

EVALUATION OF SEA LION PREDATION IN THE BONNEVILLE DAM TAILRACE

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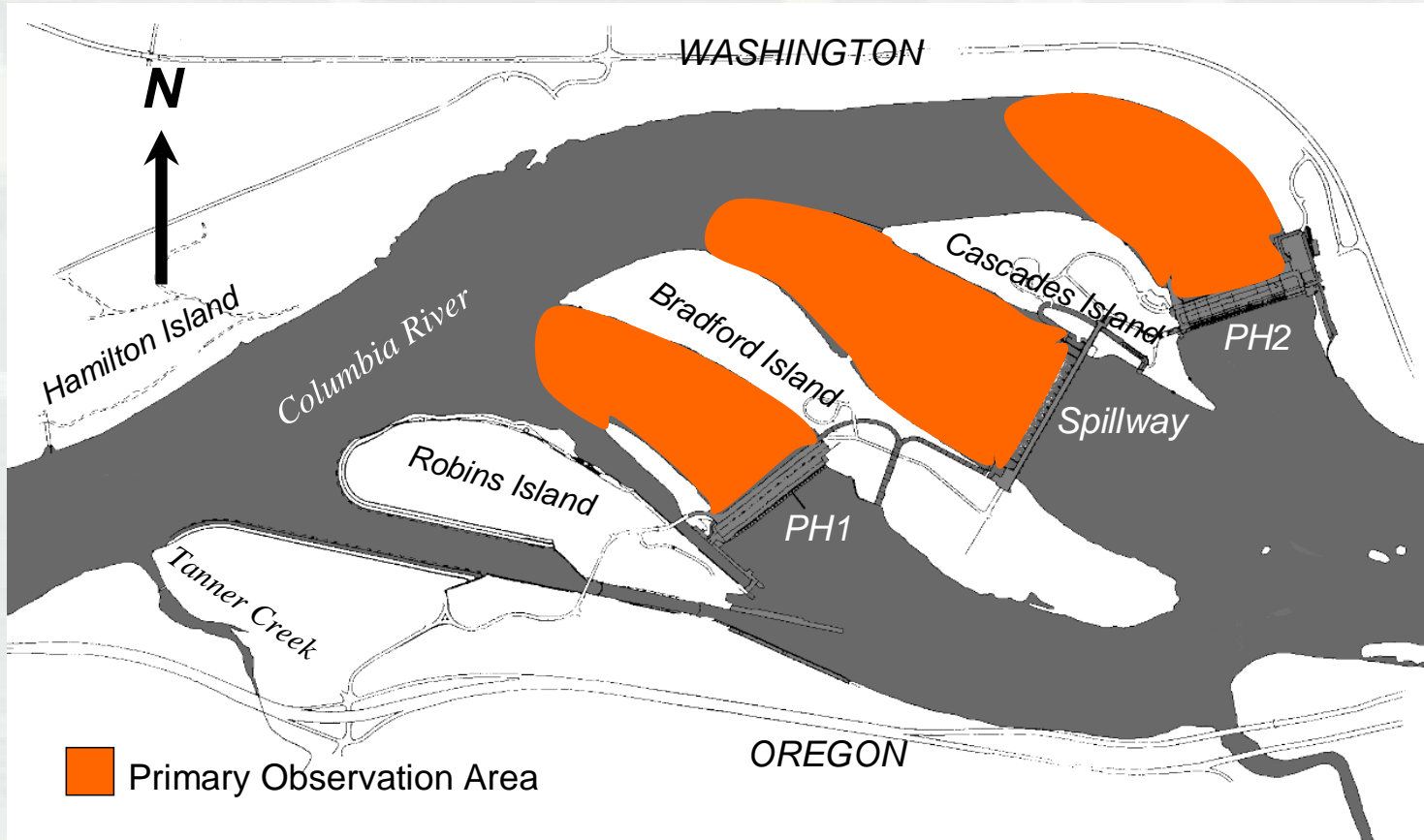
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USACE, ODFW, WDFW, CRITFC, NOAA

- **Objectives/Results**
 - ▶ **Pinniped Abundance**
 - ▶ **Pinniped Predation**
 - ▶ **Deterrent Activities**
 - ▶ **Removal Program**
 - ▶ **Movement Patterns**
 - ▶ **Weight Gain Data**



