**Yellowstone National Park**

**Thematic Unit**

**For**

**Fifth Grade**

Written by

Bev Amlaner

July 2008

**Introduction for Yellowstone National Park Thematic Unit**

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Introduction

 Yellowstone National Park is the first national park in United States and in the world. The wonders of Yellowstone were caught in the imaginations of explorers and Congress. On March 1, 1872, President Ulysses Grant signed the Yellowstone National Park Act into law. Yellowstone National Park was named after the Yellowstone River that runs through the park.

 Yellowstone National Park is called a Biosphere Reserve because of the protected samples of the world’s major ecosystem types. The park has 2.2 million acres of land. This park is one of the largest intact temperate-zone ecosystems on earth today. Yellowstone National Park has such a variety features encompassed all within this one area. The features represented are the hydrothermal, lakes, wildlife, petrified trees, and the Grand Canyon of the Yellowstone River. The variety of plants is determined by the rocks and sediments that create the topography of the park. Mountain ranges reach high into the sky with snow covered peaks.

 The beauty of the land is insurmountable! The variety of wildlife for visitors to see is amazing! The hydrothermal geysers, hot springs, fumaroles, and mud pots are spectacular! The colors of wildflowers and plant life are breathtaking! Yellowstone is not just a place to visit, but rather a place to experience. Around three million visitors go to Yellowstone National park each year.

 I was fortunate to take a two and half week field experience that studied the issues of the land management of Yellowstone National Park. This public land has many interest groups in conflict over how to manage the park. There are different groups concerned for their point of view as to how the land should be cared for. For instance, these groups represent the issues surrounding the wolves, bison, winter use, bio-prospecting, fire management, and of course the management of the park itself. The workshop met locally for a week to be introduced to the issues at stake. Then fourteen of us flew together to Yellowstone National Park for nine days. Yellowstone Association, the education branch of the park, planned six days of complete emersion in the issues that surround the park management. The tour guide drove a small bus and took us throughout the park to see many important sights, coordinated speakers from the different interest groups, and guided us through the different issues and conflicts.

 This workshop gave me an once-in-a-lifetime experience to go to Yellowstone National Park. Never in all my life would I have even begun to scratch the surface of learning and experiencing all these issues without having actually gone to the park and listened to all the different speakers share the side of the conflict they stood for. I could easily have read about Yellowstone National Park and all the issues surrounding the management of the park, but by actually going I have a firsthand experience of significant value. With being there and listening to personal passionate testimonies I realize the major impacts these issues have on individual lives, livelihoods, and belief systems.

 I have created this thematic unit for fifth grade based on the different aspects of the conflicts of the issues involved. This set of lesson plans for each subject area use the Indiana Standards for fifth grade. Certainly the conflict issues involve the people that live immediately around the Yellowstone National Park, but I want my students to realize the issues also involve each of us because we are citizens of the United States of America. This national park is “our” park, not just some beautiful land out west somewhere that someone else cares for. These are public lands for our enjoyment, but also for preservation for the future. Now I personally have an even greater desire to passionately share with my students the importance of their involvement in the future of our nation. I want to instill in my students a sense of belonging to the state of Indiana and to this nation. We each must make a difference for our generation and future generations.

**Unit Plan Format for Yellowstone National Park Thematic Unit**

By Bev Amlaner

Written for 5th Grade

July 2008

Objective for Thematic Unit: Students learn about issues involved in the preservation, control, and public policy for the public lands of Yellowstone National Park.

**Lesson Plan for Wildlife in Yellowstone National Park**

Subject: English Language Arts

Objective: Students are to learn about the variety of wildlife roaming free in Yellowstone National Park and how visitors to the park see the wildlife in their natural settings.

Indiana Standards:

Standard 5.2.3 Recognize main ideas presented in texts, identifying and assessing evidence that supports those ideas.

Standard 5.2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

Standard 5.3.1 Identify and analyze the characteristics of poetry, drama, fiction, and nonfiction and explain the appropriateness of the literary forms chosen by an author for a specific purpose.

Standard 5.3.7 Evaluate the author’s use of various techniques to influence readers’ perspectives.

Standard 5.4.1 Discuss ideas for writing, keep a list or notebook of ideas, and use graphic organizers to plan writing.

Standard 5.5.2 Write responses to literature that: demonstrate an understanding of a literary work, support judgments through references to the text and to prior knowledge, and develop interpretations that exhibit careful reading and understanding.

Time Frame for this Lesson:

This lesson is set up for a week or could be lengthened into two weeks with the amount of materials available and the centers set up.

**Lesson Plan for the Bison at Yellowstone National Park**

Subject: Social Studies (Economics)

Objective: Students are to learn about the complex issues surrounding the management of bison in Yellowstone National Park. Students are also to learn about conflict resolution in connection with the public land usage of Yellowstone National Park.

Indiana Standards:

5.2.6 Identify and give examples of individual rights in the Bill of Rights.

5.3.2 Name and locate states, major cities, major regions, major rivers and mountain ranges in the United States.

5.4.4 Explain how education and training, specialization, and investment in capital resources increase productivity.

5.4.5 Use economic reasoning to explain why certain careers are more common in one region than in another, and how specialization results in more interdependence.

5.4.6 Predict the effect of changes in supply and demand on price.

5.4.7 Analyze how the causes and effects of changes in price of certain goods and services had significant influence on events in United States history.

Time Frame for this Lesson:

This lesson is written for three days although there are enough resource materials to lengthen the lessons as fits the individual teacher.

**Lesson Plan about the Visitors and Park Facts of Yellowstone National Park**

Subject: Math

Objective: Students will use facts about Yellowstone National Park within a mathematical setting.

Indiana Standards:

Standard 5.1.2 Round whole numbers and decimals to any place value.

Standard 5.2.6 Use estimation to decide whether answers are reasonable in addition, subtraction, multiplication, and division problems.

Standard 5.6.2 Find the mean, median, mode, and range of a set of data and describe what each does, and does not, tell about the data set.

Standard 5.7.3 Apply strategies and results from simpler problems to solve more complex problems.

Standard 5.7.7 Make precise calculations and check the validity of the results in the context of the problem.

Time Frame for this Lesson:

This lesson is written for three days with lots of resource materials and web sites available to lengthen as needed for the teacher.

**Lesson Plan for the Hydrothermal Features of Yellowstone National Park**

Subject: Science

Objective: Students will learn about the hydrothermal features of Yellowstone National Park and how these features are like a giant plumbing system under the earth. These hydrothermal features are the largest in any one area of anywhere on the earth.

Indiana Standards:

Standard 5.1.7 Give examples of materials not present in nature, such as cloth, plastic, and concrete, that have become available because of science and technology.

Standard 5.3.4 Investigate that when liquid water disappears it turns into a gas (vapor) mixed into the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.

Standard 5.3.5 Observe and explain that clouds and fog are made of tiny droplets of water.

Standard 5.3.8 Investigate, observe, and describe that heating and cooling cause changes in the properties of materials, such as water turning into steam by boiling and water turning into ice by freezing. Notice that many kinds of changes occur faster at higher temperatures.

Standard 5.3.10 Investigate that some materials conduct heat much better than others, and poor conductors can reduce heat loss. Temperature: a measure of average heat energy that can be measured using a thermometer.

Standard 5.4.4 Explain that in any particular environment, some kinds of plants and animals survive well, some do not survive as well, and some cannot survive at all.

Standard 5.4.6 Recognize and explain that most microorganisms do not cause disease and many are beneficial.

Time Frame for this Lesson:

This lesson is written for six days although there are a lot of resource materials given so the teacher may easily lengthen as fits the schedule.

**Lesson Plan for the Wolves of Yellowstone National Park**

Subject: Health and Physical Education

Objective: Students are to follow directions and rules, take turns, and exercise while playing games that use animal characteristics found in Yellowstone National Park. Health wellness issues, such as food and exercise, are emphasized in comparison to animals in Yellowstone National Park needing to eat and exercise to stay healthy.

Indiana Standards:

Standard 5.1.1 Demonstrate the ability to integrate locomotor (traveling action), non-locomotor (movement in place), and stability (balance) movements in more complex skills. Example: Demonstrate mature motor (movement) patterns in increasingly complex environments (e.g. obstacle courses).

Standard 5.2.1 Identify ways that movement concepts can be used to refine movement skills. Example: Understand that practice improves performance.

Standard 5.3.1 Participate in health enhancing physical activity. Example: Establish physical activity goals.

Standard 5.5.1 Exhibit independence and ability to succeed in groups. Example: Participate in cooperative and challenge activities.

Standard 5.5.2 Perform activities safely and follows class rules of conduct. Example: Describe appropriate conduct including ethical and unethical behavior.

Standard 5.7.1 Exhibit positive feelings about participation in physical activity. Example: Celebrates individual and group accomplishments.

Time Frame for this Lesson:

This lesson is written with five games that specifically match the thematic unit. Depending on the schedule for recess or P.E. the games may be used over several times or play one new game each recess for five days.

**Lesson Plan for the Wolves of Yellowstone National Park**

Subject: Art and Music

Objective: Students are to learn about the return of the wolves to Yellowstone National Park and the enjoyment the wolves bring to three million visitors each year.

Indiana Standards:

Visual Arts

5.7.1 Demonstrate refined observational skills through accurate rendering of representational objects and subject matter from life.

5.8.1 Apply elements (line, shape, form, texture, color, value, and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis, and unity) in work that effectively communicates their ideas.

5.9.2 Identify and control different media, techniques, and processes to effectively communicate ideas, experiences, and stories including drawing. Media: pencils, colored pencils, markers, chalks, crayons, oil pastels, charcoals.

Music

5.1.1 Sing independently and in ensembles maintaining good breath control, pitch, diction, tone quality, and posture.

Standard 5.8.3 Identify the integration of disciplines such as social studies, art, and geometry (measurement, diameter, and circumference) for a project such as making “poi balls” when studying Mäori music and dance.

Time Frame for this Lesson:

This lesson is written for four days. Again there are enough resource materials and web sites given that a teacher may easily expand this lesson as per classroom needs.

**Lesson Plans for Yellowstone National Park Thematic Unit**

By Bev Amlaner

Written for 5th Grade

July 2008

**Lesson Plan for Wildlife in Yellowstone National Park**

Note: Constructivist teaching is used in this lesson by involving students in learning centers, choosing books to read, utilizing heterogeneous grouping, and differentiation of instruction to provide instruction based on needs of students.

Subject: English Language Arts

Grade Level: 5th Grade

Objective: Students are to learn about the variety of wildlife roaming free in Yellowstone National Park and how visitors to the park see the wildlife in their natural settings.

Indiana Standards:

Standard 5.2.3 Recognize main ideas presented in texts, identifying and assessing evidence that supports those ideas.

Standard 5.2.4 Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.

Standard 5.3.1 Identify and analyze the characteristics of poetry, drama, fiction, and nonfiction and explain the appropriateness of the literary forms chosen by an author for a specific purpose.

Standard 5.3.7 Evaluate the author’s use of various techniques to influence readers’ perspectives.

Standard 5.4.1 Discuss ideas for writing, keep a list or notebook of ideas, and use graphic organizers to plan writing.

Standard 5.5.2 Write responses to literature that: demonstrate an understanding of a literary work, support judgments through references to the text and to prior knowledge, and develop interpretations that exhibit careful reading and understanding.

