



NJ Forest Fire Service

Wildfire Prevention Education

Lesson Plan # 5 - A (HW)

Title/Topic: **Blazing Laptops**

Group Level(s): Group 5

AE: 14 through 18 years

Skills:

Students explore how digital maps and global satellite positioning are helping firefighters control a blaze. Students will then research what factors promote fire danger and various firefighting techniques.



Learning Objective:

Students will:

1. Use longitude and latitude to find a location on a map.
2. Read and discuss the article "Fighting Fire With Technology as Computers Help Out," focusing discussion on technology's role in fighting fires.
3. Research and present findings on one of three topics: factors and conditions, which promote fire danger, fire-fighting techniques, and specific strategies used in fighting the fires.

Time: 45 minutes, plus additional time for homework and presentations.

Materials:

Copies of the New York Times article:

Fighting Fire With Technology as Computers Help Out

www.nytimes.com/learning/teachers/featured_articles/19981015thursday.html

NJ Pine Barrens Fire www.burlco.lib.nj.us/pinelands/fire.shtml

Procedures:

Vocabulary:

wildfire, archeological, topography, endangered species, veteran, terrain, laptop, incident, satellite, longitude, and latitude

WARM-UP/ DO-NOW: Ask students to find the locations of several places mentioned in the articles. The teacher gives latitude and longitude, asking students to identify the places they find at those coordinates. Alternatively, the teacher can give the names of the locations, asking students to find their longitude and latitude coordinates. Locations include San Bernardino, San Bernardino National Forest, Death Valley, Waterman Canyon, Los Angeles, and Mojave Desert, New Jersey Pine Barrens. The teacher asks students to consider how long it took them to find each place.

Instructor's Explanation:

Students read the articles; the teacher leads a group discussion based on the following prompts:

- a. What factors other than the presence of buildings and archaeological sites might wildland firefighters need to consider when planning their strategy to fight a fire?
- b. What is a global positioning device?
- c. How does it utilize satellite technology?
- d. Why would digital maps that show topography, archaeological sites, and the presence of endangered species be beneficial to wildland firefighters? What other agencies might benefit from using this technology?
- e. Although advanced technology is costly, do you think its use is justified? Why? Why not?
- f. What are the conventional strategies, techniques, and tools used to fight wildfires?

WRAP-UP/ HOMEWORK:

Present the following research topics to students:

Students (individually or in small groups) should choose one topic for a homework research project.

Students may write a research paper, give an oral report with visual aids, or create an informative display on a region in New Jersey.

After researching topic, students present their findings in class.

Essential Closure Questions to be addressed by Instructor:

1--Should lives be risked and money and resources be used to fight wildfires in areas not inhabited by people, or should such fires be left to burn?

2--Should zoning laws allow people to build homes in areas with a history of major wild fires?

3--Do you think technology will one day completely replace people in forest ranger stations? Why? Why not?

NJCCCS:

[Visual and Performing Arts](#)

[Comprehensive Health and Physical Education](#)

[Language Arts Literacy 3.1;3.2;3.3;3.4;3.5](#)

[Mathematics](#)

[Science 5.4; 5.5; 5.7; 5.8; 5.10](#)

[Social Studies 6.6](#)

[World Languages](#)

[Technological Literacy 8.1](#)

[Career Education and Consumer, Family and Life Skills](#)

References/Resources:

Maps, from Excite

(<http://city.net/maps>)

New York Times

<http://www.nytimes.com/learning/teachers/lessons/19981015thursday.html>

Journey North: A Global Study of Wildlife Migration

Calculating Your Own Latitude and Longitude

(<http://www.learner.org/jnorth/1997/orientation/global.html>)

Additional Related Articles:

"Fighting Fire With Technology as Computers Help Out."

Other Information on the Web

Weather Search, from Excite

(<http://www.excite.com/weather>)



NJ Forest Fire
Service

Wildfire Prevention Education

Lesson Plan # *5-B (HW)*

Title/Topic: **SMOKEY BEAR TAKES ALGEBRA**

For advanced students.

Group Level(s): Group 5

AE: 14 through 18 years

Skills:

Students will be able to work with the Angstrom and Nesterov Indexes. To complete the activities related to these indexes, students should be comfortable with linear, quadratic and exponential functions. Summation notation is also used with the Nesterov index. Graphing calculators are required for completing some of the activities. **For advanced students.**

Learning Objective:

*This lesson introduces students to the many factors that play a role in creating a forest-fire danger-rating index. They will be looking at how we use a scale to quantify the abstract idea of wild fire danger. Using the real-world situation, students examine the meaning of the slope and intercepts of a line. To complete the activities related to these indexes, students should be comfortable with linear, quadratic and exponential functions and their graphs. Students' facility with a graphing calculator is assumed. Students also use summation notation to do the activities relating to the Nesterov index. This lesson plan was adapted from the article "Smokey the Bear Takes Algebra," which appeared in the October 1999 issue of the [*Mathematics Teacher*](#).*

Students will be able to:

- explain the relationship between relative humidity, temperature and the likelihood of fire-danger
- explain the real-world meaning of the intercepts and slope in the Angstrom index.
- use summation notation to find the Nesterov index for each of the thirty-one days in August
- use graphing calculators to find equations to model the relationship between the slope of the land versus rate of fire spread

Time: Two to three Class Periods

Materials:

(Please refer to lesson 4-C "Fire Danger Rating System" for additional assistance if necessary.)