Observation Area, Bonneville Dam, 2002-2010



RESULTS: PINNIPED ABUNDANCE



California sea lion
Zalophus californianus

Steller sea lion
Eumetopias jubatus



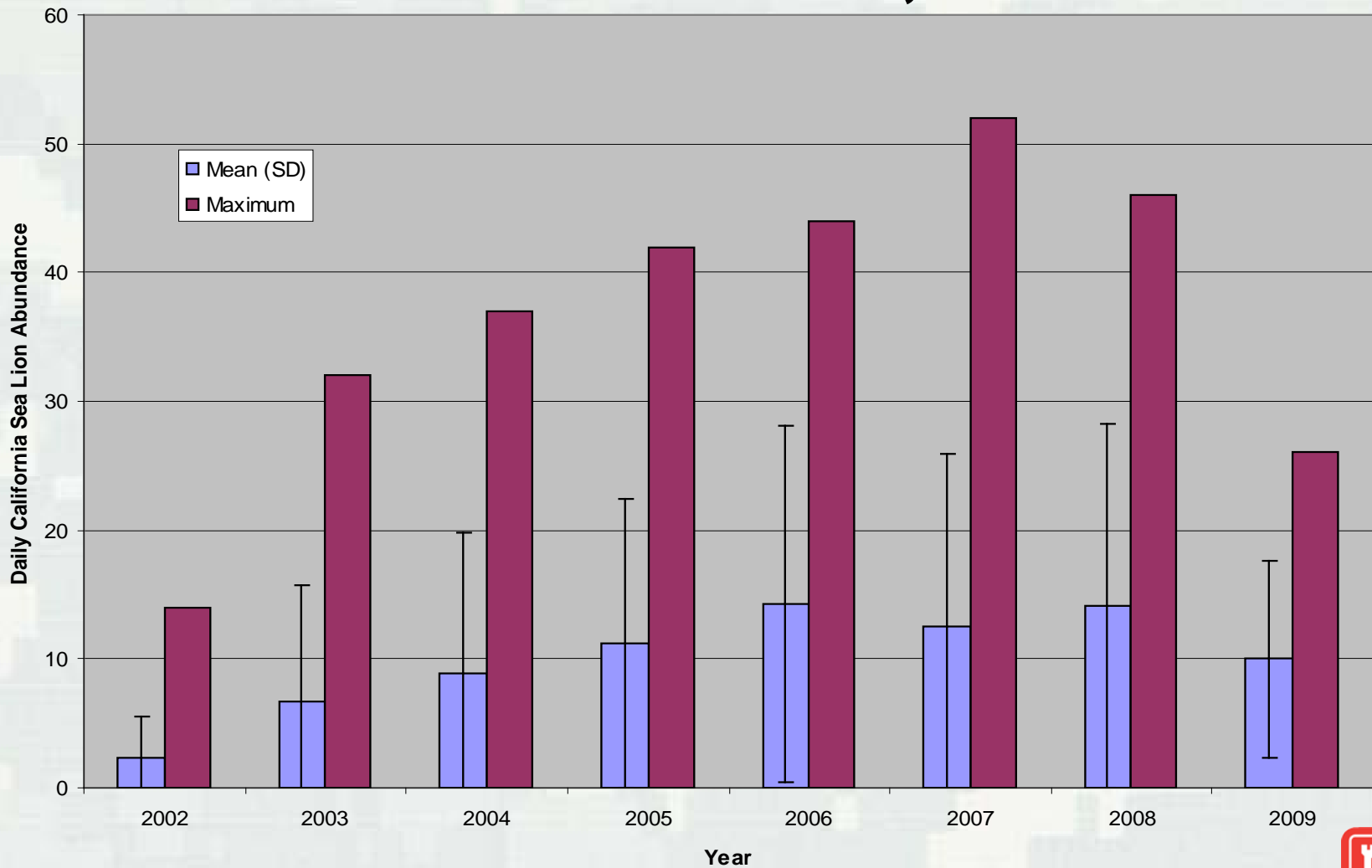
Harbor seal
Phoca vitulina



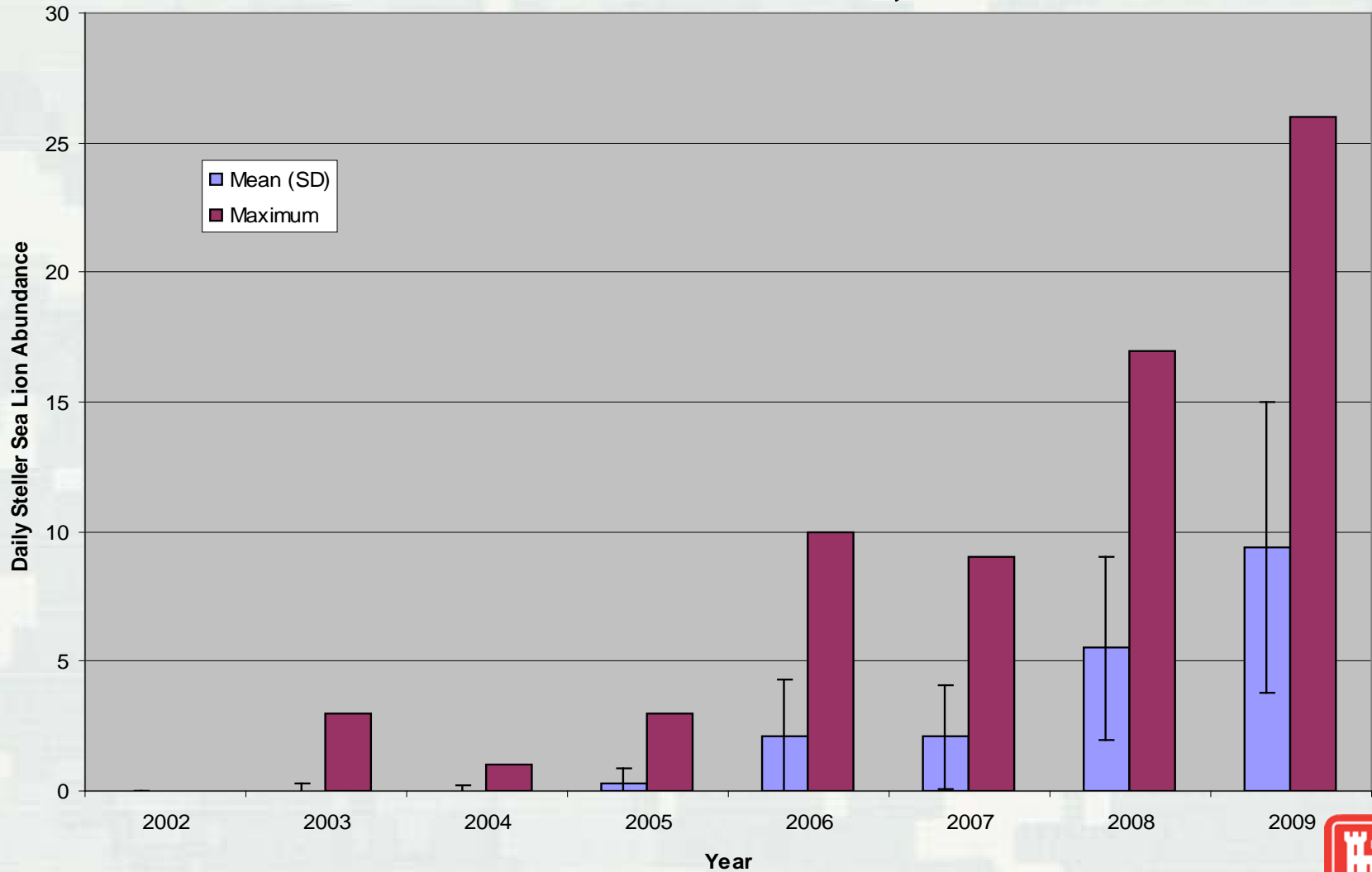
Minimum Estimated Pinniped Abundance at Bonneville Dam (Season Total), 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
California Sea Lions	30	104	99	81+	72	71	82	54
Steller Sea Lions	0	3	2	4	10	9	17	26
Harbor Seals	1	2	2	1	3	2	2	2
Total Pinnipeds	31	109	103	86+	85	82	101	82

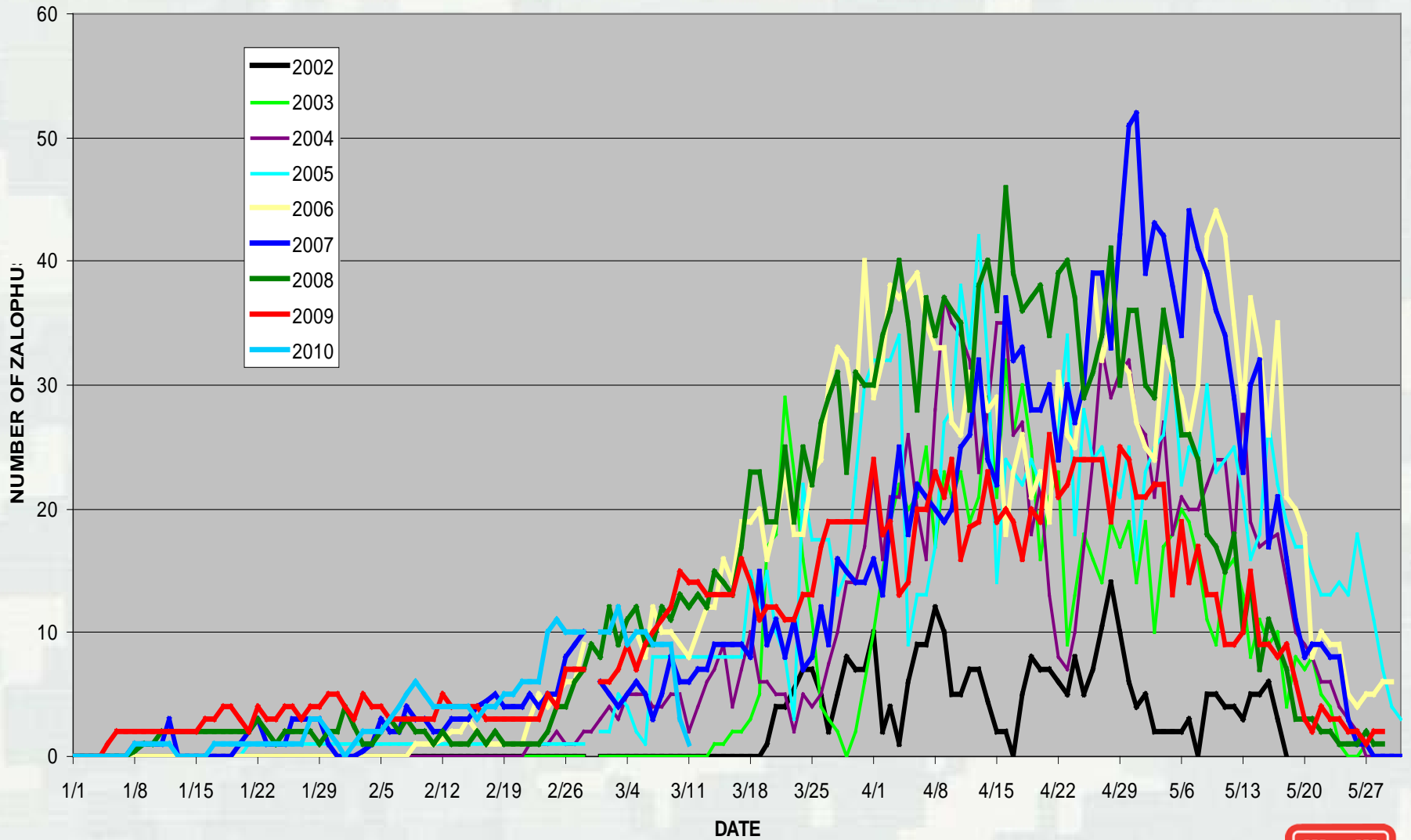
Daily Average and Maximum California Sea Lion Abundance, 2002-2009



