2007

Ecophysiological boundaries for the distribution of the Peaks of Otter Salamander (Plethodon hubrichti)

Anna Fredrickson
Liberty University

Timothy R. Brophy
Liberty University, tbrophy@liberty.edu

Norman Reichenbach
Liberty University, nreichen@liberty.edu

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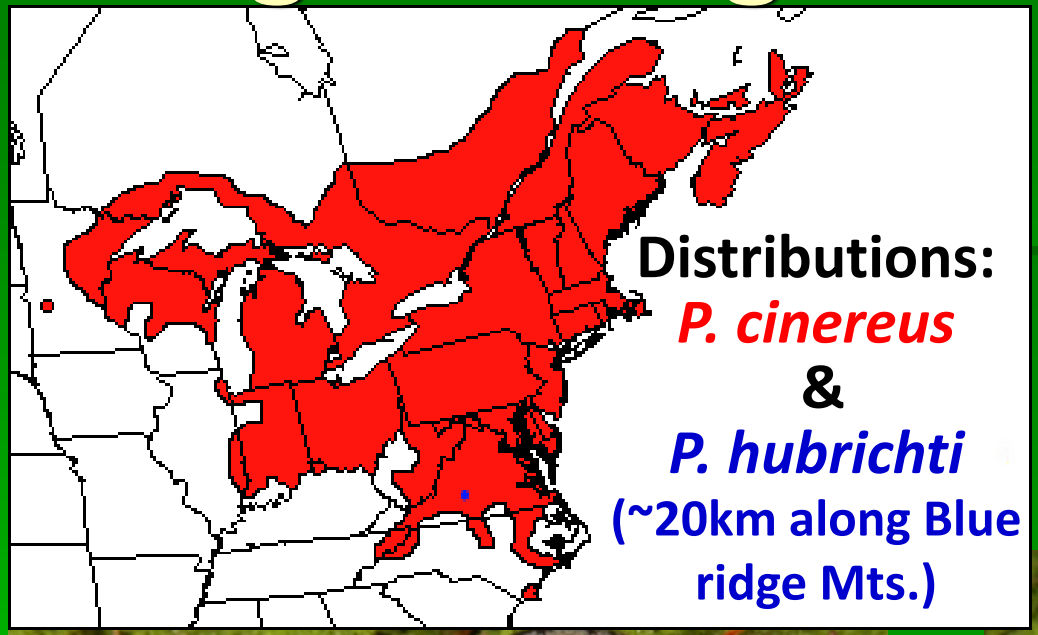
By
Anna Fredrickson
Tim Brophy
Norm Reichenbach

Liberty University

Overview

- Background
  - Distribution
  - Mapping the contact zone
  - Hypotheses
- Study Design
  - Our sites
  - Methods
- Results/Discussion
  - Temperature & elevation
  - Condition factors
  - Eggs per female
  - % gravid
  - Densities
- Summary
- Future Plans

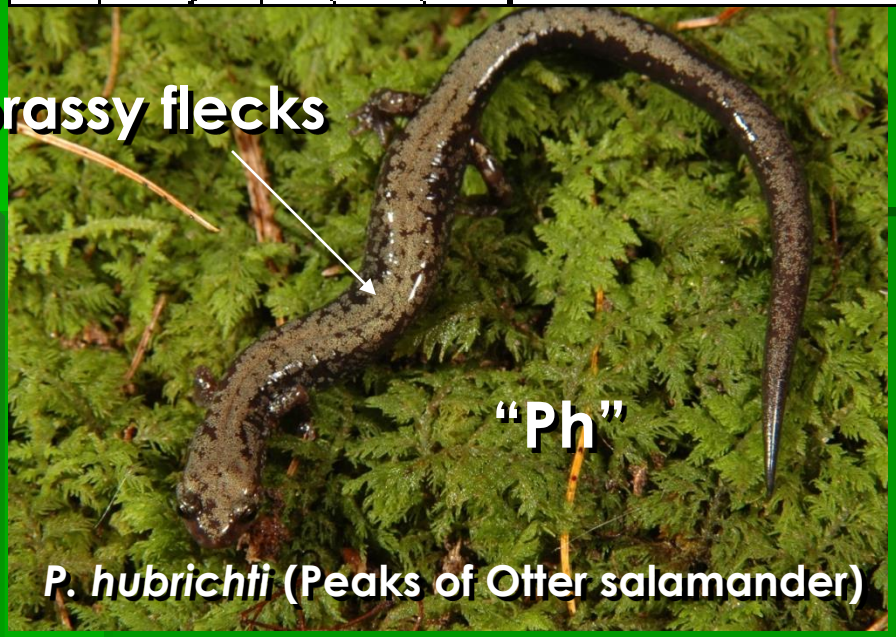
Background – general distribution



Pc – Widely distributed in NE

Ph – Montane with limited distribution

Why does the Peaks of Otter Salamander have such a limited distribution?



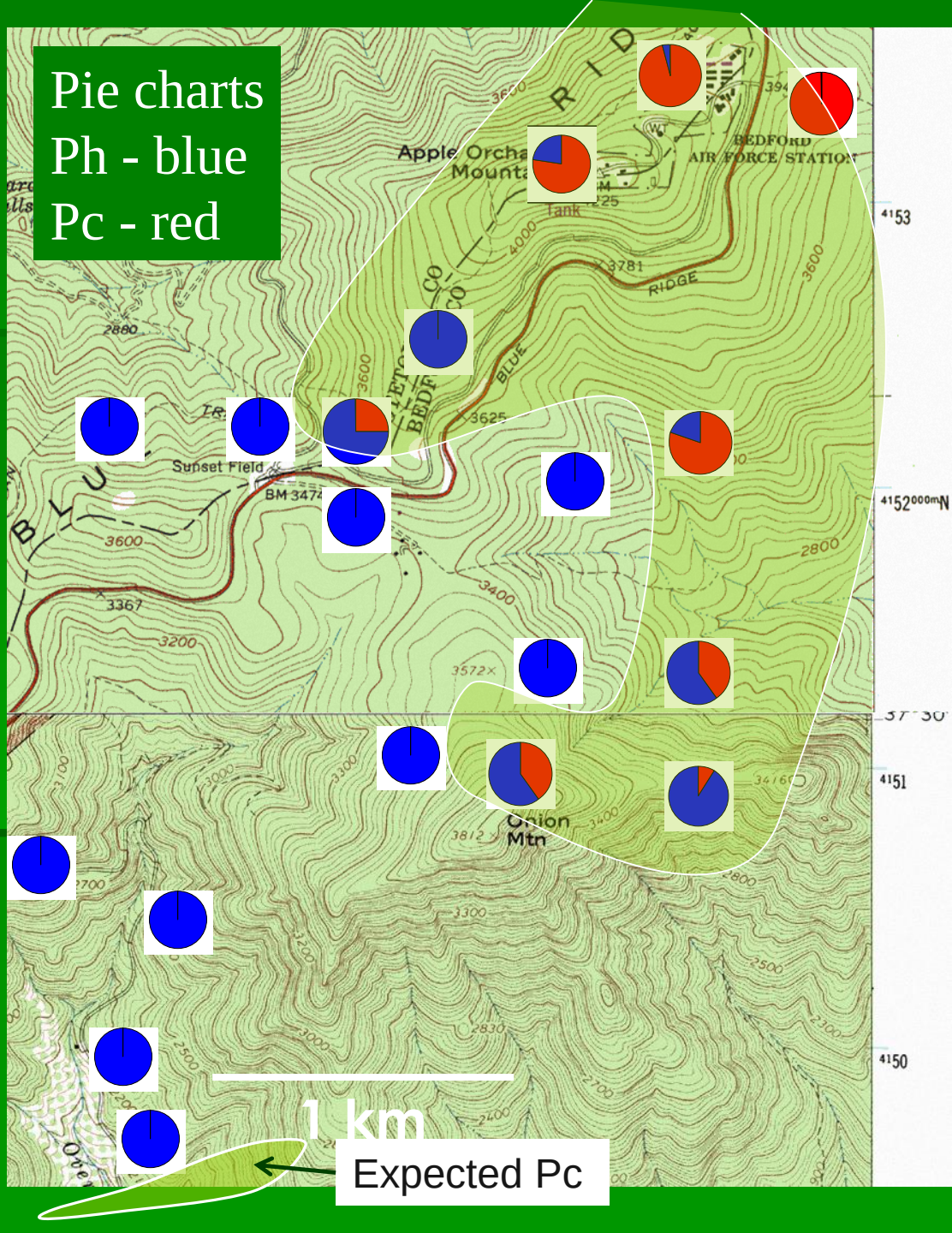
*Photos by Andrew Kniowski

Background –
a more detailed look at the distribution

Working hypotheses:

1. Ph in sympatric areas – range in high elevation areas (>850 m) restricted by Pc and not physiological factors

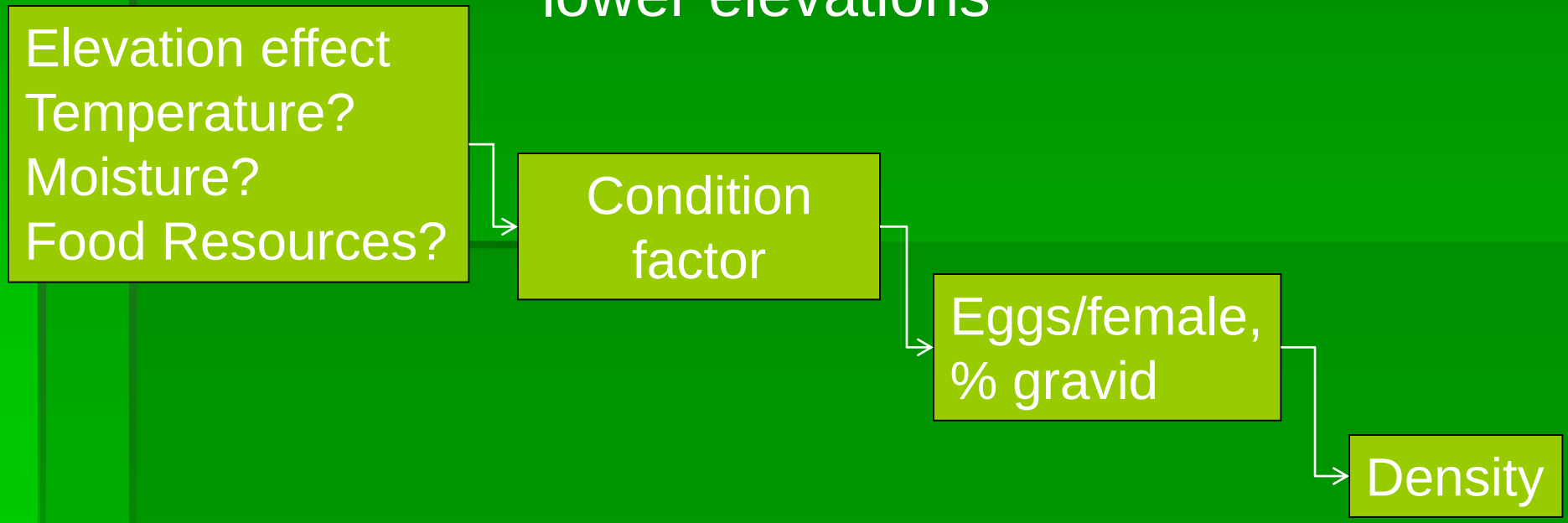
2. Ph in allopatric areas – range restricted by physiological factors associated with lower elevations



Background

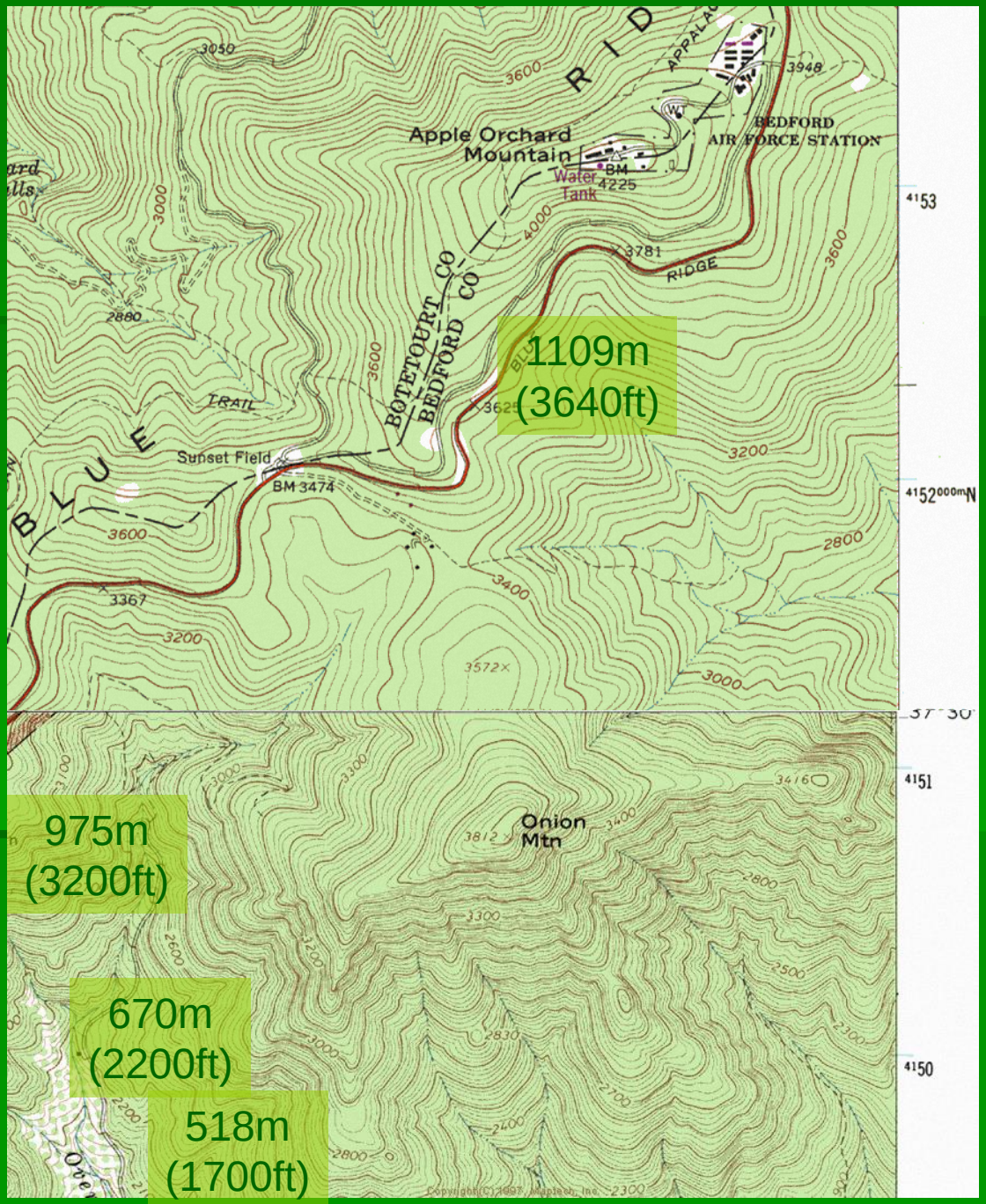
Current Project:
Focus on the second hypothesis

Ph in allopatric areas – range restricted by physiological factors associated with lower elevations



Study Design (Fall 2006)

