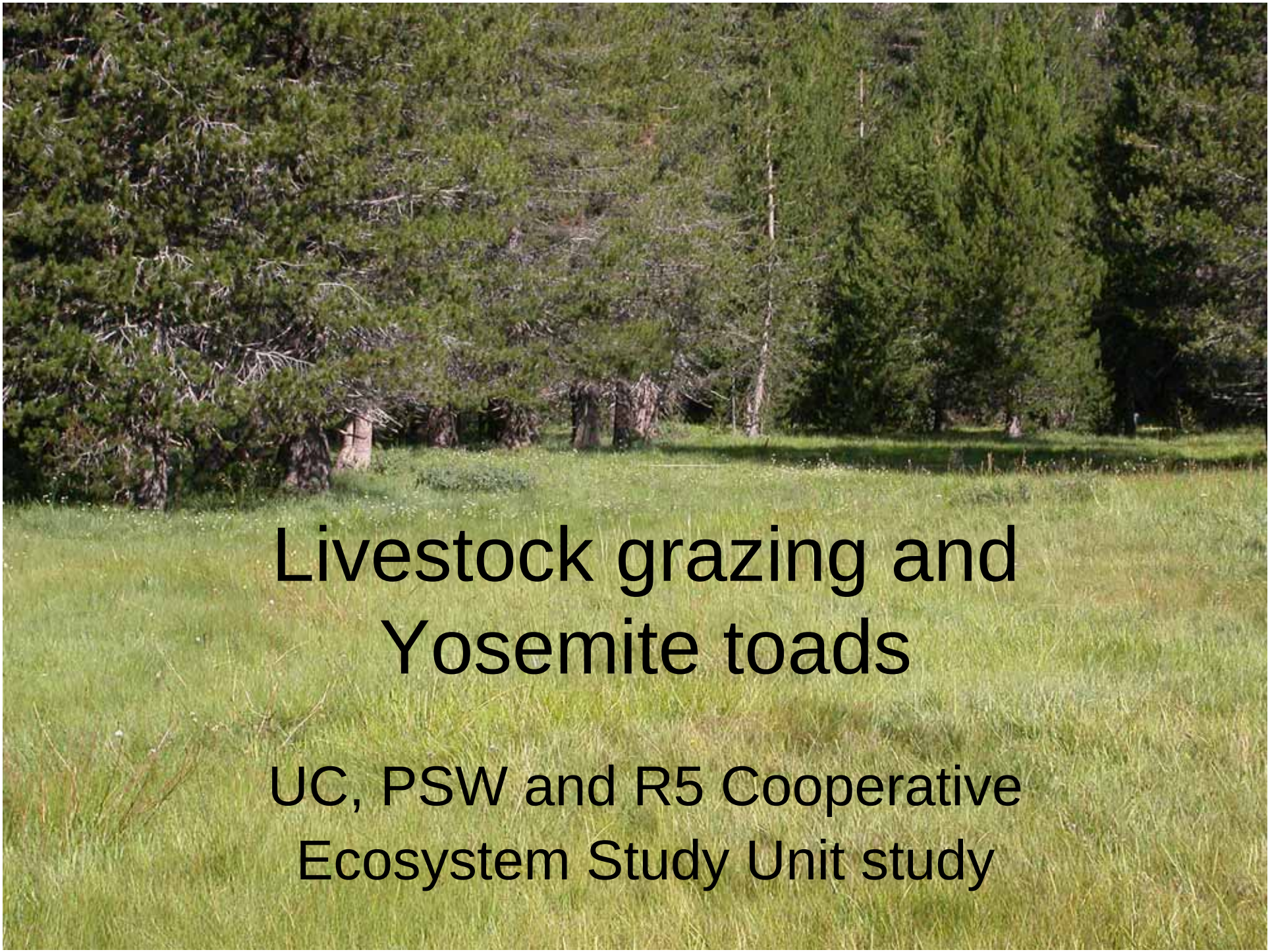


Livestock grazing and Yosemite toads

UC, PSW and R5 Cooperative Ecosystem Study Unit study

DETERMINING THE EFFECTS OF LIVESTOCK GRAZING ON YOSEMITE TOADS (*Bufo canorus*) AND THEIR HABITAT 2005-2010

Funded by R5 USDA Forest Service

Cooperative Ecosystem Studies Unit study

Amy Lind, Rob Grasso, Peter Stine
PSW: Sierra Nevada Research Center

Barbara Allen-Diaz, Ken Tate, Susan McIlroy
Leslie Roche, Bill Frost, Neil McDougald
U.C. Berkeley, Davis and UC Coop Extension

OUTLINE

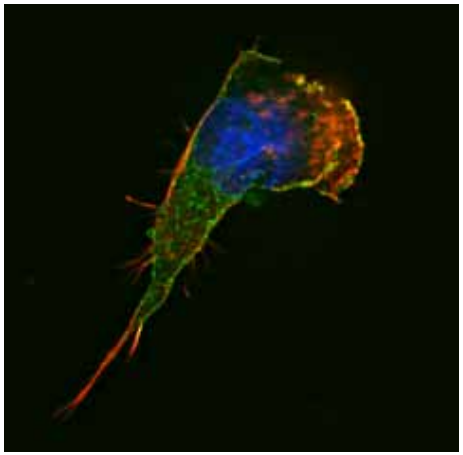
- Need for study
- Yosemite toad (*Bufo canorus*) natural history
- Study questions
- Field Methods
- Accomplishments (1st yr)
  - Study plan and review
  - Study allotments and meadows
  - Infrastructure installation
  - Field data collection

NATURAL HISTORY OF YOSEMITE TOAD

- ***Bufo canorus*** (Bufo = “w/o teeth” canorus = “melodious”)
- 6,500 – 11,500 feet
- South Lake Tahoe (Ebbets Pass) – Kings Canyon NP (Evolution Valley)
- Active: April – October, depending on snowpack
- Diurnal (active during day)
- Sexual dimorphism (rare in toads, female more brilliantly colored)

