



★ DIVERSITY OF SPECIES AND ECOSYSTEMS ★

Promoting 'diversity' is a basic principle of urban forestry. A diverse forest implies a more resilient forest, since disease or insect outbreaks likely won't affect every tree all at once.

Goal & Objectives

Goal: Students will evaluate how the diversity of species affects the ecosystem.

Objectives: Students will

1. Explain the meaning of diversity and biodiversity in an ecosystem.
2. Investigate and explain the benefits of a diverse forest ecosystem.
3. Define ways fire benefits the ecosystem.
4. Develop a campaign commercial and conduct a rally addressing diversity, biodiversity and ecosystem issues.
5. Design and evaluate an ideal diverse forest community.
6. Evaluate a *Diversity of Species and Ecosystems* experience.

Content Area TEKS/STAAR

Language Arts: 5.11 (D) use multiple text features and graphics to gain and overview of the contents of text and to locate information.

Mathematics: 5.5 (A) describe the relationship between sets of data in graphic organizers such as lists, tables, charts, and diagrams.

5.9 (A) locate and name points on a coordinate grid using ordered pairs of whole numbers.

Science: 5.9 (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements.

5.9 (C) Predict the effects of changes in ecosystems caused by living organisms.

5.9 (D) identify the significance of the carbon dioxide-oxygen cycle to the survival of plants and animals.

Social Studies: 5.6 (A) apply geographic tools, including grid systems, legends, symbols, scales, and compass roses, to construct and interpret maps.

Technology Applications: b (3) (D) acquire information appropriate to specific tasks.

b (4) (B) collect, analyze, and represent data to solve problems using tools such as word processing, databases, spreadsheets, graphic organizers, charts, multimedia, simulations, models, and programming languages.

Materials

- Tablet(s) or computer(s) with internet access
- Projector and screen
- Whiteboard or chart paper and markers
- Chart paper and markers for small groups
- Legos or similar building pieces
- Tree Trails Portfolio, Learning Log/Journal
- (Optional) Platform Statements and Resources handout
- (Optional) Cameras or camera phones

Time & Resources

Preparation Time: 3 hours

Instructional Time: 2-3 sessions, 45 minutes each

- Tree Characteristics Observation Record handout
- Diverse Ecosystem Rubric handout
- Instructional Strategies, Graphic Organizers
<http://schools.spsd.sk.ca/curriculum/instructionalstrategies/>
- Fire is Nature's Housekeeper
<http://smokeybear.com/natures-housekeeper.asp>
- Fire Adaptations - Nowhere to Run
<http://www.nps.gov/fire/wildland-fire/learning-center/educator-resources/lesson-plans/fire-adaptation.cfm>
- History and Human Use of Fire
<http://www.nps.gov/fire/wildland-fire/learning-center/fire-i-n-depth/human-use.cfm>

I. Engage/Excite

- A. Large Group Activity: Ask the students if they have noticed different kinds of trees around their neighborhood. Take students outside on a walk around the school grounds. Move students into small groups consisting of three or four students. Assign all groups a specific area of the school grounds to investigate. But assign only one group to a section that has limited diversity of plants or trees, such as just grass or just one type of plant or tree.
- B. Small Group Activity: Ask each group to investigate their assigned section for a variety of plants and animals and trees. Provide each group paper and with a list of different tree characteristics to observe: size, shape, leaves, fruit, and bark. Tell students to list the plants and animals they observe and to indicate the characteristics of the trees they observe on the tree characteristics list. Ask each group to appoint a recorder to take notes and/or photographs of the trees, animals and organisms they observe. Students need to save their tree characteristics list, their notes and drawings and the photographs for the evaluation section.
- C. Small Group Activity continued: Give each group a set of Legos or building pieces. Have each group build a replica to represent their landscape with different trees, shrubs, plants, etc. They may add birds and animals on the trees and ground. The group without contrasting landscape will build a landscape also. Ask each group to talk briefly about their landscape. Then have all groups connect their landscapes to represent the entire area observed.
- D. Large Group Discussion: Ask students to notice that one set of building blocks does not have much difference, it is mostly the same. Help students connect the concept of "Diversity" to their landscape replicas. Ask students why diversity is important. Ask what might happen if we did not have diversity and all landscapes were the same. Guide students to conclude that without diversity, the landscape would not be as varied and pleasing; animals would not be different and the health of the trees might be affected. For instance, one disease could wipe out the entire population. Tell them they will learn more about diversity and its importance in this module.
- E. (Optional): Large Group Demonstration: Ask students what it would look like if a destructive insect or disease invaded the landscape. A student group could pretend to be the pest and swoop across the blocks and knock them down to animate that an insect or disease could seriously harm the diversity of the landscape.
- F. (Optional) Individual Activity: Have the students take the *Diversity of Species and Ecosystems* pretest.