- 4 sites
- Hand collected salamanders
- Measured SVL and mass in field
- Gender ID by morphology and internal anatomy



Study Design (Fall 2006)

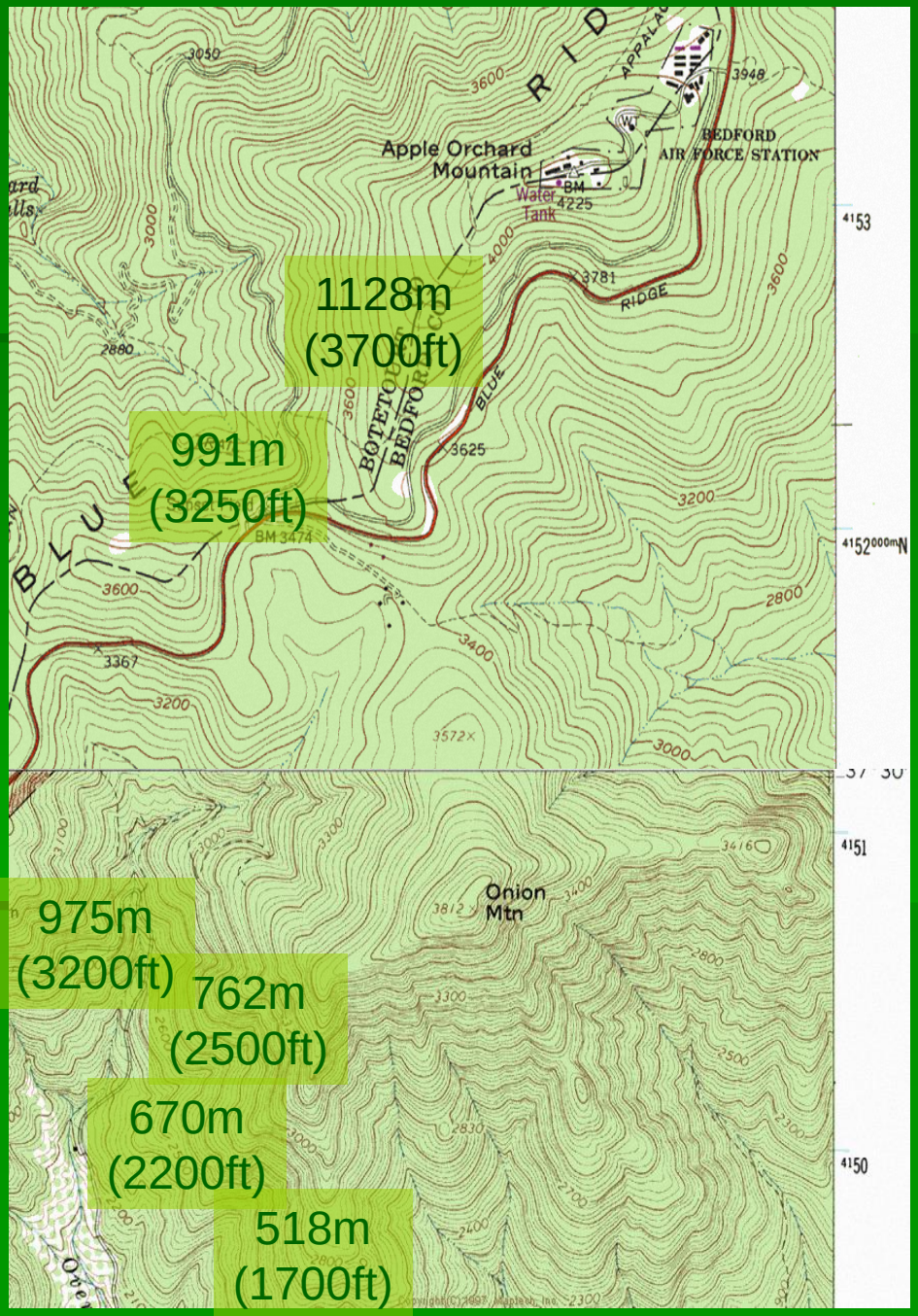
Gender identification in the fall

*Male

*Photos by Andrew Kniowski

Study Design (Spring 2007)

- Field Methods
  - Groups of students
  - 6 sites
    - 3 the same as in 2006
    - Added 762, 991 & 1128 m sites
    - Dropped 1109 m site
  - Turned rocks and logs
  - Storage & transport method
  - Measured collection area
  - Sampled all sites on 4/28
  - Ibuttons – temperature measured every 2 hours (May thru mid-October)

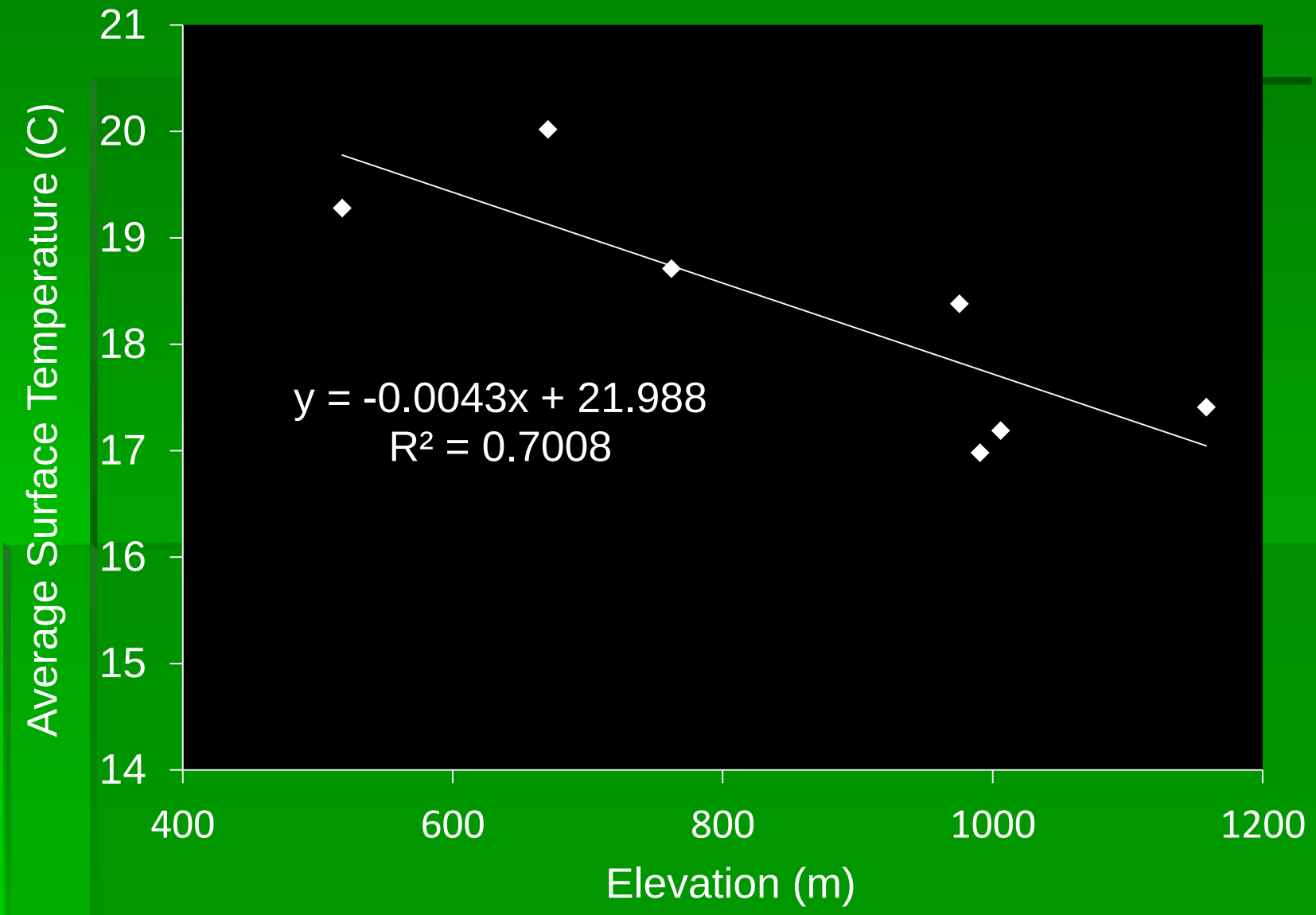


Study Design (Spring 2007)

