

Summary of Delta Cross Channel Studies

J.R. Burau, USGS

Large interdisciplinary interagency effort

Acknowledgements

USFWS

Mark Pierce
Pat Brandes
Jeff McLain
Paul Cadrett

USEPA

Bruce Herbold

USBR

Mike Horn
Tom Morstein-Marx
Paul Fujitani

DWR

Chris Enright

Consultant

Dave Vogel

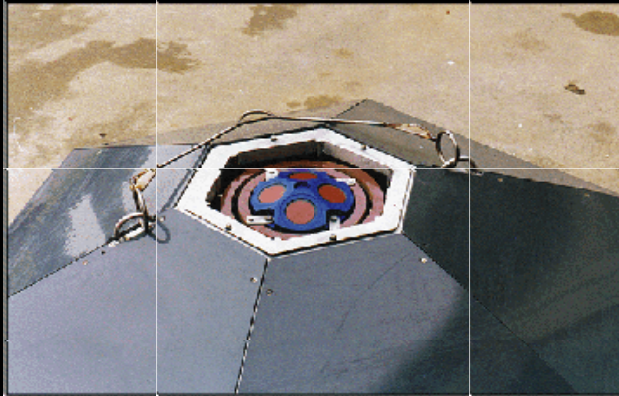
WATER MOVEMENT IN THE VICINITY OF THE DCC



J.R. Burau, USGS

Methods: (1) Long-term deployments

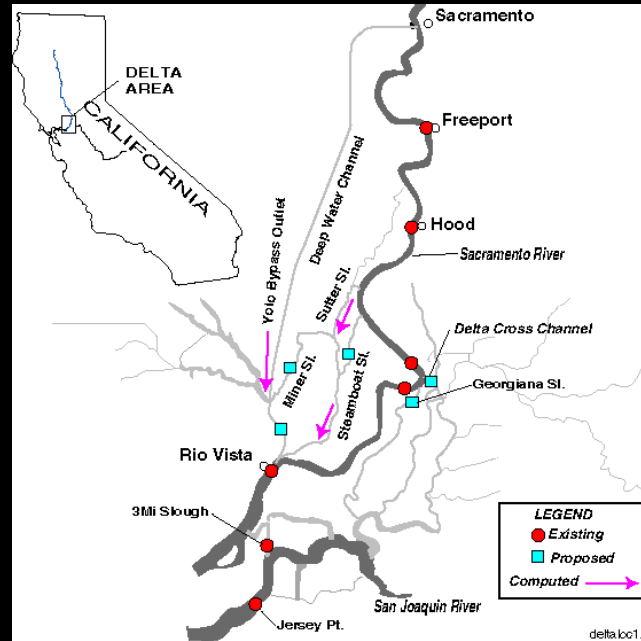
ADCP's



Upward-looking



Sideward-looking



CTD's

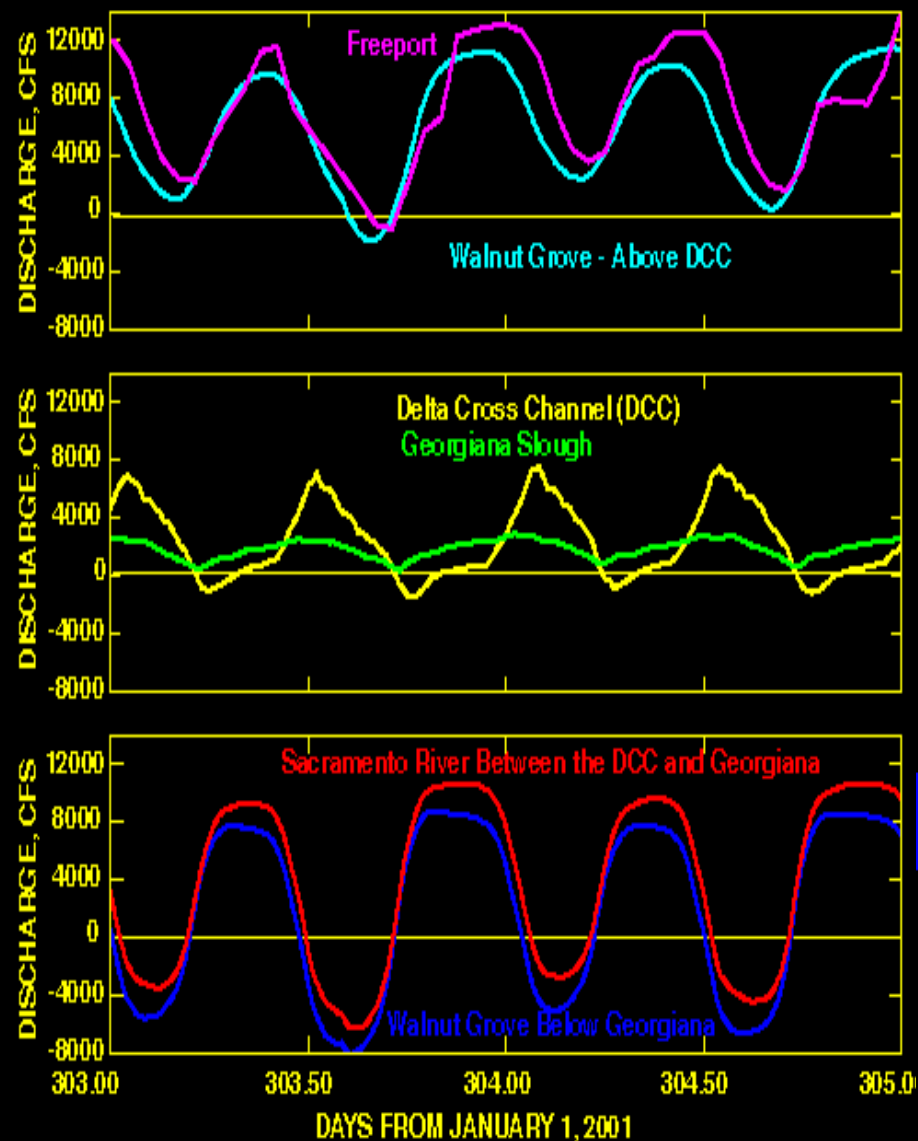


Meteorological Station

Methods 2: Drifters (Lagrangian)

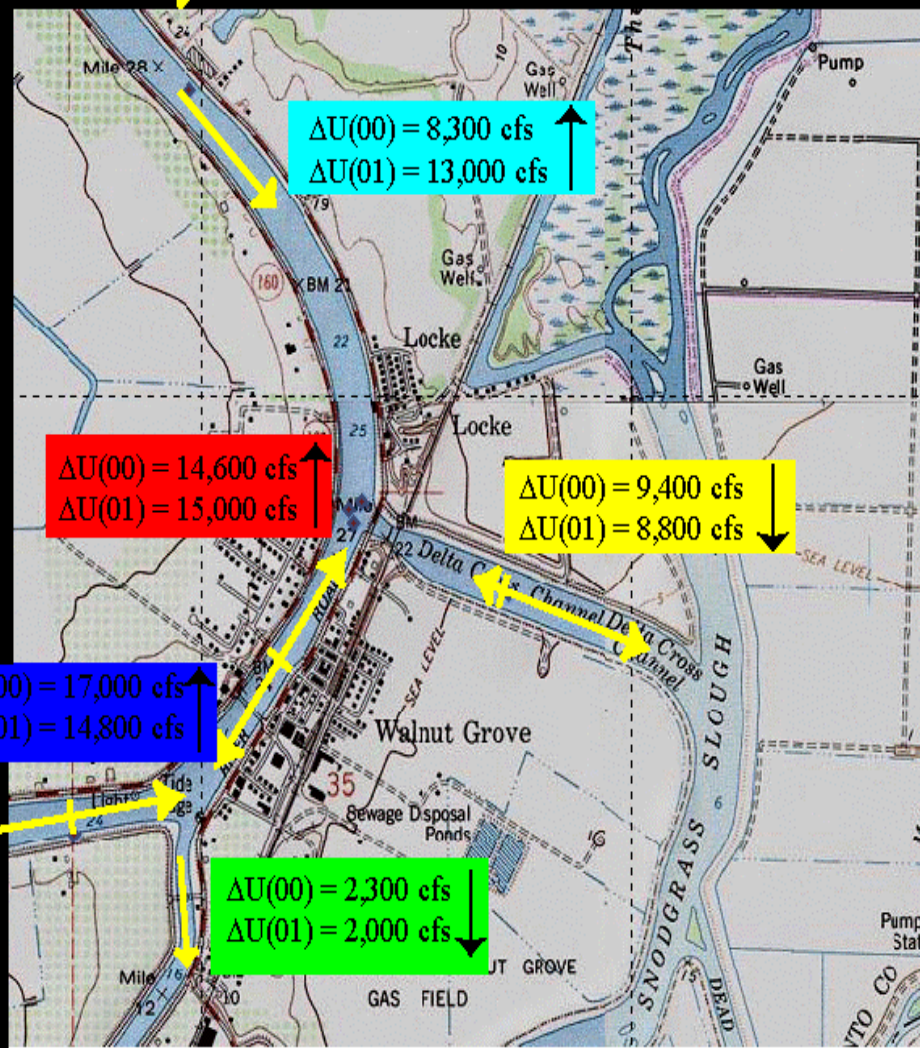


Tidal Flows

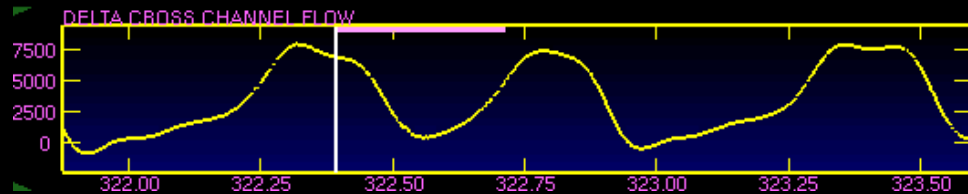
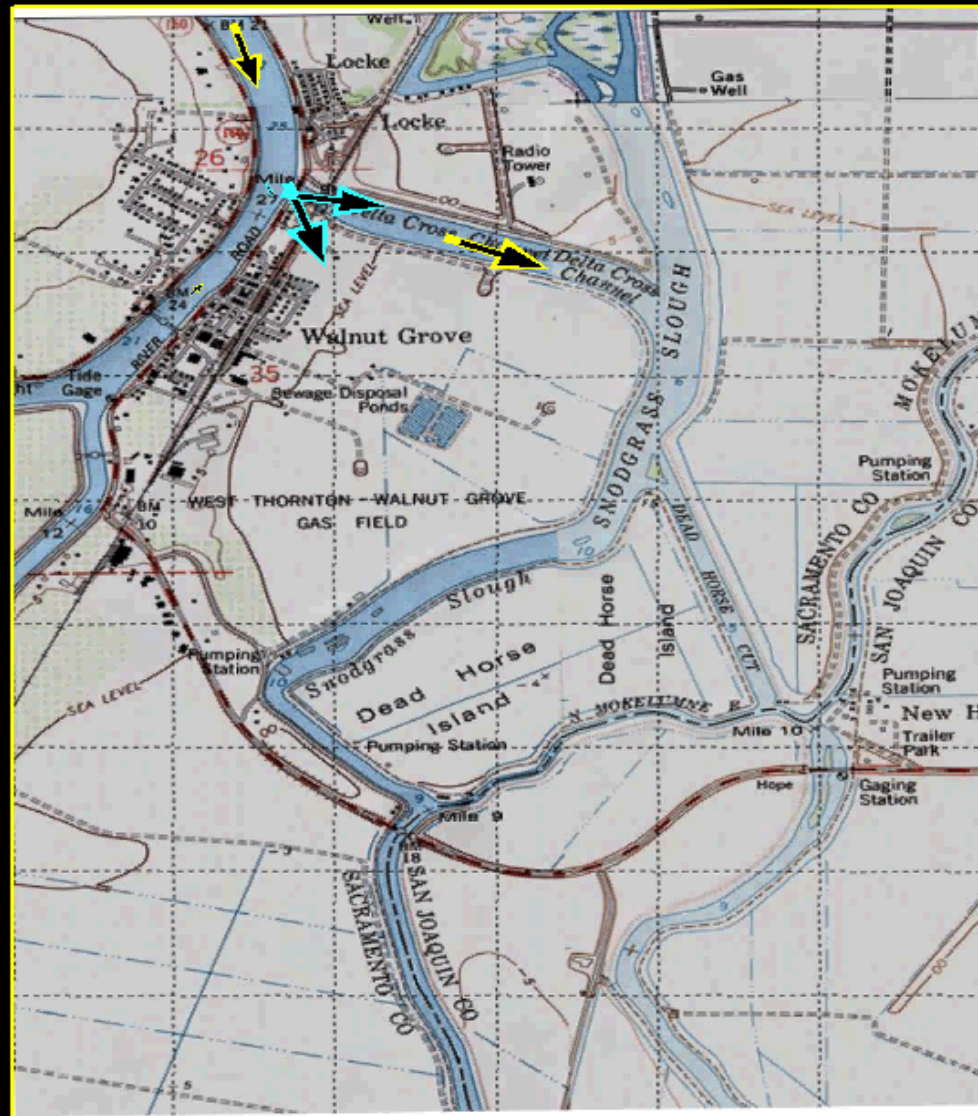
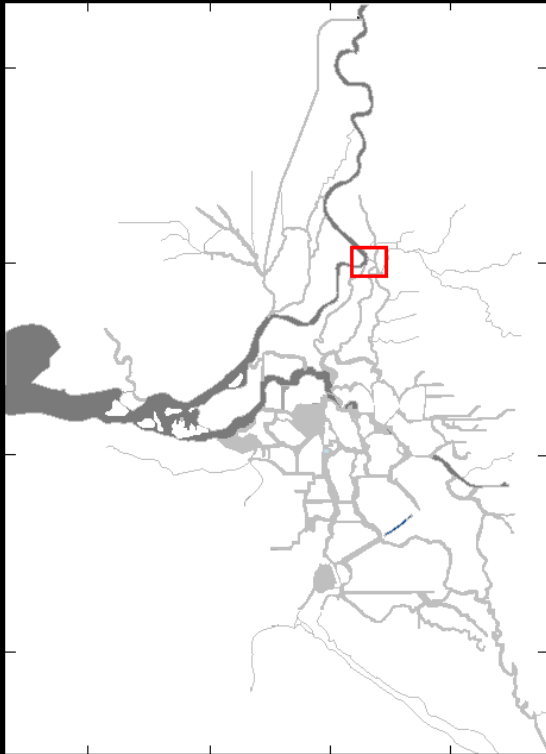


Freeport
 $\Delta U(00) = 9,300$ cfs \uparrow
 $\Delta U(01) = 14,000$ cfs \uparrow