Key Concepts:

Yellowstone is home to the largest concentration of mammals in the lower 48 states

67 different large and small mammals live in Yellowstone National Park

Wildlife live in their natural settings and visitors to the park may see many different animals

Students gain a greater appreciation for the preservation of the wildlife and natural ecosystems to sustain the wildlife

Materials:

Bulletin board prepared by teacher with wildlife paw print border around the bulletin board. The words on the board say, “Yellowstone National Park Wildlife.” Photos by the teacher of wildlife seen while visiting the park are printed in 8 ½” by 11” size with the name of each wildlife in letters below the picture.

*Yellowstone Resources & Issues, 2008,* Yellowstone Association, pp. 103-134 about “Wildlife.”

Reading Center

The list provided of books for students to read silently to oneself or in paired heterogeneous small groups and the library books for students to choose. In the reading center are stuffed animals from the list of animals on the book list. The students reading in the reading center may hold a stuffed animal that coordinates with their book while reading.

Center 1

A computer to watch the videos of wildlife taken by the videographer with the class the teacher was with. A second computer to look at the still pictures of wildlife in Yellowstone National Park taken by the photographer with the class the teacher was with.

Center 2

A computer to watch videos of wildlife in Yellowstone Na Teacher circle scale points for the assessment of the student’s responses at the end of each Language Arts class and the twenty statements game on the last day.tional Park.

Video produced by Nature, *Christmas in Yellowstone*

Video produced by Nature, *In the Valley of the Wolves*

Video produced by National Geographic, *Secret Yellowstone: Explore beyond the Tourist Hotspots*

Video produced by Discovery, *Sunrise Earth,* Vol. 4

Center 3

A table with different paw print patterns of wildlife for the students to draw on colored precut 5” by 5” construction paper, pencils to write the name of the book the student read and the student’s name to help create the path of books read around the room. Masking tape or whatever wall attachment is allowed in the school will be used to attach the paw print to the continued path of paw prints around the classroom.

Center 4

Play dough on a table or desk for the students to create animals that are in Yellowstone. (The play dough can be homemade to save money and have a lot more quantity.)

Center 5

Have a table with copied blank charts for students to write facts about animals in Yellowstone. The charts have one side for “What I Know” and the other side for “What I Learned” about a specific animal the student read a book about. At the bottom of the chart the student draws a little picture of the animal that is described.

Procedures:

This lesson plan may go for a week or longer during the Language Arts time slot. The teacher has a bin where the library books for a specific thematic unit or lesson plan are kept. The books are about wildlife found in Yellowstone National Park. The teacher will divide the class in six heterogeneous groups and with each group starting at a different center. Each student will choose a book from the wildlife bin of books and have the book on their desks. These books are progressively read through the week and when one book is finished it is traded out for another book from the bin. Divide the time slot by six so that 10 to 15 minutes are allotted for reading in the reading center and moving around to the five different preset centers in the classroom as described above. The teacher will use the management plan that works best for the smooth transition of students from one center to the next. The last five minutes of the time slot the teacher will call all students’ attention and the teacher will ask each student to name the animal in the book that he or she is currently reading and give an interesting fact learned that day about the animal.

Prior to starting this lesson plan the teacher will have the bulletin board already up for the students to read and enjoy. The bulletin board will have pictures of the animals named in the library book list given. The five centers will already be set and ready to go. The bin of books will already have been chosen so students do not waste any time looking for books. A list of books is that I will use from the library is at the end of this lesson. The list may vary from school to school depending on the books available to that teacher.

The reading of the books is to be a fun time for the students. The teacher will excite the students by setting goals for how far the path of paw prints will go along the wall. Students should also have a way to check these books out and take them home to read in the evening.

Last Day of Wildlife Lesson Plan

The students will play charades. The teacher has prewritten slips of paper folded and in a container. Depending on the size of the class the teacher has one or two slips of paper for each child with the name of the animal that the students have been reading about from Yellowstone. The student is to come to the front and play act like the animal. The class guesses in an orderly fashion (teacher uses classroom management skills) which animal the student is acting like. After each student has had a turn then repeat the process as time allows.

Play twenty statements with the students. The teacher can model the first time for the students. The student chosen starts with a general statement and students raise their hands to guess. The student chosen answers “yes” or “no.” The animal must be guessed within twenty statements. For example:

 I am a mammal. (Students guess.)

 I am brown in color. (Students guess.)

 The females are pregnant through the winter. (Students guess.)

 The baby is 25-35 pounds at birth. (Students guess.)

 The baby walks a few hours after birth. (Students guess.)

 The males have bumps on each side of the head. (Students guess.)

 The bumps are covered with black fuzz. (Students guess.)

 I am the largest member of the deer family in Yellowstone. (Students guess.)

 A male can weigh 1000 pounds. (Students guess.)

 A male can stand more than 7 feet at the shoulder. (Students guess.)

 The black fuzzy bumps grow into antlers that are 5 feet from tip to tip. (Students guess.)

 Yes, I am a moose in Yellowstone National Park. (The answer is given.)

The twenty statements game continues with each student taking a turn to make the statements about the animal that the student personally decided upon. The Language Arts progress of each student is evaluated by his or her ability to express the facts to the other classmates learned through the reading of books and the five learning centers.

Accommodations for Special Needs, ELL, and Exceptional Learners:

As needed have the heterogeneous small group read out loud together to the teacher or in the reading center. The teacher can get books for this group with multiple copies so each student has a book to look at and read from.

The teacher can work individually with a student that needs special help or is ELL. Also the teacher could choose easy readers as needed to accommodate the specific needs of the student.

At Center 5 where the charts are filled out with facts about an animal the heterogeneous group could work together with one student writing for the group or have a student typing the answers on a computer.

The exceptional learner could keep count of the statements made for the game.

Technology:

Three computers for Centers 1 and 2 to view videos and still life photography

Evaluation:

A rubric is provided to be used as a scoring guide for reading. The rubric is scored from 1 through 4 in ascending order of points. This rubric is to evaluate the student’s responses at the end of each Language Arts class and the twenty statements game on the last day.

List of Books about Wildlife in Yellowstone National Park

|  |  |  |
| --- | --- | --- |
| **Animal** | Author | Book Title |
| Bears | Buxton | *Baby Bears* |
|  | Fertl, Reddy & Stoops | *Bears* |
|  | Greene | *Grizzly Bears* |
|  | Helbrough | *Bears* |
|  | Hirschi | *Searching for Grizzlies* |
|  | Hodge | *Bears* |
|  | Horton | *Endangered Bears* |
|  | Markle | *Growing Up Wild Bears* |
|  | Sartore | *Face to Face with Grizzlies* |
|  | Turbak | *Grizzly Bears* |
|  | Ward | *Born to be Wild* |
| Bison or Buffalo | Caper | *American Bison* |
|  | Crewe | *The Buffalo* |
|  | Lepthien | *Buffalo* |
|  | Swanson | *Buffalo Sunrise* |
|  | Walker | *Mammals* |
| Deer, Elk, Moose | Hodge | *Deer, Moose, Elk & Caribou* |
| Moose | Ritchie and Fair | *The Wonder of Moose* |
|  | Petersen | *Moose* |
|  | Taylor | *Roscoe, A North American Moose* |
| Big Horn Sheep | Lang | *Baby Mountain Sheep* |
| Mountain Goats | Rinard | *Animals of the High Mountains* |
| Wolves | Kalman | *Endangered Wolves* |
|  | Lepthien | *Wolves* |
|  | Markle | *Wolves* |
|  | Patent | *When the Wolves Returned* |
|  | Smith | *Journey of the Red Wolf* |
| Coyotes | Resnick | *Wolves and Coyotes* |
| Beavers | Hodge | *Beavers* |
|  | Lane | *The Beaver* |
|  | Lepthien | *Beavers* |
|  | Martin-James | *Building Beavers* |
| Eagles | Gieck | *Bald Eagles* |
|  | Gieck | *Eagles* |
|  | Horton | *Endangered Eagles* |
|  | Lepthien | *Bald Eagles* |
|  | Patent | *The Bald Eagle Returns* |
|  | Raven | *Challenger, Am. Favorite Eagle* |
|  | Stone | *Eagles* |
| Osprey | Stone | *Bird of Prey* |
| Sandhill Cranes | Stone | *Sandhill Cranes* |
| Ravens | Pringle | *Crows! Strange and Wonderful* |

Student Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name of Animal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Chart for Animal Facts**

|  |  |
| --- | --- |
| **What I Know** | **What I Learned** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**Draw a little picture of the animal.**

Student Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Rubric for Scoring Guide in Reading**

4 Addresses all the key facts

 Demonstrates comprehensive understanding of key facts

 Relates prior knowledge with new learned knowledge

3 Addresses most of the key facts

 Demonstrates an understanding of the key facts

 Relates some prior knowledge with some new learned knowledge

2 Addresses some of the key facts

 Understands some of the new learned knowledge

1 Addresses only one or two key facts

 No new learned knowledge

0 No response

Note: Teacher circle scale points for the assessment of the student’s responses at the time of discussion and the twenty statements game on the last day.

Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lesson Plan for the Bison at Yellowstone National Park**

Subject: Social Studies (Economics)

Grade Level: 5th Grade

Objective: Students are to learn about the complex issues surrounding the management of bison in Yellowstone National Park. Students are also to learn about conflict resolution in connection with the public land usage of Yellowstone National Park.

Indiana Standards:

5.2.6 Identify and give examples of individual rights in the Bill of Rights.

5.3.2 Name and locate states, major cities, major regions, major rivers and mountain ranges in the United States.

5.4.4 Explain how education and training, specialization, and investment in capital resources increase productivity.

5.4.5 Use economic reasoning to explain why certain careers are more common in one region than in another, and how specialization results in more interdependence.

5.4.6 Predict the effect of changes in supply and demand on price.

5.4.7 Analyze how the causes and effects of changes in price of certain goods and services had significant influence on events in United States history.

Key Concepts:

Historic range for bison in North America spread from the Pacific to the Appalachians with 30 to 60 million bison

In Yellowstone National park poaching reduced the bison population to about 20 in 1902

Yellowstone National Park management strategies used to increase the bison herd in the 1900s

In 1968 manipulative management of bison changed to a strategy of natural ecological processes to allow the bison to roam free in Yellowstone National Park

Yellowstone National Park bison management requires bison to stay in the park, be hazed if leave the park, and eventually slaughtered if bison continue to go out of the park

Livestock producers concerned that the bison infected with the disease brucellosis will transmit to the cattle which will result in the whole herd of cattle slaughtered

Buffalo Field Campaign against hazing and slaughtering of bison and actively campaign against such activity

Snowmobiles in the winter pack down the roads and create easy paths for bison to leave the park

Wyoming and Montana have both lost their brucellosis-free status for cattle

Issues surrounding bison in Yellowstone National Park have created heated and complex resource controversies

Key Words:

Activists, aggressive, bison, brucellosis, buffalo, Buffalo Field Campaign, capital resources, cattle, conflicts, demand, disease, economics, elk, fences, free-ranging, gestation, grasses, grasslands, habitat, Hayden Valley, hazing, herd, hydrothermal, infected, livestock producers, Native Americans, natural ecological processes, Northern Range, park management, poaching, protection, productivity, ranchers, ranges, resource controversy, rut, sedges, services, snowmobiles, supply, ungulates, vaccine, Yellowstone National Park

Materials:

PowerPoint pictures of bison in Yellowstone National Park

Videos of Rancher, Park Management, Activist, and Buffalo Field Camp interviews while teacher was in Yellowstone National Park on DVD

Word search puzzle of Key Words created at [www.puzzlemaker.com](http://www.puzzlemaker.com)

*Yellowstone Resources & Issues, 2008.* Yellowstone Association, p. 118-119 on Bison.