Teacher Tip: Explain that the test is only to make sure the learning activities are appropriate and not something they already know. The pretest will help them know more about what they will be learning.

To administer the tests by paper, copy from the teacher lesson module. To administer the test electronically, recreate the test in an online survey program. Free programs allow the creator to see results from a class set.

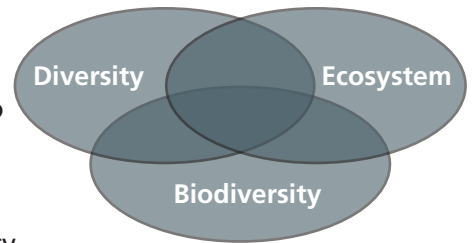
II. Explore

- A. Large Group Discussion: Lead a brief discussion to explain that the purpose of this module is to



II. Explore continued

understand how the diversity of trees, the biodiversity of forests and animals and its ecosystems are important to our community and world. Depending on the depth of student knowledge about these terms, a Venn diagram concept map may be used to expand the students prior knowledge. The diagram should have the terms "Diversity" and "Biodiversity" in two ovals that are connected and these two terms connected to an oval with "Ecosystem" on a chart/whiteboard. (Optional: Combine Diversity and Biodiversity into the same oval to make two ovals instead of three.)



- B. (Optional) Small Group Discussions: Move students into small groups to explore the three concepts: Diversity, Biodiversity and Ecosystem. Ask students to discuss and define the difference between diversity and biodiversity and ecosystems and the relationship between the concepts.
- C. Large Group Discussion: Write or have students write their responses around or on the corresponding area of the diagram. Have students draw a conclusion that describes the relationship of these concepts and write that description at the bottom of the chart.

*Teacher Tip: As students respond with their definitions, lead a discussion to help them understand the difference in the terms: diversity, biodiversity and ecosystems. **Diversity** is the difference in a set of like species, such as trees. **Biodiversity** means the diversity, or variety, of plants, trees, animals and other living things in a particular area or region. An **ecosystem** is a complex set of relationships among the living and non-living resources, habitats, and the community of residents of the area. This includes plants, trees, animals, birds, fish, microorganisms, water, soil and people interacting as a system. Everything that lives in an ecosystem is dependent on the other species and elements. The balance of an ecosystem is delicate and a disruption, such as the introduction of a new element, can damage or interrupt the balance.*

III. Explain

- A. Large Group Discussion: Have a discussion about elections and campaigns. Ask students to define a campaign and tell what makes a campaign successful. Lead students to conclude that a campaign must provide convincing reasons to vote for the candidate. Tell students to imagine that they have joined a campaign to elect Mr. D. V. Forest as Mayor. The campaign's purpose is to convince the public that Mr. D. V. Forest is the best candidate for Mayor. He has promised to address the public's biggest concerns about diversity, biodiversity and the forest ecosystem.
- B. Large Group Discussion continued: Explain to the students the steps they will take to create a Commercial and have a Campaign Rally to get Mr. D. V. Forest elected. The students will need to divide into small Campaign Committees to address different platform statements. Students should
1. research one campaign platform statement, 2. write a convincing script for their platform statement, 3. make the script into one section of the commercial, 4. put all the sections together to create the Campaign Commercial and 5. conduct a Campaign Rally using their section of the commercial.
- C. Large Group Discussion and Small Group Assignments: Put the following platform statements on a

III. Explain continued

chart/whiteboard or pass out the Diversity Platform Statements and Resources handout so all students can read and make a selection. Ask students to select one platform statement they want to research. As possible, assign the students to the platform committee of their choice. Each committee should appoint a leader, recorder, reporter and assistants to find the answers. The platform statements and the supporting resources are:

1. Platform: Every forest needs to contain a variety of habitats that support diverse, interdependent communities of plants and animals.
Resources: Have students return to the list of diverse trees, plants and animals they observed earlier. Have them focus on the interaction of the ecosystem organisms. (They may need to return outside to add to their lists. They may make a food chain and/or take pictures or videos to use in the commercial.)
2. Platform: We need to promote a diverse forest because of its many benefits.
Resources: Make pictures or videos of the forest benefits we share in our ecosystem.
3. Platform: We need to evaluate how altering a forest environment affects all living things and interrelationships in an ecosystem.
Resources: Use pictures or make a before and after drawing depicting a change in the diversity of their own environment and the way it would alter the landscape.
4. Platform: We need to better understand fire and ways to use fire to benefit natural habitats and the ecosystem.
Resources: Fire is Nature's Housekeeper. Review the website and animated illustrations. Have students summarize the presentation and/or show it or parts of the recording.
5. Platform: We need to understand how animals and plants, including trees, protect themselves from fire so we can promote a better ecosystem for them.
Resources: Nowhere to Run section of the National Park Service's Fire Adaptations lesson background information on helping animals and plants and trees protect themselves. Review the website.
Have students summarize the internet information and/or show parts to the class.
6. Extra Platform, Potential Teacher Committee: Remind the public of how Native Americans managed forests with fire and the History and Human Uses of Fire
Resources: National Park Service's Human Use of Fire information on how Native Americans managed forests with fire. Review the website.
Have students summarize and/or show sections of the internet resource.

IV. Extend/Elaborate

A. Small Group Activity: Provide students with a format to compile the research and develop a script for the campaign commercial. They should develop a platform statement presentation that will not take more than two to four minutes to present.

1. Topic: the Platform Statement

IV. Extend/Elaborate continued

2. Purpose: one sentence telling why this action is important
 3. Findings: three to five phrases or sentences telling how to make this action happen
 4. Conclusion: summary of what Mr. D. V. Forest will do (one sentence)
- B. Small Group Activities continued: Once the groups have finished their research and script, have them add music and/or interesting media into their commercial section.
- C. Large Group Presentation: Brainstorm possible slogans for the campaign. Have students vote on their choice. Each of the small groups come together to conduct the recording/filming of the commercial. Select someone (teacher, administrator, student or parent) to introduce the candidate for Mayor (selected by the class) and the campaign committees. Each group presents their platform script. Then, for the ending, all groups may chime in to convince the public to elect Mr. D. V. Forest who will "Make the Forest Ecosystem Better for All" or (whatever slogan is chosen).
- D. Large Group Activity: Take the groups outside to conduct the rally to take advantage of the setting to present the mayor and the platform committee's stand on issues related to diversity, biodiversity and the ecosystem. Invite other classes to attend. The person selected to introduce may also close the rally by restating all the reasons the public should elect Mr. D. V. Forest for Mayor. Other students, parents, etc. may record and/or take pictures to display after the campaign rally.

V. Evaluate

- A. Small Group Activity: Have each group retrieve their photographs, drawings, notes, etc. from Excite: B. Have students review their work and decide what needs to be added to make a better, more diverse landscape to their materials. Provide each group with the diverse ecosystem rubric to assist them with adding the ingredients that can create a better landscape. Have each group share with another. Then have the class decide which group has developed the most diverse ecosystem.
- B. (Optional) Individual Activity: Have students take the *Diversity of Species and Ecosystems* posttest. Have them compare their results to self-evaluate what they learned and what they did not know.

Teacher Tip: You may use the results to determine the need for Extra Mileage/Attention.

VI. Extra Mileage/Attention

- Extra Mileage:** Have students locate a different forest ecosystem (in another area of the community, a local park, the state capitol or county seat, etc.) and evaluate it according to the Diverse Ecosystem Rubric handout.
- Extra Attention:** Have an "expert" peer work with students to draw a community that has diversity, biodiversity and is a healthy ecosystem.

Tree Trails curriculum was developed by Texas A&M Forest Service in cooperation with Texas Urban Forestry Council and was supported by a grant from the USDA Forest Service.

Student Assessment / Pretest and Posttest

Diversity of Species and Ecosystems

Directions: Answer the following questions by rating your response 1-5, with 5 being the highest.