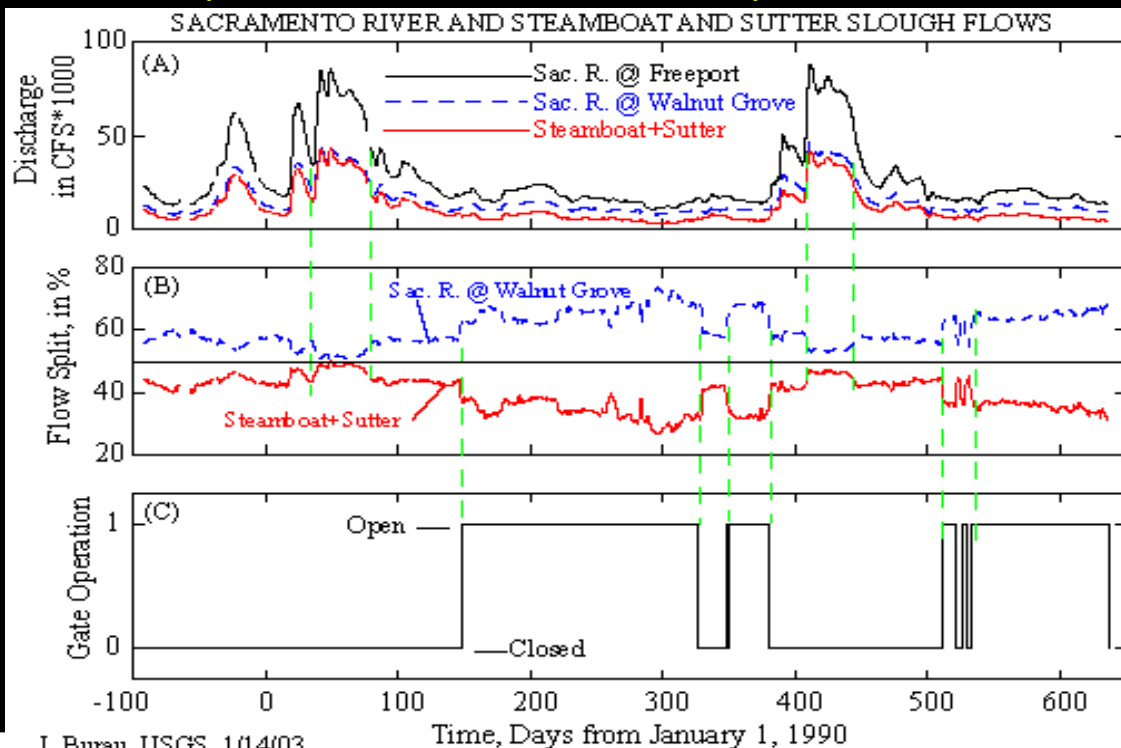
$\Delta U =$ Tidal Flow Range



Drifters in the Delta Cross Channel



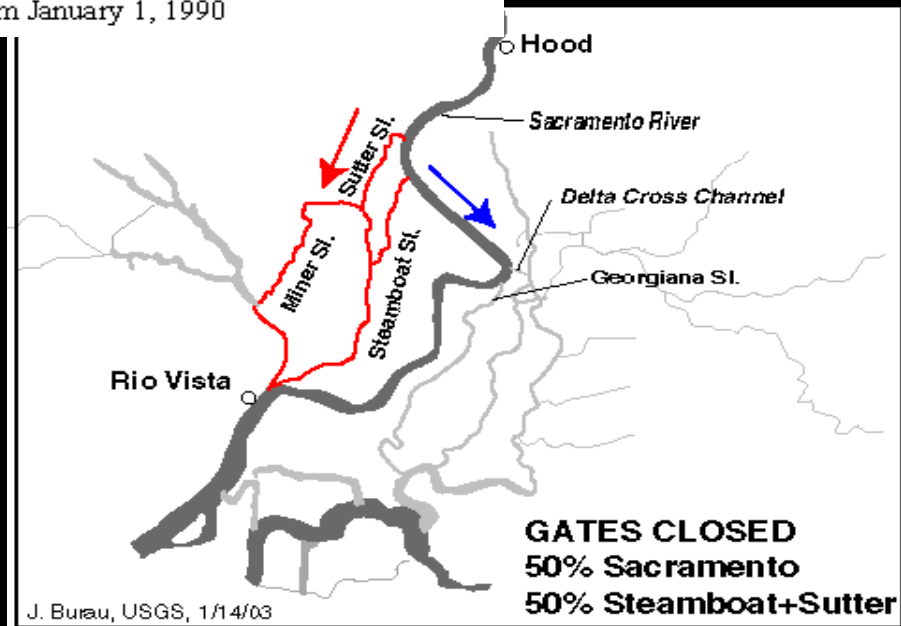
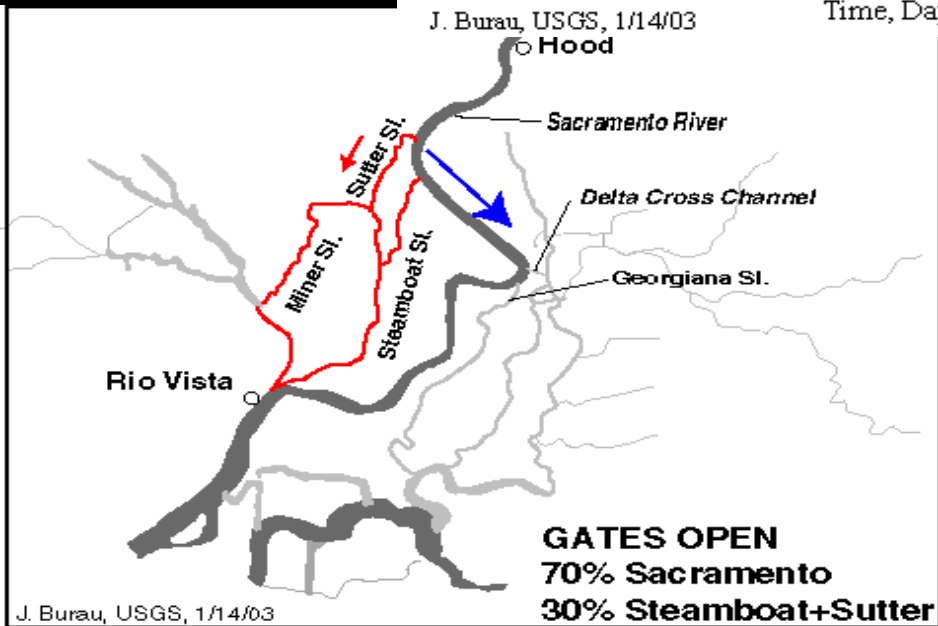
DCC Gate operations affect upstream flow splits



JRB

J. Burau, USGS, 1/14/03

Time, Days from January 1, 1990



J. Burau, USGS, 1/14/03

J. Burau, USGS, 1/14/03

JUVENILE SALMON MOVEMENT IN THE VICINITY OF THE DCC

Used multiple approaches

An aerial photograph of a river winding through a patchwork of agricultural fields. The fields are in various stages of cultivation, with some appearing green and others brown. The river is a prominent feature, curving through the landscape. In the background, there are some buildings and more fields.

Mass-mark recapture studies
USFWS: Mark Pierce, Paul Cadrett

Hydroacoustics
USBR: Mike Horn

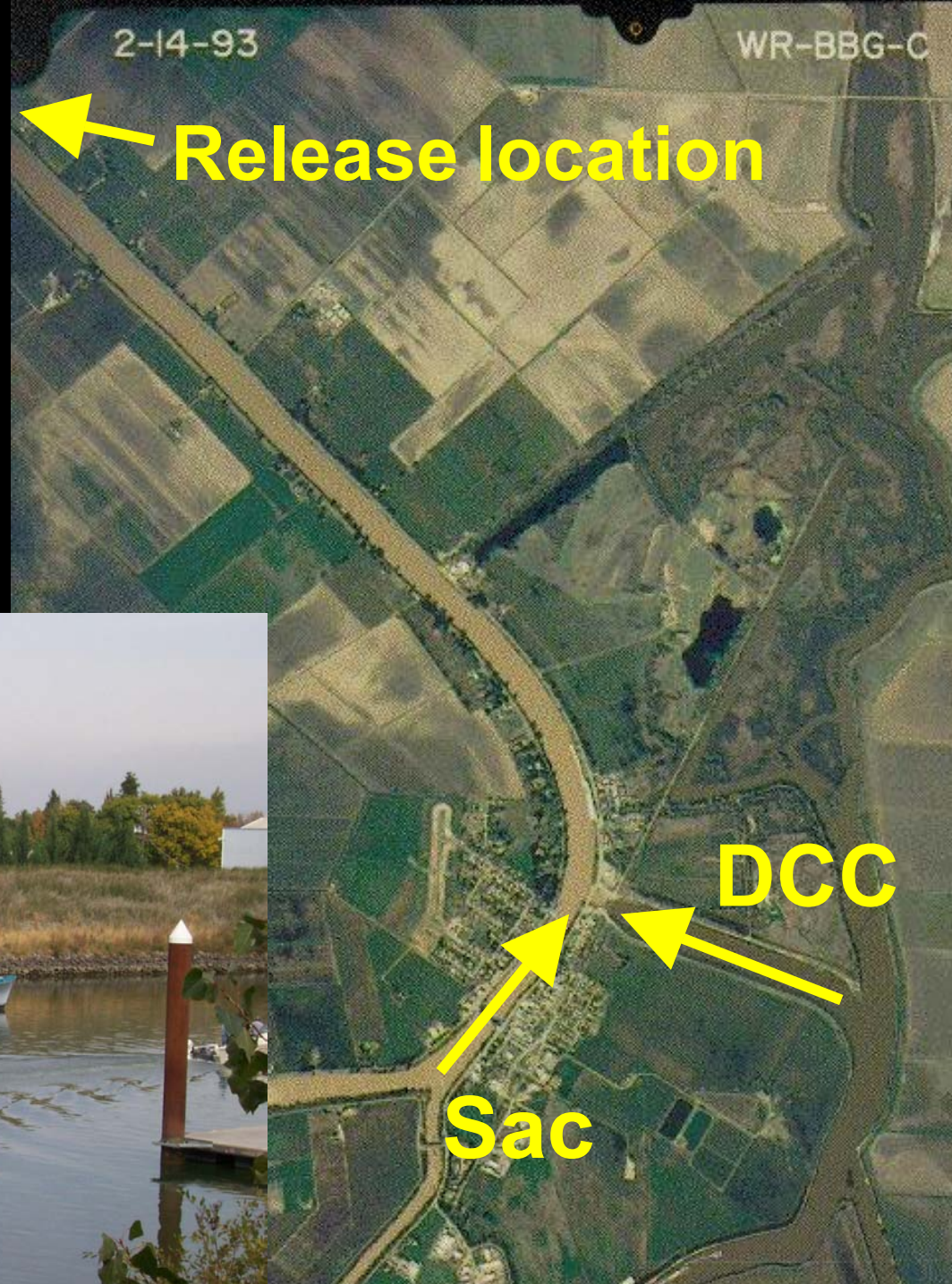
Radio tracking
Resource Scientists: Dave Vogel

Mass Release of Juvenile Salmon

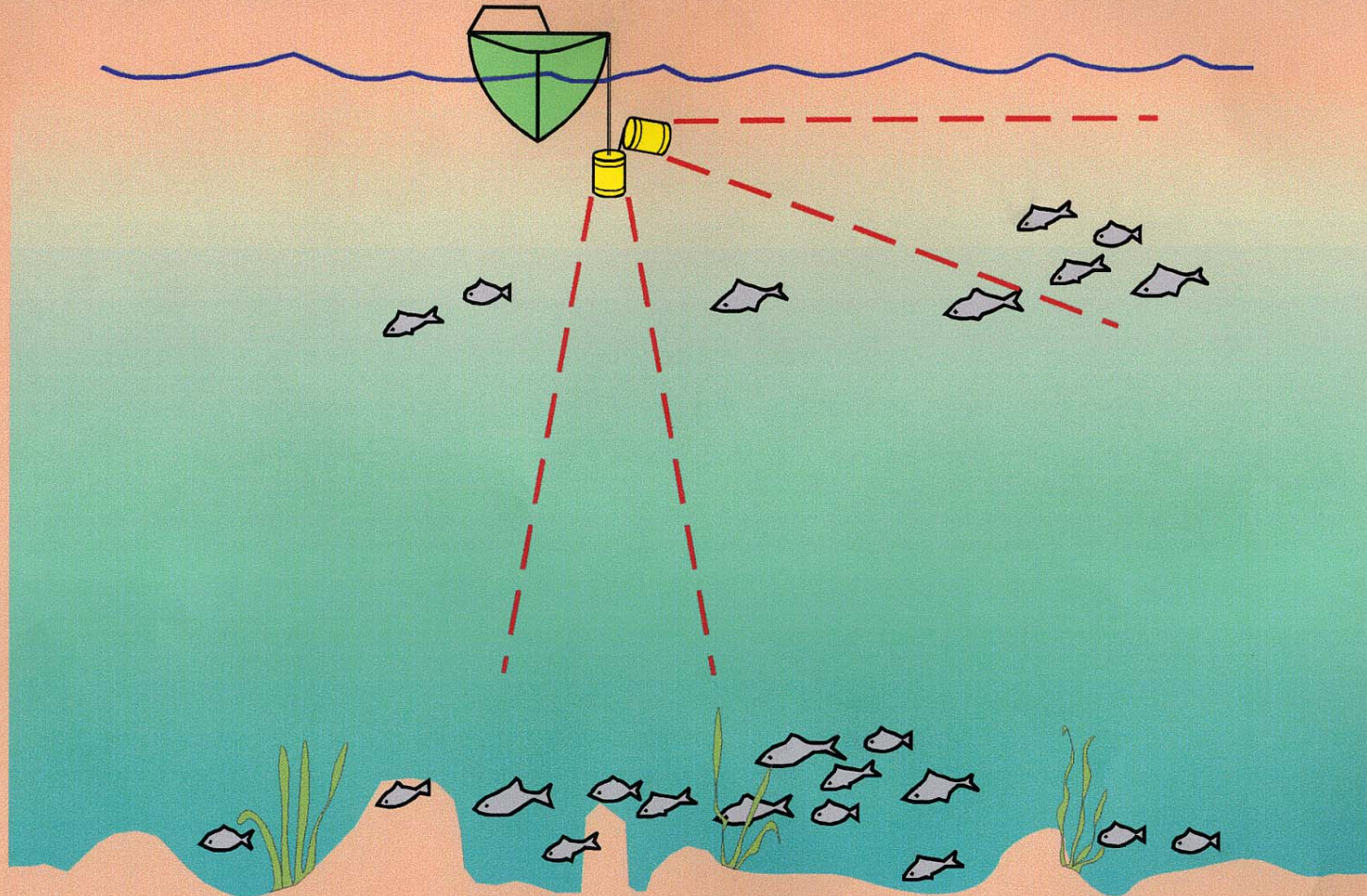


Logistics

Recovery effort:
Continuous MWT
w/ Chipps Is. nets
(larger, 10' x 30')



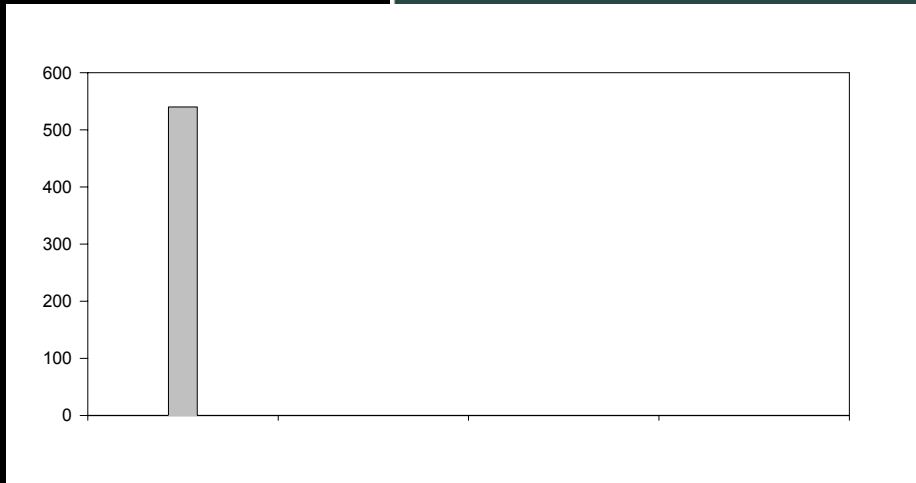
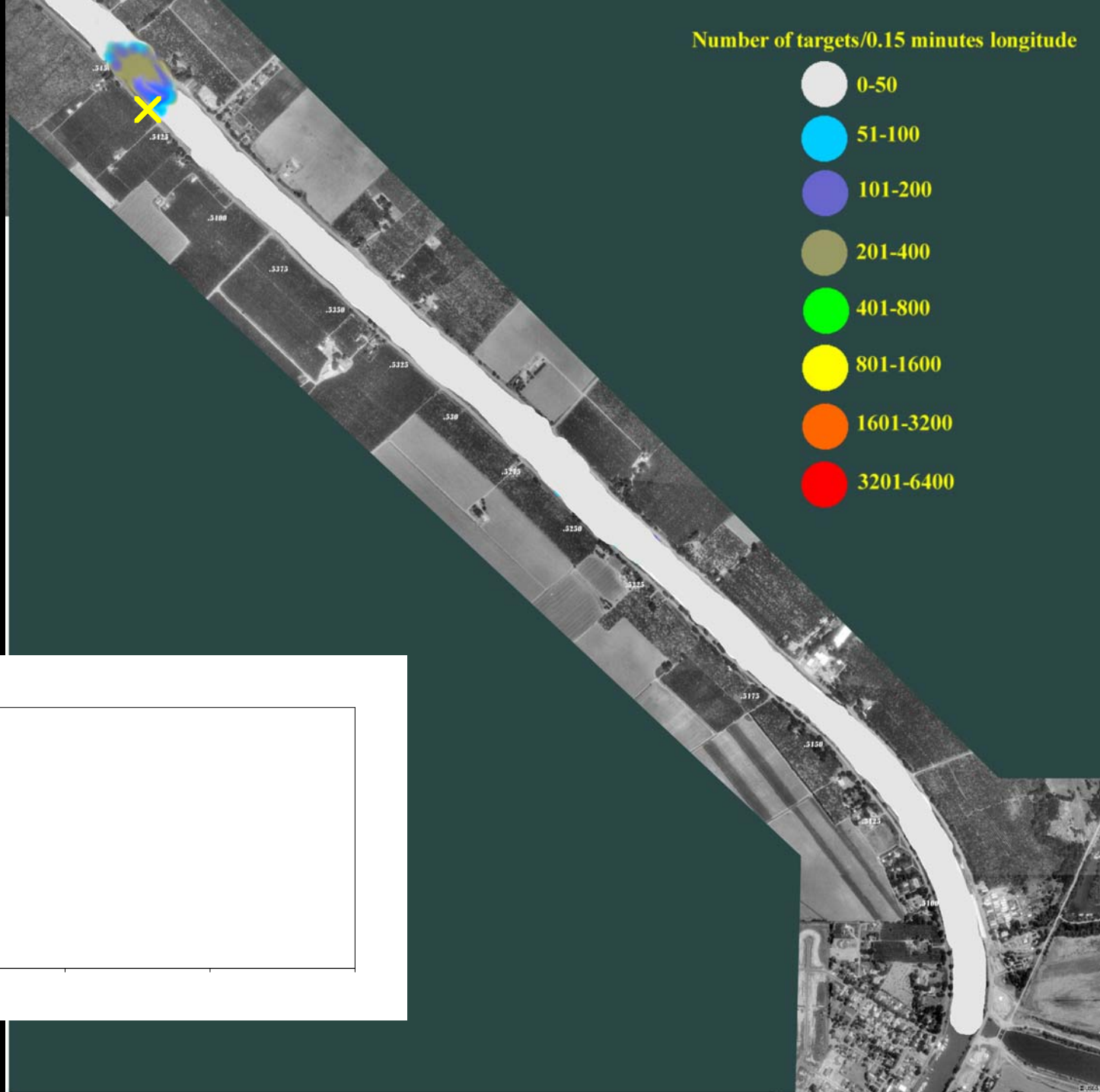
Boat mounted Hydro-acoustic Detection



