Measuring the Abundance and Distribution of Green Sturgeon

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With Direct Assistance From:
US Army Corps of Engineers
National Marine Fisheries Service
California Department of Water Resources
Yurok Tribal Fisheries
Oregon Department of Fish and Wildlife

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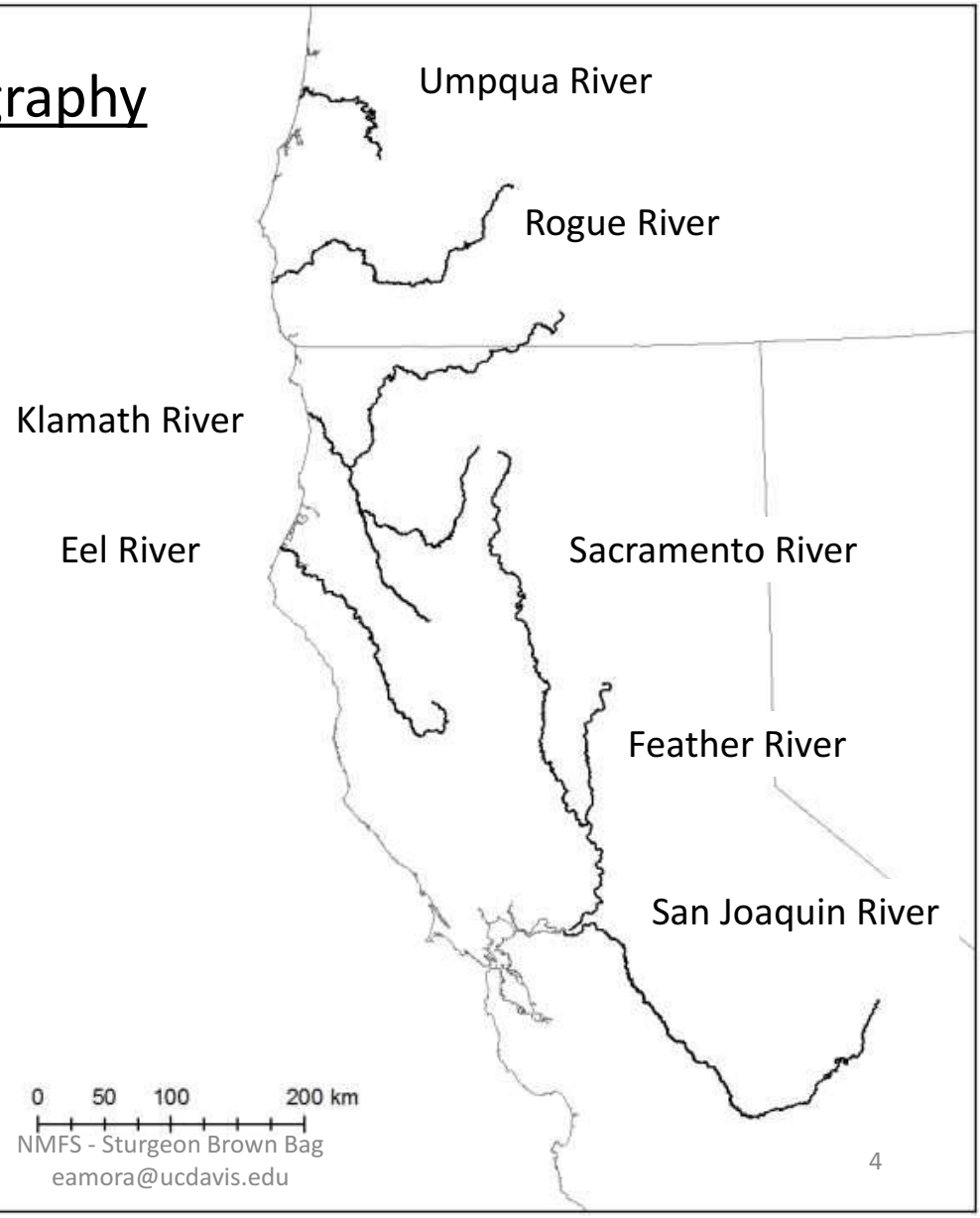
Green Sturgeon Geography



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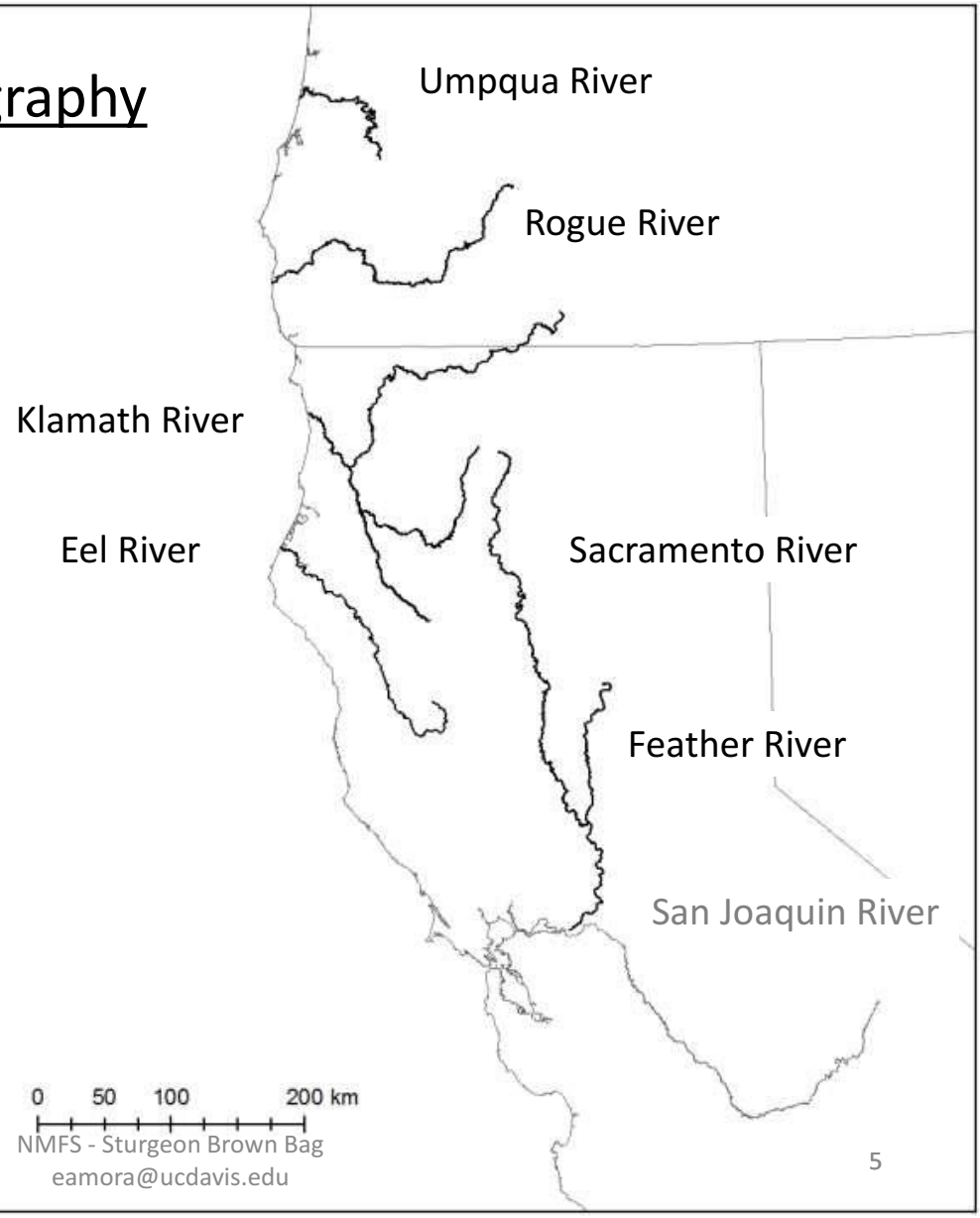

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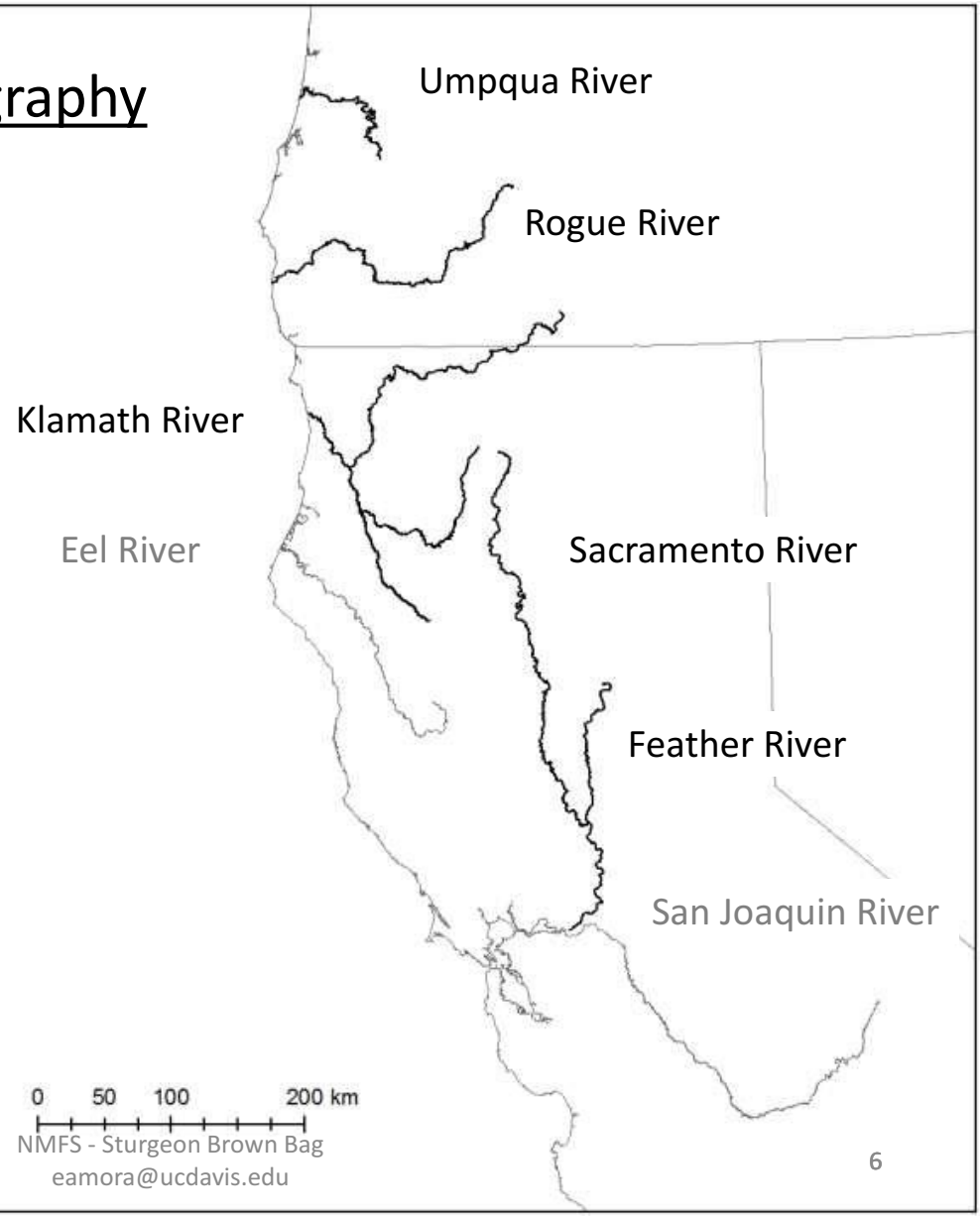

