



Spatio-temporality of the earthworm community in an ephemeral wetland

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Introduction:

Study System:

- Ephemeral wetlands are areas that contain water for some part of the year.
- The constant changes in water quantity, are caused by the increase and decrease of evapotranspiration.
- Excess of water determines physical and chemical properties of the soils.
- During most part of the year, anaerobic conditions dominate the soil.
- Organism must adapt to these changes, to ensure survival.

Study Individuals:

- Earthworms populations are related to chemical conditions of the soil.
- They improved physical conditions making soil more permeable for water.
- Affected by presence or absence of oxygen in the topsoil.
- Sensitive to the pH levels of the soil.

Earthworm Identification:

All earthworms were identified to their respective genus using the dichotomous key from the Soil Biology Guide (Schwert, 1990).



Lumbricus



Eisenia



Allolobophora



Aporectodea



Dendrobaena



Amyntas

Objective:

- The objective of this study is to examine the spatio-temporality of earthworm communities in response to the seasonal dry down in a Virginia ephemeral wetland. To accomplish this goal, the following questions are posed:

Questions:

- 1) How do earthworm abundance, richness and biodiversity are spatially and temporally during seasonal dry down in and around Lake Arnold?
- 2) What are the relationships of earthworm's populations to soil chemical and physical properties in and around Lake Arnold?
- 3) Which is the best method of extraction, "hand sorting method" or "hot mustard powder", to sampling earthworms in soil next to wetlands?

Methods:

- Four transect of 30 m around lake Arnold, with 15 m inside and 15 m outside the lake, being plot 15 in the edge of it at the beginning.



- Temperature (5 cm, 12 cm, 20 cm depth) , Moisture (12 and 20 cm depth) and pH (5 cm depth) was measured three times every five meters; in each sampling period.
- Soil samples (20 cm depth) taken two times every five meters.
- Hand sorting method used to extract the earthworms. In an area of 32 x 32 cm length and 45 cm depth.



- Hot Mustard Powder used to extract earthworms in a plot of 42 x 42 cm length.

Data:

First Question

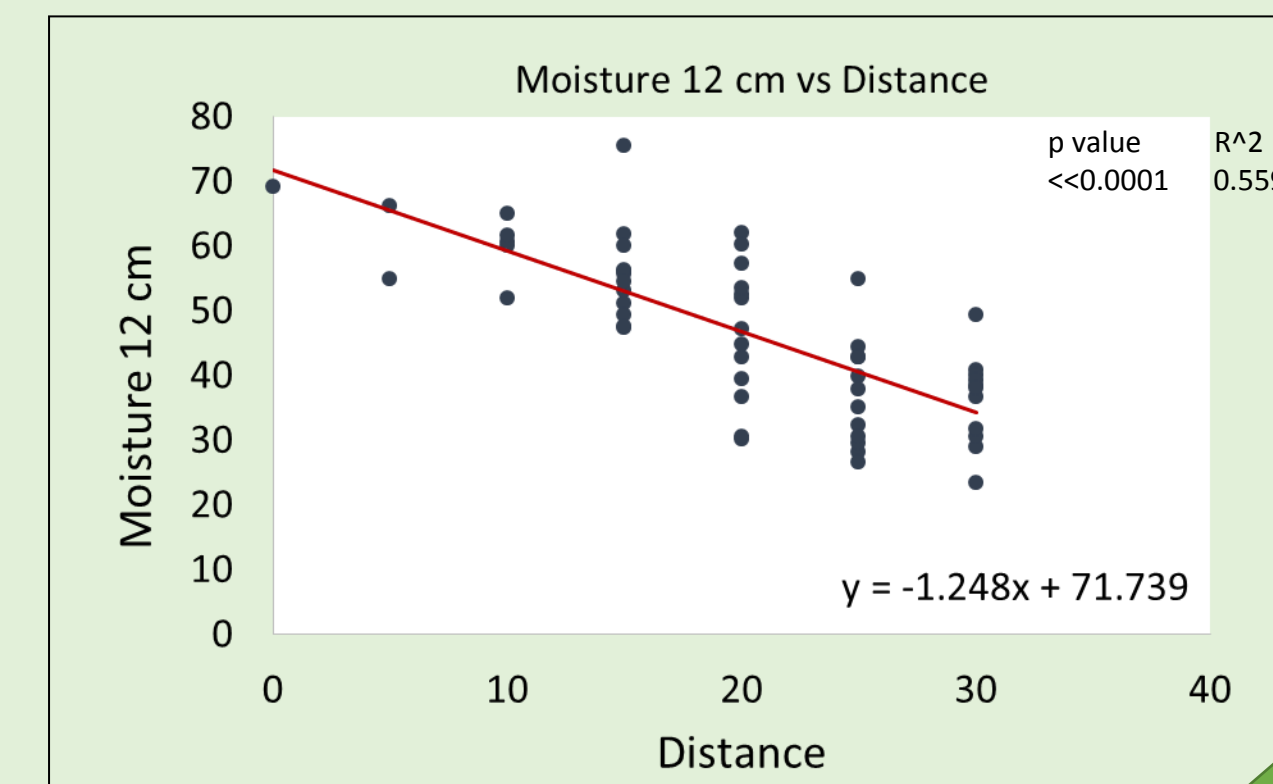


Fig. 1 - Moisture increase when the distance decrease (both).

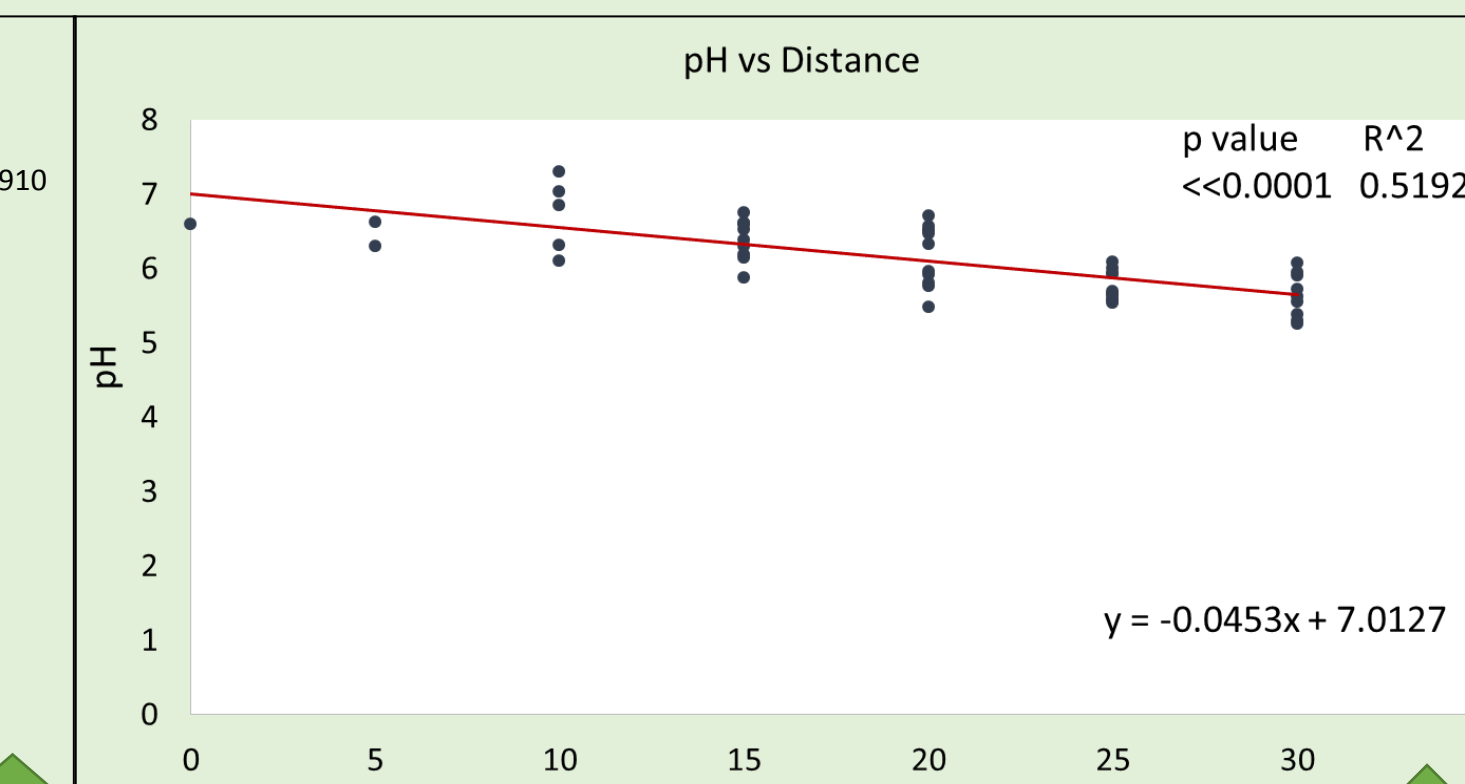


Fig. 2 - pH increase when the distance decrease.

