

The *Nature* of Teaching

• UNIT 5 •

Ashes to Ashes: We All Grow Up

These activities will be used to describe how an ecosystem is constantly changing and what causes the changes.



Overview	2
Lesson 1: Succession and Disturbance	3
Lesson 2: Wildlife Habitat through Succession and Disturbance	5
Teacher's Notes	7
Script for Succession and Disturbance	9
Script for Wildlife Habitat through Succession and Disturbance	11
Succession and Disturbance Worksheet.....	14
Fire Worksheet.....	15
Cards for Succession and Disturbance	16

Jarred Brooke, Kim Dishman, Daniel Hamilton, Jeff Hubley,
Katie McCausland, Melissa Mills, and Rod Williams

Department of Forestry and Natural Resources, Purdue University, West Lafayette, IN 47907

Unit 5 • Overview

Estimated Time

One 45-minute lesson plan and one 60-minute lesson plan.

Vocabulary

- Succession
- Disturbance
- Annual
- Perennial
- Shrub
- Ecosystem
- Habitat
- Hypothesis
- Natural
- Prescribed Fire

Unit Objectives

Students should be able to:

- List the four major stages of succession.
- Understand the importance and benefits of natural fire in nature.
- Recognize that animals use different successional stages of an ecosystem differently, depending on what they need to survive.

Reference Materials

- *Common Indiana Mammals* (FNR-413-W)
- Science book, teacher edition
- Mammal books from the library

Targeted Grade-Level Indiana Standards

3–5 Science Standards

- 3.3.5, 3.4.4, 3.6.1, 3.6.2, 3.6.3, 3.6.5
- 4.2.4, 4.3.2, 4.4.3, 4.4.4, 4.4.6
- 5.4.4, 5.4.7

K-5 English Standards

- 3.1.9
- 4.3.2, 4.6.1

K-5 Math Standards

- 4.6.2

Required Materials

- Lanyards and Succession and Disturbance Cards
- Succession and Disturbance Worksheet
- Fire Worksheet
- Prairie and House Fire Pictures

Authors

Jarred Brooke, Kim Dishman, Daniel Hamilton, Jeff Hubley, Katie McCausland, Melissa Mills, and Rod Williams

Acknowledgments

The authors would like to thank the Indiana licensed teacher, V. Pounds, for allowing us to pilot test our lesson plan in her classroom. The authors would also like to give special thanks to J. Rohs and J. Call for helpful comments on earlier drafts of this lesson plan. All drawings were done by Katie McCausland and pictures taken by Jarred Brooke. This lesson plan is dedicated to the memory of Daniel Hamilton.

Purdue University Agricultural Communication Service • Purdue University Cooperative Extension Service • Editor: Steve Leer • Designer: Dan Annarino

Oct. 2012

It is the policy of the Purdue University Cooperative Extension Service that all persons have equal opportunity and access to its educational programs, services, activities, and facilities without regard to race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability or status as a veteran. Purdue University is an Affirmative Action institution. This material may be available in alternative formats.

Lesson 1:

Succession and Disturbance

This activity will provide students with an understanding of how an ecosystem is constantly changing and what causes those changes.

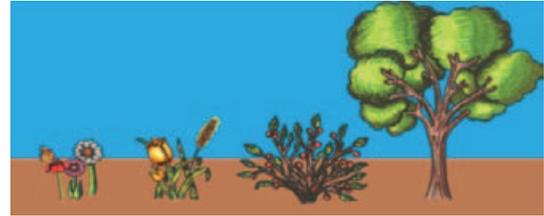
Procedure

1. Review Teacher's Notes on succession and disturbance.
2. Hand out the Succession and Disturbance Worksheet. Use the worksheet schematic to introduce the terms *disturbance* and *succession* and discuss how they are a normal part of nature. Introduce the four successional stages (annual, perennial, shrubs, trees) and have students fill out the definitions on the worksheet.
3. Show the Prairie Fire picture and ask the students if they think the fire is good or bad, or if they are not sure. Have the students record their answers on the Fire Worksheet "Before" section. Keep a tally of the totals and make a bar graph on the board for the students to see the class response. Have them compare the class response to their individual response on their Fire Worksheet.
4. Show the House Fire picture and ask students if they think the fire is good or bad, or if they are not sure. Have the students record their answer on the Fire Worksheet "Before" section. Keep a tally of the totals and make a bar graph on the board for the students to see the class response. Have them compare the class response to their individual response on their Fire Worksheet.

