



SAN DIEGO STATE
UNIVERSITY



CENTER FOR EARTH SYSTEM SCIENCES
AND REMOTE SENSING TECHNOLOGIES

AGRICULTURAL AND HYDROLOGIC RESPONSES TO CHANGING WATER SUPPLIES IN IMPERIAL VALLEY, CALIFORNIA

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CSU Water Resources and Policy Initiative Conference

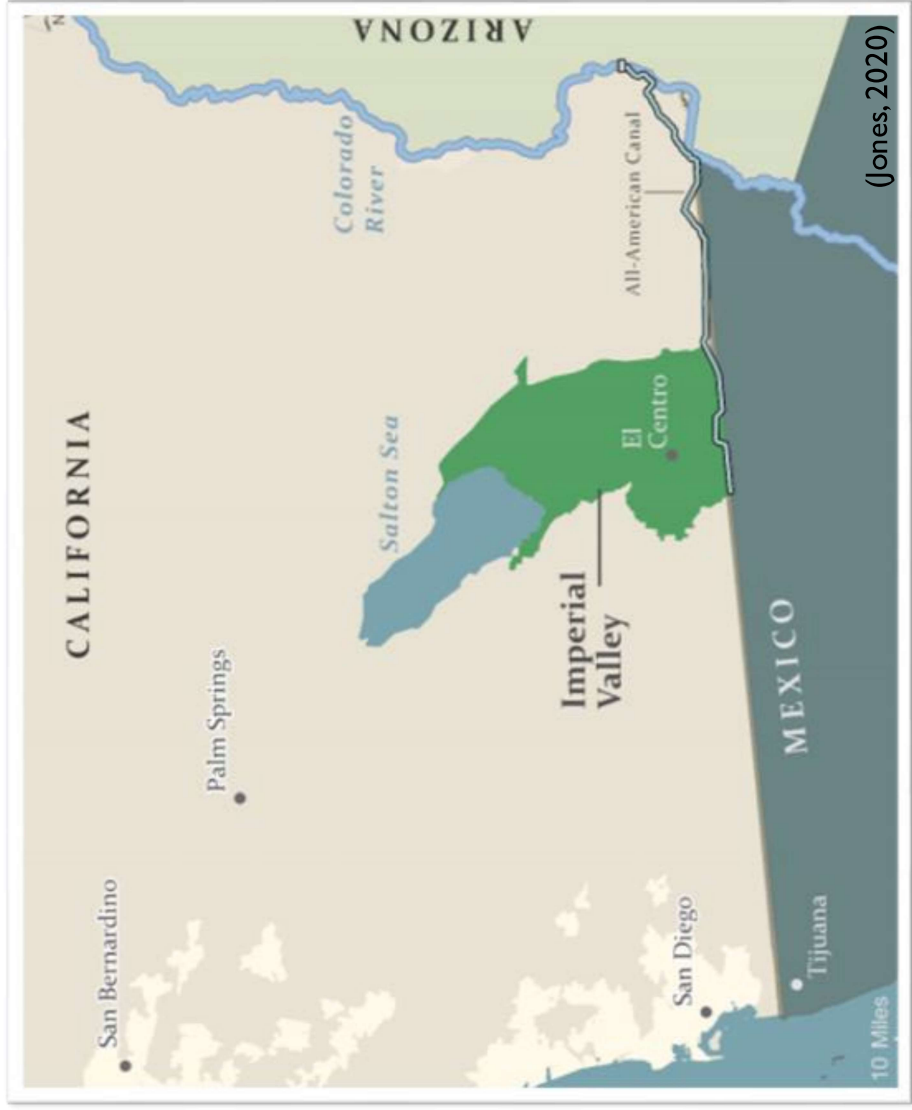
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OUTLINE

1. Background – Imperial Valley and the QSA
2. Framework – What do we know?
3. Research Question
4. Mixed Methods Approach and Execution
5. Results – Water Quantity and Quality
6. Future Goals and Applications

BACKGROUND: THE IMPERIAL VALLEY



THE QUANTIFICATION SETTLEMENT AGREEMENT (QSA)

