

**Salt River Ecosystem Restoration Project
Post-Construction Geomorphic Channel Survey Report
Phase 1
Year 5 – 2018**

Prepared by:

Daniel O'Shea, M.S.

Melissa Kobetsky, B.S.



Prepared for:
Humboldt County Resource Conservation District
5630 South Broadway
Eureka, CA 95503
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1) INTRODUCTION

Phase one of the Salt River Ecosystem Restoration Project (SRERP) was implemented to re-establish intertidal wetland habitat and increase the tidal prism in the lower Salt River. In 2013, 330 acres of dairy ranchland were restored to a salt marsh from the mouth of the Salt River to just downstream of the confluence with Reas creek. In order to promote the natural evolution of a more complex drainage network, over two miles of the Salt River main channel were excavated and three new miles of North and South slough channels were constructed.

In compliance with the SRERP Adaptive Management Plan, cross-sectional and longitudinal surveys were conducted across the Phase 1 project area to assess the amount of sediment deposition, erosion, bank slumping, scour and channel migration. A total of nine cross-sectional and three longitudinal profiles were conducted on the main channel of the lower Salt River (SR), as well as the North (NC) and South (SC) slough channels (fig. 1).

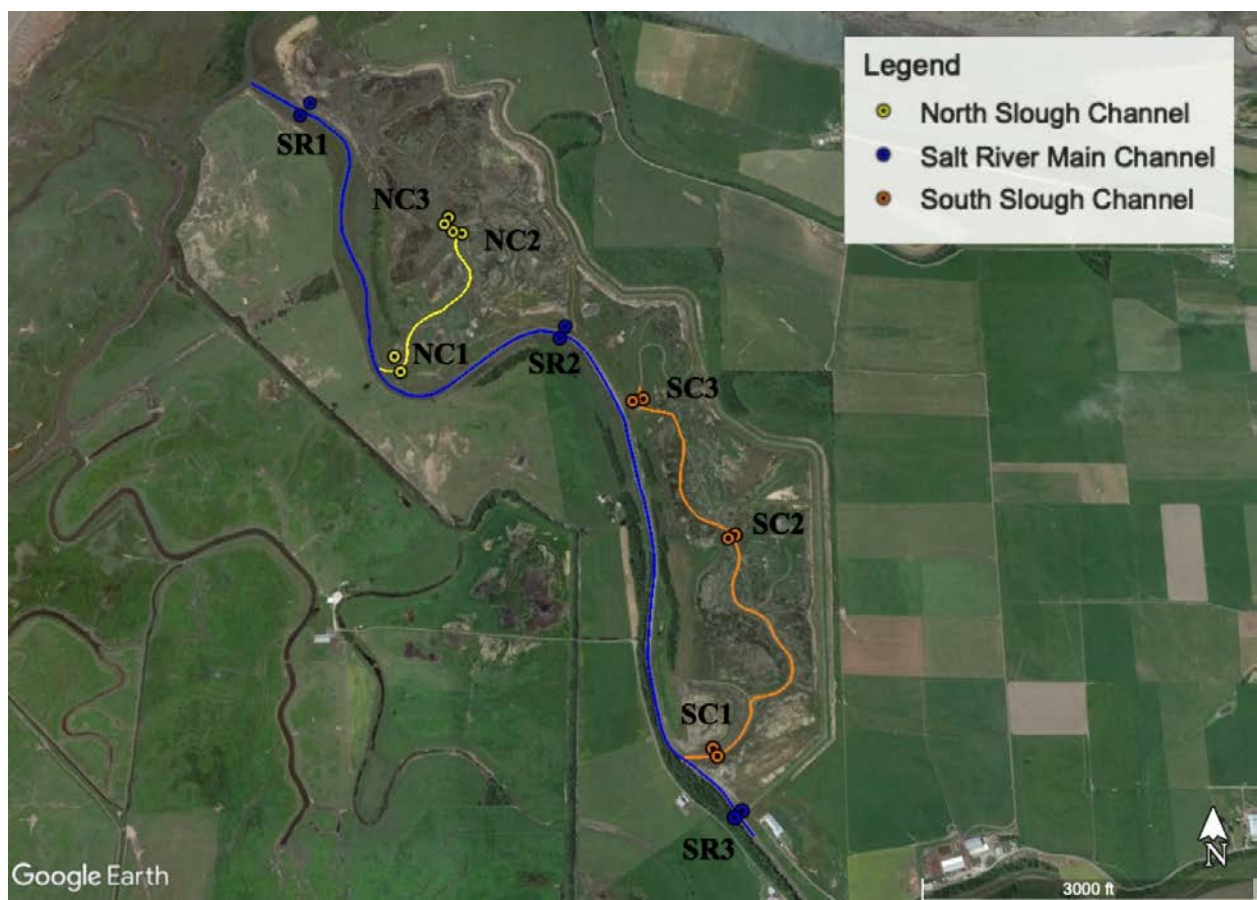


Figure 1: Locations of the cross section and longitudinal profiles for Salt River Ecosystem Restoration Survey Project, 2018. SR = Salt River main channel profiles; NC= North slough channel profiles; SC= South slough channel profiles.

2) METHODS

2.1) Elevation surveys

Data for the 2014 cross-sections and longitudinal profiles were collected using a CTS/Berger automatic level, tripod and stadia rod. For survey years 2015 through 2018, a Nikon DTM-352 Total Station laser theodolite, tripod, prism pole and single prism were used. Elevations are geo-referenced, in feet, to the 1988 North American Vertical Datum (NAVD88) based on corrected positions from survey benchmarks SR11 and SR14 (Appendix VIII). Horizontal locations were determined using GPS North American Datum 1983 (NAD83) in decimal degrees.

2.2) Channel cross-section and longitudinal profiles

A total of nine cross-section survey transects and benchmarks were established in 2014, with 3 profiles on the main stem Salt river (SR), the North slough channel (NC), and the South slough channel (SC). Data for cross-section transects has been collected annually from 2014 to 2018. All cross sections are GPS referenced (NAD83) to the survey benchmarks and original endpins (e.g. SR1, SC1, NC1, etc.) are monumented with ½" rebar and orange caps. Due to disturbance, biofouling and/or burial, several endpins were not re-occupied and transects were located using GPS coordinates and True north azimuth direction (14.5°E declination). Endpins and locations that were determined by GPS were marked with three foot wooden stakes to facilitate exact re-location in future surveys.

Cross-section elevations and distances were collected across the flood plain, channel slope, vegetation edge, water's edge, thalweg and channel- with a minimum of eight points within the channel between vegetation edges. Between 15 and 32 elevation points were collected per cross section depending on the size and morphological complexity of the channel, floodplain and banks. Flood plain measurements were collected up to 200-feet on either side of the main channel, with the exception of the south (or left) bank of SR3 due to dense vegetation and restricted access to private land. Cross sectional profiles for North and South slough channels are viewed looking downstream towards their confluence with the main-stem Salt River with the zero-point on the graph starting from the east and extending west. Main channel SR cross sectional profiles are viewed looking upstream starting from the right bank (zero-point on the graph) and extending south.

Longitudinal profiles extended parallel to channel flow following the thalweg and were conducted on the main-stem Salt River (SRL), the North slough channel (NCL), and of the South slough channel (SCL). The prism pole was placed in the thalweg approximately every 200-feet along the survey length. The SRL extended 12,000ft from Cutoff Slough to the Phase 1 excavation boundary near the Riverside Ranch barn. NCL and SCL profiles began at the confluence of the main-stem Salt River and extended upstream 2,000ft and 4,800ft respectively (fig.1).