Estimated Time ► 45 minutes

Required Materials

- Lanyards and Succession and Disturbance Cards
- Succession and Disturbance Worksheet
- Fire Worksheet
- Script for Succession and Disturbance
- Prairie and House Fire Pictures



5. Ask the class the following questions: Do you think that forest fires are bad or good, and why? What can cause a natural forest fire? What happens when a natural fire travels through an ecosystem? What are some good things that can happen in an ecosystem after a fire?
6. Ask the students to think about a hypothesis (an educated guess) of what they think will happen to the ecosystem after a natural fire. Write their hypothesis on their Succession and Disturbance Worksheet.
7. Involve students in an interactive activity in which a skit (Script for Succession and Disturbance) will be read aloud, and students will be components of the ecosystem and act out the different stages of succession.
8. Pass out lanyards with succession cards that describe what part each child will play in the skit (4 annual, 4 perennial, 5 shrubs, 6 trees, 2 fire, 2 wind, 2 birds) to each of the students.
9. Directions for completing the skit:
 - Bold sections should be the narrated portion of the story.
 - Italicized section will help the teacher coordinate movement of students, as well as add information about what is happening.

10. Read all steps of the skit to complete the cycle of succession.
11. Review the four steps of succession and have the students explain what happened in each stage during the skit. Ask the students to revisit their hypothesis about fire to see if it was correct or incorrect based on what they saw in the skit. Ask the students if there were advantages of having a natural fire in the ecosystem.
12. Show the picture of the prairie fire again and ask the students their views on fire after performing the skit. Have the students record their answer on the Fire Worksheet “After” section. Keep a tally of the totals and make a bar graph on the board for the students to see the class response. Have them compare the class response to their individual response on their Fire Worksheet.

Lesson 2:

Wildlife Habitat through Succession and Disturbance

This activity will provide students with an understanding of how an ecosystem is constantly changing and what causes the changes, as well as how different animals use the different successional stages.

Estimated Time ► 60 minutes

Required Materials

- Lanyards with Succession and Disturbance Cards
- Succession and Disturbance Worksheet
- Script for Wildlife through Succession and Disturbance
- Fire Worksheet
- Prairie and House Fire Pictures



Procedure

1. Review Teacher's Notes on succession and disturbance.
2. Hand out the Succession and Disturbance Worksheet. Use the worksheet schematic to introduce the terms *disturbance* and *succession* and discuss how they are a normal part of nature. Introduce the four successional stages (annual, perennial, shrubs, trees) and have students fill out the definitions on the worksheet.
3. Show the Prairie Fire picture and ask the students if they think the fire is good or bad, or if they are not sure. Have the students record their answer on the Fire Worksheet "Before" section. Keep a tally of the totals and make a bar graph on the board for the students to see the class response. Have them compare the class response to their individual response on their Fire Worksheet.
4. Show the House Fire picture and ask students if they think the fire is good or bad, or if they are not sure. Have the students record their answer on the Fire Worksheet "Before" section. Keep a tally of the totals and make a bar graph on the board for the students to see the class response. Have them compare the class response to their individual response on their Fire Worksheet.
5. Ask the class the following questions: Do you think that forest fires are bad or good, and why? What can cause a natural forest fire? What happens when a natural fire travels through an ecosystem? What are some good things that can happen in an ecosystem after a fire?
6. Ask the students to think about a hypothesis (an educated guess) of what they think will happen to the ecosystem after a natural fire. Write their hypothesis on their Succession and Disturbance Worksheet.
7. Involve students in an interactive activity in which a skit (Script for Wildlife Habitat through Succession and Disturbance) will be read aloud, and students will be components of the ecosystem and act out the different stages of succession.

