

Appendix F

Steps for Evaluating, Creating, and Maintaining Replacement Habitat

Steps for Evaluating, Creating, and Maintaining Replacement Habitat

Much of the following information was adapted from the “Lower Colorado River Multi-Species Conservation Program Guidelines for the Screening and Evaluation of Potential Conservation Areas” (USBR 2006).

Table 1. Schedule of tasks for evaluating, creating, and maintaining replacement habitat.

Step	Task	Schedule
1	Identify sites, conduct site visits, prepare site reports	Within 3 months for first site, within 12 months for all sites
2	Submit site assessments and cost estimates	Within 3 months for first site, within 12 months for all sites
3	Submit habitat creation opportunity rating	Within 3 months for first site, within 12 months for all sites
4	Complete environmental compliance, if necessary	Within 6 months for first site, within 18 months for all sites
5	Submit mitigation and monitoring plan	Within 6 months for first site, within 18 months for all sites
6	Implement mitigation plan (site preparation, and planting vegetation, maintenance)	Begin within 12 months for first site, within 24 months for all sites
7	Annually monitor mitigation sites to ensure plantings are progressing to desired habitat conditions until mitigation obligation is complete	As per monitoring plan and established protocols
8	Submit annual report and work plan	September 30 annually
9	Submit final report	Within 180 days of completion of project

Step 1: Identify Sites, Conduct Site Visits, Prepare Site Reports

Identify sites that may be suitable for creating riparian habitats, based on the potential availability of lands and likely suitability to meet requirements for habitat creation.

Conduct site visits and collect information necessary to further assess the suitability of sites. Prepare site visit reports that include the following:

- water right and priority;
- location map, showing the property location in context to nearby roads, towns, and other local features;
- property map showing location of fences, buildings, roads, agricultural fields, drains, canals, pumps, and other infrastructure as appropriate;
- land use description (e.g., if the site is farmed, the types of crops that are grown; undeveloped);

- land cover map showing dominant vegetation types and acreage (e.g., farmed fields, saltcedar stands);
- description of infrastructure condition;
- description of preliminary habitat creation concepts for developing the site; and
- description of potential issues related to the establishment and management of created habitats.

Sites must meet the following minimum requirements:

- The landowner must demonstrate clear title to the land and water.
- No deed, easement, or other legal restrictions are attached to the site that could limit the ability to create and manage habitats over the term of the project.
- Sites offered for the establishment of riparian habitats must be large enough to accommodate the establishment of a minimum acreage of habitat (10 acres), and any additional area required for use as buffer land, infrastructure (e.g., roads, canals), and other features required to support the created habitat.
- The site is *not* located where levels of human activity are sufficiently high that it is unlikely that created land cover types can fully function as covered species habitat.
- The site must support conditions that would allow for the creation of habitats.
- No hazardous materials are present on the site of a type or in quantities that would preclude the establishment, future management, or value of habitats created on the site. Hazardous materials would need to be removed from the site prior to implementation.

Step 2: Submit Site Assessments and Cost Estimates

Assess the suitability of potential sites and prepare preliminary cost estimates that could be associated with securing the resource (land and water) and developing and managing the created habitats. The habitat site suitability assessment and cost estimates would be conducted concurrently through an iterative process, but are described separately below.

Assess Site Conditions

Riparian habitat site evaluation and screening criteria include:

- water availability,
- soil conditions,
- site location,
- habitat development potential,
- site constraints.

The project proponent with guidance from BLM or other agencies would evaluate and rate each site criterion and, based on the collective criteria ratings, would assign an overall habitat creation opportunity rating for the site. Site ratings may be adjusted higher if the proponent or BLM identifies opportunities for implementing “low-cost” corrective actions that would improve the site conditions addressed by the criterion (e.g., although soils on a site may be highly saline, the site could be rated higher than otherwise if sufficient water is available to flush salts from the soil).

