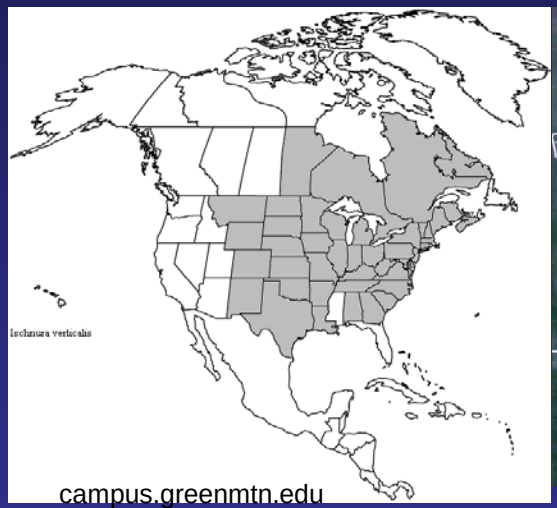
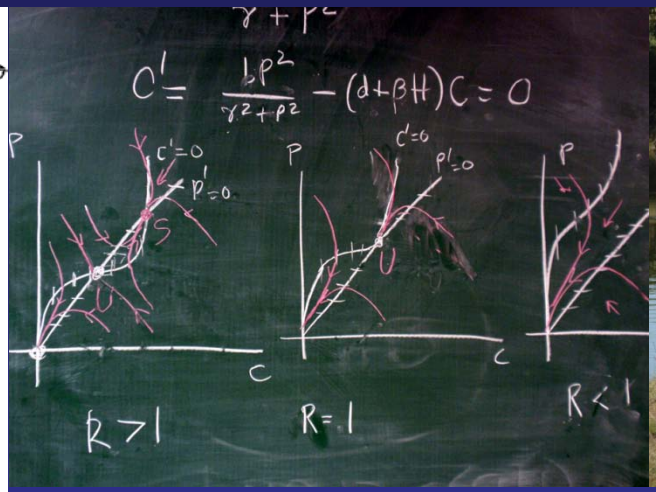
# The RUTE Data Set - 2010

## 120210 BIOS 915P

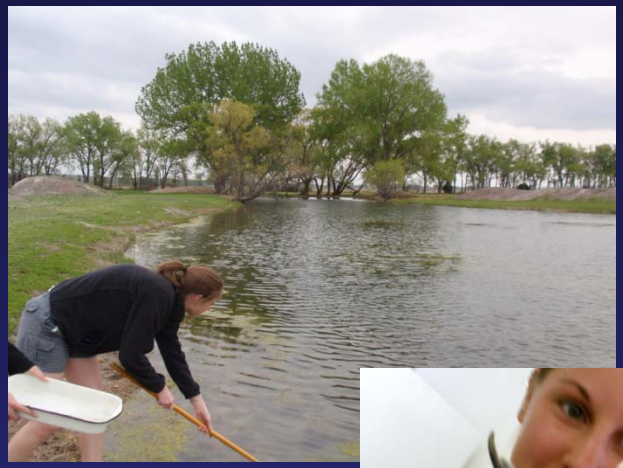





# The RUTE Data Set - 2010

- Five sites, sampled every two weeks
- One site (G&P Pond) sampled repeatedly, sometimes daily
- A semester of math modeling before; a semester of math and writing afterward.
- Thousands of measurements, counts, and specimens, etc.
- Several kinds of “experiments” (feeding rates, cyst shedding rates, etc.)



