

The Zebulon M. Pike Curriculum Guide

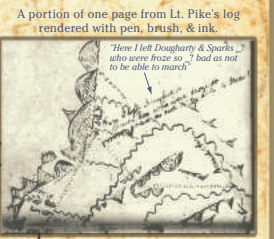
1806



Portrait by Robert E. Pratt, 1982. Courtesy of Colorado Historical Society.



A portion of Lt. Pike's *A MAP OF THE INTERNAL PROVINCES OF NEW SPAIN* Published in 1810 within his accounts of the expedition.



A portion of one page from Lt. Pike's log rendered with pen, brush, & ink.

This map and others can be found on the Library of Congress web site.

For more information on Pike's Expedition visit www.zebulonpike.org

On July 15, 1806 a young Army Lieutenant left Ft. Bellefontaine, Missouri to begin an expedition that would forever change the southwestern United States. His name was Zebulon Montgomery Pike. His expedition is a story of perseverance, tenacity, friendship, and fortitude.

"I thought I could distinguish a mountain to our right which appeared like a small blue cloud;..."



Lt. Pike's candid journal entries paints a saga of adventure & hardship.

Nov. 12, 1806
"I determined to spare no pains to accomplish every object even if it obliged me to spend another winter in the desert."

Nov. 15, 1806
Pike encountered bluffs that force them out of the river valley. A "small blue cloud" caught Pike's eye. Later, a snow-covered peak materialized from the prairie floor. They were still 120 miles from the mountains.

Nov. 18-19, 1806
"Sent out the hunters; I walked, myself, to an eminence from whence I took the courses to the different mountains, and a small sketch of their appearance."

Nov. 21, 1806
"Marched at our usual hour. Passed two Spanish camps within three miles of each other."

Nov. 22, 1806
"... about five miles... Baroney cried out *Voila un Savage*... When they were in some order we found them to be sixty warriors, half with firearms and half with bows, arrows, and lances. Our party was sixteen total. In a short time they were arranged in a ring and I took my seat between the two partisans. During this time Doctor Robinson was standing up to observe their actions, in order that we might be ready to commence hostilities as soon as them."

Nov. 23, 1806
"At one o'clock came to the fork on the south side and camped at night in the point of the grand forks."

Nov. 24, 1806
"...cut down fourteen logs and put up a breast work five feet high on three sides and the other was thrown on the river." Pike gave orders for his absence and marched with three others north for the "Grand Peak."

Nov. 26, 1806
"We commenced ascending but found it very difficult... And after marching all day we camped in a cave, without victuals or water."

Nov. 27, 1806
"The unbounded prairie was overhung with clouds, which appeared like the ocean in a storm... the thermometer... here fell to 4° below 0."

Dec. 1, 1806
"Entered the Wet Mtn. Valley Pike marches to the 'White Mountain's' treeline. He spends the next week desperately hunting buffalo and exploring route options. With his men suffering from frostbite, starvation, and heavy snows, Pike (for the first time) worries about surviving. One of his men voices thoughts of mutiny."

Dec. 2-3, 1806

Dec. 4, 1806

Dec. 5-9, 1806

Jan. 1-2, 1806

Jan. 3, 1806

Jan. 5-13, 1806
(two men left behind)

Jan. 14, 1806

Jan. 15, 1806

Jan. 16-26, 1807

Jan. 17-21, 1806
(two men left behind)

Jan. 22, 1806

Jan. 23, 1806

Jan. 24-26, 1806
(one man left behind)

Jan. 27, 1806

Jan. 28, 1806

Jan. 29, 1806

Jan. 30, 1806

Jan. 31-Feb. 26, 1806
Pike's Stockade
Arrest by Spanish troops from Santa Fe

Dec. 16, 1806
"The Doctor and myself ascended high enough to ... lay down the course of the river into the mountains. One of our party found a large camp, which had been occupied by at least 3,000 Indians, with a large cross in the middle."

Dec. 25, 1806
"800 miles from the frontiers of our country, in the most inclement season of the year, not one person clothed for the winter, many without blankets..."

Jan. 1-4, 1807
"We had great difficulty in getting our horses along, some having nearly killed themselves falling on the ice. I marched five miles on the river, which was one continuous fall through a narrow channel and immense cliffs..."

