Considerations in Projecting Future Hydrology Scenarios for the Salton Sea

Sujoy B. Roy
Tetra Tech Inc.

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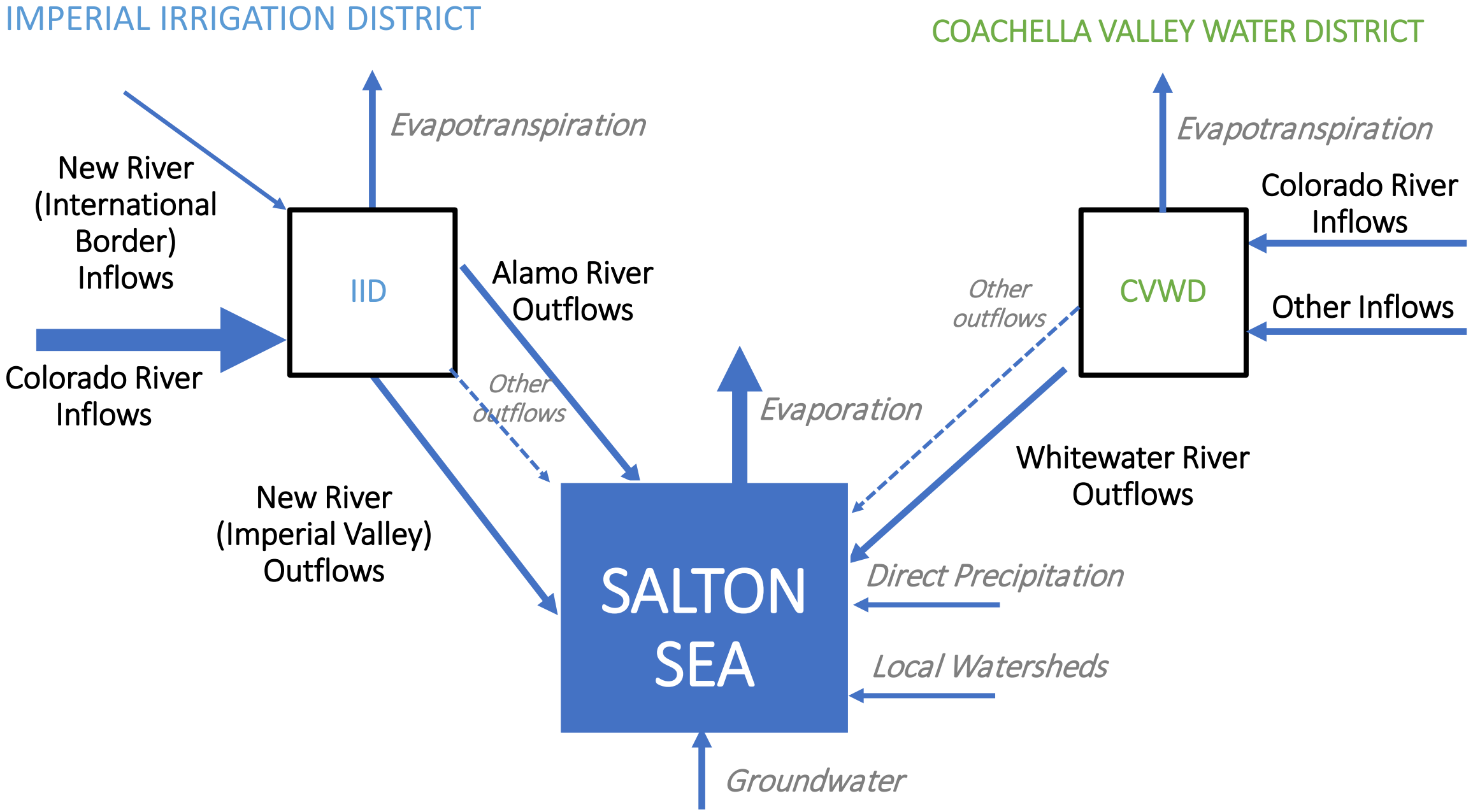
Overview

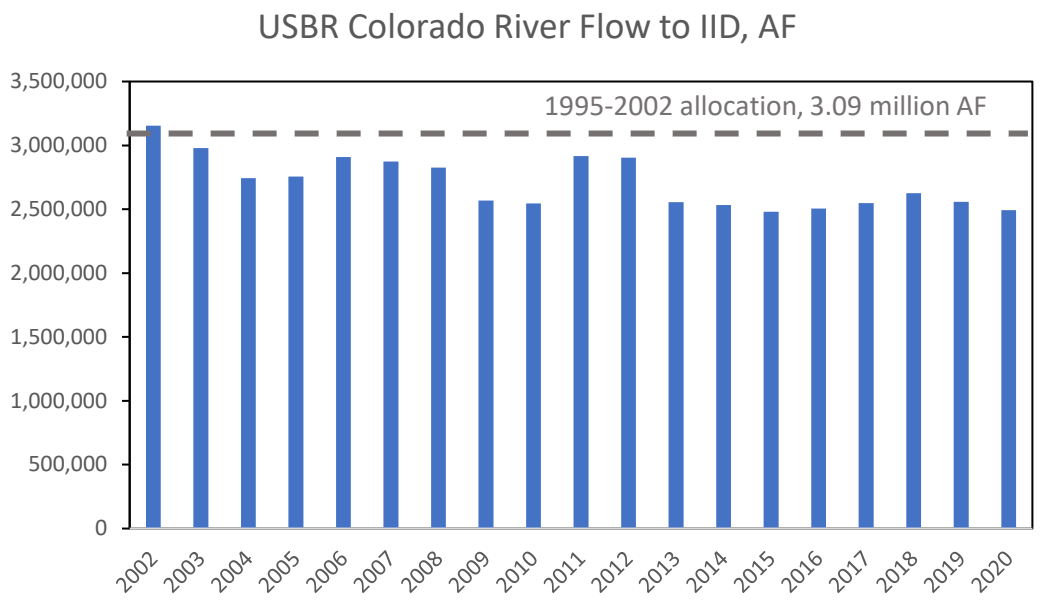
- Habitat and dust suppression projects, and long-range projects, such as those planned for the Salton Sea Management Program, require assessments of water availability
- We used recent observed data on inflows to the Sea, combined with elevation and salinity data, to update the current water balance
- We used this understanding to develop scenarios of future inflows based on
  - Continuing conditions
  - Climate change and increased evapotranspiration
  - Effect of drought periods
  - Previously published IID scenarios (2018, embedded in SALSA model)
  - More extreme climate conditions

