

Historical Changes in the Lower Santa Cruz River

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Background

Lower Santa Cruz River: Effluent-Dependent River

- * Efforts to Restore Ecosystems along the River
 - * Regional Optimization Master Plan (ROMP, PCRWRD): Two major regional wastewater treatment plants upgrade
 - * Effluent Quality will improve
 - * There is a possibility water providers/non-providers may take more of it.



Background

- * Lower Santa Cruz River Management Plan (COT/PC)
 - * Better Resource Assessment of the Lower SCR

Study Needs for Lower Santa Cruz Management Plan:

- * Better understanding of effluent flow conditions of the Lower SCR

Focus of this study:

- * Evaluate low flow channel changes in the Lower SCR

Study Reach and Data

- * Study Reach

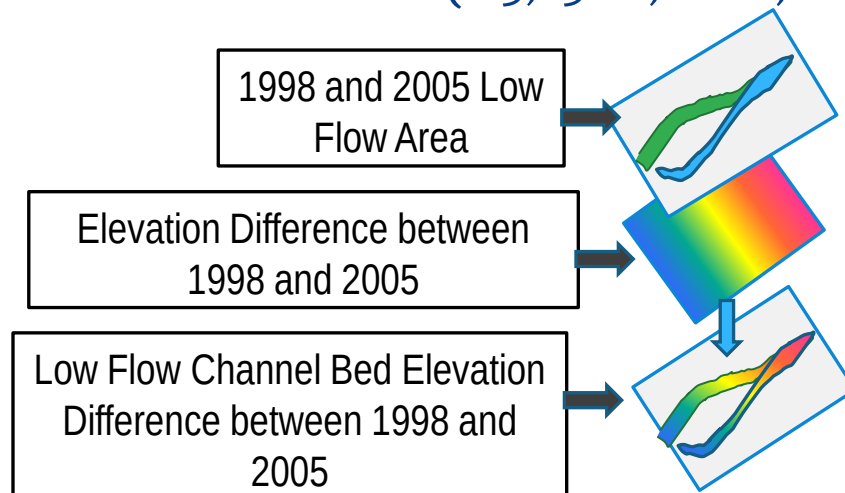
- * Sweetwater Dr. to Trico Rd. (~28 miles)
- * Divided into 7 Reaches based on Road Crossing
 - * Sunset Rd., Ina Rd., Cortaro Rd., Twin Peaks Rd., Cement Plant Rd., Avra Valley Rd., Sanders Rd.

- * Data Used

- * Aerial Photos (1998, 2002, 2005, 2008, 2010, 2011)
 - * 1998: Black and White
 - * 2002-2011: Color
- * DEM (1998, 2005, 2008): 20 feet
 - * 1998 DEM was developed by using 2-ft contour and points spaced 30-ft apart
 - * 2005, 2008 DEMs were created from LiDAR data

Data Analysis

- * Evaluate Changes in **Low Flow Channel**
 - * Location and Flow Area: Digitize Low Flow Area using Aerial Photos
 - * **Bed Elevation***: (*LiDAR data represents water surface, not the bottom of a channel*)
 - * Elevation Difference within Low Flow Channels between Two Periods
 - * Divided into 8 Classes (<-3, -3~-2, -2~-1, -1~0, 0~1, 1~2, >3: feet)



- * Volume: Flow Area x Bed Elevation Difference (use middle value of a class)

Results

Low Flow Channels in the Lower SCR

- * **Result 1: Location Changes**

- * Result 2: Flow Area Changes
- * Result 3: Bed Elevation Changes
- * Result 4: Volume Changes