Side Scan - Hydroacoustic Technique

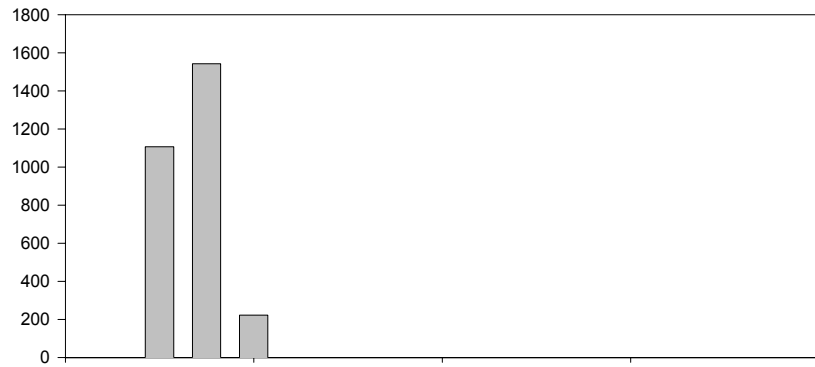
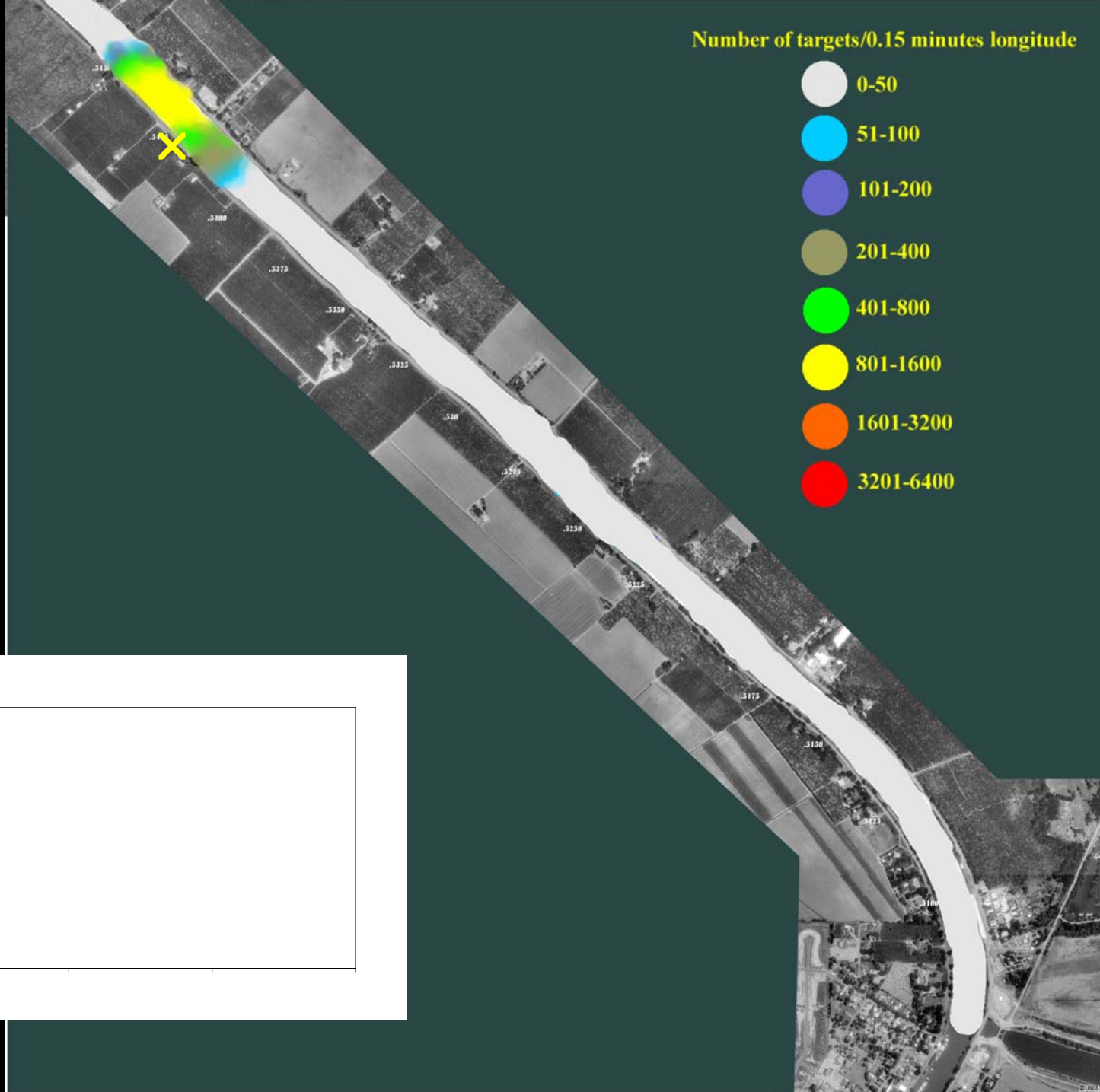
Courtesy of Mike Horn, USBR

Time
1625



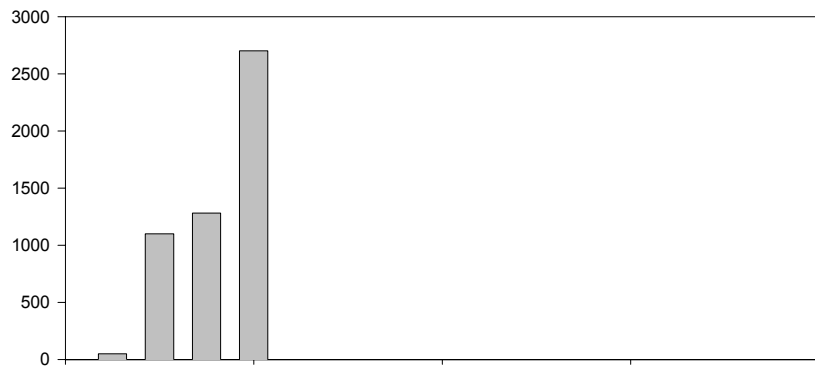
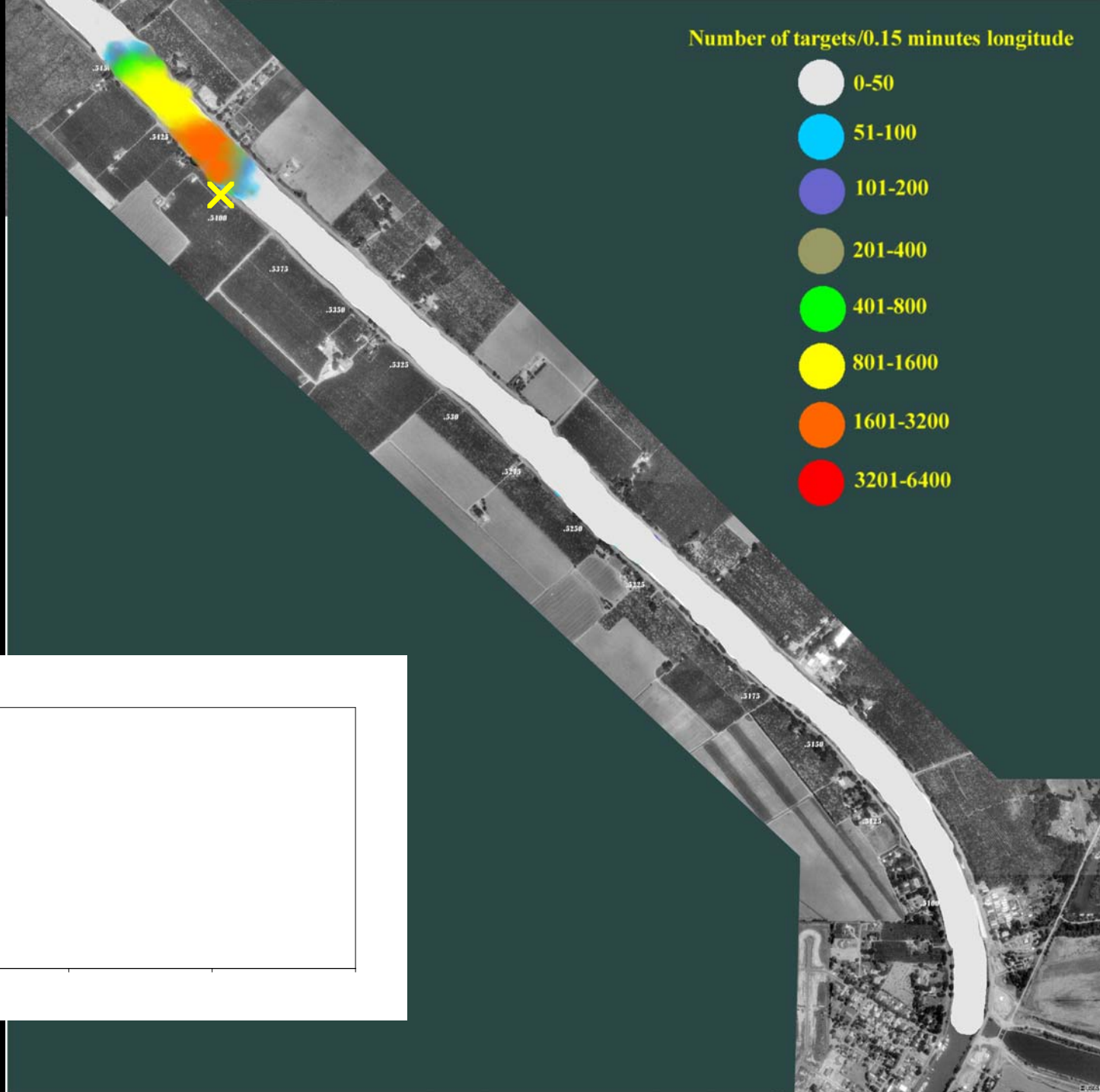
Time
1659

Number of targets/0.15 minutes longitude

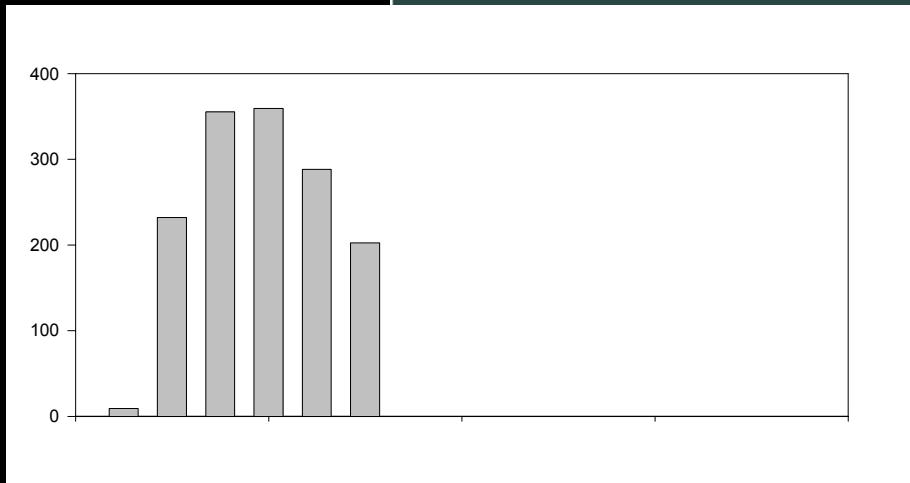
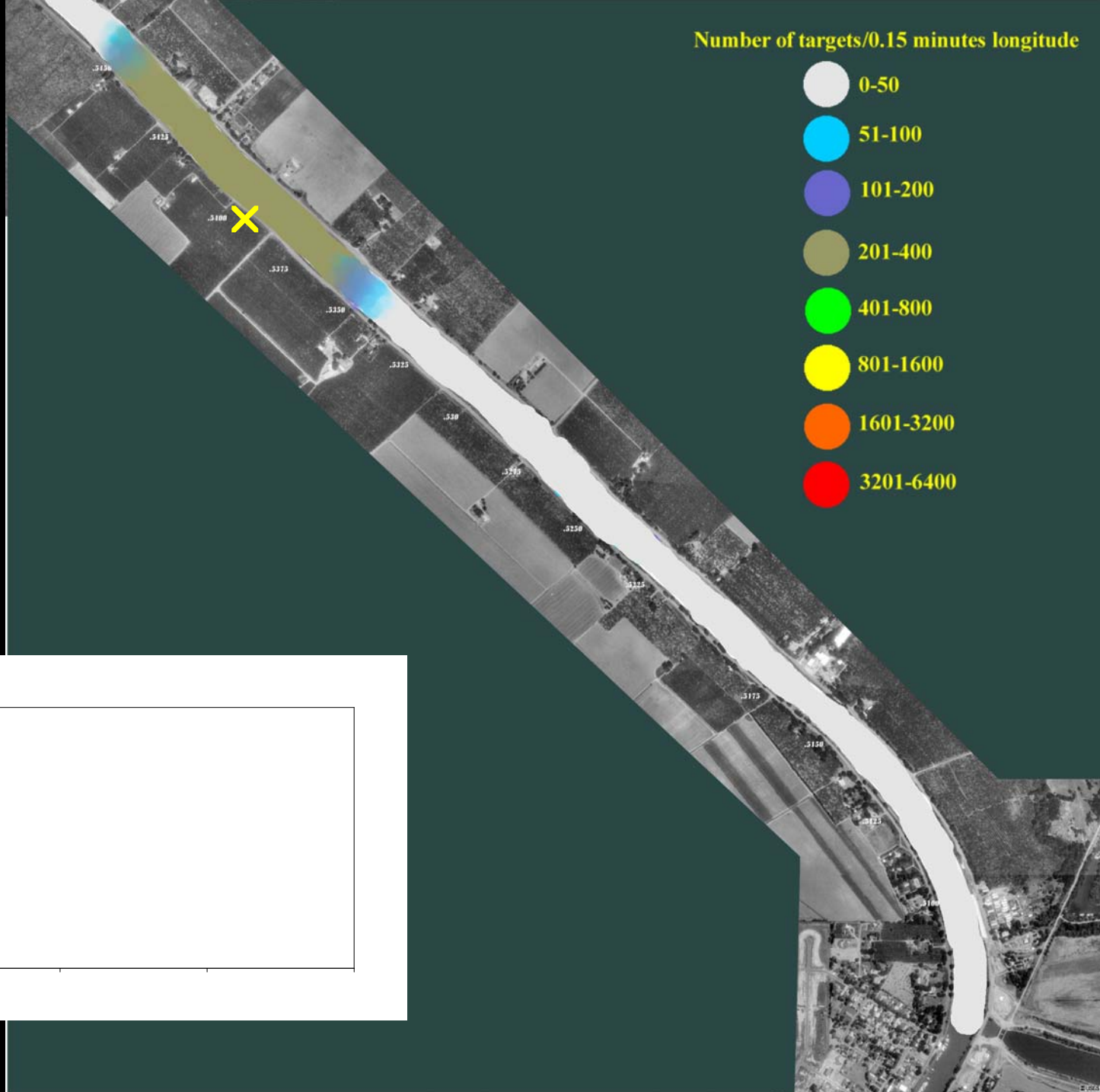


