Suggested Citation: California Department of Water Resources, Aquatic Ecology Section. Yolo Bypass Fyke Trap Meta Data. 2016.

IEP Aquatic Ecology Section
Yolo Bypass Fyke Trap Meta Data
Last updated: August 2016

I. Contact Information

Program Manager: Brian Schreier

Lead Contact: Naoaki Ikemiyagi
Dept. of Water Resources
Division of Environmental Services
3500 Industrial Blvd., West Sacramento, CA.
(916) 376-9822
email: Naoaki.Ikemiyagi@water.ca.gov

II. Study Elements and Objectives

Largely supported by the Interagency Ecological Program (IEP), DWR has operated a fisheries and invertebrate monitoring program in the Yolo Bypass since 1998. The project has provided a wealth of information regarding the significance of seasonal floodplain habitat to native fishes. The basic objectives of the project are to collect baseline data on lower trophic levels (phytoplankton, zooplankton, and invertebrate drift), juvenile and adult fish, hydrology, and physical conditions within the Yolo Bypass. As the Yolo Bypass has been identified as a high restoration priority by the US Fish and Wildlife Service and National Marine Fisheries Service biological opinions for Delta Smelt (*Hypomesus transpacificus)* and winter and spring-run Chinook Salmon (*Oncorhynchus tshawytscha*), and by California EcoRestore, these baseline data are critical for evaluating the success of future restoration projects. In addition, the data have already served to increase our understanding of the role of the Yolo Bypass in the life history of native fishes, and its ecological function in the San Francisco Estuary. Key findings include: (1) Yolo Bypass is a major factor regulating year class strength of splittail, *Pogonichthys macrolepidotus* (Sommer et al., 1997; Feyrer et al., 2006; Sommer et al., 2007a); (2) Yolo Bypass is a key migration corridor for adult fish of several listed and sport fish (Harrell and Sommer 2003); (3) it is one of the most important regional rearing areas for juvenile Chinook Salmon (Sommer et al., 2001a; 2005); (4) Yolo Bypass is a source of phytoplankton to the food web of the San Francisco Estuary (Jassby and Cloern 2000; Schemel et al., 2004; Sommer et al., 2004); and (5) Inundation of the Yolo Bypass enhances the quantity and quality of phytoplankton carbon to the downstream estuary (Lehman et al. 2007).

The fyke trap is one element of the Aquatic Ecology Section's (AES), Yolo Bypass Fish Monitoring Program (YBFMP) that is conducted under the IEP umbrella. The fyke trap is designed to examine species composition and the timing and duration of large fish migrations through the Yolo Bypass relative to different physical conditions. The focus has been on anadromous fish species (i.e. adult Chinook Salmon and sturgeon); however useful data is also collected on other fishes. The objectives are to (1) examine adult species composition; (2) identify general timing and duration of anadromous species use relative to different physical conditions; and (3) to compare timing and duration of species captured in the Yolo Bypass to those captured in other Sacramento Valley tributaries.

Key findings to date: http://www.water.ca.gov/aes/pubs/ and http://www.water.ca.gov/aes/pubs/reports.cfm