Result 1: Major Location Change between

Ex. Sanders-A

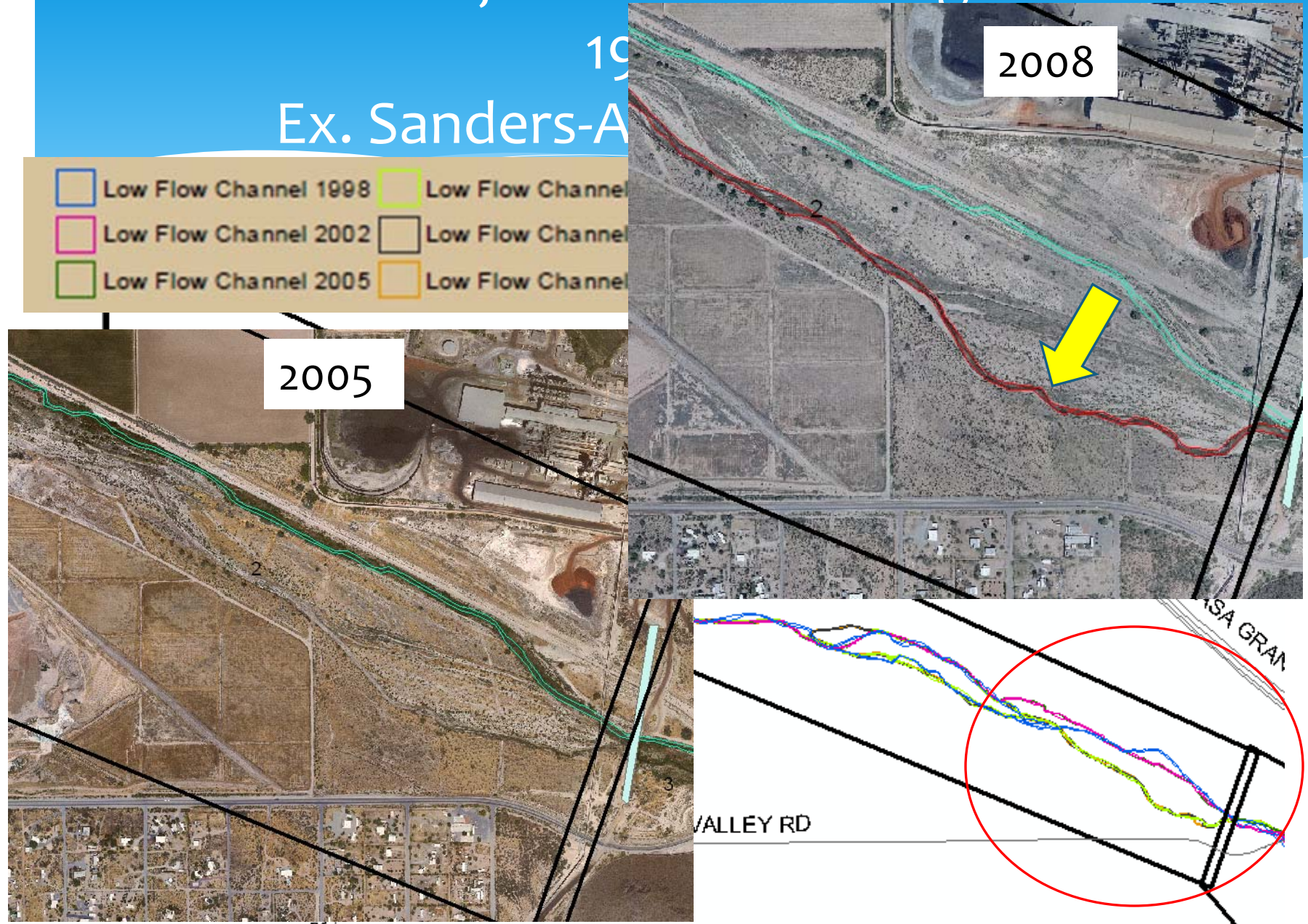
- | | |
|--|--|
|  Low Flow Channel 1998 |  Low Flow Channel |
|  Low Flow Channel 2002 |  Low Flow Channel |
|  Low Flow Channel 2005 |  Low Flow Channel |

2005

2008

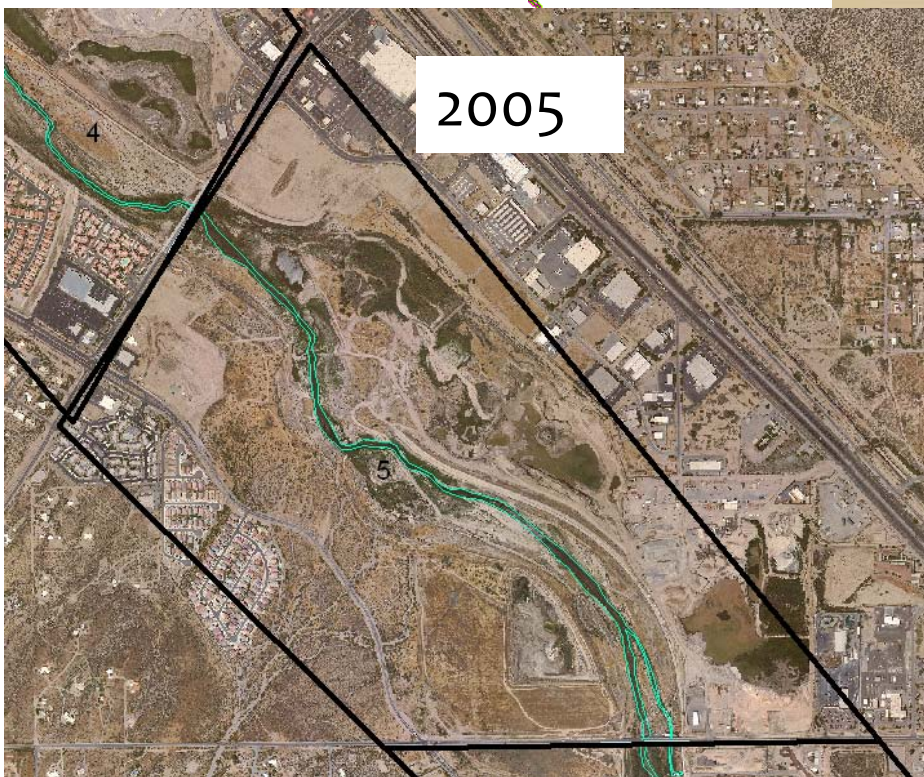
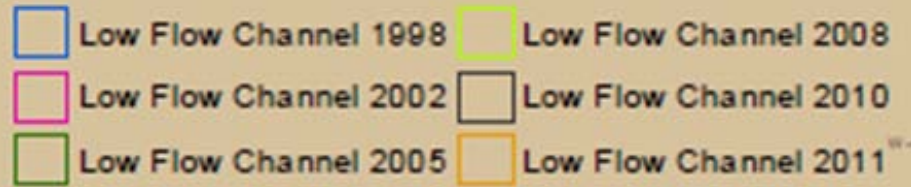
VALLEY RD

