

Telemetry Study Summary Framework

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Study Timing: <ul style="list-style-type: none"> Study Duration: 5 years Release Dates (range): 10/1 – 3/31; daily release after capture and tagging 	Study site(s): <ul style="list-style-type: none"> Collection site(s): Sacramento River between Red Bluff and Colusa Release location(s): within 0.5 km of collection site(s)
Fish	
<ul style="list-style-type: none"> Species: Green Sturgeon Life stage: juvenile (age-0) Source: wild 	Size (median & range): <ul style="list-style-type: none"> Weight: 39.7 grams (18 - 170 g) Total Length: 199 mm (152-322 mm)
Transmitter Information <ul style="list-style-type: none"> Type/model: ATS SS300/SS400 single battery or PNNL 'sturgeon' tag Weight (g): .22, 0.34, or 0.72 PRI/life of tag: 10 sec PRI/90 – 255 d 	Implant procedure <ul style="list-style-type: none"> Surgical placement of acoustic tag in peritoneal cavity of juvenile sturgeon. No sutures (Liss et al. 2018).
Telemetry Receivers: <ul style="list-style-type: none"> Receivers Maintained: 10 ATS receivers (USFWS) in the Mainstem Sacramento River, 19 ATS receivers (NMFS) plus 5 Techno (USFWS) receivers as part of ITAG. Additional receivers deployed in Sacramento River/Delta/SF Bay by USFWS, USGS and UCSC/NMFS. Receiver Deployment: Deployed in Sac River in September prior to juvenile sturgeon trawling and tagging season start; remain in place for 90 days after last fish is tagged. Coordination with other studies/receivers needed?: Yes Coordinated Acoustic Telemetry receivers for lower Sacramento and Delta entry timing; real-time receivers and autonomous array. <p>Frequency of data download required: 90-120 days (as receivers need to be rebatteried)</p>	
Survival estimate (per species or objective) <ul style="list-style-type: none"> Type (project, etc.): N/A Value & SE: N/A Sample size/replicate: 50+ # replicates: 5 Analytical model: DEB KIS behavioral model (UCSC/NMFS) 	
Hypothesis test and results (if applicable) <ul style="list-style-type: none"> H.: Flow, temperature and/or turbidity have no effect on initiation of sturgeon migration to lower river/Delta. H.: Flow, temperature and/or turbidity have an effect on the initiation of sturgeon migration to lower river/Delta Conclusion: Observational. Potentially useful in Delta Cross Channel Operations. 	
Characteristics of estimate <ul style="list-style-type: none"> Effects reflected (direct, total, etc): Evaluate migration cues and rates in the Sacramento River (upper and lower), Delta and San Francisco Bay across multiple years. Associate movement and 	

<p>migration rates with flow, water temperature or turbidity in each region to evaluate their influence on juvenile distribution. Evaluate real-time distribution through river and Delta.</p> <ul style="list-style-type: none"> • Absolute or relative: relative distribution, absolute migration rates.
<p>Environmental/operating conditions (if applicable)</p> <ul style="list-style-type: none"> • Relevant discharge indices: 1.5 X fall Keswick Release • Temperature: between 10 and 18 C • TDG: N/A • Treatment(s): Flow, turbidity, temperature
<p>Unique study characteristics:</p> <p>The exceptional size and numbers of juvenile sturgeon captured by benthic trawl in the upper Sacramento River makes this study ideal for acoustic tagging purposes. The median juvenile sturgeon length/weights are large enough that concerns for predation on tagged fish as well as acoustic tag shedding are low. The variable numbers of fish captured each year is reflective of larval abundance indices generated by USFWS rotary trapping operations at Red Bluff. Some years allow for large numbers (50+) of juveniles to be tagged and survival estimates appear to be relatively high (75-95%) as compared to juvenile salmon studies. This study continues to be the most relevant for wild juvenile sturgeon migration and life history characterization from the upper Sacramento River to the legal Delta. This study is unique in that it gives biologists and managers a snapshot into survival and movement cues and rates during periods of time when other AT fish are not being tracked (fall to early winter). This study also results in new life history information addressing significant data gaps on the habits and behaviors of juvenile sturgeon in the Sacramento River and Delta which is useful for management and conservation of this Threatened fish species.</p>