NATURAL HISTORY OF YOSEMITE TOAD

- Long-lived (over ten years) longest known: 15 years
- Adult female toads may only breed every other year
- Lower fecundity (1,500-2,000 eggs) compared to closely related Western toad (>15,000)
- Tadpoles metamorphose in 6-8 weeks
- Predators: Mountain yellow-legged frogs, birds, garter snakes
- **Potential causes for decline**: disease, pesticides, dams & water diversion, livestock grazing, vegetation & fire management, timber harvest, climate change, roads, recreation



mating, eggs

about to metamorphose

subadult

Need for Research

- Yosemite Toad (YOTO)
  - CA State Species of Concern
  - Forest Service Sensitive Species
  - Federal Endangered Candidate
- Suspected link between YOTO decline and livestock grazing
- 2001/2004 Sierra Nevada Forest Plan amendments
  - included direction for limited operating periods (during YOTO breeding and rearing)
- Lack of quantitative data on connection between livestock grazing and YOTO
- Adaptive Management Study

Study Purpose

- To investigate whether livestock grazing under SNFP Amendment Riparian Standards and Guidelines has a measurable affect on Yosemite toad populations.
- To discover what are the effects of livestock grazing on the habitat components that affect survival and recruitment of Yosemite toad populations.

Design Overview

- **Two main components**:
  - **I. Correlative, multivariate**
    - **> 50 meadows, potentially range-wide**
    - **Relate grazing history and other environmental characteristics to toad occupancy**
    - **Capitalize on existing toad occupancy data**
  - **II. Experimental Grazing Treatments**
    - **20 meadows on Stanislaus and Sierra NF's**
    - **3 distinct treatments lasting 4-5 years**
    - **Analyze treatments relative to toad population and habitat/vegetation outcomes**

Experimental Treatments

- No grazing within the meadow
- Exclusion of livestock in wet areas within a meadow
- Grazing in accordance with Riparian S&Gs across the entire meadow

PSW components

- Quantify toad populations
  - counts and population estimates by life stage
    * adults, subadults, tadpoles

- Local (micro) habitat conditions/relationships
  - measure habitat conditions at rearing and subadult and adult locations
  - relate used habitats to available (habitat selection?)

UC components

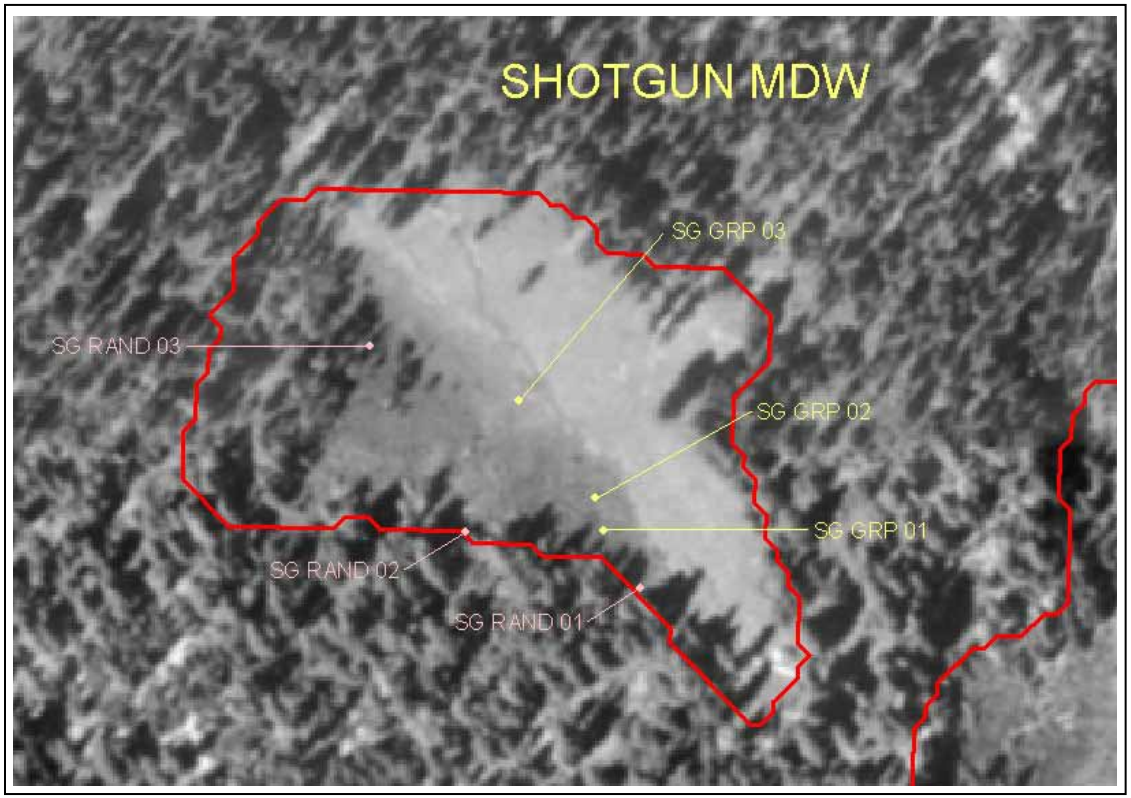
- Describe and quantify meadow habitats
  - Plant community types
  - Meadow productivity
  - Water table dynamics
  - Water quality (temperature and chemistry)
  - Grazing
    - Timing (records and cameras)
    - Intensity based on utilization
    - Intensity based on stubble height

Integration

- Quantify toad population status in meadows with different livestock grazing characteristics
- Identify habitat features important to toads at several spatial scales
- Describe effects of livestock on habitat for toads and other meadow characteristics

