Recent Year-end Groundwater Level Changes within the EBID

Summary Points and Generalizations

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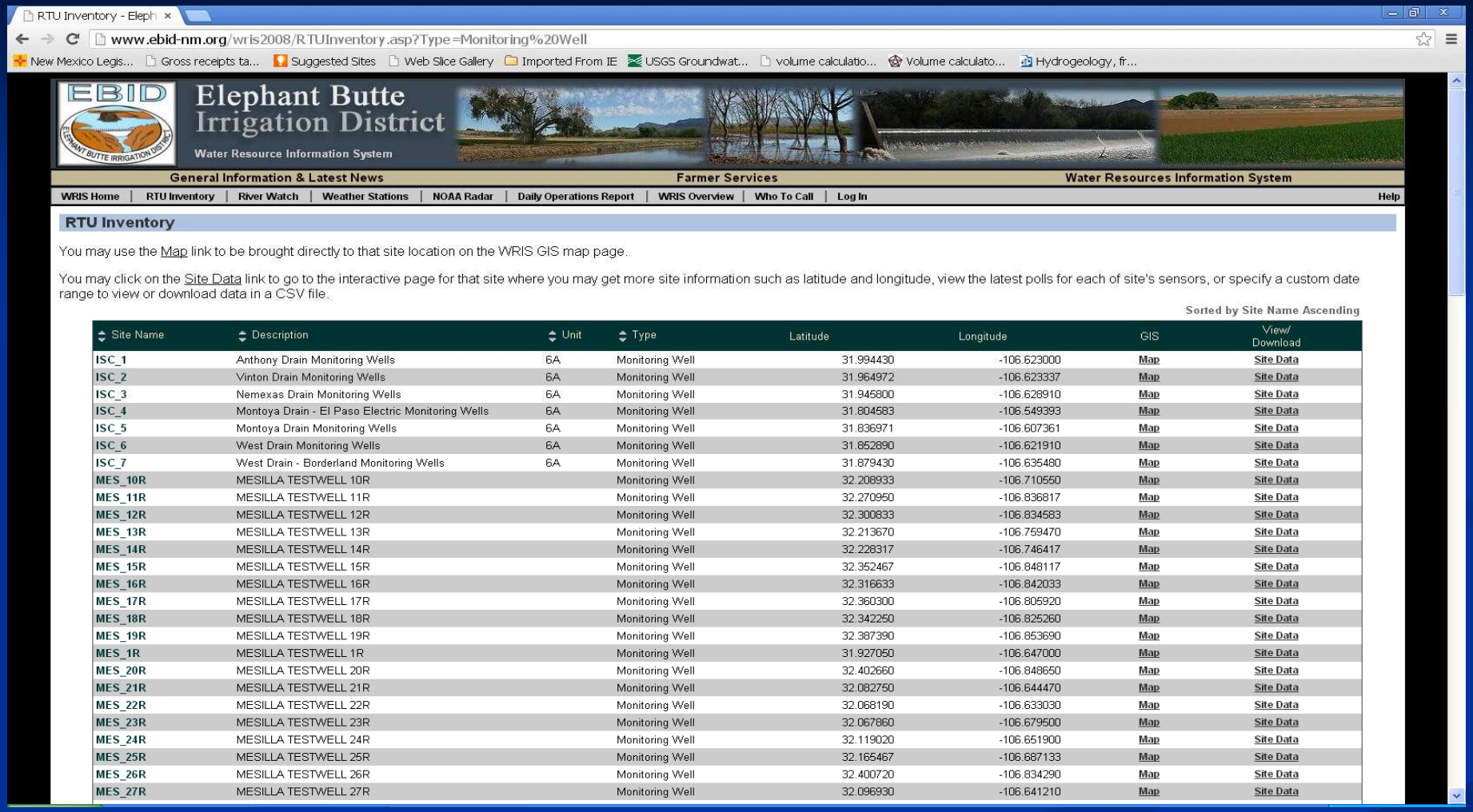
3-13-2013