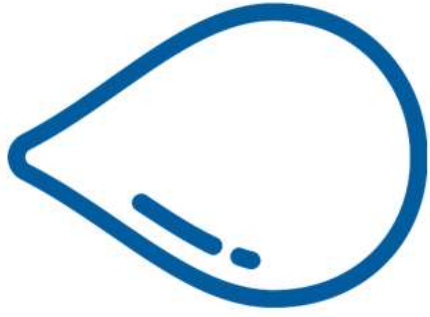
- Enacted in 2003 by several water-governing bodies to reduce overdependence on the Colorado River
- Required the Imperial Valley to transfer large amounts of water to San Diego County for up to 75 years
- Agriculture-to-urban transfers were enabled by fallowing and water conservation programs in the Imperial Irrigation District
- Reduced the overall volume of water delivered to the Imperial Valley



WHAT DO WE ALREADY KNOW?

- Aridland agricultural systems are sensitive to changes in water supply because they rely on imported water (Clemmens, 2008)
- Decreased water availability can strain rural communities that depend on agriculture (Cortez-Lara, 2014)
- Competition with urban and metropolitan water demand contributes to stress (Varady, Scott, Wilder, & Morehouse, 2012)
- Water scarcity – Does demand exceed supply?

How did the hydrologic and agricultural systems of the Imperial Valley respond to the decreased water supply brought on the Quantification Settlement Agreement (QSA)?