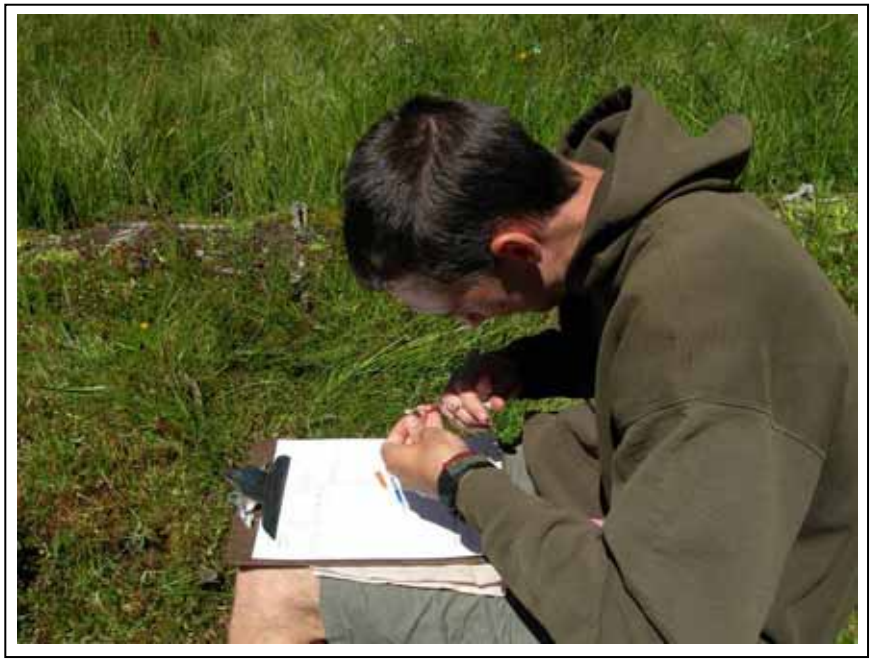
Toad Population Methods

- Complete meadow surveys for toads, and other amphibians and reptiles
- Quantification of breeding area size and abundance of tadpoles



Toad Population Methods

- Marking of metamorphs, subadults, and adults

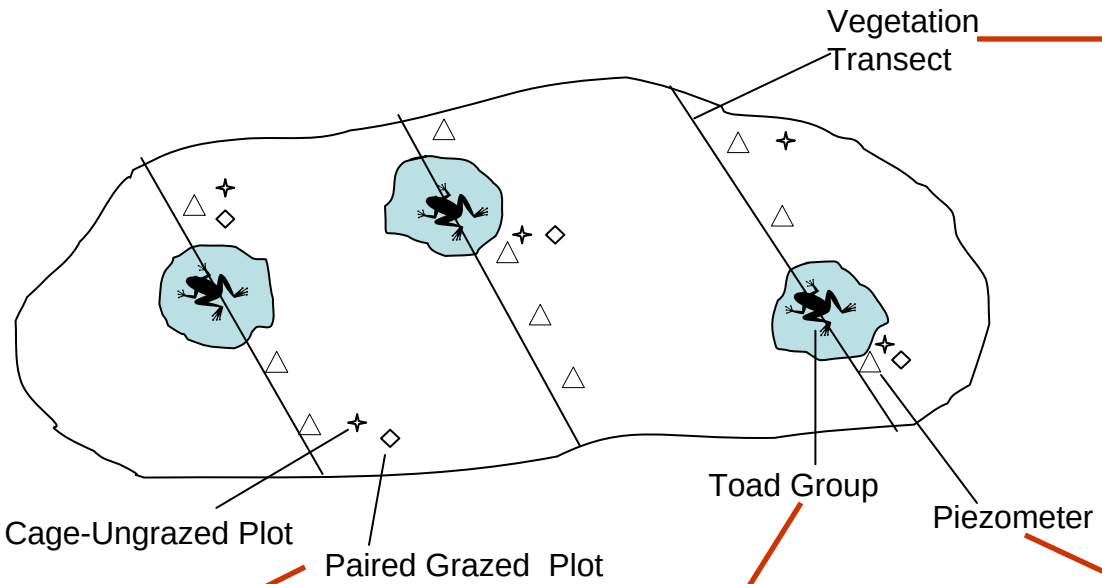


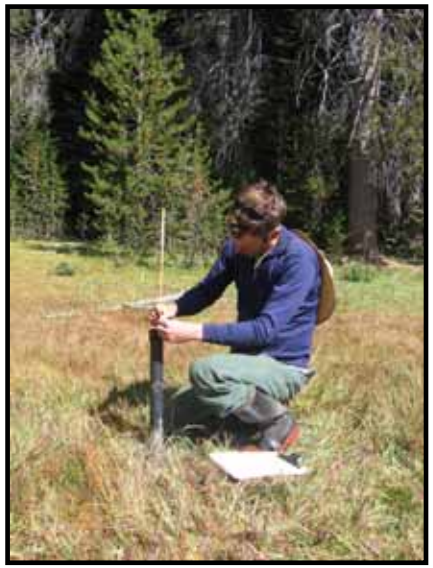
Toad Micro-Habitat Methods

- Measurements of habitat conditions at tadpole and toad locations and in a small area around toad locations (2.5m radius)
- Measurements at unoccupied (random) locations

- water depth, flow, temperature
- substrate types, detritus depth
- vegetation composition
- slope
- evidence of livestock use
- fish presence/absence