Pike's Expedition
Lt. Melgares' Spanish Expeditionary Force

□ Pike's stockades ○ present day town names
□ Pike's Colorado Camp (reenactors)

0 miles 25

Photo by Ken Wilk of the Army Corps of Engineers Reenactors

Foreword

The Historic Arkansas Riverwalk of Pueblo began planning for the Bicentennial of Zebulon Pike's Expedition in 2005. Planning included the development of a curriculum guide that would encourage regional educators to discover the history of southeastern Colorado through this remarkable expedition that paralleled the Lewis and Clark Expedition.

A partnership was developed with members of the Keating Education Center Staff to create standards based thematic/cross curricular units focusing on the Pike Expedition. The goal of the project is to tie the learning community of Pueblo together with the Historic Arkansas Riverwalk of Pueblo utilizing Pike Plaza and the Boettcher Outdoor Education Center. With the aid of CSU-Pueblo, six academic disciplines joined to create valid and relevant lessons for students.

This curriculum education guide for Pike covers a five-day unit. It is based on Colorado State and District 60 standards. Each lesson is designed to be taught singularly or as a whole unit. All disciplines address a particular theme every day. Day one is involved with historical context—defining what was the early American West in the 1800s. Day two involves western exploration. Day three examines Pike's life and family while day four looks at who was present in Colorado when Pike came here. The theme for day five is to feel and experience Pike at the Pike Plaza on the Historic Arkansas Riverwalk of Pueblo.

The Riverwalk would like to acknowledge the hard work and dedication of the District 60 work group: Social Studies, Delphine Grayson; Science, Debra Edelmann; Mathematics, Charity Krow; Reading/Writing/LBLP, Maggie Crowell; PE & Health, Rich Guerrero; and Technology, Ken Crowell, and the involvement of CSU-Pueblo Professor Tim Peters and School District 70 - Southeastern Colorado American History Project in 2004 Grant Administrator Scott Whited. The project was guided by Margo Hatton-Wolf, Development Director of the HARP Foundation and Clive Siegle, Executive Director of the Santa Fe Trail Association. Thank you to Deborah Espinosa and the staff of the El Pueblo History Museum for their far reaching vision and cooperation. And a very special thank you to the Riverwalk staff, especially JonTodd Baker and Samantha Engelbrecht who gave freely of their time and design talent.

This project was made possible by grants from the John B. Farley Family Foundation, Pueblo City Schools, the Burlington Northern Foundation, Xcel Energy Foundation, the City of Pueblo, the Department of Local Affairs, and the Greater Pueblo Chamber of Commerce.

Dedication

This guide is the kind of document my mother, Mary Magdalene Farley, always envisioned for this section of the Arkansas River. Born and raised in Ft. Smith, Arkansas and a resident of Pueblo's south side from 1932 until her death in 1998, she lived along the River from source to mouth her entire life. Those who knew her were abundantly aware that she was a "history nut". She compiled several booklets, now located at the Rawlings Library, about our history in the Pueblo region from the time of Pike, Ft. Pueblo, the later explorers, to the "most historic mile" - Union Avenue. She truly loved this area and would have loved this superb teaching document..

I am extremely pleased to have the honor of dedicating this Curriculum Guide to her memory.

Now - Let's use it! For our kids' sake.

Thomas T. Farley
Life Long Puebloan
Trustee, Farley Foundation

A Note to Teachers

The Historic Arkansas Riverwalk of Pueblo invites you use the Boettcher Outdoor Education Center and Pike Plaza for your class field trip. This natural area of the Riverwalk near Santa Fe Avenue was designed for class field trips with an outdoor classroom, laboratory with microscopes, and an amphitheater. Use of the facility is free of charge.

To reserve the Boettcher Outdoor Education Center and Pike Plaza area for your classroom please contact the HARP Authority at 719-595-0242.