Key: 1 = Not Sure 2 = Poor 3 = OK 4 = Good 5 = Great

- | | | | | | | |
|----|--|---|---|---|---|---|
| 1. | I can define the difference in diversity and biodiversity. | 1 | 2 | 3 | 4 | 5 |
| 2. | I can describe an ecosystem. | 1 | 2 | 3 | 4 | 5 |
| 3. | I can tell why a forest ecosystem needs diversity. | 1 | 2 | 3 | 4 | 5 |
| 4. | I can name two ways fire benefits the ecosystem. | 1 | 2 | 3 | 4 | 5 |
| 5. | I know two causes of an unhealthy ecosystem. | 1 | 2 | 3 | 4 | 5 |
| 6. | I can describe what Native Americans did to preserve their forests. | 1 | 2 | 3 | 4 | 5 |
| 7. | I can evaluate a forest ecosystem community. | 1 | 2 | 3 | 4 | 5 |
| 8. | I can help my family learn more about the needs for a healthy ecosystem. | 1 | 2 | 3 | 4 | 5 |
| 9. | I am interested in knowing what I can do to improve the quality of the ecosystem in my neighborhood. | 1 | 2 | 3 | 4 | 5 |

Comments:



Diverse Ecosystem Rubric

Directions:

Review the ecosystem plan and decide which level your plan achieves. Circle the description that fits best for each Quality. Record the points for each below the table and add them together.

	1 Point	2 Points	3 Points	4 Points
Tree Qualities	Little or no trees	Few of same trees	Diverse number of trees	Diversity of trees planted in ideal locations
Plant Qualities	Little or no plants	Few of same plants	Diverse number of plants	Diversity of plants planted in ideal locations
Animal Qualities	Little or no animals	Few of same animals	Diverse number of animals	Diversity of useful animals on landscape
Insect Qualities	Little or no insects	Few of same insects	Diverse number of insects	Helpful insects found in landscape

Tree Qualities _____

Plant Qualities _____

Animal Qualities _____

Insect Qualities _____

Total _____

Score Review:

0-3 = Poor Plan, You need more variety, consider adding items for each Quality.

4-8 = Average Plan, You're on your way, consider adding items for each Quality.

9-13 = Good Plan, Well done, your plan shows some diversity.

14-16 = Excellent Plan, Diversity in your ecosystem shows a healthy system.



Diversity Platform Statements and Resources

1. Platform: Every forest needs to contain a variety of habitats that support diverse, interdependent communities of plants and animals.

Resources: Return to the list of diverse trees, plants and animals you observed earlier. Focus on the interaction of the ecosystem organisms. (You may need to return outside to add to your lists. You may want to make a food chain and/or take pictures or videos to use in the commercial.)
2. Platform: We need to promote a diverse forest because of its many benefits.

Resources: Make pictures or videos of the forest benefits we share in our ecosystem.
3. Platform: We need to evaluate how altering a forest environment affects all living things and interrelationships in an ecosystem.

Resources: Use pictures or make a before and after drawing depicting a change in the diversity of your own environment and the way it would alter the landscape.
4. Platform: We need to better understand fire and ways to use fire to benefit natural habitats and the ecosystem.

Resources: Fire is Nature's Housekeeper. Review the website and animated illustrations at <http://smokeybear.com/natures-housekeeper.asp>

Summarize the presentation and/or show it or parts of the recording.
5. Platform: We need to understand how animals and plants, including trees, protect themselves from fire so we can promote a better ecosystem for them.

Resources: Nowhere to Run section of the National Park Service's Fire Adaptations lesson background information on helping animals and plants and trees protect themselves. Review the website at <http://www.nps.gov/fire/wildland-fire/learning-center/educator-resources/lesson-plans/fire-adaptation.cfm>

Summarize the internet information and/or show parts to the class.
6. Extra Platform: Remind the public of how Native Americans managed forests with fire and the History and Human Uses of Fire

Resources: National Park Service's Human Use of Fire information on how Native Americans managed forests with fire. Review the website at <http://www.nps.gov/fire/wildland-fire/learning-center/fire-in-depth/human-use.cfm>

Summarize and/or show sections of the internet resource.



Tree Characteristics Observation Record

Describe and/or draw the Tree Characteristics observed:

Size - compare to the height of another object like a light pole or building

Branches - how are they organized, what patterns can you see

Shape - pretend to draw an outline around the tree, describe that shape

Fruit - look at color, shape, and size

Leaves - look at color, shape, size, and movement

Bark - what patterns are found in the bark, look at color, how does it feel

Plants and animals observed:

Sketches of trees, plants, and animals:

