The background image shows a view from the deck of a boat. In the foreground, a black Yamaha outboard motor is visible on the left, and a white cylindrical object is partially seen. A large, light-colored metal box sits on the deck. In the middle ground, a large yellow and black dredger is operating in the water. The sky is clear and blue.

# NOAA MANDATED FISH COMMUNITY AND DREDGE ENTRAINMENT MONITORING IN THE DELTA'S FEDERAL NAVIGATION CHANNELS: 2006-2009

Mari-Gold Environmental Consulting  
and  
Novo Aquatic Sciences

# Biological Opinions

- ▣ Sacramento Deep Water Ship Channel Maintenance Dredging and Bank Protection project, August 29, 2006
- ▣ Stockton Deep Water Ship Channel Maintenance Dredging and Levee stabilization Project, April 4, 2006

# ACOE Response:

- ▣ Fish entrainment and fish community monitoring plan for the 2006 Stockton and Sacramento deepwater ship channel maintenance dredging project

# Monitoring Methodology

- ▣ Fish Community Sampling: Bottom Trawling
- ▣ Dredge Entrainment Sampling: Ponds and Screens









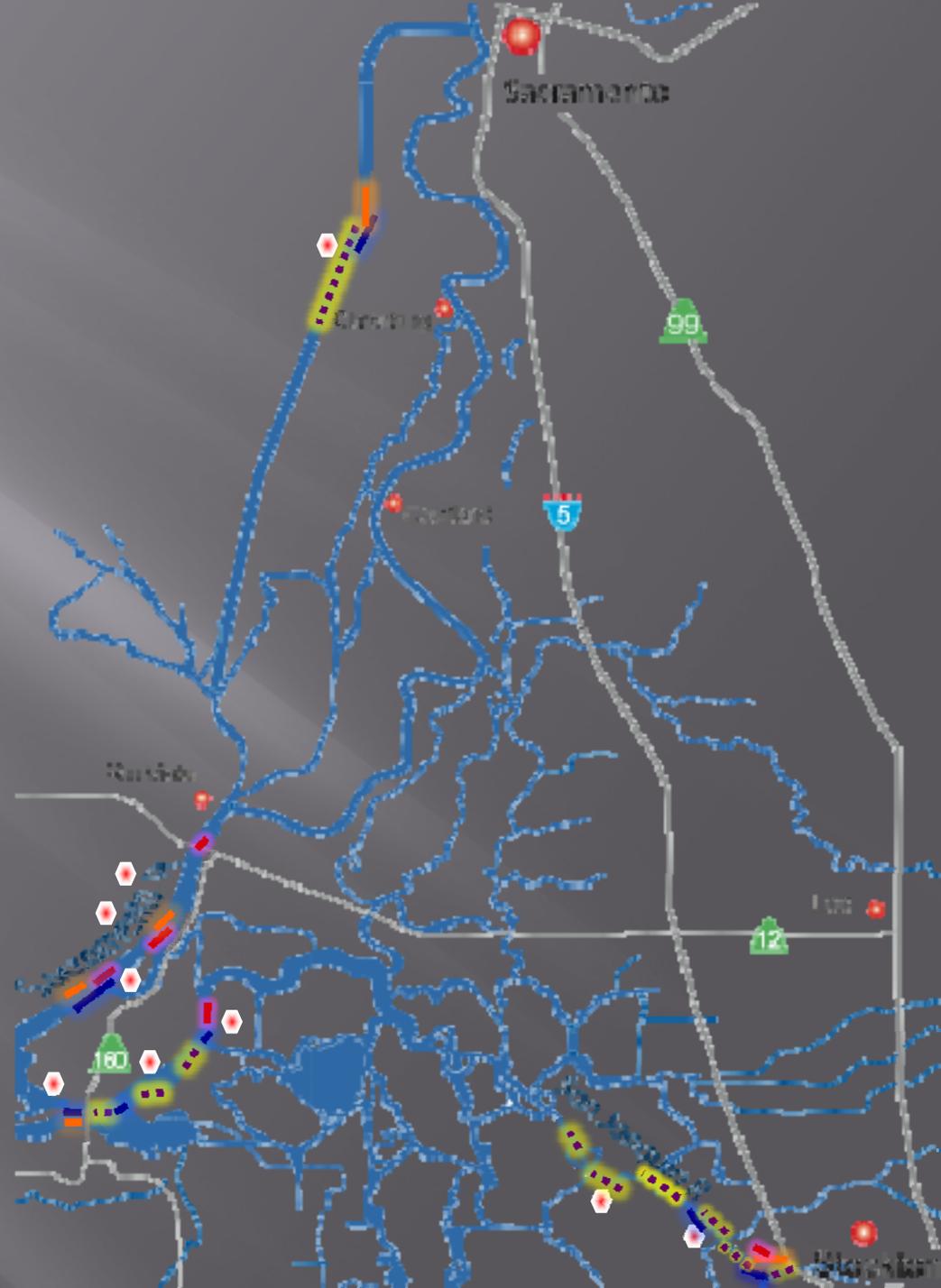
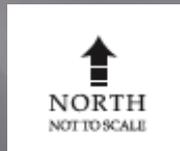
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# Project Area