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Course Objectives

Section 1 – The American West in 1806

Social Studies

- Examine historical maps of the lands west of the Mississippi
- Examine modern maps of the United States to locate our position on the map
- Discuss the key components needed on any map
- Define the key vocabulary words

Science

- Utilize the constructivist approach to learning
- Describe the medical beliefs and practices of the 1800's.
- Identify the degree of proof required for medical practices or medicines
- Identify medicinal drugs that are derived from plants and the uses of these drugs.
- Utilize computers and the internet in order to research the past
- Use summarizing and evaluation skills to create a list of materials to take on their journey.
- Write to justify their choices.

Math

- Discuss the implications of being able to travel in a straight line as opposed to the route that Pike took.

Reading/Writing

- Examine the subtle differences in wording.
- Explore various words meanings from the 18th Century and compare them with the 21st Century.
- Define key vocabulary words.
- Read a historical reference to the Louisiana Purchase

Physical Education

- Study the pre-training and preparation Pike and his soldiers participated in to prepare physically for their travels westward.
- Identify the diet and hydration requirements for each soldier.
- Identify and write out health risks of soldiers.

Section 2 – The Journey Begins

Social Studies

- Compare and contrast the expeditions between Lewis & Clark and Zebulon Pike.
- Read historical accounts of expeditions of Lewis & Clark and Zebulon Pike.
- Write in a Venn diagram to compare and contrast the expeditions between Lewis & Clark and Zebulon Pike.

Science

- Explore the role of the prairie dogs as it pertains to animal classification.
- Explore human impact on biodiversity.
- Collaboratively share their classification worksheets .

Math

- Use a map and string to estimate travel distances of Zebulon Pike between two points map.
- Locate an online resource to find the actual distance between two points on a map.
- Calculate the difference between their estimates and the direct distance from the points and a straight line.

Reading/Writing

- Read and discuss Pike's personal background, personality, and stature.
- Read and discuss Pike's military and exploration background.
- Utilize visualization questions in conjunction with the reading.

Physical Education

- Create a pre-fitness preparation for the soldiers. Example: stretches, exercises, diet, sleep schedule, etc.

Section 3 – Pike and Family

Social Studies

- Analyze written historical writings to determine what influence family and friends have on who would lead the western exploration expeditions.
- Create a family tree for Zebulon Pike.
- Read short excerpts from historical documents to determine what influence family and friends had on who would lead the western exploration expeditions .

Science

- Explore the Pike Family DNA project.
- Discover what DNA looks like.
- Analyze what DNA is used for.

Math

- Construct graphs from given data sets.
- Analyze graphical information that applies to Zebulon Pike's Expedition.
- Write definitions for vocabulary words.
- Draw pictures for vocabulary words.

Reading/Writing

- Examine writings as to the start of Pike's southwest expedition.
- Read about Zebulon Pike's expedition set up and start of travels.
- Identify and define vocabulary words as they appear in the reading.

Physical Education

- Research and gather lists of equipment needed by Pike's soldiers and provide a list of pre-training activities.
Example: calisthenics, marching, running, etc.
- Analyze the weight of equipment to be carried.

Section 4 - Pike's Colorado

Social Studies

- Compare and contrast maps of the Spanish and Pike's route.
- Examine a brief history of Zebulon M. Pike.
- Draw in Pike's southwest route on a map.
- Read a brief history of Zebulon M. Pike.

Science

- Explore the history of water and the impact on freshwater resources that development and exploration had on this resource.
- Understand how waste disposal has changed throughout history.
- Recognize the impact that daily life has on the quality of water, and gain understanding of the impact of their personal actions on this renewable resource.
- Read background information on the history and practices that were used to settle the west. Using this informational narrative, students will speculate as to the impact on the quality of water resources by writing a short constructive paragraph that outlines the sources of pollution evident in the reading.

Math

- Build sextant.
- Compare angles.
- Identify possible reasons for variations in angle measure.
- Write about the differences in angle measure.
- Read angle from their sextant.

Reading/Writing

- Examine journal entries which reference Pike's attempt at climbing the "Grand Mountain".
- Read various journal writings from *The Southwestern Journals of Zebulon Pike 1806 – 1807*
- Identify and define vocabulary words.

Physical Education

- Keep a personal diary stating their experience as Pike's soldiers and developing a pre-fitness preparation.

