Life Cycle Monitoring and DIDSON Cameras: Promise and Pitfalls

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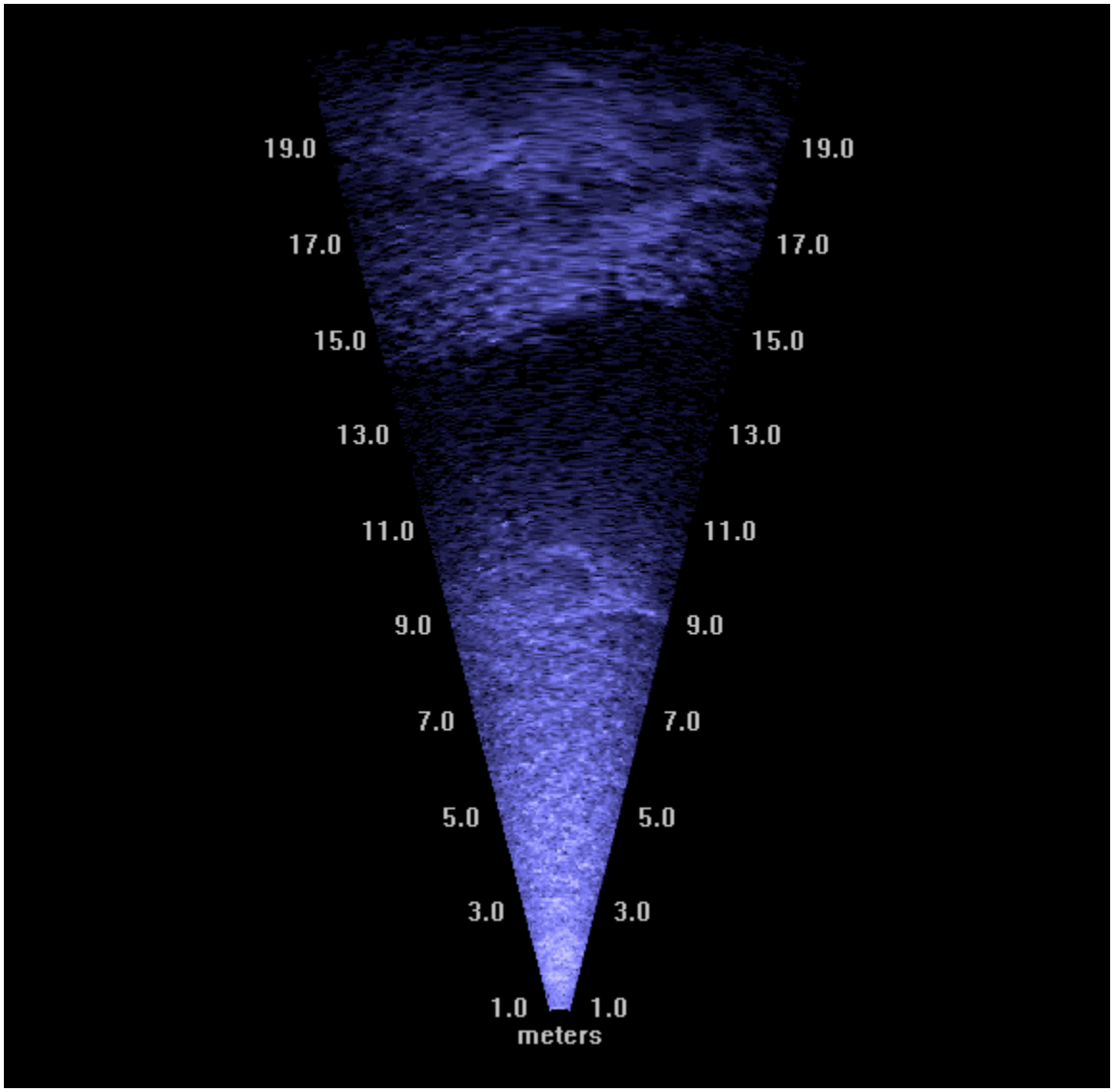
Outline of Presentation