Meet Smokey Activity Sheet

<http://illuminations.nctm.org/lessons/9-12/smokey/SmokeyBear-AS-MeetSmokey.pdf>

Angstrom Index Activity Sheet

<http://illuminations.nctm.org/lessons/9-12/smokey/SmokeyBear-AS-AngstromIndex.pdf>

Nesterov Index Activity Sheet

<http://illuminations.nctm.org/lessons/9-12/smokey/SmokeyBear-AS-NesterovIndex.pdf>

Graphing calculator

<http://illuminations.nctm.org/lessons/9-12/smokey/SmokeyBear-AS-Rules.pdf>

Instructor's Explanation:

To begin the lesson, gather background knowledge from students about wildfires.

- Where are Smokey Bear fire danger signs located?
- Why are these signs important to the public?
- What is the difference between *high* danger of a wildfire and *very high* danger?
- What are some of the extreme losses that occur during uncontrolled wildfires?

To get students thinking about the factors that are considered when rating fire-danger, distribute copies of the Meet Smokey Bear activity sheet. Go over the introduction with students, and have them work in small groups to answer the questions.

Solutions to Meet Smokey Bear

- 1: Relative humidity, wind speed, the number of days since the last rainfall, the terrain, the nature of the available fuel (e.g., grasses will burn more readily than brush, which will burn more readily than redwood trees); in general, the finer the fuel, the greater the fire danger.
- 2: Answers will vary. Students should justify their hypotheses.
- 3: Hilly terrain causes fires to spread more quickly. The greater surface area of the ground that is exposed to flame, the quicker the fire will spread. Flames will preheat the fuel that is upslope of the fire, making ignition easier.
- 4: To combat fires effectively, firefighters need to deploy personnel and physical resources in the optimal way. Where should trenches be dug? Where should helicopter teams be stationed? How much of the fire-fighting resources of personnel and material need to be used, and when? How can people be kept safe? Students should see that the model is useful in preparing for controlling fires.

Next, explain to students how the National Fire Danger Rating System, or NFDRS (lesson 4-C), is a tool used for predicting and controlling fires. The NFDRS takes in many environmental variables, such as the factors students just discussed, to predict the rate of spread of a fire. Experts create an index using these inputs and compare it with the fire history of a given area, and one of the five ratings is given: low, medium, high, very high, or extreme. Fire management officials use these ratings in making decisions about deploying personnel and other resources that will aid in fire suppression. Since the NFDRS is a complex system, simpler indexes, the Angstrom and the Nesterov, are examined during this lesson.

Distribute the Angstrom Index activity sheet, and explain that this index is a simpler precursor to the NFDRS. It was designed so that fire-danger could be computed mentally; in fact, it is the only index in use that can be calculated in this way. Go over the introduction with students, pointing out the factors that are used in this index and those that are not.

1. What does I represent?
2. As I increases, what is happening to fire danger?

Be sure they see that the value of I and the chance of fire are inversely related: the greater the value for I , the smaller the chance of fire.

Note: Teachers may wish to rewrite the formula in terms of a Fahrenheit scale for students unfamiliar with Celsius temperatures. For example, a window in which x (temperature) varies from 0 to 40 degrees Celsius will take into account all reasonable temperatures, 32 degrees to 104 degrees Fahrenheit, for the fire season in most areas of the United States. Having students think of Celsius temperatures in multiples of 5 makes conversion easier for them.

Solutions to the Angstrom Index

- 1:** Students should obtain a line with negative slope in the first quadrant.
- 2:** The intersection of the line in question 1 with the horizontal line $y = 2$ occurs at $x = 24.5$, or 76.1 degrees on a Fahrenheit scale, and with the horizontal line $y = 4$ at $x = 4.5$ or 40.1 degrees Fahrenheit.
- 3:** The slope can be described as how much the fire-danger rating changes for each degree of change in temperature for the given humidity. Students should make the connection that for the given relative humidity, the fire danger increases as the temperature increases. The x -intercept, 44.5 in this example, represents the temperature at which the fire index becomes 0, whereas the y -intercept is the fire-danger when the temperature is 0 degrees. Any value of x greater than 44.5 will result in negative values for the fire index.
- 4:** When the humidity is raised to 40 percent, students should see that the new line is parallel to the original line with a slightly higher y -intercept. If students are using the Celsius scale, they can get a nice picture by restricting the calculator window to $[0, 50]$ by $[0, 5]$. The Celsius temperatures at which fire danger becomes likely and unlikely, respectively, are 27 and 7; those temperatures in degrees Fahrenheit are 80.6 and 44.6.
- 5:** To obtain these last answers algebraically, students need to solve the linear inequality

$$2 \leq \left(\frac{R}{20} \right) + \left(\frac{27 - T}{10} \right) \leq 4$$

with the appropriate values substituted for R .

- 6:** When students hold the temperature constant instead of the humidity, they obtain a line with a positive slope that represents the change in fire danger per increase in percent humidity. At the given temperature, fire danger is very likely at a relative humidity at or below 46 percent; fire danger is unlikely for relative humidity greater than 86 percent. Again, some confusion might arise because of the inverse nature of the meter: low numbers mean higher fire danger. But students should be able to understand that as relative humidity increases, the chance of fire occurring decreases. Thus their graphs should confirm their scientific understanding. When the temperature is raised to 35 degrees Celsius, the relative humidity at which fire danger is likely or unlikely becomes 56 percent and 96 percent, respectively.
- 7:** Fixing the relative humidity and considering only temperature change produces a line with a slope of magnitude .1; fixing the temperature and considering only relative humidity produces a line with slope .05. The index seems to be more sensitive to temperature change.