Elisabeth Tracey

Brittany Bunker

Ayla Duba

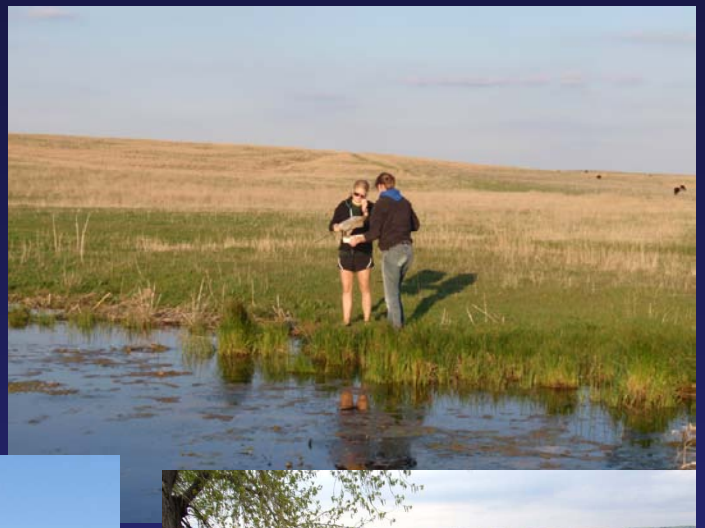
Austin Barnes

Matt Shuman

# THE PEOPLE

# THE PLACES


Nevens Ranch



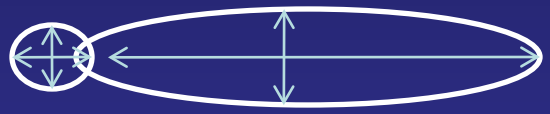


Game and
Parks Pond

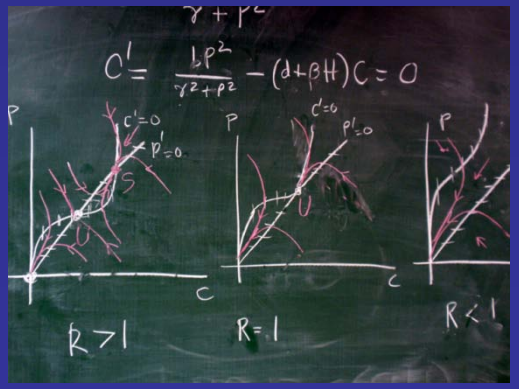
Dunwoody
Pond

# The main studies:

- Gregarine and mite counts – larvae, tenerals, and adults – all sites, *Ishnura verticalis*.
- Measurements and photography of all gregarines (four dimensions).



- Feeding rates of larvae.
- Enclosure cages for emergents.
- Cyst shedding counts.

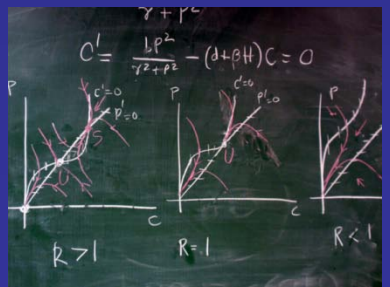



(These observations were intended to provide parameter values for various equations developed during the spring semester.)

# The main questions:

- What are the population distribution parameter values and distributions of best fit for all parasites?
- What is the relationship between host life cycle and developmental stages and parasite populations?
- What are the rate values for movement of infective stages (of parasites) through the system(s)?

(These observations were intended to provide parameter values for various equations developed during the spring semester.)



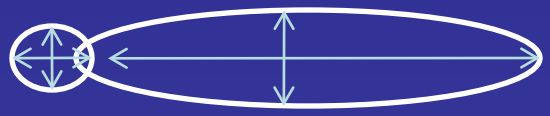
| Count | Coll code | Sort Sort | Inv code | Sci | Date | Genus | species | LC Stage | Dev Stage | CollSite | Head width | Total Length | Sex | Greg | Mites | Epistylis | Rm 2 verification | Rm 1 verification | Verification match data? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 1 | 33 | 4119 | BB | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 1.5 | M | 0 | 0 | 1 | 0 | 0 | yes |
| 31 | 1 | 35 | 4121 | BB | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 2 | M | 0 | 0 | 0 | 0 | 0 | yes |
| 1 | 1 | 1 | 2023 | AB | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 2.5 | M | 1 | 0 | 1 | 0 | 1 | yes |
| 32 | 1 | 36 | 4122 | BB | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 2.5 | F | 0 | 0 | 0 | 0 | 0 | yes |
| 43 | 1 | 52 | 8059 | MS | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 0.75 | 2.5 | F | 0 | 0 | 0 | 0 | 0 | yes |
| 46 | 1 | 61 | 8068 | MS | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 2.5 | M | 0 | 0 | 0 | 0 | 0 | yes |
| 73 | 1 | 97 | 10119 | ET | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 0.5 | 2.5 | M | 0 | 0 | 0 | 0 | 0 | yes |
| 76 | 1 | 100 | 10122 | ET | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 0.5 | 2.5 | M | 0 | 0 | 0 | 0 | 0 | yes |
| 20 | 1 | 21 | 4107 | BB | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 3.5 | F | 2 | 0 | 0 | 0 | 2 | yes |
| 28 | 1 | 32 | 4118 | BB | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 3.5 | M | 0 | 0 | 0 | 0 | 0 | yes |
| 59 | 1 | 79 | 8086 | MS | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 3.5 | M | 0 | 0 | 0 | 0 | 0 | yes |
| 71 | 1 | 94 | 10116 | ET | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 3.5 | M | 4 | 0 | 0 | 0 | 4 | yes |
| 74 | 1 | 98 | 10120 | ET | 52810 | *Ischnura* | *verticalis* | Larva | YL | GP | 1 | 3.5 | F | 0 | 0 | 0 | 0 | 0 | yes |
| 44 | 1 | 57 | 8064 | MS | 52810 | *Ischnura* | *verticalis* | Larva | ML | GP | 1.5 | 3.75 | F | 0 | 0 | 0 | 0 | 0 | yes |

