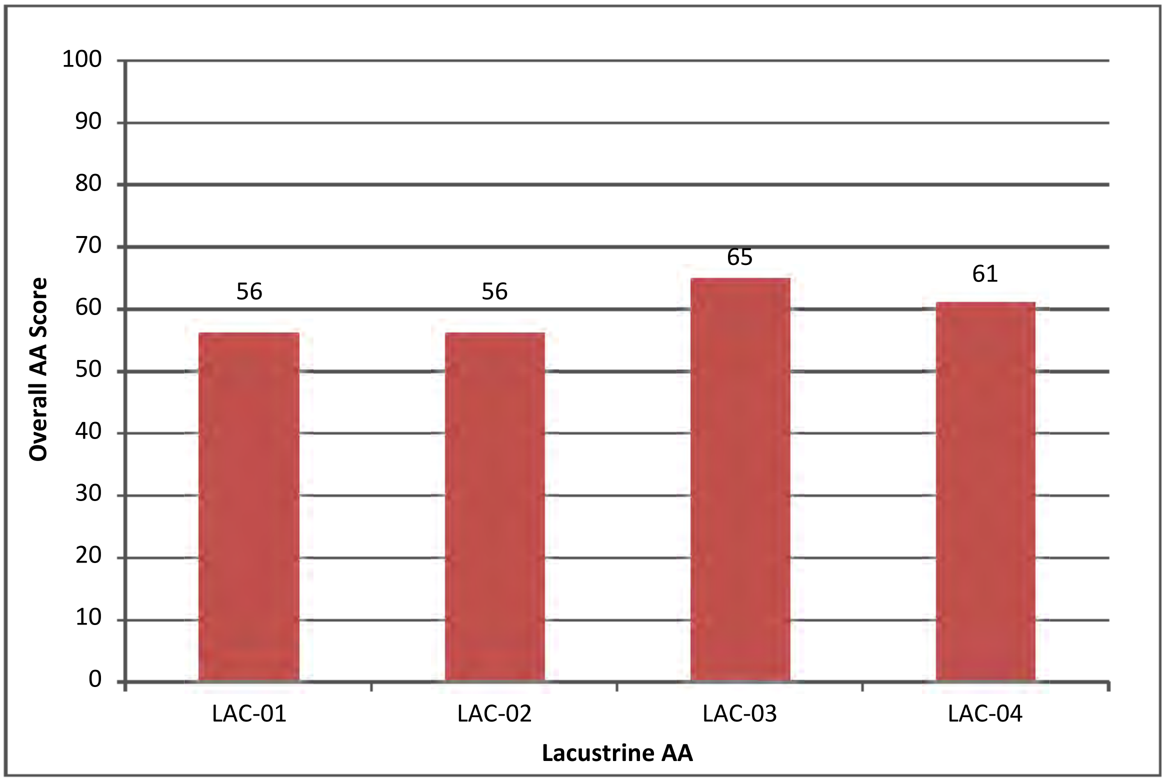
Chart 3 illustrates the final attribute scores for each lacustrine AA investigated within the Project area.

Chart 3
Lacustrine Final Attribute Scores



LAC-03 scored the highest overall CRAM score, while LAC-01 and LAC-02 scored the lowest overall CRAM score. Overall, the scores between the four lacustrine AAs were very similar. Chart 4 illustrates the distribution of overall lacustrine AA scores for the waters investigated within the SCH Project study area.

Chart 4
Lacustrine Overall AA Scores



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5.0 PREDICTION OF POST-PROJECT FUNCTIONS AND SERVICES

Dudek conducted a CRAM Forecast Analysis to compare the functions and services of the wetland and riparian habitat associated with the Salton Sea and tributary drainages between the pre-construction condition and the forecasted post-construction condition for the SCH Project.

The purpose of the CRAM Forecast Analysis is to determine the functional condition of wetlands within the SCH Project area relative to the baseline conditions. Dudek used the most recent version of the CRAM (version 5.0.2) for both the Existing Conditions and Post-Project Forecast Analysis.

Dudek evaluated the lacustrine and riparian areas in the context of the proposed design concept for the Project. One additional AA was evaluated in the Forecast Analysis than was done for the existing conditions CRAM (nine riverine AAs instead of eight) to add an AA into a proposed restoration area that is currently an abandoned agricultural field. The boundaries and conditions of the four AAs along the New River remain unchanged in the post-Project forecast. The boundaries of the other eight AAs (four riverine and four lacustrine) had to be modified and shifted or relocated to fit within the post-Project design (Figure 16). The AAs that were shifted or relocated were repositioned in areas that were considered functionally similar to the locations of the AAs in the pre-Project assessment, and are considered to represent the range of ecological conditions within the SCH Project. Dudek reviewed the pre-Project CRAM data sheets to ensure that the post-Project AAs were representative.

Dudek made several assumptions to conduct the Forecast Analysis. The Forecast Analysis evaluated the site from the perspective of the functions and services expected or anticipated after the passage of several years following Project construction to allow for the passive reestablishment of vegetation in the Project area following the large-scale disturbances resulting from construction. Extensive lacustrine areas are currently barren, lacking any vegetation at all, and that condition is expected to remain following Project construction. Because of this, the areas chosen for the post-Project AAs may or may not be locations where vegetation ultimately develops. Additional assumptions included that the hydrologic conditions (water source) of the drainage basin would remain essentially the same between the pre-Project condition and the post-Project condition, and that the attributes of AAs not directly affected by the proposed Project would remain essentially the same.

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SOURCE: Imagery, USDA NAIP, 2009

FIGURE 16

Assessment AreasPost-Project Forecast Overview Map

DRAFT CALIFORNIA RAPID ASSESSMENT METHOD REPORT FOR THE SALTON SEA SPECIES CONSERVATION HABITAT PROJECT

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6.0 DISCUSSION OF RESULTS

6.1 Pre-Project Baseline CRAM

In general, the CRAM analysis revealed that both the riverine AAs and the lacustrine AAs are very similar in scoring trends, with high Buffer and Landscape Context scores, moderate Hydrology scores, and lower Physical and Biotic Structure scores.

6.1.1 Riverine AAs

Buffer and Landscape Context: The sites chosen for the assessment typically had good Buffer and Landscape Context attribute scores, which meant that buffers were present and there were little to no buffer interruptions (e.g., paved roads, developments) within the 250-meter and 500-meter study areas. Unpaved access roads were present near some of the assessment areas, but overall the AAs had medium to high scores for Buffer and Landscape Context. Within all of the AAs, the buffer and landscape connectivity was suitable for wildlife movement. Each of the AAs contained a large assemblage of non-native vegetation, which resulted in a low to moderate Buffer Condition score. The low to moderate scores for Buffer Condition was the most significant factor that lowered the Buffer and Landscape Context attribute score for the riverine AAs. Relative to the other attributes measured by CRAM, the Buffer and Landscape Context scored the highest.

Hydrology: The agricultural drainages and the New River are distinct in their hydrologic characteristics, which is the primary reason that this attribute has the greatest differential in CRAM scores compared to the other 3 attributes when comparing the New River to the agricultural drainages. The agricultural drainages function to convey irrigation runoff from the adjacent agricultural fields into the Sea and are primarily unnatural drainage courses. These drainages have fluctuating, perennial flow that varies depending on the agricultural uses of the season. The New River is a natural stream course that has been significantly altered to benefit surrounding agricultural uses. The New River is bermed along the both margins within the Project area to prevent flood waters from reaching the adjacent lands. The New River is also perennial and fluctuates seasonally, although it carries a substantially larger volume of water compared to the agricultural drainages. Consequently, the Hydrologic Connectivity metric score was high within the AAs associated with the agricultural drainages, indicating that water that flows through these drainages is able to flow laterally within the floodplain without encountering hillsides, terraces, or other obstructions, whereas the hydrologic connectivity for the New River AAs scored lower because the river is bermed on either side and is therefore constrained to the main channel. Both the New River and the agricultural drainages were indicative of channels approaching equilibrium with few indicators of degradation and/or aggradation, although the relatively stable conditions are largely manufactured with periodic management activities (e.g., dredging and berming).

Physical Structure: The physical structure of the assessment areas are based on physical features (e.g., structural patch types) and the topographic complexity (e.g., variety of elevational gradients) within the waterways. Within all of the AAs, the physical structure consisted of a mostly uniform slope with little to moderate micro-topography resulting in relatively low scores for topographic complexity. Likewise, the drainages exhibit minimal structural patch richness and received very low Patch Richness scores. Overall, the Physical Structure attribute received the lowest scores of any of the CRAM attributes, which is indicative of the extensive management of the New River, as well as unnatural conditions of the agricultural drainages.

Biotic Structure: The Biotic Structure attribute of CRAM measures the biotic structure and architecture of living vegetation and course detritus. In CRAM, individual metrics measure the quantity, quality, and spatial distribution of plant layers, dominant species, and plant zones. The vegetation communities had little biotic structural diversity, both in different types and distribution of vegetation communities and in overlap of tall, medium, and short plant layers. Also, the majority of the AAs were either dominated or co-dominated by non-native vegetation. These features are representative of a highly disturbed ecosystem, which was reflected in the low Biotic Structure attribute scores for both the New River and the agricultural drainages.

6.1.2 Lacustrine AAs

Buffer and Landscape Context: Similar to the riverine AAs, the lacustrine AAs had good Buffer and Landscape Context attribute scores, which meant that buffers were present and there were little to no buffer interruptions (e.g., paved roads, developments) within the 250-meter and 500-meter study areas. Other than a "B" for Landscape Connectivity for AA LAC-01, all AAs received scores of "A" for all metrics besides Buffer Condition. Buffer Condition scored lower due to predominance of non-native vegetation. Relative to the other attributes measured by CRAM, the Buffer and Landscape Context scored the highest.

Hydrology: The Hydrology attribute for the lacustrine AAs scored low to moderate. The low scores for this attribute were largely affected by low scores for the Water Source metric, which measures the freshwater sources that affect the dry season condition. In the case of the Salton Sea, these water sources are predominantly artificial, resulting in a low metric score. The Hydroperiod (i.e., frequency and duration of inundation) and Hydrologic Connectivity (ability of water to flow into or out of wetland) metrics had moderate scores. Features that affected the Hydroperiod and Hydrologic Connectivity scores were unnatural filling or inundation and limited lateral movement of flood waters due to constructed berms and elevated access roads. Relative to the other three attribute scores, the average Hydrology attribute scored the second highest after Buffer and Landscape Context.

Physical Structure: The lacustrine AAs are on the shore of the Sea, which is often mostly barren and relatively flat. Consequently, the physical structure characteristics within the lacustrine AAs were minimal. For example, there are minimal structural patch types and only minor elevational gradients along the shore. The lack of physical structure is related to the seasonal variation in the water level of the Sea as well as the continued decline of the water level, which leaves behind previously submerged land along the shore. Overall, the Physical Structure attribute received the lowest scores of any of the CRAM attributes.

Biotic Structure: As described previously, the lacustrine AAs are on the shore of the Sea, which is mostly barren. Thus, the Biotic Structure attribute scores are low. Further, there are large swaths of the shore that could not be evaluated with CRAM because they did not support at least 5 percent cover of vegetation. Within the areas that did have at least 5 percent vegetated cover, the biotic structural diversity was minimal. There was little overlap of plant layers, few vegetation communities/complexes, few dominant species, and the dominant species was often invasive. Compared to the other three attributes, the average scores of the Biotic Structure attribute were the second lowest.

6.2 Post-Project CRAM Score Prediction

Similar to the CRAM analysis for existing conditions, the post-Project forecast predicts that the riverine AAs and the lacustrine AAs are generally similar in scoring trends. The forecast shows high Buffer and Landscape Context scores, moderate Hydrology scores, and lower Physical and Biotic Structure scores. With the exception of the four AAs on the New River, which remain unchanged, all the AAs had to be relocated and reconfigured due to Project construction that will significantly alter the landscape. In addition, a ninth riverine AA was placed in an area that is currently an abandoned agricultural field that will be revegetated to create habitat to replace permanent impacts to habitat after the Project is built. This new AA is forecasted to have similar conditions to the existing AAs.

6.2.1 Riverine AAs

Buffer and Landscape Context: The assessment sites have good Buffer and Landscape Context attribute scores, which means that buffers will be present and there will be little to no buffer interruptions (e.g., paved roads, developments) within the 250-meter and 500-meter study areas. Unpaved access roads will be present near some of the assessment areas, but overall the AAs are expected to have medium to high scores for Buffer and Landscape Context. Within all of the AAs, the buffer and landscape connectivity is presumed to be suitable for wildlife movement. Each of the AAs is assumed to contain a large assemblage of non-native vegetation, primarily salt cedar, which results in a low to moderate Buffer Condition score. The low to moderate scores for Buffer Condition is the most significant factor that lowers the Buffer and Landscape Context attribute score for the riverine AAs. Relative to the other attributes measured by CRAM, the Buffer and Landscape Context scores are the highest.

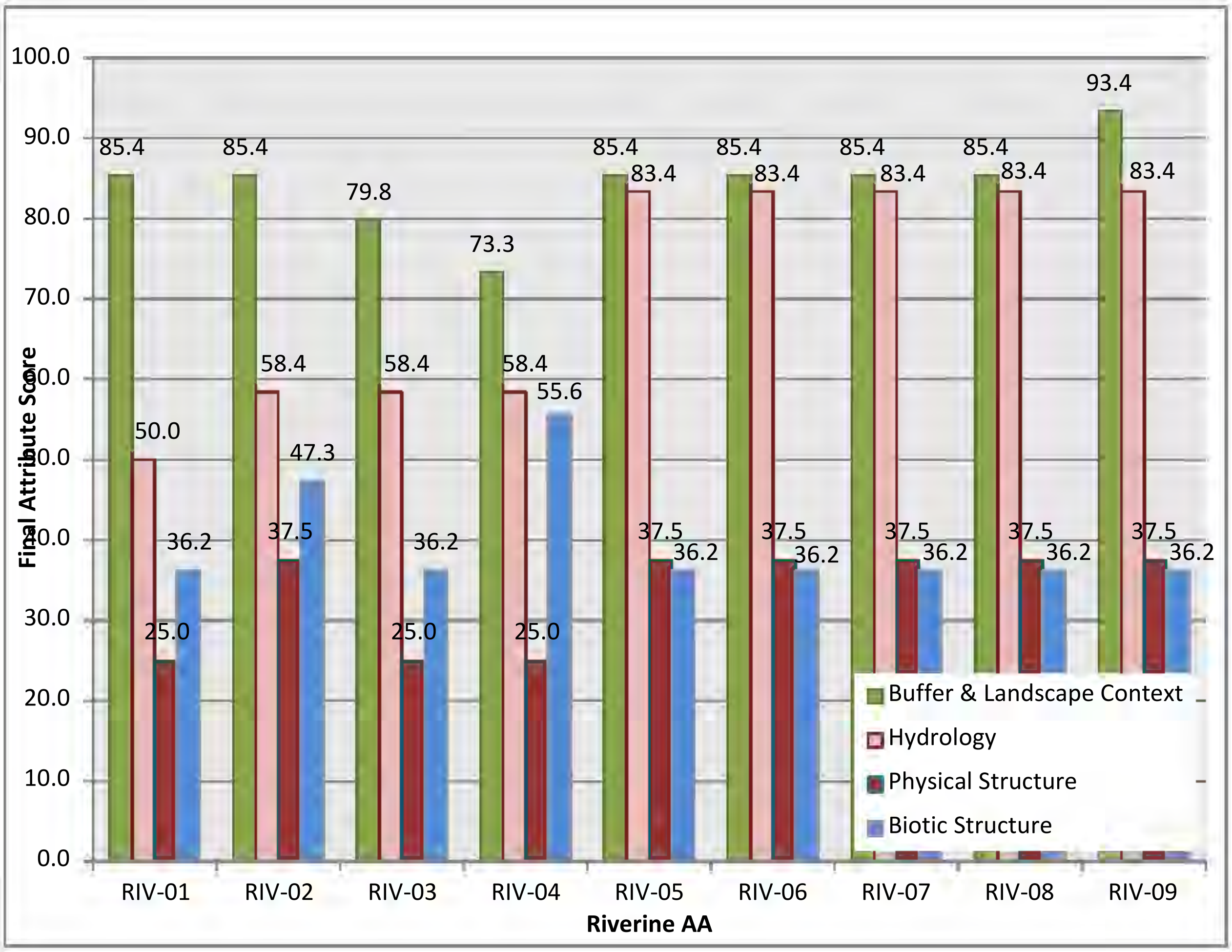
Hydrology: The agricultural drainages and interceptor ditches, when compared to the New River, are distinct from each other in their hydrologic characteristics. The functions and services of the wetlands habitats associated with the New River will remain essentially unchanged. However, the interception ditch will be a new feature that functionally replaces the former agricultural drainages. The interception ditch will convey agricultural runoff around the ponds and into the Sea. It is anticipated that the hydrologic characteristics of the interception ditch will be similar to the agricultural drainages, with fluctuating, perennial flow that varies depending on the agricultural uses of the season, and the drainages being largely manufactured with periodic management activities (e.g., dredging and berming).

Physical Structure: The physical structure of the assessment areas is based on physical features (e.g., structural patch types) and the topographic complexity (e.g., variety of elevational gradients) within the waterways. Within all of the AAs, the physical structure is forecasted to consist of mostly uniform slopes with little micro-topography resulting in low scores for topographic complexity. Likewise, the drainages are forecasted to exhibit minimal structural patch richness and receive low Patch Richness scores. Overall, the Physical Structure attribute receives the lowest scores of any of the CRAM attributes, as is the case with the existing conditions, which is indicative of the extensive management of the New River, as well as unnatural conditions of the agricultural drainages and interceptor ditches.

Biotic Structure: The vegetation communities are forecasted to have little biotic structural diversity, both in different types and distribution of vegetation communities and in overlap of tall, medium, and short plant layers. Also, the majority of the AAs are expected to either be dominated or co-dominated by non-native vegetation. These features are representative of a highly disturbed ecosystem, which is reflected in the low Biotic Structure attribute scores forecasted for both the New River and the agricultural drainages.

Chart 5 illustrates the post-Project forecast final attribute scores for each riverine AA investigated within the Project area.

Chart 5
Final Riverine AA Attribute Scores



Like the existing conditions CRAM, overall predicted post-Project CRAM scores varied from 48 to 62, with RIV-09 receiving the highest overall CRAM score, and RIV-01 receiving the lowest. Chart 6 illustrates the distribution of overall AA scores for the post-Project forecast riverine wetlands investigated within the Project area.

Chart 6
Overall Riverine AA Scores

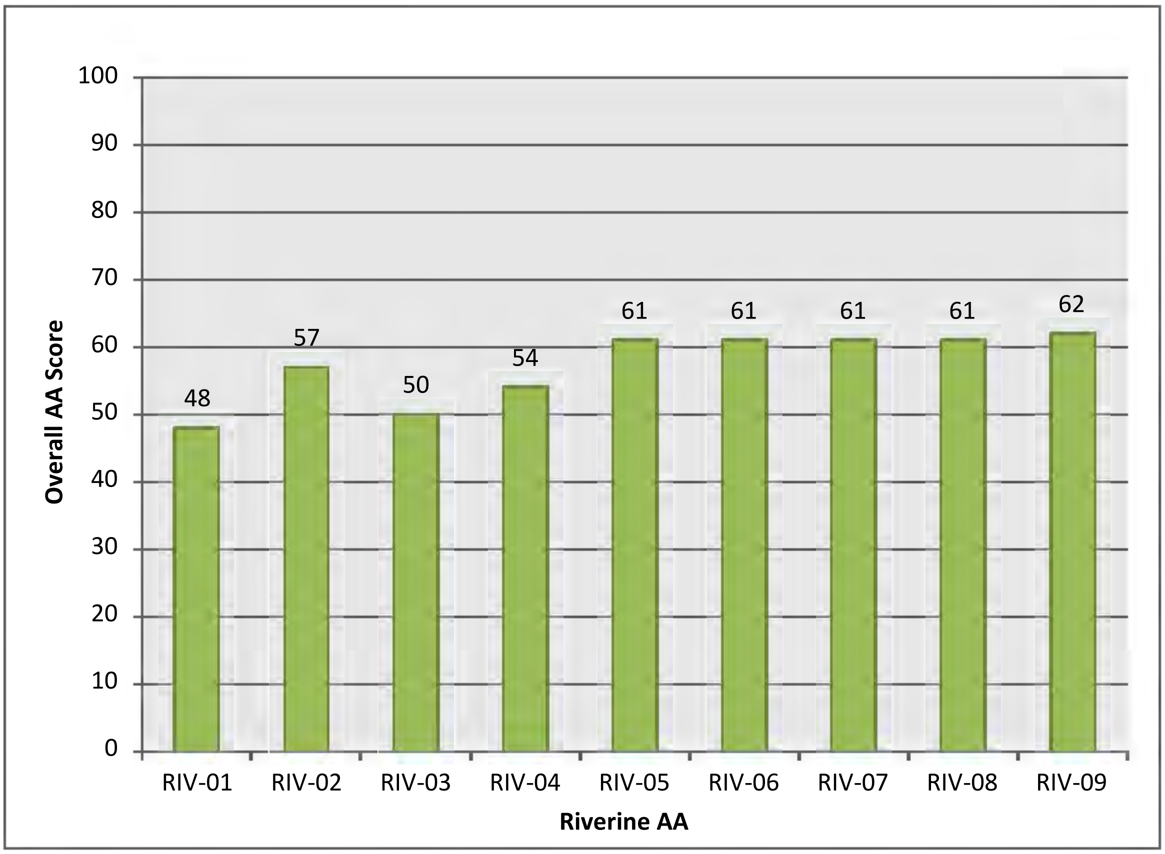


Table 3 shows side-by-side comparisons for the average CRAM attribute scores for both the existing conditions and the forecasted post-Project conditions for the riverine AAs.

Table 3
Comparison of Average CRAM Attribute Scores between the Existing Conditions AAs and the Forecasted Post-Project Riverine AAs

CRAM Attributes	Existing Condition AAs	Forecasted Post-Project AAs
Buffer and Landscape Context	82.5	84.3
Hydrology	66.7	71.4
Physical Structure	32.8	33.3
Biotic Structure	40.3	39.6
Overall Score	56.0	57.2

6.2.2 Lacustrine AAs

Buffer and Landscape Context: Similar to the riverine AAs, the lacustrine AAs are forecasted to have good Buffer and Landscape Context attribute scores because buffers will be present and there will be little to no buffer interruptions (e.g., paved roads, developments) within the 250-meter and 500-meter study areas. Other than a "B" score for Landscape Connectivity for AA LAC-01, all AAs are forecasted to have "A" scores for all metrics besides Buffer Condition. Buffer Condition scores are lower due to the expected predominance of non-native vegetation. Relative to the other attributes measured by CRAM, the Buffer and Landscape Context is forecasted to score the highest.

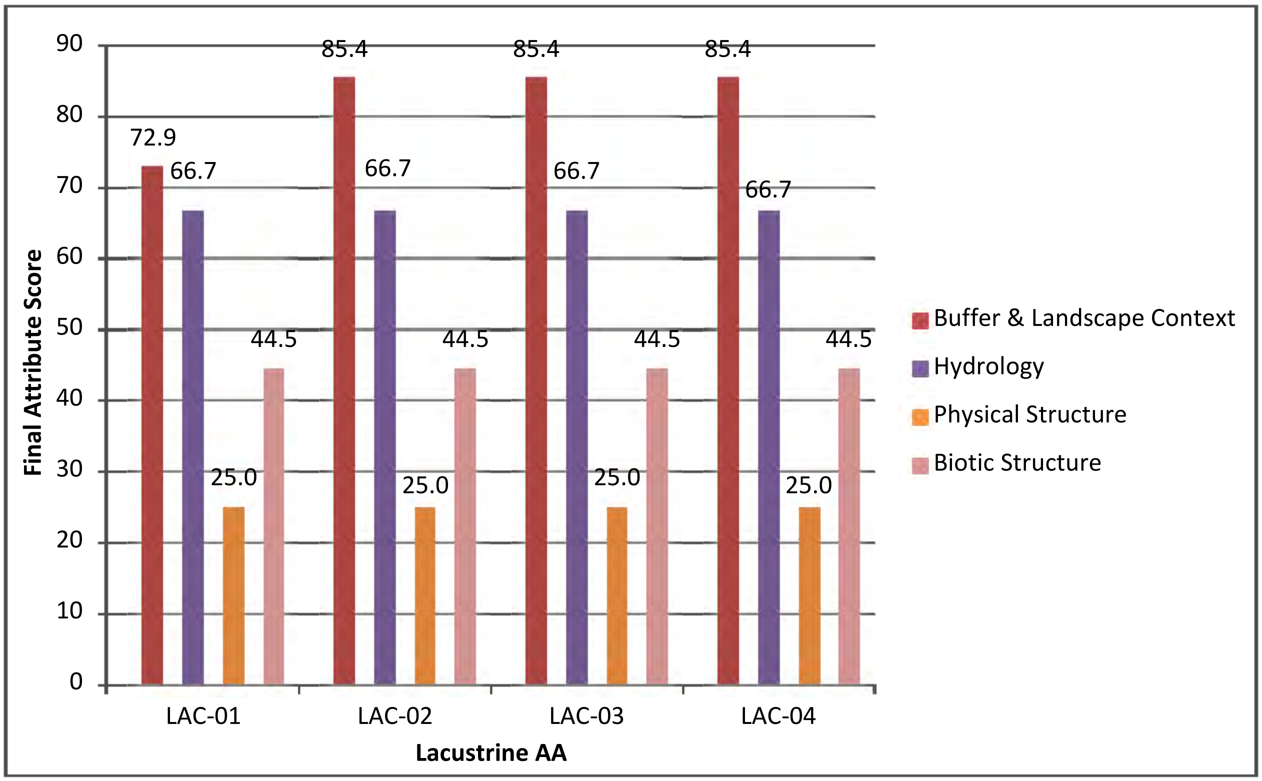
Hydrology: The Hydrology attribute for the lacustrine AAs is forecasted to score low to moderate. The low scores for this attribute are largely affected by low scores for the Water Source metric, which are expected to remain predominantly artificial, resulting in a low metric score. The Hydroperiod (i.e., frequency and duration of inundation) and Hydrologic Connectivity (ability of water to flow into or out of wetland) metrics are forecasted to have moderate scores. Features that affect the forecasted Hydroperiod and Hydrologic Connectivity scores are the unnatural filling or inundation and limited lateral movement of flood waters due to constructed berms and elevated access roads. Relative to the other three attribute scores, the average Hydrology attribute is forecasted to score the second highest after Buffer and Landscape Context.

Physical Structure: The lacustrine AAs are on the shore of ponds, which are anticipated to be mostly barren and relatively flat. Consequently, the physical structure characteristics within the lacustrine AAs are forecasted to remain minimal. The lack of physical structure is forecasted to remain due to the flatness of the land and the engineered, constructed nature of the ponds. Overall, the Physical Structure attribute received the lowest scores of any of the CRAM attributes.

Biotic Structure: As described previously, the lacustrine AAs are on the shore of ponds, which are anticipated to be mostly barren, with emergent vegetation establishing in suitable micro-habitats. The establishing vegetation is anticipated to be similar to what occurs on site now, with little overlap of plant layers, few vegetation communities/complexes, few dominant species, and a substantial presence of invasive species. Compared to the other three attributes, the average scores of the Biotic Structure attribute is forecasted to remain the second lowest.

Chart 7 illustrates the final attribute scores for each lacustrine post-Project forecast AA investigated within the Project area.

Chart 7
Final Lacustrine AA Attributes Score



LAC-01 scored the lowest overall CRAM score at 53, while LAC-02, LAC-03, and LAC-04 all scored slightly higher overall post-Project forecast CRAM scores at 56. Overall, the scores between the four lacustrine post-Project forecast AAs were very similar. Chart 8 illustrates the distribution of overall lacustrine post-Project forecast AA scores for the waters investigated within the SCH Project study area.

Chart 8
Overall Lacustrine AA Scores

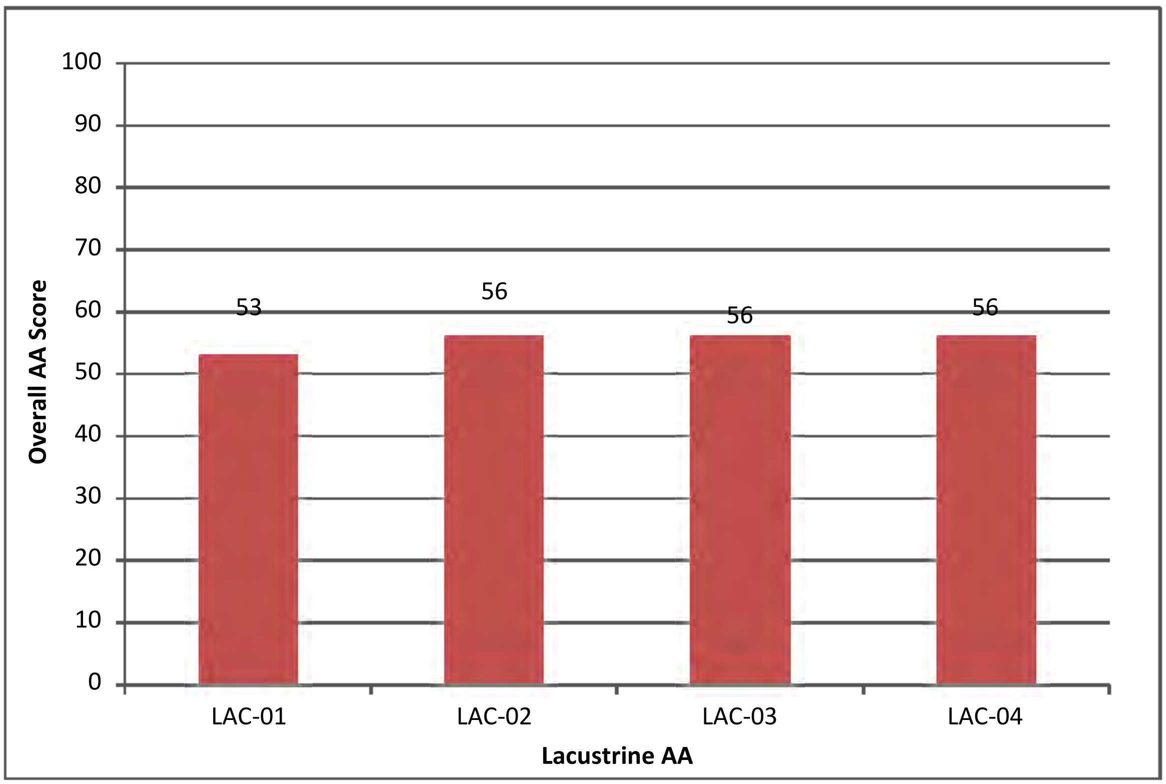


Table 4 shows side-by-side comparisons for the average CRAM attribute scores for both the existing conditions and the forecasted post-Project conditions for the lacustrine AAs.

Table 4
Comparison of Average CRAM Attribute Scores between the Existing Conditions AAs and the Forecasted Post-Project Lacustrine AAs

CRAM Attributes	Existing Conditions AAs	Forecasted Post-Project AAs
Buffer and Landscape Context	84.3	82.3
Hydrology	68.8	66.7
Physical Structure	31.3	25.0
Biotic Structure	50.8	44.5
Overall Score	60.0	55.0

7.0 CONCLUSIONS

This assessment provides the baseline conditions of the vegetated wetlands and waters that will be impacted by the proposed Project and a comparison to the predicted conditions after Project construction. Based on the results of the baseline and forecast conditional assessments, Dudek believes the proposed SCH Project is adequate to compensate for the loss of functions and services. Results of the Forecast Analysis indicate similar functions and services of wetland habitats would result from the proposed design. For the vegetated areas, the results of the CRAM assessment indicate generally similar conditions. The riverine AA overall scores show a slight improvement in average overall score from 56 to 57.2, while the lacustrine AA overall scores show a slight decrease in score from 60 to 55. The slight decrease in the overall average lacustrine score is primarily a result of a predicted slightly lower functional condition of physical and biotic structure within the context of the managed ponds. However the decline is negligible, and is within the error precision tolerance for CRAM (e.g., 10 percent for overall index scores and 5 percent for individual attribute scores). Further, the ponds and associated shorelines are anticipated to provide much greater biologic functions and services (including functions and services specific to wildlife not measured by CRAM) for the target wildlife species as described in the EIS/EIR and HMMP compared to the current condition or future condition absent the SCH Project.

While a comparison has been made in this report to the future conditions of the vegetated portions of the proposed Project, the post-Project conditions will result in substantial reconfiguration of the land to develop the ponds. Therefore, several AA locations had to be relocated in order to evaluate the post-Project condition in accordance with the CRAM protocols. Thus, the results of the comparative analysis between pre-Project and post-Project conditions should not be compared on an AA by AA basis, but rather on an average condition of the AAs for each wetland classification. Acknowledging this fact, the CRAM assessment AAs were established in areas to measure the full range of ecological conditions. Resulting scores for each wetland class tend to lack extensive variability, indicating that the ecological conditions of the wetland classes in the study area are very similar.

Although the open water and mudflats could not be evaluated with CRAM, the ecological functions and services of these areas were evaluated qualitatively within the HMMP (DWR and DFG 2012). The proposed Project involves constructing ponds to provide a measure against the loss of fish and wildlife dependent on the Salton Sea. The existing aquatic areas would otherwise be lost due to the declining water levels of the Sea, or become degraded and incapable of supporting the invertebrate and fish species that many of the wildlife species rely upon. Therefore, it is predicted that the resulting functions and services of the aquatic resources impacted by the proposed Project will be replaced and even increased.

The results of this CRAM analysis, coupled with the primary tenant of the Salton Sea SCH Project as a whole, which is to restore essential aquatic habitats, confirm that there will be no net loss of functions and services of the wetlands and waters due to the implementation of the proposed Project.

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APPENDIX A

CRAM Metric Description

APPENDIX A
CRAM Metric Description

This appendix describes the individual metrics that were used to assess the condition of Buffer and Landscape Context, Hydrologic, Physical Structure, and Biotic Structure attributes of wetlands and riverine areas in the Project area. The metrics described below have been summarized from the *California Rapid Assessment Method (CRAM) for Wetlands*, version 5.0.2, for the riverine classes for easy reference (Collins et al. 2008).

BUFFER AND LANDSCAPE CONTEXT

Landscape Connectivity

Definition: The landscape connectivity of an Assessment Area (AA) is assessed in terms of its spatial association with other areas of aquatic resources, such as other wetlands, lakes, streams, etc. It is assumed that wetlands close to each other have a greater potential to interact ecologically and hydrologically, and that such interactions are generally beneficial.

Table A-1
Rating for Landscape Connectivity for All Wetlands Except Riverine

Rating	Alternative States
A	An average of 76%–100% of the transects is wetland habitat of any kind.
B	An average of 51%–75% of the transects is wetland habitat of any kind.
C	An average of 26%–50% of the transects is wetland habitat of any kind.
D	An average of 0%–25% of the transects is wetland habitat of any kind.

Table A-2
Rating for Landscape Connectivity for Riverine

Rating	Alternative States	Alternative States
A	The combined total length of all non-buffer segments is less than 100 m for wadeable systems (“2-sided” AAs), 50 m for non-wadeable systems (“1-sided” AAs).	The combined total length of all non-buffer segments is less than 100 m for wadeable systems (“2-sided” AAs), 50 m for nonwadeable systems (“1-sided” AAs).
B	Combined length of all non-buffer segments is less than 100 m for “2-sided” AAs, 50 m for “1-sided” AAs.	Combined length of all non-buffer segments is between 100 m and 200 m for “2-sided” AAs; 50 m and 100 m for “1-sided” AAs.
C	Combined length of all non-buffer segments is between 100 m and 200 m for “2-sided” AAs; 50 m and 100 m for “1-sided“ AAs.	Total length of all non-buffer segments is between 100 m and 200 m for “2-sided” AAs; 50 m and 100 m for “1-sided“ AAs.
D	Combined length of non-buffer segments is greater than 200 m for “2-sided” AAs; greater than 100 m for “1-sided” AAs.	Any condition.
	OR	
D	Any condition.	Combined length of non-buffer segments is greater than 200 m for “2-sided” AAs; greater than 100 m for “1-sided” AAs.

Percent of AA with Buffer

Definition: The buffer is the area adjoining the AA that is in a natural or semi-natural state and currently not dedicated to anthropogenic uses that would severely detract from its ability to entrap contaminants, discourage forays into the AA by people and non-native predators, or otherwise protect the AA from stress and disturbance.

Table A-3
Rating for Percent of AA with Buffer

Rating	Alternative States (not including open water areas)
A	Buffer is 75%–100% of AA perimeter.
B	Buffer is 50%–74% of AA perimeter.
C	Buffer is 25%–49% of AA perimeter.
D	Buffer is <25% of AA perimeter.

Average Buffer Width

Definition: The average width of the buffer adjoining the AA is estimated by averaging the lengths of straight lines drawn at regular intervals around the AA from its perimeter outward to the nearest non-buffer land cover at least 30 m wide, or to a maximum distance of 250 m, whichever is first encountered. It is assumed that the functions of the buffer do not increase significantly beyond an average width of about 250 m. The maximum buffer width is therefore 250 m. The minimum buffer width is 5 m, and the minimum length of buffer along the perimeter of the AA is also 5 m. Any area that is less than 5 m wide and 5 m long is assumed to be too small to provide buffer functions.

Table A-4
Rating for Average Buffer Width

Rating	Alternative States
A	Average buffer width is 190–250 m.
B	Average buffer width 130–189 m.
C	Average buffer width is 65–129 m.
D	Average buffer width is 0–64 m.

Buffer Condition

Definition: The condition of a buffer is assessed according to the extent and quality of its vegetation cover and the overall condition of its substrate. Evidence of direct impacts by people are excluded from this metric and included in the Stressor Checklist. Buffer conditions are assessed only for the portion of the wetland border that has already been identified or defined as buffer.

Table A-5
Rating for Buffer Condition

Rating	Alternative States
A	Buffer for AA is dominated by native vegetation, has undisturbed soils, and is apparently subject to little or no human visitation.
B	Buffer for AA is characterized by an intermediate mix of native and non-native vegetation, but mostly undisturbed soils, and is apparently subject to little or no human visitation.
C	Buffer for AA is characterized by substantial amounts of non-native vegetation AND there is at least a moderate degree of soil disturbance/compaction, and/or there is evidence of at least moderate intensity of human visitation.
D	Buffer for AA is characterized by barren ground and/or highly compacted or otherwise disturbed soils, and/or there is evidence of very intense human visitation.

HYDROLOGY

Water Source

Definition: Water Sources directly affect the extent, duration, and frequency of saturated or ponded conditions within an Assessment Area. Water Sources include inputs of water into the AA as well as any diversions of water from the AA. Diversions are considered a water source because they affect the ability of the AA to function as a source of water for other habitats while also directly affecting the hydrology of the AA.

Table A-6
Rating for Water Source

Rating	Alternative States
A	Freshwater sources that affect the dry season condition of the AA, such as its flow characteristics, hydroperiod, or salinity regime, are precipitation, groundwater, and/or natural runoff, or natural flow from an adjacent freshwater body, or the AA naturally lacks water in the dry season. There is no indication that dry season conditions are substantially controlled by artificial water sources.
B	Freshwater sources that affect the dry season condition of the AA are mostly natural, but also obviously include occasional or small effects of modified hydrology. Indications of such anthropogenic inputs include developed land or irrigated agricultural land that comprises less than 20% of the immediate drainage basin within about 2 km upstream of the AA, or that is characterized by the presence of a few small stormdrains or scattered homes with septic systems. No large point sources or dams control the overall hydrology of the AA.
C	Freshwater sources that affect the dry season conditions of the AA are primarily urban runoff, direct irrigation, pumped water, artificially impounded water, water remaining after diversions, regulated releases of water through a dam, or other artificial hydrology. Indications of substantial artificial hydrology include developed or irrigated agricultural land that comprises more than 20% of the immediate drainage basin within about 2 km upstream of the AA, or the presence of major point source discharges that obviously control the hydrology of the AA. OR Freshwater sources that affect the dry season conditions of the AA are substantially controlled by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from its drainage basin.
D	Natural, freshwater sources that affect the dry season conditions of the AA have been eliminated based on the following indicators: impoundment of all possible wet season inflows, diversion of all dry-season inflow, predominance of xeric vegetation, etc.

Hydroperiod or Channel Stability

Definition: Hydroperiod is the characteristic frequency and duration of inundation or saturation of a wetlands during a typical year. The natural hydroperiod for estuarine wetlands is governed by the tides, and includes predictable variations in inundation regimes over days, weeks, months, and seasons. Depressional, lacustrine, playas, and riverine wetlands typically have daily variations in water height that are governed by diurnal increases in evapotranspiration and seasonal cycles that are governed by rainfall and runoff. Seeps and springs that depend on groundwater may have relatively slight seasonal variations in hydroperiod.

Channel stability only pertains to riverine wetlands. It's assessed as the degree of channel aggradation (i.e., net accumulation of sediment on the channel bed causing it to rise over time), or degradation (i.e., net loss of sediment from the bed causing it to be lower over time). There is much interest in channel entrenchment (i.e., the inability of flows in a channel to exceed the channel banks) and this is addressed in the Hydrologic Connectivity metric.

Table A-7a
Rating for Hydroperiod for Depressional, Lacustrine, Playas, and Slope Wetlands

Rating	Alternative States
A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
D	Both the inundation and drawdown of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

Table A-7b
Rating for Riverine Channel Stability

Rating	Alternative States
A	Most of the channel through the AA is characterized by equilibrium conditions, with little evidence of aggradation or degradation (based on the field indicators listed in worksheet).
B	Most of the channel through the AA is characterized by some aggradation or degradation, none of which is severe, and the channel seems to be approaching an equilibrium form (based on the field indicators listed in worksheet).
C	There is evidence of severe aggradation or degradation of most of the channel through the AA (based on the field indicators listed in worksheet), or the channel is artificially hardened through less than half of the AA.
D	The channel is concrete or otherwise artificially hardened through most of AA.

Hydrologic Connectivity

Definition: Hydrologic Connectivity describes the ability of water to flow into or out of the wetland, or to accommodate rising flood waters without dramatic changes in water level, which can result in stress to wetland plants and animals. This metric pertains only to riverine, estuarine, vernal pool systems, individual vernal pools, depressional, and playas.

Table A-8a
Rating for Hydrologic Connectivity for Non-Confined Riverine Wetlands

Rating	Alternative States
A	Entrenchment ratio is >2.2
B	Entrenchment ratio is 1.9 to 2.2
C	Entrenchment ratio is 1.5 to 1.8
D	Entrenchment ratio is <1.5

Table A-8b
Rating for Hydrologic Connectivity for Confined Riverine Wetlands

Rating	Alternative States
A	Entrenchment ratio is >2.0
B	Entrenchment ratio is 1.6 to 2.0
C	Entrenchment ratio is 1.2 to 1.5
D	Entrenchment ratio is <1.2

Table A-8c
Rating for Hydrologic Connectivity for Estuarine, Depressional, Lacustrine, and Slope Wetlands, Playas, Individual Vernal Pools, and Vernal Pool Systems

Rating	Alternative States
A	Rising water in the wetland that contains the AA has unrestricted access to adjacent areas, without levees or other obstructions to the lateral movement of flood waters.
B	There are unnatural features such as levees or road grades that limit the amount of adjacent transition zone or the lateral movement of flood waters, relative to what is expected for the setting. But, the limitations exist for less than 50% of the boundary of wetland that contains the AA. Restrictions may be intermittent along margins of the wetland, or they may occur only along one bank or shore of the wetland. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
C	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for 50%–90% of the wetland that contains the AA. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
D	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for more than 90% of the wetland that contains the AA.

PHYSICAL STRUCTRURE

Structural Patch Richness

Definition: Patch richness is the number of different obvious types of physical surfaces or features that may provide habitat for aquatic, wetland, or riparian species. This metric is different from topographic complexity in that it addresses the number of different patch types, whereas topographic complexity evaluates the spatial arrangement and interspersion of the types. Physical patches can be natural or unnatural.

Table A-9
Rating for Structural Patch Richness (based on results from worksheets)

Rating	Confined Riverine, Playas, Springs and Seeps, Indiv Vernal Pools	Vernal Pool Systems and Depressional	Estuarine	Nonconfined Riverine, Lacustrine
A	8	11	9	12
B	6–7	8–10	6–8	9–11
C	4–5	5–7	3–5	6–8
D	≤3	≤4	≤2	≤5

Topographic Complexity

Definition: Topographic complexity refers to the variety of elevations within a wetland due to physical, abiotic features, and elevations gradients.

Table A-10a
Rating of Topographic Complexity for Depressional Wetlands, Playas, Individual Vernal Pools, and Slope Wetlands Rating Alternative States

Rating	Alternative States
A	AA as viewed along a typical cross-section has at least two benches or breaks in slope, and each of these benches, plus the slopes between them contain physical patch types or features that contribute to abundant micro-topographic relief or variability as illustrated in profile A of Figure 4.6a (of CRAM v.5).
B	AA has at least two benches or breaks in slope above the middle area or bottom zone of the AA, but these benches and slopes mostly lack abundant micro-topographic relief. The AA resembles profile B (Fig 4.6a).
C	AA lacks any obvious break in slope or bench, and is best characterized has a single slope that has at least a moderate amount of micro-topographic complexity, as illustrated in profile C (Fig 4.6a).
D	AA has a single, uniform slope with little or no micro-topographic complexity, as illustrated in profile D (Fig 4.6a).

Table A-10b
Rating of Topographic Complexity for all Riverine Wetlands Rating Alternative States

Rating	Alternative States
A	AA as viewed along a typical cross-section has at least two benches or breaks in slope, including the riparian area of the AA, above the channel bottom, not including the thalweg. Each of these benches, plus the slopes between the benches, as well as the channel bottom area contain physical patch types or features such as boulders or cobbles, animal burrows, partially buried debris, slump blocks, furrows, or runnels that contribute to abundant micro-topographic relief as illustrated in profile A of Figure 4.6c (of CRAM v.5).
B	AA has at least two benches or breaks in slope above the channel bottom area of the AA, but these benches and slopes mostly lack abundant micro-topographic complexity. The AA resembles profile B of Figure 4.6c (of CRAM v.5).
C	AA has a single bench or obvious break in slope that may or may not have abundant micro-topographic complexity, as illustrated in profile C of Figure 4.6c (of CRAM v.5).
D	AA as viewed along a typical cross-section lacks any obvious break in slope or bench. The cross-section is best characterized as a single, uniform slope with or without micro-topographic complexity, as illustrated in profile D of Figure 4.6c (of CRAM v.5) (includes concrete channels).

BIOTIC STRUCTURE

Plant Community Metric

Definition: The Plant Community metric is composed of three submetrics for each wetland type. Two of these sub-metrics, Number of Co-Dominant Plants and Percent Invasion, are common to all wetland types. For all wetlands except vernal pools and vernal pool systems, the Number of Plant Layers as defined for CRAM is also assessed. For vernal pools and pool systems, the Number of Plant Layers submetric is replaced by the Native Species Richness submetric. A thorough reconnaissance of an AA is required to assess its condition using these submetrics. The assessment for each submetric is guided by a set of Plant Community Worksheets. The Plant Community metric is calculated based on these worksheets.

Table A-11
Ratings for Submetrics of Plant Community Metric

Rating	Number of Plant Layers Present	Number of Co-Dominant Species	Percent Invasion
Lacustrine, Depressional, and Non-confined Riverine Wetlands			
A	4–5	≥ 12	0%–15%
B	3	9–11	16%–30%
C	1–2	6–8	31%–45%
D	0	0–5	46%–100%
Confined Riverine Wetlands			
A	4	≥ 11	0%–15%
B	3	8–10	16%–30%
C	1–2	5–7	31%–45%
D	0	0–4	46%–100%

Horizontal Interspersion and Zonation

Definition: Horizontal biotic structure refers to the variety and interspersion of plant "zones." Plant zones are plant monocultures or obvious multispecies association that are arrayed along gradients of elevation, moisture, or other environmental factors that seem to affect the plant community organization in plan view. Interspersion is essentially a measure of the number of distinct plant zones and the amount of edge between them.

Table A-12a
Rating of Horizontal Interspersion of Plant Zones for all AAs except Riverine and Vernal Pool Systems

Rating	Alternative States
A	AA has a high degree of plan-view interspersion
B	AA has a moderate degree of plan-view interspersion
C	AA has a low degree of plan-view interspersion
D	AA has essentially no plan-view interspersion

Note: Based on Figures 4.7, 4.8, and 4.10 of CRAM v.5.

Table A-12b
Rating of Horizontal Interspersion of Plant Zones for Riverine AAs

Rating	Alternative States
A	AA has a high degree of plan-view interspersion
B	AA has a moderate degree of plan-view interspersion
C	AA has a low degree of plan-view interspersion
D	AA has essentially no plan-view interspersion

Note: Based on Figure 4.9 of CRAM v.5.

Vertical Biotic Structure

Definition: The vertical component of biotic structure consists of the interspersion and complexity of plant layers. The same plant layers used to assess the Plant Community Composition metrics (see Section 4.4.2 of CRAM v.5) are used to assess Vertical Biotic Structure. To be counted in CRAM, a layer must cover at least 5 percent of the portion of the AA that is suitable for the layer. This metric does not pertain to vernal pools, vernal pool systems, or playas.

Table A-13a
Rating of Vertical Biotic Structure for Riverine AAs and for Lacustrine and Depressional AAs supporting Tall or Very Tall plant layers

Rating	Alternative States
A	More than 50% of the vegetated area of the AA supports abundant overlap of plant layers (see Figure 4.11 of CRAM v.5).
B	More than 50% of the area supports at least moderate overlap of plant layers.
C	25%–50% of the vegetated AA supports at least moderate overlap of plant layers, or three plant layers are well represented in the AA but there is little to no overlap.
D	Less than 25% of the vegetated AA supports moderate overlap of plant layers, or two layers are well represented with little overlap, or AA is sparsely vegetated overall.

Note: See Figure 4.11 of CRAM v.5.

Table A-13b
Rating of Vertical Biotic Structure for Wetlands Dominated by Emergent Monocots or Lacking Tall and Very Tall Plant Layers, Especially Estuarine Saline Wetlands

Rating	Alternative States
A	Most of the vegetated plain of the AA has a dense canopy of living vegetation or entrained litter or detritus forming a “ceiling” of cover 10–20 cm above the wetland surface that shades the surface and can provide abundant cover for wildlife.
B	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter as described in “A” above. OR Most of the vegetated plain has a dense canopy but the ceiling it forms is much less than 10–20 cm above the ground surface.
C	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter AND the ceiling it forms is much less than 10–20 cm above the ground surface.
D	Most of the AA lacks a dense canopy of living vegetation or entrained litter or detritus.

Note: See Figure 4.12 of CRAM v.5.

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APPENDIX B

Baseline CRAM Metric Scores – Riverine AAs

APPENDIX B
CRAM Metric Scores – Impact AAs

	RIV-01	RIV-02	RIV-03	RIV-04	RIV-05	RIV-06	RIV-07	RIV-08
Assessment Area Size (acres)	1.96	1.81	1.79	2.21	1.47	1.41	0.41	0.33
Buffer & Landscape Context								
Landscape Connectivity	12	12	12	12	12	12	12	3
Percent AA with Buffer	12	12	12	12	12	12	12	12
Average Buffer Width	12	12	6	9	12	12	12	12
Buffer Condition	6	6	6	3	9	9	9	9
Raw Score	20.5	20.5	19.1	17.6	22.4	22.4	22.4	13.4
Final Score	85.4	85.4	79.8	73.3	93.4	93.4	93.4	55.9
Hydrology								
Water Source	6	6	6	6	6	6	6	6
Hydroperiod/Stability	6	9	9	9	12	12	6	9
Hydrologic Connectivity	6	6	6	6	12	12	12	12
Raw Score	18.0	21.0	21.0	21.0	30.0	30.0	24.0	27.0
Final Score	50.0	58.4	58.4	58.4	83.4	83.4	66.7	75.0
Physical Structure								
Patch Richness	3	3	3	3	3	3	3	3
Topographic Complexity	3	6	3	3	6	6	6	6
Raw Score	6.0	9.0	6.0	6.0	9.0	9.0	9.0	9.0
Final Score	25.0	37.5	25.0	25.0	37.5	37.5	37.5	37.5
Biotic Structure								
Number of Plant Layers	6	9	6	9	6	6	6	6
Co-Dominant Species	3	3	3	3	3	3	3	3
Percent Invasion	3	3	3	3	3	3	3	6
Plant Community Metric	4.0	5.0	4.0	5.0	4.0	4.0	4.0	5.0
Interspersion/Zonation	6	6	6	3	3	3	3	6
Vertical Structure	3	6	3	12	6	3	9	3
Raw Score	13.0	17.0	13.0	20.0	13.0	10.0	16.0	14.0
Final Score	36.2	47.3	36.2	55.6	36.2	27.8	44.5	38.9
Overall AA Score	48	57	50	54	62	60	60	53

*Note: Final scores are calculated by dividing the raw score by the total possible raw score for each attribute. The total possible raw score for each attribute varies and is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, and 36 for Biotic Structure.

