Airborne Contaminants and Amphibian Population Declines in the Sierra Nevada and Cascades Mountains, California

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Las Vegas, NV

Sierra Nevada - Southern Cascades Contaminants Workshop
Three Rivers, CA
April 8, 2009

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Collaborators

- Ed Heithmar – EPA Las Vegas
- Nita Tallent-Halsell – EPA Las Vegas
- Georges-Marie Momplaisir – EPA Las Vegas
- Charlita Rosal – EPA Las Vegas
- Maliha Nash – EPA Las Vegas
- Katrina Varner – EPA Las Vegas
- Lee Riddick – EPA Las Vegas
- Kerri Stanley – Oregon State University
- Staci Simonich – Oregon State University
- Laura McConnell – USDA Agric. Research Service
- Carlos Davidson – San Francisco State University
- Don Sparling – Southern Illinois University

Mortality Event:
Mountain Yellow-legged Frog (*Rana muscosa*)

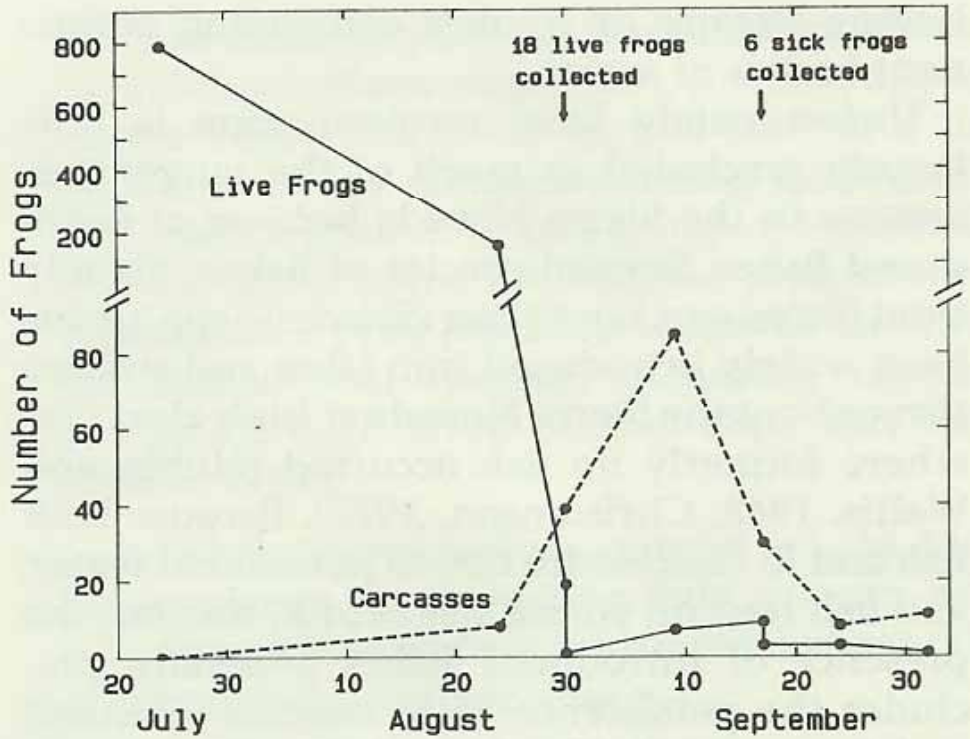
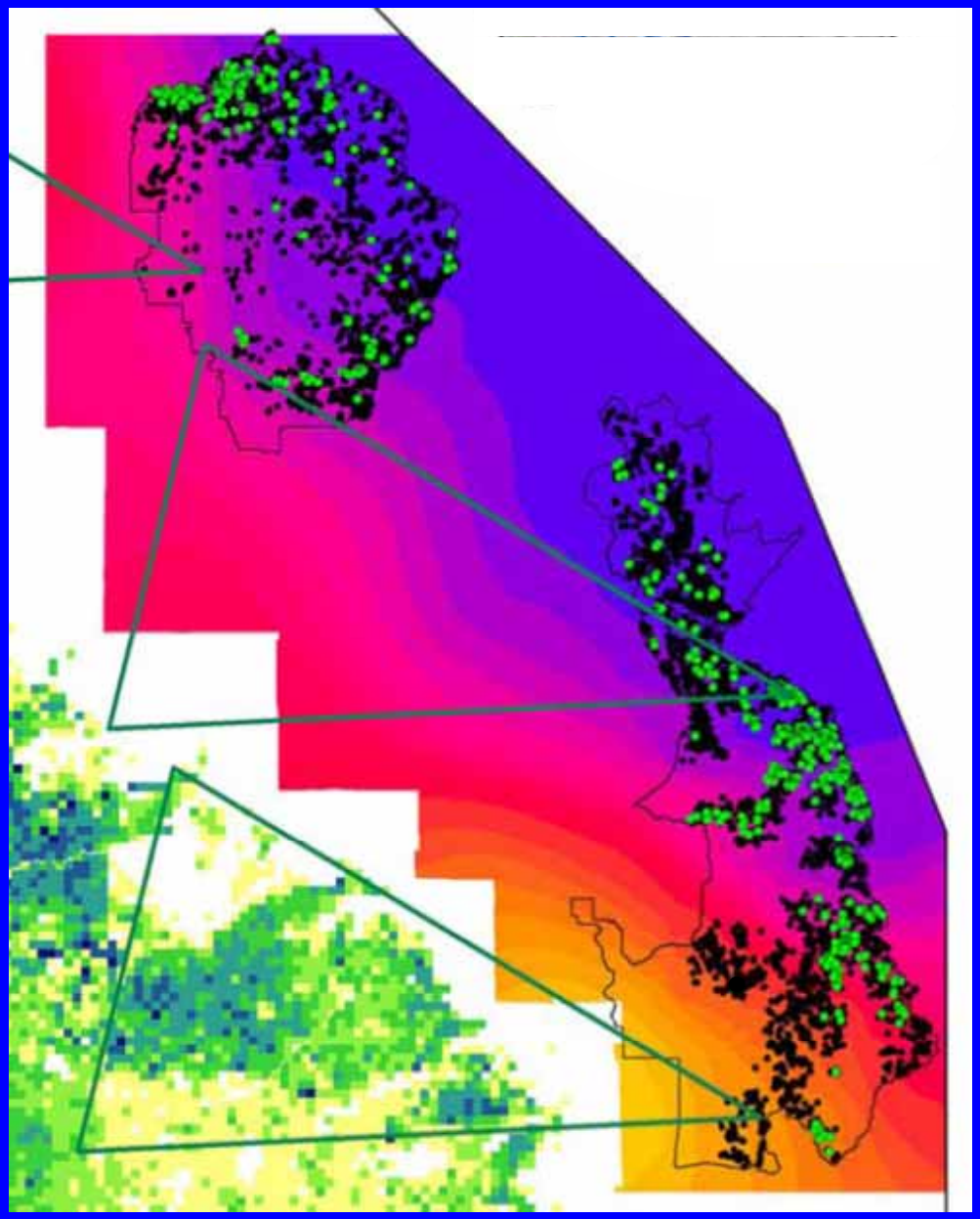


FIG. 1. Numbers of live frogs present and frog carcasses collected in Ridge Lake during summer, 1979.

