

# Problem-Based Learning

## Return of the Wolves

**High School**

**Life Science: Biology**

**SC11915**



## Return of the Wolves

**High School**

**Life Science: Biology**

### **Overview**

You work for the U.S. Fish and Wildlife Service, and your team has been asked to evaluate the possible reintroduction of red wolves to the southern range of the Appalachian Mountains! Students will explore concepts related to biological evolution.

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## PBL Problem Guide

FOR FACILITATOR USE ONLY

### Timeframe

This lesson plan will take approximately 3 - 4 hours.

### Step-by-step guide

- Put students into teams of three to four members.
- Ask for a volunteer to read the STUDENT PROBLEM aloud [page 6].
- As a whole group, ask students to list What We Know [FACTS, page 7].
- Have each team create a list of What We Need to Know [NEED TO KNOWS & LEARNING ISSUES, page 8].
- Have each team begin a list of POSSIBLE HYPOTHESES [page 11].
- Provide ADDITIONAL INFORMATION for NEED TO KNOWS, allow teams to research LEARNING ISSUES [pages 9 & 12].
- Teams re-evaluate POSSIBLE HYPOTHESES [page 11] and determine one DEFENDABLE SOLUTION for Final Product [page 13].
- Teams create and present DEFENDABLE SOLUTION and individual students write ACTION PLAN [page 13].

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## PBL Resources

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### Resources provided

Included with this case are:

- Species Distribution websites
- Genetic Variation websites
- Human Effect on Biodiversity website
- Endangered Species website

### Resources to assemble

You may wish to assemble the following resources ahead of time:

- Biology textbook

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### Student Problem

FOR STUDENT USE

**You work for the U.S. Fish and Wildlife Service. Your team has just received a new assignment! You've been asked to evaluate the possible reintroduction of red wolves to the southern range of the Appalachian Mountains.**

In the mid-1900's, red wolves were nearly driven to extinction. Your team will need to investigate the environmental conditions that led to the near extinction and evaluate how the red wolves might be affected by these conditions currently.

### Consider:

- What are your initial thoughts about what might have caused the red wolves to become nearly extinct?
- What do you think might be different about the conditions from the mid-1900's to the present?

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### Key Facts

### FOR FACILITATOR USE ONLY

- You work for the U.S. Fish and Wildlife Service.
- Your team has just received a new assignment to evaluate the possible reintroduction of red wolves to the southern range of the Appalachian Mountains.
- In the mid-1900's, red wolves were nearly driven to extinction.
- Your team will need to investigate the environmental conditions that led to the near extinction.
- Your team will need to evaluate how the red wolves might be affected by these conditions currently.

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**Need-to-knows / Learning Issues**

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**NEED TO KNOWS**

- Are there natural populations of red wolves?
- What caused the near extinction of red wolves?

**LEARNING ISSUES**

- How do environmental conditions affect the distribution of a species?
- How is genetic variation affected by environmental conditions?
- How do humans affect biodiversity?

**NEED TO KNOW ANSWERS**

- Yes, in eastern North Carolina.
- Provide teams with the Additional Information for Students, page 9. Teams may also use other sources to research the species decline.

**LEARNING ISSUE RESOURCES**

- Students will investigate using the Learning Issue Resource Guide, page 12.



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### Additional Information

FOR STUDENT USE

Red wolves are endangered.  
 More information about red wolves can be found at:  
[www.earthsendangered.com/profile.asp?gr=M&sp=938](http://www.earthsendangered.com/profile.asp?gr=M&sp=938)  
[www.fws.gov/redwolf/faq.html](http://www.fws.gov/redwolf/faq.html)



Notes about red wolf species reduction:

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## Additional Information

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Students will examine the red wolf population to explore how environmental conditions affect populations. They will propose a solution for how to reintroduce a threatened/endangered species to the natural environment. Some teams may decide that the wolves should not be reintroduced, but they must have supportive evidence for this.

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### Hypotheses

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- Hypotheses will vary by the factors that teams determine led to the decline in the red wolf population.
- Hypotheses will vary by each team's decision about reintroduction. These may include:

Red wolves should not be reintroduced due to their lack of fitness for current environmental conditions.

Red wolves should be reintroduced due to their potential ability to survive and reproduce in current environmental conditions.

Humans will adversely impact the reintroduced populations of wolves.