1) Considerations in using DIDSON
2) DIDSON in the context of the Coastal Monitoring Plan
3) Estimating escapement using DIDSON
4) Biological data collected with DIDSON
5) Uncertainty with DIDSON and uncertainty with redd surveys

Considerations in using DIDSON

- Site selection
- Run timing
- River hydrology
- Security
- Data management
- Non-salmonids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VSP Parameters and DIDSON

VSP Parameter	Redd Counts	DIDSON
Abundance (adult)	Yes	Yes
Productivity (smolt)	No	Potential
Spatial structure (adult)	Yes	No
Diversity (adult)	Yes	In part (time)

Error Sources

- Incomplete coverage
- Missing hours/days
- Undetected fish
- Variation among reviewers
- Non-fish
- Sub-sampling

Two Approaches to Estimating Escapement Using a DIDSON

- Total census
  - Applicable to small populations
- Sub-sampling
  - Used when population size is larger

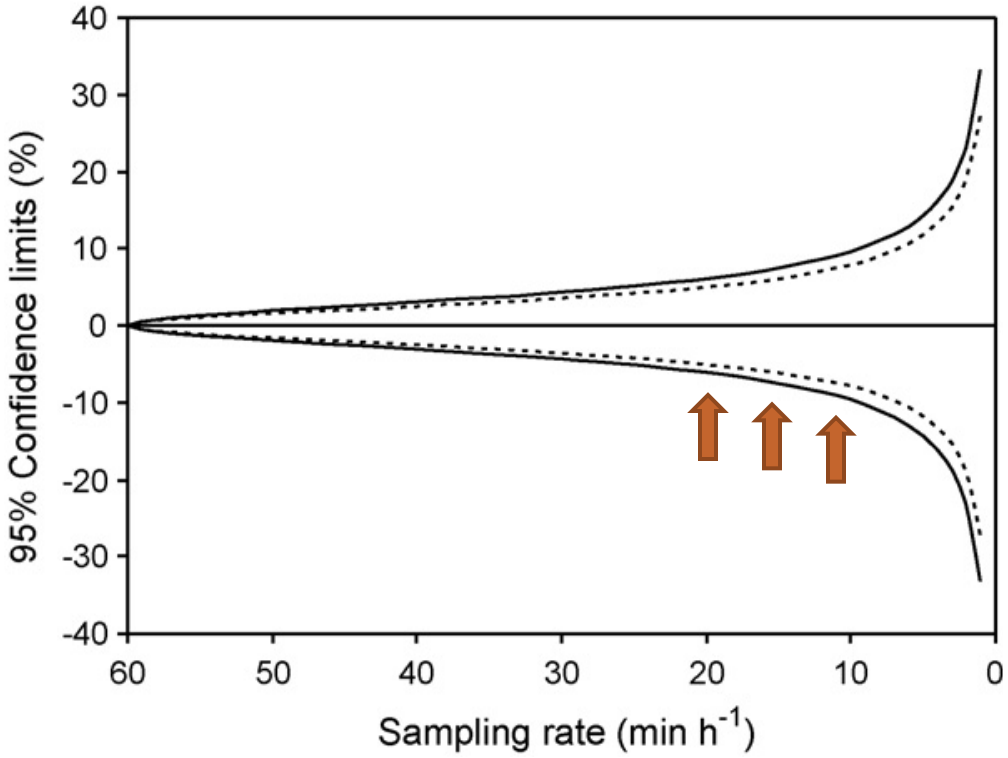
Sub-Sample of Larger Populations

- Temptation is to conduct a total census.
  - However a total census is not practical and is not the best use of staff time.
- Sub-sampling temporally allows for:
  - An estimate of escapement.
  - Calculation of confidence intervals on the escapement estimate.
  - Evaluation of sub-sample size (number of minutes).