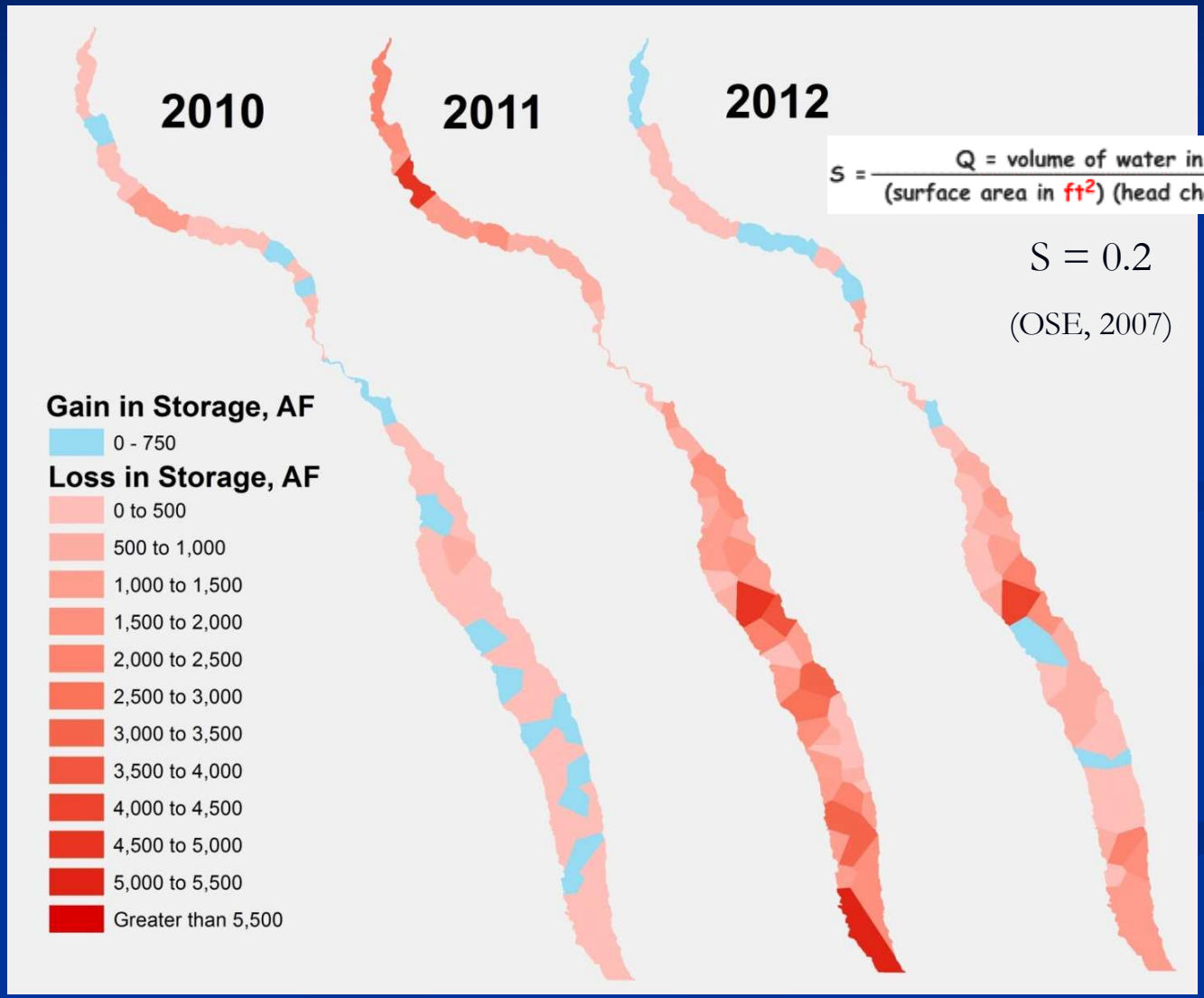
EBID Water Resource Information System



Site Name	Description	Unit	Type	Latitude	Longitude	GIS	View/ Download
ISC_1	Anthony Drain Monitoring Wells	6A	Monitoring Well	31.994430	-106.623000	Map	Site Data
ISC_2	Vinton Drain Monitoring Wells	6A	Monitoring Well	31.964972	-106.623337	Map	Site Data
ISC_3	Nemexas Drain Monitoring Wells	6A	Monitoring Well	31.945800	-106.628910	Map	Site Data
ISC_4	Montoya Drain - El Paso Electric Monitoring Wells	6A	Monitoring Well	31.804583	-106.549393	Map	Site Data
ISC_5	Montoya Drain Monitoring Wells	6A	Monitoring Well	31.836971	-106.607361	Map	Site Data
ISC_6	West Drain Monitoring Wells	6A	Monitoring Well	31.852890	-106.621910	Map	Site Data
ISC_7	West Drain - Borderland Monitoring Wells	6A	Monitoring Well	31.879430	-106.635480	Map	Site Data
MES_10R	MESILLA TESTWELL 10R		Monitoring Well	32.208933	-106.710550	Map	Site Data
MES_11R	MESILLA TESTWELL 11R		Monitoring Well	32.270950	-106.836817	Map	Site Data
MES_12R	MESILLA TESTWELL 12R		Monitoring Well	32.300833	-106.834583	Map	Site Data
MES_13R	MESILLA TESTWELL 13R		Monitoring Well	32.213670	-106.759470	Map	Site Data
MES_14R	MESILLA TESTWELL 14R		Monitoring Well	32.228317	-106.746417	Map	Site Data
MES_15R	MESILLA TESTWELL 15R		Monitoring Well	32.352467	-106.848117	Map	Site Data
MES_16R	MESILLA TESTWELL 16R		Monitoring Well	32.316633	-106.842033	Map	Site Data
MES_17R	MESILLA TESTWELL 17R		Monitoring Well	32.360300	-106.805920	Map	Site Data
MES_18R	MESILLA TESTWELL 18R		Monitoring Well	32.342250	-106.825260	Map	Site Data
MES_19R	MESILLA TESTWELL 19R		Monitoring Well	32.387390	-106.853690	Map	Site Data
MES_1R	MESILLA TESTWELL 1R		Monitoring Well	31.927050	-106.647000	Map	Site Data
MES_20R	MESILLA TESTWELL 20R		Monitoring Well	32.402660	-106.848650	Map	Site Data
MES_21R	MESILLA TESTWELL 21R		Monitoring Well	32.082750	-106.644470	Map	Site Data
MES_22R	MESILLA TESTWELL 22R		Monitoring Well	32.068190	-106.633030	Map	Site Data
MES_23R	MESILLA TESTWELL 23R		Monitoring Well	32.067860	-106.679500	Map	Site Data
MES_24R	MESILLA TESTWELL 24R		Monitoring Well	32.119020	-106.651900	Map	Site Data
MES_25R	MESILLA TESTWELL 25R		Monitoring Well	32.165467	-106.687133	Map	Site Data
MES_26R	MESILLA TESTWELL 26R		Monitoring Well	32.400720	-106.834290	Map	Site Data
MES_27R	MESILLA TESTWELL 27R		Monitoring Well	32.096930	-106.641210	Map	Site Data

