

Name: _____

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AP Environmental Science

Ecological Succession Lab

In this lab you will apply what you have learned about succession to the ecological changes that occur in an abandoned hay field. After only 5 years, several types of trees have begun to grow where there was once only hay. You will observe, by counting, the number and types of trees that grow in this field 5, 20, 50 and 100 years after abandonment, in both the understory (smaller trees and plants below the canopy) and the canopy (the highest level of trees).

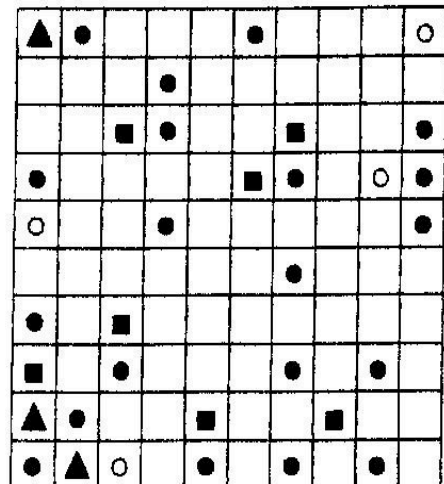
Part A:

For Figures 1-6, count how many of each species of tree are found in the field, using the key as a guide. Add up all of the trees to find the total number of trees present in the field. After you have counted, you will now calculate the percentage of each tree species observed during each time period. Use the following formula:

$$\text{Number of specific tree} \div \text{TOTAL number of trees} = \text{_____} \times 100 = \text{_____}\%$$

Figure 1 (Understory and Canopy after 5 years)

Tree species	Number of Trees	% of Total
Yellow birch ○		
Aspen ▲		
Pin cherry ■		
Blackberry ●		
Sugar Maple □		
Beech ◇		
TOTAL		



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Figure 2 (Understory after 20 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○		
Aspen ▲		
Pin cherry ■		
Blackberry ●		
Sugar Maple □		
Beech ◇		
TOTAL		

**July 1, 12pm - Air Temperature: 75°F;
Soil Surface Temperature: 84°F**

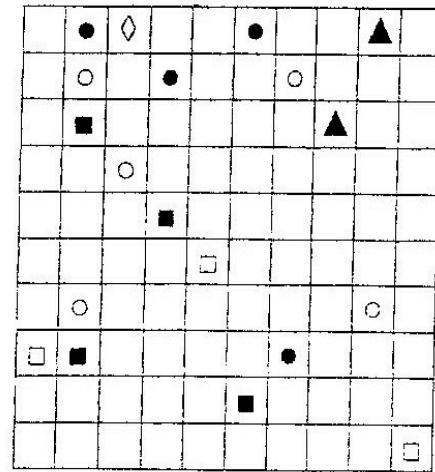
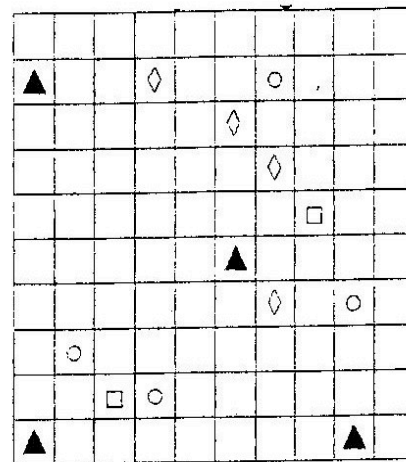


Figure 3 (Understory after 50 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○		
Aspen ▲		
Pin cherry ■		
Blackberry ●		
Sugar Maple □		
Beech ◇		
TOTAL		

**July 1, 12pm - Air Temperature: 70°F;
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Figure 4 (Canopy after 20 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○		
Aspen ▲		
Pin cherry ■		
Blackberry ●		
Sugar Maple □		
Beech ◇		
TOTAL		

