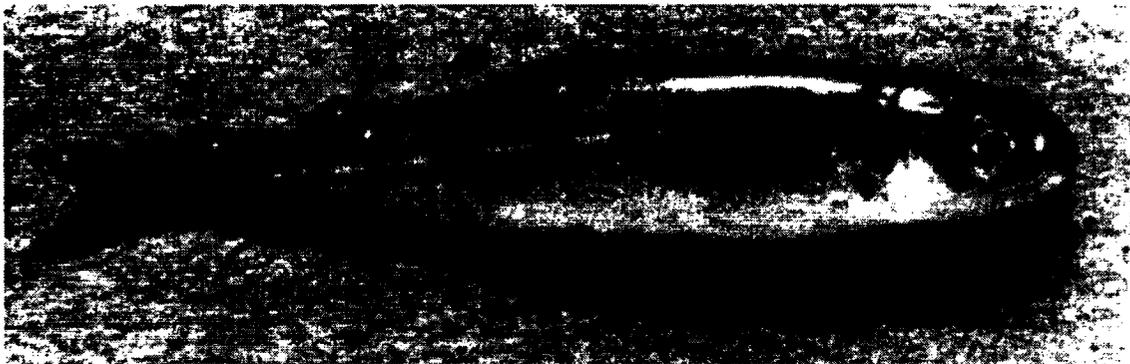


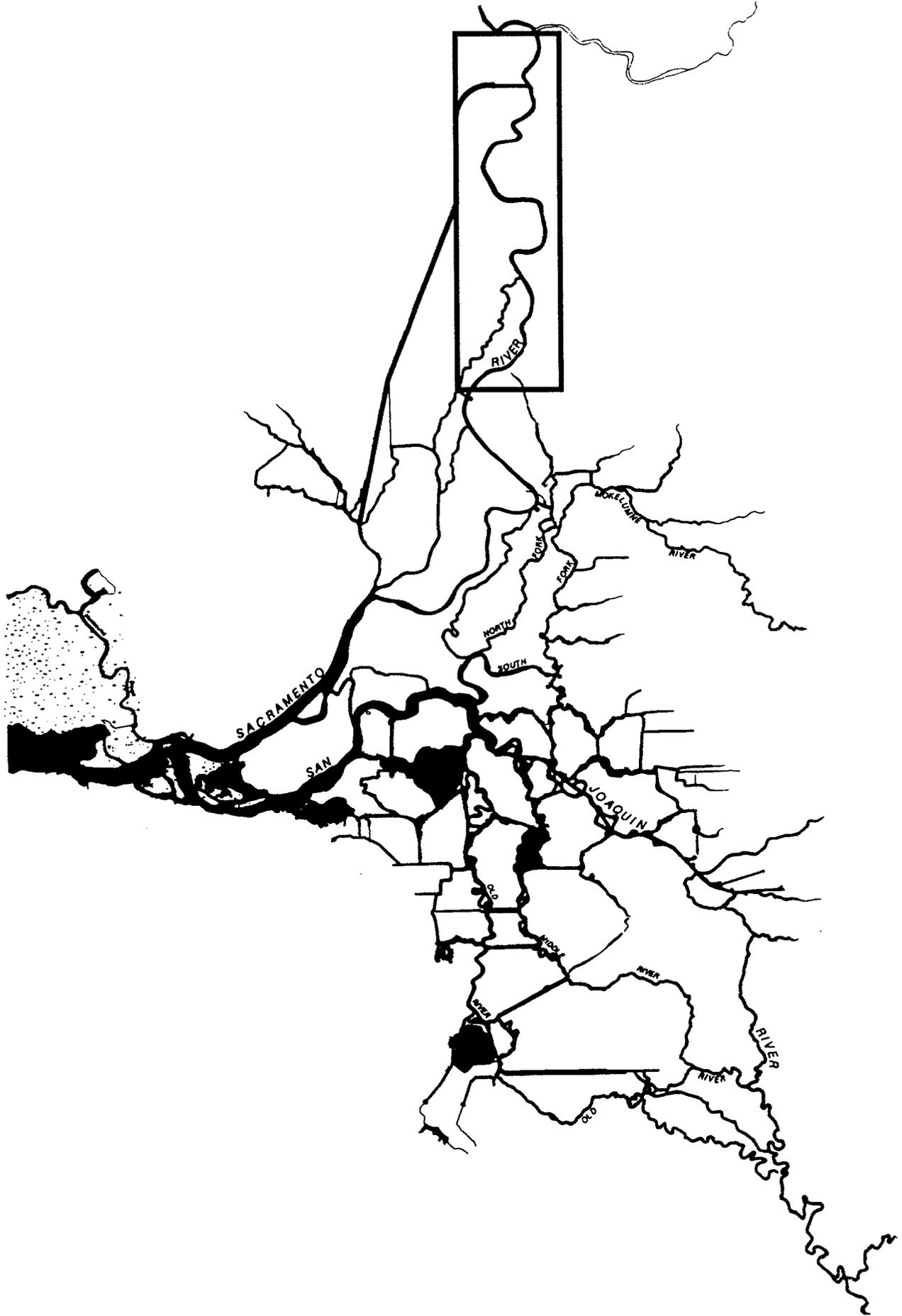
U.S. Fish and Wildlife Service  
Smolt Mortality Model

or

Smolt Survival Model



# Reach 1 - Sacramento to Walnut Grove



# Reach 1 Mortality

Data from 1978 - 1982, 1988 and 1989

Average mortality 0.41, ranged from 0.00 to 1.0

## Mortality Equation

$$M1 = -2.45925 + (0.042074 * \text{Water Temperature})$$

Reach 2 - Walnut Grove to Chipps Island  
(via the Mokelumne and lower San Joaquin rivers)