ISA GRAN



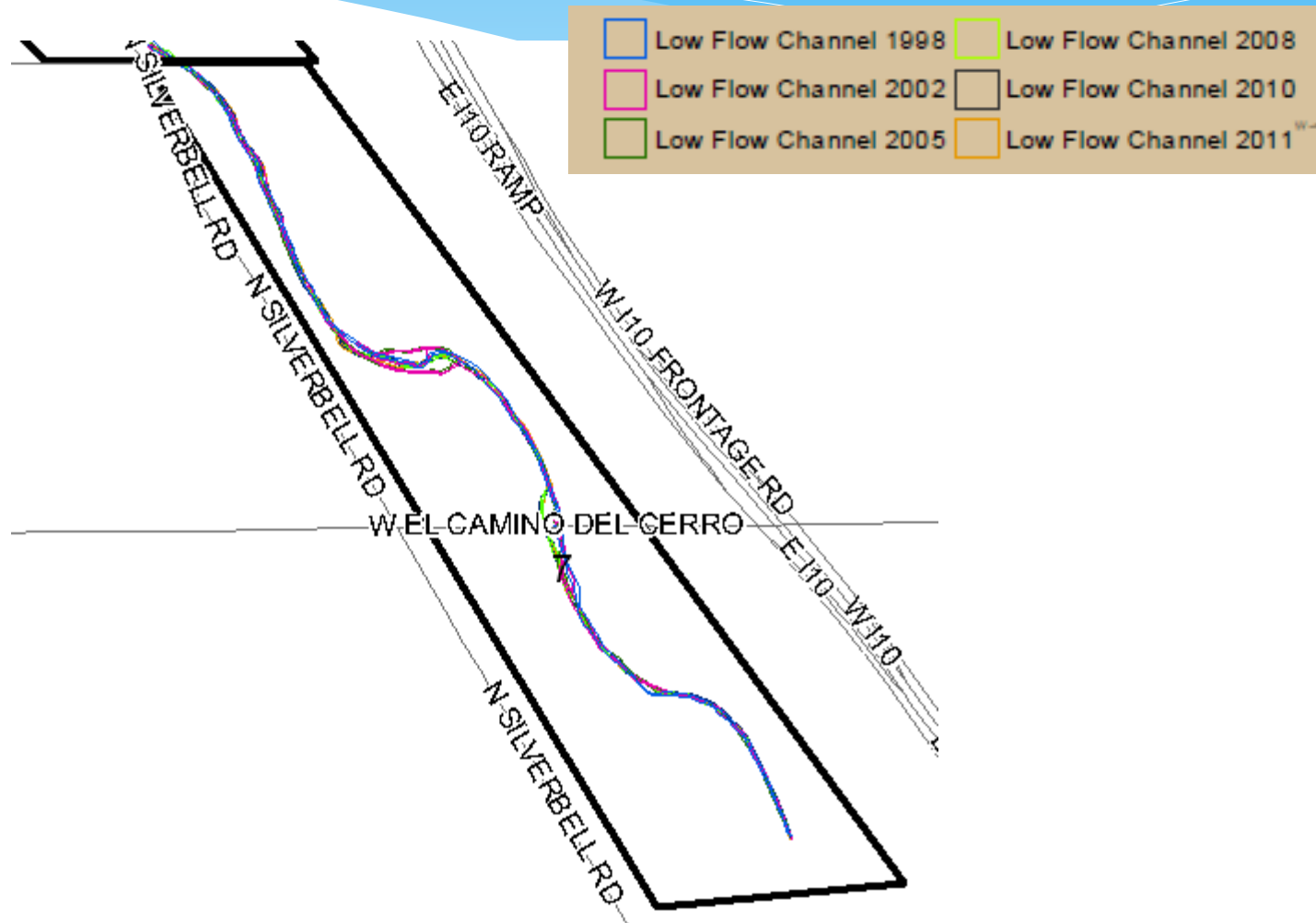
Result 1: Major Location Change between 1998-2011

Ex. Ina – Cortaro (Reach 5)