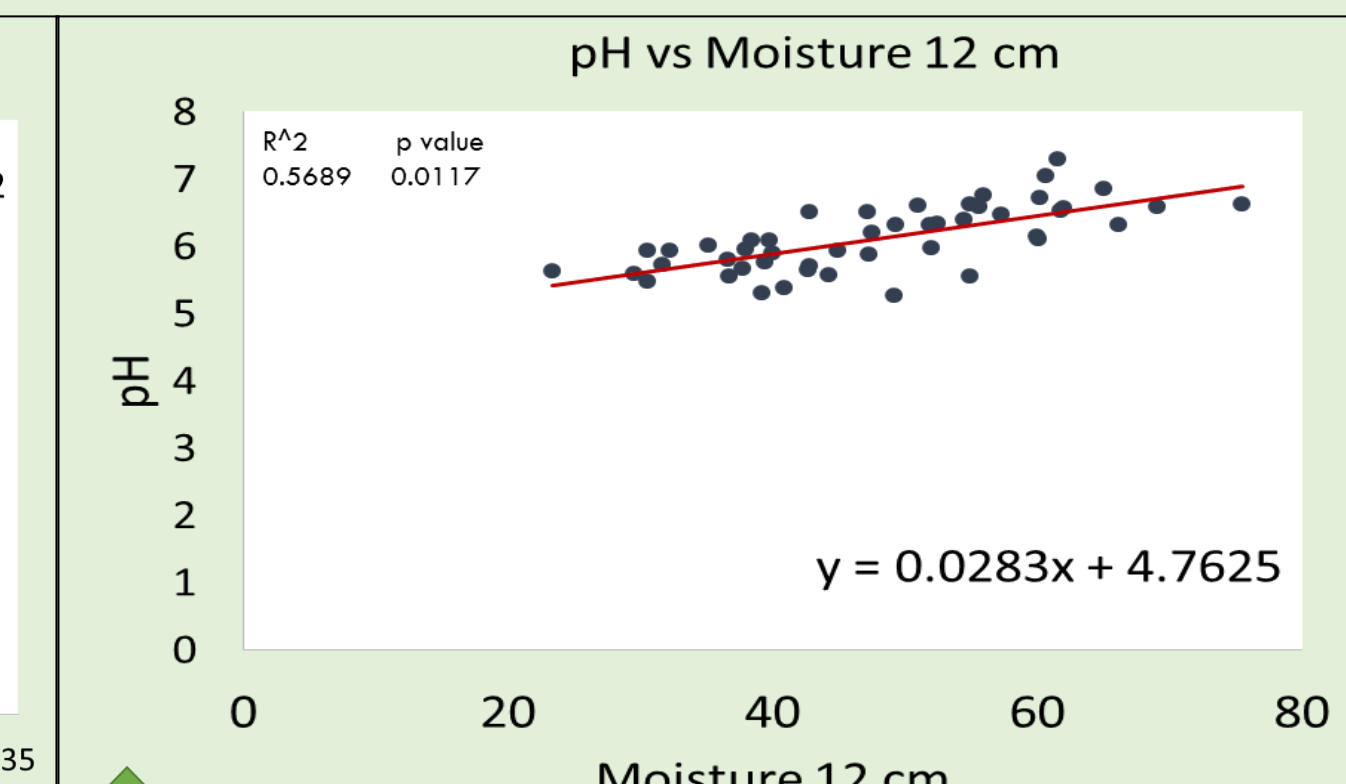


Fig. 3 - pH increase with moisture (at both deeps)

