

APPENDIX C. HABITAT RESTORATION AND MANAGEMENT PLAN

1 INTRODUCTION

This Habitat Restoration and Monitoring Plan (HRMP) provides a framework for the restoration of temporarily affected areas associated with implementation of United's MSHCP. Restoration activities and monitoring will occur within the permit area where the renovation of the Freeman Diversion and fish passage is to occur. Monitoring will be implemented to ensure success criteria are achieved. The active restoration period because of fish passage and Freeman Diversion renovation is expected to last no more than 5 years, after which the temporary disturbance area should be successfully restored to pre-renovation conditions. Further monitoring or restoration activities in years 5-10 may be necessary if success criteria for restoration have not been met. In addition, on-going passive restoration (e.g., invasive species management) is expected in response to covered maintenance activities that may remove riparian habitat adjacent to United's facilities. The restoration activities and monitoring contained within this HRMP will be conducted in support of Conservation Measure 2.3.1 under Goal 2, described in Chapter 5 (Conservation Program), and provided below.

Goal 2 - Contribute to the conservation of covered species within the plan area.

Objective 2.3: Restore riparian and riverine habitat within the permit area that experience temporary disturbance from covered activities to pre-disturbance conditions within five years of completion of activity.

Conservation Measure 2.3.1- Implement the Habitat Restoration and Management Plan

United will implement the Habitat Restoration and Management Plan to restore areas of temporary disturbance from covered activities.

All renovation activity that requires initial habitat restoration efforts (e.g. recontouring, erosion control installation, reseeding, etc.), or on-going restoration (e.g. recontouring, weeding) will be monitored in accordance with Conservation Measure 2.1.6 for on-site construction monitoring. In addition, pre-activity habitat surveys and short-term (0-5 years) restoration monitoring will be conducted to track and verify achievement of success criteria. Restoration conditions will be documented within annual reports.

2 EXISTING SITE CONDITIONS

The permit area is composed of both developed and undeveloped lands. The portion currently developed is used for water conservation operations. Several water retention basins and associated conveyance channels are located throughout the property. The Freeman Diversion facility is located within and adjacent to the Santa Clara River at the northeastern extent of the permit area. All existing developed property within the permit area is routinely maintained to control weed growth

(e.g., herbicide). The majority of the undeveloped portion of the permit area consists of the Santa Clara River, extending from the Freeman Diversion at the northeastern end to the Santa Clara River Estuary at the southwestern end. Land uses surrounding the permit area consist primarily of agriculture, with some private landholdings such as city lots, ranchettes, and commercial and residential developments. See Chapter 2 – Existing Environment, for a complete description of existing conditions.

2.1 VEGETATION

The uplands of the Santa Clara River watershed are dominated by chaparral and coastal sage scrub communities. The river itself floodplain is dominated by riparian and various wetland communities. A wide diversity of native plant species are found in the watershed as are several non-native, invasive species. The restoration area consists only of riparian, freshwater wetland, and aquatic vegetation communities.

Riparian habitat is typically comprised of dense thickets dominated by broad-leafed, winter-deciduous trees such as willows (*Salix* spp.), and often scattered with Fremont cottonwoods (*Populus fremontii*), and sycamores (*Platanus racemosa*). The habitat is typically found along major drainages but also occurs in smaller drainages. The density of the willows typically prevents a dense understory of smaller plants from growing. Representative species typically grow in loose, sandy, or fine gravelly alluvium deposited near stream channels during flood flows. Dominant species within riparian habitat adjacent to the Freeman Diversion include arroyo willow (*Salix lasiolepis*), narrowleaf willow (*S. exigua*), mule fat (*Baccharis salicifolia*), red willow (*S. laevigata*), giant reed (*Arundo donax*), California mugwort (*Artemisia douglasiana*), and western ragweed (*Ambrosia psilostachya*).

