A Post-Fire Wildlife Habitat Restoration Classroom Curriculum Unit for Grades 5-8

An integrated study of the ecology connected to a wild fire, wildlife, habitat, and people

(or just a good excuse to go outdoors with the kids and have fun learning relevant stuff!)

- **Overview**
- **Activities (Pages 3-19)**
- **Resources (Pages 4-5; also see student products online.)**

See the website http://kidsinthecreek.org for the links and further information… Student Examples, PowerPoints, Data, Photo's, Brochures, and more links are on the Curriculum / Resources Website linked from KidsintheCreek.org

Funded by the Nature Restoration Trust, a partnership between the National Fish & Wildlife Foundation and Pacific Gas & Electric Company

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Curriculum, Blog, and Website by Kirk Heims (kheims@rsdnmp.org)
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Activities || Resources

The mission of this unit is to provide activities and lessons that can help students better understand variables involved in a habitat, specifically post-fire wildlife habitat restoration. Integrating standards, achieving higher levels of problem solving, and working cooperatively will empower students to better understand their role in understanding and influencing habitat in a post-fire situation, as future landowners and community members.

Check out the curriculum, pictures and student input at the waterblogged site which is linked off of the project website- KidsInTheCreek.org. I propose that we use these activities in an interactive, up-to-date approach that integrates technology skills and real world examples.

Kids in the Creek was the name we used for our project and it seemed that part of the kids recovery after a 14,000 acre fire was to be a part of the solution and better understand what changes are taking place in our own backyards. The Clear Creek Student Restoration and Monitoring Project was a collaborative service-learning project that taught and provided educational experiences about the Upper Clear Creek watershed in Shasta County, California. This project was located on French Gulch Creek near the town of French Gulch and assisted students from three local schools with studying, restoring, and monitoring riparian habitat severely burned during the August 2004 French Fire.

Tips for success: Get partnerships with local agencies that can support your effort and offer expertise; plan on as many field trips to watershed sites, or the site, as possible; Role playing is powerful; Have fun; Get money through grants; Integrate subject areas; Get a URL and build a web site and blog; Learn the local invasive and native plants...

Timeline: As much or as little time as you have in the classroom- Easily adaptable to a few lessons, a quarter, semester, or all year. Make this relevant to the fire or local ecology so that kids can relate and be involved.

Activities:

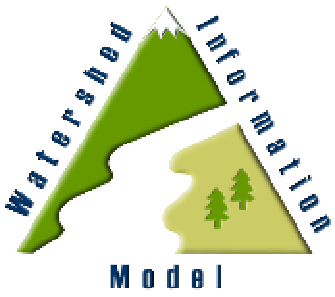
• Burn Area Concept Map:	*Allow students to look at relationships between environmental variables, wildlife needs, & fire. Assess prior knowledge.* *This is a good tool for pre/post assessment.*
• Map Reading - Visualize Burn Area:	*Students identify their watershed with the Watershed Information Model, GoogleEarth, & other maps.*
• Science Notebooks:	*Writing Journals, Data Collection, Concept Maps, Notes, Insect ID, Contacts, Blogs*
• Animal Needs:	*Oh Deer Game and Ecology Modeling- Based on annual cycles of water, food, shelter, & disaster (natural/human)*
• Data, Data, Everywhere:	*Usage and types of Data in understanding a habitat*
• Animal Track Boxes:	*Students build tracking plate boxes to monitor passing wildlife.*
• Assessing Water Quality using Invertebrates- Biodiversity:	*Collect and key out aquatic insects*
• Native vs.Invasive Plants:	*Which plants were introduced to the area? why and how? Why all of the concern? Compare new plants that emerge after a fire or event to an area that hasn't been effected. Did the fire kill Everything? Soil, insect, and seed investigations. Lead in to seed scarification/germination.*
• Water Quality Monitoring:	*Monitor stream temperatures; Take the dissolved oxygen, pH, Nitrite levels; Submit data to cooperative agencies*
• How Fast? How Much?:	*Calculate / CFS stream flows (discharge of water) (PDF version)*
• News Podcast:	*Students create a recording and/or podcast that summarizes the event, habitat, or data.*
• Connect fire ecology to history:	*Research and present on lessons learned, famous fires, and /or connecting fire ecology to history.*

Other Ideas that could be developed:

- Measure or estimate stream channel widths, Stream Profiles
- Calculate canopy cover % ; Take photo points of sites w/ digital camera
- Biomass Lab; Bottle Biology
- Water Quality and Habitat Monitoring; Kid Herbariums

Resource Links (best used online- See Appendix for these files):

- Willows of French Creek project.pdf
- ENVIRONMENTAL CURRICULUM RESOURCE TABLE
  http://www.waterlessons.org/pdf/curricula.pdf (includes links and info on the following: A Child's Place in the Environment – Caring for Aquatic Systems; Project WILD Aquatic; Project WET Curriculum & Activity Guide; Adopt-A-Watershed: Wade Into Watersheds; and, Water Wisdom; Dipping Into Creeks)



Watershed Information Model

- Current River Conditions
- Investigating Fire Ecology Curriculum developed for 6th Graders by NPS
- POW- The Hydrological Cycle.pdf
- POW2 - Build A Working Stream Model.pdf
- Pow2- Scoring Rubric.pdf ; Pow2- Scoring Rubric.doc
- Native Species on our Site.pdf
- Stream Ecology- Reading and Illustration Activity.pdf
- Hydrology Cycle.pdf
- Stream Ecology Vocabulary.pdf
- Stream Ecology -Macro-invertebrates drawing.pdf
- Brochure on Non-Native Plants or Blackberries
- Willows of French Creek project.pdf
- Native Species on our Site.pdf
- Native Species that were planted at the site (PDF)
- Hobo Temp data from French Creek & Cline Gulch- **Data**: FG1, FG4, FG6, FGCrk WQ, HoboZipfile
  a. FG1 was placed furthest downstream below the tributary
  b. FG4 was placed furthest upstream
  c. FG6 was placed in Cline Gulch
  d. FG2 was lost and never recovered; FG3 had three records and then failed, but still seems to work; FG5 was placed in Clear Creek and seems to be dead & unable to be read.
  e. Zip file of all 4 readouts including the bombed FG3

Resource links for Grades K-12 (http://www.nbii.gov/education/curriculum.html)

- (watershededucation.org)

California Water Boards Water Quality Service Learning Program Web site (waterlessons.org)

Resources for the Greater Redding Area (westernshastarcd.org)

Clear Creek Watershed - Kids in the Creek

kidsinthecreek.org

Clear Creek Student Restoration and Monitoring Project

Funded by a grant from the National Fish and Wildlife Foundation

The Clear Creek Student Restoration and Monitoring Project is a collaborative service-learning project that teaches and provides educational experiences about the Upper Clear Creek watershed in Shasta County, California. This project is located on French Gulch Creek near the town of French Gulch and aims to assist students from three local schools with studying, restoring, and monitoring riparian habitat severely burned during the August 2004 French Fire.

The three schools include:

French Gulch-Whiskeytown || Chrysalis || NAWA

Project Summary	**Brochure on Invasive Plants** **Prensentation on Project (8mb-PDF)**	**Curriculum**
Photo's	**WIM-Watershed Info Model**	**Resources**
Water Blogged (Student Blog)		**Map of the Site**

View our story in the Redding Record Searchlight Article on the Watershed Project!
French Creek plot has become an outdoor classroom.

Creek Day was on May 17th. Students lead the day and shared their knowledge with other schools and the community.

Burn Area Concept Map

Allow students to look at relationships between environmental variables, wildlife needs, & fire. Assess prior knowledge.

Student Goals: Students create a concept map to assess prior knowledge and as a post assessment comparison/tool.

Instructional Resources: no

Activities:

- Students use a large piece of paper to individually build a concept map(s) related to Wildfires, Forest Fires, Community, Habitats, or whatever is most appropriate for the unit of study.

Cross-curricular:

- Language Arts: Use the concept map as a beginning point for writing. This can provide the details and organization to describe an incident or an area.
- Math:
- Science: Look at the relationships between different concepts and/or facts provided about the burn area, habitat, and variables involved in a disaster, before-during-after.
- Social Studies: Model how to do concept maps using different branches to represent different aspects that could be focused on such as conflict/solutions, social and/or physical outcomes of event, or about an area and the impact of disasters.

Multi-sensory- learner involvement & self assessment / Outcome:

- Create a concept map relating to an event that puts the event in the center and allows students to build in details. Do this at the end of the unit, using a different color, to represent post unit knowledge.

Extensions:

- Different concept map types, different topics

Map Reading - Visualize Burn Area

Students identify their watershed with the Watershed Information Model, GoogleEarth, & other maps.