613 lines – the larval collections from G&P

(Similar collections from other four sites, although not as many lines.

| Host numb | Date | Site | Host leng | Parasite | a | b | c | d | AlphaPhot obj lens | Host stage | Conversion factor: 100 microns = 2.2 cm (low power) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8053 | 52810 | G&P | 6 | S. dunwoodyi | 3.1 | 2.3 | 4.8 | 4 | | YL | |
| 8053 | 52810 | G&P | 6 | S. dunwoodyi | 1.1 | 1 | 1.9 | 1.3 | | YL | |
| 2023 | 52810 | G&P | 2.5 | S. dunwoodyi | 3.5 | 4.9 | 7.1 | 5.5 | | TL | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 1.4 | 1.3 | 3.9 | 1.5 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 3.3 | 3.5 | 6.4 | 3.9 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 2 | 1.8 | 5.3 | 1.9 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 2 | 1.8 | 5.6 | 1.8 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 1.5 | 1 | 8.9 | 1.2 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 0.8 | 0.4 | 2.4 | 0.5 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 1.9 | 1.2 | 4.8 | 1.1 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 1 | 0.6 | 2 | 0.9 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 1.7 | 1.8 | 4.7 | 1.9 | | ML | |
| 6012 | 52810 | G&P | 10 | S. dunwoodyi | 1.9 | 1.9 | 5.9 | 2.2 | | ML | |
| 4097 | 52810 | G&P | 6 | S. dunwoodyi | 2.2 | 2.7 | 5.9 | 2.6 | | ML | |

# 13,110 lines – gregarine measurements from G&P hosts.



(Similar measurement data from other four sites, but not as many lines.)