D-002970

D-002970

## Reach 2 Mortality

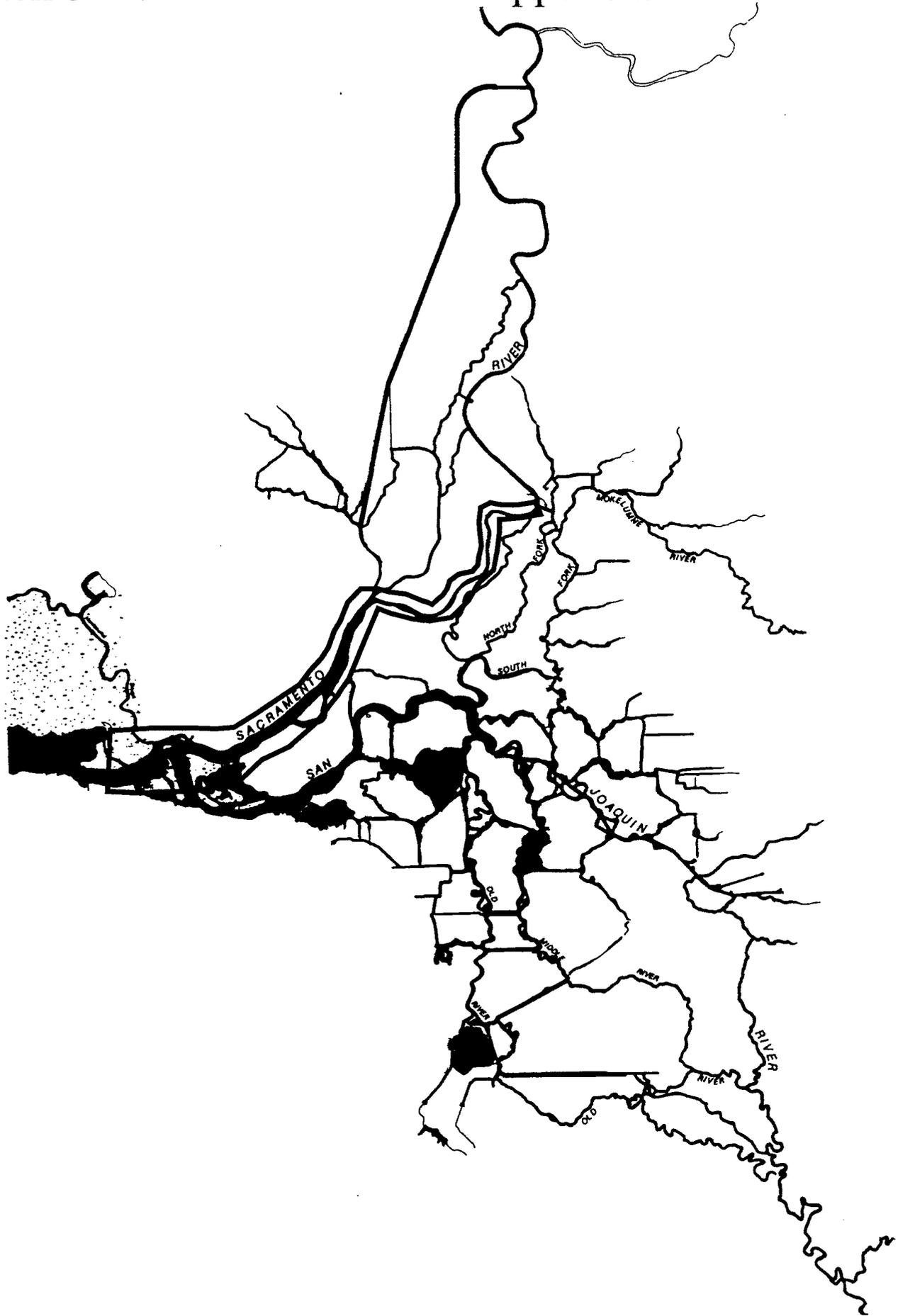
Data for releases made at Courtland from 1983

Average mortality 0.85, ranged from 0.63 to 1.00

## Mortality Equation

$$M2 = (-0.5916024) + (0.0174968 * \text{Water Temperature}) + (4.34E-05 * \text{Combined Exports})$$

# Reach 3 - Walnut Grove to Chipps Island



# Reach 3 Mortality

Data from 1983 through 1989

Releases made just below DCC (both open and closed)