Daily Average and Maximum Steller Sea Lion Abundance, 2002-2009

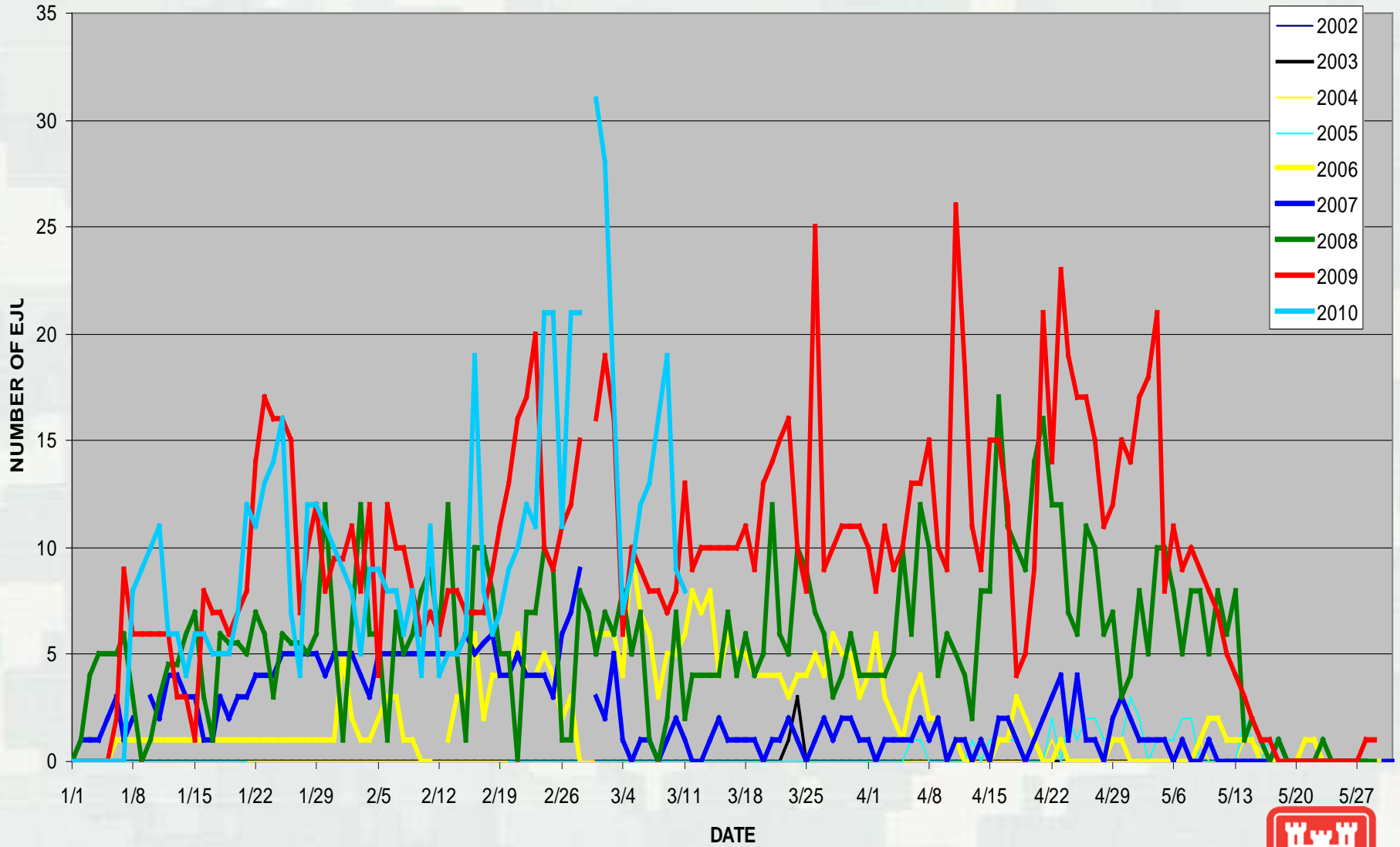


DAILY CALIFORNIA SEA LION ABUNDANCE, 2002-2010



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DAILY STELLER SEA LION ABUNDANCE AT BONNEVILLE DAM, 2002-2010





MARCH 1, 2010, 0630



TRAP ONE



TRAP TWO



TRAPS THREE
AND FOUR





RESULTS: PREDATION



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Annual Salmonid Passage and Estimated Consumption by Pinnipeds, Bonneville Dam

Year	Bonneville Dam Salmonid Passage	Expanded Salmonid Estimated Consumption	% of Run (Jan 1-May31)	Adjusted Salmonid Estimated Consumption	% of Run (Jan 1-May31)
2002	284,733	1,010	0.4%	-	-
2003	217,185	2,329	1.1%	-	-
2004	186,804	3,533	1.9%	-	-
2005	82,006	2,920	3.4%	-	-
2006	105,063	3,023	2.8%	3,401	3.1%
2007	88,474	3,859	4.2%	4,355	4.7%
2008	147,543	4,446	2.9%	4,927	3.2%
2009	186,060	4,489	2.4%	4,960	2.7%

Salmonid Consumption by California and Steller Sea Lions at Bonneville Dam, 2002-2009

Year	Expanded Salmonid Consumption CSL	Salmonid Consumption per California Sea Lion	Maximum # Salmonids Caught by Individual CSL	Expanded Salmonid Consumption SSL	Salmonid Consumption per Steller Sea Lion
2002	1,010	33.7	51	0	0
2003	2,329	22.4	52	0	0
2004	3,516	35.1	35	13	7
2005*	2,904	35.9	11*	16	4
2006	2,944	40.9	79	76	8
2007	3,846	54.2	64	13	1
2008	4,294	52.4	107	176	10
2009	4,014	74.3	157	475	18

