

# Lower Yuba River salmonid redd surveys: 2008 pilot study results

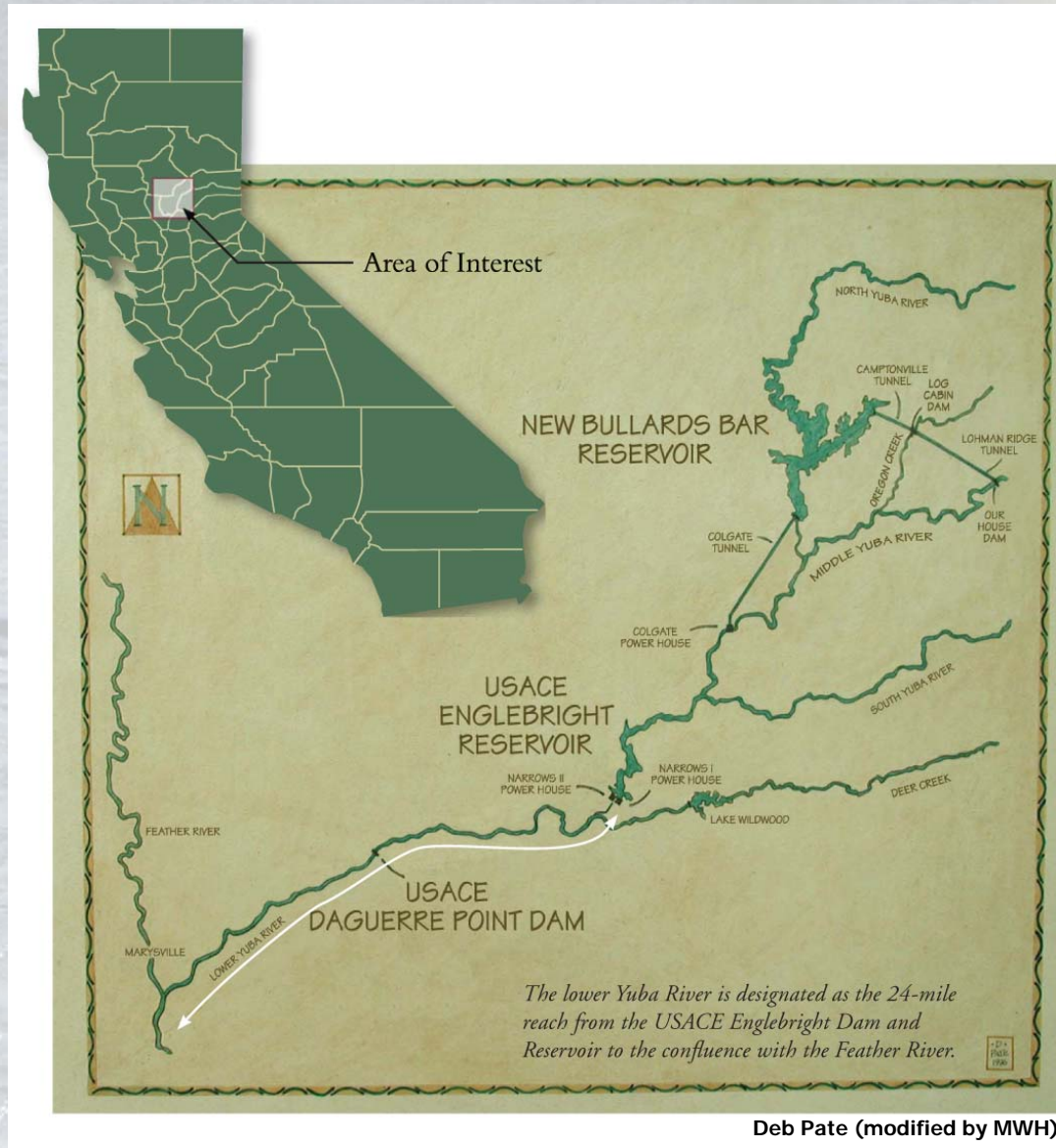
July, 7<sup>th</sup> 2009

Colin Purdy - PSMFC

Lower Yuba River Accord Fisheries Research

# Today's Presentation

- Overview
- Goals and data needs
- Methods compared and QAQC
- Conclusion and preliminary findings
- Next steps