3) RESULTS

3.1) Cross section profiles

3.1.1) Salt River cross section profiles

Cross section profiles of the main channel indicate that the SR1 has predominately experienced scour, particularly on the left/ south side of the channel, which deepened approximately one foot since 2017 (fig. 2A). As noted in previous years, bank slumping is more pronounced on the left bank than the right. Cross-section SR2 also shows degradation throughout the channel with an average deepening of 0.49ft (fig. 2B). SR3 channel shape remains relatively stable but experienced almost uniform deposition of roughly 0.25ft throughout the channel width (fig. 2C).

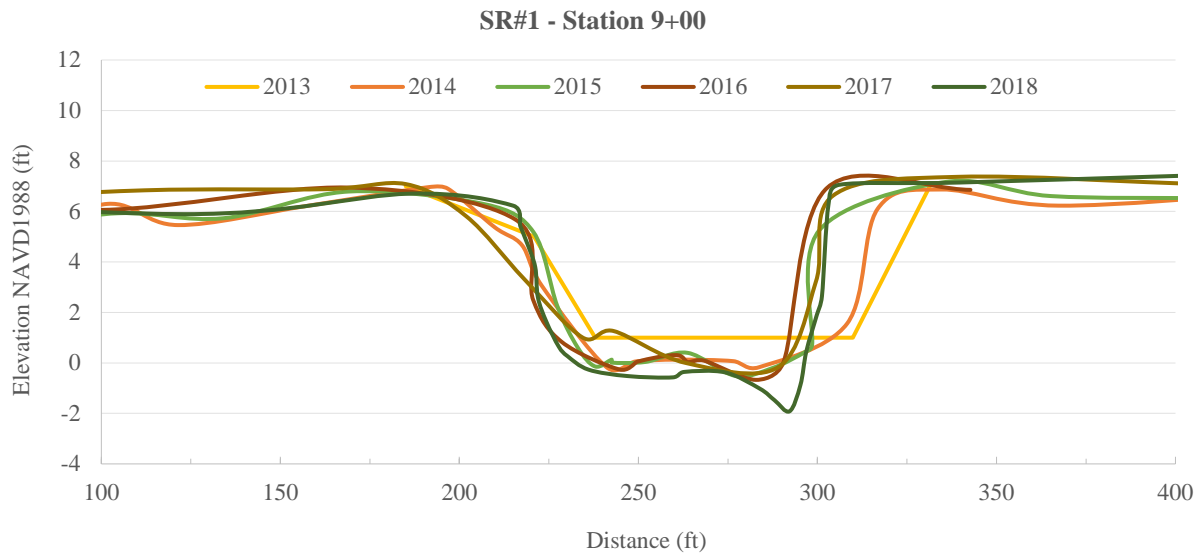


Figure 2A: Salt River main channel cross section one profile for years 2013-2018.

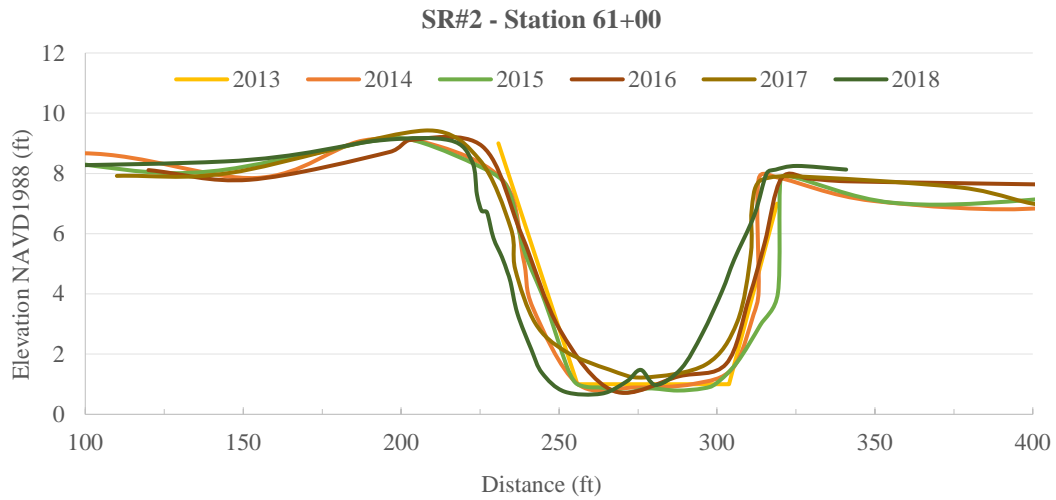


Figure 2B: Salt River main channel cross section two profile for years 2013-2018.

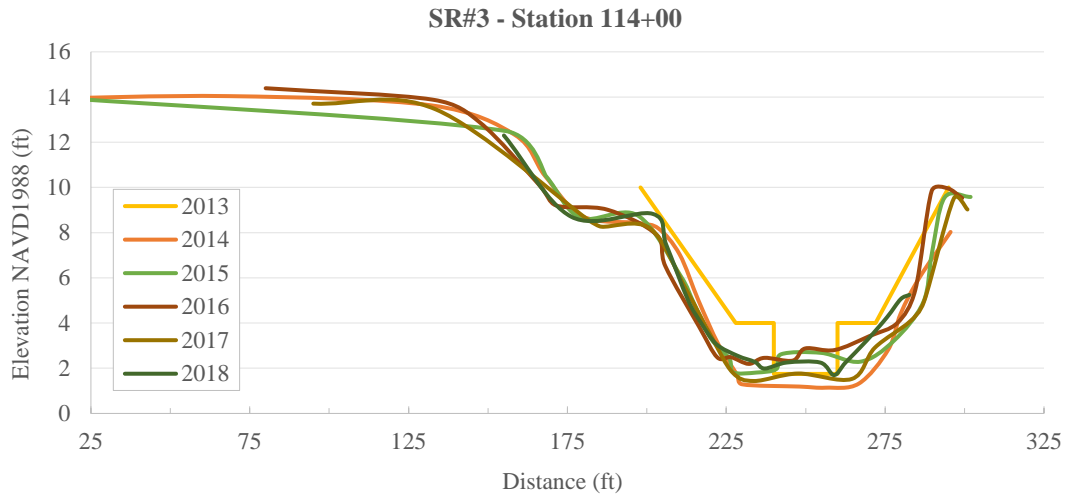


Figure 2C: Salt River main channel cross section three profile for years 2013-2018.

3.1.2) North slough channel cross section profiles

The North slough channel cross section profiles show that the dominant trend across all transects is channel degradation which is consistent with previous survey years. NC1 had the largest areal change among cross sections with significant scour on the left bank and deepening throughout the width of the channel (fig. 3A). The channel in NC2 also deepened, with a thalweg elevation roughly 0.78ft lower than in 2017 (fig. 3B). Channel deepening at NC3 was minimal compared to other cross sections in the NC with less than 0.5ft of elevation loss (fig. 3C).

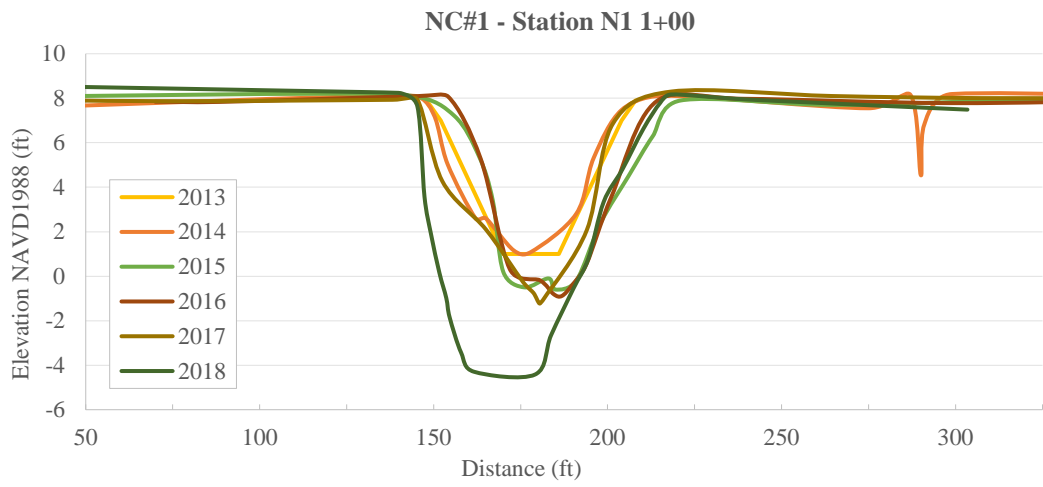


Figure 3A: North slough channel cross section one profile for years 2013-2018.