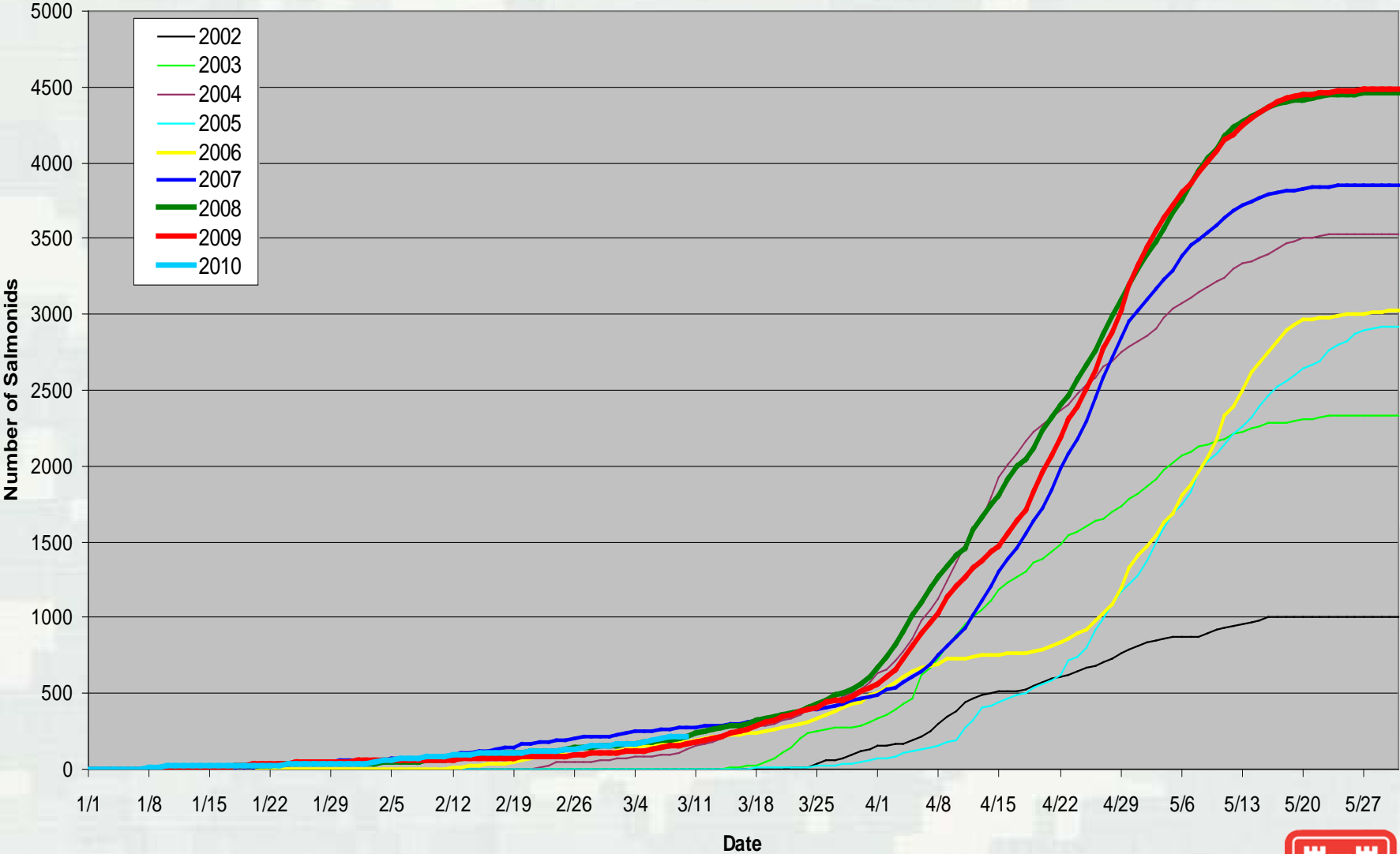
* - Observers not trained on individual ID of CSL due to late start. **BUILDING STRONG®**

CLEPTOPARASITISM (Stealing Prey)

Year	Total Steals	ZCA From ZCA	EJU From ZCA	Other	ZCA Sal. Take	EJU Sal. Take	ZCA Adj. Catch	EJU Adj. Catch
2008	303	161	135	7	4294	176	4159	311
2009	490	152	324	14	4014	475	3690	799