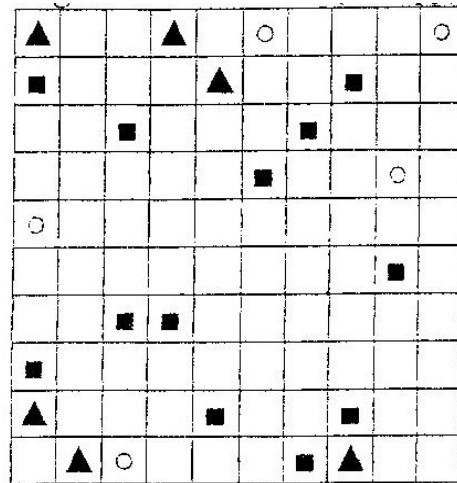
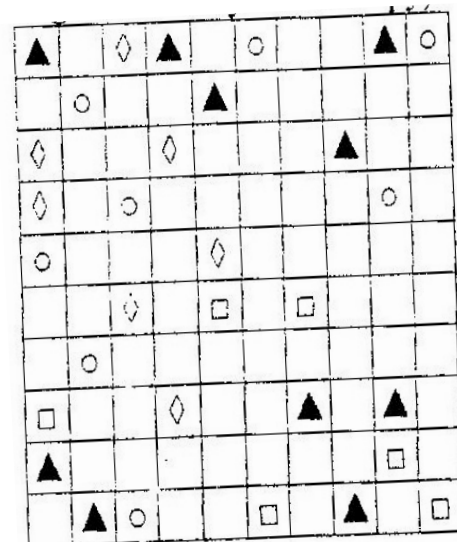


Figure 5 (Canopy after 50 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○		
Aspen ▲		
Pin cherry ■		
Blackberry ●		
Sugar Maple □		
Beech ◇		
TOTAL		



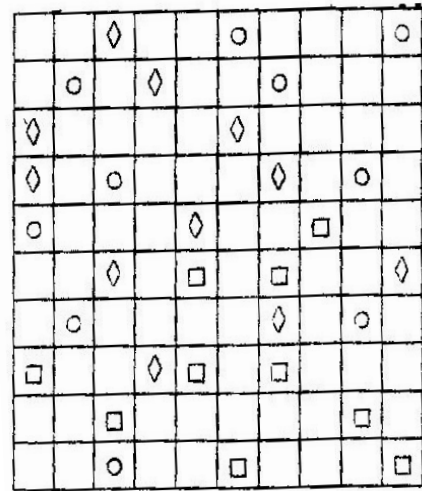
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AP Environmental Science**Figure 6 (Canopy after 100 Years)**

Tree species	Number of Trees	% of Total
Yellow birch ○		
Aspen ▲		
Pin cherry ■		
Blackberry ●		
Sugar Maple □		
Beech ◇		
TOTAL		

**Part B:**

Using the data in the tables you just completed, construct two graphs.

Graph 1: Show the changes in the percentage of each tree species in the understory from 5 to 50 years after the hay field was abandoned. Use the percentages of each tree species from Figures 1, 2, and 3 to construct your graph of the understory changes.

Graph 2: Show the changes in the percentage of each tree species in the canopy from 5 to 100 years after the hay field was abandoned. Use the percentages of each tree species from figures 1, 4, 5 and 6 to construct your graph of the canopy changes.

*Make sure to follow the directions given by your teacher very carefully to construct your graphs.

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Part C: After completing both graphs, answer the following analysis questions.

1. Using your graphs, describe, in terms of **decreasing or increasing** percentage, what happened to each of the following tree populations (in both the canopy and the understory) from 5 to 100 years after the field was abandoned:

Sample Answer: Increased from 5-20 years and then decreased

A. Yellow Birch

a. Understory: _____

b. Canopy: _____

B. Aspen

a. Understory: _____

b. Canopy: _____

C. Pin Cherry

a. Understory: _____

b. Canopy: _____

D. Blackberry

a. Understory: _____

b. Canopy: _____

E. Sugar Maple

a. Understory: _____

b. Canopy: _____

F. Beech

a. Understory: _____

b. Canopy: _____

2. Using the Understory Figures 2 and 3, which tree species disappeared between 20 and 50 years after the field was abandoned? (Note: do not include trees that had already disappeared after 20 years.)

