

San Pedro River Expedition 2023

Appendix A

Site Photos



Pictured above: The San Pedro River at Boquillas, 01 June 2023.

Prepared by James Robertson



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Site Name: Palominas South

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
1	GPS Middle	-110.12721256	31.35705605	09 June 2023	

Site Name: Palominas South

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
1	GPS Middle	-110.12721256	31.35705605	09 June 2023	

Site Name: Palominas

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
1	GPS Middle	-110.11870015	31.36957905	09 June 2023	

Site Name: Palominas

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
1	GPS Middle	-110.11870015	31.36957905	09 June 2023	

Site Name: Kolbe

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Both sides of the river featured marks of recent burn.
2	GPS Middle	-110.10490508	31.41452666	29 May 2023	

Site Name: Kolbe

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
2	GPS Middle	-110.10490508	31.41452666	29 May 2023	

Site Name: Kolbe

Position: View to east; recent burn



Reach	Transect	Longitude	Latitude	Date	Notes: Burned SAGO on east side of San Pedro. Cattle hoof prints and dung in channel. JR sampling streamside herbs.
2	GPS Middle	-110.10488569	31.41454011	29 May 2023	

Site Name: Hereford

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Recent flooding rerouted the river through an old, overgrown channel along the middle transect.
2	GPS Middle	-110.10971293	31.45445928	29 May 2023	

Site Name: Hereford

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes: Recent flooding rerouted the river through an old, overgrown channel along the middle transect.
2	GPS Middle	-110.10971293	31.45445928	29 May 2023	

Site Name: Hereford

Position: Avulsed channel; upstream



Reach	Transect	Longitude	Latitude	Date	Notes
2	GPS Middle	-110.10912596	31.45417428	29 May 2023	Slightly upstream of middle transect looking upstream along avulsed, newer channel.

Site Name: Hereford

Position: Avulsed channel and reroute; downstream



Reach	Transect	Longitude	Latitude	Date	Notes: View of avulsed channel and recent reroute as river cuts away to left (west) to join older, overgrown channel.
2	GPS Middle	-110.10912596	31.45417428	29 May 2023	

Site Name: Hunter South

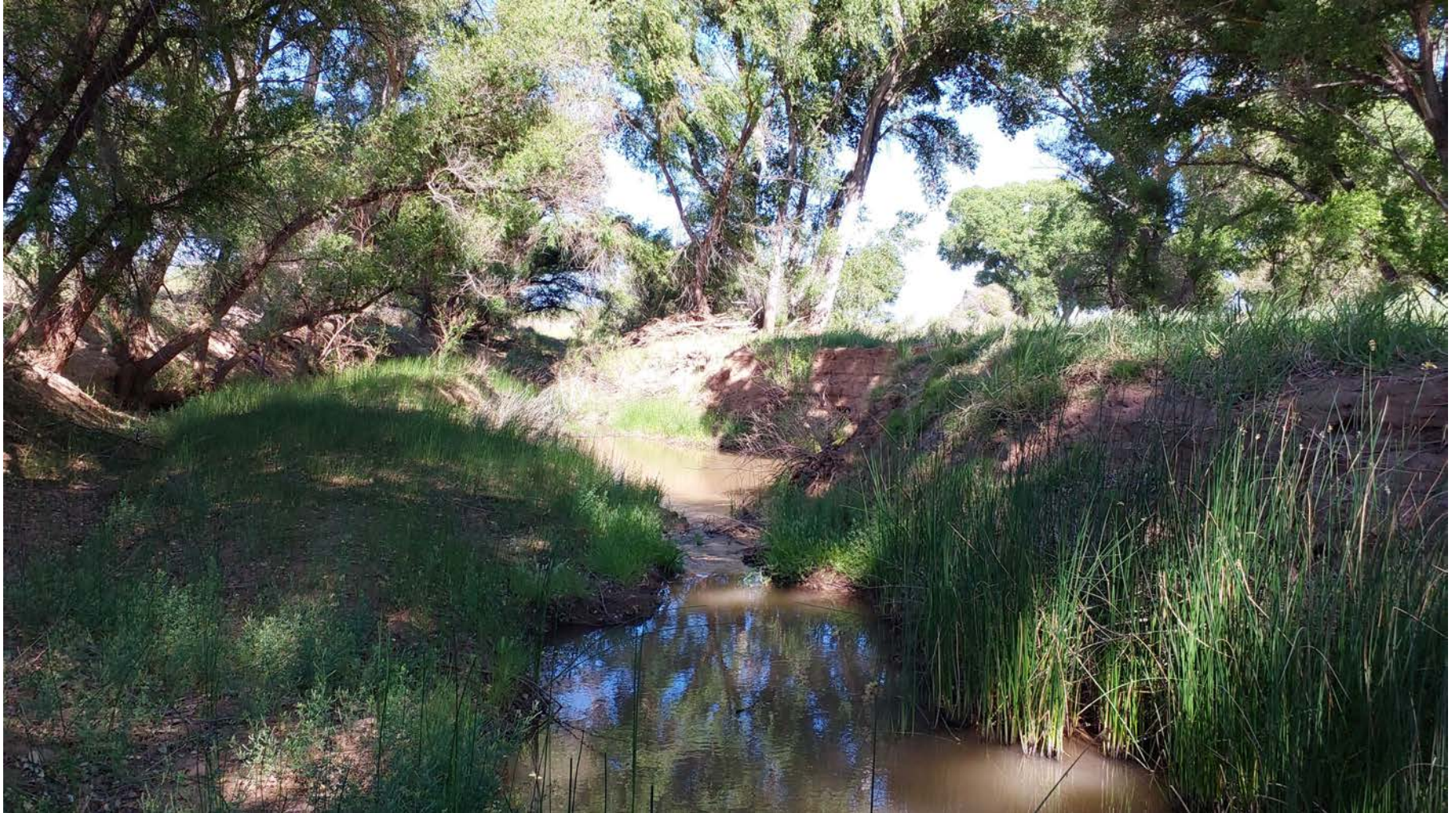
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: JR pictured sampling streamside herbs.
3	GPS Middle	-110.11107195	31.47153043	29 May 2023	

Site Name: Hunter South

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
3	GPS Middle	-110.11107195	31.47153043	29 May 2023	

Site Name: Hunter
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
3	GPS Middle	-110.11844919	31.48288907	28 May 2023	

Site Name: Hunter

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
3	GPS Middle	-110.11844919	31.48288907	28 May 2023	

Site Name: Hunter

Position: Downstream; flood debris



Reach	Transect	Longitude	Latitude	Date	Notes: From upstream of middle transect showing split channel and flood debris. Felled bole on left also on page 14.
3	GPS Middle	-110.11817647	31.48275939	28 May 2023	

Site Name: Cottonwood

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Primary channel; note small secondary channel branching to right (west) upstream of snag.
4	GPS Middle	-110.12890968	31.5198936	28 May 2023	

Site Name: Cottonwood

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
4	GPS Middle	-110.12890968	31.5198936	28 May 2023	