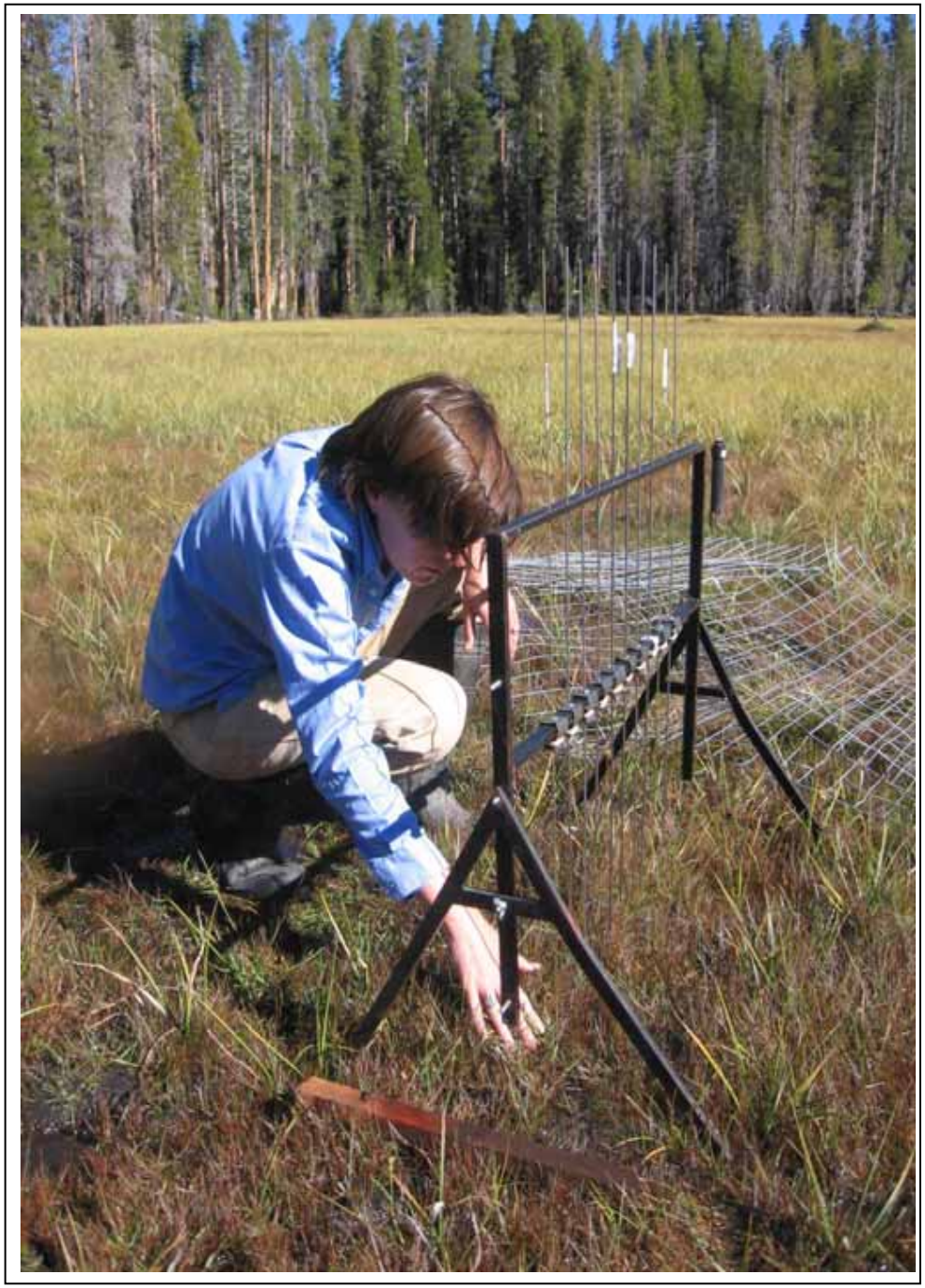
Field Data Collection





Veg Methods

- Vegetation transects
- Toad-centric plots
- Cages-utilization
- Stubble heights



Water Methods

- Water parameters
  - Water table dynamics
  - Water temperature sensors
  - Water chemistry