- Lab Methods
  - Determination of gender (Candling)
  - Egg count (only large yolked eggs counted)
  - Determination of SVL & Mass

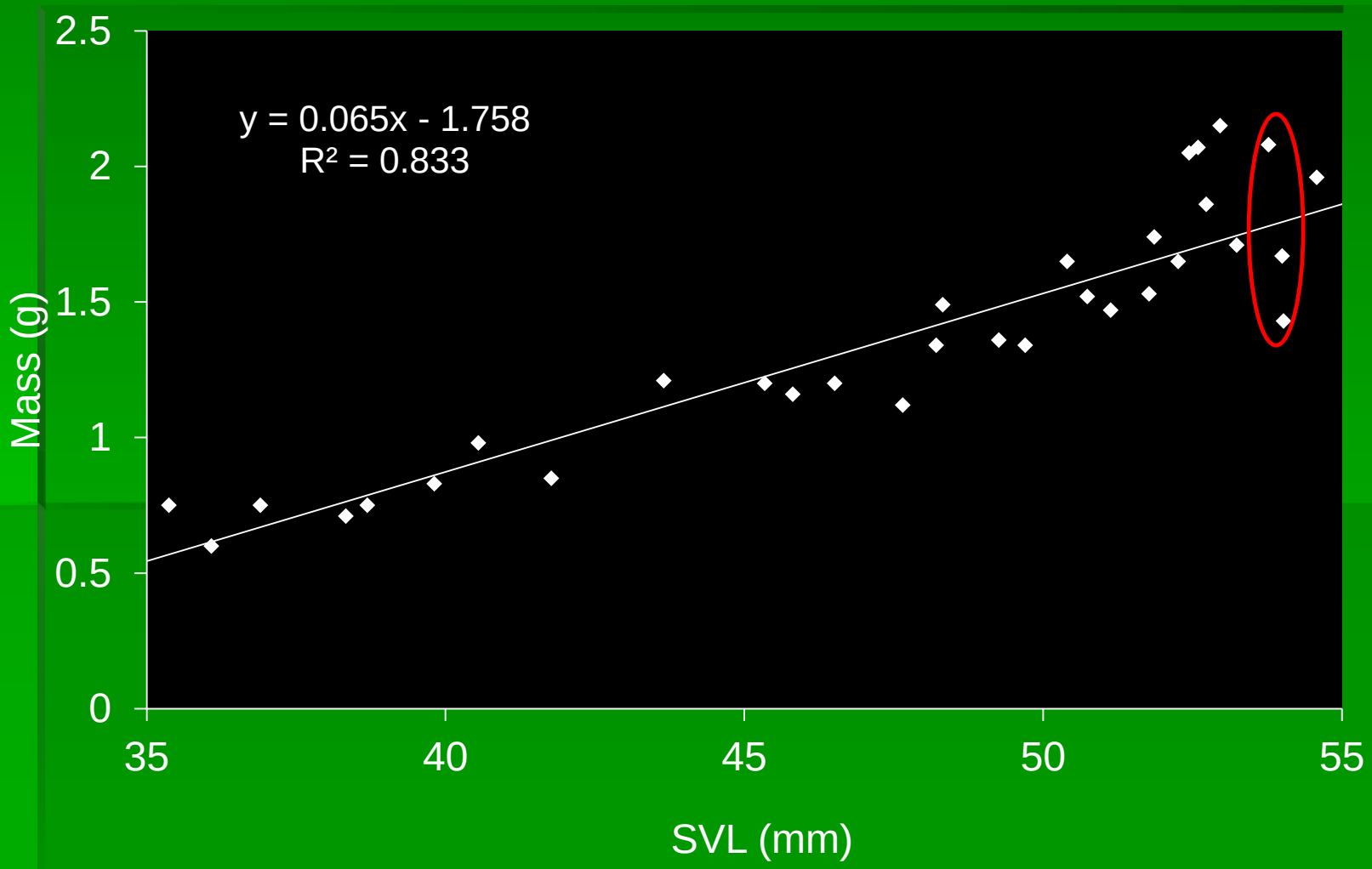
Results (Spring 2007)

- Average temperature increased with decline in elevation



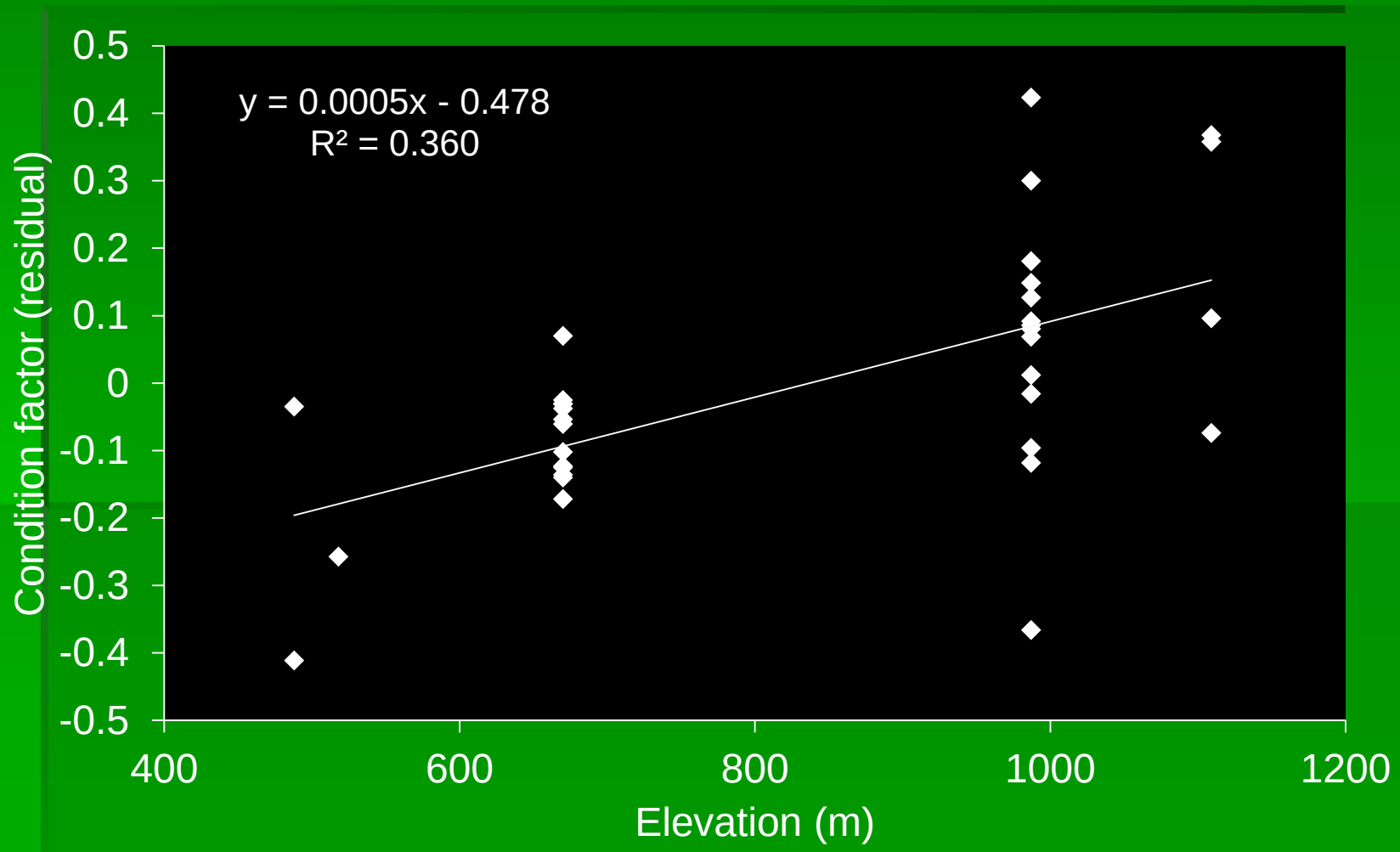
Results (Fall 2006)

- Condition Factor – Residual Method
- Does the condition of Ph change with elevation?