Site Name: Cottonwood

Position: Side channel; upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Small secondary channel to the west of the main.
4	GPS Middle	-110.12890103	31.51992611	28 May 2023	

Site Name: Cottonwood

Position: Side channel; downstream



Reach	Transect	Longitude	Latitude	Date	Notes: Small secondary channel to the west of the main.
4	GPS Middle	-110.12890103	31.51992611	28 May 2023	

Site Name: Cottonwood North

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
4	GPS Middle	-110.12937355	31.53049055	27 May 2023	

Site Name: Cottonwood North

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
4	GPS Middle	-110.12937355	31.53049055	27 May 2023	

Site Name: Cottonwood North

Position: North transect; downstream



Reach	Transect	Longitude	Latitude	Date	Notes: Channel and flood debris viewed from upstream of north transect.
4	100m North	-110.12957549	31.53131505	19 June 2023	

Site Name: Lewis Springs

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
5	GPS Middle	-110.14034801	31.55736663	27 May 2023	

Site Name: Lewis Springs

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
5	GPS Middle	-110.14034801	31.55736663	27 May 2023	

Site Name: Moson
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
6	GPS Middle	-110.16711872	31.61176523	31 May 2023	

Site Name: Moson

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
6	GPS Middle	-110.16711872	31.61176523	31 May 2023	

Site Name: Charleston South
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
7	GPS Middle	-110.16878479	31.62093768	31 May 2023	

Site Name: Charleston South

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
7	GPS Middle	-110.16878479	31.62093768	31 May 2023	

Site Name: Charleston Bridge
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
7	GPS Middle	-110.17600165	31.62829703	31 May 2023	

Site Name: Charleston Bridge
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
7	GPS Middle	-110.17600165	31.62829703	31 May 2023	

Site Name: Charleston Mesquite
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
8	GPS Middle	-110.17870497	31.66612899	01 June 2023	

Site Name: Charleston Mesquite

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
8	GPS Middle	-110.17870497	31.66612899	01 June 2023	

Site Name: Boquillas
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Strong recruitment among POFR seedlings was noted on sandbars here.
8	GPS Middle	-110.18498863	31.69047839	01 June 2023	

Site Name: Boquillas
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
8	GPS Middle	-110.18498863	31.69047839	01 June 2023	

Site Name: Boquillas North

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
9	GPS Middle	-110.18039999	31.70032972	01 June 2023	

Site Name: Boquillas North
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes: Cattle hoof prints are visible in sandbars.
9	GPS Middle	-110.18039999	31.70032972	01 June 2023	

Site Name: Boquillas North

Position: North transect; upstream



Reach	Transect	Longitude	Latitude	Date	Notes: View upstream from north transect; cattle hoof prints.
9	100m North	-110.18106184	31.70103397	20 July 2023	

Site Name: Fairbank
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
9	GPS Middle	-110.19386575	31.72188775	03 June 2023	

Site Name: Fairbank
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
9	GPS Middle	-110.19386575	31.72188775	03 June 2023	

Site Name: Depot
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
10	GPS Middle	-110.19610956	31.728405	03 June 2023	

Site Name: Depot
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
10	GPS Middle	-110.19610956	31.728405	03 June 2023	

Site Name: Fairbank North
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
10	GPS Middle	-110.19558231	31.74005295	07 June 2023	

Site Name: Fairbank North
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
10	GPS Middle	-110.19558231	31.74005295	07 June 2023	

Site Name: Fairbank North

Position: North transect; downstream



Reach	Transect	Longitude	Latitude	Date	Notes: View downstream to north transect over broad alluvial flat; cattle hoof prints.
10	100m North	-110.19521261	31.7407924	18 July 2023	

Site Name: Tombstone South

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
11	GPS Middle	-110.20062357	31.75002152	07 June 2023	

Site Name: Tombstone South

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
11	GPS Middle	-110.20062357	31.75002152	07 June 2023	

Site Name: Tombstone

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
11	GPS Middle	-110.20131884	31.75177747	07 June 2023	

Site Name: Tombstone

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
11	GPS Middle	-110.20131884	31.75177747	07 June 2023	

Site Name: Contention

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
12	GPS Middle	-110.20369286	31.76731516	05 June 2023	

Site Name: Contention

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
12	GPS Middle	-110.20369286	31.76731516	05 June 2023	

Site Name: Contention

Position: North transect; side channel upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Upstream view from north transect along side channel; abundant TAMRAM between channel braids.
12	100m North	-110.20475763	31.76775708	19 July 2023	

Site Name: Summers

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Note entry of abandoned channel along right bank.
12	GPS Middle	-110.21844823	31.79338174	05 June 2023	

Site Name: Summers

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
12	GPS Middle	-110.21844823	31.79338174	05 June 2023	

Site Name: Summers

Position: South transect; abandoned channel upstream



Reach	Transect	Longitude	Latitude	Date	Notes: View upstream of abandoned channel where intersected by south transect.
12	100m South	-110.21881992	31.79262099	06 July 2023	

Site Name: Summers

Position: South transect; abandoned channel downstream



Reach	Transect	Longitude	Latitude	Date	Notes: View downstream of abandoned channel where intersected by south transect; flood debris.
12	100m South	-110.21881992	31.79262099	06 July 2023	

Site Name: St. David

Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
13	GPS Middle	-110.21509006	31.81586824	06 June 2023	

Site Name: St. David

Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
13	GPS Middle	-110.21509006	31.81586824	06 June 2023	

Site Name: St. David North
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: POFR specimens 2-3m in height were occasional along banks and bars here.
13	GPS Middle	-110.21714816	31.82178893	06 June 2023	

Site Name: St. David North
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
13	GPS Middle	-110.21714816	31.82178893	06 June 2023	

Site Name: St. David North
Position: South transect; view to west



Reach	Transect	Longitude	Latitude	Date	Notes: View to west along south transect; channel braiding and TAMRAM on floodplain.
13	100m South	-110.21702351	31.82094766	04 July 2023	

Site Name: Escalante 225m South
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes:
14	GPS Middle	-110.20766492	31.86027061	26 July 2023	

Site Name: Escalante 225m South
Position: Downstream



Reach	Transect	Longitude	Latitude	Date	Notes:
14	GPS Middle	-110.20766492	31.86027061	26 July 2023	

Site Name: Escalante
Position: Upstream



Reach	Transect	Longitude	Latitude	Date	Notes: Fish fry were abundant in the river during June sampling; strong recruitment among SAGO/POFR seedlings.
14	GPS Middle	-110.20967613	31.86107504	06 June 2023	