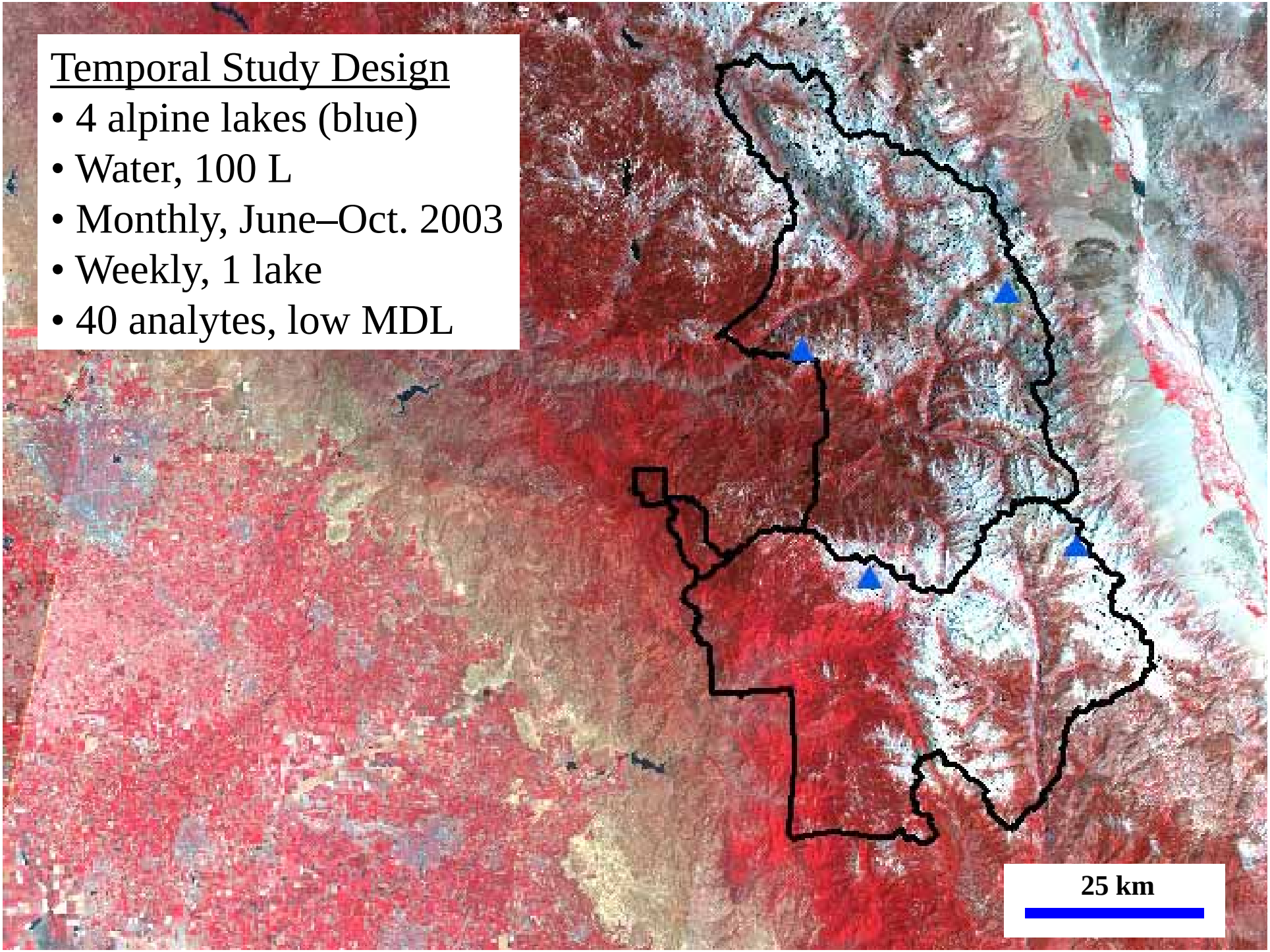
From Davidson & Knapp 2007



- 6800 sites surveyed
- Green dots = MYL Frog present
- Black dots = MYL Frog absent
- Color bands = predicted pesticide exposure
- Exposure signif. related to frog absence
- Chytridiomycosis ongoing

Projects

- SEKI Temporal Study
  - Temporal variation & tracking of pesticide application in San Joaquin Valley
- SEKI Spatial Study
  - Contaminant distributions re. distance from Valley
  - Distribution relative to MYL Frog declines
- YOSE Frog Relocation Study
- East vs. West Cascades Contaminant Distributions
  - Relative to Cascades Frog declines
- Cascades–SEKI Contaminant Distributions
  - Relative to proximity to contaminant sources

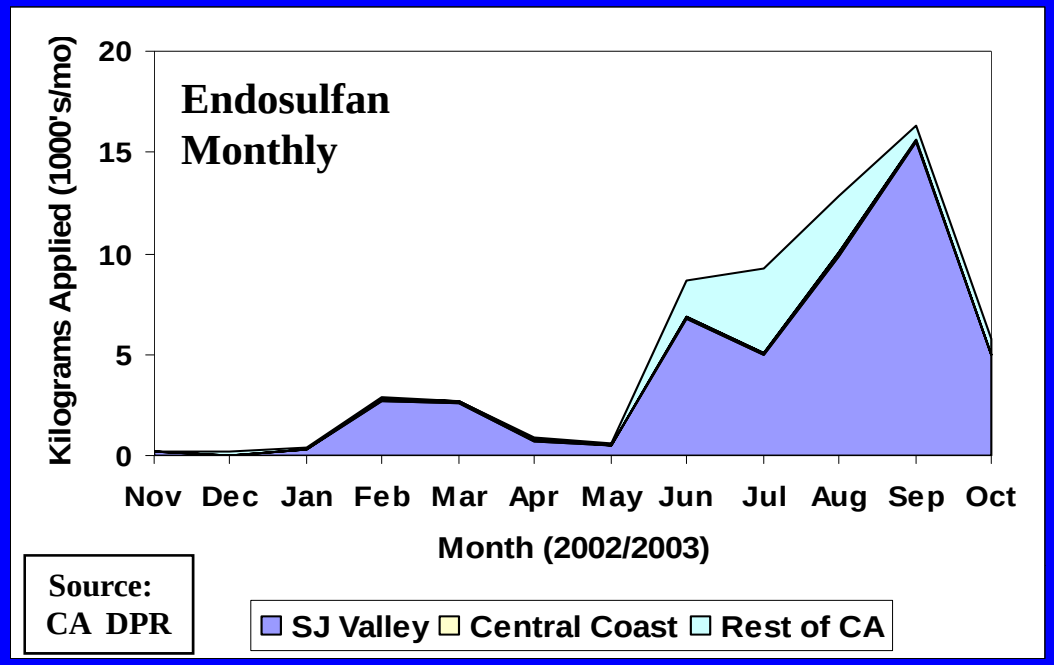

Temporal Study Design
• 4 alpine lakes (blue)
• Water, 100 L
• Monthly, June–Oct. 2003
• Weekly, 1 lake
• 40 analytes, low MDL
25 km