Next, students will examine another rating system, the Nesterov Index. To use the Nesterov index, students will need a month of weather data (dew point, temperature, and relative humidity), preferably for the area in which they live. As an alternative, data for a typical thirty days in the summer in Asheville, North Carolina, is included in the activity sheet.

Distribute the [Nesterov Index](#) activity sheet. Go over the introduction with students, and explain that the computations begin on the first spring day when the high temperature is above freezing and continue until a rainfall of 3 mm, whereupon the process starts anew.

Solutions to Nesterov Index

2: The principal virtue of the Angstrom index is its ease of computation. The fire danger can be computed mentally when the data are available. Neither of the rating systems is particularly comprehensive, as neither takes into account wind speed, terrain, or fuel moisture.

As a closing, distribute the [Rules of Firefighting](#) activity sheet. This activity allows students to work with some rules that firefighters have incorporated into their set of tools.

Solutions to Rules of Firefighting

1: This rule deals with the moisture content in potential fuel, an important aspect of fire danger that is not directly addressed by the Nesterov and Angstrom indexes. Students should indicate the fuel-moisture level on the independent axis, and the rate of spread on the dependent. The nature of the information demands that the graphs be qualitative. Graphs of fine and large fuels should overlap on the intervals [0, 5] and [10, 15]. On the interval between 5 percent and 10 percent, the fine-fuel graph should be higher than that for large fuel, whereas for fuel-moisture values greater than 15 percent, the fine-fuel graph should find its way down to the horizontal axis.

2-4: Here, students are given a practical application of geometric or exponential growth. Students must also decide what is reasonable for wind speed: 28 meters a second is roughly equivalent to 60 miles an hour, an unreasonable wind speed in fire season.

5: The rule is another example of a geometric or exponential relationship.

6: The data in the chart are not particularly linear. Linear, quadratic, and exponential-regression models obtained on a TI-83 calculator for grass, loose litter, and tightly packed litter are given in the following chart:

	Grass	Loose Litter	Tightly Packed Litter
Linear	$1.85x - 20.97$	$.93x - 9.9$	$.46x - 4.49$
Quadratic	$.06x^2 - 1.5x + 7.09$	$.03x^2 - .75x + 4.04$	$.01x^2 - .38x + 2.51$
Exponential	$1.13(1.08)^x$	$.93(1.07)^x$	$.81(1.06)^x$

The exponential model for all three types of fuel is a much better fit than the linear models and a somewhat better fit than the quadratic; nonetheless, students with minimal experience with regression can find a line of best fit.

Essential Closure Questions to be addressed by Instructor:

What is the relationship between relative humidity, temperature and the likelihood of fire-danger ?

Explain the real-world meaning of the intercepts and slope in the Angstrom index.

NJCCCS:

[Visual and Performing Arts](#)

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[Language Arts Literacy](#)

[Mathematics 4.1; 4.2; 4.3; 4.4; 4.5](#)

[Science 5.3; 5.7; 5.8; 5.10](#)

[Social Studies](#)

[World Languages](#)

[Technological Literacy](#)

[Career Education and Consumer, Family and Life Skills](#)

References/Resources:

National Council for the Teachers of Mathematics

National Interagency Fire Center www.nifc.gov

Mathematics Teacher http://my.nctm.org/eresources/journal_home.asp?journal_id=2

Understanding the Graph

3. What is the real-world meaning of the slope of the line that you have graphed?
 - a. What is the meaning of the x -intercept?
 - b. What is the meaning of the y -intercept?
 - c. Find the value of T that makes I negative.
4. Now change the relative humidity to 40 percent. Explain how the graph changes. How hot would it have to be for fire occurrence to be considered very likely?
5. The work that you did in Problem 4 can be done algebraically, without using the calculator. Explain how you might do this work.

6. Next, hold the temperature constant, and vary the relative humidity. Fix the temperature at 30 degrees Celsius and graph I vs. R on your calculator. Describe your results and the window that you used.

a. Explain the real-world meaning of the slope of the line that you have graphed.

b. Use your calculator to complete the following table.

TEMPERATURE (°C)	HUMIDITY AT WHICH FIRE DANGER BECOMES LIKELY	HUMIDITY AT WHICH FIRE DANGER BECOMES UNLIKELY
30		
35		

7. On the basis of your answers to the previous questions, is this fire index more sensitive to temperature or to humidity? Explain your analysis.

The Nesterov Index

NAME _____

The Nesterov Index is a simple fire-danger rating system that came about in 1949. It is as follows:

$$P = \sum_{i=1}^W (t_i - D_i) \cdot t_i$$

P represents the ignition index

W is the number of days since the last rainfall greater than 3 mm

t is the temperature in degrees Celsius

D is the dew-point temperature in degrees Celsius.

The computations begin on the first spring day when the high temperature is above freezing after snow melts and continue until a rainfall of 3 mm, whereupon the process starts anew. The index shows the fire danger:

VALUE OF P	FIRE DANGER
Between 0 and 300	Minimal
Between 301 and 1000	Moderate
Between 1001 and 4000	High
Above 4000	Extreme

Using the Index

1. Consult your local newspaper or the Internet to obtain data for the most recent August in your area or state. Compute the Nesterov index for each of the thirty-one days in August (assume that it rained on July 31). Complete the table on the following page.