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## Learning Issue Resource Guide

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### WEBSITES

Species Distribution

[en.wikipedia.org/wiki/Species\\_distribution](https://en.wikipedia.org/wiki/Species_distribution)

[www.nature.com/scitable/knowledge/library/environmental-constraints-to-the-geographic-expansion-of-13236052](http://www.nature.com/scitable/knowledge/library/environmental-constraints-to-the-geographic-expansion-of-13236052)

[pediaview.com/openpedia/Species\\_distribution](http://pediaview.com/openpedia/Species_distribution)

Genetic Variation

[www.nature.com/scitable/topicpage/the-genetic-variation-in-a-population-is-6526354](http://www.nature.com/scitable/topicpage/the-genetic-variation-in-a-population-is-6526354)

[evolution.berkeley.edu/evosite/relevance/IIIA2Lowvariation.shtml](http://evolution.berkeley.edu/evosite/relevance/IIIA2Lowvariation.shtml)

Human Effect on Biodiversity

[www.ncbi.nlm.nih.gov/pmc/articles/PMC1852758/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1852758/)

Endangered Species

[science.jrank.org/pages/2467/Endangered-Species.html](http://science.jrank.org/pages/2467/Endangered-Species.html)

## Return of the Wolves

**Final Product and Writing Guide**

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**Team**

- Each team will create a plan for the reintroduction of the red wolf to the southern range of the Appalachian Mountains. The plan must address the environmental conditions that led to the near extinction and how the red wolves might be affected by these conditions currently, including conditions that affect the distribution of the wolves; how genetic variation in the wolves is affected by environmental conditions; and how humans affect the wolf population.

**Individual**

- Each student will submit a written report of their team's findings, including the environmental conditions that led to the near extinction and how the red wolves might be affected by these conditions currently, including conditions that affect the distribution of the wolves, how genetic variation in the wolves is affected by environmental conditions, and how humans affect the wolf population.

## Return of the Wolves

## Rubric

## FOR FACILITATOR USE ONLY

AREA	ABOVE AVERAGE Three points each	AVERAGE Two points each	BELOW AVERAGE One point each	NO EVIDENCE Zero points each	POINTS
Final Product	<ul style="list-style-type: none"> <li>All Learning Issues addressed</li> <li>Three or more hypotheses present</li> <li>High quality final product</li> </ul>	<ul style="list-style-type: none"> <li>Most Learning Issues addressed</li> <li>Two hypotheses present</li> <li>Roles somewhat define</li> <li>Fair quality final product</li> </ul>	<ul style="list-style-type: none"> <li>Few learning issues addressed</li> <li>One hypothesis present</li> <li>Low quality final product</li> </ul>	<ul style="list-style-type: none"> <li>No learning issues addressed</li> <li>No hypotheses present</li> <li>No final product</li> </ul>	
Writing Assessment	<ul style="list-style-type: none"> <li>Problem Summary, Learning Issues/New Information Integrated well presented</li> <li>Hypotheses well presented</li> <li>Solution and Defense well presented</li> </ul>	<ul style="list-style-type: none"> <li>Problem Summary, Learning Issues/New Information Integrated presented</li> <li>Hypotheses presented</li> <li>Solution and Defense presented</li> </ul>	<ul style="list-style-type: none"> <li>Problem Summary, Learning Issues/New Information Integrated poorly presented</li> <li>Hypotheses poorly presented</li> <li>Solution and Defense poorly presented</li> </ul>	<ul style="list-style-type: none"> <li>Problem Summary, Learning Issues/New Information Integrated not presented</li> <li>Hypotheses not presented</li> <li>Solution and Defense not presented</li> </ul>	
Collaboration	<ul style="list-style-type: none"> <li>Individual works well with group members</li> <li>Individual communicates well with group members</li> <li>Individual carries out their individual responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>Individual works acceptably with group members</li> <li>Individual communicates acceptably with group</li> <li>Individual mostly carries out their individual responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>Individual does not work well with group members</li> <li>Individual does not communicate well with group members</li> <li>Individual attempts but fails to carry out their individual responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>Individual interferes with group members</li> <li>Individual does not communicate at all</li> <li>Individual does not attempt to carry out their individual responsibilities</li> </ul>	

24 – 27 Points = Above Average

15 – 23 = Average

6 – 14 = Below Average

0 – 6 = Failing

# Wake Forest School of Medicine Problem-Based Learning

## Wake Forest School of Medicine Problem-Based Learning

provides essential case studies to K–12 teachers across the United States. Access useful and easy-to implement case studies on Math, English Language and other STEM topics online at [www.wakeproblembasedlearning.com](http://www.wakeproblembasedlearning.com).



**Problem Based Learning**  
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