Pima County Regional Flood Control District
Ecosystem Restoration Projects
RFCD has planned, implemented and manages Ecosystem Restoration Projects within the following watersheds (HUC):

- Upper Santa Cruz River (USCR)
- Lower Santa Cruz River (LSCR)
- Canada Del Oro/Big Wash (LSCR)
- Rillito River (RR)
- San Pedro River (SPR)
Projects chosen based on the following criteria:

- Realistic potential to improve aquatic resources and habitat corridors
- Maximize impact of County-wide restoration efforts
- Conform with goals of SDCP
- Located on RFCD/Pima County owned property
Marana High Plains Oxbow Channel
Marana High Plains Oxbow Channel

Purpose
- Multipurpose underground storage facility
- Groundwater replenishment
- Environmental enhancement

Design Elements
- 11 acres aquatic habitat
- 28 acres preserved riparian habitat
- Habitat to support aquatic & terrestrial species & neotropical migratory birds

Partners
RFCD, PCRWRD, BOR, AZ Water Protection Fund, Town of Marana
Great Egrets

Black necked stilt

Mallard family

Black necked stilt nest

Nest
Marana High Plains Oxbow Channel
Cortaro Mesquite Bosque

2012 5-yr post constr.
Cortaro Mesquite Bosque

Purpose

- Increase biodiversity and riparian vegetation structure on 80 acres of degraded floodplain terrace of Santa Cruz River
- Provide wildlife habitat with diverse vegetation communities (riparian, xeroriparian, riparian scrub, riparian grassland). ‘Edge’ habitat to maximize wildlife use

Design Elements

- Non-potable irrigation water for plant establishment & maintenance
- Stormwater harvesting for habitat sustainability
- Native plants propagated from locally collected seeds and provided by Pima County Native Plant Nursery
Cortaro Mesquite Bosque

August 2007
Large scale water harvesting basin during construction

Aerial view
2010
3-yr post construction

June 2011
3.5 - yr post construction
Cortaro Mesquite Bosque

Top Photos
March 2008
(1st Spring post-constr.)

Bottom Photos
August 2012
(4 yr post-constr.)
Cortaro Mesquite Bosque

Basin Nov. 2007

Basin March 2008

Basin August 2012
Paseo de las Iglesias
Paseo de las Iglesias

Partners
USACE & Pima County
multi-phase, multi-purpose project
completed in 2015

Project Objectives
Public Safety, Recreation; Ecosystem restoration, Erosion & Flood control, River Park project

Design Elements
- Wildlife habitat restoration, preservation of existing habitat
- Water harvesting basins, diverse native plant communities, toad and lizard salvage & reintroduction
- Trail linkage; shared use urban river park system ‘The Loop’ links & Juan Bautista de Anza National Trail
Paseo de las Iglesias

Blind snake/
Western thread snake

Regal horned lizard

Zebra tailed lizard

Desert spiny lizard
Paseo de las Iglesias

Lizard Salvage/Preservation Fencing
Recently metamorphosed Couch’s spadefoot toads at Mesquite Circle Pond
Paseo de las Iglesias

Cooper’s Hawk

Burrowing Owl

Great Egret

Greater Roadrunner

Gambel’s Quail
Paseo de las Iglesias

Post-Project Mitigation

Pre-Project Erosion
Paseo de las Iglesias
Paseo de las Iglesias

Red spotted toad
West Branch Preserve
Bosque Basins
West Branch Preserve
Bosque Basins

Design Elements

- Preserve & enhance habitat connectivity
- Preserve historical plant community
- Habitat for locally rare giant spotted whiptail lizard & narrow-mouthed toad
- Water harvesting, invasive species control, delineation of equestrian & pedestrian paths for neighborhood use, erosion repair and control along river bank
West Branch Preserve
Bosque Basins

August 2012
Project construction

September 2014
2-yr post construction
KERP  Kino Environmental Restoration Project
Partners
USACE Section 1135/Pima County
completed in 2002

Project Objectives
Retain original flood control storage capacity of 125 acre regional basin, add environmental benefits, and conserve groundwater.

Design Elements
• 20 acres of lined ponds and streams
• 7 acre (50-ft deep) pond – provides 92 ac-ft of harvested storm water storage for regional use
• 52 acres of cottonwood willow gallery, mesquite bosque, and riparian shrub vegetation communities
KERP  Kino Environmental Restoration Project

January 1996 (pre-project)

May 2015

October 2002 (during construction)

June 2011
Great blue heron
Great Plains toad
Hooded merganser
Arroyo Chico
Arroyo Chico
Phase 2b
Park Avenue Basins

USACE multi-phase, multi-purpose project completed in 2012

Project objectives
- Provide extensive flood damage reduction by removal of residential, railroad, and interstate from 100-year floodplain.
- Restoration and mitigation focused on creation of naturally sustainable riparian vegetation and habitat for native lizards, amphibians, and bird species.