Methods

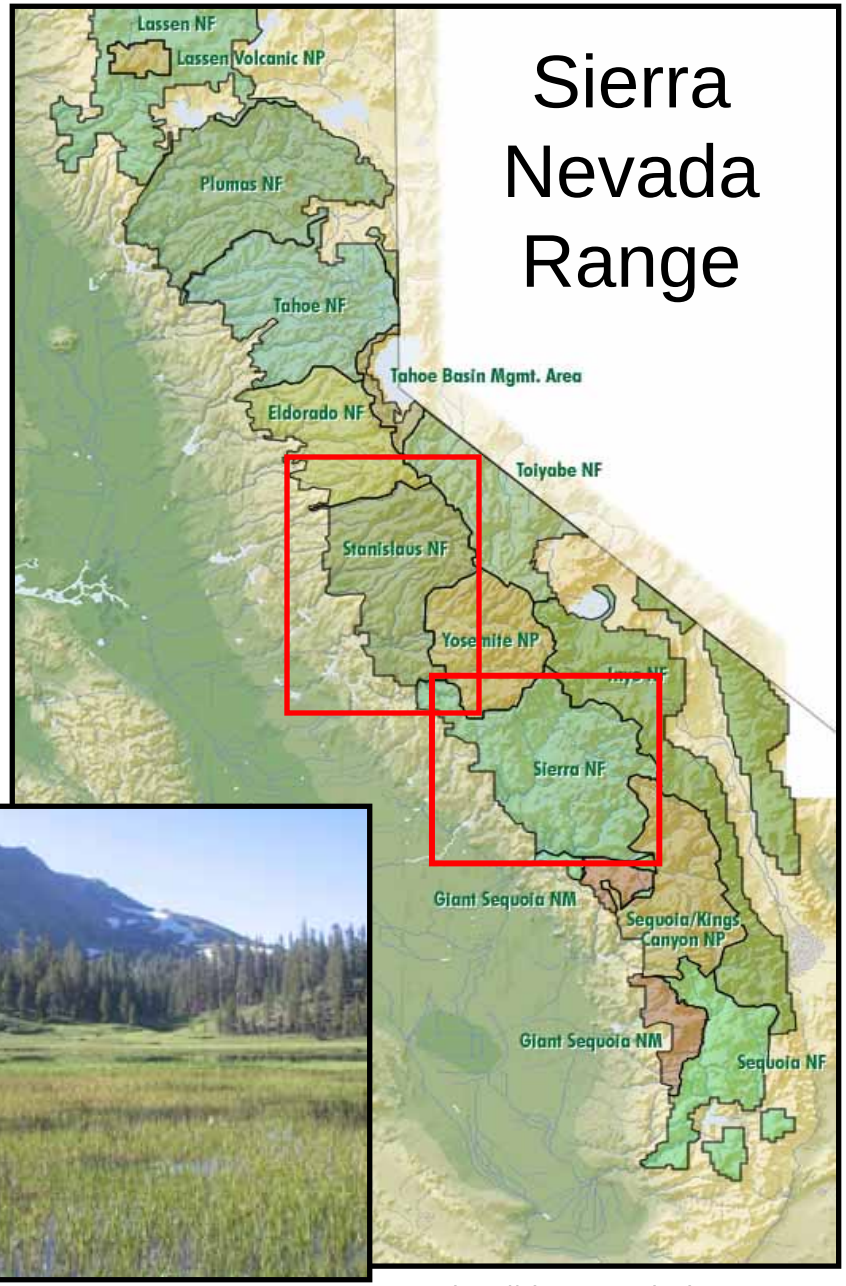
- Camera data

2005 Accomplishments

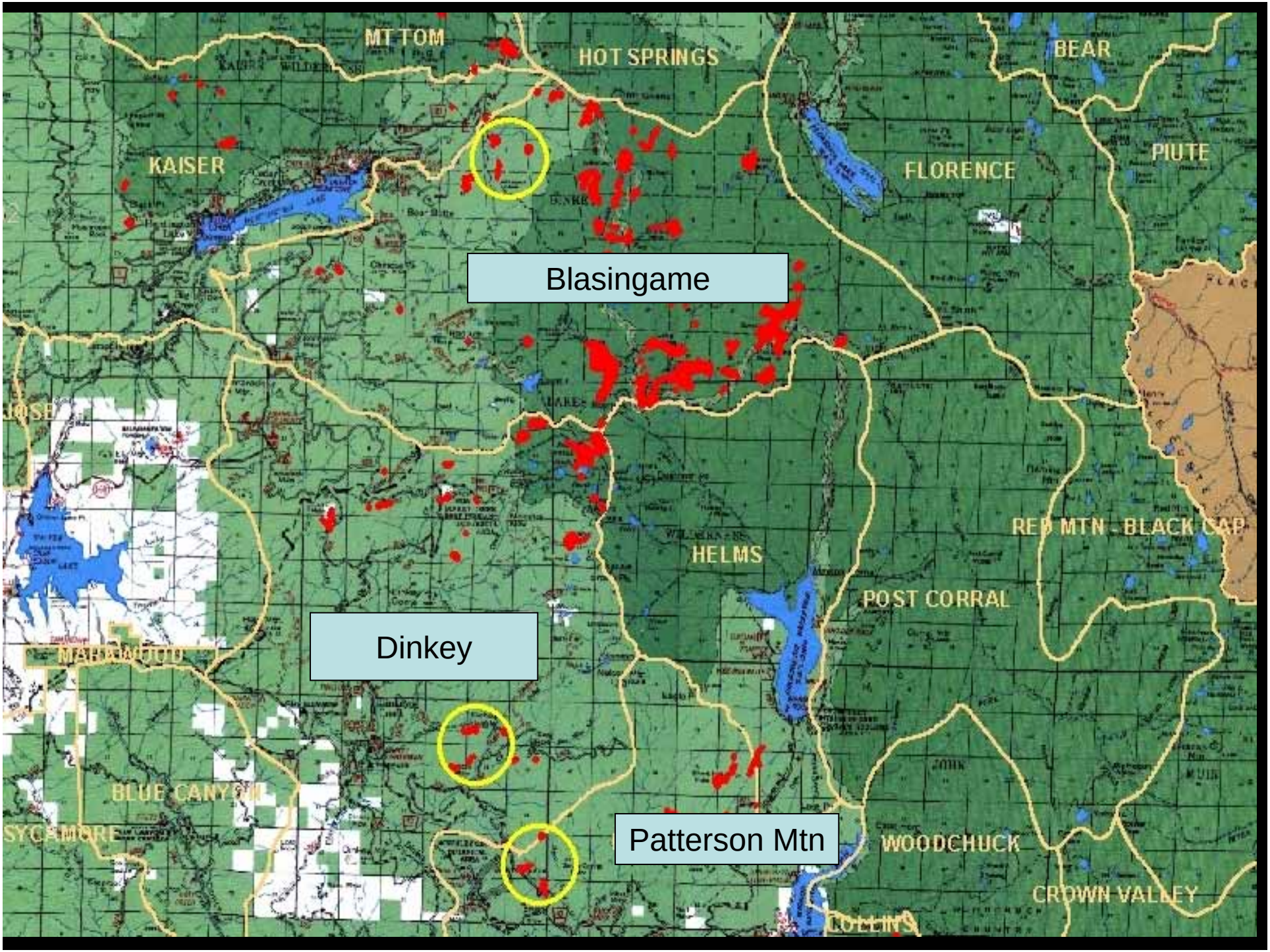
- Put together study plan
- Reviewed internally
- Peer reviewed
- Sent to stakeholders
- Site selection

