Sea Lion Monitoring and Non-Lethal Hazing

Columbia River Inter-Tribal Fish Commission

In cooperation with:

Oregon Department of Fish and Wildlife
Washington Department of Fish and Wildlife
U.S. Army Corps of Engineers
National Oceanic and Atmospheric Administration

Funded By:
Bonneville Power Administration

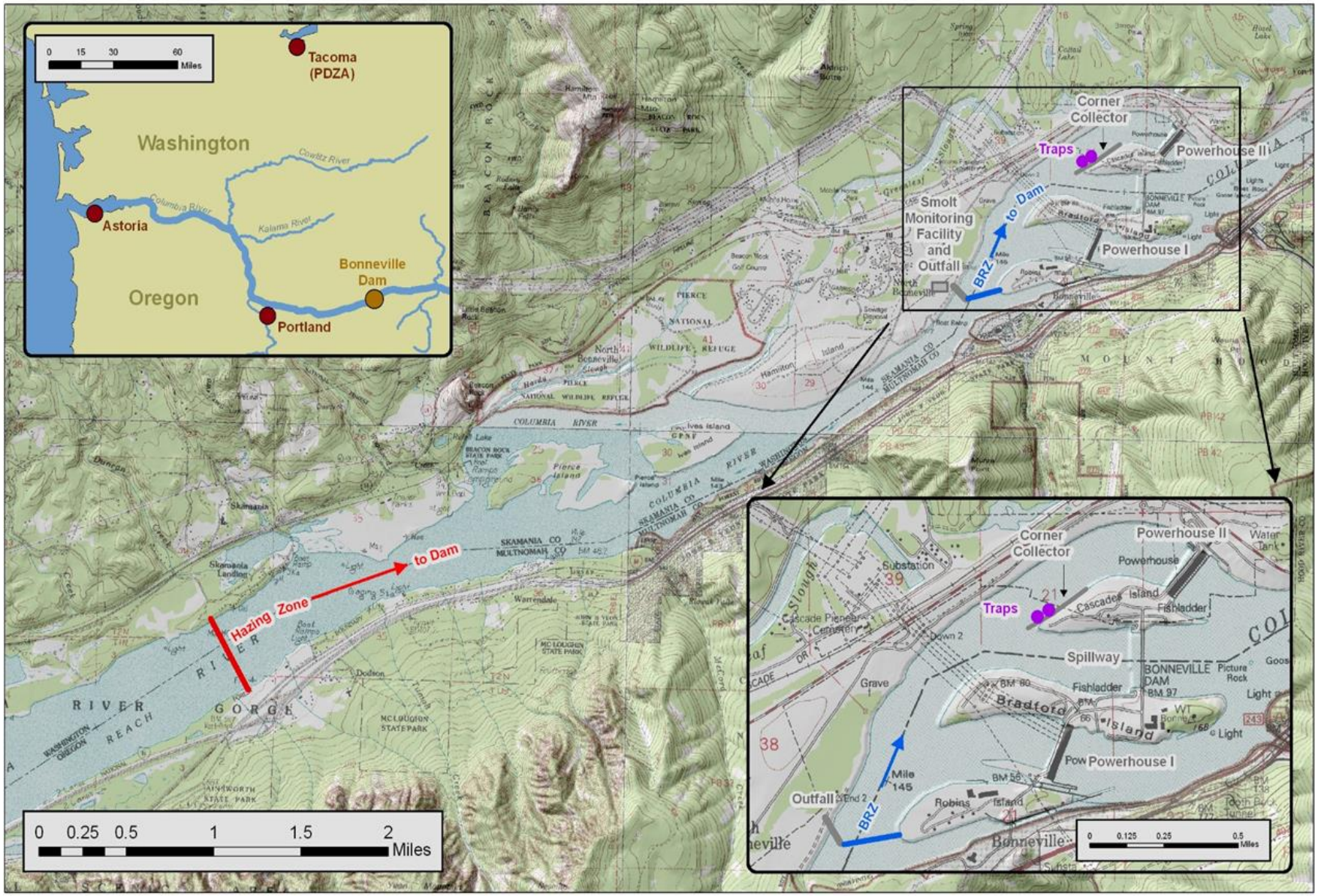
Project Objectives

1. Boat Based Non-lethal Hazing

2. Develop Sea Lion Abundance Estimates for Columbia River

3. Develop Sea Lion Predation Estimation Technologies

CRITFC Hazing Map



Hazing Methods

Cracker Shells
Seal Bombs
Boat Chase

Annual Hazing Summary

			Take*		Munitions	
Year	Days	Events	#CSL	#SSL	Cracker Shells	Seal Bombs
2009	38	277	395	104	6667	1154
2010	23	196	158	207	3431	697
2011	38	257	173	359	7839	2439
2012	31	288	112	371	1183	401
2013	34	299	114	359	740	392
2014	35	252	188	171	711	440
2015	31	361	476	222	1254	735

Hazing Observations