Uncertainty Related to Subsampling Effort

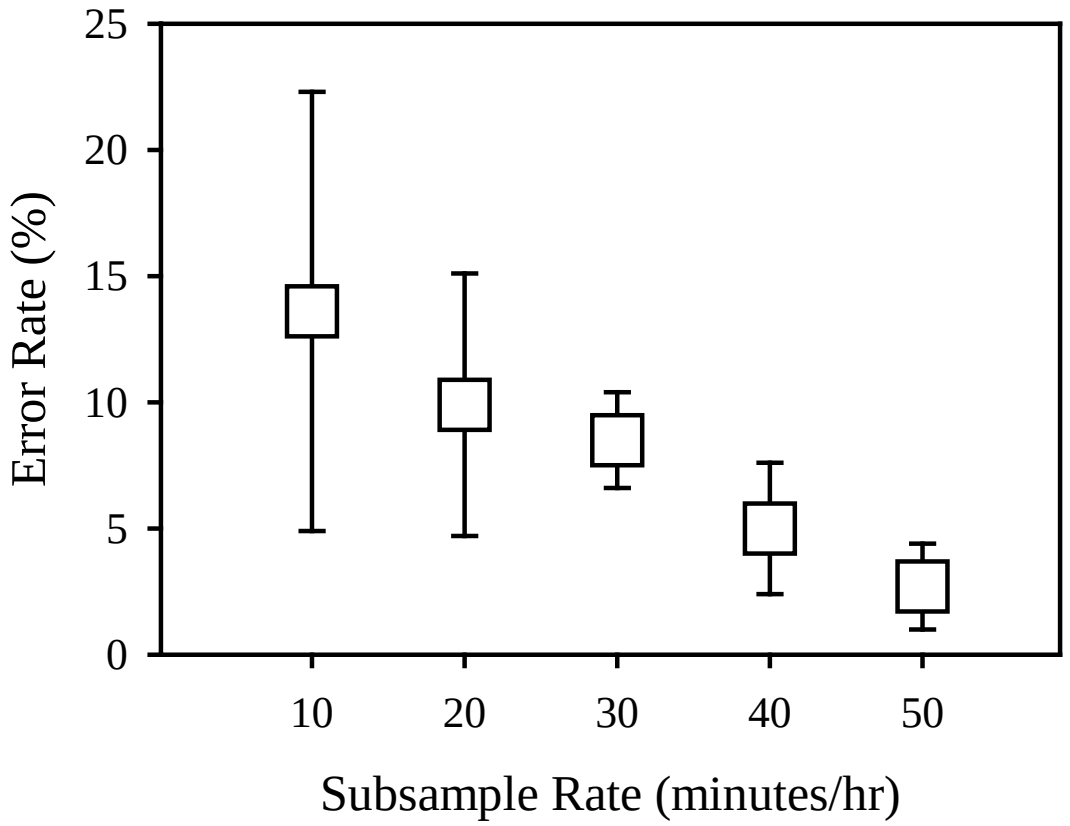
Confidence intervals for total fish passage estimated from different sampling rates.

Lilja et al. (2008). Fisheries Research 90:118-127.