Procedures:

Day 1

Teacher gives PowerPoint Presentation and shows pictures of bison in Yellowstone National Park. Many of the pictures were taken by the teacher while visiting the park. The teacher discusses the issues surrounding the bison management that has become heated and complex. The issues include the economics of the greater Yellowstone area and all the different groups of people involved.

Students are given the Word search puzzle of Key Words to help learn the vocabulary.

Day 2

Teacher and students review and discuss the issues presented the previous day surrounding the bison in greater Yellowstone area. The economics key words are discussed and reviewed.

Teacher shows videos from the interviews and discussions with key persons involved in the bison management in Yellowstone National Park when the teacher was in Yellowstone. The groups represented are Park Management, Ranchers, and the Buffalo Field Campaign.

After the videos are finished the teacher explains the next day’s assignment that there will be a debate. The students will represent three different groups: Park Management, Ranchers, and Buffalo Field Campaign. The class will be divided into three equal groups. (Depending on the class either the teacher will allow the students to choose the groups, or the teacher will assign the groups.)

Homework for each student is to write out five strong reasons to represent the group’s reasoning about bison for the debate. The students are to include the economics for each group and how the bison affect the group economically.

Day 3

The students will sit in three different groups in a circular fashion so no one group is seen as the center or most important in the debate. Each group will choose a person to speak first. This student will be the team leader for the debate for the specific group. The team leader will present an original statement for what that team stands for in the issue at hand. This state is one strong sentence to state their group’s position on the issue of the bison. The teacher will move around the outside of the circle and monitor the debate. As needed the teacher will interject comments and statements to keep the debate fast paced and actively engage all members of each group. The teacher will direct the debate so that no one side actually “wins” to help the students recognize the issues surrounding the bison are very complex and not easily solved.

Accommodations for Special Needs, ELL, or Exceptional Learners:

Pair a student for the Word search puzzle if help is needed or have the student sit near the teacher for clues to find the words.

The teacher could help a special needs student by discussing with them debate issues previous to the debate and have the student or the teacher as needed write out the debate comments in advance.

The exceptional student could be assigned the position of team leader for one of the groups for the debate.

Technology:

Computer and projector for the PowerPoint presentation

DVD player and projector for the videography DVD viewing

Evaluation:

A grade will be given for correct completion of the Word search puzzle.

A rubric is used for the debate to assess each student’s involvement and contribution to the debate.

Teacher Resources:

Haines, Aubrey (1996) *The Yellowstone Story,* Vol. 1. Boulder: University Press of Colorado.

Haines, Aubrey (1996) *The Yellowstone Story,* Vol. 2. Boulder: University Press of Colorado.

Schullery, Paul (2004) *Searching for Yellowstone.* Helena: Montana Historical Society Press.

Spencer, Janet (2006) *Yellowstone Trivia.* Helena: Riverbend Publishing.

Treanor, John; Wallen, Richard; Maehr, David; Crowley, Philip (2007) “Brucellosis in yellowstone Bison, Implications for Conservation Management.” *Yellowstone Science,* Vol. 15, number 2.

[www.YellowstoneAssociation.org](http://www.YellowstoneAssociation.org)

[www.greateryellowstonescience.org](http://www.greateryellowstonescience.org)

<http://www.nps.gov/yell/>

[www.BearCreekCouncil.org](http://www.BearCreekCouncil.org)

[www.BuffaloFieldCampapaign.org](http://www.BuffaloFieldCampapaign.org)

<http://www.focuswest.org/lands/intro_lands.cfm>

<http://www.focuswest.org/lands/collaborate.cfm>

Video produced by A & E Television Networks (1998/99) Investigative Reports: *War on the Range.*

Video by National Geographic. *Making Sense of the Millenium*.

**Bison in Yellowstone National Park**

S S F E Z K B U F F A L O F I E L D C A M P N G Z O L P S S

E U R W K B N P B W O G D E D R E H O W N B N I H F A I T N

C P Q O Z R S D N A L S S A R G P R F B I I M T W R M W S O

N P X C F R A I G N I H C A O P D N P S Z L F D K F R Z I W

E L N S I K N P E E K V R R D P M B O A R K F M S L E V V M

F Y O S O F Q A L Y D L D E B O Z N H I K A A S J Y H Y I O

P Q B M E E L T T A C G E Z F Z M C K B T N S I L I T S T B

G D S C N L T E Q W N I B G P W H C M C A C O T J G O R C I

X E T R A J F V Y E J O Z U V C Y O S G U Y E O X W R E A L

S E S S E C O R P L A C I G O L O C E L A R U T A N D V A E

D Y V T D I S E A S E C Y T O U G M S A S X H D O V Y O N S

J T E L A A S A U T M T G L A Z E R Q N T E F H V R H R A N

O L D L S T E W W O I C A P P N E Z A P U P K I O A P T T R

G T V F L A I Q W V I F A D T C E B P S R O S Z C U F N I E

K Q Q H J A Y O I E F H N P U H B N J Q S J U H N N S O V V

F L O E Q V V T N U K G B D I X H N O S S E R Y W G E C E J

Y R T Y E P C N B R N I O S Y T H S O T P V S K F U C E A U

X C E M S U J O E A L R W S D L A L R D S P M L D L I C M H

T X R E D E D I G D P W T X H I U L W E O W N M F A V R E A

N Q D O R D D G K K Y C V L U H O F R A H K O B J T R U R B

S D R N Z A R G C P I A R A N G E S F E I C N L W E E O I I

V P E Y A E N O E L B L H H G M G X K Z S B N S L S S S C T

L B S J S M T G F S E G N A R N R E H T R O N A V E Y E A A

J O V S Z S E N I E C O N O M I C S J L N Y U A R K Y R N T

X B I Z E Q O D K N Y I W E R G X X E Y S B C R E V P C S G

C V N V H C U K B M G H A B G B Y A I W M C Q G C G A E G P

E C I B R U C E L L O S I S T J Y N L T I Q Z P O E M X U P

C L G M O K Z M J Q K G A C D S B X X N A G F A B L S E S N

P B A Z O O S O C I P I J V E R R L E C X D S L L Z B X U Y

M H D S R G A E J J G D Y K B B E U T O K M E F S T W X T S

ACTIVISTS HAZING SUPPLY

AGGRESSIVE HERD UNGULATES

BISON HYDROTHERMAL VACCINE

BRUCELLOSIS INFECTED YELLOWSTONE NATIONAL PARK

BUFFALO LIVESTOCK PRODUCERS

BUFFALO FIELD CAMP NATIVE AMERICANS

CAPITAL RESOURCES NATURAL ECOLOGICAL PROCESSES

CATTLE NORTHERN RANGE

CONFLICTS PARK MANAGEMENT

DEMAND POACHING

DISEASE PRODUCTIVITY

ECONOMICS PROTECTION

ELK RANCHERS

FENCES RANGES

FREE RANGING RESOURCE CONTROVERSY

GESTATION RUT

GRASSES SEDGES

HABITAT SERVICES

HAYDEN VALLEY SNOWMOBILES

**Bison in Yellowstone National Park Solution**

S S + + + + B U F F A L O F I E L D C A M P + G + + L P S S

E U + + K + + + + + + + + + D R E H + + + B N + + + A + T N

C P + + + R S D N A L S S A R G + + + + I I + + + R M + S O

N P + + + + A I G N I H C A O P + N + S Z + + + K + R + I W

E L + + + + N P + + K + + + + + + + O A + + + M + + E + V M

F Y + + + F + + L + + L + + + + + N H I + + A + + + H Y I O

+ + + + E E L T T A C + E + + + + + + + T N + + + + T S T B

G + + C + + + + + + N + + + + + + + + + A C + + + + O R C I

+ E T + + + + + + + + O + + + + + + + G + + E + + + R E A L

S E S S E C O R P L A C I G O L O C E L A R U T A N D V + E

D Y + T D I S E A S E + Y T O + G M S + + + + + O + Y O N S

+ + E + A + + + + + + T + L A + E R + + T + + + + R H R A +

+ + + L + T + + + + I C A + + N E + A + U + + + + + P T T +

+ + + + L + I + + V + F A + T C E + + S R + + + + U + N I +

+ + + + + A + O I + F + + P U + + N + + S + + + + N S O V +

F + + + + + V T N U + + + D I + + + O + + E + + + G E C E +

+ R + + + + C N B + + + O + + T + S + T + + S + + U C E A +

+ + E + S U + + E A + R + S + + A + R + S + + + + L I C M H

+ + + E D E + + G D P + T + + + + L + E + W + + + A V R E A

+ + D O R + D G + K Y C + + + + + + R + H + O + + T R U R B

+ + R N + A R G C + I A R A N G E S + E + C + L + E E O I I

+ P + + A E N O E L + + H + + + + + + + S + N + L S S S C T

+ + + + S M T G F S E G N A R N R E H T R O N A V E + E A A

+ + + S + S E N I E C O N O M I C S + + + + U A R + Y R N T

+ + I + E + O D + N + + + + + + + + + + + + C R + + + + S +

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E + I B R U C E L L O S I S + + + + + + I + + + + E + + + +

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+ + + + + + + + + + + + + + + + + + + + + + + + + + + + + +

(Over,Down,Direction)

ACTIVISTS(29,9,N) HAZING(19,6,NE) UNGULATES(26,14,S)

AGGRESSIVE(10,18,SW) HERD(18,2,W) VACCINE(25,23,SW)

BISON(22,2,SW) HYDROTHERMAL(27,12,N) YELLOWSTONE NATIONAL

BRUCELLOSIS(4,27,E) INFECTED(8,4,SW) PARK(27,24,NW)

BUFFALO(9,17,NE) LIVESTOCK PRODUCERS(2,28,NE)

BUFFALO FIELD CAMP(7,1,E) NATIVE AMERICANS(29,11,S)

CAPITAL RESOURCES(12,13,SE) NATURAL ECOLOGICAL PROCESSES(26,10,W)

CATTLE(11,7,W) NORTHERNRANGE(23,23,W)

CONFLICTS(6,26,NE) PARKMANAGEMENT(28,1,SW)

DEMAND(8,25,NW) POACHING(16,4,W)

DISEASE(5,11,E) PRODUCTIVITY(2,22,NE)

ECONOMICS(10,24,E) PROTECTION(27,13,NW)

ELK(13,7,NW) RANCHERS(25,24,NW)

FENCES(1,6,N) RANGES(13,21,E)

FREE RANGING(1,16,SE) RESOURCE CONTROVERSY(28,24,N)

GESTATION(1,8,SE) RUT(21,14,N)

GRASSES(17,11,SE) SEDGES(5,18,SE)

GRASSLANDS(16,3,W) SERVICES(27,22,N)

HABITAT(30,18,S) SNOWMOBILES(30,1,S)

HAYDEN VALLEY(13,22,NW) SUPPLY(2,1,S)

Student Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Rubric for Debate in Social Studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Exemplary****4** | **Proficient****3** | **Basic****2** | **Unsatisfactory****1** |
| **Presentation Style** | All style characteristics used were convincing | Some style characteristics used were convincing | Few style characteristics used were convincing | Few style characteristics were used and no convincing |
| **Organization or Information** | Very understandable and clear | Mostly understandable and clear | Some parts understandable | Not understandable |
| **Arguments and Viewpoints** | Relevant reasons given in support | Most reasons given in support | Some reasons given in support  | No reasons given in support |
| **Rebuttals to Other Team** | Very compelling counter arguments | Some compelling counter arguments | Few compelling counter arguments | No counter arguments |
| **Respect for the Other Team** | All responses and body language were respectful | Most responses and body language were respectful | Some responses and body language were respectful | No responses and body language were respectful |

Average Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lesson Plan about the Visitors and Park Facts of Yellowstone National Park**

Subject: Math

Grade Level: 5th Grade

Objective: Students will use facts about Yellowstone National Park within a mathematical setting.