Evaluating the Index

2. Compare the Nesterov and Angstrom indexes.
 - a. Which seems easier to use, and why?

 - b. Which seems more comprehensive, and why?

DATE	HIGH TEMPERATURE (°C)	DEW POINT (°C)	% RELATIVE HUMIDITY	NESTEROV INDEX (VALUE OF P)
8/1				
8/2				
8/3				
8/4				
8/5				
8/6				
8/7				
8/8				
8/9				
8/10				
8/11				
8/12				
8/13				
8/14				
8/15				
8/16				
8/17				
8/18				
8/19				
8/20				
8/21				
8/22				
8/23				
8/24				
8/25				
8/26				
8/27				
8/28				
8/29				
8/30				
8/31				

The following table shows weather data for a southeastern state in the United States. Use the data to compute the Nesterov fire-danger index for this area.

DAY	TEMPERATURE AT 1 P.M. (°C)	DEW POINT (°C)	% HUMIDITY
1	27	14	46
2	28	17	51
3	18	17	49
4*	28	21	61
5	28	19	57
6	26	18	60
7	28	18	55
8	26	23	91
9	29	22	63
10	29	16	45
11	26	26	54
12	27	19	62
13*	27	17	54
14	23	17	69
15	28	16	48
16	29	19	53
17	29	19	53
18	30	15	40
19*	32	18	44
20	31	20	53
21	32	19	48
22*	24	22	85
23	30	19	53
24*	27	21	71
25	24	21	82
26	26	18	60
27	21	21	97
28	28	20	61
29	29	18	51
30	27	21	71
31	24	22	88

An asterisk () indicates that more than 3 mm of precipitation fell on that day.*

Rules of Firefighting

NAME _____

Fire-fighters don't rely completely on the computer-generated indices to control fires. There are some general rules that they incorporate into their tools when predicting how a fire will behave.

Rule #1: Fuel Moisture

When fuel moisture is below 5 percent, fires in both fine fuels and large fuels tend to spread equally quickly. When moisture levels are between 5 and 10 percent, fine-fuels fires spread more rapidly than large-fuel fires. At levels above 10 percent, the rates of spread are about the same again. When fuel moisture is above 15 percent, the fine-fuel fires will tend to extinguish themselves, whereas large-fuel fires will continue to spread.

1. On a single set of axes, draw possible graphs for the rate of spread of fine-fuel and large-fuel fires. Share your graph with another student. Discuss any differences.

Rule #2: Wind Speed

A general rule states that *rate of spread*, a dimensionless index that measures how quickly a fire will grow, will double for each increase of 4 meters per second (mps) in wind speed.

2. What is the nature of the relationship between rate of spread and wind speed? Draw a possible graph that relates rate of spread to wind speed.
3. Assume that the rate of spread is 6 when wind speed is 0 meters per second. Complete the table of values for rate of spread. Plot the graph of spread vs. wind speed.

RATE OF SPREAD	WIND SPEED
6	0 mps
	28 mps

4. How many miles per hour is 4 meters per second? What do you think is the reasonable part of the graph that you just drew?

Rule #3: Slope of Terrain

Several rules concern spread rate and the slope of the terrain on which the fire is spreading. One suggests that the rate of spread will double for every increase of 10° in slope. Discrepancies occur because other factors affect the rate of spread, including how packed the fuel bed is.

5. What is the nature of the relationship in this rule?
6. Use the data in the following chart to create scatterplots for each of the different kinds of fuel. Superimpose on the scatterplots the graphs of the functions previously obtained. How closely do these equations model the given rules?

Relative Rates of Spread

SLOPE IN DEGREES	GRASS	LOOSE LITTER	TIGHTLY PACKED LITTER
0	1.0	1.0	1.0
10	2.3	1.7	1.3
20	6.6	3.8	2.4
30	15.0	8.0	4.5
40	30.1	15.8	8.4
50	60.5	30.8	15.9
60	126.7	64.0	32.6



**NJ Forest Fire
Service**

Wildfire Prevention Education

Lesson Plan # 5-C

Title/Topic: Wildland Firefighting & Fire Safety

Group Level(s): Group 5

AE: 14 through 18 years old.

Skills:

Formulate an essay describing the tactics used by the Incident Commander or Operations Section Chief to successfully manage a wildfire.

Learning Objective:

- 1. Students will be able to:**
- 2. Learn different firefighting tactics.**
- 3. Learn about fire safety.**
- 4. Understand the role of each firefighter in the case of an incident.**
- 5. Find the different agencies associated with an incident.**

Time: One to two class periods.

Materials:

- 1. Computers with Internet access.**
- 2. Once you have clicked on the site, you merely “facilitate” your students to navigate the sites and complete the task demands, which are included.**

Procedures:

This project requires some deep thought and strategy when forming ideas for their papers.