Student Goals: Students learn to use models to understand a geographic area. Students will learn the vocabulary and skills necessary for map reading.

Instructional Resources: Watershed Information Model, GoogleEarth, GPS unit, topo maps, maps that are unique to the region such as habitat, burn intensity, ownership...

Activities:

- Students explore their region. Analyze escape routes, watershed boundaries, different habitats, soil types as they relate to geography, economic factors related to the physical environment, recreational uses of the maps. Look up information that gives new insights on the area. Find satellite images of the area. Put yarn or outline the watersheds on the map/ discuss sub watersheds and the bigger ones.

Cross-curricular:

- Language Arts: Write about and describe the area being looked at from a unique perspective
- Math: Show examples of scale, elevation and slope as they relate to topo maps; Create a topo map example
- Science: Examine different habitats and discuss what variables make each unique. Discuss adaptations by plants, animals, and fungi as they relate to the habitats in your region. Have students identify fire challenges.
- Social Studies: Teach basic map reading, latitude/longitude, map types, and use of technological tools to better understand geography; Examine signs of historical activity as it relates to the maps and the region.

Multi-sensory- learner involvement & self assessment / Outcome:

- Create a paper Mache environment and develop a topo map to accompany it. Students write a page on the social history (logging, gold, where the name came from, explorers, Indians) of the area (fiction or non), and a page on the Natural history of the area as it matches the maps (such as the geology, watershed, animals, plants, micro-climates...) Have students answer how fire has played a role in this.

Extensions:

- Investigate Geo-caching; Guest speakers that can better explain specific types of maps; Develop maps;

Science Notebooks

Writing Journals, Data Collection, Notes, Insect ID, Contacts, Blogs

Student Goals: Students write about their observations, understanding, events, feelings, and their project.

Instructional Resources: notebooks, word processing tools, blogs (if available)

Activities:

- Practice different styles of writing with the use of appropriate rubrics. Students date and label journal entries based on trips, observations, for notes, or illustrating organisms. They should keep track of guest speakers, data, and activities.

Cross-curricular:

- Language Arts: Use the grading rubrics that apply to different styles of writing. Practice writing, poetry, and objective vs. subjective writing to describe burned areas, rehabilitated areas, and observations. Brochures, speeches, presentations are excellent outcome based projects.
- Math:
- Science: Write about topics appropriate to the unit of study.
- Social Studies: Write about topics appropriate to the unit of study.

Multi-sensory- learner involvement & self assessment / Outcome:

- Write in a journal on a regular basis.

Extensions:

- Refine journal entries; share them with each other or through blogs.

Animal Needs

Oh Deer Game and Ecology Modeling- Based on annual cycles of water, food, shelter, & disaster (natural/human)

Student Goals: Students learn to use models to understand wildlife populations and variables that effect them.

Instructional Resources: Oh Deer Game

Activities:

- Brainstorm a list of wildlife needs (group into food, water, shelter, space); discuss limiting factors.
- Students follow game play as described in the Oh Deer Game; Use fire as an occasional variable

Cross-curricular:

- Language Arts: Students take turns describing and summarizing outcomes and observations after looking at data.
- Math: Graph the population in different formats. Use a spreadsheet as an extension.
- Science: Look at whether the data is a good model. Invite a wildlife biologist to speak on this. Look into successional patterns where certain species take over.
- Social Studies: Examine how this would apply to introduced species (deliberately or not) effect ecology. Examine why and how species were introduced. Debate the pro's and con's of wildlife management scenario's.

Multi-sensory- learner involvement & self assessment / Outcome:

- Play the game- Oh Deer. Graph it out. Make observations and look for trends.

Extensions:

- Examine which species live in your region and hypothesis how they will be impacted. Discuss the effects of fire on the wildlife modeling that is done.
- Use different modeling software or simulation games to look at the effects of different variables on populations.

Data, Data, Everywhere

Usage and types of Data in understanding a habitat

Student Goals: Students collect and learn to interpret data.

Instructional Resources: Data collecting tools: pH strips, phosphate test strips, nitrite/nitrate strips, Dissolved Oxygen meter, Hobo temp temperature probes, other tools for measuring data as they are available.