8. Pass out lanyards with succession cards that describe what part each child will play in the skit (3 annual, 3 perennial, 4 shrub, 3 tree, and 1 for each fire, wind, bird, woodpecker, deer, box turtle, hummingbird, mouse, kingsnake, hawk, grouse and bear) to each of the students.
9. Directions for completing the skit:
 - Bold sections should be the narrated portion of the story.
 - Italicized section will help the teacher coordinate movement of students, as well as add information about what is happening.
10. Read all steps of the skit to complete the cycle of succession.
11. Review the four steps of succession and have the students explain what happened in each stage during the skit. Ask the students to revisit their hypothesis about fire to see if it was correct or incorrect based on what they saw in the skit. Ask the students if there were advantages of having a natural fire in the ecosystem.
12. Show the picture of the prairie fire again and ask the students their views on fire after performing the skit. Have the students record their answer on the Fire Worksheet “After” section. Keep a tally of the totals and make a bar graph on the board for the students to see the class response. Have them compare the class response to their individual response on their Fire Worksheet.

Teacher's Notes

SUCCESSION

Succession:

Changes in an ecosystem over time due to a disturbance or the progression of time.

First Successional Stage - Annual plant community:

A set of plant species that live only one year, long enough to produce seeds.

Examples: ragweed, corn, marigold

Second Successional Stage - Perennial plant community:

A set of plant species that continue to grow year after year.

Examples: prairie grasses, thistle, grass, iris

Third Successional Stage - Shrub plant community:

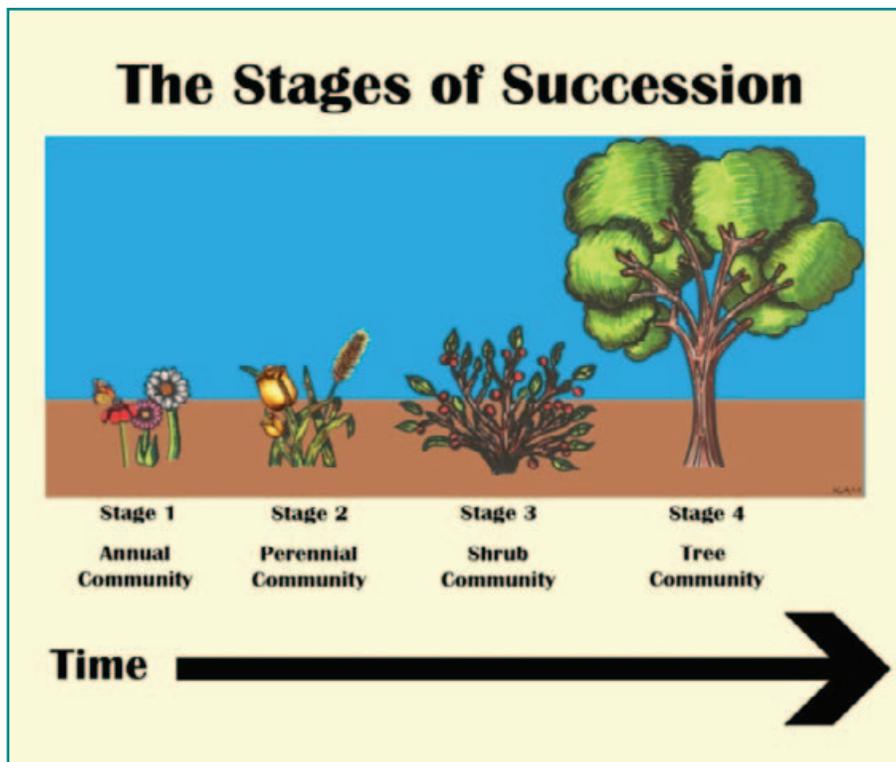
A set of woody plant species that tend to be bush-like and are not taller than 15 feet.

Examples: raspberry, rose bush

Fourth Successional Stage - Tree community:

A set of woody plant species that grows taller than 15 feet.

Examples: pine, walnut, oak, maple



DISTURBANCE

Disturbance:

A natural or unnatural force that changes the successional stage of an ecosystem. Disturbance can take the process back to an earlier stage.