Indiana Standards:

Standard 5.1.2 Round whole numbers and decimals to any place value.

Standard 5.2.6 Use estimation to decide whether answers are reasonable in addition, subtraction, multiplication, and division problems.

Standard 5.6.2 Find the mean, median, mode, and range of a set of data and describe what each does, and does not, tell about the data set.

Standard 5.7.3 Apply strategies and results from simpler problems to solve more complex problems.

Standard 5.7.7 Make precise calculations and check the validity of the results in the context of the problem.

Key Concepts:

Yellowstone National Park has nearly 3 million visitors each year

The park is the largest national park in the 48 lower states

Yellowstone Lake is largest natural freshwater lake in the U.S. above 7000 feet

Materials:

*Yellowstone Resources & Issues, 2008,* Yellowstone Association, p. 7 for Park Facts.

Statistics for visitors to Yellowstone National Park each year see <http://www.yellowstone-natl-park.com/stats.htm>

Visitors to Yellowstone National Park is copied from the above web site at the end of this lesson. Copy in advance so each student will have a copy to use for the math lesson on Day 1.

Graph paper for students to graph visitor information

Yellowstone National Park map (paper copy from the park)

Statistics for average temperatures, rainfall, and snowfall for the last 48 years <http://www.yellowstone-natl-park.com/weather.htm>

Statistics for average temperatures, rainfall, and snowfall for the last 48 years in Yellowstone National Park is copied from the above web site at the end of this lesson. Copy in advance so each student will have a copy to use for the math lesson on Day 3.

Procedures:

Day 1

Yellowstone National Park has had around 3 million visitors each year for about the last 15 years, but this has not always been the case. Students are to use the Visitor Statistics chart which is handed to each of them along with a large piece (legal size) of graph paper. The teacher will use whole group teaching for the following questions for the students to understand and graph the information.

1. Students are to look at the Visitor Statistics and understand the information included on the chart. On a notebook piece of paper have the students copy down every five year period starting with 1875.

 Example: 1875

 1880

 1885

 1890 …

 2000

 2005

2. Give the students plenty of time to copy vertically on the paper every five years. The teacher copied with skipping every five years. Have the students take a ruler and draw a vertical line to start the next column. Next go back to 1875 and notice the visitors column beside the year. Copy this number next to the year. The teacher needs to roam the room again and make sure the students are correctly copying these numbers.

3. Have the students draw another vertical line to create a third column. In this column the students are to round the visitor number that has already been copied from the chart. The teacher needs to review and model rounding numbers. Have the students round the number to the next to the largest digit from the number. The teacher needs to roam the classroom to make sure each student is understanding and accomplishing the task.

 Example:

|  |  |  |
| --- | --- | --- |
| 1950 | 1,109,926 | 1,100,000 …  |
| 1990 | 2,823,572 | 2,800,000 |

4. When the students are completed with the rounding of numbers have them get their graph paper ready to use. On the blackboard model for the students how to create a line graph using the year on the bottom of the chart in horizontal fashion. Discuss with the students the value for the numbers on the left as to how large the skip between each line should be to represent from 500 visitors in 1875 up to about 3 million visitors in recent years. Model for the students the vertical numbers so they understand and can complete the task.

5. The students are to use the third column from their papers and plot the rounded numbers coordinated with the year on the graph. When all the plotted dots are completed the students are to take a ruler and connect the dots to show a single line plotted graph.

6. When all of the above is completed the students will title the graph “Visitors to Yellowstone National Park”. Each student will label the table and graph with their names for the completed assignment.

**The number of visitors from 1872 to 1894 is estimated, and this info is from "The** [**Yellowstone**](http://www.yellowstone-natl-park.com/stats.htm) **Story" Volume Two by Aubrey L. Haines. Figures from 1895 through 2006 were provided by the National Park Service. From 1895 to 1951 the number of visitors was tabulated from 01 Oct to 30 Sep. From 1952 to the present, the figures represent visitors for the calendar year.**

**Visitor Statistics**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Visitors** | **Total\*** |  | **Year** | **Visitors** | **Total\*** |  | **Year** | **Visitors** | **Total\*** |  | **Year** | **Visitors** | **Total\*** |
| **1872** | **300** | **300** |  | **1911** | **23,054** | **327,459** |  | **1950** | **1,109,926** | **12,043,661** |  | **1989** | **2,644,442** | **89,894,883** |
| **1873** | **500** | **800** |  | **1912** | **22,970** | **350,429** |  | **1951** | **1,166,346** | **13,210,007** |  | **1990** | **2,823,572** | **92,718,455** |
| **1874** | **500** | **1,300** |  | **1913** | **24,929** | **375,350** |  | **1952** | **1,350,295** | **14,560,302** |  | **1991** | **2,920,537** | **95,638,992** |
| **1875** | **500** | **1,800** |  | **1914** | **20,250** | **395,608** |  | **1953** | **1,326,858** | **15,887,160** |  | **1992** | **3,144,405** | **98,783,397** |
| **1876** | **500** | **2,300** |  | **1915** | **51,895** | **447,503** |  | **1954** | **1,328,893** | **17,216,053** |  | **1993** | **2,912,193** | **101,695,590** |
| **1877** | **1,000** | **3,300** |  | **1916** | **35,849** | **483,352** |  | **1955** | **1,368,515** | **18,584,568** |  | **1994** | **3,046,645** | **104,742,235** |
| **1878** | **1,000** | **4,300** |  | **1917** | **35,400** | **518,752** |  | **1956** | **1,457,782** | **20,042,350** |  | **1995** | **3,125,285** | **107,867,520** |
| **1879** | **1,030** | **5,330** |  | **1918** | **21,275** | **540,027** |  | **1957** | **1,595,875** | **21,638,225** |  | **1996** | **3,012,171** | **110,879,691** |
| **1880** | **1,000** | **6,330** |  | **1919** | **62,261** | **602,288** |  | **1958** | **1,442,428** | **23,080,653** |  | **1997** | **2,889,513** | **113,769,204** |
| **1881** | **1,000** | **7,330** |  | **1920** | **79,777** | **682,065** |  | **1959** | **1,408,667** | **24,489,320** |  | **1998** | **2,496,362** | **116,265,566** |
| **1882** | **1,000** | **8,330** |  | **1921** | **81,651** | **763,716** |  | **1960** | **1,443,288** | **25,932,608** |  | **1999** | **3,131,381** | **119,396,947** |
| **1883** | **5,000** | **13,330** |  | **1922** | **98,225** | **861,941** |  | **1961** | **1,524,088** | **27,456,696** |  | **2000** | **2,838,233** | **122,235,180** |
| **1884** | **5,000** | **18,330** |  | **1923** | **138,352** | **1,000,293** |  | **1962** | **1,925,227** | **29,381,923** |  | **2001** | **2,758,710** | **124,993,890** |
| **1885** | **5,000** | **23,330** |  | **1924** | **144,158** | **1,144,451** |  | **1963** | **1,872,417** | **31,254,340** |  | **2002** | **2,942,586** | **127,936,476** |
| **1886** | **5,000** | **28,330** |  | **1925** | **154,282** | **1,298,733** |  | **1964** | **1,929,316** | **33,183,656** |  | **2003** | **3,019,384** | **130,955,860** |
| **1887** | **5,000** | **33,330** |  | **1926** | **187,807** | **1,486,540** |  | **1965** | **2,095,509** | **35,279,165** |  | **2004** | **2,868,316** | **133,824,176** |
| **1888** | **6,000** | **39,330** |  | **1927** | **200,825** | **1,687,365** |  | **1966** | **2,130,313** | **37,409,478** |  | **2005** | **2,835,649** | **136,659,825** |
| **1889** | **6,000** | **45,330** |  | **1928** | **230,984** | **1,918,349** |  | **1967** | **2,210,023** | **39,619,501** |  | **2006** | **2,870,293** | **139,530,118** |
| **1890** | **7,808** | **53,138** |  | **1929** | **260,697** | **2,179,046** |  | **1968** | **2,229,657** | **41,849,158** |  | **2007** |  |  |
| **1891** | **7,154** | **60,292** |  | **1930** | **227,901** | **2,406,947** |  | **1969** | **2,193,894** | **44,043,052** |  | **2008** |  |  |
| **1892** | **7,290** | **67,582** |  | **1931** | **221,248** | **2,628,195** |  | **1970** | **2,297,290** | **46,340,342** |  | **2009** |  |  |
| **1893** | **6,154** | **73,736** |  | **1932** | **157,624** | **2,785,819** |  | **1971** | **2,120,487** | **48,460,829** |  | **2010** |  |  |
| **1894** | **3,105** | **76,841** |  | **1933** | **161,938** | **2,947,757** |  | **1972** | **2,246,827** | **50,707,656** |  | **2011** |  |  |
| **1895** | **5,438** | **82,279** |  | **1934** | **260,775** | **3,208,532** |  | **1973** | **2,061,537** | **52,769,193** |  | **2012** |  |  |
| **1896** | **4,659** | **86,938** |  | **1935** | **317,998** | **3,526,530** |  | **1974** | **1,928,915** | **54,698,100** |  | **2013** |  |  |
| **1897** | **10,680** | **97,618** |  | **1936** | **432,570** | **3,959,100** |  | **1975** | **2,239,483** | **56,937,591** |  | **2014** |  |  |
| **1898** | **6,534** | **104,152** |  | **1937** | **499,242** | **4,458,342** |  | **1976** | **2,519,224** | **59,456,819** |  | **2015** |  |  |
| **1899** | **9,579** | **113,731** |  | **1938** | **466,185** | **4,924,527** |  | **1977** | **2,481,933** | **61,938,748** |  | **2016** |  |  |
| **1900** | **8,928** | **122,659** |  | **1939** | **486,936** | **5,411,463** |  | **1978** | **2,618,380** | **64,557,128** |  | **2017** |  |  |
| **1901** | **10,769** | **133,428** |  | **1940** | **526,437** | **5,937,900** |  | **1979** | **1,982,908** | **66,450,036** |  | **2018** |  |  |
| **1902** | **13,433** | **146,861** |  | **1941** | **581,761** | **6,519,661** |  | **1980** | **2,000,273** | **68,450,309** |  | **2019** |  |  |
| **1903** | **13,165** | **160,026** |  | **1942** | **191,830** | **6,711,491** |  | **1981** | **2,516,744** | **70,967,053** |  | **2020** |  |  |
| **1904** | **13,727** | **173,753** |  | **1943** | **64,144** | **6,775,635** |  | **1982** | **2,368,867** | **73,335,950** |  | **2021** |  |  |
| **1905** | **26,188** | **199,941** |  | **1944** | **85,347** | **6,860,982** |  | **1983** | **2,347,242** | **75,683,192** |  | **2022** |  |  |
| **1906** | **17,182** | **217,123** |  | **1945** | **178,296** | **7,039,278** |  | **1984** | **2,222,027** | **77,905,219** |  | **2023** |  |  |
| **1907** | **16,414** | **233,537** |  | **1946** | **814,907** | **7,854,185** |  | **1985** | **2,226,159** | **80,131,378** |  | **2024** |  |  |
| **1908** | **18,748** | **252,285** |  | **1947** | **932,508** | **8,786,688** |  | **1986** | **2,363,756** | **82,495,134** |  | **2025** |  |  |
| **1909** | **32,545** | **284,830** |  | **1948** | **1,013,531** | **9,800,219** |  | **1987** | **2,573,194** | **85,068,328** |  | **2026** |  |  |
| **1910** | **19,575** | **304,405** |  | **1949** | **1,133,516** | **10,933,735** |  | **1988** | **2,182,113** | **87,250,441** |  | **2027** |  |  |

**\* Cumulative Total**

Day 2

The teacher will write the following Park Facts on the blackboard for the students to copy and use for the following math problems. Use the map to show the students where the Yellowstone Lake is located in the park.