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APPENDIX C

Baseline CRAM Metric Scores – Lacustrine AAs

APPENDIX C
CRAM Metric Scores – Preserve AAs

	LAC-01	LAC-02	LAC-03	LAC-04
Assessment Area Size (acres)	4.94	4.94	4.94	4.94
Buffer & Landscape Context				
Landscape Connectivity	9	12	12	12
Percent AA with Buffer	12	12	12	12
Average Buffer Width	12	12	12	12
Buffer Condition	6	6	9	6
Raw Score	17.5	20.5	22.4	20.5
Final Score	72.9	85.4	93.4	85.4
Hydrology				
Water Source	6	6	6	6
Hydroperiod/Stability	9	9	9	9
Hydrologic Connectivity	9	9	9	12
Raw Score	24.0	24.0	24.0	27.0
Final Score	66.7	66.7	66.7	75.0
Physical Structure				
Patch Richness	6	3	3	3
Topographic Complexity	3	3	6	3
Raw Score	9.0	6.0	9.0	6.0
Final Score	37.5	25.0	37.5	25.0
Biotic Structure				
Number of Plant Layers	6	6	6	6
Co-Dominant Species	3	3	3	3
Percent Invasion	3	3	3	12
Plant Community Metric	4.0	4.0	4.0	7.0
Interspersion/Zonation	6	6	12	9
Vertical Structure	6	6	6	3
Raw Score	16.0	16.0	22.0	19.0
Final Score	44.5	44.5	61.2	52.8
Overall AA Score	56	56	65	61

*Note: Final scores are calculated by dividing the raw score by the total possible raw score for each attribute. The total possible raw score for each attribute varies and is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, and 36 for Biotic Structure.

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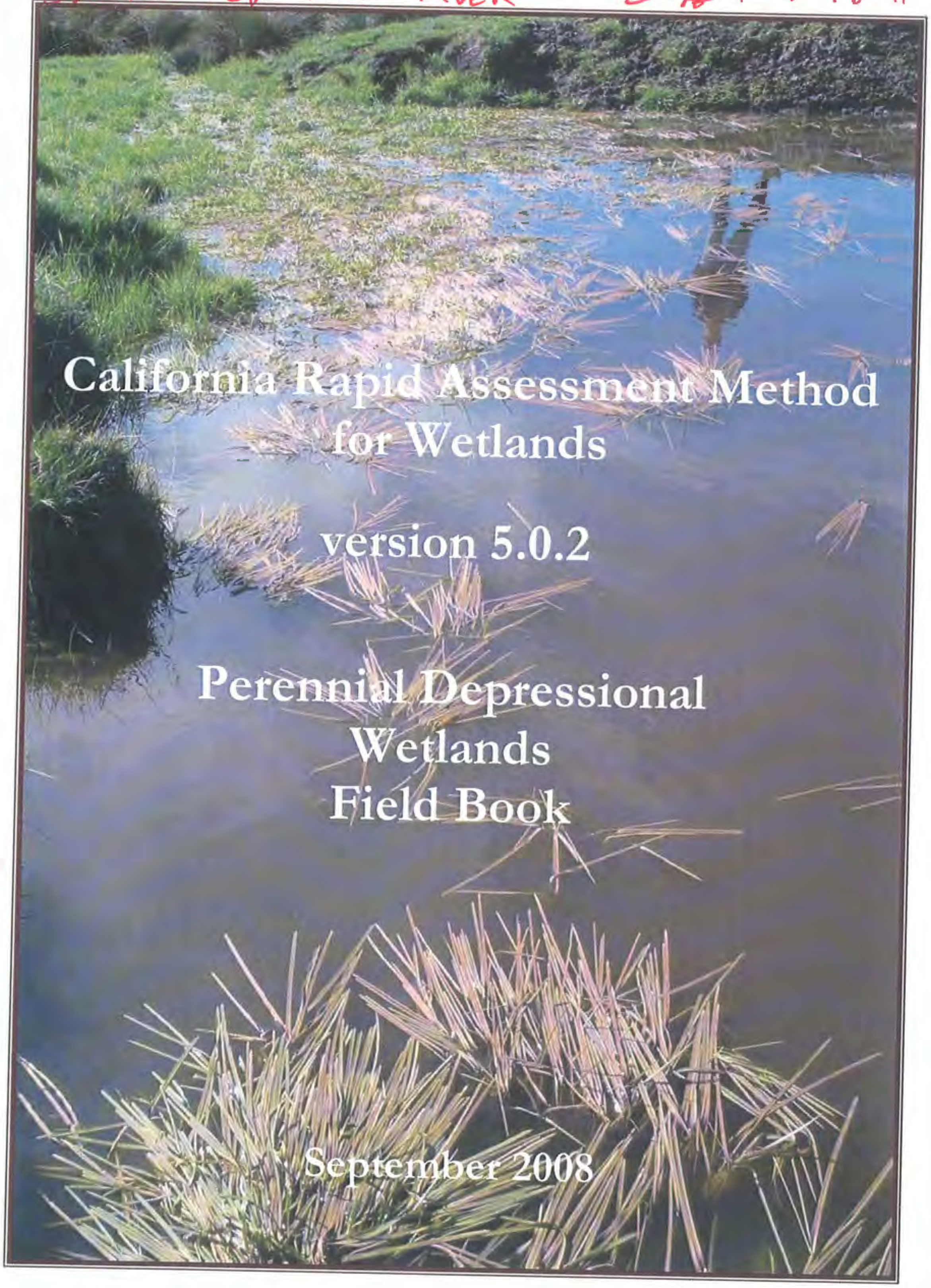
APPENDIX D

CRAM Field Forms

SALTON SEA - NEW RIVER L-1 9-18-11



Basic Information Sheet: Perennial Depressional Wetlands

Your Name: ANDY DOUG STU CHRIS				
Assessment Area Name: L 1				
Assessment No.		**Date (m/d/y)** 8	12	11
Assessment Team Members for This AA				
ANDY DOUG STU CHRIS				

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Which best describes the type of depressional wetland?

☐ freshwater marsh ☐ alkaline marsh ☐ alkali flat ☐ other (specify):

Which best describes the hydrologic state of the wetland at the time of assessment?

☐ ponded/inundated ☒ saturated soil, but no surface water ☐ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

☐ long-duration ☒ medium-duration ☐ short-duration

Does your wetland connect with the floodplain of a nearby stream? ☒ yes ☐ no

Is the topographic basin of the wetland ☒ distinct or ☐ indistinct ?

An *indistinct*, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas, topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes.

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	L1-N	North			
2	L1-S	South			
3	L1-E	East			
4	L1-W	West			
5					
6					

Comments:

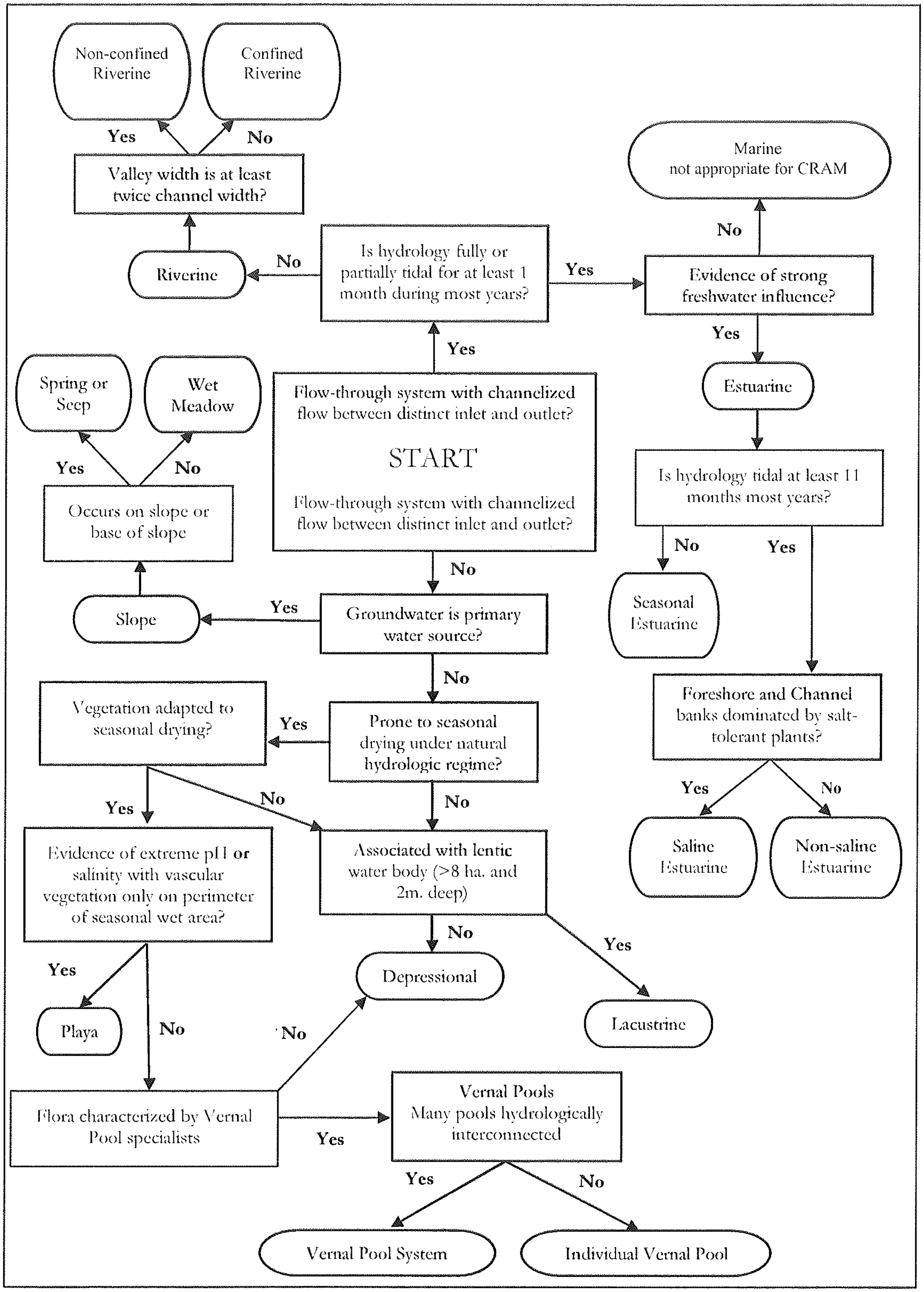
Photos taken from center of AA

Scoring Sheet: Perennial Depressional Wetlands

AA Name: L – 1			(m/d/y) 08 | 18 | 11
Attributes and Metrics	**Scores**		**Comments**
Buffer and Landscape Context			
Landscape Connectivity (D)	B		
Buffer submetric A: Percent of AA with Buffer	A		
Buffer submetric B: Average Buffer Width	A		
Buffer submetric C: Buffer Condition	C		
D + [C x (A x B)$^{1/2}$] $^{1/2}$ = **Attribute Score**	Raw ~~.8~~ 17.5	Final ~~.85~~ 72.9	Final Attribute Score = (Raw Score/24)100
Hydrology			
Water Source	C		
Hydroperiod or Channel Stability	B		
Hydrologic Connectivity	~~A~~	B	Road berm along southern edge of wetland
Attribute Score	Raw ~~27~~ 24	Final ~~.75~~ .667	Final Attribute Score = (Raw Score/36)100
Physical Structure			
Structural Patch Richness	C		
Topographic Complexity	D		
Attribute Score	Raw 9	Final .38	Final Attribute Score = (Raw Score/24)100
Biotic Structure			
Plant Community submetric A: Number of Plant Layers	C		
Plant Community submetric B: Number of Co-dominant species	D		
Plant Community submetric C: Percent Invasion	D		
Plant Community Metric (*average of submetrics A-C*)	4		
Horizontal Interspersion and Zonation	C		
Vertical Biotic Structure	C		CHECK ON MAP TO VERIFY
Attribute Score	Raw 16	Final 45	Final Attribute Score = (Raw Score/36)100
Overall AA Score	56		**Average of Final Attribute Scores**

Identify Wetland Type

Figure 3.2: Flowchart to determine wetland type and sub-type.



3.2.2.2 Depressional Wetlands

Note: This section was primarily based on perennial depressional wetlands and caution should be applied in the interpretation of scores in seasonal depressional wetlands. The depressional module will be revised during the CRAM validation/calibration process in 2008-2009.

Depressional wetlands exist in topographic lows that do not usually have outgoing surface drainage except during extreme flood events or heavy rainfall. Precipitation is their main source of water. Depressional wetlands can have distinct or indistinct boundaries. Many depressional wetlands are seasonal, and some lack surface ponding or saturated conditions during dry years. A complex of shallows and seasonally wet swales and depressions created by the slight topographic relief of a vernal pool system is an example of an indistinct depressional wetland. The margins of distinct depressional wetlands are relatively easy to discern in aerial photos and in the field. Examples of distinct depressional wetlands include sag ponds, snowmelt ponds, kettle-holes in moraines, cutoff ox-bows on floodplains, and water hazards on golf courses.

3.2.2.3 Other Depressional Wetlands

Depressional wetlands other than vernal pools can be seasonal or perennial, but their flora and fauna are mostly not characteristic of vernal pools, and they lack the impervious substrate that controls vernal pool hydrology. They differ from lacustrine wetlands by lacking an adjacent area of open water at least 2 m deep and 8 ha total area). They differ from playas by lacking an adjacent area larger than the wetland of either alkaline or saline open water less than 2 m deep or non-vegetated, fine-grain sediments. Unlike slope wetlands (i.e., springs and seeps), depressional wetlands depend more on precipitation than groundwater as their water source.

Establish the Assessment Area (AA)

Table 3.5: Examples of features that *should* be used to delineate AA boundaries.

Flow-Through Wetlands	Non Flow-Though Wetlands	
Riverine, Estuarine and Slope Wetlands	**Lacustrine, Wet Meadows, Depressional, and Playa Wetlands**	**Vernal Pools and Vernal Pool Systems**
diversion ditches end-of-pipe large discharges grade control or water height control structures major changes in riverine entrenchment, confinement, degradation, aggradation, slope, or bed form major channel confluences water falls open water areas more than 50 m wide on average or broader than the wetland transitions between wetland types foreshores, backshores and uplands at least 5 m wide weirs, culverts, dams, levees, and other flow control structures	above-grade roads and fills berms and levees jetties and wave deflectors major point sources or outflows of water open water areas more than 50 m wide on average or broader than the wetland foreshores, backshores and uplands at least 5 m wide weirs and other flow control structures	above-grade roads and fills major point sources of water inflows or outflows weirs, berms, levees and other flow control structures

Table 3.6: Examples of features that should *not* be used to delineate any AAs.

- at-grade, unpaved, single-lane, infrequently used roadways or crossings
- bike paths and jogging trails at grade
- bare ground within what would otherwise be the AA boundary
- equestrian trails
- fences (unless designed to obstruct the movement of wildlife)
- property boundaries
- riffle (or rapid) – glide – pool transitions in a riverine wetland
- spatial changes in land cover or land use along the wetland border
- state and federal jurisdictional boundaries

Table 3.7: Recommended maximum and minimum AA sizes for each wetland type. Note: Wetlands smaller than the recommended AA sizes can be assessed in their entirety.

Wetland Type	Recommended AA Size
Slope	
Spring or Seep	Maximum size is 0.50 ha (about 75 m x 75 m, but shape can vary); there is no minimum size.
Wet Meadow	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.1 ha (about 30 m x 30 m).
Depressional	
Vernal Pool	There are no size limits (see Section 3.5.6 and Table 3.8).
Vernal Pool System	There are no size limits (see Section 3.5.6 and Table 3.8).
Other Depressional	**Maximum size is 1.0 ha (about 100 m x 100 m, but shape can vary); there is no minimum size.**
Riverine	
Confined and Non-confined	Recommended length is 10x average bankfull channel width; maximum length is 200 m; minimum length is 100 m. AA should extend laterally (landward) from the bankfull contour to encompass all the vegetation (trees, shrubs vines, etc) that probably provide woody debris, leaves, insects, etc. to the channel and its floodplain (Figure 3.4); minimum width is 2 m.
Lacustrine	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Playa	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Estuarine	
Perennial Saline	Recommended size and shape for estuarine wetlands is a 1 ha circle (radius about 55 m), but the shape can be non-circular if necessary to fit the wetland and to meet hydro-geomorphic and other criteria as outlined in Sections 3.5.1-3. The minimum size is 0.1 ha (about 30 m x 30 m).
Perennial Non-saline	
Seasonal	

Attribute 1: Buffer and Landscape Context

Landscape Connectivity

Definition: The landscape connectivity of an Assessment Area is assessed in terms of its spatial association with other areas of aquatic resources, such as other wetlands, lakes, streams, etc. It is assumed that wetlands close to each other have a greater potential to interact ecologically and hydrologically, and that such interactions are generally beneficial.

For all wetlands except riverine: On digital or hardcopy site imagery, draw a straight line extending 500 m from the AA boundary in each of the four cardinal compass directions. Along each transect line, estimate the percentage of the segment that passes through wetland or aquatic habitat of any kind, including open water. Use the worksheet below to record these estimates.

Worksheet for Landscape Connectivity Metric for All Wetlands Except Riverine

Percentage of Transect Lines that Contains Wetland Habitat of Any Kind	
Segment Direction	Percentage of Transect Length That is Wetland
North	100
South	~~10~~ 15
East	~~100~~ 67%
West	100
Average Percentage of Transect Length That Is Wetland	~~78%~~ 70.5%

Table 4.1: Rating for Landscape Connectivity for all wetlands except Riverine.

Rating	Alternative States
A	An average of 76 – 100 % of the transects is wetland habitat of any kind.
B	An average of 51 – 75 % of the transects is wetland habitat of any kind.
C	An average of 26 – 50 % of the transects is wetland habitat of any kind.
D	An average of 0 – 25 % of the transects is wetland habitat of any kind.

Percent of AA with Buffer

Definition: The buffer is the area adjoining the AA that is in a natural or semi-natural state and currently not dedicated to anthropogenic uses that would severely detract from its ability to entrap contaminants, discourage forays into the AA by people and non-native predators, or otherwise protect the AA from stress and disturbance.

To be considered as buffer, a suitable land cover type must be at least 5 m wide and extend along the perimeter of the AA for at least 5 m. The maximum width of the buffer is 250 m. At distances beyond 250 m from the AA, the buffer becomes part of the landscape context of the AA.

Any area of open water at least 30 m wide that is adjoining the AA, such as a lake, large river, or large slough, is not considered in the assessment of the buffer. Such open water is considered to be neutral, neither part of the wetland nor part of the buffer. There are three reasons for excluding large areas of open water (i.e., more than 30 m wide) from Assessment Areas and their buffers. First, assessments of buffer extent and buffer width are inflated by including open water as a part of the buffer. Second, while there may be positive correlations between wetland stressors and the quality of open water, quantifying water quality generally requires laboratory analyses beyond the scope of rapid assessment. Third, open water can be a direct source of stress (i.e., water pollution, waves, boat wakes) or an indirect source of stress (i.e., promotes human visitation, encourages intensive use by livestock looking for water, provides dispersal for non-native plant species), or it can be a source of benefits to a wetland (e.g., nutrients, propagules of native plant species, water that is essential to maintain wetland hydroperiods, etc.). However, any area of open water at least 30 m wide that is within 250 m of the AA but is not adjoining the AA is considered part of the buffer.

In the example below (Figure 4.2), most of the area around the AA (outlined in white) consists of non-buffer land cover types. The AA adjoins a major roadway, parking lot, and other development that is a non-buffer land cover type. There is a nearby wetland but it is separated from the AA by a major roadway and is not considered buffer. The open water area is neutral and not considered in the estimation of the percentage of the AA perimeter that has buffer. In this example, the only areas that would be considered buffer is the area labeled "Upland Buffer".

Figure 4.2: Diagram of buffer and non-buffer land cover types.

Table 4.4: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	**Examples of Land Covers Excluded from Buffers** Notes: buffers do not cross these land covers; areas of open water adjacent to the AA are not included in the assessment of the AA or its buffer.
□ bike trails	□ commercial developments
□ dry-land farming areas	□ fences that interfere with the movements of wildlife
□ foot trails	□ intensive agriculture (row crops, orchards and vineyards lacking ground cover and other BMPs)
□ horse trails	□ paved roads (two lanes plus a turning lane or larger)
□ links or target golf courses	□ lawns
□ natural upland habitats	□ parking lots
□ nature or wildland parks	□ horse paddocks, feedlots, turkey ranches, etc.
□ open range land	□ residential areas
□ railroads	□ sound walls
□ roads not hazardous to wildlife	□ sports fields
□ swales and ditches	□ traditional golf courses
□ vegetated levees	□ urbanized parks with active recreation
	□ pedestrian/bike trails (i.e., nearly constant traffic)

Table 4.5: Rating for Percent of AA with Buffer.

Rating	**Alternative States (not including open-water areas)**
A	Buffer is 75 - 100% of AA perimeter.
B	Buffer is 50 – 74% of AA perimeter.
C	Buffer is 25 – 49% of AA perimeter.
D	Buffer is 0 – 24% of AA perimeter.

~ 80%

* Open water is <u>not</u> adjoining AA and is >30m wide, so is included in buffer percent.
(see previous page)

Average Buffer Width

Definition: The average width of the buffer adjoining the AA is estimated by averaging the lengths of eight straight lines drawn at regular intervals around the AA from its perimeter outward to the nearest non-buffer land cover or 250 m, which ever is first encountered. It is assumed that the functions of the buffer do not increase significantly beyond an average width of about 250 m. The maximum buffer width is therefore 250 m. The minimum buffer width is 5 m, and the minimum length of buffer along the perimeter of the AA is also 5 m. Any area that is less than 5 m wide and 5 m long is too small to be a buffer. See Table 4.4 above for more guidance regarding the identification of AA buffers.

Table 4.6: Steps to estimate Buffer Width for all wetlands.

Step 1	Identify areas in which open water is directly adjacent to the AA, with no vegetated intertidal or upland area in between. These areas are excluded from buffer calculations.
Step 2	Draw straight lines 250 m in length perpendicular to the AA through the buffer area at regular intervals along the portion of the perimeter of the AA that has a buffer. For one-sided riverine AAs, draw four lines; for all other wetland types, draw eight lines (see Figures 4.3 and 4.4 below).
Step 3	Estimate the buffer width of each of the lines as they extend away from the AA. Record these lengths on the worksheet below.
Step 4	Estimate the average buffer width. Record this width on the worksheet below.

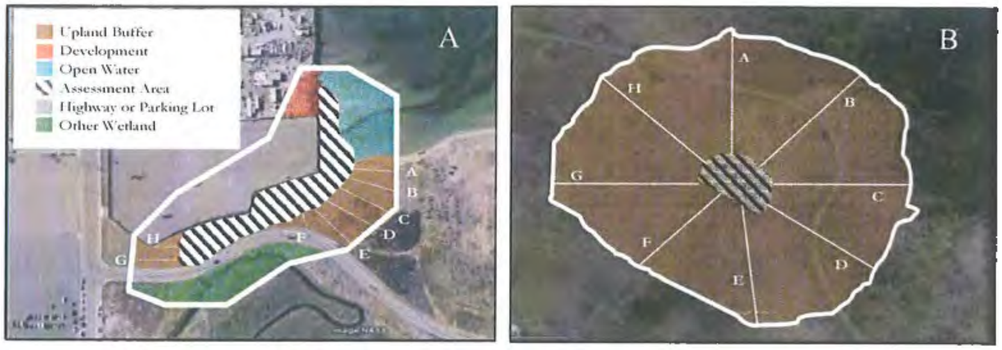


Figure 4.3: Examples of the method used to estimate Buffer Width. Note that the width is based on the lengths of eight lines A-H that extend at regular intervals though the buffer areas, whether only a small part of the 250 m zone around the AA is buffer (A) or all of the zone around the AA is buffer (B).

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	250
C	250
D	173
E	88
F	250
G	250
H	250
Average Buffer Width	220

Table 4.7: Rating for average buffer width.

Rating	Alternative States
A	Average buffer width is 190 – 250 m.
B	Average buffer width 130 – 189 m.
C	Average buffer width is 65 – 129 m.
D	Average buffer width is 0 – 64 m.

Buffer Condition

Definition: The condition of a buffer is assessed according to the extent and quality of its vegetation cover and the overall condition of its substrate. Evidence of direct impacts by people are excluded from this metric and included in the Stressor Checklist. Buffer conditions are assessed only for the portion of the wetland border that has already been identified or defined as buffer, based on Section 4.1.2 above. If there is no buffer, assign a score of D.

Table 4.8: Rating for Buffer Condition.

Rating	Alternative States
A	Buffer for AA is dominated by native vegetation, has undisturbed soils, and is apparently subject to little or no human visitation.
B	Buffer for AA is characterized by an intermediate mix of native and non-native vegetation, but mostly undisturbed soils and is apparently subject to little or no human visitation.
C	Buffer for AA is characterized by substantial amounts of non-native vegetation AND there is at least a moderate degree of soil disturbance/compaction, and/or there is evidence of at least moderate intensity of human visitation.
D	Buffer for AA is characterized by barren ground and/or highly compacted or otherwise disturbed soils, and/or there is evidence of very intense human visitation.

Attribute 2: Hydrology

Water Source

Definition: Water Sources directly affect the extent, duration, and frequency of saturated or ponded conditions within an Assessment Area. Water Sources include the kinds of direct inputs of water into the AA as well as any diversions of water from the AA. Diversions are considered a water source because they affect the ability of the AA to function as a source of water for other habitats while also directly affecting the hydrology of the AA.

A water source is direct if it supplies water mainly to the AA, rather than to areas through which the water must flow to reach the AA. Natural, direct sources include rainfall, ground water discharge, and flooding of the AA due to high tides or naturally high riverine flows. Examples of unnatural, direct sources include stormdrains that empty directly into the AA or into an immediately adjacent area. For seeps and springs that occur at the toes of earthen dams, the reservoirs behind the dams are direct water source. Indirect sources that should not be considered in this metric include large regional dams or urban storm drain systems that do not drain directly into the AA but that have systemic, ubiquitous effects on broad geographic areas of which the AA is a small part. For example, the salinity regimes of estuarine wetlands in San Francisco Bay are affected by dams in the Sierra Nevada, but these effects are not direct. But some of the same wetlands are directly affected by nearby discharges from sewage treatment facilities. Engineered hydrological controls, such as weirs, tide gates, flashboards, grade control structures, check dams, etc., can serve to demarcate the boundary of an AA (see Section 3.5), but they are not considered water sources.

The typical suite of natural water sources differs among the wetland types. The water for estuarine wetlands is by definition a combination of marine (i.e., tidal) and riverine (i.e., fluvial) sources. This metric is focused on the non-tidal water sources that account for the conditions during the growing season, regardless of the time of year when these sources exist. To assess water source, the plant species composition of the wetland should be compared to what is expected, in terms of the position of the wetland along the salinity gradient of the estuary, as adjusted for the overall wetness of the water year. In general, altered sources are indicated by vegetation that is either more tolerant of saline conditions or less tolerant than would be expected. If the plant community is unexpectedly salt-tolerant, then an unnatural decrease in freshwater supply is indicated. Conversely, if the community is less salt-tolerant than expected, than an unnatural increase in freshwater is indicated.

Table 4.9: Rating for Water Source.

Rating	Alternative States
A	Freshwater sources that affect the dry season condition of the AA, such as its flow characteristics, hydroperiod, or salinity regime, are precipitation, groundwater, and/or natural runoff, or natural flow from an adjacent freshwater body, or the AA naturally lacks water in the dry season. There is no indication that dry season conditions are substantially controlled by artificial water sources.
B	Freshwater sources that affect the dry season condition of the AA are mostly natural, but also obviously include occasional or small effects of modified hydrology. Indications of such anthropogenic inputs include developed land or irrigated agricultural land that comprises less than 20% of the immediate drainage basin within about 2 km upstream of the AA, or that is characterized by the presence of a few small stormdrains or scattered homes with septic systems. No large point sources or dams control the overall hydrology of the AA.
C	Freshwater sources that affect the dry season conditions of the AA are primarily urban runoff, direct irrigation, pumped water, artificially impounded water, water remaining after diversions, regulated releases of water through a dam, or other artificial hydrology. Indications of substantial artificial hydrology include developed or irrigated agricultural land that comprises more than 20% of the immediate drainage basin within about 2 km upstream of the AA, or the presence of major point source discharges that obviously control the hydrology of the AA. OR Freshwater sources that affect the dry season conditions of the AA are substantially controlled by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from its drainage basin.
D	Natural, freshwater sources that affect the dry season conditions of the AA have been eliminated based on the following indicators: impoundment of all possible wet season inflows, diversion of all dry-season inflow, predominance of xeric vegetation, etc.

Hydroperiod or Channel Stability

Definition: Hydroperiod is the characteristic frequency and duration of inundation or saturation of a wetland during a typical year. The natural hydroperiod for estuarine wetlands is governed by the tides, and includes predictable variations in inundation regimes over days, weeks, months, and seasons. Depressional, lacustrine, playas, and riverine wetlands typically have daily variations in water height that are governed by diurnal increases in evapotranspiration and seasonal cycles that are governed by rainfall and runoff. Seeps and springs that depend on groundwater may have relatively slight seasonal variations in hydroperiod.

Channel stability only pertains to riverine wetlands. It is assessed as the degree of channel aggradation (i.e., net accumulation of sediment on the channel bed causing it to rise over time), or degradation (i.e., net loss of sediment from the bed causing it to be lower over time). There is much interest in channel entrenchment (i.e., the inability of flows in a channel to exceed the channel banks) and this is addressed in the Hydrologic Connectivity metric.

Table 4.10: Field Indicators of Altered Hydroperiod.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
☐ Upstream spring boxes ☐ Impoundments ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Evidence of aquatic wildlife mortality ☐ Encroachment of terrestrial vegetation ☐ Stress or mortality of hydrophytes ☐ Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
☐ Berms ☐ Dikes ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Late-season vitality of annual vegetation ☐ Recently drowned riparian vegetation ☐ Extensive fine-grain deposits

Depressional, Lacustrine, Playas, and Slope Wetlands: Assessment of the hydroperiod for these kinds of wetlands should be initiated with an office-based review of. Field indicators for altered hydroperiod include pumps, spring boxes, ditches, hoses and pipes, and encroachment of terrestrial vegetation (see Table 4.10 above). Tables 4.11a and 4.11b provide narratives for rating Hydroperiod for depressional, lacustrine, and seep and spring wetlands.

Table 4.11a: Rating of Hydroperiod for Depressional, Lacustrine, Playas, and Slope wetlands.

Rating	Alternative States (based on Table 4.10 above)
A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
D	Both the inundation and drawdown of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

Hydrologic Connectivity

Definition: Hydrologic Connectivity describes the ability of water to flow into or out of the wetland, or to inundate their adjacent uplands. This metric pertains only to Riverine, Estuarine, Vernal Pool Systems, individual Vernal Pools, and Playas.

This metric is scored by assessing the degree to which the hydrologic connectivity of the AA is restricted by unnatural features, such as levees and excessively high banks. These features may be restricting the hydrology of the wetland in which the AA is contained, and thus do not need to directly adjoin the AA.

Table 4.15c: Rating of Hydrologic Connectivity for Estuarine, Depressional, Lacustrine, and Slope wetlands, Playas, Individual Vernal Pools, and Vernal Pool Systems.

Rating	Alternative States
A	Rising water in the wetland that contains the AA has unrestricted access to adjacent areas, without levees or other obstructions to the lateral movement of flood waters.
B	There are unnatural features such as levees or road grades that limit the amount of adjacent transition zone or the lateral movement of flood waters, relative to what is expected for the setting. But, the limitations exist for less than 50% of the boundary of wetland that contains the AA. Restrictions may be intermittent along margins of the wetland, or they may occur only along one bank or shore of the wetland. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
C	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for 50-90% of the wetland that contains the AA. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
D	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for more than 90% of the wetland that contains the AA.

Attribute 3: Physical Structure

Structural Patch Richness

Definition: Patch richness is the number of different obvious types of physical surfaces or features that may provide habitat for aquatic, wetland, or riparian species. This metric is different from topographic complexity in that it addresses the number of different patch types, whereas topographic complexity evaluates the spatial arrangement and interspersion of the types. Physical patches can be natural or unnatural.

Patch Type Definitions:

Animal mounds and burrows. Many vertebrates make mounds or holes as a consequence of their foraging, denning, predation, or other behaviors. The resulting soil disturbance helps to redistributes soil nutrients and influences plant species composition and abundance. To be considered a patch type there should be evidence that a population of burrowing animals has occupied the Assessment Area. A single burrow or mound does not constitute a patch.

Bank slumps or undercut banks in channels or along shorelines. A bank slump is a portion of a depressional, estuarine, or lacustrine bank that has broken free from the rest of the bank but has not eroded away. Undercuts are areas along the bank or shoreline of a wetland that have been excavated by waves or flowing water.

Cobble and boulders. Cobble and boulders are rocks of different size categories. The long axis of cobble ranges from about 6 cm to about 25 cm. A boulder is any rock having a long axis greater than 25 cm. Submerged cobbles and boulders provide abundant habitat for aquatic macroinvertebrates and small fish. Exposed cobbles and boulders provide roosting habitat for birds and shelter for amphibians. They contribute to patterns of shade and light and air movement near the ground surface that affect local soil moisture gradients, deposition of seeds and debris, and overall substrate complexity.

Concentric or parallel high water marks. Repeated variation in water level in a wetland can cause concentric zones in soil moisture, topographic slope, and chemistry that translate into visible zones of different vegetation types, greatly increasing overall ecological diversity. The variation in water level might be natural (e.g., seasonal) or anthropogenic.

Debris jams. A debris jam is an accumulation of drift wood and other flotage across a channel that partially or completely obstructs surface water flow.

Hummocks or sediment mounds. Hummocks are mounds created by plants in slope wetlands, depressions, and along the banks and floodplains of fluvial and tidal systems. Hummocks are typically less than 1m high. Sediment mounds are similar to hummocks but lack plant cover.

Islands (exposed at high-water stage). An island is an area of land above the usual high water level and, at least at times, surrounded by water in a riverine, lacustrine, estuarine, or playa system. Islands differ from hummocks and other mounds by being large enough to support trees or large shrubs.

Macroalgae and algal mats. Macroalgae occurs on benthic sediments and on the water surface of all types of wetlands. Macroalgae are important primary producers, representing the base of the food web in some wetlands. Algal mats can provide abundant habitat for macro-invertebrates, amphibians, and small fishes.

Non-vegetated flats (sandflats, mudflats, gravel flats, etc.). A flat is a non-vegetated area of silt, clay, sand, shell hash, gravel, or cobble at least 10 m wide and at least 30 m long that adjoins the wetland

foreshore and is a potential resting and feeding area for fishes, shorebirds, wading birds, and other waterbirds. Flats can be similar to large bars (see definitions of point bars and in-channel bars below), except that they lack the convex profile of bars and their compositional material is not as obviously sorted by size or texture.

Pannes or pools on floodplain. A panne is a shallow topographic basin lacking vegetation but existing on a well-vegetated wetland plain. Pannes fill with water at least seasonally due to overland flow. They commonly serve as foraging sites for waterbirds and as breeding sites for amphibians.

Point bars and in-channel bars. Bars are sedimentary features within intertidal and fluvial channels. They are patches of transient bedload sediment that form along the inside of meander bends or in the middle of straight channel reaches. They sometimes support vegetation. They are convex in profile and their surface material varies in size from small on top to larger along their lower margins. They can consist of any mixture of silt, sand, gravel, cobble, and boulders.

Pools in channels. Pools are areas along tidal and fluvial channels that are much deeper than the average depths of their channels and that tend to retain water longer than other areas of the channel during periods of low or no surface flow.

Riffles or rapids. Riffles and rapids are areas of relatively rapid flow and standing waves in tidal or fluvial channels. Riffles and rapids add oxygen to flowing water and provide habitat for many fish and aquatic invertebrates.

Secondary channels on floodplains or along shorelines. Channels confine riverine or estuarine flow. A channel consists of a bed and its opposing banks, plus its floodplain. Estuarine and riverine wetlands can have a primary channel that conveys most flow, and one or more secondary channels of varying sizes that convey flood flows. The systems of diverging and converging channels that characterize braided and anastomosing fluvial systems usually consist of one or more main channels plus secondary channels. Tributary channels that originate in the wetland and that only convey flow between the wetland and the primary channel are also regarded as secondary channels. For example, short tributaries that are entirely contained within the CRAM Assessment Area (AA) are regarded as secondary channels.

Shellfish beds. Oysters, clams and mussels are common bivalves that create beds on the banks and bottoms of wetland systems. Shellfish beds influence the condition of their environment by affecting flow velocities, providing substrates for plant and animal life, and playing particularly important roles in the uptake and cycling of nutrients and other water-borne materials.

Soil cracks. Repeated wetting and drying of fine grain soil that typifies some wetlands can cause the soil to crack and form deep fissures that increase the mobility of heavy metals, promote oxidation and subsidence, while also providing habitat for amphibians and macroinvertebrates. Cracks must be a minimum of 1 inch deep to qualify.

Standing snags. Tall, woody vegetation, such as trees and tall shrubs, can take many years to fall to the ground after dying. These standing "snags" they provide habitat for many species of birds and small mammals. Any standing, dead woody vegetation that is at least 3 m tall is considered a snag.

Submerged vegetation. Submerged vegetation consists of aquatic macrophytes such as *Elodea canadensis* (common elodea), and *Zostera marina* (eelgrass) that are rooted in the sub-aqueous substrate but do not usually grow high enough in the overlying water column to intercept the water surface. Submerged vegetation can strongly influence nutrient cycling while providing food and shelter for fish and other organisms.

Swales on floodplain or along shoreline. Swales are broad, elongated, vegetated, shallow depressions that can sometimes help to convey flood flows to and from vegetated marsh plains or floodplains. But, they lack obvious banks, regularly spaced deeps and shallows, or other characteristics of channels. Swales can entrap water after flood flows recede. They can act as localized recharge zones and they can sometimes receive emergent groundwater.

Variegated or crenulated foreshore. As viewed from above, the foreshore of a wetland can be mostly straight, broadly curving (i.e., arcuate), or variegated (e.g., meandering). In plan view, a variegated shoreline resembles a meandering pathway. variegated shorelines provide greater contact between water and land.

Wrackline or organic debris in channel or on floodplain. Wrack is an accumulation of natural or unnatural floating debris along the high water line of a wetland.

Structural Patch Type Worksheet for All Wetland Types, Except Vernal Pool Systems

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table 4.16 below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see section 3.2.2.1).

STRUCTURAL PATCH TYPE (check for presence)	Riverine (Non-confined)	Riverine (Confined)	All Estuarine	**Depressional**	Slope Wetlands	Lacustrine	Individual Vernal Pools	Playas
Minimum Patch Size	3 m^2	3 m^2	3 m^2	**3 m^2**	1 m^2	3 m^2	1 m^2	3 m^2
Secondary channels on floodplains or along shorelines	1	0	1	**0**	1	1	0	1
Swales on floodplain or along shoreline	1	0	0	**1**	1	1	1	1
Pannes or pools on floodplain	1	0	1	**0**	1	1	1	1
Vegetated islands (mostly above high-water)	1	0	0	**1**	0	0	1	1
Pools or depressions in channels (wet or dry channels)	1	1	1	**0**	0	0	0	0
Riffles or rapids (wet channel) or planar bed (dry channel)	1	1	0	**0**	0	0	0	0
Non-vegetated flats or bare ground (sandflats, mudflats, gravel flats, etc.)	0	0	1	**1**	1	1	1	1
Point bars and in-channel bars	1	1	1	**0**	0	0	0	0
Debris jams	1	1	1	**0**	0	1	0	0
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	1	1	1	**1**	0	1	0	0
Plant hummocks and/or sediment mounds	1	1	1	**1**	1	1	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1	1	**1**	0	1	0	0
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1	0	**1**	0	1	0	0
Animal mounds and burrows	0	0	1	**1**	1	0	1	1
Standing snags (at least 3 m tall)	1	1	1	**1**	1	1	0	0
Filamentous macroalgae or algal mats	1	1	1	**1**	1	1	1	1
Shellfish beds	0	0	1	**0**	0	1	0	0
Concentric or parallel high water marks	0	0	0	**1**	1	1	1	1
Soil cracks	0	0	1	**1**	0	1	1	1
Cobble and/or Boulders	1	1	0	**0**	1	1	1	0
Submerged vegetation	1	0	1	**1**	0	1	0	0
Total Possible	16	11	15	**13**	10	16	10	10
No. Observed Patch Types (enter here and use in Table 4.16 below)						6		

Table 4.16: Rating of Structural Patch Richness (based on results from worksheets).

Rating	Confined Riverine, Playas, Springs & Seeps, Individual Vernal Pools	**Vernal ,Pool Systems and Depressional**	Estuarine	Non-confined Riverine, Lacustrine
A	≥ 8	**≥ 11**	≥ 11	≥ 12
B	6 – 7	**8 – 10**	8 – 10	9 – 11
C	4 – 5	**5 – 7**	6 – 7	6 – 8
D	≤ 3	**≤ 4**	≤ 5	≤ 5

Topographic Complexity

Definition: Topographic complexity refers to the variety of elevations within a wetland due to physical, abiotic features and elevations gradients.

Table 4.17: Typical indicators of Macro- and Micro-topographic Complexity for each wetland type.

Type	Examples of Topographic Features
Depressional and Playas	**pools, islands, bars, mounds or hummocks, variegated shorelines, soil cracks, partially buried debris, plant hummocks, livestock tracks**
Estuarine	channels large and small, islands, bars, pannes, potholes, natural levees, shellfish beds, hummocks, slump blocks, first-order tidal creeks, soil cracks, partially buried debris, plant hummocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines, cobble, boulders, partially buried debris, plant hummocks
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams, cobble, boulders, slump blocks, tree-fall holes, plant hummocks
Slope Wetlands	pools, runnels, plant hummocks, burrows, plant hummocks, cobbles, boulders, partially buried debris, cattle or sheep tracks
Vernal Pools and Pool Systems	soil cracks, "mima-mounds," rivulets between pools or along swales, cobble, plant hummocks, cattle or sheep tracks

Figure 4.6: Scale-independent schematic profiles of Topographic Complexity.
Each profile A-D represents one-half of a characteristic cross-section through an AA. The right end of each profile represents either the buffer along the backshore of the wetland encompassing the AA, or, if the AA is not contiguous with the buffer, then the right end of each profile represents the edge of the AA.

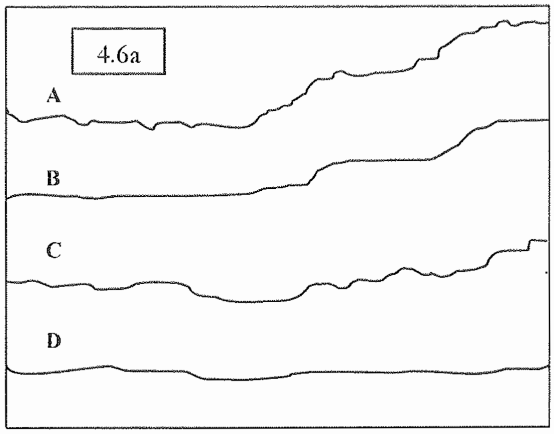


Table 4.18a: Rating of Topographic Complexity for Depressional Wetlands, Playas, Individual Vernal Pools, and Slope Wetlands.

Rating	Alternative States (based on diagrams in Figure 4.6 above)
A	AA as viewed along a typical cross-section has at least two benches or breaks in slope, and each of these benches, plus the slopes between them contain physical patch types or features that contribute to abundant micro-topographic relief or variability as illustrated in profile A of Figure 4.6a.
B	AA has at least two benches or breaks in slope above the middle area or bottom zone of the AA, but these benches and slopes mostly lack abundant micro-topographic relief. The AA resembles profile B of Figure 4.6a.
C	AA lacks any obvious break in slope or bench, and is best characterized has a single slope that has at least a moderate amount of micro-topographic complexity, as illustrated in profile C of Figure 4.6a.
D	AA has a single, uniform slope with little or no micro-topographic complexity, as illustrated in profile D of Figure 4.6a.

Attribute 4: Biotic Structure

Plant Community Metric

Definition: The Plant Community Metric is composed of three submetrics for each wetland type. Two of these sub-metrics, Number of Co-dominant Plants and Percent Invasion, are common to all wetland types. For all wetlands except Vernal Pools and Vernal Pool Systems, the Number of Plant Layers as defined for CRAM is also assessed. For Vernal Pools and Pool Systems, the Number of Plant layers submetric is replaced by the Native Species Richness submetric. A thorough reconnaissance of an AA is required to assess its condition using these submetrics. The assessment for each submetric is guided by a set of Plant Community Worksheets. The Plant Community metric is calculated based on these worksheets.

A "plant" is defined as an individual of any species of tree, shrub, herb/forb, moss, fern, emergent, submerged, submergent or floating macrophyte, including non-native (exotic) plant species. For the purposes of CRAM, a plant "layer" is a stratum of vegetation indicated by a discreet canopy at a specified height that comprises at least 5% of the area of the AA where the layer is expected.

Non-native species owe their occurrence in California to the actions of people since shortly before Euroamerican contact. "Invasive" species are non-native species that tend to dominate one or more plant layers within an AA. CRAM uses the California Invasive Plant Council (Cal-IPC) list to determine the invasive status of plants, with augmentation by regional experts.

Number of Plant Layers Present

To be counted in CRAM, a layer must cover at least 5% of *the portion of the AA that is suitable for the layer.* This would be the littoral zone of lakes and depressional wetlands for the one aquatic layer, called "floating." The "short," "medium," and "tall" layers might be found throughout the non-aquatic areas of each wetland class, except in areas of exposed bedrock, mudflat, beaches, active point bars, etc. The "very tall" layer is usually expected to occur along the backshore, except in forested wetlands.

It is essential that the layers be identified by the actual plant heights (i.e., the approximate maximum heights) of plant species in the AA, regardless of the growth potential of the species. For example, a young sapling redwood between 0.5 m and 0.75 m tall would belong to the "medium" layer, even though in the future the same individual redwood might belong to the "very tall" layer. Some species might belong to multiple plant layers. For example, groves of red alders of all different ages and heights might collectively represent all four non-aquatic layers in a riverine AA. Riparian vines, such as wild grape, might also dominate all of the non-aquatic layers.

Layer definitions:

Floating Layer. This layer includes rooted aquatic macrophytes such as *Ruppia cirrhosa* (ditchgrass), *Ranunculus aquatilis* (water buttercup), and *Potamogeton foliosus* (leafy pondweed) that create floating or buoyant canopies at or near the water surface that shade the water column. This layer also includes non-rooted aquatic plants such as *Lemna* spp. (duckweed) and *Eichhornia crassipes* (water hyacinth) that form floating canopies.

Short Vegetation. This layer varies in maximum height among the wetland types, but is never taller than 50 cm. It includes small emergent vegetation and plants. It can include young forms of species that grow taller. Vegetation that is naturally short in its mature stage includes *Rorippa nasturtium-aquaticum* (watercress), small Isoetes (quillworts*), Distichlis spicata* (saltgrass), *Jaumea carnosa* (jaumea), *Ranunculus flamula* (creeping buttercup), *Alisma* spp. (water plantain), *Sparganium* (burweeds), and *Sagitaria* spp. (arrowhead).

Medium Vegetation. This layer never exceeds 75 cm in height. It commonly includes emergent vegetation such *Salicornia virginica* (pickleweed), *Atriplex* spp. (saltbush), rushes (*Juncus* spp.), and *Rumex crispus* (curly dock).

Tall Vegetation. This layer never exceeds 1.5 m in height. It usually includes the tallest emergent vegetation and the larger shrubs. Examples include *Typha latifolia* (broad-leaved cattail), *Scirpus californicus* (bulrush), *Rubus ursinus* (California blackberry), and *Baccharis piluaris* (coyote brush).

Very Tall Vegetation. This layer is reserved for shrubs, vines, and trees that are taller than 1.5 m. Examples include *Plantanus racemosa* (western sycamore), *Populus fremontii* (Fremont cottonwood), *Alnus rubra* (red alder), *Sambucus mexicanus* (Blue elderberry), and *Corylus californicus* (hazelnut).

Standing (upright) dead or senescent vegetation from the previous growing season can be used in addition to live vegetation to assess the number of plant layers present. However, the lengths of prostrate stems or shoots are disregarded. In other words, fallen vegetation should not be "held up" to determine the plant layer to which it belongs. The number of plant layers must be determined based on the way the vegetation presents itself in the field.

Appendix I: Flow Chart to Determine Plant Dominance

Step 1: Determine the number of plant layers. Estimate which possible layers comprise at least 5% of the portion of the AA that is suitable for supporting vascular vegetation.

< 5 %

It does not count as a layer, and is no longer considered in this analysis.

≥ 5 %

It counts as a layer.

Step 2: Determine the co-dominant plant species in each layer. For each layer, identify the species that represent at least 10% of the total area of plant cover.

< 10 %

It is not a "dominant" species, and is no longer considered in the analysis.

≥ 10 %

It is a "dominant" species.

Step 3: Determine invasive status of co-dominant plant species. For each plant layer, use the list of invasive species (Appendix IV) or local expertise to identify each co-dominant species that is invasive. eCRAM software will automatically identify known invasive species that are listed as co-dominants.

Plant Community Metric Worksheet 1 of 8: Plant layer heights for all wetland types.

Wetland Type	Plant Layers				
	Aquatic	Semi-aquatic and Riparian			
	Floating	Short	Medium	Tall	Very Tall
Perennial Saline Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Perennial Non-saline Estuarine, Seasonal Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Lacustrine, Depressional and Non-confined Riverine	**On Water Surface**	**<0.5 m**	**0.5 – 1.5 m**	**1.5 - 3.0 m**	**>3.0 m**
Slope	NA	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Confined Riverine	NA	<0.5 m	0.5 – 1.5 m	1.5 – 3.0 m	>3.0 m

Number of Co-dominant Species

For each plant layer in the AA, all species represented by living vegetation that comprises at least 10% relative cover within the layer are considered to be dominant. Only living vegetation in growth position is considered in this metric. Dead or senescent vegetation is disregarded.

Percent Invasion

The number of invasive co-dominant species for all plant layers combined is assessed as a percentage of the total number of co-dominants, based on the results of the Number of Co-dominant Species sub-metric. The invasive status for many California wetland and riparian plant species is based on the Cal-IPC list (Appendix IV). However, the best professional judgment of local experts may be used instead to determine whether or not a co-dominant species is invasive.

Plant Community Metric Worksheet 2 of 8: Co-dominant species richness for all wetland types, except Confined Riverine, Slope wetlands, Vernal Pools, and Playas (A dominant species represents ≥10% *relative* cover)

Note: Plant species should only be counted once when calculating the Number of Co-dominant Species and Percent Invasion metric scores.

Floating or Canopy-forming	Invasive?	Short	Invasive?
Medium	**Invasive?**	**Tall**	**Invasive?**
TAMARISK RAM.	Y	TAMARISK RAM.	Y
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined (enter here and use in Table 4.19)	1
		Percent Invasion (enter here and use in Table 4.19)	100%

Table 4.19: Ratings for submetrics of Plant Community Metric.

Rating	Number of Plant Layers Present	Number of Co-dominant Species	Percent Invasion
Lacustrine, Depressional and Non-confined Riverine Wetlands			
A	4 – 5	≥ 12	0 – 15%
B	3	9 – 11	16 – 30%
C	1 – 2	6 – 8	31 – 45%
D	0	0 – 5	46 – 100%

Horizontal Interspersion and Zonation

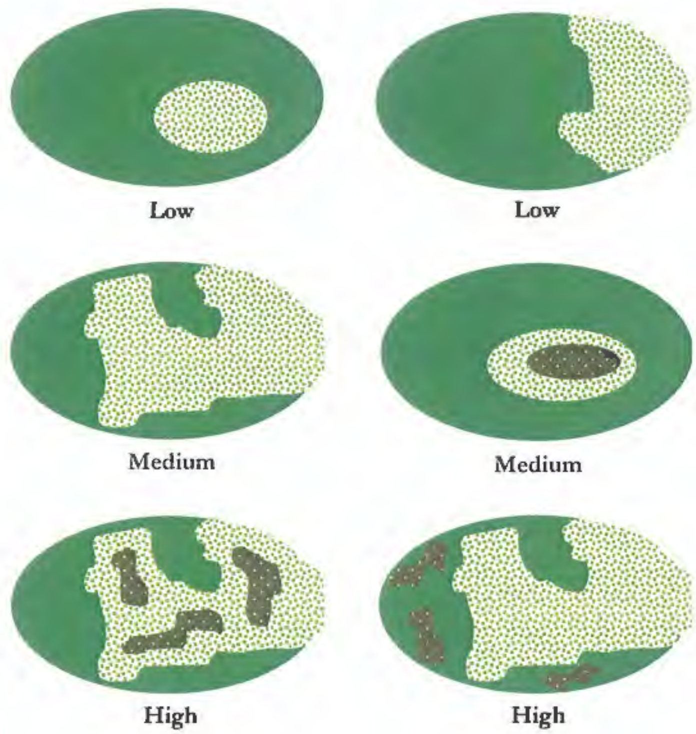
Definition: Horizontal biotic structure refers to the variety and interspersion of plant "zones." Plant zones are plant monocultures or obvious multi-species association that are arrayed along gradients of elevation, moisture, or other environmental factors that seem to affect the plant community organization in plan view. Interspersion is essentially a measure of the number of distinct plant zones and the amount of edge between them.

Table 4.20a: Rating of Horizontal Interspersion of Plant Zones for all AAs except Riverine and Vernal Pool Systems.

Rating	Alternative States (based on Figures 4.7, 4.8, and 4.10)
A	AA has a high degree of plan-view interspersion.
B	AA has a moderate degree of plan-view interspersion.
C	AA has a low degree of plan-view interspersion.
D	AA has essentially no plan-view interspersion.

Note: When using this metric, it is helpful to assign names of plant species or associations of species to the colored patches in Figure 4.10.

Figure 4.7: Diagram of the degrees of interspersion of plant zones for Lacustrine, Depressional, Playas, and Slope wetlands. Hatching patterns represent plant zones (adapted from Mack 2001). Each zone must comprise at least 5% of the AA.



Vertical Biotic Structure

Definition: The vertical component of biotic structure consists of the interspersion and complexity of plant layers. The same plant layers used to assess the Plant Community Composition Metrics (see Section 4.4.2) are used to assess Vertical Biotic Structure. To be counted in CRAM, a layer must cover at least 5% of the portion of the AA that is suitable for the layer. This metric does not pertain to Vernal Pools, Vernal Pool Systems, or Playas.

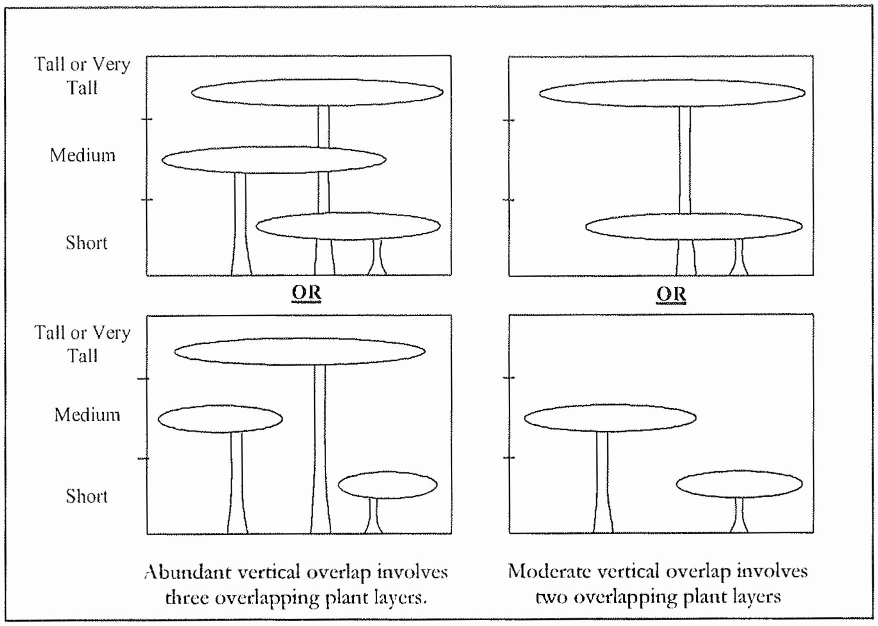


Figure 4.11: Schematic diagrams of vertical interspersion of plant layers for Riverine AAs and for Depressional and Lacustrine AAs having Tall or Very Tall plant layers.

Table 4.21: Rating of Vertical Biotic Structure for Riverine AAs and for Lacustrine and Depressional AAs supporting Tall or Very Tall plant layers (see Figure 4.11).

Rating	Alternative States
A	More than 50% of the vegetated area of the AA supports abundant overlap of plant layers (see Figures 4.11).
B	More than 50% of the area supports at least moderate overlap of plant layers.
C	25–50% of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
D	Less than 25% of the vegetated AA supports moderate overlap of plant layers, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

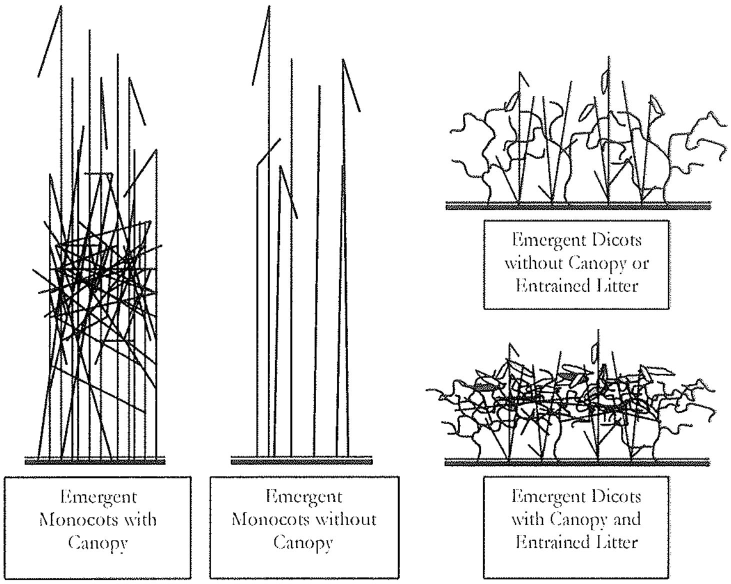


Figure 4.12: Schematic diagrams of plant canopies and entrained litter used to assess Vertical Biotic Structure in all Estuarine wetlands, or in Depressional and Lacustrine wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers.

Table 4.22: Rating of Vertical Biotic Structure for wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers, especially Estuarine saline wetlands (see Figure 4.12).

Rating	Alternative States
A	Most of the vegetated plain of the AA has a dense canopy of living vegetation or entrained litter or detritus forming a "ceiling" of cover 10-20 cm of above the wetland surface that shades the surface and can provide abundant cover for wildlife.
B	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter as described in "A" above; OR Most of the vegetated plain has a dense canopy but the ceiling it forms is much less than 10-20 cm above the ground surface.
C	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter AND the ceiling it forms is much less than 10-20 cm above the ground surface.
D	Most of the AA lacks a dense canopy of living vegetation or entrained litter or detritus.

Guidelines to Complete the Stressor Checklists

Definition: A stressor, as defined for the purposes of the CRAM, is an anthropogenic perturbation within a wetland or its environmental setting that is likely to negatively impact the condition and function of the CRAM Assessment Area (AA). A disturbance is a natural phenomenon that affects the AA.

There are four underlying assumptions of the Stressor Checklist: (1) deviation from the best achievable condition can be explained by a single stressor or multiple stressors acting on the wetland; (2) increasing the number of stressors acting on the wetland causes a decline in its condition (there is no assumption as to whether this decline is additive (linear), multiplicative, or is best represented by some other non-linear mode); (3) increasing either the intensity or the proximity of the stressor results in a greater decline in condition; and (4) continuous or chronic stress increases the decline in condition.

The process to identify stressors is the same for all wetland types. For each CRAM attribute, a variety of possible stressors are listed. Their presence and likelihood of significantly affecting the AA are recorded in the Stressor Checklist Worksheet. For the Hydrology, Physical Structure, and Biotic Structure attributes, the focus is on stressors operating within the AA or within 50 m of the AA. For the Buffer and Landscape Context attribute, the focus is on stressors operating within 500 m of the AA. More distant stressors that have obvious, direct, controlling influences on the AA can also be noted.

Table 5.1: Wetland disturbances and conversions.

<table>
<tr><td>Has a major disturbance occurred at this wetland?</td><td>Yes</td><td colspan="2">No</td><td colspan="2"></td><td></td></tr>
<tr><td>If yes, was it a flood, fire, landslide, or other?</td><td>flood</td><td colspan="2">fire</td><td colspan="2">landslide</td><td>other</td></tr>
<tr><td>If yes, then how severe is the disturbance?</td><td colspan="2">likely to affect site next 5 or more years</td><td colspan="2">likely to affect site next 3-5 years</td><td colspan="2">likely to affect site next 1-2 years</td></tr>
<tr><td rowspan="4">Has this wetland been converted from another type? If yes, then what was the previous type?</td><td colspan="2">depressional</td><td colspan="2">vernal pool</td><td colspan="2">vernal pool system</td></tr>
<tr><td colspan="2">non-confined riverine</td><td colspan="2">confined riverine</td><td colspan="2">seasonal estuarine</td></tr>
<tr><td colspan="2">perennial saline estuarine</td><td colspan="2">perennial non-saline estuarine</td><td colspan="2">wet meadow</td></tr>
<tr><td colspan="2">lacustrine</td><td colspan="2">seep or spring</td><td colspan="2">playa</td></tr>
</table>

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)	X	
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		X
Heavy metal impaired (PS or Non-PS pollution)		X
Pesticides or trace organics impaired (PS or Non-PS pollution)		X
Bacteria and pathogens impaired (PS or Non-PS pollution)		X
Trash or refuse	X	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources	X	
Lack of treatment of invasive plants adjacent to AA or buffer	X	X
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture	X	
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

CRAM Score Guidelines

Table 3.11: Steps to calculate attribute scores and AA scores.

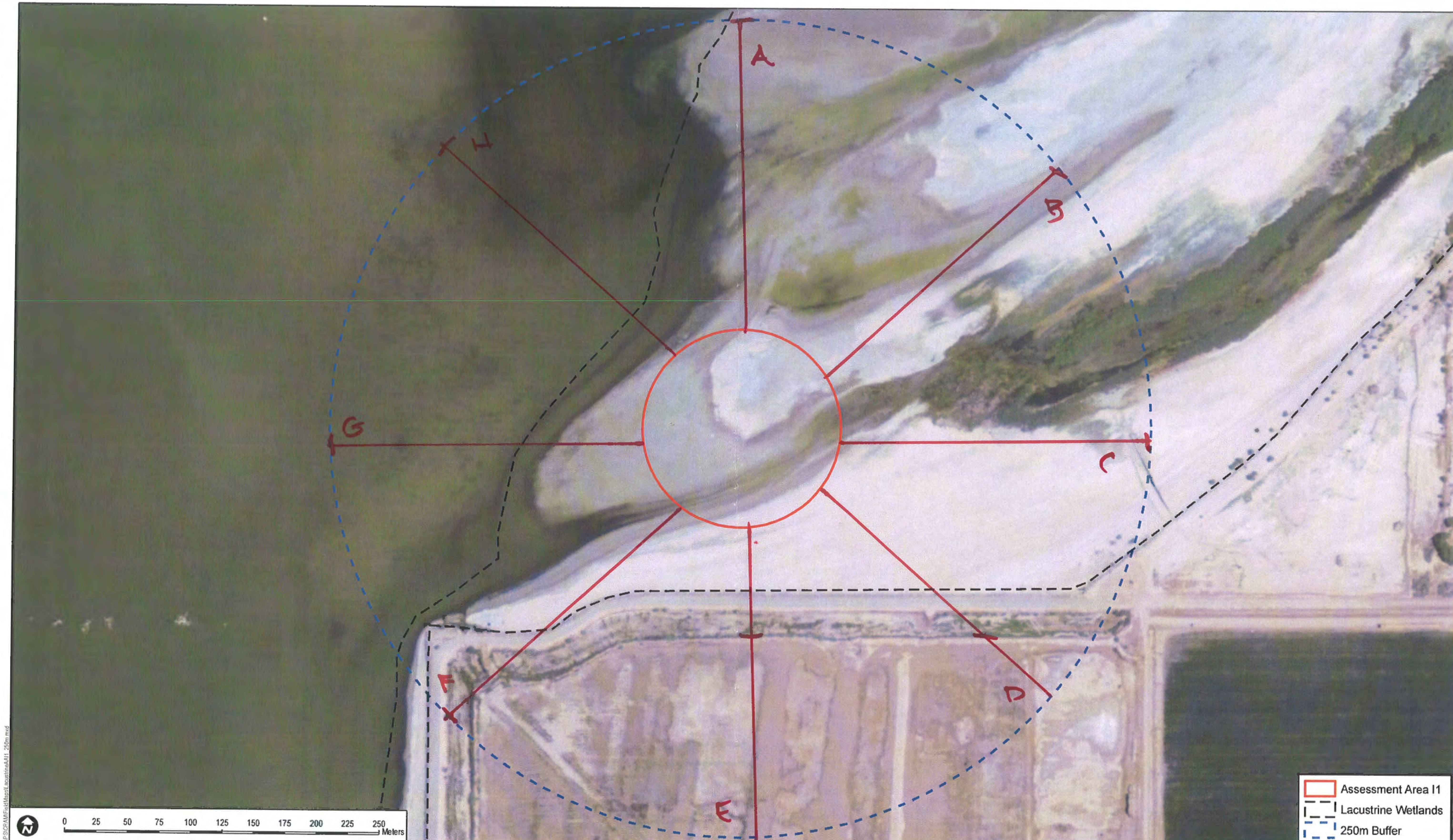
Step 1: Calculate Metric Score	For each Metric, convert the letter score into the corresponding numeric score: A=12, B=9, C=6 and D=3.
Step 2: Calculate raw Attribute Score	For each Attribute, calculate the Raw Attribute Score as the sum of the numeric scores of the component Metrics, except in the following cases: - For Attribute 1 (Buffer and Landscape Context), the submetric scores relating to buffer are combined into an overall buffer score that is added to the score for the Landscape Connectivity metric, using the following formula: $\left(\boxed{\text{Buffer Condition}} \times \left(\boxed{\text{\% AA with Buffer}} \times \boxed{\text{Average Buffer Width}} \right)^{1/2} \right)^{1/2} + \boxed{\text{Landscape Connectivity}}$ - Prior to calculating the Biotic Structure Raw Attribute Score, average the three Plant Community sub-metrics. - For vernal pool systems, first calculate the average score for all three Plant Community sub-metrics for each replicate pool, then average these scores across all six replicate pools, and then calculate the average Topographic Complexity score for all six replicates.
Step 3: Calculate final Attribute Score	For each Attribute, divide its Raw Attribute Score by its maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, and 36 for Biotic Structure.
Step 4: Calculate the AA Score	Calculate the AA score by averaging the Final Attribute Scores. Round the average to the nearest whole integer.

64/98

DUDEK
6575
AUGUST 2011

SALTON SEA SCH

Lacustrine Assessment Area I1 - 500m Field Map



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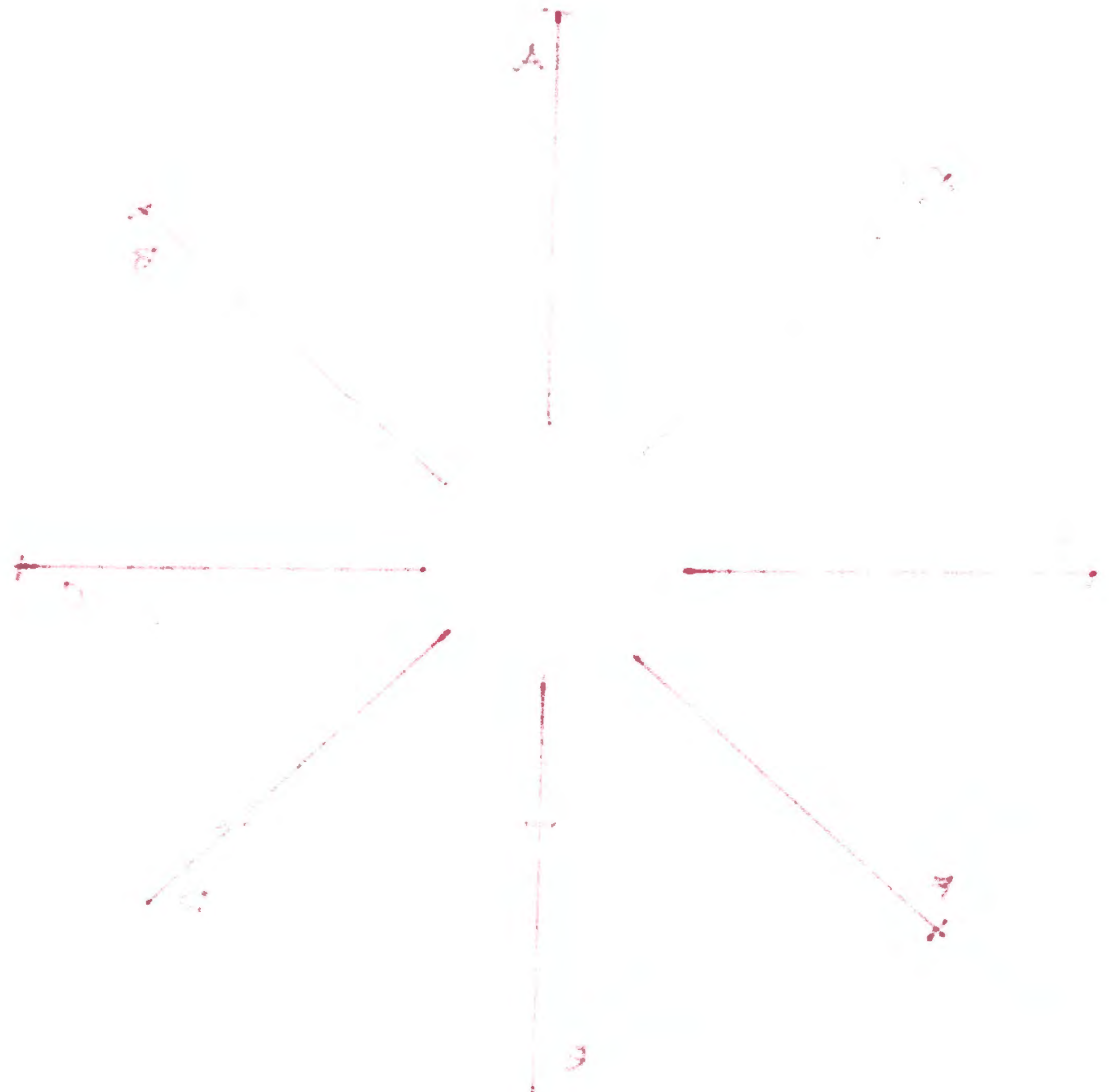
Lacustrine Assessment Area I1 - 250m Field Map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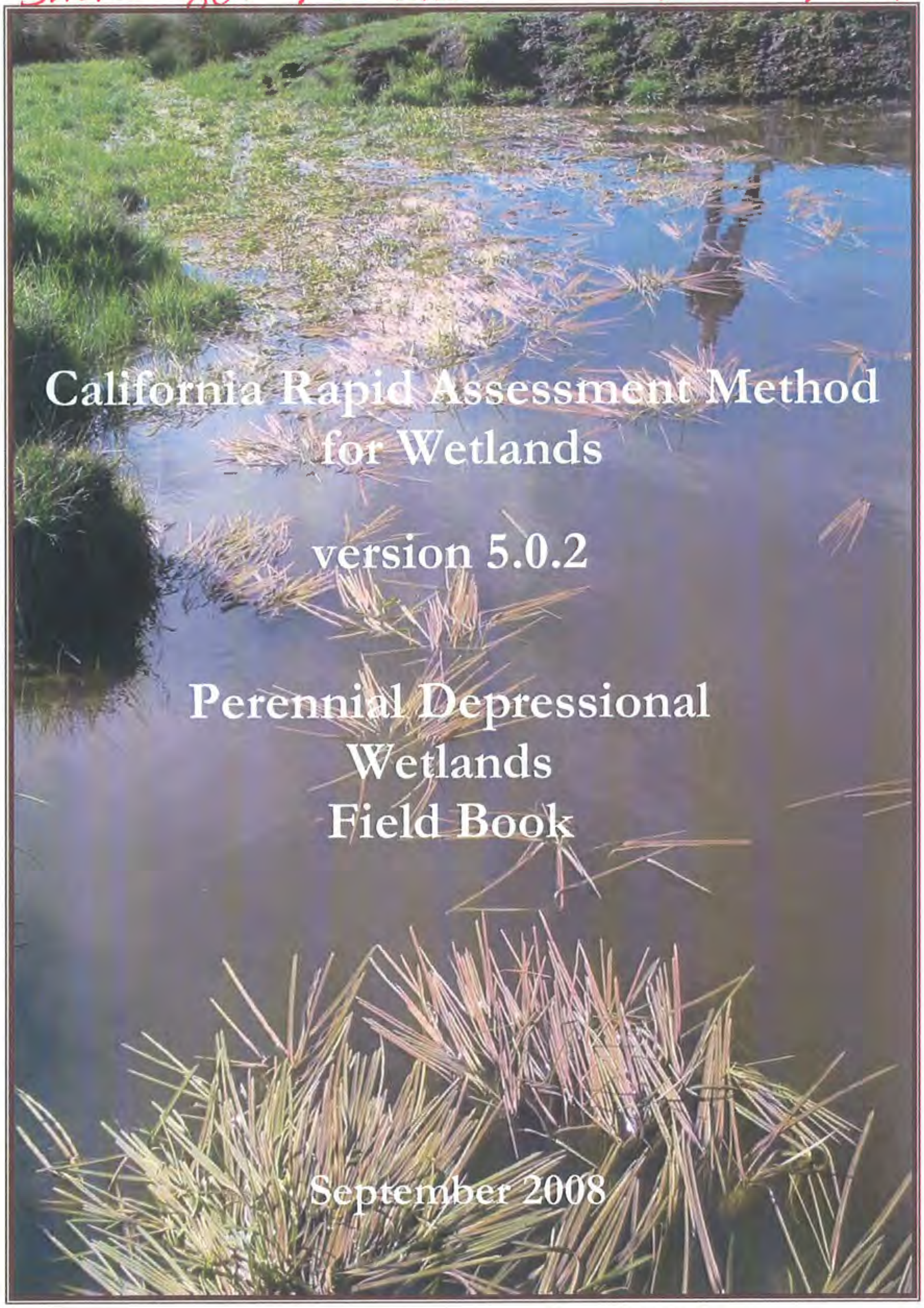
SALTON SEA - NEW RIVER L-2 7-17-11



California Rapid Assessment Method for Wetlands

version 5.0.2

Perennial Depressional Wetlands Field Book

September 2008

Basic Information Sheet: Perennial Depressional Wetlands

Your Name:	Chris / Doug			
Assessment Area Name:	LZ			
Assessment No.		**Date (m/d/y)**	08	18	11

Assessment Team Members for This AA

Andy, Doug, Chris, Stu

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☑ Other

Which best describes the type of depressional wetland?

☐ freshwater marsh ☐ alkaline marsh ☐ alkali flat ☑ other (specify): Lake

Which best describes the hydrologic state of the wetland at the time of assessment?

☐ ponded/inundated ☐ saturated soil, but no surface water ☑ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

☐ long-duration ☑ medium-duration ☐ short-duration

Does your wetland connect with the floodplain of a nearby stream? ☐ yes ☑ no

Is the topographic basin of the wetland ☑ distinct **or** ☐ indistinct **?**

An *indistinct*, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas, topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes.

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	L2_N	North			
2	L2_S	South			
3	L2-E	East			
4	L2-W	West			
5					
6					

Comments:

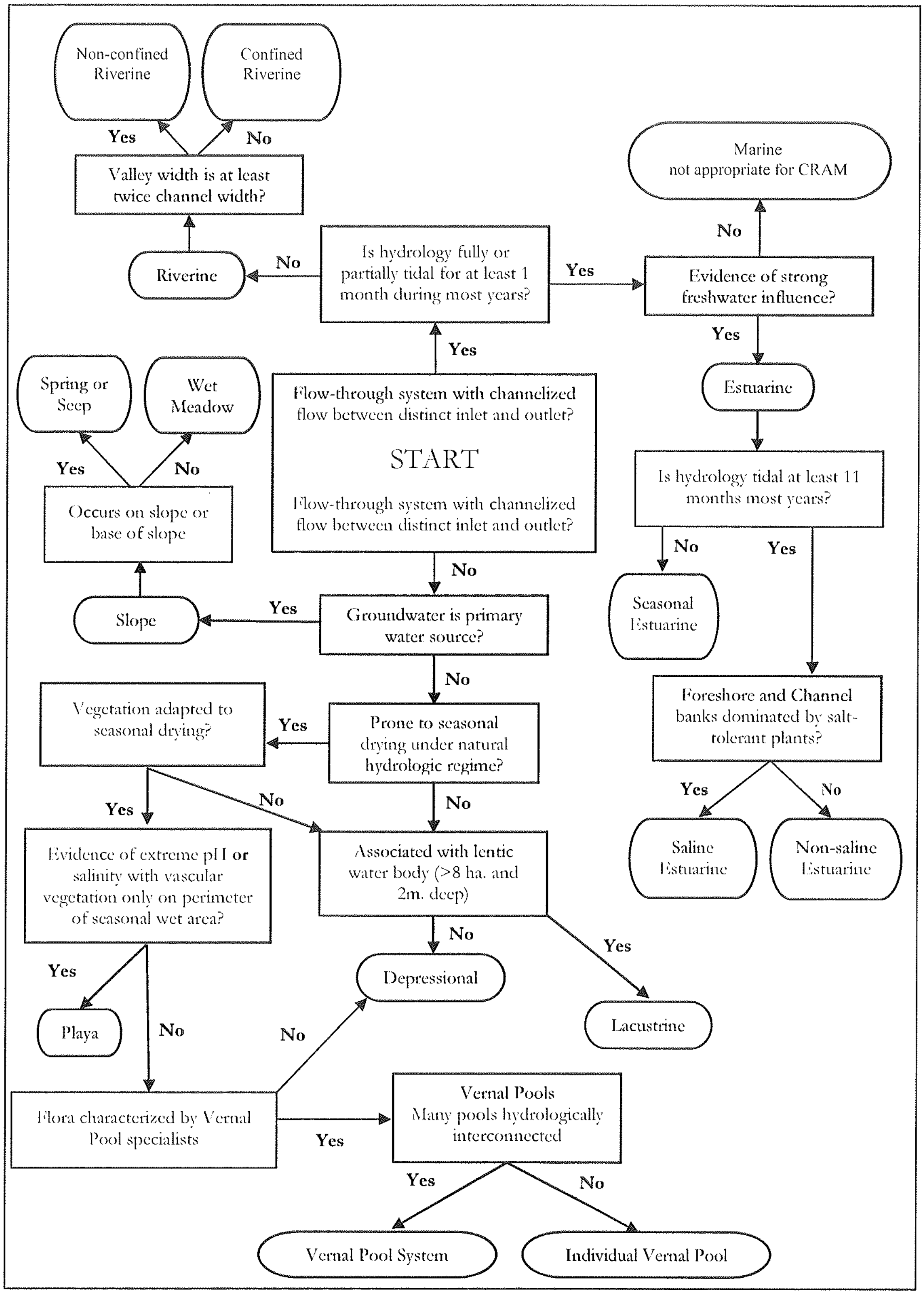
Photos were taken from the center of the AA.

Scoring Sheet: Perennial Depressional Wetlands

AA Name: L-2				(m/d/y) 08 18 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context		A		
Landscape Connectivity (D)				
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	C			
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 20.5	Final .85	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		B		
Hydrologic Connectivity		~~A~~ B		
Attribute Score		Raw ~~27.0~~ 24	Final ~~.75~~ .667	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		~~6~~ D		
Topographic Complexity		D		
Attribute Score		Raw 6.0	Final .25	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	C			
Plant Community submetric B: Number of Co-dominant species	D			
Plant Community submetric C: Percent Invasion	D			
Plant Community Metric (*average of submetrics A-C*)		4		
Horizontal Interspersion and Zonation		C		
Vertical Biotic Structure		C		
Attribute Score		Raw 16	Final ~~.445~~ .45	Final Attribute Score = (Raw Score/36)100
Overall AA Score		~~.58~~ .56		**Average of Final Attribute Scores**

Identify Wetland Type

Figure 3.2: Flowchart to determine wetland type and sub-type.



3.2.2.2 Depressional Wetlands

Note: This section was primarily based on perennial depressional wetlands and caution should be applied in the interpretation of scores in seasonal depressional wetlands. The depressional module will be revised during the CRAM validation/calibration process in 2008-2009.

Depressional wetlands exist in topographic lows that do not usually have outgoing surface drainage except during extreme flood events or heavy rainfall. Precipitation is their main source of water. Depressional wetlands can have distinct or indistinct boundaries. Many depressional wetlands are seasonal, and some lack surface ponding or saturated conditions during dry years. A complex of shallows and seasonally wet swales and depressions created by the slight topographic relief of a vernal pool system is an example of an indistinct depressional wetland. The margins of distinct depressional wetlands are relatively easy to discern in aerial photos and in the field. Examples of distinct depressional wetlands include sag ponds, snowmelt ponds, kettle-holes in moraines, cutoff ox-bows on floodplains, and water hazards on golf courses.

3.2.2.3 Other Depressional Wetlands

Depressional wetlands other than vernal pools can be seasonal or perennial, but their flora and fauna are mostly not characteristic of vernal pools, and they lack the impervious substrate that controls vernal pool hydrology. They differ from lacustrine wetlands by lacking an adjacent area of open water at least 2 m deep and 8 ha total area). They differ from playas by lacking an adjacent area larger than the wetland of either alkaline or saline open water less than 2 m deep or non-vegetated, fine-grain sediments. Unlike slope wetlands (i.e., springs and seeps), depressional wetlands depend more on precipitation than groundwater as their water source.

Establish the Assessment Area (AA)

Table 3.5: Examples of features that *should* be used to delineate AA boundaries.

Flow-Through Wetlands	Non Flow-Though Wetlands	
Riverine, Estuarine and Slope Wetlands	**Lacustrine, Wet Meadows, Depressional, and Playa Wetlands**	**Vernal Pools and Vernal Pool Systems**
☐ diversion ditches ☐ end-of-pipe large discharges ☐ grade control or water height control structures ☐ major changes in riverine entrenchment, confinement, degradation, aggradation, slope, or bed form ☐ major channel confluences ☐ water falls ☐ open water areas more than 50 m wide on average or broader than the wetland ☐ transitions between wetland types ☐ foreshores, backshores and uplands at least 5 m wide ☐ weirs, culverts, dams, levees, and other flow control structures	☐ above-grade roads and fills ☐ berms and levees ☐ jetties and wave deflectors ☐ major point sources or outflows of water ☐ open water areas more than 50 m wide on average or broader than the wetland ☐ foreshores, backshores and uplands at least 5 m wide ☐ weirs and other flow control structures	☐ above-grade roads and fills ☐ major point sources of water inflows or outflows ☐ weirs, berms, levees and other flow control structures

Table 3.6: Examples of features that should *not* be used to delineate any AAs.

☐ at-grade, unpaved, single-lane, infrequently used roadways or crossings
☐ bike paths and jogging trails at grade
☐ bare ground within what would otherwise be the AA boundary
☐ equestrian trails
☐ fences (unless designed to obstruct the movement of wildlife)
☐ property boundaries
☐ riffle (or rapid) – glide – pool transitions in a riverine wetland
☐ spatial changes in land cover or land use along the wetland border
☐ state and federal jurisdictional boundaries

Table 3.7: Recommended maximum and minimum AA sizes for each wetland type. Note: Wetlands smaller than the recommended AA sizes can be assessed in their entirety.

Wetland Type	Recommended AA Size
Slope	
Spring or Seep	Maximum size is 0.50 ha (about 75 m x 75 m, but shape can vary); there is no minimum size.
Wet Meadow	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.1 ha (about 30 m x 30 m).
Depressional	
Vernal Pool	There are no size limits (see Section 3.5.6 and Table 3.8).
Vernal Pool System	There are no size limits (see Section 3.5.6 and Table 3.8).
Other Depressional	**Maximum size is 1.0 ha (about 100 m x 100 m, but shape can vary); there is no minimum size.**
Riverine	
Confined and Non-confined	Recommended length is 10x average bankfull channel width; maximum length is 200 m; minimum length is 100 m. AA should extend laterally (landward) from the bankfull contour to encompass all the vegetation (trees, shrubs vines, etc) that probably provide woody debris, leaves, insects, etc. to the channel and its floodplain (Figure 3.4); minimum width is 2 m.
Lacustrine	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Playa	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Estuarine	
Perennial Saline	Recommended size and shape for estuarine wetlands is a 1 ha circle (radius about 55 m), but the shape can be non-circular if necessary to fit the wetland and to meet hydro-geomorphic and other criteria as outlined in Sections 3.5.1-3. The minimum size is 0.1 ha (about 30 m x 30 m).
Perennial Non-saline	
Seasonal	

Attribute 1: Buffer and Landscape Context

Landscape Connectivity

Definition: The landscape connectivity of an Assessment Area is assessed in terms of its spatial association with other areas of aquatic resources, such as other wetlands, lakes, streams, etc. It is assumed that wetlands close to each other have a greater potential to interact ecologically and hydrologically, and that such interactions are generally beneficial.

For all wetlands except riverine: On digital or hardcopy site imagery, draw a straight line extending 500 m from the AA boundary in each of the four cardinal compass directions. Along each transect line, estimate the percentage of the segment that passes through wetland or aquatic habitat of any kind, including open water. Use the worksheet below to record these estimates.

Worksheet for Landscape Connectivity Metric for All Wetlands Except Riverine

Percentage of Transect Lines that Contains Wetland Habitat of Any Kind	
Segment Direction	Percentage of Transect Length That is Wetland
North	100
South	97
East	100
West	100
Average Percentage of Transect Length That Is Wetland	99%

Table 4.1: Rating for Landscape Connectivity for all wetlands except Riverine.

Rating	Alternative States
A	An average of 76 – 100 % of the transects is wetland habitat of any kind.
B	An average of 51 – 75 % of the transects is wetland habitat of any kind.
C	An average of 26 – 50 % of the transects is wetland habitat of any kind.
D	An average of 0 – 25 % of the transects is wetland habitat of any kind.

Percent of AA with Buffer

Definition: The buffer is the area adjoining the AA that is in a natural or semi-natural state and currently not dedicated to anthropogenic uses that would severely detract from its ability to entrap contaminants, discourage forays into the AA by people and non-native predators, or otherwise protect the AA from stress and disturbance.

To be considered as buffer, a suitable land cover type must be at least 5 m wide and extend along the perimeter of the AA for at least 5 m. The maximum width of the buffer is 250 m. At distances beyond 250 m from the AA, the buffer becomes part of the landscape context of the AA.

Any area of open water at least 30 m wide that is adjoining the AA, such as a lake, large river, or large slough, is not considered in the assessment of the buffer. Such open water is considered to be neutral, neither part of the wetland nor part of the buffer. There are three reasons for excluding large areas of open water (i.e., more than 30 m wide) from Assessment Areas and their buffers. First, assessments of buffer extent and buffer width are inflated by including open water as a part of the buffer. Second, while there may be positive correlations between wetland stressors and the quality of open water, quantifying water quality generally requires laboratory analyses beyond the scope of rapid assessment. Third, open water can be a direct source of stress (i.e., water pollution, waves, boat wakes) or an indirect source of stress (i.e., promotes human visitation, encourages intensive use by livestock looking for water, provides dispersal for non-native plant species), or it can be a source of benefits to a wetland (e.g., nutrients, propagules of native plant species, water that is essential to maintain wetland hydroperiods, etc.). However, any area of open water at least 30 m wide that is within 250 m of the AA but is not adjoining the AA is considered part of the buffer.

In the example below (Figure 4.2), most of the area around the AA (outlined in white) consists of non-buffer land cover types. The AA adjoins a major roadway, parking lot, and other development that is a non-buffer land cover type. There is a nearby wetland but it is separated from the AA by a major roadway and is not considered buffer. The open water area is neutral and not considered in the estimation of the percentage of the AA perimeter that has buffer. In this example, the only areas that would be considered buffer is the area labeled "Upland Buffer".

Figure 4.2: Diagram of buffer and non-buffer land cover types.

Table 4.4: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers Excluded from Buffers Notes: buffers do not cross these land covers; areas of open water adjacent to the AA are not included in the assessment of the AA or its buffer.
☐ bike trails ☐ dry-land farming areas ☐ foot trails ☐ horse trails ☐ links or target golf courses ☐ natural upland habitats ☐ nature or wildland parks ☐ open range land ☐ railroads ☐ roads not hazardous to wildlife ☐ swales and ditches ☐ vegetated levees	☐commercial developments ☐fences that interfere with the movements of wildlife ☐intensive agriculture (row crops, orchards and vineyards lacking ground cover and other BMPs) ☐paved roads (two lanes plus a turning lane or larger) ☐lawns ☐parking lots ☐horse paddocks, feedlots, turkey ranches, etc. ☐residential areas ☐sound walls ☐sports fields ☐traditional golf courses ☐urbanized parks with active recreation ☐pedestrian/bike trails (i.e., nearly constant traffic)

Table 4.5: Rating for Percent of AA with Buffer.

Rating	Alternative States (not including open-water areas)
A	Buffer is 75 - 100% of AA perimeter.
B	Buffer is 50 – 74% of AA perimeter.
C	Buffer is 25 – 49% of AA perimeter.
D	Buffer is 0 – 24% of AA perimeter.

Average Buffer Width

Definition: The average width of the buffer adjoining the AA is estimated by averaging the lengths of eight straight lines drawn at regular intervals around the AA from its perimeter outward to the nearest non-buffer land cover or 250 m, which ever is first encountered. It is assumed that the functions of the buffer do not increase significantly beyond an average width of about 250 m. The maximum buffer width is therefore 250 m. The minimum buffer width is 5 m, and the minimum length of buffer along the perimeter of the AA is also 5 m. Any area that is less than 5 m wide and 5 m long is too small to be a buffer. See Table 4.4 above for more guidance regarding the identification of AA buffers.

Table 4.6: Steps to estimate Buffer Width for all wetlands.

Step 1	Identify areas in which open water is directly adjacent to the AA, with no vegetated intertidal or upland area in between. These areas are excluded from buffer calculations.
Step 2	Draw straight lines 250 m in length perpendicular to the AA through the buffer area at regular intervals along the portion of the perimeter of the AA that has a buffer. For one-sided riverine AAs, draw four lines; for all other wetland types, draw eight lines (see Figures 4.3 and 4.4 below).
Step 3	Estimate the buffer width of each of the lines as they extend away from the AA. Record these lengths on the worksheet below.
Step 4	Estimate the average buffer width. Record this width on the worksheet below.

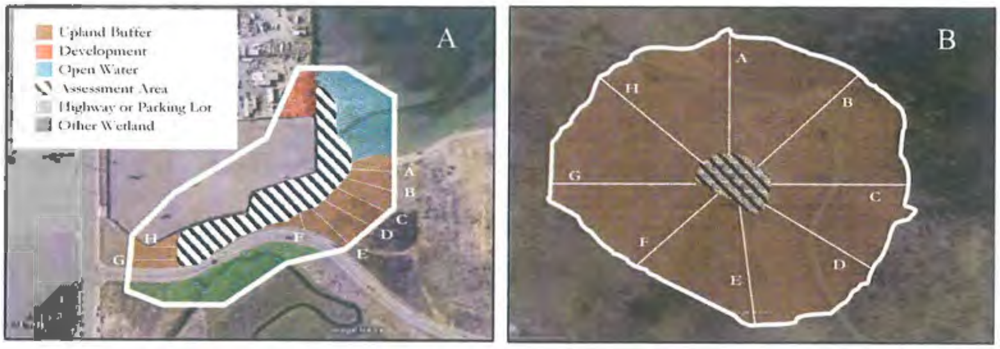


Figure 4.3: Examples of the method used to estimate Buffer Width. Note that the width is based on the lengths of eight lines A-H that extend at regular intervals though the buffer areas, whether only a small part of the 250 m zone around the AA is buffer (A) or all of the zone around the AA is buffer (B).

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	250
C	250
D	250
E	213
F	250
G	250
H	250
Average Buffer Width	245

Table 4.7: Rating for average buffer width.

Rating	Alternative States
A	Average buffer width is 190 – 250 m.
B	Average buffer width 130 – 189 m.
C	Average buffer width is 65 – 129 m.
D	Average buffer width is 0 – 64 m.

Buffer Condition

Definition: The condition of a buffer is assessed according to the extent and quality of its vegetation cover and the overall condition of its substrate. Evidence of direct impacts by people are excluded from this metric and included in the Stressor Checklist. Buffer conditions are assessed only for the portion of the wetland border that has already been identified or defined as buffer, based on Section 4.1.2 above. If there is no buffer, assign a score of D.

Table 4.8: Rating for Buffer Condition.

Rating	Alternative States
A	Buffer for AA is dominated by native vegetation, has undisturbed soils, and is apparently subject to little or no human visitation.
B	Buffer for AA is characterized by an intermediate mix of native and non-native vegetation, but mostly undisturbed soils and is apparently subject to little or no human visitation.
C	Buffer for AA is characterized by substantial amounts of non-native vegetation AND there is at least a moderate degree of soil disturbance/compaction, and/or there is evidence of at least moderate intensity of human visitation.
D	Buffer for AA is characterized by barren ground and/or highly compacted or otherwise disturbed soils, and/or there is evidence of very intense human visitation.

Attribute 2: Hydrology

Water Source

Definition: Water Sources directly affect the extent, duration, and frequency of saturated or ponded conditions within an Assessment Area. Water Sources include the kinds of direct inputs of water into the AA as well as any diversions of water from the AA. Diversions are considered a water source because they affect the ability of the AA to function as a source of water for other habitats while also directly affecting the hydrology of the AA.

A water source is direct if it supplies water mainly to the AA, rather than to areas through which the water must flow to reach the AA. Natural, direct sources include rainfall, ground water discharge, and flooding of the AA due to high tides or naturally high riverine flows. Examples of unnatural, direct sources include stormdrains that empty directly into the AA or into an immediately adjacent area. For seeps and springs that occur at the toes of earthen dams, the reservoirs behind the dams are direct water source. Indirect sources that should not be considered in this metric include large regional dams or urban storm drain systems that do not drain directly into the AA but that have systemic, ubiquitous effects on broad geographic areas of which the AA is a small part. For example, the salinity regimes of estuarine wetlands in San Francisco Bay are affected by dams in the Sierra Nevada, but these effects are not direct. But some of the same wetlands are directly affected by nearby discharges from sewage treatment facilities. Engineered hydrological controls, such as weirs, tide gates, flashboards, grade control structures, check dams, etc., can serve to demarcate the boundary of an AA (see Section 3.5), but they are not considered water sources.

The typical suite of natural water sources differs among the wetland types. The water for estuarine wetlands is by definition a combination of marine (i.e., tidal) and riverine (i.e., fluvial) sources. This metric is focused on the non-tidal water sources that account for the conditions during the growing season, regardless of the time of year when these sources exist. To assess water source, the plant species composition of the wetland should be compared to what is expected, in terms of the position of the wetland along the salinity gradient of the estuary, as adjusted for the overall wetness of the water year. In general, altered sources are indicated by vegetation that is either more tolerant of saline conditions or less tolerant than would be expected. If the plant community is unexpectedly salt-tolerant, then an unnatural decrease in freshwater supply is indicated. Conversely, if the community is less salt-tolerant than expected, than an unnatural increase in freshwater is indicated.

Table 4.9: Rating for Water Source.

Rating	Alternative States
A	Freshwater sources that affect the dry season condition of the AA, such as its flow characteristics, hydroperiod, or salinity regime, are precipitation, groundwater, and/or natural runoff, or natural flow from an adjacent freshwater body, or the AA naturally lacks water in the dry season. There is no indication that dry season conditions are substantially controlled by artificial water sources.
B	Freshwater sources that affect the dry season condition of the AA are mostly natural, but also obviously include occasional or small effects of modified hydrology. Indications of such anthropogenic inputs include developed land or irrigated agricultural land that comprises less than 20% of the immediate drainage basin within about 2 km upstream of the AA, or that is characterized by the presence of a few small stormdrains or scattered homes with septic systems. No large point sources or dams control the overall hydrology of the AA.
C	Freshwater sources that affect the dry season conditions of the AA are primarily urban runoff, direct irrigation, pumped water, artificially impounded water, water remaining after diversions, regulated releases of water through a dam, or other artificial hydrology. Indications of substantial artificial hydrology include developed or irrigated agricultural land that comprises more than 20% of the immediate drainage basin within about 2 km upstream of the AA, or the presence of major point source discharges that obviously control the hydrology of the AA. OR Freshwater sources that affect the dry season conditions of the AA are substantially controlled by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from its drainage basin.
D	Natural, freshwater sources that affect the dry season conditions of the AA have been eliminated based on the following indicators: impoundment of all possible wet season inflows, diversion of all dry-season inflow, predominance of xeric vegetation, etc.

Hydroperiod or Channel Stability

Definition: Hydroperiod is the characteristic frequency and duration of inundation or saturation of a wetland during a typical year. The natural hydroperiod for estuarine wetlands is governed by the tides, and includes predictable variations in inundation regimes over days, weeks, months, and seasons. Depressional, lacustrine, playas, and riverine wetlands typically have daily variations in water height that are governed by diurnal increases in evapotranspiration and seasonal cycles that are governed by rainfall and runoff. Seeps and springs that depend on groundwater may have relatively slight seasonal variations in hydroperiod.

Channel stability only pertains to riverine wetlands. It is assessed as the degree of channel aggradation (i.e., net accumulation of sediment on the channel bed causing it to rise over time), or degradation (i.e., net loss of sediment from the bed causing it to be lower over time). There is much interest in channel entrenchment (i.e., the inability of flows in a channel to exceed the channel banks) and this is addressed in the Hydrologic Connectivity metric.

Table 4.10: Field Indicators of Altered Hydroperiod.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
☐ Upstream spring boxes ☐ Impoundments ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Evidence of aquatic wildlife mortality ☐ Encroachment of terrestrial vegetation ☐ Stress or mortality of hydrophytes ☐ Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
☐ Berms ☐ Dikes ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Late-season vitality of annual vegetation ☐ Recently drowned riparian vegetation ☐ Extensive fine-grain deposits

Depressional, Lacustrine, Playas, and Slope Wetlands: Assessment of the hydroperiod for these kinds of wetlands should be initiated with an office-based review of. Field indicators for altered hydroperiod include pumps, spring boxes, ditches, hoses and pipes, and encroachment of terrestrial vegetation (see Table 4.10 above). Tables 4.11a and 4.11b provide narratives for rating Hydroperiod for depressional, lacustrine, and seep and spring wetlands.

Table 4.11a: Rating of Hydroperiod for Depressional, Lacustrine, Playas, and Slope wetlands.

Rating	Alternative States (based on Table 4.10 above)
A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
D	Both the inundation and drawdown of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

Hydrologic Connectivity

Definition: Hydrologic Connectivity describes the ability of water to flow into or out of the wetland, or to inundate their adjacent uplands. This metric pertains only to Riverine, Estuarine, Vernal Pool Systems, individual Vernal Pools, and Playas.

This metric is scored by assessing the degree to which the hydrologic connectivity of the AA is restricted by unnatural features, such as levees and excessively high banks. These features may be restricting the hydrology of the wetland in which the AA is contained, and thus do not need to directly adjoin the AA.

Table 4.15c: Rating of Hydrologic Connectivity for Estuarine, Depressional, Lacustrine, and Slope wetlands, Playas, Individual Vernal Pools, and Vernal Pool Systems.

Rating	Alternative States
A	Rising water in the wetland that contains the AA has unrestricted access to adjacent areas, without levees or other obstructions to the lateral movement of flood waters.
B	There are unnatural features such as levees or road grades that limit the amount of adjacent transition zone or the lateral movement of flood waters, relative to what is expected for the setting. But, the limitations exist for less than 50% of the boundary of wetland that contains the AA. Restrictions may be intermittent along margins of the wetland, or they may occur only along one bank or shore of the wetland. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
C	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for 50-90% of the wetland that contains the AA. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
D	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for more than 90% of the wetland that contains the AA.

Attribute 3: Physical Structure

Structural Patch Richness

Definition: Patch richness is the number of different obvious types of physical surfaces or features that may provide habitat for aquatic, wetland, or riparian species. This metric is different from topographic complexity in that it addresses the number of different patch types, whereas topographic complexity evaluates the spatial arrangement and interspersion of the types. Physical patches can be natural or unnatural.

Patch Type Definitions:

Animal mounds and burrows. Many vertebrates make mounds or holes as a consequence of their foraging, denning, predation, or other behaviors. The resulting soil disturbance helps to redistributes soil nutrients and influences plant species composition and abundance. To be considered a patch type there should be evidence that a population of burrowing animals has occupied the Assessment Area. A single burrow or mound does not constitute a patch.

Bank slumps or undercut banks in channels or along shorelines. A bank slump is a portion of a depressional, estuarine, or lacustrine bank that has broken free from the rest of the bank but has not eroded away. Undercuts are areas along the bank or shoreline of a wetland that have been excavated by waves or flowing water.

Cobble and boulders. Cobble and boulders are rocks of different size categories. The long axis of cobble ranges from about 6 cm to about 25 cm. A boulder is any rock having a long axis greater than 25 cm. Submerged cobbles and boulders provide abundant habitat for aquatic macroinvertebrates and small fish. Exposed cobbles and boulders provide roosting habitat for birds and shelter for amphibians. They contribute to patterns of shade and light and air movement near the ground surface that affect local soil moisture gradients, deposition of seeds and debris, and overall substrate complexity.

Concentric or parallel high water marks. Repeated variation in water level in a wetland can cause concentric zones in soil moisture, topographic slope, and chemistry that translate into visible zones of different vegetation types, greatly increasing overall ecological diversity. The variation in water level might be natural (e.g., seasonal) or anthropogenic.

Debris jams. A debris jam is an accumulation of drift wood and other flotage across a channel that partially or completely obstructs surface water flow.

Hummocks or sediment mounds. Hummocks are mounds created by plants in slope wetlands, depressions, and along the banks and floodplains of fluvial and tidal systems. Hummocks are typically less than 1m high. Sediment mounds are similar to hummocks but lack plant cover.

Islands (exposed at high-water stage). An island is an area of land above the usual high water level and, at least at times, surrounded by water in a riverine, lacustrine, estuarine, or playa system. Islands differ from hummocks and other mounds by being large enough to support trees or large shrubs.

Macroalgae and algal mats. Macroalgae occurs on benthic sediments and on the water surface of all types of wetlands. Macroalgae are important primary producers, representing the base of the food web in some wetlands. Algal mats can provide abundant habitat for macro-invertebrates, amphibians, and small fishes.

Non-vegetated flats (sandflats, mudflats, gravel flats, etc.). A flat is a non-vegetated area of silt, clay, sand, shell hash, gravel, or cobble at least 10 m wide and at least 30 m long that adjoins the wetland

foreshore and is a potential resting and feeding area for fishes, shorebirds, wading birds, and other waterbirds. Flats can be similar to large bars (see definitions of point bars and in-channel bars below), except that they lack the convex profile of bars and their compositional material is not as obviously sorted by size or texture.

Pannes or pools on floodplain. A panne is a shallow topographic basin lacking vegetation but existing on a well-vegetated wetland plain. Pannes fill with water at least seasonally due to overland flow. They commonly serve as foraging sites for waterbirds and as breeding sites for amphibians.

Point bars and in-channel bars. Bars are sedimentary features within intertidal and fluvial channels. They are patches of transient bedload sediment that form along the inside of meander bends or in the middle of straight channel reaches. They sometimes support vegetation. They are convex in profile and their surface material varies in size from small on top to larger along their lower margins. They can consist of any mixture of silt, sand, gravel, cobble, and boulders.

Pools in channels. Pools are areas along tidal and fluvial channels that are much deeper than the average depths of their channels and that tend to retain water longer than other areas of the channel during periods of low or no surface flow.

Riffles or rapids. Riffles and rapids are areas of relatively rapid flow and standing waves in tidal or fluvial channels. Riffles and rapids add oxygen to flowing water and provide habitat for many fish and aquatic invertebrates.

Secondary channels on floodplains or along shorelines. Channels confine riverine or estuarine flow. A channel consists of a bed and its opposing banks, plus its floodplain. Estuarine and riverine wetlands can have a primary channel that conveys most flow, and one or more secondary channels of varying sizes that convey flood flows. The systems of diverging and converging channels that characterize braided and anastomosing fluvial systems usually consist of one or more main channels plus secondary channels. Tributary channels that originate in the wetland and that only convey flow between the wetland and the primary channel are also regarded as secondary channels. For example, short tributaries that are entirely contained within the CRAM Assessment Area (AA) are regarded as secondary channels.

Shellfish beds. Oysters, clams and mussels are common bivalves that create beds on the banks and bottoms of wetland systems. Shellfish beds influence the condition of their environment by affecting flow velocities, providing substrates for plant and animal life, and playing particularly important roles in the uptake and cycling of nutrients and other water-borne materials.

Soil cracks. Repeated wetting and drying of fine grain soil that typifies some wetlands can cause the soil to crack and form deep fissures that increase the mobility of heavy metals, promote oxidation and subsidence, while also providing habitat for amphibians and macroinvertebrates. Cracks must be a minimum of 1 inch deep to qualify.

Standing snags. Tall, woody vegetation, such as trees and tall shrubs, can take many years to fall to the ground after dying. These standing "snags" they provide habitat for many species of birds and small mammals. Any standing, dead woody vegetation that is at least 3 m tall is considered a snag.

Submerged vegetation. Submerged vegetation consists of aquatic macrophytes such as *Elodea canadensis* (common elodea), and *Zostera marina* (eelgrass) that are rooted in the sub-aqueous substrate but do not usually grow high enough in the overlying water column to intercept the water surface. Submerged vegetation can strongly influence nutrient cycling while providing food and shelter for fish and other organisms.

Swales on floodplain or along shoreline. Swales are broad, elongated, vegetated, shallow depressions that can sometimes help to convey flood flows to and from vegetated marsh plains or floodplains. But, they lack obvious banks, regularly spaced deeps and shallows, or other characteristics of channels. Swales can entrap water after flood flows recede. They can act as localized recharge zones and they can sometimes receive emergent groundwater.

Variegated or crenulated foreshore. As viewed from above, the foreshore of a wetland can be mostly straight, broadly curving (i.e., arcuate), or variegated (e.g., meandering). In plan view, a variegated shoreline resembles a meandering pathway. variegated shorelines provide greater contact between water and land.

Wrackline or organic debris in channel or on floodplain. Wrack is an accumulation of natural or unnatural floating debris along the high water line of a wetland.

Structural Patch Type Worksheet for All Wetland Types, Except Vernal Pool Systems

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table 4.16 below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see section 3.2.2.1).

STRUCTURAL PATCH TYPE (check for presence)	Riverine (Non-confined)	Riverine (Confined)	All Estuarine	**Depressional**	Slope Wetlands	Lacustrine	Individual Vernal Pools	Playas
Minimum Patch Size	3 m^2	3 m^2	3 m^2	**3 m^2**	1 m^2	3 m^2	1 m^2	3 m^2
Secondary channels on floodplains or along shorelines	1	0	1	**0**	1	1	0	1
Swales on floodplain or along shoreline	1	0	0	**1**	1	1	1	1
Pannes or pools on floodplain	1	0	1	**0**	1	1	1	1
Vegetated islands (mostly above high-water)	1	0	0	**1**	0	0	1	1
Pools or depressions in channels (wet or dry channels)	1	1	1	**0**	0	0	0	0
Riffles or rapids (wet channel) or planar bed (dry channel)	1	1	0	**0**	0	0	0	0
Non-vegetated flats or bare ground (sandflats, mudflats, gravel flats, etc.)	0	0	1	**1**	1	1	1	1
Point bars and in-channel bars	1	1	1	**0**	0	0	0	0
Debris jams	1	1	1	**0**	0	1	0	0
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	1	1	1	**1**	0	1	0	0
Plant hummocks and/or sediment mounds	1	1	1	**1**	1	1	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1	1	**1**	0	1	0	0
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1	0	**1**	0	1	0	0
Animal mounds and burrows	0	0	1	**1**	1	0	1	1
Standing snags (at least 3 m tall)	1	1	1	**1**	1	1	0	0
Filamentous macroalgae or algal mats	1	1	1	**1**	1	1	1	1
Shellfish beds	0	0	1	**0**	0	1	0	0
Concentric or parallel high water marks	0	0	0	**1**	1	1	1	1
Soil cracks	0	0	1	**1**	0	1	1	1
Cobble and/or Boulders	1	1	0	**0**	1	1	1	0
Submerged vegetation	1	0	1	**1**	0	1	0	0
Total Possible	16	11	15	**13**	10	16	10	10
No. Observed Patch Types (enter here and use in Table 4.16 below)						4		

Table 4.16: Rating of Structural Patch Richness (based on results from worksheets).

Rating	Confined Riverine, Playas, Springs & Seeps, Individual Vernal Pools	**Vernal ,Pool Systems and Depressional**	Estuarine	Non-confined Riverine, $\boxed{\text{Lacustrine}}$
A	≥ 8	**≥ 11**	≥ 11	≥ 12
B	6 – 7	**8 – 10**	8 – 10	9 – 11
C	4 – 5	**5 – 7**	6 – 7	6 – 8
D	≤ 3	**≤ 4**	≤ 5	≤ 5 — ok

Topographic Complexity

Definition: Topographic complexity refers to the variety of elevations within a wetland due to physical, abiotic features and elevations gradients.

Table 4.17: Typical indicators of Macro- and Micro-topographic Complexity for each wetland type.

Type	Examples of Topographic Features
Depressional and Playas	**pools, islands, bars, mounds or hummocks, variegated shorelines, soil cracks, partially buried debris, plant hummocks, livestock tracks**
Estuarine	channels large and small, islands, bars, pannes, potholes, natural levees, shellfish beds, hummocks, slump blocks, first-order tidal creeks, soil cracks, partially buried debris, plant hummocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines, cobble, boulders, partially buried debris, plant hummocks
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams, cobble, boulders, slump blocks, tree-fall holes, plant hummocks
Slope Wetlands	pools, runnels, plant hummocks, burrows, plant hummocks, cobbles, boulders, partially buried debris, cattle or sheep tracks
Vernal Pools and Pool Systems	soil cracks, "mima-mounds," rivulets between pools or along swales, cobble, plant hummocks, cattle or sheep tracks

Figure 4.6: Scale-independent schematic profiles of Topographic Complexity.
Each profile A-D represents one-half of a characteristic cross-section through an AA. The right end of each profile represents either the buffer along the backshore of the wetland encompassing the AA, or, if the AA is not contiguous with the buffer, then the right end of each profile represents the edge of the AA.

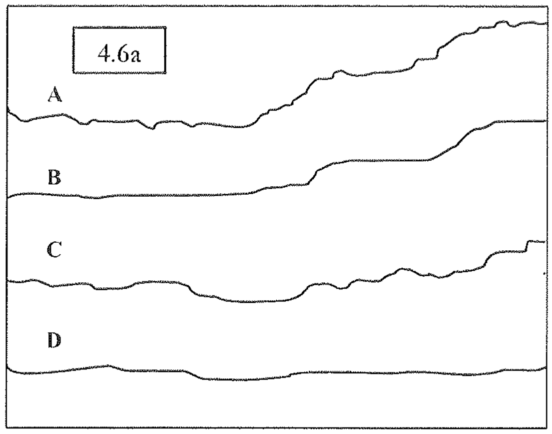


Table 4.18a: Rating of Topographic Complexity for Depressional Wetlands, Playas, Individual Vernal Pools, and Slope Wetlands.

Rating	Alternative States (based on diagrams in Figure 4.6 above)
A	AA as viewed along a typical cross-section has at least two benches or breaks in slope, and each of these benches, plus the slopes between them contain physical patch types or features that contribute to abundant micro-topographic relief or variability as illustrated in profile A of Figure 4.6a.
B	AA has at least two benches or breaks in slope above the middle area or bottom zone of the AA, but these benches and slopes mostly lack abundant micro-topographic relief. The AA resembles profile B of Figure 4.6a.
C	AA lacks any obvious break in slope or bench, and is best characterized has a single slope that has at least a moderate amount of micro-topographic complexity, as illustrated in profile C of Figure 4.6a.
D	AA has a single, uniform slope with little or no micro-topographic complexity, as illustrated in profile D of Figure 4.6a.

Attribute 4: Biotic Structure

Plant Community Metric

Definition: The Plant Community Metric is composed of three submetrics for each wetland type. Two of these sub-metrics, Number of Co-dominant Plants and Percent Invasion, are common to all wetland types. For all wetlands except Vernal Pools and Vernal Pool Systems, the Number of Plant Layers as defined for CRAM is also assessed. For Vernal Pools and Pool Systems, the Number of Plant layers submetric is replaced by the Native Species Richness submetric. A thorough reconnaissance of an AA is required to assess its condition using these submetrics. The assessment for each submetric is guided by a set of Plant Community Worksheets. The Plant Community metric is calculated based on these worksheets.

A "plant" is defined as an individual of any species of tree, shrub, herb/forb, moss, fern, emergent, submerged, submergent or floating macrophyte, including non-native (exotic) plant species. For the purposes of CRAM, a plant "layer" is a stratum of vegetation indicated by a discreet canopy at a specified height that comprises at least 5% of the area of the AA where the layer is expected.

Non-native species owe their occurrence in California to the actions of people since shortly before Euroamerican contact. "Invasive" species are non-native species that tend to dominate one or more plant layers within an AA. CRAM uses the California Invasive Plant Council (Cal-IPC) list to determine the invasive status of plants, with augmentation by regional experts.

Number of Plant Layers Present

To be counted in CRAM, a layer must cover at least 5% of *the portion of the AA that is suitable for the layer.* This would be the littoral zone of lakes and depressional wetlands for the one aquatic layer, called "floating." The "short," "medium," and "tall" layers might be found throughout the non-aquatic areas of each wetland class, except in areas of exposed bedrock, mudflat, beaches, active point bars, etc. The "very tall" layer is usually expected to occur along the backshore, except in forested wetlands.

It is essential that the layers be identified by the actual plant heights (i.e., the approximate maximum heights) of plant species in the AA, regardless of the growth potential of the species. For example, a young sapling redwood between 0.5 m and 0.75 m tall would belong to the "medium" layer, even though in the future the same individual redwood might belong to the "very tall" layer. Some species might belong to multiple plant layers. For example, groves of red alders of all different ages and heights might collectively represent all four non-aquatic layers in a riverine AA. Riparian vines, such as wild grape, might also dominate all of the non-aquatic layers.

Layer definitions:

Floating Layer. This layer includes rooted aquatic macrophytes such as *Ruppia cirrhosa* (ditchgrass), *Ranunculus aquatilis* (water buttercup), and *Potamogeton foliosus* (leafy pondweed) that create floating or buoyant canopies at or near the water surface that shade the water column. This layer also includes non-rooted aquatic plants such as *Lemna* spp. (duckweed) and *Eichhornia crassipes* (water hyacinth) that form floating canopies.

Short Vegetation. This layer varies in maximum height among the wetland types, but is never taller than 50 cm. It includes small emergent vegetation and plants. It can include young forms of species that grow taller. Vegetation that is naturally short in its mature stage includes *Rorippa nasturtium-aquaticum* (watercress), small Isoetes (quillworts*), Distichlis spicata* (saltgrass), *Jaumea carnosa* (jaumea), *Ranunculus flamula* (creeping buttercup), *Alisma* spp. (water plantain), *Sparganium* (burweeds), and *Sagitaria* spp. (arrowhead).

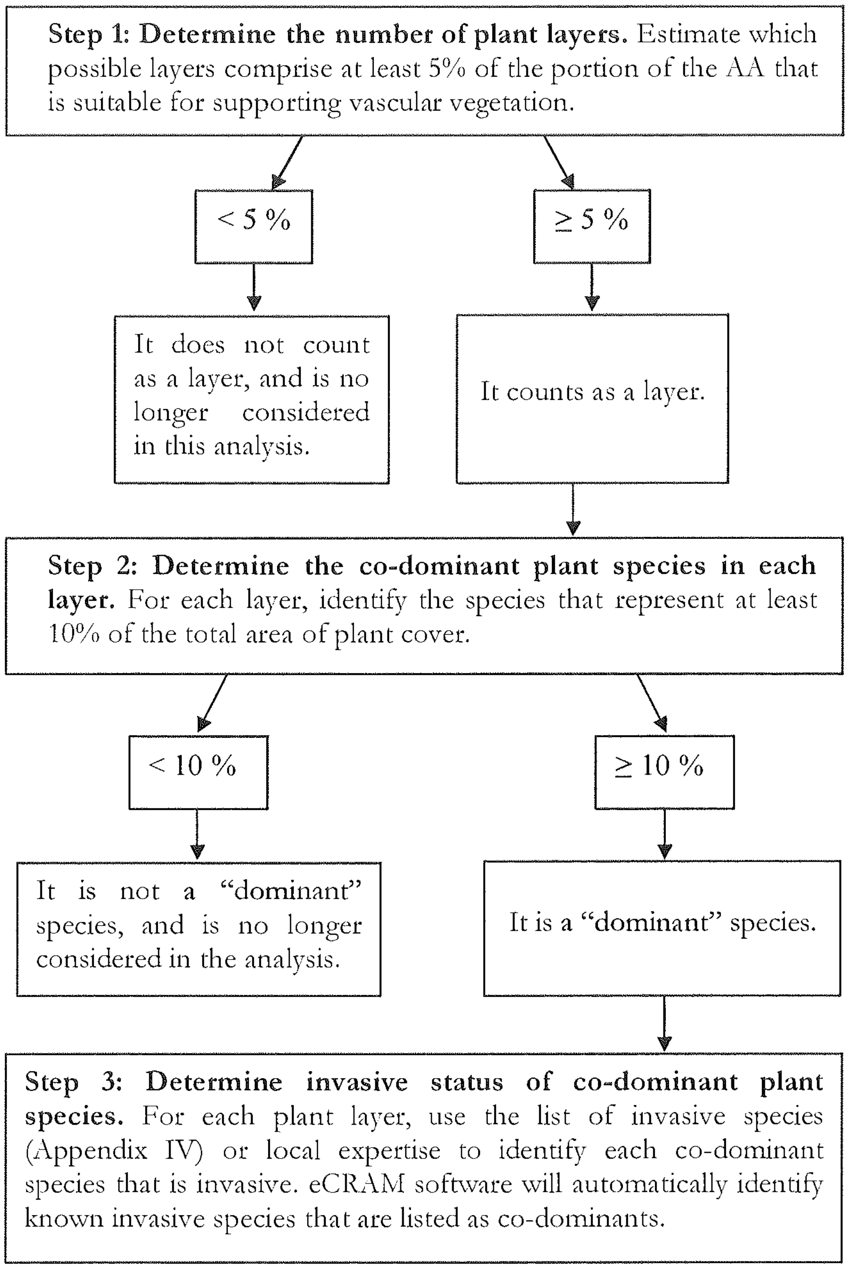
Medium Vegetation. This layer never exceeds 75 cm in height. It commonly includes emergent vegetation such *Salicornia virginica* (pickleweed), *Atriplex* spp. (saltbush), rushes (*Juncus* spp.), and *Rumex crispus* (curly dock).

Tall Vegetation. This layer never exceeds 1.5 m in height. It usually includes the tallest emergent vegetation and the larger shrubs. Examples include *Typha latifolia* (broad-leaved cattail), *Scirpus californicus* (bulrush), *Rubus ursinus* (California blackberry), and *Baccharis piluaris* (coyote brush).

Very Tall Vegetation. This layer is reserved for shrubs, vines, and trees that are taller than 1.5 m. Examples include *Plantanus racemosa* (western sycamore), *Populus fremontii* (Fremont cottonwood), *Alnus rubra* (red alder), *Sambucus mexicanus* (Blue elderberry), and *Corylus californicus* (hazelnut).

Standing (upright) dead or senescent vegetation from the previous growing season can be used in addition to live vegetation to assess the number of plant layers present. However, the lengths of prostrate stems or shoots are disregarded. In other words, fallen vegetation should not be "held up" to determine the plant layer to which it belongs. The number of plant layers must be determined based on the way the vegetation presents itself in the field.

Appendix I: Flow Chart to Determine Plant Dominance



Plant Community Metric Worksheet 1 of 8: Plant layer heights for all wetland types.

Wetland Type	Plant Layers				
	Aquatic	Semi-aquatic and Riparian			
	Floating	Short	Medium	Tall	Very Tall
Perennial Saline Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Perennial Non-saline Estuarine, Seasonal Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Lacustrine, Depressional and Non-confined Riverine	**On Water Surface**	**<0.5 m**	**0.5 – 1.5 m**	**1.5 - 3.0 m**	**>3.0 m**
Slope	NA	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Confined Riverine	NA	<0.5 m	0.5 – 1.5 m	1.5 – 3.0 m	>3.0 m

Number of Co-dominant Species

For each plant layer in the AA, all species represented by living vegetation that comprises at least 10% relative cover within the layer are considered to be dominant. Only living vegetation in growth position is considered in this metric. Dead or senescent vegetation is disregarded.

Percent Invasion

The number of invasive co-dominant species for all plant layers combined is assessed as a percentage of the total number of co-dominants, based on the results of the Number of Co-dominant Species sub-metric. The invasive status for many California wetland and riparian plant species is based on the Cal-IPC list (Appendix IV). However, the best professional judgment of local experts may be used instead to determine whether or not a co-dominant species is invasive.

Plant Community Metric Worksheet 2 of 8: Co-dominant species richness for all wetland types, except Confined Riverine, Slope wetlands, Vernal Pools, and Playas (A dominant species represents ≥10% *relative* cover)

Note: Plant species should only be counted once when calculating the Number of Co-dominant Species and Percent Invasion metric scores.

Floating or Canopy-forming	Invasive?	Short	Invasive?
		Allen occid	N
		Tam ram	Y
Medium	**Invasive?**	**Tall**	**Invasive?**
Allen occid	N		
Tam ram	Y		
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined (enter here and use in Table 4.19)	2
		Percent Invasion (enter here and use in Table 4.19)	1/2

Table 4.19: Ratings for submetrics of Plant Community Metric.

Rating	Number of Plant Layers Present	Number of Co-dominant Species	Percent Invasion
Lacustrine, Depressional and Non-confined Riverine Wetlands			
A	4 – 5	≥ 12	0 – 15%
B	3	9 – 11	16 – 30%
C	1 – 2	6 – 8	31 – 45%
D	0	0 – 5	46 – 100%

Horizontal Interspersion and Zonation

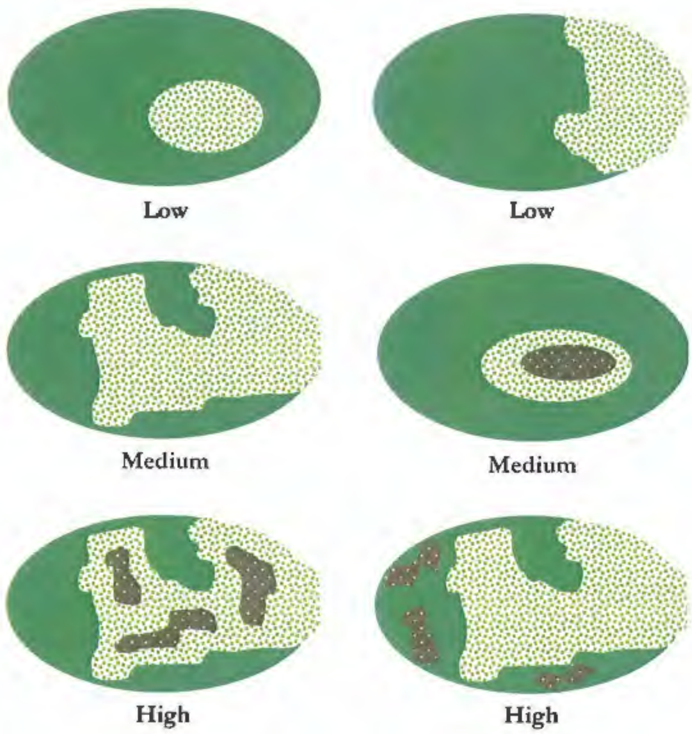
Definition: Horizontal biotic structure refers to the variety and interspersion of plant "zones." Plant zones are plant monocultures or obvious multi-species association that are arrayed along gradients of elevation, moisture, or other environmental factors that seem to affect the plant community organization in plan view. Interspersion is essentially a measure of the number of distinct plant zones and the amount of edge between them.

Table 4.20a: Rating of Horizontal Interspersion of Plant Zones for all AAs except Riverine and Vernal Pool Systems.

Rating	Alternative States (based on Figures 4.7, 4.8, and 4.10)
A	AA has a high degree of plan-view interspersion.
B	AA has a moderate degree of plan-view interspersion.
C	AA has a low degree of plan-view interspersion.
D	AA has essentially no plan-view interspersion.

Note: When using this metric, it is helpful to assign names of plant species or associations of species to the colored patches in Figure 4.10.

Figure 4.7: Diagram of the degrees of interspersion of plant zones for Lacustrine, Depressional, Playas, and Slope wetlands. Hatching patterns represent plant zones (adapted from Mack 2001). Each zone must comprise at least 5% of the AA.



Vertical Biotic Structure

Definition: The vertical component of biotic structure consists of the interspersion and complexity of plant layers. The same plant layers used to assess the Plant Community Composition Metrics (see Section 4.4.2) are used to assess Vertical Biotic Structure. To be counted in CRAM, a layer must cover at least 5% of the portion of the AA that is suitable for the layer. This metric does not pertain to Vernal Pools, Vernal Pool Systems, or Playas.

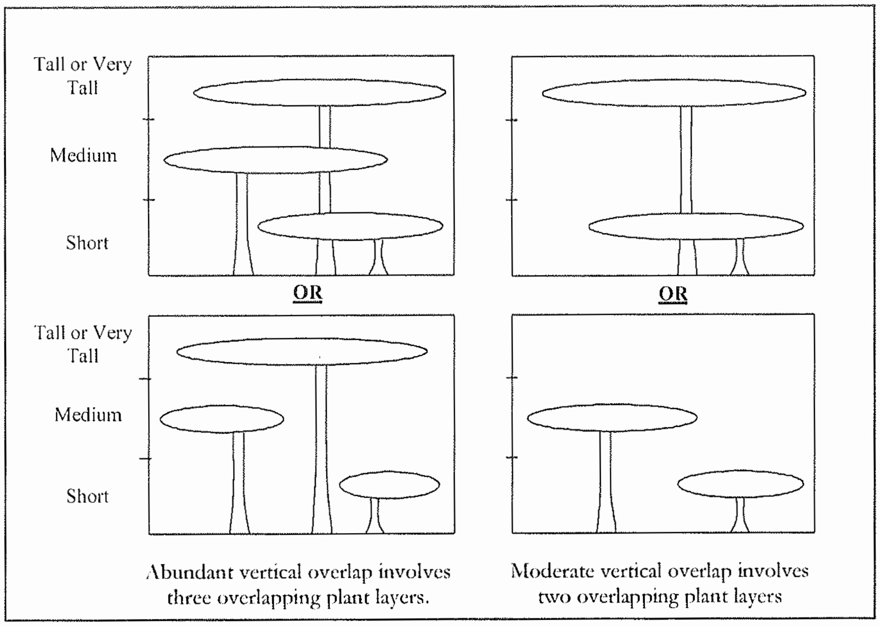


Figure 4.11: Schematic diagrams of vertical interspersion of plant layers for Riverine AAs and for Depressional and Lacustrine AAs having Tall or Very Tall plant layers.

Table 4.21: Rating of Vertical Biotic Structure for Riverine AAs and for Lacustrine and Depressional AAs supporting Tall or Very Tall plant layers (see Figure 4.11).

Rating	Alternative States
A	More than 50% of the vegetated area of the AA supports abundant overlap of plant layers (see Figures 4.11).
B	More than 50% of the area supports at least moderate overlap of plant layers.
C	25–50% of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
D	Less than 25% of the vegetated AA supports moderate overlap of plant layers, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

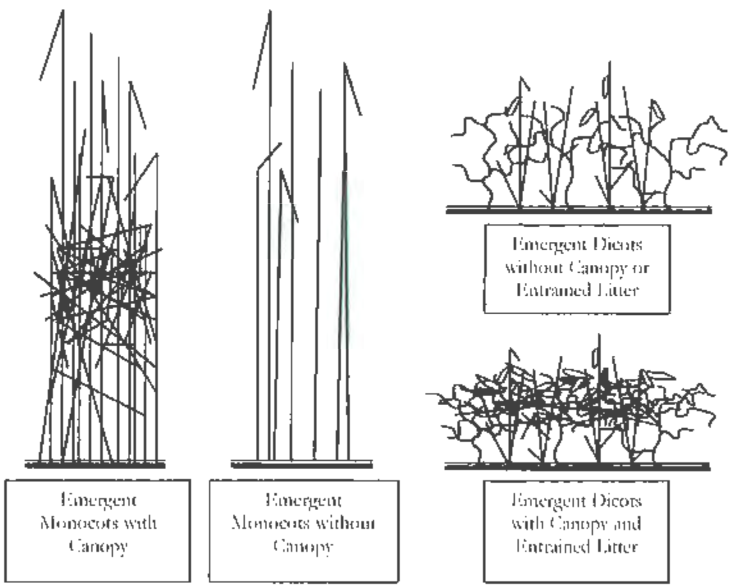


Figure 4.12: Schematic diagrams of plant canopies and entrained litter used to assess Vertical Biotic Structure in all Estuarine wetlands, or in Depressional and Lacustrine wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers.

Table 4.22: Rating of Vertical Biotic Structure for wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers, especially Estuarine saline wetlands (see Figure 4.12).

Rating	Alternative States
A	Most of the vegetated plain of the AA has a dense canopy of living vegetation or entrained litter or detritus forming a "ceiling" of cover 10-20 cm of above the wetland surface that shades the surface and can provide abundant cover for wildlife.
B	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter as described in "A" above; OR Most of the vegetated plain has a dense canopy but the ceiling it forms is much less than 10-20 cm above the ground surface.
C	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter AND the ceiling it forms is much less than 10-20 cm above the ground surface.
D	Most of the AA lacks a dense canopy of living vegetation or entrained litter or detritus.

Guidelines to Complete the Stressor Checklists

Definition: A stressor, as defined for the purposes of the CRAM, is an anthropogenic perturbation within a wetland or its environmental setting that is likely to negatively impact the condition and function of the CRAM Assessment Area (AA). A disturbance is a natural phenomenon that affects the AA.

There are four underlying assumptions of the Stressor Checklist: (1) deviation from the best achievable condition can be explained by a single stressor or multiple stressors acting on the wetland; (2) increasing the number of stressors acting on the wetland causes a decline in its condition (there is no assumption as to whether this decline is additive (linear), multiplicative, or is best represented by some other non-linear mode); (3) increasing either the intensity or the proximity of the stressor results in a greater decline in condition; and (4) continuous or chronic stress increases the decline in condition.

The process to identify stressors is the same for all wetland types. For each CRAM attribute, a variety of possible stressors are listed. Their presence and likelihood of significantly affecting the AA are recorded in the Stressor Checklist Worksheet. For the Hydrology, Physical Structure, and Biotic Structure attributes, the focus is on stressors operating within the AA or within 50 m of the AA. For the Buffer and Landscape Context attribute, the focus is on stressors operating within 500 m of the AA. More distant stressors that have obvious, direct, controlling influences on the AA can also be noted.

Table 5.1: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	✓	✓
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		
	~~None~~	

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**	✓	
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	✓	
Heavy metal impaired (PS or Non-PS pollution)	✓	
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	
Trash or refuse		
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species	✓	
Pesticide application or vector control	✓	
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources	✓	✓
Lack of treatment of invasive plants adjacent to AA or buffer	✓	✓

Comments

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)	✓	✓
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		

Comments

CRAM Score Guidelines

Table 3.11: Steps to calculate attribute scores and AA scores.

Step 1: Calculate Metric Score	For each Metric, convert the letter score into the corresponding numeric score: A=12, B=9, C=6 and D=3.
Step 2: Calculate raw Attribute Score	For each Attribute, calculate the Raw Attribute Score as the sum of the numeric scores of the component Metrics, except in the following cases: - For Attribute 1 (Buffer and Landscape Context), the submetric scores relating to buffer are combined into an overall buffer score that is added to the score for the Landscape Connectivity metric, using the following formula: $\left(\boxed{\text{Buffer Condition}} \times \left(\boxed{\text{\% AA with Buffer}} \times \boxed{\text{Average Buffer Width}} \right)^{1/2} \right)^{1/2} + \boxed{\text{Landscape Connectivity}}$ - Prior to calculating the Biotic Structure Raw Attribute Score, average the three Plant Community sub-metrics. - For vernal pool systems, first calculate the average score for all three Plant Community sub-metrics for each replicate pool, then average these scores across all six replicate pools, and then calculate the average Topographic Complexity score for all six replicates.
Step 3: Calculate final Attribute Score	For each Attribute, divide its Raw Attribute Score by its maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, and 36 for Biotic Structure.
Step 4: Calculate the AA Score	Calculate the AA score by averaging the Final Attribute Scores. Round the average to the nearest whole integer.

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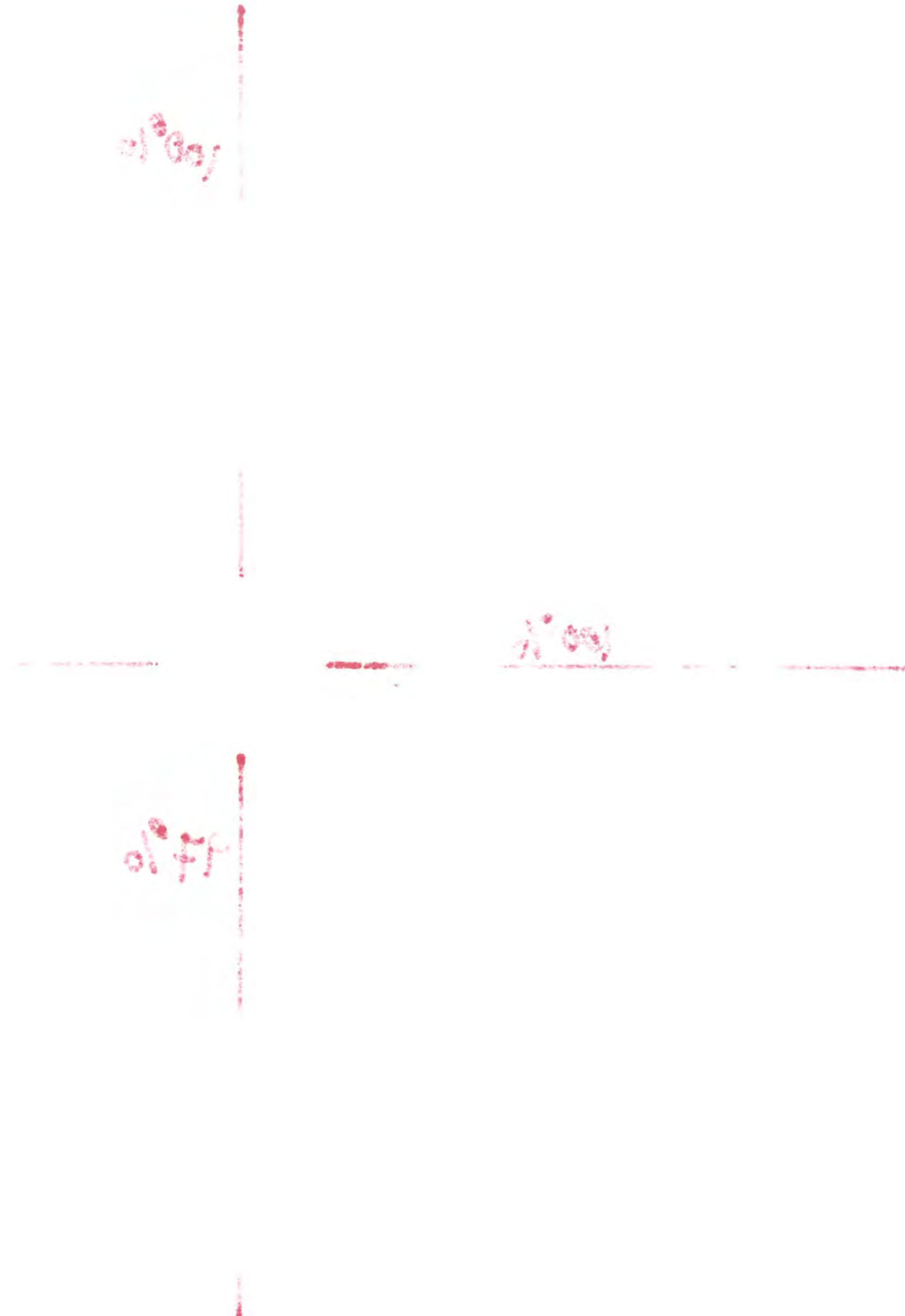
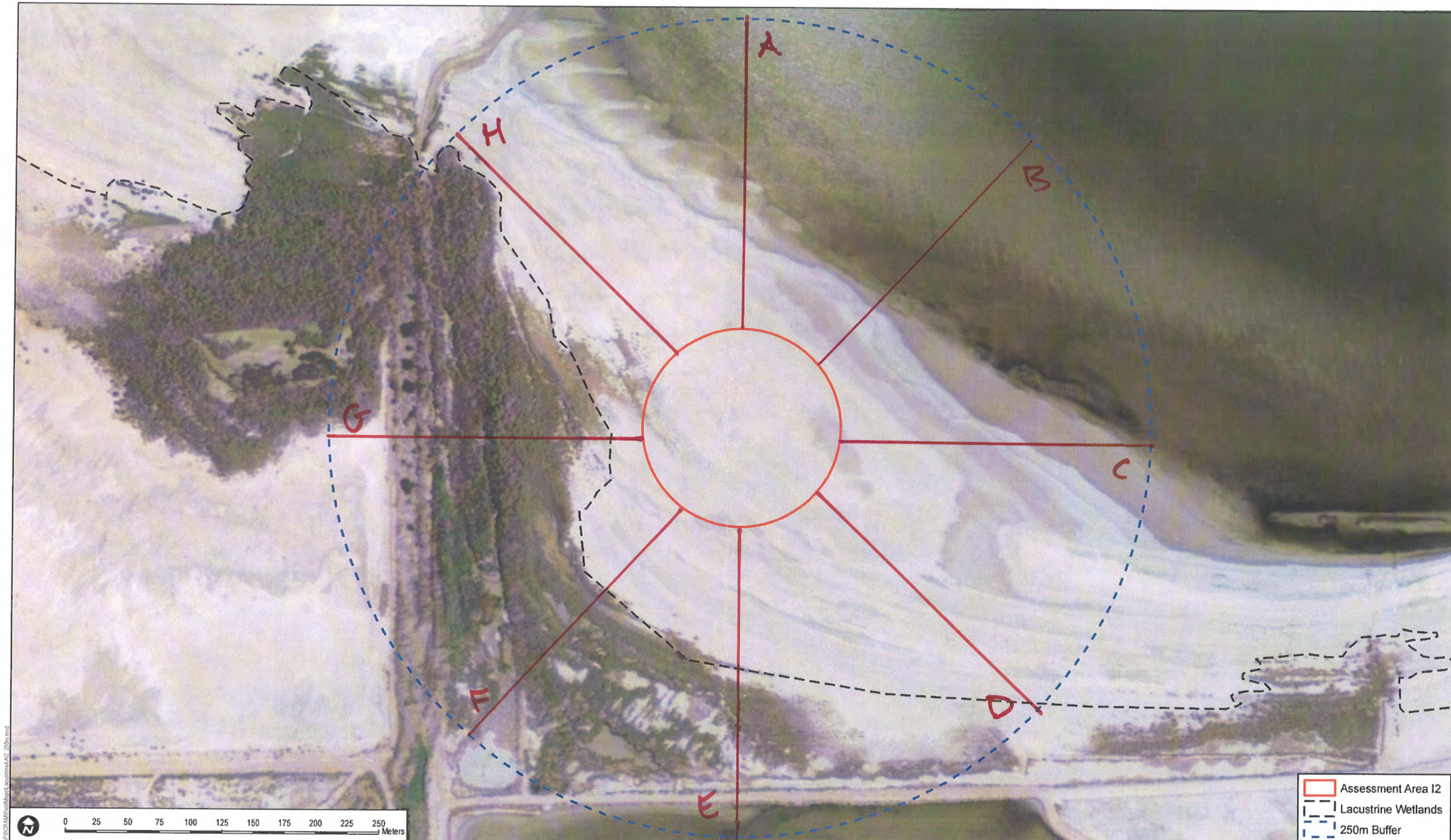
AUGUST 2011

SALTON SEA SCH

Lacustrine Assessment Area I2 - 500m Field Map





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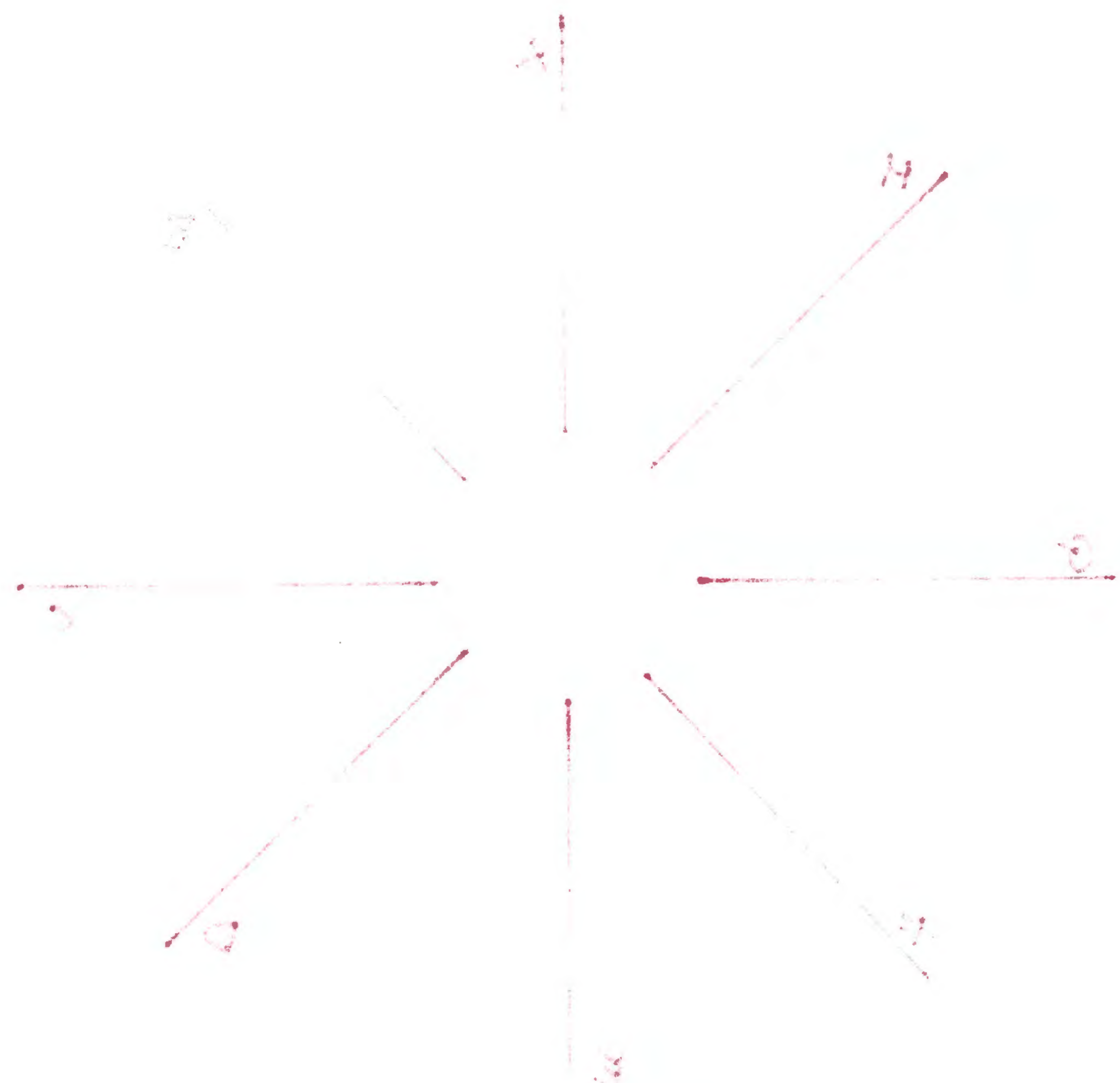
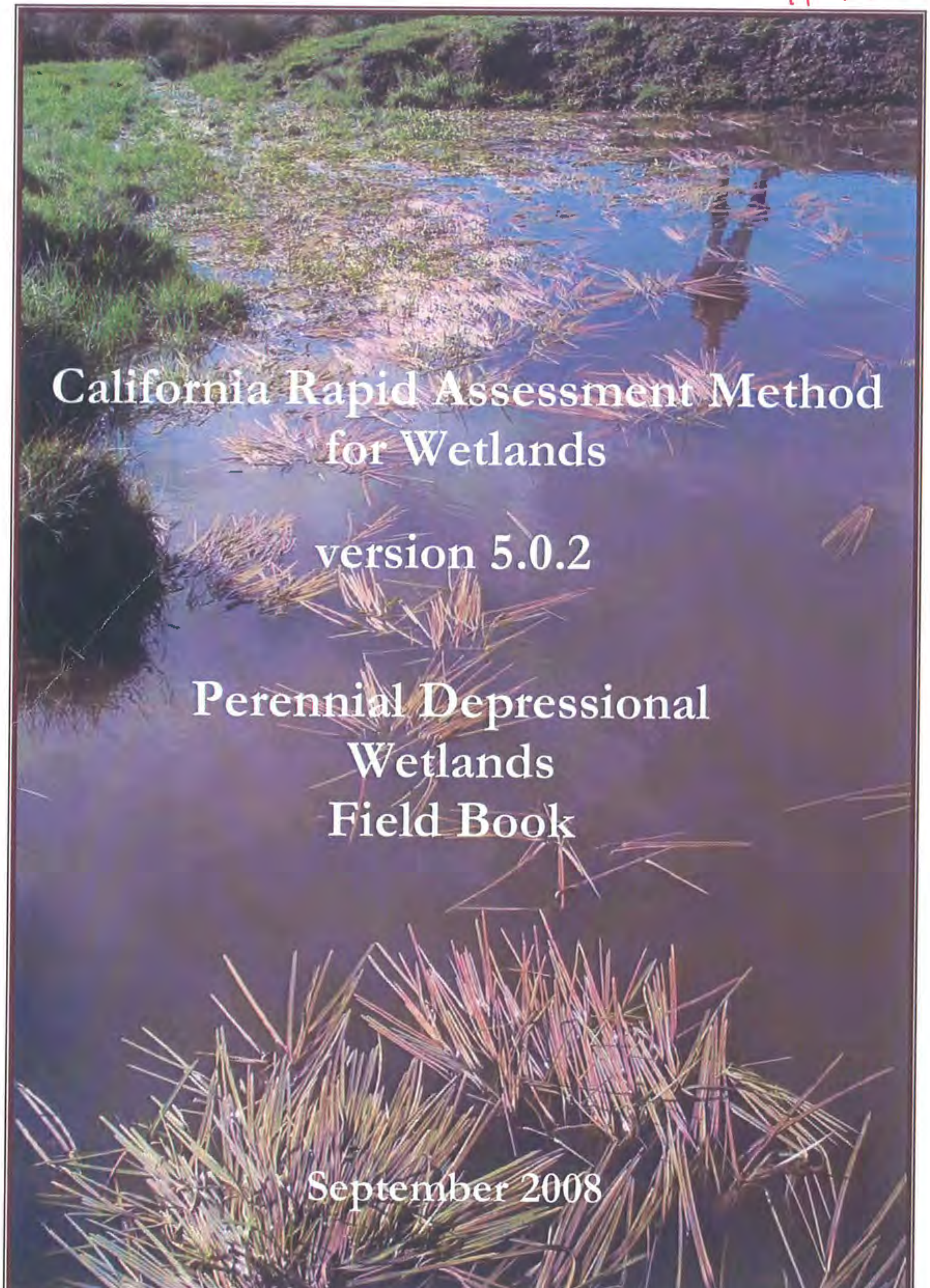
Lacustrine Assessment Area I2 - 250m Field Map



L-AA-3 LNC
11-17-11



California Rapid Assessment Method for Wetlands

version 5.0.2

Perennial Depressional Wetlands Field Book

September 2008

Basic Information Sheet: Perennial Depressional Wetlands

Your Name: AA-3 SALTON SEA				
Assessment Area Name: AA 3				
Assessment No.		**Date (m/d/y)** 11	17	11
Assessment Team Members for This AA SFF / KCD				

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☑ Other

Which best describes the type of depressional wetland?

☐ freshwater marsh ☐ alkaline marsh ☑ alkali flat ☐ other (specify):

Which best describes the hydrologic state of the wetland at the time of assessment?

☐ ponded/inundated ☑ saturated soil, but no surface water ☐ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

☐ long-duration ☑ medium-duration ☐ short-duration

Does your wetland connect with the floodplain of a nearby stream? ☑ yes ☐ no

Is the topographic basin of the wetland ☑ distinct **or** ☐ indistinct ?

An *indistinct*, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas, topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes.

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	L3-N	North			
2	L3-S	South			
3	L3-E	East			
4	L3-W	West			
5					
6					

Comments:

Photos were taken from the center of the AA.

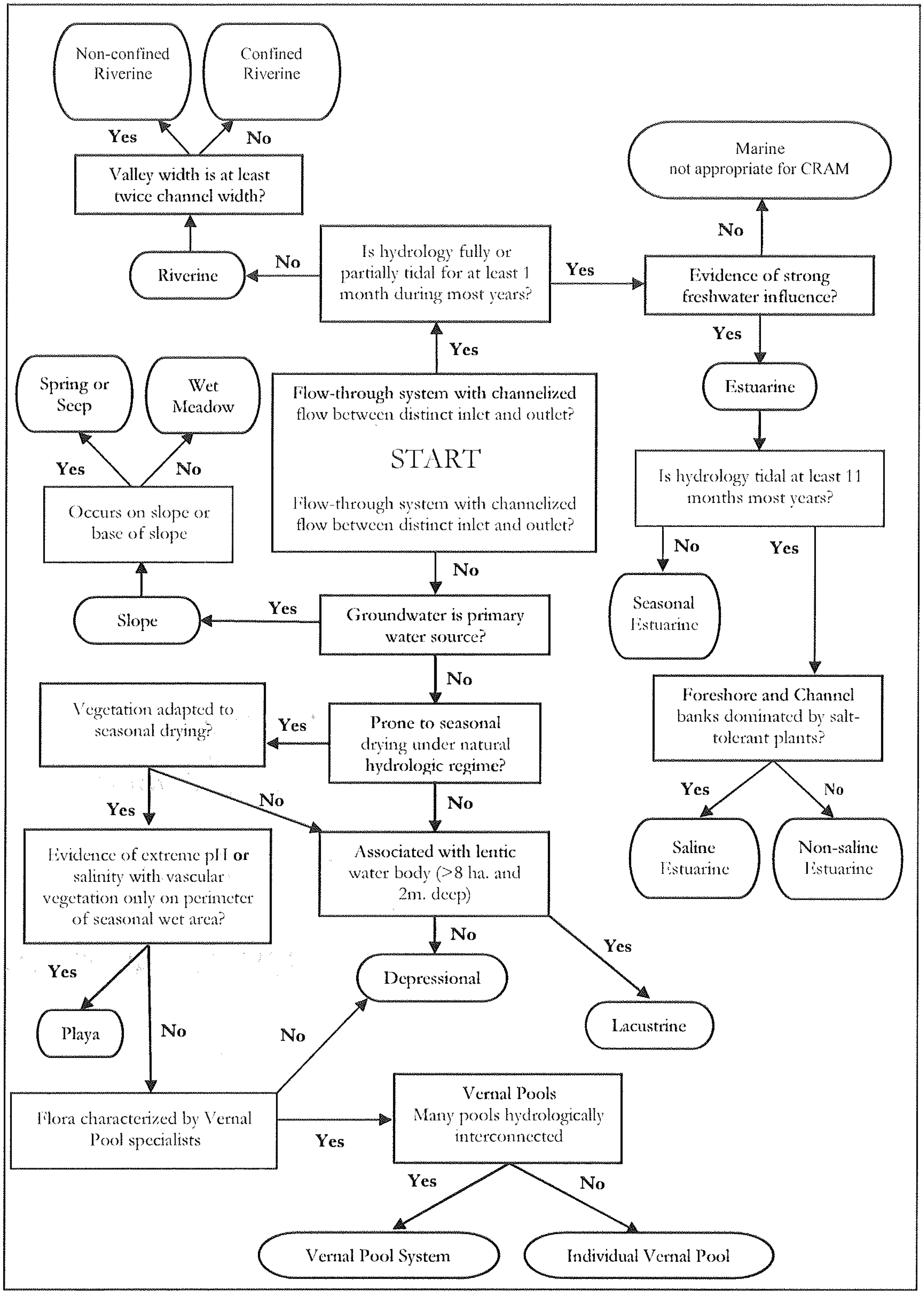
Scoring Sheet: Perennial Depressional Wetlands

AA Name: AA-3				**(m/d/y)** 11 / 17 / 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	B			
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 22.4	Final 93.4	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		B ~~B~~ ~~[illegible]~~		DOUBLE CHECK ~~[illegible]~~
Hydrologic Connectivity		~~A~~ B		? RISING WATER YES - LOWERS INLAND YES
Attribute Score		Raw 24	Final 66.7	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		C		
Attribute Score		Raw 9	Final 37.5	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	~~B~~ ~~B~~	C		~~3~~ 2 LAYERS S, M, ~~[illegible]~~ ~~[illegible]~~
Plant Community submetric B: Number of Co-dominant species	D			3 CO-DOMINANTS
Plant Community submetric C: Percent Invasion	D			~~50%~~ ~~TAM~~ 67% 1/3
Plant Community Metric (*average of submetrics A-C*)		4		
Horizontal Interspersion and Zonation		A		VERY PATCHY & INTERSPERSED
Vertical Biotic Structure		C		
Attribute Score		Raw 22	Final 61.2	Final Attribute Score = (Raw Score/36)100
Overall AA Score		65		**Average of Final Attribute Scores**

Road berms @ east edge of wetland

Identify Wetland Type

Figure 3.2: Flowchart to determine wetland type and sub-type.



3.2.2.2 Depressional Wetlands

Note: This section was primarily based on perennial depressional wetlands and caution should be applied in the interpretation of scores in seasonal depressional wetlands. The depressional module will be revised during the CRAM validation/calibration process in 2008-2009.

Depressional wetlands exist in topographic lows that do not usually have outgoing surface drainage except during extreme flood events or heavy rainfall. Precipitation is their main source of water. Depressional wetlands can have distinct or indistinct boundaries. Many depressional wetlands are seasonal, and some lack surface ponding or saturated conditions during dry years. A complex of shallows and seasonally wet swales and depressions created by the slight topographic relief of a vernal pool system is an example of an indistinct depressional wetland. The margins of distinct depressional wetlands are relatively easy to discern in aerial photos and in the field. Examples of distinct depressional wetlands include sag ponds, snowmelt ponds, kettle-holes in moraines, cutoff ox-bows on floodplains, and water hazards on golf courses.

3.2.2.3 Other Depressional Wetlands

Depressional wetlands other than vernal pools can be seasonal or perennial, but their flora and fauna are mostly not characteristic of vernal pools, and they lack the impervious substrate that controls vernal pool hydrology. They differ from lacustrine wetlands by lacking an adjacent area of open water at least 2 m deep and 8 ha total area). They differ from playas by lacking an adjacent area larger than the wetland of either alkaline or saline open water less than 2 m deep or non-vegetated, fine-grain sediments. Unlike slope wetlands (i.e., springs and seeps), depressional wetlands depend more on precipitation than groundwater as their water source.

Establish the Assessment Area (AA)

Table 3.5: Examples of features that *should* be used to delineate AA boundaries.

Flow-Through Wetlands	Non Flow-Though Wetlands	
Riverine, Estuarine and Slope Wetlands	**Lacustrine, Wet Meadows, Depressional, and Playa Wetlands**	**Vernal Pools and Vernal Pool Systems**
☐ diversion ditches ☐ end-of-pipe large discharges ☐ grade control or water height control structures ☐ major changes in riverine entrenchment, confinement, degradation, aggradation, slope, or bed form ☐ major channel confluences ☐ water falls ☐ open water areas more than 50 m wide on average or broader than the wetland ☐ transitions between wetland types ☐ foreshores, backshores and uplands at least 5 m wide ☐ weirs, culverts, dams, levees, and other flow control structures	☐ above-grade roads and fills ☐ berms and levees ☐ jetties and wave deflectors ☐ major point sources or outflows of water ☐ open water areas more than 50 m wide on average or broader than the wetland ☐ foreshores, backshores and uplands at least 5 m wide ☐ weirs and other flow control structures	☐ above-grade roads and fills ☐ major point sources of water inflows or outflows ☐ weirs, berms, levees and other flow control structures

Table 3.6: Examples of features that should *not* be used to delineate any AAs.

☐	at-grade, unpaved, single-lane, infrequently used roadways or crossings
☐	bike paths and jogging trails at grade
☐	bare ground within what would otherwise be the AA boundary
☐	equestrian trails
☐	fences (unless designed to obstruct the movement of wildlife)
☐	property boundaries
☐	riffle (or rapid) – glide – pool transitions in a riverine wetland
☐	spatial changes in land cover or land use along the wetland border
☐	state and federal jurisdictional boundaries

Table 3.7: Recommended maximum and minimum AA sizes for each wetland type. Note: Wetlands smaller than the recommended AA sizes can be assessed in their entirety.

Wetland Type	Recommended AA Size
Slope	
Spring or Seep	Maximum size is 0.50 ha (about 75 m x 75 m, but shape can vary); there is no minimum size.
Wet Meadow	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.1 ha (about 30 m x 30 m).
Depressional	
Vernal Pool	There are no size limits (see Section 3.5.6 and Table 3.8).
Vernal Pool System	There are no size limits (see Section 3.5.6 and Table 3.8).
Other Depressional	**Maximum size is 1.0 ha (about 100 m x 100 m, but shape can vary); there is no minimum size.**
Riverine	
Confined and Non-confined	Recommended length is 10x average bankfull channel width; maximum length is 200 m; minimum length is 100 m. AA should extend laterally (landward) from the bankfull contour to encompass all the vegetation (trees, shrubs vines, etc) that probably provide woody debris, leaves, insects, etc. to the channel and its floodplain (Figure 3.4); minimum width is 2 m.
Lacustrine	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Playa	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Estuarine	
Perennial Saline	Recommended size and shape for estuarine wetlands is a 1 ha circle (radius about 55 m), but the shape can be non-circular if necessary to fit the wetland and to meet hydro-geomorphic and other criteria as outlined in Sections 3.5.1-3. The minimum size is 0.1 ha (about 30 m x 30 m).
Perennial Non-saline	
Seasonal	

Attribute 1: Buffer and Landscape Context

Landscape Connectivity

Definition: The landscape connectivity of an Assessment Area is assessed in terms of its spatial association with other areas of aquatic resources, such as other wetlands, lakes, streams, etc. It is assumed that wetlands close to each other have a greater potential to interact ecologically and hydrologically, and that such interactions are generally beneficial.

For all wetlands except riverine: On digital or hardcopy site imagery, draw a straight line extending 500 m from the AA boundary in each of the four cardinal compass directions. Along each transect line, estimate the percentage of the segment that passes through wetland or aquatic habitat of any kind, including open water. Use the worksheet below to record these estimates.

Worksheet for Landscape Connectivity Metric for All Wetlands Except Riverine

Percentage of Transect Lines that Contains Wetland Habitat of Any Kind	
Segment Direction	Percentage of Transect Length That is Wetland
North	100
South	100
East	99
West	100
Average Percentage of Transect Length That Is Wetland	100

Table 4.1: Rating for Landscape Connectivity for all wetlands except Riverine.

Rating	Alternative States
A	An average of 76 – 100 % of the transects is wetland habitat of any kind.
B	An average of 51 – 75 % of the transects is wetland habitat of any kind.
C	An average of 26 – 50 % of the transects is wetland habitat of any kind.
D	An average of 0 – 25 % of the transects is wetland habitat of any kind.

Percent of AA with Buffer

Definition: The buffer is the area adjoining the AA that is in a natural or semi-natural state and currently not dedicated to anthropogenic uses that would severely detract from its ability to entrap contaminants, discourage forays into the AA by people and non-native predators, or otherwise protect the AA from stress and disturbance.

To be considered as buffer, a suitable land cover type must be at least 5 m wide and extend along the perimeter of the AA for at least 5 m. The maximum width of the buffer is 250 m. At distances beyond 250 m from the AA, the buffer becomes part of the landscape context of the AA.

Any area of open water at least 30 m wide that is adjoining the AA, such as a lake, large river, or large slough, is not considered in the assessment of the buffer. Such open water is considered to be neutral, neither part of the wetland nor part of the buffer. There are three reasons for excluding large areas of open water (i.e., more than 30 m wide) from Assessment Areas and their buffers. First, assessments of buffer extent and buffer width are inflated by including open water as a part of the buffer. Second, while there may be positive correlations between wetland stressors and the quality of open water, quantifying water quality generally requires laboratory analyses beyond the scope of rapid assessment. Third, open water can be a direct source of stress (i.e., water pollution, waves, boat wakes) or an indirect source of stress (i.e., promotes human visitation, encourages intensive use by livestock looking for water, provides dispersal for non-native plant species), or it can be a source of benefits to a wetland (e.g., nutrients, propagules of native plant species, water that is essential to maintain wetland hydroperiods, etc.). However, any area of open water at least 30 m wide that is within 250 m of the AA but is not adjoining the AA is considered part of the buffer.