Examples: fire, wind, logging, catastrophes

Fire:

A natural occurring disturbance event. Fire also is a management tool and an important “natural” part of the environment. The use of prescribed (planned) fires can help prevent future large destructive fires. Contrary to popular belief, prescribed fire has many benefits and is very important for the ecosystem. Fire has been used as a tool.

Misconceptions of fire:

- Fire is always bad
- Fire kills all plants
- Fire kills all wildlife
- After a fire, the habitat will never recover

Benefits of fire:

- Reduces fuel buildup (causing less intense fires)
- Maintains a current habitat for wildlife
- Adds an abundance of nutrients to the soil and the ecosystem
- Helps manage for desirable trees for timber production

Fire is not always bad and, when used correctly, can have many benefits. Also, fire does not kill all plants and, depending on when and how the fire is set, may kill only the undesirable plants in a habitat. Another misconception is that wildlife cannot escape wildfires. This, however, is not always true because most prescribed fires are slow moving and most animals are able to escape without harm. Some animals cannot survive without the presence of fire because they need the habitat that grows after the fire. When a fire moves through an ecosystem, the burned debris releases nutrients into the soil. These nutrients support the growth of new young plants.

Script for Succession and Disturbance

Directions

The Underlined words designate the students' cards. • **Bold** sections should be narrated by the teacher.

Italicized sections will help the teacher coordinate movement of students. • PAUSES are optional.

The students with the tree cards will begin the skit. Have the students with the tree cards begin the scene. The students are standing tall with their arms out straight.

Once upon a yesterday, there stood an old forest with many big, tall trees and animals that lived in and around them. One day, a dark cloud formed over the old forest and a bolt of lightning burst from the sky. KA-BOOM! The lightning bolt struck the forest, starting a fire, which burned down half of the trees.

Students with fire cards select half of the trees to burn down. Half of the trees leave the scene.

The next day, a great gust of wind blew seeds of annual plants from far away into the burned area.

Students with wind cards bring students with annual cards to the scene. Wind cards then leave.

The seeds grew up into annual plants and took advantage of the open space and sunlight that was available, because some of the trees had burned down.

PAUSE: Take a moment to explain to the students that this is the first group of plants that comes after a major disturbance. Once again, give a refresher that annuals are plants that live only for one year, and give examples.

Make sure to note that this type of habitat is much different in size and structure than the original woods.

A few years later, the wind brought in more seeds from perennials.

Students with wind cards bring students with perennial cards to the scene. Wind cards then leave.

The perennials were more competitive than the annual plants and took over the area.

Students with annual cards leave scene.

PAUSE: Explain that with the perennial plants coming in the habitat is now in its second succession stage. Refresh the fact that perennials are plants that live for multiple years, and give examples. Once again note that this habitat is different than both the annual stage and the original woods.

Script for Succession and Disturbance *continued*

Birds help bring in the next succession stage by eating berries and depositing the seed of shrubs.

-Students with bird cards bring students with shrub cards to the scene. Bird cards then leave.

The shrubs grow up and shade out the perennials, becoming the dominant plant.

Students with perennial cards leave the scene.

PAUSE: Explain that with shrubs present we have now reached the third stage of succession. Show the students that the habitat is different in size and structure than any previous habitat type shown.

Many years later, seeds from the trees make their way to the area and begin to grow.

Students with tree cards that previous sat down may return to the scene.

The trees grow up, up, up, and become very tall and block out the sun. The shrubs run out of sunlight and wither away.

Students with shrub cards leave the scene.

PAUSE: Explain to the students that once again the forest has come back and created a woods, which is the fourth and final succession stage.

Over time the forest grows old and the trees grow taller, until the day a fire comes through and starts the cycle over again.

Script for Wildlife Habitat through Succession and Disturbance

Directions

The Underlined words designate the students' cards. • **Bold** sections should be narrated by the teacher.
Italicized sections will help the teacher coordinate movement of students. • PAUSES are optional.

The students with the tree cards will begin the scene. Have the students with the tree cards start on the main stage area.

Once upon a yesterday, there stood an old forest with many big, tall trees and animals that lived in and around them.

The trees stood tall, providing food, shade, and shelter.

The woodpeckers pecked at trees and made houses.

