

24. *WebQuest: Invasive Species*

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Description: Students work in teams of two to complete a WebQuest about invasive species in the bosque, to develop a management plan with their recommendations for improving the situation and to produce a presentation demonstrating what they have learned.

Objectives: Students will:

- know how the Internet can be used to search for biological resource information;
- understand how invasive species affect an ecosystem; and
- know how to prepare a basic species management plan.

Materials: Computers with Internet access (one for each team of two students)

copies of student activity pages

supplies for making posters or software for creating computer presentations

Background: Terms:

Invasive species: a species non-native (or alien) to the ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. They can be plants, animals or microbes. Human actions are the primary means of invasive species introductions.

Refer to the “Changing River” activity for more information on non-native species.

This WebQuest is based on a lesson format designed by Bernie Dodge at San Diego State University. A WebQuest is an inquiry-oriented activity in which nearly all of the information that students interact with comes from resources on the Internet. For more information about WebQuests and examples of other WebQuests, visit <http://webquest.sdsu.edu/webquest.html>.

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Grades: 6–12

Time: three hours for Internet research; two hours for writing management plan; time for class presentations

Subjects: science

Terms: *invasive species*



Depending on the time available and the skill level of the students, the activity pages can be used independently of each other. For instance, Activity Page 1, “Introduction to the Bosque Training Course,” might be used to give students an introduction to using the Internet to find information about the bosque.

Procedure:

Preparation:

1. Make sure that computers are available, working, and connected to the Internet.
2. Assign students to teams of two and assign each team an invasive species:

Saltcedar, *Tamarix chinensis*

Russian olive, *Elaeagnus augustifolia*

Tree of heaven, *Ailanthus altissima*

Cheat grass, *Bromus tectorum*

Kochia, *Kochia scoparia*

Sweet clover, *Melilotus alba*

3. Make copies of student activity pages.

Doing the activity:

1. Introduce the concept of a WebQuest. Directions are included on the Student Activity Sheets.
2. Provide students with a time-line for completing the Web-Quest.
3. Discuss guidelines for using the computers and internet.
4. The teacher should act as a facilitator, helping to trouble-shoot technology problems, asking questions, and helping students to organize their work.

Assessment:

Use the rubric found at the end of this section to evaluate the students’ work. The rubric can also be used by the students as a self-evaluation.

Extension:

Research additional non-native species in the bosque. Some examples are: camel thorn, perennial pepperweed, hoary cress, Russian knapweed, musk thistle, Siberian elm, mulberry, cheat grass, cocklebur, tumbleweed.

Reference:

Krasny, Marianne. 2003. *Invasion Ecology*. National Science Teachers Association (NSTA) Press. Available in both student and teacher editions designed to show students how to apply scientific knowledge to solving real-life problems.



Note about Webography:

There are many formats and styles for citing web sites, but the MLA (Modern Language Association), APA (American Psychological Association), and CBE (Council of Biology Editors) are the most common. The choice of style is generally governed by the content matter of the work. Since this WebQuest is science-based, a sample citation using the CBE style is below:

Stevens, Larry E. 2002 Jan 30. Exotic Tamarisk on the Colorado Plateau. Canyons, Cultures and Environmental Change. <<http://www.cpluhna.nau.edu/Biota/tamarisk.htm>>. Accessed 2002 July 9.

The citation should include the following information:

Author's name (if known)

Date of publication or last revision

Title of document

Title of web site (if relevant)

URL, in angle brackets

Date of access



Answers to the Bosque WebQuest Training

1. Where is the cottonwood found?

The Rio Grande cottonwood grows near water and in places where it can get its roots wet, in the lower valleys, from 4,000 to 7,000 feet or so in elevation, the lower limit of the narrowleaf cottonwood, along the Colorado, San Juan, Yampa, White, and Gunnison Rivers; in the southwestern corner of Colorado; and especially near the old Spanish settlements along the Rio Grande in Colorado and New Mexico.

2. Describe one interesting thing you found out about the cottonwood.

Answers will vary.

3. Name at least two reasons cottonwood/willow forests have been reduced.

Levees and dams were built that disrupted the flow of the river which altered the conditions needed for cottonwood reproduction and growth. Cottonwood-willow forests have also been reduced by land clearing, tree harvesting, water diversion, and agricultural uses.