Activities:

- Students collect data. This is often done by a couple within the class for each type of data, but results can be interpreted as a class. Students graph the data and learn different ways to present data. Look for anomalies in the data and discuss why.
- Using a couple or a few temperature measuring devices (Hobo's or thermometers), follow the temperature changes in a bucket of water, soil, and air and discuss the significance of this to global weather patterns (air changes quickest, land next, and the water acts as a stabilizing factor). This is one of the main variables that causes on/off shore breezes. Graph different data sets using line graphs over time.
- Look at historical fire data, temperature data, precipitation data, or other available information and identify trends/patterns. Make predictions.

Cross-curricular:

- Language Arts: Write about and describe how data can be used well, carelessly, or deceptively.
- Math: Use and create graphs to illustrate data.
- Science: Examine different habitats and weather by using data. Use the data as an objective tool for comparing populations of wildlife, plants, or for making predictions of recovery. Students learn techniques for standardized data reading and collection..
- Social Studies: Look at historical data and analyze it's effect on social situations in the region.

Multi-sensory- learner involvement & self assessment / Outcome:

- Students design their own data collection projects for a period of weeks. Data should support what the objective was and have a neat table and graph. Conclusions based on the data should be listed as well as any anomalies and why.

Extensions:

- Lots of data exist already and there are many ways that students can collect data.

Animal Track Boxes

Students build tracking plate boxes to monitor passing wildlife.

Student Goals: Students learn about local wildlife by making inferences based on clues.

Instructional Resources: Animal tracking boxes

Activities:

- Students set out and monitor animal tracking boxes.

  Track plates were used to identify small animals that returned to the project site. The track plates consist of a metal sheet that is coated with chalk on both ends. In the center of the plate is an approximately 8" by 8" square of Contact paper secured by masking tape. Critters cross the plate and chalk in search of the small amount of bait placed in the center of the Contact paper, leaving their prints on the adhesive paper. Because the metal plates were left out all winter, wood boxes were used to shield the plates from rain and other moisture thereby only permitting small animals to cross the plate. Plates and boxes were donated by the USDI Bureau of Land Management.

Cross-curricular:

- Language Arts: Write about animal sighting, encounters, or how to react if there is an encounter. Write about the species and their needs, perhaps even discussing displacement from fire or other natural limiting factors.
- Math: Collect data on observations and look for best ways to interpret the data.
- Science: Research and study the species and their niche in your region.
- Social Studies: Examine how the observed tracks connect to wildlife that may have (or had) a greater role in the local economy such as mice contributing to coyotes which were a threat to sheep, or were used for pelts.

Multi-sensory- learner involvement & self assessment / Outcome:

- Create a wildlife tracking box or another way to identify what species pass through an area.

Extensions:

- Have a wildlife biologist be a guest speaker. Tag birds, count salmon, identify species in the schoolyard, go bird watching...

Assessing Water Quality using Invertebrates-Biodiversity

Collect and key out aquatic insects

Student Goals: Students learn techniques to collect different species and learn what they are indicating about the area.

Instructional Resources: Kick nets, vials, local (as much so as possible) identification guides, aquatic invertebrate chart (pdf)

- Native Species on our Site.pdf
- Stream Ecology- Reading and Illustration Activity.pdf
- Hydrology Cycle.pdf
- Stream Ecology Vocabulary.pdf
- Stream Ecology -Macro-invertebrates drawing.pdf

Activities:

- Students use kick nets to collect aquatic invertebrates. Sort, compare, and analyze by species as to what adaptations contribute to their success in their niche. Ice cube trays work well for sorting. Use magnifiers and scopes to analyze and hypothesize about various adaptations. Do various activities related to structure and function. Look for good indicator species in different settings (such as the overly generalized example of cockroaches or flies being associated with filth).

Cross-curricular:

- Language Arts: Write about cause and effect as it relates to the riparian habitat. Describe why invertebrates are good water quality indicators.
- Math: Use numbers, math, and graphs to support observations and conclusions.
- Science: Make hypothesis about different species, variables affecting them, limiting factors, indicator species, or how the habitat changes as a result of fire, and why certain species can succeed in place of others. Why is this bad or good? Do the aquatic invertebrate chart (pdf). ; Stream Ecology- Reading and Illustration Activity.pdf; Hydrology Cycle.pdf; Stream Ecology Vocabulary.pdf; Stream Ecology -Macro-invertebrates drawing.pdf
- Social Studies: Investigate how different species indicate environmental health or devastation in different regions / areas (such as lots of bats being good in the farm belt or mosquitoes being really bad in the city).