## Dredge Reach & DMP Locations

- 2006
- 2007
- 2008
- 2009
- DMP



# Sacramento Fish Community

Rank	n	Proportion	Common Name	Origin
1	947	.285	longfin smelt	Native
2	554	.167	threadfin shad	Introduced
3	497	.149	striped bass	Introduced
4	347	.104	white catfish	Introduced
5	225	.068	channel catfish	Introduced
6	154	.046	wakasagi	Introduced
7	96	.029	white sturgeon	Native
8	76	.023	Shokihaze goby	Introduced
9	75	.023	yellowfin goby	Introduced
10	74	.022	shimofuri goby	Introduced
11	66	.020	starry flounder	Native
12	56	.017	tule perch	Native
13	45	.014	American shad	Introduced
14	32	.010	delta smelt	Native
15	27	.008	prickly sculpin	Native
16	20	.006	lamprey spp.	Native
17	12	.004	Sacramento splittail	Native
17	12	.004	unid. goby	Introduced
18	3	.001	Pacific staghorn sculpin	Native
19	2	.001	green sturgeon	Native
19	2	.001	brown bullhead	Introduced
20	1		river lamprey	Native
20	1		Sacramento blackfish	Native
20	1		Sacramento pikeminnow	Native
20	1		blue catfish	Introduced

# San Joaquin Fish Community

Rank	n	Proportion	Common Name	Origin
1	18,036	.544	white catfish	Introduced
2	6,641	.200	American shad	Introduced
3	4,454	.134	threadfin shad	Introduced
4	2,563	.077	stripped bass	Introduced
5	1,261	.038	channel catfish	Introduced
6	61	.009	yellowfin goby	Introduced
7	24	.001	Shimofuri goby	Introduced
8	18	.001	Shokihaze goby	Introduced
9	17	.001	starry flounder	Native
9	17	.001	warmouth	Introduced
10	10		white sturgeon	Native
11	9		bluegill	Introduced
12	7		Sacramento splittail	Native
13	7		brown bullhead	Introduced
14	5		Tule perch	Native
15	4		delta smelt	Native
16	4		common carp	Introduced
17	3		longfin smelt	Native
17	3		blue catfish	Introduced
17	3		black crappie	Introduced
17	3		white crappie	Introduced
18	2		Sacramento blackfish	Native
18	2		redeer sunfish	Introduced
18	2		prickly sculpin	Native
19	1		Pacific staghorn sculpin	Native
19	1		Sacramento pikeminnow	Native
19	1		Unid. catfish	Introduced
19	1		Mississippi silverside	Introduced
19	1		big scale logperch	Introduced
19	1		large mouth bass	Introduced

