Site Name: Escalante

Position: Downstream



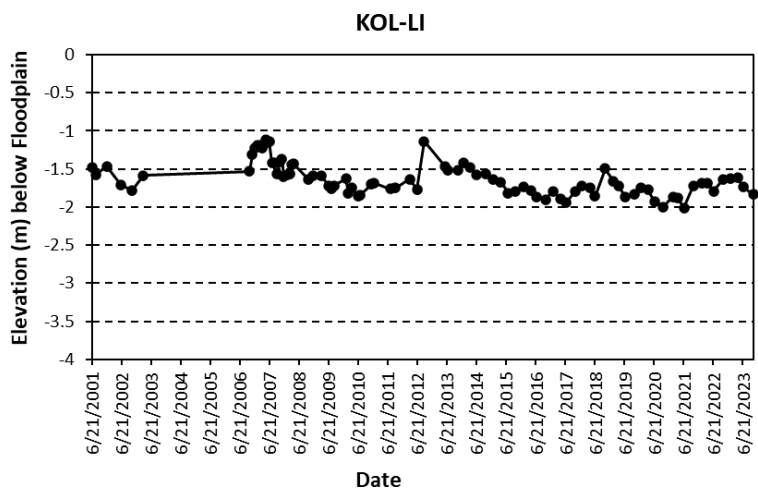
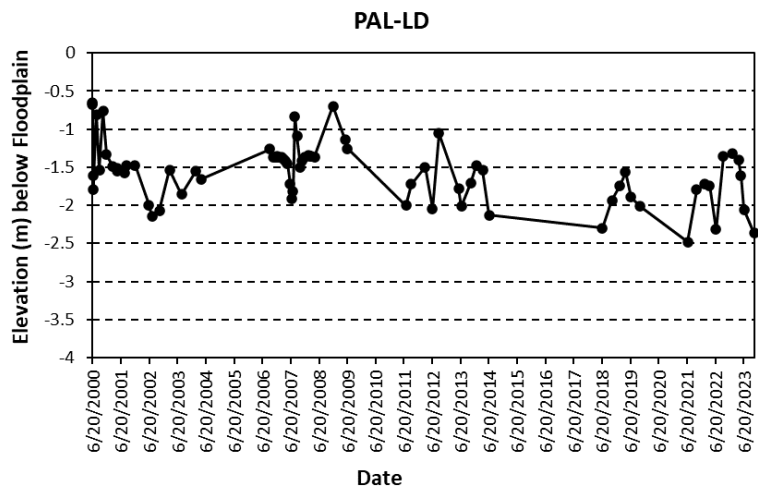
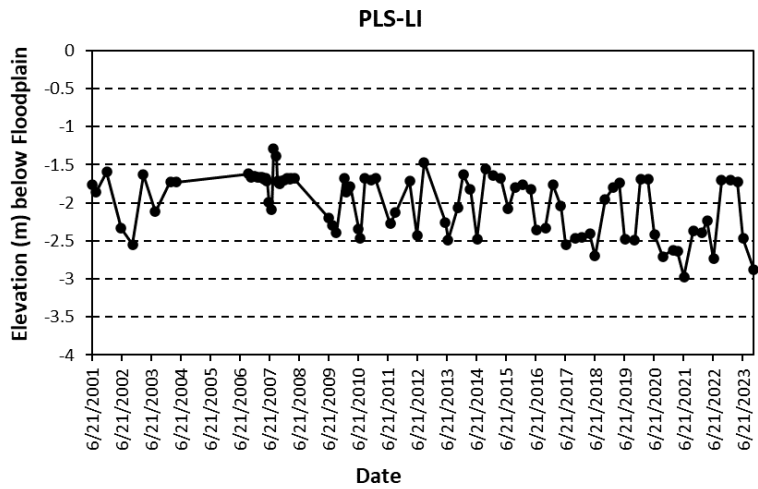
Reach	Transect	Longitude	Latitude	Date	Notes:
14	GPS Middle	-110.20967613	31.86107504	06 June 2023	

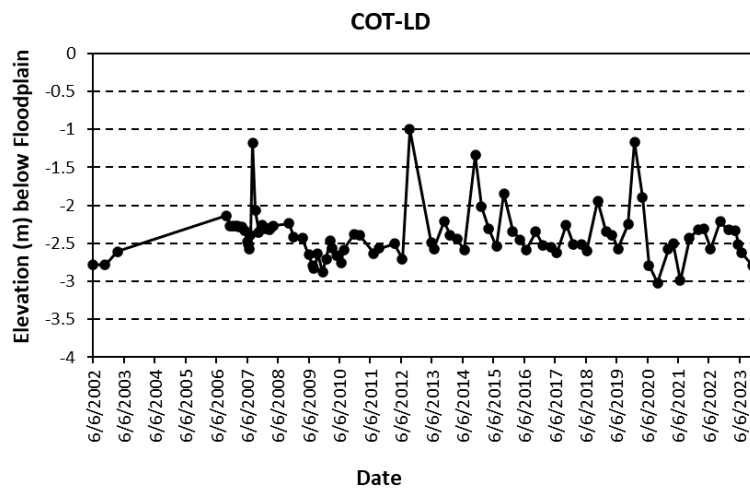
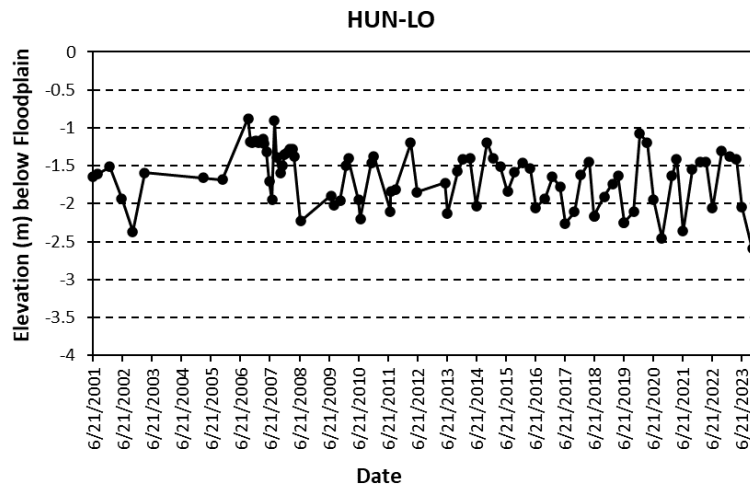
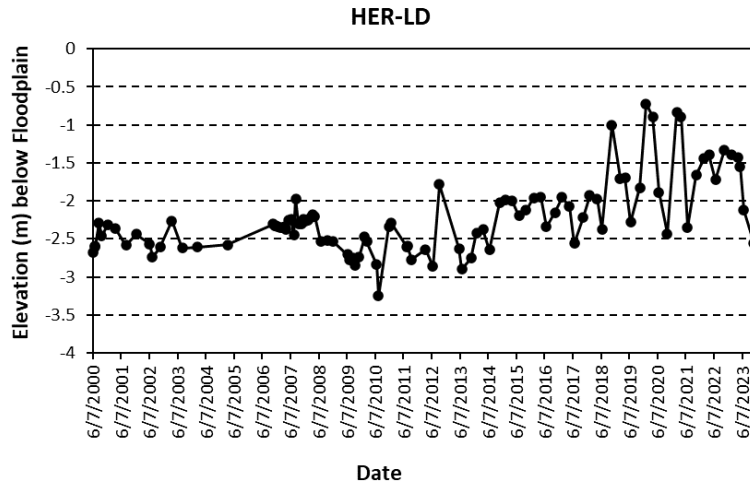
Appendix B: Table. Information on wells used for groundwater calculations (Leenhouts et al. 2006: Digital Appendix 1C). Floodplain elevations are estimated from Leenhouts et al. (2006: Digital Appendix 2 A-P).