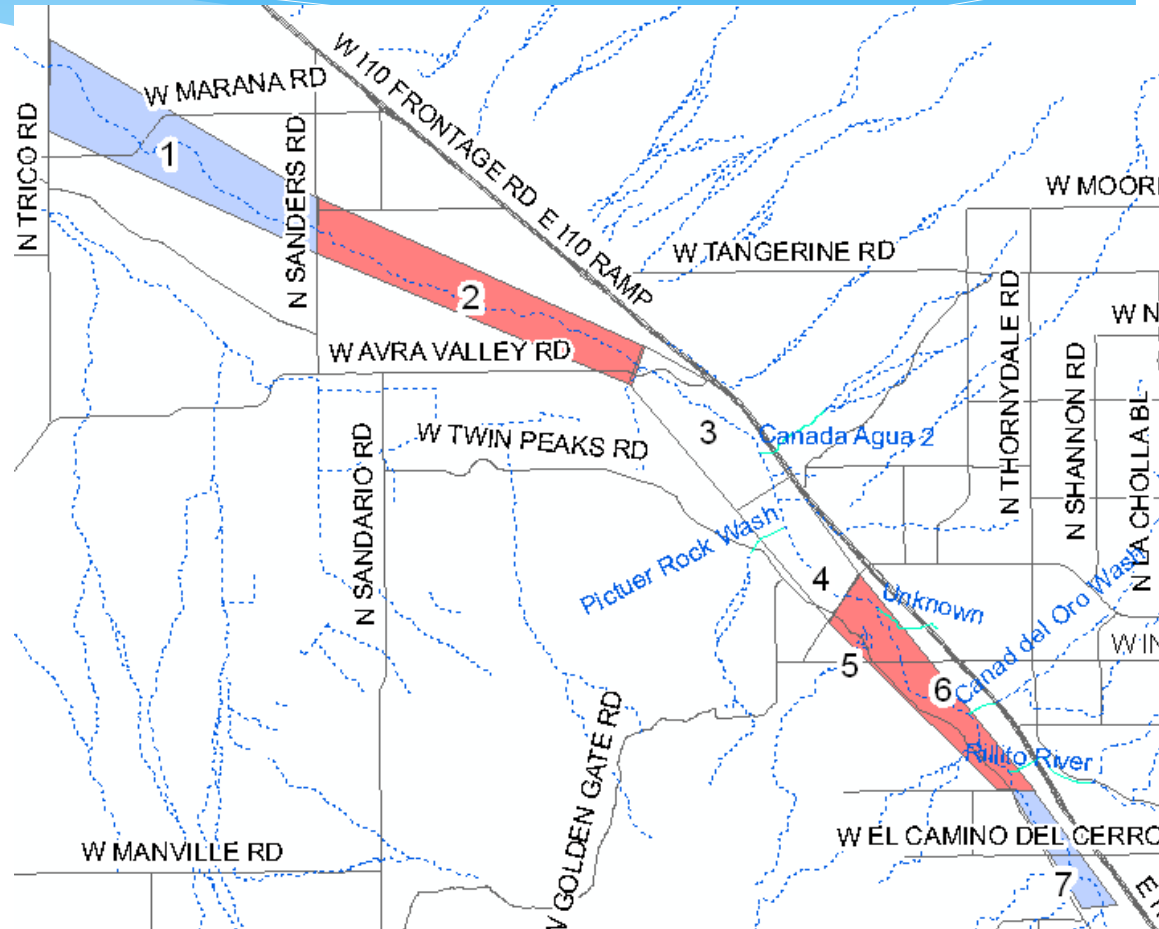
Result 1: Minor Location Change between 1998-2011

Ex. Sunset-Sweetwater (Reach 7)



Result 1: Location Change between 1998-2011

- * Major Changes (Red):
 - * Sanders- Avra Valley (2)
 - * Cortaro- Sunset (5 and 6)
- * Minor Changes (Blue):
 - * Trico-Sanders (1)
 - * Sunset-Sweetwater (7)