Multi-sensory- learner involvement & self assessment / Outcome:

- Create your own chart based on local species. This should show what the species are and what they indicate.

Extensions:

- Investigate stories about indicator species - everything from the canary in the coal mine to scarab beetles.

Native vs. Invasive Plants

Which plants were introduced to the area? why and how? Why all of the concern? How does fire effect the plants? Why some and not others?

Student Goals: Students learn about native species as well as invasive/non-native plants (and other species).

Instructional Resources: Field Guides, Guest Botanists, Ranger, Scientist, or Person familiar with the vegetation.

Willows of French Creek project.pdf

Native Species on our Site.pdf

Native Species that were planted at the site (PDF)

Activities:

- Students learn which plants are native and plants that are invasive. Students remove the non-native/ invasive plants with clippers and if available re-plant native species.
- Invasive plants including Himalayan Blackberry and Tree of Heaven were quick to re-sprout at the project site. These and other plants are considered invasive as they are not native to the area and cause environmental harm to native plant species also trying to rebound after the fire. Students and cooperators mechanically removed invasive species and replanted over 400 native plants on the project site. Natural re-growth has also been successful, helping out-compete the persistent invasive species. A list of all species planted can be found on the project Website, http://www.kidsinthecreek.org.
- Compare new plants that emerge after a fire or event to an area that hasn't been effected. Did the fire kill Everything? Soil, insect, and seed investigations. Lead in to seed scarification/germination. Students examine the effects of fire on seed survival. They learn that some plants need fire and that too much heat can cause different results.
- Raise and propagate native plants.

Cross-curricular:

- Language Arts: Make a brochure (that covers whatever topics are most relevant for your area). Write about and describe the dilemma of native and non-native species; Why is this a problem?
- Math: Count, compare, graph, and analyze population numbers and density. Use math to describe an observation. Various transect and objective analysis activities can be created or found to gather data.
- Science: Examine different micro-habitats and look at what species returned and why. Play a

game that simulates how some plants or animal characteristics are more advantageous in survival (good seed and beak simulations can be found). Learn what limiting factors and variables are influencing the success of some species.
- Social Studies: Look at patterns of travel compared to introduced species. Discuss the social significance of having certain species as opposed to the environmental challenge that may occur (such as introduction of starlings, tree-of-heaven, or certain grasses and weeds.

Multi-sensory- learner involvement & self assessment / Outcome:

- Create a presentation and share it with a group. Include flyers, notes, brochure...
- Raise and propagate native plants.

Extensions:

- Investigate problems of introduced species further. (this is a big problem in a lot of areas)

Water Quality Monitoring

Monitor stream temperatures; Take the dissolved oxygen, pH, Nitrite levels; Submit data to cooperative agencies

Student Goals: Students will Monitor stream temperatures; Take the dissolved oxygen, pH, Nitrite levels; Submit data to cooperative agencies.

Instructional Resources: a Professional that can show a person that is not familiar with techniques, how to collect and interpret data. Water quality monitoring tools (kits, strips, meters, sechi disk, kick nets- whatever you can get your hands on...)- Good data can be collected with as little as a thermometer, pH strips, and kids collecting clues such as aquatic invertebrates.

Activities:

- Collect Dissolved Oxygen (DO), pH, Nitrite/Nitrate levels, phosphate levels. Strategic data collection locations can illustrate the effect of fire, riffles, stagnant pools, etc. on water quality. Students should understand what dissolved oxygen is and why it's important to trout, salmon, and other species. Answer 2 ways that DO gets in the water and what an acceptable range is. Answer, research, and investigate cause and effect related to each of the water quality attributes.
- Interpret data and communicate it by posting it or sharing it.
- Collect and monitor data.
- Guest speakers

Cross-curricular:

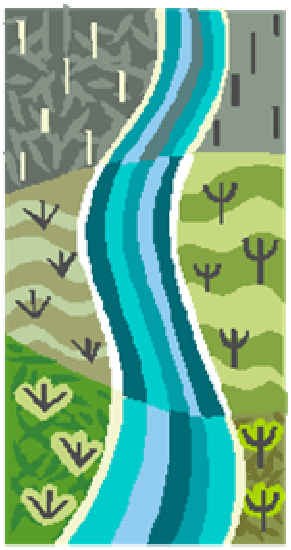
- Language Arts: Write a summary of the water quality and how it was determined. Can you make conclusions? how and why?
- Math: Use math to make conclusions and measurements. Graph data to make points.
- Science: Collect Dissolved Oxygen (DO), pH, Nitrite/Nitrate levels, phosphate levels. Strategic data collection locations can illustrate the effect of fire, riffles, stagnant pools, etc. on water quality. Students should understand what dissolved oxygen is and why it's important to trout, salmon, and other species. Answer 2 ways that DO gets in the water and what an acceptable range is. Answer, research, and investigate cause and effect related to each of the water quality attributes.
- Social Studies: Use a GPS unit to record locations where data was collected.