Design elements
- 33 acre, 3-basin project excavated 12 to 20 feet below grade
- 22 acres of riparian ecosystem restoration, mitigation, and preservation
- Supports 6 species of native lizards, 2 species of native toads, and dozens of nesting and migratory bird species
Arroyo Chico
Phase 2b  Park Avenue Basins

April 2008

May 2014
Arroyo Chico
Phase 2
Park Avenue Basins

Regal horned lizard

Side blotched lizard
Great plains toad

Diving beetle

Backswimmer

Aquatic Invertebrates
Arroyo Chico
Phase 2b  Park Avenue Basins
Purpose
Serve as mitigation (under RFCD Riparian Habitat Ordinance) for disturbance to xeroriparian habitat downstream within the Julian Wash watershed

Design Elements
- Repair and prevention of side slope erosion
- Invasive species control
- Establishment of native vegetation
- Utilization of harvested stormwater for plant sustainability
- Tall-pot planting technique to encourage deep rooted plants provided by Pima County Native Plant Nursery
Kolb Basin

1. planting zones

2. tall pots

3. hydroseeding

- Microbasin Bottom (MB): analogous to naturally occurring depressions, these areas are subject to long periods of inundation and fine sediment deposits; generally, species in this group are non-woody and annual.
- Microbasin Terrace (MT) and Channel Rim (CR): analogous to the margins of depression and streams, these areas are inundated only in times of moderate to large storm events. Plant species within these areas can withstand temporary inundation, and depend upon increased water availability in the soils of adjacent zones for root growth.
- Upland Inundated (UI): analogous to upland areas that experience rare short flow inundation, the species within this zone must be able to withstand rare inundation from the master detention basin in large events, and are either non-woody, succulent, or woody. Sonoran desert species common to dry hillsides are excluded from this group.

Key Questions for Design Decision:

1. Which zones of the site will experience high-velocity flow, precluding plant growth?
2. In which areas must maintenance vehicles be able to pass?
3. Which zones of the site will experience frequent inundation? Infrequent inundation? No inundation?
4. Based upon soil condition, subsurface improvements, and volume of flow, how long will the recharge zone remain saturated over the course of the year? What is the target plant community based upon these conditions?
5. Are there invasive plant species in the contributing watershed?
Kolb Basin

Pre-Project 2011
Side slope erosion

Planted Bench June 2015
Erosion mitigation

Alkali sacaton
Cane bluestem
Tobosa grass
Whiplash pappusgrass
Kolb Basin Environmental Restoration

- Regal horned lizard
- Javelina
- Wilson’s warbler
- Wildlife drinker
- Cottontail rabbit
- Harris’ antelope squirrel
Detention Basins
– Countryside - Massingale - Kolb - Rita –
Big Wash Ecosystem Restoration Project
Big Wash Ecosystem Restoration Project

Purpose
Mitigation for disturbance to riparian habitat and floodplain terrace (under RFCD Riparian Habitat Ordinance)

Design Elements
- 77 acres of degraded agricultural floodplain terrace
- Water harvesting for sustainability
- Diverse planting to benefit SDCP Priority Vulnerable Species, particularly endemic Rufous-winged sparrow, Bell’s Vireo and Abert’s Towhee
- Replacement of invasive species with native plants to increase biodiversity
- Locally collected seed used to propagate project plants
Big Wash Ecosystem Restoration Project
Big Wash Ecosystem Restoration Project

Javelina
Coyote
Common kingsnake

Gray fox
Bobcat
Couch's spadefoot

Round tailed ground squirrel
Mule deer
Regal horned lizard
Big Wash Ecosystem Restoration Project

Bell’s vireo

Vesper sparrow

Abert’s towhee

Yellow-rumped warbler

Rufous-winged sparrow

White-crowned sparrow
Swan Wetlands

Project Objectives
- Mitigation for adverse environmental impacts of soil cement bank protection.
- To restore habitat for native flora and fauna while also providing passive recreation.
- Preserve functionality of flood control infrastructure

Design Elements
- Water harvesting for sustainable habitat
- Increase aquatic habitat through channel meander
- Reclaimed water use for establishment irrigation
- Amphibian preservation, salvage & translocation
- Monitoring & invasive species control
Swan Wetlands

- 2005 Pre-Project
- 2008 Construction
- 2010 2-yr Post-Constr.
Swan Wetlands

Pre-Project 2004

2010 6-yr Post Constr.
Swan Wetlands

Atriplex species provide excellent habitat for Gambel’s quail

Atriplex lentiformis – Quail bush

Atriplex canescens – Fourwing saltbush
1996 – Partnership with USFWS & AZGFD Partners for Wildlife
- Establishment of mesquite bosque & sacaton grassland on former agricultural land adjacent to Cienega Creek
- Increase structure & diversity of native habitat for benefit of neotropical birds
- Improve stream function & control erosion
- Seed collected onsite for plant propagation
- Monitoring program for restored sacaton & stream function

2014 – Lowland Leopard Frog Conservation; RFCD & Cienega Watershed Partnership
- Ponds to provide permanent refuge & breeding habitat to protect frog population during flooding and cold winter temperatures
- Habitat restoration benefit Mexican garter snake, Huachuca water umbrel, and Gila topminnow
Pantano Jungle 1 & 2

Lowland leopard frog
Bingham Cienega

Deciduous Riparian Woodland Restoration
Stewardship/monitoring/restoration

1999 Pre-Project

2004 5-yr post construction
**Bingham Cienega**

**Design Elements**

- 300 acre agricultural site contains a rheocrene spring
- **1989** restoration - breach agricultural dam for 30 acre marsh re-establishment
- **1997** – AZ Water Protection Fund Grant - sustainable restoration of 50 acres of sacaton grassland and mesquite bosque, plus 10 acres of Sonoran Decidous Forest for Botteri sparrow habitat
- **2004** – RFCD, TNC, AZGF partners in Long-fin Dace release
- Seed for trees and sacaton propagation collected onsite
- Habitat for yellow billed cuckoo, willow flycatcher, zone tailed hawk, narrow mouthed toad, gray fox
- Recent drought conditions have caused diminished flows in San Pedro River and the spring but obligate wetland species such as yerba mansa, netleaf hackberry & cottonwood persist
Bingham Cienega

Net leaf hackberry
Yellow-billed cuckoo
Zone-tailed hawk
Yerba mansa
Botteri’s sparrow
Willow flycatcher
Instant Bosque

Just add water.....