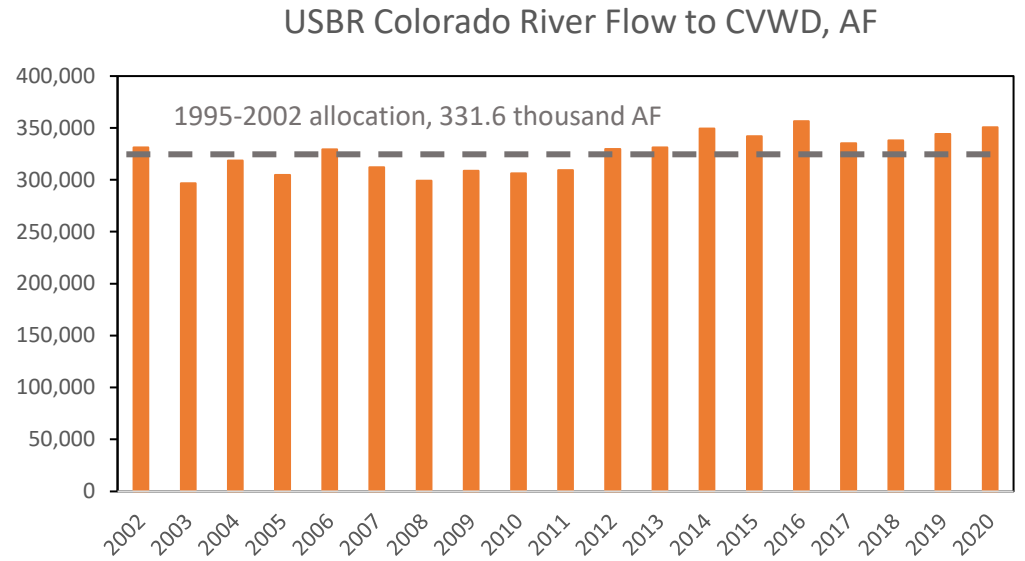

IMPERIAL IRRIGATION DISTRICT
COACHELLA VALLEY WATER DISTRICT
Evapotranspiration
Evapotranspiration
New River (International Border) Inflows
Colorado River Inflows
IID
Alamo River Outflows
Other outflows
Other outflows
CVWD
Colorado River Inflows
Other Inflows
Evaporation
Whitewater River Outflows
New River (Imperial Valley) Outflows
SALTON SEA
Direct Precipitation
Local Watersheds
Groundwater

Historical Colorado River Flows to IID and CVWD

1995 – 2002 average is the pre-QSA allocation

- IID allocations have decreased in the last two decades, following QSA
- CVWD allocations have been steady and have increased in the last five years





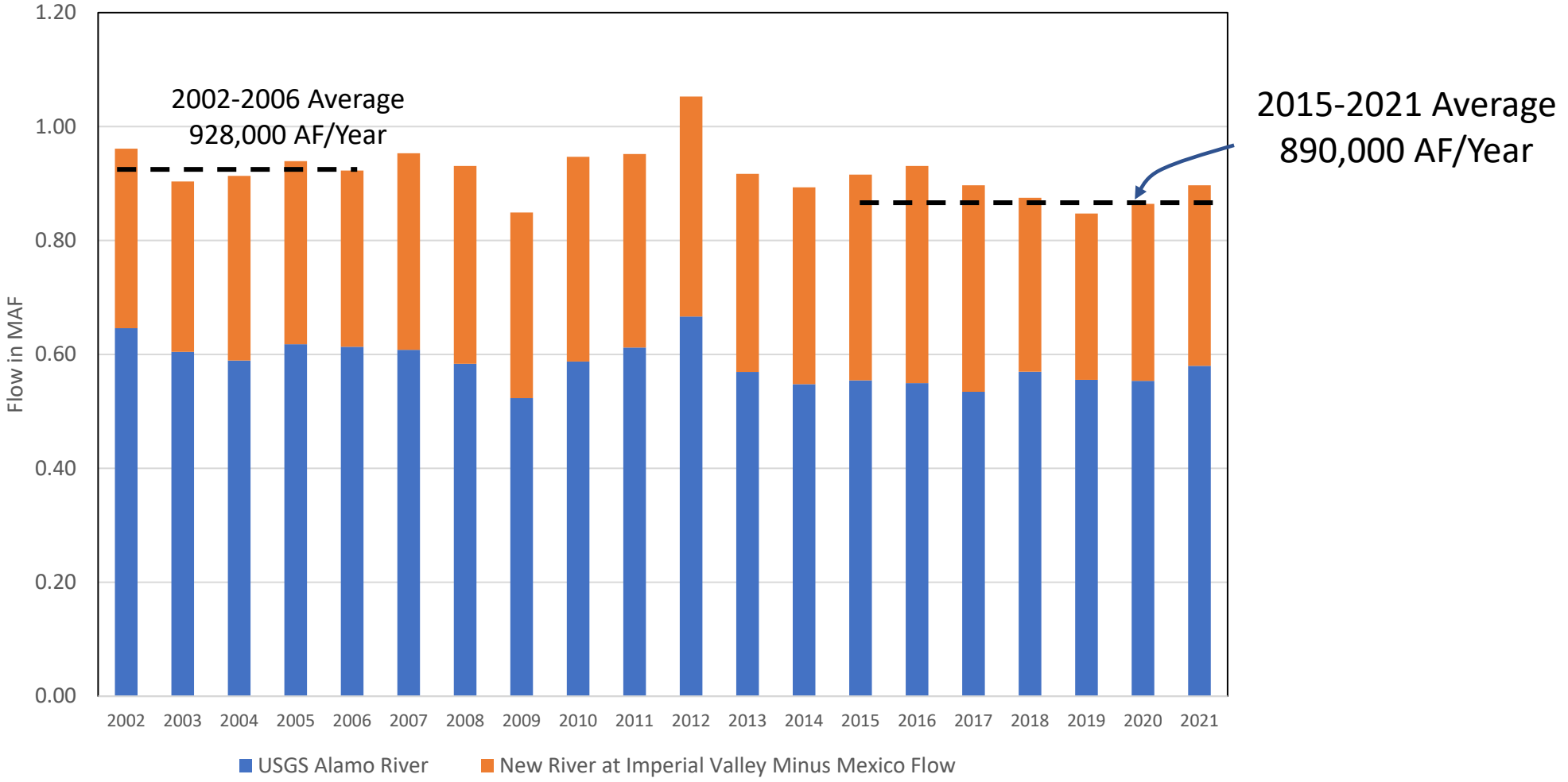
(SOURCE: USBR Water Accounting Reports)