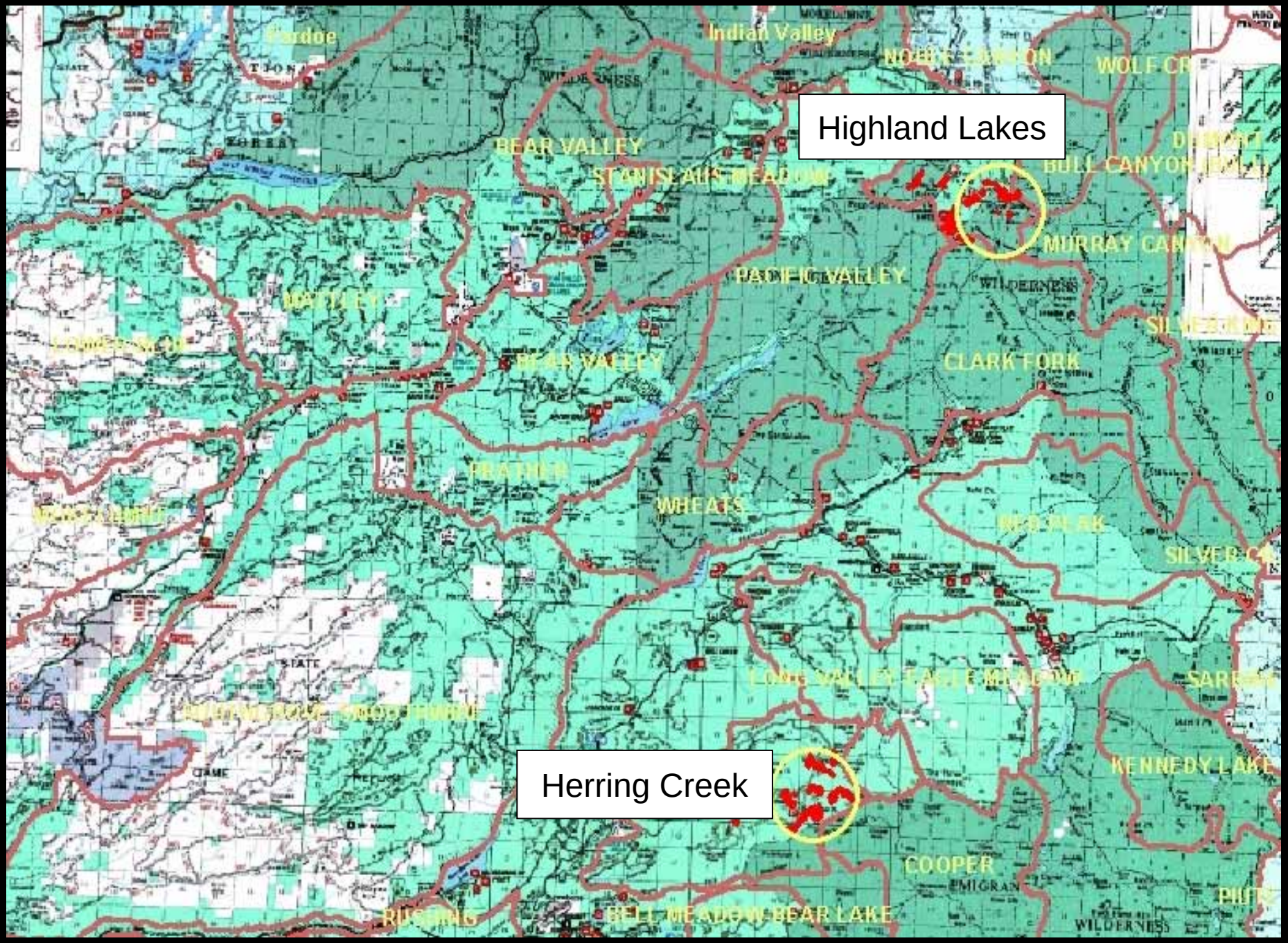
Study Area and Site Selection

- 5 randomly selected grazing allotments
- Meadow selection criteria
  - YOTO
  - cattle grazing
  - accessibility
- Meadows in clusters of 3
- 1-6 ha & 2,000-3,000 m



Map: http://sierranevadaphotos.com


MT TOM
HOT SPRINGS
BEAR
KAISER
FLORENCE
PIUTE
Blasingame
HELMS
RED MTN - BLACK CAP
POST CORRAL
Dinkey
BLUE CANYON
SYCAMORE
Patterson Mtn
WOODCHUCK
CROWN VALLEY
COLLINS


Highland Lakes
Herring Creek
Indian Valley
BEAR VALLEY
STANISLAUS MEADOW
PACIFIC VALLEY
CLARK FORK
WHEATS
KENNEDY LAKE
COOPER
BELL MEADOW BEAR LAKE

2005 Accomplishments

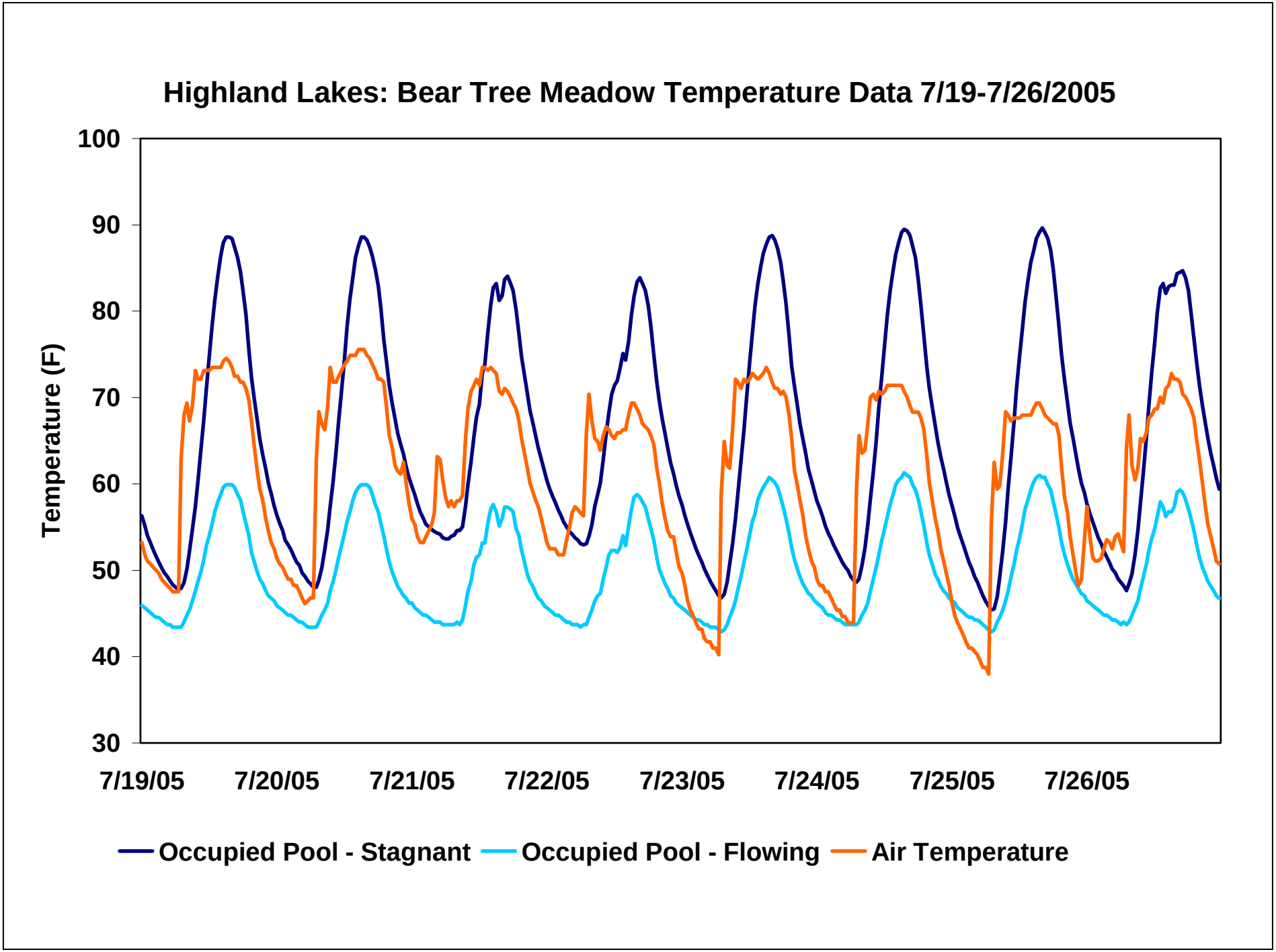
- Sampled toads and toad micro-habitat
- Sampled vegetation
- Installed piezometers
- Pilot sampled water temp, chemistry
- Piloted 3 time-scaled field cameras