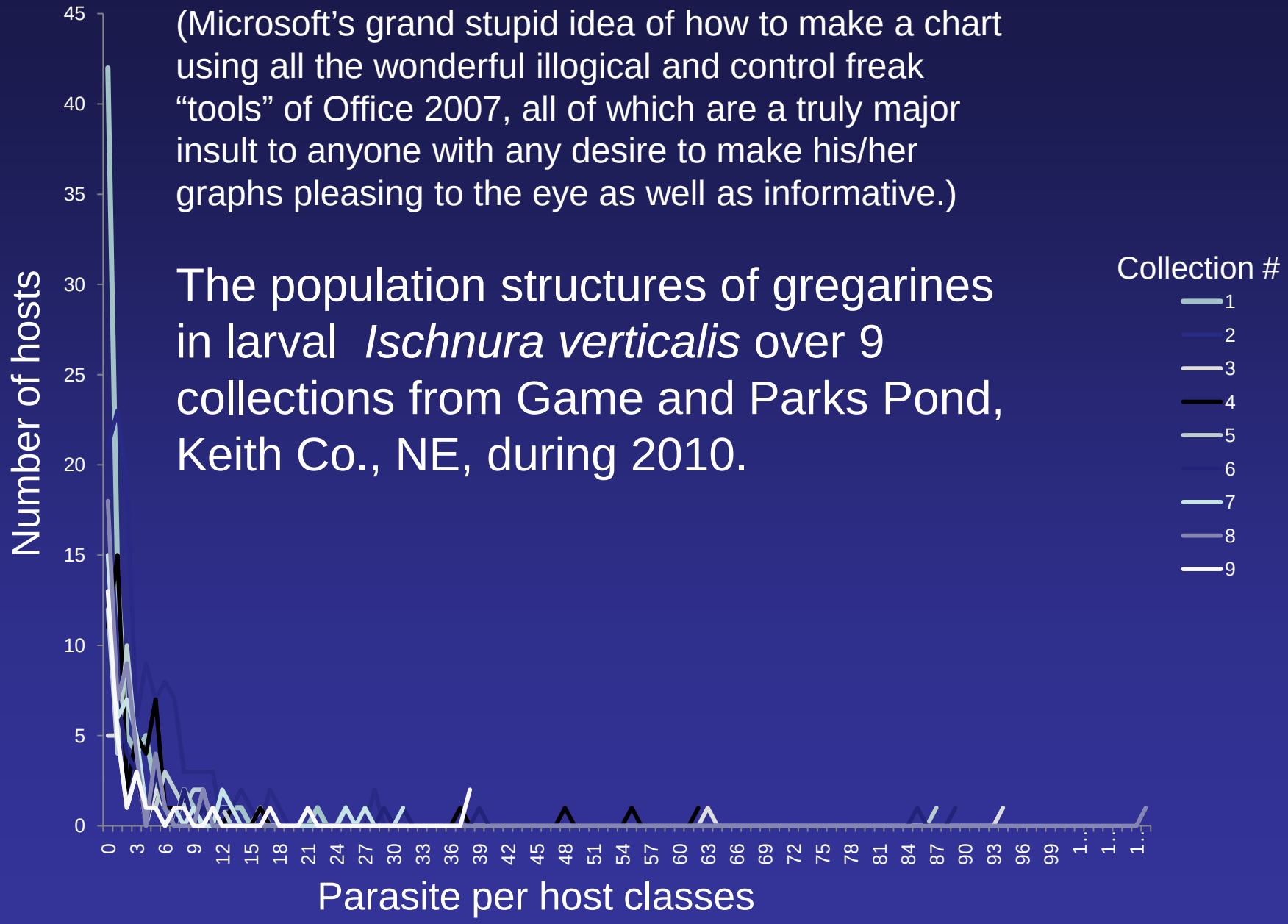
# Summary of larval data from G&P Pond - 2010

| * | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| HW vs Par | 0.26 | 0.01 | 0.24 | -0.01 | 0.15 | -0.13 | 0.30 | 0.20 | 0.42 |
| TL vs Par | 0.33 | -0.05 | 0.15 | -0.05 | 0.12 | 0.14 | 0.22 | 0.22 | 0.48 |
| HW vs TL | 0.81 | 0.85 | 0.62 | 0.56 | 0.77 | 0.90 | 0.92 | 0.90 | 0.86 |
| Mean | 2.43 | 4.56 | 9.82 | 6.40 | 5.05 | 9.18 | 4.33 | 4.53 | 5.32 |
| Var | 22.67 | 32.10 | 526.44 | 183.34 | 170.84 | 372.69 | 56.61 | 255.91 | 101.69 |
| Prev | 0.49 | 0.83 | 0.77 | 0.79 | 0.73 | 0.67 | 0.65 | 0.62 | 0.58 |
| n | 82 | 101 | 17 | 41 | 44 | 45 | 28 | 47 | 18 |

*First three rows are correlation r values between larval head width and # gregarines, total length and # gregarines, and head width vs total length of larvae.  Last four rows are parasite population data for all gregarines.

