**Lab: Simulating Succession**

Class Copy

**Objectives:**

* Model an ecological system, and the process of ecological succession
* Track and graph population changes to an ecological system over time
* Use quantitative and qualitative data to analyses the process of ecological succession

**Background:** We often view an ecosystem as unchanging; however, this is often not the case. Disturbances, both from the natural world (fire, flood, drought, etc.) and the human world (pollution, urban development, deforestation, etc.), keep ecosystems in flux. Even though an ecosystem may have experienced a disturbance, it may gradually return to its original state if given enough time. This return often occurs in predictable way. The gradual replacement of established species or shifts in proportions of species or populations is **ecological succession**.

We can use aquatic organisms to study ecological succession. The organisms we will be using are called **protists.**. They are unicellular, microscopic and live in fresh water ponds. There are two types of **protists**:

**protozoa** are animal-like. They consume plants and algae.

**algae** are plant-like so they photosynthesize (autotrophs)

There are two parts to this experiment:

1. In part one, we will be following the population of microscopic organisms called **protozoa** over time.
2. In part two, we will be modeling the process of **aquatic** **succession** that occurs when a pond fills with sediment.

Lab Set Up: This is a final draft lab. Be sure to type it, and follow all final draft lab requirements on Ms. Grant’s website!

* Neatly type (or write in blue or black ink) on a separate sheet.

**Populations and Ecological Succession**

Your name, Partner’s name

Date, Period

|  |  |
| --- | --- |
| Problem Q 1:  Hypothesis 1:  Procedure 1:  1.  2.  3.  Ect… | Problem Q 2:  Hypothesis 2:  Procedure 2:  1.  2.  3.  Ect… |

Page 1:

* Title the lab “Populations and Ecological Succession”. Write your name and your partner’s name below the title, circle your name, and write the date and period
* Read through the procedure to get familiar with the lab and then…
* Divide your paper in half by drawing a line. On the left hand side, write **problem question #1**. On the right hand side copy **problem question #2**
  + Under both problem questions, create a **hypothesis** (you will have 2 hypotheses).

Part 1 problem question: What will happen to the protozoa population over time?

Part 2 problem question: What will happen to the model pond once the water dries up?

* Summarize the procedures after your hypothesis

**Your Data table for Part 1**:

*Follow data table notes! Be sure to include a correct title,*

**Class Data table for Part 1**:

*Follow data table notes! Be sure to include a correct title,*

**Data Table for Part 2:**

*Be sure to include enough space to record good qualitative data! Be sure to include a correct title*

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* Create two data tables for Part 1 that will accommodate your protozoa population over 7 days.
* Create a data table to hold qualitative data for Part 2

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**Procedure:**

**Initial Set-Up and Base-line Data Collection:**

1. As a group of 4, use a baster to add 100 mL of pond water from the class pond to a plastic cup in three increments:
   1. ~33mL of water from the **bottom of the pond**
   2. ~33mL of water from the **middle of the pond**
   3. ~33mL of water from the **top of the pond**
   4. Be sure to mix your sample thoroughly with your pipette!
2. Take your cup back to your lab station, and use it as the source for your sampling procedure

**Sampling procedure:**

1. In pairs (there will be two per group), make a wet mount slide
   1. Use a pipette to take a small sample of water
   2. Add one drop of liquid from your pipette to the slide
   3. Put the rest of the sample back into its source
   4. Place a coverslip over the drop of water
2. Place your slide onto the microscope, and bring the sample into focus (choose any location) under **medium (100X) power.**
3. Count the number of protozoa visible within the field of view over a 30-second timespan, and record in the data table.
4. Move to a new location on the slide, and repeat step 3.
5. Move to a third and final location on the same slide, and repeat step 3.

**We will be running parts 1 and 2 of this lab at the same time.** Follow instructions below to continue the set-up for both parts. **Complete the set up for part one, then the set-up for part two.**

**Part 1: Population of a Pond Ecosystem**

This is completed **as a pair**. There will be two pairs per group, each with their own test tube to observe.

**Investigative Question:** What is the effect of time on the population density of protests in a pond ecosystem?

**Day 1:** Set Up (DO THIS FIRST)

Procedure:

1. Label a screw-top vial with your group initials, and place it in a test tube rack to hold it upright.
2. Add 1 wheat grain.
3. Cut several small pieces of the hay and add it to your vial.
4. Cover the bottom of the vial with a pinch of the soil.
5. Fill the vial about halfway with spring water.
6. Add 2 pipettes full of water from pond water cup.
7. Add 2 drops of the Alga-Gro® medium to your vial and top it off with spring water.
8. Loosely cap and then label your vial.
9. Place your vial in the class test tube rack, near a light source.

**Day 2 and onward, until end of lab:** Sampling

You will collect data every other day for more than two weeks. Follow the sampling procedure from day 1, but sample from your own test tube. Be sure record your data accurately, and to record class data.

**Part 2: Succession of an Aquatic Ecosystem**

This is completed as a **group of 4.** The entire group will make observations about the same pond

**Investigative Question:** What is the effect of time on the biodiversity of species in a pond ecosystem when it fills with sediment?

**Day 1:** Set-Up (DO THIS SECOND)

Procedure:

1. Label a pie tin with your group initials. This will be your model pond.
2. Fill the pie tin about three-fourths full with humus.
3. Add 2 tablespoons of the seed mixture, and mix the seeds thoroughly throughout the humus.
4. Make a crater for a pond in the middle of the pan, but leave a thin layer of humus cover
5. Move your pie tin to a well-lit location designated by your teacher
6. Carefully pour your pond water sample into the crater in your pie tin. Add enough spring water to fill the crater to the top edge of the humus

**Day 2**

1. Add enough spring water to fill the crater again.
2. Write qualitative observations about the pond environment into your data table

**Day 3 and onward, until the end of lab:**

1. On the third day and thereafter, water the humus only enough to keep it wet; do not fill the depression in the center.
2. Make regular qualitative observations of the community in the pie tin
3. Continue making observations about the community in the pie tin until the end of the lab

**Data Collection:**

1. Create two data tables (according to the data table notes) to record your data for Part 1.
   * One for your pair’s protist counts
   * One for the class protist counts
2. Create a separate data table to record your qualitative observations for Part 2.

**Graph**

After collection is complete, you will create a line graph to display both sets of data (personal and class) for Part 1

* You should make one graph with 2 lines; one for your own average protist population and one for the class average protist population over the same period of time
* Include a key (legend).

Once you’ve complete the graph, answer the following questions

1. Describe the shape of the graphs.
2. What do your graphs reveal about protist population growth?
3. Is protist population growth logistic or exponential? How do you know?

**Analysis:**

**Part 1:**

1. What environmental factors impact the organisms in the vial?
2. What organisms did you observe first? Over time, how did the populations change? What factors may have influenced these population changes?
3. What impact do certain species appear to have on others in the vial?
4. Identify examples of succession in the local environment. How might you model some of these types of succession in the classroom?
5. What are some ways in which people influence succession in ecosystems?

**Conclusion**: Use CER to write a conclusion for Part 1 of this lab

**Part 2:**

Answer the following questions.

1. What organisms made up the community of the pie tin ecosystem when you first observed it?
2. Do you think the protists are still present in the soil even if a pond is dry? Why or why not? How could you test for their presence?
3. What abiotic factors caused succession to take place?
4. What was the pioneer species when the water was gone?
5. In this simulation, did another plant species take overtake the pioneer species? Why or why not? How might a natural system differ?
6. If the pie tin were an actual pond, what would happen over time to the community? Predict the climax community.
7. If a pond dried up and evolved into a field community, how would that community change if the field were to be flooded?

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| --- | --- |
| Analysis Part 1  **Questions:**  1.  2.  3.  4.  5.  **Conclusion** | Analysis Part 2  **Questions:**  1.  2.  3.  4.  5.  6.  7. |

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**Graph for Part 1**: *Be sure to*

* *include two lines, one for personal and one for class*
* *Include a key*
* *Include a correct title and axis labels*
* *Follow graphing notes*
* *Use graph paper or a computer program*

**Graph Questions**:

1.

2.

3.

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