Results

Low Flow Channels in the Lower SCR

- * Result 1: Location Changes

- * **Result 2: Flow Area Changes**

- * Result 3: Bed Elevation Changes

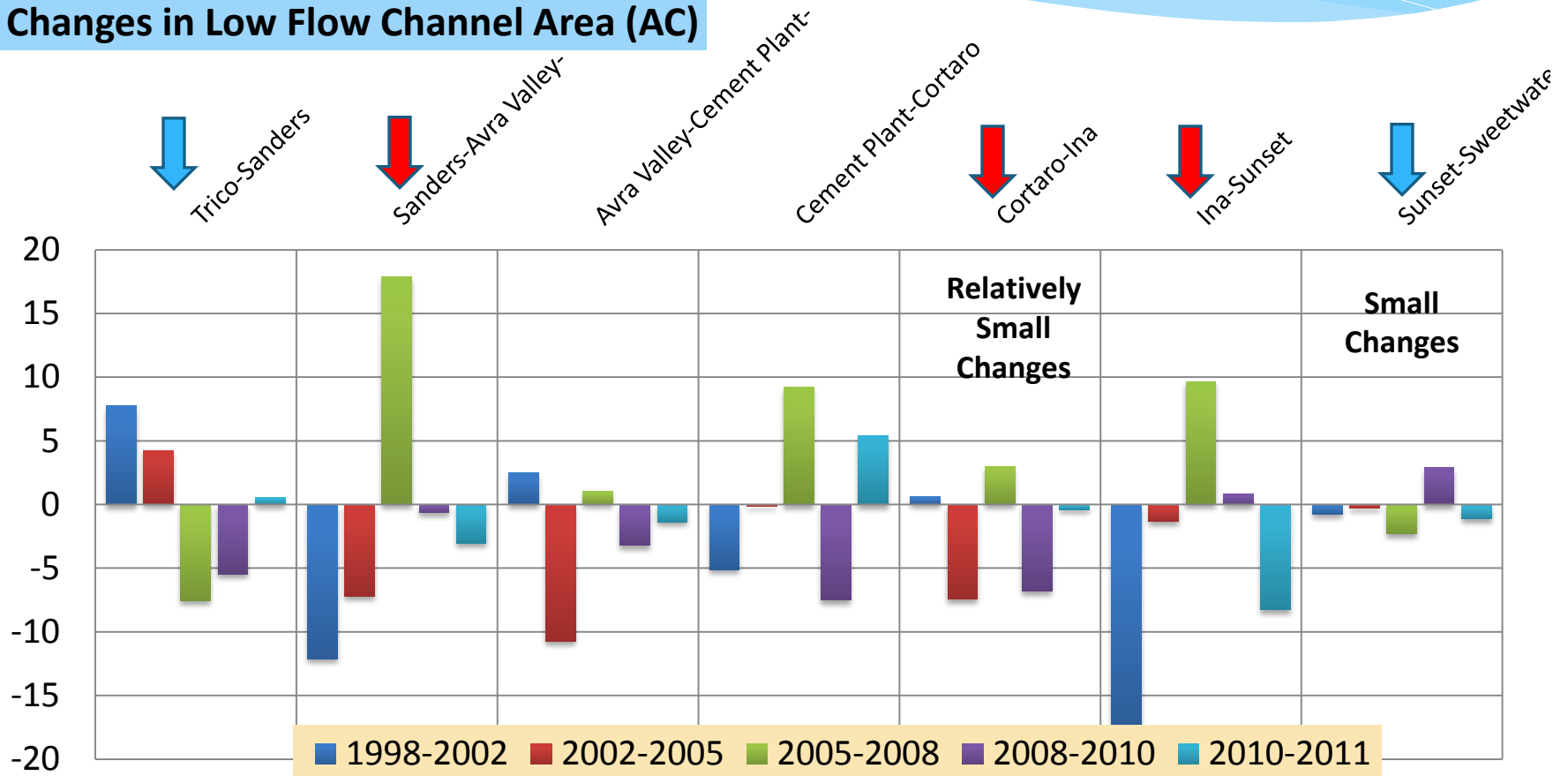
- * Result 4: Volume Changes

Result 2: Flow Area Change between 1998-2011

* Pattern of Area Changes varied

- * Major Location Changes: Red
- * Minor Location Changes: Blue

Changes in Low Flow Channel Area (AC)



Results

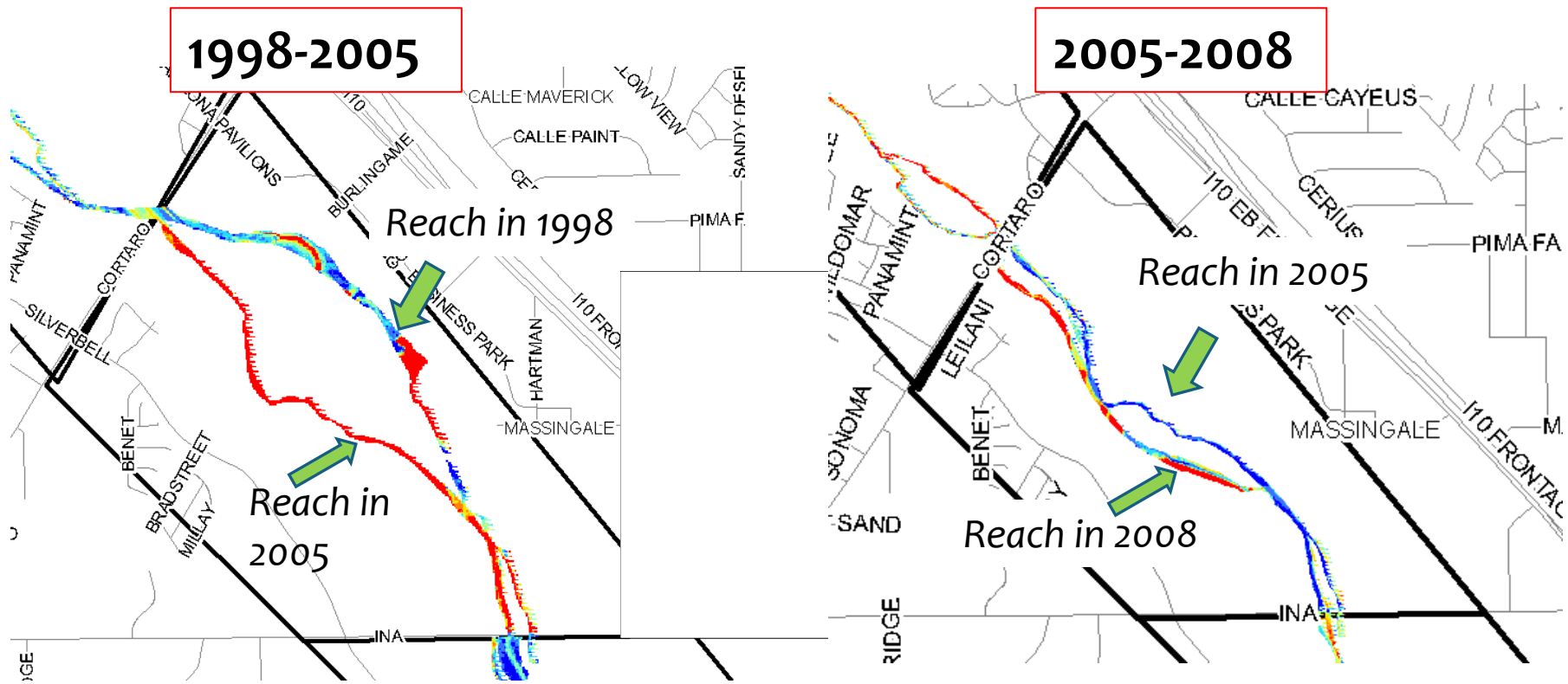
Low Flow Channels in the Lower SCR

- * Result 1: Location Changes
- * Result 2: Flow Area Changes
- * **Result 3: Bed Elevation Changes**
- * Result 4: Volume Changes

Result 3: Channel Bed Elevation Changes Ex. Cortaro-Ina (Reach 5)