Section 5 - Pike Plaza at the Boettcher Outdoor Education Classroom on the Historic Arkansas Riverwalk of Pueblo

Social Studies

- Observe and analyze the exhibits at Pike Plaza
- Read the exhibits at Pike Plaza
- Take post-test on Zebulon Pike

Science

- Collect and observe samples of water from different zones in the river in order to determine the presence of protozoa.
- Show evidence of their findings of the presence or absence of protozoans through written observations and drawings.
- Share information in order to draw conclusions from their data.
- Demonstrate proper use of laboratory techniques and microscopes.
- Write to describe the mode of locomotion, characteristics, and features of the protozoan found.
- Use reading and evaluative skill in order to draw conclusions concerning the preferred habitat and tolerances of the species of protozoan found.

Math

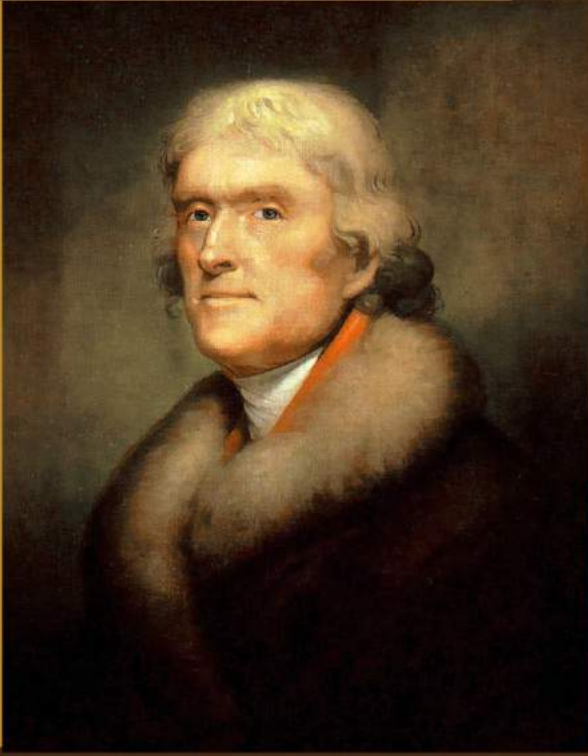
- Measure length and width of leaf samples to the nearest millimeter and circumference of trees.
- Calculate the diameter of the same trees.
- Calculate the height of the trees using ratios and proportions.
- Write brief tree descriptions.
- Summarize findings.
- Discuss outcomes.

Reading/Writing

- Observe and analyze the exhibits at Pike Plaza
- Read the exhibits at Pike Plaza
- Write down the answers to the questionnaire for Pike Plaza

Physical Education

- Demonstrate cardiovascular fitness by sustaining and maintaining a moderate aerobic activity at target working heart rate for 30-40 minutes.



SECTION 1 | JEFFERSON AND THE WEST

Lesson One – Social Studies

Lesson Title: Jefferson and the West

Standards with Benchmarks:

History 1.1 Students know the general chronological order of events and people in history.

As students in grades 5-8 extend their knowledge, what they know and are able to do includes:

- chronologically organizing major events and people of United States history and
- describing significant events and people which form the foundation of United States history in the chronological context of the history of the Americas and the world.

Geography 1.1 Students know how to use maps, globes, and other geographic tools to acquire, process, and report information from a spatial perspective.

- a. interpret maps and other geographic tools, through the analysis of case studies and using data
- b. use geographic tools to represent and interpret Earth's physical and human systems

History 5.3 Students know how political power has been acquired, maintained, used, and/or lost throughout history.

As students in grades 5-8 extend their knowledge, what they know and are able to do includes

- describing how attributes of various people have affected their individual political rights (for example, gender, racial identity, national origin, property ownership, religion legal status)
- describing how military and/or economic expansion resulted in the assumption or seizure of political power throughout history; and
- describing how forms of involuntary servitude have been used to maintain and expand political power throughout history (for example, slavery, serfdom, impressments).

History 5.4 Students know the history of relationships among different political powers and the development of international relations.

Students in grades 5-8 extend their knowledge, what they know and are able to do includes:

- describing how the relationship between the United States and external political powers developed with the growth of the nation and:
- identifying basic patterns of political alliances in the modern world.

Geography 6.1 Students know how to apply geography to understand the past.

Analyze the fundamental role that places and environments have played in history

Essential Question: What difference does a detailed and relevant map make for an explorer?