The deer ate acorns that had fallen.

The box turtles crawled on the ground enjoying the shade and eating plants and bugs.

And this is the way the woods were until one day, a dark cloud formed over the old forest and a bolt of lightning burst from the sky. KA-BOOM! The lightning bolt struck the forest, starting a fire, which burned down all of the trees, and caused all the animals to run away.

-Fire should make all trees and animal cards leave the scene, leaving an empty stage.

The next day, a great gust of wind blew seeds of annual plants from far away into the burned area. Annuals are plants that live for only one year.

The seeds grew up into annual plants and took advantage of the open space and sunlight that was available, because the trees had burned down.

PAUSE: Take a moment to explain to the students that this is the first group of plants that comes after a major disturbance. Once again, give a refresher that annuals are plants that live only for one year, and give examples. Make sure to note that this type of habitat is much different in size and structure than the original woods. Ask students if they think different animals are going to use this different habitat.

During the spring, the annual plants bloom. These flowers become a tasty treat for a hummingbird, which comes to drink the nectar produced by the flowers.

A few years later, the wind brought in seeds from perennials. Perennials are plants that live for more than two years.

Script for Wildlife Habitat through Succession and Disturbance *continued*

The perennials grew into tall grasses, even taller than the annuals, and by the end of the year the perennials grew so tall that the annuals could no longer get enough sunlight, and died.

Students with annual cards and hummingbird should exit, leaving only perennial plants.

PAUSE: Explain that with the perennial plants coming in that the habitat is now in its second succession stage. Refresh the fact that perennials are plants that live for multiple years, and give examples. Once again note that this habitat is different than both the annual stage, as well as the original woods.

Now that there is a new grassland, animals decide to move in. The mice come to enjoy the many fresh seeds in the area.

Next, the kingsnakes come to eat the many fresh mice in the area.

And lastly, hawks come to eat the many fresh kingsnakes and mice in the area.

Birds that have eaten berries come to the habitat and deposit the seeds of shrubs.

Students with bird cards bring students with shrub cards to the scene. Then, the birds can leave.

The shrubs grow up and shade out the perennials, becoming the dominant plant. Because of the lack of sunlight, the perennials die off.

The students with perennial cards exit the scene.

PAUSE: Explain that with shrubs present we have now reached the third stage of succession. Show the students that the habitat is different in size and structure than any previous habitat type shown.

As the shrubs grow up, they become dense and thick, providing a perfect place for the shy grouse to perform its dance.

Also, the shrubs make berries, which attract the big black bear to eat them.

But soon seeds from the trees begin to grow again.

Allow the students with the tree cards that left earlier to rejoin the scene.

The trees grow up, up, up, and become very tall and block out the sun.

The shrubs no longer are dense and thick, and the grouse leaves to find a new place to dance.

The berries are no longer growing in large quantities, so the black bear decides to go elsewhere.

And the shrubs can't get enough sunlight, so they die.

Have students with shrub, bear, and grouse cards leave the scene, leaving only trees.

Script for Wildlife Habitat through Succession and Disturbance *continued*

Over time the forest grows old and the trees grow taller – tall enough that they provide food, shade, and shelter.

PAUSE: Explain to the students that once again the forest has come back and created a woods, which is the fourth and final succession stage.

As they get taller the woodpeckers come back to peck on the trees to make houses.

The deer come back and eat the acorns.

And the box turtle comes back to enjoy the shade and eat bugs and plants.