		Total Hazing events		Post Hazing Direction
Year	Events	BRZ	Outside BRZ	down stream
2009	277	81.6%	18.4%	79.4%
2010	196	79.6%	20.4%	73.5%
2011	257	72.0%	28.0%	78.6%
2012	288	56.9%	43.1%	74.3%
2013	299	79.6%	20.4%	70.2%
2014	252	65.5%	34.5%	70.6%
2015	361	75.6%	24.4%	61.3%
Average	**275.7**	**73.0%**	**27.0%**	**72.6%**

Hazing Observations Continued

	Predation	Proportion	Predation Observations		Salmonid Predation		Sturgeon Predation	
Year	Observation Rate	Salmonid	BRZ	Outside BRZ	CSL	SSL	CSL	SSL
2009	22.4%	85.5%	91.9%	8.1%	89.4%	10.6%	66.7%	33.3%
2010	16.8%	69.7%	60.6%	39.4%	76.2%	23.8%	0.0%	100.0%
2011	23.3%	76.7%	61.7%	38.3%	73.9%	26.1%	0.0%	100.0%
2012	16.7%	35.4%	47.9%	52.1%	76.5%	23.5%	0.0%	100.0%
2013	14.4%	62.8%	59.5%	40.5%	51.9%	48.1%	0.0%	100.0%
2014	24.6%	79.0%	54.8%	45.2%	87.8%	12.2%	25.0%	75.0%
2015	29.9%	93.5%	80.6%	19.4%	89.8%	10.2%	33.3%	66.7%
Average	**21.2%**	**71.8%**	**65.3%**	**34.7%**	**77.9%**	**22.1%**	**17.9%**	**82.1%**