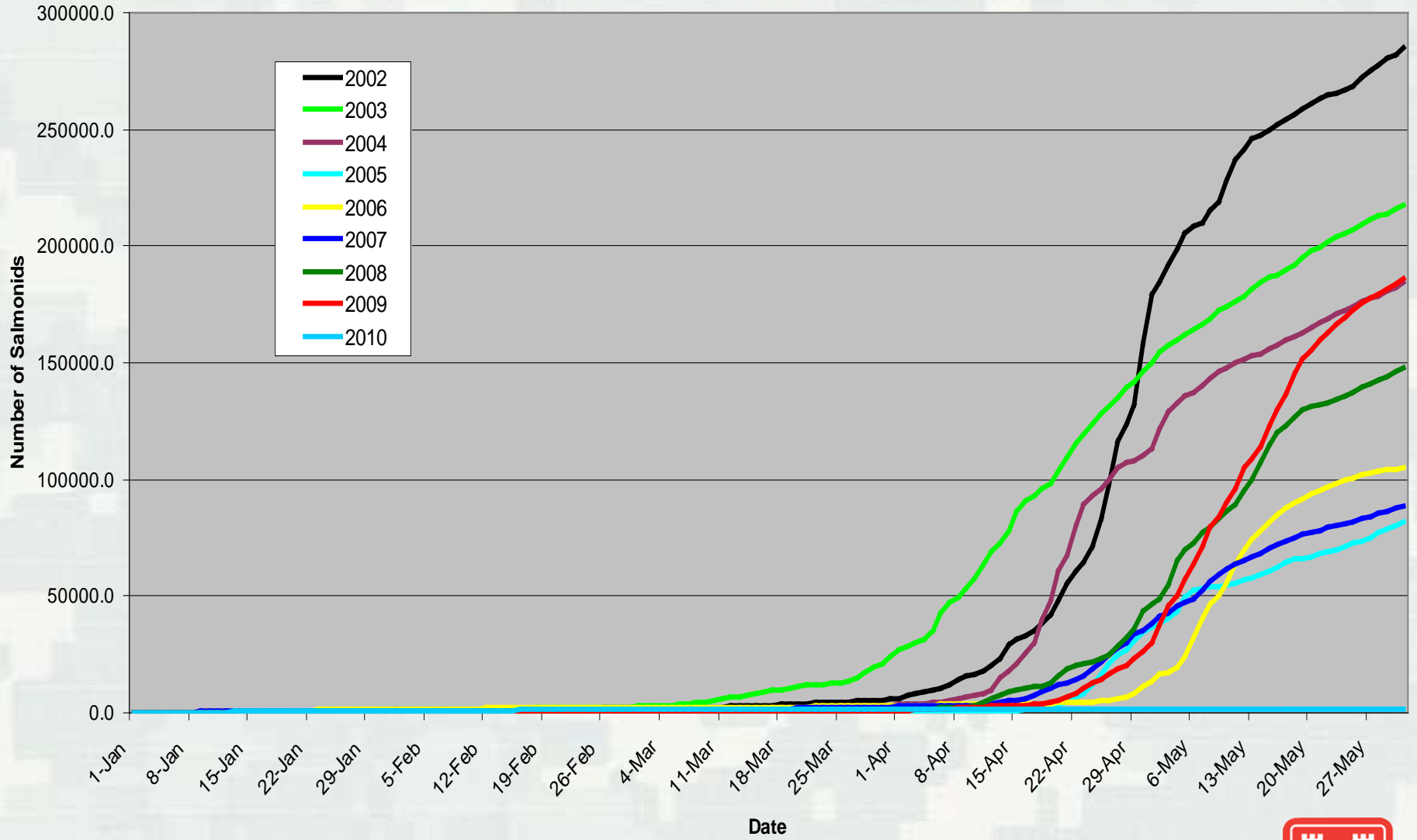


Cummulative Salmonid Catch at Bonneville Dam, 2002-2010



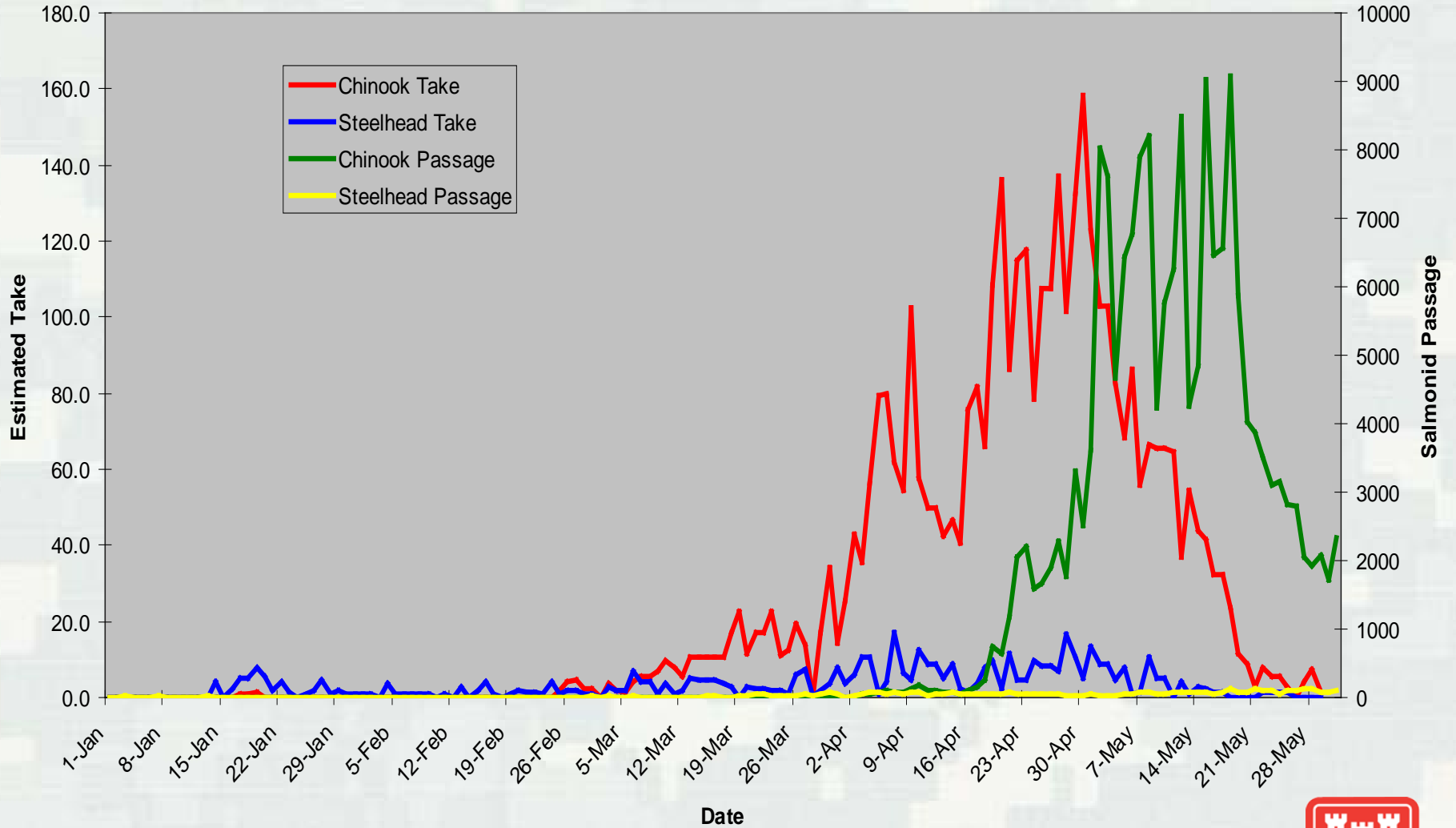
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Cumulative Salmonid Counts for Bonneville Dam, 2002-2010



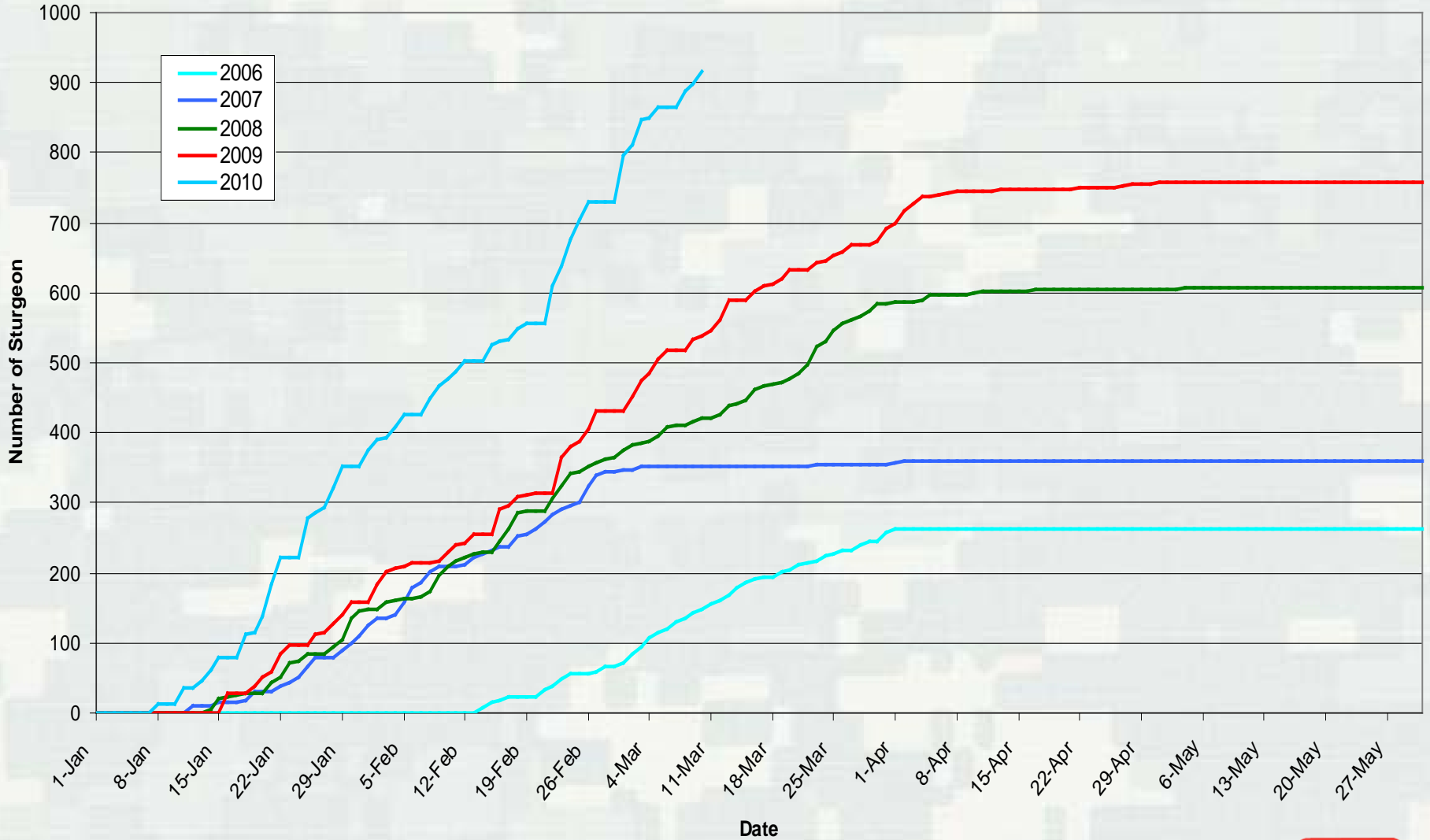
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Daily Passage and Expanded Catch of Chinook and Steelhead by Pinnipeds at Bonneville Dam, 2009



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Cummulative Observed Daily Sturgeon Catch at Bonneville Dam, 2006-2010



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Sturgeon Predation at Bonneville Dam Tailrace, 2006-2010