# Lower Yuba River Pilot Redd Survey

- Goal: Develop annual survey => Influences of flow, temp, & flow fluctuations on spawning activity
  - Spring, fall, & late-fall runs of Chinook (*O. tshawytscha*)
  - Steelhead trout (*O. mykiss*)
- Data collection needs:
  - Spatial and temporal habitat usage
  - Run timing
  - Superimposition
  - Substrate utilization
  - Relative abundance

A necessary component of monitoring is sampling in a statistically valid and representative manner (Williams 1978)

# Redd surveying methods (Background):

Methods: strengths & weakness

- Ground surveys:
  - Index area
    - Surveyed intensively
    - Index of run timing, relative abundance, etc.
    - Trend information
  - Single/multi pass
    - Evaluate number and distribution redds
- Aerial photography:
  - Lasting record
  - Cover large areas
  - GIS analysis
  - Equal effort

There are numerous sampling strategies, each with a unique set of strengths and weaknesses that can affect the accuracy and precision of parameter estimates. Therefore, determining which strategy is optimal for a given application is important, because it affects the power of the results and project costs (Courbois et al. 2008).

# Pilot year surveying approach:

- Complication: Counting every redd in large watersheds can be prohibitively expensive if not impossible.
  - Statistical power
  - Surveyor bias
  - Fish/redd
  - Abiotic conditions (weather, turbidity, light, geographic size, vertical relief etc.)
  - Vegetation

Fish per redd values can vary by year, by stream, by survey area (index versus extensive area), and method used in the calculation (Kucera and Orme 2006).

- Methods Implemented:
  - Aerial Photography
    - Redd count on entire river
  - Extensive Area Single Pass Ground Surveys
    - Redd count on entire river
    - Redd attributes
  - Indexed Area Surveys
    - Investigate superimposition
    - Frequent surveys
    - Redd attributes



# Method 1: Aerial Photography

- Photo based redd survey
  - Redd count for each reach
  - QAQC
    - Blind comparison by three readers to determine accuracy of count
    - Abiotic conditions: midday, weather, and NTU



# Method 2: Single Pass Redd Surveys

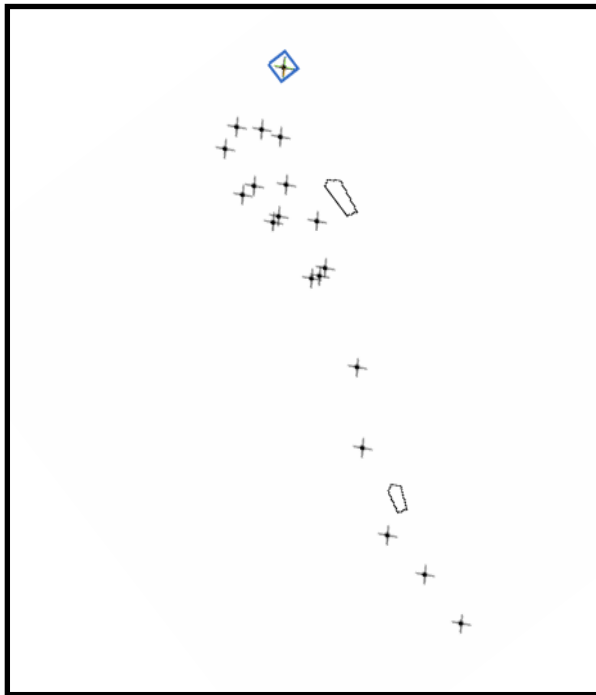
- Survey approach:
  - Kayak based extensive area survey
- Data collection:
  - Redd count
  - GPS
  - Substrate
  - Fish observed
  - QAQC