Time
1729

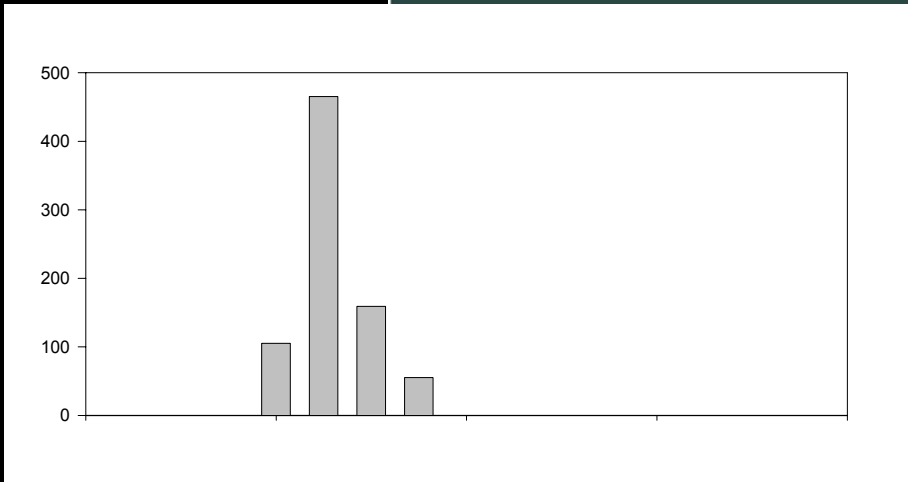
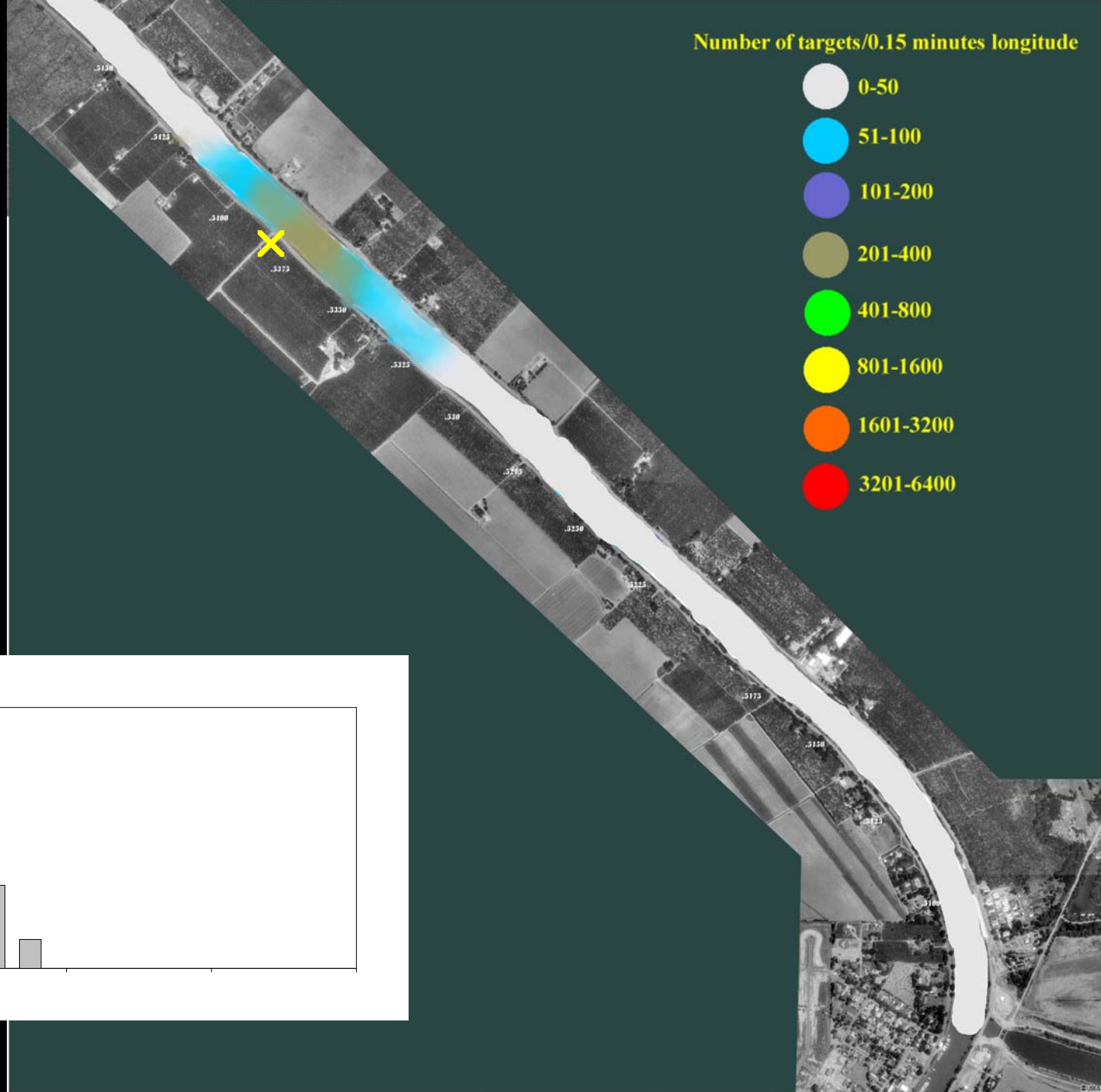
Number of targets/0.15 minutes longitude



Time
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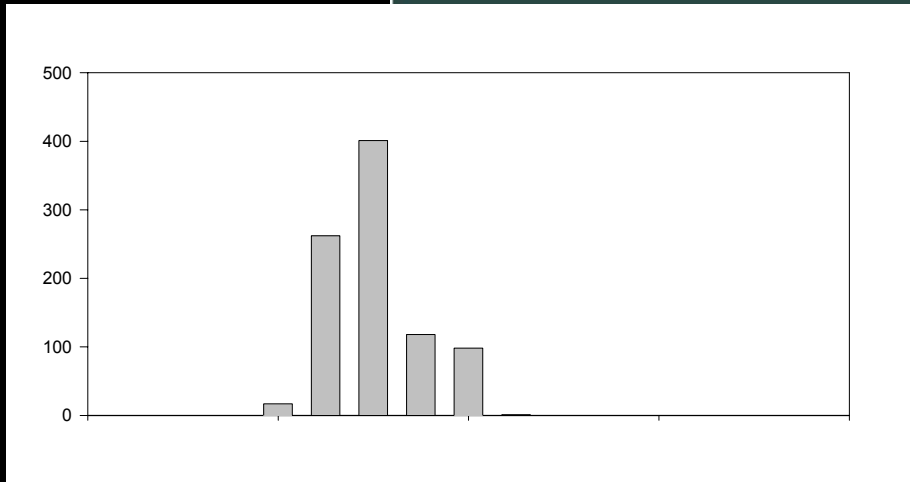
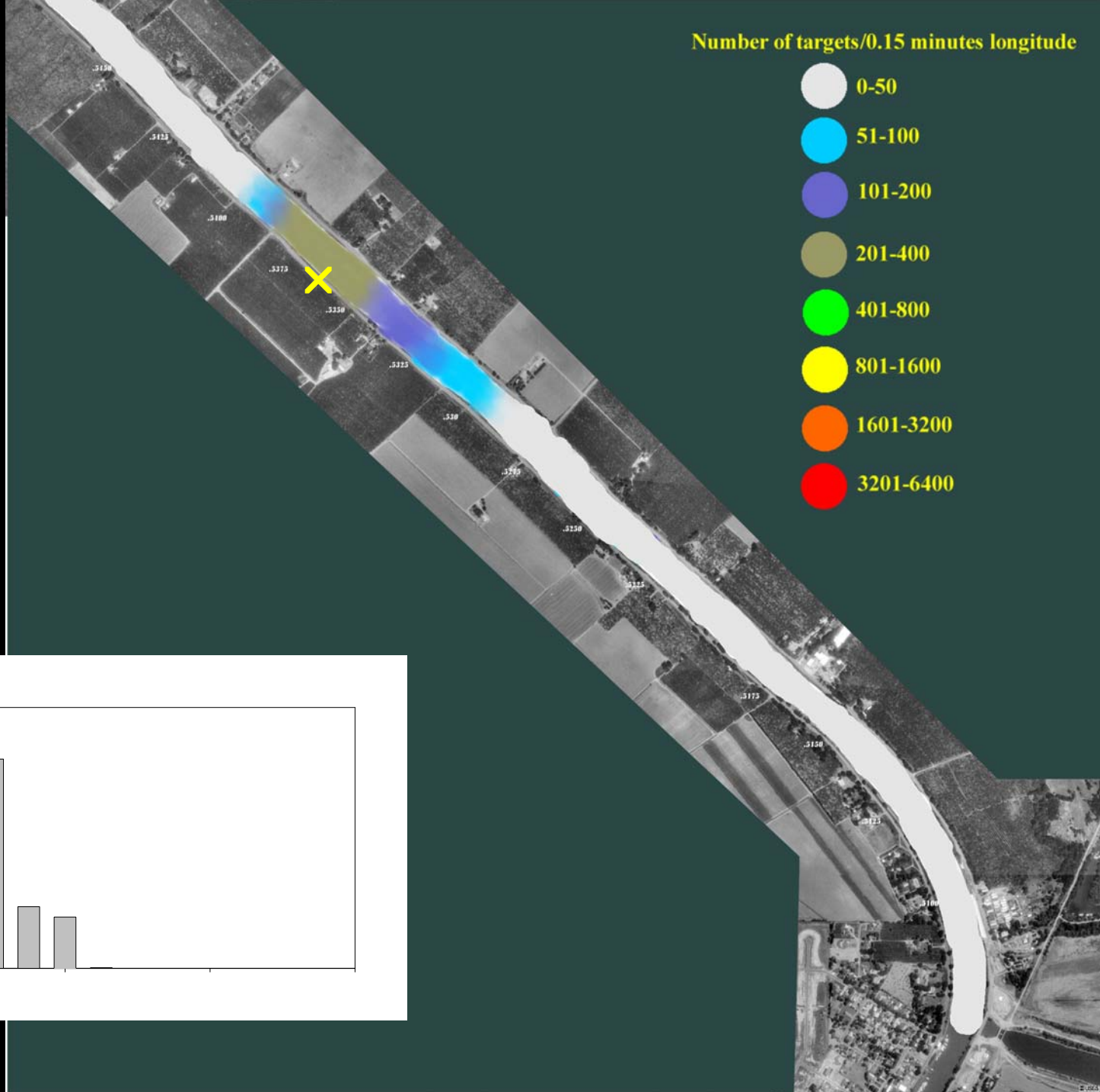


Time
1816



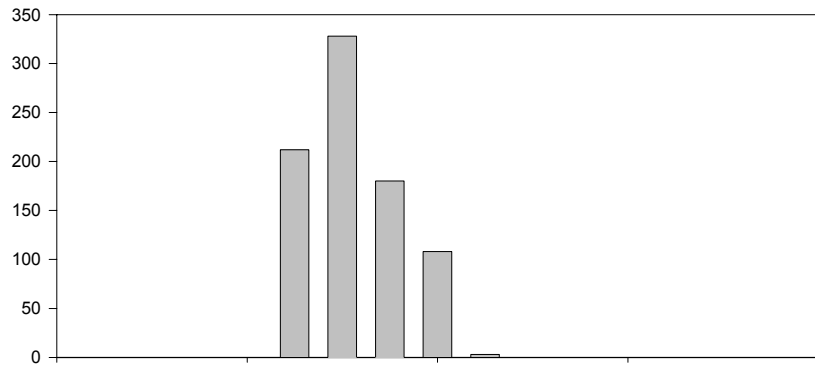
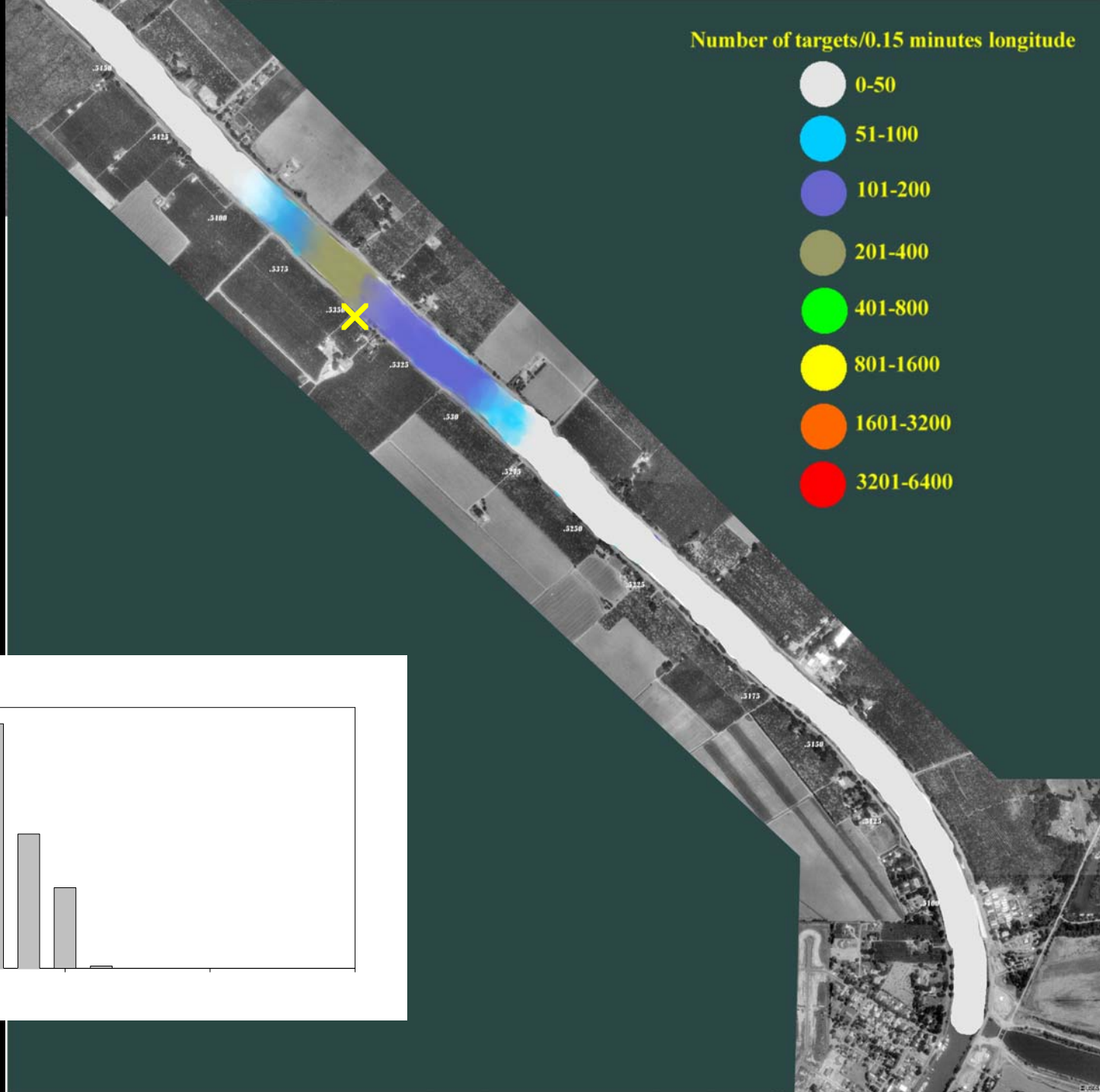
Time
1833

Number of targets/0.15 minutes longitude



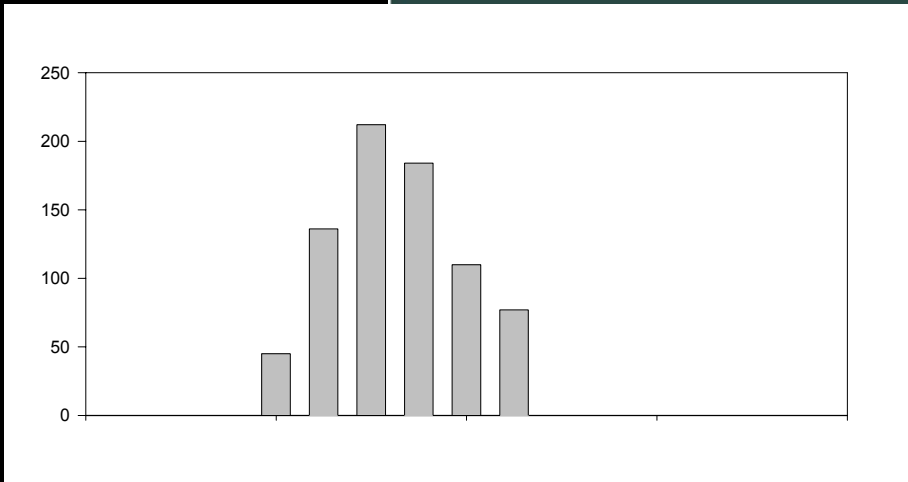
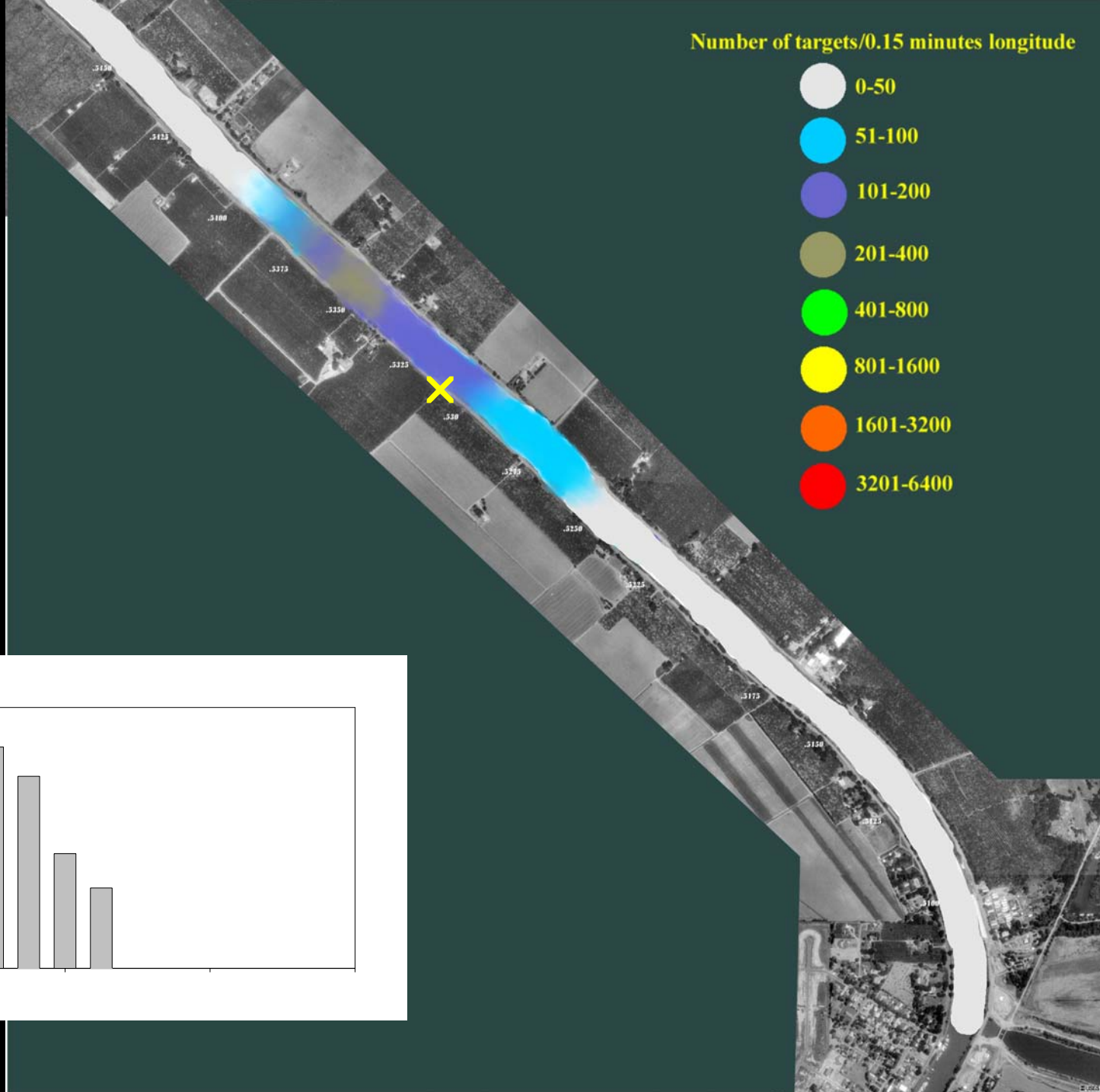
Time
1855