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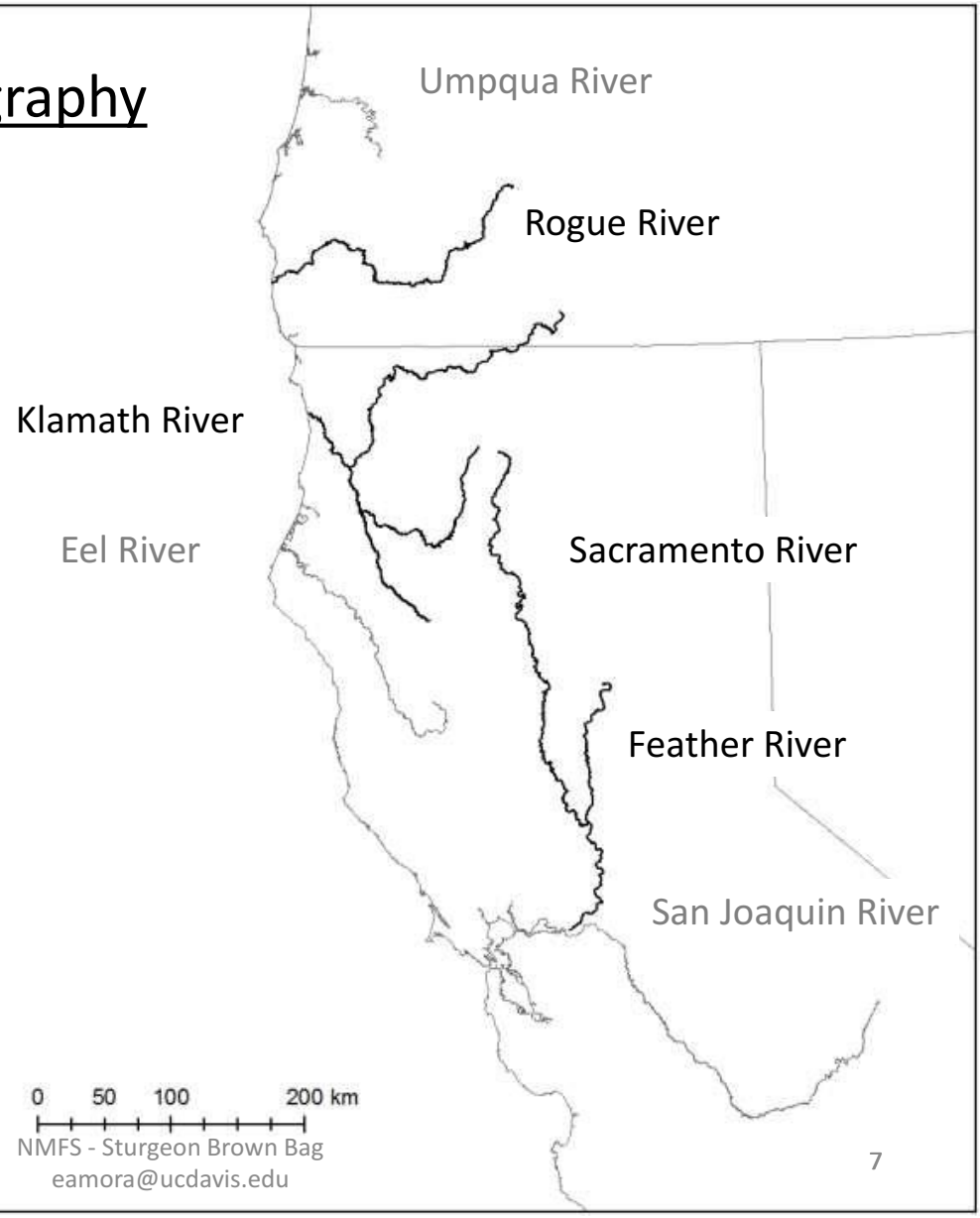

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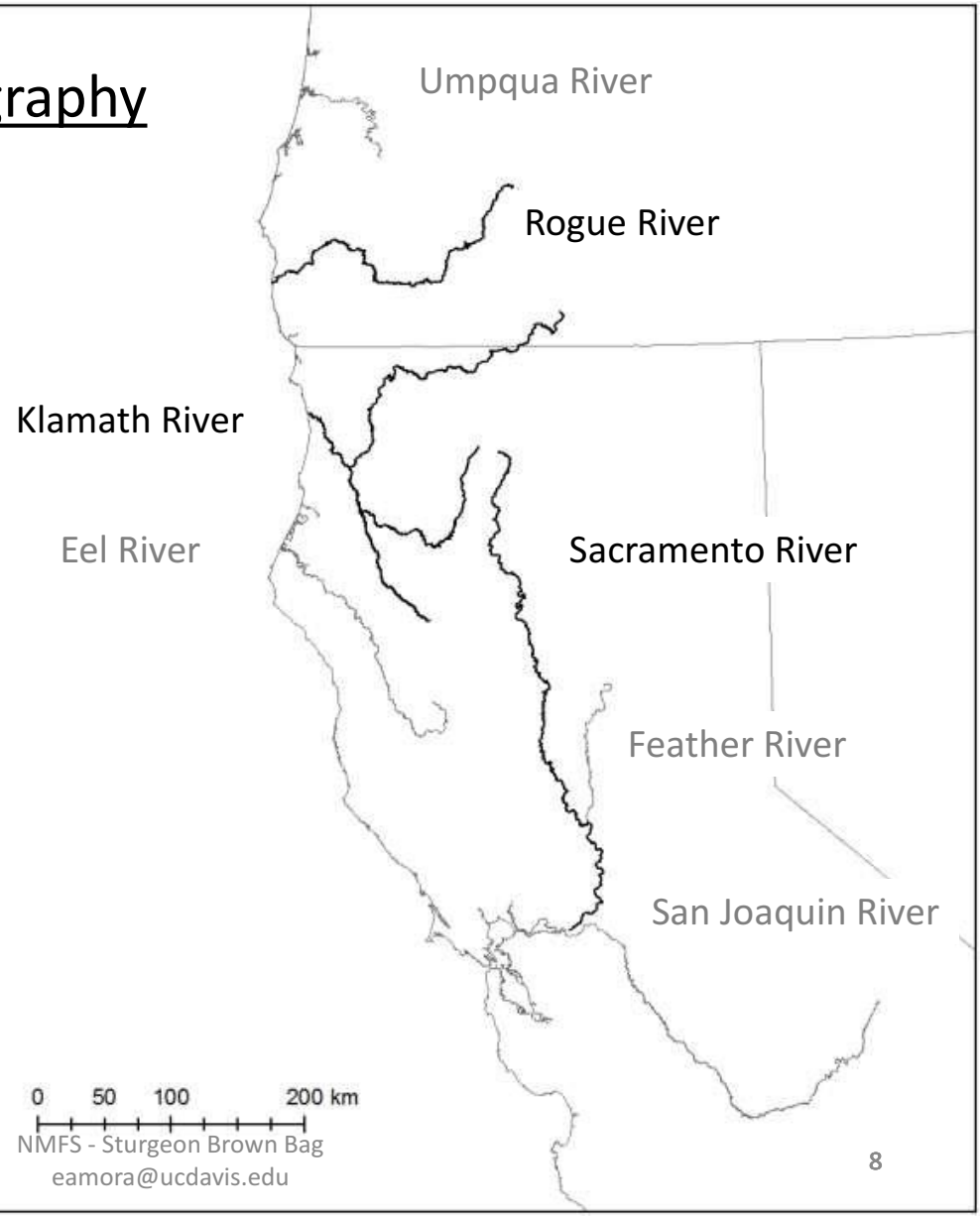