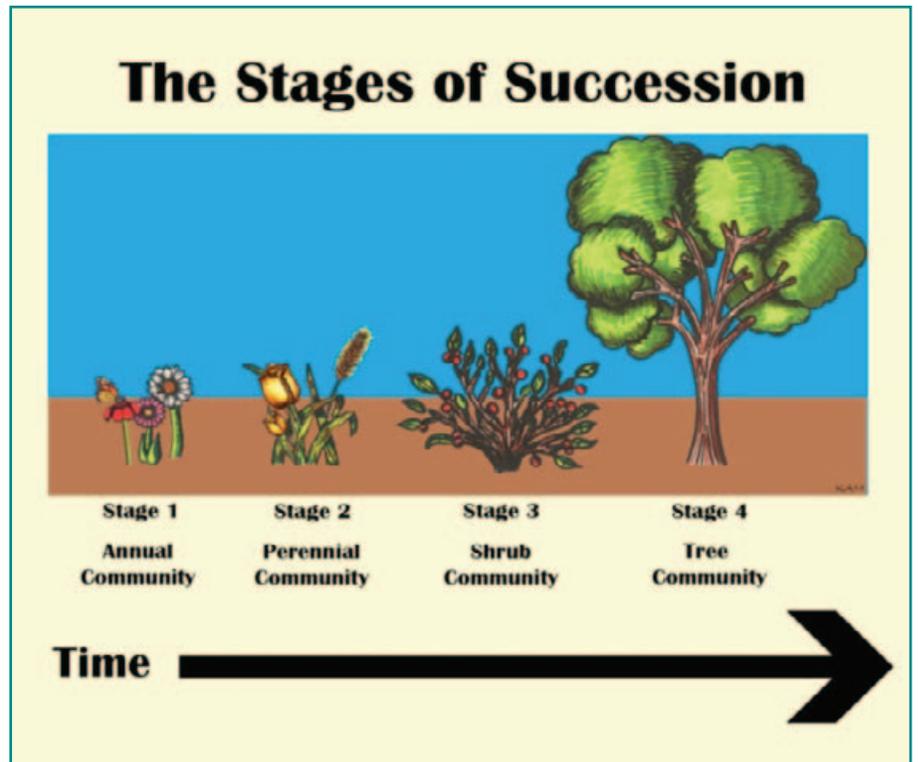
And this is how it was until the day another fire came through and started the cycle all over again.

Succession and Disturbance Worksheet

Directions

Directions: From the following image, match the terms to their appropriate definitions below.

Word Bank
Succession
Shrubs
Trees
Perennial
Annual
Ecosystem
Disturbance



1. _____ - Consisting of all the living and non-living things in the environment
2. _____ - A set of plant species that live only one year, long enough to produce seeds
3. _____ - A set of plant species that continues to grow year after year
4. _____ - A set of woody plant species that tend to be bush-like but less than 15 feet tall
5. _____ - A set of woody plant species that grows taller than 15 feet
6. _____ - A force that changes the successional stage of an ecosystem
7. _____ - A change in an ecosystem over time

What do you hypothesize a fire event will do to a forest plant community?

Fire Worksheet

Directions

Please mark whether you feel fire is good, bad, or not sure when shown a series of pictures.

	GOOD	BAD	NOT SURE
BEFORE			

	GOOD	BAD	NOT SURE
AFTER			

In the space below, write a couple of sentences that describe the observations you made during the class activity and in the bar graph. Was your hypothesis about fire's effects correct? Why or why not?