# Sturgeon

## Reach Location & Year Encountered

-  2006
-  2007
-  2008
-  2009



(\*GS) indicates green sturgeon;  
otherwise white sturgeon

Decker Island	
n	Year
75	2006
2 (*GS)	2006
2	2007
7	2008

Rio Vista	
n	Year
3	2006

Sandy Beach	
n	Year
3	2006

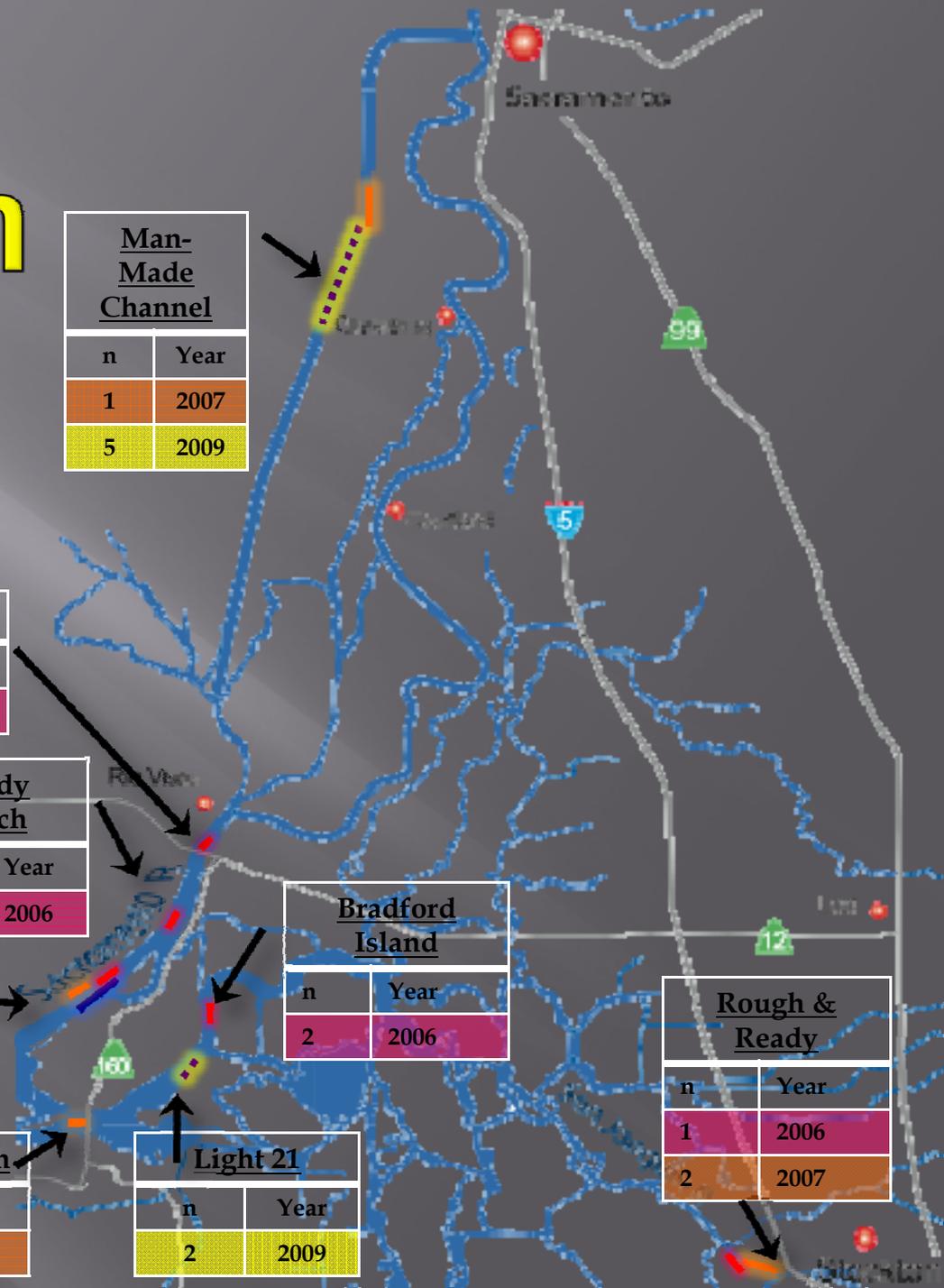
Bradford Island	
n	Year
2	2006

Rough & Ready	
n	Year
1	2006
2	2007

Scour/Antioch	
n	Year
3	2007

Light 21	
n	Year
2	2009

Man-Made Channel	