Average mortality 0.56, ranged from 0.29 to 0.91

## Mortality Equation

$$M3 = -1.613493 + (0.0319584 * \text{Water Temperature})$$

# Equation Modifications

$$M1H = M1 + \text{Hood Mortality} - (M1 * \text{Hood Mortality})$$

$$M1H23 = M1H + M23 - (M1H * M23)$$

# Limitations

- 1 - Survival measurements not made over a broad range of conditions.
- 2 - No survival measurements for specific reaches in the Delta.
- 3 - Sample variability or potential error is present in both sample and environmental measures.
- 4 - Colinearity between factors.
- 5 - Reach 1 incorporates additional mortality not attributed to Reaches 2 and 3.
- 6 - Designed under one set of Delta conditions and may not be applicable to future conditions.

15% mortality at Hood diversion

Year	w/lype	month	SAC	Hood Inversion of	Hood Mortality	EXPORT	Percent in DCC & G	observed temp	Sac+Hood Combined m1h	m2	m3	m23	m1H23	*1H23
1989	d	4	9425	0	0.00	3622	0.52	62.0	0.149	0.680	0.368	0.531	0.601	0.399
1989	d	5	9425	0	0.00	3622	0.24	62.0	0.149	0.680	0.368	0.444	0.527	0.473
1989	d	4	9425	0	0.00	3622	0.60	62.0	0.149	0.680	0.368	0.556	0.622	0.378
1989	d	4	9425	0	0.00	3622	0.24	62.0	0.149	0.680	0.368	0.444	0.527	0.473
1989	d	4	9425	2000	0.03	3622	0.46	62.0	0.149	0.680	0.368	0.510	0.595	0.404
1989	d	4	9425	2000	0.03	3622	0.21	62.0	0.149	0.680	0.368	0.434	0.534	0.465
1989	d	4	9425	2000	0.01	3622	0.21	62.0	0.149	0.680	0.368	0.434	0.524	0.476

Temperatures and related \*1H23

60 61 63 64 65  
0.565 0.514 0.42 0.377 0.336

10% Mortality at Hood diversion

Year	w/lype	month	SAC	Hood Inversion of	Hood Mortality	EXPORT	Percent	observed temp	Sac+Hood Combined m1h	m2	m3	m23	m1H23	*1H23
1989	d	4	9425	0	0.00	3622	0.52	62.0	0.149	0.680	0.368	0.531	0.601	0.399
1989	d	5	9425	0	0.00	3622	0.24	62.0	0.149	0.680	0.368	0.444	0.527	0.473
1989	d	4	9425	0	0.00	3622	0.60	62.0	0.149	0.680	0.368	0.556	0.622	0.378
1989	d	4	9425	0	0.00	3622	0.24	62.0	0.149	0.680	0.368	0.444	0.527	0.473
1989	d	4	9425	2000	0.02	3622	0.46	62.0	0.149	0.680	0.368	0.510	0.592	0.408
1989	d	4	9425	2000	0.02	3622	0.21	62.0	0.149	0.680	0.368	0.434	0.529	0.471

5% Mortality at Hood diversion

Year	w/lype	month	SAC	Hood Inversion of	Hood Mortality	EXPORT	Percent	observed temp	Sac+Hood Combined m1h	m2	m3	m23	m1H23	*1H23
1989	d	4	9425	0	0.00	3622	0.52	62.0	0.149	0.680	0.368	0.531	0.601	0.399
1989	d	5	9425	0	0.00	3622	0.24	62.0	0.149	0.680	0.368	0.444	0.527	0.473
1989	d	4	9425	0	0.00	3622	0.60	62.0	0.149	0.680	0.368	0.556	0.622	0.378
1989	d	4	9425	0	0.00	3622	0.24	62.0	0.149	0.680	0.368	0.444	0.527	0.473
1989	d	4	9425	2000	0.01	3622	0.46	62.0	0.149	0.680	0.368	0.510	0.587	0.413
1989	d	4	9425	2000	0.01	3622	0.21	62.0	0.149	0.680	0.368	0.434	0.524	0.476

Year	w/lype	month	SAC	Hood Inversion of	Hood Mortality	EXPORT	Percent	observed temp	Sac+Hood Combined m1h	m2	m3	m23	m1H23	*1H23
1989	d	5	14559	0	0.00	4047	0.44	65.0	0.276	0.752	0.464	0.592	0.704	0.298
1989	d	5	14559	0	0.00	4047	0.20	65.0	0.276	0.752	0.464	0.521	0.653	0.347
1989	d	5	14559	0	0.00	4047	0.52	65.0	0.276	0.752	0.464	0.614	0.720	0.280
1989	d	5	14559	0	0.00	4047	0.20	65.0	0.276	0.752	0.464	0.521	0.653	0.347
1989	d	5	14559	2000	0.01	4047	0.43	65.0	0.276	0.752	0.464	0.588	0.704	0.298
1989	d	5	14559	2000	0.01	4047	0.18	65.0	0.276	0.752	0.464	0.515	0.651	0.349