In the example below (Figure 4.2), most of the area around the AA (outlined in white) consists of non-buffer land cover types. The AA adjoins a major roadway, parking lot, and other development that is a non-buffer land cover type. There is a nearby wetland but it is separated from the AA by a major roadway and is not considered buffer. The open water area is neutral and not considered in the estimation of the percentage of the AA perimeter that has buffer. In this example, the only areas that would be considered buffer is the area labeled "Upland Buffer".

Figure 4.2: Diagram of buffer and non-buffer land cover types.

Table 4.4: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers Excluded from Buffers Notes: buffers do not cross these land covers; areas of open water adjacent to the AA are not included in the assessment of the AA or its buffer.
☐ bike trails	☐commercial developments
☐ dry-land farming areas	☐fences that interfere with the movements of wildlife
☐ foot trails	☐intensive agriculture (row crops, orchards and vineyards lacking ground cover and other BMPs)
☐ horse trails	☐paved roads (two lanes plus a turning lane or larger)
☐ links or target golf courses	☐lawns
☐ natural upland habitats	☐parking lots
☐ nature or wildland parks	☐horse paddocks, feedlots, turkey ranches, etc.
☐ open range land	☐residential areas
☐ railroads	☐sound walls
☐ roads not hazardous to wildlife	☐sports fields
☐ swales and ditches	☐traditional golf courses
☐ vegetated levees	☐urbanized parks with active recreation
	☐pedestrian/bike trails (i.e., nearly constant traffic)

Table 4.5: Rating for Percent of AA with Buffer.

Rating	Alternative States (not including open-water areas)
A	Buffer is 75 - 100% of AA perimeter.
B	Buffer is 50 – 74% of AA perimeter.
C	Buffer is 25 – 49% of AA perimeter.
D	Buffer is 0 – 24% of AA perimeter.

Average Buffer Width

Definition: The average width of the buffer adjoining the AA is estimated by averaging the lengths of eight straight lines drawn at regular intervals around the AA from its perimeter outward to the nearest non-buffer land cover or 250 m, which ever is first encountered. It is assumed that the functions of the buffer do not increase significantly beyond an average width of about 250 m. The maximum buffer width is therefore 250 m. The minimum buffer width is 5 m, and the minimum length of buffer along the perimeter of the AA is also 5 m. Any area that is less than 5 m wide and 5 m long is too small to be a buffer. See Table 4.4 above for more guidance regarding the identification of AA buffers.

Table 4.6: Steps to estimate Buffer Width for all wetlands.

Step 1	Identify areas in which open water is directly adjacent to the AA, with no vegetated intertidal or upland area in between. These areas are excluded from buffer calculations.
Step 2	Draw straight lines 250 m in length perpendicular to the AA through the buffer area at regular intervals along the portion of the perimeter of the AA that has a buffer. For one-sided riverine AAs, draw four lines; for all other wetland types, draw eight lines (see Figures 4.3 and 4.4 below).
Step 3	Estimate the buffer width of each of the lines as they extend away from the AA. Record these lengths on the worksheet below.
Step 4	Estimate the average buffer width. Record this width on the worksheet below.

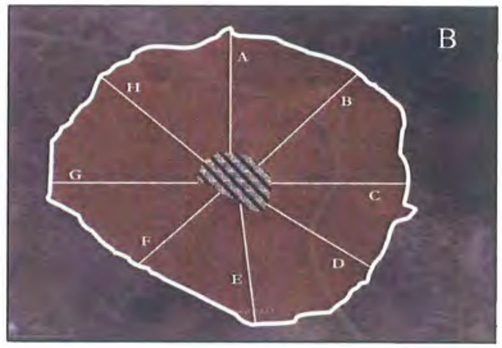


Figure 4.3: Examples of the method used to estimate Buffer Width. Note that the width is based on the lengths of eight lines A-H that extend at regular intervals though the buffer areas, whether only a small part of the 250 m zone around the AA is buffer (A) or all of the zone around the AA is buffer (B).

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	
B	
C	
D	
E	
F	
G	
H	
Average Buffer Width	250

Table 4.7: Rating for average buffer width.

Rating	Alternative States
A	Average buffer width is 190 – 250 m.
B	Average buffer width 130 – 189 m.
C	Average buffer width is 65 – 129 m.
D	Average buffer width is 0 – 64 m.

Buffer Condition

Definition: The condition of a buffer is assessed according to the extent and quality of its vegetation cover and the overall condition of its substrate. Evidence of direct impacts by people are excluded from this metric and included in the Stressor Checklist. Buffer conditions are assessed only for the portion of the wetland border that has already been identified or defined as buffer, based on Section 4.1.2 above. If there is no buffer, assign a score of D.

Table 4.8: Rating for Buffer Condition.

Rating	Alternative States
A	Buffer for AA is dominated by native vegetation, has undisturbed soils, and is apparently subject to little or no human visitation.
B	Buffer for AA is characterized by an intermediate mix of native and non-native vegetation, but mostly undisturbed soils and is apparently subject to little or no human visitation.
C	Buffer for AA is characterized by substantial amounts of non-native vegetation AND there is at least a moderate degree of soil disturbance/compaction, and/or there is evidence of at least moderate intensity of human visitation.
D	Buffer for AA is characterized by barren ground and/or highly compacted or otherwise disturbed soils, and/or there is evidence of very intense human visitation.

Attribute 2: Hydrology

Water Source

Definition: Water Sources directly affect the extent, duration, and frequency of saturated or ponded conditions within an Assessment Area. Water Sources include the kinds of direct inputs of water into the AA as well as any diversions of water from the AA. Diversions are considered a water source because they affect the ability of the AA to function as a source of water for other habitats while also directly affecting the hydrology of the AA.

A water source is direct if it supplies water mainly to the AA, rather than to areas through which the water must flow to reach the AA. Natural, direct sources include rainfall, ground water discharge, and flooding of the AA due to high tides or naturally high riverine flows. Examples of unnatural, direct sources include stormdrains that empty directly into the AA or into an immediately adjacent area. For seeps and springs that occur at the toes of earthen dams, the reservoirs behind the dams are direct water source. Indirect sources that should not be considered in this metric include large regional dams or urban storm drain systems that do not drain directly into the AA but that have systemic, ubiquitous effects on broad geographic areas of which the AA is a small part. For example, the salinity regimes of estuarine wetlands in San Francisco Bay are affected by dams in the Sierra Nevada, but these effects are not direct. But some of the same wetlands are directly affected by nearby discharges from sewage treatment facilities. Engineered hydrological controls, such as weirs, tide gates, flashboards, grade control structures, check dams, etc., can serve to demarcate the boundary of an AA (see Section 3.5), but they are not considered water sources.

The typical suite of natural water sources differs among the wetland types. The water for estuarine wetlands is by definition a combination of marine (i.e., tidal) and riverine (i.e., fluvial) sources. This metric is focused on the non-tidal water sources that account for the conditions during the growing season, regardless of the time of year when these sources exist. To assess water source, the plant species composition of the wetland should be compared to what is expected, in terms of the position of the wetland along the salinity gradient of the estuary, as adjusted for the overall wetness of the water year. In general, altered sources are indicated by vegetation that is either more tolerant of saline conditions or less tolerant than would be expected. If the plant community is unexpectedly salt-tolerant, then an unnatural decrease in freshwater supply is indicated. Conversely, if the community is less salt-tolerant than expected, than an unnatural increase in freshwater is indicated.

Table 4.9: Rating for Water Source.

Rating	Alternative States
A	Freshwater sources that affect the dry season condition of the AA, such as its flow characteristics, hydroperiod, or salinity regime, are precipitation, groundwater, and/or natural runoff, or natural flow from an adjacent freshwater body, or the AA naturally lacks water in the dry season. There is no indication that dry season conditions are substantially controlled by artificial water sources.
B	Freshwater sources that affect the dry season condition of the AA are mostly natural, but also obviously include occasional or small effects of modified hydrology. Indications of such anthropogenic inputs include developed land or irrigated agricultural land that comprises less than 20% of the immediate drainage basin within about 2 km upstream of the AA, or that is characterized by the presence of a few small stormdrains or scattered homes with septic systems. No large point sources or dams control the overall hydrology of the AA.
C	Freshwater sources that affect the dry season conditions of the AA are primarily urban runoff, direct irrigation, pumped water, artificially impounded water, water remaining after diversions, regulated releases of water through a dam, or other artificial hydrology. Indications of substantial artificial hydrology include developed or irrigated agricultural land that comprises more than 20% of the immediate drainage basin within about 2 km upstream of the AA, or the presence of major point source discharges that obviously control the hydrology of the AA. OR Freshwater sources that affect the dry season conditions of the AA are substantially controlled by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from its drainage basin.
D	Natural, freshwater sources that affect the dry season conditions of the AA have been eliminated based on the following indicators: impoundment of all possible wet season inflows, diversion of all dry-season inflow, predominance of xeric vegetation, etc.

Hydroperiod or Channel Stability

Definition: Hydroperiod is the characteristic frequency and duration of inundation or saturation of a wetland during a typical year. The natural hydroperiod for estuarine wetlands is governed by the tides, and includes predictable variations in inundation regimes over days, weeks, months, and seasons. Depressional, lacustrine, playas, and riverine wetlands typically have daily variations in water height that are governed by diurnal increases in evapotranspiration and seasonal cycles that are governed by rainfall and runoff. Seeps and springs that depend on groundwater may have relatively slight seasonal variations in hydroperiod.

Channel stability only pertains to riverine wetlands. It is assessed as the degree of channel aggradation (i.e., net accumulation of sediment on the channel bed causing it to rise over time), or degradation (i.e., net loss of sediment from the bed causing it to be lower over time). There is much interest in channel entrenchment (i.e., the inability of flows in a channel to exceed the channel banks) and this is addressed in the Hydrologic Connectivity metric.

Table 4.10: Field Indicators of Altered Hydroperiod.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
☐ Upstream spring boxes ☐ Impoundments ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Evidence of aquatic wildlife mortality ☐ Encroachment of terrestrial vegetation ☐ Stress or mortality of hydrophytes ☐ Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
☐ Berms ☐ Dikes ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Late-season vitality of annual vegetation ☐ Recently drowned riparian vegetation ☐ Extensive fine-grain deposits

Depressional, Lacustrine, Playas, and Slope Wetlands: Assessment of the hydroperiod for these kinds of wetlands should be initiated with an office-based review of. Field indicators for altered hydroperiod include pumps, spring boxes, ditches, hoses and pipes, and encroachment of terrestrial vegetation (see Table 4.10 above). Tables 4.11a and 4.11b provide narratives for rating Hydroperiod for depressional, lacustrine, and seep and spring wetlands.

Table 4.11a: Rating of Hydroperiod for Depressional, Lacustrine, Playas, and Slope wetlands.

Rating	Alternative States (based on Table 4.10 above)
A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
D	Both the inundation and drawdown of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

Hydrologic Connectivity

Definition: Hydrologic Connectivity describes the ability of water to flow into or out of the wetland, or to inundate their adjacent uplands. This metric pertains only to Riverine, Estuarine, Vernal Pool Systems, individual Vernal Pools, and Playas.

This metric is scored by assessing the degree to which the hydrologic connectivity of the AA is restricted by unnatural features, such as levees and excessively high banks. These features may be restricting the hydrology of the wetland in which the AA is contained, and thus do not need to directly adjoin the AA.

Table 4.15c: Rating of Hydrologic Connectivity for Estuarine, Depressional, Lacustrine, and Slope wetlands, Playas, Individual Vernal Pools, and Vernal Pool Systems.

Rating	Alternative States
A	Rising water in the wetland that contains the AA has unrestricted access to adjacent areas, without levees or other obstructions to the lateral movement of flood waters.
B	There are unnatural features such as levees or road grades that limit the amount of adjacent transition zone or the lateral movement of flood waters, relative to what is expected for the setting. But, the limitations exist for less than 50% of the boundary of wetland that contains the AA. Restrictions may be intermittent along margins of the wetland, or they may occur only along one bank or shore of the wetland. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
C	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for 50-90% of the wetland that contains the AA. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
D	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for more than 90% of the wetland that contains the AA.

Attribute 3: Physical Structure

Structural Patch Richness

Definition: Patch richness is the number of different obvious types of physical surfaces or features that may provide habitat for aquatic, wetland, or riparian species. This metric is different from topographic complexity in that it addresses the number of different patch types, whereas topographic complexity evaluates the spatial arrangement and interspersion of the types. Physical patches can be natural or unnatural.

Patch Type Definitions:

Animal mounds and burrows. Many vertebrates make mounds or holes as a consequence of their foraging, denning, predation, or other behaviors. The resulting soil disturbance helps to redistributes soil nutrients and influences plant species composition and abundance. To be considered a patch type there should be evidence that a population of burrowing animals has occupied the Assessment Area. A single burrow or mound does not constitute a patch.

Bank slumps or undercut banks in channels or along shorelines. A bank slump is a portion of a depressional, estuarine, or lacustrine bank that has broken free from the rest of the bank but has not eroded away. Undercuts are areas along the bank or shoreline of a wetland that have been excavated by waves or flowing water.

Cobble and boulders. Cobble and boulders are rocks of different size categories. The long axis of cobble ranges from about 6 cm to about 25 cm. A boulder is any rock having a long axis greater than 25 cm. Submerged cobbles and boulders provide abundant habitat for aquatic macroinvertebrates and small fish. Exposed cobbles and boulders provide roosting habitat for birds and shelter for amphibians. They contribute to patterns of shade and light and air movement near the ground surface that affect local soil moisture gradients, deposition of seeds and debris, and overall substrate complexity.

Concentric or parallel high water marks. Repeated variation in water level in a wetland can cause concentric zones in soil moisture, topographic slope, and chemistry that translate into visible zones of different vegetation types, greatly increasing overall ecological diversity. The variation in water level might be natural (e.g., seasonal) or anthropogenic.

Debris jams. A debris jam is an accumulation of drift wood and other flotage across a channel that partially or completely obstructs surface water flow.

Hummocks or sediment mounds. Hummocks are mounds created by plants in slope wetlands, depressions, and along the banks and floodplains of fluvial and tidal systems. Hummocks are typically less than 1m high. Sediment mounds are similar to hummocks but lack plant cover.

Islands (exposed at high-water stage). An island is an area of land above the usual high water level and, at least at times, surrounded by water in a riverine, lacustrine, estuarine, or playa system. Islands differ from hummocks and other mounds by being large enough to support trees or large shrubs.

Macroalgae and algal mats. Macroalgae occurs on benthic sediments and on the water surface of all types of wetlands. Macroalgae are important primary producers, representing the base of the food web in some wetlands. Algal mats can provide abundant habitat for macro-invertebrates, amphibians, and small fishes.

Non-vegetated flats (sandflats, mudflats, gravel flats, etc.). A flat is a non-vegetated area of silt, clay, sand, shell hash, gravel, or cobble at least 10 m wide and at least 30 m long that adjoins the wetland

foreshore and is a potential resting and feeding area for fishes, shorebirds, wading birds, and other waterbirds. Flats can be similar to large bars (see definitions of point bars and in-channel bars below), except that they lack the convex profile of bars and their compositional material is not as obviously sorted by size or texture.

Pannes or pools on floodplain. A panne is a shallow topographic basin lacking vegetation but existing on a well-vegetated wetland plain. Pannes fill with water at least seasonally due to overland flow. They commonly serve as foraging sites for waterbirds and as breeding sites for amphibians.

Point bars and in-channel bars. Bars are sedimentary features within intertidal and fluvial channels. They are patches of transient bedload sediment that form along the inside of meander bends or in the middle of straight channel reaches. They sometimes support vegetation. They are convex in profile and their surface material varies in size from small on top to larger along their lower margins. They can consist of any mixture of silt, sand, gravel, cobble, and boulders.

Pools in channels. Pools are areas along tidal and fluvial channels that are much deeper than the average depths of their channels and that tend to retain water longer than other areas of the channel during periods of low or no surface flow.

Riffles or rapids. Riffles and rapids are areas of relatively rapid flow and standing waves in tidal or fluvial channels. Riffles and rapids add oxygen to flowing water and provide habitat for many fish and aquatic invertebrates.

Secondary channels on floodplains or along shorelines. Channels confine riverine or estuarine flow. A channel consists of a bed and its opposing banks, plus its floodplain. Estuarine and riverine wetlands can have a primary channel that conveys most flow, and one or more secondary channels of varying sizes that convey flood flows. The systems of diverging and converging channels that characterize braided and anastomosing fluvial systems usually consist of one or more main channels plus secondary channels. Tributary channels that originate in the wetland and that only convey flow between the wetland and the primary channel are also regarded as secondary channels. For example, short tributaries that are entirely contained within the CRAM Assessment Area (AA) are regarded as secondary channels.

Shellfish beds. Oysters, clams and mussels are common bivalves that create beds on the banks and bottoms of wetland systems. Shellfish beds influence the condition of their environment by affecting flow velocities, providing substrates for plant and animal life, and playing particularly important roles in the uptake and cycling of nutrients and other water-borne materials.

Soil cracks. Repeated wetting and drying of fine grain soil that typifies some wetlands can cause the soil to crack and form deep fissures that increase the mobility of heavy metals, promote oxidation and subsidence, while also providing habitat for amphibians and macroinvertebrates. Cracks must be a minimum of 1 inch deep to qualify.

Standing snags. Tall, woody vegetation, such as trees and tall shrubs, can take many years to fall to the ground after dying. These standing "snags" they provide habitat for many species of birds and small mammals. Any standing, dead woody vegetation that is at least 3 m tall is considered a snag.

Submerged vegetation. Submerged vegetation consists of aquatic macrophytes such as *Elodea canadensis* (common elodea), and *Zostera marina* (eelgrass) that are rooted in the sub-aqueous substrate but do not usually grow high enough in the overlying water column to intercept the water surface. Submerged vegetation can strongly influence nutrient cycling while providing food and shelter for fish and other organisms.

Swales on floodplain or along shoreline. Swales are broad, elongated, vegetated, shallow depressions that can sometimes help to convey flood flows to and from vegetated marsh plains or floodplains. But, they lack obvious banks, regularly spaced deeps and shallows, or other characteristics of channels. Swales can entrap water after flood flows recede. They can act as localized recharge zones and they can sometimes receive emergent groundwater.

Variegated or crenulated foreshore. As viewed from above, the foreshore of a wetland can be mostly straight, broadly curving (i.e., arcuate), or variegated (e.g., meandering). In plan view, a variegated shoreline resembles a meandering pathway. variegated shorelines provide greater contact between water and land.

Wrackline or organic debris in channel or on floodplain. Wrack is an accumulation of natural or unnatural floating debris along the high water line of a wetland.

Structural Patch Type Worksheet for All Wetland Types, Except Vernal Pool Systems

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table 4.16 below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see section 3.2.2.1).

STRUCTURAL PATCH TYPE (check for presence)	Riverine (Non-confined)	Riverine (Confined)	All Estuarine	**Depressional**	Slope Wetlands	Lacustrine	Individual Vernal Pools	Playas
Minimum Patch Size	3 m^2	3 m^2	3 m^2	**3 m^2**	1 m^2	3 m^2	1 m^2	3 m^2
Secondary channels on floodplains or along shorelines	1	0	1	**0**	1	1	0	1
Swales on floodplain or along shoreline	1	0	0	**1**	1	1	1	1
Pannes or pools on floodplain	1	0	1	**0**	1	1	1	1
Vegetated islands (mostly above high-water)	1	0	0	**1**	0	0	1	1
Pools or depressions in channels (wet or dry channels)	1	1	1	**0**	0	0	0	0
Riffles or rapids (wet channel) or planar bed (dry channel)	1	1	0	**0**	0	0	0	0
Non-vegetated flats or bare ground (sandflats, mudflats, gravel flats, etc.)	0	0	1	**1**	1	1	1	1
Point bars and in-channel bars	1	1	1	**0**	0	0	0	0
Debris jams	1	1	1	**0**	0	1	0	0
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	1	1	1	**1**	0	1	0	0
Plant hummocks and/or sediment mounds	1	1	1	**1**	1	1	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1	1	**1**	0	1	0	0
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1	0	**1**	0	1	0	0
Animal mounds and burrows	0	0	1	**1**	1	0	1	1
Standing snags (at least 3 m tall)	1	1	1	**1**	1	1	0	0
Filamentous macroalgae or algal mats	1	1	1	**1**	1	1	1	1
Shellfish beds	0	0	1	**0**	0	1	0	0
Concentric or parallel high water marks	0	0	0	**1**	1	1	1	1
Soil cracks	0	0	1	**1**	0	1	1	1
Cobble and/or Boulders	1	1	0	**0**	1	1	1	0
Submerged vegetation	1	0	1	**1**	0	1	0	0
Total Possible	16	11	15	**13**	10	16	10	10
No. Observed Patch Types (enter here and use in Table 4.16 below)						3		

Table 4.16: Rating of Structural Patch Richness (based on results from worksheets).

Rating	Confined Riverine, Playas, Springs & Seeps, Individual Vernal Pools	**Vernal ,Pool Systems and Depressional**	Estuarine	Non-confined Riverine, Lacustrine
A	≥ 8	**≥ 11**	≥ 11	≥ 12
B	6 – 7	**8 – 10**	8 – 10	9 – 11
C	4 – 5	**5 – 7**	6 – 7	6 – 8
D	≤ 3	**≤ 4**	≤ 5	≤ 5

Topographic Complexity

Definition: Topographic complexity refers to the variety of elevations within a wetland due to physical, abiotic features and elevations gradients.

Table 4.17: Typical indicators of Macro- and Micro-topographic Complexity for each wetland type.

Type	Examples of Topographic Features
Depressional and Playas	**pools, islands, bars, mounds or hummocks, variegated shorelines, soil cracks, partially buried debris, plant hummocks, livestock tracks**
Estuarine	channels large and small, islands, bars, pannes, potholes, natural levees, shellfish beds, hummocks, slump blocks, first-order tidal creeks, soil cracks, partially buried debris, plant hummocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines, cobble, boulders, partially buried debris, plant hummocks
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams, cobble, boulders, slump blocks, tree-fall holes, plant hummocks
Slope Wetlands	pools, runnels, plant hummocks, burrows, plant hummocks, cobbles, boulders, partially buried debris, cattle or sheep tracks
Vernal Pools and Pool Systems	soil cracks, "mima-mounds," rivulets between pools or along swales, cobble, plant hummocks, cattle or sheep tracks

Figure 4.6: Scale-independent schematic profiles of Topographic Complexity.
Each profile A-D represents one-half of a characteristic cross-section through an AA. The right end of each profile represents either the buffer along the backshore of the wetland encompassing the AA, or, if the AA is not contiguous with the buffer, then the right end of each profile represents the edge of the AA.

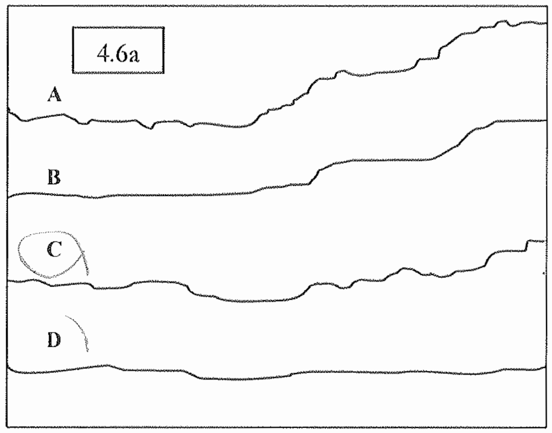


Table 4.18a: Rating of Topographic Complexity for Depressional Wetlands, Playas, Individual Vernal Pools, and Slope Wetlands.

Rating	Alternative States (based on diagrams in Figure 4.6 above)
A	AA as viewed along a typical cross-section has at least two benches or breaks in slope, and each of these benches, plus the slopes between them contain physical patch types or features that contribute to abundant micro-topographic relief or variability as illustrated in profile A of Figure 4.6a.
B	AA has at least two benches or breaks in slope above the middle area or bottom zone of the AA, but these benches and slopes mostly lack abundant micro-topographic relief. The AA resembles profile B of Figure 4.6a.
C	AA lacks any obvious break in slope or bench, and is best characterized has a single slope that has at least a moderate amount of micro-topographic complexity, as illustrated in profile C of Figure 4.6a.
D	AA has a single, uniform slope with little or no micro-topographic complexity, as illustrated in profile D of Figure 4.6a.

Attribute 4: Biotic Structure

Plant Community Metric

Definition: The Plant Community Metric is composed of three submetrics for each wetland type. Two of these sub-metrics, Number of Co-dominant Plants and Percent Invasion, are common to all wetland types. For all wetlands except Vernal Pools and Vernal Pool Systems, the Number of Plant Layers as defined for CRAM is also assessed. For Vernal Pools and Pool Systems, the Number of Plant layers submetric is replaced by the Native Species Richness submetric. A thorough reconnaissance of an AA is required to assess its condition using these submetrics. The assessment for each submetric is guided by a set of Plant Community Worksheets. The Plant Community metric is calculated based on these worksheets.

A "plant" is defined as an individual of any species of tree, shrub, herb/forb, moss, fern, emergent, submerged, submergent or floating macrophyte, including non-native (exotic) plant species. For the purposes of CRAM, a plant "layer" is a stratum of vegetation indicated by a discreet canopy at a specified height that comprises at least 5% of the area of the AA where the layer is expected.

Non-native species owe their occurrence in California to the actions of people since shortly before Euroamerican contact. "Invasive" species are non-native species that tend to dominate one or more plant layers within an AA. CRAM uses the California Invasive Plant Council (Cal-IPC) list to determine the invasive status of plants, with augmentation by regional experts.

Number of Plant Layers Present

To be counted in CRAM, a layer must cover at least 5% of *the portion of the AA that is suitable for the layer.* This would be the littoral zone of lakes and depressional wetlands for the one aquatic layer, called "floating." The "short," "medium," and "tall" layers might be found throughout the non-aquatic areas of each wetland class, except in areas of exposed bedrock, mudflat, beaches, active point bars, etc. The "very tall" layer is usually expected to occur along the backshore, except in forested wetlands.

It is essential that the layers be identified by the actual plant heights (i.e., the approximate maximum heights) of plant species in the AA, regardless of the growth potential of the species. For example, a young sapling redwood between 0.5 m and 0.75 m tall would belong to the "medium" layer, even though in the future the same individual redwood might belong to the "very tall" layer. Some species might belong to multiple plant layers. For example, groves of red alders of all different ages and heights might collectively represent all four non-aquatic layers in a riverine AA. Riparian vines, such as wild grape, might also dominate all of the non-aquatic layers.

Layer definitions:

Floating Layer. This layer includes rooted aquatic macrophytes such as *Ruppia cirrhosa* (ditchgrass), *Ranunculus aquatilis* (water buttercup), and *Potamogeton foliosus* (leafy pondweed) that create floating or buoyant canopies at or near the water surface that shade the water column. This layer also includes non-rooted aquatic plants such as *Lemna* spp. (duckweed) and *Eichhornia crassipes* (water hyacinth) that form floating canopies.

Short Vegetation. This layer varies in maximum height among the wetland types, but is never taller than 50 cm. It includes small emergent vegetation and plants. It can include young forms of species that grow taller. Vegetation that is naturally short in its mature stage includes *Rorippa nasturtium-aquaticum* (watercress), small Isoetes (quillworts*), Distichlis spicata* (saltgrass), *Jaumea carnosa* (jaumea), *Ranunculus flamula* (creeping buttercup), *Alisma* spp. (water plantain), *Sparganium* (burweeds), and *Sagitaria* spp. (arrowhead).

Medium Vegetation. This layer never exceeds 75 cm in height. It commonly includes emergent vegetation such *Salicornia virginica* (pickleweed), *Atriplex* spp. (saltbush), rushes (*Juncus* spp.), and *Rumex crispus* (curly dock).

Tall Vegetation. This layer never exceeds 1.5 m in height. It usually includes the tallest emergent vegetation and the larger shrubs. Examples include *Typha latifolia* (broad-leaved cattail), *Scirpus californicus* (bulrush), *Rubus ursinus* (California blackberry), and *Baccharis piluaris* (coyote brush).

Very Tall Vegetation. This layer is reserved for shrubs, vines, and trees that are taller than 1.5 m. Examples include *Plantanus racemosa* (western sycamore), *Populus fremontii* (Fremont cottonwood), *Alnus rubra* (red alder), *Sambucus mexicanus* (Blue elderberry), and *Corylus californicus* (hazelnut).

Standing (upright) dead or senescent vegetation from the previous growing season can be used in addition to live vegetation to assess the number of plant layers present. However, the lengths of prostrate stems or shoots are disregarded. In other words, fallen vegetation should not be "held up" to determine the plant layer to which it belongs. The number of plant layers must be determined based on the way the vegetation presents itself in the field.

Appendix I: Flow Chart to Determine Plant Dominance

Step 1: Determine the number of plant layers. Estimate which possible layers comprise at least 5% of the portion of the AA that is suitable for supporting vascular vegetation.

< 5 %

It does not count as a layer, and is no longer considered in this analysis.

≥ 5 %

It counts as a layer.

Step 2: Determine the co-dominant plant species in each layer. For each layer, identify the species that represent at least 10% of the total area of plant cover.

< 10 %

It is not a "dominant" species, and is no longer considered in the analysis.

≥ 10 %

It is a "dominant" species.

Step 3: Determine invasive status of co-dominant plant species. For each plant layer, use the list of invasive species (Appendix IV) or local expertise to identify each co-dominant species that is invasive. eCRAM software will automatically identify known invasive species that are listed as co-dominants.

Plant Community Metric Worksheet 1 of 8: Plant layer heights for all wetland types.

Wetland Type	Plant Layers				
	Aquatic	Semi-aquatic and Riparian			
	Floating	Short	Medium	Tall	Very Tall
Perennial Saline Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Perennial Non-saline Estuarine, Seasonal Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Lacustrine, Depressional and Non-confined Riverine	**On Water Surface**	**<0.5 m**	**0.5 – 1.5 m**	**1.5 - 3.0 m**	**>3.0 m**
Slope	NA	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Confined Riverine	NA	<0.5 m	0.5 – 1.5 m	1.5 – 3.0 m	>3.0 m

Number of Co-dominant Species

For each plant layer in the AA, all species represented by living vegetation that comprises at least 10% relative cover within the layer are considered to be dominant. Only living vegetation in growth position is considered in this metric. Dead or senescent vegetation is disregarded.

Percent Invasion

The number of invasive co-dominant species for all plant layers combined is assessed as a percentage of the total number of co-dominants, based on the results of the Number of Co-dominant Species sub-metric. The invasive status for many California wetland and riparian plant species is based on the Cal-IPC list (Appendix IV). However, the best professional judgment of local experts may be used instead to determine whether or not a co-dominant species is invasive.

Plant Community Metric Worksheet 2 of 8: Co-dominant species richness for all wetland types, except Confined Riverine, Slope wetlands, Vernal Pools, and Playas (A dominant species represents ≥10% *relative* cover)

Note: Plant species should only be counted once when calculating the Number of Co-dominant Species and Percent Invasion metric scores.

Floating or Canopy-forming	Invasive?	Short	Invasive?
		Allen. occ. 30%	N
		Polyp. mons 4%	Y
		Rum cris 2%	—
		Tam ram 2%	—
Medium	**Invasive?**	**Tall** 38%	**Invasive?**
Tam ram 4%	Y		
Allen. occid. 3%	N		
Scirpus <1%	—		
Poly monsp. 2%	Y		
Very Tall 9%	**Invasive?**		
		Total number of co-dominant species for all layers combined (enter here and use in Table 4.19)	3
Also ~~[illegible]~~ <1% Atriplex can.			
		Percent Invasion (enter here and use in Table 4.19)	2/3 = 67%

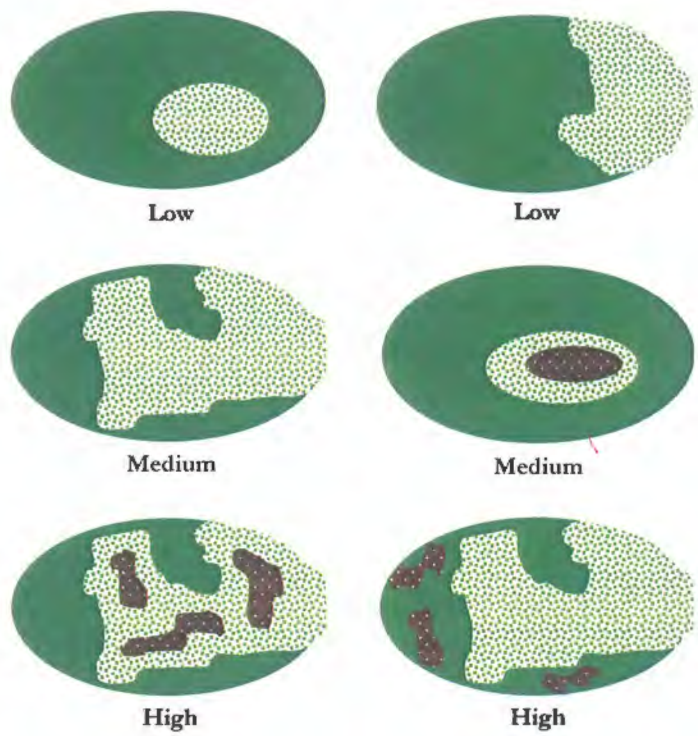
co-dom.

Not co-dom.

Table 4.19: Ratings for submetrics of Plant Community Metric.

Rating	Number of Plant Layers Present	Number of Co-dominant Species	Percent Invasion
Lacustrine, Depressional and Non-confined Riverine Wetlands			
A	4 – 5	≥ 12	0 – 15%
B	3	9 – 11	16 – 30%
C	1 – 2	6 – 8	31 – 45%
D	0	0 – 5	46 – 100%

Figure 4.7: Diagram of the degrees of interspersion of plant zones for Lacustrine, Depressional, Playas, and Slope wetlands. Hatching patterns represent plant zones (adapted from Mack 2001). Each zone must comprise at least 5% of the AA.



Vertical Biotic Structure

Definition: The vertical component of biotic structure consists of the interspersion and complexity of plant layers. The same plant layers used to assess the Plant Community Composition Metrics (see Section 4.4.2) are used to assess Vertical Biotic Structure. To be counted in CRAM, a layer must cover at least 5% of the portion of the AA that is suitable for the layer. This metric does not pertain to Vernal Pools, Vernal Pool Systems, or Playas.

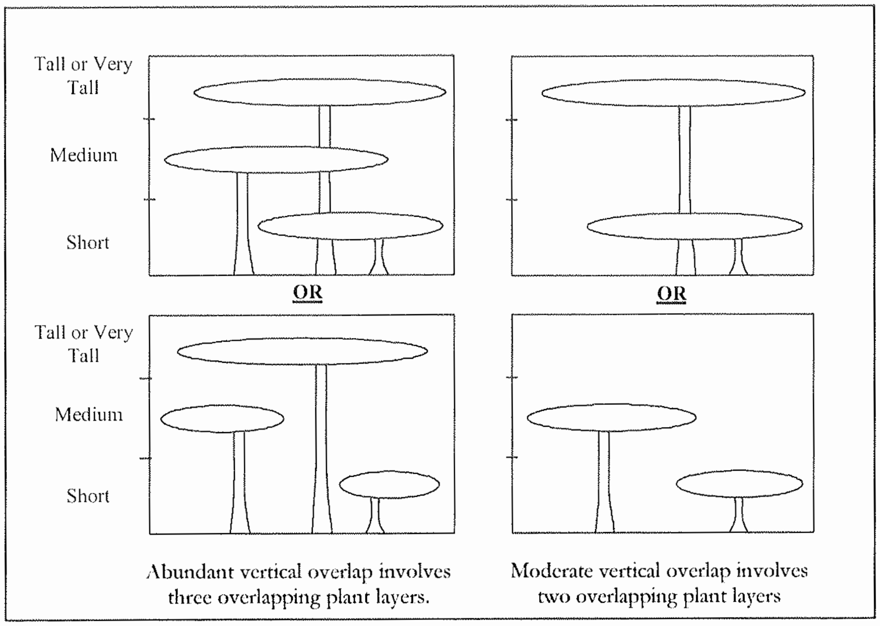


Figure 4.11: Schematic diagrams of vertical interspersion of plant layers for Riverine AAs and for Depressional and Lacustrine AAs having Tall or Very Tall plant layers.

Table 4.21: Rating of Vertical Biotic Structure for Riverine AAs and for Lacustrine and Depressional AAs supporting Tall or Very Tall plant layers (see Figure 4.11).

Rating	Alternative States
A	More than 50% of the vegetated area of the AA supports abundant overlap of plant layers (see Figures 4.11).
B	More than 50% of the area supports at least moderate overlap of plant layers.
C	25–50% of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
D	Less than 25% of the vegetated AA supports moderate overlap of plant layers, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

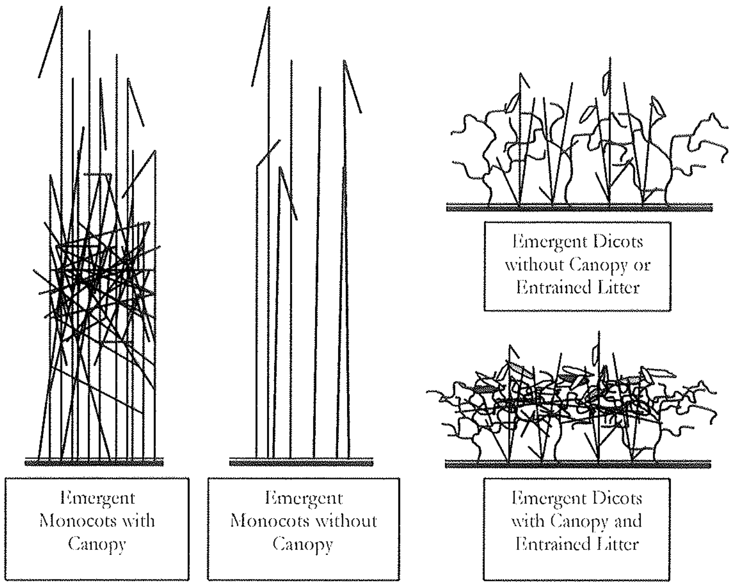


Figure 4.12: Schematic diagrams of plant canopies and entrained litter used to assess Vertical Biotic Structure in all Estuarine wetlands, or in Depressional and Lacustrine wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers.

Table 4.22: Rating of Vertical Biotic Structure for wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers, especially Estuarine saline wetlands (see Figure 4.12).

Rating	Alternative States
A	Most of the vegetated plain of the AA has a dense canopy of living vegetation or entrained litter or detritus forming a "ceiling" of cover 10-20 cm of above the wetland surface that shades the surface and can provide abundant cover for wildlife.
B	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter as described in "A" above; OR Most of the vegetated plain has a dense canopy but the ceiling it forms is much less than 10-20 cm above the ground surface.
C	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter AND the ceiling it forms is much less than 10-20 cm above the ground surface.
D	Most of the AA lacks a dense canopy of living vegetation or entrained litter or detritus.

Guidelines to Complete the Stressor Checklists

Definition: A stressor, as defined for the purposes of the CRAM, is an anthropogenic perturbation within a wetland or its environmental setting that is likely to negatively impact the condition and function of the CRAM Assessment Area (AA). A disturbance is a natural phenomenon that affects the AA.

There are four underlying assumptions of the Stressor Checklist: (1) deviation from the best achievable condition can be explained by a single stressor or multiple stressors acting on the wetland; (2) increasing the number of stressors acting on the wetland causes a decline in its condition (there is no assumption as to whether this decline is additive (linear), multiplicative, or is best represented by some other non-linear mode); (3) increasing either the intensity or the proximity of the stressor results in a greater decline in condition; and (4) continuous or chronic stress increases the decline in condition.

The process to identify stressors is the same for all wetland types. For each CRAM attribute, a variety of possible stressors are listed. Their presence and likelihood of significantly affecting the AA are recorded in the Stressor Checklist Worksheet. For the Hydrology, Physical Structure, and Biotic Structure attributes, the focus is on stressors operating within the AA or within 50 m of the AA. For the Buffer and Landscape Context attribute, the focus is on stressors operating within 500 m of the AA. More distant stressors that have obvious, direct, controlling influences on the AA can also be noted.

Table 5.1: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments GROUNDWATER SEEPAGE FROM AG.		

(SUBSURFACE)

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed	✓	
Nutrient impaired (PS or Non-PS pollution)	✓	✓
Heavy metal impaired (PS or Non-PS pollution)	✓	✓
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	✓
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	✓
Trash or refuse	✓	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources	✓	✓
Lack of treatment of invasive plants adjacent to AA or buffer	✓	✓

Comments

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming	✓	
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)	✓	
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		

Comments

CRAM Score Guidelines

Table 3.11: Steps to calculate attribute scores and AA scores.

Step 1: Calculate Metric Score	For each Metric, convert the letter score into the corresponding numeric score: A=12, B=9, C=6 and D=3.
Step 2: Calculate raw Attribute Score	For each Attribute, calculate the Raw Attribute Score as the sum of the numeric scores of the component Metrics, except in the following cases: □ For Attribute 1 (Buffer and Landscape Context), the submetric scores relating to buffer are combined into an overall buffer score that is added to the score for the Landscape Connectivity metric, using the following formula: $\left(\boxed{\text{Buffer Condition}} \times \left(\boxed{\text{\% AA with Buffer}} \times \boxed{\text{Average Buffer Width}} \right)^{1/2} \right)^{1/2} + \boxed{\text{Landscape Connectivity}}$ □ Prior to calculating the Biotic Structure Raw Attribute Score, average the three Plant Community sub-metrics. □ For vernal pool systems, first calculate the average score for all three Plant Community sub-metrics for each replicate pool, then average these scores across all six replicate pools, and then calculate the average Topographic Complexity score for all six replicates.
Step 3: Calculate final Attribute Score	For each Attribute, divide its Raw Attribute Score by its maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, and 36 for Biotic Structure.
Step 4: Calculate the AA Score	Calculate the AA score by averaging the Final Attribute Scores. Round the average to the nearest whole integer.

DUDEK

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NOVEMBER 2011

SALTON SEA SCH

Lacustrine Assessment Area 3 - 500m Field Map

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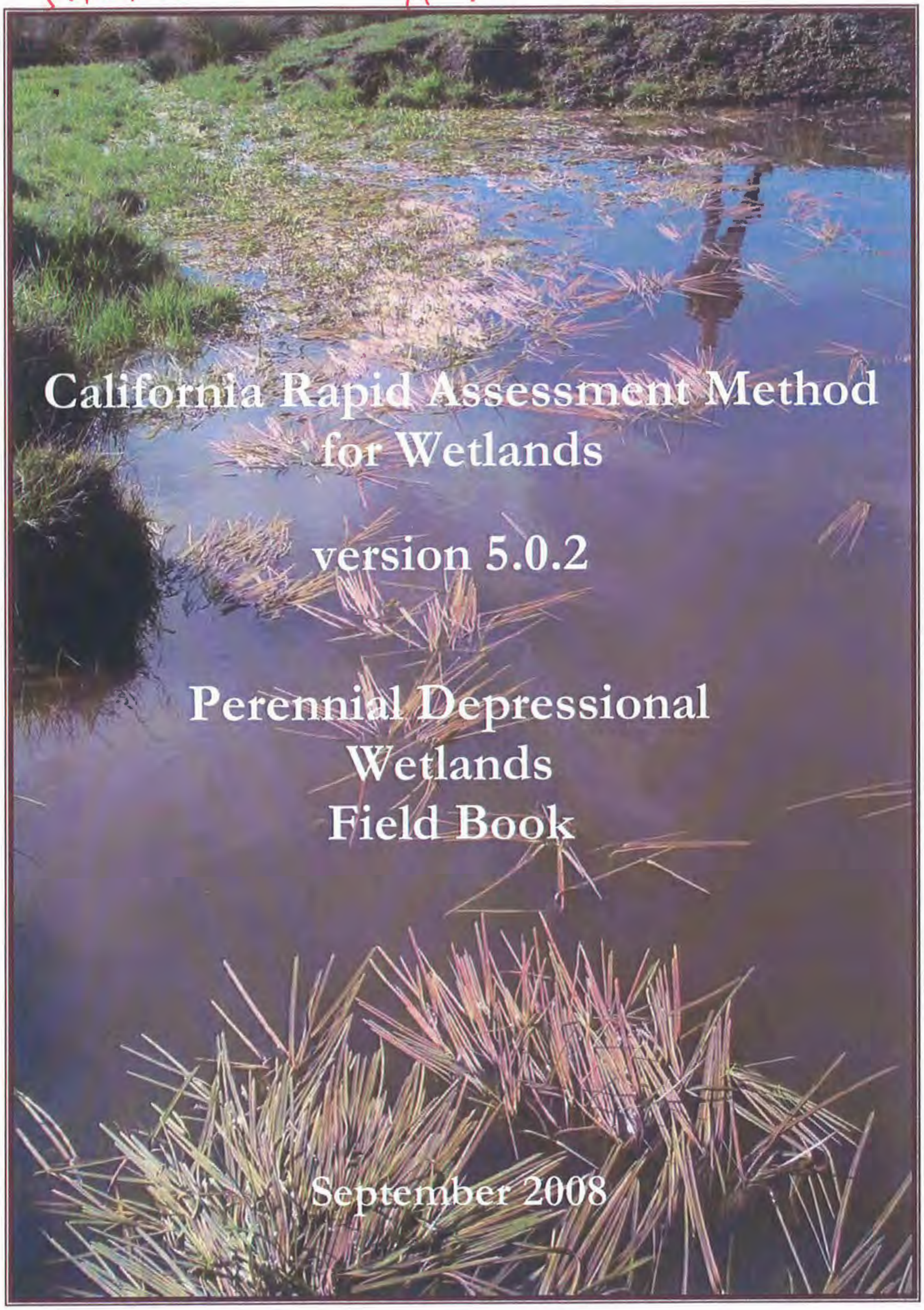
Lacustrine Assessment Area 3 - 250m Field Map

L-4

CALTON SEA 11-15-11



Basic Information Sheet: Perennial Depressional Wetlands

Your Name:	Doug Gettinger				
Assessment Area Name:	L-4				
Assessment No.		**Date (m/d/y)**	11	15	11

Assessment Team Members for This AA
DG, TS

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Which best describes the type of depressional wetland?

☐ freshwater marsh ☐ alkaline marsh ☐ alkali flat ☒ other (specify):

Lacustrine

Which best describes the hydrologic state of the wetland at the time of assessment?

☐ ponded/inundated ☐ saturated soil, but no surface water ☒ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

☐ long-duration ☐ medium-duration ☐ short-duration

Does your wetland connect with the floodplain of a nearby stream? ☐ yes ☒ no

Is the topographic basin of the wetland ☒ distinct **or** ☐ indistinct **?**

An *indistinct*, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas, topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes.

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	L4-N	North			
2	L4-S	South			
3	L4-E	East			
4	L4-W	West			
5					
6					

Comments:

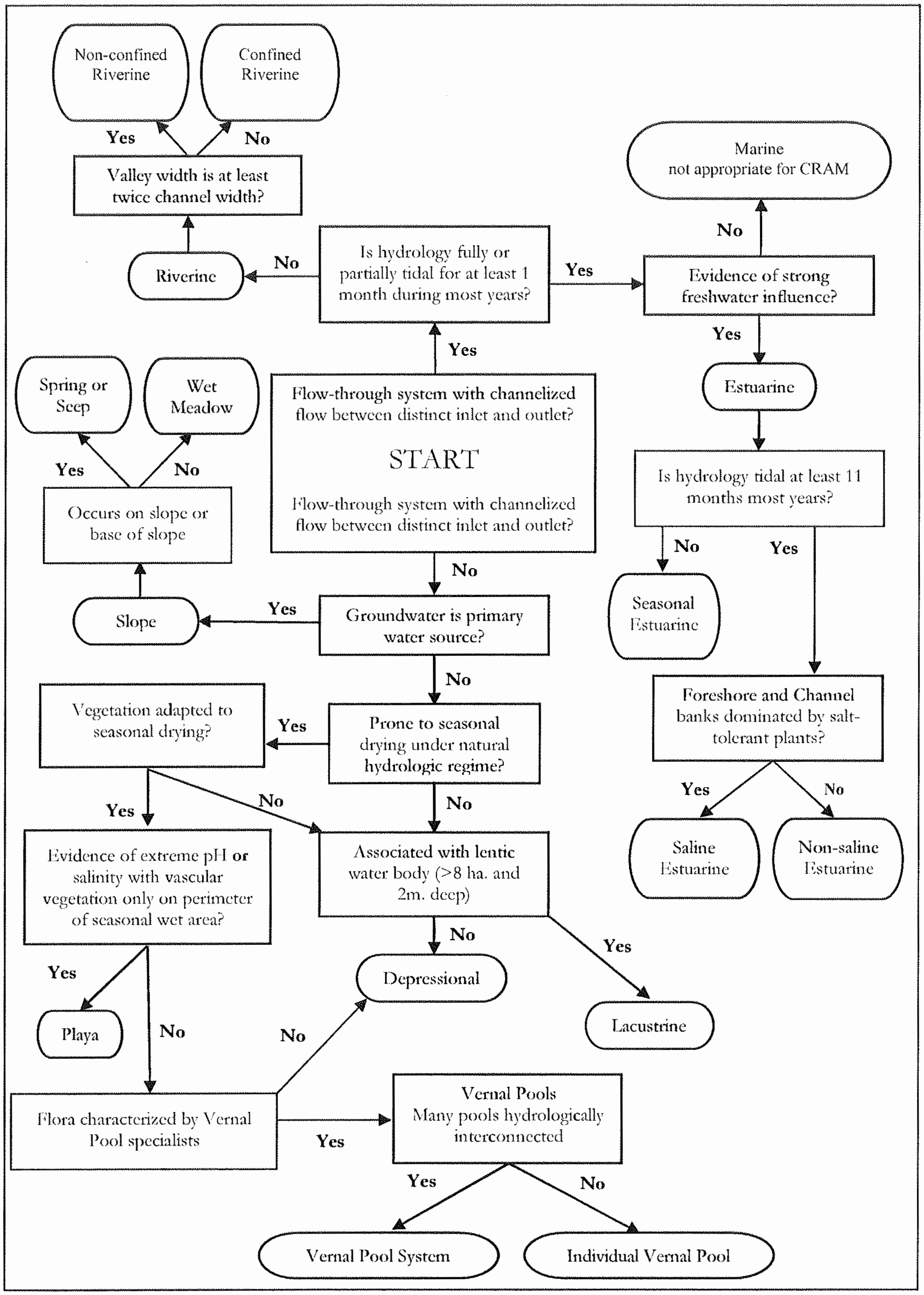
Photos were taken from the center of the AA.

Scoring Sheet: Perennial Depressional Wetlands

AA Name: L-4				**(m/d/y)** 11 / 15 / 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	C			
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 20.5	Final 85.4	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		B		
Hydrologic Connectivity		A		
Attribute Score		Raw 27	Final 75	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		D		
Attribute Score		Raw 6	Final 25	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	C			
Plant Community submetric B: Number of Co-dominant species	D			lots of dead Tam ram
Plant Community submetric C: Percent Invasion	A			*Salt cedar was abundant, but almost all seedlings/saplings are dead.
Plant Community Metric (*average of submetrics A-C*)		7		
Horizontal Interspersion and Zonation		B		
Vertical Biotic Structure		D		
Attribute Score		Raw 19	Final 52.8	Final Attribute Score = (Raw Score/36)100
Overall AA Score		61		**Average of Final Attribute Scores**

Identify Wetland Type

Figure 3.2: Flowchart to determine wetland type and sub-type.



3.2.2.2 Depressional Wetlands

Note: This section was primarily based on perennial depressional wetlands and caution should be applied in the interpretation of scores in seasonal depressional wetlands. The depressional module will be revised during the CRAM validation/calibration process in 2008-2009.

Depressional wetlands exist in topographic lows that do not usually have outgoing surface drainage except during extreme flood events or heavy rainfall. Precipitation is their main source of water. Depressional wetlands can have distinct or indistinct boundaries. Many depressional wetlands are seasonal, and some lack surface ponding or saturated conditions during dry years. A complex of shallows and seasonally wet swales and depressions created by the slight topographic relief of a vernal pool system is an example of an indistinct depressional wetland. The margins of distinct depressional wetlands are relatively easy to discern in aerial photos and in the field. Examples of distinct depressional wetlands include sag ponds, snowmelt ponds, kettle-holes in moraines, cutoff ox-bows on floodplains, and water hazards on golf courses.

3.2.2.3 Other Depressional Wetlands

Depressional wetlands other than vernal pools can be seasonal or perennial, but their flora and fauna are mostly not characteristic of vernal pools, and they lack the impervious substrate that controls vernal pool hydrology. They differ from lacustrine wetlands by lacking an adjacent area of open water at least 2 m deep and 8 ha total area). They differ from playas by lacking an adjacent area larger than the wetland of either alkaline or saline open water less than 2 m deep or non-vegetated, fine-grain sediments. Unlike slope wetlands (i.e., springs and seeps), depressional wetlands depend more on precipitation than groundwater as their water source.

Establish the Assessment Area (AA)

Table 3.5: Examples of features that *should* be used to delineate AA boundaries.

Flow-Through Wetlands	Non Flow-Though Wetlands	
Riverine, Estuarine and Slope Wetlands	**Lacustrine, Wet Meadows, Depressional, and Playa Wetlands**	**Vernal Pools and Vernal Pool Systems**
☐ diversion ditches ☐ end-of-pipe large discharges ☐ grade control or water height control structures ☐ major changes in riverine entrenchment, confinement, degradation, aggradation, slope, or bed form ☐ major channel confluences ☐ water falls ☐ open water areas more than 50 m wide on average or broader than the wetland ☐ transitions between wetland types ☐ foreshores, backshores and uplands at least 5 m wide ☐ weirs, culverts, dams, levees, and other flow control structures	☐ above-grade roads and fills ☐ berms and levees ☐ jetties and wave deflectors ☐ major point sources or outflows of water ☐ open water areas more than 50 m wide on average or broader than the wetland ☐ foreshores, backshores and uplands at least 5 m wide ☐ weirs and other flow control structures	☐ above-grade roads and fills ☐ major point sources of water inflows or outflows ☐ weirs, berms, levees and other flow control structures

Table 3.6: Examples of features that should *not* be used to delineate any AAs.