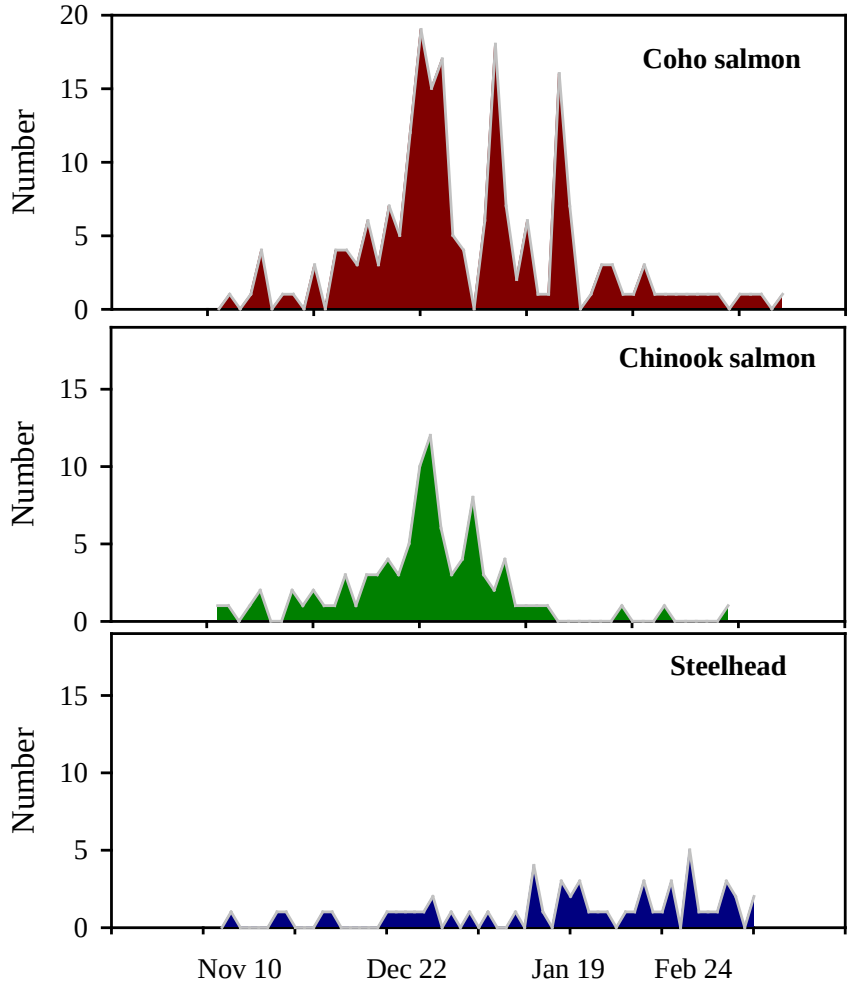


Our Redwood Creek Experience

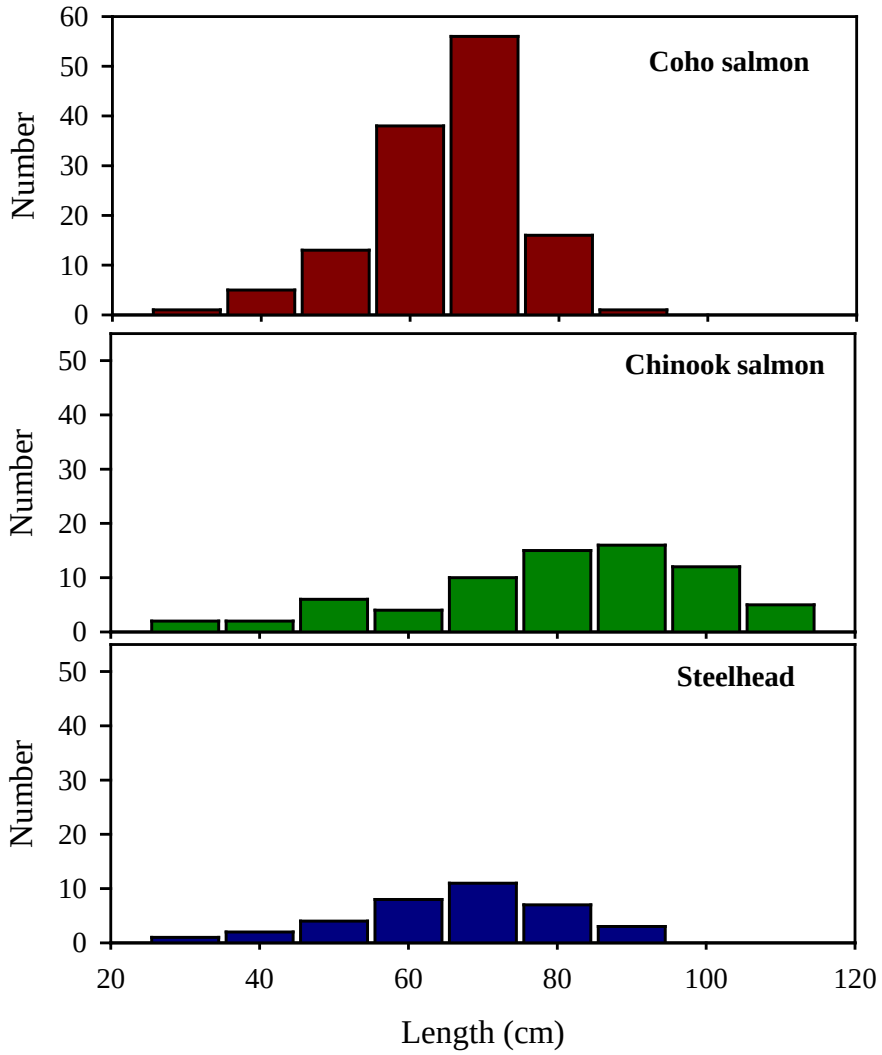
Subsample Size & Error Rate in Redwood Creek