n	Year
1	2007
5	2009



# Delta Smelt

## Reach Location & Year Encountered

— 2007  
— 2008

<u>Man-Made Channel</u>	
n	Year
2	2007
1	2008

<u>Decker Island</u>	
n	Year
8	2007
21	2008

<u>Scour/Antioc h</u>	
n	Year
1	2007
3	2008



# Longfin Smelt

## Reach Location & Year Encountered

- 2006
- 2007
- 2008

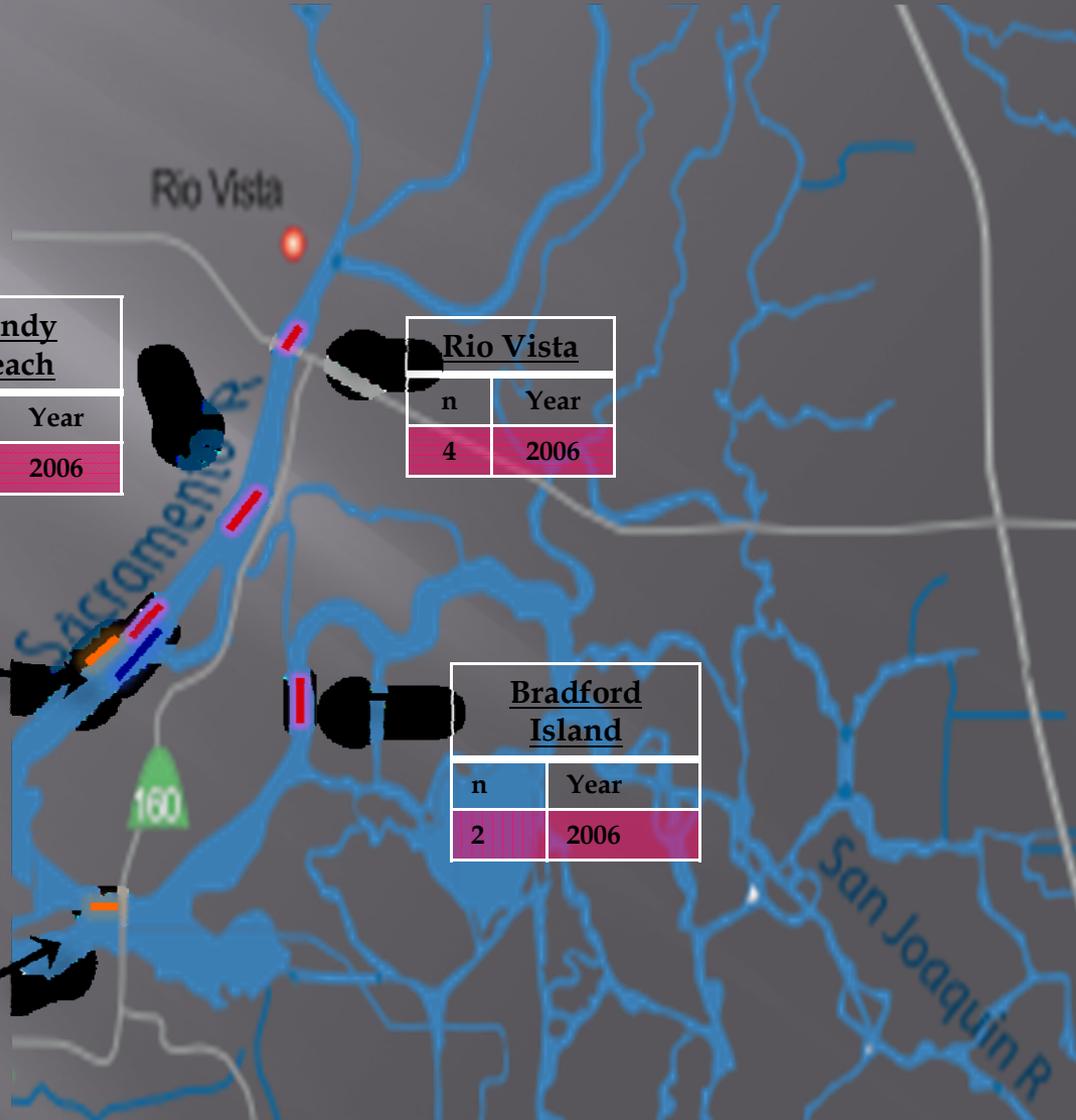
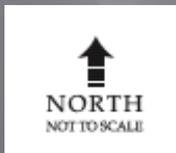
<u>Sandy Beach</u>	
n	Year
8	2006