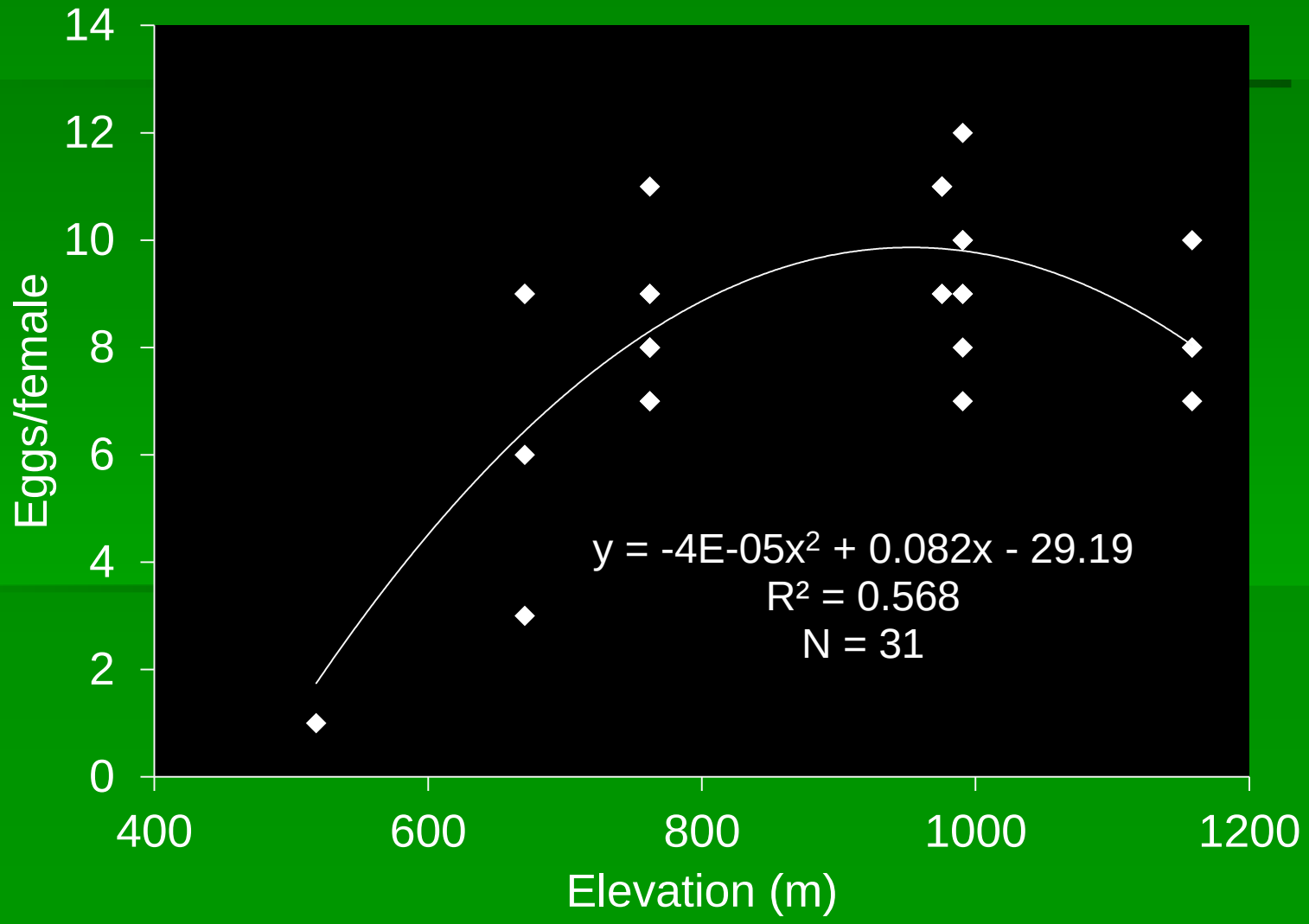
Results (Fall 2006)

- Salamanders in poorer condition at lower elevations



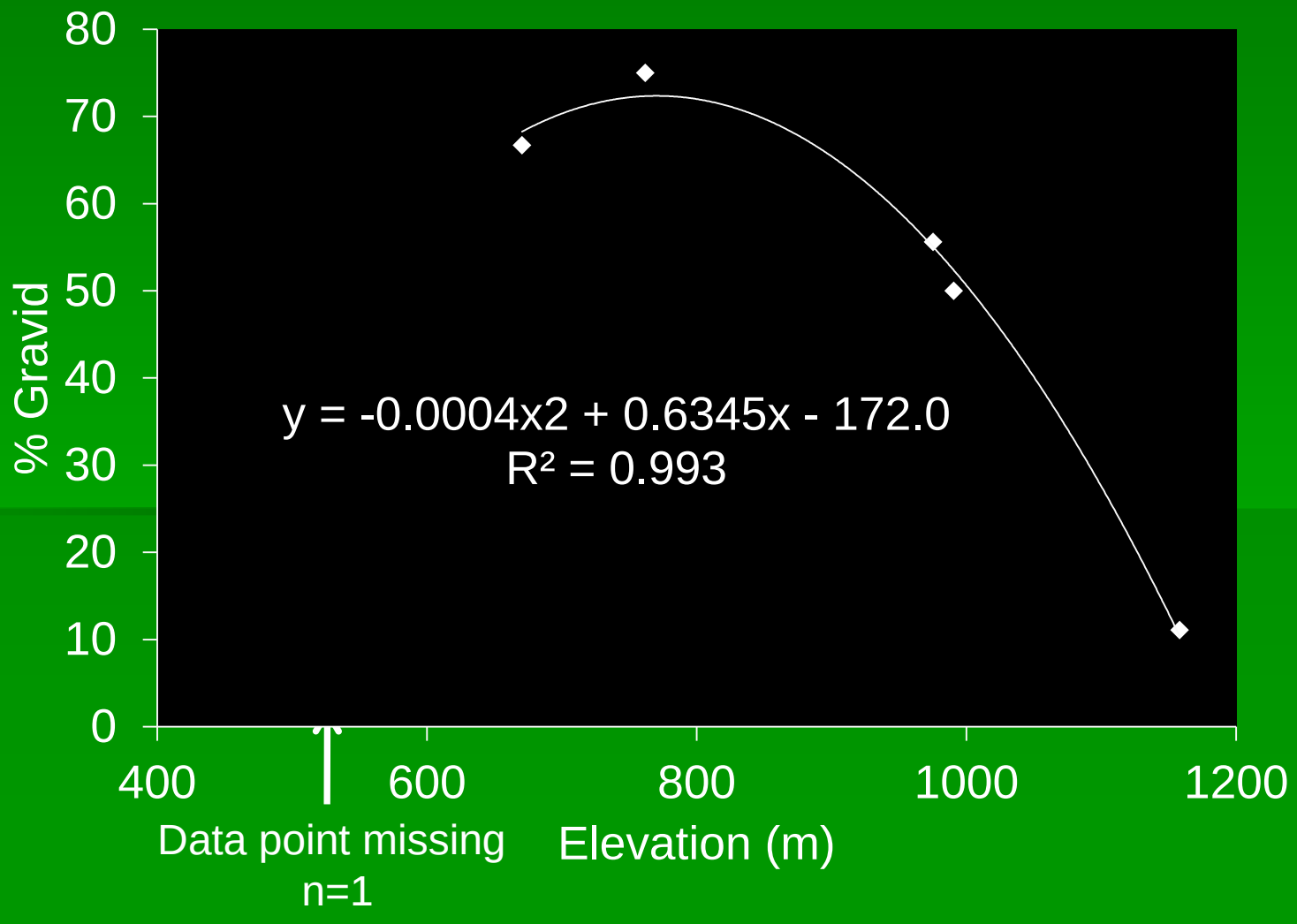
Results (Spring 2007)