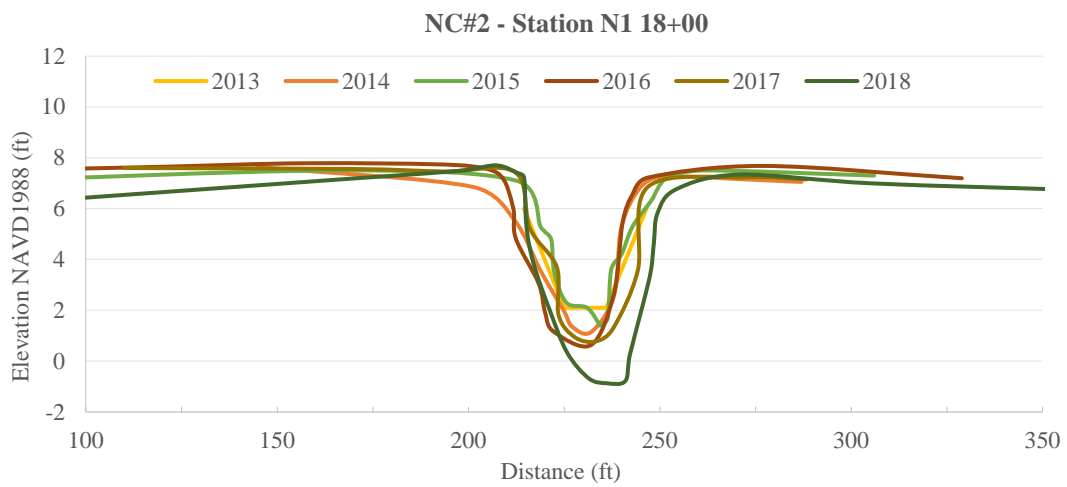


Figure 3B: North slough channel cross section two profile years 2013-2018.

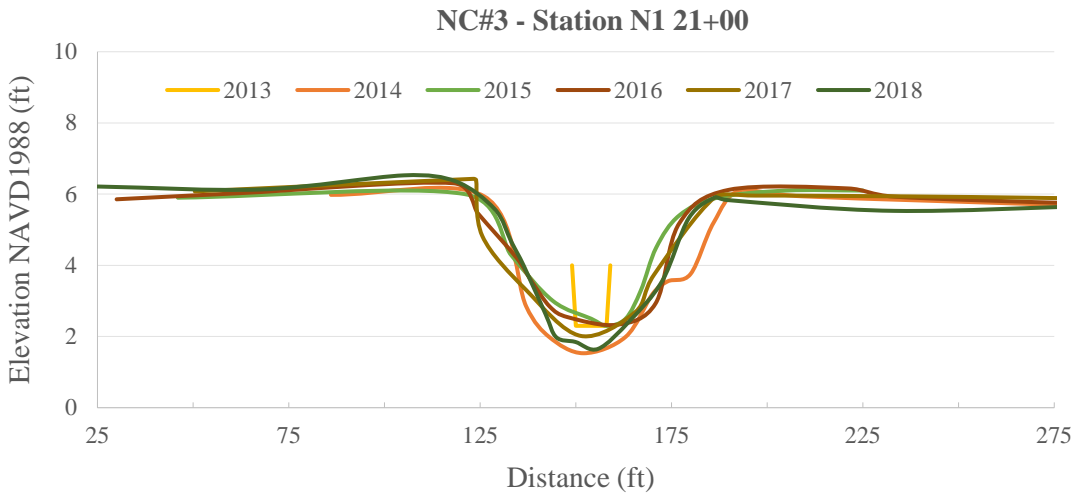


Figure 3C: North slough channel cross section three profile for years 2013-2018.

3.1.3) South slough channel cross section profiles

South slough channel cross-sectional profiles indicate that the SC portion of the project area have undergone the least morphological change out of the three reaches that were surveyed. SC1 showed lateral migration on the left bank to the south (0.21ft) and change in thalweg elevation of less than two inches (fig. 4A). SC2 had uniform deposition across the channel, with a thalweg elevation increase of 0.43ft. compared to 2017 (fig. 4B). SC3 experienced 0.2 ft. of aggradation along the right bank but otherwise had very little morphological change between all survey years (fig. 4C).

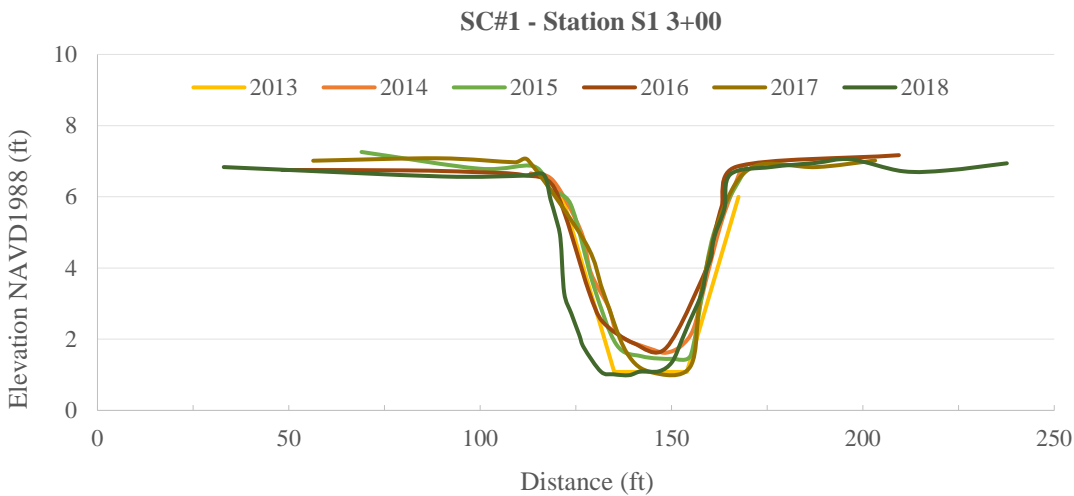


Figure 4A: South slough channel cross section one profile for years 2013-2018.

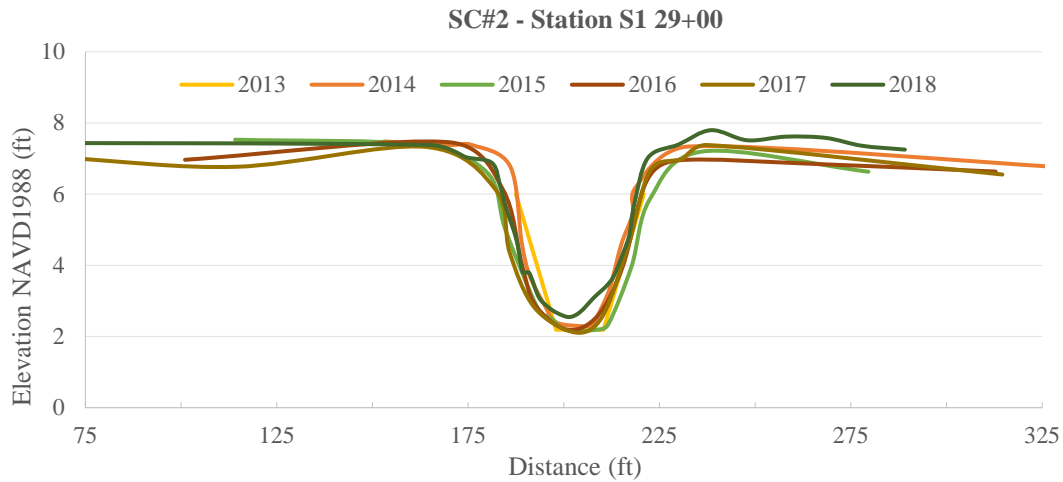


Figure 4B: South slough channel cross section profile two for years 2013-2018.