Freshwater wetlands, or marshes, are typically comprised of perennial emergent monocots typically forming a closed canopy. This habitat occurs in open bodies of fresh water, such as ponds, impoundments, and to a lesser extent around seeps and springs. Freshwater marshes are usually found in areas of permanent or semi-permanent inundation by freshwater with minimal active stream flow. Freshwater wetlands occur within the low-flow channel of the river adjacent to open water and riparian habitats. They are emergent stands of cattail, bulrush, and willows where sediment has accumulated above the diversion dam and the impounded water has limited depth (approximately 0 – 3 feet). Dominant species include southern cattail (*Typha domingensis*), chairmaker's bulrush (*Schoenoplectus americanus*), and annual rabbitsfoot grass (*Polypogon monspeliensis*).

Aquatic, or open water habitat occurs within the low-flow channel of the river where water is impounded behind and below the diversion dam. This area includes the active channel within the portion of the riverbed subject to perennial flows as well as meandering low-flow channels and sandbars periodically, but regularly, scoured by seasonal storms. During the dry season the sandbars may support some hydrophytic flora; however, these plants often do not reach a significant height before the next flood event scours the area and removes the vegetation.

Vegetation types and cover are subject to change over time given the dynamic nature of the Santa Clara River. One major factor contributing to the vegetative composition is the amount of water flow present during any given year. During wet years, the river may contain constant heavy surface flows

that wipe out large swaths of existing vegetation. During dry years or periods of drought, vegetation may become well-established on exposed dry ground throughout the river.

2.2 HYDROLOGY

The Santa Clara River and estuary are the main hydrologic features within the permit area. The water resources associated with the river are a complex system of interconnected groundwater aquifers and an extremely dynamic river that contains both surface and sub-surface flows. The river flows in a northeast to southwest direction, terminating at the Pacific Ocean.

Stream flow in the Santa Clara River at the Freeman Diversion is highly variable, and most directly influenced by rainfall events occurring in the watershed during the winter rainy season (December to March). Stream flow can increase by tens of thousands of cubic feet per second (cfs) in a day following a significant rainfall event. The duration of the flow hydrograph recession limb varies from days to months, depending on rainfall amount and duration, antecedent moisture conditions, and to a lesser degree, groundwater storage in the basins of the Santa Clara River valley. The time difference between the peak storm activity within the watershed and the peak of discharge at the Freeman Diversion is often between 12 and 24 hours, due in large part to the time of travel for runoff from the upper Sespe Creek watershed, the largest tributary to the Santa Clara River. These factors can result in substantial changes in hydrologic and physical conditions at the Freeman Diversion from year to year.