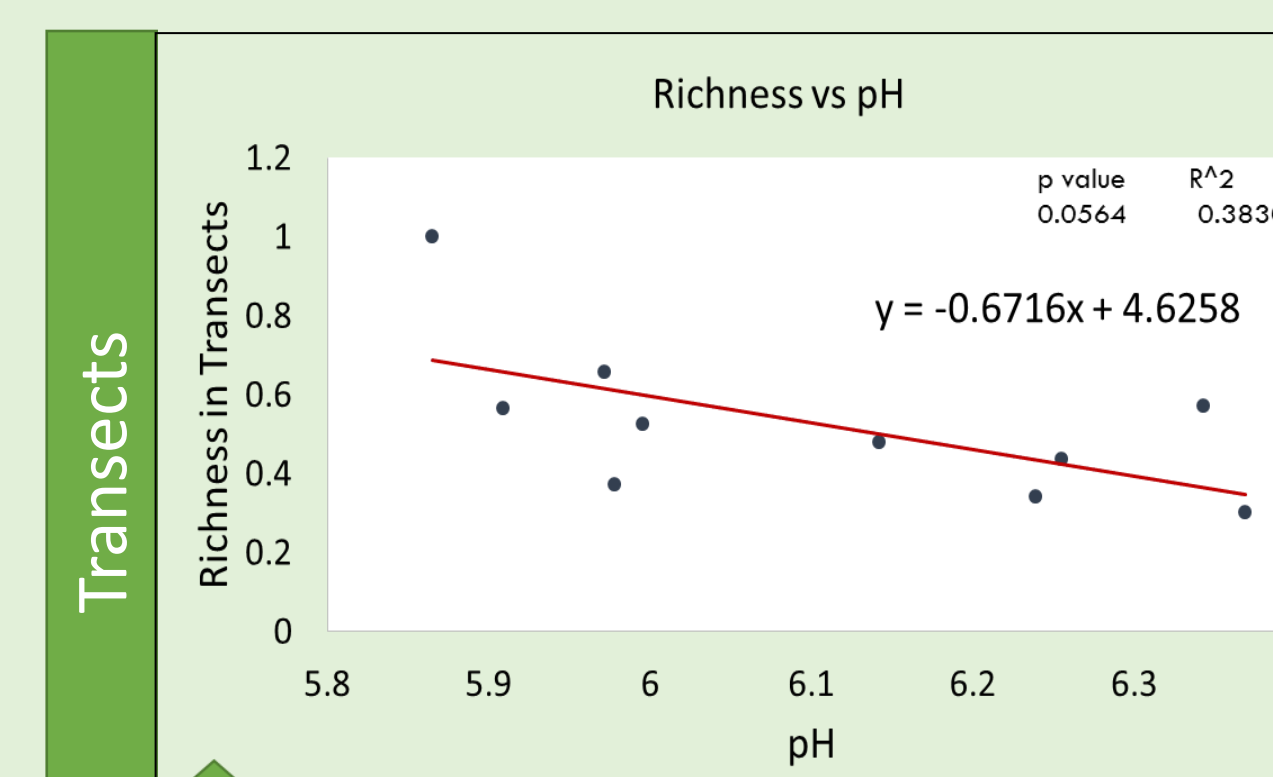


Fig. 4 – Decrease of richness with the increase of pH

Abundance as a function of each variable
Lumbricus is negatively correlated with temperature at 5 cm (p = 0.0501) and temperature at 12 cm (p = 0.0498).
Eisenia is negatively correlated with temperature at 12 cm (p = 0.0299), temperature at 20 cm (p = 0.0222), and positively correlated with moisture at 12 cm (p = 0.0277) and moisture at 20 cm (p = 0.0288).
Aporectodea is negatively correlated with temperature at 5 cm (p = 0.0325) and temperature at 12 cm (p = 0.0428).
Amyntas is positively correlated affected by the pH (p = 0.0061).