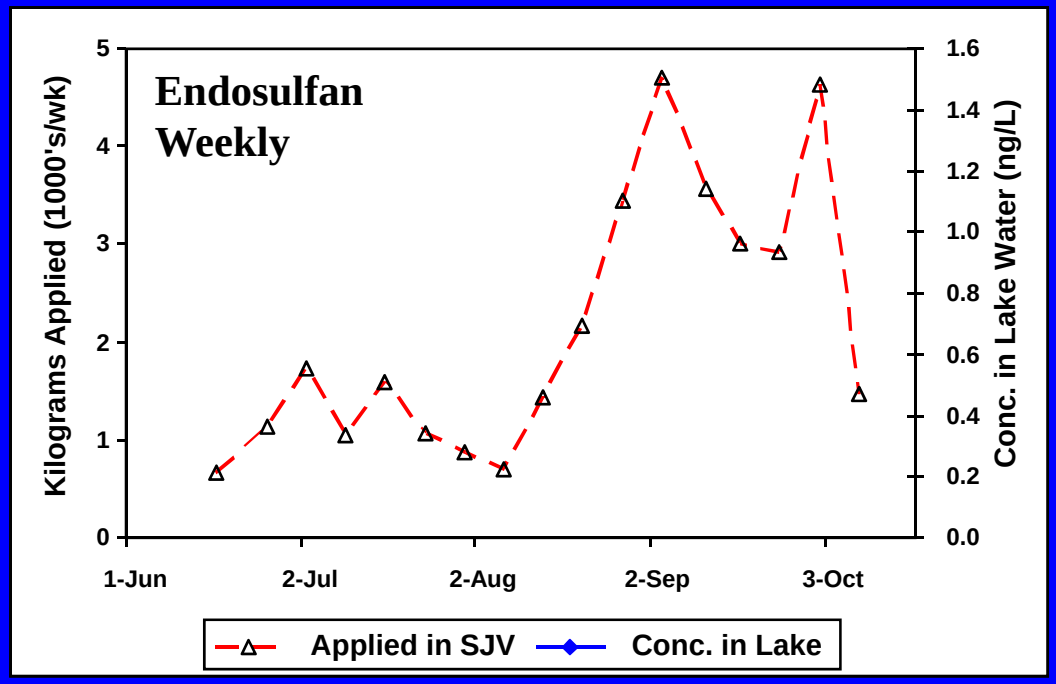
Lakes Sampled

Logistics

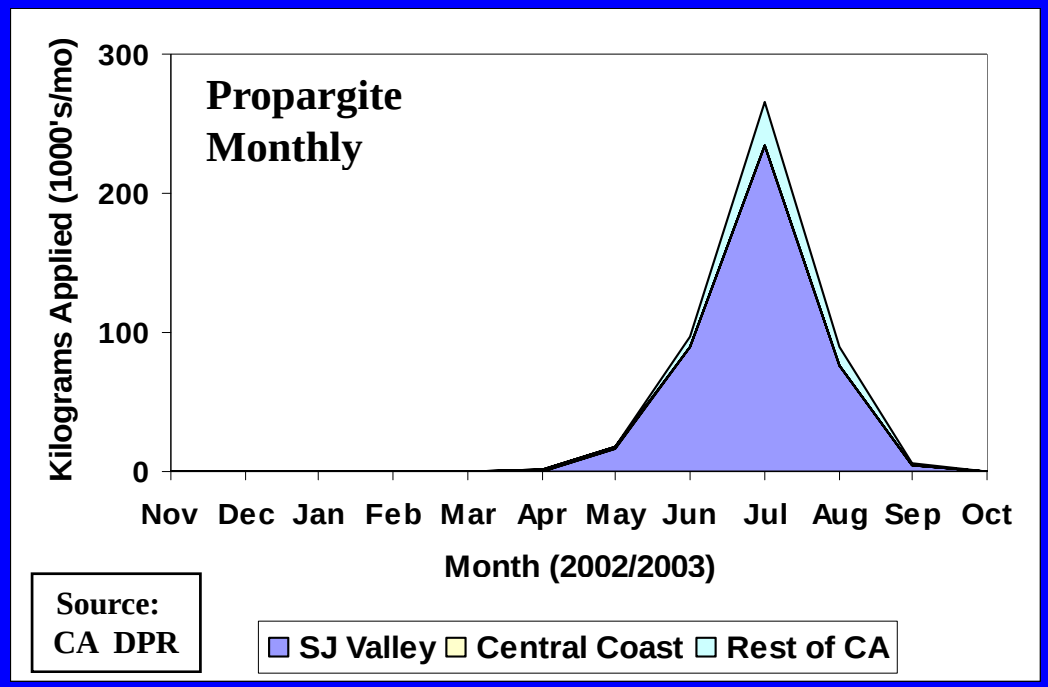
Water Sampling Apparatus

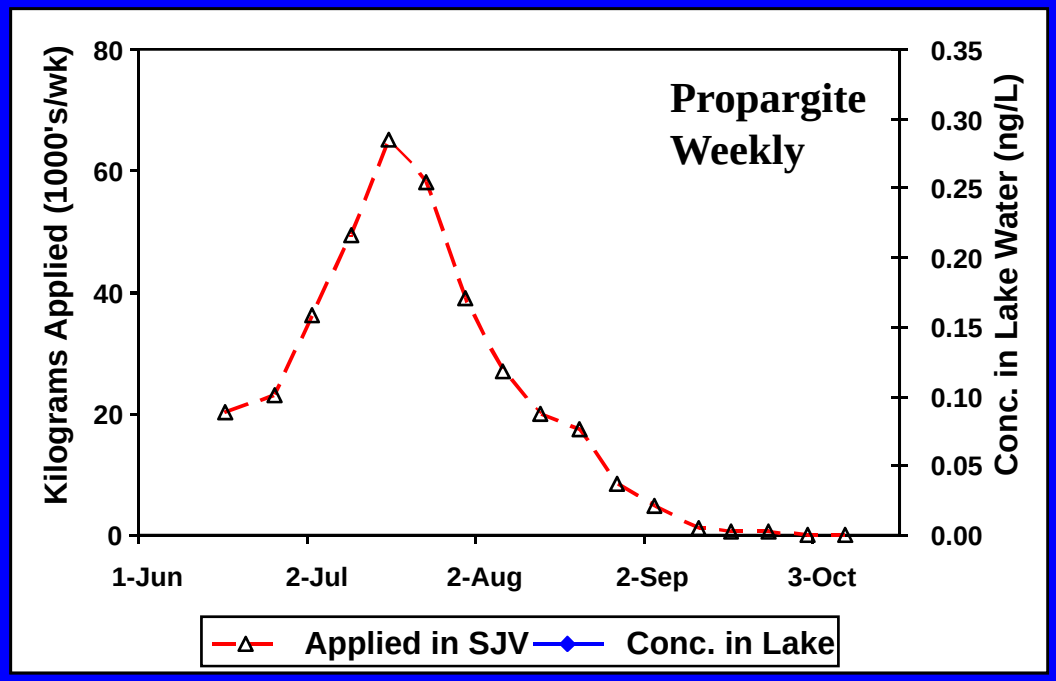
Endosulfan: Application vs. Frog Lake Concentrations



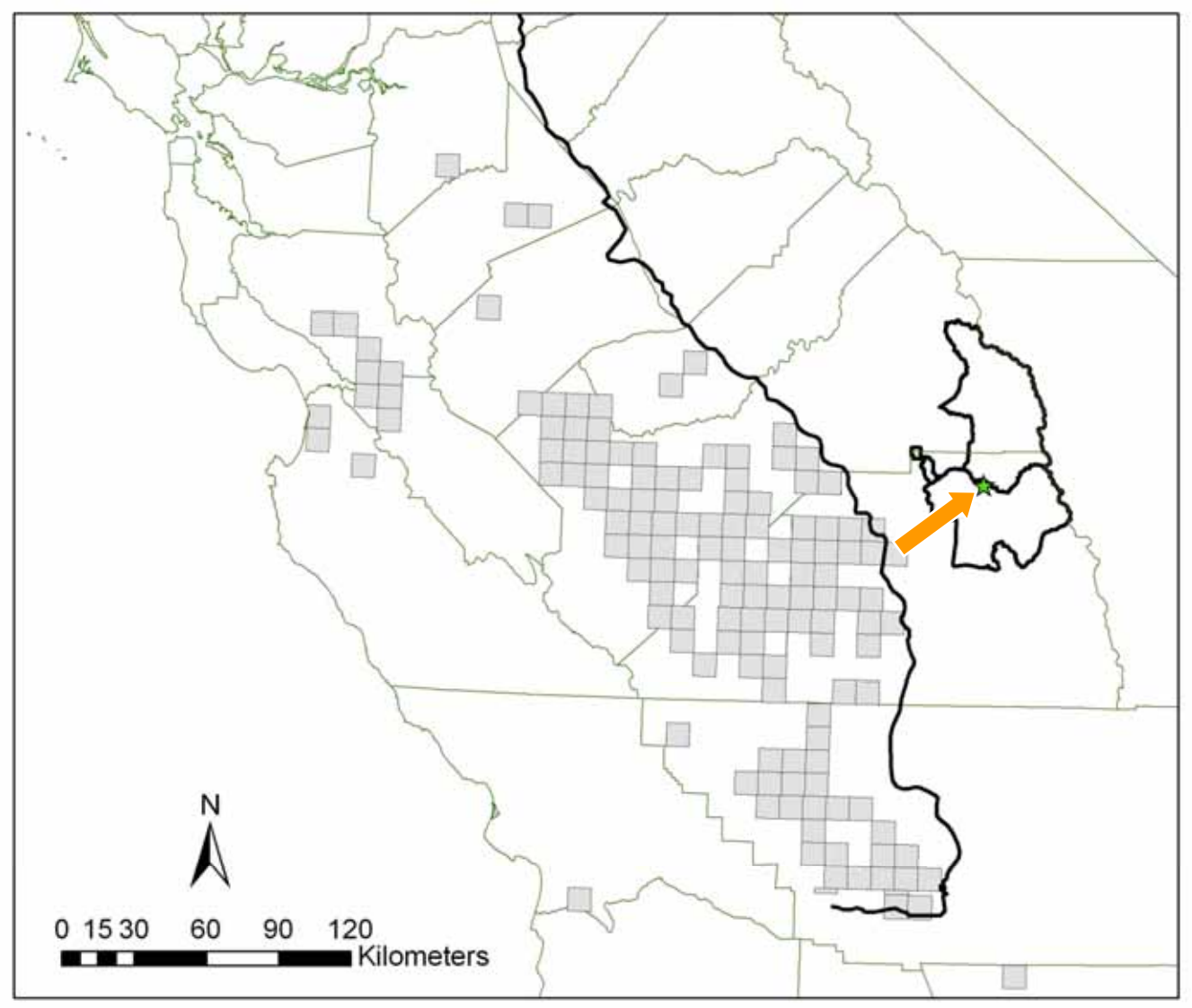


Propargite: Application vs. Frog Lake Concentrations

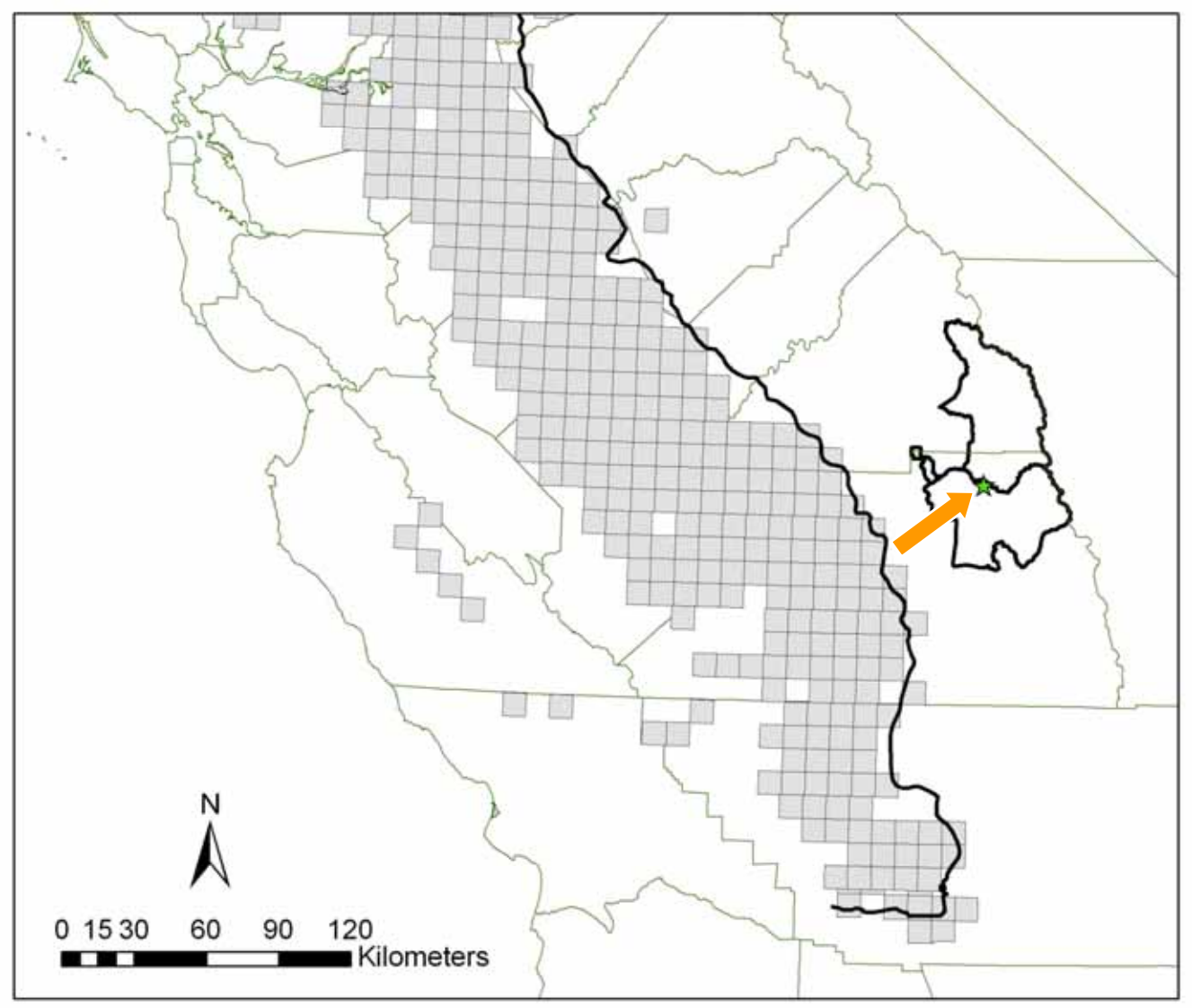




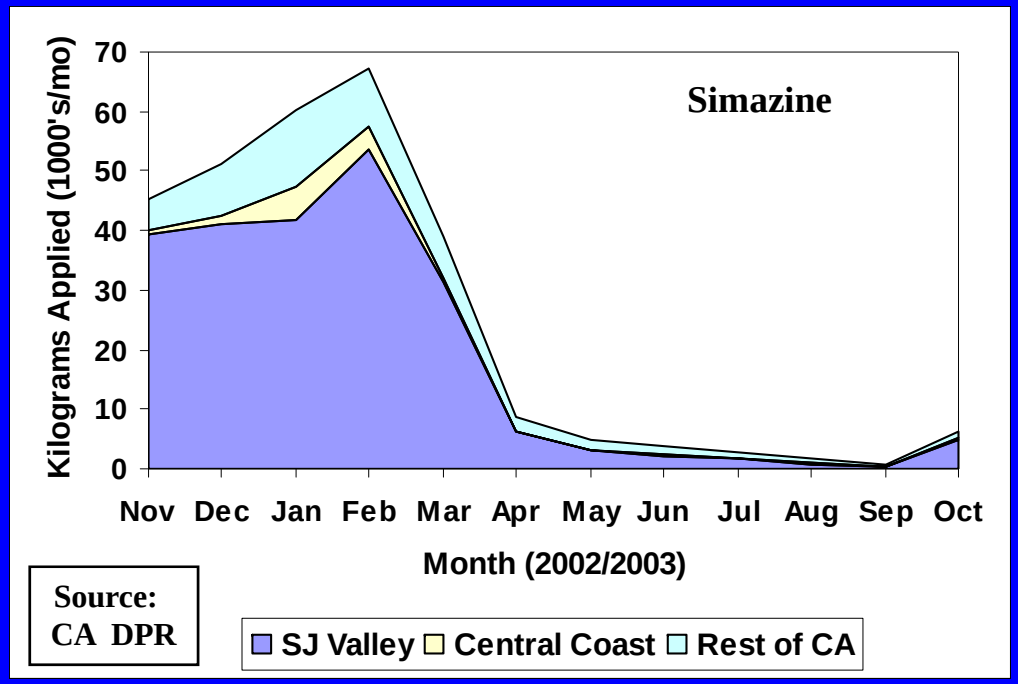
Townships with Endosulfan Use



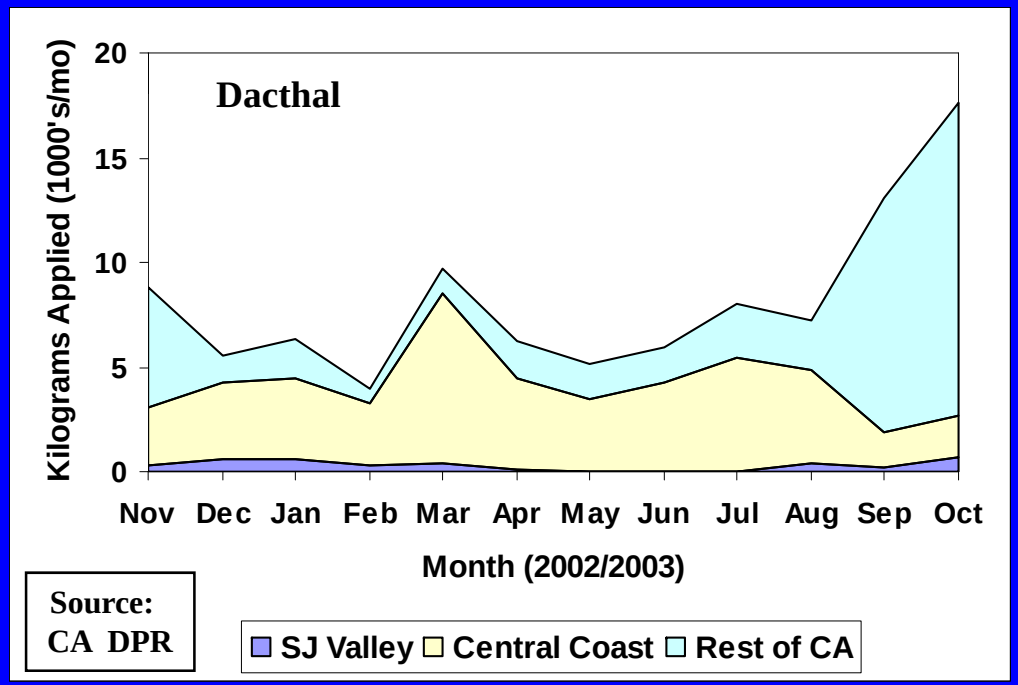