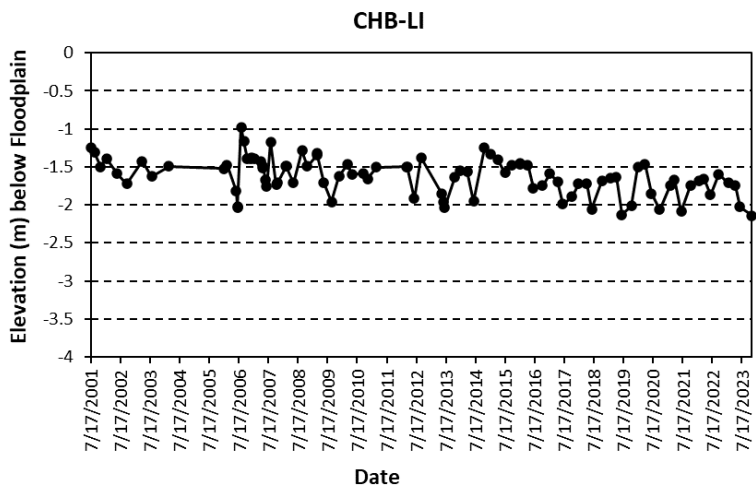
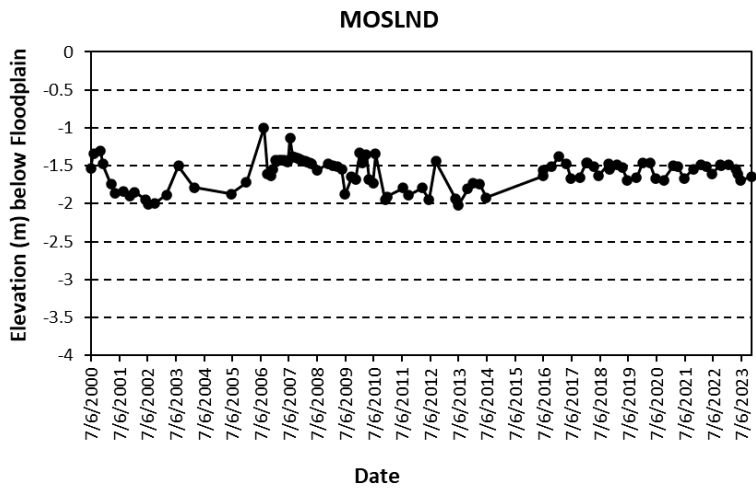
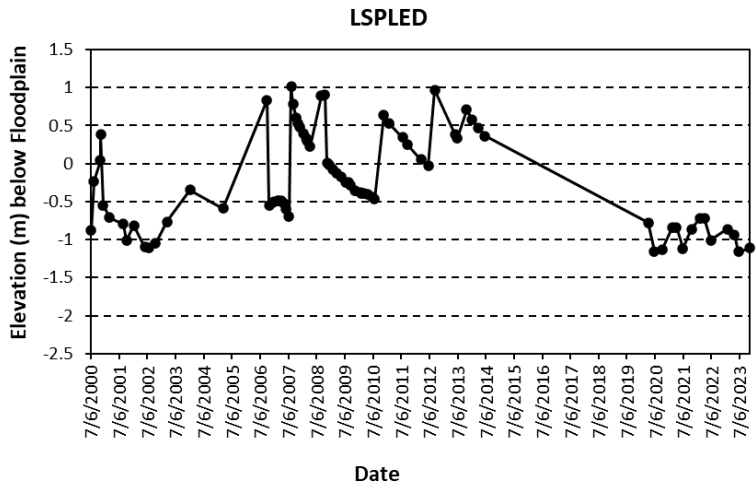
Reach #	Site Name	Well designator code	Station identifier	Borehole name	UTM Northing (m)	UTM Easting (m)	Land surface elevation (m)	Mean floodplain elevation (m)
1	Palominas South	PLS-LI	312127110073101	D-24-2208DBA1	3469550	583121.9	1292.31	1292.60
1	Palominas	PAL-LD	312208110070502	D-24-2204CBA2	3470839.6	583801.7	1288.42	1288.02
2	Kolbe	KOL-LI	312453110061401	D-23-2222CBB1	3475920	585110	1274.22	1273.23
2	Hereford	HER-LD	312716110063202	D-23-2204DCD2	3480320.4	584589.6	1261.6	1262.18
3	Hunter	HUN-LO	312900110071001	D-22-2228CAA2	3483503.2	583588	1253.1	1253.19
4	Cottonwood	COT-LD	313110110074402	D-22-2217ACC2	3487520	582660	1241.25	1242.91
5	Lewis Springs	LSPLED	313310110081701	D-22-2206AAA1	3491220	581760	1233.44	1232.96
6	Moson	MOSLND	313643110100102	D-21-2113BAB2	3497719.4	578966.9	1213.16	1213.40
7	Charleston Bridge	CHB-LI	313738110102901	D-21-2102DDC	3499436.9	578202.9	1207.08	1206.87
8	Boquillas	BOQ-LI	314125110110501	D-20-2115DBD1	3506411.5	577216.4	1179.4	1178.74
9	Fairbank	FBK-LI	314317110113401	D-20-2103CBA	3509846.2	576427.4	1169.49	1168.00
11	Tombstone	TOM-LI	314511110120601	D-19-2128ACD	3513301	575539	1156.36	1155.98
12	Contention	CONLID	314601110120902	D-19-2121ACC2	3514898.4	575453.5	1150.68	1151.07
12	Summers	SUM-LI	314736110130001	D-19-2108DAC1	3517755.1	574066	1135.76*	1135.15
13	St. David	STD-LO	314904110125001	D-19-2105AAA2	3520518.4	574331.1	1126.35	1125.06