Run Timing in Redwood Creek



Size Distribution on Redwood creek



Estimated Escapement to Redwood Creek – 2009/2010

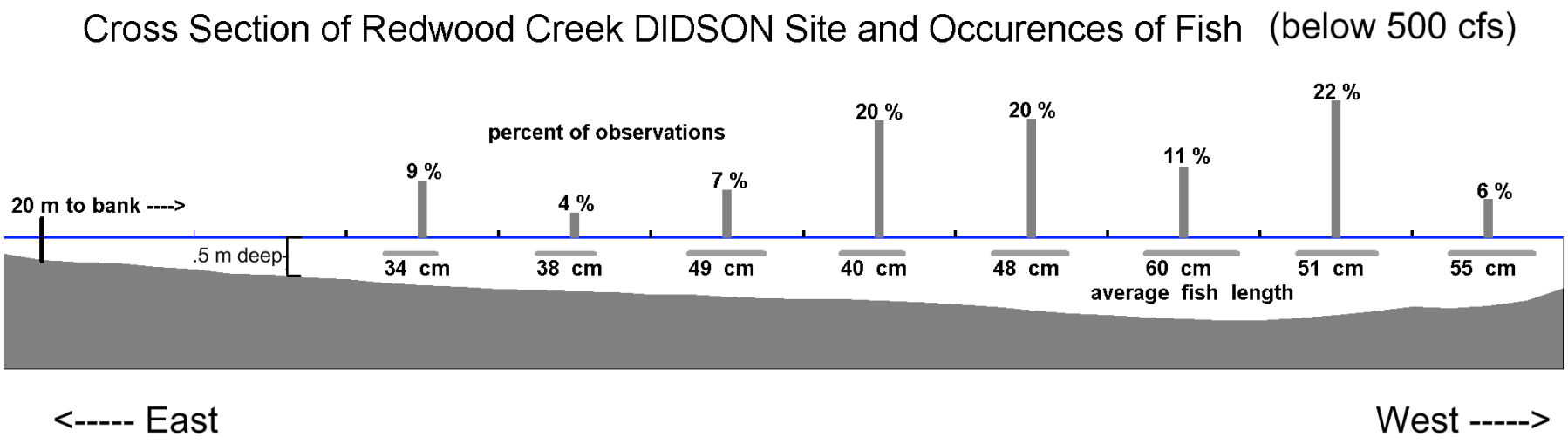
Species	DIDSON	Redd Surveys[1]
Coho salmon	368	382
Chinook salmon	2,444	520
Steelhead	550	436

Redd survey data are from Ricker's (2011) estimate of redd numbers using simple random sample method and assuming 2 fish/redd.