Content Objectives:

1. We will examine historical maps of the lands west of the Mississippi.
2. We will examine modern maps of the United States to locate our position on the map.

Language Objectives:

1. We will discuss the key components needed on any map.
2. We will define the key vocabulary words.
3. We will read a historical reference to the Louisiana Purchase.

Key Vocabulary:

Louisiana Purchase
Mississippi River
Thomas Jefferson
Pueblo, CO
Pikes Peak
Rocky Mountains
Canada
Zebulon M. Pike
Meriwether Lewis
William C. Clark

Lesson Overview:

(Activities, procedure for deliver of instruction)

1. Hand out pre-test to determine students familiarity with Zebulon Pike
2. Handout reading material on the Louisiana Purchase and the United States map
 - a. Have students read about the Louisiana Purchase and then have students identify the land (states) that were added to the U.S. Have students locate and mark their position on the map.
 - c. If time permits—have students locate other familiar landmarks

Handout a map of Hanover, CO

3. Discuss what a map needs before you set out on a trip
 - Title
 - Compass Rose
 - Scale
 - Grid
 - Highways and roadways

4. Discussion—compare and contrast the two maps
 - a. Ask students how easy would it be to travel with either of these maps
 - b. Review what is needed on a map before you could travel today
6. Define the vocabulary words—Vocabulary Worksheet #1
7. Closure—handout Word search on Exploring the West

Strategies for differentiation:

- Longer reading on Louisiana Purchase
- Have students color in the lands (states) that were added to U.S. from handout on the Louisiana Purchase and on the current U.S.
- Handout Vocabulary Worksheet#1--Key

Materials/Resources:

1. Handouts for Students
 - a. Pre-test
 - b. Maps
 - c. Reading
 - d. Vocabulary Worksheet #1
 - e. Word search on Exploring the West
2. Transparencies of maps #1-#4
3. Colors for students

Assessment:

1. Pretest
2. Oral questioning
3. Map coloring
4. Participation
5. Word search on Exploring the West

Evaluation/Reflection:

The Louisiana Purchase

By a treaty signed on Apr. 30, 1803, the United States purchased from France the Louisiana Territory, more than 2 million sq km (800,000 sq mi) of land extending from the Mississippi River to the Rocky Mountains. The price was 60 million francs, about \$15 million; \$11,250,000 was to be paid directly, with the balance to be covered by the assumption by the United States of French debts to American citizens.

In 1762, France had ceded Louisiana to Spain, but by the secret Treaty of San Ildefonso (1800) the French had regained the area. Napoleon Bonaparte (the future Emperor Napoleon I) envisioned a great French empire in the New World, and he hoped to use the Mississippi Valley as a food and trade center to supply the island of Hispaniola, which was to be the heart of this empire. First, however, he had to restore French control of Hispaniola, where Haitian slaves under TOUSSAINT L'OUVERTURE had seized power (1801; see HAITI). In 1802 a large army sent by Napoleon under his brother-in-law, Charles Leclerc, arrived on the island to suppress the Haitian rebellion. Despite some military success, the French lost thousands of soldiers, mainly to yellow fever, and Napoleon soon realized that Hispaniola must be abandoned. Without that island he had little use for Louisiana. Facing renewed war with Great Britain, he could not spare troops to defend the territory; he needed funds, moreover, to support his military ventures in Europe. Accordingly, in April 1803 he offered to sell Louisiana to the United States.



Concerned about French intentions, President Thomas Jefferson had already sent James Monroe and Robert R. Livingston to Paris to negotiate the purchase of a tract of land on the lower Mississippi or, at least, a guarantee of free navigation on the river. Surprised and delighted by the French offer of the whole territory, they immediately negotiated the treaty.

Jefferson was jubilant. At one stroke the United States would double its size, an enormous tract of land would be open to settlement, and the free navigation of the Mississippi would be assured. Although the Constitution did not specifically empower the federal government to acquire new territory by treaty, Jefferson concluded that the practical benefits to the nation far outweighed the possible violation of the Constitution. The Senate concurred with this decision and voted ratification on October 20, 1803. The Spanish, who had never given up physical possession of Louisiana to the French, did so in a ceremony at New Orleans on November 30, 1803. In a second ceremony, on December 20, 1803, the French turned Louisiana over to the United States.