Toad Results

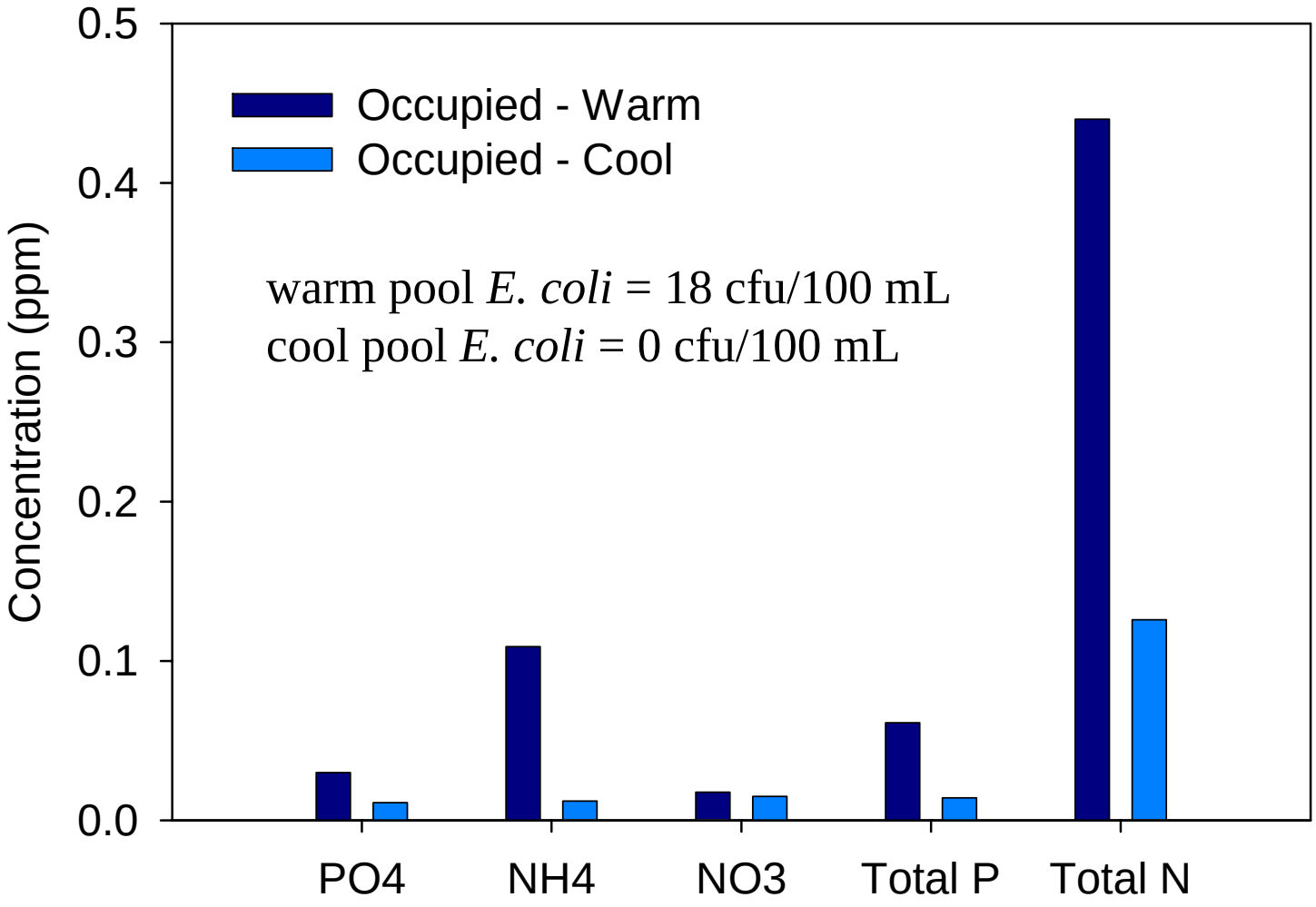
Example mark/recapture:

metamorphs estimates

Meadow	Initial visit: # marked	Revisit: marked	unmarked	(% marked)	Abundance Estimate
Exchequer	113	8	51	14%	833
Bear Paw	59	5	19	21%	283


Highland Lakes: Bear Tree Meadow Temperature Data 7/19-7/26/2005
Temperature (F)
100
90
80
70
60
50
40
30
7/19/05
7/20/05
7/21/05
7/22/05
7/23/05
7/24/05
7/25/05
7/26/05
Occupied Pool - Stagnant
Occupied Pool - Flowing
Air Temperature