NMFS - Sturgeon Brown Bag
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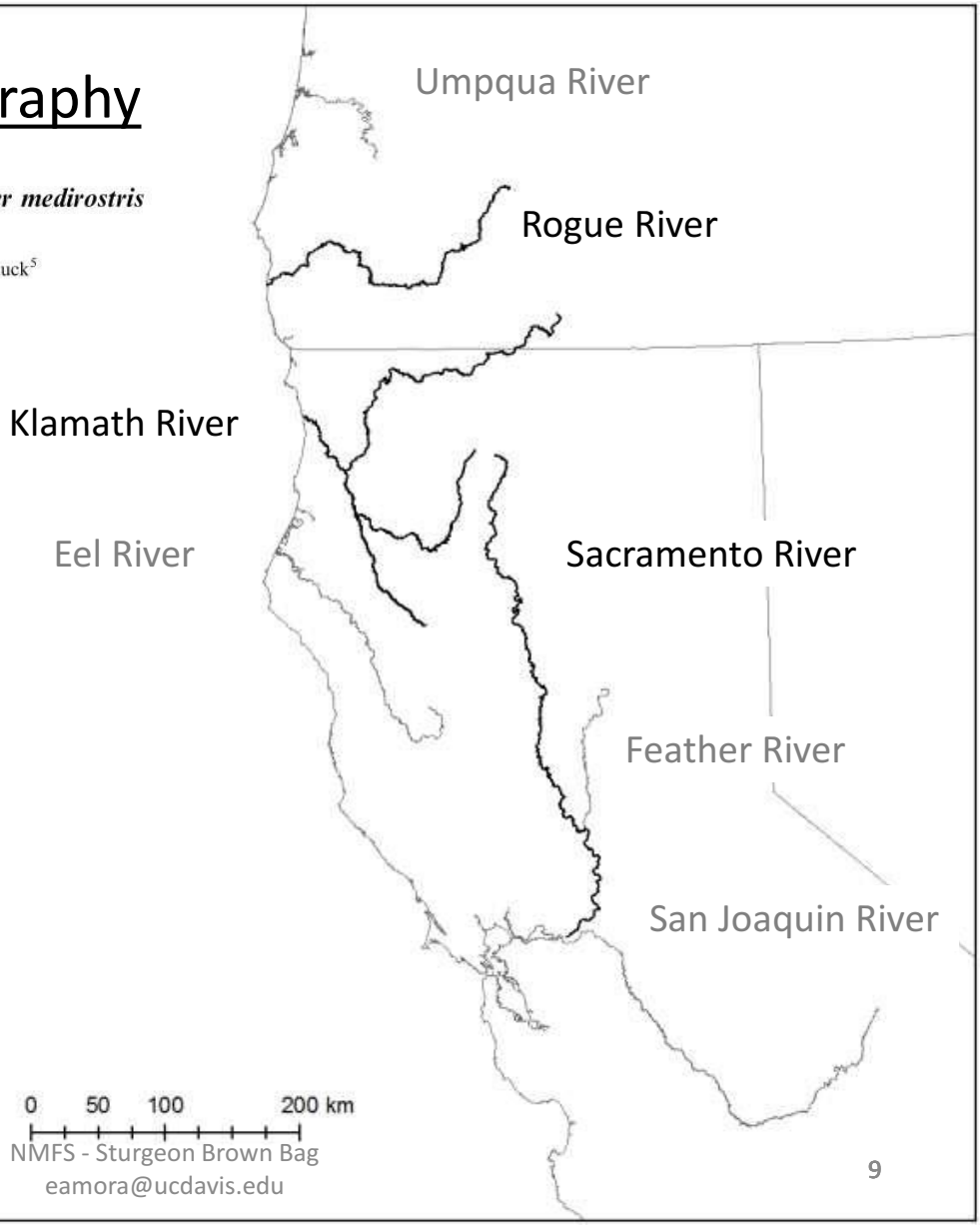
Movement and habitat use of green sturgeon *Acipenser medirostris* in the Rogue River, Oregon, USA

By D. L. Erickson[1], J. A. North[2], J. E. Hightower[3], J. Weber[4] and L. Lauck[5]

Summary

Green sturgeon (*Acipenser medirostris*) movement patterns and habitat use within the Rogue River, Oregon were evaluated using radio telemetry. Nineteen specimens ranging from 154 to 225 cm total length were caught by gill netting and tagged with radio transmitters during May–July 2000. One tagged green sturgeon was verified as a female near spawning condition. Individual green sturgeons spent more than 6 months in fresh water and traveled as far as river kilometer (rkm) 39.5. Green sturgeon preferred specific holding sites within the Rogue River during summer and autumn months. These sites were typically deep (>5 m) low-gradient reaches or off-channel coves. Home ranges within holding sites were restricted. All tagged individuals emigrated from the system to the sea during the autumn and winter, when water temperatures dropped below 10°C and flows increased. This species is extremely vulnerable to habitat alterations and overfishing because it spawns in only a few North American rivers and individuals reside within extremely small areas for extended periods of time.