3 HABITAT RESTORATION METHODS

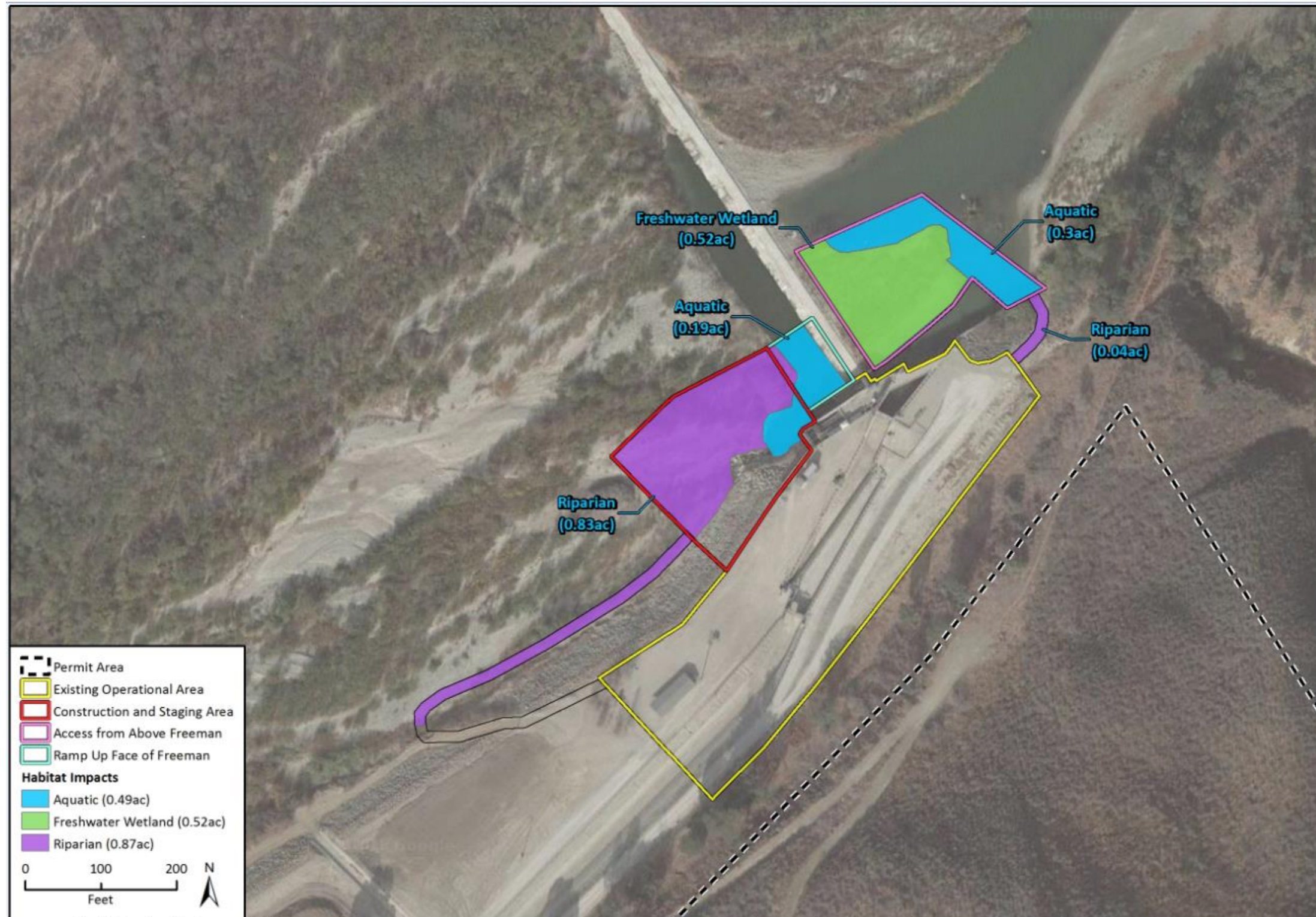
All restoration activities and monitoring will occur within the fish passage and Freeman Diversion renovation footprint (i.e., the restoration site or area). The restoration area therefore includes 1.88 acres of riparian, freshwater wetland, and aquatic habitat within the river at the Freeman Diversion. Figure C-1 shows the restoration area subset indicated by impact area types. The restoration area will not include the access roads into and out of the restoration site, as United previously developed, regularly uses, and maintains these roads. Restoration of this site will result in replacement of the pre-renovation habitat within the site and is expected to offset the biological value temporarily lost or impacted from implementation of the fish passage and Freeman Diversion renovation and maintenance activities.

3.1 SITE PREPARATION

Habitat restoration will be coordinated with fish passage and Freeman Diversion renovation activities, with consideration for the seasonal condition of the site at that time. If water is present in the riverbed within the restoration site, restoration activities may be postponed until no water is present, to reduce the need for further diversions and disruption of the channel. After fish passage facility and Freeman Diversion renovations are completed, the site will be recontoured as needed. If considered necessary by a qualified restoration biologist, biodegradable erosion control will be installed along recontoured portions of the river within the restoration area to help stabilize unvegetated areas. Topsoil will be salvaged and redistributed, and the top layer of soil will be decompacted to encourage seeding success and natural recruitment of riparian habitat. BMPs for sediment and erosion control will be installed and maintained as needed. Restoration following any maintenance activities will be more passive in nature, as maintenance activities are expected to be

infrequent (every year or less) and of low-impact. Therefore, site preparation for restoration post-maintenance will consist of recontouring of the area where impact occurred and will only involve installation of erosion control if considered necessary by the restoration biologist.