QSA Transfers and Mitigation Water

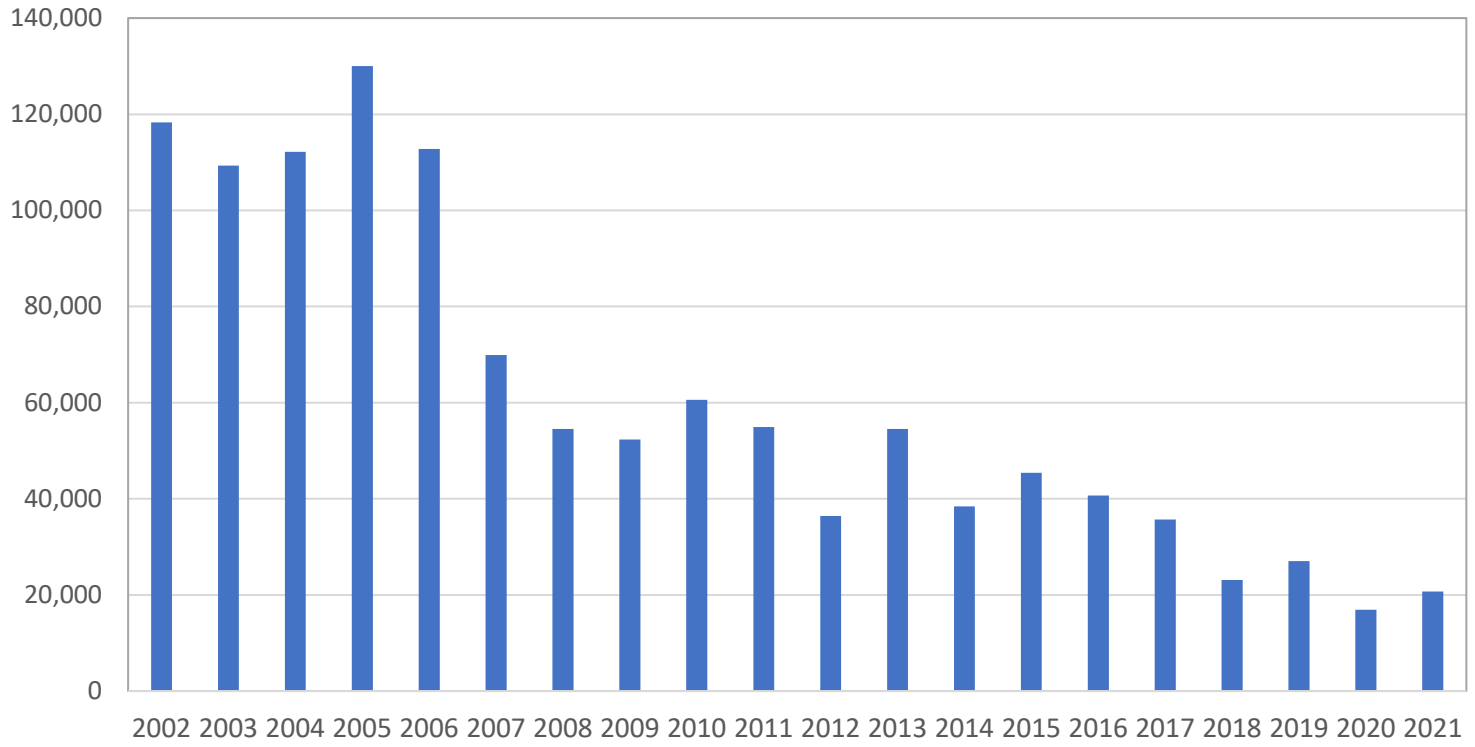
Year	SDCWA Transfer	CVWD Transfer	Salton Sea Mitigation Water created by fallowing
2003	3,445	0	0
2004	20,000	0	30,239
2005	30,000	0	21,476
2006	40,000	0	0
2007	50,000	0	23,306
2008	50,000	4,000	26,085
2009	60,000	8,000	30,158
2010	70,000	12,000	80,282
2011	63,278	16,000	0
2012	106,722	21,000	15,110
2013	100,000	26,000	71,470
2014	100,000	31,000	90,000
2015	100,000	36,000	110,000
2016	100,000	41,000	130,000
2017	100,000	45,000	150,000
2018	130,000	63,000	0
2019	160,000	68,000	0
2020	190,000	73,000	0
2021	200,000	78,000	0
2022	200,000	83,000	0
2023	200,000	88,000	0
2024	200,000	93,000	0
2025	200,000	98,000	0
2026-2047	200,000	103,000	0

(SOURCE: USBR, IID)

