

EATSM Release Summary Form
July 9th, 2019

Study objective(s): The objective is to improve survival rates of wild and hatchery juvenile spring- and fall-run Chinook salmon smolts through the Sacramento River using a managed pulse flow during the spring out-migration period.	
Study Timing: <ul style="list-style-type: none"> Study Duration (years): 5 years Release Dates (range): 05/16/19, 05/23/19 (releases of 250 fish on each day) 	Study site(s): <ul style="list-style-type: none"> Collection site(s): Coleman Hatchery Release location(s): below Red Bluff Diversion Dam
Fish	
<ul style="list-style-type: none"> Species-race: fall-run Life stage: smolt Source: Hatchery 	Size (median & range): <ul style="list-style-type: none"> Weight: 9.5g (6.3-15.1g) Length: 92.6mm (84-105mm)
Transmitter Information <ul style="list-style-type: none"> Type/model: ATS SS300 single battery Weight (gm): .30 PRI/life of tag: 5 sec PRI 	Implant procedure <ul style="list-style-type: none"> Surgical placement of acoustic tag in peritoneal cavity of juvenile salmon. Incision closed using two sutures.
Telemetry Receivers: <ul style="list-style-type: none"> Receivers Maintained: Upper Sacramento River receivers (Red Bluff to Colusa) maintained by USFWS. Lower Sacramento River receivers (Tisdale to Verona) maintained by UCSC. Delta receivers (Freeport to Rio Vista) maintained by USGS. SF Bay (Golden Gate) maintained by UCSC. All receivers in Sacramento River and Delta/SF Bay are primarily ATS with some Teknologic receivers deployed at various sites. Receiver Deployment: Spring deployment – April through June Coordination with other studies/receivers needed?: CDFW may supplement receivers to gain resolution at points of interest, such as above and inside GCID oxbow. Frequency of data download required: Receivers retrieved and downloaded no more than 60 days after fish are released 	
Survival estimate (per species or objective) <ul style="list-style-type: none"> Type (project, etc.): Value & SE: NA Sample size/replicate: 250 # replicates: 2 Analytical model: Mark-recapture River model. The analysis will be completed by NMFS at the end of the year 	
Hypothesis test and results (if applicable) The null hypothesis for this study is that a managed pulse flow does not influence survival of outmigrating smolts. However, existing data strongly suggests this hypothesis will be refuted. Alternative (and non-mutually exclusive) hypotheses for this study, all of which can be tested through a Cormack Jolly-Seber mark-recapture model, are that:	

<ul style="list-style-type: none"> • flow influences survival but its influence is different depending on the water year type • flow influences survival similarly in each region (i.e. upper Sacramento River, lower Sacramento River) • flow influences survival but its influence is different in each geographic region • Physical parameters such as turbidity and water velocity are the mechanisms driving the relationship between flow and survival • Hatchery releases during natural or managed pulses improve survival by significantly exceeding the predation demand
Characteristics of estimate <ul style="list-style-type: none"> • Effects reflected (direct, total, etc): • Absolute or relative:
Environmental/operating conditions (if applicable) <ul style="list-style-type: none"> • Relevant discharge indices: • Temperature: • TDG: • Treatment(s):
Unique study characteristics: The National Marine Fisheries Service (NMFS), California Department of Fish and Wildlife (CDFW), and US Bureau of Reclamation (BOR) have designed a multiyear study to evaluate the potential survival benefits for juvenile spring and fall-run Chinook salmon during a managed spring pulse flow on the Sacramento River. Results of the multiyear study proposal will provide technical assistance towards developing and implementing future water management actions, among other salmon restoration actions, in the Sacramento River.