Elevation Change within Low Flow Channel in 1998 and/or 2005, 2005 and/or 2008

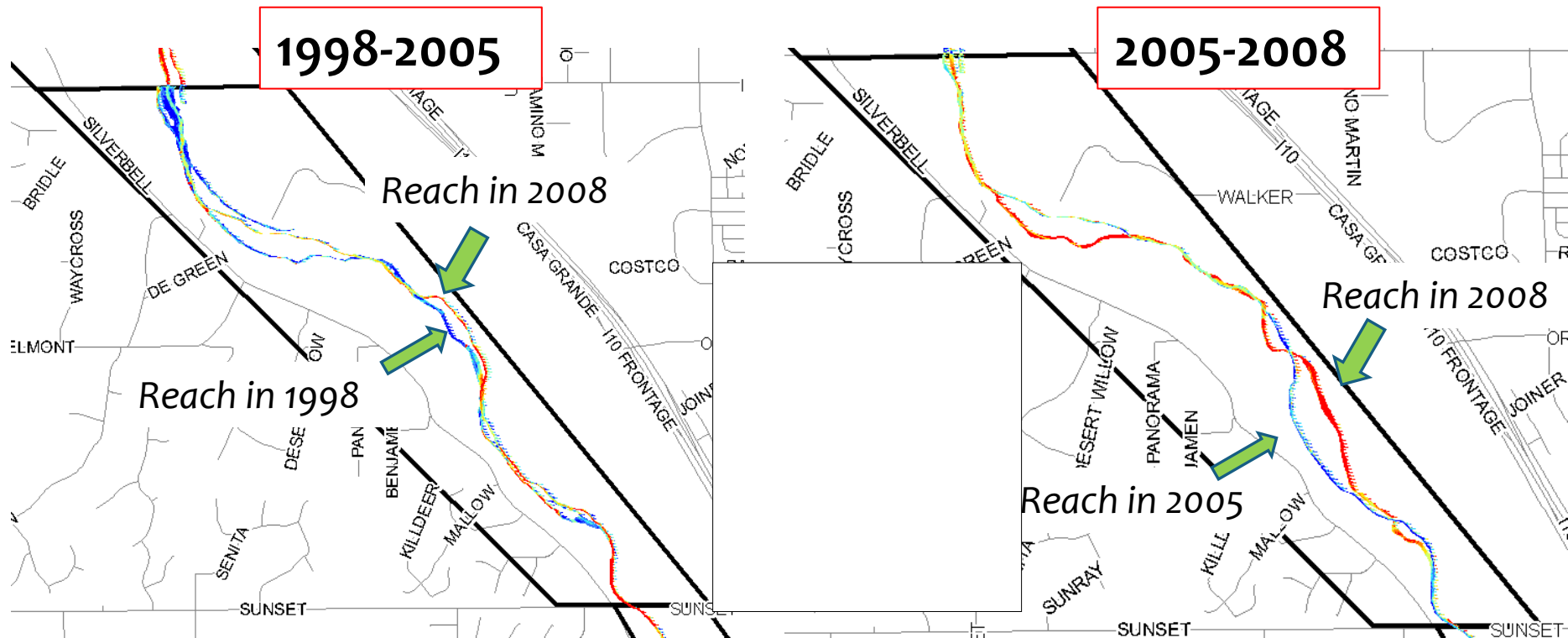
- * Major Location Changes (Result 1)
- * Deep Erosion/Deposition



Result 3: Channel Bed Elevation Changes

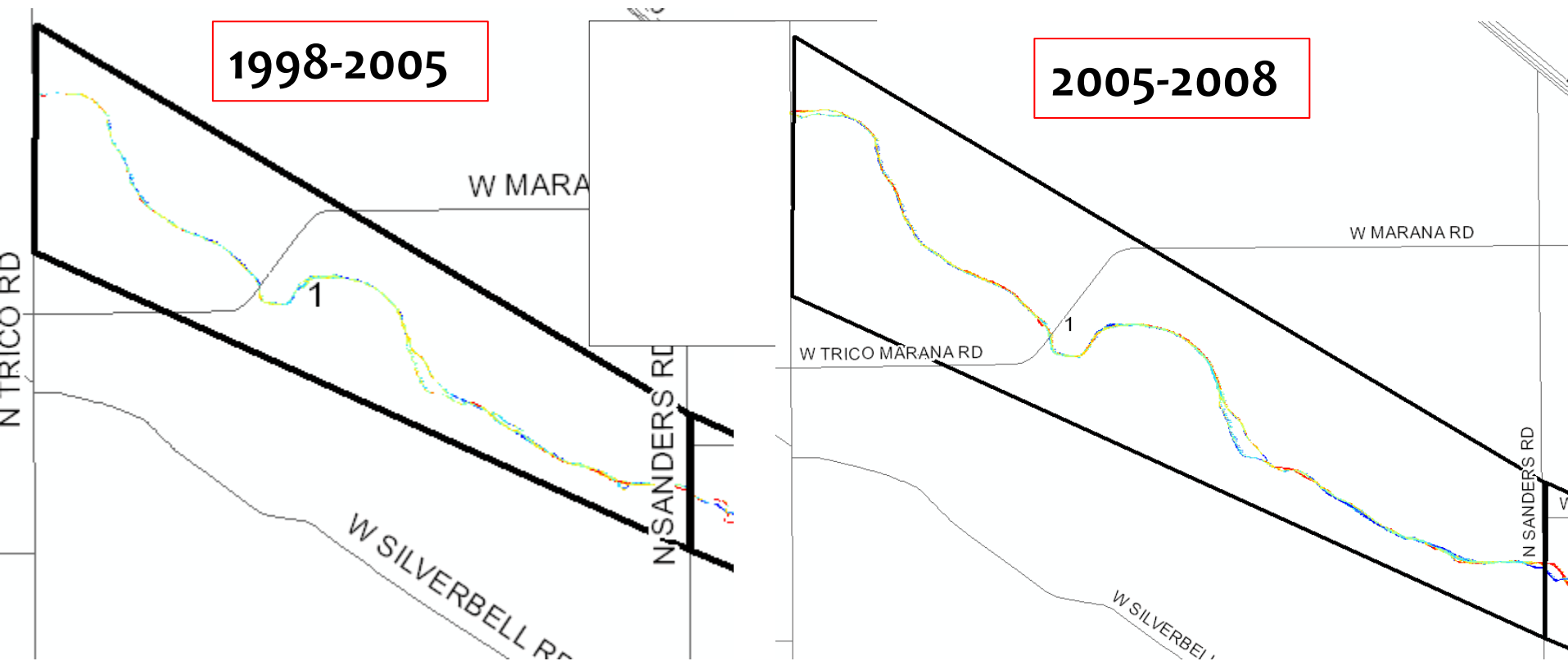
Ex. Ina- Sunset (Reach 6)