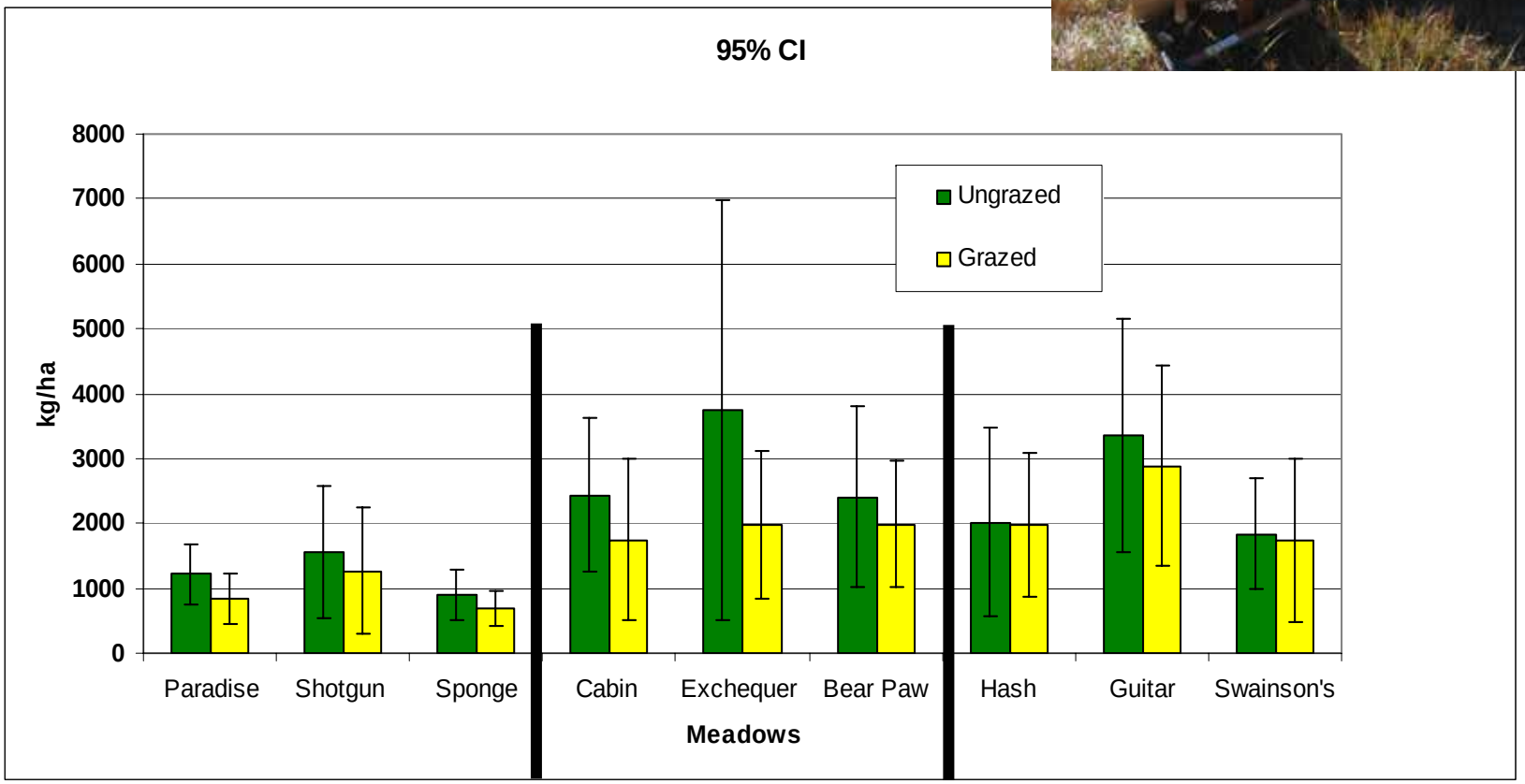
Nutrient levels in warm-stagnant and cool-flowing occupied pools
Highland Lakes, Bear Tree Meadow, August 2005



Vegetation

- We've identified about 160 different species
- Some of the most common include:
  - -Carex utriculata
  - -Carex echinata
  - -Eleocharis pauciflora
  - -Muhlenbergia filiformis
  - -Juncus nevadensis
  - -Juncus oxymeris
  - -Aster occidentalis

Utilization

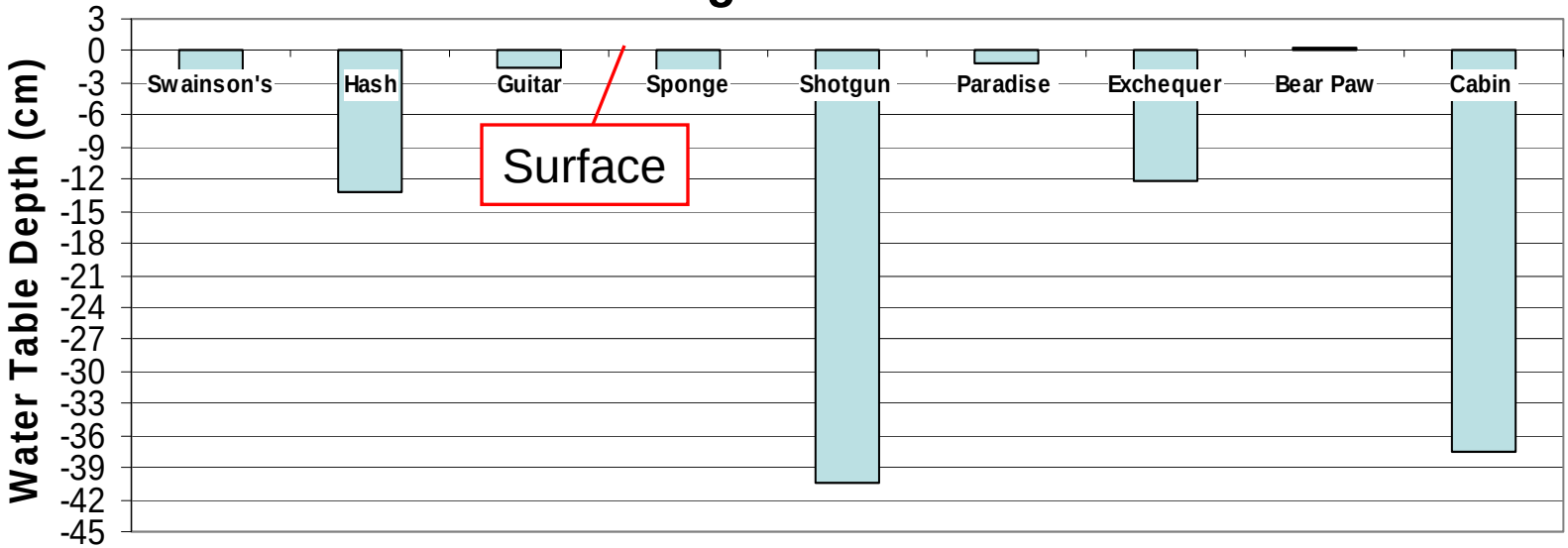


Blasingame allotment

Dinkey allotment

Patterson allotment

Average Water Table Depth for Sierra Meadows-August 2005



Digital Time-Lapse Cameras

- Lack of quantitative data about livestock numbers in meadows
- Allotment-scale data, but with camera data we can ask:
- Where are the cows grazing and at what density?
- How long are they staying in the meadows?
- What time of day do they primarily graze?
- How can these data be used for management decisions?

2005-08-22 1:46:26 PM T 73°F
WWW.RECONYX.COM

2005-08-20 9:17:05 AM T 57°F
WWW.RECONYX.COM

PLANS FOR 2006

- Build fences for treatment implementation
- Collect full data set according to study design in the spring and summer of ‘06