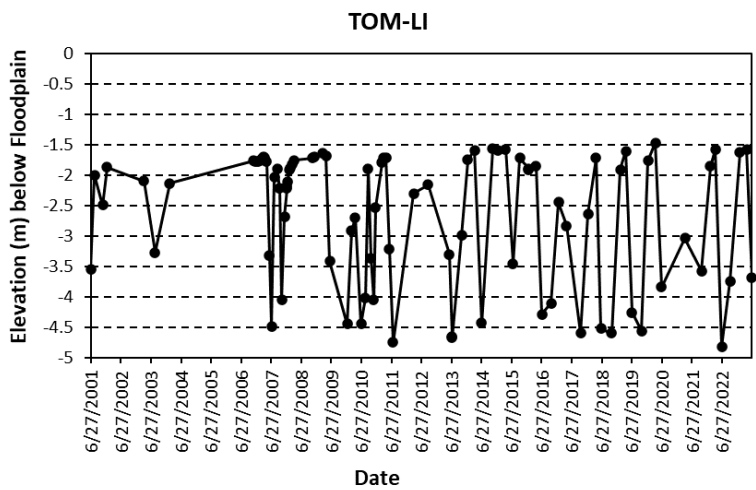
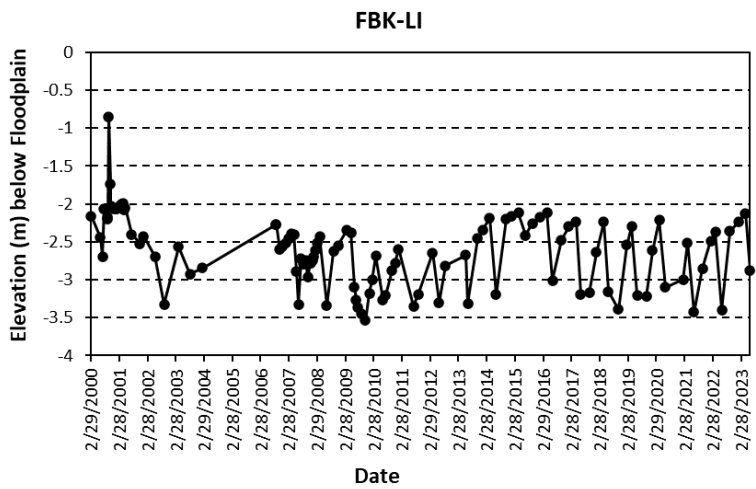
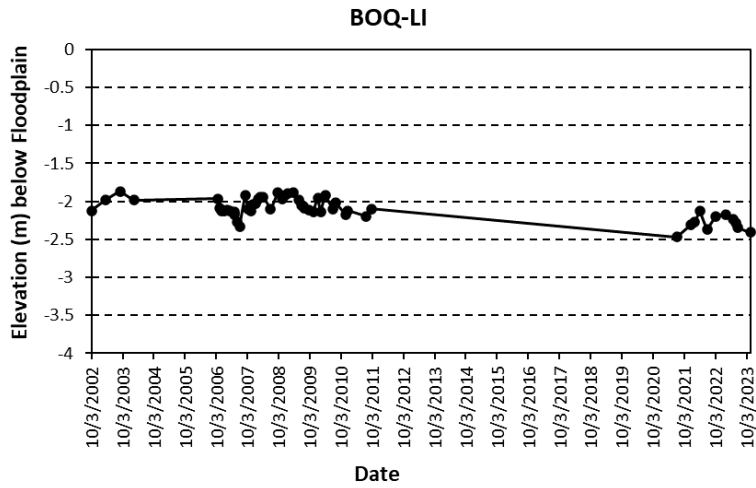
*At SUM-LI, used 1135.76 instead of 1135.71 for land surface elevation for 2022-2023, based on station data from https://nwis.waterdata.usgs.gov/usa/nwis/gwlevels?site_no=314736110130001.

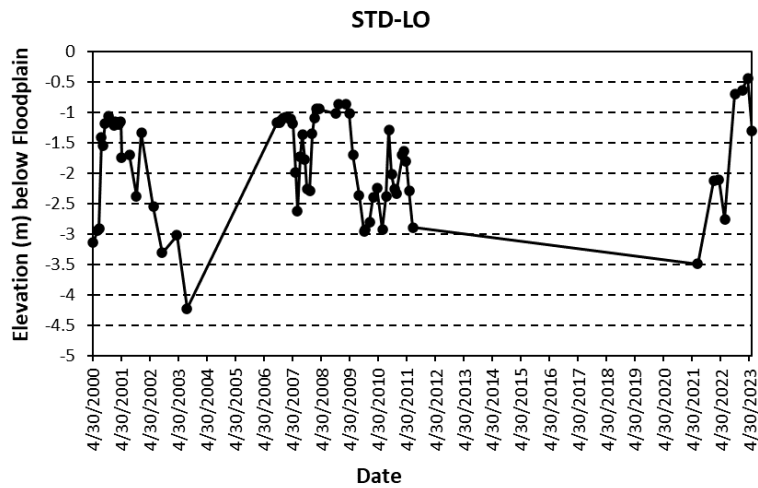
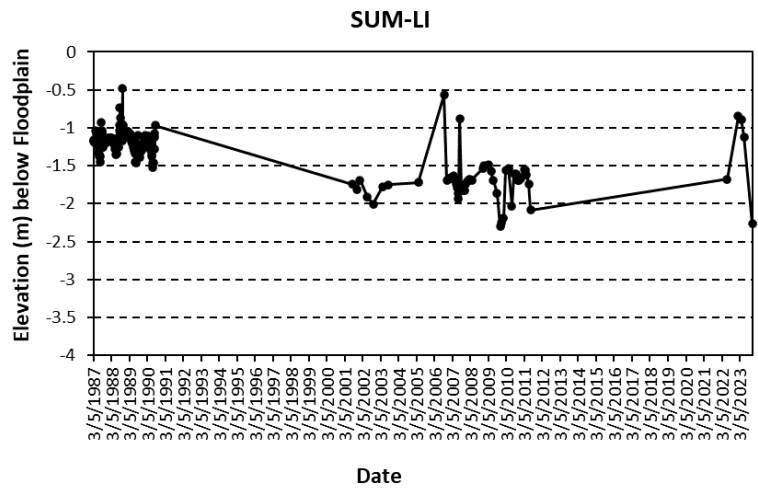
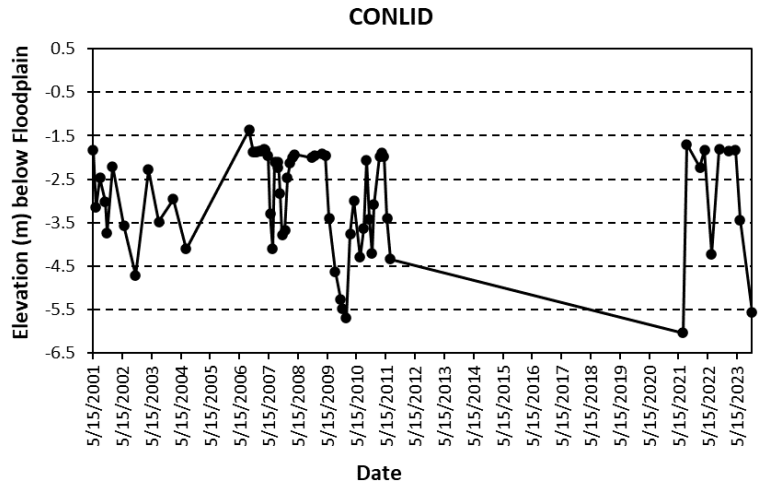
Appendix B: Graphs. Historical measurements of alluvial groundwater levels for 15 USGS groundwater wells (see Appendix II, Table 1) along the upper San Pedro River, adjusted for land surface elevation of well and approximate mean floodplain elevation. Only data for 2022-2023 were used in the report.