Imperial Valley Gaged Annual Flows to Salton Sea Without Mexico Flows



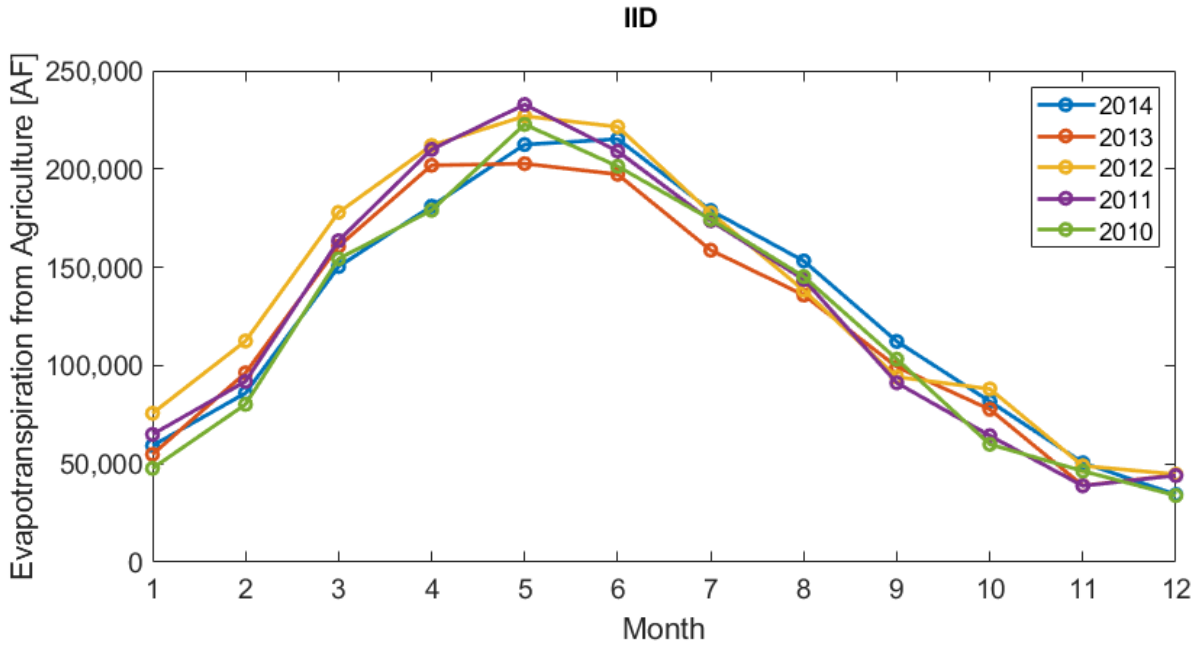
New River Flows from Mexico at International Border, AF

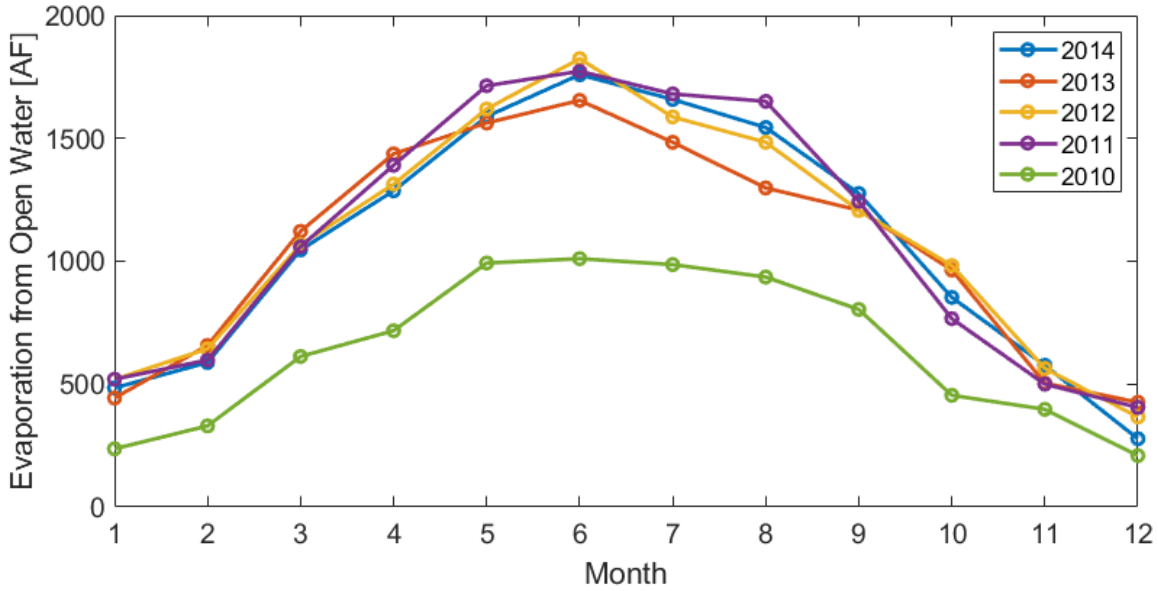


IID: Evapotranspiration

CY	Net Irrigated Area (Reported by IID)	Acres (Agriculture + Open Water) (Reported by USBR)	Total ET [AF] (Reported by USBR)
2010	431,823	490,150	1,456,100
2011	440,650	536,290	1,541,549
2012	432,555	575,480	1,631,700
2013	411,195	488,130	1,481,400
2014	405,246	491,290	1,528,600