- http://www.ebid-nm.org/wris2008/RTUInventory.asp?Type=Monitoring%20Well
- An extensive network of monitoring well sites is maintained throughout the EBID.
- Data is posted continuously and almost real-time.

ESTIMATED CHANGE IN WATER STORAGE



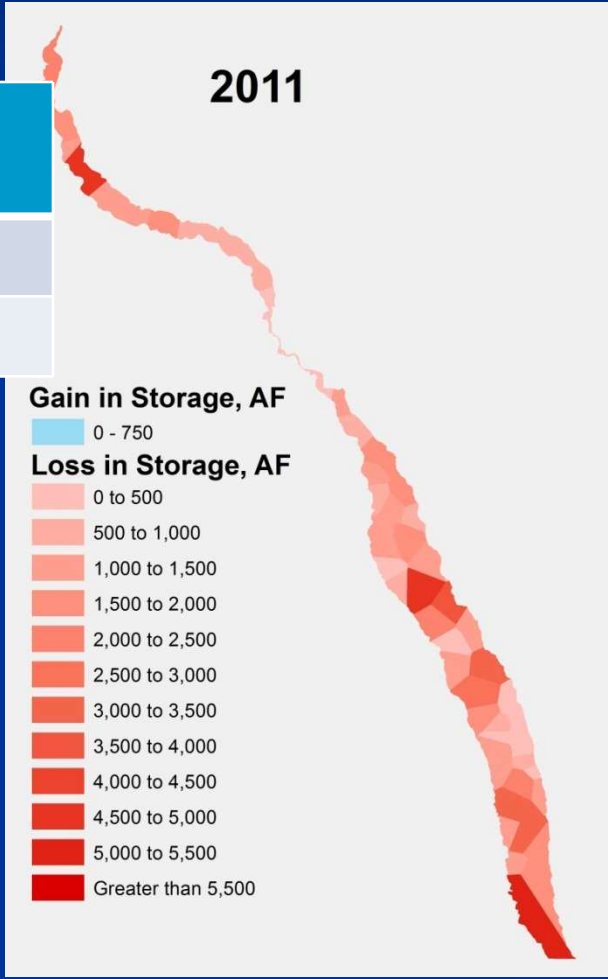
$$S = \frac{Q = \text{volume of water in } ft^3}{(\text{surface area in } ft^2)\,(\text{head change in } ft)} = \frac{ft^3}{ft^3}$$

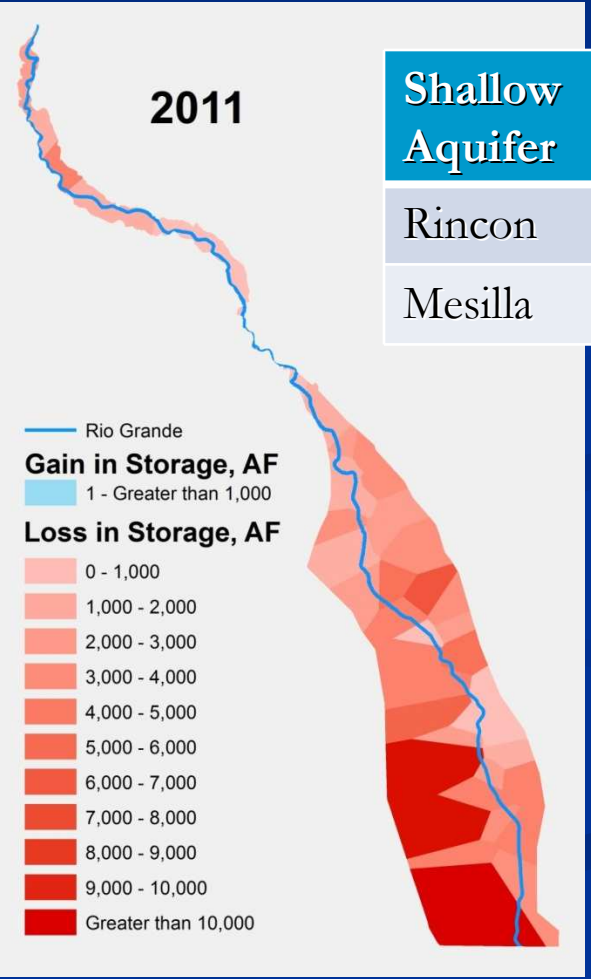
$S = 0.2$

(OSE, 2007)