III. Study Area and Sample Sites

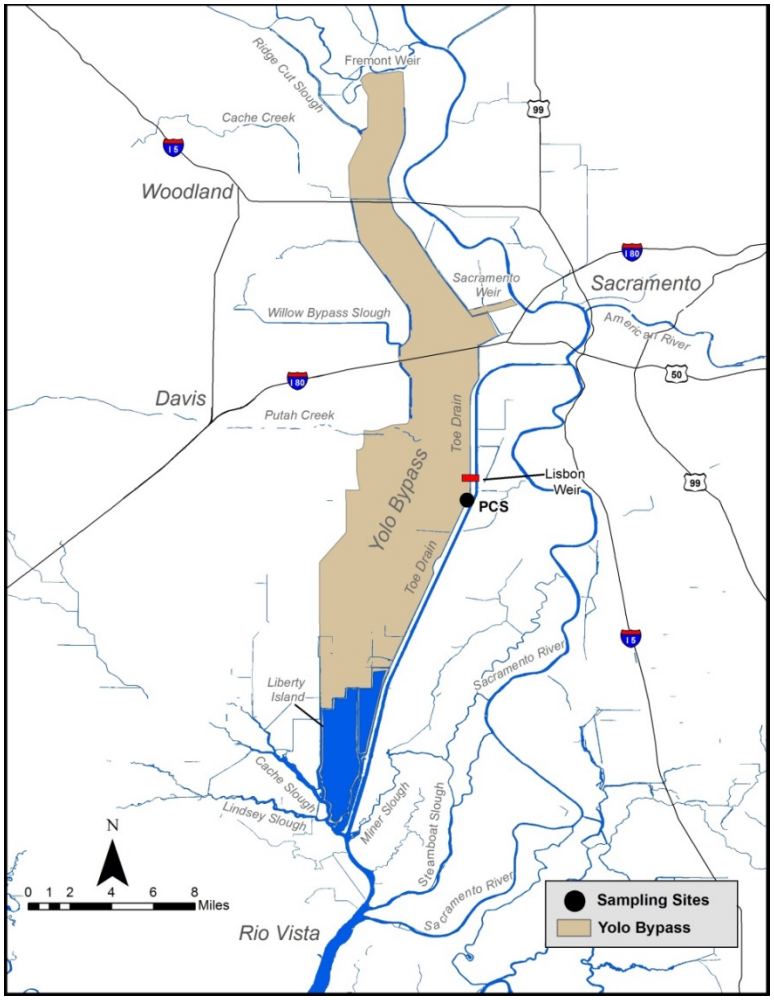
A. General Information

The fyke trap is deployed in the Yolo Bypass Toe Drain just below Lisbon Weir at levee mile six and is typically operated from October through June. The trap site has been selected based on ease of installation, operation, and maintenance, including: (1) suitable depth: greater than ten feet at high tide during low flow; (2) suitable anchoring point; (3) suitable bank: absent of large woody debris; and (4) limited public access. Fyke trap sampling is operated in conjunction with our screw trap and beach seine sampling.

B. Name and Locations of current Sampling Sites

Fyke trapping at site PCS began in November 1999 and continues through the present.

Station Code	Latitude	Longitude
PCS	38.466958	-121.590934
Alt_Fyke	38.436971	-121.604878



IV. Period of Record

There have been several changes in sampling frequency, the number of traps and trap location throughout this monitoring effort: (1) in 1998 and 1999 there were two traps fishing four months a year and seven days a week, (2) in 2001 a second trap was deployed, (3) in 2002 there was a design change in the fyke trap and three fyke traps were deployed, (4) between 2003 and 2006 the trap was check every-other day instead of daily, and (5) in 2014 and 2015 clogging by water hyacinth rendered the trap likely ineffective for some period and the trap was out of operation and then relocated (from October to December).

V. Sampling Frequency

The fyke trap is typically fished and checked daily during the months of October/November through June. There has been some variability in sampling frequency in the earlier sampling years, with the trap being fished up to seven days a week and checked every two to three days, but was generally not checked on weekends unless the Bypass floods. Since early 2010, the trap has been consistently fished during weekdays and has been checked daily.

Year	# of Sampling Events	Operation Hours	Notes
1999	26	1411	Pilot year
2000	110	5711	
2001	117	6549	
2002	104	5963	
2003	101	5841	
2004	108	5817	
2005	108	5876	
2006	68	3305	Trap sampling events significantly reduced due to extended flooding
2007	105	5817	
2008	152	5368	
2009	192	5348	
2010	166	2847	
2011	183	3410	
2012	179	3398	
2013	175	3314	

2014	167	3110	Trap not operated due to hyacinth from October 10th to November 13th.
2015	192	3529	Alternate site used from December 1st through 10th.