Park Facts:

Yellowstone Lake

20 miles north to south

14 miles east to west

Average depth: 140 feet

Maximum depth: 410 feet

1. From the Park Facts given about the miles the students are to give what the perimeter around the park would be approximately. The teacher should discuss with the whole group how to figure the perimeter in miles around the park. Have the students draw a rectangle and label the width 14 miles and the length 20 miles. Next have the students write the formula for the perimeter.

 Example: Perimeter = 2 lengths + 2 widths

 Perimeter = (2 x 20) + (2 x 14)

 Perimeter = 40 + 28 = 68 miles

2. From the Park Facts given about the miles the students are to what the surface area of the lake would be approximately. The teacher should discuss with the whole group how to figure the area of the lake in miles.

 Example: Area = length x width

 Area = 20 x 14 = 280 square miles

Now show the students the map again and ask if the lake is truly a rectangle shape. Discuss from the visual of the map about how much of the 280 square miles from the exact rectangle would probably not be part of the water. Have the students estimate about how much of the rectangle would not be covered in water due to the shape and discuss as a whole group. The teacher could do a drawing of the rectangle and then in a different color chalk outline an approximate shape of the lake within the rectangle. After discussion have the students multiply the 280 square miles by about ½.

 Example: 280 sq. miles x ½ = 140 approx. sq. miles of surface area

The actual answer for surface area is 131.7 square miles.

3. With the surface area of the lake approximately 140 sq. miles the students will now figure out what the cubic feet of water the lake holds when the lake has an average depth of 140 feet. Discuss with the students how to accomplish this math problem. The first thing to understand is the surface area is in square miles and the depth is in feet. The students must understand to do this problem they need to change a square mile into square feet. Have the students figure this problem using a calculator to facilitate time.

 Example: 1 square mile = 5280 feet x 5280 feet = 27,878,400 sq. feet

 140 sq. miles = 140 x 27,878,400 sq. feet = 3,902,976,000 sq. ft

The next number to tackle is the cubic feet. The teacher should show a cubic block or some example so the students know visually what is being figured out. At my school I use the floor tiles because they are square feet. The students again discuss with the teacher how to figure cubic feet.

 Example: Cubic foot = length x width x height

Since the length times width has already been done the large answer is going to have to be multiplied by height or in this case it is called depth.

 Example: 3,902,976,000 sq. ft x 140 feet = 546,416,640,000 cubic feet

This is approximately the amount of water in the Yellowstone Lake in cubic feet. Discuss some more to think how the lake is way deeper in many areas since it gets up to 410 feet deep, but obviously quite a bit more shallow near the shoreline.

After the students have copied these answers on a continual basis throughout the class they need to write their names on the paper and turn it in to the teacher.

Day 3

1. The mountains in Yellowstone National Park are beautiful and have some high peaks. When you are in the park it seems everywhere you look you see mountains. Some of the peak heights of mountains are listed below. The teacher needs to write this data on the blackboard so the students may copy the information down to find the mean, median, mode, and range of these mountain peaks.

Mountain Range Peaks

Parker Peak 10,203 feet

Pollux Peak 11,067 feet

Electric Peak 11,155 feet

Saddle Mountain 10,670 feet

Eagle Peak 11,358 feet

Francs Peak 13,153 feet

Discuss with the students as a review the meanings of these words: mean, median, mode, and range. Then have the students arrange the numbers in the correct order to accomplish the required task.

 Example: 10,203 , 10,670 , 11,067 , 11,155 , 11,358 , 13,153

 Mean: the average of all these numbers = 67,606 divide by 6 = 11,267 feet

 Median: the middle number in the list which is halfway between 11,067 and 11,155 = 11,111 feet

 Mode: there is no mode because there are no repeated numbers

 Range: the distance between the smallest and the largest number 2950 feet

2. The data in the table below is the compiled information for Yellowstone’s average temperatures and precipitation or rainfall and snow fall. Give each student a copy of this table to answer the following questions. The teacher reads the questions and the students write the answers on their papers.

**Yellowstone's Average Temperatures and Precipitation**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Weather Data - 48 Year Average** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Annual** |
| **Average Maximum Temperature (F)** | **28.6** | **34.0** | **39.6** | **49.4** | **60.4** | **70.0** | **79.6** | **78.3** | **67.8** | **55.7** | **38.7** | **30.5** | **52.8** |
| **Average Minimum Temperature (F)** | **9.6** | **13.0** | **17.2** | **26.0** | **34.3** | **41.2** | **46.7** | **45.3** | **37.0** | **29.4** | **19.2** | **11.8** | **27.6** |
| **Average Precipitation (Inches)** | **1.1** | **0.75** | **1.1** | **1.2** | **2.0** | **2.0** | **1.5** | **1.4** | **1.3** | **1.0** | **1.0** | **1.0** | **15.4** |
| **Average Total Snow Fall (Inches)** | **14.5** | **10.4** | **13.1** | **5.9** | **1.5** | **0.1** | **0.0** | **0.0** | **0.5** | **3.7** | **9.0** | **13.5** | **72.1** |

**Data provided by the Western Regional Climate Center and is public information and is not copyrighted**

a. How many years are the averages on this table covering? 48 years

b. Which month has the highest average temperature? July

c. How much higher is July than August? 1.3 degrees F

d. What is the lowest temperature average? 9.6 degrees F in January

e. What is the difference between the lowest and the highest average temperatures? 70 F

f. Which months had no snow at all? July and August

g. What is the total amount of snow on average for each year? 72.1 inches

h. How many feet tall are those 72.1 inches? 6 feet tall

i. Which month do you think you would like to visit Yellowstone? Student choice

j. Why did you choose this month? Student reasons given

Teacher Note: These statistics used for these three days of math lessons are just a sampling of what a teacher can easily do to use real-life data for math lessons. Real-life situations are realistic to students and help them learn the facts about a thematic topic.

Accommodations for Special Needs, ELL, and Exceptional Learners:

For some of the harder questions with several steps have the student do just the first part of the questions, give the student more time, or have them copy the work from the blackboard to have at least tried to comprehend.

The exceptional student may help explain the processes to the special needs or ELL student which helps cement the learning in the exceptional student’s mind.

The exceptional student may be given other data and the student makes up own questions and answers from other Yellowstone National Park facts.

Technology:

A computer with the internet could be used beforehand for the teacher to have the data for the above assignment, although the information is already copied into this lesson and matches with the questions.

Evaluation:

The teacher will observe the student engagement in the whole group learning and also the individual processing of each math problem. The teacher will use the Math Rubric for Problem Solving to score each student.

Teacher Resources:

Spencer, Janet (2006) *Yellowstone Trivia.* Helena: Riverbend Publishing.

[www.YellowstoneAssociation.org](http://www.YellowstoneAssociation.org)

[www.greateryellowstonescience.org](http://www.greateryellowstonescience.org)

<http://www.nps.gov/yell/>

Student Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Math Rubric for Problem Solving**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Criteria** | **Exemplary****4** | **Proficient****3** | **Basic****2** | **Unsatisfactory****1** |
| **Engaged in Teacher Presentation** | Listens to teacher, eye contact, and involved in discussion. | Listens to teacher and somewhat involved in discussion. | Listens to teacher, but no involvement in discussion. | Does not appear to listen or involve in the discussion. |
| **Understands the Problem** | Reads the problem, uses correct numbers, and uses correct operation. | Reads the problem, uses correct numbers, and operation may or may not be correct . | Reads the problem, can use correct numbers, and not know what to do with numbers. | Cannot read the problem, and not know what to do. |
| **Computation of the Problem** | Uses correct numbers, operations and answers are correct. | Uses correct numbers, operations correct, answers may or may not be correct. | Uses correct numbers, operations may or may not be correct. | May or may not use correct numbers. |
| **Use of Tables and Graphs** | Uses correct numbers, tables and graphs are drawn correctly. | Uses correct numbers, tables and graphs may or may not be drawn correctly. | Uses correct numbers, and not sure how to make tables or graphs. | May or may not use correct numbers, and cannot draw tables or graphs. |

Average Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lesson Plan for the Hydrothermal Features of Yellowstone National Park**

Subject: Science

Grade Level: 5th Grade

Objective: Students will learn about the hydrothermal features of Yellowstone National Park and how these features are like a giant plumbing system under the earth. These hydrothermal features are the largest in any one area of anywhere on the earth.

Indiana Standards:

Standard 5.1.7 Give examples of materials not present in nature, such as cloth, plastic, and concrete, that have become available because of science and technology.

Standard 5.3.4 Investigate that when liquid water disappears it turns into a gas (vapor) mixed into the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.

Standard 5.3.5 Observe and explain that clouds and fog are made of tiny droplets of water.

Standard 5.3.8 Investigate, observe, and describe that heating and cooling cause changes in the properties of materials, such as water turning into steam by boiling and water turning into ice by freezing. Notice that many kinds of changes occur faster at higher temperatures.

Standard 5.3.10 Investigate that some materials conduct heat much better than others, and poor conductors can reduce heat loss. Temperature: a measure of average heat energy that can be measured using a thermometer.

Standard 5.4.4 Explain that in any particular environment, some kinds of plants and animals survive well, some do not survive as well, and some cannot survive at all.

Standard 5.4.6 Recognize and explain that most microorganisms do not cause disease and many are beneficial.

Key Concepts:

Yellowstone’s hydrothermal features exist because magma release the heat

Water in these hydrothermal features rise well above boiling to even 400oF

The great underground plumbing system withstands great pressure to create geysers

Fumaroles are the hottest hydrothermal features in Yellowstone

Mudpots are acidic hot springs with a limited water supply

Hot springs are the most common hydrothermal features and the plumbing has no constrictions

Materials:

Computers with internet connection

DVD player and projector

Prepared worksheet, Hydrothermal Features, and preload on computers in Word so answers may be hot linked on the internet

Ph acid and base strips

Fruit, vegetables, juice, and water for acid, neutral, and alkaline testing

Various colors of construction paper

Handheld infrared thermometer to read temperatures

Microwave and refrigerator for boiling water and ice*Water*

Video produced by Finley-Holiday Films. *Yellowstone: A Symphony of Fire and Water.*

Video produced by Finley-Holiday Films. *Geysers of Yellowstone and Other Thermal Features.*

Procedures:

Day 1

Teacher introduces hydrothermal features in Yellowstone National Park and tells personal experiences of visiting the park this summer. The introduction gets the interest of the students and how very different from anything in Indiana.

Show the video *Yellowstone: A Symphony of Fire and Water.* After viewing the video the students are to write five questions that they wondered about while watching the video.

Day 2

Start the class with a trivia from the *Yellowstone Trivia* book.

Discuss some of the questions posed by the students from the previous day. If the answers are not readily known then add them to the worksheet to research and find the answers or something about the subject of the questions.