- * Major Location Changes (Result 1)
- * Deposition Dominant between 1998-2005
- * More Erosion occurred between 2005- 2008



Result 3: Channel Bed Elevation Changes Ex. Trico- Sanders (Reach 1)

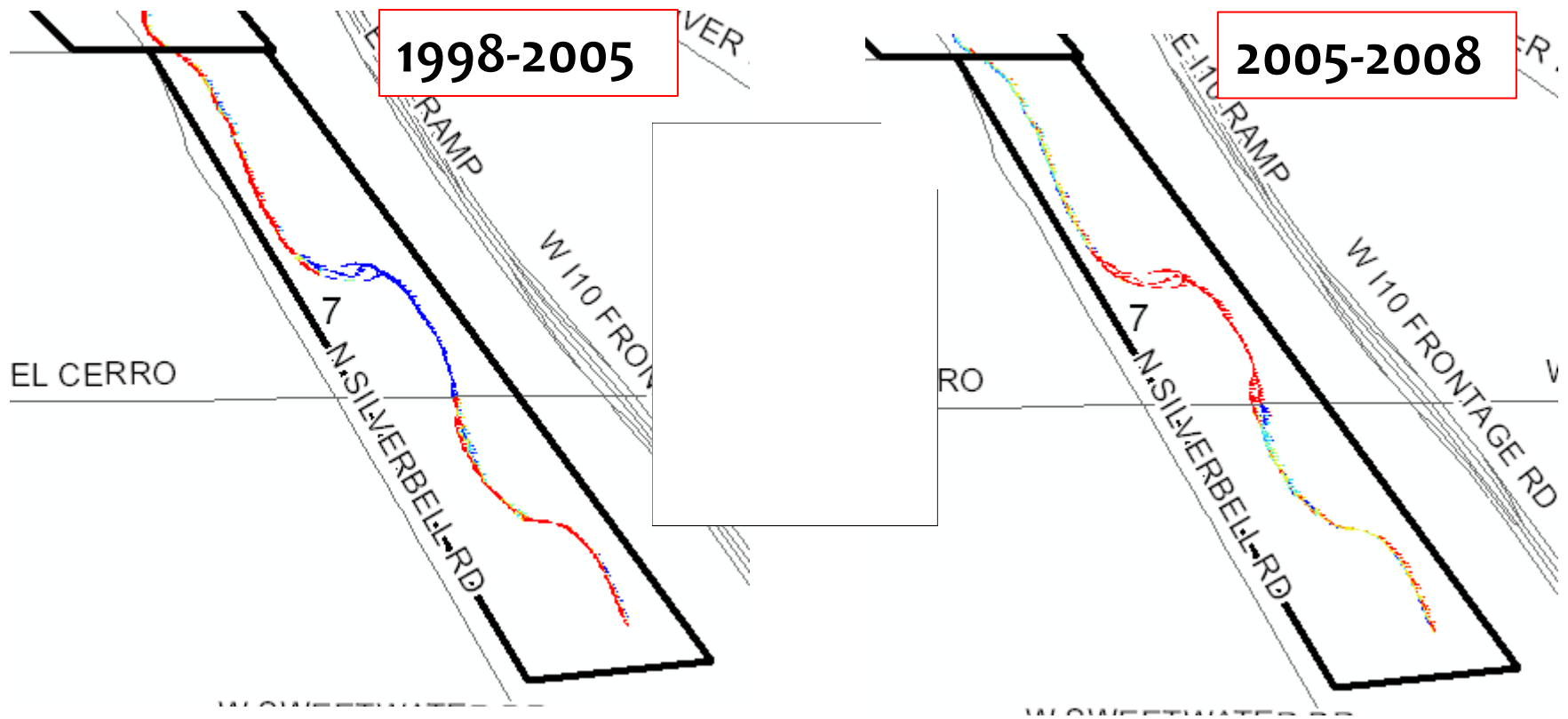
- * Minor Location Change (Result 1)
- * Shallow Erosion/Deposition



Result 3: Channel Bed Elevation Changes

Ex. Sunset- Sweetwater (Reach 7)