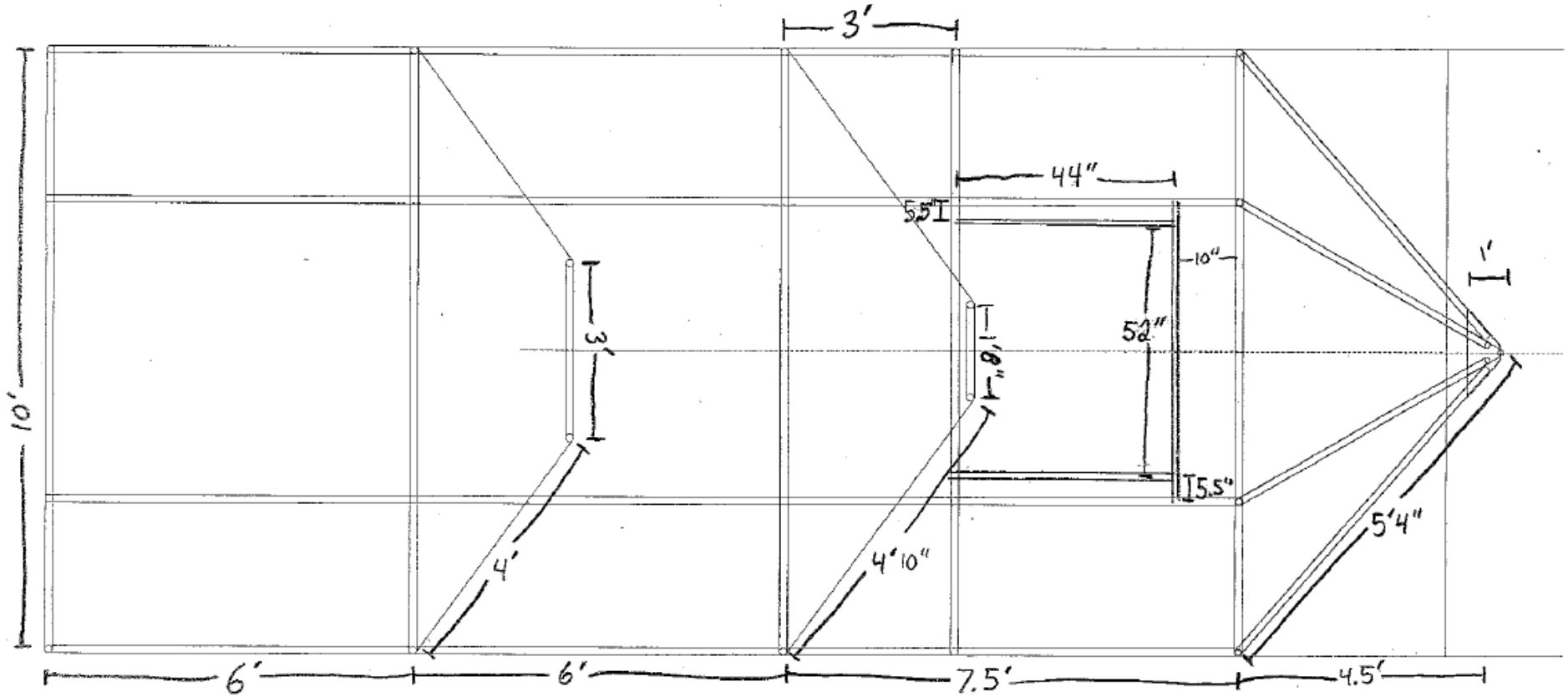
VI. Field Collection Methods

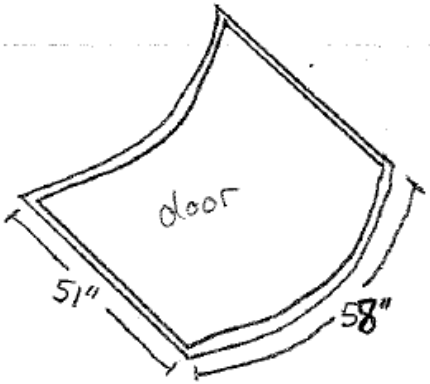
When the fyke trap is deployed and operational, fish enter the downstream opening of the trap (10 ft. diameter), pass through the first funnel (3 ft. diameter), and enter a central chamber, then move further through the second funnel (1 ft. 8 in. diameter), and become trapped inside the upstream (terminal) compartment. The fyke trap is installed with one warning float attached to the downstream end of the trap (pictured in C) and one float rigged to the upstream anchoring (nose) cable (pictured in D), trap guide and anchor cables are anchored to t-posts on the levee shoreline, and two guide ropes are also set to help guide the trap when it is rolled up the bank during the retrieval process (pictured in B). The fyke trap doesn't cover the entire channel as wings are not used, and should not be viewed as a traditional fyke net.