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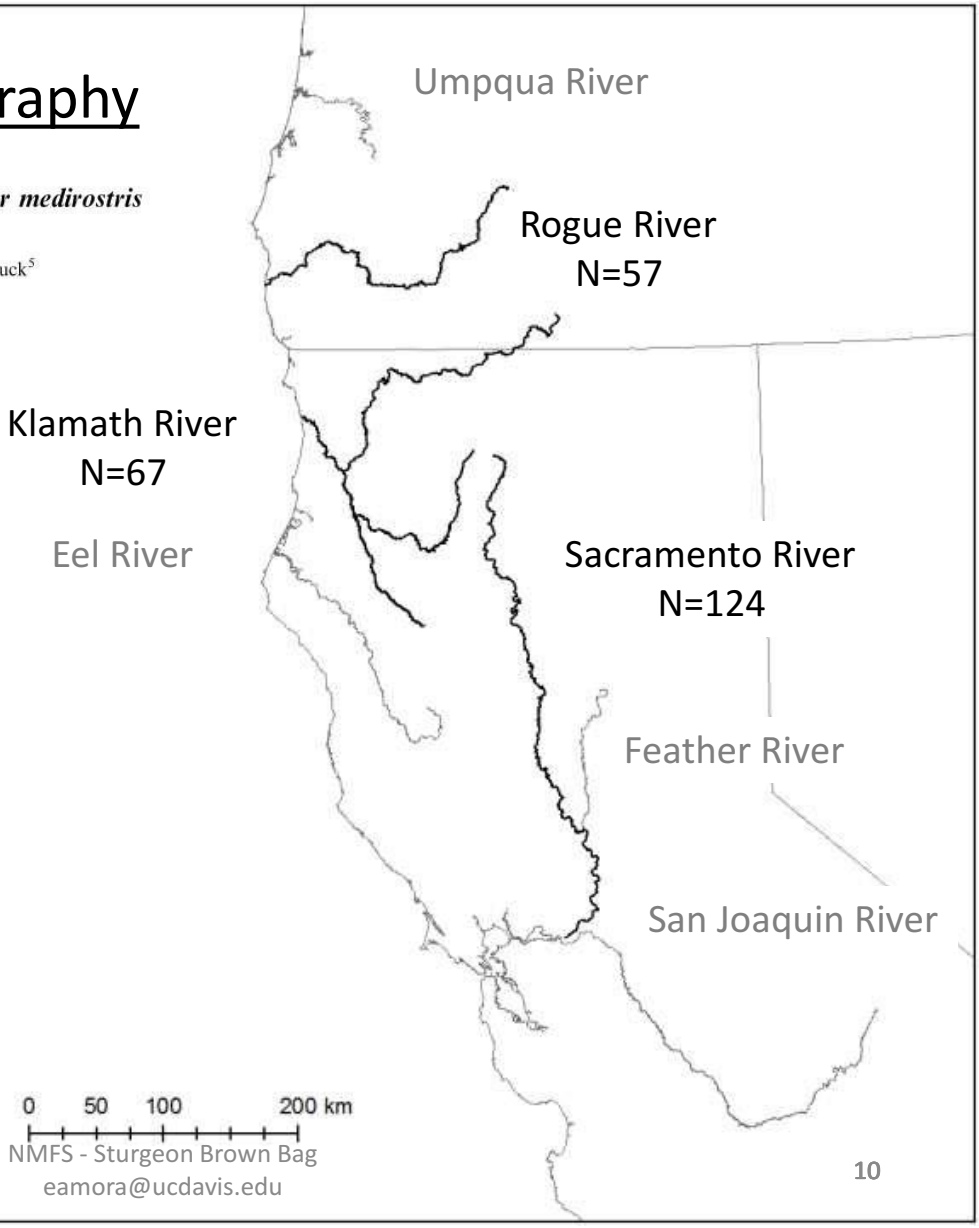
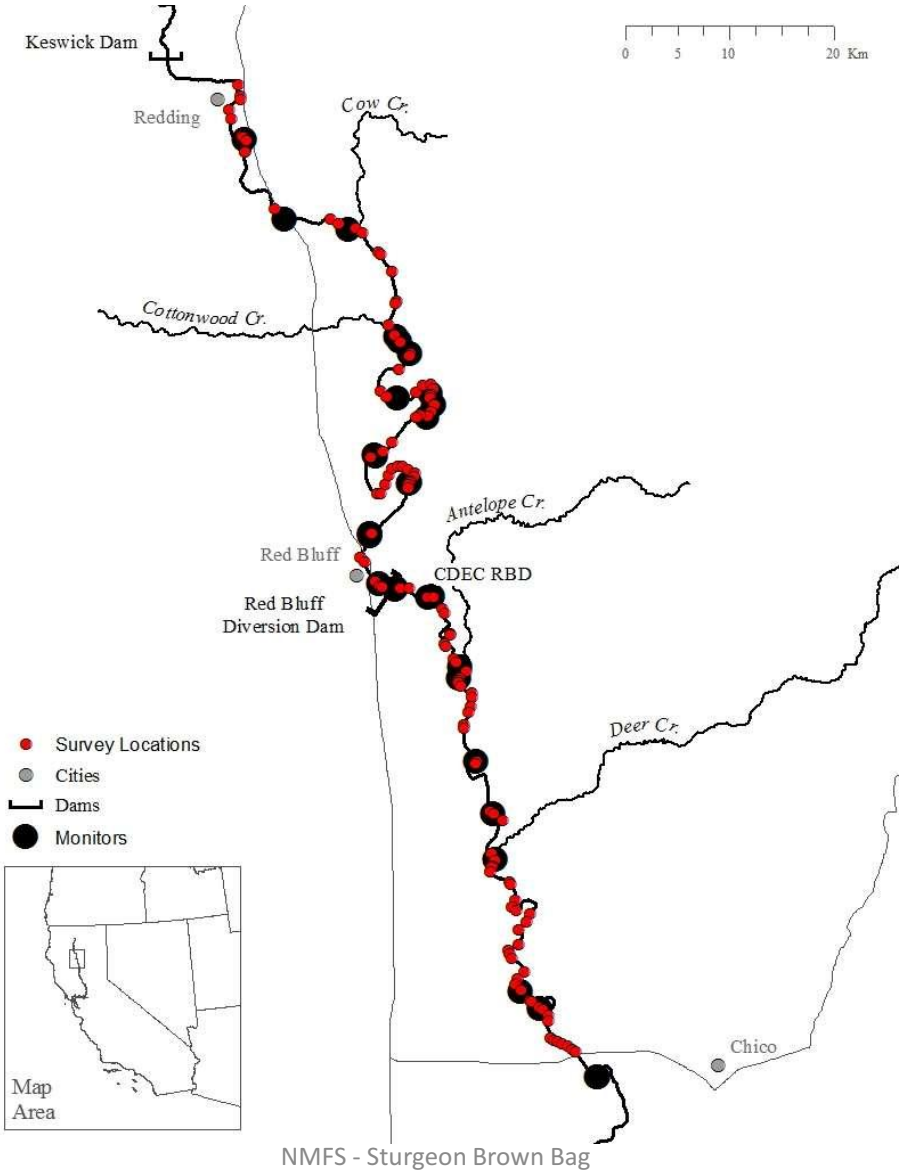
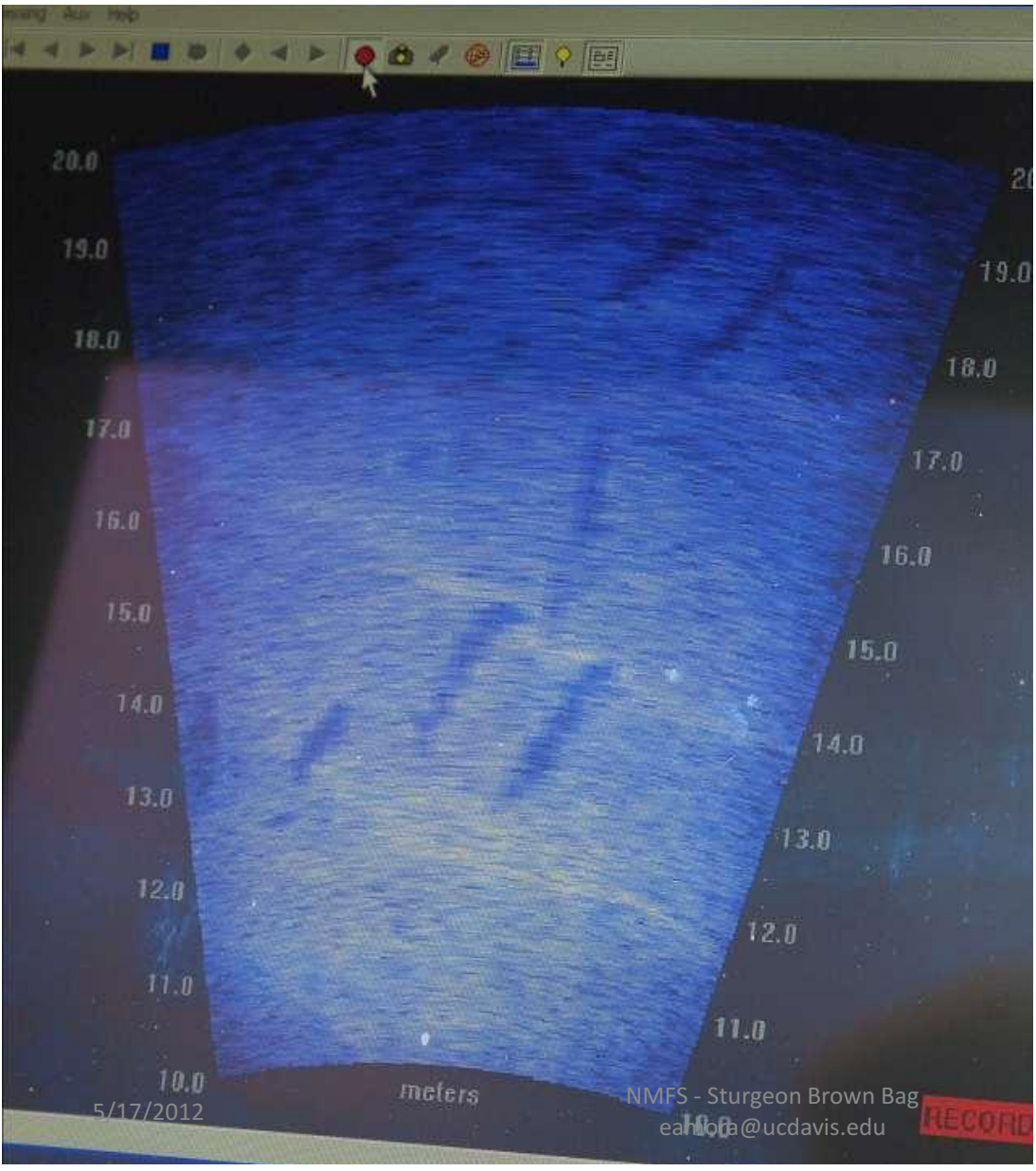
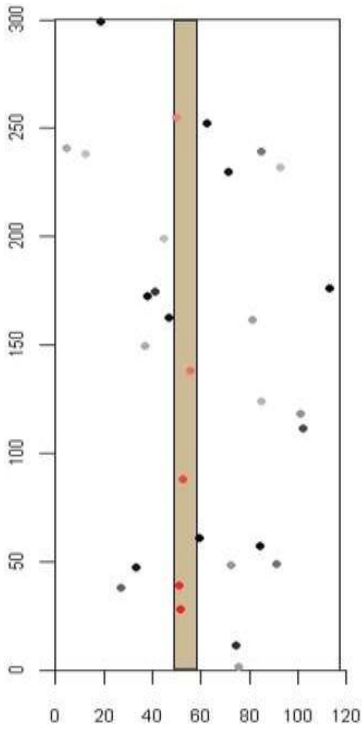


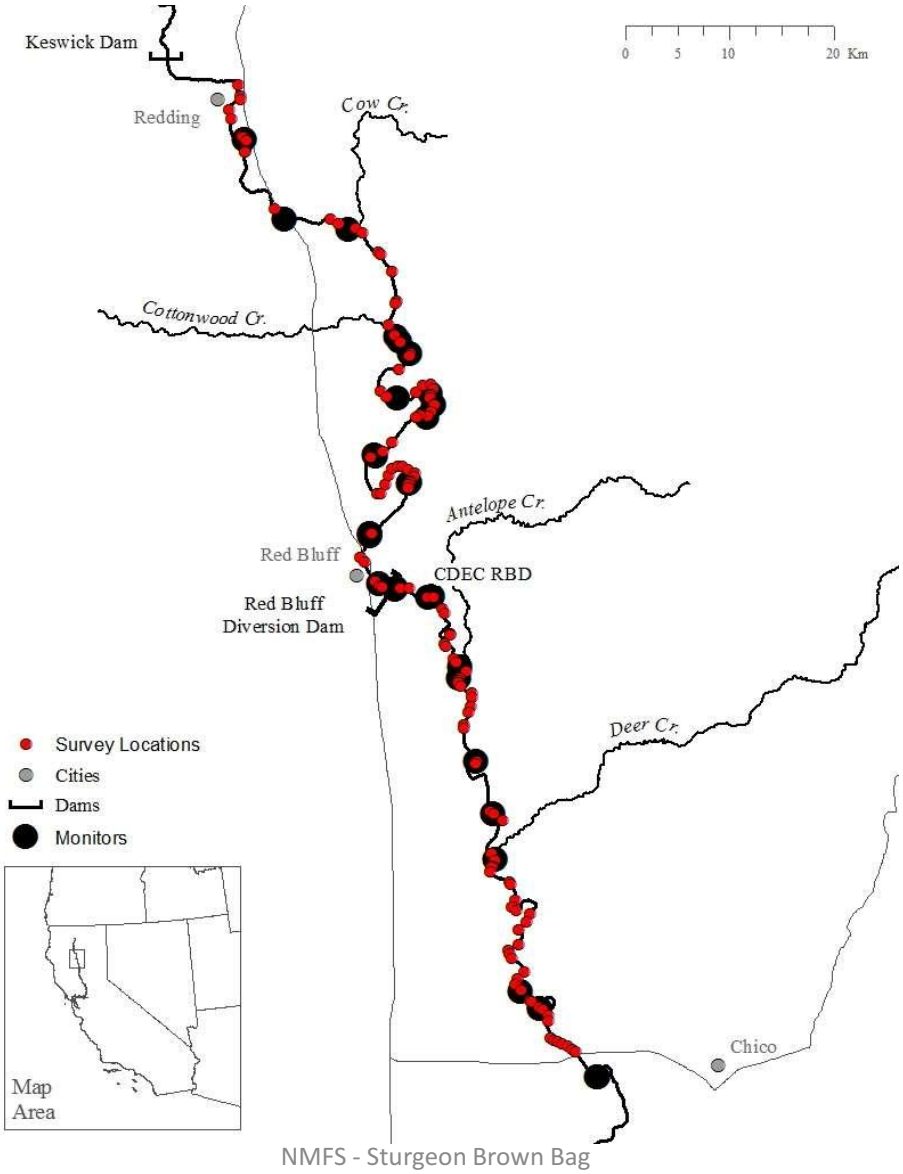

Keswick Dam
Redding
Cow Cr.
Cottonwood Cr.
Antelope Cr.
Red Bluff
CDEC RBD
Red Bluff
Diversion Dam
Deer Cr.
Chico
0 5 10 20 Km
Survey Locations
Cities
Dams
Monitors
Map
Area