Students are to do the prepared research worksheet, Hydrothermal Features, using the internet to look up the given websites to find the answers. The answers are to be given in sentence form. (If possible have the worksheet loaded on the computer so the students can use the hotlinks to go straight to the answers.) The teacher will roam among the students to help them as needed.

Day 3

Start the class with a trivia from the *Yellowstone Trivia* book.

Continue and finish the prepared research worksheet, Hydrothermal Features, using the internet to look up the given websites to find the answers. Remind the students to give their answers in sentence form. This sheet is to be completed in class, otherwise it needs to be finished as homework on the internet at home or go to a library to use the internet. The teacher will roam among the students to help them as needed.

Ask students to bring acid, neutral, and alkaline fruits, vegetables, and juices for the ph test the next day. Preplan with the students who will bring what and make sure the students know to bring a very small amount for the ph tape to test.

Day 4

Start the class with a trivia from the *Yellowstone Trivia* book.

The students get the fruits, vegetables, and juices from the kitchen for the ph strip tests. Discuss with the students what acid, neutral, and alkaline are and how the strip will differentiate by color.

Carry out the experiment. Have each student test at least one item and document on the blackboard. When everyone has had a turn with the ph strips and food item discuss the results.

Show the video, as time allows, *Geysers of Yellowstone and Other Thermal Features.* After viewing the video the students are to write five questions that they wondered about while watching the video.

Day 5

Start the class with a trivia from the *Yellowstone Trivia* book.

Continue and finish showing the video, *Geysers of Yellowstone and Other Thermal Features.*

Day 6

Start the class with a trivia from the *Yellowstone Trivia* book.

Carry out the demonstration of the handheld infrared thermometer to read temperatures. (Previously at recess time if it is a hot sunny day put four different colors of construction paper outside held down by a rock to absorb the heat. Use white, orange, red, black paper.) Get cold ice water from the refrigerator, boiling water prepared in the microwave, and faucet room temperature water in bowl containers. Use the handheld infrared thermometer to read the different temperatures. Let students also hold the thermometer and determine the temperatures.

Next go outside and point the thermometer at the different colored papers that are in the sun. Find the different temperatures. Also test the sidewalk, side of the school, grass areas, etc. Go back inside the classroom and discuss the different temperatures compared to the colors of paper. Discuss thermophiles and how the different colors represent different temperatures of bacteria and virus. See *Yellowstone Trivia,* p. 35 for a chart about the colors representing the different temperatures. The teacher can share experience in Yellowstone National Park and taking the temperatures of the different areas.

Accommodations for Special Needs, ELL, and Exceptional Learners:

The worksheet may be too difficult for some of the less advanced readers. Pair less advanced and advanced readers together at a computer as needed.

The exceptional learner may use the additional resources for more research. If the student reads well have them read part or all of the books given about Yellowstone.

Technology:

Computers with internet for research

DVD player and projector for videos

Evaluation:

The teacher will use the Rubric for critical thinking and inquiry skills to assess the level of student understanding of this science lesson.

Teacher Resources:

Fritz, William (1985) *Roadside Geology.* Missoula: Mountain press Publishing Company.

Schullery, Paul (2004) *Searching for Yellowstone* Helena: Montana Historical Society Press.

Spencer, Janet (2006) *Yellowstone Trivia.* Helena: Riverbend Publishing.

*Mammoth Hot SpringsTrail Guide.* Yellowstone Association.

*Norris Geyser Basin Trail Guide.* Yellowstone Association.

*Fountain Paint Pot Area Trail Guide.* Yellowstone Association.

*Yellowstone Resources & Issues, 2008.* Yellowstone Association, pp. 57-60, 67-74, for hydrothermal features and thermophiles.

**Hydrothermal Features Worksheet**

1. Where on the planet can geysers be found?

<http://geology.com/articles/geyser.shtml>

2. What’s the tallest geyser?

<http://www.wyojones.com/tall.htm>

3. Watch Old Faithful erupt on the National Park Service’s Old Faithful Webcam. What especially interested you?

<http://www.nps.gov/yell/oldfaithfulcam.htm>

4. Where can I find more information on geothermal energy?

<http://www.eia.doe.gov/kids/energyfacts/sources/renewable/geothermal.html#WhatIs>

5. Can anything live in a geyser or boiling water?. What is it?

6. Are there people who study and protect geysers? Visit the Geyser Observation and Study Association website. What do they do to protect the geysers?

<http://www.geyserstudy.org>

7. What is a hot spring? What makes a hot spring? <http://www.yellowstoneparknet.com/mammoth_hot_springs/>

8. What creates the terraces at Mammoth Hot Springs?

<http://www.yellowstoneparknet.com/mammoth_hot_springs/>

9. What is travertine at Mammoth Hot Springs?

<http://www.yellowstoneparknet.com/mammoth_hot_springs/>

10. What are the mud pots of Yellowstone?

<http://www.yellowstoneparknet.com/geothermal_features/mud_pots.php>

11. What does a person smell when they are near the the mud pots?

<http://www.yellowstoneparknet.com/geothermal_features/mud_pots.php>

12. What are fumaroles?

<http://volcanoes.usgs.gov/Products/Pglossary/fumarole.html>

13. What is so special about thermophiles?

<http://library.thinkquest.org/CR0212089/therm.htm>

14. Where do thermophiles grow? Thermophiles grow in geothermal habitats, or they live in environments that create heat.

 <http://library.thinkquest.org/CR0212089/therm.htm>

15. What products do we have today that science learned from the thermophiles? Find a website and write it down along with the answer you find.

16. Glossary of geyser terms. Find four words you do not know and write the words and meanings. Write the words and meanings on the back of this page.

<http://www.uweb.ucsb.edu/~glennon/geysers/glossary.htm>

**Hydrothermal Features Worksheet**

**Teacher’s Answer Copy**

1. Where on the planet can geysers be found?

<http://geology.com/articles/geyser.shtml>

Yellowstone National Park, Chile, New Zealand, Iceland (Jupiter on another planet)

2. What’s the tallest geyser?

<http://www.wyojones.com/tall.htm>

See copied chart below.

3. Watch Old Faithful erupt on the National Park Service’s Old Faithful Webcam. What especially interested you?

<http://www.nps.gov/yell/oldfaithfulcam.htm>

4. What is geothermal energy?

<http://www.eia.doe.gov/kids/energyfacts/sources/renewable/geothermal.html#WhatIs>

Geothermal energy is heat from within the earth.

5. Can anything live in a geyser or boiling water?. What is it?

6. Are there people who study and protect geysers? Visit the Geyser Observation and Study Association website. What do they do to protect the geysers?

<http://www.geyserstudy.org>

Yes, see website. The Geyser Observation and Study Association.

7. What is a hot spring? In the mountains of Yellowstone the snow or rain seeps through the rock down to 10,000 feet. The cold water comes into contact with the hot rocks from the magma chamber. The water is heated well above boiling to superheated water. The great pressure pushes the water to the surface through cracks, fissures, and weak area of the earth’s crust. As the hot water travels through this natural plumbing system and rushes out like a giant pressure cooker with water temperatures in excess of 400F. <http://www.yellowstoneparknet.com/mammoth_hot_springs/>

8. What creates the terraces at Mammoth Hot Springs?

Heat, water, limestone, and rock fracture combine to create the terraces. <http://www.yellowstoneparknet.com/mammoth_hot_springs/>

9. What is travertine at Mammoth Hot Springs? Travertine is deposited as white rock, however the microorganisms and living bacteria create beautiful shades of oranges, pinks, yellows, greens, and browns.

<http://www.yellowstoneparknet.com/mammoth_hot_springs/>

10. What are the mud pots of Yellowstone? Turbulent pools of hot, muddy water.

<http://www.yellowstoneparknet.com/geothermal_features/mud_pots.php>

11. What do you smell by the mud pots? The distinct odor of sulfur creates the infamous odor which is hydrogen sulfide gas.

<http://www.yellowstoneparknet.com/geothermal_features/mud_pots.php>

12. What are fumaroles? Fumaroles are steam vents from which volcanic gas escapes into the atmosphere. Fumaroles may occur along tiny cracks or long fissures, in chaotic clusters or fields, and on the surfaces of lava flows and thick deposits of pyroclastic flows. The sound is like a loud hissing vent of steam and gases.

<http://volcanoes.usgs.gov/Products/Pglossary/fumarole.html>

13. What is so special about thermophiles?

Thermophiles are microorganisms that live and grow in extremely hot environments that would kill most other microorganisms. Thermophiles are grouped into either prokaryotes or eukaryotes and these two groups of extremophiles are classified in the group of archaea.

<http://library.thinkquest.org/CR0212089/therm.htm>

14. Where do thermophiles grow? Thermophiles grow in geothermal habitats, or they live in environments that create heat. <http://library.thinkquest.org/CR0212089/therm.htm>

15. What products do we have today that science learned from the thermophiles? Find a website and write it down along with the answer you find.

16. Glossary of geyser terms. Find four words you do not know and write the words and meanings. Write the words and meanings on the back of this page.

<http://www.uweb.ucsb.edu/~glennon/geysers/glossary.htm>

The following is background information for the 2nd question on the Worksheet. Information is from <http://www.wyojones.com/tall.htm> .

#### What is the largest geyser in the world?

#### This is a difficult question. It depends on what your definition of large is. Is it the geyser with the greatest eruptive height? Is it the geyser with the largest discharged volume of water during an eruption? Is it the geyser with the widest column of water?   The answer will depend on what you want to consider.   This page lists the 28 of the largest geysers in the world   by height. The list includes only those geysers with eruptions greater than 110 feet.  "What are the geysers with the highest eruptive heights?" Even answering this question is a difficult task. Does the geyser need to be capable of eruptions or do you want to consider extinct geysers like Waimangu which have been naturally destroyed ?  Do you include geysers, like Abuse Spring,  whose eruptions of world class heights lasted for a very short period of time. Do you include geysers. like " Incline", whose first few eruptions were greater than 100 feet but whose normal eruption is now much smaller. Do you include geysers, like Grot Yubileinyi, whose eruption would be much higher if they shot straight up instead at an incline. I have included all of the above but if you chose not too you would have a viable but smaller list.

#### Even with that said, determining a geysers height is a difficult proposition. Geysers tend to have bursts. Do you measure the highest burst or a average burst? Getting a measurement of a burst that lasts a second can be difficult if not impossible. Wind can also shear off the top of an eruptive column making it appear shorter. In  my experience measurements by sight or dead reckoning are usually dead wrong, It is difficult to compare the eruption to nearby objects since geysers usually sit on a silica mound some distance from trees or other tall objects. In order to get good measurements one must measure the distance from the geyser to the measuring and observation points. This is almost impossible if one is confined to boardwalks as one should be to [protect](http://www.wyojones.com/../jonesy2/protecti.htm) oneself and the thermal features. With that said the measurements listed below are the best available and are from the [literature](http://www.wyojones.com/../jonesy2/referenc.htm). I do not know how they were measured or how accurate they are but there are the best available.

