

The Once and Future River: Historical Conditions Report and Anticipated Future of an Effluent Dependent Stream

AKITSU KIMOTO ¹

James DuBois ²

Julia Fonseca ³ 1 - Pima County Regional Flood Control District

Brian Powell ³ 2 - Pima County Regional Wastewater Reclamation Department

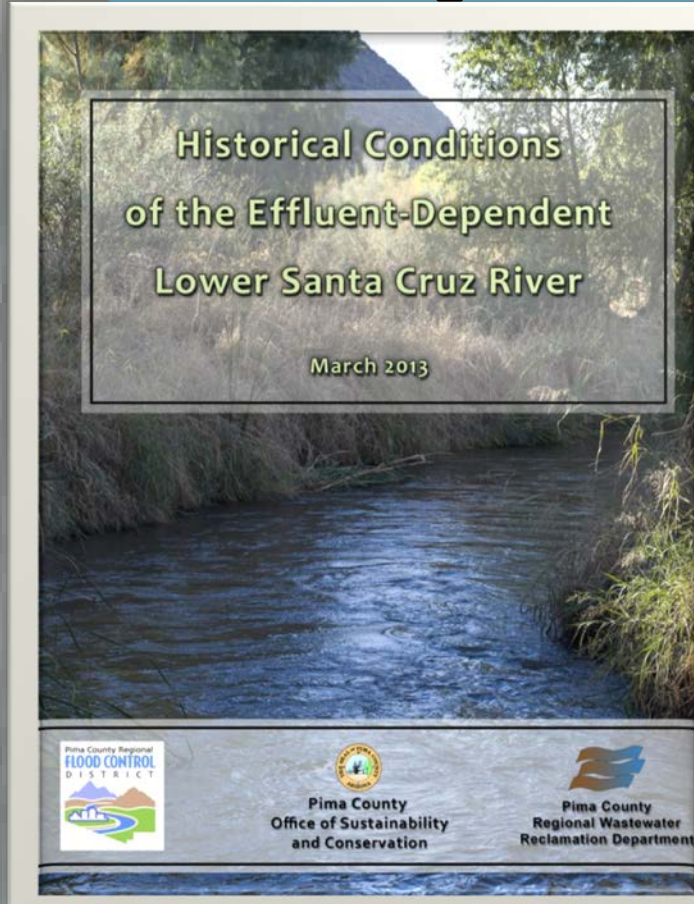
Jacob Prietto ⁴ 3 - Pima County Office of Sustainability and Conservation

Evan Canfield ¹ 4 - University of Arizona, Department of Hydrology & Water Resources

Background: The Regional Optimization Master Plan (ROMP) will upgrade the two major regional wastewater treatment plants discharging to the Lower Santa Cruz River. Pima County launched a “Living River” project for the Lower Santa Cruz River with financial assistance of EPA.

Historical Conditions Report

- **Objective:** Understand the historical and existing wetland conditions in the Lower Santa Cruz River.
- **Approach:** Compile and interpret existing data.
- **Benefit:** The report will provide the historical context for developing monitoring strategies of the Living River Project.



- Stream Discharge and Loss
- Changes in Channel
- Geomorphology
- Vegetation
- Water Quality
- Macro Invertebrate
- **Anticipated Changes due to the ROMP Upgrades**

The ROMP Upgrades

Existing and Projected Capacities of WRFs in MGD (AFY)

	Existing	Projected
Ina Rd WRF	37.5 (42,000)	50 (56,000)
Roger Rd WRF	41 (45,920)	32 (35,840)