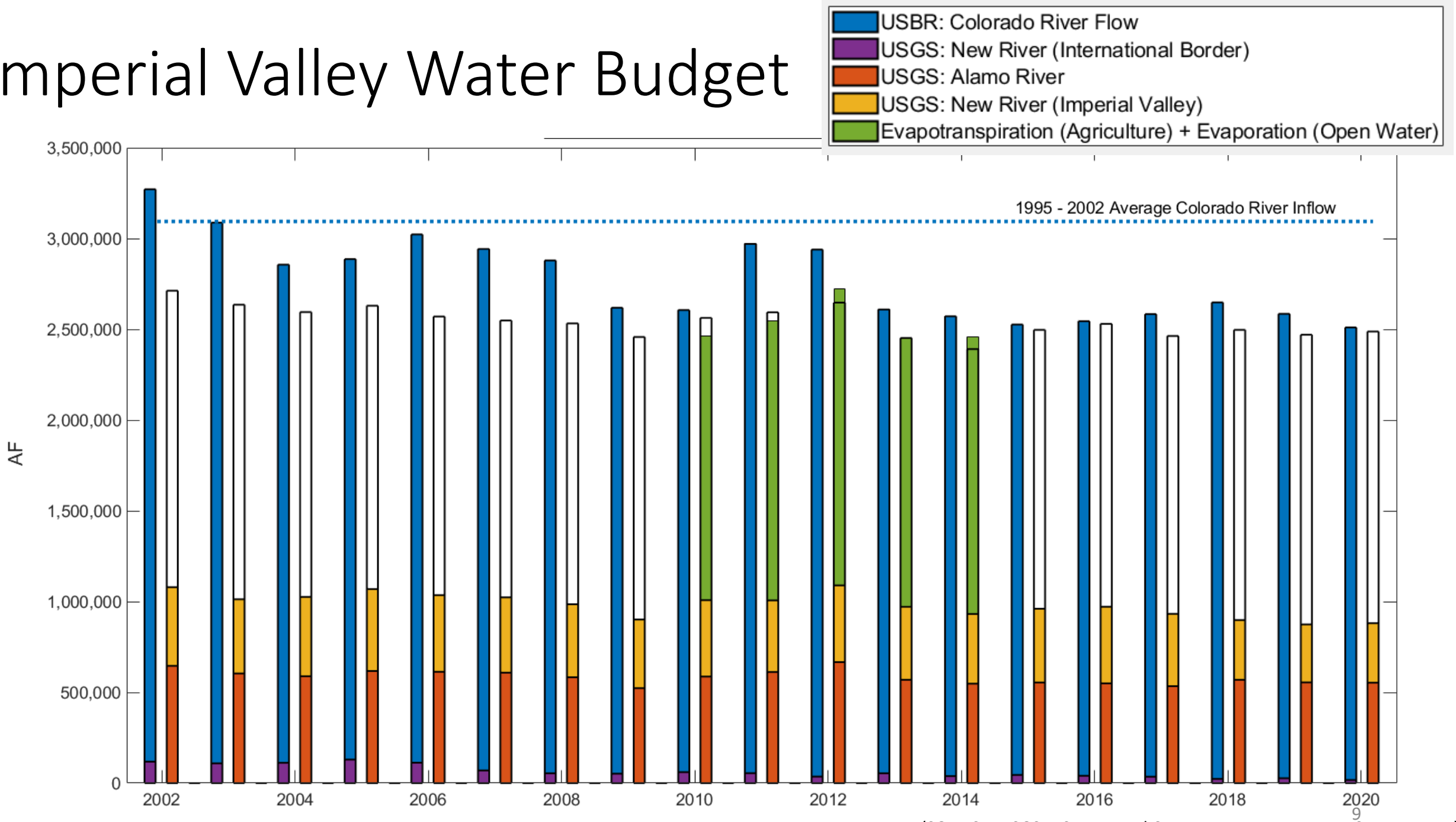
Net ET Rate = Total ET / Net Irrigated Area
= 3.601 AF/acre





(SOURCE: USBR ET and Crop Acreage Reports)

Imperial Valley Water Budget

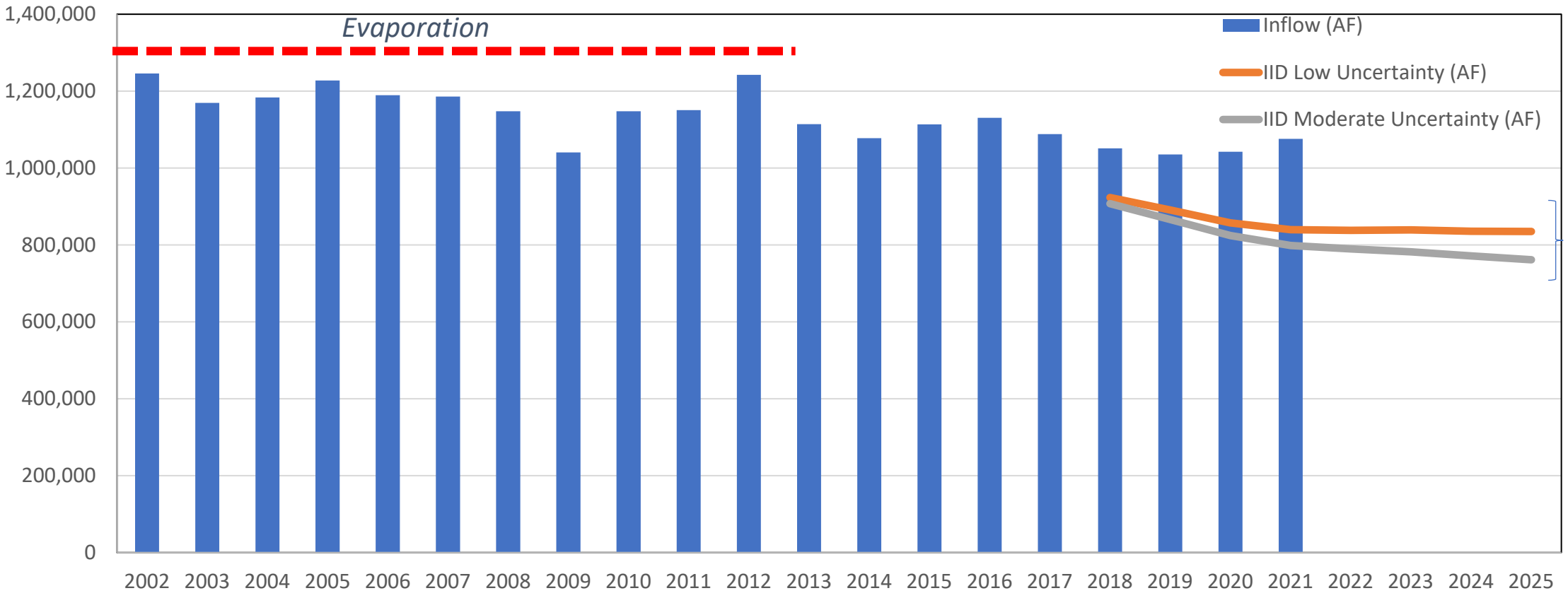


(SOURCE: USGS, USBR ET and Crop Acreage Reports, IID Crop Reports)