ESTIMATED CHANGE IN WATER STORAGE 2011

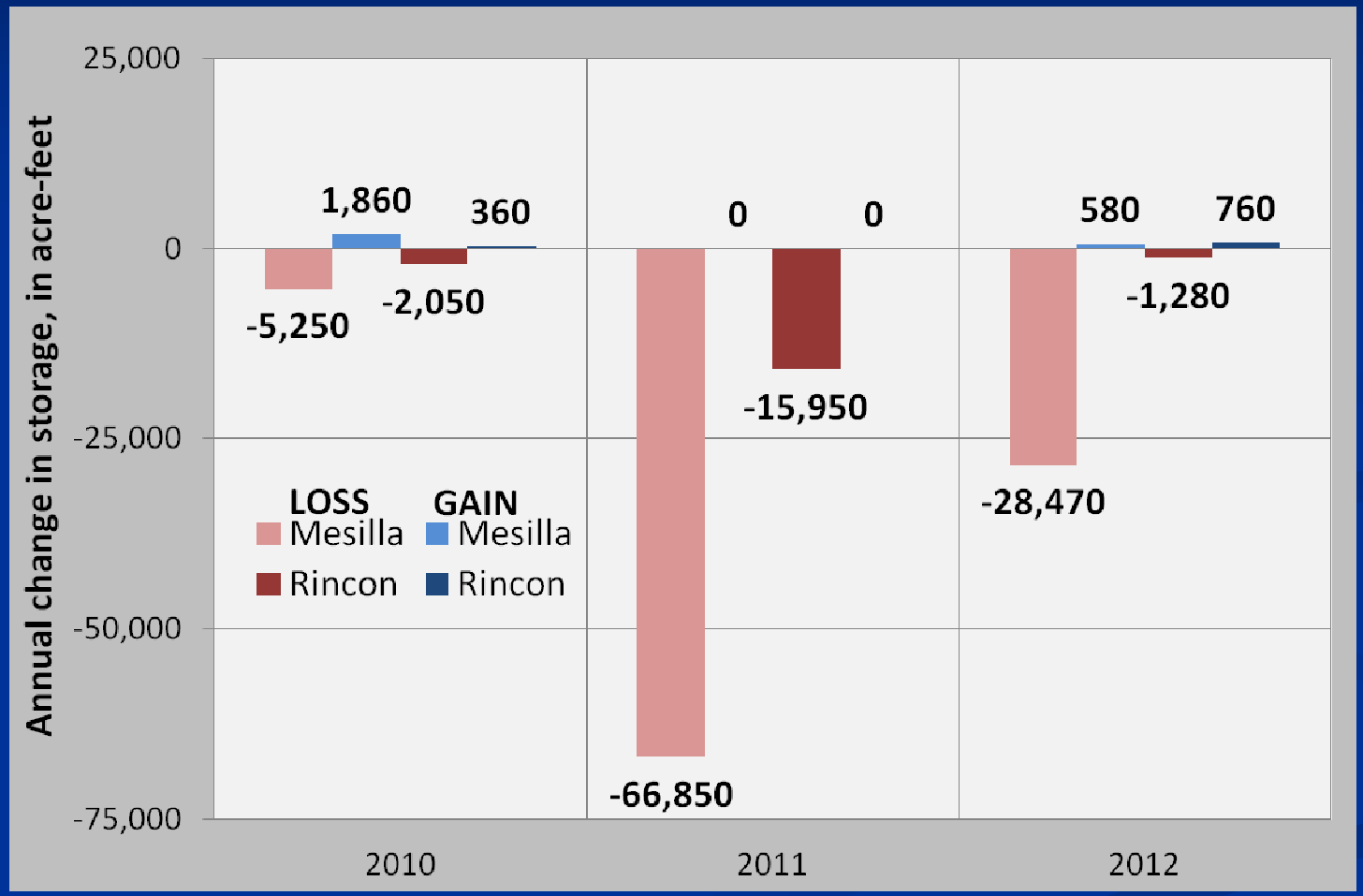
Valley Floor	Acres
Rincon	28,064
Mesilla	108,777