Figure C-1. Restoration Area Subset Indicated by Impact Area Types



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3.2 SITE REVEGETATION

Seeding will be implemented within the restoration area to restore the riparian habitat present in the pre-renovation phase of the project. No seeding will occur within the low flow channel or open water areas. Given the dynamic nature of the Santa Clara River (and fluvial systems in general), revegetation through seeding within these areas would likely be unsuccessful. Dynamic fluvial processes are constantly washing away vegetation and disturbing the soil of the riverbed, allowing ruderal forbs and annual grasses to colonize quickly. Therefore, revegetation within the low flow channel will be accomplished by way of natural recruitment and management of invasive species.

Seeding outside the low flow channel will consist of spreading pre-approved seed mixes via hand broadcasting in two initial applications following the site preparation activities. The seed mix will be comprised of in-kind species based on pre-activity surveys of the impact and adjacent area. The palette is expected to include a mix of the dominant native species. In particular, these species would include mule fat, arroyo willow, narrowleaf willow, red willow, Fremont's cottonwood, California mugwort, southern cattail, and chairmaker's bulrush. The seed mix will be tailored to the existing physical and hydrologic site conditions at the time of seeding (i.e., riparian or freshwater wetland).

Preparation of the area to be seeded will include tillage of the area with a rake to establish a receptive surface. The seed will then be spread by hand throughout the prepared area. Following seeding, the area will be raked again to help incorporate the seed, improve seed to soil contact, and improve the germination rate. Finally, if the seeded area is dry, the area will be watered using a mist sprayer so the ground is wet, but not inundated, to aid in germination. Hand broadcast seeding will only occur during conditions of low (less than 3 mph) to no wind.

To hand broadcast:

- Seed may be mixed with equal parts clean and damp sand in broadcasting
- Seed mix is applied in a two-step application, as follows
 - Step one consists of broadcasting one-half of the seed mix across the planting area in one direction (e.g., north to south)
 - Step two consists of broadcasting the remaining seed over the same area while moving in a perpendicular direction to step one

All seeding activities will be monitored by an approved restoration biologist. No seeding is expected to take place as part of on-going restoration efforts due to maintenance activities unless determined necessary based on the nature of the impact. These areas will be passively restored through invasive species management.

3.3 INVASIVE SPECIES MANAGEMENT

Hand weeding will be employed throughout the 5-year active restoration period to control invasive non-native plants in the restoration area, after both fish passage renovation and maintenance activities. If determined necessary by the restoration biologist, mechanical weeding may be employed for large outbreaks of invasive species (e.g., arundo, tamarisk). In this circumstance, relevant conservation measures for species and habitat protection (e.g., monitoring, BMPs) will be employed. Maintenance activities that occur past the 5-year restoration period may merit additional

weeding, if considered necessary by the restoration biologist. Control of invasive plants will be overseen by the restoration biologist. During monitoring visits, the site will be thoroughly examined for the presence of invasive, non-native plant species, particularly giant reed and tamarisk. Undesirable weed seeds, pollen, and biomass will be removed at the appropriate time of year to minimize spread by wind, water, animal, or other means.

When removing weeds by hand, care must be taken to avoid significantly disturbing on-site soils which could lead to increased erosion. All roots and stems should be completely dug out and, along with any flowers or seeds, must be disposed of off-site. Diligent and systematic control of weeds will be critical to restoration project success. The restoration biologist may revise treatment methods if weeds are not being adequately controlled.