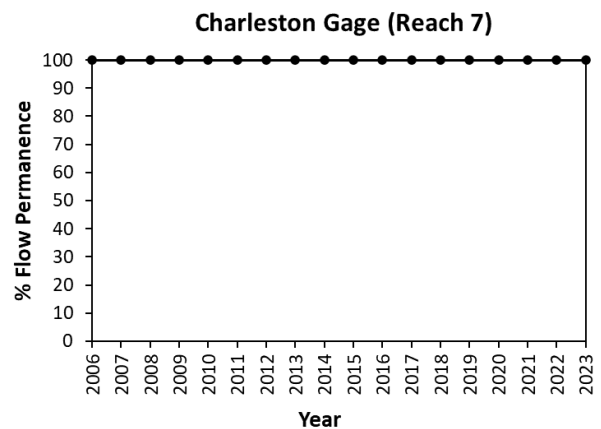
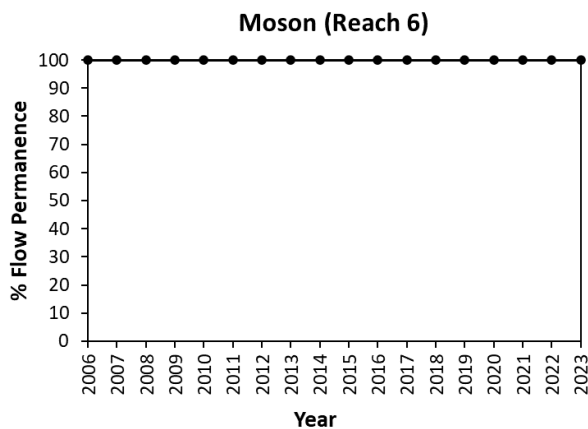
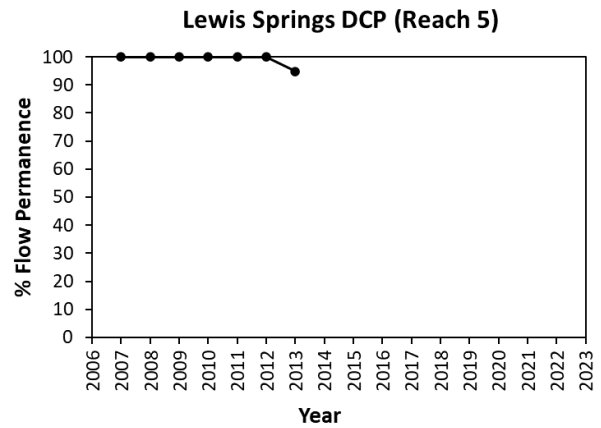
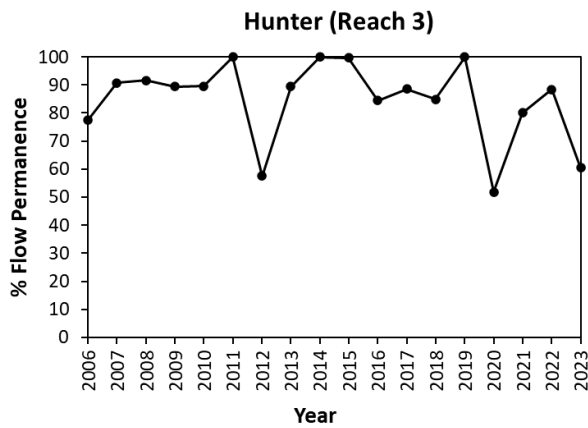
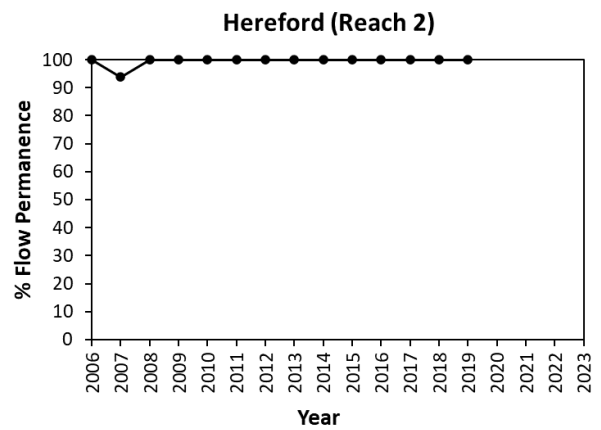
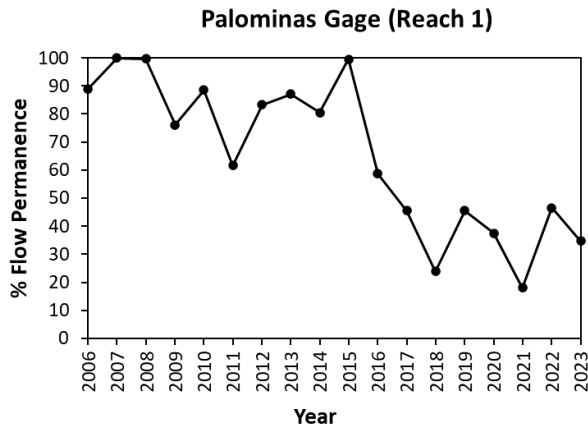