4. Which two non-native trees have replaced the cottonwood?

Saltcedar and Russian olive.

5. What is a native plant?

The resident plant species that evolved within, or naturally dispersed to, a region are “native” or “indigenous” species.

6. What is an invasive species?

An invasive species is defined as a species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

7. How are most invasive species introduced?

Human actions are the primary means of invasive species introductions.

8. Tour the Rio Grande from Santa Fe to Elephant Butte. What kinds of restoration projects are the Pueblos involved with?

Several Pueblos are working on restoration projects to lower the riverbanks, widen active channels, eliminate exotic species, and replant native vegetation.

9. What is the goal of the Bosque del Apache National Wildlife Refuge?

The goal of refuge management is to provide habitat and protection for migratory birds and endangered species and to provide the public with a high quality wildlife and educational experience.

10. What are some of the management tools used on the refuge?

Management tools used on the refuge include farming, prescribed burning, exotic plant control, moist soil management, and water level manipulation.

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Student School Activity

Introduction

There are aliens in New Mexico! No, not UFOs, but alien, non-native plants. Non-native plants that cause environmental harm are often called “invasive species.” These species, like tamarisk (saltcedar), are threatening the health of the bosque ecosystem by taking over from the species that have lived there for thousands of years.

Here is the scenario: The state legislature of New Mexico has established a new wildlife refuge along a five-mile stretch of the Middle Rio Grande. According to the legislation, the mission of the refuge is to preserve the beauty of the bosque and to provide habitat for bosque plants and animals, for the enjoyment of all New Mexicans. What should be done about the invasive plants?

Task

You and a partner have been hired by the refuge manager as invasive plant consultants. You will work together as a team to complete training about the bosque ecosystem and become experts on a particular invasive plant. Your team will then determine a management plan for this plant and present it to the class during a “public hearing.” It will be your job to learn more about these plants and about ways to manage them.

Process

1. Before being trusted with the responsibility of making a decision about the new refuge, the team must complete an Introduction to the Bosque Training Course. Use Activity Page 1 for your training.
2. Your teacher will assign your team an invasive plant species to research. As a team, you will locate web sites or web pages about your species, and you will prepare a species profile. Use Activity Pages 2 and 3.
3. Write a management plan. Use Activity Page 4.
4. Present your management plan to the class. You may present a poster with appropriate drawings and illustrations or a computer presentation (web page, PowerPoint slide show, or hyper-studio slide show).
5. Evaluate your team’s work.



Activity Page 1: Introduction to the Bosque Training Course

Visit the following web sites to find answers to the questions listed below. Answer the questions on a separate sheet of paper.

www.iws.net/wier/RioGrandeCottonwood.html
native trees of the southern Rocky Mountains

1. Where is the cottonwood found?
2. Describe one interesting thing you found out about the cottonwood.

biology.usgs.gov/s+t/SNT/noframe/sw155.htm
changing landscapes of the Middle Rio Grande

3. Name at least two reasons cottonwood/willow forests have been reduced.
4. Which two non-native trees have replaced the cottonwood?

npsnm.unm.edu
Native Plant Society of New Mexico

5. What is a native plant?

www.invasivespecies.gov/index.shtml
federal invasive species web site

6. What is an invasive species?
7. How are most invasive species introduced?

www.rioweb.org/tour/
Rio Grande/Rio Bravo Basin Coalition

8. Tour the Rio Grande from Santa Fe to Elephant Butte. What kinds of restoration projects are the Pueblos involved with?

southwest.fws.gov/refuges/newmex/bosque.html
Bosque del Apache National Wildlife Refuge, U.S. Fish and Wildlife Service

9. What is the goal of the Bosque del Apache National Wildlife Refuge?
10. What are some of the management tools used on the refuge?

Activity Page 2: Web Site Identification

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Find at least three web sites that have descriptions of the invasive species you have been assigned. (A web site may contain multiple web pages—you can count each page separately.) Fill out the information for each web page you find. You may add additional web sites if you find more than three that seem especially useful.

The following web sites are good starting points for invasive species information:

www.nbi.gov

National Biological Information Infrastructure

www.invasivespecies.gov

look at species profiles

www.invasivespecies.gov/databases/tpdb.shtml

All the above web sites have good search tools. Click on the search feature on the page and then enter either the common or scientific name of your invasive species.

