

# How to Build a forest

Science communication lesson, grades 9-12

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## Lesson overview

In this lesson, students will explore principles of communicating science with a lay audience and create two products designed to communicate a scientific topic to the general public.

## Learning objectives & “I can” statements

### Learning objectives

Students will be able to

- compare and contrast how scientists communicate differently from artists.
- explore and evaluate different modes of communication.
- make a personal connection to the landscape and share it with others.

### “I can” statements

“I can compare and contrast how scientists communicate differently from artists.”

“I can explore and evaluate different modes of communication.”

“I can make a personal connection to the landscape and share it with others.”

# Common Core State Standards & North Carolina Essential Standards

## CCSS Language Arts

- 9-10.SL.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
- 9-10.SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
- 9-10.SL.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
- 9-10.SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
- 9-10.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 9-10.W.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

## NCES Earth/Environment 9-12

- EEn.2.7.3 Explain how human activities impact the biosphere.

## NCES Biology 9-12

- Bio.2.1.3 Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems.
- Bio.2.2.2 Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next.

## Materials

- video and audio players (e.g., computer) for students individually or class
- materials for portable communication (e.g., paper or smartphone)

# Before the performance

## Explore effective science communication

Have students listen to an interview with a science communicator. Some examples:

- a. Olsen, Randy. "Don't be such a scientist." Interview with Rebecca Roberts. *Talk of the Nation*. 15 October 2009.  
<http://www.npr.org/templates/story/story.php?storyId=113832764>
- b. Krulwich, Robert. "Tell me a story." California Institute of Technology 114<sup>th</sup> Annual Commencement. 13 June 2008.  
<http://www.radiolab.org/blogs/radiolab-blog/2008/jul/29/tell-me-a-story/>
- c. Alda, Alan. "The Flame Challenge." Interview with Stephen Colbert. *The Colbert Report*. 30 May 2012. <http://www.colbertnation.com/the-colbert-report-videos/414597/may-30-2012/alan-alda>  
More information: <http://flamechallenge.org/>

## Discussions

In small groups, have students discuss the following topics:

1. *Scientific communication*: How do scientists communicate among themselves? What formats do they use? (For example, consider journal articles, books, scientific talks, and posters. It may be necessary to inform students about some of these communication avenues before this lesson – e.g., have them read at least one scientific journal article about an ecology topic related to your classwork. Remind them also of the products (lab reports, posters) that they have made themselves.) What are the purposes of these exchanges? What types of language do scientists use among themselves? Why? What is successful about these ways of communicating and what might be challenging about them?

### 2. *Personal experiences with science communication*

On a personal level, what is your experience trying to communicate science? What have you done to engage your audience? Think of an instance where you learned something new, remembered it for a long time, and changed your behavior because of it. What do you think made that a successful learning experience?

3. *Science communication with the general public*: Why should science be communicated to the general public? How is a general public audience different from a scientific audience? What themes arose in the interviews you listened to about

communicating science with the public? What formats, venues, and types of language would be appropriate?

\*Partway through this discussion, or in advance, show the students at least two contrasting short videos explaining the same ecological topic (which you have already discussed in class). For example, the following two videos discuss the nitrogen cycle:

- a. Mdesautels. "Niitrogen Cycle.mov." Uploaded 12 March 2010.  
<http://www.youtube.com/watch?v=6GLzlUD-zw&feature=related>
- b. Brightstorm. "Nitrogen Cycle." Uploaded 2 September, 2010.  
<http://www.youtube.com/watch?v=GU17Q10GEE8&feature=related>

Additional videos to consider:

- c. Marvinsmiths. "Nutrient Cycling." Uploaded 13 August 2008.  
<http://www.youtube.com/watch?v=AXWDbAYb-5c>
- d. NanKnits. "Salmon Nutrient Cycle." Uploaded 15 December 2010.  
<http://www.youtube.com/watch?v=IrnY611T-QY>

None of these videos is perfect. From a scientific perspective, consider what they leave out (e.g., nitrate leaching), what they represent imperfectly (e.g., "fulfilled it's role"), and what they convey effectively (e.g., nutrient uptake and release by different organisms). Then, from a communication perspective, consider the following questions: What makes one video more memorable than the other? What do you take away about effective communication to a general audience? (Topics to elicit from the class include use of story and visual representations. Note that the same part of our brains processes written and oral language, whereas a different part processes images. Writing down the words that are spoken can be much more distracting to our brains than visually illustrating spoken concepts.)