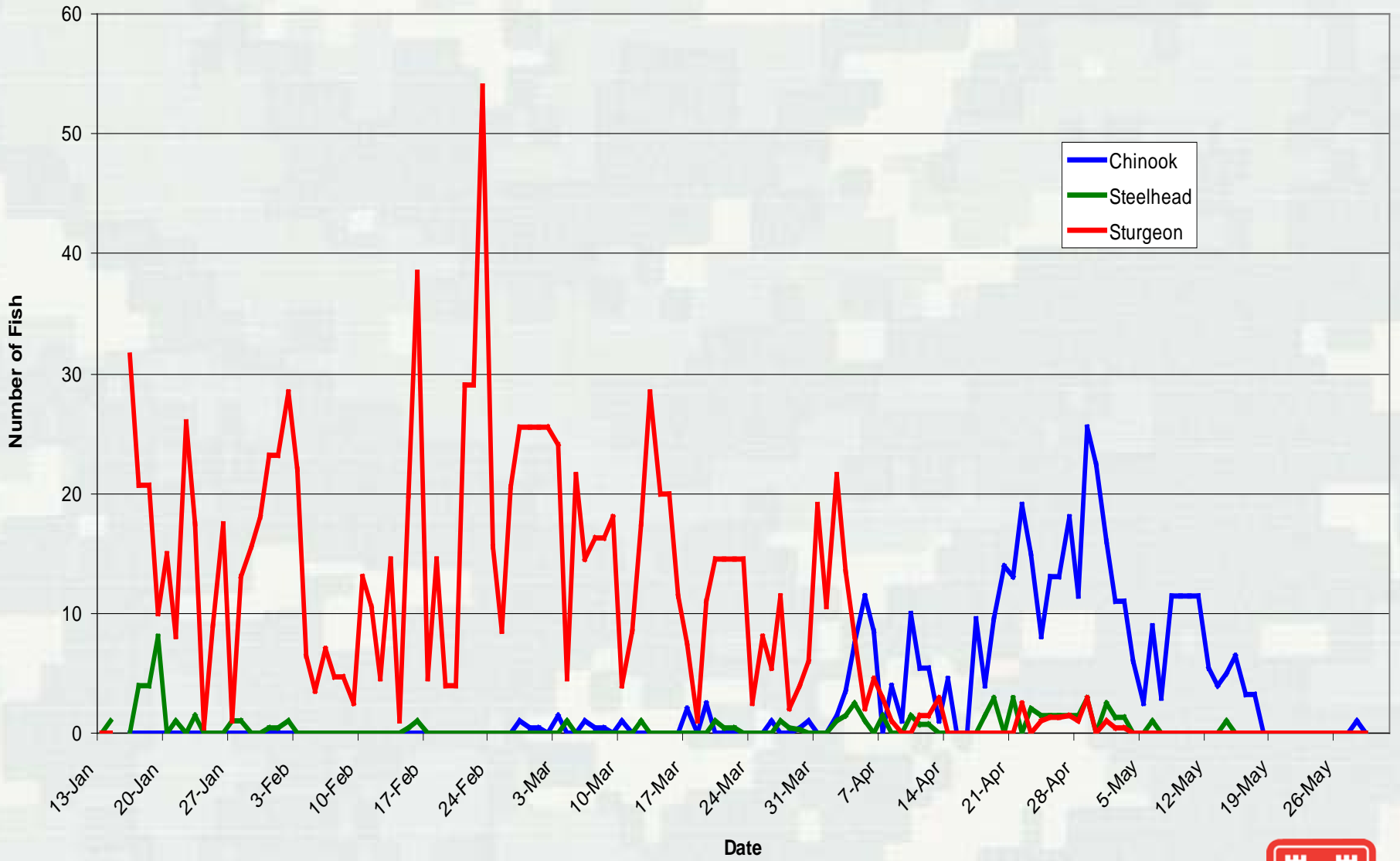
Year	Observed Catch	Estimated Catch	Adjusted Catch
2006	264	315	413
2007	360	467	664
2008	606	792	1,139
2009	758	1,241	1,710
2010*	914	~1,300	~1,500

* Through March 10, 2010

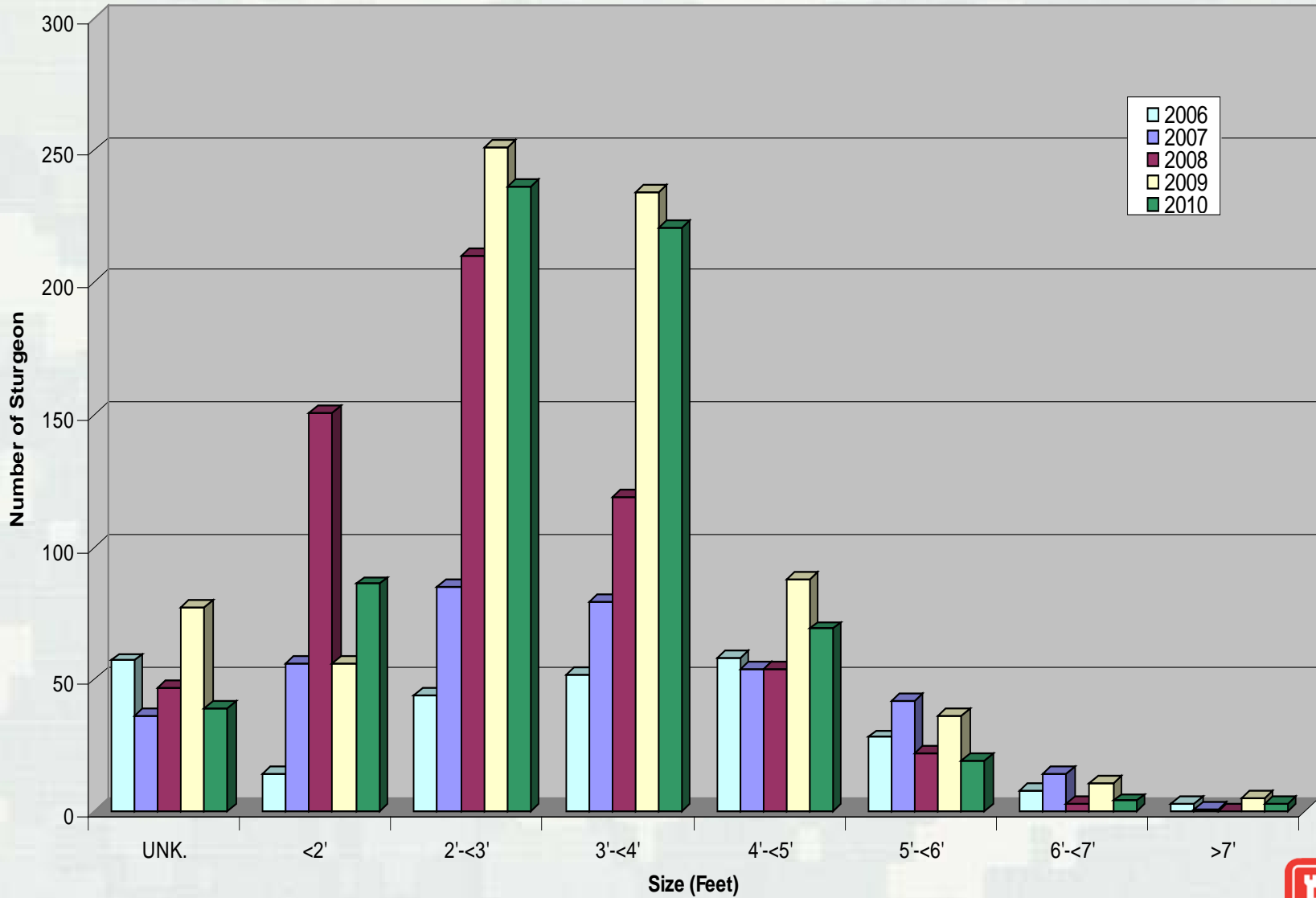


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Estimated Chinook, Steelhead, and Sturgeon Take by Steller Sea Lions at Bonneville Dam, 2009



Length Distribution of Sturgeon Taken by Pinnipeds at Bonneville Dam, 2006-2010



Year	Total Hours Observed	Expanded Pacific Lamprey Consumption Estimate	Percent of Total Observed Fish Catch
2002	662	47	5.6%
2003	1,356	317	11.3%
2004	553	816	12.8%
2005	1,108	810	25.1%
2006	3,647	424	9.8%
2007	4,433	143	2.6%
2008	5,131	145	2.0%
2009	3,455	102	1.4%

RESULTS: DETERRENTS, TRAPPING AND REMOVAL



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Deterrent Measures at Bonneville Dam, 2010

- SLED's and FOG's installed and still effective (No entry into fishways observed after installed).
- ADD's installed near entrances and activated, no effect noticed.
- Hazing by USDA (land) and States (boat) continued, limited effectiveness.
- Trapping and removal program (15 removed in 2009, 11 in 2008).