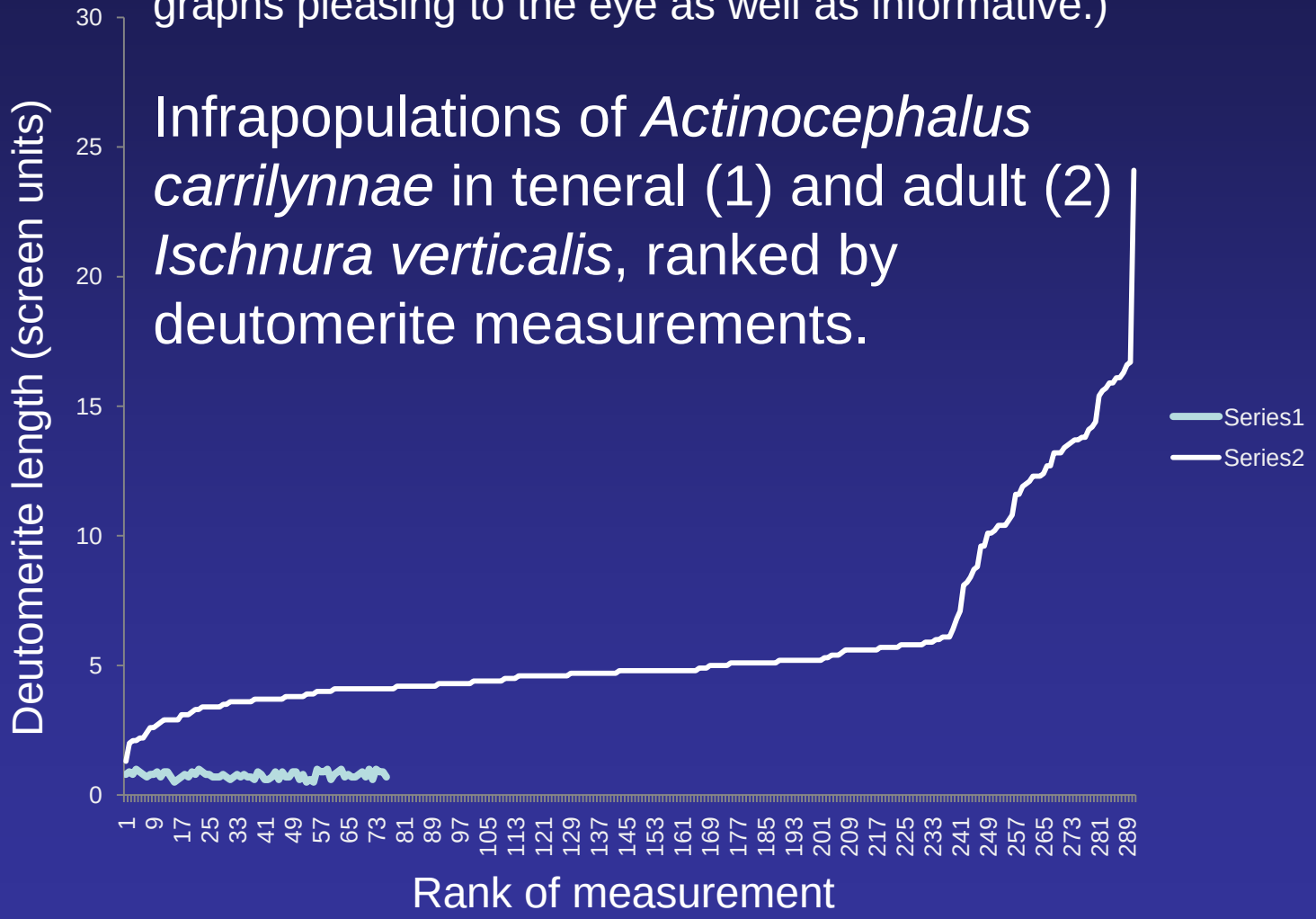
(Microsoft's grand stupid idea of how to make a chart using all the wonderful illogical and control freak "tools" of Office 2007, all of which are a truly major insult to anyone with any desire to make his/her graphs pleasing to the eye as well as informative.)

The population structures of gregarines in larval *Ischnura verticalis* over 9 collections from Game and Parks Pond, Keith Co., NE, during 2010.



(Microsoft's grand stupid idea of how to make a chart using all the wonderful illogical and control freak "tools" of Office 2007, all of which are a truly major insult to anyone with any desire to make his/her graphs pleasing to the eye as well as informative.)

Infrapopulations of *Actinocephalus carrilynnae* in teneral (1) and adult (2) *Ischnura verticalis*, ranked by deutomerite measurements.