☐	at-grade, unpaved, single-lane, infrequently used roadways or crossings
☐	bike paths and jogging trails at grade
☐	bare ground within what would otherwise be the AA boundary
☐	equestrian trails
☐	fences (unless designed to obstruct the movement of wildlife)
☐	property boundaries
☐	riffle (or rapid) – glide – pool transitions in a riverine wetland
☐	spatial changes in land cover or land use along the wetland border
☐	state and federal jurisdictional boundaries

Table 3.7: Recommended maximum and minimum AA sizes for each wetland type. Note: Wetlands smaller than the recommended AA sizes can be assessed in their entirety.

Wetland Type	Recommended AA Size
Slope	
Spring or Seep	Maximum size is 0.50 ha (about 75 m x 75 m, but shape can vary); there is no minimum size.
Wet Meadow	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.1 ha (about 30 m x 30 m).
Depressional	
Vernal Pool	There are no size limits (see Section 3.5.6 and Table 3.8).
Vernal Pool System	There are no size limits (see Section 3.5.6 and Table 3.8).
Other Depressional	**Maximum size is 1.0 ha (about 100 m x 100 m, but shape can vary); there is no minimum size.**
Riverine	
Confined and Non-confined	Recommended length is 10x average bankfull channel width; maximum length is 200 m; minimum length is 100 m. AA should extend laterally (landward) from the bankfull contour to encompass all the vegetation (trees, shrubs vines, etc) that probably provide woody debris, leaves, insects, etc. to the channel and its floodplain (Figure 3.4); minimum width is 2 m.
Lacustrine	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Playa	Maximum size is 2.25 ha (about 150 m x 150 m, but shape can vary); minimum size is 0.5 ha (about 75 m x 75 m).
Estuarine	
Perennial Saline	Recommended size and shape for estuarine wetlands is a 1 ha circle (radius about 55 m), but the shape can be non-circular if necessary to fit the wetland and to meet hydro-geomorphic and other criteria as outlined in Sections 3.5.1-3. The minimum size is 0.1 ha (about 30 m x 30 m).
Perennial Non-saline	
Seasonal	

Attribute 1: Buffer and Landscape Context

Landscape Connectivity

Definition: The landscape connectivity of an Assessment Area is assessed in terms of its spatial association with other areas of aquatic resources, such as other wetlands, lakes, streams, etc. It is assumed that wetlands close to each other have a greater potential to interact ecologically and hydrologically, and that such interactions are generally beneficial.

For all wetlands except riverine: On digital or hardcopy site imagery, draw a straight line extending 500 m from the AA boundary in each of the four cardinal compass directions. Along each transect line, estimate the percentage of the segment that passes through wetland or aquatic habitat of any kind, including open water. Use the worksheet below to record these estimates.

Worksheet for Landscape Connectivity Metric for All Wetlands Except Riverine

Percentage of Transect Lines that Contains Wetland Habitat of Any Kind	
Segment Direction	Percentage of Transect Length That is Wetland
North	100
South	100
East	100
West	100
Average Percentage of Transect Length That Is Wetland	100%

Table 4.1: Rating for Landscape Connectivity for all wetlands except Riverine.

Rating	Alternative States
A	An average of 76 – 100 % of the transects is wetland habitat of any kind.
B	An average of 51 – 75 % of the transects is wetland habitat of any kind.
C	An average of 26 – 50 % of the transects is wetland habitat of any kind.
D	An average of 0 – 25 % of the transects is wetland habitat of any kind.

Percent of AA with Buffer

Definition: The buffer is the area adjoining the AA that is in a natural or semi-natural state and currently not dedicated to anthropogenic uses that would severely detract from its ability to entrap contaminants, discourage forays into the AA by people and non-native predators, or otherwise protect the AA from stress and disturbance.

To be considered as buffer, a suitable land cover type must be at least 5 m wide and extend along the perimeter of the AA for at least 5 m. The maximum width of the buffer is 250 m. At distances beyond 250 m from the AA, the buffer becomes part of the landscape context of the AA.

Any area of open water at least 30 m wide that is adjoining the AA, such as a lake, large river, or large slough, is not considered in the assessment of the buffer. Such open water is considered to be neutral, neither part of the wetland nor part of the buffer. There are three reasons for excluding large areas of open water (i.e., more than 30 m wide) from Assessment Areas and their buffers. First, assessments of buffer extent and buffer width are inflated by including open water as a part of the buffer. Second, while there may be positive correlations between wetland stressors and the quality of open water, quantifying water quality generally requires laboratory analyses beyond the scope of rapid assessment. Third, open water can be a direct source of stress (i.e., water pollution, waves, boat wakes) or an indirect source of stress (i.e., promotes human visitation, encourages intensive use by livestock looking for water, provides dispersal for non-native plant species), or it can be a source of benefits to a wetland (e.g., nutrients, propagules of native plant species, water that is essential to maintain wetland hydroperiods, etc.). However, any area of open water at least 30 m wide that is within 250 m of the AA but is not adjoining the AA is considered part of the buffer.

In the example below (Figure 4.2), most of the area around the AA (outlined in white) consists of non-buffer land cover types. The AA adjoins a major roadway, parking lot, and other development that is a non-buffer land cover type. There is a nearby wetland but it is separated from the AA by a major roadway and is not considered buffer. The open water area is neutral and not considered in the estimation of the percentage of the AA perimeter that has buffer. In this example, the only areas that would be considered buffer is the area labeled "Upland Buffer".

Figure 4.2: Diagram of buffer and non-buffer land cover types.

Table 4.4: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	**Examples of Land Covers Excluded from Buffers** Notes: buffers do not cross these land covers; areas of open water adjacent to the AA are not included in the assessment of the AA or its buffer.
☐ bike trails	☐commercial developments
☐ dry-land farming areas	☐fences that interfere with the movements of wildlife
☐ foot trails	☐intensive agriculture (row crops, orchards and vineyards lacking ground cover and other BMPs)
☐ horse trails	☐paved roads (two lanes plus a turning lane or larger)
☐ links or target golf courses	☐lawns
☐ natural upland habitats	☐parking lots
☐ nature or wildland parks	☐horse paddocks, feedlots, turkey ranches, etc.
☐ open range land	☐residential areas
☐ railroads	☐sound walls
☐ roads not hazardous to wildlife	☐sports fields
☐ swales and ditches	☐traditional golf courses
☐ vegetated levees	☐urbanized parks with active recreation
	☐pedestrian/bike trails (i.e., nearly constant traffic)

Table 4.5: Rating for Percent of AA with Buffer.

Rating	**Alternative States (not including open-water areas)**
A	Buffer is 75 - 100% of AA perimeter.
B	Buffer is 50 – 74% of AA perimeter.
C	Buffer is 25 – 49% of AA perimeter.
D	Buffer is 0 – 24% of AA perimeter.

Average Buffer Width

Definition: The average width of the buffer adjoining the AA is estimated by averaging the lengths of eight straight lines drawn at regular intervals around the AA from its perimeter outward to the nearest non-buffer land cover or 250 m, which ever is first encountered. It is assumed that the functions of the buffer do not increase significantly beyond an average width of about 250 m. The maximum buffer width is therefore 250 m. The minimum buffer width is 5 m, and the minimum length of buffer along the perimeter of the AA is also 5 m. Any area that is less than 5 m wide and 5 m long is too small to be a buffer. See Table 4.4 above for more guidance regarding the identification of AA buffers.

Table 4.6: Steps to estimate Buffer Width for all wetlands.

Step 1	Identify areas in which open water is directly adjacent to the AA, with no vegetated intertidal or upland area in between. These areas are excluded from buffer calculations.
Step 2	Draw straight lines 250 m in length perpendicular to the AA through the buffer area at regular intervals along the portion of the perimeter of the AA that has a buffer. For one-sided riverine AAs, draw four lines; for all other wetland types, draw eight lines (see Figures 4.3 and 4.4 below).
Step 3	Estimate the buffer width of each of the lines as they extend away from the AA. Record these lengths on the worksheet below.
Step 4	Estimate the average buffer width. Record this width on the worksheet below.

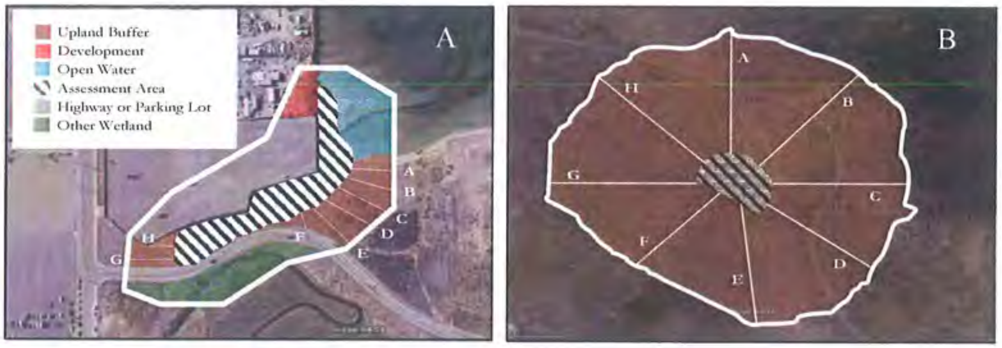


Figure 4.3: Examples of the method used to estimate Buffer Width. Note that the width is based on the lengths of eight lines A-H that extend at regular intervals though the buffer areas, whether only a small part of the 250 m zone around the AA is buffer (A) or all of the zone around the AA is buffer (B).

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	
C	
D	
E	
F	
G	
H	
Average Buffer Width	250

Table 4.7: Rating for average buffer width.

Rating	Alternative States
A	Average buffer width is 190 – 250 m.
B	Average buffer width 130 – 189 m.
C	Average buffer width is 65 – 129 m.
D	Average buffer width is 0 – 64 m.

Buffer Condition

Definition: The condition of a buffer is assessed according to the extent and quality of its vegetation cover and the overall condition of its substrate. Evidence of direct impacts by people are excluded from this metric and included in the Stressor Checklist. Buffer conditions are assessed only for the portion of the wetland border that has already been identified or defined as buffer, based on Section 4.1.2 above. If there is no buffer, assign a score of D.

Table 4.8: Rating for Buffer Condition.

Rating	Alternative States
A	Buffer for AA is dominated by native vegetation, has undisturbed soils, and is apparently subject to little or no human visitation.
B	Buffer for AA is characterized by an intermediate mix of native and non-native vegetation, but mostly undisturbed soils and is apparently subject to little or no human visitation.
C	Buffer for AA is characterized by substantial amounts of non-native vegetation AND there is at least a moderate degree of soil disturbance/compaction, and/or there is evidence of at least moderate intensity of human visitation.
D	Buffer for AA is characterized by barren ground and/or highly compacted or otherwise disturbed soils, and/or there is evidence of very intense human visitation.

Attribute 2: Hydrology

Water Source

Definition: Water Sources directly affect the extent, duration, and frequency of saturated or ponded conditions within an Assessment Area. Water Sources include the kinds of direct inputs of water into the AA as well as any diversions of water from the AA. Diversions are considered a water source because they affect the ability of the AA to function as a source of water for other habitats while also directly affecting the hydrology of the AA.

A water source is direct if it supplies water mainly to the AA, rather than to areas through which the water must flow to reach the AA. Natural, direct sources include rainfall, ground water discharge, and flooding of the AA due to high tides or naturally high riverine flows. Examples of unnatural, direct sources include stormdrains that empty directly into the AA or into an immediately adjacent area. For seeps and springs that occur at the toes of earthen dams, the reservoirs behind the dams are direct water source. Indirect sources that should not be considered in this metric include large regional dams or urban storm drain systems that do not drain directly into the AA but that have systemic, ubiquitous effects on broad geographic areas of which the AA is a small part. For example, the salinity regimes of estuarine wetlands in San Francisco Bay are affected by dams in the Sierra Nevada, but these effects are not direct. But some of the same wetlands are directly affected by nearby discharges from sewage treatment facilities. Engineered hydrological controls, such as weirs, tide gates, flashboards, grade control structures, check dams, etc., can serve to demarcate the boundary of an AA (see Section 3.5), but they are not considered water sources.

The typical suite of natural water sources differs among the wetland types. The water for estuarine wetlands is by definition a combination of marine (i.e., tidal) and riverine (i.e., fluvial) sources. This metric is focused on the non-tidal water sources that account for the conditions during the growing season, regardless of the time of year when these sources exist. To assess water source, the plant species composition of the wetland should be compared to what is expected, in terms of the position of the wetland along the salinity gradient of the estuary, as adjusted for the overall wetness of the water year. In general, altered sources are indicated by vegetation that is either more tolerant of saline conditions or less tolerant than would be expected. If the plant community is unexpectedly salt-tolerant, then an unnatural decrease in freshwater supply is indicated. Conversely, if the community is less salt-tolerant than expected, than an unnatural increase in freshwater is indicated.

Table 4.9: Rating for Water Source.

Rating	Alternative States
A	Freshwater sources that affect the dry season condition of the AA, such as its flow characteristics, hydroperiod, or salinity regime, are precipitation, groundwater, and/or natural runoff, or natural flow from an adjacent freshwater body, or the AA naturally lacks water in the dry season. There is no indication that dry season conditions are substantially controlled by artificial water sources.
B	Freshwater sources that affect the dry season condition of the AA are mostly natural, but also obviously include occasional or small effects of modified hydrology. Indications of such anthropogenic inputs include developed land or irrigated agricultural land that comprises less than 20% of the immediate drainage basin within about 2 km upstream of the AA, or that is characterized by the presence of a few small stormdrains or scattered homes with septic systems. No large point sources or dams control the overall hydrology of the AA.
C	Freshwater sources that affect the dry season conditions of the AA are primarily urban runoff, direct irrigation, pumped water, artificially impounded water, water remaining after diversions, regulated releases of water through a dam, or other artificial hydrology. Indications of substantial artificial hydrology include developed or irrigated agricultural land that comprises more than 20% of the immediate drainage basin within about 2 km upstream of the AA, or the presence of major point source discharges that obviously control the hydrology of the AA. OR Freshwater sources that affect the dry season conditions of the AA are substantially controlled by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from its drainage basin.
D	Natural, freshwater sources that affect the dry season conditions of the AA have been eliminated based on the following indicators: impoundment of all possible wet season inflows, diversion of all dry-season inflow, predominance of xeric vegetation, etc.

Hydroperiod or Channel Stability

Definition: Hydroperiod is the characteristic frequency and duration of inundation or saturation of a wetland during a typical year. The natural hydroperiod for estuarine wetlands is governed by the tides, and includes predictable variations in inundation regimes over days, weeks, months, and seasons. Depressional, lacustrine, playas, and riverine wetlands typically have daily variations in water height that are governed by diurnal increases in evapotranspiration and seasonal cycles that are governed by rainfall and runoff. Seeps and springs that depend on groundwater may have relatively slight seasonal variations in hydroperiod.

Channel stability only pertains to riverine wetlands. It is assessed as the degree of channel aggradation (i.e., net accumulation of sediment on the channel bed causing it to rise over time), or degradation (i.e., net loss of sediment from the bed causing it to be lower over time). There is much interest in channel entrenchment (i.e., the inability of flows in a channel to exceed the channel banks) and this is addressed in the Hydrologic Connectivity metric.

Table 4.10: Field Indicators of Altered Hydroperiod.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
☐ Upstream spring boxes ☐ Impoundments ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Evidence of aquatic wildlife mortality ☐ Encroachment of terrestrial vegetation ☐ Stress or mortality of hydrophytes ☐ Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
☐ Berms ☐ Dikes ☐ Pumps, diversions, ditching that move water ***into*** the wetland	☐ Late-season vitality of annual vegetation ☐ Recently drowned riparian vegetation ☐ Extensive fine-grain deposits

Depressional, Lacustrine, Playas, and Slope Wetlands: Assessment of the hydroperiod for these kinds of wetlands should be initiated with an office-based review of. Field indicators for altered hydroperiod include pumps, spring boxes, ditches, hoses and pipes, and encroachment of terrestrial vegetation (see Table 4.10 above). Tables 4.11a and 4.11b provide narratives for rating Hydroperiod for depressional, lacustrine, and seep and spring wetlands.

Table 4.11a: Rating of Hydroperiod for Depressional, Lacustrine, Playas, and Slope wetlands.

Rating	Alternative States (based on Table 4.10 above)
A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
D	Both the inundation and drawdown of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

Hydrologic Connectivity

Definition: Hydrologic Connectivity describes the ability of water to flow into or out of the wetland, or to inundate their adjacent uplands. This metric pertains only to Riverine, Estuarine, Vernal Pool Systems, individual Vernal Pools, and Playas.

This metric is scored by assessing the degree to which the hydrologic connectivity of the AA is restricted by unnatural features, such as levees and excessively high banks. These features may be restricting the hydrology of the wetland in which the AA is contained, and thus do not need to directly adjoin the AA.

Table 4.15c: Rating of Hydrologic Connectivity for Estuarine, Depressional, Lacustrine, and Slope wetlands, Playas, Individual Vernal Pools, and Vernal Pool Systems.

Rating	Alternative States
A	Rising water in the wetland that contains the AA has unrestricted access to adjacent areas, without levees or other obstructions to the lateral movement of flood waters.
B	There are unnatural features such as levees or road grades that limit the amount of adjacent transition zone or the lateral movement of flood waters, relative to what is expected for the setting. But, the limitations exist for less than 50% of the boundary of wetland that contains the AA. Restrictions may be intermittent along margins of the wetland, or they may occur only along one bank or shore of the wetland. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
C	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for 50-90% of the wetland that contains the AA. Flood flows may exceed the obstructions, but drainage back to the wetland is obstructed.
D	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees or road grades, for more than 90% of the wetland that contains the AA.

Attribute 3: Physical Structure

Structural Patch Richness

Definition: Patch richness is the number of different obvious types of physical surfaces or features that may provide habitat for aquatic, wetland, or riparian species. This metric is different from topographic complexity in that it addresses the number of different patch types, whereas topographic complexity evaluates the spatial arrangement and interspersion of the types. Physical patches can be natural or unnatural.

Patch Type Definitions:

Animal mounds and burrows. Many vertebrates make mounds or holes as a consequence of their foraging, denning, predation, or other behaviors. The resulting soil disturbance helps to redistributes soil nutrients and influences plant species composition and abundance. To be considered a patch type there should be evidence that a population of burrowing animals has occupied the Assessment Area. A single burrow or mound does not constitute a patch.

Bank slumps or undercut banks in channels or along shorelines. A bank slump is a portion of a depressional, estuarine, or lacustrine bank that has broken free from the rest of the bank but has not eroded away. Undercuts are areas along the bank or shoreline of a wetland that have been excavated by waves or flowing water.

Cobble and boulders. Cobble and boulders are rocks of different size categories. The long axis of cobble ranges from about 6 cm to about 25 cm. A boulder is any rock having a long axis greater than 25 cm. Submerged cobbles and boulders provide abundant habitat for aquatic macroinvertebrates and small fish. Exposed cobbles and boulders provide roosting habitat for birds and shelter for amphibians. They contribute to patterns of shade and light and air movement near the ground surface that affect local soil moisture gradients, deposition of seeds and debris, and overall substrate complexity.

Concentric or parallel high water marks. Repeated variation in water level in a wetland can cause concentric zones in soil moisture, topographic slope, and chemistry that translate into visible zones of different vegetation types, greatly increasing overall ecological diversity. The variation in water level might be natural (e.g., seasonal) or anthropogenic.

Debris jams. A debris jam is an accumulation of drift wood and other flotage across a channel that partially or completely obstructs surface water flow.

Hummocks or sediment mounds. Hummocks are mounds created by plants in slope wetlands, depressions, and along the banks and floodplains of fluvial and tidal systems. Hummocks are typically less than 1m high. Sediment mounds are similar to hummocks but lack plant cover.

Islands (exposed at high-water stage). An island is an area of land above the usual high water level and, at least at times, surrounded by water in a riverine, lacustrine, estuarine, or playa system. Islands differ from hummocks and other mounds by being large enough to support trees or large shrubs.

Macroalgae and algal mats. Macroalgae occurs on benthic sediments and on the water surface of all types of wetlands. Macroalgae are important primary producers, representing the base of the food web in some wetlands. Algal mats can provide abundant habitat for macro-invertebrates, amphibians, and small fishes.

Non-vegetated flats (sandflats, mudflats, gravel flats, etc.). A flat is a non-vegetated area of silt, clay, sand, shell hash, gravel, or cobble at least 10 m wide and at least 30 m long that adjoins the wetland

foreshore and is a potential resting and feeding area for fishes, shorebirds, wading birds, and other waterbirds. Flats can be similar to large bars (see definitions of point bars and in-channel bars below), except that they lack the convex profile of bars and their compositional material is not as obviously sorted by size or texture.

Pannes or pools on floodplain. A panne is a shallow topographic basin lacking vegetation but existing on a well-vegetated wetland plain. Pannes fill with water at least seasonally due to overland flow. They commonly serve as foraging sites for waterbirds and as breeding sites for amphibians.

Point bars and in-channel bars. Bars are sedimentary features within intertidal and fluvial channels. They are patches of transient bedload sediment that form along the inside of meander bends or in the middle of straight channel reaches. They sometimes support vegetation. They are convex in profile and their surface material varies in size from small on top to larger along their lower margins. They can consist of any mixture of silt, sand, gravel, cobble, and boulders.

Pools in channels. Pools are areas along tidal and fluvial channels that are much deeper than the average depths of their channels and that tend to retain water longer than other areas of the channel during periods of low or no surface flow.

Riffles or rapids. Riffles and rapids are areas of relatively rapid flow and standing waves in tidal or fluvial channels. Riffles and rapids add oxygen to flowing water and provide habitat for many fish and aquatic invertebrates.

Secondary channels on floodplains or along shorelines. Channels confine riverine or estuarine flow. A channel consists of a bed and its opposing banks, plus its floodplain. Estuarine and riverine wetlands can have a primary channel that conveys most flow, and one or more secondary channels of varying sizes that convey flood flows. The systems of diverging and converging channels that characterize braided and anastomosing fluvial systems usually consist of one or more main channels plus secondary channels. Tributary channels that originate in the wetland and that only convey flow between the wetland and the primary channel are also regarded as secondary channels. For example, short tributaries that are entirely contained within the CRAM Assessment Area (AA) are regarded as secondary channels.

Shellfish beds. Oysters, clams and mussels are common bivalves that create beds on the banks and bottoms of wetland systems. Shellfish beds influence the condition of their environment by affecting flow velocities, providing substrates for plant and animal life, and playing particularly important roles in the uptake and cycling of nutrients and other water-borne materials.

Soil cracks. Repeated wetting and drying of fine grain soil that typifies some wetlands can cause the soil to crack and form deep fissures that increase the mobility of heavy metals, promote oxidation and subsidence, while also providing habitat for amphibians and macroinvertebrates. Cracks must be a minimum of 1 inch deep to qualify.

Standing snags. Tall, woody vegetation, such as trees and tall shrubs, can take many years to fall to the ground after dying. These standing "snags" they provide habitat for many species of birds and small mammals. Any standing, dead woody vegetation that is at least 3 m tall is considered a snag.

Submerged vegetation. Submerged vegetation consists of aquatic macrophytes such as *Elodea canadensis* (common elodea), and *Zostera marina* (eelgrass) that are rooted in the sub-aqueous substrate but do not usually grow high enough in the overlying water column to intercept the water surface. Submerged vegetation can strongly influence nutrient cycling while providing food and shelter for fish and other organisms.

Swales on floodplain or along shoreline. Swales are broad, elongated, vegetated, shallow depressions that can sometimes help to convey flood flows to and from vegetated marsh plains or floodplains. But, they lack obvious banks, regularly spaced deeps and shallows, or other characteristics of channels. Swales can entrap water after flood flows recede. They can act as localized recharge zones and they can sometimes receive emergent groundwater.

Variegated or crenulated foreshore. As viewed from above, the foreshore of a wetland can be mostly straight, broadly curving (i.e., arcuate), or variegated (e.g., meandering). In plan view, a variegated shoreline resembles a meandering pathway. variegated shorelines provide greater contact between water and land.

Wrackline or organic debris in channel or on floodplain. Wrack is an accumulation of natural or unnatural floating debris along the high water line of a wetland.

Structural Patch Type Worksheet for All Wetland Types, Except Vernal Pool Systems

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table 4.16 below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see section 3.2.2.1).

STRUCTURAL PATCH TYPE (check for presence)	Riverine (Non-confined)	Riverine (Confined)	All Estuarine	**Depressional**	Slope Wetlands	Lacustrine	Individual Vernal Pools	Playas
Minimum Patch Size	3 m^2	3 m^2	3 m^2	**3 m^2**	1 m^2	3 m^2	1 m^2	3 m^2
Secondary channels on floodplains or along shorelines	1	0	1	**0**	1	1	0	1
Swales on floodplain or along shoreline	1	0	0	**1**	1	1	1	1
Pannes or pools on floodplain	1	0	1	**0**	1	1	1	1
Vegetated islands (mostly above high-water)	1	0	0	**1**	0	0	1	1
Pools or depressions in channels (wet or dry channels)	1	1	1	**0**	0	0	0	0
Riffles or rapids (wet channel) or planar bed (dry channel)	1	1	0	**0**	0	0	0	0
Non-vegetated flats or bare ground (sandflats, mudflats, gravel flats, etc.)	0	0	1	**1**	1	1	1	1
Point bars and in-channel bars	1	1	1	**0**	0	0	0	0
Debris jams	1	1	1	**0**	0	1	0	0
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	1	1	1	**1**	0	1	0	0
Plant hummocks and/or sediment mounds	1	1	1	**1**	1	1	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1	1	**1**	0	1	0	0
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1	0	**1**	0	1	0	0
Animal mounds and burrows	0	0	1	**1**	1	0	1	1
Standing snags (at least 3 m tall)	1	1	1	**1**	1	1	0	0
Filamentous macroalgae or algal mats	1	1	1	**1**	1	1	1	1
Shellfish beds	0	0	1	**0**	0	1	0	0
Concentric or parallel high water marks	0	0	0	**1**	1	1	1	1
Soil cracks	0	0	1	**1**	0	1	1	1
Cobble and/or Boulders	1	1	0	**0**	1	1	1	0
Submerged vegetation	1	0	1	**1**	0	1	0	0
Total Possible	16	11	15	**13**	10	16	10	10
No. Observed Patch Types (enter here and use in Table 4.16 below)						3		

Table 4.16: Rating of Structural Patch Richness (based on results from worksheets).

Rating	Confined Riverine, Playas, Springs & Seeps, Individual Vernal Pools	**Vernal ,Pool Systems and Depressional**	Estuarine	Non-confined Riverine, Lacustrine
A	≥ 8	**≥ 11**	≥ 11	≥ 12
B	6 – 7	**8 – 10**	8 – 10	9 – 11
C	4 – 5	**5 – 7**	6 – 7	6 – 8
D	≤ 3	**≤ 4**	≤ 5	≤ 5

Topographic Complexity

Definition: Topographic complexity refers to the variety of elevations within a wetland due to physical, abiotic features and elevations gradients.

Table 4.17: Typical indicators of Macro- and Micro-topographic Complexity for each wetland type.

Type	Examples of Topographic Features
Depressional and Playas	**pools, islands, bars, mounds or hummocks, variegated shorelines, soil cracks, partially buried debris, plant hummocks, livestock tracks**
Estuarine	channels large and small, islands, bars, pannes, potholes, natural levees, shellfish beds, hummocks, slump blocks, first-order tidal creeks, soil cracks, partially buried debris, plant hummocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines, cobble, boulders, partially buried debris, plant hummocks
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams, cobble, boulders, slump blocks, tree-fall holes, plant hummocks
Slope Wetlands	pools, runnels, plant hummocks, burrows, plant hummocks, cobbles, boulders, partially buried debris, cattle or sheep tracks
Vernal Pools and Pool Systems	soil cracks, "mima-mounds," rivulets between pools or along swales, cobble, plant hummocks, cattle or sheep tracks

Figure 4.6: Scale-independent schematic profiles of Topographic Complexity.
Each profile A-D represents one-half of a characteristic cross-section through an AA. The right end of each profile represents either the buffer along the backshore of the wetland encompassing the AA, or, if the AA is not contiguous with the buffer, then the right end of each profile represents the edge of the AA.

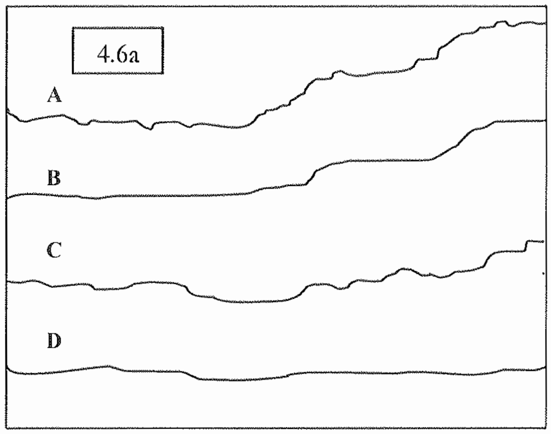


Table 4.18a: Rating of Topographic Complexity for Depressional Wetlands, Playas, Individual Vernal Pools, and Slope Wetlands.

Rating	Alternative States (based on diagrams in Figure 4.6 above)
A	AA as viewed along a typical cross-section has at least two benches or breaks in slope, and each of these benches, plus the slopes between them contain physical patch types or features that contribute to abundant micro-topographic relief or variability as illustrated in profile A of Figure 4.6a.
B	AA has at least two benches or breaks in slope above the middle area or bottom zone of the AA, but these benches and slopes mostly lack abundant micro-topographic relief. The AA resembles profile B of Figure 4.6a.
C	AA lacks any obvious break in slope or bench, and is best characterized has a single slope that has at least a moderate amount of micro-topographic complexity, as illustrated in profile C of Figure 4.6a.
D	AA has a single, uniform slope with little or no micro-topographic complexity, as illustrated in profile D of Figure 4.6a.

Attribute 4: Biotic Structure

Plant Community Metric

Definition: The Plant Community Metric is composed of three submetrics for each wetland type. Two of these sub-metrics, Number of Co-dominant Plants and Percent Invasion, are common to all wetland types. For all wetlands except Vernal Pools and Vernal Pool Systems, the Number of Plant Layers as defined for CRAM is also assessed. For Vernal Pools and Pool Systems, the Number of Plant layers submetric is replaced by the Native Species Richness submetric. A thorough reconnaissance of an AA is required to assess its condition using these submetrics. The assessment for each submetric is guided by a set of Plant Community Worksheets. The Plant Community metric is calculated based on these worksheets.

A "plant" is defined as an individual of any species of tree, shrub, herb/forb, moss, fern, emergent, submerged, submergent or floating macrophyte, including non-native (exotic) plant species. For the purposes of CRAM, a plant "layer" is a stratum of vegetation indicated by a discreet canopy at a specified height that comprises at least 5% of the area of the AA where the layer is expected.

Non-native species owe their occurrence in California to the actions of people since shortly before Euroamerican contact. "Invasive" species are non-native species that tend to dominate one or more plant layers within an AA. CRAM uses the California Invasive Plant Council (Cal-IPC) list to determine the invasive status of plants, with augmentation by regional experts.

Number of Plant Layers Present

To be counted in CRAM, a layer must cover at least 5% of *the portion of the AA that is suitable for the layer.* This would be the littoral zone of lakes and depressional wetlands for the one aquatic layer, called "floating." The "short," "medium," and "tall" layers might be found throughout the non-aquatic areas of each wetland class, except in areas of exposed bedrock, mudflat, beaches, active point bars, etc. The "very tall" layer is usually expected to occur along the backshore, except in forested wetlands.

It is essential that the layers be identified by the actual plant heights (i.e., the approximate maximum heights) of plant species in the AA, regardless of the growth potential of the species. For example, a young sapling redwood between 0.5 m and 0.75 m tall would belong to the "medium" layer, even though in the future the same individual redwood might belong to the "very tall" layer. Some species might belong to multiple plant layers. For example, groves of red alders of all different ages and heights might collectively represent all four non-aquatic layers in a riverine AA. Riparian vines, such as wild grape, might also dominate all of the non-aquatic layers.

Layer definitions:

Floating Layer. This layer includes rooted aquatic macrophytes such as *Ruppia cirrhosa* (ditchgrass), *Ranunculus aquatilis* (water buttercup), and *Potamogeton foliosus* (leafy pondweed) that create floating or buoyant canopies at or near the water surface that shade the water column. This layer also includes non-rooted aquatic plants such as *Lemna* spp. (duckweed) and *Eichhornia crassipes* (water hyacinth) that form floating canopies.

Short Vegetation. This layer varies in maximum height among the wetland types, but is never taller than 50 cm. It includes small emergent vegetation and plants. It can include young forms of species that grow taller. Vegetation that is naturally short in its mature stage includes *Rorippa nasturtium-aquaticum* (watercress), small Isoetes (quillworts*), Distichlis spicata* (saltgrass), *Jaumea carnosa* (jaumea), *Ranunculus flamula* (creeping buttercup), *Alisma* spp. (water plantain), *Sparganium* (burweeds), and *Sagitaria* spp. (arrowhead).

Medium Vegetation. This layer never exceeds 75 cm in height. It commonly includes emergent vegetation such *Salicornia virginica* (pickleweed), *Atriplex* spp. (saltbush), rushes (*Juncus* spp.), and *Rumex crispus* (curly dock).

Tall Vegetation. This layer never exceeds 1.5 m in height. It usually includes the tallest emergent vegetation and the larger shrubs. Examples include *Typha latifolia* (broad-leaved cattail), *Scirpus californicus* (bulrush), *Rubus ursinus* (California blackberry), and *Baccharis piluaris* (coyote brush).

Very Tall Vegetation. This layer is reserved for shrubs, vines, and trees that are taller than 1.5 m. Examples include *Plantanus racemosa* (western sycamore), *Populus fremontii* (Fremont cottonwood), *Alnus rubra* (red alder), *Sambucus mexicanus* (Blue elderberry), and *Corylus californicus* (hazelnut).

Standing (upright) dead or senescent vegetation from the previous growing season can be used in addition to live vegetation to assess the number of plant layers present. However, the lengths of prostrate stems or shoots are disregarded. In other words, fallen vegetation should not be "held up" to determine the plant layer to which it belongs. The number of plant layers must be determined based on the way the vegetation presents itself in the field.

Appendix I: Flow Chart to Determine Plant Dominance

Step 1: Determine the number of plant layers. Estimate which possible layers comprise at least 5% of the portion of the AA that is suitable for supporting vascular vegetation.

- < 5 % → It does not count as a layer, and is no longer considered in this analysis.
- ≥ 5 % → It counts as a layer.

Step 2: Determine the co-dominant plant species in each layer. For each layer, identify the species that represent at least 10% of the total area of plant cover.

- < 10 % → It is not a "dominant" species, and is no longer considered in the analysis.
- ≥ 10 % → It is a "dominant" species.

Step 3: Determine invasive status of co-dominant plant species. For each plant layer, use the list of invasive species (Appendix IV) or local expertise to identify each co-dominant species that is invasive. eCRAM software will automatically identify known invasive species that are listed as co-dominants.

Plant Community Metric Worksheet 1 of 8: Plant layer heights for all wetland types.

Wetland Type	Plant Layers				
	Aquatic	Semi-aquatic and Riparian			
	Floating	Short	Medium	Tall	Very Tall
Perennial Saline Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Perennial Non-saline Estuarine, Seasonal Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Lacustrine, Depressional and Non-confined Riverine	**On Water Surface**	**<0.5 m**	**0.5 – 1.5 m**	**1.5 - 3.0 m**	**>3.0 m**
Slope	NA	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m
Confined Riverine	NA	<0.5 m	0.5 – 1.5 m	1.5 – 3.0 m	>3.0 m

Number of Co-dominant Species

For each plant layer in the AA, all species represented by living vegetation that comprises at least 10% relative cover within the layer are considered to be dominant. Only living vegetation in growth position is considered in this metric. Dead or senescent vegetation is disregarded.

Percent Invasion

The number of invasive co-dominant species for all plant layers combined is assessed as a percentage of the total number of co-dominants, based on the results of the Number of Co-dominant Species sub-metric. The invasive status for many California wetland and riparian plant species is based on the Cal-IPC list (Appendix IV). However, the best professional judgment of local experts may be used instead to determine whether or not a co-dominant species is invasive.

Plant Community Metric Worksheet 2 of 8: Co-dominant species richness for all wetland types, except Confined Riverine, Slope wetlands, Vernal Pools, and Playas (A dominant species represents ≥10% *relative* cover)

Note: Plant species should only be counted once when calculating the Number of Co-dominant Species and Percent Invasion metric scores.

Floating or Canopy-forming	Invasive?	Short	Invasive?
		All OCC 10%	
Medium	**Invasive?**	**Tall**	**Invasive?**
All OCC 10%		~~Tam Tam <0.1%~~	✓
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined (enter here and use in Table 4.19)	1
		Percent Invasion (enter here and use in Table 4.19)	0

> 5% large

Not >10%, so not included.

Table 4.19: Ratings for submetrics of Plant Community Metric.

Rating	Number of Plant Layers Present	Number of Co-dominant Species	Percent Invasion
	Lacustrine, Depressional and Non-confined Riverine Wetlands		
A	4 – 5	≥ 12	0 – 15%
B	3	9 – 11	16 – 30%
C	1 – 2	6 – 8	31 – 45%
D	0	0 – 5	46 – 100%

Horizontal Interspersion and Zonation

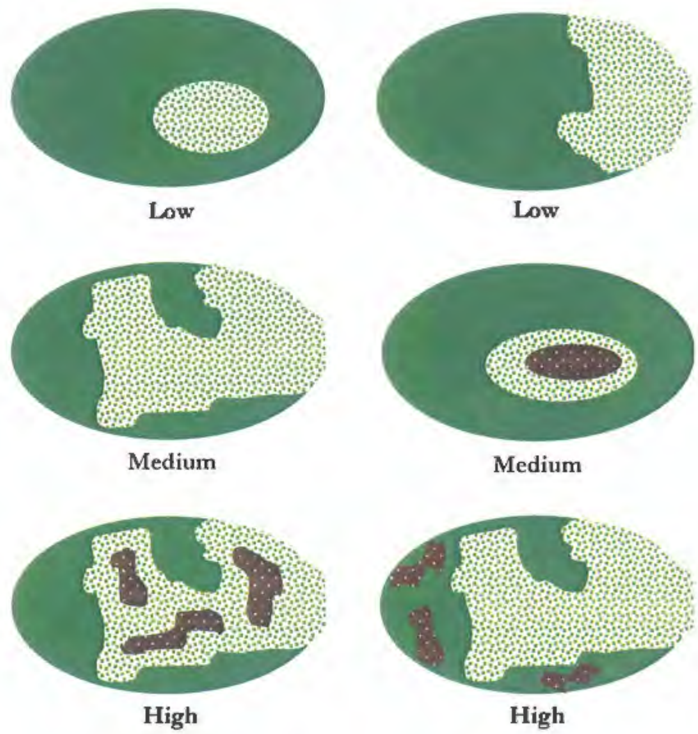
Definition: Horizontal biotic structure refers to the variety and interspersion of plant "zones." Plant zones are plant monocultures or obvious multi-species association that are arrayed along gradients of elevation, moisture, or other environmental factors that seem to affect the plant community organization in plan view. Interspersion is essentially a measure of the number of distinct plant zones and the amount of edge between them.

Table 4.20a: Rating of Horizontal Interspersion of Plant Zones for all AAs except Riverine and Vernal Pool Systems.

Rating	Alternative States (based on Figures 4.7, 4.8, and 4.10)
A	AA has a high degree of plan-view interspersion.
B	AA has a moderate degree of plan-view interspersion.
C	AA has a low degree of plan-view interspersion.
D	AA has essentially no plan-view interspersion.

Note: When using this metric, it is helpful to assign names of plant species or associations of species to the colored patches in Figure 4.10.

Figure 4.7: Diagram of the degrees of interspersion of plant zones for Lacustrine, Depressional, Playas, and Slope wetlands. Hatching patterns represent plant zones (adapted from Mack 2001). Each zone must comprise at least 5% of the AA.



Vertical Biotic Structure

Definition: The vertical component of biotic structure consists of the interspersion and complexity of plant layers. The same plant layers used to assess the Plant Community Composition Metrics (see Section 4.4.2) are used to assess Vertical Biotic Structure. To be counted in CRAM, a layer must cover at least 5% of the portion of the AA that is suitable for the layer. This metric does not pertain to Vernal Pools, Vernal Pool Systems, or Playas.

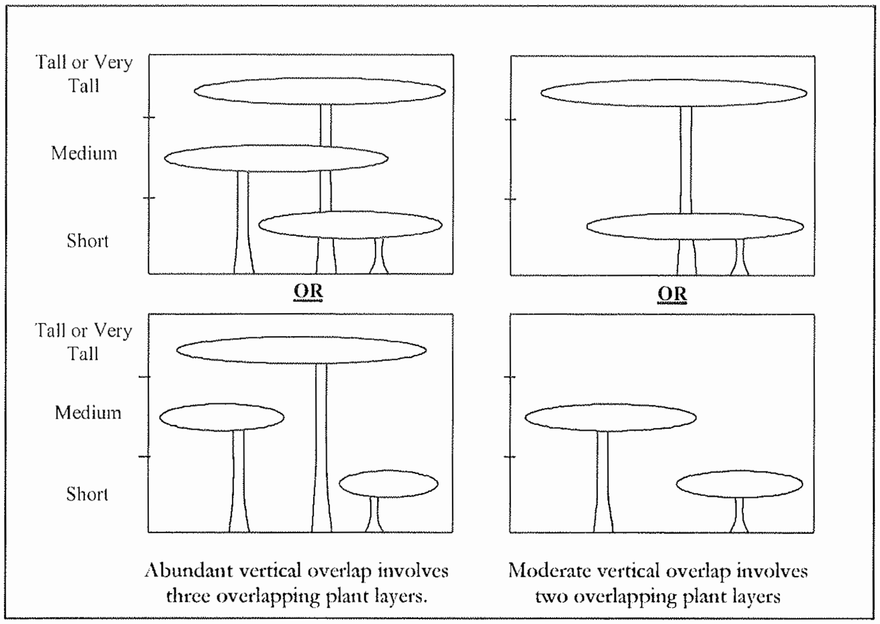


Figure 4.11: Schematic diagrams of vertical interspersion of plant layers for Riverine AAs and for Depressional and Lacustrine AAs having Tall or Very Tall plant layers.

Table 4.21: Rating of Vertical Biotic Structure for Riverine AAs and for Lacustrine and Depressional AAs supporting Tall or Very Tall plant layers (see Figure 4.11).

Rating	Alternative States
A	More than 50% of the vegetated area of the AA supports abundant overlap of plant layers (see Figures 4.11).
B	More than 50% of the area supports at least moderate overlap of plant layers.
C	25–50% of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
D	Less than 25% of the vegetated AA supports moderate overlap of plant layers, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

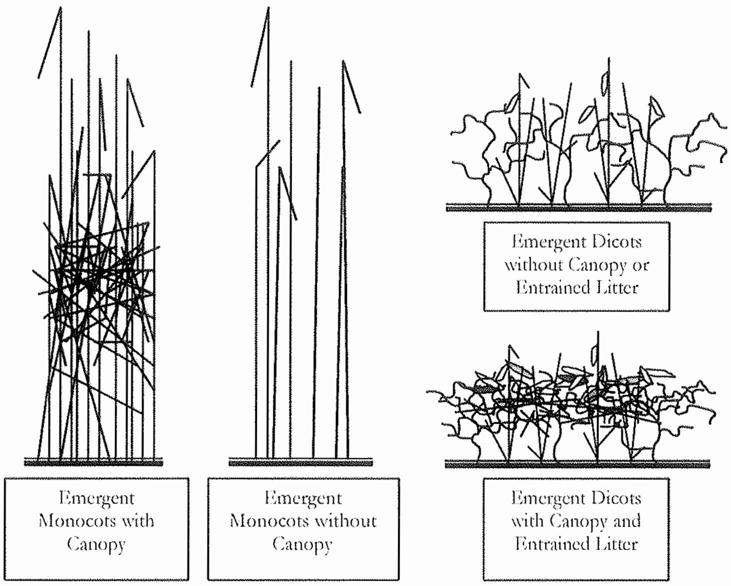


Figure 4.12: Schematic diagrams of plant canopies and entrained litter used to assess Vertical Biotic Structure in all Estuarine wetlands, or in Depressional and Lacustrine wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers.

Table 4.22: Rating of Vertical Biotic Structure for wetlands dominated by emergent monocots or lacking Tall and Very Tall plant layers, especially Estuarine saline wetlands (see Figure 4.12).

Rating	Alternative States
A	Most of the vegetated plain of the AA has a dense canopy of living vegetation or entrained litter or detritus forming a "ceiling" of cover 10-20 cm of above the wetland surface that shades the surface and can provide abundant cover for wildlife.
B	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter as described in "A" above; OR Most of the vegetated plain has a dense canopy but the ceiling it forms is much less than 10-20 cm above the ground surface.
C	Less than half of the vegetated plain of the AA has a dense canopy of vegetation or entrained litter AND the ceiling it forms is much less than 10-20 cm above the ground surface.
D	Most of the AA lacks a dense canopy of living vegetation or entrained litter or detritus.

Guidelines to Complete the Stressor Checklists

Definition: A stressor, as defined for the purposes of the CRAM, is an anthropogenic perturbation within a wetland or its environmental setting that is likely to negatively impact the condition and function of the CRAM Assessment Area (AA). A disturbance is a natural phenomenon that affects the AA.

There are four underlying assumptions of the Stressor Checklist: (1) deviation from the best achievable condition can be explained by a single stressor or multiple stressors acting on the wetland; (2) increasing the number of stressors acting on the wetland causes a decline in its condition (there is no assumption as to whether this decline is additive (linear), multiplicative, or is best represented by some other non-linear mode); (3) increasing either the intensity or the proximity of the stressor results in a greater decline in condition; and (4) continuous or chronic stress increases the decline in condition.

The process to identify stressors is the same for all wetland types. For each CRAM attribute, a variety of possible stressors are listed. Their presence and likelihood of significantly affecting the AA are recorded in the Stressor Checklist Worksheet. For the Hydrology, Physical Structure, and Biotic Structure attributes, the focus is on stressors operating within the AA or within 50 m of the AA. For the Buffer and Landscape Context attribute, the focus is on stressors operating within 500 m of the AA. More distant stressors that have obvious, direct, controlling influences on the AA can also be noted.

Table 5.1: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type? no	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		

Comments

none

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		

Comments none

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation	✓	
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer		

Comments

4-wheel drive tracks the area, also duck blinds

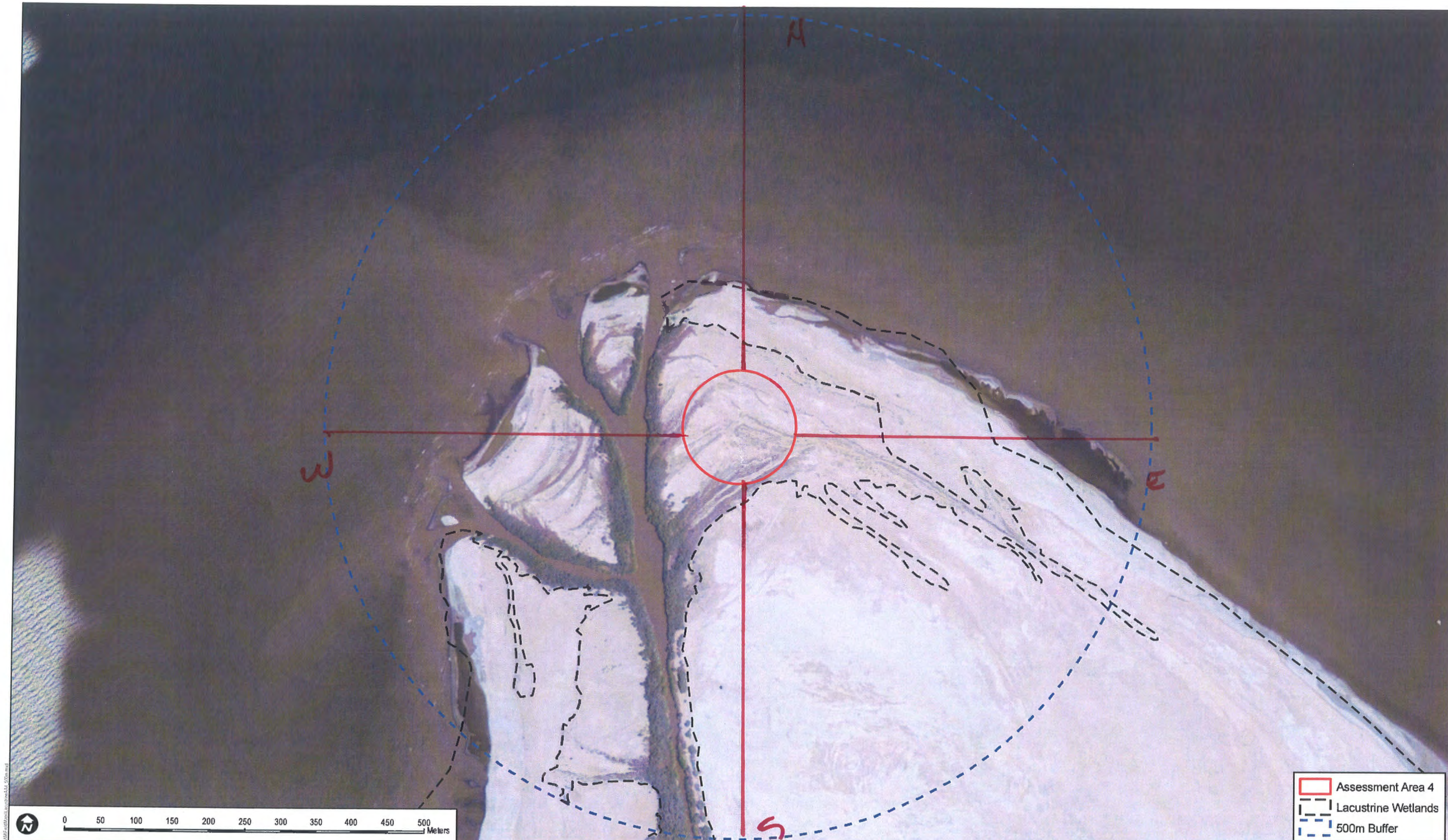
BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)	✓	
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		

Comments

CRAM Score Guidelines

Table 3.11: Steps to calculate attribute scores and AA scores.

Step 1: Calculate Metric Score	For each Metric, convert the letter score into the corresponding numeric score: A=12, B=9, C=6 and D=3.
Step 2: Calculate raw Attribute Score	For each Attribute, calculate the Raw Attribute Score as the sum of the numeric scores of the component Metrics, except in the following cases: □ For Attribute 1 (Buffer and Landscape Context), the submetric scores relating to buffer are combined into an overall buffer score that is added to the score for the Landscape Connectivity metric, using the following formula: $\left(\boxed{\text{Buffer Condition}} \times \left(\boxed{\text{\% AA with Buffer}} \times \boxed{\text{Average Buffer Width}}\right)^{1/2}\right)^{1/2} + \boxed{\text{Landscape Connectivity}}$ □ Prior to calculating the Biotic Structure Raw Attribute Score, average the three Plant Community sub-metrics. □ For vernal pool systems, first calculate the average score for all three Plant Community sub-metrics for each replicate pool, then average these scores across all six replicate pools, and then calculate the average Topographic Complexity score for all six replicates.
Step 3: Calculate final Attribute Score	For each Attribute, divide its Raw Attribute Score by its maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, and 36 for Biotic Structure.
Step 4: Calculate the AA Score	Calculate the AA score by averaging the Final Attribute Scores. Round the average to the nearest whole integer.