The fish handling and sub-sampling protocol follows DFG (1997) to minimize impacts to salmon and splittal. The trap is rolled using a truck-operated winch (pictured in A) to the edge of the Toe Drain channel in about 0.5 to 1.5 meters of water depending on the number of fish in the trap. The trap door is then opened and the fish are netted out using a long handled dip net (pictured in E). All fish are netted individually, transferred to a wetted measuring board, and then released back into the Toe Drain. Chinook Salmon and splittail will be sorted from other species and processed first. Each fish is identified and counted, and then fork length to the nearest millimeter will be measured for up to 50 of each species.

A. Fyke Trap

The fyke trap is ten feet in diameter and twenty-four feet long with a modified design based on fyke traps operated by the California Department of Fish and Wildlife (CDFW) office in Stockton. It is constructed out of square stainless steel tubing with galvanized chain link fencing for the main structural netting and black 0.5" square polypropylene fencing lining the terminal compartment to aid in retention and fish safety.


3'
44"
5.5"
10"
52"
5.5"
1'
3'
1'8"
10'
4'
4'10"
5'4"
6'
6'
7.5'
4.5'


door
51"
58"

VII. Data Management and Quality Assurance/Quality Control

A. Field Data

Data is recorded using data sheets based on a modified version of “standard” Interagency Ecological Program forms (see example below). In addition to catch, water quality parameters are recorded when the sample is collected. Tide stage, weather, and trap condition are observed and temperature (C), electrical conductivity (uS/cm), dissolved oxygen (mg/L), turbidity (NTU), pH, and Secchi depth (cm) are measured.

Data QA/QC is a four stage process. First, the data sheets are error checked at the end of each day by the crew leader. Data is then entered into a Microsoft Access form with automatic error-checking and data validation. Third, a separate data entry person compares the original data sheets to the electronic database. Finally, each data field is sorted and/or summarized based on unique records to highlight erroneous outliers.

YOLO BYPASS DATA – 2015 / 2016 Page: ___ of ___

Site Code: _____ Date: _____

Time: _____ Gear type: FYKE RSTR SEINE 50 Tide: _____

Temp: ___ °C Weather: _____ Secchi: ___ m DO: ___

Turbidity Vial #: ___ ___ NTU SpCnd: ___ EC: ___

Recorder: _____ Crew: _____ pH: ___

Comments: _____

FYKE RSTR Status: S C P Rev.Counter: _____ Condition code: 1 2 3 4

SEINE Region: _____ Bypass Side: _____

Habitat: AG RIPARIAN VEG Condition code: 1 2 3 4

Length: ___ m Width: ___ m Depth: ___ m Substrate: _____

FORK LENGTH (mm)

Species Code	1	2	3	4	5	6	7	8	9	10	Plus Count

Entered by:_____ Date:_____ Error Checked by:_____ Date:_____

YOLO BYPASS - 2016

AMS	American Shad
AMM	Ammocoete Lamprey
BGS	Bluegill
BKB	Black Bullhead
BKS	Black Crappie
BPF	Bay Pipefish
BRB	Brown Bullhead
BT	Brown Trout
C	Carp
CAR	California Roach
CHC	Channel Catfish
CHG	Chameleon Goby
CHN	Chinook Salmon, Unknown Race
CHNA	Chinook Salmon, Adult
CHNF	Chinook Salmon, Fall-Run
CHNL	Chinook Salmon, Late-Fall-Run
CHNM	Chinook Salmon, Marked (Dyed)
CHNS	Chinook Salmon, Spring-Run
CHNT	Chinook Salmon, Tagged
CHNW	Chinook Salmon, Winter-Run
DSM	Delta Smelt
FHM	Fathead Minnow
GF	Gold Fish
GSF	Green Sunfish
GSN	Golden Shiner
GST	Green Sturgeon
HCH	Hitch
HH	Hardhead
JSM	Jacksmelt
LAM	Lamprey, Unidentified
LFS	Longfin Smelt
LMB	Largemouth Bass
LP	Loggerch
MQF	Mosquito Fish
MSS	Mississipi (Inland) Silverside
NAN	Northern Anchovy
PAH	Pacific Herring
PKS	Pumpkinseed
PL	Pacific Lamprey
PMP	Plainfin Midshipman
PRS	Prickly Sculpin
PSS	Pacific Staghorn Sculpin
RBT	Rainbow Trout (Steel Head)
RBTT	Rainbow Trout, Tagged
RES	Redear Sunfish
RFS	Riffle Sculpin
RL	River Lamprey
RSN	Red Shiner
SASQ	Sacramento Pikeminnow
SASU	Sacramento Sucker
SCB	Sacramento Blackfish
SHM	Shimofuri Goby
SMB	Smallmouth Bass
SPLT	Sacramento Splittail
SSM	Surf Smelt
STF	Starry Flounder
SPB	Spotted Bass
STB	Striped Bass
TFS	Threadfin Shad
TSM	Top Smelt
TSS	Threespine Stickleback
TP	Tule Perch
W	Warmouth
WAG	Wakasagi
WCK	White Croaker
WHC	White Catfish
WHS	White Crappie
WST	White Sturgeon
YEB	Yellow Bullhead
YFG	Yellowfin Goby