Trapping (ODFW and WDFW)

- Up to 4 floating traps
- ODFW and WDFW
- Located near corner collector outfall at PH2, old Navigation Lock, forebay (C697), Astoria



3 Objectives:

- ▶ Remove Calif. sea lions that meet permit criteria (At Bonn. 5d, seen to take salmon, individually identifiable)
- ▶ Brand, acoustic tag, and release Calif. sea lions not on “the list” and in 2010 up to 10 Stellers



Trapping and Removal Results, 2008-2010

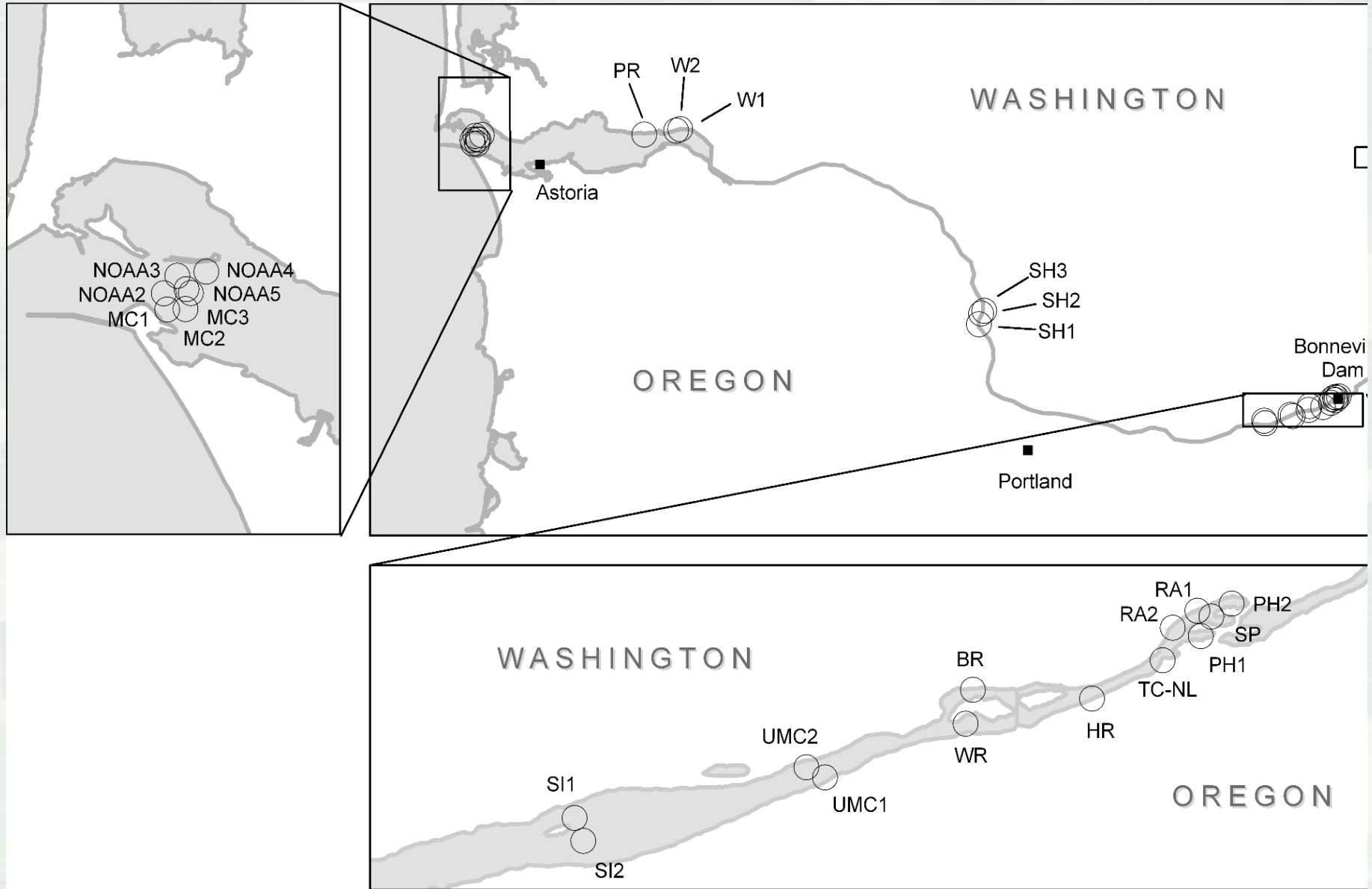
- In 2008, 6 were trapped and sent to Sea World, 1 died under anesthesia, 4 died from a trap closure incident (3 not on list), 4 were branded and released.
- In 2009, 4 were trapped and sent to zoos/aquariums, 11 were euthanized after failing health exams, 5 were branded and given acoustic tags and released, 1 was already branded but given an acoustic tag and released.
- Total of 26 removed to through 2009 from list of 87 (only about 30 still likely to return in 2010).



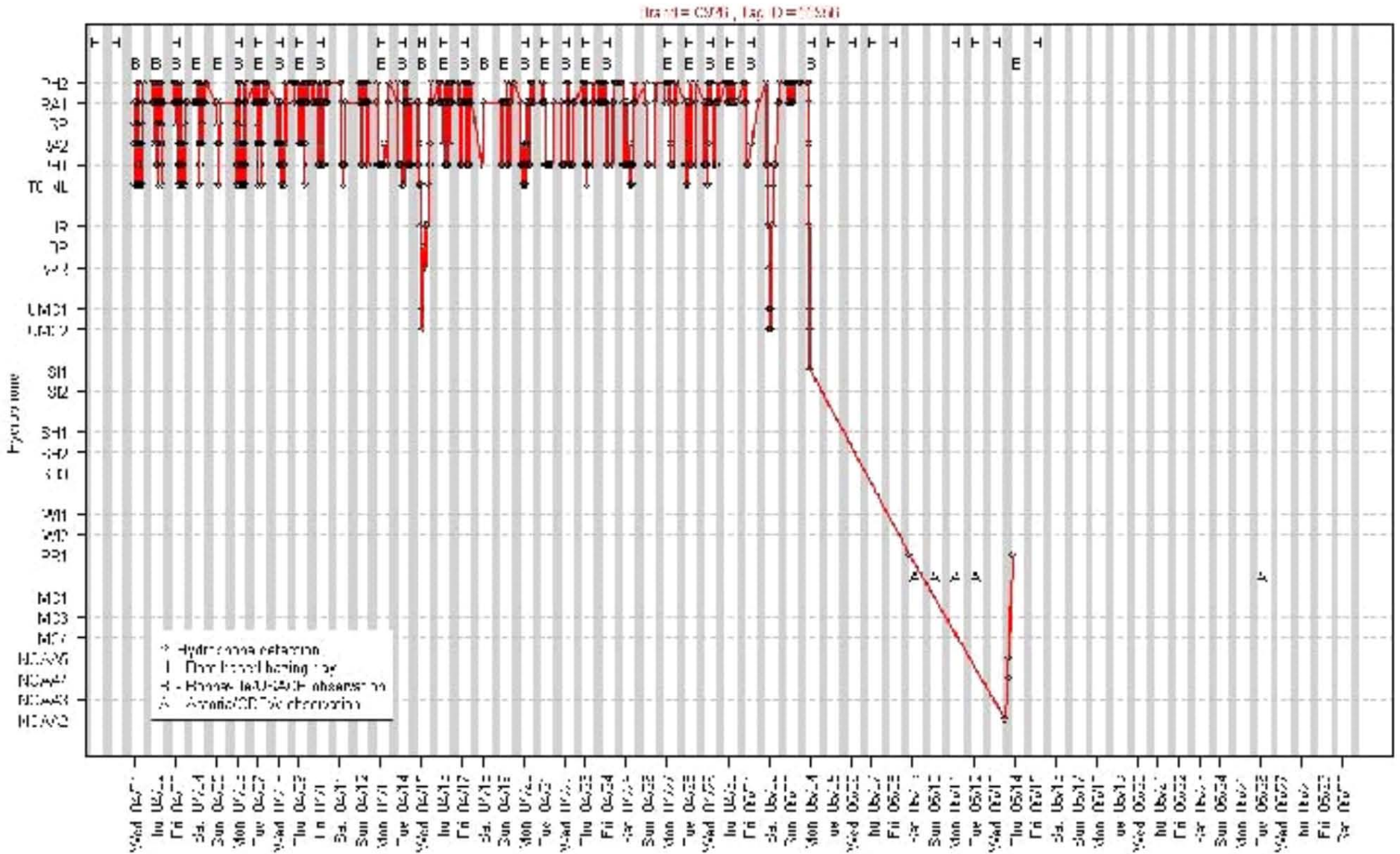
Removal Program Targeting Biggest “Problem” Individuals So Far