Track Logs for extensive single pass redd survey

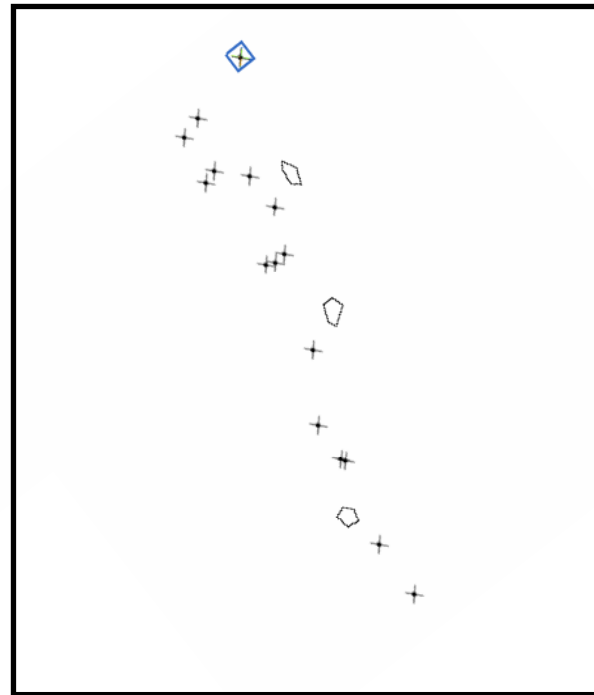


# Blind surveyor comparison

- Evaluate survey crews
- Refine protocols
- Redd detection probability w/ habitat type