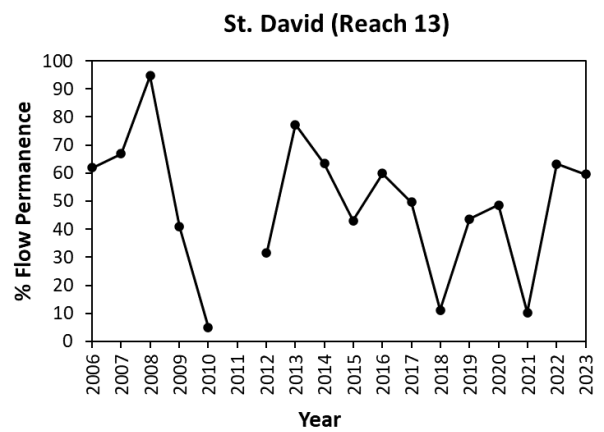
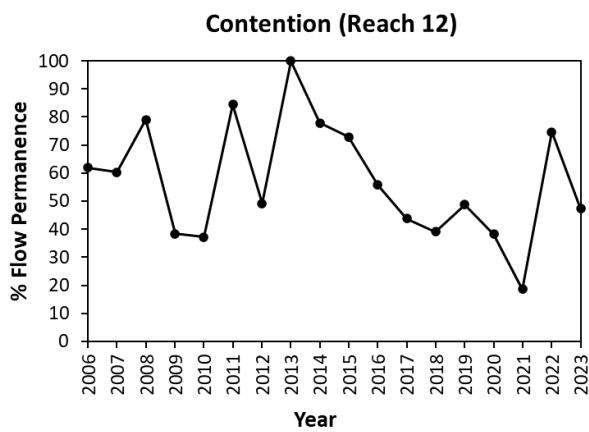
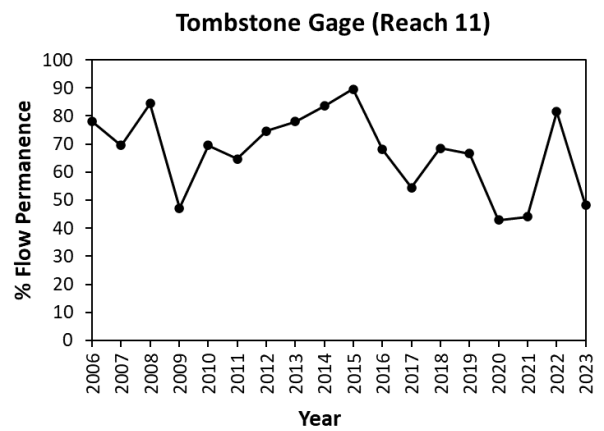
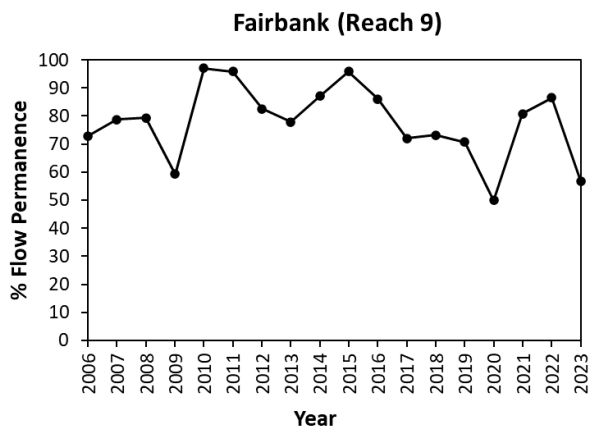
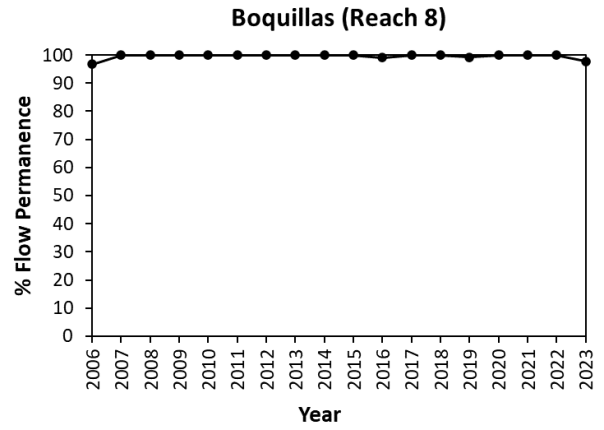
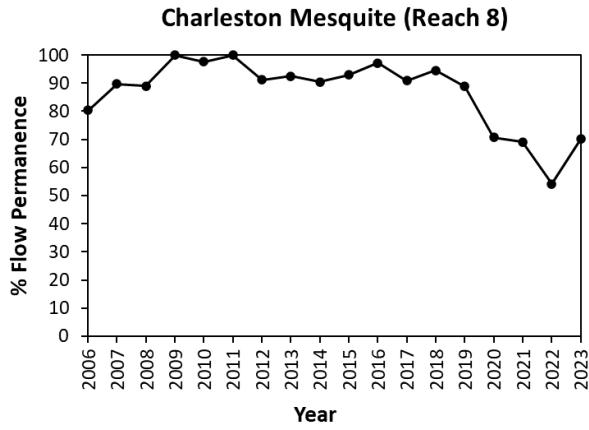




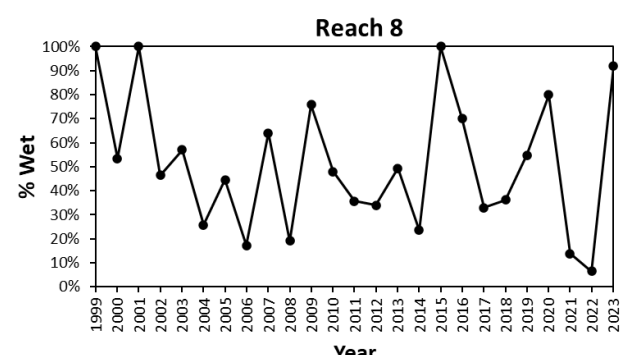
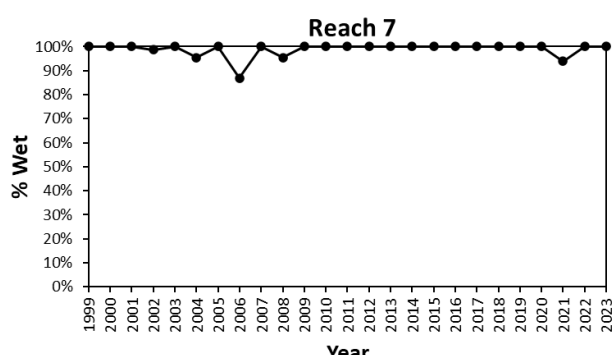
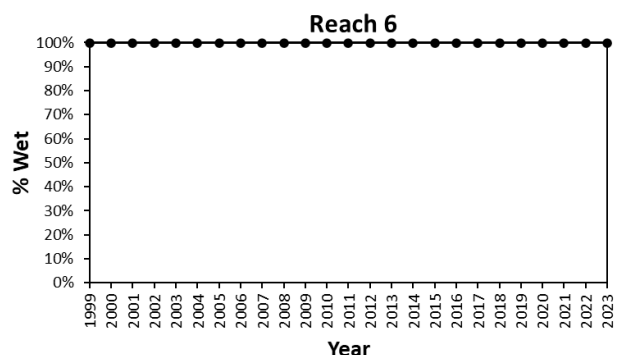
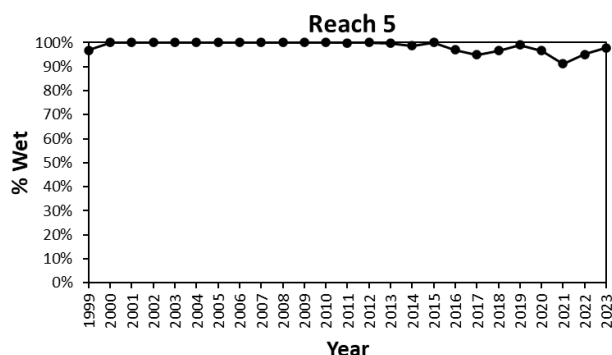
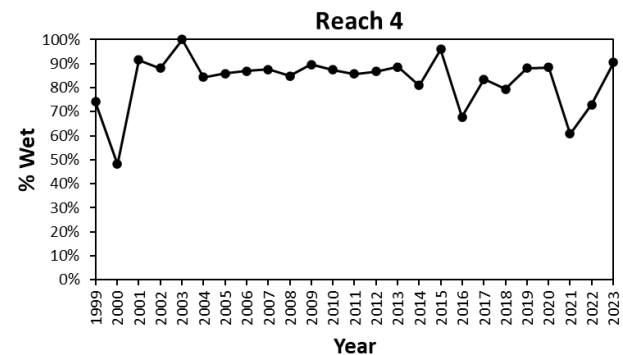
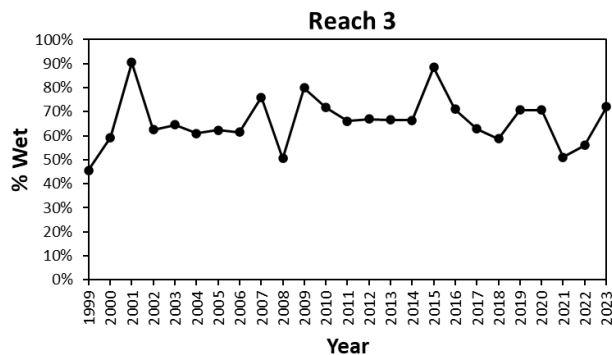
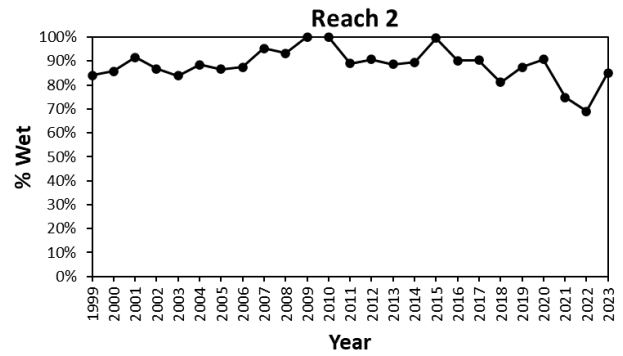
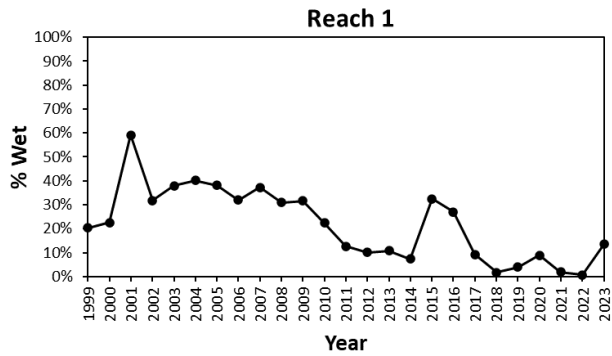