- Optimal elevation for # eggs/F with declines most prominently at low elevations



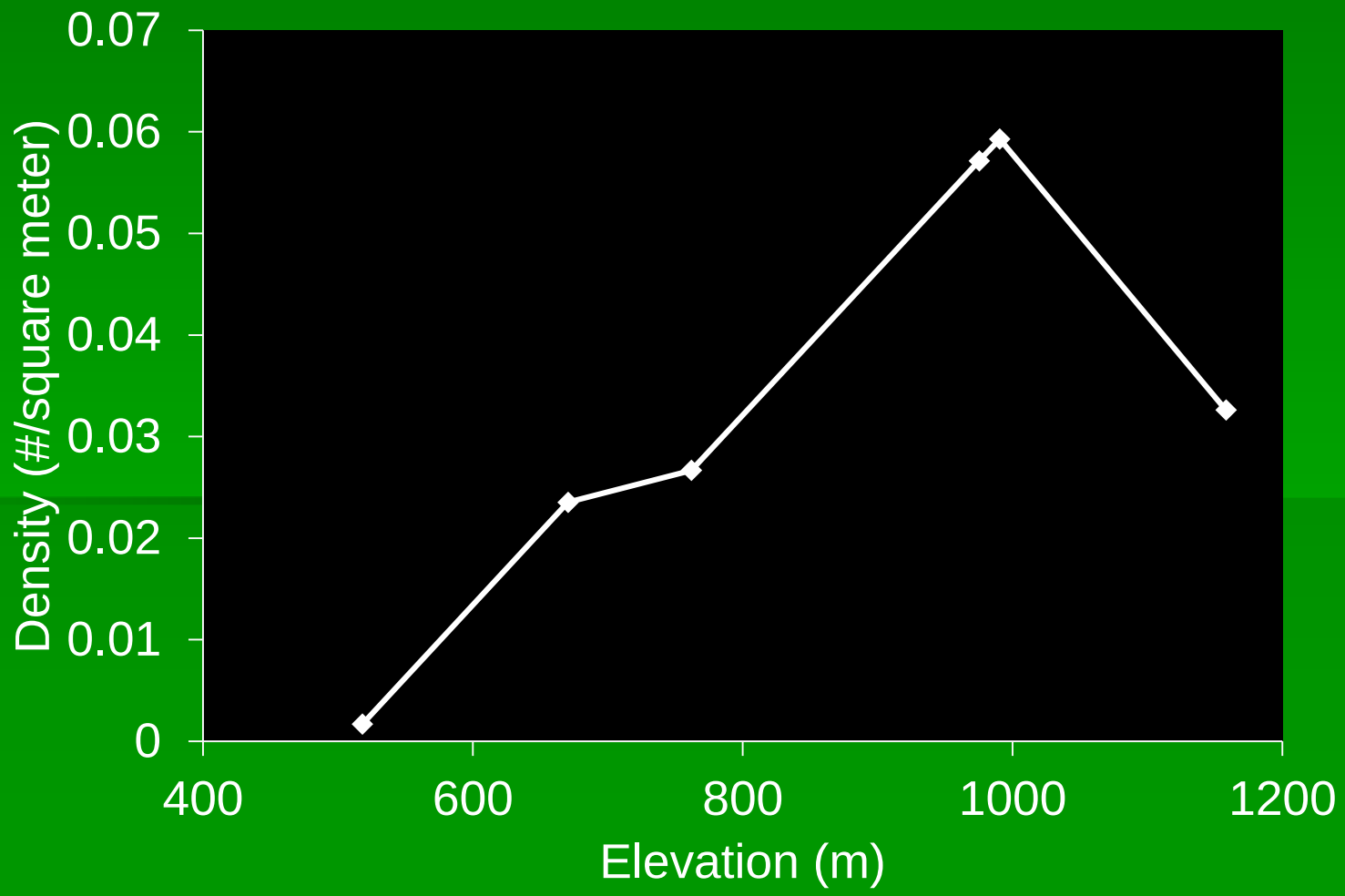
Results (Spring 2007)

- 43.7 mm SVL - minimum size for gravid F
- Mean number of females >43.7 mm SVL per site = 10
- Optimal elevation for % gravid with declines at higher and lower elevations



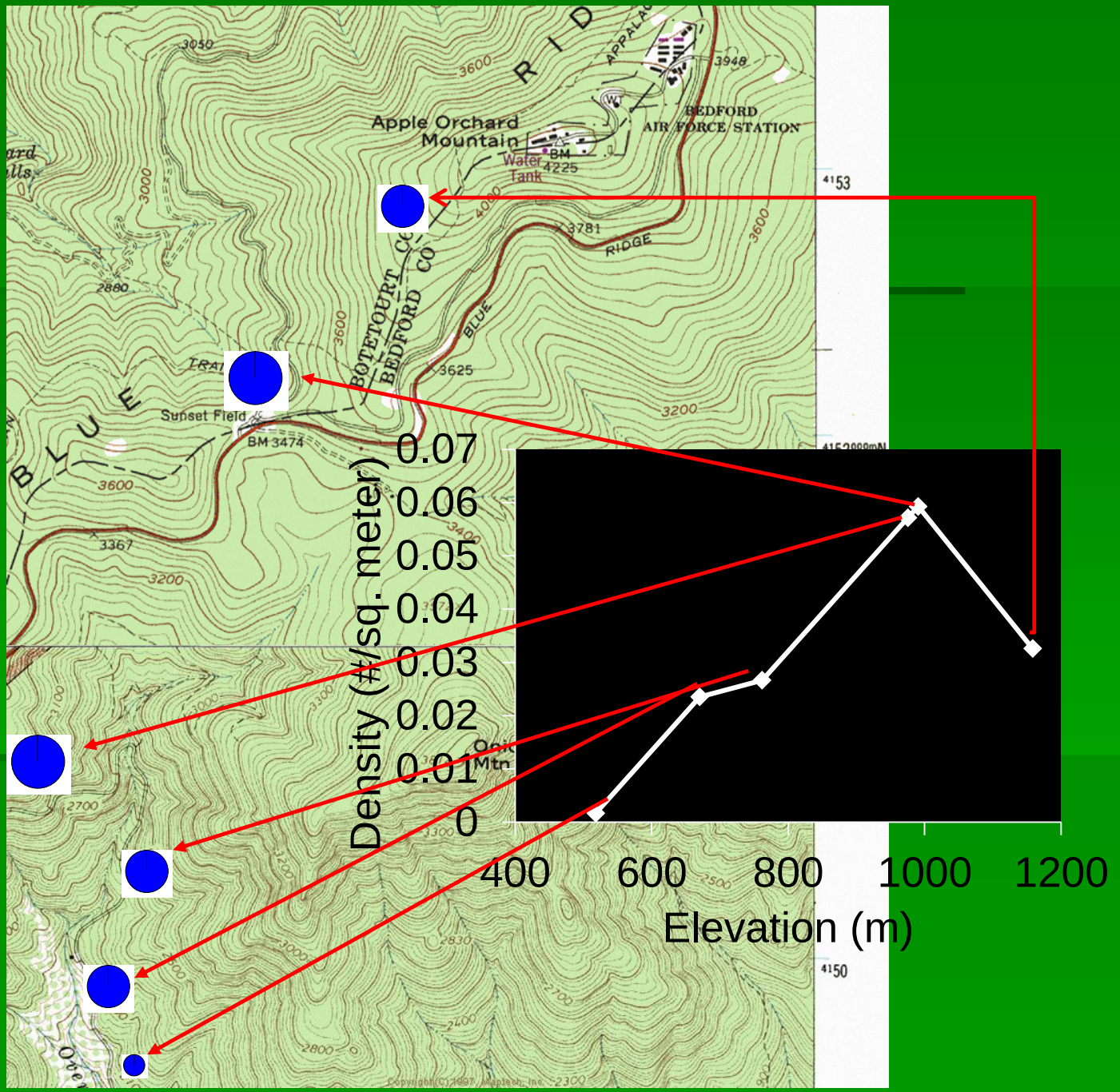
Results (Spring 2007)