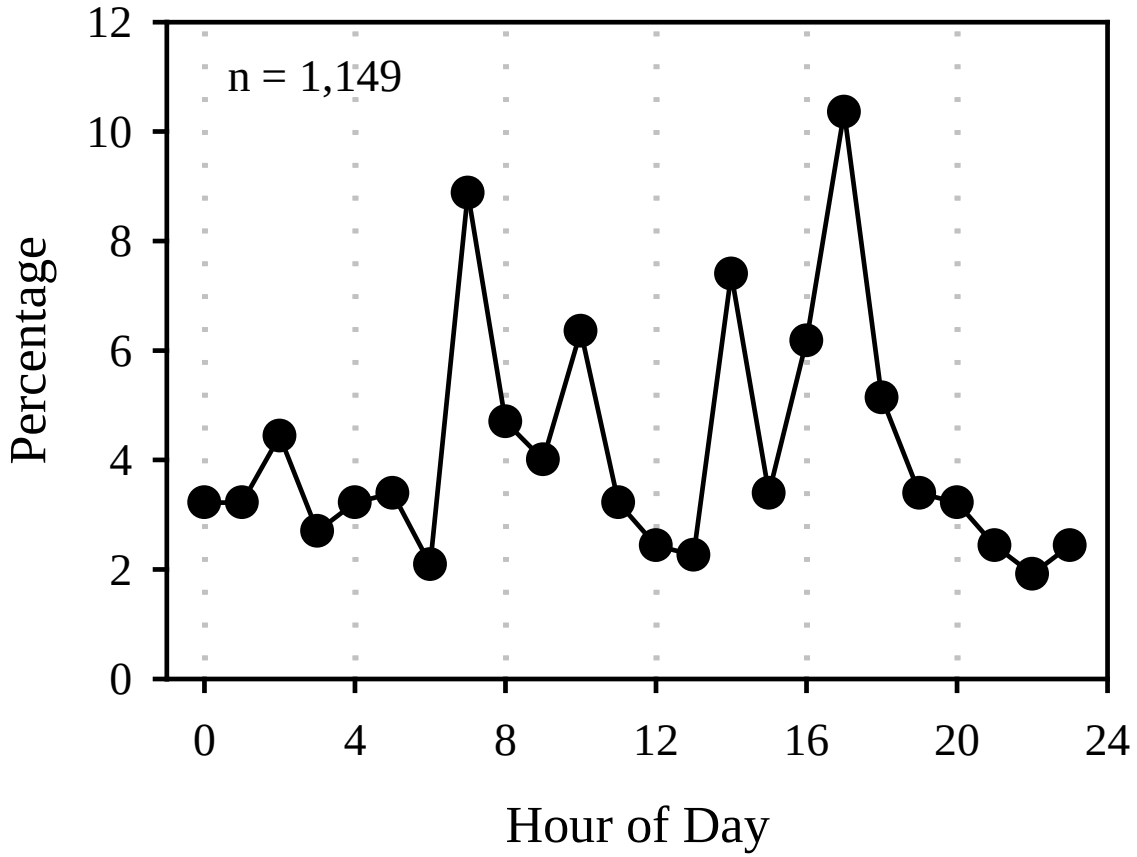
Comparison of DIDSON AND Live Fish Survey Estimates of Escapement to Redwood Creek

Method	Coho		Chinook		Steelhead	
	2009/10	2011/12	2009/10	2011/12	2009/10	2011/12
Logistic model (individual assign)	321	1040	2488	1,216	12	130
Logistic model (sum probability)	490	788	2,318	1,433	12	165
Survey interval	368	456	2,444	1,842	8	88
Normalized distribution	314	928	2,500	1,300	6	158
Spawning survey live fish observed	33	172	99	283	38	33