Selective application of an approved herbicide (if necessary, and as approved by the restoration biologist and agencies) would be limited to infestations that cannot be feasibly controlled by hand weeding, and where adverse effects to native plants can be avoided. If herbicides are needed, only those which are approved for aquatic use shall be used. No herbicides shall be used on native vegetation. Herbicide shall not be applied if there has been a rain event within 24 hours and foliage is still wet, if rain is forecasted to occur within 48 hours, or if winds are in excess of 5 miles per hour.

The level of required weed removal will likely be higher in the first year and is expected to decrease in later years (2-5) as native plant cover increases. Weeding will be conducted as needed to prevent displacement of native species, which may include treatment or removal several times per year. Specifically, weeding will be conducted at least three times annually (spring, summer, and fall), or until it is determined that the restoration site is not at risk from competition by invasive plants. Increased frequency of weeding may be required if deemed necessary by the restoration biologist.

4 HABITAT RESTORATION MONITORING

As part of the MSHCP, United will conduct pre- and post-activity monitoring. Appropriate monitoring methodologies, timing, and frequencies are dependent on the biological goals and objectives, and based on total area of suitable habitat for covered species. This section describes the type, timing, and frequency of habitat restoration monitoring that will be conducted within the restoration area. Table 1 provides a summary of the restoration monitoring program.

Area	Monitoring Type	Timing / Duration	Detailed Description of Restoration and Management Action
All Covered Activity Areas Containing Suitable Habitat for Covered Species	On-Site Construction Monitoring	During activities	A pre-activity survey assessing and documenting the condition of habitat in areas to be disturbed by construction activities shall be conducted prior to the initiation of maintenance or repair activities. A qualified biological monitor will be present for all maintenance and repair activities occurring within or adjacent to sensitive habitat for covered species if the maintenance or repair activity occurs during breeding season or migration periods. Should construction activities result in temporary impacts (e.g., roads, staging areas, and other areas), areas will be passively restored to appropriate conditions (e.g., recontour, install biodegradable erosion control (as-needed), manage invasive species). Aquatic and riparian habitat temporarily affected by covered activities will be managed to assure natural revegetation with native plant species representative of the pre-existing plant community. Habitat may also be enhanced through removal of invasive non-native plants in or adjacent to the areas of impact to help assure restoration of the pre-existing plant community.
Fish Passage/ Freeman Diversion/ Maintenance Areas	Short-term Restoration Monitoring	Years 0-5: Quarterly monitoring	A pre-activity survey assessing and documenting the condition of habitat in the fish passage and Freeman Diversion renovation area to be disturbed by construction activities shall be conducted prior to the initiation of covered activities. Quarterly and annual monitoring and invasive species management within the Freeman Diversion temporary impact area to ensure restoration and enhancement success criteria are met (site has been naturally restored to pre-existing conditions as determined in pre-activity survey). Remedial measures will be implemented as necessary through adaptive management to assure restoration sites achieve success criteria.
Fish Passage/ Freeman Diversion/ Maintenance Areas	Long-term Monitoring of Habitat Restoration and Enhancement	Years 5-10: Semi-annual qualitative and quantitative monitoring (if needed)	Semi-annual quantitative and qualitative annual monitoring to be conducted for sites that have not achieved success criteria at Year 5. Recommendations will be made through adaptive management, if necessary, to ensure the restoration sites retain their biological value.

4.1 SUCCESS CRITERIA

Restoration success will be measured relative to documented pre-renovation conditions based on the pre-activity assessment described below, with the exception that weeds should be fully eradicated within the 5-year active restoration period. The following criteria will be used to determine when restoration has been successfully achieved:

- Native vegetative plant cover equal to the average total cover in the pre-activity site(s) after 5 years (Section 4.2, below)
- Species makeup and diversity equal to the pre-activity site(s)
- Plant communities are equally sufficient as pre-renovation conditions for supporting wildlife use in the area

- Invasive weed density is no higher than the pre-activity reference sites after 5 years
- 100 percent eradication of identified arundo and tamarisk stands in restoration areas at end of five years

If a natural event outside of United's control, such as a flood, impacts the restoration area in such a way as to set restoration efforts back, the success criteria may be re-evaluated to create a more realistic goal. Similarly, because restoration success will be almost entirely judged based on pre-renovation conditions, this may ultimately limit the required restoration acreage and species composition.