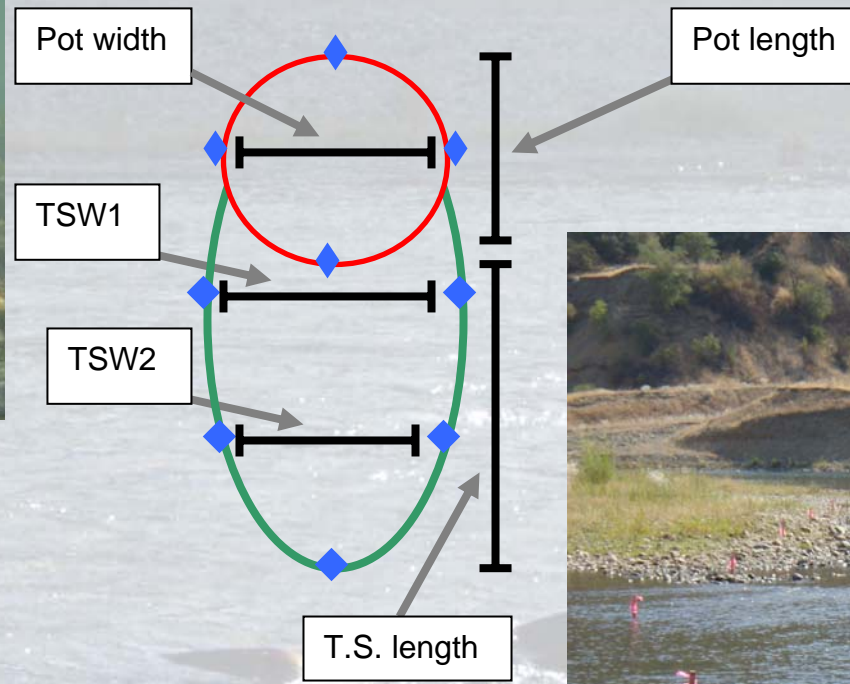
**Survey Team 1**



**Survey Team 2**



# Method 3: Index Area Survey



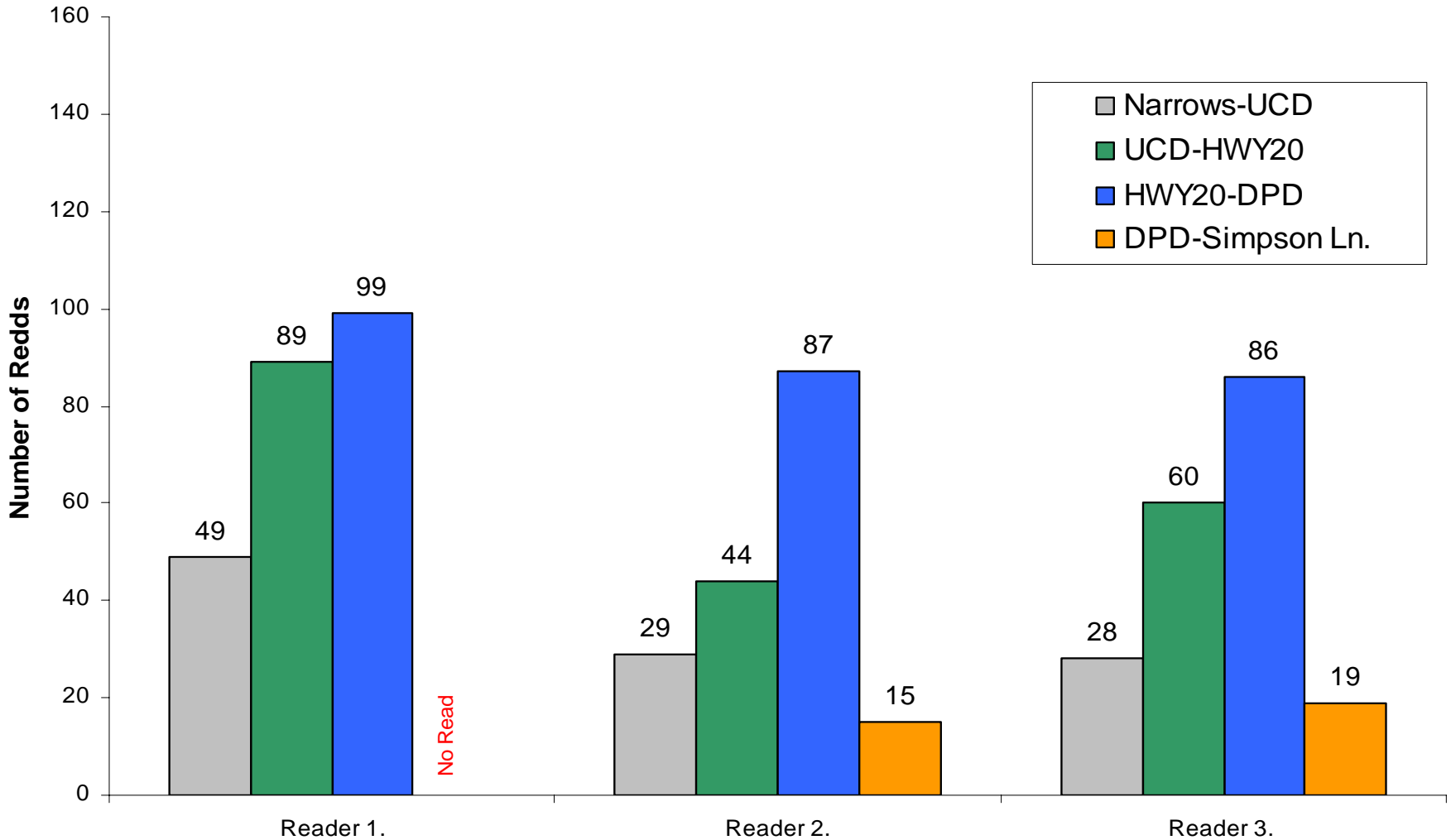
## Data collection:

- Redd count