- 1. Students will split into groups of two.**
- 2. Students will start out by researching the different websites that are associated with wild-land firefighting and their roles.**
 - www.fs.fed.us/fire– United States Forest Service**
 - www.wildlandfire.com**
 - www.wildfirenews.com**
 - www.smokejumpers.com/index.html**
 - www.fs.fed.us/fire/fire_new/links/links_education.html**
- 3. The students will choose an incident to work with from the two listed below.**
- 4. They will then formulate a plan-of-attack for the incident.**
- 5. When formulating this plan the students will need to list the resources and personnel needed for the incident. Along with listing whom will be needed, the students will need to describe the tasks each person will need to perform. They will need to make a map showing where all the different resources will be positioned.**

6. When describing the different operations each person will need to perform, the student needs to list and integrate the different safety tips that should be integrated into the personnel's job description.

- www.fs.fed.us/fire/safety
- <http://www.impulse.net/~mlynch/WildFireSafety.html>
- www.safecom.gov
- <http://www.wildfirenews.com/fire/10orders.html>

Incident Scenarios

- I. It is July 10th with temperatures reaching 90+. There is a large incident fire burning out of control in the NW part of Montana that started the night before from a thunderstorm passing through. This region is very mountainous and difficult to hike to. There are no resources currently at the site of the fire. There is very little access to the site of the fire. The fire has burnt up to 300 acres and is continuing to burn hot and fast. The weather conditions are fairly mild except for gusty winds reaching 30+ out of the NW. The weather report is calling for a clear starry night. The ground and grass is dry from a dry summer. The fire is currently burning below standing pine and spruce trees, in the grass, but with the right winds this fire could jump into some of the trees and possibly torch out.**
- II. It is August 3rd with temperatures towering in the 90's. There is a large incident fire burning out of control in the Black Hills of SD that has been burning for 2 days. There are some local crews trying to contain the 1000-acre fire that started just off of Hwy. 16. The region is very hilly and somewhat hard to access with the large canyons that are in the area of the incident. The weather conditions are mild except for gusty winds reaching 25+ out of the NW. The weather report for tonight calls for developing thunderstorms. The ground cover is mostly covered with grass and a few saplings. There are however, large stands of Ponderosa pine trees in the area.**

Instructor's Explanation:

Determine the cause of the fire and sort out different resources you would order for the specific incident you have chosen from above. Specify which personnel you would need to accomplish the goal of extinguishing the fire.

Students will be provided a rubric with which to refer to as they complete their essay.

Rubric Cube Tool <http://learn.sdstate.edu/webquest/firefighting/eval.html> Click here to review and/or share with students.

Parent Involvement:

Parents must assist their son/daughter in collecting the datum/research necessary to provide to the Firewarden. Parents will provide a running list of sites and or reference materials located in a library, which was of use to their son/daughter in completing this assignment.

NJCCCS:

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[Language Arts Literacy 3.1; 3.2; 3.3; 3.4; 3.5](#)

[Mathematics](#)

[Science 5.4; 5.6; 5.7; 5.8; 5.10](#)

[Social Studies](#)

[World Languages](#)

[Technological Literacy 8.1](#)

[Career Education and Consumer, Family and Life Skills](#)

References/Resources:

- www.fs.fed.us/fire/safety
- <http://www.impulse.net/~mlynch/WildFireSafety.html>
- www.safecom.gov
- <http://www.wildfirenews.com/fire/10orders.html>
- <http://www.geocities.com/fire-ed/firesetters.html>

Evaluation

	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Writing Skills	Many mistakes made and in need of serious revision.	Few mistakes made and in need of a revision.	Good job of writing skills in a fairly acceptable form for grading.	Excellent presentation of a paper with no mistakes.	
Contents	Very little information portrayed. Lacked detail in material covered.	Student has some information. Little time put into the project.	Information was good, but covered a limited number of topics. Content was informative, but lacking specific details.	Excellent topic knowledge. Researched a great number of topics.	
Creative Products	Map lacking any creativity and not complete.	Some creativity included. Still not complete.	Creativity shown, but could use some improvement. Map completed.	Map completed and excellent creativity evident. Great design included.	
Collaboration with Partner	Partners fight and/or argue the whole time. One partner does the presentation by themselves.	One partner does most of the work with a few disagreements. Lack of participation by one partner.	Partners get along well and equally participate. The presentation goes well.	Partners get along well and respect each other. They work well together excellent in all facets of the project.	



**NJ Forest Fire
Service**

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Lesson Plan # 5-D

Title/Topic: To Develop or Not To Develop?

Group Level(s): Group 5

AE: Ages 14 through 18 years.

Skills:

Recognize the environmental issues that may or may not affect a developer's plan to build.

Learning Objective:

The students will be able to:

Investigate the ecological significance of wildfire

Study the frequency and scope of fires and their influence patterns of forest succession.

Examine the controversial issues influencing decisions about controlling wildfires.

Understand the effects to the environment influenced by the wildland/urban interface.

Time:

This may vary depending upon how often the class meets, can be up to two weeks long in gathering data, contacting outside resources, and finalizing project in a group.

Materials:

- 1. Vocabulary: succession, ecosystems, coniferous trees, deciduous trees, serotinous cones, and wildland-urban interface, prescribed burn.**
- 2. Internet access.**
- 3. Time for letter writing and/or contact with the NJ Forest Fire Service to speak/communicate with Forest Fire Service personnel.**
- 4. Copies of Self Evaluation for all students.**
- 5. Sample letters and assignment for all students.**
- 6. Copies of Rubric for all students.**

Procedures: (Discuss as class/group with instructor)

1. Facts and Information:

- From an ecological standpoint, fire in an integral part of the life cycle of many forests. Fire clears dead and dying trees and under story litter, opening up the forest floor for new growth. In addition, fire aides in recycling nutrients as its mineral rich ash is deposited across the forest floor. This ash nourishes the soil and provides an ideal environment for germination of many seeds and regeneration of post fire plants. Fire supports the process of natural selections, improving growth opportunities for stronger healthier trees by thinning small tress and removing**

weak and insect or disease-ridden tree. Fire is considered a primary agent in preparing seedbeds of many forest species. Certain species of conifers that produce closed, or serotinous cones rely on heat from fire to open the cones and release seeds. The fire opened cones help reseed the area following a fire.