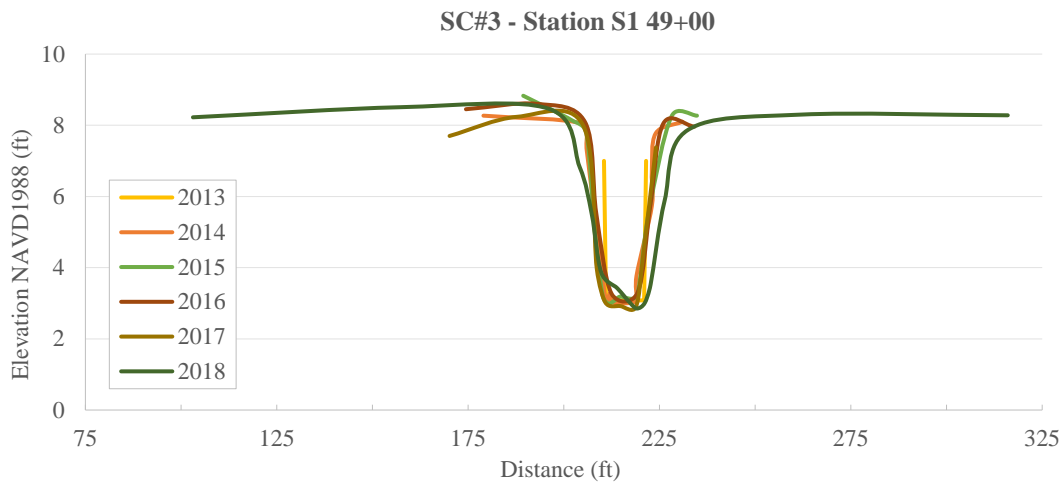


Figure 4C: South slough channel cross section profile three for years 2013-2018.

3.2) Longitudinal profiles

3.2.1) Salt River longitudinal profile

The total relief on the 11,900-foot longitudinal profile section of the main Salt River channel surveyed in 2017 was 3.672 feet, yielding an average gradient of 0.3% per thousand feet, which is a 0.01% increase from 2017. The dominant trend in the main channel longitudinal profile was scouring, most notably between 0 and 3,000ft which had an average elevation approximately 1.41ft lower than 2017. In contrast, an average of 1ft of deposition occurred from 5,000 to 6,000ft upstream from Cutoff Slough. Considerable channel deepening was observed at 4,500ft near the NC confluence, which has consistently scoured since the beginning of the survey in 2014.

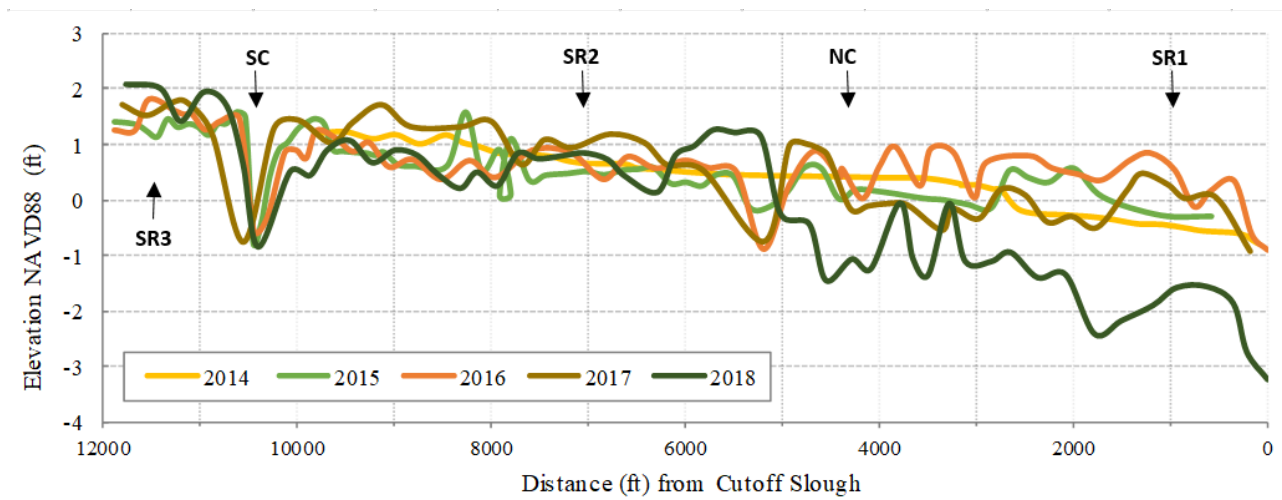


Figure 5: Salt River longitudinal profile for years 2014-2018.

3.2.2) North slough channel longitudinal profile

The longitudinal profile of the NC for 2018 indicates scouring throughout almost the entirety of the channel reach with the exception of less than half a foot of deposition between 375 and 425ft (fig. 5). Degradation of the channel was relatively consistent, with an average elevation drop of approximately one foot between 400ft from the confluence of the Salt River to the end of the reach. Additionally, considerable scour occurred at the beginning of the reach (roughly 175ft) and severe undercutting of the bank was observed.

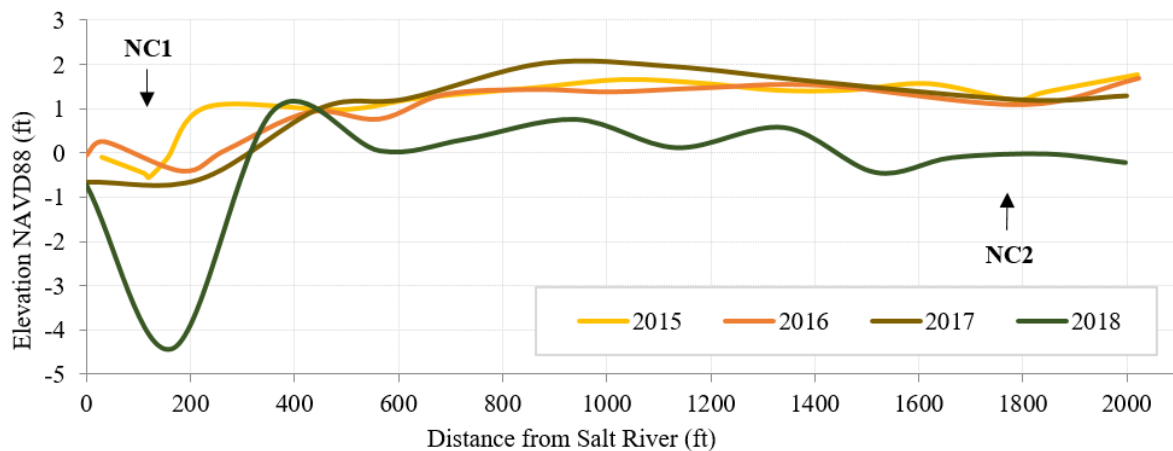


Figure 6: North slough channel profile for years 2015-2018.

