BACKGROUND

The Rillito River Ecosystem Restoration Project totals over 55 acres in Tucson, Arizona. This project was initiated under the U.S. Army Corps of Engineers (USACE) Continuing Authorities Program under Section 1132 of the Water Resources Development Act of 1986 (Public Law 99-660), as amended. Section 1132 authorizes the Secretary of the Army to modify the construction and operations of water resources projects constructed by USACE to improve the quality of the environment consistent with authorized purposes, and to undertake measures for restoration of environmental quality where the construction or operation of a water resources project built by USACE has contributed to the degradation of the fish and wildlife of the environment. In this case, Section 1132 is used to modify an existing flood control project (concrete bank protection) on the south bank of the Rillito River in metropolitan Tucson. This work was coordinated with Pima County Regional Flood Control District (PCRFCD), the nonfederal sponsor, in cooperation with the USACE.

The work plan for environmental restoration of this river ecosystem included an initial site analysis to inventory native plant species and communities present on site as well as comparison to a reference site. This was followed by a 22-month three phase monitoring of native species abundance and biomass. The work plan included a 5-year monitoring schedule. Qualitative monitoring ensured that maintenance issues were addressed as they arose.

This project is committed to conserving groundwater resources through the use of reclaimed water to support new plantings through their establishment period. The design further conserves water through the creation of natural water catchment basins to direct and capture surface water, concentrating it in areas where new plantings will be installed, and the design of a temporary irrigation system with batter-operated valves. The water catchment basins function as passive stormwater harvesting elements, by collecting rainwater that would otherwise run off, and concentrating moisture in basins with native plant materials. The existing increase in soil moisture has been instrumental in the establishment of plant species native to the site. The native plant palette was carefully selected to be able to survive solely on natural precipitation once established – irrigation will be progressively weaned over the first 5 years.

In areas of desirable native vegetation and known locations of native amphibian breeding, the restoration design emphasized limiting surface disturbance to the greatest extent possible. This low-impact approach protects existing vegetation and soil structure, minimizes the potential for ecologically harmful invasive species to establish, and avoids impacts to native small biomes which sites burned in the soil. The preservation of existing native trees in places contributed significantly to the structural diversity of the new plant communities. Intensive invasive species management was performed before and during construction, and continues through the 5-year maintenance period to control and remove invasive species. PCRFCD contracted with an amphibian salvage and translocation project prior to project construction to further limit impacts to these animals. The translocation site is monitored by the habitat restoration specialist both qualitatively and quantitatively before, during, and for five years following the construction year.

DESIGN LESSONS

The Rillito River Ecosystem Restoration Project seeks to model the native prairie ecosystem that existed on this site. The design includes an initial site analysis to inventory native plant species and communities present on site as well as comparison to a reference site. The work plan for environmental restoration of this river ecosystem included an initial site analysis to inventory native plant species and communities present on site as well as comparison to a reference site. This was followed by a 22-month three phase monitoring of native species abundance and biomass. The work plan included a 5-year monitoring schedule. Qualitative monitoring ensured that maintenance issues were addressed as they arose.

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DESIGN SUCCESSES

Species and amounts of seed should be adjusted based on whether the area will be irrigated. Some species, such as saltbush (Atriplex sp.), germinate very readily in irrigated areas, but not in some of the other plantings, whereas the same PLS was inappropriate in non-irrigated areas.

Anticipated level of effort for invasive species control should be specifically called out in the Work Plan. This will ensure that when landscape contractors bid on this work that they understand the scope of "weed control" and budget appropriately.

Contractual commitment for invasive species management needs to ensure an aggressive and responsive schedule that allows for effective control and adaptive management according to the approved Invasive Species Management plan.

Biodegradable hemp/silk erosion control netting was very effective in controlling erosion.

ANNUAL HERBS

- Germination in hydroseeded areas with passive stormwater harvesting basins was delayed but successful without irrigation.
- Flexible but controlled plant palette and seed mix allowed for plant materials to be easily adjusted when availability became an issue, while preserving diversity and density design parameters.

SMALL PERENNIALS

- Performance goals and standards referenced the original design parameters. Monitoring transects were established to document conditions prior to implementation, and during the monitoring period.
- Design Intent was carried through implementation and beyond into the adaptive management and monitoring in Year 1.

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PROCESS SUCCESSES

Invasive species management was performed before and during construction, and continues through the 5-year maintenance period to control and remove invasive species. PCRFCD contracted with an amphibian salvage and translocation project prior to project construction to further limit impacts to these animals. The translocation site is monitored by the habitat restoration specialist both qualitatively and quantitatively before, during, and for five years following the construction year.

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Pima County [Sweetwater] Native Plant Nursery provided restoration quality native plant materials. These seed-grown materials originated from natural local populations and were acclimated to the environment prior to being planted. There was a 22% mortality rate at Area 1, where the plant materials were supplied by commercial wholesale nurseries.

Habitat Restoration Specialist was onsite during plant deliveries to ensure proper species and quantities and to organize the temporary nursery for vegetation community. Plant pots were color coded so that installation personnel who were unfamiliar with the restoration species, were able to carry out the planting per the design.

The Habitat Restoration Specialist worked with the Landscape Contractor to increase site biodiversity [with previously unavailable species] when plants need to be replaced.

Comparison of vegetation treatments at the Rillito River Ecosystem Restoration Project, Areas 1 – 3

<table>
<thead>
<tr>
<th>Species</th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annuan Herbs</td>
<td>12</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Small Perennials</td>
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</tr>
<tr>
<td>Shrubs</td>
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<td>10</td>
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<tr>
<td>Trees</td>
<td>10</td>
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</tbody>
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PROCESS LESSONS

There is no such thing as over-communication.

Monitoring is a crucial component to the maintenance and adaptive management. The Habitat Restoration Specialist is trained to identify issues unique to restoration sites, such as the emergence of invasive species, and the most strategic ways to arrive at ecologically meaningful solutions. Budgets for monitoring need to be preserved throughout the funding process.

Bi-weekly and Monthly monitoring reports were emailed to the entire Project Team to keep everyone apprised of site conditions and management needs. Design Team involvement throughout the design intent was carried through implementation and beyond into the adaptive management and monitoring in Year 1.

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