NR

GP

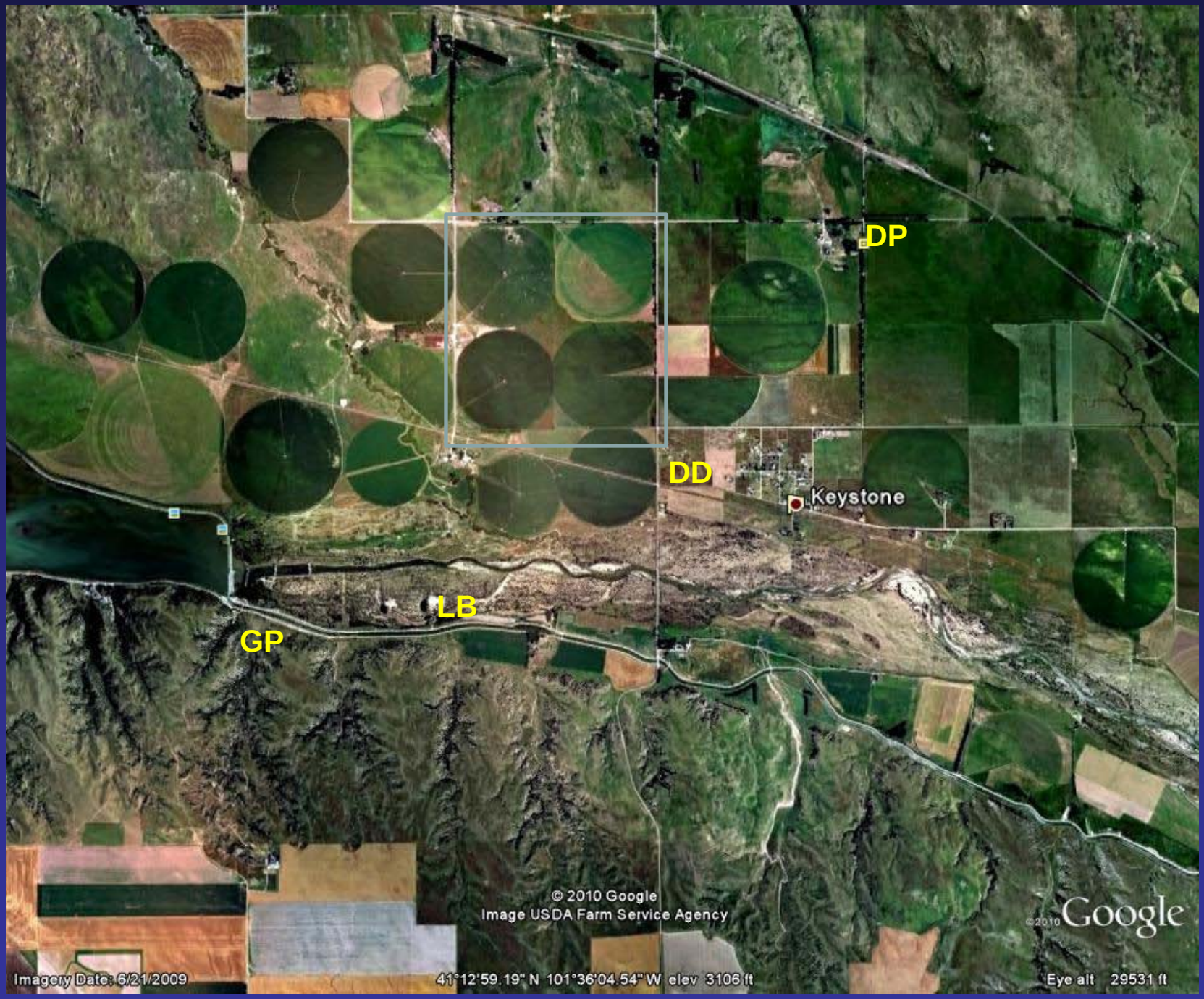
LB

DP

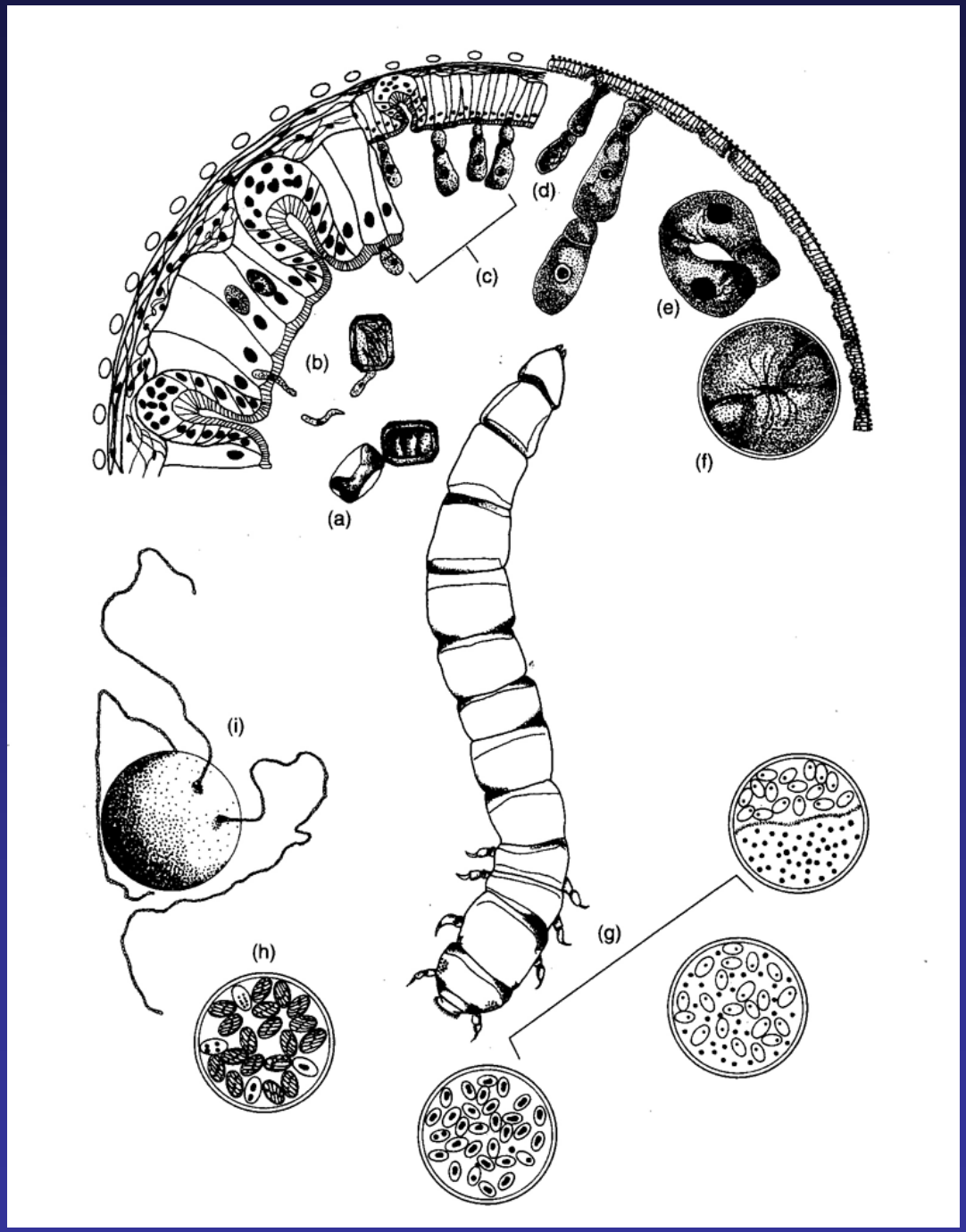
DD

What kinds of information, what kinds of questions, what kinds of adjustments to our paradigms, arise from a comparison of different sites within a region?

Possible answer: a bunch.


DP
DD
Keystone
LB
GP
© 2010 Google
Image USDA Farm Service Agency
Google
Imagery Date: 6/21/2009
41°12'59.19" N 101°36'04.54" W elev 3106 ft
Eye alt 29531 ft


DD
DP
LB
GP
NR
Keith
© 2010 Google
Image USDA Farm Service Agency
Image © 2010 DigitalGlobe
Imagery Date: 6/21/2009
41°12'39.20" N 101°30'33.75" W elev 3111 ft
Eye alt 15.39 mi




The famous (infamous?) Clopton drawing of the life cycle of *Gregarina cuneata* in *Tenebrio molitor* larvae.

(Which of these events really make a difference in evolutionary terms?)





# Acknowledgements:

NSF – RUTE project
Local landowners
CPBS
Project personnel

Various host insects
Past students (a bunch)