Shallow Aquifer	Acres
Rincon	28,064
Mesilla	264,728

ESTIMATED CHANGE IN WATER STORAGE – VALLEY FLOOR



ESTIMATED CHANGE IN WATER STORAGE

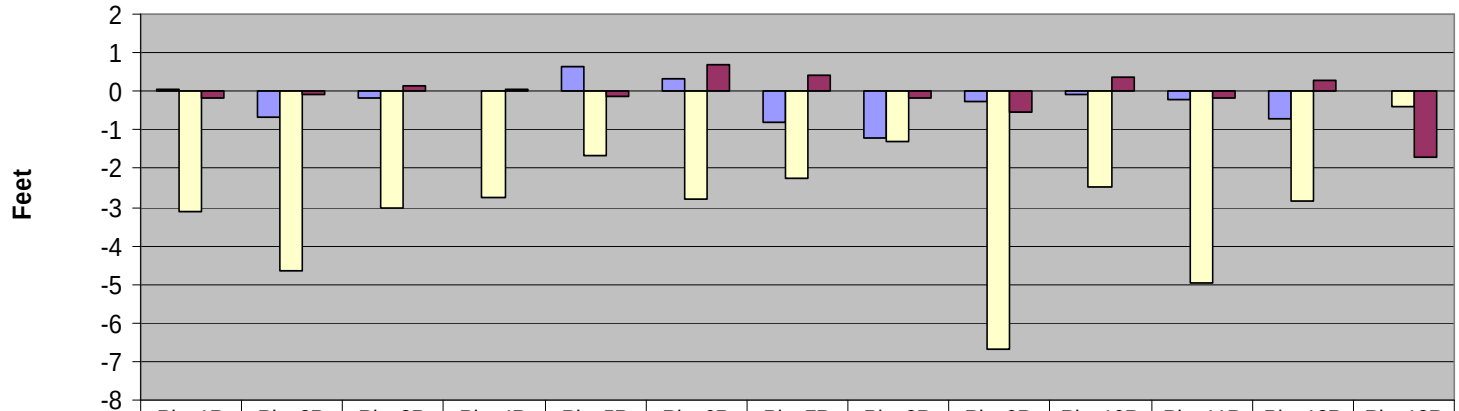
		2010	2011	2012
Mesilla	Average Water Level Change, in feet	-0.15	-2.9	-1.2
	Estimated Storage Change, in AF	-3,400	-66,900	-27,900
Rincon	Average Water Level Change, in feet	-0.24	-2.9	-0.07
	Estimated Storage Change, in AF	-1,700	-16,000	-500
Lower Rio Grande – Valley Floor	**Estimated Storage Change, in AF**	**-5,100**	**-82,900**	**-28,400**
Lower Rio Grande – Shallow Aquifer	**Estimated Storage Change, in AF**	**-11,400**	**-175,300**	**-65,200**

ESTIMATED CHANGE IN WATER STORAGE

- Estimated change in storage in collective LRG valley floor throughout the EBID in 2011 ~ 82,900 AF (net loss, assume consumed)
- Estimated total pumping for 2011 as reported by the OSE from meter records for irrigation throughout the EBID ~ 280,000 AF
- A LOT of water is getting back to the system through return flows!