- Area samples min = 558 m^2 max = 1445 m^2
- Numbers found per area sampled min = 2, max = 45, mean = 30
- Optimal elevation for densities declining most prominently at low elevations



Results (Spring 2007)

- Decline in density with decline in elevation



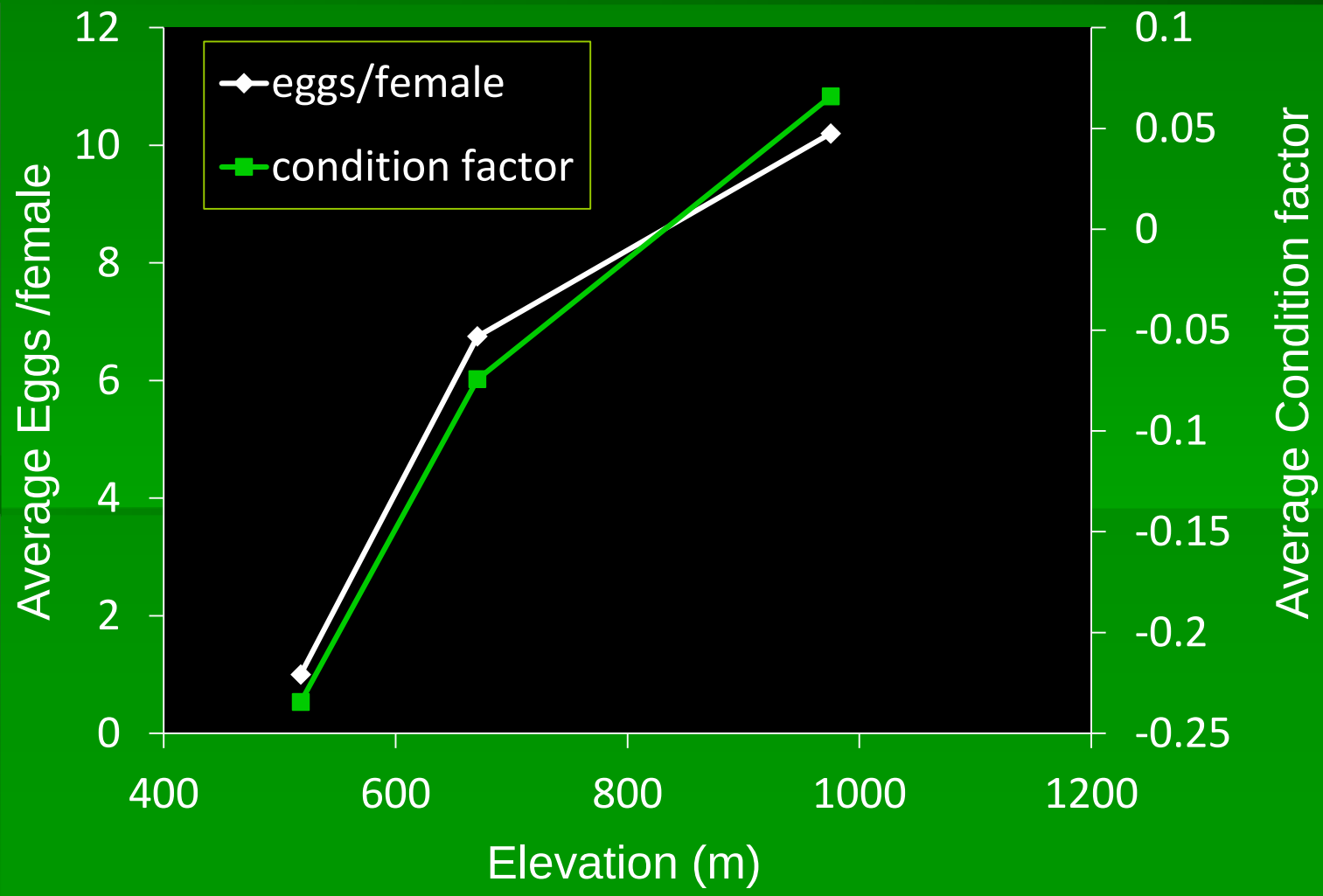
Elevation effect
Temperature?
Moisture?
Food Resources?

Condition factor

Eggs/female,
% gravid

Density

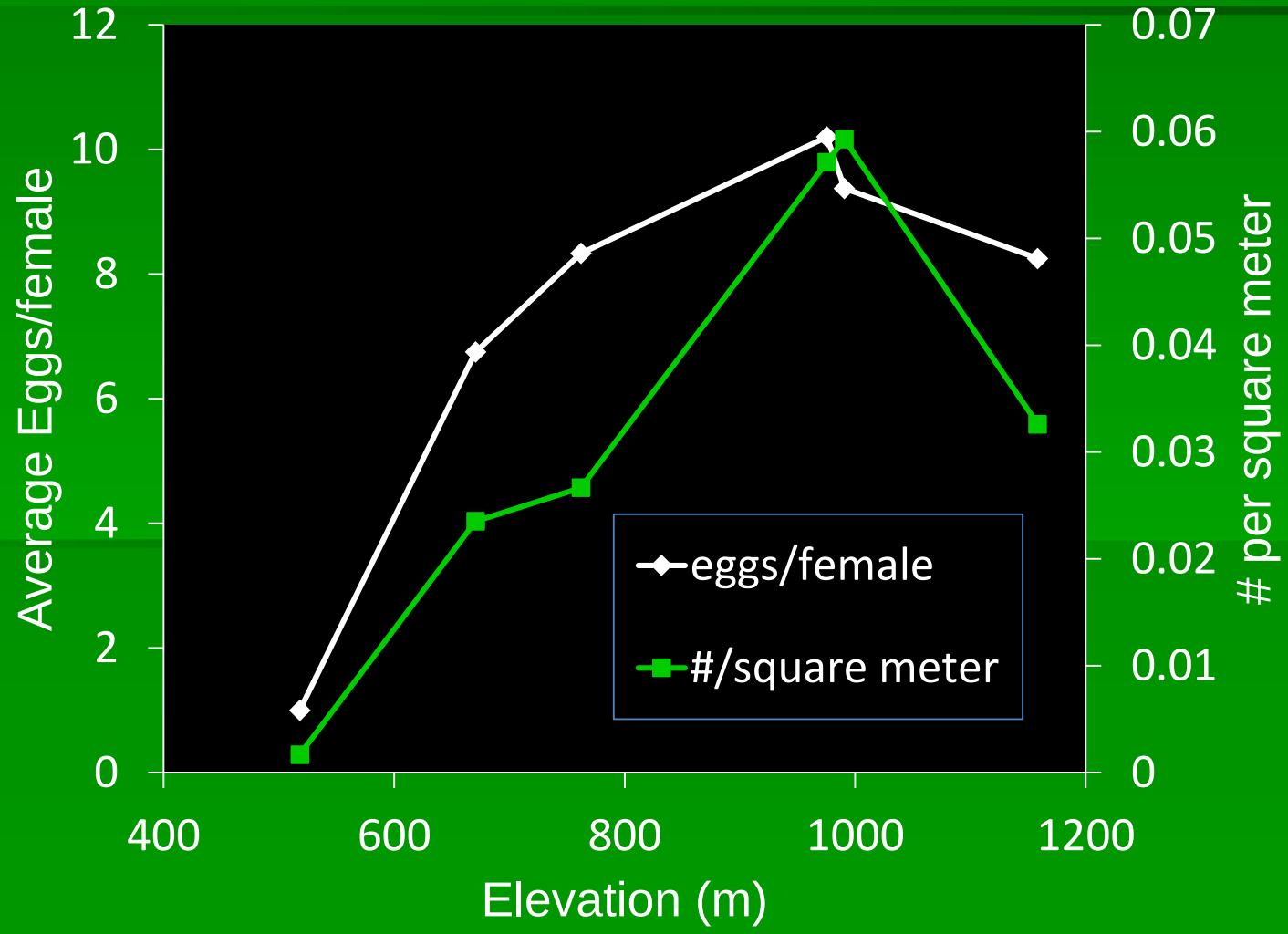
- Used sites sampled in both fall and spring
- Impact of poorer condition factors at lower elevations