3.2.3) South slough channel longitudinal profile

The total relief of the SCL was 2.34ft in 2018, a decrease compared to 2017 (3.42ft) due to a combination of deposition at the beginning of the reach and scouring at the end. The 2018 survey is consistent with previous longitudinal surveys which predominantly scoured.

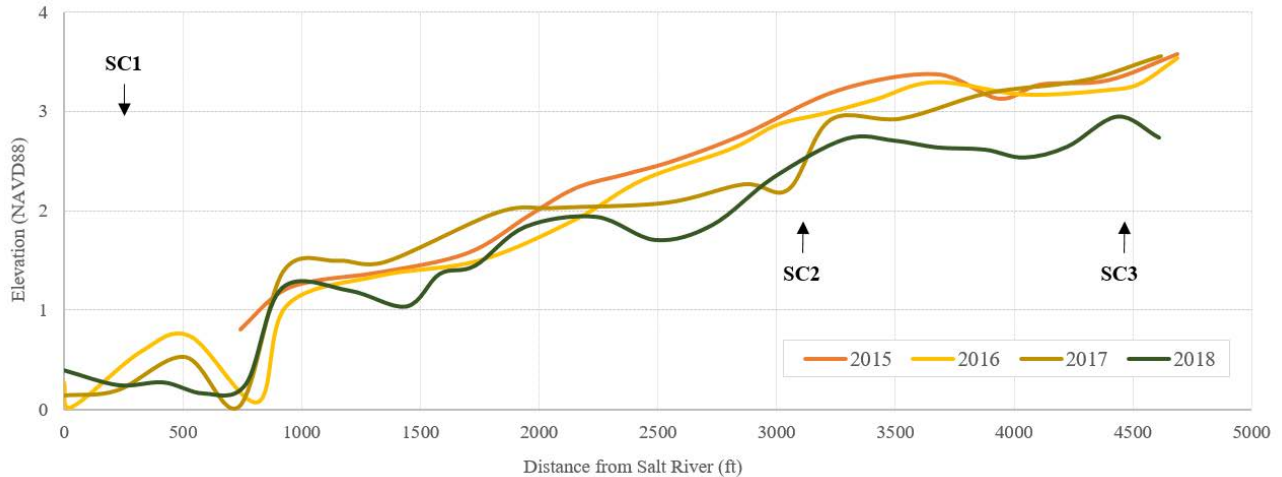


Figure 7: South channel slough longitudinal profile for years 2015-2018.

4.) DISCUSSION

Overall, the data show trends of decreased channel elevation and potential net sediment transport out of the project area, which is similar to past survey years. Channel degradation is most prominent in the downstream portions of SR near the confluence of cutoff slough and NC, which is a process that has continued since 2016. Despite an overall trend in channel degradation in water year 2018, sediment deposition that did occur was predominantly in upstream sections. The majority of change in channel geometries occurred vertically rather than laterally as the data indicates smaller variation in cross-sectional channel widths compared to channel depths. Although cross-section lateral geometries appear to be relatively stable, bank erosion and slumping was observed throughout the project area. Channel deepening in 2018 could potentially be due to a combination of low sediment inputs from the relatively dry water year in conjunction with re-suspension and transport of fine grained sediments out of the system from tidal influences. However, spatial variation and temporal fluctuations naturally occur in rivers and do not always equate to a state of disequilibrium, but rather a short term quasi-equilibrium. Therefore, monitoring across a longer timeframe is necessary to determine persistent hydraulic processes that might compromise the objectives of the SRERP and require management intervention.

4.1) Salt River Main channel

Areas of deposition and scour in the longitudinal profile were less variable in their spatial distribution in 2018 compared to 2017. In 2017, the SRL shows mostly scour in the downstream half of the reach and deposition in the upstream half, whereas this year was dominated by scour. A notable change between survey years occurred in the upstream portion immediately after the confluence with SC that extends approximately 1,000ft downstream. This portion of the reach aggraded considerably in 2017 then scoured in 2018 which resulted in

channel morphology more similar to the 2016 survey. Furthermore, a hole at roughly 9,900ft that formed in 2016 and subsequently filled in 2017 has redeveloped with an elevation decrease of approximately a 0.25ft compared to 2016. The downstream portion of the SRL from 0 to 5,000ft indicates a consistent trend in elevation loss, which is more similar to previous survey years although to a greater magnitude this year (fig. 5). Pools in the downstream portion continue to deepen as much as 1.5 feet near Cutoff Slough and the around the confluence of the NC. All cross sections show the formation of bar in the middle of the channel and lower elevations near the banks (fig. 2A, 2B, 2C). While the middle of the channel in SR1 showed no elevation change, distinct scouring occurred to the right and left, which contrasts to deposition that occurred in 2017. Elevation in the middle channel of SR2 increased by 3 inches with an average decrease of 4 inches on either side of the middle channel. SR3 was the only cross-section on the main channel of the Salt River that experienced uniform deposition, with an average elevation increase of 4.5 in across the wetted width of the channel.

4.2) North slough channel

The NC includes a main channel and three, upstream channel branches. The main channel underwent considerable erosion to the channel bottom as indicated in the longitudinal profile as well as NC1 and NC2 (figs. 4A, 4B, 6). Cross sections show signs of channel incision via steepening of channel banks and elevation decreases within the wetted width of the channel. NC1, which is located near the confluence of the main channel Salt river, exhibited severe erosion on the left-side cut-bank (Appendix VII, NC1-B), which is a process that has persisted since 2015. The large areal change in channel width represented in NC1 (fig. 4A) could partially be due to differences of in-channel sample sizes across surveys (2018: $n=11$, 2017: $n=5$). Bank erosion and channel deepening also occurred at NC 2 (Appendix VII, NC2-B) with an average bank slope increase of 11% since 2017. Erosion around a large root wad in the channel 75 feet downstream of NC2 continues, as noted in 2017 (Appendix VII, NC2-A). NC3 is located on the north branch and exhibited minor mid-channel erosion (0.77ft) compared to other NC cross sections. NC3 was the only cross section within the North slough channel that had sediment deposition, which occurred in the toe of the right bank (Appendix VII, NC3).

4.3) South slough channel

The South slough channel has two linear, channels with floodgates that drain bottomlands located to the northeast of the project area that were not surveyed. Data for 2108 shows a trend of scouring which is consistent with the main-stem and the North slough channel. Average elevation loss in the longitudinal profile was 4 inches with more pronounced degradation in the second half of the reach. The formation and deepening of insipient pools indicates an increase in morphological complexity of the channel. Overall, the South slough channel has the most minimal morphological change among all survey reaches which is consistent throughout survey years. Channel elevation of SC1 did not change and appears relatively stable. Channel width increased, mostly due to lateral migration towards the east bank (fig. 4A). As previously noted in other cross sections, the higher density of in-channel elevation points in 2018 compared to 2017 likely inflates the rate of lateral change in channel geometries. SC2 had uniform deposition across the channel of approximately five inches, channel width and bank slope remain stable (fig. 4B). SC3 very little change in channel form and an average of 2 inches of deposition from the mid-channel extending towards the left bank (fig 4C).

Appendix I: Salt River main channel cross section data with distance (D) and elevation (E).