Hatch-Rincon alluvial aquifer trends in recent years

Rincon/Hatch - Recent year-end groundwater level changes



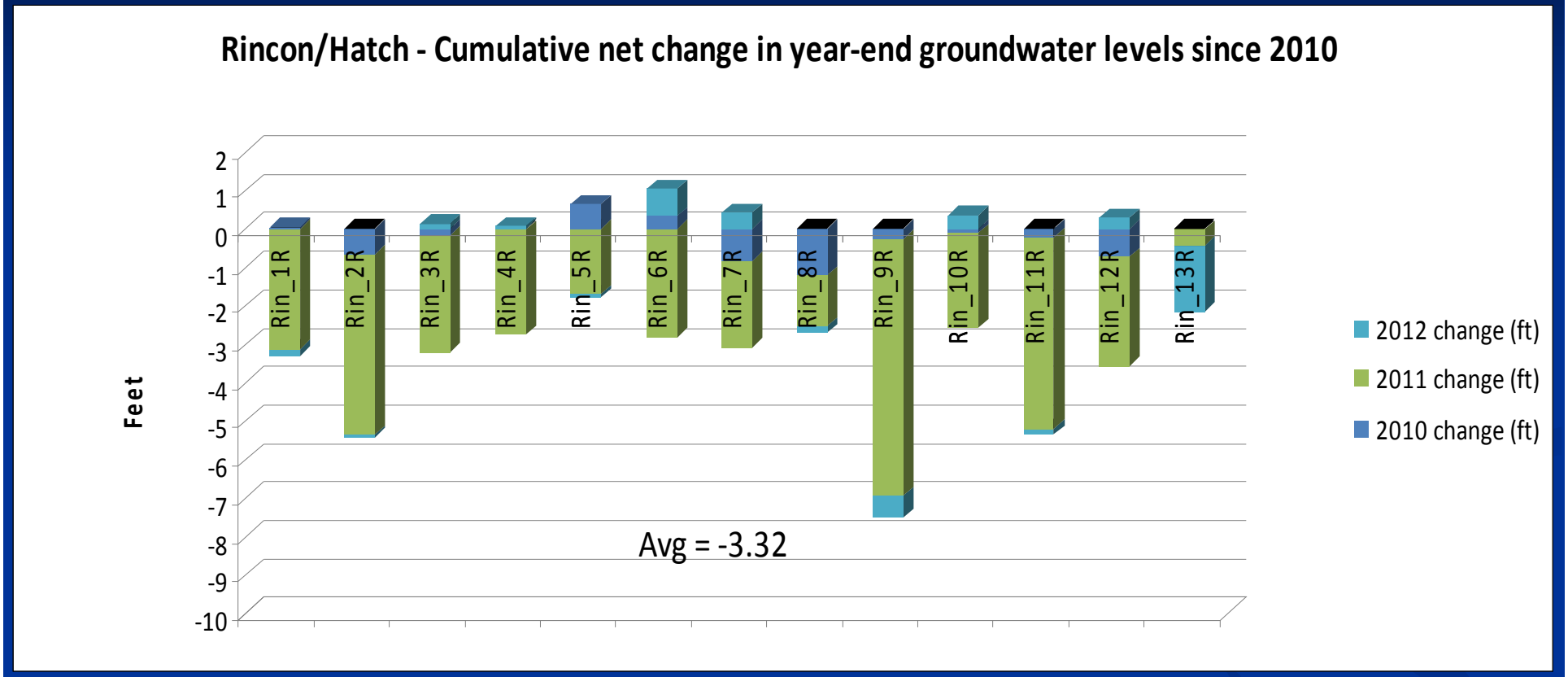
Monitoring well:	Rin_1R	Rin_2R	Rin_3R	Rin_4R	Rin_5R	Rin_6R	Rin_7R	Rin_8R	Rin_9R	Rin_10R	Rin_11R	Rin_12R	Rin_13R
2010 change (ft)	0.044	-0.661	-0.173	-0.010	0.642	0.333	-0.824	-1.204	-0.261	-0.094	-0.211	-0.730	-0.011
2011 change (ft)	-3.114	-4.673	-3.033	-2.739	-1.676	-2.813	-2.245	-1.312	-6.677	-2.486	-4.975	-2.829	-0.417
2012 change (ft)	-0.183	-0.084	0.148	0.073	-0.105	0.708	0.414	-0.191	-0.552	0.352	-0.151	0.293	-1.717

2010: 24-inch SWA; avg year-end GW level decline of -0.24 feet

2011: 4-inch SWA; avg year-end GW level decline of -3.00 feet

2012: 10-inch SWA; avg year-end GW level decline of -0.08 feet

Hatch-Rincon alluvial aquifer trends in recent years



Not too bad, as long as we don't see very many years like 2011…

Or worse???

Hatch-Rincon alluvial aquifer trends in recent years

Year	EBID surface water allotment (SWA)	Year-end GW level (DTW) avg. chg.
2010	24.0 inches	-0.243 ft
2011	4.0 inches	-2.999 ft
2012	10.0 inches	-0.077 ft

9 pt diff.

2010 – 2011: 83% **decrease** in SWA = 92% increase in avg. year-end GW level decline relative to the previous year.

37 pt diff.

2011 – 2012: 60% **increase** in SWA = 97% change (abatement) in avg. year-end GW level decline relative to the previous year.

- **Very generally speaking and assuming all other things being equal (i.e., no significant fallowing or major changes in cropping patterns, etc.) it appears that the Hatch-Rincon alluvial aquifer system is considerably more responsive positively to even moderate increases in the SWA than to substantial decreases in the SWA.**

Hatch-Rincon alluvial aquifer trends in recent years

- **In other words, the system is currently demonstrating the potential (to the extent that surface water might be available) to gain considerably faster than it may lose.**