As a class, compare and contrast scientific communication and science communication with the public. Brainstorm strategies for successful communication with lay audiences.

### **Assignment: Communicating about a tree**

In this assignment, students will develop a short ecological communication designed for a general audience.

1. Pick a tree from the list of species found on Duke's campus (attached)

2. Research this tree species. Where does it grow? How does it interact with other organisms, including people? What conditions does it need? How have human activities influenced this species (or how might human activities influence it in the future – e.g., with climate change)? Where is the largest known individual of this species (the Champion Tree)?
3. Identify the most important thing you want people to learn about your tree.
4. Design a portable vehicle of communication. It must be something that can be viewed while walking outdoors, e.g., a brochure with trifold layout or an animation that can be viewed on a smartphone. Keep in mind that you have to design your information so that people will find it engaging and learn what you intend them to learn.
5. Think creatively about how to display your content. You must include the following information (but you can include more):
  - Common name(s)
  - Latin name: Genus, Species, Family
  - Description of tree – trunk, leaf, bud, flower, fruit, form
  - Graphics (with attribution)
  - Location and size of your Champion Tree
  - Uses: economic, wildlife, other
  - Ecological requirements
  - Current range (in the continental US)
  - At least 3 sources cited properly (e.g., URL, access date, etc.)

## During the performance

Visit the stage of *How to Build a Forest*, twice over time, separated by at least 1 hour. Be sure to sit in the audience as well as on stage. Write down your impressions. What did the artists communicate to you? How did they do this?

Go outside and find your tree – show it to someone and share your tree info with them.

## After the performance

### **Assignment: Design your own communication**

Identify something related to ecology that you would like to communicate. Design a way to communicate in any mode you want, keeping in mind that you want to share your

core idea effectively to a general audience. Effective communication would cause your audience to learn something new, remember it for a long time, and have the potential to change behavior.

Components to consider:

- Clear focus
- Appropriate language for a general audience
- Use of story
- Necessary context or background information for the audience
- Relevance to the audience
- Non-verbal images and sounds

## Assessment

Collect the communication products from each student and assess them for coherent explanations of ecological processes in manners appropriate to their audience. Have the students write briefly reflecting on their experience. What was it like to share their tree communication with someone? What have they discovered about science communication?

## Duke University's Chapel Woods Primary Tree Species

Eastern Redcedar (*Juniperus virginiana*)  
Shortleaf Pine (*Pinus echinata*)  
Loblolly Pine (*Pinus taeda*)  
Northern Red Oak (*Quercus rubra*)  
Southern Red Oak (*Quercus falcata*)  
Post Oak (*Quercus stellata*)  
Willow Oak (*Quercus phellos*)  
Sweetgum (*Liquidambar styraciflua*)  
Southern Magnolia (*Magnolia grandiflora*)  
White Ash (*Fraxinus americana*)  
Black Cherry (*Prunus serotina*)  
Eastern Redbud (*Cercis canadensis*)  
Red Mulberry (*Morus rubra*)  
White Mulberry (*Morus alba*)  
Mockernut Hickory (*Carya tomentosa*)  
Red Maple (*Acer rubrum*)  
Florida Maple (*Acer floridanum*)

**Also present but either in fewer numbers or small individuals (saplings) only**  
(Some of these species could arguably be included in the group above.)

Flowering Dogwood (*Cornus florida*)  
Water Oak (*Quercus nigra*)  
Darlington Oak (*Quercus hemisphaerica*)  
Scarlet Oak (*Quercus coccinea*)  
Yaupon Holly (*Ilex vomitoria*)  
Persimmon (*Diospyros virginiana*)  
Winged Elm (*Ulmus alata*)  
American Sycamore (*Platanus occidentalis*)  
Black Gum (*Nyssa sylvatica*)  
Pignut Hickory (*Carya glabra*)  
Silktree Mimosa (*Albizia julibrissin*)  
Carolina Laurel Cherry (*Prunus caroliniana*)