Water Availability

The water availability criterion evaluates the suitability of a site's water supply to provide for:

- the establishment of riparian habitats, including moist surface soil conditions in cottonwood-willow to provide habitat for the southwestern willow flycatcher
- the ability to ensure ongoing irrigation of created habitats to maintain habitat values over the term of the project
- water rights, including the priority, type, and quality.
- water quality: considerations include potential contribution of selenium, salts, and other contaminants at levels that could affect biotic communities, including dominant vegetation in created covered species habitats based on the quality of the available water.

Conditions that can affect water requirements include:

- soil permeability (e.g., sandier soils may require more water than less sandy soils);
- soil salinity (e.g., highly saline soils may require additional water to maintain soil salinity at levels that would sustain established vegetation);
- site factors that may result in water loss (e.g., unlined water delivery canals and ditches); and
- groundwater elevations during the growing season (e.g., sites where presence of high groundwater elevations maintained by LCR flows may reduce water requirements for the establishment and maintenance of cottonwood-willow habitats).

The water availability criterion would be rated based on an assessment of the combined ratings for each of the criterion elements using the guidelines presented in Appendix A of the Lower Colorado River Multi-Species Conservation Program Guidelines for the Screening and Evaluation of Potential Conservation Areas (USBR 2006).

Soil Condition

- the soils present on the site based on the best available information;
- a description of the habitats and extent of habitat that could be established and maintained on site soils;
- soil-related limitations to the establishment of cottonwood-willow, cottonwood-willow-honey mesquite habitats.

The soil condition criterion evaluates the suitability of a site's soils to provide for the establishment and sustainment of habitats. Elements of soil conditions that would be evaluated under this criterion include:

- soil texture: considerations include the suitability of the soil to support dominant land cover type plant species and, depending on the habitat type, water retention or drainage requirements.
- soil salinity: considerations include whether or not soil salinity is within the tolerance range of the dominant land cover type plant species.

Soil texture and salinity conditions at each site would be identified from Natural Resource Conservation Service soil survey reports and any additional information provided by the landowner/manager. In the absence of mapped soils, an assessment of soil conditions may be developed based on observable soils conditions (e.g., high salinity may be inferred by the presence of salt on the soil surface) and, for agricultural lands,

cropping history. The soil condition criterion would be rated based on an assessment of the combined ratings for each of the criterion elements using the guidelines presented in Appendix A of the Lower Colorado River Multi-Species Conservation Program Guidelines for the Screening and Evaluation of Potential Conservation Areas (USBR 2006). The evaluation would take into consideration the quantity of water available to mitigate effects of salinity on sites with low to moderate salinity ratings.

Site Location

If conditions are appropriate, sites closer to the Limitrophe would receive higher priority than sites farther away.

Habitat Development Potential

The habitat development potential criterion evaluates the extent of habitat that can be created on a site and the extent to which creating habitat on the site can improve the value of existing nearby habitats. Sites that can accommodate creation of habitat in patches larger than the minimum patch sizes required to provide habitat can support a greater abundance of species and larger sites increase the opportunity to create mosaics of habitat that more closely approximate habitat conditions historically present along the lower Colorado River. Attributes that can generally be expected to be associated with the extent of habitat that can be created on a site are presented in Appendix A of the Lower Colorado River Multi-Species Conservation Program Guidelines for the Screening and Evaluation of Potential Conservation Areas (USBR 2006).

Site Constraints

The long-term management considerations criterion qualitatively evaluates each site based on other factors that may affect the ability to effectively establish, manage, and maintain created habitats over the term of the project. Site constraints most likely to be associated with evaluated sites are anticipated to be those associated with human activity and adjacent land uses. A major consideration in rating these site constraints is the degree to which habitats established on sites are buffered from the potential adverse effects of human activity and adjacent land uses. Additional considerations include evaluating whether or not site specific conditions (e.g., soils) are such that water management activities could adversely affect water quality on or off-site.