Inflows to the Salton Sea, 2015-2021

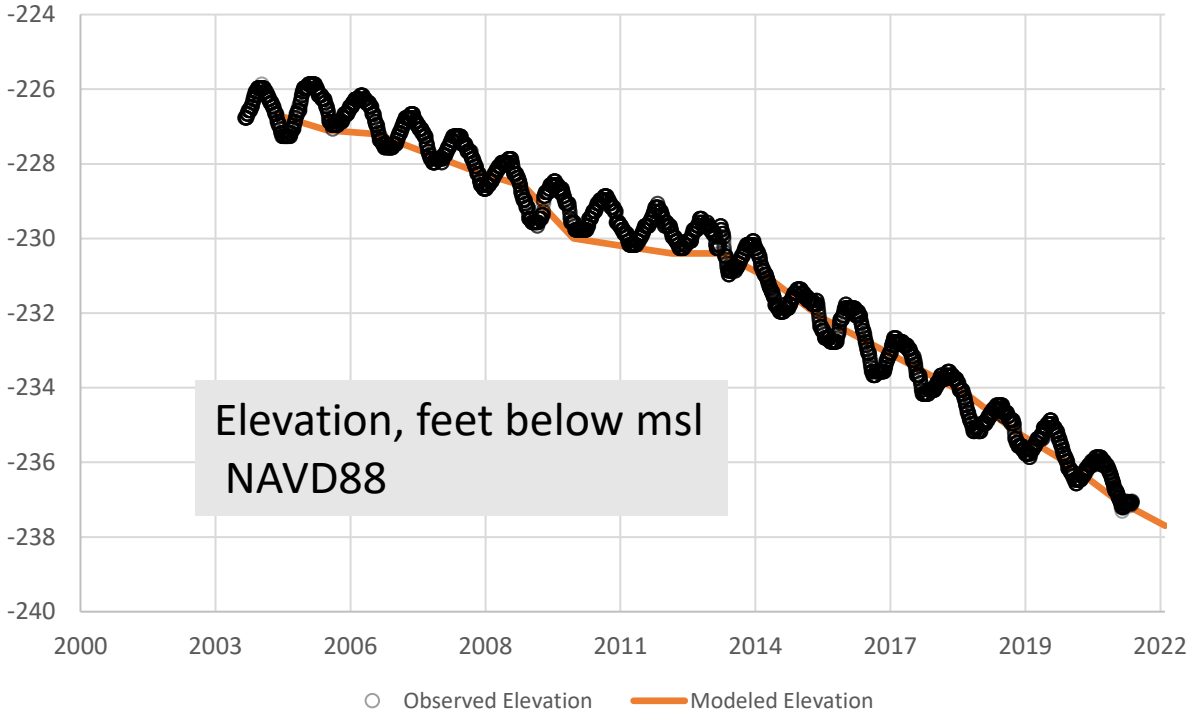
Gaged flow to Salton Sea from New and Alamo Rivers:	890,000 AF
Ungaged Flows (adding 9%):	80,000 AF
Total Imperial Valley Flows:	970,000 AF
Other Inflows	
Whitewater River Flow:	46,942 AF
Coachella Valley Ungaged Flow (40% of gaged flows):	18,777 AF
Local Watershed Flow:	10,000 AF
Groundwater Flow:	2,470 AF
Total Inflows:	1,068,290 AF

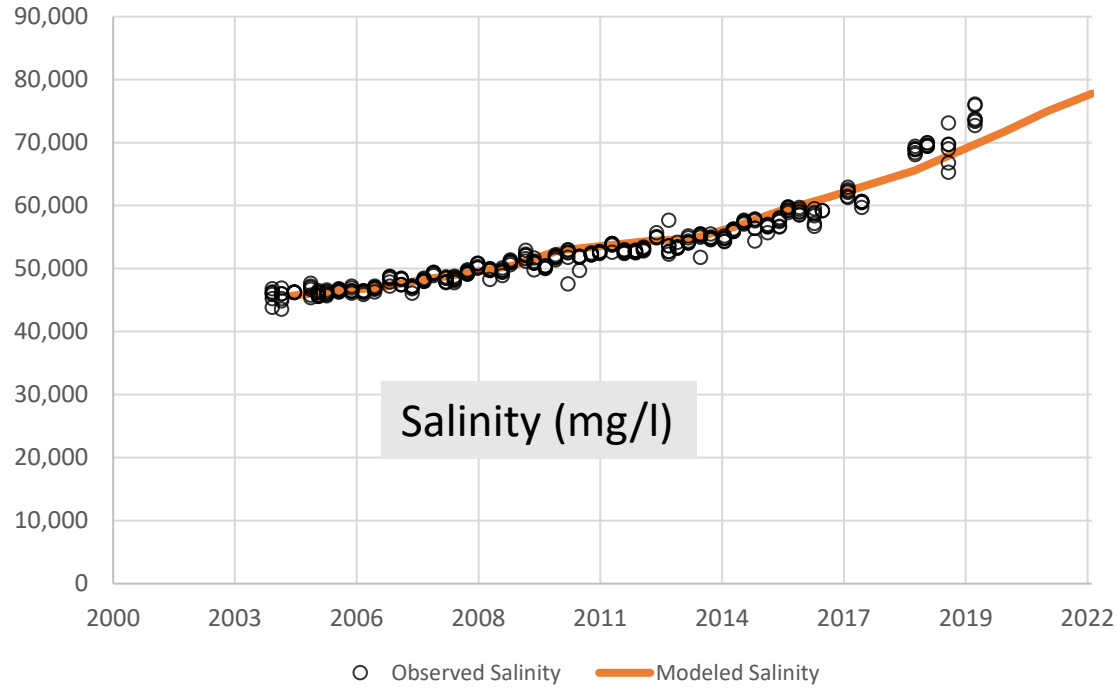
Total Inflows to the Salton Sea



2018 Projections in SALSA Model

Salton Sea Accounting Model (SSAM) to Model Recent Inflow, Salinity and Elevation Data