Number of targets/0.15 minutes longitude



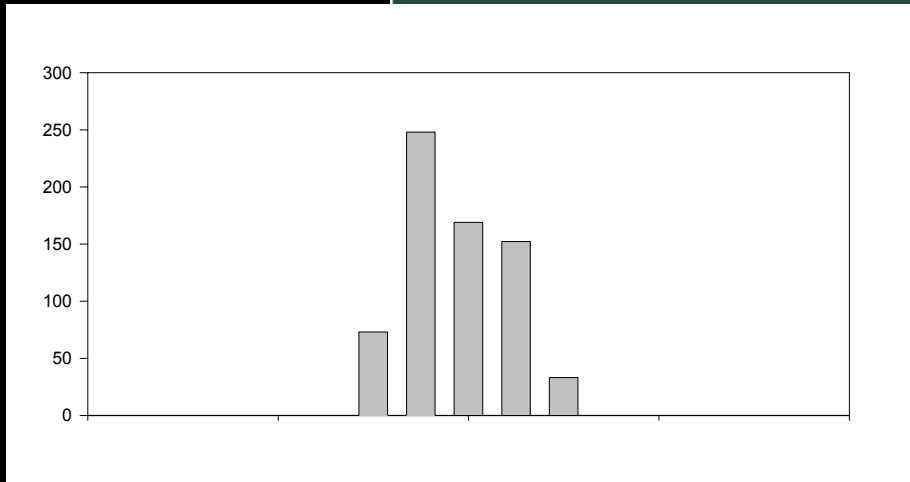
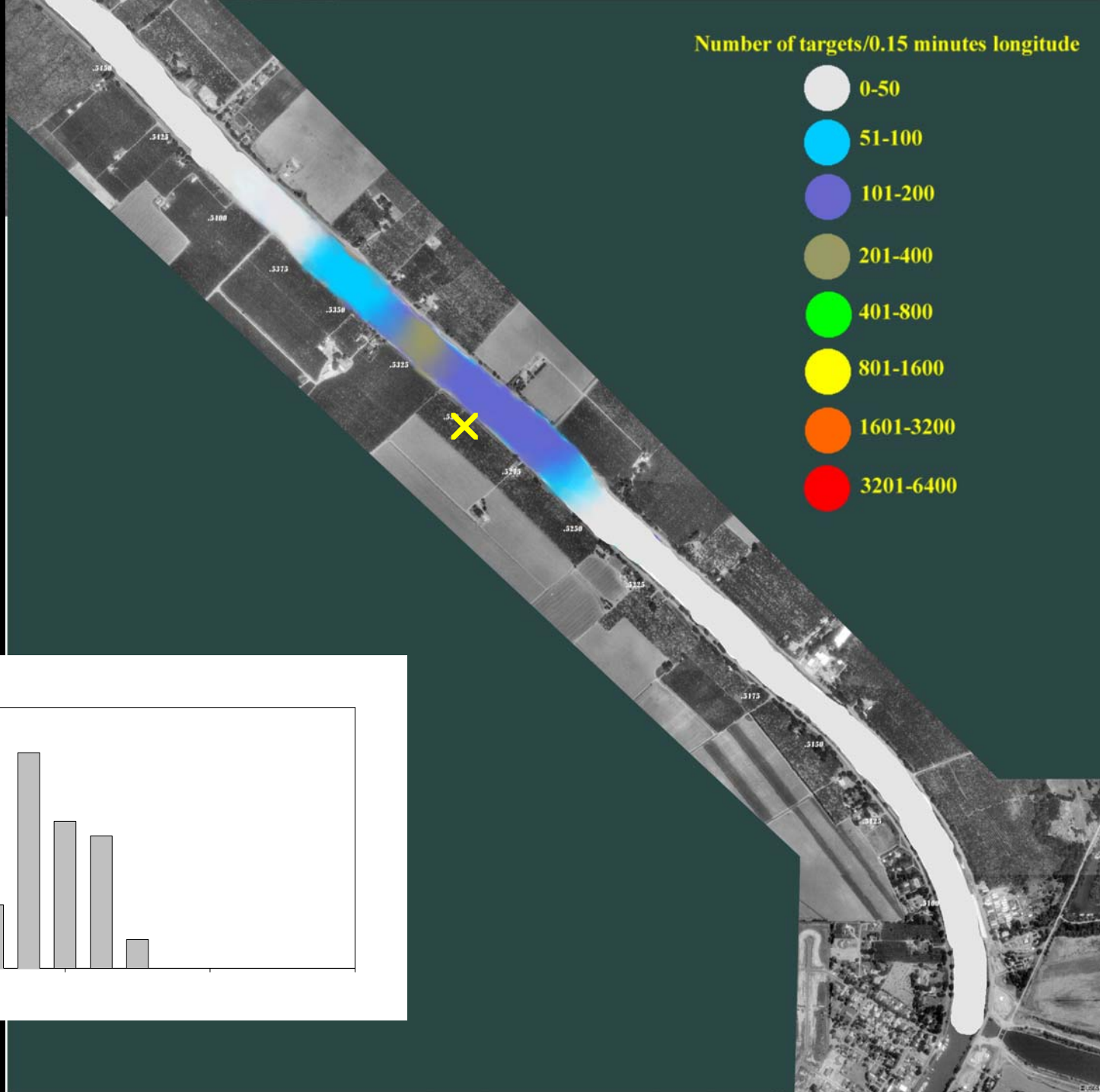
Time
1913

Number of targets/0.15 minutes longitude



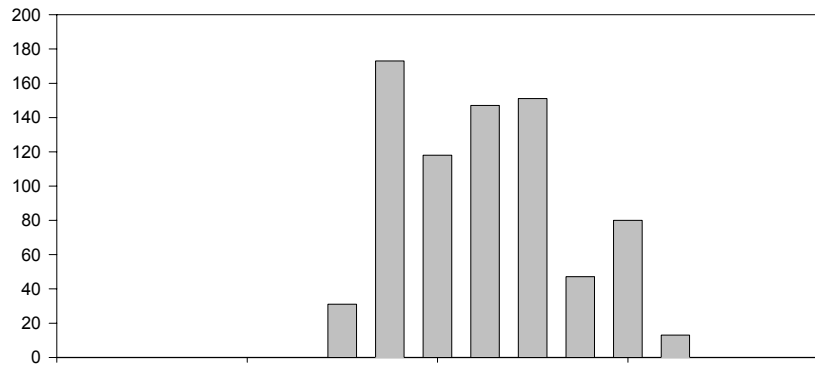
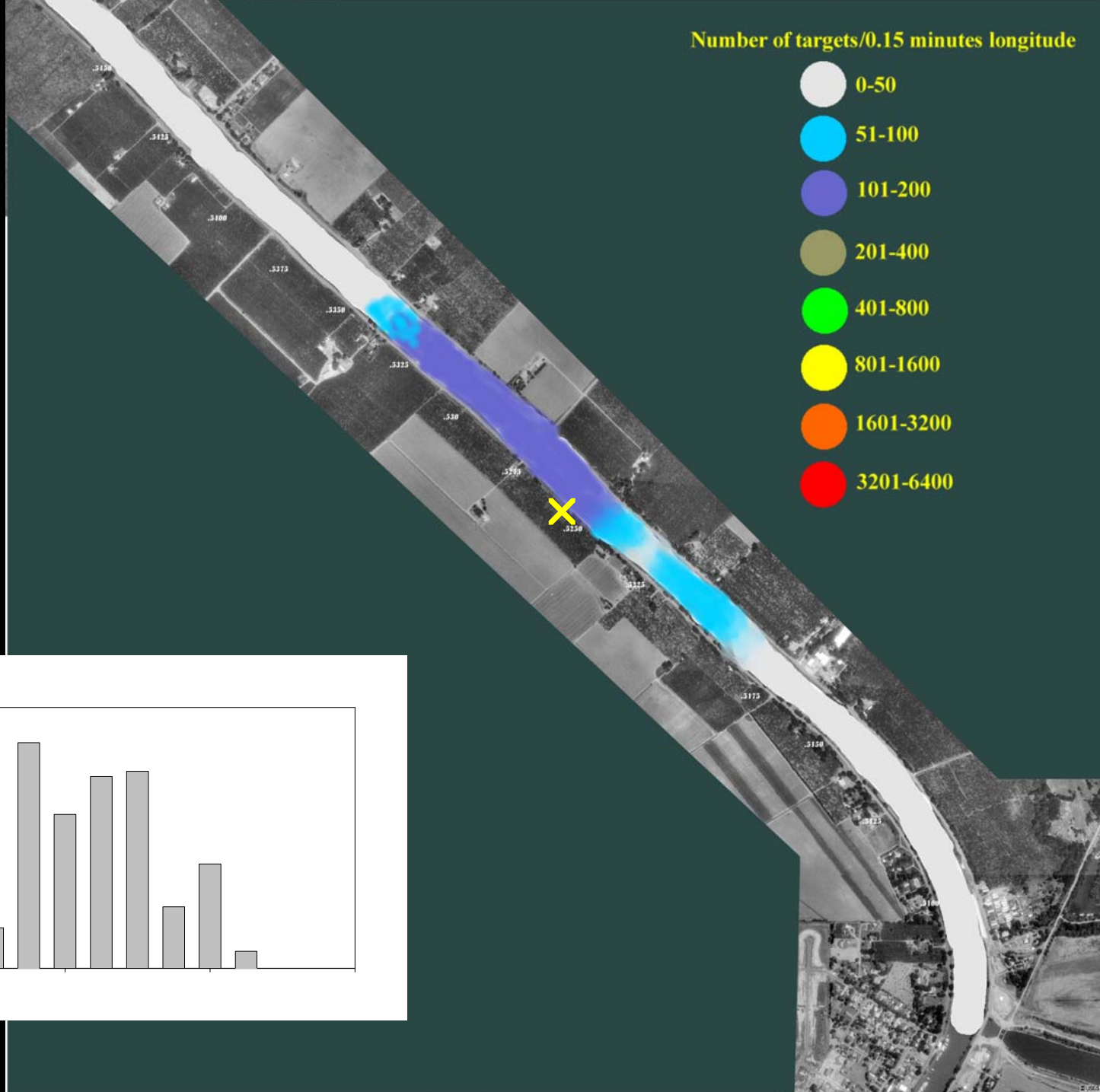
Time
1933

Number of targets/0.15 minutes longitude



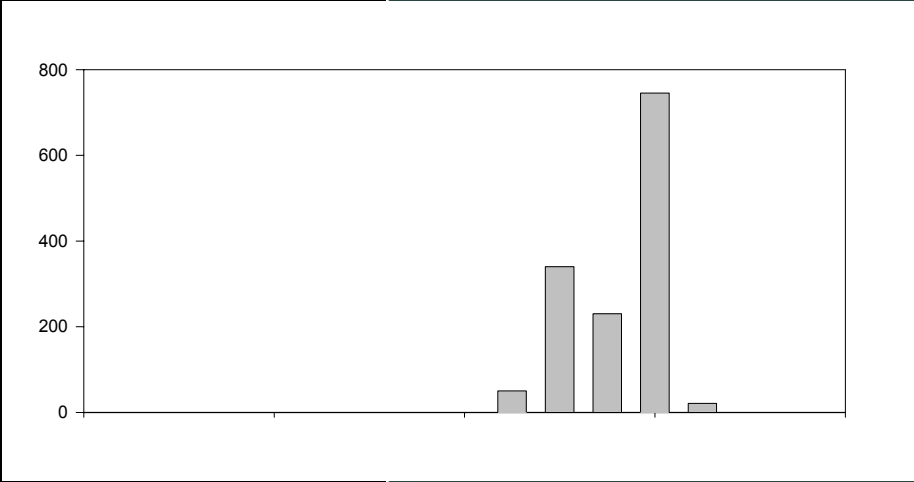
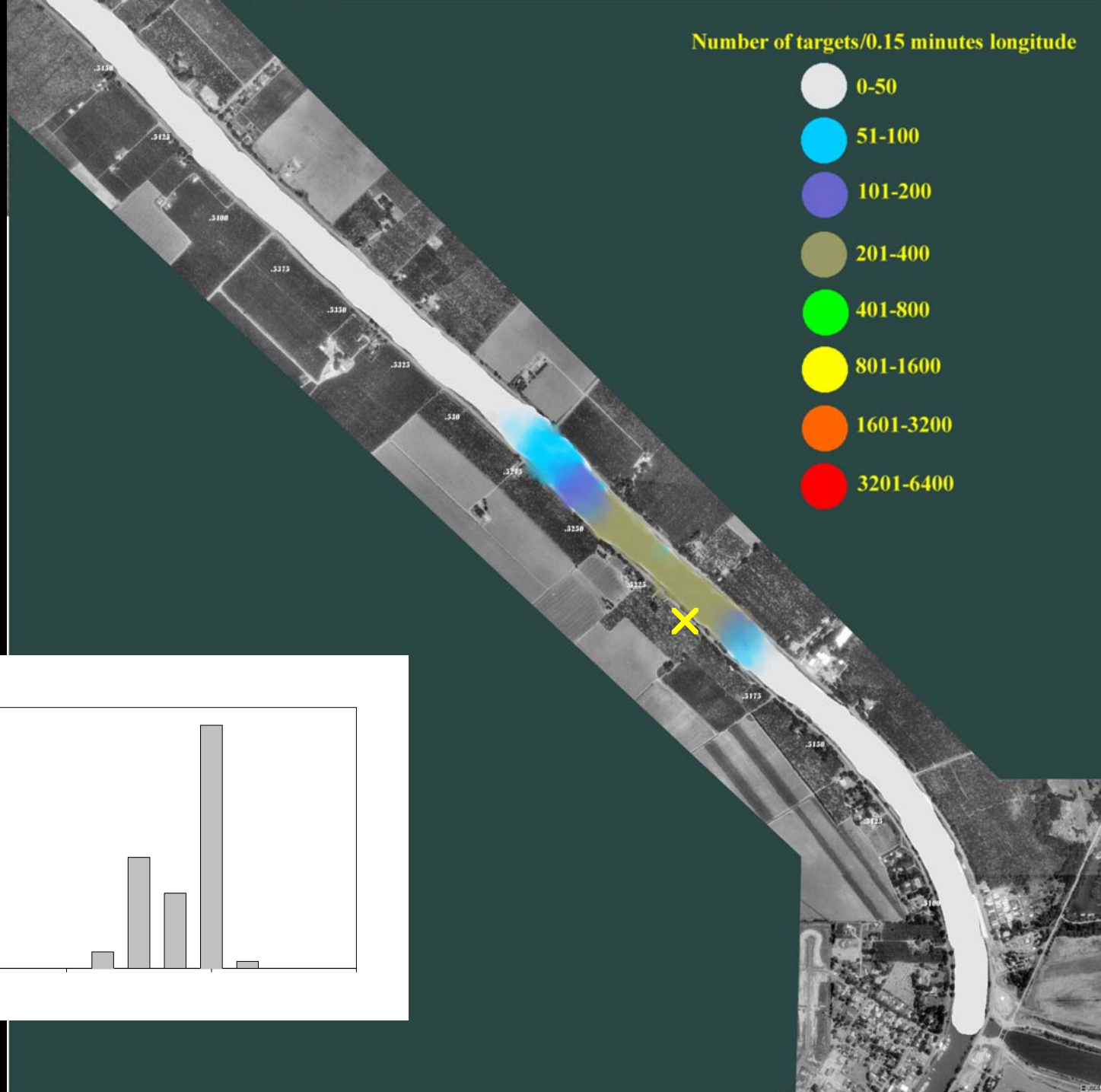
Time
1955