NORTH RIVER



Site Visits:
Minimum 3 Transects at Every Unit

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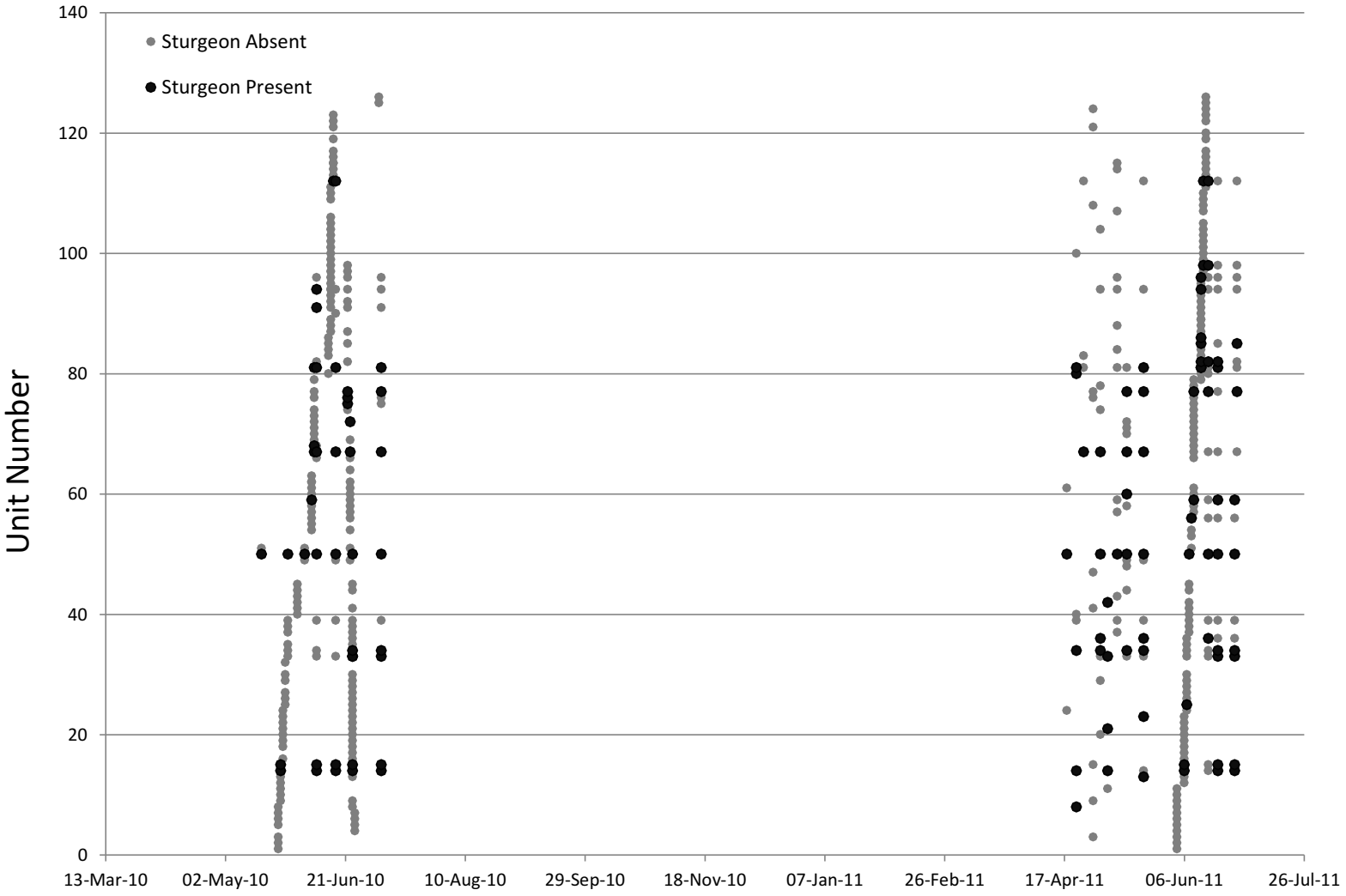
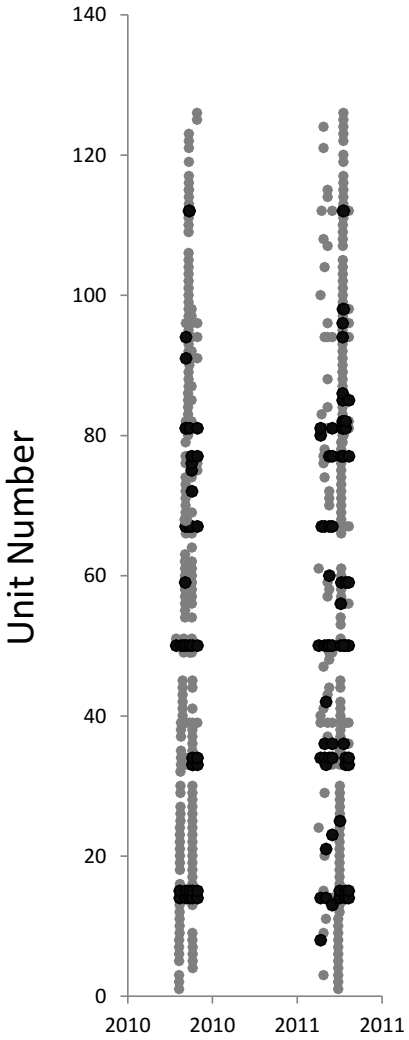

Sturgeon Absent
Sturgeon Present
Unit Number
140
120
100
80
60
40
20
0
13-Mar-10
02-May-10
21-Jun-10
10-Aug-10
29-Sep-10
18-Nov-10
07-Jan-11
26-Feb-11
17-Apr-11
06-Jun-11
26-Jul-11


Unit Number
140
120
100
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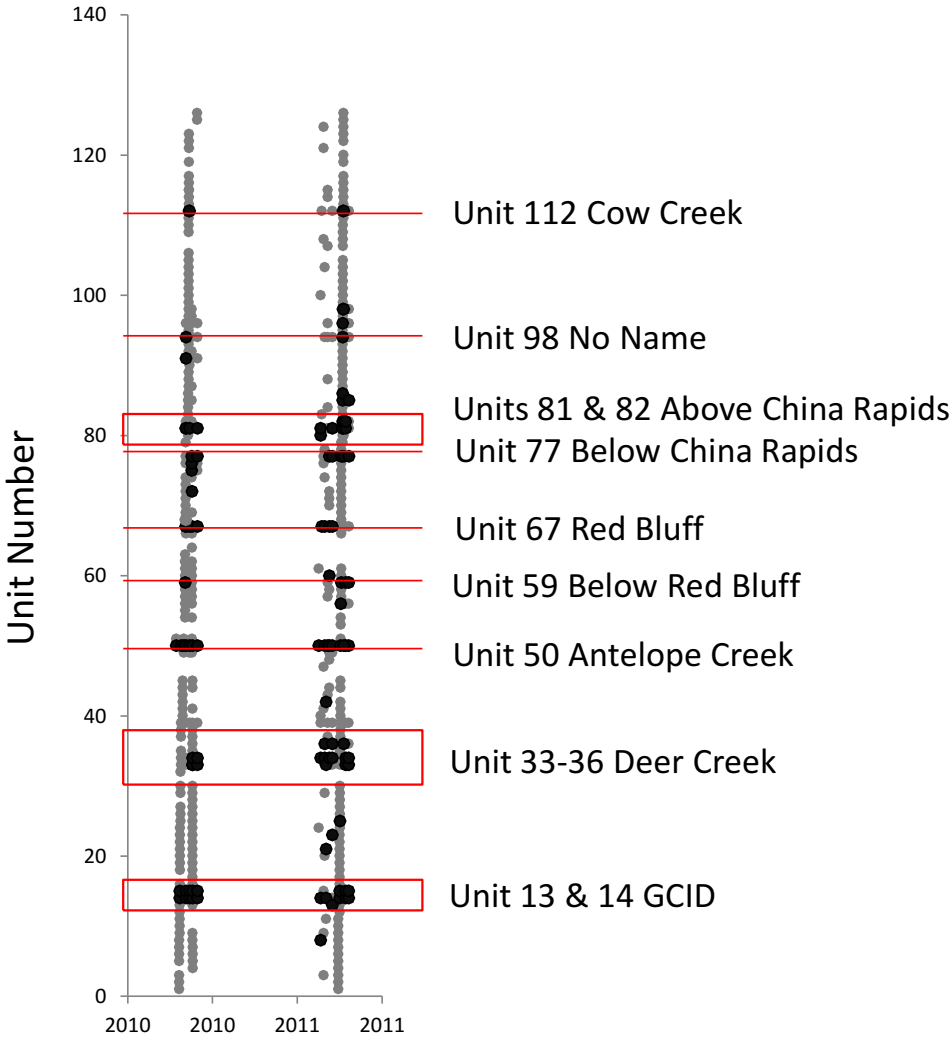
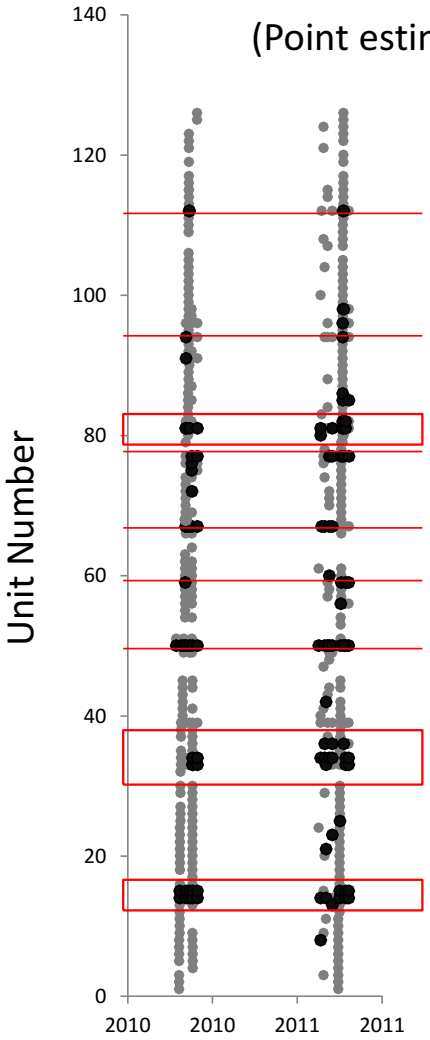
60
40
20
0
2010
2010
2011
2011