Cards for Succession and Disturbance



1



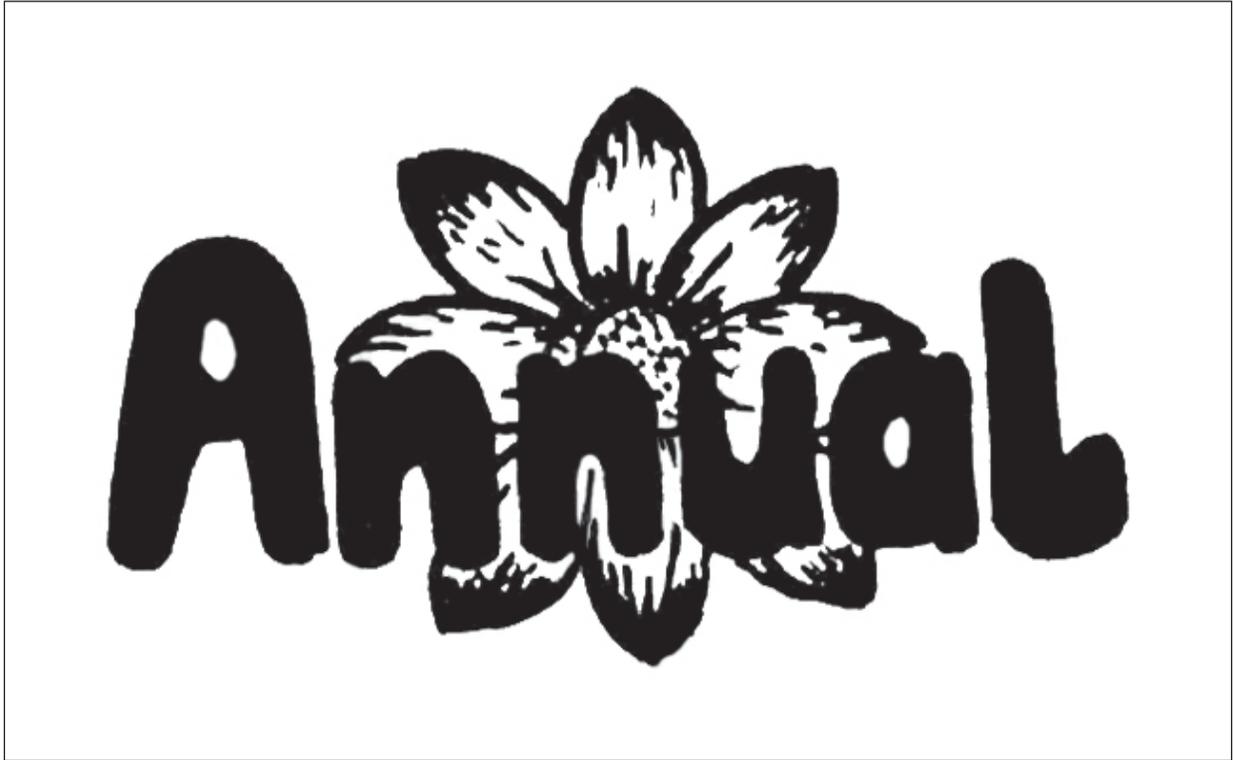
2



3



4



5



6



7



8