SR1

2013		2014		2015		2016		2017		2018	
D	E	D	E	D	E	D	E	D	E	D	E
185	7	0	6.63	0	7.18	0.0	6.90	0.0	7.88	0	6.772
220.9	5	44.9	6.62	45	6.38	43.2	6.62	32.9	6.02	123	5.894
237.9	1	57.4	5.13	67.5	5.38	100.3	6.06	55.9	6.42	186	6.704
309.9	1	73.8	4.97	104.7	5.93	168.6	6.95	112.1	6.84	215	6.23
331.4	7	101.7	6.3	134	5.73	215.5	5.70	162.8	6.88	217	5.424
		121.4	5.46	169.1	6.79	220.6	2.50	185.1	7.08	219	4.714
		157.4	6.22	207.3	6.28	228.6	0.83	201.9	5.82	221.188	3.792
		191.2	6.96	220.7	5.18	244.7	-0.26	217.9	3.35	221.924	2.596
		196.8	6.9	227.3	2.27	249.5	0.03	234.4	1.00	224.308	1.626
		209.9	5.37	233	0.62	249.8	0.05	243.0	1.27	227.742	0.648
		217.5	4.66	237.9	-0.14	255.8	0.24	263.2	0.00	230.244	0.262
		223	3.06	242.5	0.13	261.2	0.30	289.1	-0.17	236.066	-0.266
		241.1	-0.17	242.6	0.01	263.5	0.05	299.6	3.25	246.938	-0.52
		249.3	0.06	252	0.04	264.4	0.04	304.4	6.64	259.638	-0.572
		260.8	0.13	263.7	0.4	268.4	0.09	339.6	7.37	262.8	-0.356
		276.5	0.07	277	-0.51	282.8	-0.67	410.1	7.06	274.184	-0.374
		283.7	-0.17	287.3	-0.21	290.5	0.03			283.884	-1.018
		308.3	1.56	296.4	0.42	302.7	6.93			288.02	-1.478
		316.8	6.1	298.5	0.71	342.7	6.86			292.216	-1.916
		334.6	6.87	300.5	5.25					295.24	-0.88
		367.4	6.23	335.9	7.17					296.89	0.454
		431.3	6.76	365.2	6.61					299.808	1.892
				411.3	6.52					301.258	2.64
										303.096	6.286
										306.18	7.058
										339.73	7.146
										416	7.478

SR2

2013		2014		2015		2016		2017		2018	
D	E	D	E	D	E	D	E	D	E	D	E
231	9	0.0	7.44	0	8.00	120.0	8.11	110.0	7.92	0	8.146
256	1	31.2	7.96	59.1	8.74	151.9	7.79	146.2	8.02	144.156	8.398
304	1	99.1	8.67	126.6	8.01	196.4	8.71	207.4	9.42	192.618	9.092
319	7	154.2	7.85	168.0	8.58	202.9	9.11	224.7	8.47	215.414	9.1
		187.9	9.09	190.5	9.07	225.7	8.90	234.7	6.19	222.432	8.406
		211.6	8.91	204.7	9.08	238.1	5.98	236.1	4.81	224.006	7.3
		232.9	7.68	228.6	8.03	250.3	2.80	242.5	3.03	225.498	6.756
		238.8	5.12	234.4	7.34	267.3	0.77	252.0	2.10	227.19	6.706
		241.7	3.54	238.9	5.46	288.0	1.27	265.9	1.48	229.222	5.858
		255.8	1.02	245.5	3.75	302.9	1.68	276.9	1.22	231.938	5.22
		273.9	0.89	252.2	1.67	310.1	3.84	296.6	1.66	233.638	4.726
		292.6	1.01	255.0	1.07	315.1	5.69	306.4	3.07	234.67	4.382
		305.0	1.53	258.8	0.91	320.4	7.84	310.7	5.32	236.81	3.35
		311.6	3.32	263.9	0.88	329.4	7.83	311.0	6.76	241.234	2.152
		313.2	4.09	271.0	0.72	341.2	7.74	313.4	7.74	244.638	1.372
		313.2	7.81	278.3	0.86	424.6	7.60	322.8	7.91	251.79	0.752
		319.8	7.85	287.4	0.79	472.6	7.48	377.1	7.53	263.52	0.688
		349.3	7.09	295.5	0.86			408.2	6.92	271.376	1.09
		403.4	6.86	299.8	1.03			447.85	7.602	275.886	1.476
		437.9	8.01	306.4	1.73					280.7	0.974
				313.7	2.96					288.676	1.52
				319.3	4.03					295.368	2.68
				320.1	7.78					301.602	4.086
				323.8	7.89					305.464	5.14
				355.3	7.03					311.87	6.626
				398.9	7.12					315.666	7.986
				466.1	7.94					318.564	8.125
										325.326	8.249
										340.92	8.128

SR3

2013		2014		2015		2016		2017		2018	
D	E	D	E	D	E	D	E	D	E	D	E
198	10	0	13.9	0	14.11	80	14.39	95	13.709	155	12.3
228	4	68.5	14.04	155.4	12.5	132.643	13.882	133.517	13.456	176.206	8.704
240	4	132.2	13.63	168.3	10.49	147.453	12.873	181.392	8.582	201.75	8.834
240	1.75	158.4	12.33	179	8.66	166.236	10.089	185.549	8.266	206.122	7.454
260	1.75	168	10.5	197	8.77	171.438	9.202	201.019	8.19	212.982	5.006
260	4	179.8	8.72	210.7	6.07	187.52	9.017	212.416	5.468	217.04	4.012
272	4	197.2	8.43	214.6	4.94	203.059	7.904	220.374	3.377	221.872	3.066
295	10	203.6	8.19	220.1	3.33	205.839	6.507	226.98	1.812	228.568	2.55
		210.3	7.04	225.9	2.44	216.399	3.85	233.721	1.436	234.002	2.278
		216.2	5.01	227.2	1.82	222.167	2.481	247.563	1.766	237.086	1.988
		222.5	3.06	234.5	1.81	226.446	2.491	264.533	1.528	244.034	2.254
		228.4	1.71	240.8	1.97	232.085	2.193	271.727	2.905	254.618	2.25
		230	1.29	242.3	2.62	236.938	2.46	282.765	4.065	258.894	1.7
		248	1.19	254.9	2.68	245.906	2.338	287.23	4.95	262.522	2.252
		256.2	1.14	267.2	2.29	249.84	2.876	296.613	9.509	269.284	3.238
		266.7	1.32	277.7	3.21	259.08	2.806	300.908	9.024	275.664	4.27
		276	2.83	287	4.92	270.036	3.421			279.868	5.054
		279.9	4.42	289.7	7.07	278.965	4.02			282.598	5.246
		285.8	6.01	293.7	9.55	284.489	5.467				
		295.6	8.03	301.9	9.58	289.65	9.844				
						294.601	9.964				
						299.25	9.53				

Appendix II: North slough channel cross section data with distance (D) and elevation (E).

*Elevation estimated due to water depth deeper than height of prism

** Elevations between 2014 and 2015 might be off

NC1

2013		2014		2015		2016		2017		2018	
D	E	D	E	D	E	D	E	D	E	D	E
148	7.9	0	7.77	48.0	8.10	70.0	7.85	10	7.97	5.00	8.63
152	7	21	7.54	114.0	8.20	88.5	7.84	71.9	7.87	133	8.27
170	1	144	8.11	144.0	8.10	145.4	8.10	138.2	7.93	140.536	8.23
186	1	150	7.27	156.0	7.20	154.2	8.07	145.2	7.96	145.334	7.624
204	7	154	5.04	163.0	5.40	163.5	5.29	152.5	4.28	147.36	3.58
208	7.9	162	2.61	167.0	3.40	171.9	0.32	165.1	2.09	149.184	1.934
		165	2.6	170.0	0.20	180.5	-0.18	175.6	-0.25	151.642	0.158
		173	1.16	176.0	-0.50	184.5	-0.81	178.7	-0.75	153.628	-0.982
		178	1.09	183.0	-0.10	186.8	-0.89	180.5	-1.23	154.602	-1.854
		191	2.81	185.0	-0.60	189.8	-0.40	181.7	-1.01	157.892	-3.436
		196	5.32	191.0	-0.20	193.9	0.55	194.0	2.08	161.644	-4.296
		204	7.47	198.0	2.40	201.2	3.60	201.5	6.85	179.154	-4.418*
		216	8.11	206.0	4.50	214.1	7.87	218.3	8.30	183.76	-2.648
		275	7.55	213.0	6.30	239.1	7.98	264.4	8.10	190.162	-0.556
		287	8.16	221.0	7.90	298.9	7.78	307.5	8.01	194.51	0.812
		290	4.55	265.0	7.70	357.0	7.92	353.3	8.018	198.866	3.34
		291	6.81	315.0	7.90					204.272	4.81
		299	8.19	365.0	8.00					210.304	6.634
		406	7.81							215.138	7.798
										218.376	8.17
										241.186	7.936
										303.424	7.488