Unit Number
140
120
100
80
60
40
20
0
2010
2010
2011
2011
Unit 112 Cow Creek
Unit 98 No Name
Units 81 & 82 Above China Rapids
Unit 77 Below China Rapids
Unit 67 Red Bluff
Unit 59 Below Red Bluff
Unit 50 Antelope Creek
Unit 33-36 Deer Creek
Unit 13 & 14 GCID

Red Numbers Indicate Occupancy Rates
(Point estimates only. They do not contain detection probability).



Unit 112 Cow Creek: N=9 **56%**

Unit 98 No Name: N=6 **33%**

Units 81 & 82 Above China Rapids: N=14 **64%**

Unit 77 Below China Rapids: N=10 **70%**

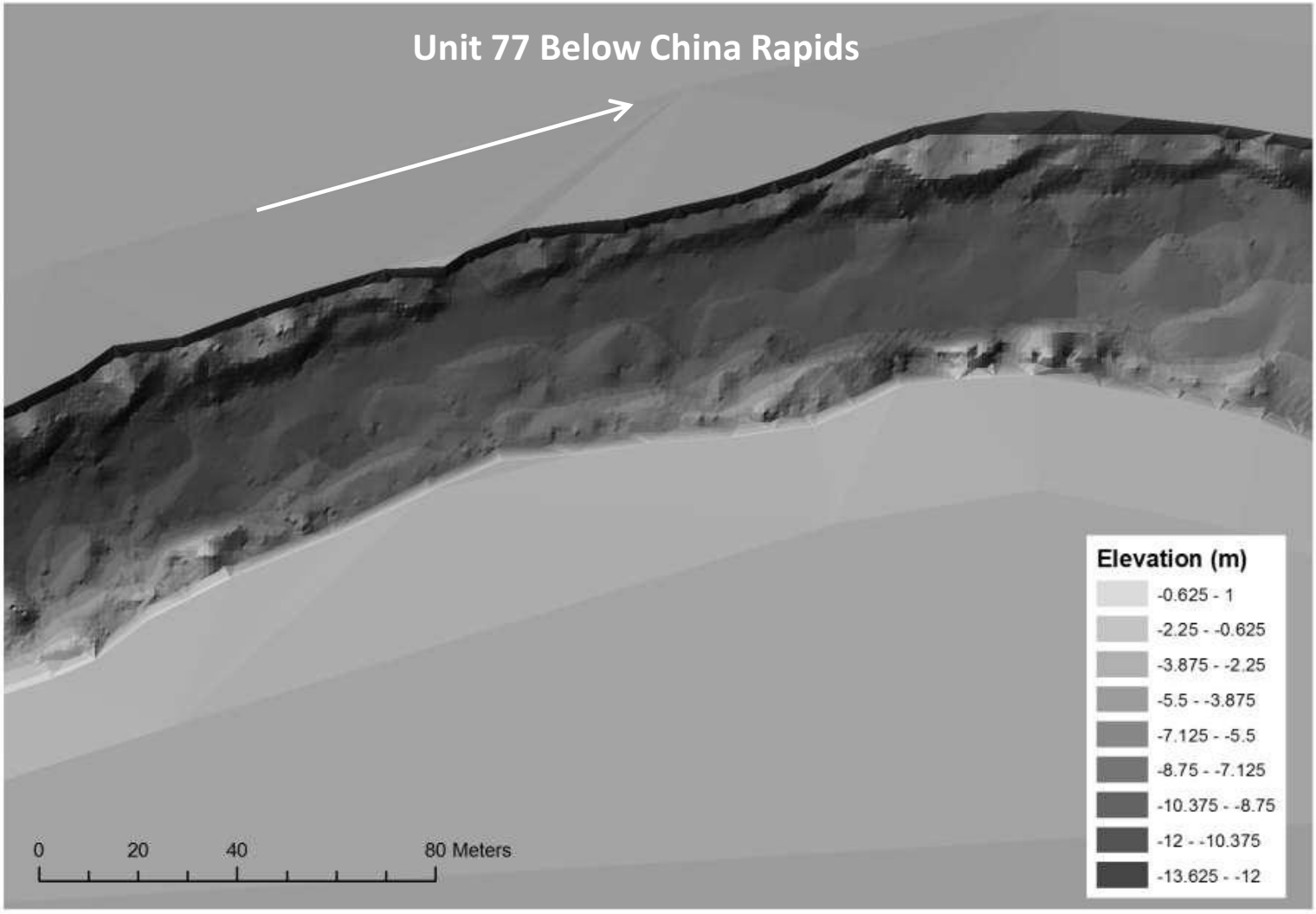
Unit 67 Red Bluff: N=13 **69%**

Unit 59 Below Red Bluff: N=7 **29%**

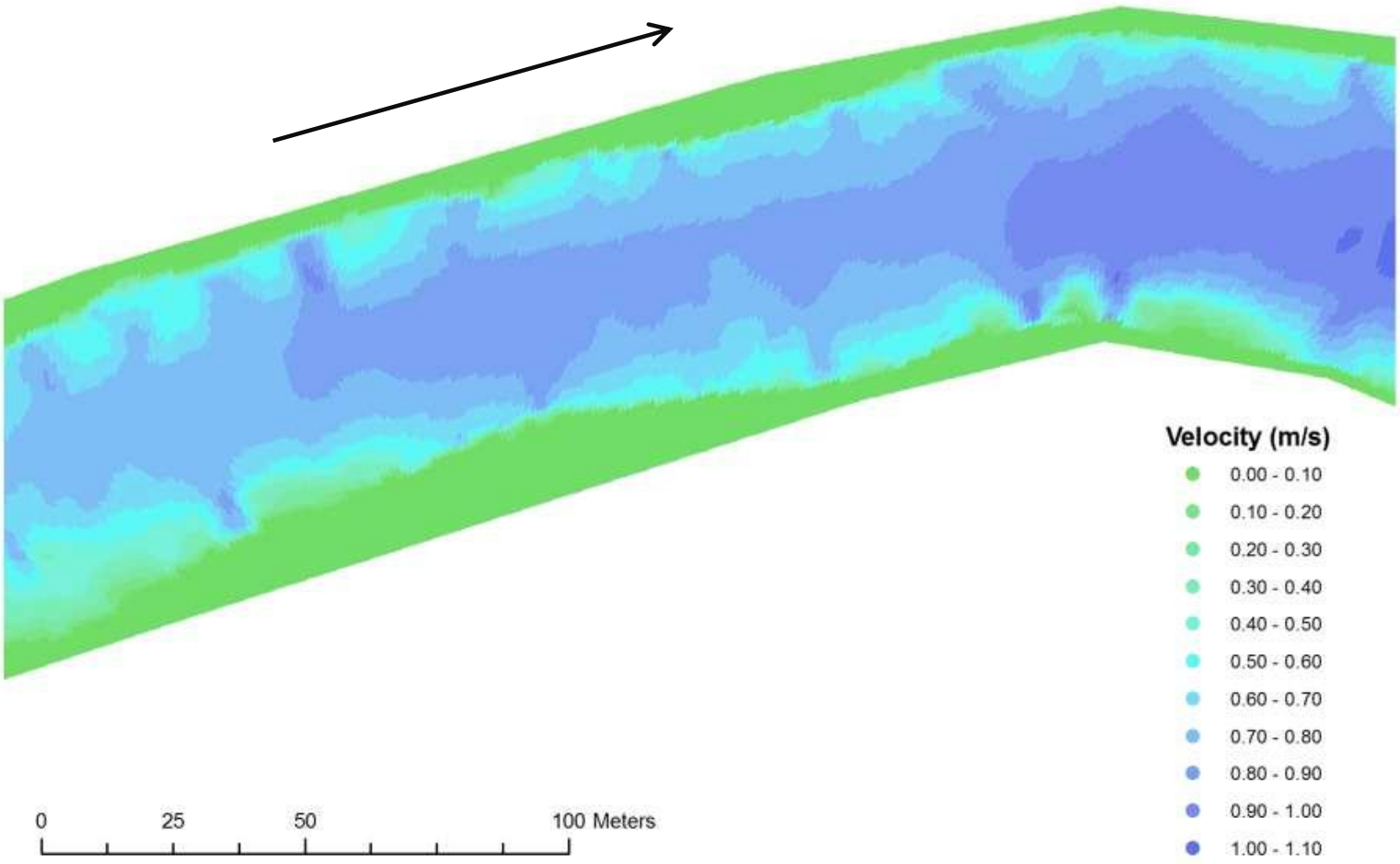
Unit 50 Antelope Creek N=16 **100%**