#### Many say Steamboat geyser *is* the *largest* geyser in the world. Is it? DEPENDS... on what the meanings of *large* and *is* are. ( Guess I should have been a politician)

#### geysersteam.gif (4010 bytes)

|  |  |  |  |
| --- | --- | --- | --- |
| **GEYSER NAME** | **HEIGHT RANGE** | **LOCATION** | **COMMENTS** |
| **Waimangu (extinct)** | **600 - 1000 feet** | **Lake Rotomahana, New Zealand** | **This geyser was born after a large volcanic eruption 1888. The geyser started erupting in 1900. The spectacular eruptions lasted for 4 years before the geyser was destroyed by a landslide.** |
| [**Steamboat**](http://www.wyojones.com/../jonesy2/steamboat.htm) **(major eruption)** | **250 - 390 feet** | **Norris Geyser Basin, Yellowstone N. P., USA** | **Last major eruption 19\_\_. It is the largest geyser in the world capable of an eruption. It has common minor eruptions.** |
| [**Excelsior**](http://www.wyojones.com/../jonesy2/excelsio.htm) | **30 - 300 feet** | **Midway Geyser Basin, Yellowstone N. P., USA** | **In 1880's this geyser played at heights of usually 100 feet with some eruptions reaching 300 feet. Water columns were nearly as wide as they were tall. The last 300 foot eruption was in 1890. Recent eruptions have been 30 to 75 feet high.** |
| [**Minquini**](http://www.wyojones.com/../jonesy2/destorye.htm) **(extinct)** | **up to 295 feet** | **Orakei Korako Geyser Field, New Zealand** | **This geyser's location was buried by water of a manmade reservoir which destroyed any chance it will erupt again.** |
| **Giant** | **150 - 250 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **Last eruptions in 1997. Hope for more soon. Go Giant Go!!!!** |
| [**Great Fountain**](http://www.wyojones.com/../jonesy2/greatfount.htm) | **100 - 230 feet** | **Lower Geyser Basin, Yellowstone N. P., USA.** | **Eruption of over 150 feet at this geyser are rare, however, possible. Normal eruption are in 70 to 100 foot range currently. It erupts almost daily.**  |
| [**Splendid**](http://www.wyojones.com/../jonesy2/daisy.htm) | **50- 220 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **Last active in 1997, this geyser usually plays to heights of around 100 plus feet. However it has had the occasional 200 foot plus eruption.** |
| [**Grand**](http://www.wyojones.com/../jonesy2/grand.htm) | **150 - 200 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **This geysers erupts once or twice a day to heights of at least 150 feet which makes it one of the tallest regularly active geyser in the world. It is also predictable making it the largest predictable geyser in the world which makes it easy to see.** |
| [**Beehive**](http://www.wyojones.com/../jonesy2/beehive.htm) | **150 - 200 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **This geysers also erupts once or twice a day to heights of at least 150 feet which makes it one of the tallest regularly active geyser in the world.  It is not a predictable as Grand.** |
| [**Geysir**](http://www.wyojones.com/../jonesy2/how_geysers_got_their_names.htm) | **100 - 200 feet** | **Haukadalur Geyser Basin, Iceland** | **The namesake of all geysers is currently dormant. It is sometimes induced to erupt but these eruptions are not to the heights of non-induced eruptions.** |
| **Giantess** | **100 - 200 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **Eruption are rare sometimes just once a year but they shake the guests at the nearby Old Faithful Inn. It is a truly powerful geyser.**  |
| **Monarch** **(major eruption)** | **100 - 200 feet** | **Norris Geyser Basin, Yellowstone N. P., USA** | **The last major eruption was in 1911. It has had rare minor eruptions since then, The last in 1994.** |
| **Morning** | **60 - 200 feet** | **Lower Geyser Basin, Yellowstone N. P., USA.** | **This  geyser, last active in 1994, can have bursts that reach 200 feet. Such bursts are rare. Heights of 100 to 150 feet are more common.** |
| [**Old Faithful**](http://www.wyojones.com/../jonesy2/oldfaith.htm) | **90 -185 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **The most eruptions daily of any of the geysers listed above it on this list. Wind can shear of the top of  its eruptive column and shorten its eruption height.**  |
| [**Orakeikorako**](http://www.wyojones.com/../jonesy2/destorye.htm) | **up to 180 feet** | **Orakei Korako Geyser Field, New Zealand** | **This geyser's location was buried by water of a manmade reservoir which destroyed any chance it will erupt again.** |
| **Gamli Strokk (extinct)** | **up to 150 feet** | **Hveravellir, Iceland** | **This geyser erupted in the 1800's. Not even a trace of its vent can be found today.** |
| **Round** | **50-150 feet** | **Upper Geyser Basin, Yellowstone N.P., USA.** | **A rare geyser last seen in 1990. It had major eruptions of around 159 feet in 1933, and from 1966 to 1981.** |
| [**Drain**](http://www.wyojones.com/../jonesy2/fissure.htm) | **5 - 150 feet** | **Lower Geyser Basin, Yellowstone N. P., USA.** | **This geyser can not be reached by foot and is only visible from a distance from the road When active can reach up to 150 feet.**  |
| **Union** | **100 - 125 feet** | **Shoshone Geyser Basin** | **Union often has long periods of dormancy. It currently is in a dormant period that started in 1977.** |
| **Fan** | **100 - 125 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **This geyser has active periods when it erupts in concert with mortar. It is usually  inactive but has periods of activity every year or two.** |
| **Ledge** | **80 - 125** | **Norris Geyser Basin, Yellowstone N. P., USA** | **This geyser is very irregular as is usually inactive. It has occasional eruptions, The last period of much activity was 1996.** |
| **Abuse Spring** | **15 - 125** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **This is a strange name for a geyser on the list of tallest geysers in the world. It is located near the Old Faithful   Inn and  inn employees threw junk and debris into this geysers pool. The first known eruption was in 1959 following the Hebgen Lake earthquake. The eruption was not observed but much debris was thrown from the pool. In May of 1977 the geyser started erupting to heights of a least 90 feet with some bursts to 125 feet, This activity last one week. It has only had minor 15 to 29 foot eruptions occasionally since. But for one week it was among the most powerful geysers in the world.** |
| **Echinus** | **10 - 125 feet** | **Norris Geyser Basin, Yellowstone N. P., USA** | **Usually this geyser plays to heights of 20 to 40 feet. However during disturbances at Norris it has had rare eruptions as high as 125.** |
| [**Sapphire Pool**](http://www.wyojones.com/../jonesy2/biscuit.htm) | **6 - 125 feet** | **Upper Geyser Basin, Yellowstone N. P., USA.** | **Until the 1959 earthquake the pool had infrequent 6 foot eruptions. Four weeks after the earthquake the pool start having huge 125 foot eruptions. The eruptions' power slowly subsided. By the mid-1960's the eruption height was down to 25 feet. Today it has rare small eruptions.** |
| **Velikan (Giant)** | **90 - 120** | **Dolina Geizrov (Geyser Valley), Kamchatka Peninsula, Russia** | **It has a 5 hour interval and a duration of about a minute.**  |
| [**Kaleidoscope**](http://www.wyojones.com/../jonesy2/fissure.htm) | **1 - 120 feet** | **Lower Geyser Basin, Yellowstone N. P., USA.** | **Located near Drain Geyser, this geyser can not be reached by foot and is only visible from a distance from the road It is, therefore, hard to distinguish from Drain at that distance. It has periods of dormancy.** |
| **"Incline"** | **20 - 110 feet** | **Norris Geyser Basin, Yellowstone N. P., USA** | **It first appeared in 1990 with the first few eruptions reaching about 110 feet. Since the first few eruptions, heights have been between 20 and 70 feet.** |
| **Grot Yubileinyi (Jubilee Grotto)** | **100 feet\*\*** | **Dolina Geizrov (Geyser Valley), Kamchatka Peninsula, Russia** | **\*\*This geyser should possibly occur higher in the list. It erupts at an angle to 100 feet but goes out over 250 feet horizontally. How high would this geyser shoot if it erupted straight up instead of at an incline? It is a powerful geyser in the league of Giant and Beehive.** |
| **Do you know of any other geyser that should be on this list?** **E-mail me.**  |  |  |  |

Student Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Rubric for Critical Thinking and Inquiry Skills in Science**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **Exemplary** | **Proficient** | **Basic** | **Unsatisfactory** |
| 1.  | The student attempts to identify and define the problem.  | 4 | 3 | 2 | 1 |
| 2.  | The student answers with relevant information.  | 4 | 3 | 2 | 1 |
| 3.  | The student raises relevant thoughtful questions. | 4 | 3 | 2 | 1 |
| 4.  | The student researches the answers to the questions. | 4 | 3 | 2 | 1 |
| 5.  | The student accurately reports the research. | 4 | 3 | 2 | 1 |
| 6.  | The student interprets the research accurately. | 4 | 3 | 2 | 1 |
| 7.  | The student reports the answer in his or her own words. | 4 | 3 | 2 | 1 |
| 8. | The student can verbally communicate what has been learned. | 4 | 3 | 2 | 1 |
| 9.  | The student critically evaluates his or her own work. | 4 | 3 | 2 | 1 |
| 10.  | The student engages in the experimentation process. | 4 | 3 | 2 | 1 |

Note: Teacher, please circle assessment value for each item in this rubric.

Average Score\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lesson Plan for the Wolves of Yellowstone National Park**

Subject: Health and Physical Education

Grade Level: 5th Grade

Objective: Students are to follow directions and rules, take turns, and exercise while playing games that use animal characteristics found in Yellowstone National Park. Health wellness issues, such as food and exercise, are emphasized in comparison to animals in Yellowstone National Park needing to eat and exercise to stay healthy.

Indiana Standards:

Standard 5.1.1 Demonstrate the ability to integrate locomotor (traveling action), non-locomotor (movement in place), and stability (balance) movements in more complex skills. Example: Demonstrate mature motor (movement) patterns in increasingly complex environments (e.g. obstacle courses).

Standard 5.2.1 Identify ways that movement concepts can be used to refine movement skills. Example: Understand that practice improves performance.

Standard 5.3.1 Participate in health enhancing physical activity. Example: Establish physical activity goals.

Standard 5.5.1 Exhibit independence and ability to succeed in groups. Example: Participate in cooperative and challenge activities.

Standard 5.5.2 Perform activities safely and follows class rules of conduct. Example: Describe appropriate conduct including ethical and unethical behavior.

Standard 5.7.1 Exhibit positive feelings about participation in physical activity. Example: Celebrates individual and group accomplishments.

Key Concepts:

Wolves prey on the sick and weak animals and consume elk, deer, and sometimes bison.

Bears and eagles follow the wolves and eat the carcasses that wolves prey and hunt.

Wolves walk in straight lines with the alpha wolf at the front and the progressively lesser in the pack order with the adolescent wolves at the back.

Eagles soar from one place to another place hunting for food.

Materials:

Cones or markers for the playing field.

Four rubber toy mice (from pet stores) or soft balls such as tennis balls.

Procedures:

Choose from the following animal games, using the terminology of the animals in the thematic unit. The games may be used throughout the time the thematic unit is being taught. These games may be used at P.E. time or recess for active involvement by each student. Several may even be used in the classroom, possibly between two classes for two or three minutes to reenergize the students before the next class. If playing in the classroom the teacher will use classroom management skills to contain the students for safety measures.

Capturing the Prey - Wolves and Elk

The playing field has an inner area set aside by markers or cones. This inner area is where the elk roam to eat and stay healthy. Most of the students are designated as elk. The wolf pack travels in a straight line looking for prey to hunt. The teacher designates three or four students (depending on how large the class is) as wolves that travel around the outside area in a straight line and the alpha wolf detects a prey. The leader of the three or four wolves goes into the inner circle with the wolves following behind. The wolves then must all tag (lightly touch) a prey for the elk to be caught. The caught elk goes out of the circle and waits for all the elk to be caught. The wolves line up out of the circle and start the process over again until all elk are caught.

Materials needed are cones or markers for the inner area for the elk.