Gear Code

SEIN 50	Beach Seine (50 Foot)
SEIN 100	Beach Seine (100 Foot)
SEIN ENCL	Beach Seine Enclosure
SEINE COVE	Beach Seine Cove Set
FYKE	Fyke Net
FKTR	Fyke Trap
RSTR	Rotary Screw Trap
PURS	Purse Seine

Gear Status

S	Set
C	Check
P	Pull

Condition Code

1	Good (normal)
2	Fair (partial block, etc.)
3	Poor (total block)
4	No sample taken

Weather Code

NIT	Night
FOG	Foggy
RAN	Precipitation
CLD	Overcast or cloud cover > 50%
CLR	Direct sunlight

Substrate

GR	Gravel	(Can be a boat ramp)
MD	Mud	
SN	Sand	
PV	Pavement (Clean boat ramp)	
VG	Vegetation	

Chinook Life Stage Codes

CHN_P	Parr
CHN_X	Transitional
CHN_S	Smolt

Yolo Bypass Regions (North-South)

FW	Fremont Weir	(FW1/FW2)
CCS	Cache Creek Sinks	(CCS1-6)
SB	Sacramento Bypass	
YB	Yolo Basin	(Pond/AL1)
PCS	Putah Creek Sinks	(AL2-4/LIS/BL1-2)
STB	Southern Bypass	(BL3-5/STS)

Yolo Bypass Trap Site Code		(Region)
FKTR	Fyke Trap in Toe Drain	(PCS)
STTD	Screw Trap in Toe Drain	(STB)
STFB	Screw Trap on Flood Plain	(STB)

Yolo Bypass Beach Seine Site Codes (North-South)

FW1	CCS1	AL1	LIS	LIB1
FW2	CCS2	AL2	BL1	LIB2
	CCS3	AL3	BL2	
	CCS4	AL4	BL3	
	CCS5		BL4 (STS)	
	CCS6		BL5 (STB4)	

STS = Screw Trap Site (Beach Seine)

Habitat Types

AG	Agriculture
RIP	Riparian
VEG	Vegetation

VIII. Implications of sampling design, Tips and Data Quirks when considering analyses

- In 2000-2009, the high number of sampling hours were due to the fyke trap often being fished over weekends and checked every 1-2 days. The operation of the fyke trap changed to daily checks with no weekend fishing in 2010.
- All fish sampling must be adjusted under different velocity and flooding levels because of debris, permitting, and safety issues. However, the influence of flows and flooding is not straightforward because discharge, tidal

inundation and seasonal short-duration flooding impact the feasibility of any one site. Additionally, because sampling is meant to be repeatable all sampling methods are proportionally sampling less when available habitat increases with over-bank flows. For example, during periods of flooding/high flows (i.e. 2006 and 2011) in the Yolo bypass, the fyke trap is often times not fished due to heavy debris loads, equipment limitations, and staff safety

- The fyke trap doesn't cover the entire channel and wings are not used, and so our fyke trap should not be viewed as a traditional fyke net. Therefore the data is most appropriate for presence and timing.
- In the fall of 2014 and 2015, clogging by water hyacinth likely reducing trap efficiency for some period and the trap was out of operation and then temporarily relocated to a downstream location (Alt_Fyke).
- Catch of certain species may be affected by fish already present in the trap. For example, white sturgeon catch increases dramatically when a female is present in the trap as multiple males attempt to gain access to her. Similarly, it is important to remember that predation can occur in the trap, especially on days where exceptionally large piscivorous fish are caught.

A. Example photographs of Seasonally Variable Conditions that affect Trap Operation: Flooding

B. Example photographs of Seasonally Variable Conditions that affect Trap Operation: Water Hyacinth