Hydrologic
Data Analysis



Basic
Economics

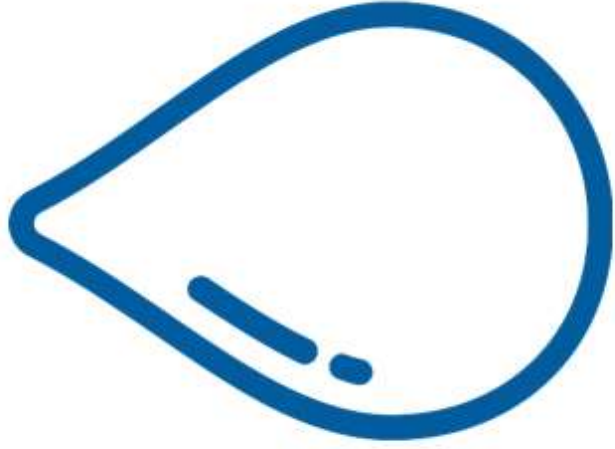


Remote Sensing
& GIS



Key Informant
Interviews

MIXED-METHODS APPROACH



HYDROLOGIC DATA ANALYSIS

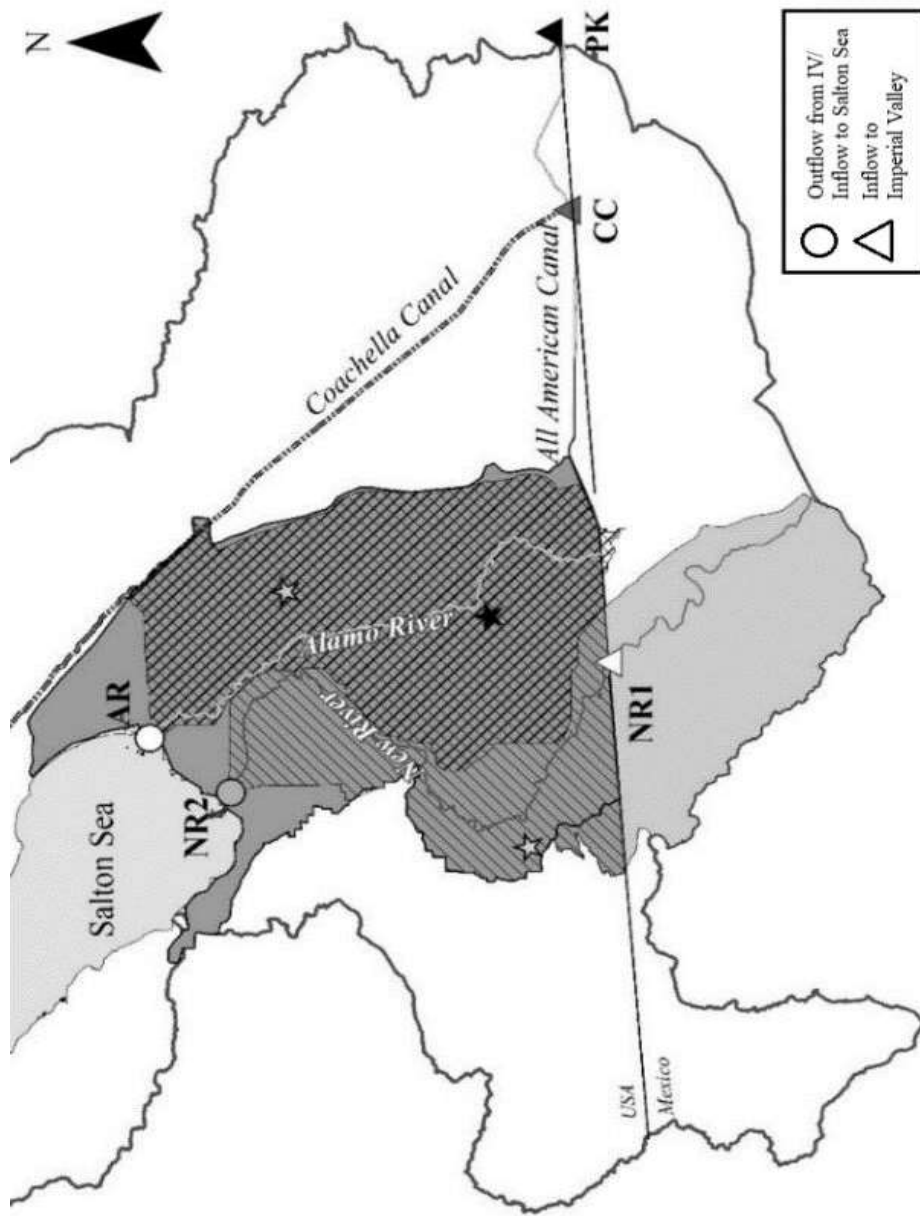
WATER BALANCE

Inflow & Outflow

Total Consumptive Water Use (TCU)