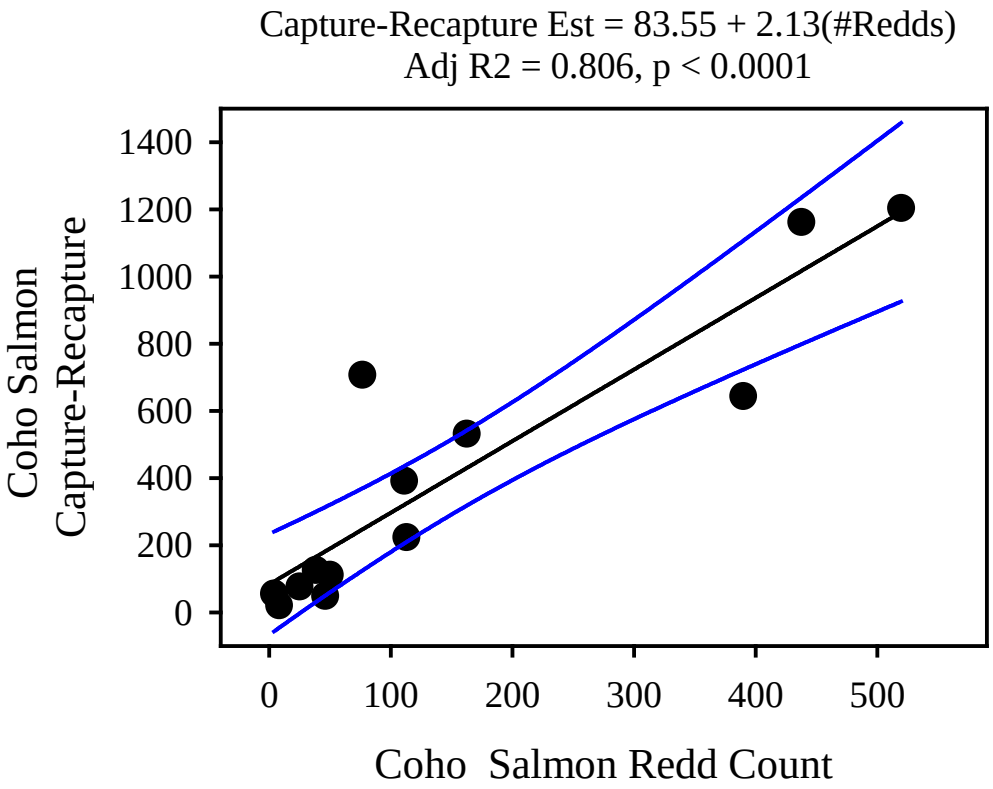
DIDSON


Cross Section of Redwood Creek DIDSON Site and Occurences of Fish (below 500 cfs)
percent of observations
20 m to bank ---->
.5 m deep
9 %
4 %
7 %
20 %
20 %
11 %
22 %
6 %
34 cm
38 cm
49 cm
40 cm
48 cm
60 cm
51 cm
55 cm
average fish length
<----- East
West ----->

Temporal Migration in Redwood Creek, Nov. 2009 – Jan. 2010

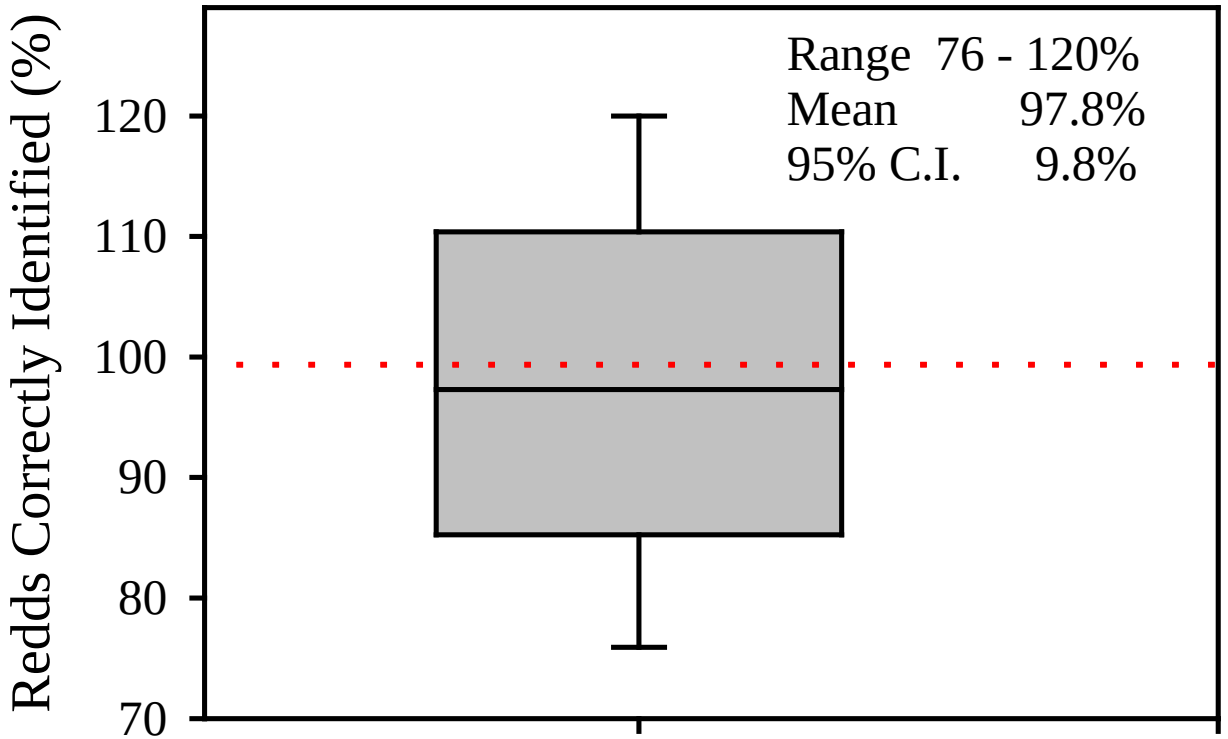


Relating Redd Counts to Escapement



Data source: Gallagher et al. (2010) NAJFM 30:1086-1097.