Unit 33-36 Deer Creek N=14 **67%**

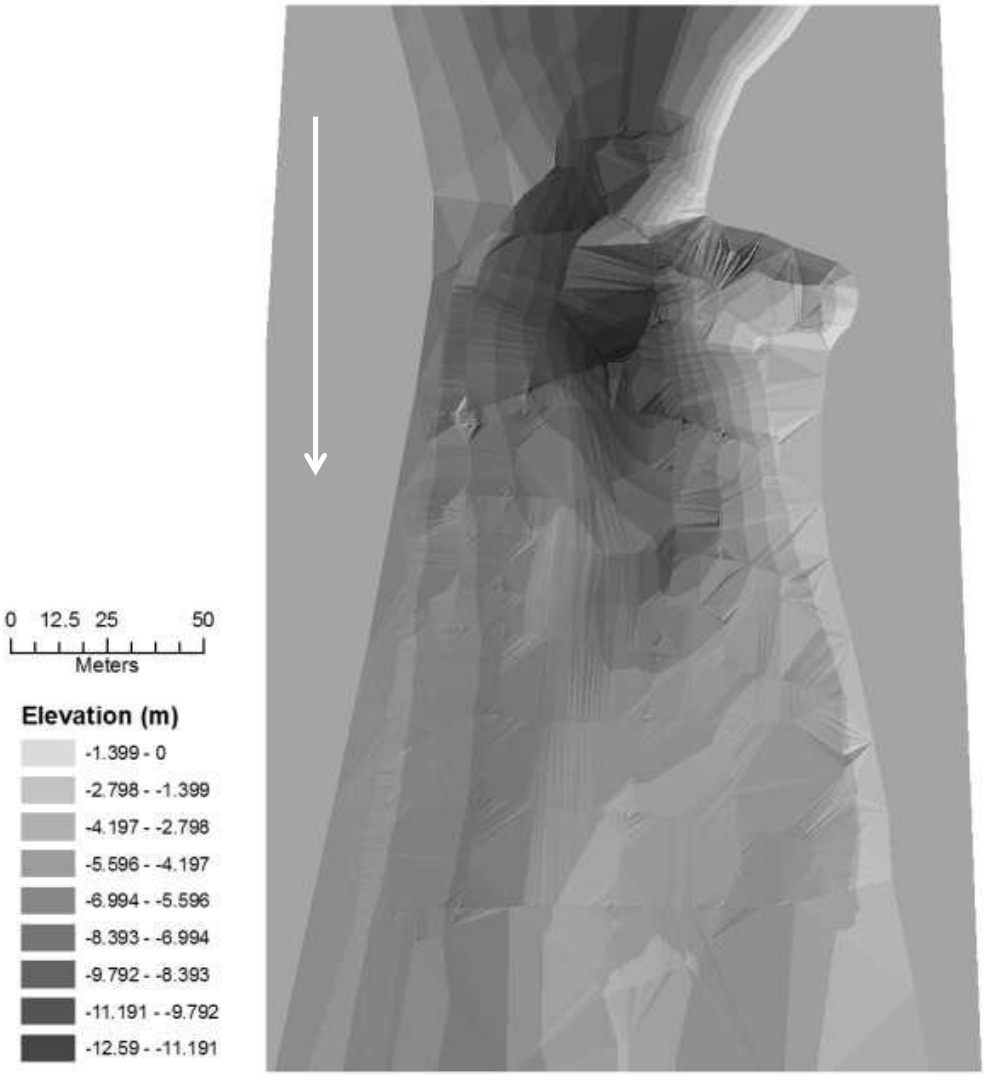
Unit 13 & 14 GCID N=12 **83%**


Unit 77 Below China Rapids
Elevation (m)
-0.625 - 1
-2.25 - -0.625
-3.875 - -2.25
-5.5 - -3.875
-7.125 - -5.5
-8.75 - -7.125
-10.375 - -8.75
-12 - -10.375
-13.625 - -12
0
20
40
80 Meters

Unit 77 Below China Rapids



Unit 50 Antelope Creek



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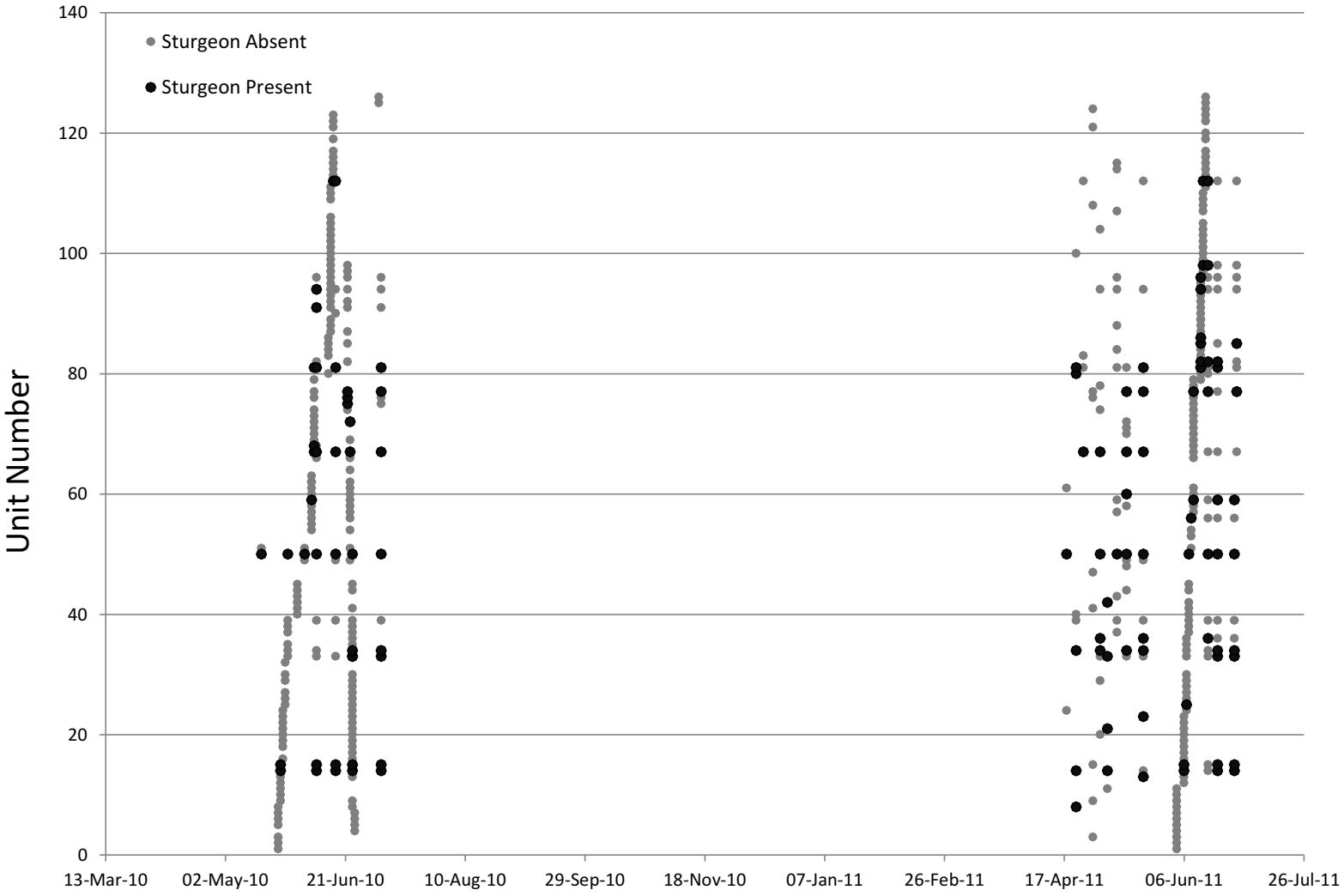
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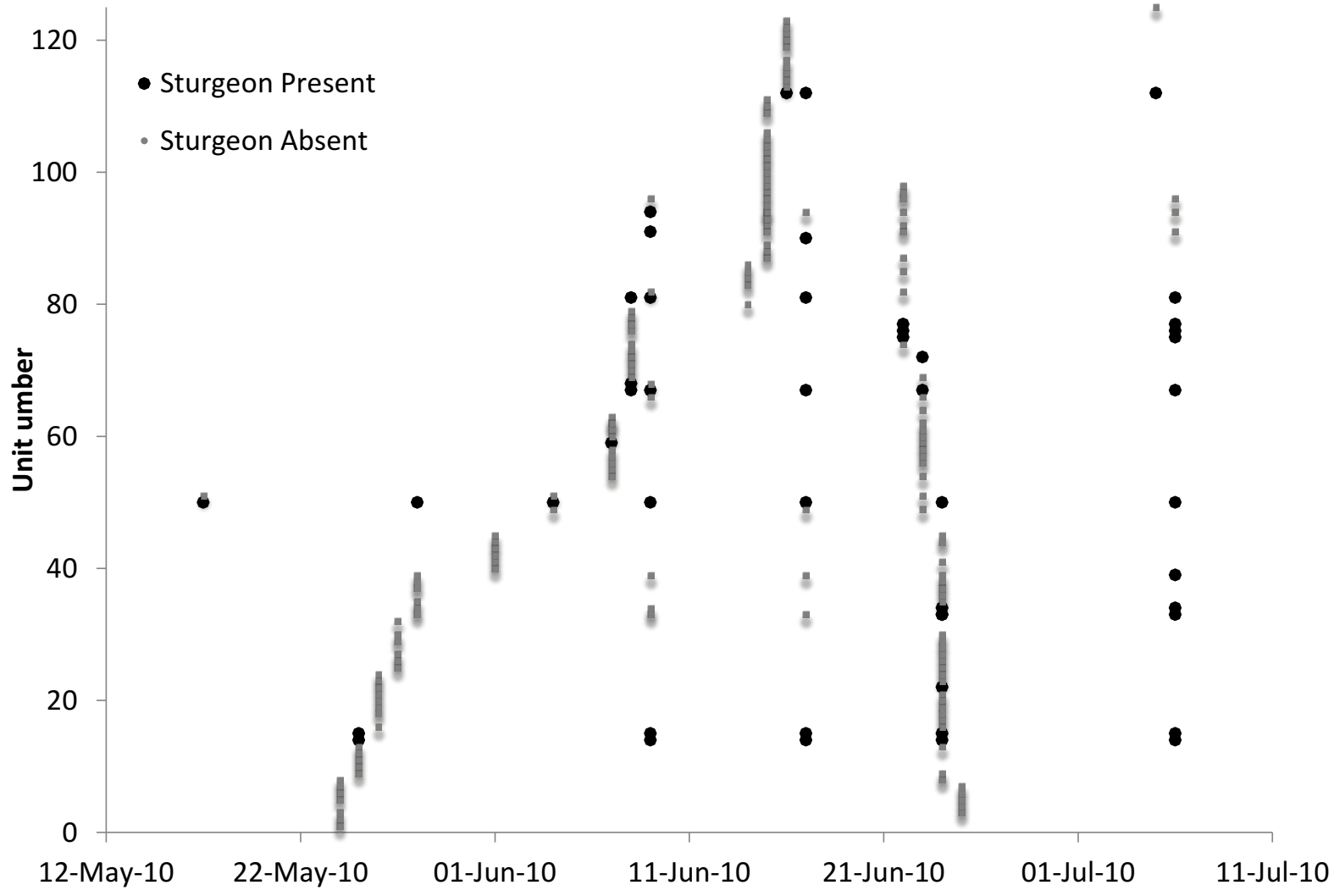
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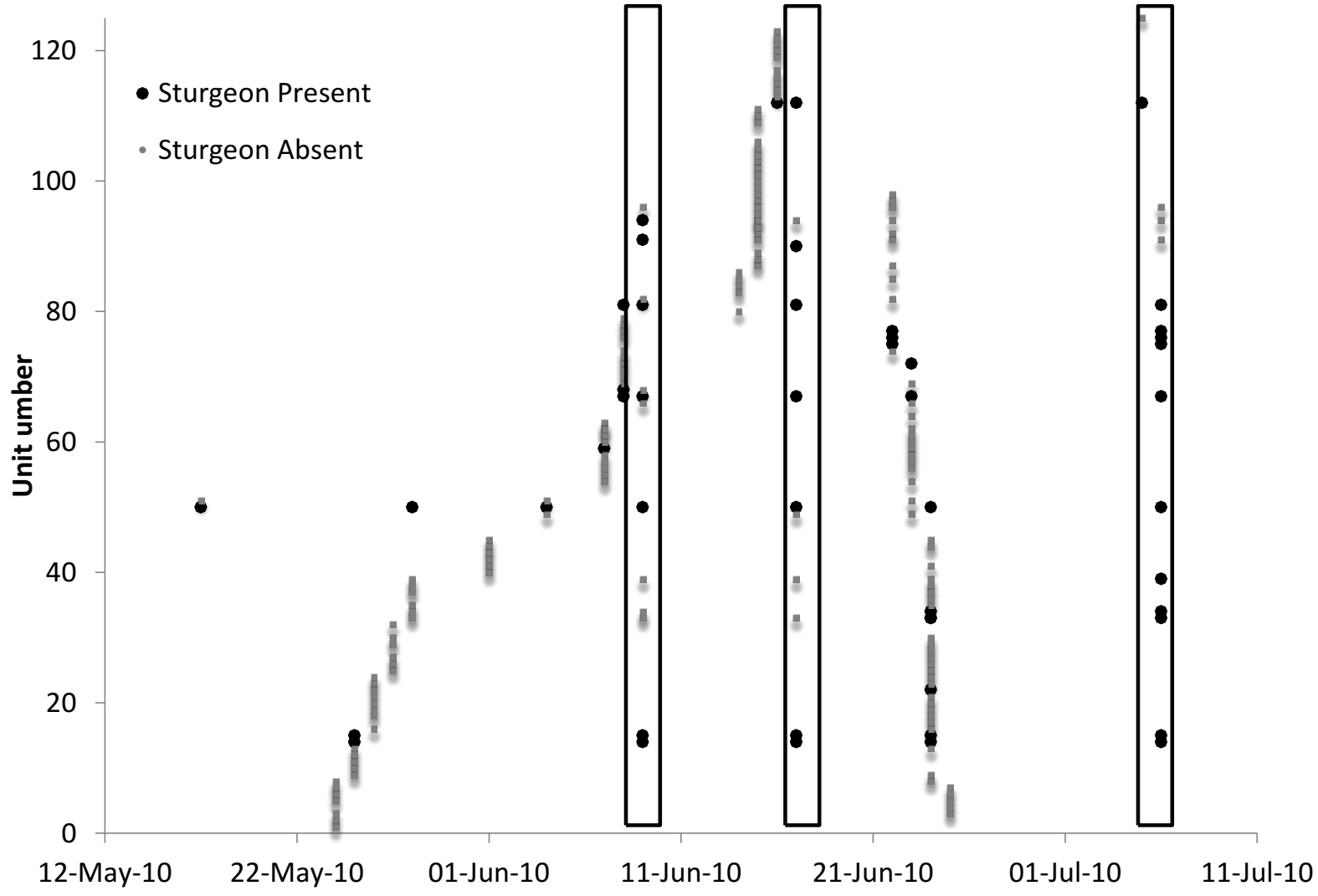
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11-Jul-10