Number of targets/0.15 minutes longitude



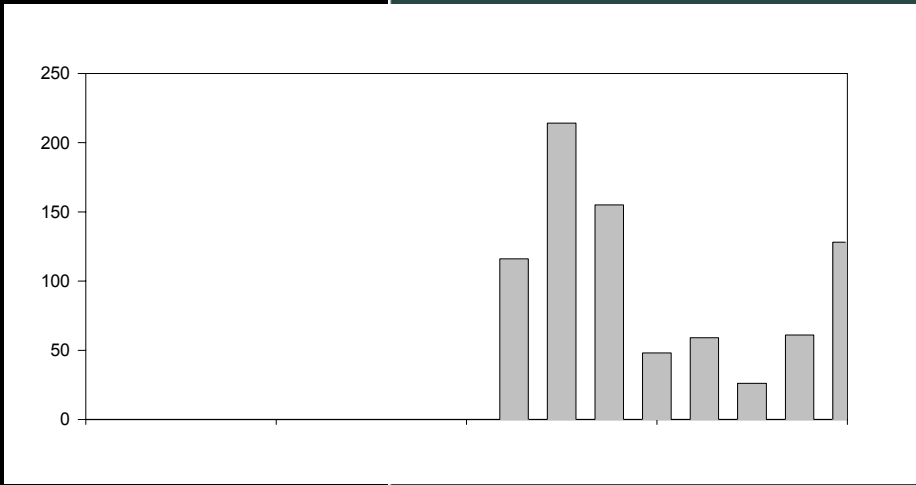
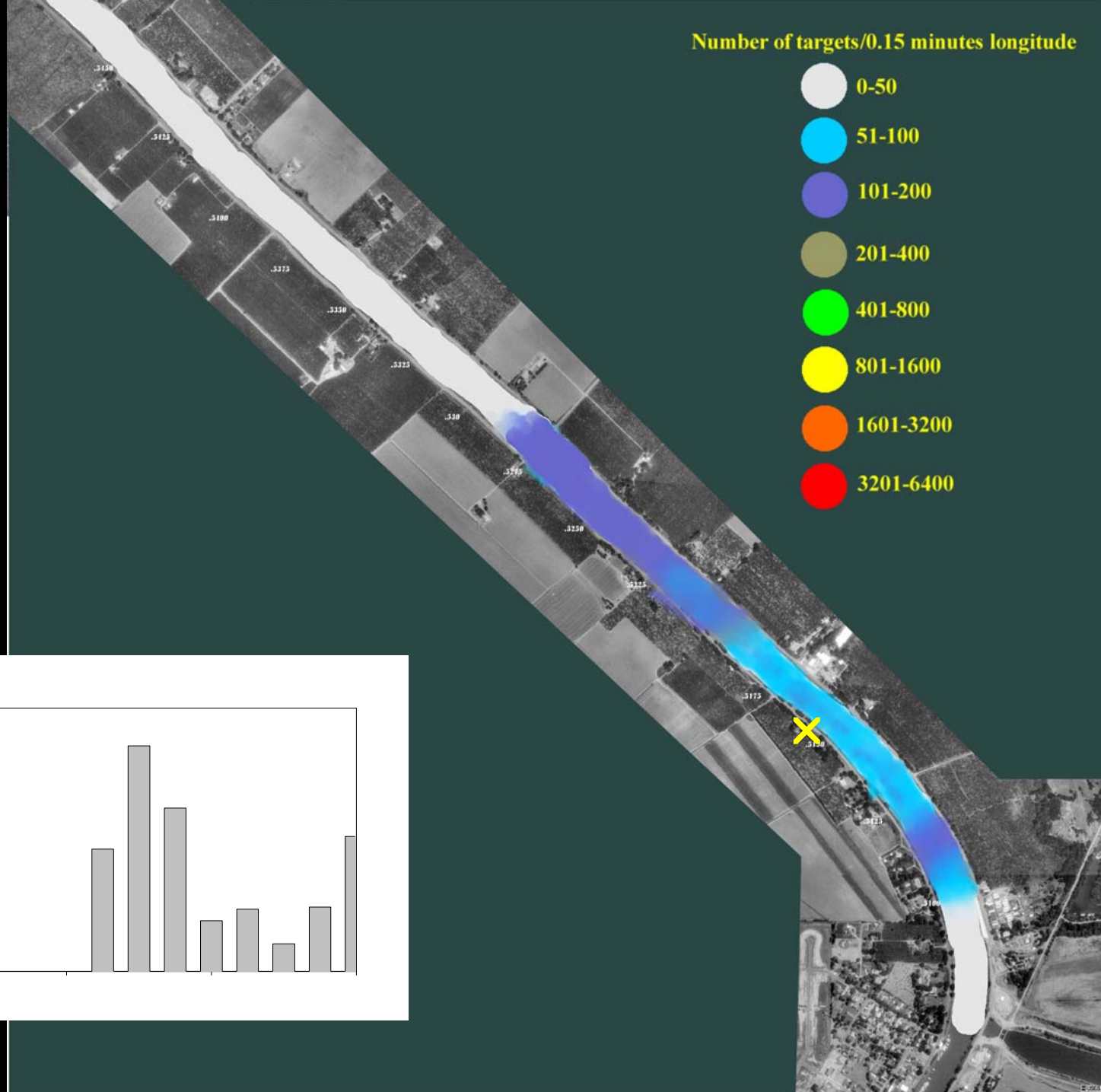
Time
2015

Number of targets/0.15 minutes longitude

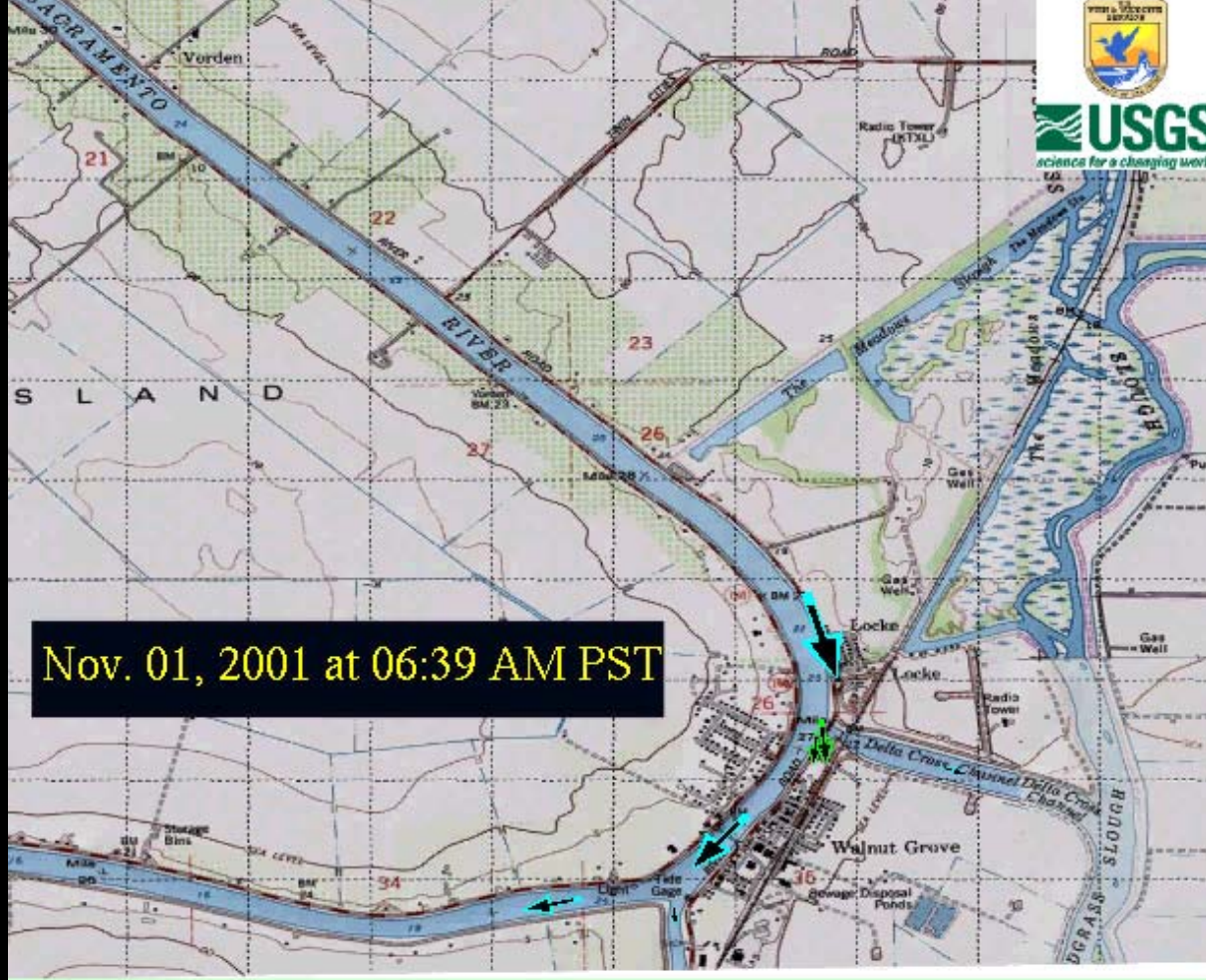


Time
2040

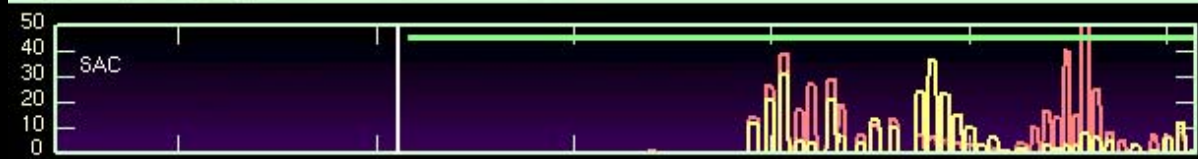
Number of targets/0.15 minutes longitude