Human Activity. The proximity of sites to human populations and high use areas (e.g., recreational areas) would be evaluated for the likelihood that:

- the risk for trespass and vandalism of equipment and other property and loss of habitat as a result of human-caused wildfire would be evaluated relative to other locations in the planning area;
- the value of created habitats for covered species could be substantially diminished by human disturbances associated with recreation and other activities, including harassment and mortality of wildlife by domesticated pets; and
- levels of mosquito production that could be associated with created backwaters, marsh, and habitats which require maintenance of moist soil surface or ponded water conditions during the breeding season (i.e., southwestern willow flycatcher) would create a nuisance in nearby populated areas.

- potential effects of these management considerations that could be associated with future development of nearby lands based on the available information (e.g., zoning designations, approved development plans).

Adjacent Land Uses. Evaluate adjacent land uses to assess their compatibility with conservation area management objectives. Consider the potential that habitat creation and management activities could adversely affect adjacent land uses.

Other Management Considerations. Other types of management considerations as they may apply to specific sites under consideration (e.g., the cultural importance of a site).

Conduct Preliminary Cost Assessment

Develop preliminary assessments of potential costs associated with securing an interest in land and water and development and maintenance of created habitats over the term of the project. Assessments would be prepared using the best readily available source for implementation and maintenance costs and would provide the basis for determining whether or not costs associated with securing, developing, and maintaining a site are cost effective and within the available funding levels. Preliminary costs would be assessed for:

- securing an interest in land and water
- site access improvements (e.g., construction of access roads)
- infrastructure improvement, construction, or installation
- site preparation (e.g., grading, grubbing)
- habitat restoration
- operation and maintenance (O&M)
- regulatory compliance
- water management requirements
- other cost categories as appropriate for each site.

Costs to Secure an Interest in Land and Water

Estimate costs for securing land and water associated with the site based on recent market valuations that are available for similar properties. Land and water costs for sites that may be secured through lease or conservation easement would be determined for the period from which an interest is secured in the land and water through the project duration.

Infrastructure Improvement Costs

Evaluate the suitability of existing infrastructure and condition for creating the habitats identified in the conceptual habitat creation plan, including access roads and other off site infrastructure required to support the site. Based on this evaluation, estimate costs that could be associated with the repair of existing infrastructure or the construction or installation of new infrastructure necessary to develop the site, including:

- roads;
- irrigation and drainage system, including pumps and diversions;
- support infrastructure (e.g., buildings, electric power supply, domestic water supply);
- site security enhancements (e.g., fences, firebreaks, signage); and
- other relevant items that may be identified by the Program Manager (PM).

Site Preparation Costs

The project proponent with guidance from BLM would develop cost estimates for the preparation of habitat creation sites based on the conceptual plan. Items for which cost estimates may be developed include:

- removal of existing vegetation and debris,
- site grading, excavation, and disposal of overburden,
- application of soil amendments, and
- other relevant site preparation activities that may be identified by Reclamation.

Habitat Restoration Costs

Develop cost estimates for the procurement, installation, and initial maintenance of planted or seeded plant materials (e.g., cottonwood-seedlings).

Operation and Maintenance Costs

Items for which cost estimates may be developed include:

- electricity and/or fuel costs for irrigation;
- pump and other infrastructure replacement costs anticipated to be incurred throughout the term of the project;
- offsite infrastructure maintenance costs (e.g., road grading, drain maintenance, canals)
- other relevant project costs that may be identified.