<u>Rio Vista</u>	
n	Year
4	2006

<u>Decker Island</u>	
n	Year
881	2006
1	2007
21	2008

<u>Bradford Island</u>	
n	Year
2	2006

<u>Scour/Antioch</u>	
n	Year
1	2007



# Lamprey

## Reach Location & Year Encountered



<u>Decker Island</u>	
n	Year
21	2006
1	2007
14	2008

<u>Scour/Antioch</u>	
n	Year
1	2008

<u>Sandy Beach</u>	
n	Year
3	2006
2	2008

<u>Rio Vista</u>	
n	Year
3	2006

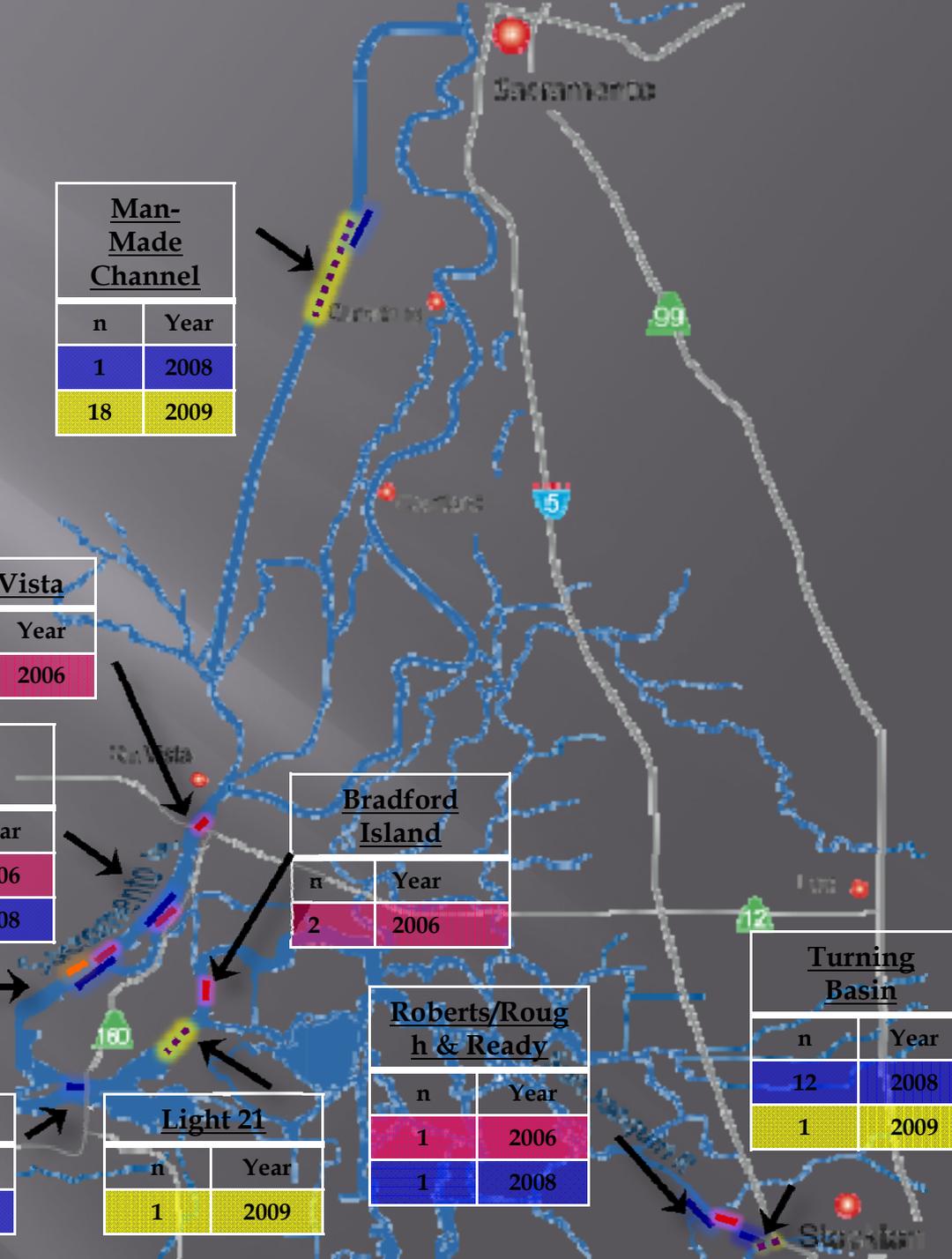
<u>Man-Made Channel</u>	
n	Year
1	2008
18	2009