- GPS redd
  - Superimposition
- Redd attributes:
  - Average width, length, and depth
  - Substrate



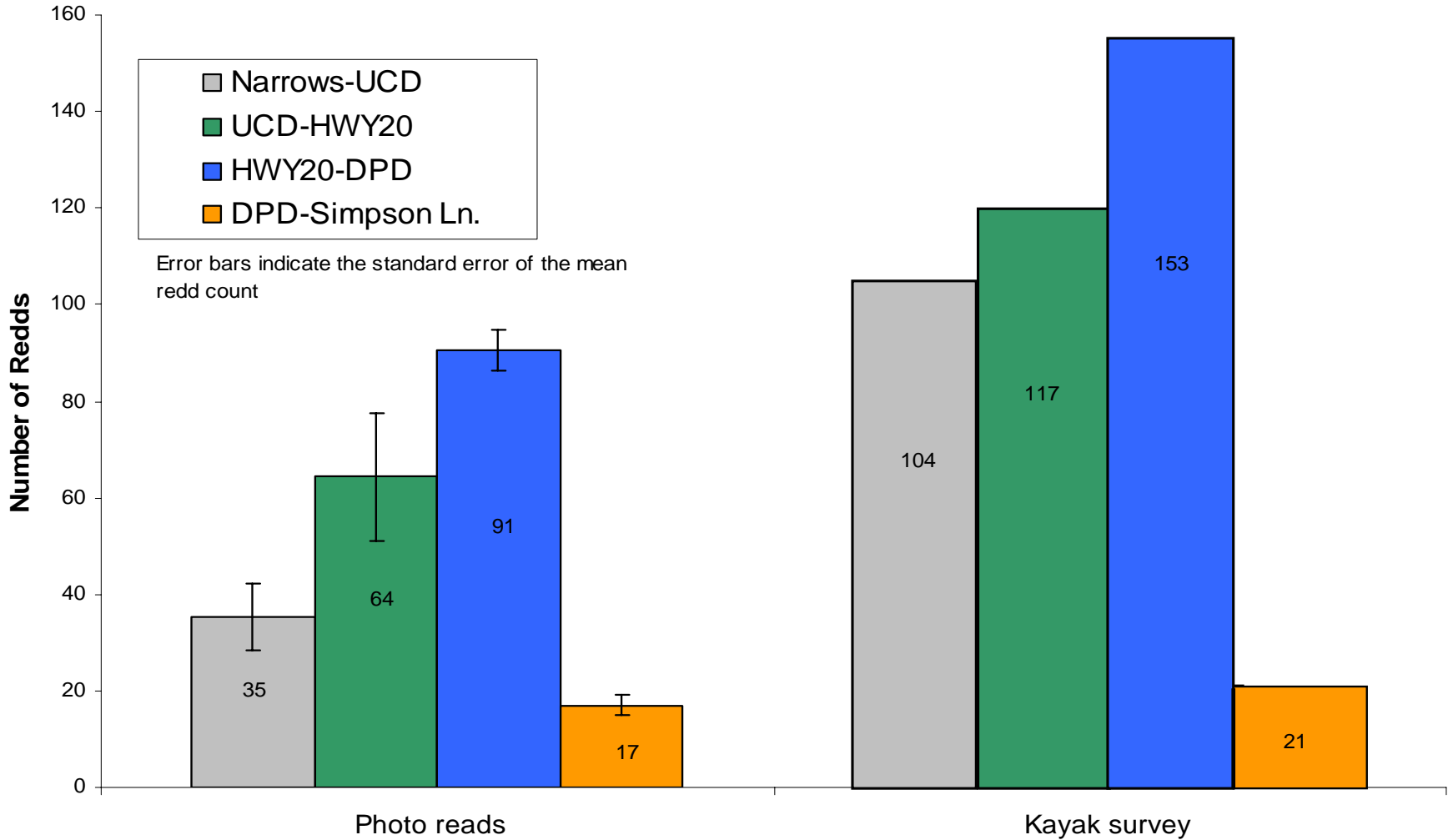
# Aerial vs. Extensive Area Comparison:

October 6th Aerial Photographic Redd Survey: Count comparison between readers



# Aerial vs. Extensive Area Comparison:

## October 5-9 Redd Survey Comparison: Mean photo reads to kayak redd counts

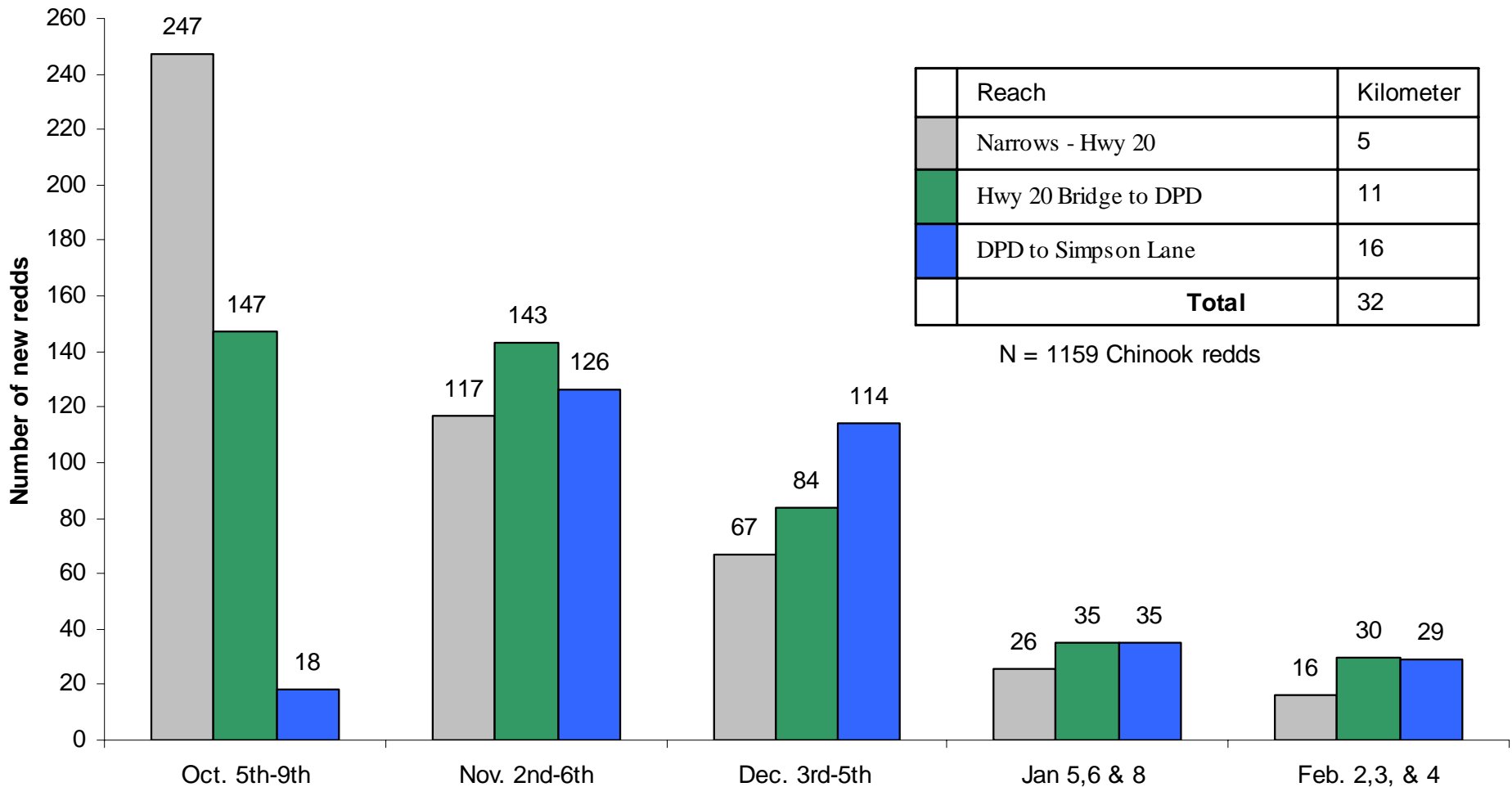


# Conclusion: Comparing Methods

- Combining ground surveys: Most effective
  - Kayak based extensive area single pass surveys
    - Spatial & temporal habitat usage
    - Redd counts
  - Index area surveys
    - Superimposition
    - Track run timing
    - Redd attributes
  - Combined datasets
    - GIS => habitat usage & superimposition
    - Attributes data => refine redd count
  - Aerial Photography => discontinued
    - Ability to count redd
    - Cost => \$6275/flight + orthorectify & GIS analysis

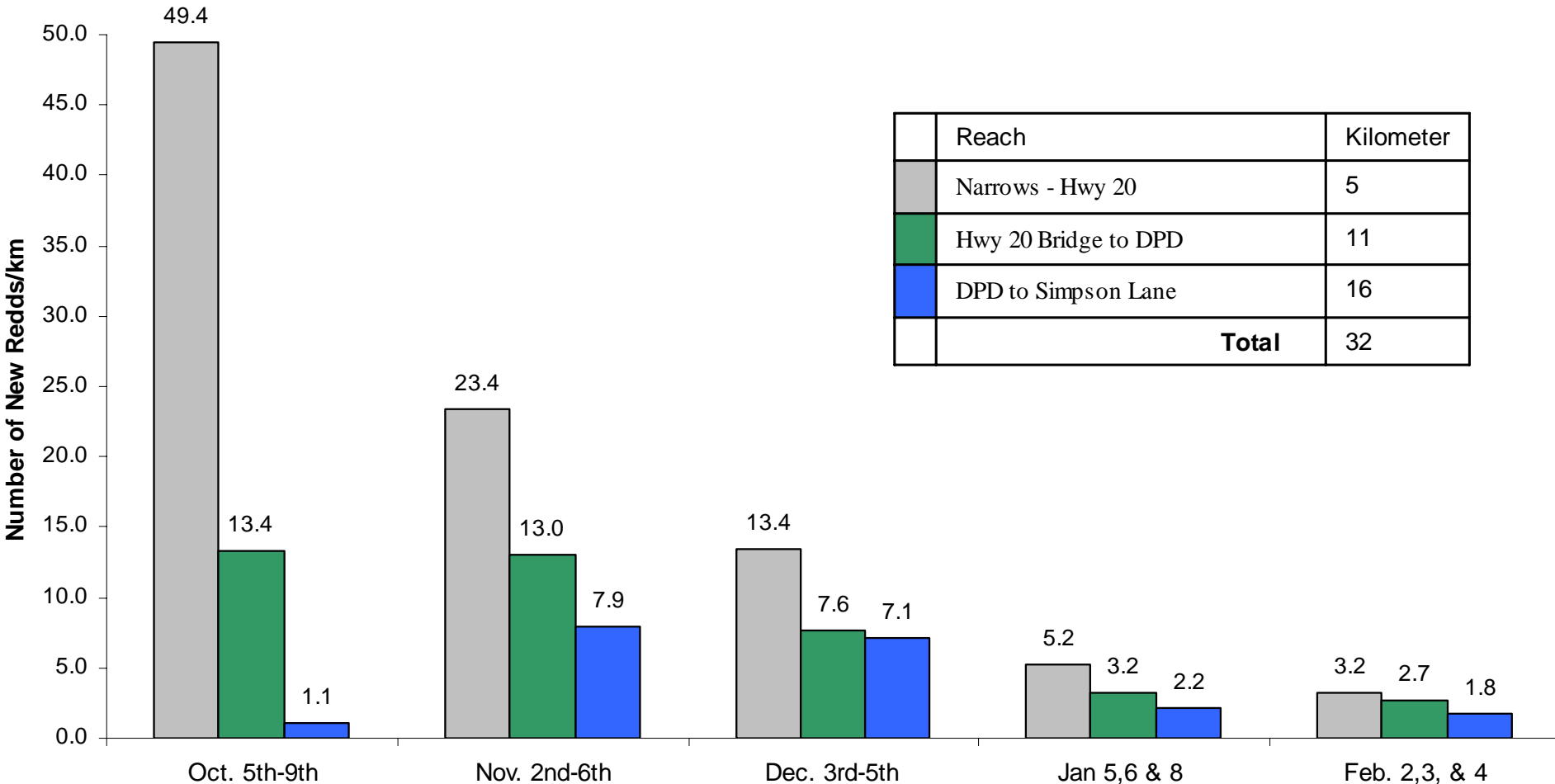
# Preliminary Surveys Results:

Lower Yuba River Extensive Area Single Pass Redd Survey: Temporal/Spatial Chinook Redd Construction



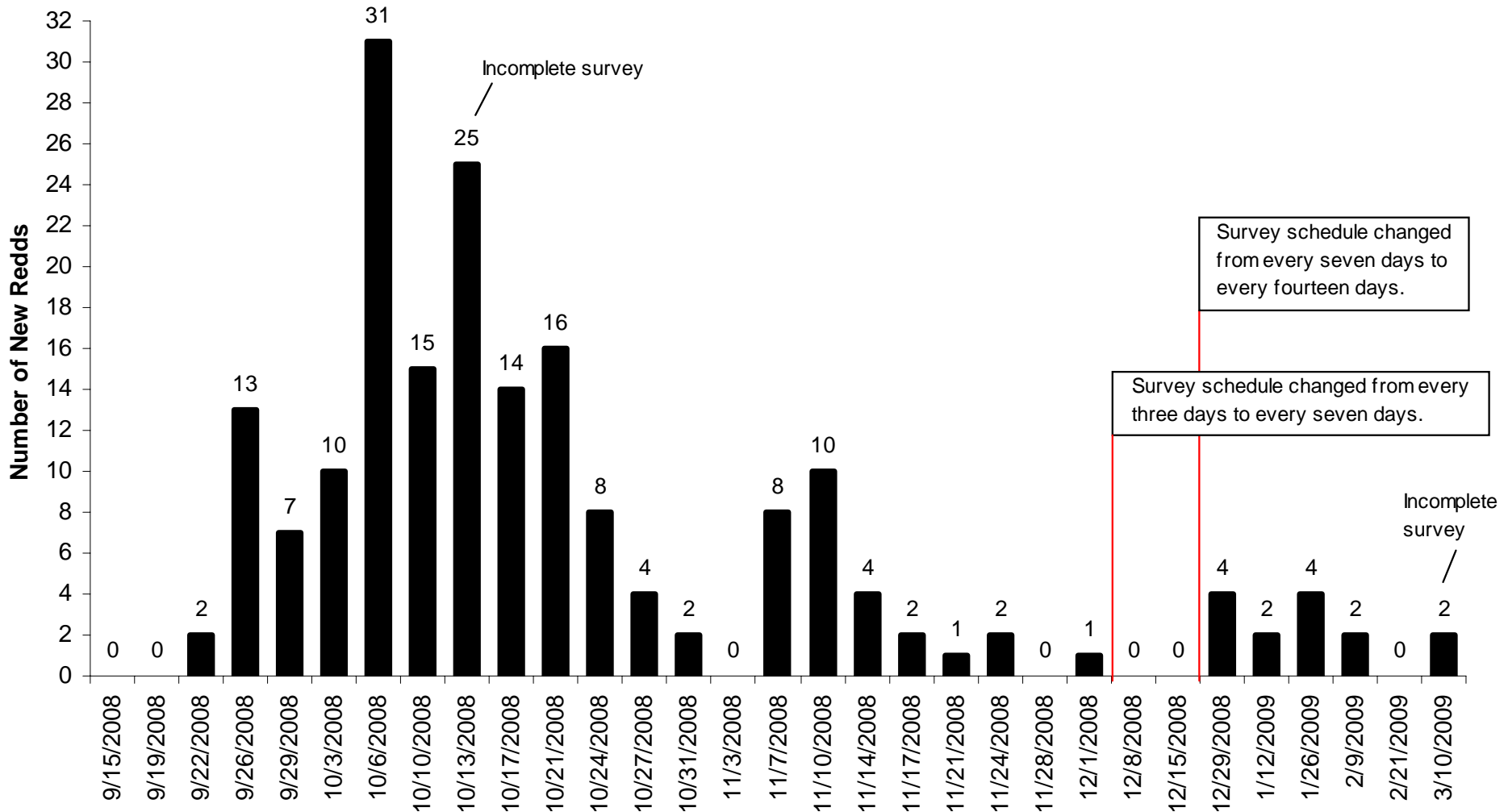
# Preliminary Surveys Results:

Lower Yuba River Extensive Area Single Pass Redd Survey: Mean Number of Redds Per Kilometer



# Preliminary Results Continued:

## Lower Yuba River Index Area Redd Survey: Number of Newly Constructed Chinook Redds





# Next Steps?



- Data analysis:
  - Statistically address redd counts & attributes
  - Flow, temp, & fluctuation correlations
  - GIS analysis
    - Temporal & spatial habitat usage => run & species
    - Overlay redds on hydrodynamic modeling
    - Superimposition
  - Fish/redd values
    - Redd count => carcass survey & electronic passage monitoring above DPD
- Develop annual survey:
  - '08 results & M&E data needs => design
    - Changes
      - Survey timing & frequency
      - Survey reaches/locations
      - Spr-run habitat usage => redd survey & acoustic tagging





# Acknowledgements:

- Lower Yuba River Management Team
- Yuba River PSMFC staff
- CDFG



- **Title: Lower Yuba River salmonid redd surveys: 2008 pilot study results**
- **Author:** Colin Purdy, MS. PSMFC Fishery Biologist - Yuba River Program. Address: 2545 Zanella Way, Suite F Chico, Ca. 95928. Office: 530-895-5522. Cell: 530-519-4313. Fax: 530-895-5031. E-mail: [cpurdy@dfg.ca.gov](mailto:cpurdy@dfg.ca.gov)
- **Presenter: Colin Purdy**
- **Abstract:** Redd surveys represent a powerful tool in examining the spawning behavior of Chinook salmon and steelhead trout. To examine how Accord mandated flows affect spawning behavior on the lower Yuba River three redd surveying techniques were implemented. This was done in part to identify the most appropriate and effective method of long-term monitoring. Data collection goals by species and run included temporal and spatial habitat usage, relative abundance, and superimposition. Surveying methods examined were aerial photography, extensive area single pass ground surveys, and index area surveys. GPS and GIS technologies were incorporated to increase data precision. This allowed for area measurements to be calculated as well as newly constructed redds to be sequentially displayed in GIS layers. To account for abiotic conditions data was collected on weather, river flow (CFS), and turbidity (NTU). On the lower Yuba River, the probability of detecting redds was found to be higher using ground based surveys as compared to aerial photography. Additionally, index area and extensive area single pass surveys when used in conjunction were found to be the most reliable and effective means of data collection. Index area surveys were used primarily to examine attributes specific to each redd, timing of spawning, and levels of superimposition. Extensive area single pass surveys conducted by kayak were primarily used to document temporal habitat usage throughout the lower Yuba River. Preliminary survey results suggest spring-run Chinook salmon to be both temporally and spatially separated from fall/late-runs. Preliminary results also show Chinook salmon to heavily utilize specific areas of the river resulting in redd superimposition.
- **Key Words:** Salmonid, Redd, Spawn, Habitat, Superimposition
- **Presentation Preference:** Oral. PowerPoint presentation.