Regulatory Compliance Costs

Estimate costs that may be required for compliance with environmental laws and regulations that could be associated with site development, including any environmental review required under the National Environmental Policy Act (NEPA) and, if applicable, California Environmental Quality Act (CEQA). Habitat creation and management activities were evaluated in the BLM vegetation treatment environmental assessment (EA) and covered under the record of decision (BLM 2008). Project-specific NEPA and CEQA (for sites developed in California) compliance would be tiered from the programmatic EA. BLM may review existing available information about or conduct reconnaissance-level surveys of sites to determine if regulated resources are present and their extent and location. If present, BLM would assess the likelihood for and extent of adverse effects on sensitive resources based on the conceptual habitat creation plan and, if regulatory compliance may be required, estimate costs for compliance. Sensitive resources for which regulatory cost estimates may be required include cultural resources regulated under Section 106 of the National Historic Preservation Act (NHPA) and wetlands and waters that are regulated under Section 404 of the Clean Water Act (CWA).

Step 3: Submit Habitat Creation Opportunity Ratings

Assign an overall habitat creation opportunity rating of high, moderate, or low for each potential riparian habitat creation site. These rated sites represent a pool of potential sites that may be investigated further. These ratings would be assigned based on the relative ability of a site to achieve overall objectives and the likely costs associated with securing, developing, and managing a site.

Generally, sites rated high would be those that:

- are available to the proponent or BLM on a schedule that would be most likely to meet the overall habitat creation schedule;
- are the most cost effective to implement;
- support site conditions that are the most conducive to the successful establishment of high value habitat.

Step 4: Complete Regulatory Compliance

The proponent would conduct compliance with NEPA, ESA, NHPA, CWA as needed.

Step 5: Submit Mitigation and Monitoring Plan

The proponent would develop a detailed restoration and monitoring plan that includes success standards and triggers for a change in management. Include:

- site information;
- site preparation plan (describe what site preparation would be implemented prior to planting, e.g. augering holes for trees, controlling weedy species, removing saltcedar, etc.)
- habitat creation design plan (describe how many trees per acre of which species would be planted for both overstory and understory, watering regime, how plants would be protected from vertebrate and invertebrate herbivores)
- habitat monitoring plan
- cost estimates.

Step 6: Implement Mitigation Plan

- prepare site for restoration.
- plant site.
- maintain habitat.

Where site conditions are appropriate, replacement habitat would be designed with the appropriate patch size and width, density of cottonwood and willow, canopy height, canopy closure, vertical foliar density, soil moisture, temperature, and humidity to support willow flycatchers (Table 2). These variables were chosen as there were statistically significant differences in use sites versus non-use sites at willow flycatcher study sites along the lower Colorado River (McLeod et al. 2005, Koronkiewicz et al. 2005). Habitat must be maintained for 10 years from the time of planting.

Depending on site-specific conditions, creation of cottonwood-willow stands may require creating canals and seasonally wet swales, creating some topographical diversity, and planting or seeding the site with cottonwoods, willow, honey mesquite or other native riparian species. It is anticipated that most created cottonwood-willow land cover would be flood irrigated (USBR 2004).

Where condition allow habitat would be designed to create cottonwood-willow stands that exceed the habitat value of existing cottonwood-willow stands on the lower Colorado River by supporting:

- greater density of cottonwood and willow trees than the 10 percent density that constitutes cottonwood-willow land cover under the Anderson and Ohmart classification

system (1984). In the Anderson and Ohmart (1984) study, diversity and abundance of wildlife tended to increase with increasing proportions of cottonwood and willow trees. Therefore, restoration would seek to achieve greater densities of cottonwood and willow trees than what currently remains in much of the Limitrophe area (USBR 2004).

- greater diversity of plant species than are typically associated with existing stands.
- greater structural diversity associated with creation of multiple layers of vegetation and seral stages than existing cottonwood-willow stands on the lower Colorado River.
- creation of patches of honey mesquite in and adjacent to patches of cottonwood-willow to more closely approximate the distribution of riparian vegetation that was present along the historical gradient of the lower Colorado River floodplain (USBR 2004).
- saltcedar that would likely become established on its own and can be an important component of wildlife habitat (USFWS 2002).

Table 2. Suitable willow flycatcher breeding habitat characteristics along the lower Colorado River (McLeod et al. 2005, Koronkiewicz et al. 2005).