Assumptions for Future Scenarios, Imperial Valley

ET rate baseline at 3.60 AF/acres (average over 2010 – 2014)

Net Irrigated Land constant at 433,540 acres (average over 2002 – 2021)

Scenario #1: Continued baseline

Scenario #2: Climate change and higher evapotranspiration, transition from current flows by 2040

Scenario #3: Periodic Drought (70% normal, 20% moderate, 10% severe drought curtailment) + Climate Change

- (i.e. full 350,000 AF decrease in CA allocation results in proportional decrease in IID allocation)

Scenario #4: IID Low Uncertainty Scenario, transition from current flows by 2040

Scenario #5: IID Moderate Uncertainty Scenario, transition from current flows by 2040

Scenario #2, Climate Change, Mid 21st Century, Imperial Valley

Current Colorado River inflows = 2,535,000 AF/year (average over 2015 – 2020)

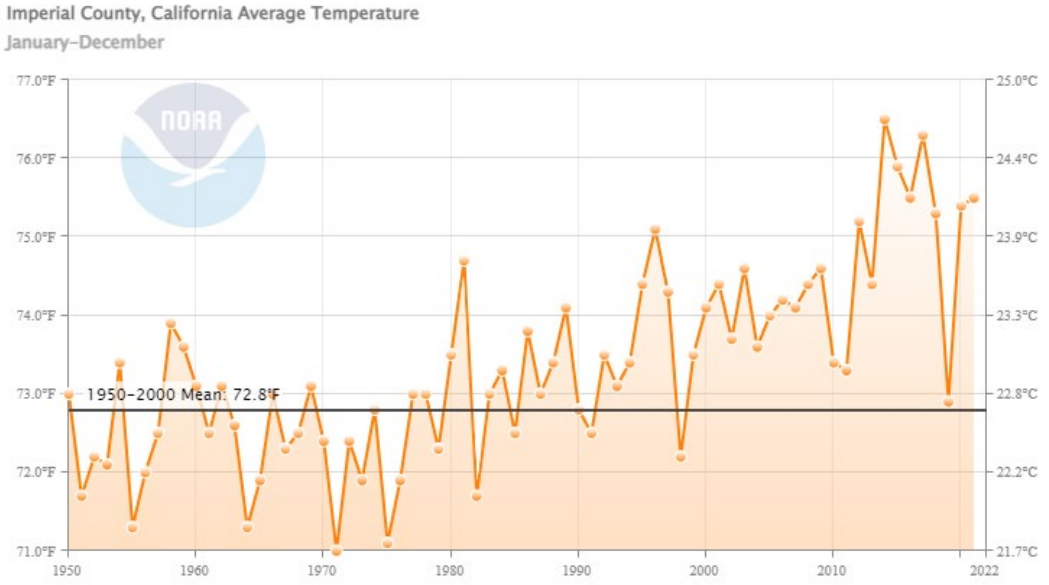
Climate-Adjusted Evapotranspiration rate = 3.78 AF/acre

(5% greater than current value of 3.6 AF/acre)

- Evapotranspiration loss = 3.78 x 433,540 = 1,638,780 AF

Estimated outflow: 898,620 AF

Transition from current flows to climate-adjusted flows occurs between 2021 and 2040



Source: NOAA, NCDC

Scenario #3, Periodic Drought Curtailment and Climate Change, Mid 21st Century, Imperial Valley

Hydrology:

70% normal, 20% moderate, 10% severe drought curtailment

Moderate drought:

Colorado River inflows to IID decrease by 4.55%

Severe drought:

Colorado River inflows to IID decrease by 7.95%

Average flow from 2040 is a weighted average of the three flow conditions: 855,350 AF/year

Transition from current conditions in 2021 to 2040

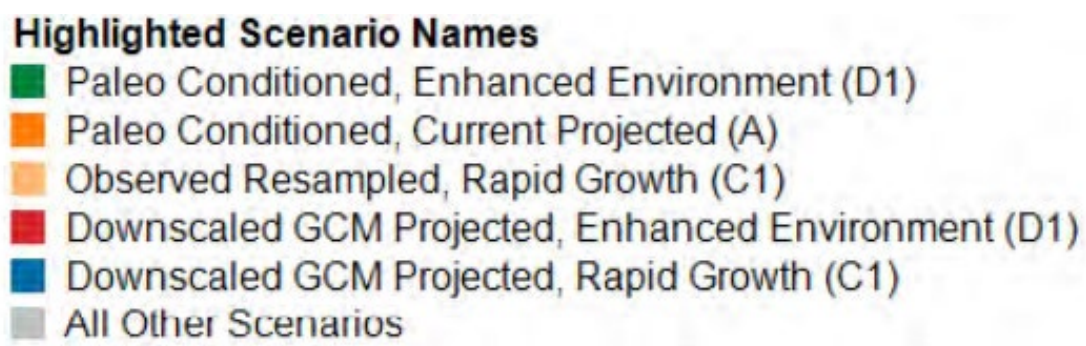
Potential Inflow Scenarios (Acre Feet)