Townships with Propargite Use

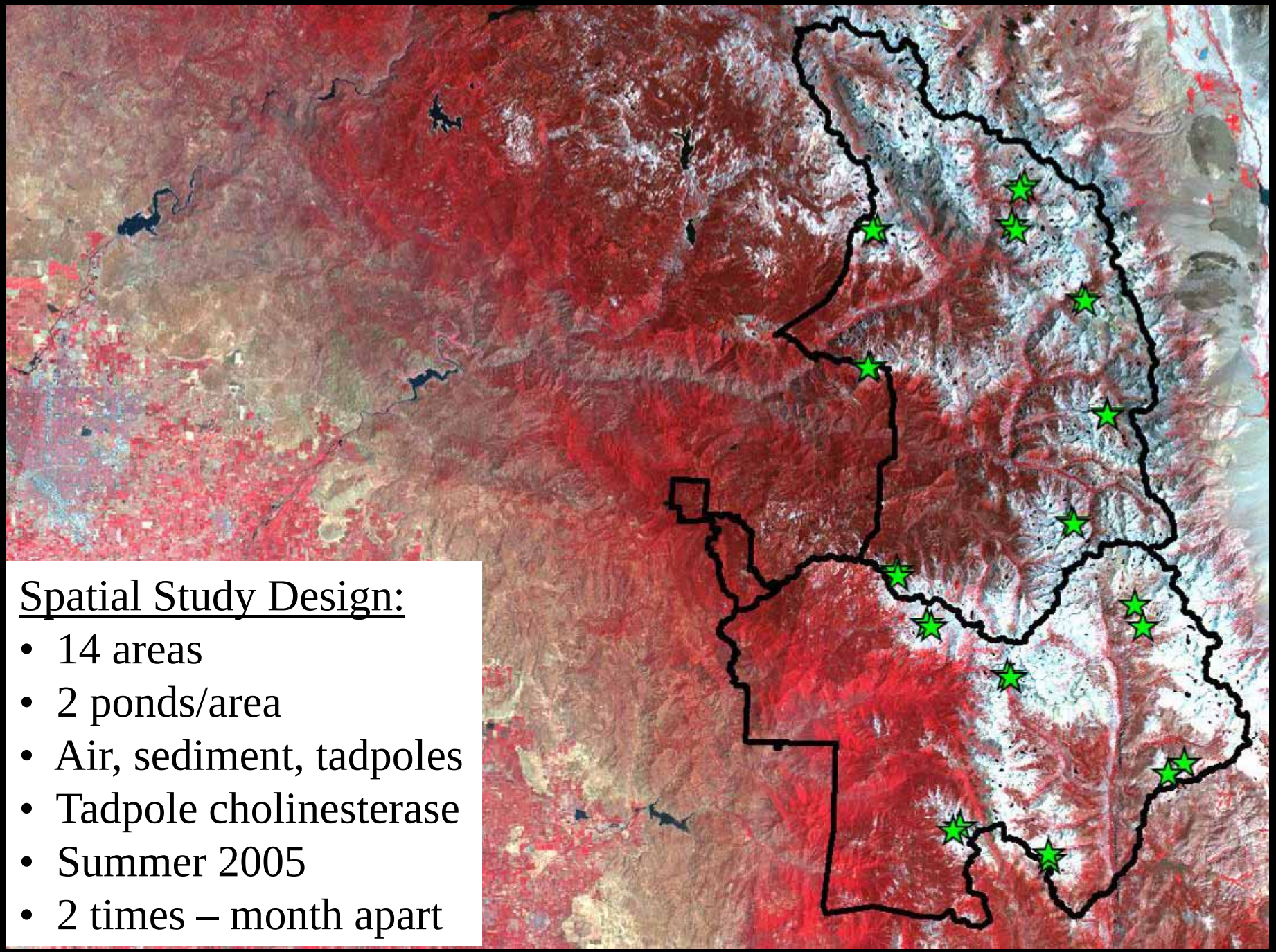


Simazine Application



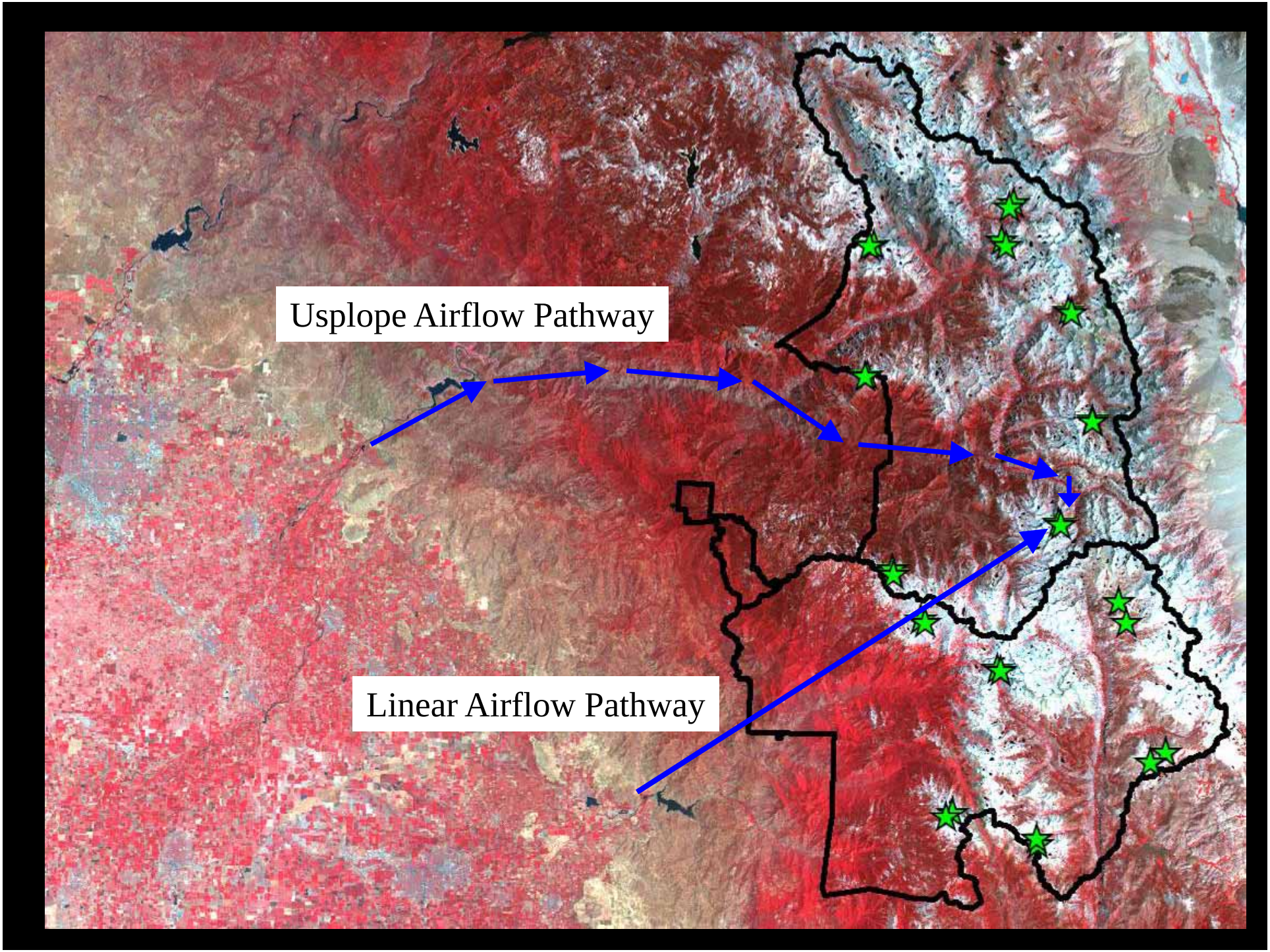
Dacthal Application





Spatial Study Design:

- 14 areas
- 2 ponds/area
- Air, sediment, tadpoles