<u>Light 21</u>	
n	Year
1	2009

<u>Bradford Island</u>	
n	Year
2	2006

<u>Roberts/Rough &amp; Ready</u>	
n	Year
1	2006
1	2008

<u>Turning Basin</u>	
n	Year
12	2008
1	2009



# Splittail

## Reach Location & Year Encountered

-  2006
-  2007
-  2008
-  2009

<u>Man-Made Channel</u>	
n	Year
3	2009

<u>Rio Vista</u>	
n	Year
2	2006

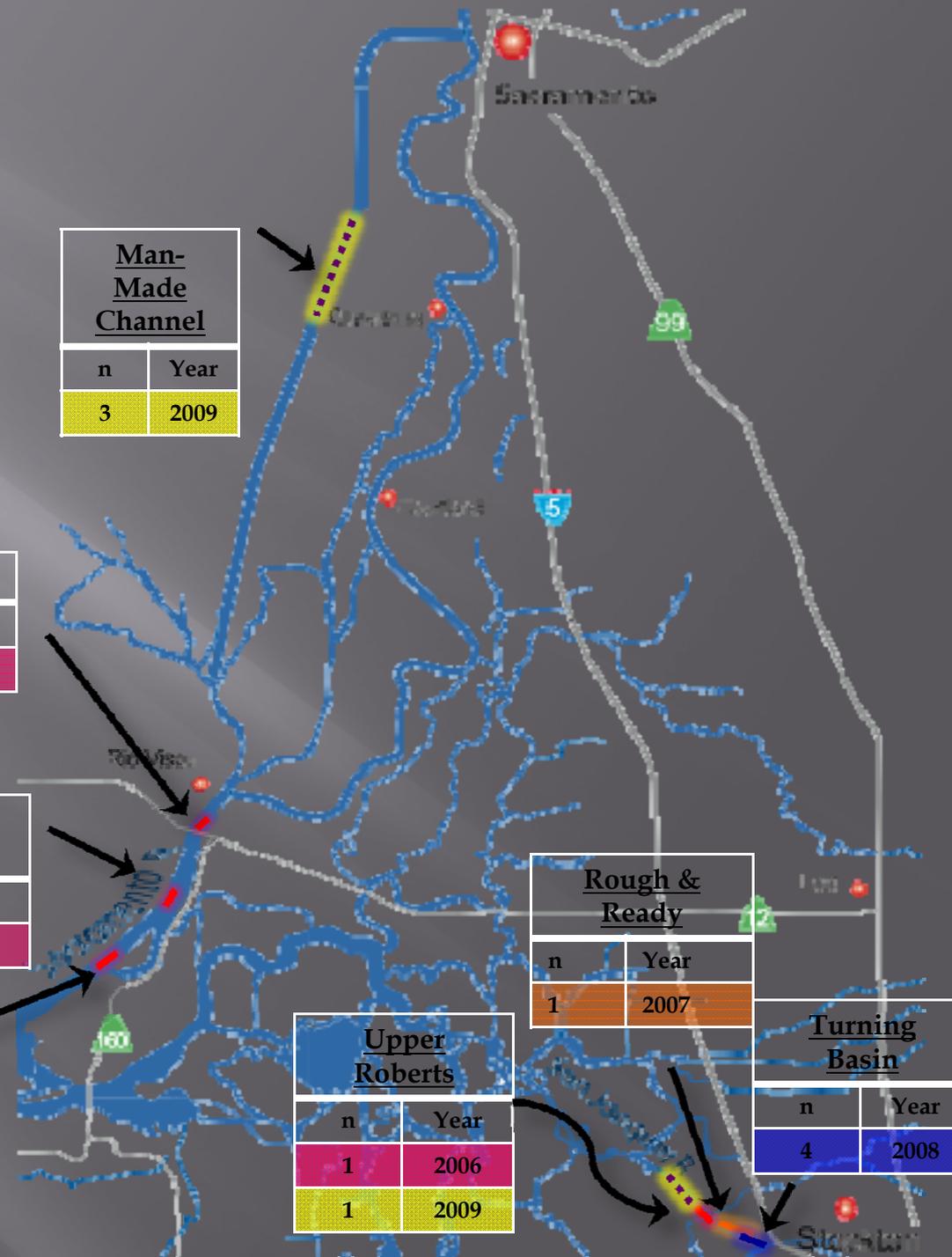
<u>Sandy Beach</u>	
n	Year
5	2006

<u>Decker Island</u>	
n	Year
2	2006

<u>Upper Roberts</u>	
n	Year
1	2006
1	2009

<u>Rough &amp; Ready</u>	
n	Year
1	2007

<u>Turning Basin</u>	
n	Year
4	2008





# Overall Fish Entrainment Sacramento Ship Channel

Rank	n	Proportion	Common Name	Origin
1	45	0.45	shimofuri goby	Introduced
2	39	0.39	lamprey	Native
5	5	0.05	white catfish	Introduced
8	4	0.04	yellowfin goby	Introduced
10	3	0.03	shokihaze goby	Introduced
2	1	0.01	channel catfish	Introduced
3	1	0.01	striped bass	Introduced
7	1	0.01	wakasagi	Introduced

Total: 99

Species: 8 (1 Native)

# Overall Fish Entrainment Stockton Ship Channel

Rank	n	Proportion	Common Name	Origin
1	221	0.368	shimofuri goby	Introduced
2	213	0.355	channel catfish	Introduced
3	86	0.143	white catfish	Introduced
4	25	0.042	shokihaze goby	Introduced
5	19	0.032	yellowfin goby	Introduced
6	15	0.025	lamprey	Native
7	5	0.008	brown bullhead	Introduced
8	4	0.007	prickly sculpin	Native
8	4	0.007	striped bass	Introduced
9	2	0.003	bluegill	Introduced
9	2	0.003	Pacific staghorn sculpin	Native
9	2	0.003	warmouth	Introduced
10	1	0.002	American shad	Introduced
10	1	0.002	threadfin shad	Introduced

Total: 600

Species: 14 (3 Native)