NC2

2013		2014		2015		2016		2017		2018	
D	E	D	E	D	E	D	E	D	E	D	E
214.5	6	145	7.64	56.7	7	90	7.547	110	7.597	100	6.432
225	2.1	201	6.86	164.2	7.5	121.245	7.651	170.576	7.558	171.95	7.208
236	2.1	212	5.55	212.5	7.1	157.967	7.785	193.555	7.46	197.77	7.488
246.5	6	219	3.51	218.8	5.3	197.436	7.709	212.149	7.439	207.132	7.704
		225	1.96	221.6	4.8	207.866	7.37	216.08	5.212	212.802	7.402
		227	1.37	222.4	3.5	211.667	6.037	223.087	3.701	214.546	7.212
		232	1.14	225.6	2.3	212.355	4.833	223.549	1.814	215.138	5.312
		238	2.57	231	2.1	218.311	3.066	227.811	0.942	217.056	3.816
		240	5.29	234.4	1.4	220.026	1.916	233.314	0.777	221.31	1.976
		245	6.85	234.5	1.4	222.318	1.156	237.834	1.297	225.816	0.33
		251	7.26	236.4	1.7	232.03	0.636	244.234	3.557	231.436	-0.676
		287	7.05	237.3	3.6	237.978	2.628	246.962	6.867	236.166	-0.868
				240	4.2	240.291	5.469	272.853	7.23	240.974	-0.782
				242.9	5.3	242.837	6.553	288.234	7.15	242.17	0.246
				247.7	6.3	246.889	7.221			245.664	2.276
				251.8	7.2	277.022	7.68			247.678	3.564
				261.2	7.5	328.913	7.195			248.45	4.652
				306	7.3					249.442	5.84
										254.358	6.768

270.618	7.338
305.664	6.992
360.706	6.726

NC3

2013		2014		2015		2016		2017		2018	
D	E	D	E	D	E	D	E	D	E	D	E
149	4	86	5.98	46	5.9	30	5.855	50.43	6.077	25	6.214
150	2.3	126	5.94	121	6	61.779	6.025	123.241	6.43	67.904	6.132
158	2.3	137	2.85	133	4.3	118.078	6.305	123.931	6.4	105.124	6.528
159	4	143	1.99	144	3	124.345	5.467	125.554	4.823	118.534	6.362
		152	1.53	154	2.5	134.481	4.215	137.109	3.295	128.802	5.58
		163	1.99	158	2.3	138.348	3.568	151.26	2.017	133.138	4.66
		170	3.19	163	2.5	143.186	2.839	165.544	2.689	136.478	3.966
		174	3.55	167	3.3	147.885	2.543	170.441	3.738	142.096	2.624
		180	3.76	171	4.5	160.836	2.331	186.177	5.897	144.892	1.978
		186	5.2	177	5.4	170.832	2.93	196.862	5.959	149.868	1.848
		193	6.11	187	5.9	176.971	5.172	253.681	5.919	155.84	1.654
		209	5.94	205	6.1	189.98	6.121	325.627	5.815	164.121	2.446
		290	5.65	225	6.1	221.129	6.16			172.615	3.572
						233.131	5.93			179.533	5.33
						281.399	5.743			186.471	5.912
						314.254	5.71			189.381	5.836
										233.219	5.53
										290.175	5.684

Appendix III: South slough channel cross section data with distance (D) and elevation (E).

SC1

2013		2014		2015		2016		2017		2018	
D	E	D	E	D	E	D	E	D	E	D	E
121.5	6	113.2	6.66	69	7.26	48.223	6.754	56.371	7.015	33	6.836
135	1.08	119.1	6.45	99.9	6.79	80.841	6.743	88.972	7.083	90.096	6.572
154	1.08	126.3	5.04	113.9	6.86	97.865	6.698	109.091	6.97	110.98	6.594
167.5	6	128.9	3.87	118.2	6.22	111.426	6.608	112.554	7.025	116.499	6.636
		133.5	2.92	123.6	5.8	119.387	6.247	127.543	4.703	118.373	5.928
		136.4	2.11	129.6	3.52	128.373	3.35	132.136	3.332	119.767	5.408
		145.3	1.7	135.6	1.85	131.873	2.506	138.189	1.639	120.969	4.834
		148.6	1.62	142.2	1.52	140.14	1.887	144.853	1.069	121.951	3.3
		152.5	1.81	150.4	1.45	148.683	1.767	154.907	1.23	123.801	2.724
		155.8	2.31	155.1	1.57	159.948	4.183	157.654	3.274	125.893	2.118
		159.4	3.83	160.9	4.92	160.673	4.683	163.257	5.597	127.137	1.756
		163.3	5.38	169.5	6.83	163.119	5.737	171.46	6.85	131.572	1.086
		168.3	6.82	213.5	7.02	167.078	6.85	187.849	6.836	134.83	1.014
		182.4	7.02			209.404	7.17	203.188	7.02	138.916	0.99
										141.974	1.096
										146.7	1.098
										150.116	1.358
										152.682	1.976
										154.666	2.486
										156.69	2.964
										158.092	3.358
										159.01	3.872
										160.115	4.282
										161.246	4.904
										163.79	5.66
										165.36	6.63
										176.022	6.838
										187.54	6.952
										196.8	7.054
										210.352	6.72
										222.086	6.744
										237.606	6.942

Appendix IV: Salt River main channel longitudinal profile data.

SRL

2015		2016		2017		2018	
Distance	Elevation	Distance	Elevation	Distance	Elevation	Distance	Elevation
9774.4	1.21	11879	1.409	11864.878	1.247	11754.1	2.096
9495	1.242	11742	1.39	11654.071	1.238	11400.1	2.024
9214	1.114	11629	1.345	11509.029	1.806	11191.8	1.428
8976.4	1.189	11542	1.237	11240.626	1.597	10951.8	1.958
8724.9	1.021	11435	1.135	11151.079	1.53	10713.8	1.698
8466.3	1.183	11332	1.46	11064.878	1.53	10550	0.662
8276.5	1.039	11228	1.31	10929.408	1.253	10393	-0.846
8118.2	0.974	11114	1.372	10773.582	1.409	10063.5	0.52
7918.4	0.856	11016	1.316	10578.671	1.459	9860.93	0.444
7726.5	0.832	10909	1.168	10429.25	-0.569	9680.93	0.91
7546.8	0.825	10810	1.374	10292.561	-0.327	9448.61	1.08
7358.1	0.788	10723	1.378	10112.392	0.845	9219.29	0.678
7204	0.714	10617	1.587	9993.962	0.886	8983.43	0.906
7012.2	0.671	10528	1.498	9890.491	0.74	8754.48	0.812
6619.7	0.66	10447	-0.79	9787.02	1.237	8555.24	0.484
6501.8	0.59	10365	-0.437	9596.059	1.114	8314.82	0.212
6293.8	0.561	10276	0.423	9410.106	0.861	8142.41	0.506
6024.1	0.522	10185	0.897	9244.412	1.026	7929.29	0.26
5779.9	0.492	10096	1.026	9039.816	0.583	7724.29	0.846
5520.3	0.466	9989	1.278	8798.423	0.721	7512.29	0.75
5251.5	0.458	9889	1.406	8503.977	0.358	7270.29	0.8
5002.4	0.445	9804	1.465	8212.608	0.7	7037.29	0.854
4755.4	0.441	9715	1.372	7943.378	0.395	6795.29	0.736
4490.7	0.434	9625	0.899	7568.522	0.884	6621.29	0.438
4226.1	0.424	9534	0.877	7171.48	0.846	6285.29	0.14
3956	0.412	9453	0.863	6832.469	0.36	6099.29	0.812
3507.7	0.401	9353	0.848	6582.891	0.771	5906.29	0.98
3156.6	0.301	9270	0.838	6292.417	0.56	5706.29	1.274
3156.4	0.275	9188	0.8	5991.844	0.703	5490.29	1.223
3003.4	0.284	9101	0.859	5750.775	0.568	5218.29	1.158
2825.7	0.209	8959	0.634	5466.24	0.499	5015.29	-0.252
2740.9	0.193	8787	0.604	5189.19	-0.896	4718.29	-0.436
2528.4	-0.185	8450	0.604	4922.004	0.257	4549.29	-1.452
2058.4	-0.26	8257	1.585	4656.993	0.875	4281.29	-1.068
1814.1	-0.29	8092	0.517	4405.815	0.404	4084.29	-1.242
1586.4	-0.341	7908	0.901	4376.747	0.551	3786.29	-0.052
1331.9	-0.419	7908	0.067	4169.585	0.014	3652.29	-1.064
1081.4	-0.429	7792	0.087	3997.051	0.588	3495.29	-1.356