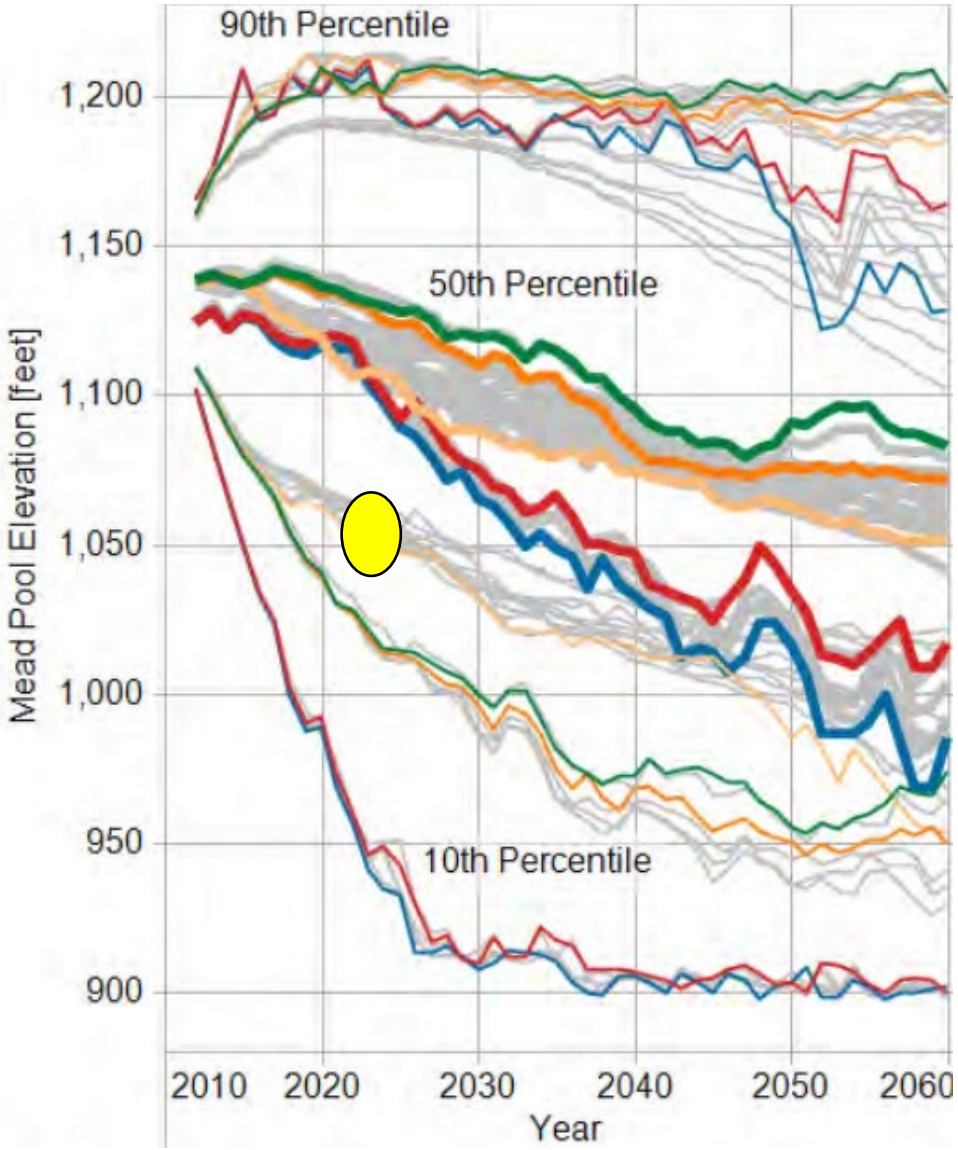
Number	Summary	Imperial Valley Flow (River and Drains)	Whitewater Flow	Mexico Flows	Whitewater Drain Flow	Local Watershed	Groundwater	Total
Scenario 1	Continued Baseline	970,100	46,942	20,000	18,777	10,000	2,470	**1,068,290**
Scenario 2 (uniform transition from 2022 to 2040)	Climate Change	898,620	46,942	-	18,777	10,000	2,470	**976,809**
Scenario 3 (uniform transition from 2022 to 2040)	Periodic Drought (70% normal, 20% moderate, 10% severe drought curtailment)	855,350	46,942	-	18,777	10,000	2,470	**933,539**
Scenario 4 (uniform transition from 2022 to 2040)	IID Low Uncertainty (2025-2077 average)	694,000	72,874	48,640	29,150	10,000	10,000	**864,664**
Scenario 5 (uniform transition from 2022 to 2040)	IID Moderate Uncertainty (2025-2077 average)	576,000	48,404	38,000	19,362	10,000	10,000	**701,766**

Decadal Projections Of Lake Mead Elevation Under Climate Scenarios

Colorado River Simulation System (CRSS) long-term output

- Input data = monthly natural inflows, evaporation rates for each reservoir, initial reservoir conditions on Jan 1, 2012
- Assumptions = shortage, surplus, and coordinated operations of the 2007 Interim Guidelines are extended past 2026
- Various supply & demand scenarios (see next slide)





(SOURCE: USBR Colorado River Bain Water Supply and Demand Study)

Summary

- Recent observed data suggest higher inflows to the Sea than projected about 5 years ago; we can use these data to relate flow, salinity and elevation at the Sea
- The key drivers of change are projected to be: Imperial Valley flows to Salton Sea, Mexico flows, and climate change impacts to evapotranspiration
- SSMP habitat projects (~15,000 acres planned in Phase 1) are expected to consume 90,000 AF annually
- New water demands, related to geothermal and lithium development, are expected to be an additional draw on inflows to the Sea
- Shorter periods of low flow, related to drought conditions, may be an additional concern besides long-term average flows
- More extreme climate impacts to Lake Mead elevations are possible in the 21st century, with significant impacts on Imperial Valley deliveries

Questions?

Sujoy B. Roy, Ph.D.

Principal Engineer

Tetra Tech Inc.

Email: sujoy.roy@tetratech.com