Variable	Value
Canopy Height (m)	Average greater than 4.0 m
Canopy Closure (percent total from ground to canopy)	Greater than 70%
Vertical Foliage Density	Density greatest between 1 and 4 m above ground; this may change as additional analysis is completed
Mean Soil Moisture (percent volume)	Minimum of 17% Average of 23%
Mean Diurnal Temperature (Celsius)	Between 26° C and 33° C
Mean Maximum Diurnal Temperature (Celsius)	Maximum of 45° C Average between 32° C and 45° C
Mean Diurnal Relative Humidity (percent)	Greater than 33%
Patch width	Greater than 10 m
Patch size	Greater than 10 acres

Step 7: Monitor Mitigation Sites

The proponent would annually monitor mitigation sites to ensure plantings are progressing to desired habitat conditions until mitigation obligation is complete. Once the data collected during implementation monitoring, habitat monitoring, and vegetation classification are analyzed, the results would be evaluated based on thresholds and trigger points identified by the reference conditions. Thresholds would be included in the

monitoring plan to signal that conditions are appropriate and to continue current management practices.

Trigger Points

Trigger points would be included in the monitoring plan that signal the need to alter current management activities to achieve goals for the restoration site. The trigger points are:

- Microclimate, water, and vegetation conditions in have not achieved the desired results
- Habitat conditions are declining
- Habitat needs exceeded water availability
- If after year 1 the tree density is less than 95% of what was planned and after year 3 is less than 90%, dead trees would be replaced.
- Time required to maintain the site would be extended beyond 10 years if thresholds are consistently not being met.
- If trees are surviving, but not growing, additional measures, such as providing additional irrigation or removing limiting factors should be implemented.

Step 8. Submit Annual Report and Work Plan

The proponent would submit an annual report summarizing the following:

- General description of the project status
- A description of all restoration, maintenance, and monitoring methods conducted over the past year
- Monitoring results
- An assessment of the effectiveness of restoration.
- The total number of acres planted
- The total number of acres that meets or exceeds the performance standards
- Costs
- Any other applicable information

Data would be evaluated annually to determine if the threshold and/or trigger points were reached. If results indicate that restoration activities were unsuccessful, recommendations on prescriptions and modifications would be identified, and other methods tested.

Submit an annual work plan for the upcoming year summarizing the following:

- Acreage to be converted
- Site preparation
- Planting design
- Maintenance plan
- Monitoring to be accomplished
- Anticipated costs

Step 9. Submit Final Report

The proponent would submit an annual report no later than 180 days after the completion of all mitigation measures. The final report would include the following information:

- Recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the species.

- Summary of restoration methods
- Summary of maintenance methods
- Summary of restoration accomplished, including acreage
- An assessment of the effectiveness of restoration.
- Summary of monitoring results
- Summary of costs