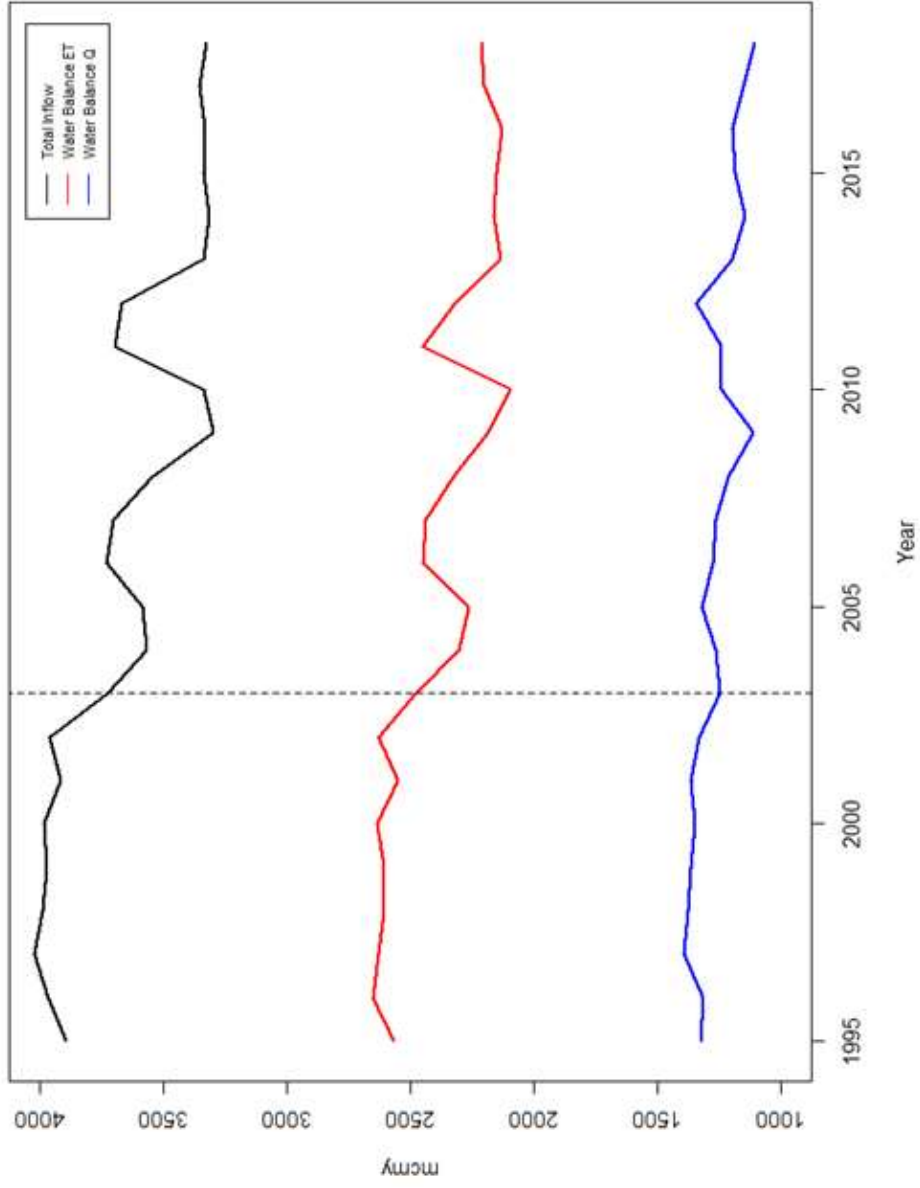
WATER PRODUCTIVITY

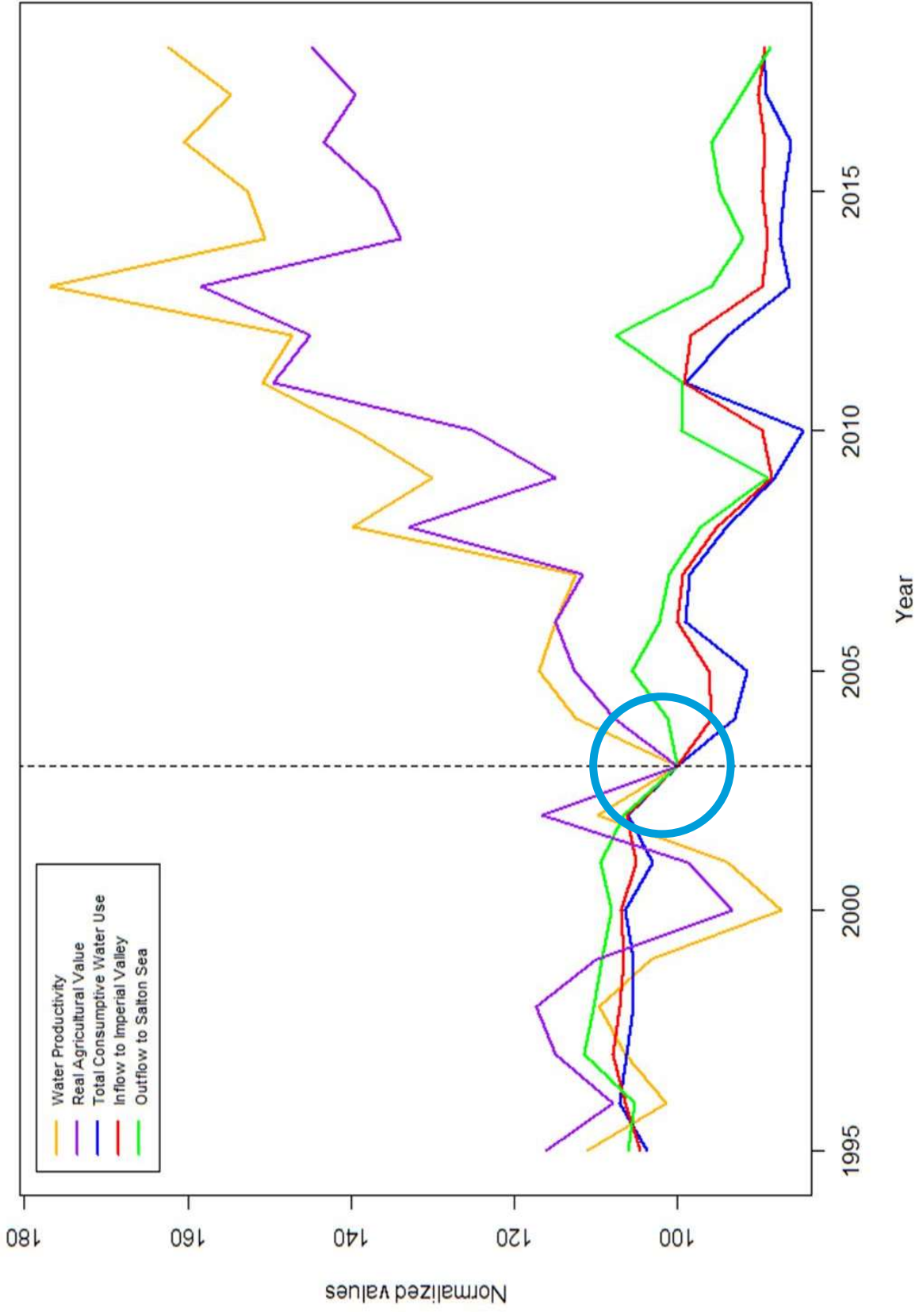
\$/Acre-Foot



(Salinas, 2017)

WATER QUANTITY





KEY INFORMANT INTERVIEWS

Tina Shields

*Professional expert from Imperial Irrigation District (IID)
working within the framework of the QSA*

Michael J. Cohen

*Researcher from The Pacific Institute with academic and
scientific interest in the Imperial Valley*

Luis Olmedo

*Director of Comite Civico de la Valle, interested in
community-level responses to the QSA's impact*



“ **Water is not a limiting factor of irrigation in the Imperial Valley. So, in the upper basin of the Colorado, demand regularly exceeds supply. There's simply not enough water in the river at the right time, for farmers to irrigate the crops as much as they'd like...but in the Imperial Valley they basically use as much water as they want.** ”

WATER AVAILABILITY AND WATER SCARCITY IN IMPERIAL VALLEY

“ **[Water] scarcity is not our issue. One thing we will never do is if somebody calls and wants water and says there's a crop in the field, we'll never say no.** ”

KEY INFORMANT RESPONSES

“ If they have a high water use crop, then maybe this field, it has to be a lower water use crop or maybe they have to put drip [irrigation] on this field. But **I don't think that their crop choices are affected by the water availability.** I think it's based on **market conditions** and how much money will they make and how they manage their farm. And frankly, now that we have this on-farm conservation program where we fund conservation measures, **that's part of their business model.** ”

WHY DID WATER PRODUCTIVITY INCREASE WITH A DECREASED WATER SUPPLY?