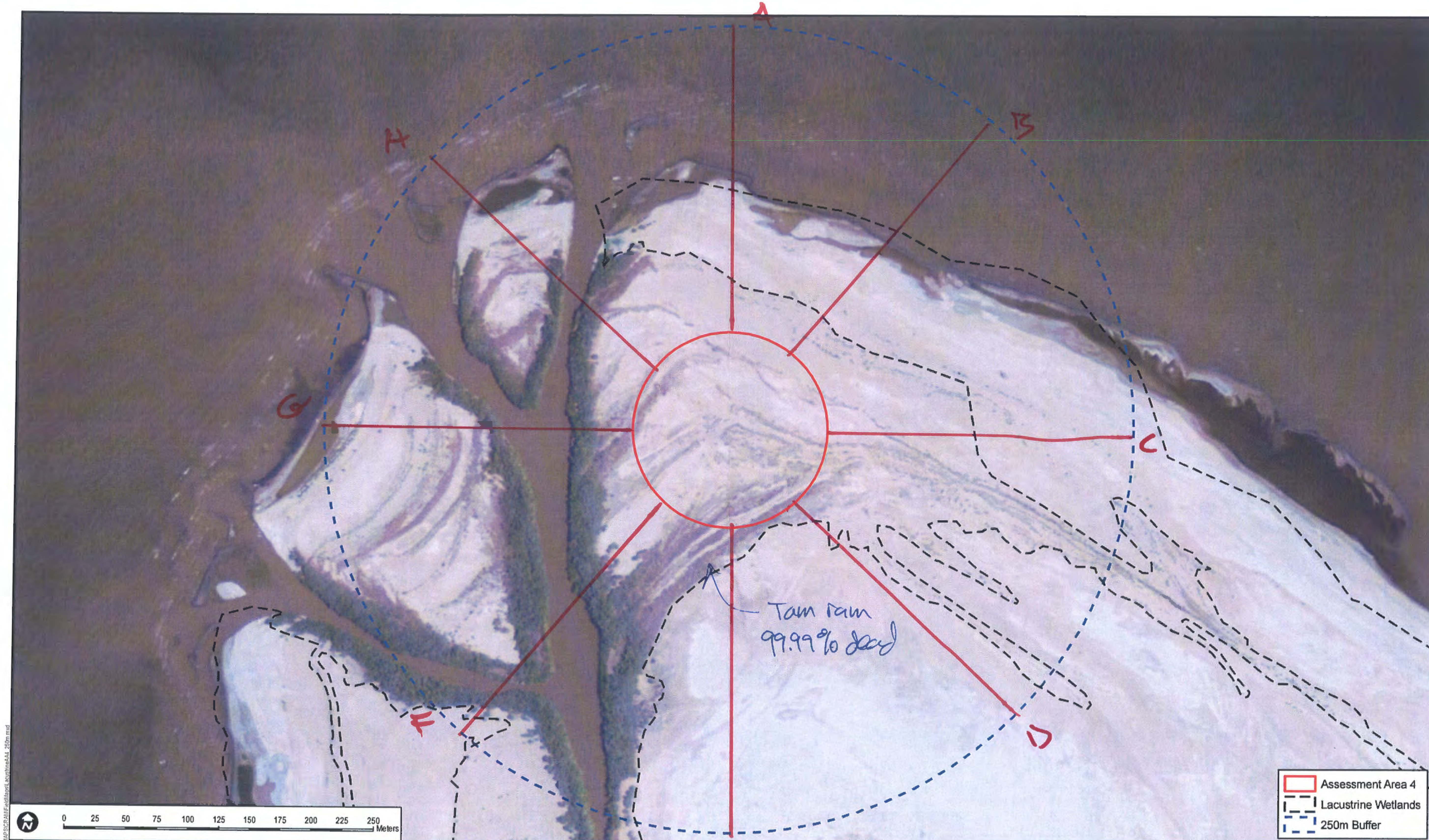
DUDEK

6575

NOVEMBER 2011

SALTON SEA SCH

Lacustrine Assessment Area 4 - 500m Field Map



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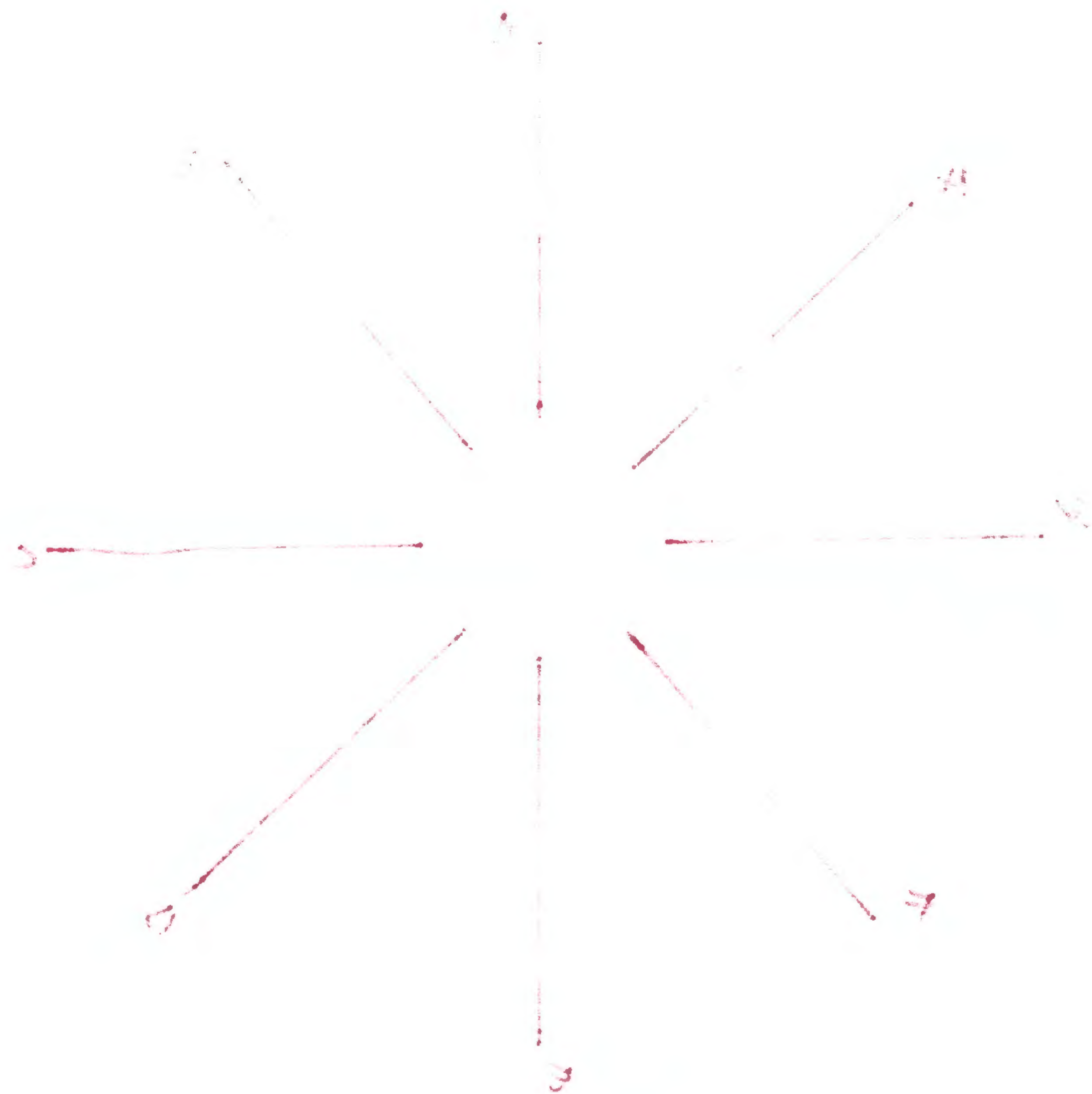
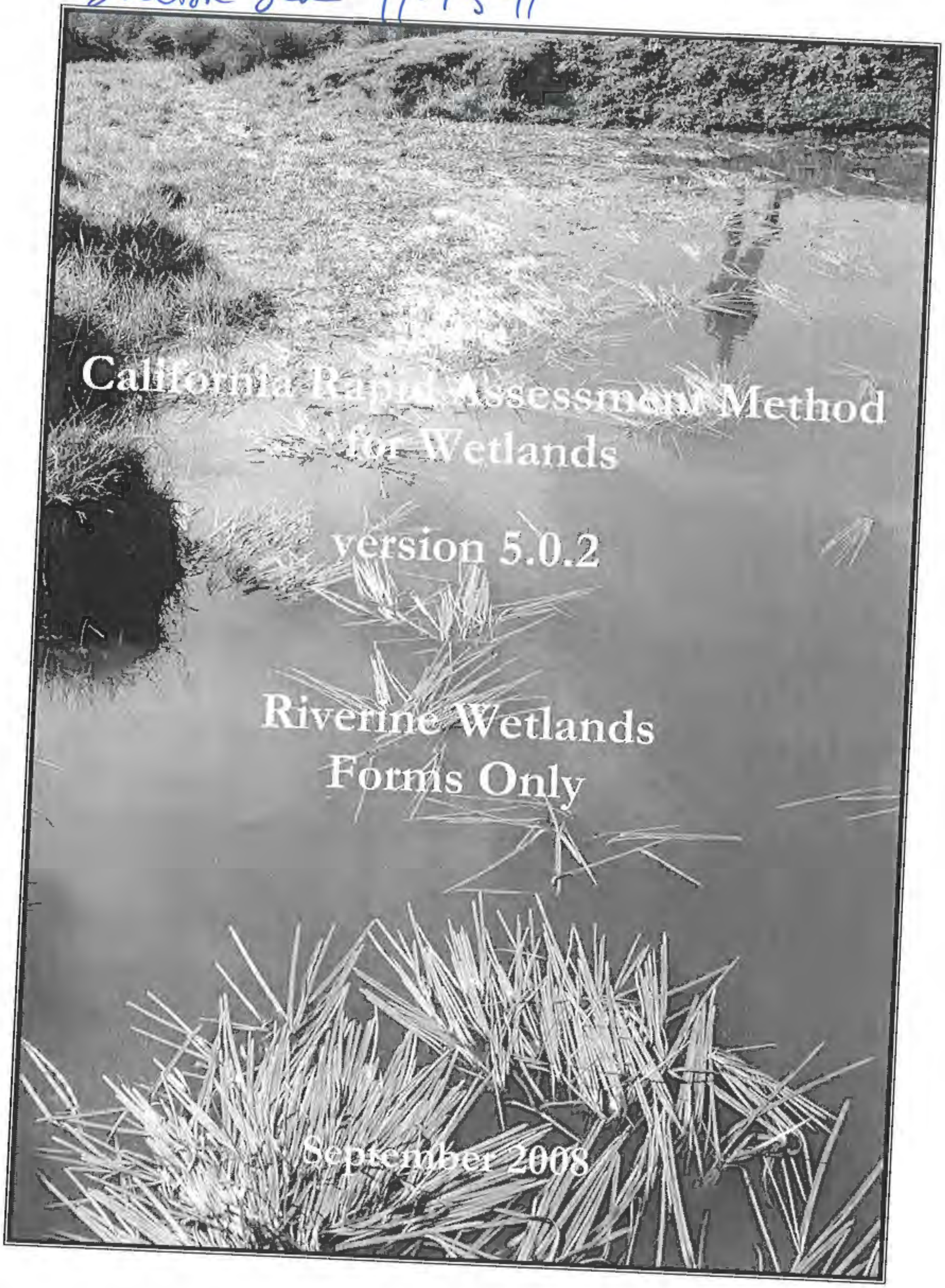
SALTON SEA SCH

Lacustrine Assessment Area 4 - 250m Field Map



~~B-4~~ R-1
Salton Sea 11-15-11



California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands
Forms Only

September 2008

Basic Information Sheet: Riverine Wetlands

Your Name:	Doug Gettinger
CRAM Site ID:	
Assessment Area Name:	R-# R-1
Date (m/d/y):	
Assessment Team Members for This AA	
DG, TS	
Average Bankfull Width:	23 m
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m):	200m

Wetland Sub-type:

☒ Confined ☐ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☒ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	R1 - center	~~North~~	Facing in towards AA		
2	R1 - center	~~South~~	Facing out towards buffer		
3	R1 - downstream	~~East~~	Facing AA		
4	R1 - upstream	~~West~~	Facing AA		
5					
6					

Comments:

one-sided AA, river not wadeable

Scoring Sheet: Riverine Wetlands

AA Name:		R1		(m/d/y) 11 / 15 / 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	C			
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 20.5	Final 85.4	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		C		
Hydrologic Connectivity		~~D~~ C		can't measure depth or width
Attribute Score		Raw 18	Final 50	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		D		
Attribute Score		Raw 6	Final 25	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	C			2 = Tall & V. tall
Plant Community submetric B: Number of Co-dominant species	D			2 spp.
Plant Community submetric C: Percent Invasion	D			50% Tam ram.
Plant Community Metric (*average of submetrics A-C*)		4		
Horizontal Interspersion and Zonation		C		
Vertical Biotic Structure		D		
Attribute Score		Raw 13	Final 36.2	Final Attribute Score = (Raw Score/36)100
Overall AA Score		48		**Average of Final Attribute Scores**

/estimated

↑ calculated from aerial imagery

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1		1	
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	∅	Downstream Total Length	∅

Worksheet 2: Calculating average buffer width of AA.

Line	Buffer Width (m)
A	250
B	250
C	250
D	250
E	
F	
G	
H	
Average Buffer Width	250

one-sided AA

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☐ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. no flood plain ☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. no pools ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☒ There is little or no active undercutting or burial of riparian vegetation. ☒ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☒ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☒ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
Steps	**Replicate Cross-sections** →	1	2	3
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	37	9	22
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	3	3	3
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	6	6	6
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	56	14	33
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1,5	1,5	1,5
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.			1,5

Can't see river along most of the AA due to a dense wall of vegetation width off of Google Earth, depth from R-17 R-2.

Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	✓
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Total Possible	11
No. Observed Patch Types	1

Worksheet 6a: Plant Community Metric –

Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Floating or Canopy-forming	Invasive?	Short	Invasive?
Medium	**Invasive?**	**Tall**	**Invasive?**
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined	
		Percent Invasion	

Worksheet 6b: Plant Community Metric –

Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
Atr len <1%		Atr len 1%	
Tall	**Invasive?**	**Very Tall**	**Invasive?**
Tam Ram 40%	✓	Tam ram 40%	✓
phrag com		Phrag com	
		Total number of co-dominants for all layers combined	2
		Percent Invasion	1/2 = 50%

Not >5% so not included

Worksheet 7: Wetland disturbances and conversions.

<table>
<tr><td>Has a major disturbance occurred at this wetland?</td><td>Yes</td><td colspan="2">No</td><td></td><td colspan="2"></td></tr>
<tr><td>If yes, was it a flood, fire, landslide, or other?</td><td>flood</td><td colspan="2">fire</td><td>landslide</td><td colspan="2">other</td></tr>
<tr><td>If yes, then how severe is the disturbance?</td><td colspan="2">likely to affect site next 5 or more years</td><td colspan="2">likely to affect site next 3-5 years</td><td colspan="3">likely to affect site next 1-2 years</td></tr>
<tr><td rowspan="4">Has this wetland been converted from another type? If yes, then what was the previous type?</td><td colspan="2">depressional</td><td colspan="2">vernal pool</td><td colspan="3">vernal pool system</td></tr>
<tr><td colspan="2">non-confined riverine</td><td colspan="2">confined riverine</td><td colspan="3">seasonal estuarine</td></tr>
<tr><td colspan="2">perennial saline estuarine</td><td colspan="2">perennial non-saline estuarine</td><td colspan="3">wet meadow</td></tr>
<tr><td colspan="2">lacustrine</td><td colspan="2">seep or spring</td><td colspan="3">playa</td></tr>
</table>

Worksheet 8: Stressor Checklist.

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	✓	✓
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	✓	✓
Excessive runoff from watershed	✓	✓
Nutrient impaired (PS or Non-PS pollution)	✓	✓
Heavy metal impaired (PS or Non-PS pollution)	✓	✓
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	✓
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	✓
Trash or refuse		
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation	✓	
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer		
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)	✓	
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

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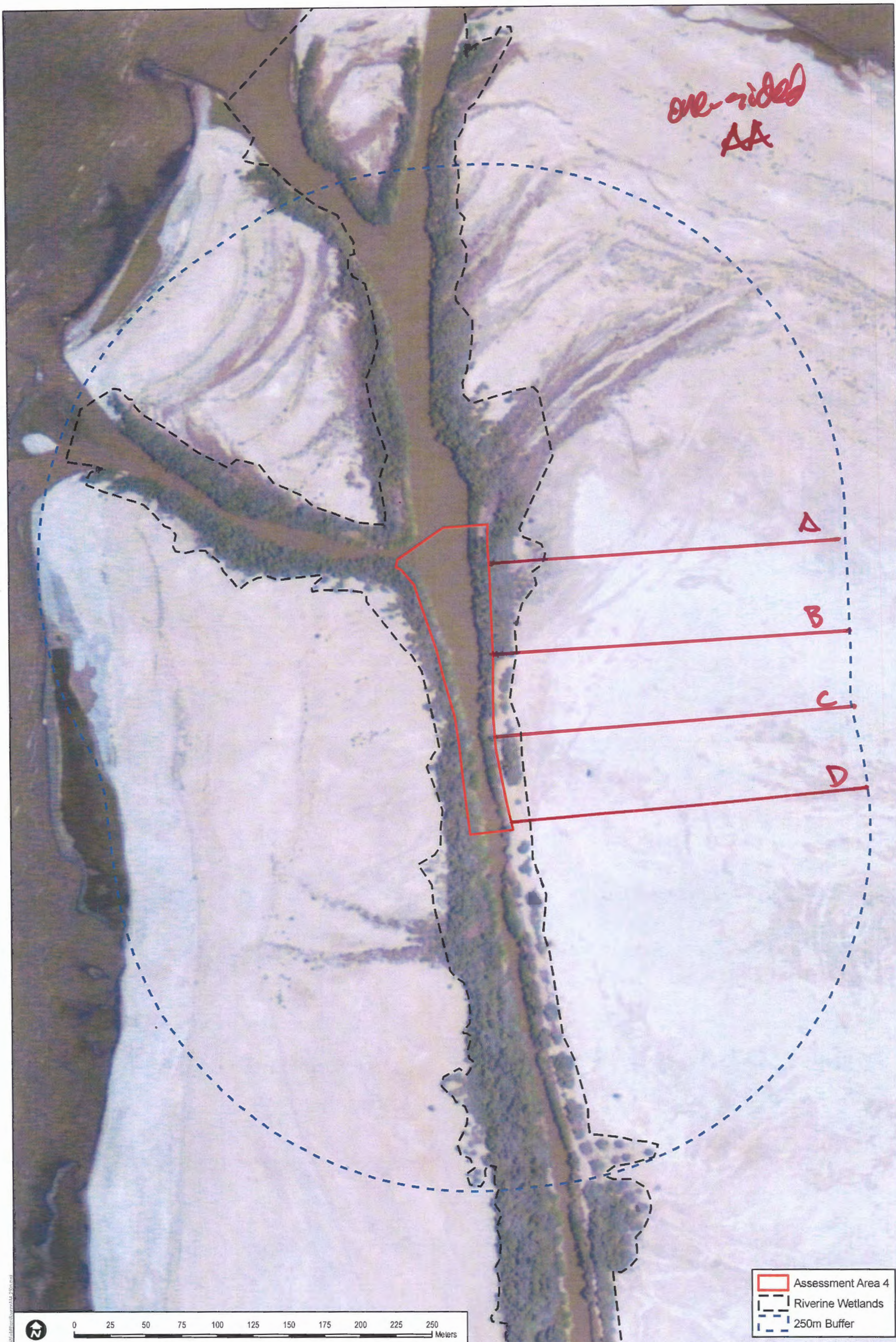
NOVEMBER 2011

Riverine Assessment Area 4 - 500m Field Map

SALTON SEA SCH



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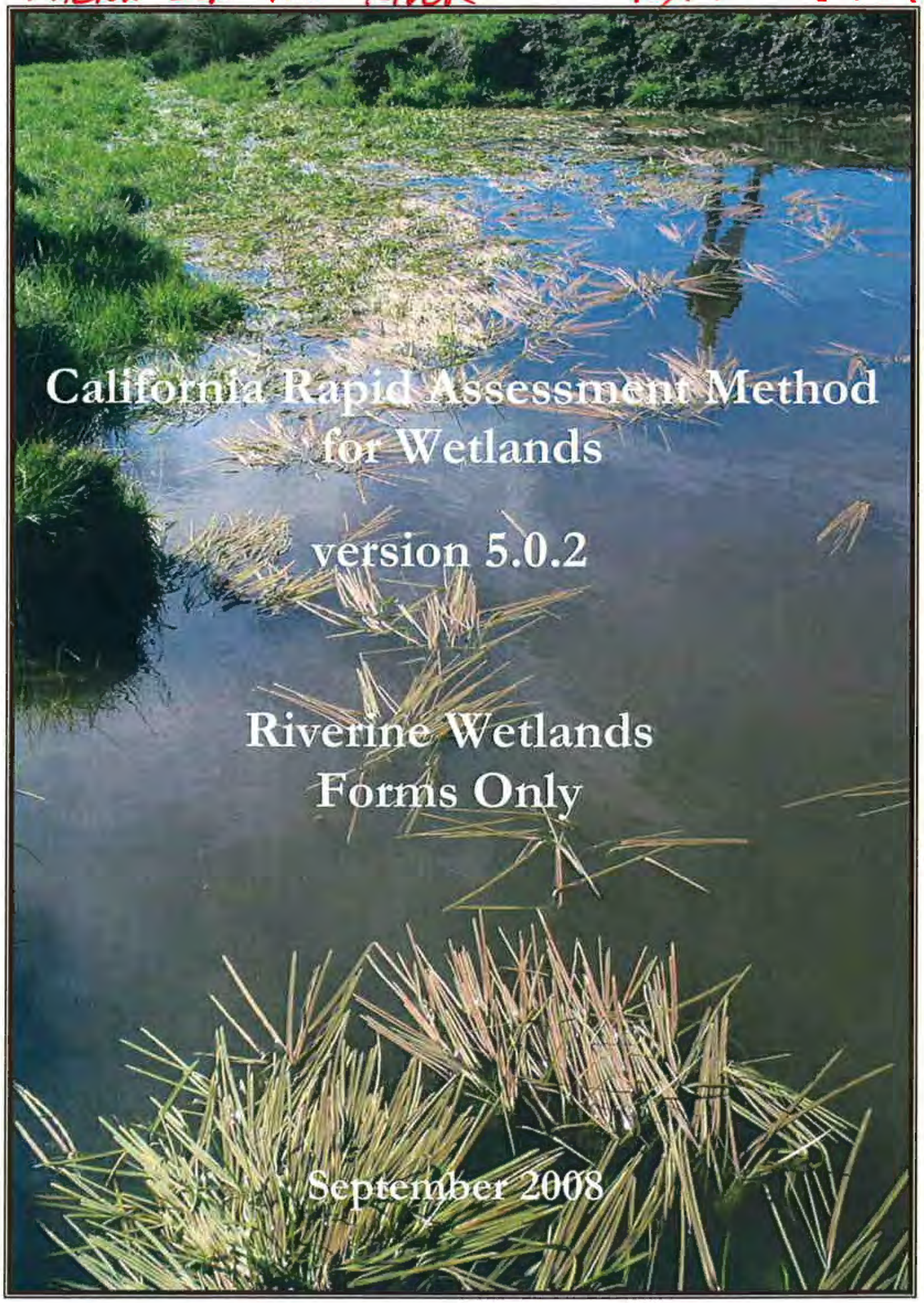
NOVEMBER 2011

Riverine Assessment Area 4 - 250m Field Map

SALTON SEA SCH

R-2

SALTON SEA - NEW RIVER R-17 8-18-11



California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands Forms Only

September 2008

Basic Information Sheet: Riverine Wetlands

Your Name:	ACT
CRAM Site ID:	SALTON SEA - NEW RIVER
Assessment Area Name:	~~R-17~~ R-2
Date (m/d/y):	8-18-11
Assessment Team Members for This AA	CEO, DAG, SF
Average Bankfull Width:	20 m
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m):	200 m

Wetland Sub-type:

☒ Confined ☐ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☒ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	R2_Center	~~North~~	Facing in towards AA		
2	R2_center	~~South~~	Facing out towards buffer		
3	R2-upstream	~~East~~	Facing AA		
4	R2-downstream	~~West~~	Facing AA		
5					
6					

Scoring Sheet: Riverine Wetlands

AA Name: ~~R-17~~ R-2				(m/d/y) 08 18 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	C			close to D when cleared field is considered/included.
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 20.5	Final .85	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		~~A~~ B		Due to artificial berms & some indicat of aggrad/degra
Hydrologic Connectivity		C		entrenchment ratio 1.5
Attribute Score		Raw ~~24~~ 21	Final ~~.67~~ .58	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		~~B~~ C		close to C, but has some microtopo
Attribute Score		Raw 9	Final .38	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	B			
Plant Community submetric B: Number of Co-dominant species	~~[illegible]~~ D			
Plant Community submetric C: Percent Invasion	~~[illegible]~~ D			
Plant Community Metric (*average of submetrics A-C*)		5		
Horizontal Interspersion and Zonation		C		C- borderline based on low spp. richness
Vertical Biotic Structure		C		3 layers w/ little overlap
Attribute Score		Raw 17	Final .47	Final Attribute Score = (Raw Score/36)100
Overall AA Score		~~.59~~ .57		**Average of Final Attribute Scores**

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		**Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA**	
Segment No.	Length (m)	Segment No.	Length (m)
1		1	
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	0

Worksheet 2: Calculating average buffer width of AA.

Line	Buffer Width (m)
A	250
B	250
C	250
D	250
E	
F	
G	
H	
Average Buffer Width	250

one-sided

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☑ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☑ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☑ There is little or no active undercutting or burial of riparian vegetation. ☑ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☑ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☑ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☑ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
Steps	**Replicate Cross-sections** ⟶	**1**	**2**	**3**
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	20	22	18
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	3	3	3
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	6	6	6
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	30	30	30
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.5	1.56	1.67
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.			1.51

bankful width 20m
floodprone width 30m
bankful depth 3 m
floodprone depth 4 m

Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	N
Riffles or rapids (wet channel) or planar bed (dry channel)	N
Point bars and in-channel bars	N
Debris jams	N
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	N
Plant hummocks and/or sediment mounds	N
Bank slumps or undercut banks in channels or along shoreline	N/Y
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	N
Standing snags (at least 3 m tall)	N
Filamentous macroalgae or algal mats	N
Cobble and/or Boulders	N
Total Possible	11
No. Observed Patch Types	0/1

Worksheet 6a: Plant Community Metric –

Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Floating or Canopy-forming	Invasive?	Short	Invasive?
Medium	**Invasive?**	**Tall**	**Invasive?**
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined	
		Percent Invasion	

Worksheet 6b: Plant Community Metric –

Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
		Phragmites australis	~~N~~ Y
Tall	**Invasive?**	**Very Tall**	**Invasive?**
Phragmites australis	N	Phragmites australis	~~N~~ Y
~~Atriplex lentiformis~~	~~N~~	Tamarisk ~~ramosissima~~	Y
Tamarisk ramosissima	Y		
		Total number of co-dominants for all layers combined	~~3~~ 2
		Percent Invasion	1/~~3~~2

~~[illegible]~~ 100%

Allenrolfea occidentalis

Worksheet 7: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Note - channelized by longitudinal berms.

Worksheet 8: Stressor Checklist.

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel	?	
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	✓	✓
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**	✓	
Plowing/Discing **(N/A for restoration areas)**	✓	
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management	✓	
Excessive sediment or organic debris from watershed	✓	✓
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	✓	✓
Heavy metal impaired (PS or Non-PS pollution)	✓	✓
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	✓
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	✓
Trash or refuse	✓	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources	✓	
Lack of treatment of invasive plants adjacent to AA or buffer	✓	✓
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture	NA	NA
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓?	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

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SALTON SEA SCH

Riverine Assessment Area R2 - 500m Field Map

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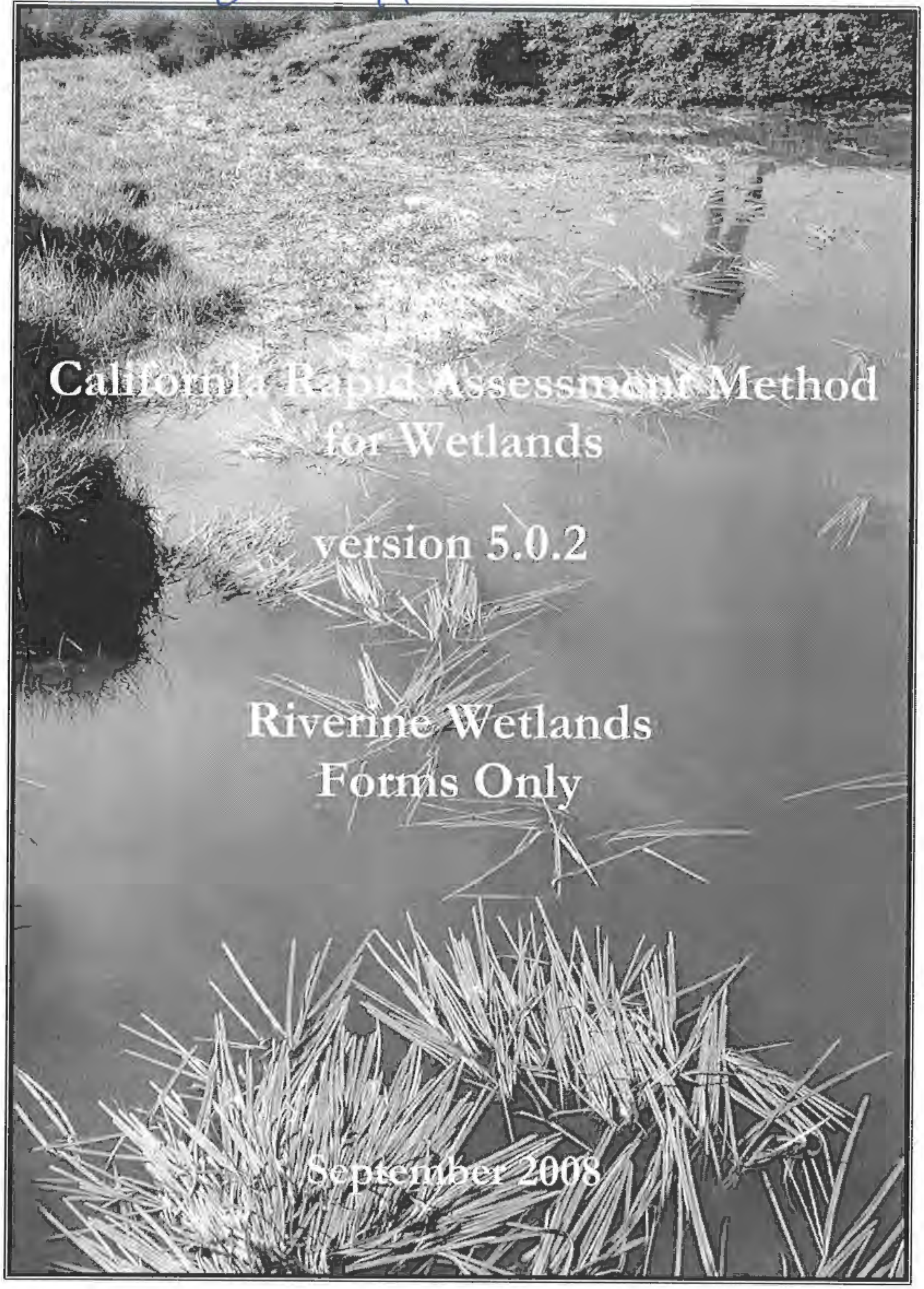
SALTON SEA SCH

Riverine Assessment Area R2 - 250m Field Map

R-20 R-3
Salton Sea 11-15-11



California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands Forms Only

September 2008

Basic Information Sheet: Riverine Wetlands

Your Name:	Doug Gettinger
CRAM Site ID:	
Assessment Area Name:	R-20 R-3
Date (m/d/y):	

Assessment Team Members for This AA

DG, TS

Average Bankfull Width: 14 m

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 200 m

Wetland Sub-type:

☒ Confined ☐ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☒ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	R3. center	North	Facing in towards AA		
2	R3. center	~~South~~	Facing out towards Lutter		
3	R3. downstrm	~~East~~	Facing AA		
4	R3. upstrm	West	Facing AA		
5					
6					

Comments:

one-sided AA, river not wadeable
cannot access shore through dense
veg & steep drop-off.

Scoring Sheet: Riverine Wetlands

AA Name: ~~[illegible]~~ R-3				(m/d/y) 11 / 15 / 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	C			
Buffer submetric C: Buffer Condition	C			
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 19.1	Final 79.8	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		B		
Hydrologic Connectivity		~~B~~ C		~~CHECK [illegible]~~ entrenchment = 1.5
Attribute Score		Raw 21	Final 58.4	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		D		
Attribute Score		Raw 6	Final 25	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	C			
Plant Community submetric B: Number of Co-dominant species	D			
Plant Community submetric C: Percent Invasion	~~A~~ D			Phragmites
Plant Community Metric (*average of submetrics A-C*)		~~X~~ 4		
Horizontal Interspersion and Zonation		C		
Vertical Biotic Structure		B		
Attribute Score		Raw ~~16~~ 13	Final ~~44.5~~ 36.2	Final Attribute Score = (Raw Score/36)100
Overall AA Score		~~58~~ 50		**Average of Final Attribute Scores**

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1		1	
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	Ø	Downstream Total Length	Ø

one-sided AA

Worksheet 2: Calculating average buffer width of AA.

Line	Buffer Width (m)
A	100
B	70
C	65
D	58
E	
F	
G	
H	
Average Buffer Width	73

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☐ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☐ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☐ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☐ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
Steps	**Replicate Cross-sections** →	**1**	**2**	**3**
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	15	12	16
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	3	3	3
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	6	6	6
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	23	18	24
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.5	1.5	1.5
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.			1.5

Cannot reach shore along this AA
solid wall of common reed & salt cedar
Bankful width measured off Google Earth
Depth estimated from R-17, same for
entrenchment ratio

Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	✓
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Total Possible	**11**
No. Observed Patch Types	1

Worksheet 6a: Plant Community Metric –

Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Floating or Canopy-forming	Invasive?	Short	Invasive?
Medium	**Invasive?**	**Tall**	**Invasive?**
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined	
		Percent Invasion	

Worksheet 6b: Plant Community Metric –

Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
		~~Atri Lent 2%~~	
Tall	**Invasive?**	**Very Tall**	**Invasive?**
~~Jam 5%~~	✓	~~JHM 5%~~	80 ✓
Phrag com 75%	✓	Phrag com 75%	✓
~~Atri Lent 2%~~			
		Total number of co-dominants for all layers combined	1
		Percent Invasion	~~0~~ 100%

< 5% cover

phragmites changed to invasive 2-21-12

Worksheet 7: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Worksheet 8: Stressor Checklist.

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	✓	✓
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	✓	✓
Excessive runoff from watershed	✓	✓
Nutrient impaired (PS or Non-PS pollution)	✓	✓
Heavy metal impaired (PS or Non-PS pollution)	✓	✓
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	✓
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	✓
Trash or refuse		
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	✓	✓
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		✓
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)	✓	
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

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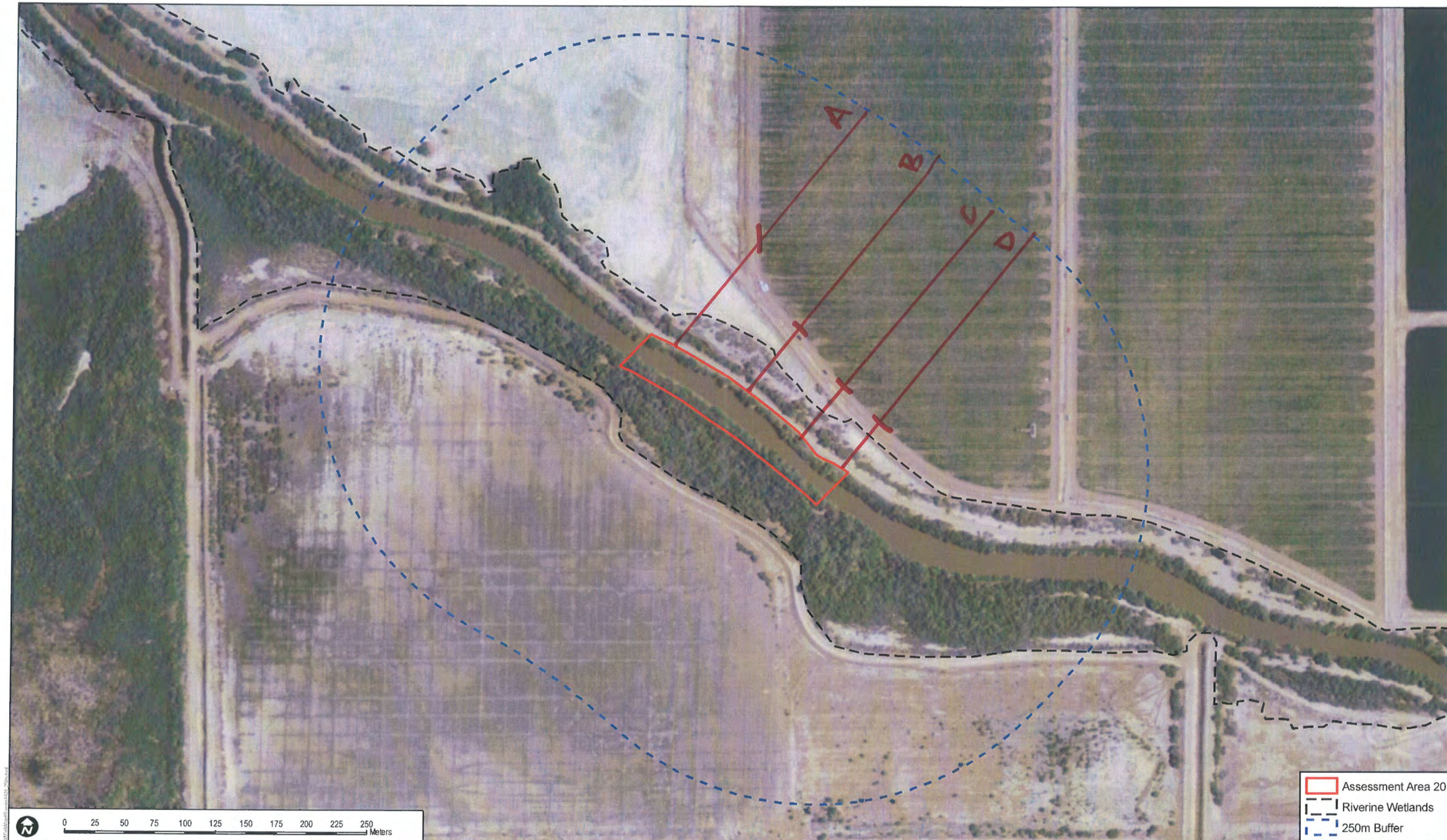
Riverine Assessment Area 20 - 500m Field Map



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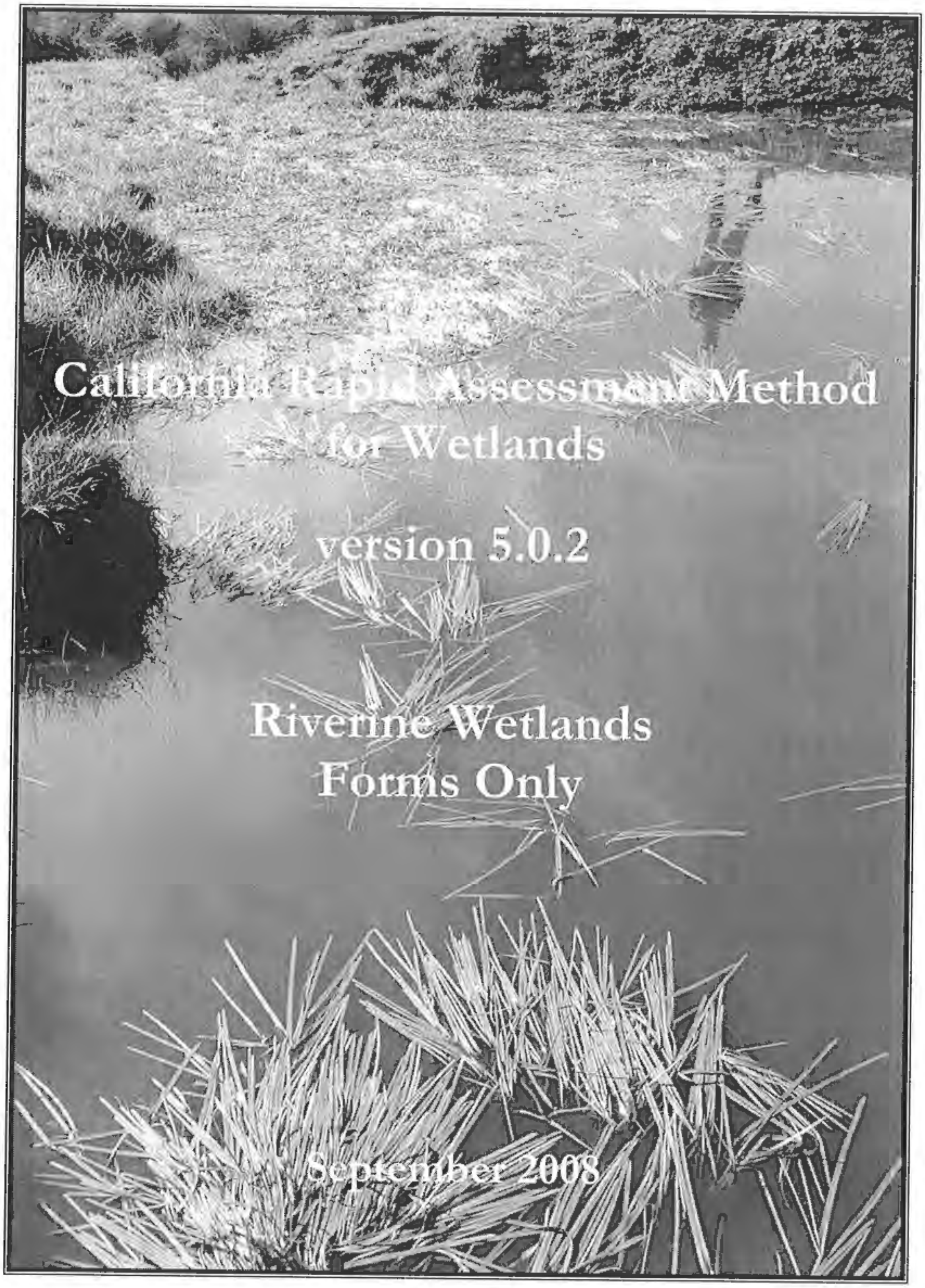
Riverine Assessment Area 20 - 250m Field Map

R-25 R-4



California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands Forms Only

September 2008

Basic Information Sheet: Riverine Wetlands

Your Name:	Doug Gettinger
CRAM Site ID:	
Assessment Area Name:	~~R-25~~ R-4
Date (m/d/y):	

Assessment Team Members for This AA

DG, TS

Average Bankfull Width: 12 m

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 200 m

Wetland Sub-type:

☒ Confined ☐ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☒ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	R4_center	North	Facing in towards AA		
2	R4-center	South	Facing out	towards buffer	
3	R4-downstrm	East	Facing AA		
4	R4-upstrm	~~West~~	Facing AA		
5					
6					

Comments:

one-sided AA, river not wadeable
cannot access shore through dense wall
of vegetation & steep drop-off

Scoring Sheet: Riverine Wetlands

AA Name: ~~[illegible]~~ RH		Scores		(m/d/y) 11 16 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	B			Buffer is completely bare
Buffer submetric C: Buffer Condition	D			
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 17.6	Final 73.3	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		B		
Hydrologic Connectivity		~~[illegible]~~ C		Entrenchment = 1.5
Attribute Score		Raw 21	Final 58.4	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		D		
Attribute Score		Raw 6	Final 25	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	~~X~~ B			3 layers of salt cedar M, T, VT
Plant Community submetric B: Number of Co-dominant species	D			Only salt cedar
Plant Community submetric C: Percent Invasion	D			100% salt cedar
Plant Community Metric (*average of submetrics A-C*)		5		
Horizontal Interspersion and Zonation		D		
Vertical Biotic Structure		A		
Attribute Score		Raw 20.0	Final 55.6	Final Attribute Score = (Raw Score/36)100
Overall AA Score		54		**Average of Final Attribute Scores**

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1		1	
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	Ø	Downstream Total Length	Ø

one-sided AA

Worksheet 2: Calculating average buffer width of AA.

Line	Buffer Width (m)
A	85
B	110
C	160
D	185
E	
F	
G	
H	
Average Buffer Width	135

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☐ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☐ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☑ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☑ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☑ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
Steps	**Replicate Cross-sections** ⟶	1	2	3
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	12	13	12
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	3	3	3
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	6	6	6
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	18	20	18
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.5	1.5	1.5
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.			1.5

Cannot access shore through dense wall of vegetation & steep drop-off
Bank-full width from Google Earth
Depth from R-17 measurements

Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	**Check for presence**
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	✓
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Total Possible	**11**
No. Observed Patch Types	1

Worksheet 6a: Plant Community Metric –

Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Floating or Canopy-forming	Invasive?	Short	Invasive?
Medium	**Invasive?**	**Tall**	**Invasive?**
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined	
		Percent Invasion	

Worksheet 6b: Plant Community Metric –

Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
		TAM 100%	✓
Tall	**Invasive?**	**Very Tall**	**Invasive?**
TAM 100%	✓	TAM 100%	✓
		Total number of co-dominants for all layers combined	1
		Percent Invasion	100

Worksheet 7: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other

If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system
	non-confined riverine	confined riverine	seasonal estuarine
	perennial saline estuarine	perennial non-saline estuarine	wet meadow
	lacustrine	seep or spring	playa

Worksheet 8: Stressor Checklist.

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		✓
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		✓
Excessive runoff from watershed		✓
Nutrient impaired (PS or Non-PS pollution)		✓
Heavy metal impaired (PS or Non-PS pollution)		✓
Pesticides or trace organics impaired (PS or Non-PS pollution)		✓
Bacteria and pathogens impaired (PS or Non-PS pollution)		✓
Trash or refuse		
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation	✓	
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer		✓
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		✓
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		✓
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

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SALTON SEA SCH

Riverine Assessment Area 25 - 500m Field Map

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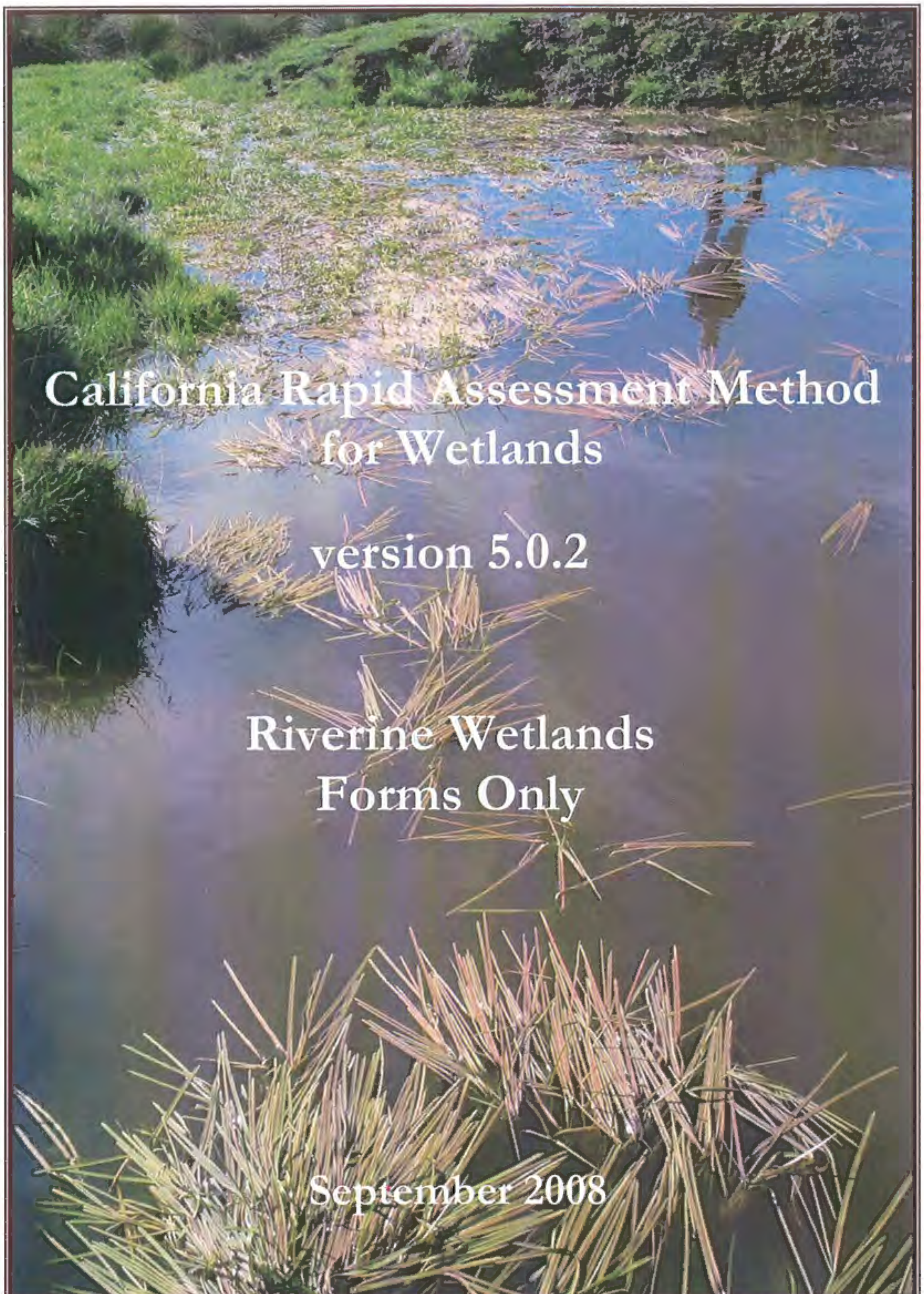
Riverine Assessment Area 25 - 250m Field Map

SALTON SEA SCH

AA-30
R-5

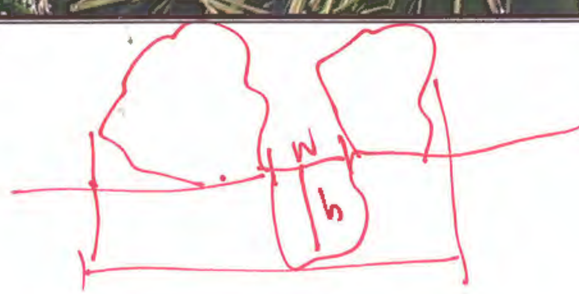


California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands
Forms Only

September 2008



Basic Information Sheet: Riverine Wetlands

Your Name:	SFF
CRAM Site ID:	SALTON SEA
Assessment Area Name:	30 R-5
Date (m/d/y):	11/16/11
Assessment Team Members for This AA	SFF, KCD

Average Bankfull Width: 4.83 m

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m):
200M

Wetland Sub-type:

☐ Confined ☑ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☑ Other

Did the river/stream have flowing water at the time of the assessment? ☑ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☑ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum	
1	R5_center	~~North~~ NW				
2	R5-center	~~South~~ SW	Photos taken	from center	of AA in	4 directions
3	R5-center	~~East~~ E				
4	R5-center	West W				
5	R5 - upstream					
6	R5 - downstream		Photos taken	from upstream &	downstream	corners of AA.

Comments:

Scoring Sheet: Riverine Wetlands

AA Name: ~~A030~~ R5				(m/d/y) 11 16 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	B			
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw 22.4	Final 93.4	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		DIVERSION TO, AGRICULTURAL RUNOFF & PUMPED WATER
Hydroperiod or Channel Stability		A		
Hydrologic Connectivity		A		MUDFLAT - FLOODPRONE CALCED AT >50 m
Attribute Score		Raw 30	Final 83.4	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		1 - AND IS QUESTIONABLE
Topographic Complexity		C		
Attribute Score		Raw 9	Final 37.5	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	C			1 - TALL
Plant Community submetric B: Number of Co-dominant species	D			1 - TAM.
Plant Community submetric C: Percent Invasion	D			TAMARISK - 100%
Plant Community Metric (*average of submetrics A-C*)		4		
Horizontal Interspersion and Zonation		~~A~~ D		
Vertical Biotic Structure		~~B~~ C		TAMARISK UNIFORM HT - SOME SHORT DIS SP. ALLENROLFEA
Attribute Score		Raw 13	Final 36.2	Final Attribute Score = (Raw Score/36)100
Overall AA Score		62		**Average of Final Attribute Scores**

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		**Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA**	
Segment No.	Length (m)	Segment No.	Length (m)
1 Ø		1 Ø	
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	0

Worksheet 2: Calculating average buffer width of AA.

Line	**Buffer Width (m)**
A	
B	250
C	
D	
E	
F	
G	
H ?	*
Average Buffer Width	250 *

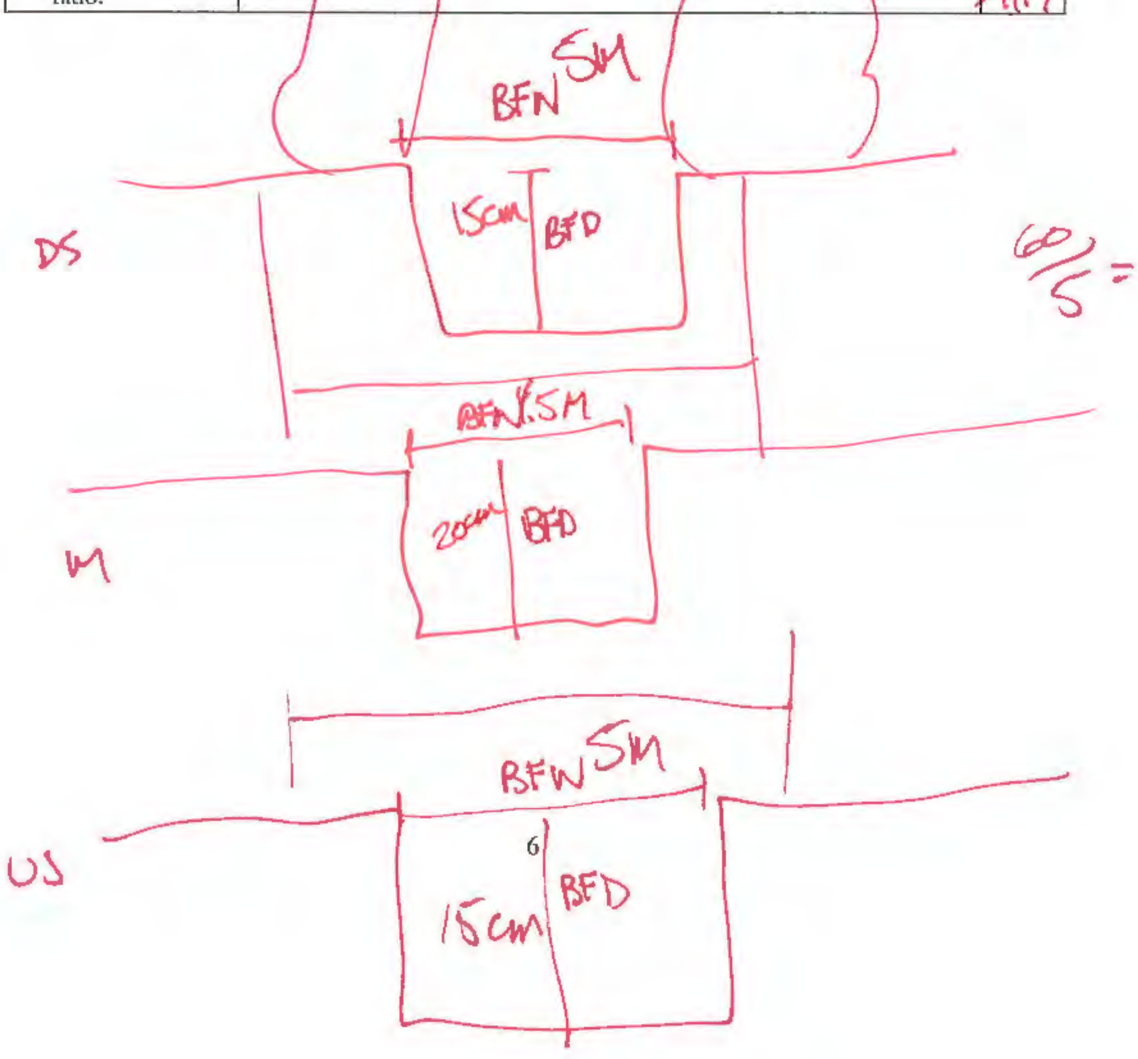
* BEACH - POSSIBLE OPEN WATER AT HIGH WATER CONDITIONS

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium (4)	☑ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☑ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. – OPAQUE WATER – UNABLE TO ASSESS BELOW BFC. ☑ There is little or no active undercutting or burial of riparian vegetation. ☑ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation (0)	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. UTE ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation (1)	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☑ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
Steps	**Replicate Cross-sections** ⟶	**1**	**2**	**3**
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	5M	4.5	5M
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	15cm	20cm	15cm
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	15cm	20cm	15cm
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	50+ ∞	50+ ∞	50+ ∞
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	50/5	50/4.5	50/5
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.	>12	>11.1	> 12 >11.7



Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel) (✓)	✓
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	1

WATER DEEP, SO NO APPARENT

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Total Possible	**11**
No. Observed Patch Types	

Worksheet 6a: Plant Community Metric –

Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

<18" ≥4

Veg not counted as layer if <5%

Floating or Canopy-forming	Invasive?	? Short <0.5	Invasive?
		JAUMEA SP <1%	
		DIS SP	
		SCHMSSP <1%	
18"-48"		3%	
Medium 0.5-1.5	Invasive?	1.5 Tall 5.0M	Invasive?
ALLOCC 1%		TAM SP 50%	✓
TAM SP <1%		~~ATRLEN 1%~~	
2%		~~PLUSER 1%~~	
		50%	
Very Tall >3.0	Invasive?		
(TAM SP. 3%)		Total number of co-dominant species for all layers combined	1
3%		Percent Invasion	100%

Not co-dom.