- * Minor Location Change (Result 1)
- * Relatively Deep Erosion/Deposition



Results

Low Flow Channels in the Lower SCR

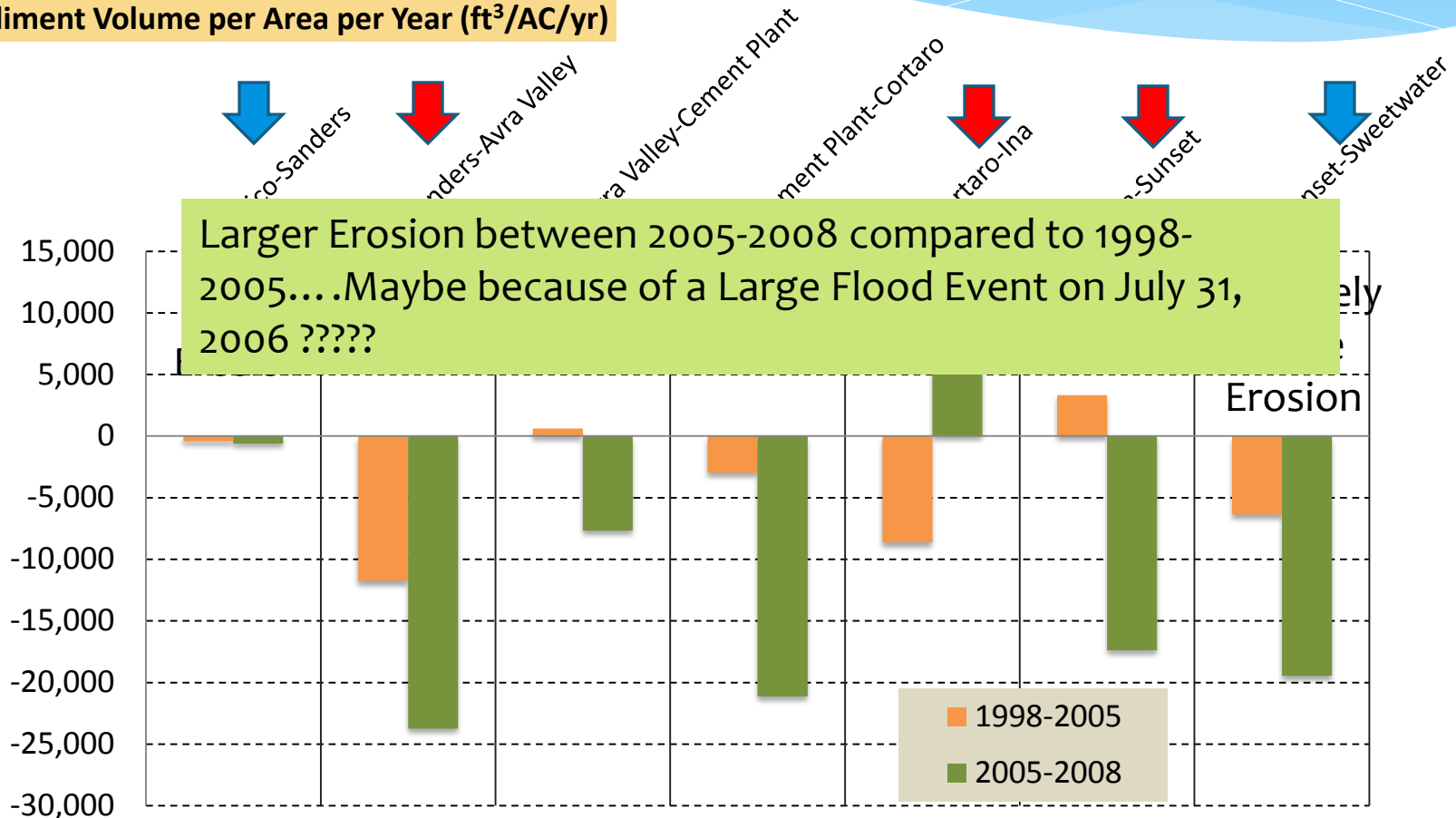
- * Result 1: Location Changes
- * Result 2: Flow Area Changes
- * Result 3: Bed Elevation Changes
- * **Result 4: Volume Changes**

Result 4: Sediment Volume Changes between 1998-2005 and 2005-2008

Major Location Changes: Red

Minor Location Changes: Blue

Sediment Volume per Area per Year ($\text{ft}^3/\text{AC}/\text{yr}$)



Summary of Results

	Trico-Sanders	Sanders-Avra Valley	Avra Valley-Cement Plant	Cement Plant-Cortaro	Cortaro-Ina	Ina-Sunset	Sunset-Sweetwater
Location Changes	Blue	Red	Blue	Blue	Red	Red	Blue
Flow Area Change	White	White	White	White	White	White	Blue
Volume Changes	Erosion	Erosion	Erosion/Deposition	Erosion	Erosion/Deposition	Erosion/Deposition	Erosion

Blue: Minor Changes; Red: Major Changes

- * Trico- Sanders

- * Location and Volume changes are relatively small : **Relatively Stable**

- * Sunset- Sweetwater

- * Location and Area changes are small while Volume change is large: **Channel Bed Degradation**

- * Cortaro- Sunset

- * Location changes are large, and Elevation changes are relatively large

Frequent Location Changes with Relatively Deep Erosion/Deposition: Unstable

Maybe influences of two major rivers (Rillito River and Canada del Oro Wash)

Question????