Year	Salmonid Consumption per Removed CSL	Salmonid Consumption per Remaining CSL	Days Present per Removed CSL	Days Present per Remaining CSL
2002	12.5	9.9	6.3	5.2
2003	28.5	8.4	15.5	6.3
2004	7.1	4.0	10.1	7.6
2005	2.6	1.6	10.9	7.1
2006	23.8	12.4	28.3	18.2
2007	18.6	12.4	28.5	16.6
2008	30.9	17.9	38.8	14.4
2009				

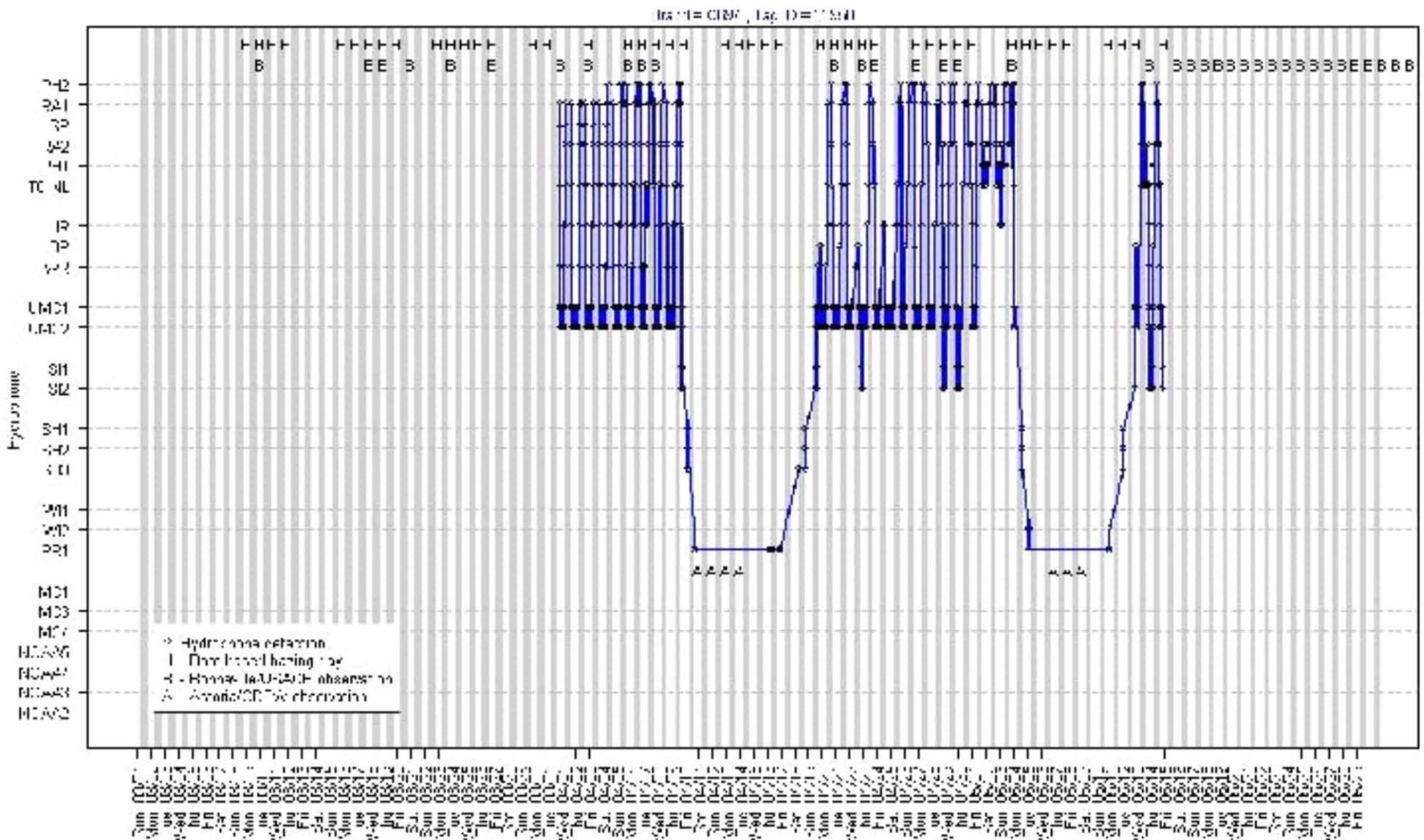
Acoustic Antenna Array Locations



Acoustic Tracks for C926



Acoustic Track for C697



Weight Gains for Bonneville Pinnipeds

- 2 Heaviest California sea lions ever weighed on record were Bonneville animals (1,454lbs, 1,151lbs)
- C319 weight gain recorded (+339lbs in 5 months)
- C265 weight gain recorded (+484lbs in 2.5 months)
- C697 weight gain recorded (weighed April 2009, locked up into forebay May 2009, captured/weighed February 2010, gained about 250 lbs.



MAY 2008 ~ Astoria, OR


Bonneville residents

Astoria residents

Summary - Key points

1. Physical barriers effectively block access to fishways.
2. 4 years of active non lethal deterrence efforts failed to reduce predation on salmonids and sturgeon at the dam.
3. Trapping and removal program working for California sea lion abundance, but full benefits not know until after 5 years (ODFW estimates 800 to 1,700 salmon “saved” so far), but:
4. Steller sea lions beginning to become more of a problem with increasing abundance and more predation on both white sturgeon and salmon species and stealing prey.
5. Salmonid catch totals continue to increase (4,489; 2.4% of run in 2009). Higher if unidentified fish are included.
6. California Sea lions coming earlier each year (some in fall), and having impact on early spring Chinook stocks.



A large, dark brown seal is lying on a concrete pier. The pier is covered with numerous pieces of salmon scraps, including skin and bones. In the foreground, the head and part of the body of another seal are visible. A thought bubble is positioned above the seal's head, containing text. The background shows a rocky shoreline and the ocean.

*I couldn't
eat another
salmon....I
feel sick*