Worksheet 6b: Plant Community Metric –

Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
Tall	Invasive?	Very Tall	Invasive?
		Total number of co-dominants for all layers combined	
		Percent Invasion	

Worksheet 7: Wetland disturbances and conversions.

<table>
<tr><td>Has a major disturbance occurred at this wetland?</td><td>Yes</td><td colspan="2">No</td><td></td><td></td></tr>
<tr><td>If yes, was it a flood, fire, landslide, or other?</td><td>flood</td><td colspan="2">fire</td><td>landslide</td><td>other</td></tr>
<tr><td>If yes, then how severe is the disturbance?</td><td>likely to affect site next 5 or more years</td><td colspan="2">likely to affect site next 3-5 years</td><td colspan="2">likely to affect site next 1-2 years</td></tr>
<tr><td rowspan="4">Has this wetland been converted from another type? If yes, then what was the previous type?</td><td>depressional</td><td colspan="2">vernal pool</td><td colspan="2">vernal pool system</td></tr>
<tr><td>non-confined riverine</td><td colspan="2">confined riverine</td><td colspan="2">seasonal estuarine</td></tr>
<tr><td>perennial saline estuarine</td><td colspan="2">perennial non-saline estuarine</td><td colspan="2">wet meadow</td></tr>
<tr><td>lacustrine</td><td colspan="2">seep or spring</td><td colspan="2">playa</td></tr>
</table>

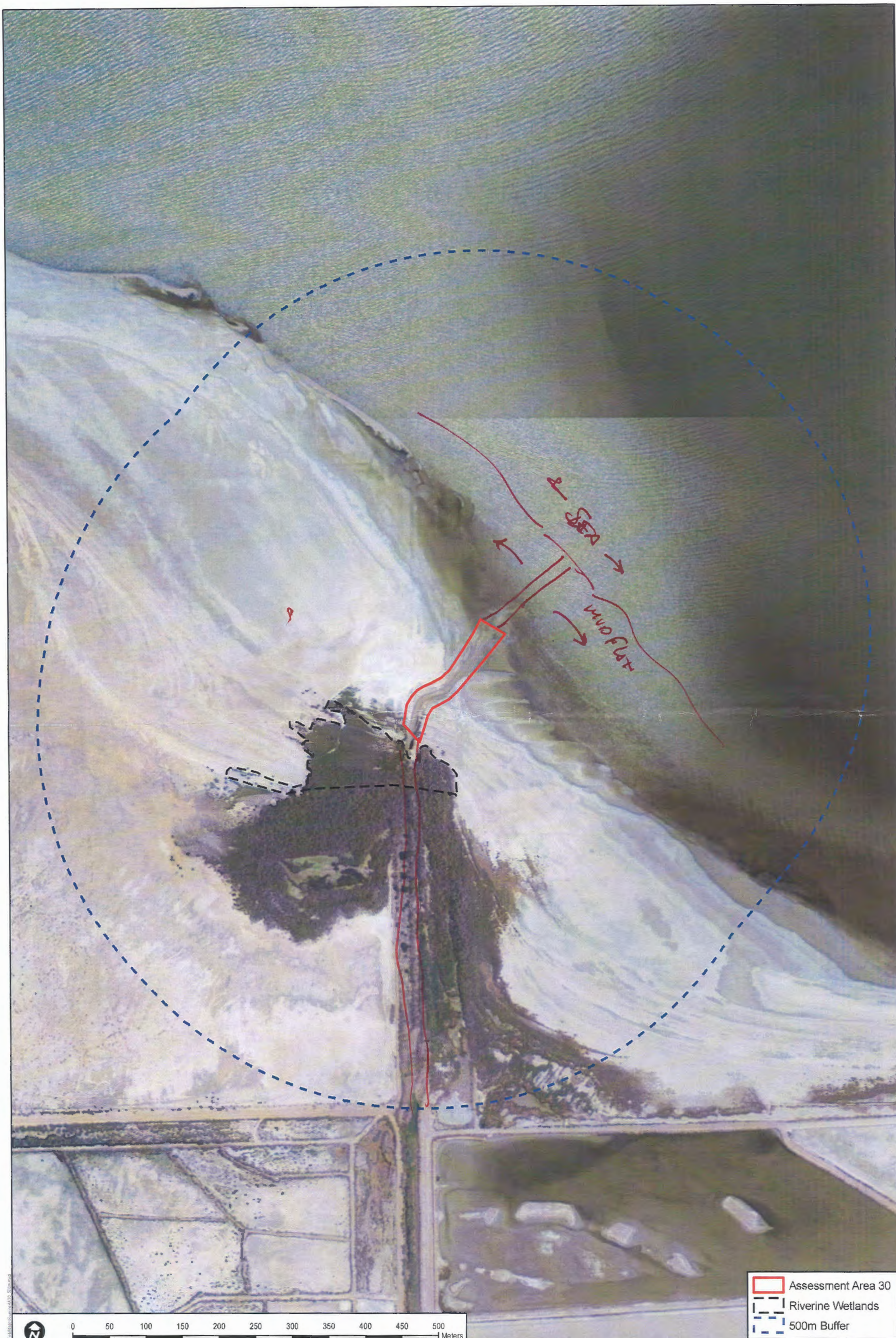
Worksheet 8: Stressor Checklist.

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	✓	✓
Flow diversions or unnatural inflows	✓	✓
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed	✓	✓
Nutrient impaired (PS or Non-PS pollution)	✓	✓
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	✓
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	✓
Trash or refuse		
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species	✓	✓
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources	✓	✓
Lack of treatment of invasive plants adjacent to AA or buffer	✓	✓
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		



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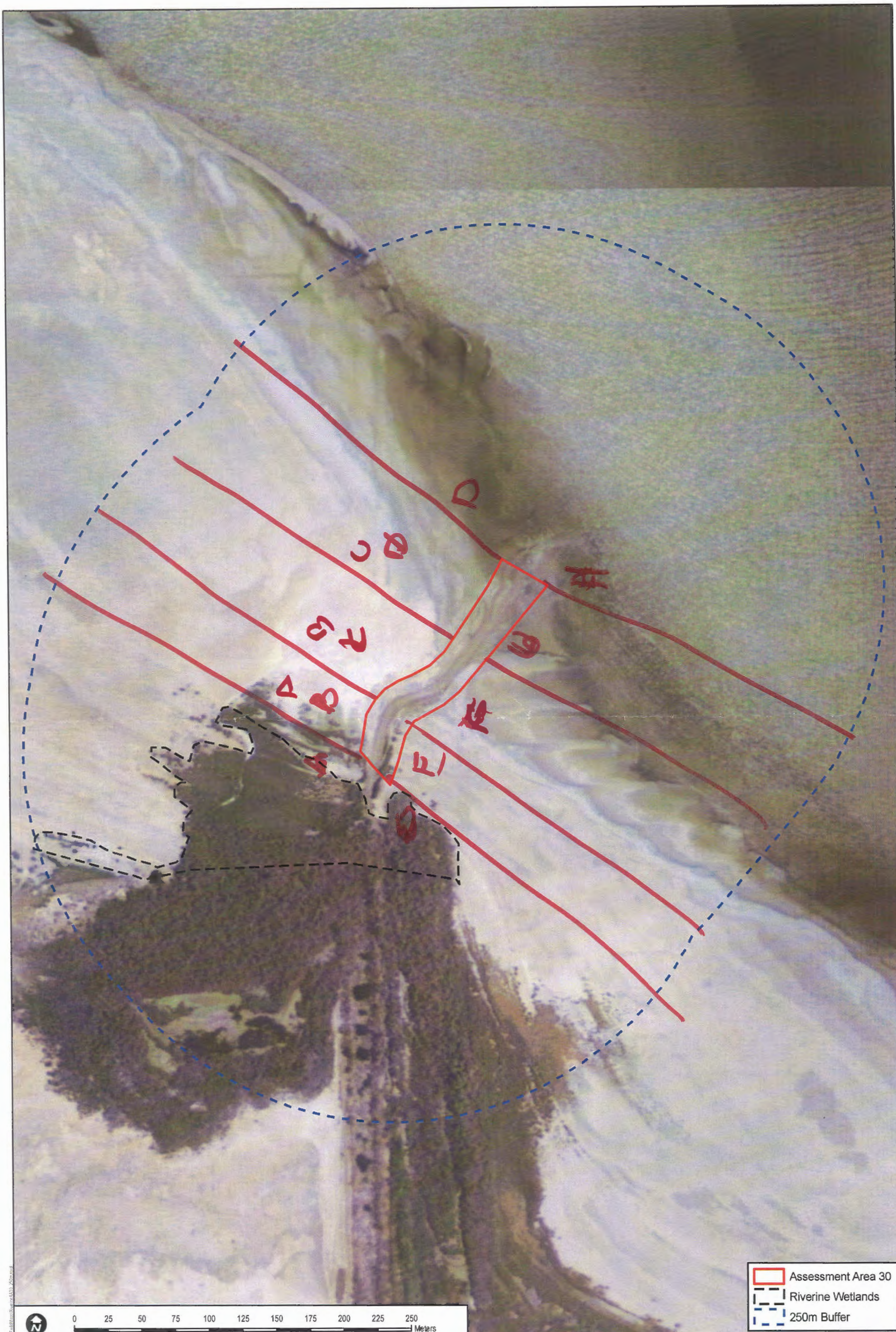
NOVEMBER 2011

Riverine Assessment Area 30 - 500m Field Map

SALTON SEA SCH



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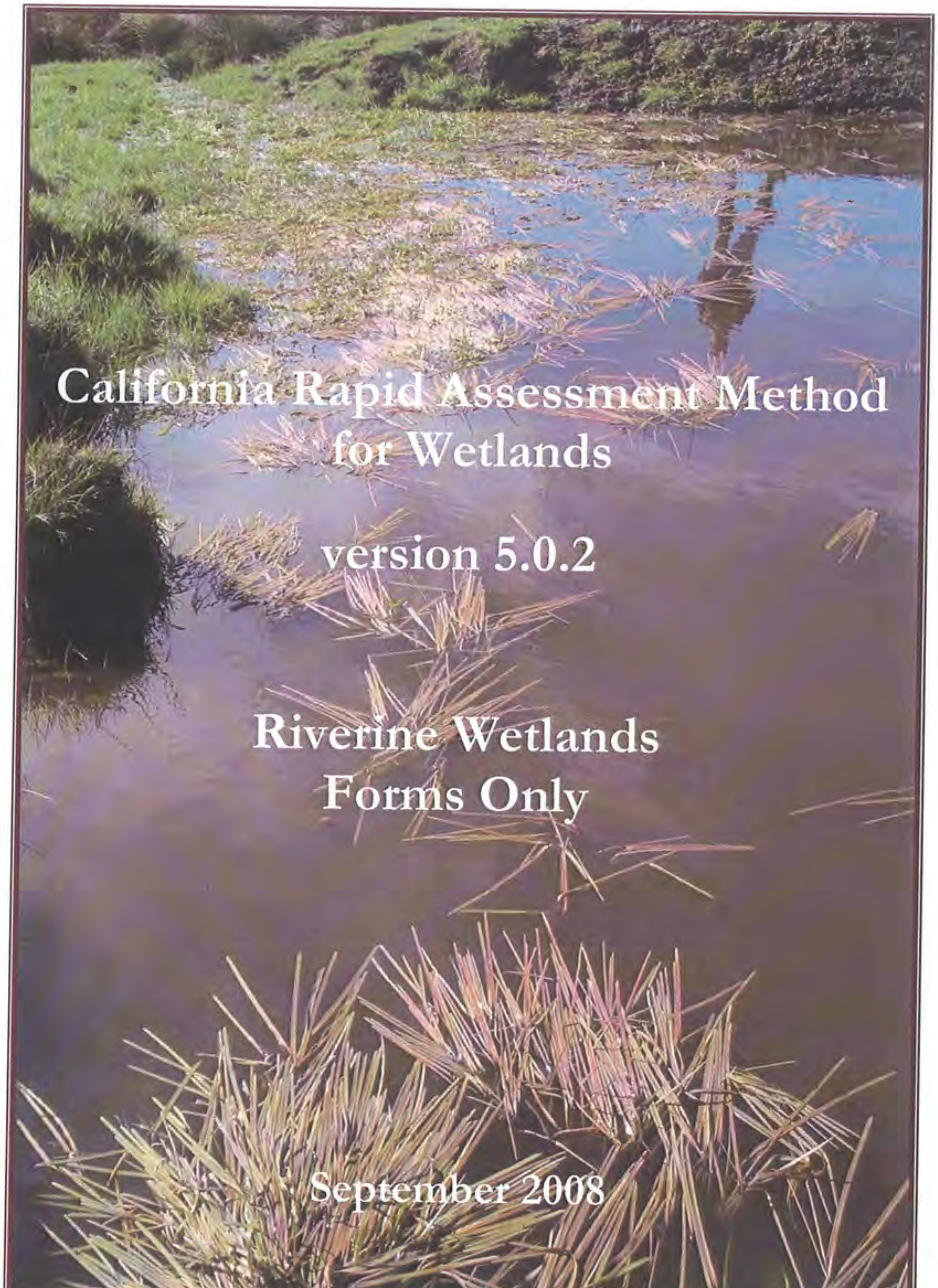
NOVEMBER 2011

Riverine Assessment Area 30 - 250m Field Map

SALTON SEA SCH

~~AA-29~~ R-6



California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands Forms Only

September 2008

Basic Information Sheet: Riverine Wetlands

Your Name:	SFF
CRAM Site ID:	Salton Sea
Assessment Area Name:	R-6
Date (m/d/y):	11/17/11
Assessment Team Members for This AA	SFF KCD
Average Bankfull Width:	1.5m
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m):	200m

Wetland Sub-type:

☐ Confined ☑ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☑ Other

Did the river/stream have flowing water at the time of the assessment? ☑ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☑ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	R6 – downstream	North (NW)			
2	R6 – Upstream	South (SW)			
3	R6 – downstream	East (NE)			
4	R6 – upstream	West (SW)			
5					
6					

Comments:

Scoring Sheet: Riverine Wetlands

AA Name: ADO20 R-6			(m/d/y) 11 17 11
Attributes and Metrics	**Scores**		**Comments**
Buffer and Landscape Context			
Landscape Connectivity (D)	A		
Buffer submetric A: Percent of AA with Buffer A			
Buffer submetric B: Average Buffer Width A			
Buffer submetric C: Buffer Condition B			
D + [C x (A x B)$^{1/2}$] $^{1/2}$ = **Attribute Score**	Raw 22.4	Final 93.4	Final Attribute Score = (Raw Score/24)100
Hydrology			
Water Source	C		PUMPED IRRIGATION WATER
Hydroperiod or Channel Stability	A		
Hydrologic Connectivity	A		MUDFLAT - FLOOD PRONE CALC'ED @ >8m
Attribute Score	Raw 30	Final 83.4	Final Attribute Score = (Raw Score/36)100
Physical Structure			
Structural Patch Richness	D		
Topographic Complexity	C		
Attribute Score	Raw 9	Final 37.5	Final Attribute Score = (Raw Score/24)100
Biotic Structure			
Plant Community submetric A: Number of Plant Layers C			2 LAYERS Tall & Very Tall
Plant Community submetric B: Number of Co-dominant species D			1 CO-DOM
Plant Community submetric C: Percent Invasion D			100%
Plant Community Metric (*average of submetrics A-C*)	4		
Horizontal Interspersion and Zonation	D		
Vertical Biotic Structure	D		
Attribute Score	Raw 10	Final 27.8	Final Attribute Score = (Raw Score/36)100
Overall AA Score	60		**Average of Final Attribute Scores**

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		**Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA**	
Segment No.	Length (m)	Segment No.	Length (m)
1		1	
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	Ø	Downstream Total Length	Ø

Worksheet 2: Calculating average buffer width of AA.

Line	Buffer Width (m)
A	
B	
C	
D	
E	
F	
G	
H	
Average Buffer Width	250

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium 4	☑ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☑ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☑ There is little or no active undercutting or burial of riparian vegetation. ☑ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation 0	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation 1	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☑ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
Steps	**Replicate Cross-sections** ⟶	**1**	**2**	**3**
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	1.5	2.0	1.0
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	40cm	30cm	40cm
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	40cm	30cm	40cm
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	>10 100±	>10	>10
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	~~0.45~~ >6.66	~~[illegible]~~ >5	~~[illegible]~~ >10
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.			~~[illegible]~~

>7.2

← FLOODFLAT UTE

Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	0

PLANAR BED BUT W/ WATER

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Total Possible	**11**
No. Observed Patch Types	

WALT SLOVAK

Worksheet 6a: Plant Community Metric –

Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

<0.5m <1.5'

Floating or Canopy-forming	Invasive?	Short	Invasive?
		DIS SP1 1%	
		TAM SP. <1%	
		ALL OCC <1%	
		1-2%	
1.5'-4' Medium .5-1.5m	Invasive?	[illegible] Tall .5-3m	Invasive? 4'-9'
TAM SP. 3%		TAM SP. 75% 1	✓
ALL SP. <1%		ATR LEN 3%	
ATR LEN <1% 4%		73%	
SCI SP. <1%			
TYPHA SP. <1% Very Tall >3.0	Invasive?		
1 TAM SP. 10%	✓	Total number of co-dominant species for all layers combined	~~4~~ 1
		Percent Invasion	100%

Veg cover <5%

9'+

[illegible]

Worksheet 6b: Plant Community Metric –

Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
Tall	Invasive?	Very Tall	Invasive?
		Total number of co-dominants for all layers combined	
		Percent Invasion	

Worksheet 7: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Worksheet 8: Stressor Checklist.

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	✓	✓
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed	✓	✓
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution) (✓)		
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	✓
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	✓
Trash or refuse		
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources	✓	✓
Lack of treatment of invasive plants adjacent to AA or buffer	✓	✓
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming	✓	
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)	✓	
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

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Riverine Assessment Area 29 - 500m Field Map

SALTON SEA SCH

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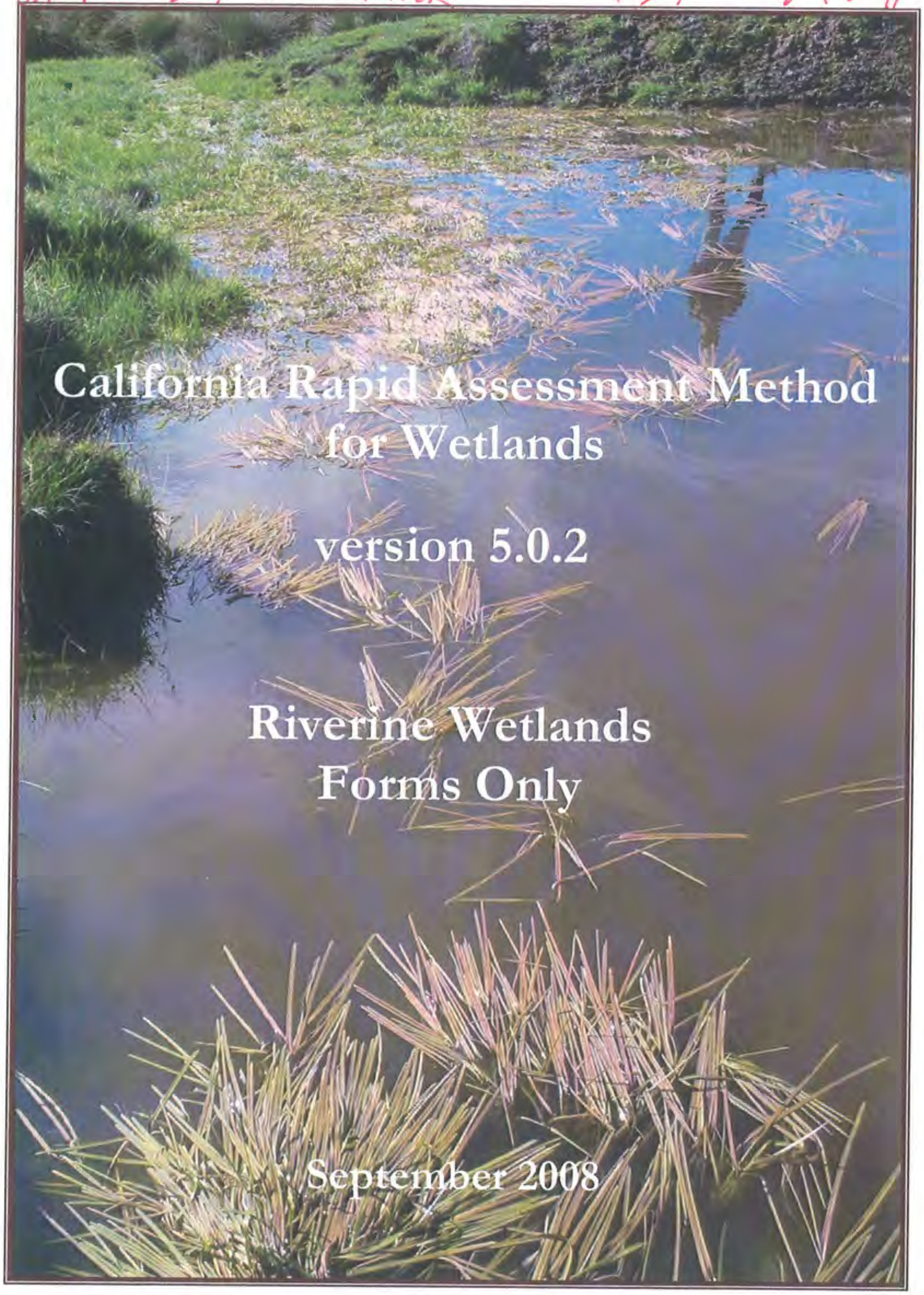
NOVEMBER 2011

Riverine Assessment Area 29 - 250m Field Map

SALTON SEA SCH

SALTON SEA - NEW RIVER R-1 → R-7 8-18-11



California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands Forms Only

September 2008

Basic Information Sheet: Riverine Wetlands

Your Name:	ACT
CRAM Site ID:	Salton Sea - New River
Assessment Area Name:	R-7
Date (m/d/y):	8-18-11

Assessment Team Members for This AA

CEO, SF, DAG

Average Bankfull Width: 2.5 m

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m):

200 m

Wetland Sub-type:

☒ Confined ☐ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☒ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	R7-center	In ~~North~~	Photo from center facing in towards AA		
2	R7-center	out ~~South~~	Photo from center facing out towards buffer		
3	R7 downstream	~~East~~	Photo from downstream facing AA		
4	R7 upstream	~~West~~	Photo from upstream facing AA		
5					
6					

Comments:

Scoring Sheet: Riverine Wetlands

AA Name: R-7				(m/d/y) 08 / 18 / 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		A		
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	B			Assume unveg. mudflat constitute habitat
$D + [C \times (A \times B)^{1/2}]^{1/2}$ = **Attribute Score**		Raw: ~~24~~ 22.4	Final: ~~1.00~~ .93	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		C		
Hydrologic Connectivity		A		Entrenchment = 2.4
Attribute Score		Raw: 24	Final: .67	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		C		artificially created from dredging operation
Attribute Score		Raw: 9	Final: ~~.50~~ .37	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	C			
Plant Community submetric B: Number of Co-dominant species	D			
Plant Community submetric C: Percent Invasion	D			
Plant Community Metric (*average of submetrics A-C*)		4		
Horizontal Interspersion and Zonation		D		
Vertical Biotic Structure		B		
Attribute Score		Raw: 16	Final: .45	Final Attribute Score = (Raw Score/36)100
Overall AA Score		~~.64~~ .60		**Average of Final Attribute Scores**

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1 ~~none~~ 1	40 m	1 none	
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	40 m	Downstream Total Length	0

Worksheet 2: Calculating average buffer width of AA.

Line	Buffer Width (m)
A	250
B	250
C	250
D	250
E	250
F	250
G	250
H	250
Average Buffer Width	250

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☐ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☐ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☒ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☒ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☒ There are partially buried, or sediment-choked, culverts. — recently dredged ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

→ severe aggradation assumed b/c recently dredged

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

Steps	Replicate Cross-sections ⟶	1	2	3
The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	3m	2m	1.5m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	.75m	.75m	.75
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	1.5m	1.5m	1.5m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	6m	6m	4m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	2	3	2.25
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.			2.4

estimated

2.4
3)7.25
6
1.25

Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	N
Riffles or rapids (wet channel) or planar bed (dry channel)	N
Point bars and in-channel bars	Y
Debris jams	N
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	N
Plant hummocks and/or sediment mounds	N
Bank slumps or undercut banks in channels or along shoreline	N
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	N
Standing snags (at least 3 m tall)	N
Filamentous macroalgae or algal mats	N
Cobble and/or Boulders	N
Total Possible	**11**
No. Observed Patch Types	1

Worksheet 6a: Plant Community Metric – Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Floating or Canopy-forming	Invasive?	Short	Invasive?
Medium	**Invasive?**	**Tall**	**Invasive?**
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined	
		Percent Invasion	

Worksheet 6b: Plant Community Metric – Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
		Tam ram	y
Tall	**Invasive?**	**Very Tall**	**Invasive?**
Tam ram	y		
		Total number of co-dominants for all layers combined	1
		Percent Invasion	100%

Worksheet 7: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Worksheet 8: Stressor Checklist.

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows	✓	✓
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates	✓	✓
Dredged inlet/channel	✓	✓
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	✓	✓
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology	✓	✓
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	✓	✓
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	✓	✓
Heavy metal impaired (PS or Non-PS pollution)	✓	✓
Pesticides or trace organics impaired (PS or Non-PS pollution)	✓	✓
Bacteria and pathogens impaired (PS or Non-PS pollution)	✓	✓
Trash or refuse	✓	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris	✓	
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources	✓	✓
Lack of treatment of invasive plants adjacent to AA or buffer	✓	✓
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	✓	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

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6575

AUGUST 2011

Riverine Assessment Area R1 - 500m Field Map

SALTON SEA SCH

DUDEK

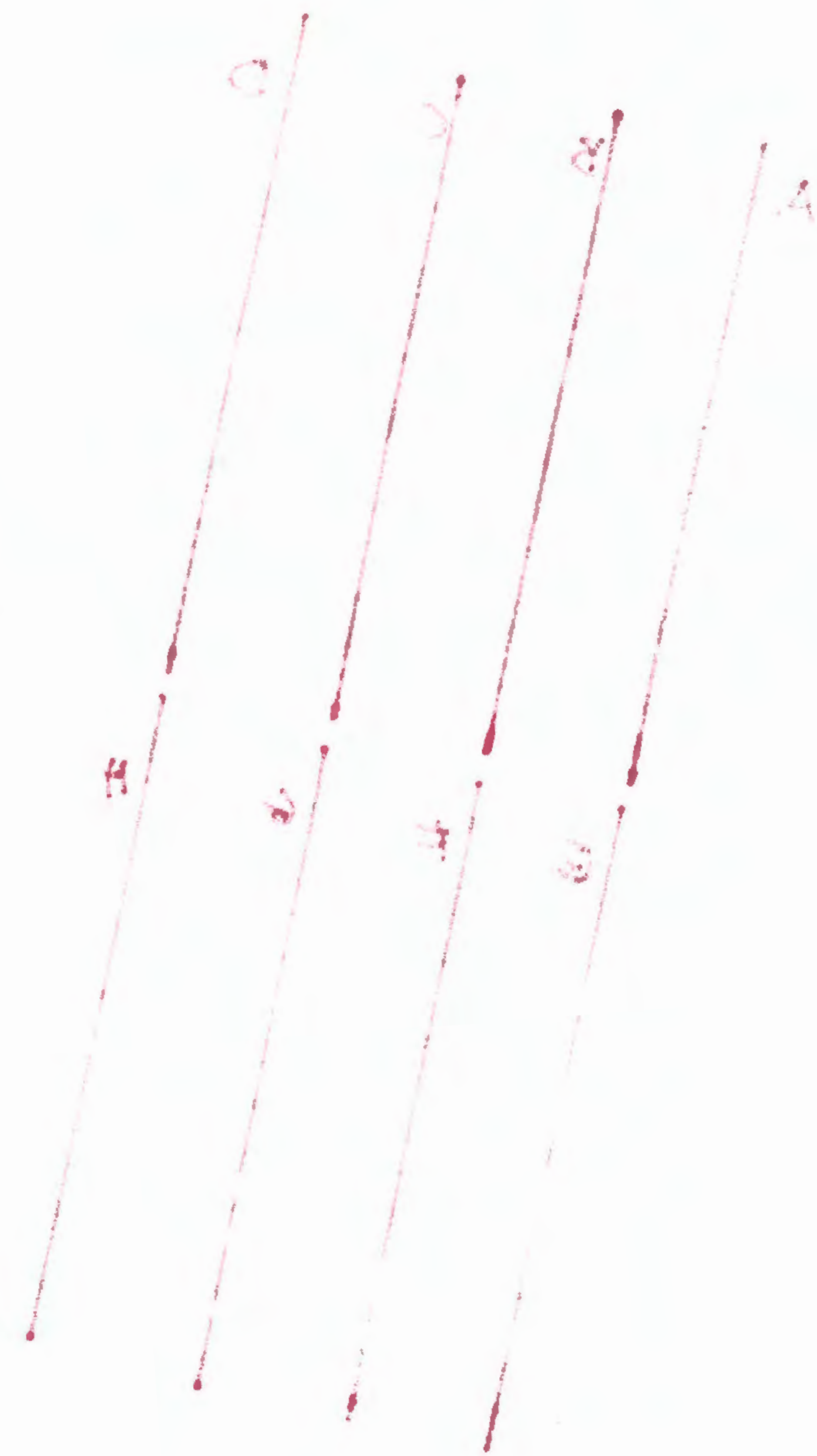
6575

AUGUST 2011

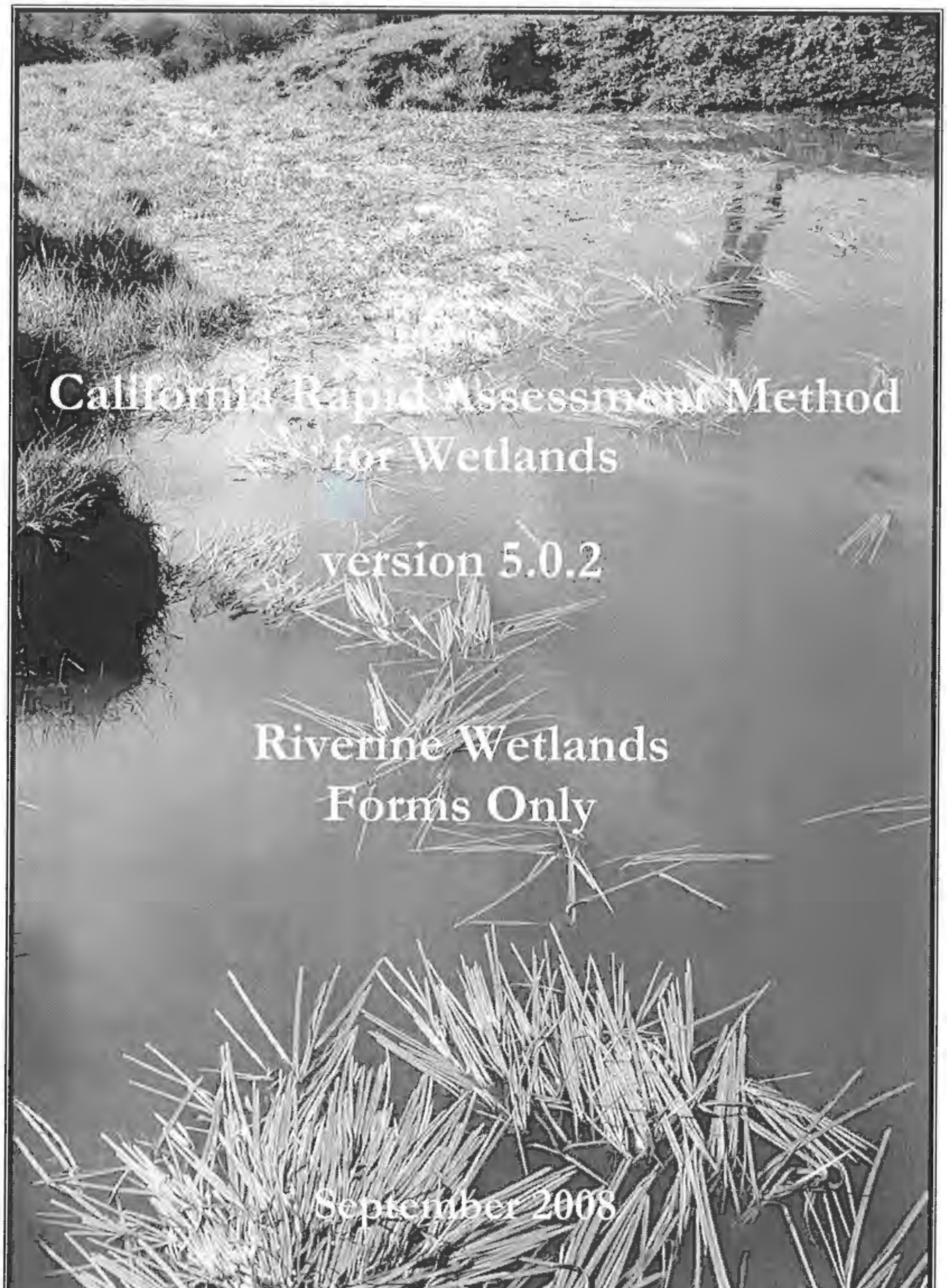
Riverine Assessment Area 21 - 250m Field Map

SALTON SEA SCH

M 285 IIA



B-27 R-8



California Rapid Assessment Method for Wetlands

version 5.0.2

Riverine Wetlands Forms Only

September 2008

Basic Information Sheet: Riverine Wetlands

Your Name:	Doug Gettinger
CRAM Site ID:	
Assessment Area Name:	~~R-27~~ R-8
Date (m/d/y):	
Assessment Team Members for This AA	
DG, TS	
Average Bankfull Width:	9m
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m):	100m

Wetland Sub-type:

☒ Confined ☐ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Other

Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☒ perennial ☐ ephemeral ☐ intermittent

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	R8 upstream	North			
2	R8 upstream	South	Photos taken	from upstream &	downstream
3	R8 downstream	East	corners	facing AA	
4	R8 downstream	West			
5					
6					

Comments:
Original AA laid out in office inaccessible due to mucky mud
~~One-sided AA~~, river not wadeable, but can
GPS'd new AA
assess from
both sides

Scoring Sheet: Riverine Wetlands

AA Name: ~~R8~~ R8				(m/d/y) 11 16 11
Attributes and Metrics		**Scores**		**Comments**
Buffer and Landscape Context				
Landscape Connectivity (D)		D		see notes - ag. runoff from ditches
Buffer submetric A: Percent of AA with Buffer	A			
Buffer submetric B: Average Buffer Width	A			
Buffer submetric C: Buffer Condition	B			mostly barren ground
D + [C x (A x B)^{½}] ^{½} = **Attribute Score**		Raw 13.4	Final 55.9	Final Attribute Score = (Raw Score/24)100
Hydrology				
Water Source		C		
Hydroperiod or Channel Stability		B		
Hydrologic Connectivity		A		Entrenchment = 2.2+
Attribute Score		Raw 27	Final 75	Final Attribute Score = (Raw Score/36)100
Physical Structure				
Structural Patch Richness		D		
Topographic Complexity		C		
Attribute Score		Raw 9	Final 37.5	Final Attribute Score = (Raw Score/24)100
Biotic Structure				
Plant Community submetric A: Number of Plant Layers	~~B~~ C			~~None~~ 2 layers over 5% = 5 ft m
Plant Community submetric B: Number of Co-dominant species	D			None over 10%
Plant Community submetric C: Percent Invasion	~~A~~ C			~~[illegible]~~ 1/3 = 33%.
Plant Community Metric (*average of submetrics A-C*)		5		
Horizontal Interspersion and Zonation		C		
Vertical Biotic Structure		D		
Attribute Score		Raw 14	Final 38.9	Final Attribute Score = (Raw Score/36)100
Overall AA Score		53		**Average of Final Attribute Scores**

Worksheet 1: Landscape Connectivity Metric for Riverine Wetlands.

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1 under berm	17	1	
2 beyond pond	250	2	
3		3	
4		4	
5		5	
Upstream Total Length	267 ~~0~~	Downstream Total Length	0

↑? wetland does not extend 500m upstream see map for notes!

Worksheet 2: Calculating average buffer width of AA.

Line	Buffer Width (m)
A	250
B	
C	
D	
E	210
F	215
G	225
H	240
Average Buffer Width	~~250~~ 236

Worksheet 3: Assessing Hydroperiod for Riverine Wetlands.

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☐ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☐ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☐ There is leaf litter, thatch, or wrack in most pools. ☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☑ There is little or no active undercutting or burial of riparian vegetation. ☑ There are no mid-channel bars and/or point bars densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material. ☐ There are channel pools, the bed is not planar, and the spacing between pools tends to be regular. ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated. ☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more nick points indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment. ☐ There are partially buried living tree trunks or shrubs along the banks. ☑ The bed is planar overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.

Worksheet 4: Entrenchment Ratio Calculation for Riverine Wetlands.

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate mid-points along straight riffles or glides, away from deep pools or meander bends.				
Steps	**Replicate Cross-sections** ⟶	1	2	3
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	7m	8m	10m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	.2m	.2m	.2m
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	.4m	.4m	.4m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	∞	∞	∞
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	2.2+	22+	22+
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections.			22+

A

non wadable, eyeballing it clear water but too muddy to enter, sinking in flood prone width almost infinite due to slope downhill on sea-side of AA

Flood prone width not constrained due to topography

Worksheet 5a: Structural Patch Type for Non-confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	**Check for presence**
Secondary channels on floodplains or along shorelines	✓
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Vegetated islands (mostly above high-water)	
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	✓
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Submerged vegetation	
Total Possible	**16**
No. Observed Patch Types	2

Worksheet 5b: Structural Patch Type for Confined Riverine Wetlands.

Identify each type of patch that is observed in the AA.

Structural Patch Type	Check for presence
Pools or depressions in channels (wet or dry channels)	
Riffles or rapids (wet channel) or planar bed (dry channel)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	
Plant hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	
Standing snags (at least 3 m tall)	
Filamentous macroalgae or algal mats	
Cobble and/or Boulders	
Total Possible	**11**
No. Observed Patch Types	

Worksheet 6a: Plant Community Metric –

Co-dominant Species Richness for Non-confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Floating or Canopy-forming	Invasive?	Short	Invasive?
		~~Helia. aur.~~ < 1	
N/A		~~Dis. spicata~~ 2%	
		~~Sal. virg.~~ 2%	
		4%	
Medium	**Invasive?**	**Tall**	**Invasive?**
Tam. ram 1%			
Sal virg. 2%			
Lep unin. 2%			
5%			
Very Tall	**Invasive?**		
		Total number of co-dominant species for all layers combined	3
		Percent Invasion	1/3 = 33%

Combined cover < 5%, so not counted as layer.

Worksheet 6b: Plant Community Metric –

Co-dominant Species Richness for Confined Riverine Wetlands.

Note: A dominant species represents ≥10% *relative* cover. Count species only once when calculating any Plant Community sub-metric.

Short	Invasive?	Medium	Invasive?
Tall	**Invasive?**	**Very Tall**	**Invasive?**
		Total number of co-dominants for all layers combined	
		Percent Invasion	

Worksheet 7: Wetland disturbances and conversions.

Has a major disturbance occurred at this wetland?	Yes	No		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Part of the Sea when water level was higher

Worksheet 8: Stressor Checklist.

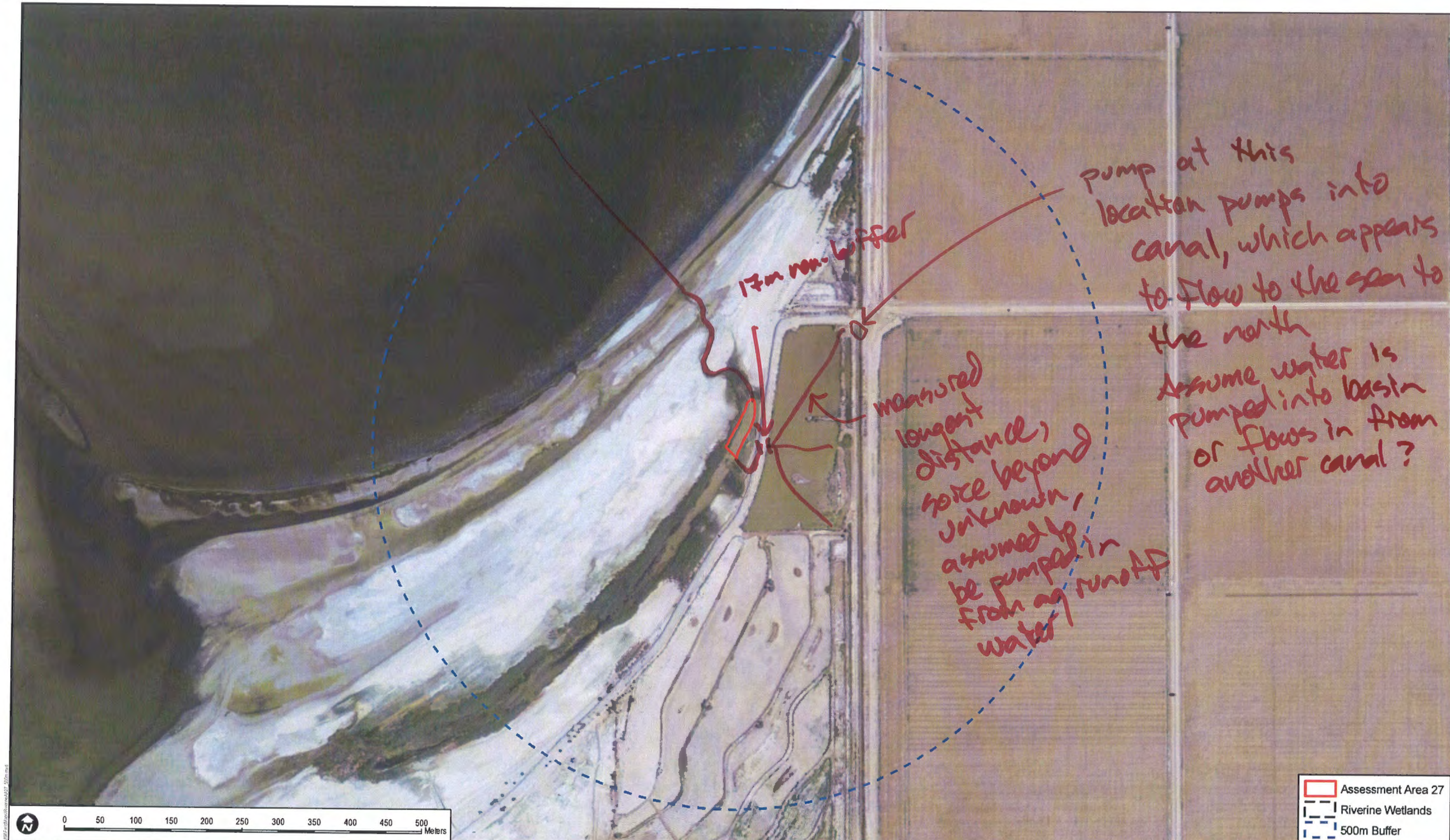
HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		

Comments

None.

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		✓
Excessive runoff from watershed		✓
Nutrient impaired (PS or Non-PS pollution)		✓
Heavy metal impaired (PS or Non-PS pollution)		✓
Pesticides or trace organics impaired (PS or Non-PS pollution)		✓
Bacteria and pathogens impaired (PS or Non-PS pollution)		✓
Trash or refuse		

Comments



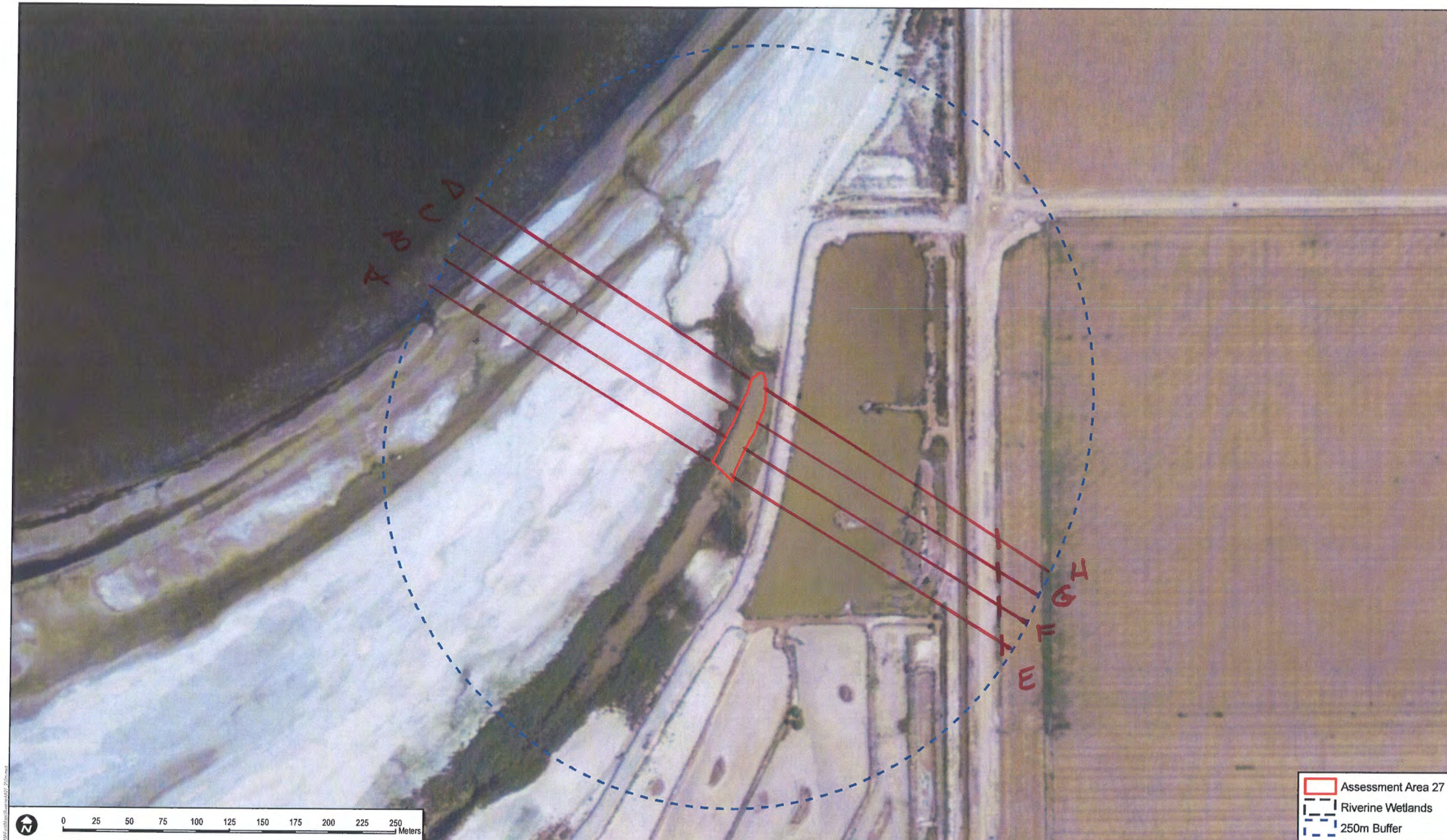
DUDEK

6575

NOVEMBER 2011

SALTON SEA SCH

Riverine Assessment Area 27 - 500m Field Map



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NOVEMBER 2011

SALTON SEA SCH

Riverine Assessment Area 27 - 250m Field Map

APPENDIX E

Forecast CRAM Metric Scores – Riverine AAs

APPENDIX E
Forecast CRAM Metric Scores – Riverine AAs

	RIV-01	RIV-02	RIV-03	RIV-04	RIV-05	RIV-06	RIV-07	RIV-08	RIV-09
Assessment Area Size (acres)	1.96	1.81	1.79	2.21	1.74	2.16	2.29	2.16	1.92
Buffer & Landscape Context									
Landscape Connectivity	12	12	12	12	12	12	12	12	12
Percent AA with Buffer	12	12	12	12	12	12	12	12	12
Average Buffer Width	12	12	6	9	12	12	12	12	12
Buffer Condition	6	6	6	3	6	6	6	6	9
Raw Score	20.5	20.5	19.1	17.6	20.5	20.5	20.5	20.5	22.4
Final Score	85.4	85.4	79.8	73.3	85.4	85.4	85.4	85.4	93.4
Hydrology									
Water Source	6	6	6	6	6	6	6	6	6
Hydroperiod/Stability	6	9	9	9	12	12	12	12	12
Hydrologic Connectivity	6	6	6	6	12	12	12	12	12
Raw Score	18.0	21.0	21.0	21.0	30.0	30.0	30.0	30.0	30.0
Final Score	50.0	58.4	58.4	58.4	83.4	83.4	83.4	83.4	83.4
Physical Structure									
Patch Richness	3	3	3	3	3	3	3	3	3
Topographic Complexity	3	6	3	3	6	6	6	6	6
Raw Score	6.0	9.0	6.0	6.0	9.0	9.0	9.0	9.0	9.0
Final Score	25.0	37.5	25.0	25.0	37.5	37.5	37.5	37.5	37.5
Biotic Structure									
Number of Plant Layers	6	9	6	9	6	6	6	6	6
Co-Dominant Species	3	3	3	3	3	3	3	3	3
Percent Invasion	3	3	3	3	3	3	3	3	3
Plant Community Metric	4.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0
Interspersion/Zonation	6	6	6	3	3	3	3	3	3
Vertical Structure	3	6	3	12	6	6	6	6	6
Raw Score	13.0	17.0	13.0	20.0	13.0	13.0	13.0	13.0	13.0
Final Score	36.2	47.3	36.2	55.6	36.2	36.2	36.2	36.2	36.2
Overall AA Score	48	57	50	54	61	61	61	61	62

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APPENDIX F

Forecast CRAM Metric Scores – Lacustrine AAs

APPENDIX F
Forecast CRAM Metric Scores – Lacustrine AAs

	LAC-01	LAC-02	LAC-03	LAC-04
Assessment Area Size (acres)	1.14	1.14	1.14	1.14
Buffer & Landscape Context				
Landscape Connectivity	9	12	12	12
Percent AA with Buffer	12	12	12	12
Average Buffer Width	12	12	12	12
Buffer Condition	6	6	6	6
Raw Score	17.5	20.5	20.5	20.5
Final Score	72.9	85.4	85.4	85.4
Hydrology				
Water Source	6	6	6	6
Hydroperiod/Stability	9	9	9	9
Hydrologic Connectivity	9	9	9	9
Raw Score	24.0	24.0	24.0	24.0
Final Score	66.7	66.7	66.7	66.7
Physical Structure				
Patch Richness	3	3	3	3
Topographic Complexity	3	3	3	3
Raw Score	6.0	6.0	6.0	6.0
Final Score	25.0	25.0	25.0	25.0
Biotic Structure				
Number of Plant Layers	6	6	6	6
Co-Dominant Species	3	3	3	3
Percent Invasion	3	3	3	3
Plant Community Metric	4.0	4.0	4.0	4.0
Interspersion/Zonation	6	6	6	6
Vertical Structure	6	6	6	6
Raw Score	16.0	16.0	16.0	16.0
Final Score	44.5	44.5	44.5	44.5
Overall AA Score	53	56	56	56

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