Literature Cited

- Ambrose, S. 1989. The Australian Bird Count-Have We Got Your Numbers? RAOU Newsletter 80:1-2. Victoria, Australia.
- Anderson, B. W. and R. D. Ohmart. 1976. Vegetation type maps of the Lower Colorado River from Davis Dam to the Southerly International Boundary. Final Report. Bureau of Reclamation, Lower Colorado Region, Boulder City, NV [p27 & p32].
- Anderson, B. W. and R. D. Ohmart. 1984. Lower Colorado River riparian methods of quantifying vegetation communities to prepare type maps. Final Report. Bureau of Reclamation, Lower Colorado Region, Boulder City, NV [p80].
- Anderson, B. W. and R. D. Ohmart. 1986. Mapping methods and vegetation changes along the lower Colorado River between Davis Dam and the border with Mexico. Submitted to Bureau of Reclamation, Boulder City, NV [p4].
- Bernstein, B. B., and J. Zalenski. 1983. An optimum sampling design and power tests for environmental biologists. *Journal of Environmental Management* 30:129-133.
- Block, W. M., A. B. Franklin, J. P. Ward, Jr., J. L. Ganey, and G. C. White. 2001. Design and implementation of monitoring studies to evaluate the success of ecological restoration on wildlife. *Restoration Ecology* 9(3):293-303.
- Bureau of Reclamation. 2006. Lower Colorado River Multi-Species Conservation Program Draft Final Scientific Strategy. Lower Colorado Region, Boulder City, NV 66pp.
- Conway, C. J. 2005. Standardized North American Marsh Bird Monitoring Protocols. Wildlife Research Report #2005-04. U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.
- Desante, D. F., K. M. Burton, P. Velez, and D. Froehlich. 2005. MAPS Manual 2005 Protocol Instructions for the Establishment and Operation of Constant-Effort Bird-Banding Stations as Part of the Monitoring Avian Productivity and Survivorship (MAPS) Program. The Institute for Bird Populations, Point Reyes Station, CA.
- Great Basin Bird Observatory. 2003. Nevada Bird Count: A habitat-based monitoring program for breeding birds of Nevada. 13 Feb. 2006. http://www.gbbo.org/nbc_protocol.htm.
- Green, R. H. 1979. *Sampling Design and Statistical Methods for Environmental Biologists*. John Wiley and Sons, New York.
- Halterman, M., and M. J. Johnson. 2005 Draft Western Yellow-billed Cuckoo Natural History Summary and Survey Methodology. Southern Sierra Research Station, Weldon, CA.
- Koronkiewicz T. J., M. A. McLeod, B. T. Brown, and S. W. Carothers. 2005. Southwestern willow flycatcher surveys, demography, and ecology along the

- lower Colorado River and tributaries, 2005. Draft annual report submitted to Bureau of Reclamation, Boulder City, NV. SWCA Environmental Consultants, Flagstaff, AZ. [p175]
- Lower Colorado River Multi-Species Conservation Program. 2004. Lower Colorado River Multi-Species Conservation Program, Volume II: Habitat Conservation Plan. Final. December 17. (J&S 00450.00) Sacramento, CA.
- McLeod, M. A., T. J. Korontiewicz, B. T. Brown, and S. W. Carothers. 2005. Southwestern willow flycatcher surveys, demography, and ecology along the lower Colorado River and tributaries, 2004. Annual report submitted to Bureau of Reclamation, Boulder City, NV. SWCA Environmental Consultants. Flagstaff, AZ. 155 pp.
- McLeod, M.A., T.J. Koronkiewicz, B.T. Brown, and S.W. Carothers. 2007. Southwestern Willow Flycatcher surveys, demography, and ecology along the lower Colorado River and tributaries, 2006. Annual report submitted to U.S. Bureau of Reclamation, Boulder City, NV by SWCA Environmental Consultants, Flagstaff, AZ. 194 pp.
- Pollard, E. 1977. A method for assessing changes in the abundance of butterflies. *Biological Conservation*. 12:115-134.
- Smith, E. P. 2002. BACI design. Volume 1, p 141-148 in *Encyclopedia of Environmetrics*. Abdel H. El-Shaarawi and Walter W. Piegorsch, eds. John Wiley & Sons, Ltd. Chichester.
- Sogge, M. K., R. M. Marshall, S. J. Sferra, and T. J. Tidbits. 1997. A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol. National Park Service Technical Report USGS/NAUCPRS/NRTR-97/12. [p38]
- Stewart-Oaten, A., J. R. Bence, and C. W. Osenberg. 1992. Assessing effects of unreplicated perturbations: no simple solutions. *Ecology* 73:1396-1404.
- U.S. Fish and Wildlife Service. 2000. Southwestern Willow Flycatcher protocol revision 2000. Albuquerque, NM. 14 Feb. 2006.
<http://www.usgs.nau.edu/swwf/Protocol%202000%20memo%20R2.p>