Correct classification of redds

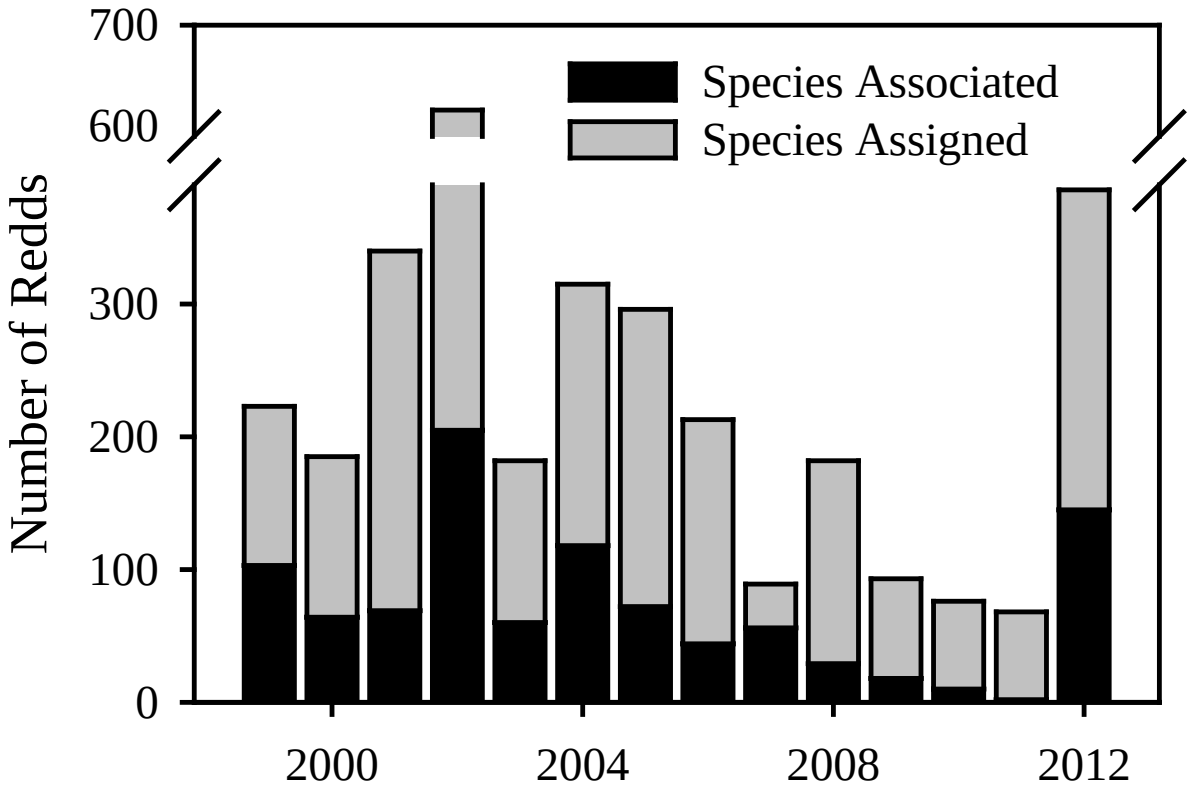


Positive association of redds with fish species

Species associated with redds

Avg 28.7 ± 8.0%

Range 3 – 63%



Conclusions

- There is uncertainty in escapement estimates from both redd counts and DIDSON.
  - Modeling required in both methods.
  - Weather can limit both methods, but more so for redd surveys.
- DIDSON can produce reliable escapement estimates for species.
- DIDSON can be cost effective.

Discussion and Questions