Nov 1-2



SAC Trawl



DCC Trawl



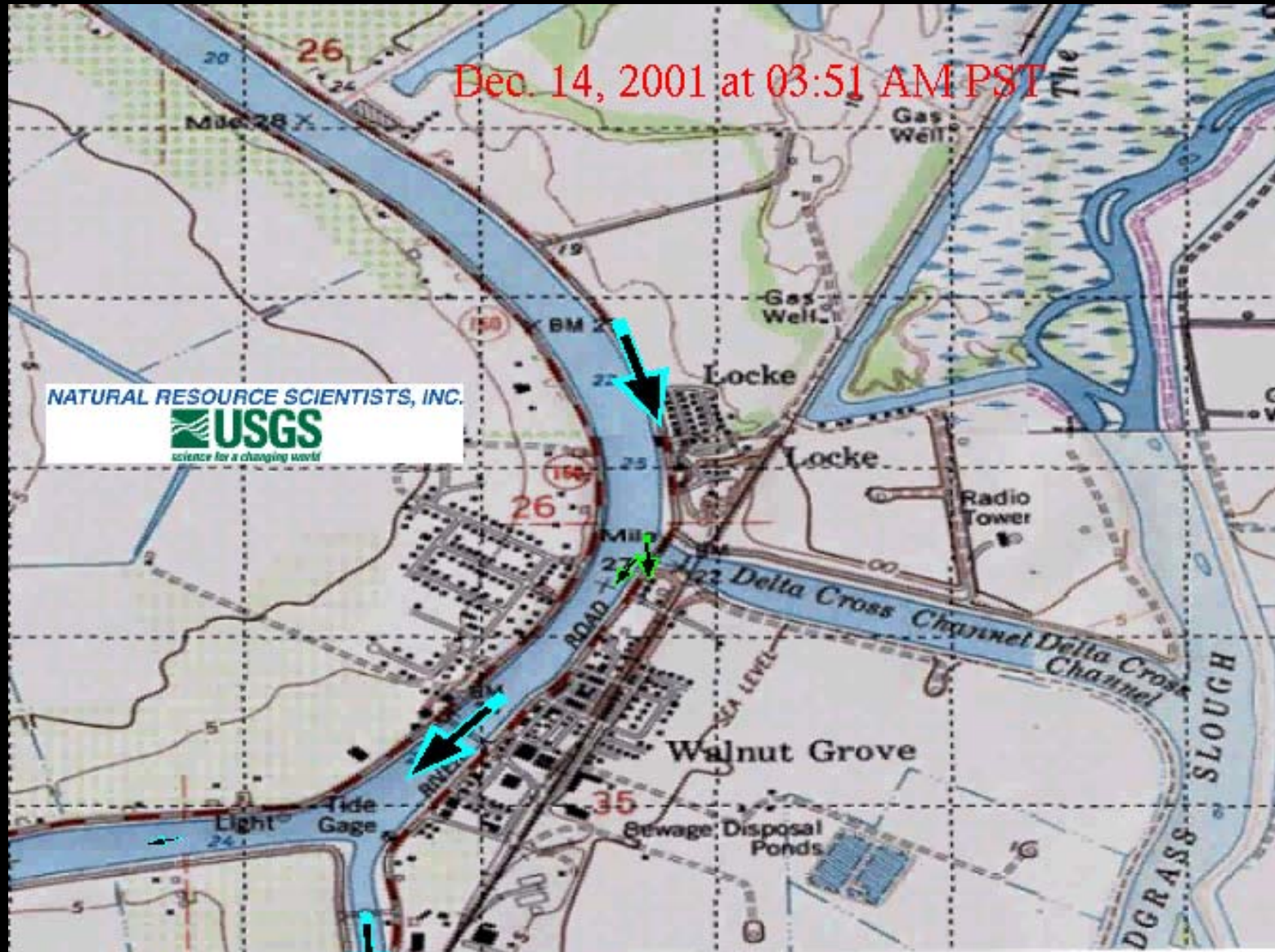
Light



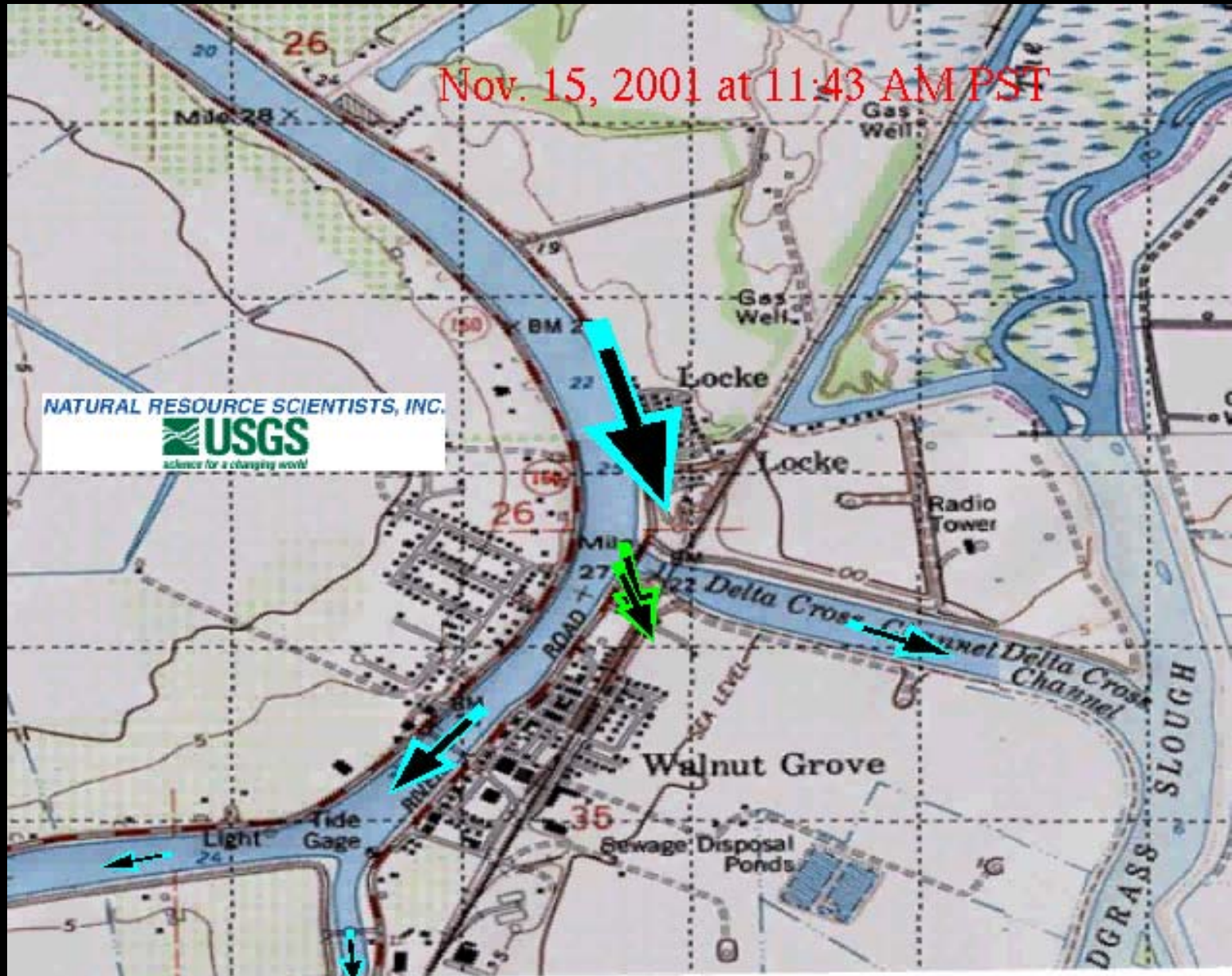
Radio Tagging



Radio Tagged Juvenile Salmon: EBB

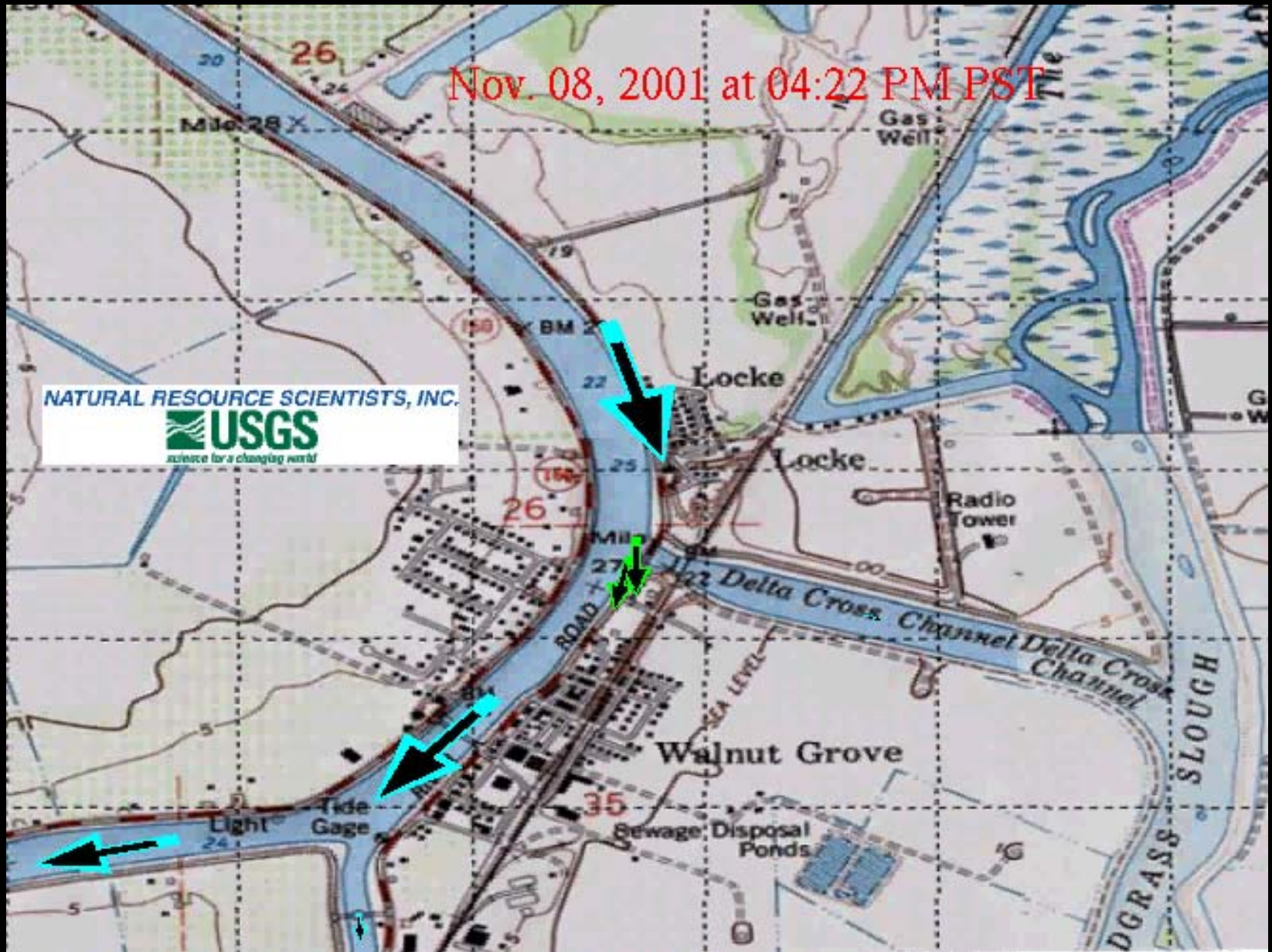


Radio Tagged Juvenile Salmon: FLOOD



Radio Tagged Juvenile Salmon: TRANSITION

Nov. 08, 2001 at 04:22 PM PST



Delta Cross Channel studies

First year results

Salmon smolts "go with the flow"

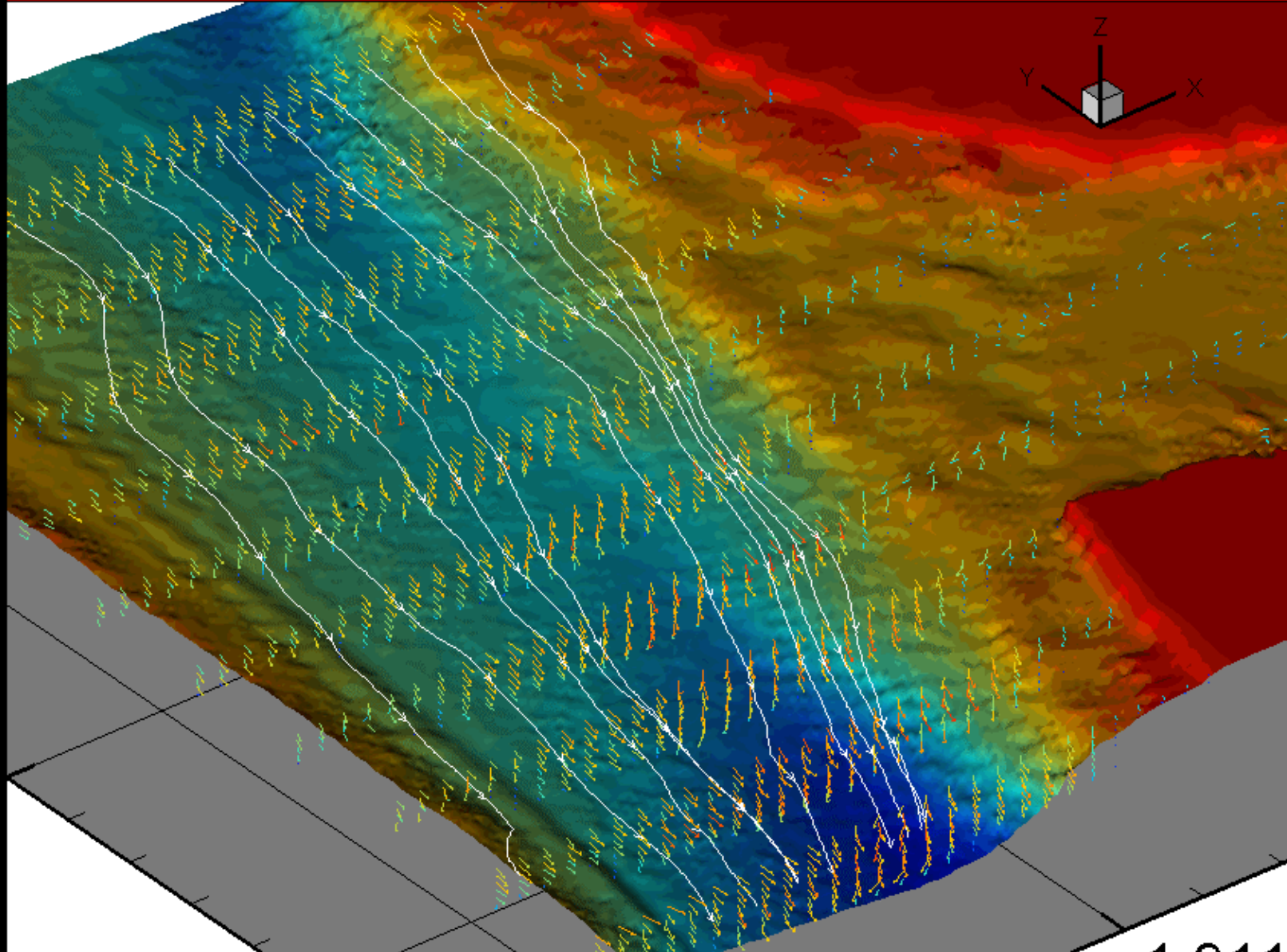
Implications

Good news: If you want to predict fish movements

Bad news: If you move water you move the smolts too

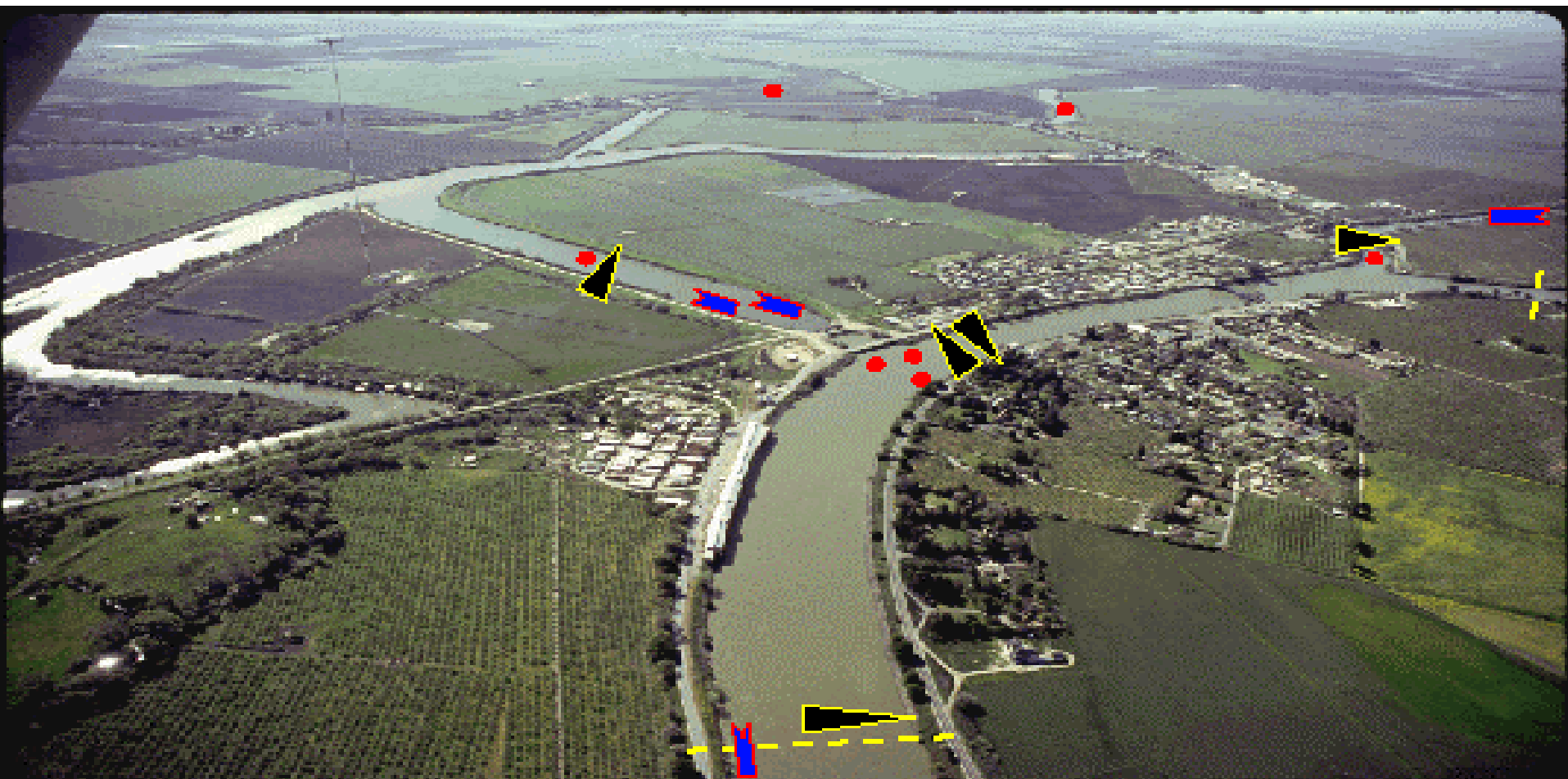
Flow structures in junctions change over the tide cycle

Frame 002 | 10 Dec 2001 | Converted Excel Data | Converted Excel Data | Converted Excel Data



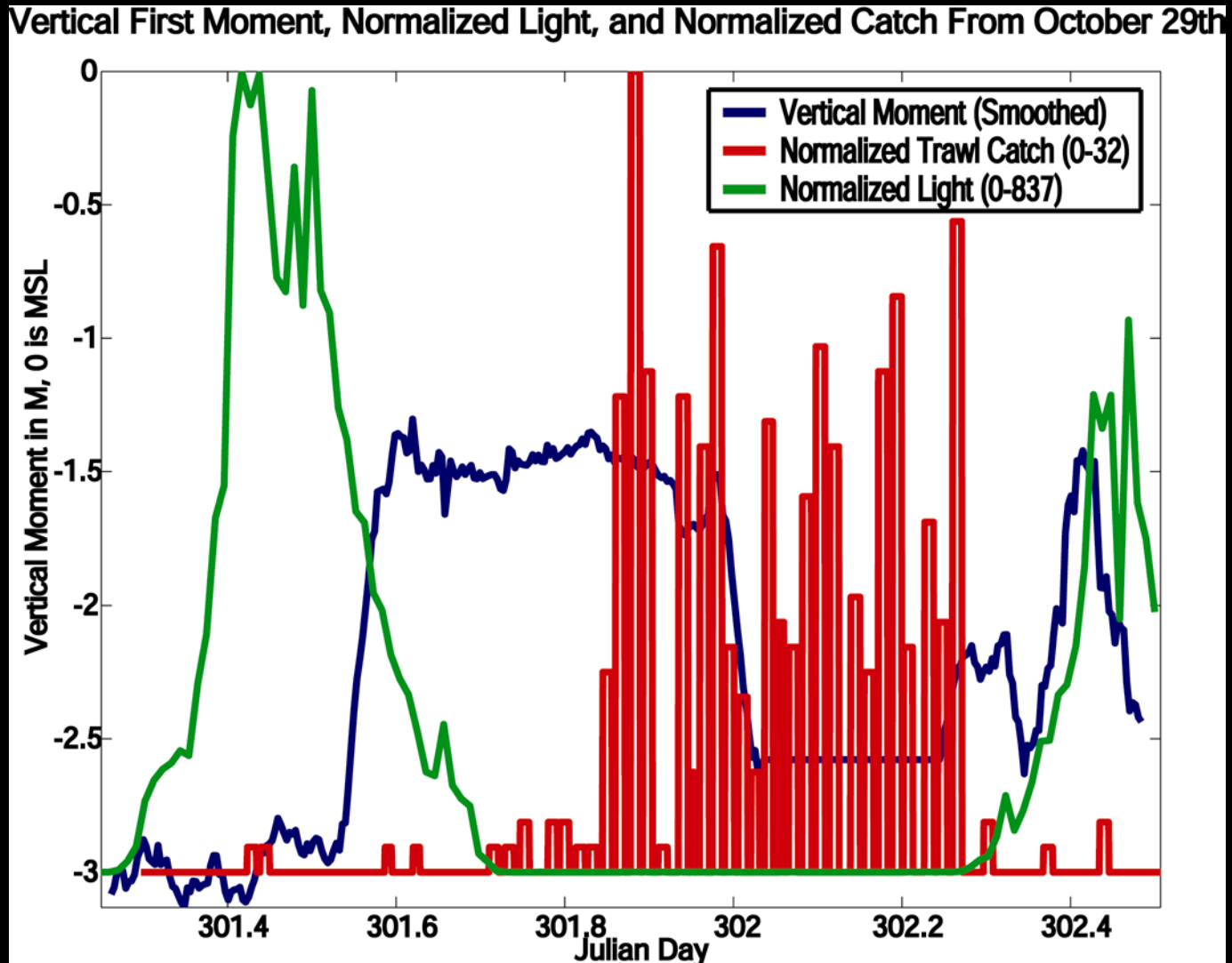
Delta Cross Channel Fish Passage Study Instrument Positions