3. Use the Canopy Figures 4, 5, and 6 to answer the following questions:

a. Which tree species disappeared between 20 and 50 years after the field was abandoned? _____

b. Which tree species appeared between 20 and 50 years after the field was abandoned? _____

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4. Look at the Air Temperature and Soil Surface Temperature that was recorded with the Understory Data at 20 and 50 years (Figures 2 & 3):

a. What happened to the air temperature and soil surface temperature in the understory between 20 and 50 years after the field was abandoned?

b. Why do you think both the air temperature and soil surface temperature decreased in the understory between 20 and 50 years? _____

5. In this activity you have observed the changes that occurred in the types of plants that grew in an abandoned hay field over 100 years. Think about the **other types of organisms** that would have been affected by these changes.

a. Give some examples of organisms (other than plants) that would have lived in the hay field before it was abandoned. _____

b. Would the same type of organisms you listed above live in the new forest that developed over the past 100 years? _____ Why or why not? _____

6. Now that a forest has been established, will the community of organisms in the forest change significantly over the next few years? _____ Why or why not?

7. Describe one disturbance/activity that could cause this forest ecosystem to become a field again. _____

a. After such disturbances, would you expect a similar forest to become the climax community again? _____ Why or why not? _____

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ANSWER KEY: Ecological Succession Lab

In this lab you will apply what you have learned about succession to the ecological changes that occur in an abandoned hay field. After only 5 years, several types of trees have begun to grow where there was once only hay. You will observe, by counting, the number and types of trees that grow in this field 5, 20, 50 and 100 years after abandonment, in both the understory (smaller trees and plants below the canopy) and the canopy (the highest level of trees).

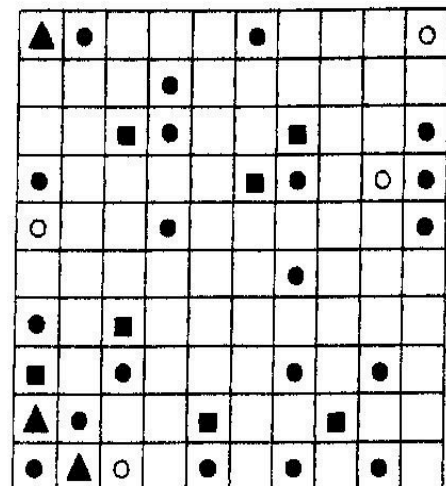
Part A:

For Figures 1-6, count how many of each species of tree are found in the field, using the key as a guide. Add up all of the trees to find the total number of trees present in the field. After you have counted, you will now calculate the percentage of each tree species observed during each time period. Use the following formula:

$$\text{Number of specific tree} \div \text{TOTAL number of trees} = \text{_____} \times 100 = \text{_____}\%$$

Figure 1 (Understory and Canopy after 5 years)

Tree species	Number of Trees	% of Total
Yellow birch ○	4	12%
Aspen ▲	3	9%
Pin cherry ■	7	22%
Blackberry ●	20	59%
Sugar Maple □	0	0%
Beech ◇	0	0%
TOTAL	34	100%



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Figure 2 (Understory after 20 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○	5	27%
Aspen ▲	2	11%
Pin cherry ■	4	22%
Blackberry ●	4	22%
Sugar Maple □	3	17%
Beech ◇	1	6%
TOTAL	19	100%