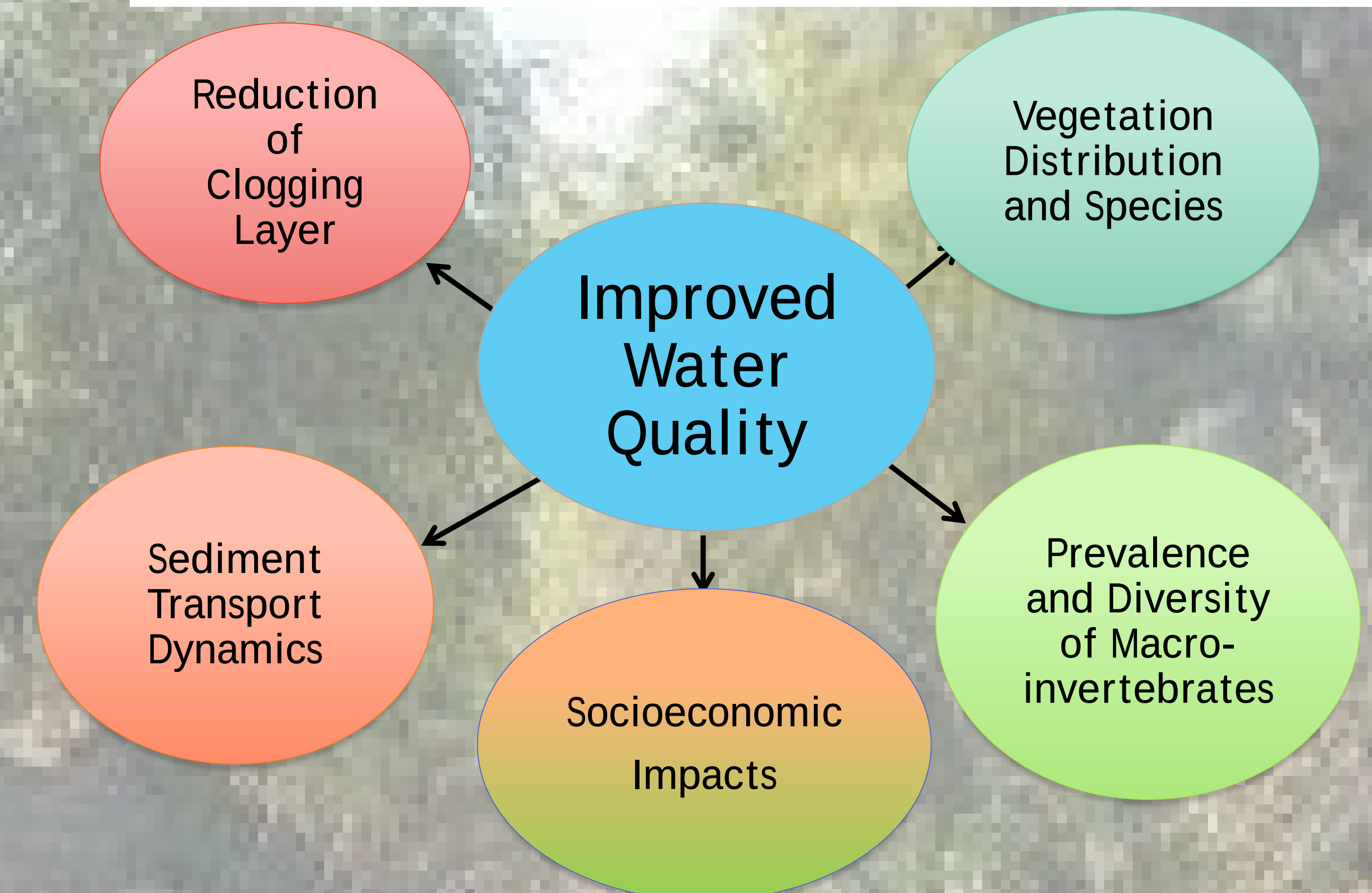
Water Reclamation Facility (WRF) Compliance with ADEQ Regulatory Requirements



Expected Water Quality Changes from ROMP

	Existing Concentration (mg/liter)		Expected Concentration (mg/liter)	
	Ina Rd WRF	Roger Rd WRF	Ina Rd WRF	Roger Rd WRF
Nitrogen	26	31	2.5	2.3
Phosphorus	3.4	4	< 1	< 1
BOD	12	10	2.4	2.7
TSS	7	16	3.1	3.3

Anticipated Changes in the Effluent-Dependent Lower Santa Cruz due to ROMP Upgrades



Possible Changes in Physical Processes

- *Reduction of the Clogging Layer* results in increased infiltration:
 - Deeper wetting area close to outfalls
 - More drying at distal end of effluent reaches
- *Sediment Transport Dynamics* is affected by biotic cohesion:
 - Reduced biotic cohesion causes less trapping of small particles in the clogging layer (schmutzdecke).
 - Changes in sediment transport characteristics of the effluent flows affects effluent flow channel geomorphology.

Possible Changes in Biota

- *Changes in Vegetation Distribution and Species:*
 - Change in access to water because of improved infiltration and reduction in effluent discharge at Roger Rd. WRFs
 - ❖ Deeper wetting area close to outfalls
 - ❖ More drying at distal end of effluent reaches, especially Roger-to-Ina reach.
 - Reduced nitrogen loading may cause some shifts in the composition of wetland forbs.
 - Increasing the salt load may favor tamarisk and discourage salt-sensitive species.
- *Changes in Prevalence and Diversity of Macroinvertebrates:*
 - Possible increased diversity because of reduced ammonia, TKN, suspended solids as well as increased dissolved oxygen.

Possible Socioeconomic Impacts

- Improved Economic Development as the Lower Santa Cruz is viewed as an amenity rather than a liability.
- Improved Public Perception because of reduced odor.
- Increased Effluent Use because of availability of a higher quality effluent.