Tandem Survey Abundance Estimates

1. Two boats operated in the navigation channel approximately one half mile apart.

2. GPS locations for sea lion sightings were recorded for all observations.

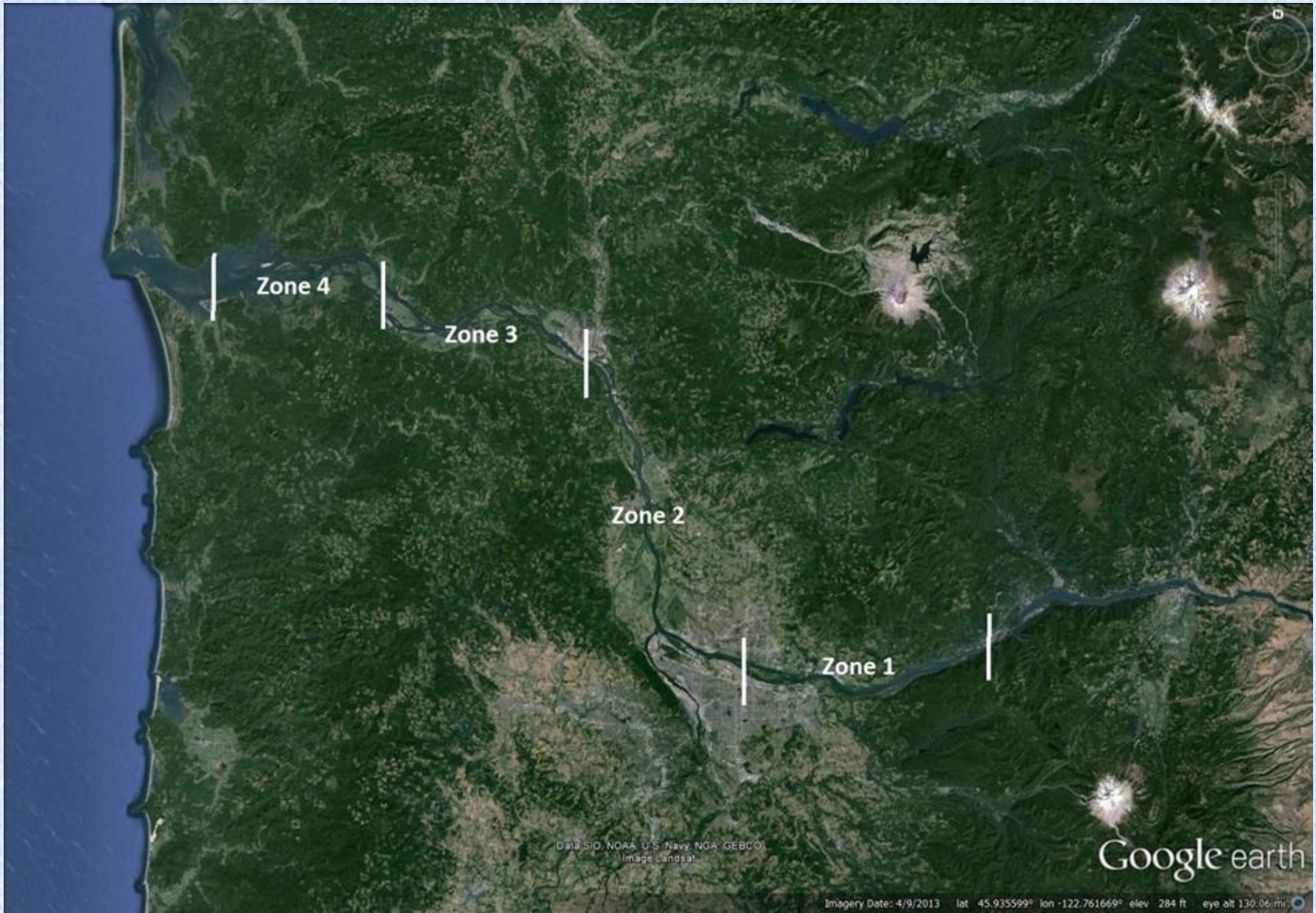
3. Observations were plotted on a map and assigned to one of three groupings.

    - Animals seen by only the first boat
    - Animals seen be only the second boat
    - Animals seen by both boats

4. We then applied statistical models to estimate the abundance of sea lions.

    - Conditional Lincoln-Peterson estimator

Tandem Survey Zone Map



Tandem Boat Abundance Estimates

2013

	6-Mar	12-Mar	19-Mar	26-Mar	2-Apr	9-Apr	16-Apr	23-Apr	30-Apr	7-May	14-May
Zone 1	4.3	4.3	11.7	37.3	57.6	10.7	7.3	8.5	1.2	3.7	-
Zone 2	3.3	11.0	185.5	73.6	110.9	12.1	7.6	1.3	0.0	0.0	-
Zone 3	-	-	176.7	-	-	32.9	-	-	-	1.3	-
Zone 4	-	-	39.6	-	-	63.3	-	-	-	0.0	-
River Total	-	-	413.6	-	-	119.0	-	-	-	4.9	-