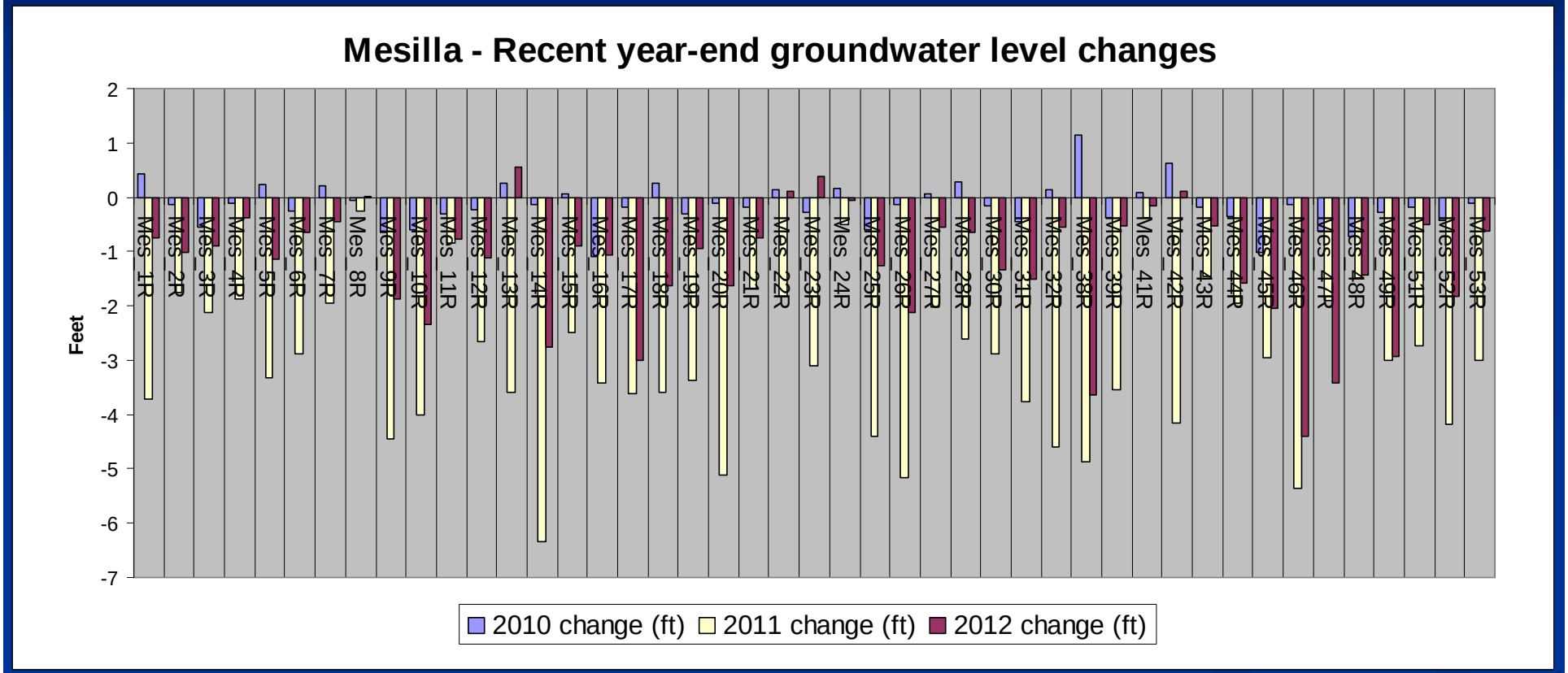
- **For this reason the Hatch-Rincon alluvial system remains highly dependent on surface water (moreso than the Mesilla), or the hope of some alternative source.**

- **Water quality is rapidly deteriorating (increasing salinity) in the Hatch-Rincon system primarily because irrigators in the area are essentially recycling return flows which comprise a significant part of what remains of the alluvial aquifer in the area. Some migration of geothermal sources may also be contributing.**

Hatch-Rincon alluvial aquifer trends in recent years

- **GW levels in the Hatch-Rincon system are likely to further decline, along with deteriorating water quality as severe drought persists. Steady-state conditions in the Hatch-Rincon are already questionable and can only worsen if the SWA remains substantially reduced as dictated by ongoing drought.**
- **Time and a deep aquifer of good quality water is currently NOT on the side of the Hatch-Rincon system.**
- **Grassroots efforts are currently underway to explore potential partial relief.**

Mesilla alluvial aquifer trends in recent years



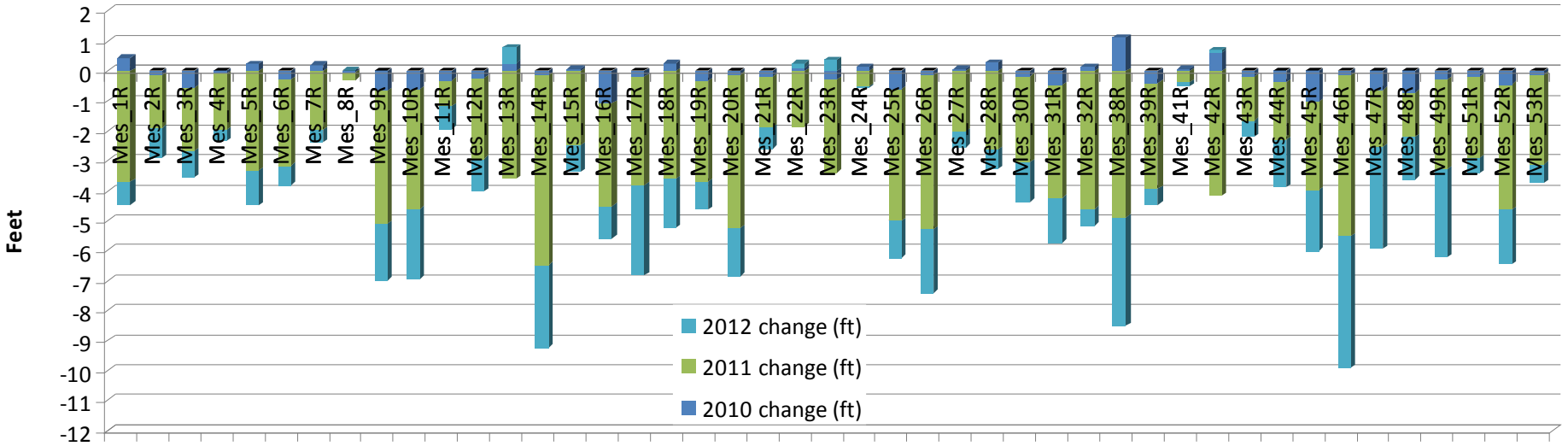
2010: 24-inch SWA; avg year-end GW level decline of -0.15 feet