- Tadpole cholinesterase
- Summer 2005
- 2 times – month apart


Usplope Airflow Pathway
Linear Airflow Pathway

Example 2005 Sample Sites

Methods – Air Sampling

Methods – Sediment Sampling

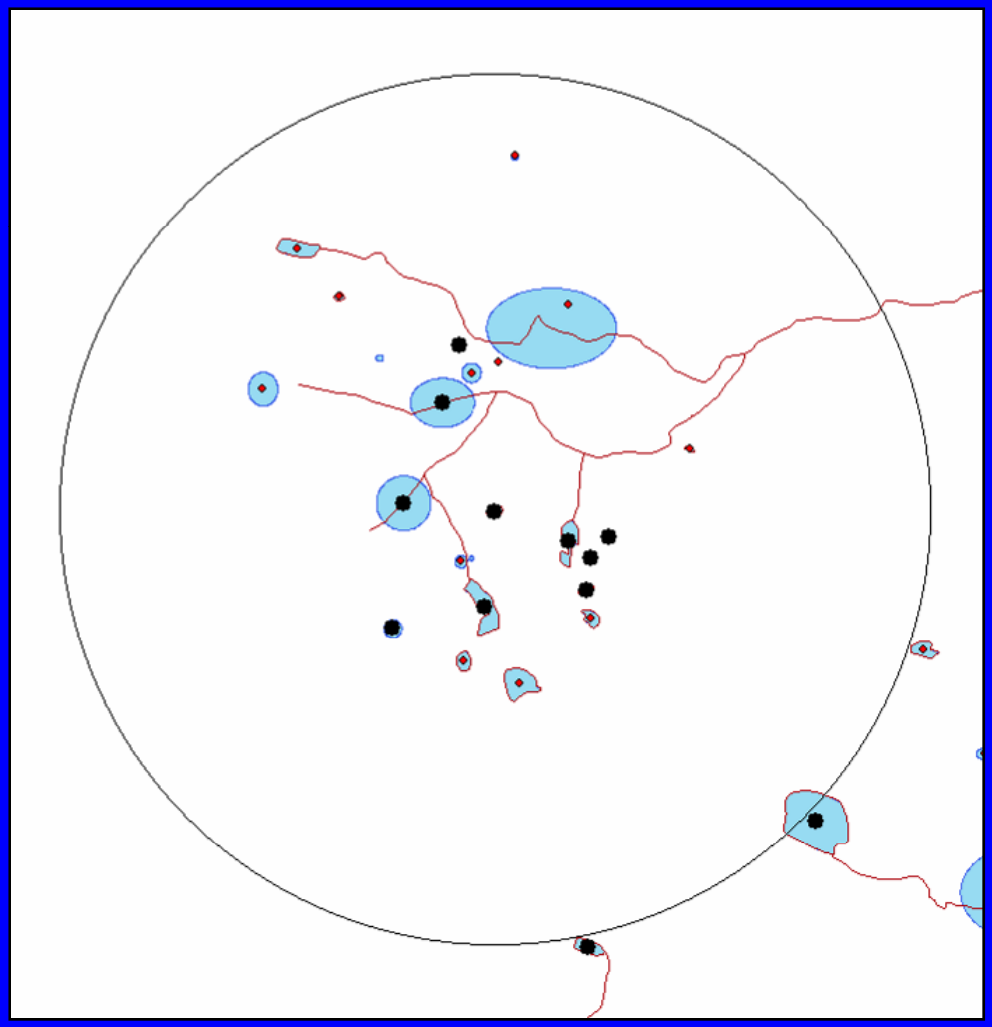
Methods – Tadpole Sampling

Logistics

Metric for MYL Frog Population Status (1997-2002)

<u>Frequency of MYL Frog Occurrence</u>

- Suitable habitat (no fish, depth >= 1.5 m)
- Occupancy from Knapp, 1997-2002
- Calculated % sites occupied in 2 km radius



