

Appendix 11L Sturgeon Analyses

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11L.1 Introduction

Analyses undertaken for sturgeon included the salvage-density analysis for south Sacramento–San Joaquin Delta (Delta) entrainment risk (green sturgeon and white sturgeon) and the Delta outflow year-class strength regression analysis (white sturgeon). These analyses are discussed below. The sturgeon analyses for upstream of the Delta are described in Chapter 11, *Aquatic Biological Resources*.

11L.2 Salvage-Density Analysis (South Delta Entrainment Risk)

The salvage-density analysis of south Delta entrainment risk weights modeled south Delta exports as a function of historical patterns in sturgeon salvage density. The methods for this analysis are described in Appendix 11Q, *Other Delta Species Analyses*, and the results are presented in Chapter 11.

11L.3 Delta Outflow Year-Class Strength Regression Analysis

The analysis of white sturgeon year-class strength as a function of Delta outflow was originally used by ICF International (2016:5-197–5-205). Historical data for white sturgeon year-class index were regressed against historical mean Delta outflow data from March through July and from April through May (Table 11L-1). These regressions (Figure 11L-1) were then applied to the CALSIM modeled data for the No Action Alternative (NAA)¹ and Alternatives 1–3 using PROC GLM and PROC PLM in SAS/STAT software, Version 9.4 of the SAS System for Windows². The results of the Delta outflow year-class strength analyses are described in Chapter 11.

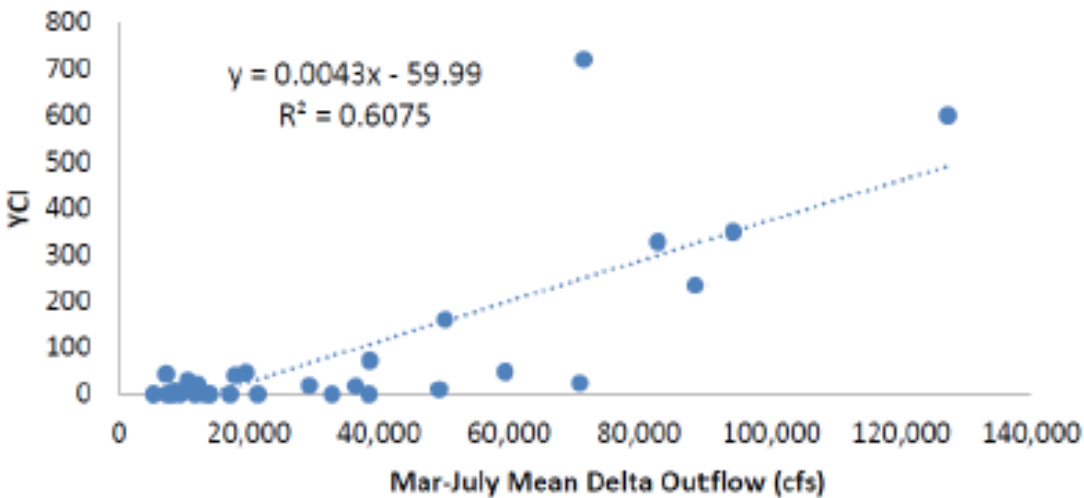
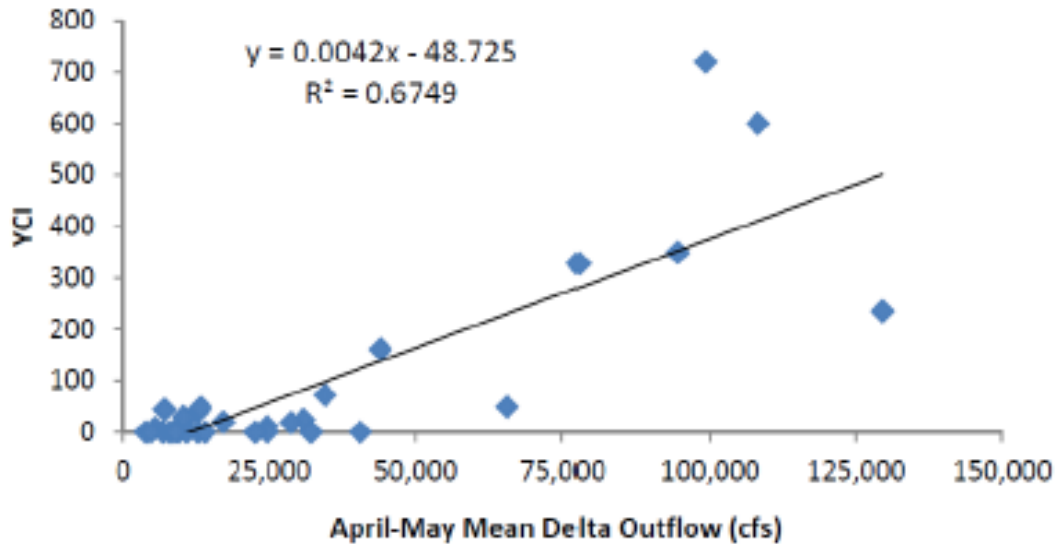
¹ The term *NAA*, which is identical to the No Project Alternative, is used throughout Chapter 11, *Aquatic Biological Resources*, and associated aquatic resources appendices in the presentation of modeled results and represents no material difference from the No Project Alternative, as discussed in Chapter 3, *Environmental Analysis*.

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Table 11L-1. Historical Data Used to Develop Regressions of White Sturgeon Year-Class Strength versus Mean Delta Outflow Data (cfs) for March–July and April–May.

Year	Year-Class Index	March–July Delta Outflow (cfs)	April–May Delta Outflow (cfs)
1980	11	49,292	24,652
1981	22	12,075	10,375
1982	720	71,601	99,295
1983	600	127,256	108,220
1984	41	17,849	12,836
1985	44	7,270	7,072
1986	24	71,010	30,923
1987	8	8,530	5,517
1988	0	5,272	7,983
1989	0	13,940	9,497
1990	0	5,366	6,826
1991	0	7,945	3,783
1992	0	7,428	4,732
1993	72	38,634	34,585
1994	0	8,284	8,044
1995	349	94,191	94,501
1996	161	50,216	44,059
1997	47	19,565	13,266
1998	328	82,985	77,724
1999	18	36,428	28,753
2000	0	38,502	24,678
2001	0	13,311	10,942
2002	0	11,725	12,762
2003	0	21,357	32,159
2004	19	29,330	17,137
2005	0	32,782	40,624
2006	235	88,725	129,578
2007	30	10,608	10,327
2008	0	9,425	8,867
2009	0	14,055	13,994
2010	0	17,082	22,611
2011	49	59,479	65,740

Notes: cfs = cubic feet per second.



Source: ICF International 2016:5-199.

Figure 11L-1. White Sturgeon Year-Class Index (YCI) for 1980–2011 as function of Mean April–May Delta Outflow (Upper Panel) and Mean March–July Delta Outflow (Lower Panel) in Cubic Feet Per Second (cfs).

11L.4 References Cited

ICF International. 2016. *Biological Assessment for the California WaterFix*. July. (ICF 00237.15.) Sacramento, CA. Prepared for U.S. Department of the Interior, Bureau of Reclamation, Sacramento, CA.