841.5	-0.493	7792	1.103	3831.827	0.95	3279.29	-0.06
650.8	-0.547	7602	0.348	3579.294	0.243	3115.29	-1.108
333.4	-0.58	7431	0.44	3466.964	0.91	2847.29	-1.112
192.5	-0.652	7201	0.472	3230.441	0.841	2648.29	-0.944
184.1	-0.679	7008	0.508	3020.005	0.03	2369.29	-1.404
95.9	-0.773	6828	0.446	2896.045	0.666	2081.29	-1.348
10	-0.784	6633	0.532	2450.541	0.785	1784.29	-2.422
		6479	0.549	2217.066	0.563	1507.29	-2.184
		6323	0.582	1947.983	0.451	1177.29	-1.902
						938.287	-1.584
						628.287	-1.564
						354.287	-1.87
						215.287	-2.75
						0	-3.25

Appendix V: North slough channel longitudinal profile data.

NCL

2015		2016		2017		2018	
Distance	Elevation	Distance	Elevation	Distance	Elevation	Distance	Elevation
2021	1.78	2022	1.69	1999	1.29	1996.972	-0.922
1843	1.39	1801	1.10	1801	1.20	1846.972	-0.028
1784	1.21	1414	1.53	1404	1.61	1663.554	-0.11
1620	1.58	1181	1.47	1127	1.96	1516.474	-0.444
1465	1.43	1010	1.38	880	2.03	1341.018	0.568
1329	1.43	863	1.44	615	1.23	1134.16	0.114
1190	1.58	689	1.33	451	1.02	940.648	0.752
1032	1.67	563	0.77	218	-0.59	727.85	0.302
867	1.49	429	0.93	0	-0.65	564.76	0.042
640	1.25	268	0.06			360.49	0.964
489	0.99	185	-0.41			166	-4.418
234	1.06	35	0.25			0	-0.712
155	-0.12	0	-0.06				
120	-0.55						
112	-0.45						
30	-0.08						

Appendix VI: South slough channel longitudinal profile data.

SCL

2015		2016		2017		2018	
Distance	Elevation	Distance	Elevation	Distance	Elevation	Distance	Elevation
4687	3.574	4687.013	3.531	4620.428	3.553	4611.002	2.739
4393	3.31	4525.862	3.271	4542.174	3.492	4434.946	2.951
4111	3.269	4395.374	3.211	4359.015	3.344	4224.024	2.647
3935	3.127	4042.344	3.166	4192.013	3.271	4042.024	2.538
3670	3.373	3666.258	3.291	3881.524	3.177	3877.424	2.618
3262	3.212	3410.387	3.112	3523.885	2.924	3676.786	2.64
2865	2.771	3196.763	2.973	3228.722	2.913	3492.172	2.71
2571	2.506	3003.053	2.863	3051.811	2.213	3290.608	2.726
2365	2.368	2805.44	2.618	2864.159	2.264	2987.978	2.338
2156	2.23	2437.057	2.309	2536.69	2.078	2730.088	1.858
1959	1.955	2151.39	1.908	2072.808	2.026	2491.43	1.706
1703	1.579	1749.974	1.499	1828.362	1.982	2240.324	1.94
1344	1.388	1322.45	1.343	1353.717	1.483	1942.504	1.84
1053	1.295	936.899	1.045	1151.782	1.494	1731.434	1.448
902	1.167	814.844	0.075	923.35	1.387	1581.434	1.364
744	0.809	529.874	0.738	736.961	0.024	1441.658	1.036
		321.856	0.58	509.708	0.525	1200.87	1.196
		31.778	0.026	223.928	0.188	917.786	1.222
		0	0.269	0	0.137	764.786	0.25
						588.482	0.158
						419.442	0.27
						229.15	0.242
						0	0.392

Appendix VII: Photographic analysis of Salt River, North and South channels.



SR1) 2018 Salt River main channel cross section 1 –SR1. View is looking east in the upstream direction.



SR2) 2018 Salt River main channel cross section 2 –SR2. View is looking south.



SR3) 20158 Salt River main channel cross section, SR3. View is looking upstream.



NC2-A) 2018 South channel slough cross-section, SC3. View is looking upstream.



NC1-B) 2018 North slough channel cross section NC-1. View is looking south. Continued scour on left bank indicated by arrow.



NC2-A) 2015 North slough channel cross section NC2. View is looking west.



NC2-B) 2016 North slough channel cross section NC2. View is looking west from mid channel. Erosion downstream of logjam and bank steepening.



NC3) 2018 North slough channel cross section NC3. View is looking west upstream.



SC1) 2018 South slough channel cross section SC1. View is looking Northeast from the left bank.



SC2) 2018 South slough channel cross section SC2. View is looking South from the left bank.

**Appendix VIII: GPS locations (NAD83) and azimuth bearings (magnetic declination=
14.5° E) for cross-section endpins.**

Salt River Endpin and Benchmark Locations			
Downstream view:rb= right bank; lb=left bank			
(*) indicates endpin not located in			
	Latitude	Longitude	(T)
Main Channel Salt River			
SR1_rb	40.61828	-124.31366	210
SR1_lb*	40.61787	-124.31399	
SR2_rb	40.61143	-124.30377	200
SR2_lb*	40.61109	-124.30396	
SR3_rb	40.59865	-124.29773	230
SR3_lb*	40.59849	-124.29797	
North Slough Channel			
NC1_rb*	40.61056	-124.30993	
NC1_lb	40.61013	-124.30968	335
NC2_rb*	40.61426	-124.30799	
NC2_lb	40.61420	-124.30765	280
NC3_rb*	40.61469	-124.30833	
NC3_lb*	40.61469	-124.30818	225
South Slough Channel			
SC1_rb*	40.60016	-124.29864	
SC1_lb*	40.59997	-124.29850	330
SC2_rb*	40.60553	-124.29799	
SC2_lb	40.60562	-124.29775	240
SC3_rb*	40.60929	-124.30132	
SC3_lb*	40.60935	-124.30094	255
Benchmarks			Elevation
SR11	40.59639	-124.30922	13.85
SR14	40.61008	-124.30818	13.32