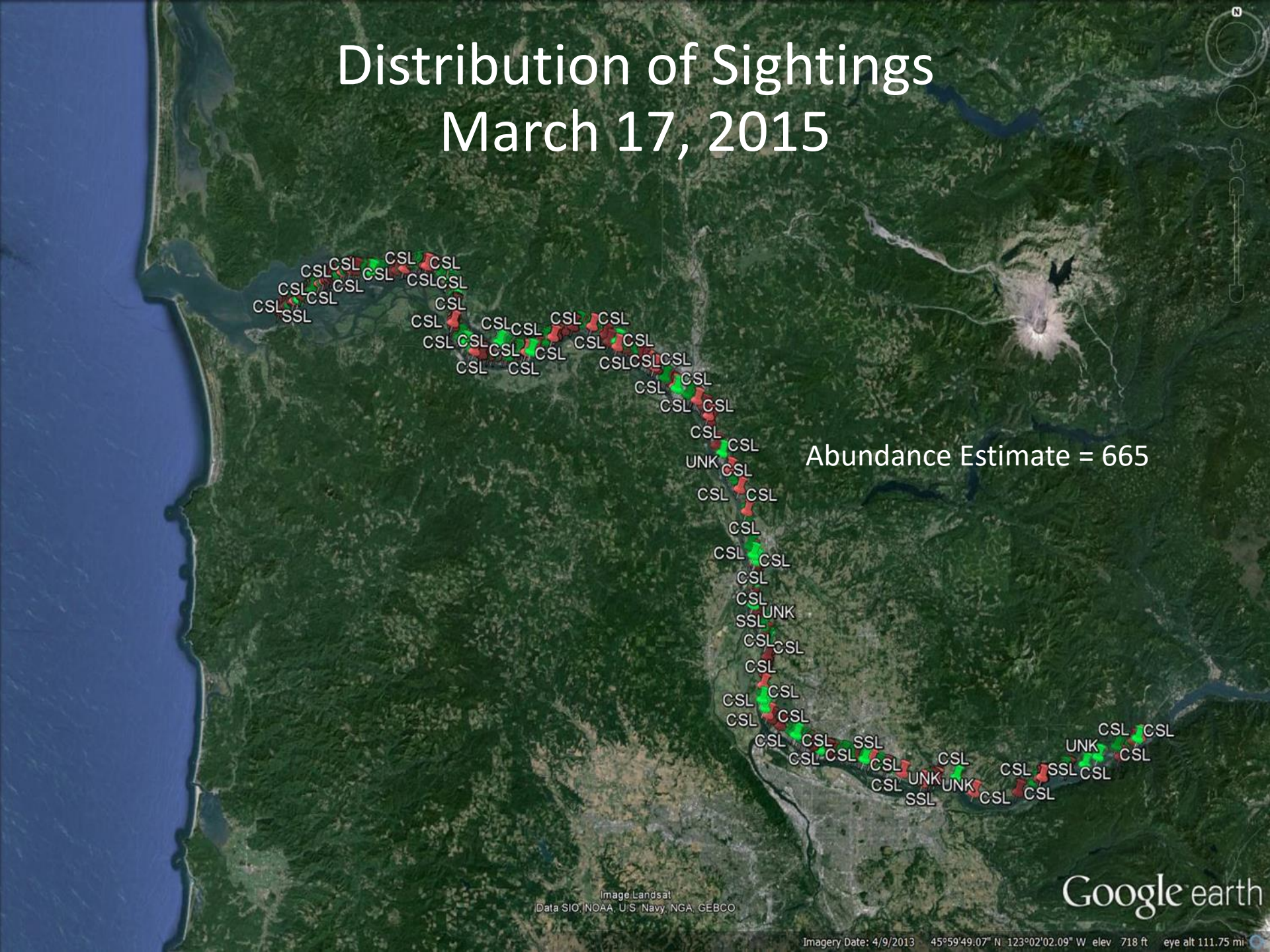
2014

	4-Mar	11-Mar	18-Mar	25-Mar	1-Apr	8-Apr	17-Apr	22-Apr	29-Apr	6-May	13-May
Zone 1	-	2.1	12.8	38.4	9.6	17.1	19.5	11.0	6.4	12.8	2.1
Zone 2	-	22.0	7.7	61.5	45.0	29.1	7.6	3.8	4.4	2.2	1.1
Zone 3	-	-	52.7	-	-	-	3.8	-	-	1.1	-
Zone 4	-	-	258.9	-	-	-	24.1	-	-	1.1	-
River Total	-	-	332.1	-	-	-	55.0	-	-	17.2	-