- Fire begins either through natural causes such as lightning strikes or through accidental or intentional human activities. Nationally, 9 out of 10 fires (90 %) are caused intentionally or by human carelessness.
- The urban/interface is the area that homes contact grassland or forested areas.
- Fire Triangle (heat/oxygen (air)/fuel)

2. What the student should understand:

- The earth's atmosphere water, soil, climate, and geology vary from region to region, thus creating a wider diversity of communities.
- Organism adapt to changes in the environment according to the genetic and behavioral capacity of their species.
- Population of organisms exhibits variation in size and structure as a result of their adaptations to their habitats.
- Organism change through their lifetimes. Species of organisms change over long periods of time.

Instructor's Explanation:

What Students Should be Able to Do:

- Use inquiry and the process of research to solve problems related to the ecological significant of fire and its impact upon building near wild land/forested areas.
- Design and conduct and investigation to identify problems/facts where wildfires have influenced patterns of forest succession and/or land development.
- Develop a hypothesis based on observation, experience/research, and understanding of events.
- Analyze and interpret the results to draw conclusion.
- Write report based upon observation, experience/research, and understanding of events to support your view on the matter.
- Identify and use your research to make a statement supporting or not supporting the wildfires' need in ecology.
- Decide to develop on the land in question or not backing it up with information from their research.

Essential Questions to guide Exploration:

1. What are the benefits and the drawbacks of using fire to manage a forest?
2. What are some environmental, social and political factors that influence the forest-use decisions?
3. How are public and private sectors of the community affected by fire?

NJCCCS:

[Visual and Performing Arts](#)

[Comprehensive Health and Physical Education](#)

[Language Arts Literacy 3.1; 3.2; 3.3; 3.4; 3.5](#)

[Mathematics](#)

[Science 5.1; 5.2; 5.3; 5.4; 5.5; 5.6; 5.7; 5.8; 5.9; 5.10](#)

[Social Studies](#)

[World Languages](#)

[Technological Literacy 8.1; 8.2](#)

[Career Education and Consumer, Family and Life Skills](#)

References/Resources:

www.njwildfire.org NJ Forest Fire Service contacts

www.state.nj.us/pinelands NJ Pinelands Commission

www.firerescue1.com/wildland/articles/102736 Dry Pinelands article

www.firerescue.com

5-D a

(Sample COVER LETTER)

TO: NJ State Forest Fire Service

From: A1 Developers

Subject Matter: Development Near Pine Barrens

We have a contact that is willing to sell us land that is not directly close, but near, the Pine Barrens of New Jersey. We are concerned about the fires that occur in this area and are sending a representative to meet with your section warden to discuss the prevalence, natural vs. human influence on wildfire, and preventative measures for our development if we choose to purchase the land.

Pending receipt of the aforementioned inquiries to your organization, we will then consider our purchase for development.

We are looking forward to meeting with you and working with you.

Sincerely,

Ms. H. Stuff

A1 Developers

HSTUFF@a1.com

5-D-b

(ASSIGNMENT)

To learn more about the fires, you will need to learn about the type of forest the Pine Barrens is:

Make a guess about what the Pine Barrens consist of _____.

Contact the NJ FFS and identify the fuels in the Pine Barrens.

[The New Jersey Pine Barrens, also known as the Pinelands, is a heavily forested area covering 1.1 million acres (4,500 km²) of coastal plain across southern and central New Jersey. The name "pine barrens" refers to the area's sandy, acidic, nutrient-poor soil, which didn't take well to the crops originally imported by European settlers. However, these uncommon conditions led the Pine Barrens to develop a unique and diverse spectrum of plant life, especially orchids and carnivorous plants. The area is also notable for its populations of rare pygmy Pitch Pines and other plant species that depend on fire to reproduce.] **Teacher information.**

Does this information pose potential threats to the developers?

Investigate urban wild land interface.

Pros and Cons of development near highly forested areas:

What Firewise techniques are in place for the current dwellings around this area?

State rationale to purchase this land to develop or not to purchase.

Self-evaluation:

Student: Task: Date:

	EXCELLENT	GOOD	NOT HELPFUL
I helped the group to be clear about the task and its requirements.			
I helped the group develop a plan for working effectively.			
I used specific knowledge understanding, and skill to contribute to the group's solution to the problem.			
I contributed directly to successful completion of the work.			
I listened carefully to the ideas and suggestions of others.			
I used time wisely during the work.			
I contributed to improving the quality of early ideas and plans.			
I helped solve problems the groups had while we worked.			