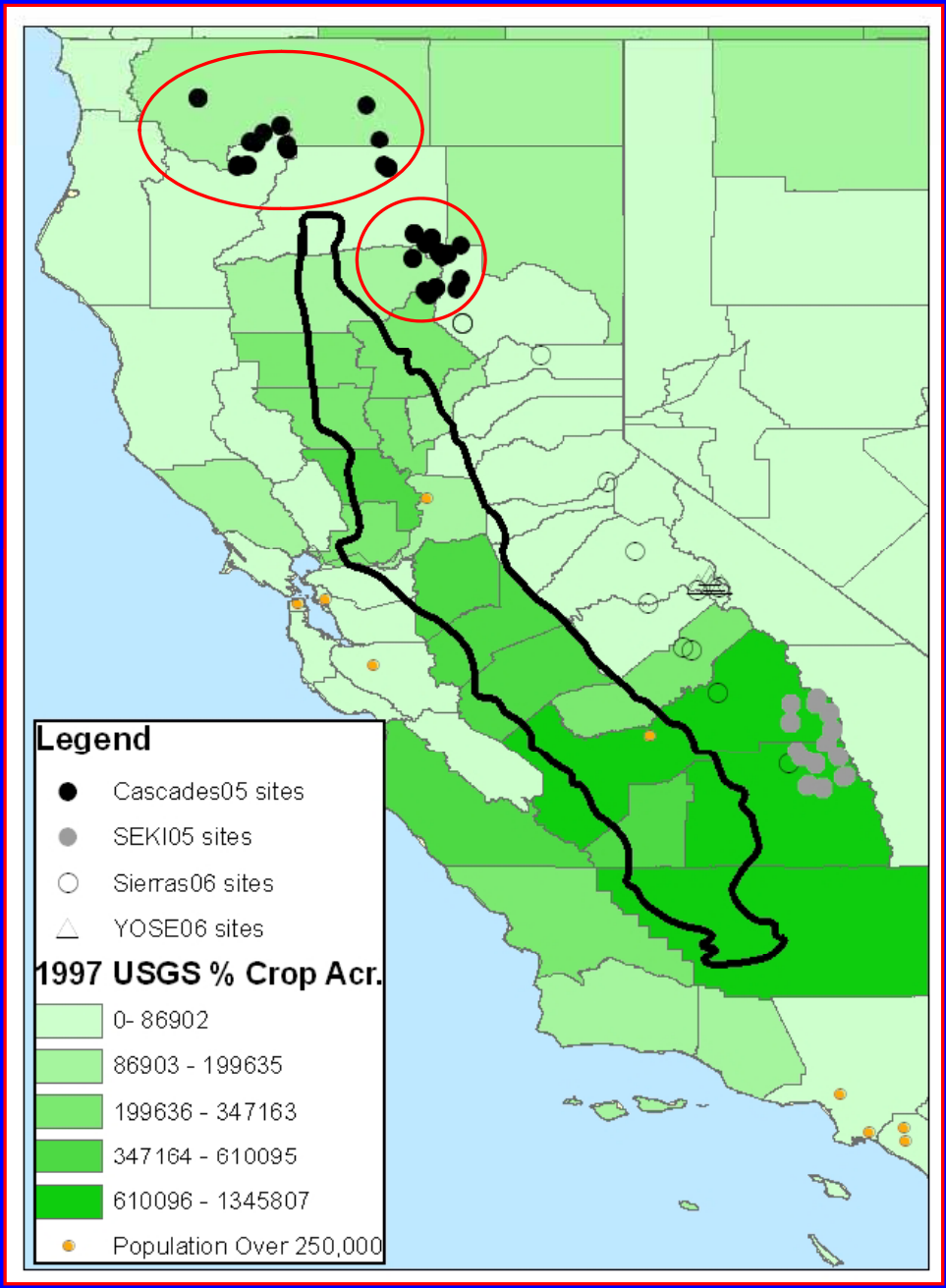
Other Projects

Yosemite

- Frog relocation study
- 4 lakes
- Tuolumne Pass region
- 2006-2008
- Concentrations similar to Sequoia/Kings Canyon

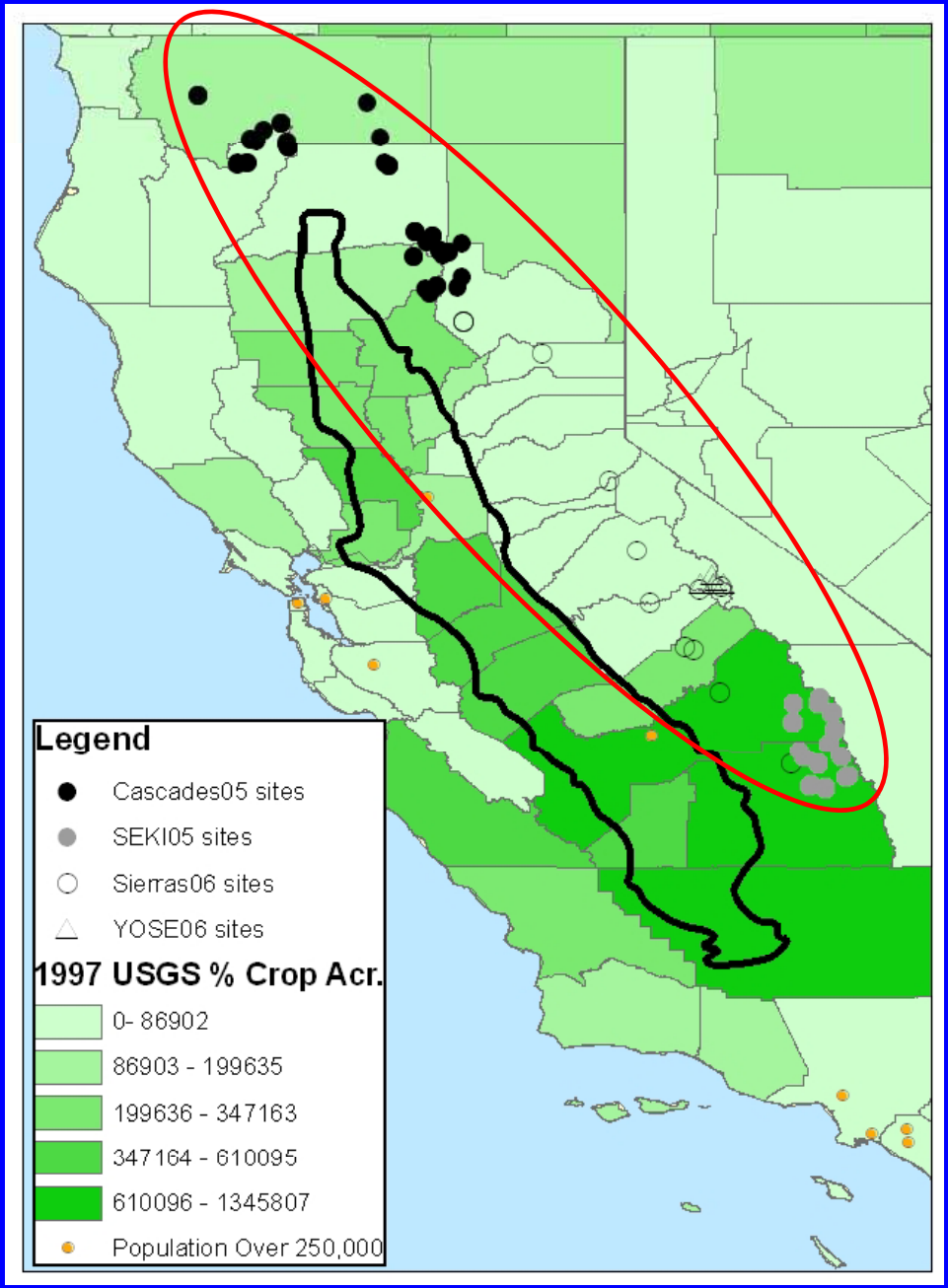
West vs. East Cascades

- Carlos Davidson & Kerri Stanley
- Cascades Frog die-offs in East (Lassen) area
-



Cascades to Sequoia/KC

- Sediment & tadpoles
- Kerri Stanley lead
- 2005 & 2006
- Concentrations vs proximity to source & Valley



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