Food Chain Command - Bears, Bison, Eagles, Moose, and Wolves

In a class of about twenty students the teacher names one bear, twelve bison, two eagles, three moose, and two wolves. The bear lumbers (student holds arms down and lumbers along looking large and dangerous) along and occasionally climbs a tree. The bison move slowly (the students walk slowly and unobtrusively with arms down) like cattle although sometimes they suddenly move very quickly, even up to 30 mph. The eagles soar (hold arms out like wings and glide along) looking for prey or even dead carcasses that have been killed by wolves or bear. The moose move regally (stand tall and hold arms up like antlers) along eating aspen trees. The wolves walk in a line (very quietly) looking for prey. In this case they will go after a bison or possibly a moose. They chase the animal and when the wolves catch the student who is a bison. The student stops. The wolves are then chased away by the bear that comes to eat the fallen prey. The wolves walk off in a line to find another bison or moose to prey. When the bear is full it moves away and the eagles come by the original prey to eat the rest of the carcass. The process repeats itself and continues until all the bison and moose are caught and standing still on the field in the place of capture.

No extra materials needed.

Following in the Pack - Wolves

This game could be done in the classroom like follow the leader when quick contained movement is needed. Wolf packs walk in straight lines. The teacher could be the wolf who walks stealthily along (scrunch down and move very quietly) with the students following and doing the same movements. Then the wolf walks proudly (stand up and walk with shoulders back and head held high). The wolf goes quickly for its prey (suddenly walk with large quick steps) and again the students follow the same actions. This could be narrated by the teacher about the wolf while the students follow without communicating. Maybe this would take two or three minutes and then right back to their desks or areas of study.

No extra materials needed.

First to the Food Source - Bears, Bison, Eagles, Moose, and Wolves

Use a large area, such as the playing field or the gym that has an inner circle, a larger area around the inner circle, and a third and/or fourth outer areas as space and markers allow. The food source is in the middle or inner circle. The students are named and use the motions as described above on the Food Chain Command game. The students stand on the outside of the largest circle and when the teacher says “go” the animals use their motions and try to get to the inner circle. The teacher will need to adjust the “stop” time depending on the size of the playing area. The students that are moving like their designated animal stop, and receive a score for how close they got to the food. The inner circle is a score of 3 or 4, depending on whether three or four circles are used. The next circle is a score of 2 and the most outside circle is a score of 1. Each student scores against him or herself. The game then starts over from outside the largest circle and repeats. The student with the highest score wins.

Materials needed are markers for the different layers of the circle on the playing field or gym.

Eagle Relay – Eagles

All students are eagles moving quickly from one place to another in search of food which in this case are mice. The two sides can be marked by cones or markers. Students are divided into teams of four for relay races. Each team is given a rubber toy mouse (soft ball or tennis ball). Two people are on one side and the other two are on the other side for the relays. Each team is lined up in the same fashion. The first runner from each teams takes the toy mouse to the other side, the receiving person intercepts the toy mouse and runs it back to the original side, the third person intercepts the toy mouse and runs back to the second side, with the fourth person returning to the original side with the toy mouse. The first team to complete the four way relay wins. Repeat the relays as time allows and keep score by how many wins for each team. The team with the most wins using the toy mouse is the winner.

Materials needed are rubber toy mice (soft ball or tennis ball) and markers for two opposite sides.

Accommodations for Special Needs, ELL, and Exceptional Learners:

If a special needs student moves at a slower pace then give the student a slower moving animal, but be inclusive. If a student is in a wheel chair and cannot be on the playing field then have that student keep score or help choose the teams. Possibly in the First to the Food Source game the special needs student could be in the center circle where the students come and must touch the wheelchair for the highest points. Whatever the student’s accommodations he or she must feel needed and wanted so the teacher will find a way for the student to be an integral part of the game.

Have the exceptional learner think of a game and discuss the process with the teacher beforehand. Have the student lead out in the game and tell the class the rules and expectations with the teacher’s help.

Evaluation:

Each student’s personal giving of his or her most to the game is the key to success for that student. Just getting the student’s body moving, running, and eyes stretching away from books and computers is important for the health of the student physically and emotionally. At the same time the student is moving and running a wellness pattern is being established as a lifelong pattern.

**Lesson Plan for the Wolves of Yellowstone National Park**

Subject: Art and Music

Grade Level: 5th Grade

Objective: Students are to learn about the return of the wolves to Yellowstone National Park and the enjoyment the wolves bring to three million visitors each year.

Indiana Standards:

Visual Arts

5.7.1 Demonstrate refined observational skills through accurate rendering of representational objects and subject matter from life.

5.8.1 Apply elements (line, shape, form, texture, color, value, and space) and principles (repetition, variety, rhythm, proportion, movement, balance, emphasis, and unity) in work that effectively communicates their ideas.

5.9.2 Identify and control different media, techniques, and processes to effectively communicate ideas, experiences, and stories including drawing. Media: pencils, colored pencils, markers, chalks, crayons, oil pastels, charcoals.

Music

5.1.1 Sing independently and in ensembles maintaining good breath control, pitch, diction, tone quality, and posture.

Standard 5.8.3 Identify the integration of disciplines such as social studies, art, and geometry (measurement, diameter, and circumference) for a project such as making “poi balls” when studying Mäori music and dance.

Key Concepts:

Gray wolves reintroduced in 1995 to Yellowstone and now doing well in park

Wolves are highly social animals and live in packs

Wolves are predators and provide a bounty of food for other animals

As of January 2008 443 wolves live in 51 packs in the greater Yellowstone area

Materials:

PowerPoint pictures of wolves in Yellowstone National Park.

Words to Wolf song.

Map of wolf packs in Yellowstone National Park in 2007, see <http://www.nps.gov/yell/naturescience/wolves.htm> .

Black construction paper to draw wolf tracks and large roll of paper for pack of wolf tracks, very large poster paper to draw life size wolves.

Markle, Sandra, 2004. *Wolves, Animal Predators,* Minneapolis, Carolrhoda Books, Inc. ISBN 9 781575 057323.

*Yellowstone Resources & Issues, 2008*, Yellowstone Association, p. 133, for size of wolves in Yellowstone National Park.

A shoe box for each student to create a diorama, miscellaneous materials for the scenery, and cool glue guns.

Procedures:

Day 1

Teacher gives PowerPoint Presentation and shows pictures of wolves in Yellowstone National Park. Many of the pictures were taken by the teacher while visiting the park. Teacher also gives a short summary of the history of the wolves in Yellowstone National Park.

Sing the Wolf Song to the tune of *My Bonnie Lies over the Ocean*. See words below.

Teacher and students look at map of wolf packs in Yellowstone National Park in 2007 on the internet at <http://www.nps.gov/yell/naturescience/wolves.htm>.

Each student draws life size wolf tracks on black construction paper. Each student makes four paw prints and glues to large roll of paper. Next student glues in line behind the first student’s wolf tracks to show how the wolf pack walks in single file. Progressively each student glues tracks in single file on roll of paper. The length of paper with the wolf pack tracks is displayed on a wall of the classroom or in the hall of the school.

The teacher asks the students to collect and bring little items from home for the diorama to use on the third day.

Day 2

Teacher reads the book, *Wolves,* by Sandra Markle to the whole class.

Sing the Wolf Song to the tune of *My Bonnie Lies over the Ocean*. See words below.

Students learn the key words: alpha wolves, cache, den, howl, pack, predator, prey, territory. Students and teacher discuss each key word and the meanings of the words.

Teacher and students discuss order of pack walking with the alpha wolf first and the continued sequence of the pack. Teacher has made correct number of wolves for the pack as coordinated with the number of students and puts slips of paper in a container. Students draw out slip of paper to determine which wolf in the pack the student is drawing. Each student draws a life size wolf on very large poster paper to coordinate to the slip of paper, use rulers and yardsticks to approximate size of wolf. Color the wolves as seen in the PowerPoint presentation and the book. Wolves are cut out and glued on the roll of paper above the wolf tracks. The wolves are 26-36 inches high at the shoulder, 4-6 feet long from nose to tail tip, males weigh 100-130 pounds, and females weigh 80-110 pounds. See the resource book, *Yellowstone Resources & Issues, 2008*, Yellowstone Association, p. 133.

The teacher reminds the students to bring the items from home for the diorama the next day.

Day 3

Sing the Wolf Song to the tune of *My Bonnie Lies over the Ocean*. See words below.

Review the key words from Day 2.

Each student creates a diorama in a shoe box. The students are to create a scene from the life of a wolf. The students will use the bits of leaves, grass, sticks, moss, or whatever they have brought in the diorama. The teacher will have the cool glue guns plugged in and available for the students to glue different parts of the diorama. Also the teacher will have available different supplies for the students to use, such as, multiple colors of construction paper, pipe cleaners, popsicle sticks, fuzz balls, and anything else that might help with the diorama.

Day 4

Sing the Wolf Song to the tune of *My Bonnie Lies over the Ocean*. See words below.

Review the key words together.

Allow time to complete the diorama project.

Accommodations for Special Needs, ELL, and Exceptional Learners:

Pair a special needs student with a student that works quickly to do two sets of wolf tracks together.

Pair all students for the drawing of the life size wolf as needed

Work in small groups of two to three for the dioramas. Ask some students to bring extra items from home to share with other students.

Technology:

Computer and projector to present the PowerPoint slides

Computer with internet to look at the map of the wolf packs in Yellowstone National Park.

Evaluation:

Use the Chart for Completion of Student Discussion and Projects. Write each student name on the chart. Check off each of the four completed student discussion and projects on chart.

1. The student involvement in the discussion of the key words

2. The drawing and completion of the wolf tracks

3. The drawing, coloring, cutting, and gluing of the life size wolf

4. The completion of the diorama scene

Teacher Resources:

Haines, Aubrey (1996) *The Yellowstone Story,* Vol. 1. Boulder: University Press of Colorado.

Haines, Aubrey (1996) *The Yellowstone Story,* Vol. 2. Boulder: University Press of Colorado.

Schullery, Paul (2004) *Searching for Yellowstone.* Helena: Montana Historical Society Press.

Smith, Douglas; Stahler, Daniel; Guernsey, Debra; Metz, *et. al*. (2007) *Yellowstone Wolf Project, Annual Report.* Yellowstone National Park: National Park Service.

Spencer, Janet (2006) *Yellowstone Trivia.* Helena: Riverbend Publishing.

*Yellowstone Resources & Issues, 2008*, Yellowstone Association.

<http://www.nps.gov/yell/naturescience/wolves.htm>

[www.YellowstoneAssociation.org](http://www.YellowstoneAssociation.org)

[www.greateryellowstonescience.org](http://www.greateryellowstonescience.org)

<http://endangered.fws.gov>

<http://midwest.fws.gov/wolf/>

<http://westerngraywolf.fws.gov>

<http://www.focuswest.org/predators/>

Video produced by National Geographic. *Wolves, A Legend Returns to Yellowstone.*

Words to Wolf Song

Sing to tune: *My Bonnie Lies over the Ocean*, Words written by Bev Amlaner

1. I want to sing about the wolves,

They’re back in Yellowstone.

They’ve come for everyone’s enjoyment,

To live back in their home.

Chorus:

Gray wolves, gray wolves,

You’ve come back to stay.

Gray wolves, gray wolves,

You’re back in our Yellowstone.

2. I’m so glad they’re here to stay,

To bring back mystery and allure.

Many people enjoy watching the wolves,

In our very own Yellowstone.

**Chart for Completion of Student Discussion and Projects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Student Name | Class Discussion | Wolf Tracks | Life Size Wolf | Diorama |
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Note: Teachers write each student name on the list and check off each of the four completed student discussion and projects on the chart.