Webography/resources list:

- <http://www.njpinebarrens.com/>
- <http://www.state.nj.us/dep/parksandforests/fire/aboutus.html>
- <http://www.nahb.org/page.aspx/category/sectionID=630> (land development)
- <http://www.fema.gov/kids/brenner.htm> (prescribed burnings)
- http://www.dnr.state.mi.us/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/Habitat_Mgmt/Grassland/Prescribed_Burning.htm (landowners guide for living near wild lands)

RUBRIC:

To Develop or Not to Develop?
Understanding Fire



Name: _____

Teacher: _____

Date: _____

Title of Work: _____

	Criteria				Points
	1	2	3	4	
Research with various sources to collect necessary information.	Contacted no one to collect information on the land proposed development.	Contacted one person to collect information on the land proposed development.	Contacted at least two persons to collect information on the land proposed development.	Contacted at least three or more persons to collect information on the land proposed development.	_____
Identify the benefits of wildfires in the proposed area to develop.	Addresses no benefits of wildfires in proposed land to develop upon.	Addresses one benefit of wildfires in proposed land to develop upon.	Addresses two benefits of wildfires in proposed land to develop upon.	Addresses three or more benefits of wildfires in proposed land to develop upon.	_____
Identify drawbacks of wildfires in the proposed area to develop.	Addresses no drawbacks of wildfires in proposed land to develop upon.	Addresses one benefit of wildfires in proposed land to develop upon.	Addresses two benefits of wildfires in proposed land to develop upon.	Addresses three or more benefits of wildfires in proposed land to develop upon.	_____
Clearly stated position to purchase or not purchase land.	No research supporting statement to purchase or not purchase land.	One citation of research supporting statement to purchase or not purchase land.	Two citations of research supporting statement to purchase or not purchase land.	Three or more citations of research supporting statement to purchase or not purchase land.	_____

				Total---->	_____

Teacher Comments:

NJ Forest Fire Service

Wildfire Prevention Education

Lesson Plan #5-E

Title/Topic: **So, do you think you have what it takes?**

Group Level(s): Group 5

AE: 14 through 18 years old

Skills:

Identify the physical and mental strengths necessary to become a wildland forest firefighter.

Learning Objective:

Students will be able to recognize and understand the levels of endurance necessary to be come a fire fighter.



Time:

Approximately one to two class periods.

Materials:

1. "Living With Fire", a video
2. Computer projector for class to view the above streaming video.
3. Information and descriptions of jobs.

Procedures:

1. View "Living With Fire"
2. List the positions available in New Jersey:
 - I. Part-Time Positions
 - Fire Fighter
 - Deputy District Warden
 - District Warden
 - II. Full Time Positions
 - Forest Fire Control Technician
 - Section Warden
 - Assistant Division Warden

- **Division Warden**
- **Assistant State Warden**
- **State Warden**
- **Fire Equipment Specialist I**
- **Fire Equipment Specialist II**
- **Assistant Supervisor of Forest fire Equipment**
- **Supervisor of Forest fire Equipment**
- **Aviation Mechanic**
- **Forest Fire Pilot**
- **Fire Observer**
- **Customer Service Representative (Secretary)**

Instructor's Explanation:

For all of the students who may not be privy to what a wildfire fighter may endure, read the following:

Here's one way to find out whether you qualify for work as a wildland firefighter. Stuff what you think you need for two weeks into a backpack, making sure it weighs at least 50 pounds. If you don't have that much stuff, add rocks to your pack till it weighs at least that much. Start hiking cross-country, and make sure you're going at a good clip for at least 10 hours per day on steep slopes - and make sure you're awake for at least 16 hours per day. If you see big movable stuff, such as rocks and logs, pick them up and move them. The bigger they are and the farther and faster you move them, the more it counts. Fall down a lot, and bang yourself up on rocks and roots as often as possible. Thrash around in the brush, get good and scraped, and go without food and water as much as possible.

Practice sleeping while standing up. This is critical. Practice it enough to where you sort of get to like it.

Try to attract as many mosquitoes and yellow jackets and bees and flies and snakes as possible, and get bit by as many as you can in as many places as possible. Get as wet and muddy as possible, and get as hot and dusty and generally filthy as you possibly can. **WHATEVER YOU DO, DON'T BATHE.**

Keep this up for two weeks. If you're still alive, and if you think you're having a good time, you may just make it as a wildland firefighter. If you're genuinely having the time of your life and you want more of this, someone may want to hire you.

For a group that may be more aware of the fire fighters' job descriptions and are curious and more serious about fire fighting, the following may be more apropos:

Maybe you've had a little experience on a trail-building crew. Maybe you're a volunteer firefighter for a rural fire protection district. Or maybe you're a high school student, and you've heard about the high adventure and big bucks possible working fire in the summer. You want to be a smokejumper – or a hotshot – but you'll settle for anything if they just give you a chance.

- If you're one of the many thousands of wannabe firefighters out there, how do you manage to land yourself a slot on a fire crew?
- There's always good news and bad news; the good news is that there are positions available. The not-so-good news is that there's no easy answer to the question – "*How do I get hired?*"

If you're looking for summer work as a temporary firefighter with the U.S. Forest Service or another federal agency, and if you're thinking you've got what it takes, but you don't know where to begin, well, this may help.

Some Forest Service districts recruit temporary fire personnel through state employment offices. Most National Forest districts do their own direct hiring of seasonal employees. This is

perfect if you're looking for just summer work and you plan to go to school in the fall. The good part of this, if you're trying to get on as a seasonal or temporary employee, is that the fire management agencies, federal or state, will always need temporary firefighters, whether they're on engines or hotshot crews or helitack – or just digging line and stacking sticks and throwing dirt. The key is to be persistent about finding the job you want and landing it.