9



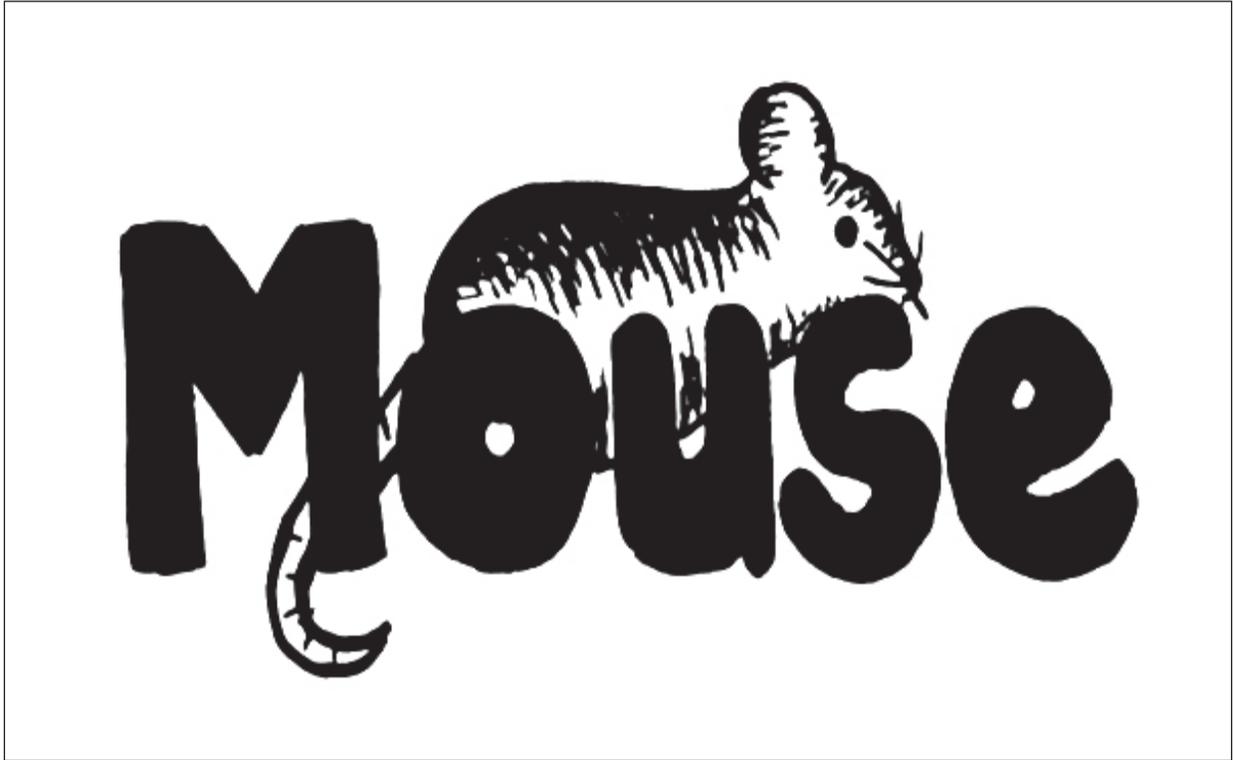
10



11



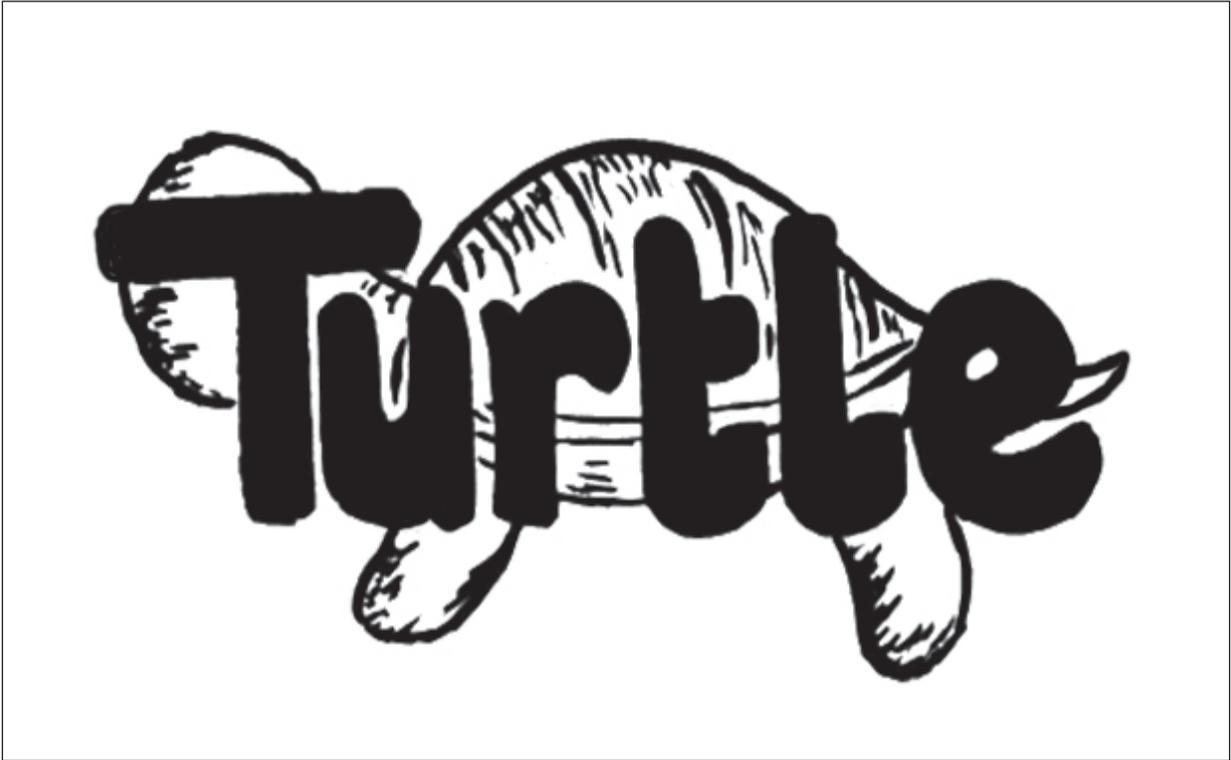
12



13



14



15



16