Elevation effect
Temperature?
Moisture?
Food Resources?

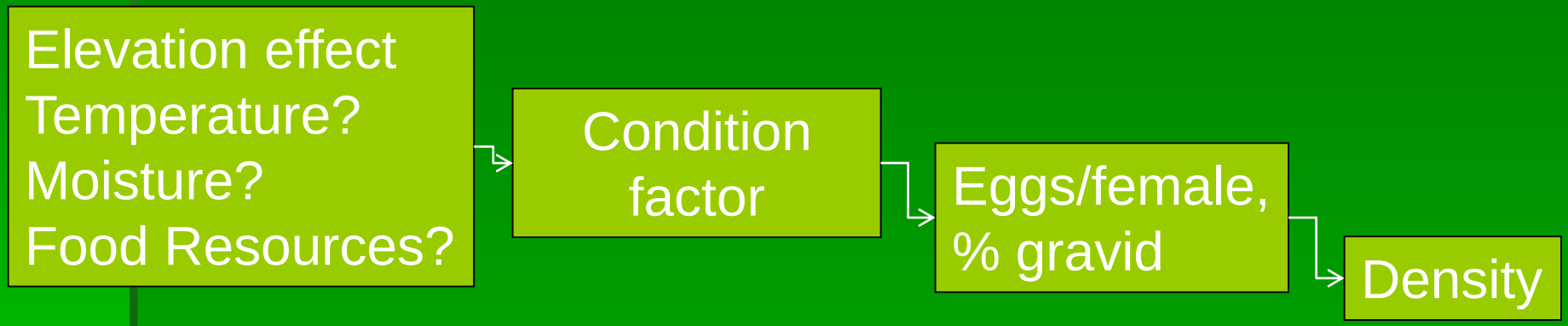
→ Condition factor → Eggs/female, % gravid → Density

- Net effect of reproduction declining at low and high elevations



Summary

Hypothesis: Ph in allopatric areas – range restricted by physiological factors associated with lower elevations



- Condition factor – declines with elevation
- Eggs/female, % gravid – rises to maximum value and then declines with elevation
- Density - declines most prominently at lower elevations

Future Work

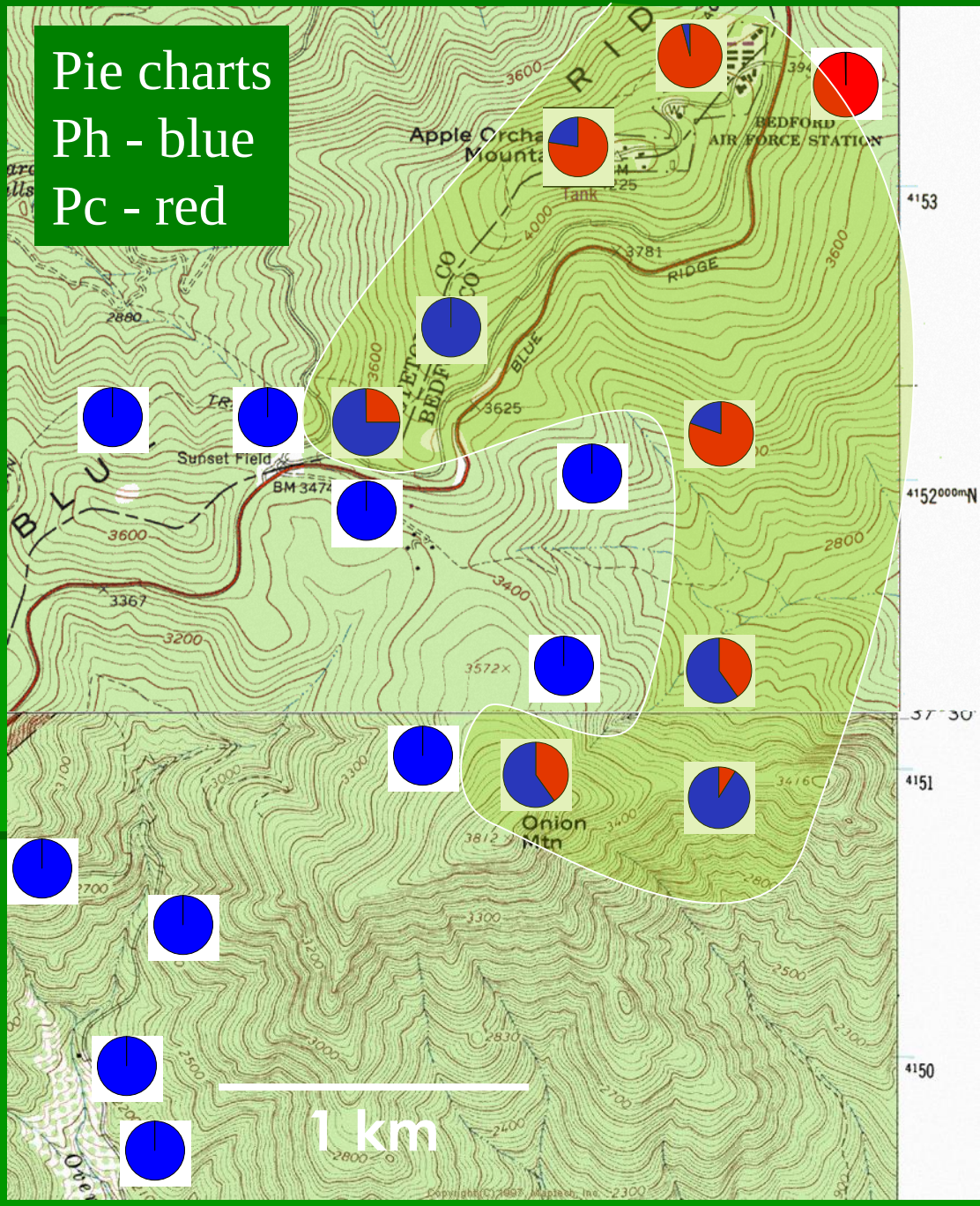
Focus on Hypothesis for allopatric Ph

- More sites at high and low elevations
- Focus on females and collect more per site
- Collect additional habitat data per site (% canopy closure, soil & litter moisture, litter depth)
- Survival rates at different elevations

Future Work

Focus on hypothesis for Ph in sympatric areas: Ph range in high elevation areas (>850m) restricted by Pc and not physiological factors

Pc Removal studies
In sympatric areas



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Questions?













*Photos by Sarah-Ashley Mackenzie