One way to seriously enhance your chances of getting hired is to up-grade your level of skills. Can you run a chainsaw? If not, find someone to teach you. Can you drop a snag within inches of obstacles on both sides of it, even when it's leaning the other way? If not, learn how. Can you drive a truck with a 5-and-a-2 transmission? Can you change a tire? Can you drive a bus? Do you have a license to drive heavy rigs? Do you have a perfect driver's record? Can you pitch a tent and cook over a fire and tie a half dozen knots and sharpen a knife? If you think that sounds like boy scout silliness, you need to rearrange your attitude and find someone to teach you these things. Learning how to get by and make do in the outdoors will come in handy. The other folks on the crew will not appreciate it if you don't have a clue and can't look out for yourself and they then have to. Speaking of outdoors skills, if you don't know basic first aid and CPR, go learn it.

Students with a basic duffel bag of skills who are looking for temporary work can usually find it if they're persistent and not too fussy about where and when they start. If you're not a student – or if you have only a vague idea of where you want to work – then your best resource is your state employment office. When crew supervisors say they need 20 people on a crew, their agency personnel office makes a job order with the state employment office that does their recruiting. The state office then handles the qualifications and initial application process – in other words, they screen out the folks who aren't going to cut it and compile a group of the ones who might – and they send the federal applications to the Forest Service district office. As a general rule, the state office makes the job referrals, and the forest supervisor's office makes the selection.

Your best bet is to call the local Forest Service district office and ask whether they do open recruitment. If you're looking for jobs on other forests, the state employment office will usually keep your application on file if you ask them to. They'll fax it to other districts as jobs come up.

In the State of New Jersey, to become a full time employee, an applicant needs to needs to take a written Civil Service test (i.e. Firewarden; Fire Observer, etc.); each test is geared for the specific position. After passing the test, the applicant is rated by score, and is interviewed by a group of supervisors. A selection is made, and the person is hired.

Part Time wildland firefighters are hired by a Section Warden. These firefighters must complete standardized wildfire training that all wildland firefighter get throughout the nation. When a wildfire is reported, a Fire Observer, manning one of the fire look-out towers, calls as many part-time firefighters as the Section Firewarden needs. Many of these firefighters leave their normal jobs to then fight the wildfire.

All agencies have become more particular in requiring qualifications in an attempt to recruit people with at least the basic skills for wildland firefighting. You must be at least 18 and a U.S. citizen. Many positions require a valid driver's license, and some require a commercial driver's license. Some are subject to drug testing (notably those requiring a commercial driver's license). Applicants are required to meet the QUALIFICATION STANDARDS HANDBOOK criteria according to the position sought.

It's not unusual for crews in one area to also draw fire duty in other parts of the country.

New Jersey sends 20– person crews and supervisory personnel across the country to assist other wildland agencies. Whether the incident is on a national forest or park land, another state, or on tribal lands, these fire crews are equally trained and accepted.

Seasonal firefighter jobs may include work on a wildland fire suppression crew and/or fuels management crew. Specific projects vary greatly, but duties may include fire line construction and slash burning. Expect to spend time cleaning, reconditioning, and storing tools and equipment, and expect to work harder than you've probably ever worked before. You will.

The work itself requires arduous physical exertion under rigorous conditions. The ability to walk over rough, uneven terrain is mandatory, and climbing hills covered with trees, brush, rocks, and debris is to be expected. Get yourself a GOOD pair of boots, and get them broken in (as in miles and miles of broken in) before you hire on. Expect no pity (and perhaps the end of your job) if you ignore this. Minimum physical skills include heavy labor, bending, lifting, and carrying backpacks weighing 45 pounds or more. Some positions require living out of a backpack for several weeks at a time, sleeping on the ground, or staying at remote spike camps or work centers.

Okay, back to jobs. When you apply, you must fill out a "medical pre-employment inquiry." If there's any doubt about your fitness, you may be required to take a medical exam. The Forest Service also specifies a "recommended fitness level," which used to mean that you had to be able to run 11/2 miles in 11 minutes and 40 seconds, or be able to pass the Step Test. Now you got to do the Pack Test – see our Pack Test articles for more information on what this is and how to get in shape for it. http://www.fs.fed.us/fire/safety/wct/wct_index.html Pack test (aka Work Capacity Test).

SELECTIVE FACTORS:

Some Forest Service positions require not only the basic qualifications, but also what's called selective factors. If you don't provide information about these factors on the questionnaire, it's assumed that you don't meet the qualifications.

Essential Closure Questions to be addressed by Instructor:

- 1. Name three part time positions in New Jersey.**
- 2. Name three things you need to do in order to best prepare yourself for the physical endurance necessary for fire fighting in the forests?**
- 3. How will you handle the dangers for yourself and/or co-workers who may get injured or die in the field?**

NJCCCS:

[Visual and Performing Arts](#)

[Comprehensive Health and Physical Education 2.2;2.5; 2.6](#)

[Language Arts Literacy 3.1; 3.4; 3.5](#)

[Mathematics](#)

[Science](#)

[Social Studies](#)

[World Languages](#)

[Technological Literacy](#)

[Career Education and Consumer, Family and Life Skills](#) 9.1; 9.2

References/Resources:

www.wildlandfire.com

www.njwildfire.com