# Delta Fish Not Encountered

Species	Origin	Utilizes Channel Bottom Habitat	Rare in the Delta
Sacramento sucker <i>Catostomus occidentalis</i>	Native	No	No
steelhead <i>Onchorhynchus mykiss</i>	Native	No	Yes
Chinook salmon <i>Onchorhynchus tshawytscha</i>	Native	No	Yes
hitch <i>Lavinia exilicauda</i>	Native	No	Yes
riffle sculpin <i>Cottus gulosus</i>	Native	No	No
hardhead <i>Mylopharodon conocephalus</i>	Native	No	Yes
threespine stickleback <i>Gasterosteus aculeatus</i>	Native	No	No
topsmelt <i>Atherinops affinis</i>	Native	No	No
California roach <i>Hesperoleucus symmetricus</i>	Native	No	No
speckled dace <i>Rhinichthys osculus</i>	Native	No	No
American eel <i>Anguila rostrata</i>	Introduced	Questionable	Yes
black bullhead <i>Ameiurus melas</i>	Introduced	Questionable	No
pumpkinseed <i>Lepomis gibbosus</i>	Introduced	No	No
green sunfish <i>Lepomis cyanellus</i>	Introduced	No	No
smallmouth bass <i>Micropterus dolemieu</i>	Introduced	No	No
spotted bass <i>Micropterus punctulatus</i>	Introduced	No	No
goldfish <i>Carrasius auratus</i>	Introduced	No	No
western mosquitofish <i>Gambusia affinis</i>	Introduced	No	No
rainwater killifish <i>Lucania parva</i>	Introduced	No	No
fathead minnow <i>Pimephales promelas</i>	Introduced	No	No

# Permitting

- ▣ Dredging
- ▣ Monitoring



# Related Projects

- ▣ Sacramento deepening project
- ▣ Stockton deepening project
- ▣ Delta LTMS

# Conservation

- ▣ Continue Development of BMP's
- ▣ More monitoring
- ▣ Mortality studies of entrained fish

# Unexpected Outcomes

- ▣ Delta Smelt and Longfin Smelt
- ▣ Lamprey
- ▣ Fish salvage

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