4.2 PRE-ACTIVITY ASSESSMENT AND MONITORING METHOD

Prior to initiation of renovation, maintenance, and restoration activities, habitat surveys using the following vegetative assessment method will be conducted to identify pre-activity conditions within the areas that will be temporarily disturbed by fish passage facility renovation. The pre-activity conditions will be used to establish restoration success criteria. The following vegetative assessment method shall also be used to assess restored habitat after restoration activities are completed.

Monitoring Method

Monitoring will be conducted using quantitative and qualitative methods. Focused vegetation assessment pre-activity condition surveys will be conducted in the restoration area and directly adjacent to determine the average cover, height class, species richness and diversity, and condition of the vegetation. Surveys will be conducted using the line-point intercept method. The plant community compositions within the restoration site and the adjacent reference site will also be directly compared. Observations of the site's ability to support wildlife species will be collected and compared to the adjacent reference sites. Data collected in the field will be tabulated in spreadsheet software by species and canopy layer. Additional tabulations will be done for native versus non-native vegetation at each point. Photographs will be taken to sufficiently capture conditions at the site.

4.3 MONITORING SCHEDULE

Short (zero to five years) and long-term (five to ten years) restoration monitoring will be implemented to verify that restoration areas achieve success criteria. As stated above, the vegetation assessment will be conducted using the same methods as used for the pre-activity vegetation assessment.

During Restoration Activities

Monitoring of restoration activities will be conducted in accordance with Conservation Measure 2.1.6 for on-site construction monitoring, as needed, depending on seasonal timing and the potential for effects to covered species.

Years Zero through Five

Monitoring in Years 0-5 will consist of quarterly qualitative and quantitative monitoring following the monitoring methods in Section 4.2, above.

Years Five to Ten

If deemed appropriate and necessary, monitoring may continue in years five to ten. Monitoring in years five to ten would consist of semi-annual qualitative and quantitative monitoring following the monitoring method in Section 4.2, above.

5 ADAPTIVE MANAGEMENT

In the event of unforeseen circumstances in restoration area within the 5-year restoration period (i.e., an extreme storm, heavy natural recontouring of the river channel, heat wave, or drought, etc.) the methods and criteria of this HRMP may be revised as appropriate. In such a case, methods and criteria would be changed to reflect realistic expectations for the restoration site, based on adjacent reference site(s) and the severity of the unforeseen change.

6 REPORTING

Restoration monitoring results will be reported in monthly and annual reports, as applicable (described in Chapter 5, Conservation Program). Specific to restoration, the following reports are anticipated:

Monitoring Memoranda. The restoration biologist (or an approved representative) shall prepare and provide a memorandum to United within one week following each quarterly qualitative site visit. The memoranda shall include date, time, and weather conditions; a discussion of general site conditions; a list of all plants and wildlife encountered; and recommendations for maintenance as necessary to ensure progress towards restoration success. Photos taken during monitoring visits shall be included with each memorandum, but only as necessary to assist in the recognition of problem plants or areas.

Annual Reports. Annual monitoring reports will be prepared by, or with oversight from, the restoration biologist. Annual monitoring reports shall document the results of each annual assessment. Annual reports are expected to include the following:

- Location and directions to the restoration area
- Date seeding was fully implemented, and dates of previous maintenance/monitoring events
- Monitoring methodology, schedule of work performed, and exotic plant control efforts
- Summary of remedial actions
- List of approved success criteria
- Table of results comparing monitoring visits against performance criteria for target dates
- Photographic record of the site during the annual monitoring visit
- Summary of field data acquired to determine compliance with success criteria
- A discussion of the results, an overview of the restoration effort, summary of significant events that may affect mitigation success, and pertinent recommendations to meet success criteria

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