- ▶ Hydro-acoustic equipment
- ▬ Fyke Trap
- ADCP location
- - - UVM location

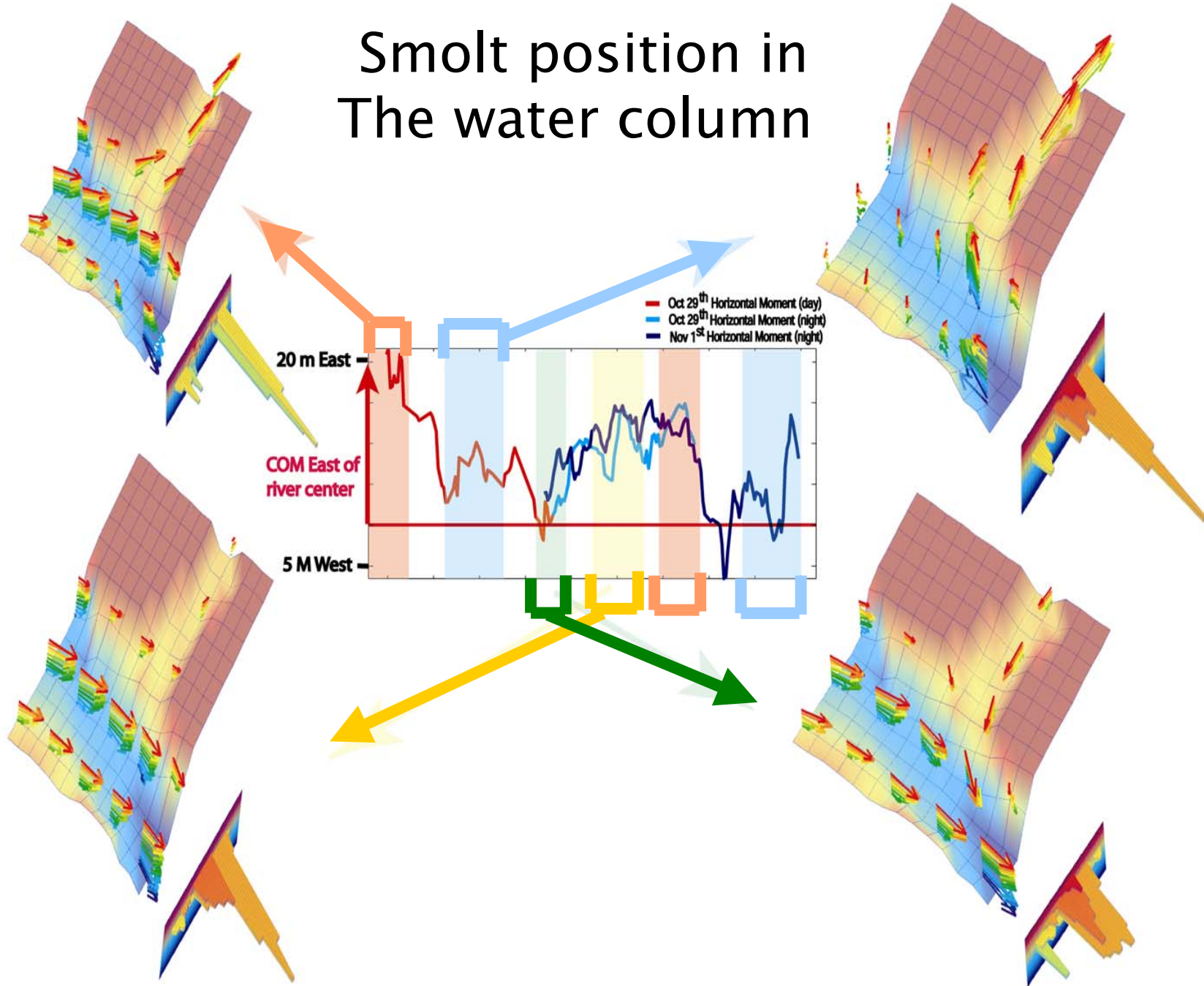


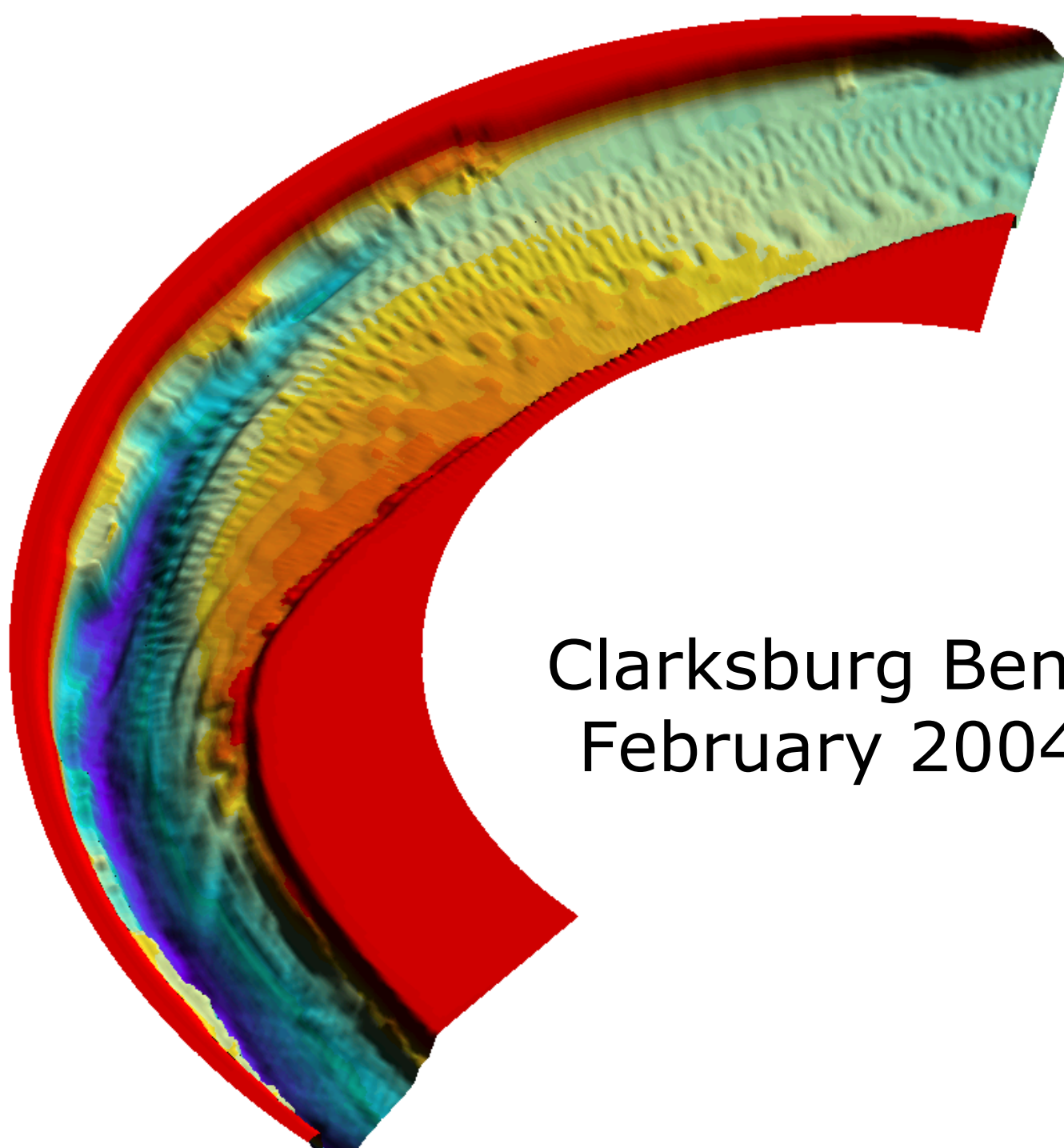
View to the southwest

Do smolts go with the flow? – Smolt Vertical Signal



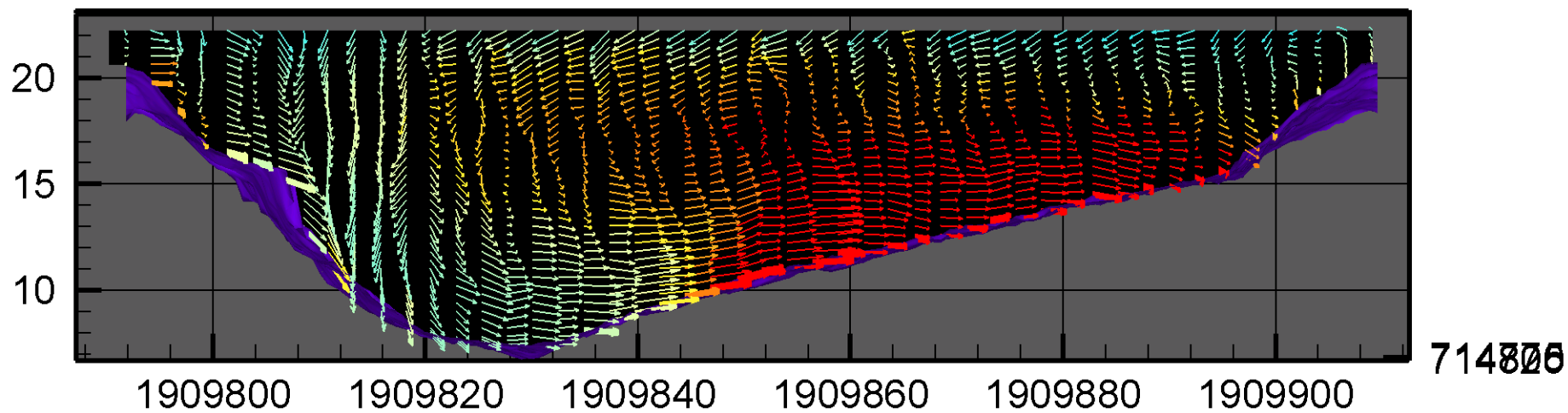
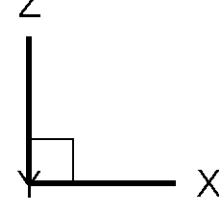
Smolt position in The water column

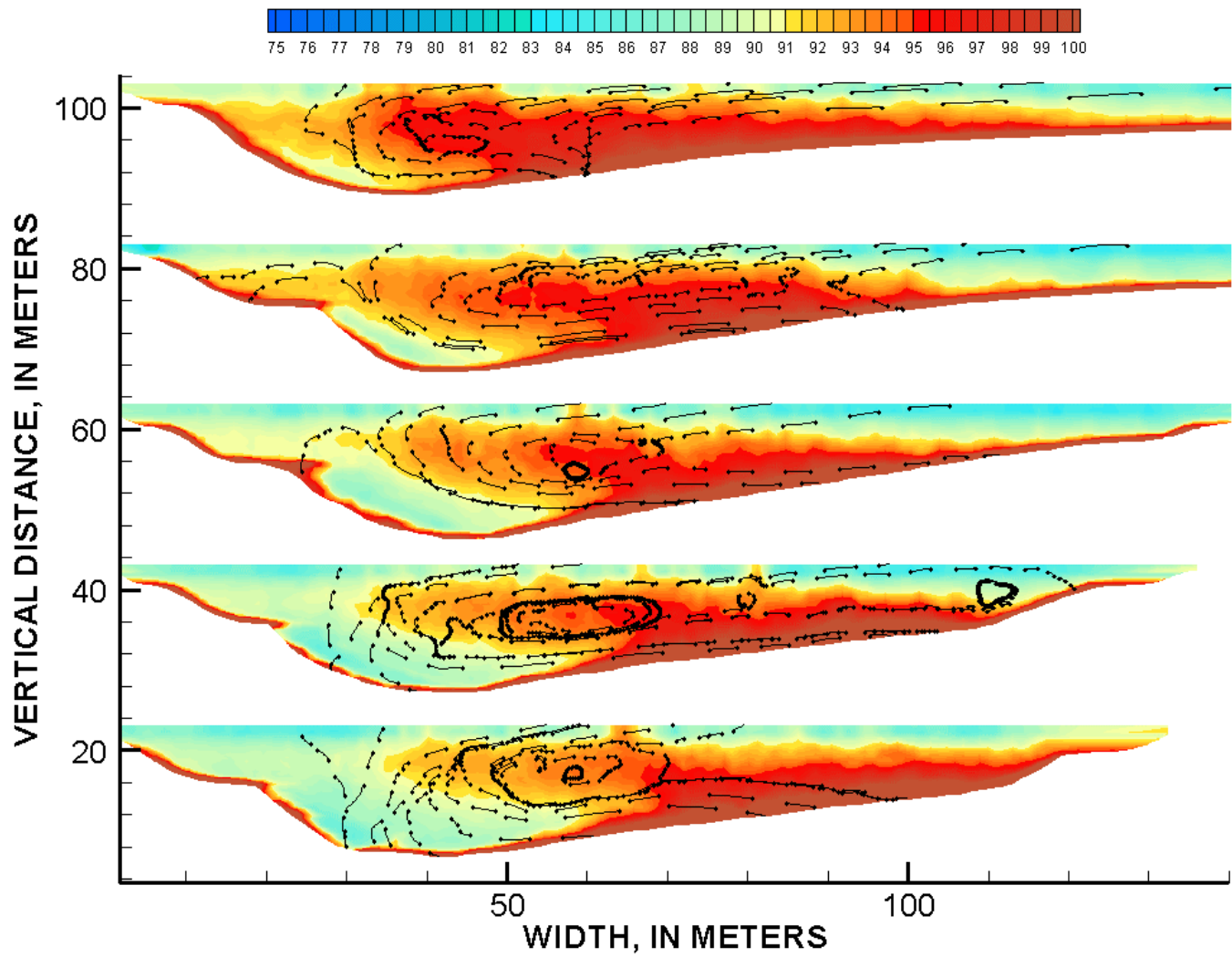




Clarksburg Bend
February 2004

Velocity Profiles in Bend





Second year results:

Salmon Smolts "go" with the velocities
(current structures)

Possible future management actions based on additional studies:

- Gate operations affects on regional migration patterns
- Close gates at night on flood tides
- Partial gate closures
- O&M review

Status of reports

Published

Horn, M. and A. Blake, 2004, Acoustic tracking of Chinook Salmon Smolts in the vicinity of the Delta Cross Channel, 2001 study, USBR Tech memo No. 8220-04-04

Draft submitted

Dinehart, R. and J. Burau, 2005, Repeated surveys by acoustic Doppler current Profiler for flow and sediment dynamics in a tidal river, Journal of Hydrology

In review

Dinehart, R. and J. Burau, 2005, Measurement of secondary circulation and sediment concentrations in river bends using an acoustic Doppler current profiler, Journal of Sedimentology

Hansen, L.J., 2004, Movement of Juvenile Chinook Salmon in the Vicinity of the Delta Cross Channel, Fall 2001: CWT Recovery Component.

McLaughlin, L. and J. McLain, 2004, Comparison of Relative Abundance of Adult Chinook Salmon in the Delta Cross Channel, Georgiana Slough, and Sacramento River, California 2001.

Status of reports – con't

Draft in progress

Burau, J. and C. Ruhl, 2005, The influence of the Delta Cross Channel gate operations on North Delta net flows: A look at the long-term Record 1993-2002, CALFED Science Journal

Burau, J., C. Ruhl, and J. Cuetara, 2005, On the hydrodynamics of the Delta Cross Channel region, CALFED Science Journal

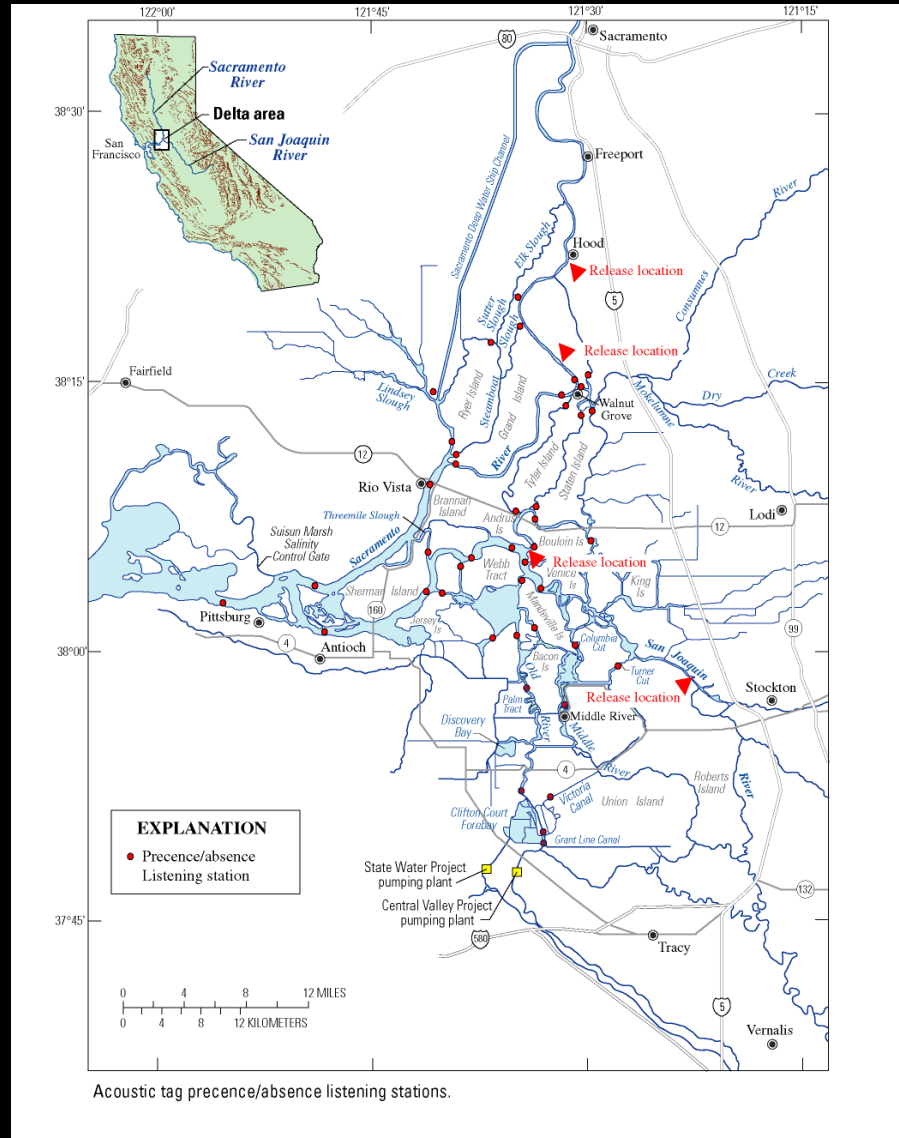
Vogel, D., 2005, Juvenile Chinook Salmon Radio-telemetry studies in the Delta Cross Channel region, 2001-2002

Proposed

Synthesis of Delta Cross Channel Results, CALFED Science Journal

Future Studies

(2) Salmon Migration





DCC Funding Delays