You may also want to search the Internet using a search engine such as Google or Yahoo. Be aware that this method may return thousands of web sites, and you will have to decide which ones best suit your needs. Also, sites with addresses that end in .gov (government) or .edu (education) tend to have more credible information than ones that end in .com or .net. Ultimately, it is up to you to decide which sites provide the best information for your purposes.

Web Page 1

URL (address):

Who sponsors or hosts this web page?

Who is the intended audience?

One thing you learned about your invasive species is:

Web Page 2

URL (address):

Who sponsors or hosts this web page?

Who is the intended audience?

One thing you learned about your invasive species is:

Web Page 3

URL (address):

Who sponsors or hosts this web page?

Who is the intended audience?

One thing you learned about your invasive species is:



Activity Page 3: Species Profile

Using the web sites you have identified, complete a profile of your species. You should incorporate information from all of the web sites you find.

Common name:

Scientific name:

Physical description (including size, leaf description, flower description, color):

How propagated (how does it reproduce?):

Distribution (where is it found?):

Effect on natural areas:

Three methods for management:

List three terms (words you didn't know) and definitions:

Activity Page 4: Management Plan

Now that you have researched your non-native species, it is time to make your recommendation to the refuge manager. Your management plan should be one to two typed pages in length.

Your management plan needs to include the following elements: statement of the problem, species profile, description of various alternative management strategies, recommendation, definition of terms, and a webography. Use this outline to help you prepare your management plan.

- I. Statement of the problem (two or three sentences about why this plant is an invasive species):
- II. Species profile (one or two paragraphs describing where this plant is found in the bosque, what it looks like, and how it affects the bosque ecosystem)
- III. Description of various alternative management strategies and consequences of the alternatives (one paragraph for each alternative). One of the alternatives must be a do-nothing alternative.
 - A. Description and consequence
 - B. Description and consequence
 - C. Do nothing and consequence
- IV. Your recommendation for managing the invasive species (one paragraph)
- V. Unfamiliar terms and definitions
- VI. Webography of web sites you accessed for your information





student's name _____

Evaluation Rubric

Component	Beginning Level	Developing Level	Advanced Level	Student Score	Teacher Score
Bosque Web Site Training	0 points Didn't follow directions. Answered less than half the questions correctly.	3 points Followed directions. Answered more than half the questions correctly.	6 points Followed directions. Answered eight or more questions correctly.		
Web Site Identification	0 points Found fewer than three web sites. Did not identify sponsor and audience for each site. Did not answer question about particular invasive species.	3 points Found three web sites. Identified some sponsors and audiences. Showed basic understanding of particular invasive species (answers were repetitive or simplistic).	6 points Found three or more web sites. Identified sponsor and audience for each. Showed strong understanding of particular invasive species.		
Species Profile	0 points Completed fewer than half the components of the profile.	4 points Completed three-fourths of the components of the profile.	8 points Completed all components of the profile.		
Management Plan	0 points Addressed fewer than half the elements of the plan. Plan is messy, illegible and/or less than one page, with numerous grammatical and/or spelling errors.	6 points Addressed most elements of the plan. Plan is neatly hand-written and/or less than one page, with few grammatical and/or spelling errors.	12 points Addressed all elements of the plan. Plan is typed and one or two pages, with no grammatical or spelling errors.		
Presentation	0 points Presentation is incomplete and paraphrased words and/or no pictures. Presentation shows little understanding about invasive species in general and/or particular species.	6 points Presentation includes essential information with some elaboration. Presentation shows some understanding about invasive species in general and/or particular species.	12 points Presentation is complete with original words and pictures. Presentation shows understanding about invasive species in general and about particular invasive species.		
Teamwork	0 points Teammates often "did their own thing." Were not able to work together to accomplish task. Had difficulty getting along with each other.	3 points Teammates were mostly able to participate appropriately. Usually came prepared and accomplished the task. Avoided most conflicts and/or were able to resolve any that occurred.	6 points Team members contributed fairly and squarely to all aspects of the project. Always came prepared and accomplished the task. Worked well cooperatively.		
Total Scores				50	50