**July 1, 12pm - Air Temperature: 75°F;
Soil Surface Temperature: 84°F**

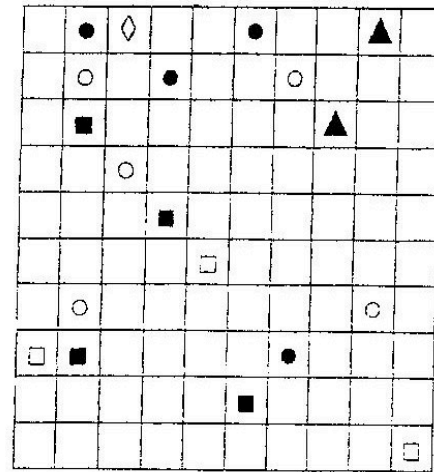
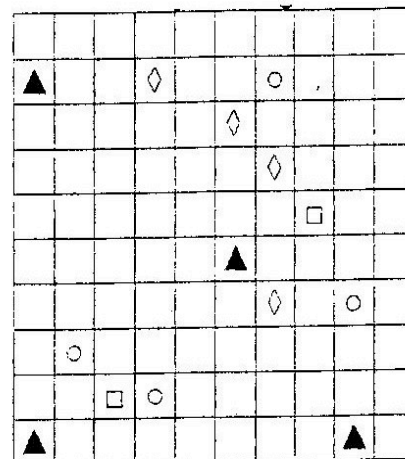


Figure 3 (Understory after 50 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○	4	29%
Aspen ▲	4	29%
Pin cherry ■	0	0%
Blackberry ●	0	0%
Sugar Maple □	2	14%
Beech ◇	4	29%
TOTAL	14	100%

**July 1, 12pm - Air Temperature: 70°F;
Soil Surface Temperature: 68°F**



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Figure 4 (Canopy after 20 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○	5	22%
Aspen ▲	6	26%
Pin cherry ■	12	52%
Blackberry ●	0	0%
Sugar Maple □	0	0%
Beech ◇	0	0%
TOTAL	23	100%

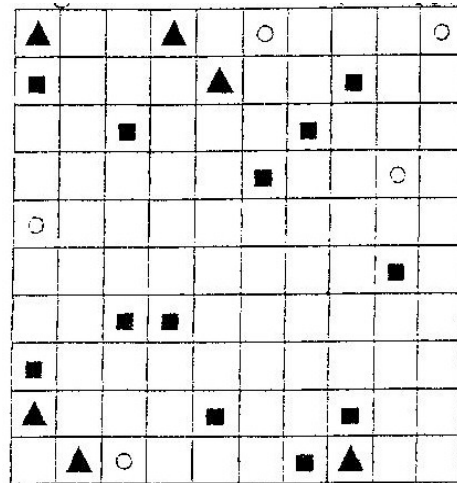
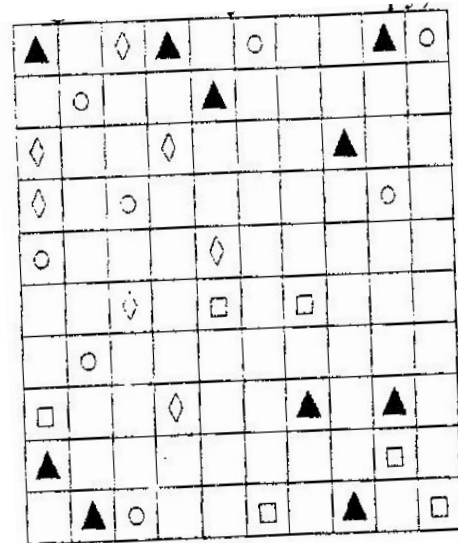


Figure 5 (Canopy after 50 Years)

Tree species	Number of Trees	% of Total
Yellow birch ○	8	26%
Aspen ▲	10	32%
Pin cherry ■	0	0%
Blackberry ●	0	0%
Sugar Maple □	6	19%
Beech ◇	7	23%
TOTAL	31	100%



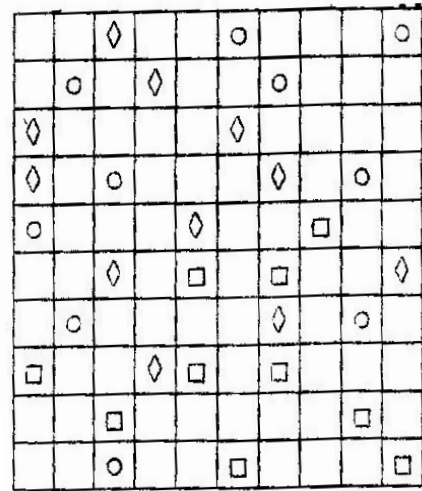
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AP Environmental Science**Figure 6 (Canopy after 100 Years)**

Tree species	Number of Trees	% of Total
Yellow birch ○	10	32%
Aspen ▲	0	0%
Pin cherry ■	0	0%
Blackberry ●	0	0%
Sugar Maple □	10	32%
Beech ◇	11	35%
TOTAL	31	100%

**Part B:**

Using the data in the tables you just completed, construct two graphs.

Graph 1: Show the changes in the percentage of each tree species in the understory from 5 to 50 years after the hay field was abandoned. Use the percentages of each tree species from Figures 1, 2, and 3 to construct your graph of the understory changes.

Graph 2: Show the changes in the percentage of each tree species in the canopy from 5 to 100 years after the hay field was abandoned. Use the percentages of each tree species from figures 1, 4, 5 and 6 to construct your graph of the canopy changes.

*Make sure to follow the directions given by your teacher very carefully to construct your graphs.

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ANSWER KEY

Part C: After completing both graphs, answer the following analysis questions.

1. Using your graphs, describe, in terms of **decreasing or increasing** percentage, what happened to each of the following tree populations (in both the canopy and the understory) from 5 to 100 years after the field was abandoned:

Sample Answer: Increased from 5-20 years and then decreased

B. Yellow Birch

a. Understory: _____

b. Canopy: _____

B. Aspen

c. Understory: _____

d. Canopy: _____

C. Pin Cherry

c. Understory: _____

d. Canopy: _____

D. Blackberry

c. Understory: _____

d. Canopy: _____

E. Sugar Maple

c. Understory: _____

d. Canopy: _____

F. Beech

c. Understory: _____

d. Canopy: _____

2. Using the Understory Figures 2 and 3, which tree species disappeared between 20 and 50 years after the field was abandoned? (Note: do not include trees that had already disappeared after 20 years.)

Pin cherry and blackberry disappeared between 20 and 50 years after the field was abandoned.

3. Use the Canopy Figures 4, 5, and 6 to answer the following questions:

a. Which tree species disappeared between 20 and 50 years after the field was abandoned? Pin cherry disappeared

b. Which tree species appeared between 20 and 50 years after the field was abandoned? Sugar Maple and Beech appeared

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4. Look at the Air Temperature and Soil Surface Temperature that was recorded with the Understory Data at 20 and 50 years (Figures 2 & 3):

a. What happened to the air temperature and soil surface temperature in the understory between 20 and 50 years after the field was abandoned?

The air temperature and soil surface temperature decreased.

b. Why do you think both the air temperature and soil surface temperature decreased in the understory between 20 and 50 years? From 20-50 years the trees in the canopy are getting taller and blocking out the sunlight in the understory.

5. In this activity you have observed the changes that occurred in the types of plants that grew in an abandoned hay field over 100 years. Think about the **other types of organisms** that would have been affected by these changes.

a. Give some examples of organisms (other than plants) that would have lived in the hay field before it was abandoned. Snakes, ants, birds, worms, rodents, etc.

b. Would the same type of organisms you listed above live in the new forest that developed over the past 100 years? No Why or why not? The forest is capable of holding a larger biodiversity of organisms.

6. Now that a forest has been established, will the community of organisms in the forest change significantly over the next few years? No Why or why not? The community has reached the status of climax community, which is end result of succession when ecosystems are living in a balance.

7. Describe one disturbance/activity that could cause this forest ecosystem to become a field again. Fire, flood, hurricane, deforestation, other human disturbances (development), etc.

a. After such disturbances, would you expect a similar forest to become the climax community again? Yes Why or why not? The forest should have remnants of the species that were living there so it will be easier for the forest to rebuild and reestablish itself.