Fig. 5 – Each genus is affected by different variables

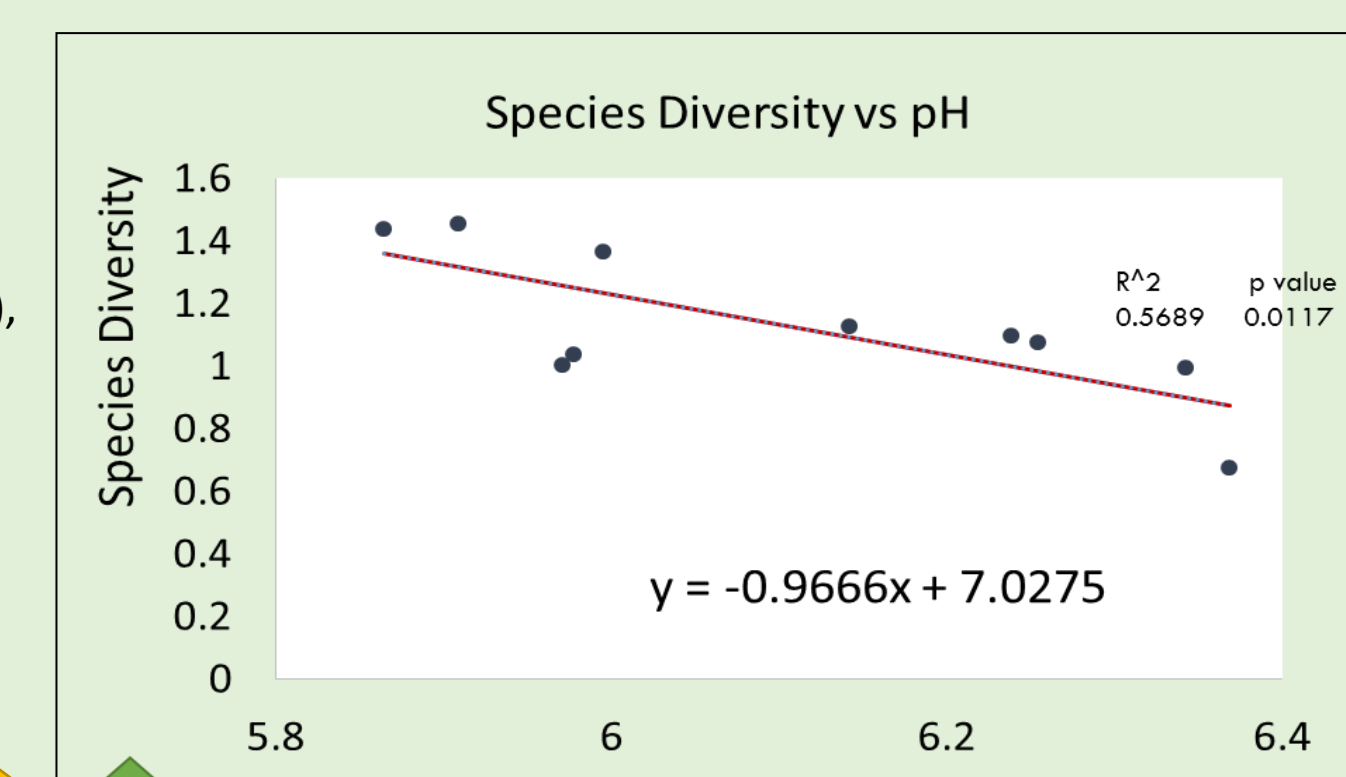


Fig. 6 – Decrease of diversity with the increase of pH

| Plots | Distance | | | | | | | | | | | | Period | | | | | | | | | | | | Distance*Period | | | | | | | | | | | | Distance | | | | | | | | | | | | Period | | | | | | | | | | | | Distance*Period | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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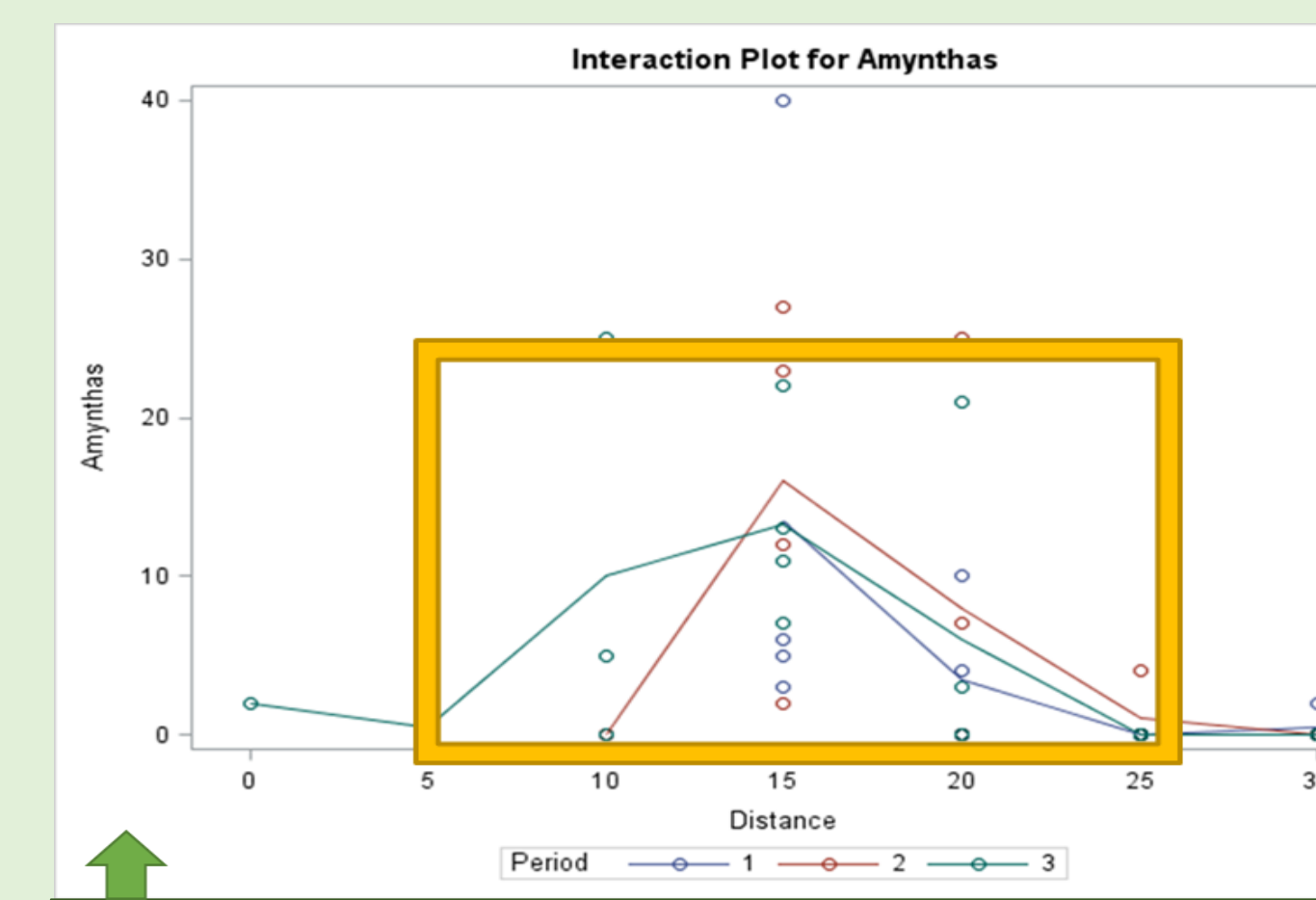


Fig. 9 – Example of how abundance changes during distance.

Third Question

- Effectiveness varies between 0% to 25%.
- Trend of the effectiveness of this sampling method in wet soils.
- Two hypothesis: Moisture alter the Hot Mustard dilution or Amyntas is not affected by Hot Mustard.

Acknowledge:

This project would not have been possible without the help of my mentor Jeff Atkins, Dr. Howard Epstein and Graduate Student Ariela Haber.

Also, I want to acknowledge Blandy Experimental Farm and the National Science Foundation for funding my research.

And all the REU students that helped me, in one way or another: Jennifer Ward, Dan Gibson, Stephen Johnson and Laura A. Aponte Díaz

Conclusions:

- pH increases as you get near to the lake, because it depends on moisture.

1-Transect

- Richness is affected by pH (negatively correlated).
- Abundance is affected by soil variables, but it depends of the earthworm genus:
 - Amyntas affected by pH.
- Diversity changes among periods, and it is affected by soil variables (Ex: temperature, pH)

Plot

- Moisture changes in distance and period, pH only changes during distance.
- Earthworms abundance changes on distance.
- Diversity is affected by soil variables (Ex: moisture)

2- Carbon appear to increase in soil exposed by the wetland, we need more replicas during a longer period to know what is happening there.

3- Hot Mustard Powder is not effective in soil near the lake.