2011: 4-inch SWA; avg year-end GW level decline of -3.00 feet

2012: 10-inch SWA; avg year-end GW level decline of -1.21 feet

Mesilla alluvial aquifer trends in recent years

Mesilla - Cumulative net change in year-end groundwater levels since 2010



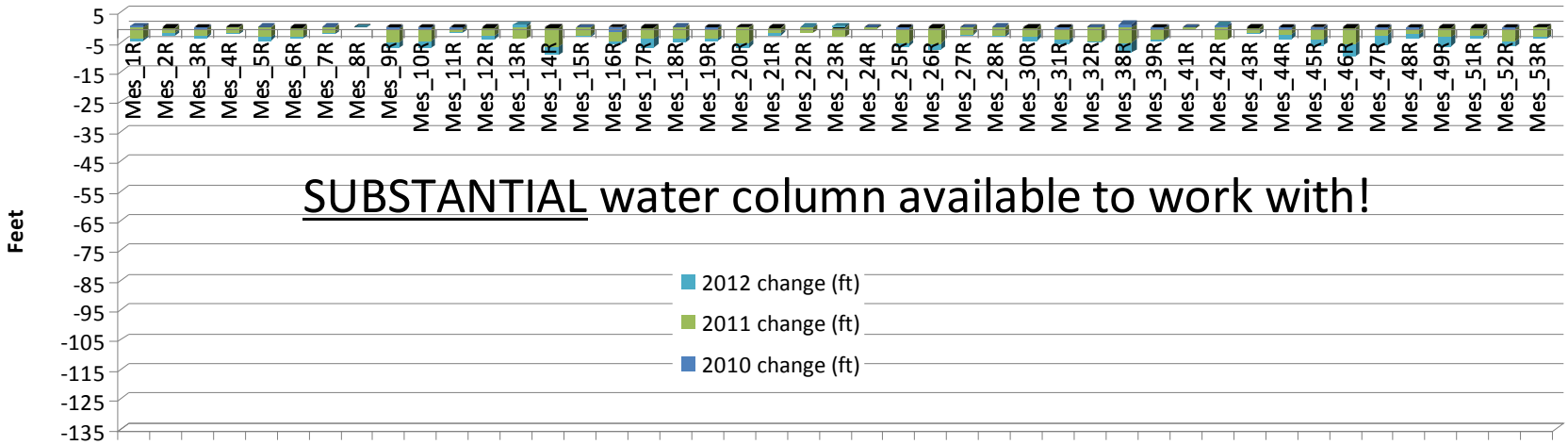
Avg. = -4.36

- Established pumping at greater depths appears to be intersecting and/or combining with established shallow effects, thereby augmenting an established negative hydraulic gradient.

Mesilla alluvial aquifer trends in recent years

Good news is that…

Mesilla - Cumulative net year-end groundwater level changes since 2010 and approximate water column available assuming average max well depth at ~200 ft and 67% max drawdown



- We've got some time (in the Mesilla) to work with.
- But, many years of full or near full surface supply might be necessary to recover.

Mesilla alluvial aquifer trends in recent years

Year	EBID surface water allotment (SWA)	Year-end GW level (DTW) avg. chg.
2010	24.0 inches	-0.082 ft
2011	4.0 inches	-2.997 ft
2012	10.0 inches	-1.212 ft

14 pt diff.

2010 – 2011: 83% **decrease** in SWA = 97% increase in avg. year-end GW level decline relative to the previous year.

0 pt diff.

2011 – 2012: 60% **increase** in SWA = 60% change (abatement) in avg. year-end GW level decline relative to the previous year.

- **Very generally speaking and assuming all other things being equal (i.e., no significant fallowing or major changes in cropping patterns, agronomic and/or pumping practices, etc.) it appears that the Mesilla alluvial aquifer system is considerably more responsive negatively to substantial decreases in the SWA than to moderate increases in the SWA.**

Mesilla alluvial aquifer trends in recent years

- In other words, the system is currently demonstrating the potential to lose somewhat faster than it may gain.

- GW levels in the Mesilla are very likely to further decline and at an increasing rate as long as drought conditions dictate a substantially reduced SWA. Increased salinity concentrations in the shallow alluvium can be expected.

- Nevertheless, steady-state conditions are highly likely in the Mesilla for many years to come and can be readily utilized (as long as wells are maintained at adequate depths), even if the SWA remains substantially reduced.

- If and when the drought subsides, many years of full or near full surface supply will be needed to facilitate recovery, but flux of this nature is not uncommon and can be expected just as surely as periodic droughts are guaranteed. But for how long????