Multi-sensory- learner involvement & self assessment / Outcome:

- Collect, Evaluate, and Communicate using specific data that makes a point.

Extensions:

- Investigate Geo-caching; Guest speakers that can better explain specific types of data and water quality monitoring techniques.



Physical Stream Characteristics

Measurements about the size and speed of the stream allow you to compare it objectively to other streams or rivers. Record the width, depth, and speed of the stream at cross-sections A, B, and C in the columns below. Remember, a cross-section is a "slice of the river."

	A:	B:	C:
Stream Width:			
Stream Depth: 1			
2			
3			
4			
5			
Timed Object (sec):			

1. Do you think the speed will be the same at each cross-section? Why or why not?

2. Do you think more water passes by A than C in one second? Why or why not?

3. Why do you think scientists record this type of data?

Finding the Rate of Stream Flow

1. Find the average stream depth for each cross-section. Add the stream depths in that column and divide by the number of readings you took there.

   Average Depths: **A:____ft.** **B:____ ft.** **C:____ ft.**

2. Now multiply each cross-section's average depth by its stream width. This gives you the area of each "slice of river".

   Area: **A:____ ft^2** **B:____ ft^2** **C:____ ft^2**

3. To record stream speed, take the distance an object floated (10 feet) and divide by the time it took (# of seconds). For example, 10 feet / 5 seconds = 2 feet per second. This is your stream speed.

   Area: **A:____ ft/sec.** **B:____ ft/sec.** **C:____ ft/sec.**

4. Finally, we need to calculate the rate of flow. Multiply each cross-section's area by stream speed. This gives you the number of cubic feet of water that pass that point each second! This is also called cubic feet per second (***cfs***).

   Rate of Flow: **A:____*cfs*** **B:____*cfs*** **C:____*cfs***

5. Give two reasons a land manager or fish biologist would want to know about stream flow.

News Podcast

Students create a recording and/or podcast that summarizes the event, habitat, or data.

Student Goals: Create a Podcast. Students learn to use technology tools to communicate and summarize an incident. This could be recorded, edited, and posted online.

Instructional Resources: Audacity (free) or iLife (Mac) (or whatever Podcast / communication programs you use); Computers with internet, speakers, recorder. Look up Podcasting online for more information.

Activities:

- Students report and summarize events of a fire, interviews, about restoration efforts, projects, events, or information that has been collected and could be communicated and shared with the public.

Cross-curricular:

- Language Arts: Write about and describe the area being looked at from a unique perspective. Students report and summarize events of a fire, interviews, about restoration efforts, projects, events, or information that has been collected and could be communicated and shared with the public.
- Math: Prepare graphs that can easily be included in a Podcast and will illustrate points.
- Science: Use proper vocabulary in your recording/script.
- Social Studies: Do an interview.

Multi-sensory- learner involvement & self assessment / Outcome:

- Create a local radio station Podcast.

Extensions:

- Explore different tools or subjects for Podcasting. Set up a Blog or a Wiki.
- Visit a TV studio or radio station; Guest speaker: a news reporter.

Connect fire ecology to history

Research and present on lessons learned, famous fires, and /or connecting fire ecology to history.

Student Goals: Students research and present on lessons learned, famous fires, and /or connecting fire ecology to history.

Instructional Resources: Internet, Tools for presenting

Activities:

- Students research and present on lessons learned, famous fires, and /or connecting fire ecology to history.

Cross-curricular:

- Language Arts: Create a script for a video, a presentation, a report, or communication plan...
- Math: Use data/graphs if appropriate
- Science: Understand the information being presented from a scientific perspective.
- Social Studies: Look at how this has influenced history locally and nationally.

Multi-sensory- learner involvement & self assessment / Outcome:

- Do a dramatic presentation.

Extensions:

- Explore different multi-media options for presenting.