2015

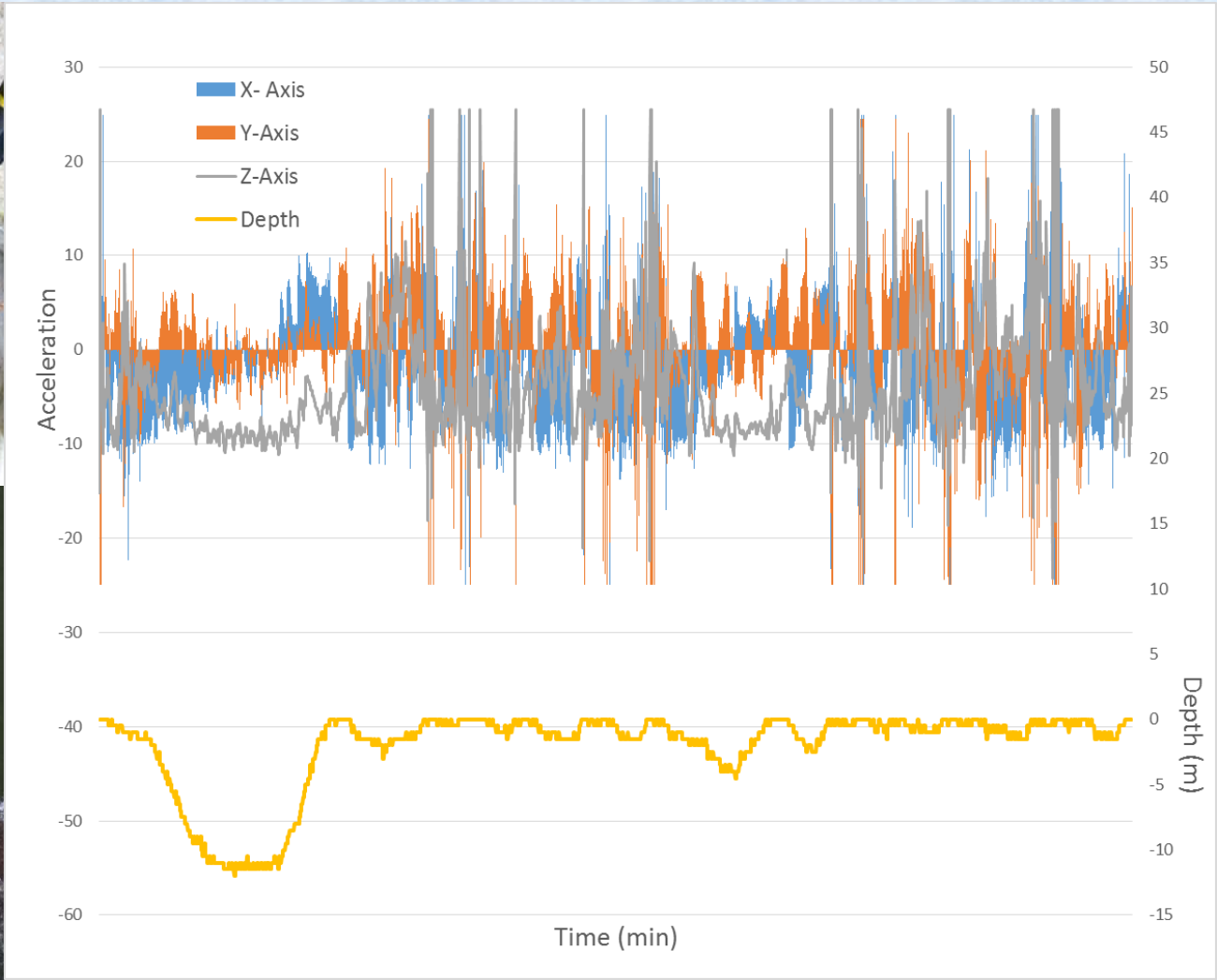
	4-Mar	10-Mar	17-Mar	24-Mar	31-Mar	7-Apr	14-Apr	21-Apr	28-Apr	5-May	12-May
Zone 1	63	108	60	29	42	27	12	19	22	9	20
Zone 2	1120	420	154	230	124	30	23	8	6	14	20
Zone 3	262	382	225	186	28	-	8	-	8	-	-
Zone 4	563	260	226	117	16	-	11	-	13	-	-
River Total	2008	1170	665	562	210	-	54	-	49	-	-

Distribution of Sightings
March 17, 2015



Predation Estimation

- Exploring accelerometer tag technology to estimate sea lion predation



Questions?