$\hat{D}_i = estimate\ of\ density\ at\ site\ (i)$

$\bar{s} = mean\ number\ of\ detected\ sturgeon$

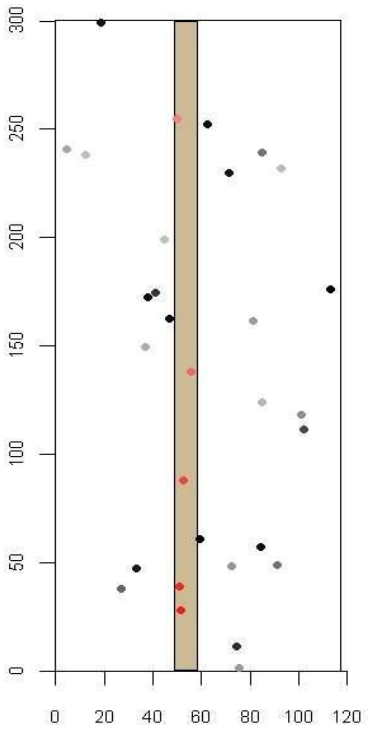
$\bar{a} = mean\ sampled\ area$

$\hat{S}_i = estimated\ number\ of\ sturgeon\ at\ site\ (i)$

$A = total\ used\ area$

$\hat{V}(\hat{D}_i) = estimate\ of\ variance\ for\ \hat{D}_i$

$\hat{V}(\hat{S}_i) = estimate\ of\ variance\ for\ \hat{S}_i$



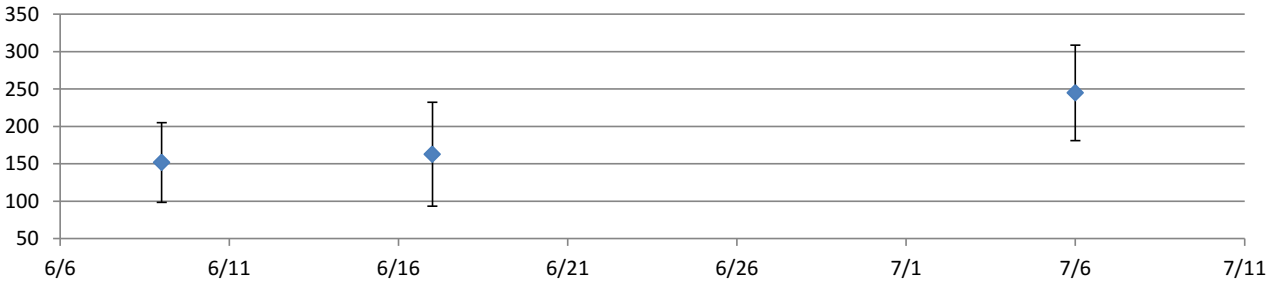
$$\hat{D}_i = \frac{\bar{s}}{\bar{a}}$$

$$\hat{S}_i = A\,\hat{D}$$

$$\hat{V}(\hat{D}) = \frac{\left(\frac{1}{n}\sum\left(\frac{a_i}{\bar{a}}\right)^2 (\hat{D}_i - \hat{D})^2\right)}{(n-1)}$$

$$\hat{V}(\hat{S}) = A^2\,\hat{V}(\hat{D})$$

Number of Detected Sturgeon in the Sacramento River
Not an estimate of Green Sturgeon abundance! Yet



	6/9/2010		6/17/2010		7/6/2010	
Unit	n	SD	n	SD	n	SD
14	**24.74**	7.56	**42.55**	10.09	**91.59**	22.48
15	**6.61**	2.61	**0.41**	0.33	**4.96**	1.62
33	**0**		**0**		**21.81**	7.94
34	**0**		**0**		**15.13**	7.39
38	**0**		**0**		**3.60**	2.54
50	**42.13**	4.78	**67.85**	17.15	**45.51**	14.06
67	**19.15**	10.68	**10.77**	4.40	**9.63**	4.67
77	**--**		**--**		**44.36**	12.61
81	**28.71**	7.45	**25.69**	7.93	**5.03**	1.11
91	**7.73**	2.68	**0**		**0**	
94	**22.67**	8.43	**0**		**0**	
112	**--**		**15.96**	23.22	**3.30**	1.74
Total	**152.74**	18.30	**163.25**	23.22	**244.92**	31.85

Conclusions

- It is likely that the of Green Sturgeon congregate in core areas during their spawning migrations. This makes them susceptible to correlated catastrophic risk. (Poaching, Toxin Spills, etc)

- Annual run size of Green Sturgeon = f(number of detected sturgeon [from previous slide],
  proportion that are White Sturgeon,
  proportion not in units during survey,
  proportion in river during survey)…