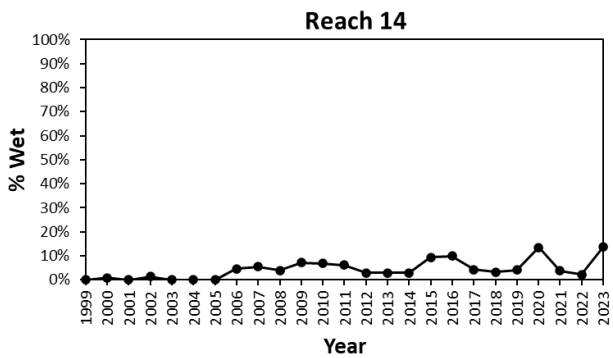
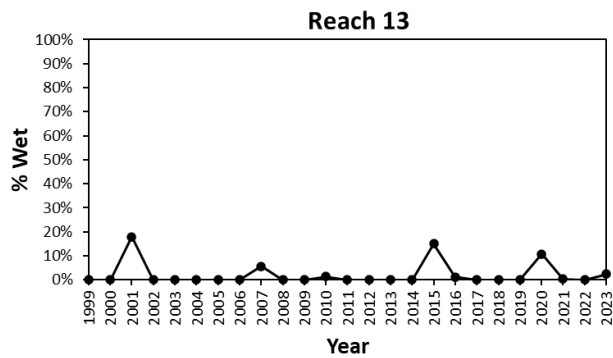
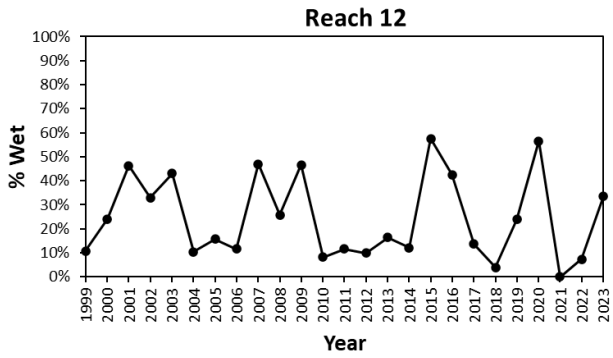
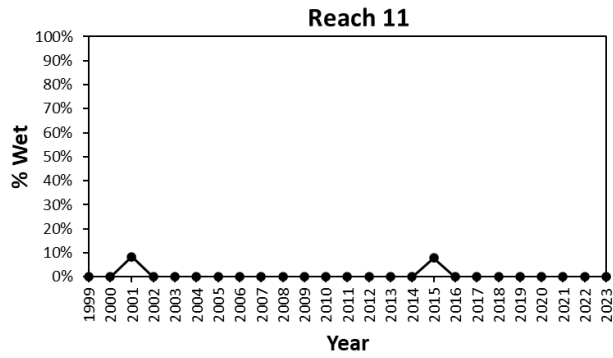
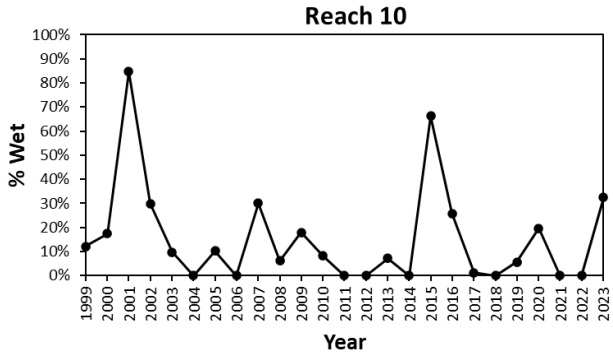
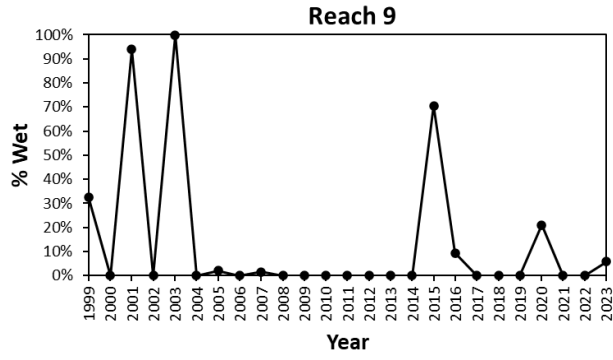
Appendix C. Flow permanence data (2006-2023), based on calendar year, for camera stations and USGS gaging stations (Palominas, Charleston, and Tombstone). Flow data for 2023 are up to early October for camera stations and December 18 (provisional data) for USGS gaging stations.





Appendix D. Percentage of surveyed river length within each reach with surface water present (wet) during June wet-dry mapping within the San Pedro Riparian National Conservation Area, 1999-2023. Data were obtained from the The Nature Conservancy, Arizona Office (Lisa McCauley, pers. comm.).





Appendix E. Trends in wetted stream length recorded in the June wet-dry mapping program within the San Pedro Riparian National Conservation Area, 1999-2023, by segment (reach). Probability (p-values) are for Mann-Kendall trend analysis. A p-value <0.05 traditionally signifies a statistically discernable (i.e., statistically significant) trend. NaN indicates no difference in wetted length values (and no trend) across years in segment 6. Data and trend analysis results were obtained from the The Nature Conservancy, Arizona Office (Lisa McCauley, pers. comm.).