“ I don't know that the farmers were thinking more broadly about the Valley, or the Colorado River Basin as a whole. **I think they're making local business decisions...**for \$400 to \$500 per acre of land, it's a pretty good return for a lot of farmers, particularly for growing crops like alfalfa, which often generate a return of \$100 an acre. So, it's a pretty good financial incentive. I think that was probably the main driver. ”

KEY INFORMANT RESPONSES

“ The biggest single change is the Salton Sea...the elevation's dropped eight and a half feet from when the QSA was signed, 25,000 acres of Salton Sea lakebed have been exposed. These are significant changes. Fish are largely absent back in the Salton Sea. **The salinity of the Salton Sea increased by probably 25% or even 30%**, so it's a very different ecosystem than it was 15 years ago. ”

WATER QUALITY AT THE SALTON SEA

“ The QSA is exacerbating Salton Sea problems...it's not causing them, it's not the root of all evil, but **it is definitely exacerbating it from an environmental standpoint.** ”

KEY INFORMANT RESPONSES

RESULTS: WATER QUANTITY



Water Supply/Canal Inflow
Total Consumptive Water Use
Water Discharge/Outflow to the Salton Sea



Annual Water Productivity of IV

Suggests that agricultural communities can **adapt** to reductions in water supply, as well as **increase** agricultural production value and system efficiency.

RESULTS: WATER QUALITY



According to Key Informants, Salton Sea water quality (and ecosystem health) are **declining**



Key Informants also suggest that local communities are experiencing **negative effects** regarding water quality, *potentially* due to QSA policy



FUTURE GOALS AND APPLICATIONS

- Assess the effectiveness of the Quantification Settlement Agreement
- Contribute to conversations surrounding water management in the IV
- Provide insight into hydrologic, socioeconomic, and agricultural change for local and regional stakeholders
- Inform future adaptations to changing water availability and quality

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