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Barry, James P., *The Louisiana Purchase, April 1 1803* (1973); Chidsey, Donald B., *The Louisiana Purchase* (1972); DeConde, Alexander, *This Affair of Louisiana* (1976); Lyon, Elijah Wilson, *Louisiana in French Diplomacy* (1934); Sprague, Marshall, *So Vast So Beautiful a Land: Louisiana and the Purchase* (1974); Whitaker, Arthur P., *The Mississippi Question, 1795-1803* (1934; repr. 1962)



Social Studies - Section One, Map One

To the Southwest

by Clive Siegle

Pike's second expedition, 1806-1807, was designed to accomplish several goals, including providing an escort for fifty-one Osage Indians ransomed from the Potawatomi tribe and a delegation of Pawnees, Osages, and Otos returning from a trip to see President Jefferson; negotiating a peace between the Kansas and Osage tribes, and attempting to make contact with the Comanche people on the high plains. Pike was also to explore the headwaters of the Arkansas then to proceed south, locate the source of the Red River and descend it to the Mississippi. As with Lewis and Clark further north, Pike was to closely study and report on natural resources and subjects of scientific interest, as well as the Indian inhabitants along the poorly defined southwestern border of the Louisiana Purchase. Pike brought along nearly all the soldiers from his Mississippi expedition, men he called a "Dam'd set of Rascels," but who, nonetheless, retained the confidence of their commander. Gen. Wilkinson's son, Lt. James Biddle Wilkinson, was to go part of the way and lead a small detachment back to St. Louis via the Arkansas and Mississippi rivers.



Pre-test on Zebulon M. Pike & Exploring the Southwest

1. Who was Zebulon M. Pike?
 - a. Lieutenant in the U.S. Army when he first started on the Southwest expedition
 - b. Explorer of the Southwest territories
 - c. A protégé of General Wilkinson
 - d. All of the above

2. Why was the Louisiana Purchase significant to the U.S.?
 - a. almost doubled the size of the U.S. in 1803
 - b. almost tripled the size of the U.S. in 1803
 - c. gave all of the lands west of the Mississippi River to the U.S. from the British
 - d. gave all of the lands east of the Mississippi river to the U.S. from the Canadians

3. Who was Thomas Jefferson?
 - a. Lived in Colorado during Pike's expeditions
 - b. One of the first settlers in Pueblo, CO
 - c. One of the first to climb Pikes Peak
 - d. President of the United States

4. What are the four components that most maps have?
 - a. Roads, Title, Grid, & Color
 - b. Color, Scale, Roads & Population
 - c. Scale, Title, Compass Rose, & Key
 - d. Compass Rose, Grid, Roads, & Color

5. Who was Meriwether Lewis?
 - a. An explorer looking for the Hawaiian Islands
 - b. An explorer looking for the Northwest Passage
 - c. An explorer looking for El Dorado
 - d. An explorer looking for the Lost Dutchman Gold Mine

6. Who was William Clark?
 - a. An explorer looking for the Northwest Passage
 - b. An explorer looking for the Hawaiian Islands
 - c. An explorer looking for El Dorado
 - d. An explorer looking for the Lost Dutchman Gold Mine

7. What was General Wilkinson's role in sending Pike to the southwest?
 - a. He didn't like Pike
 - b. Commander of the U.S. Army
 - c. Pike murdered General Wilkinson's brother
 - d. The General was the travel agent for the U.S. Government

8. What was Zebulon M. Pike's assignment in the southwest?
 - a. Escort 51 Osages back to their village in Nebraska
 - b. Make contact with the Comanche people
 - c. Find the Headwaters of the Arkansas/Red Rivers and note the natural resources of the area
 - d. All of the above

9. How long did Zebulon M. Pike have to get ready for his second expedition?
 - a. Was given several weeks to get ready
 - b. Was given six months to get ready
 - c. Was given two years to get ready
 - d. Was given five years to get ready

10. Which of the following was a success for Pike?
 - a. He climbed to the top of Pikes Peak
 - b. He was able to report about the natural resources of the area and military establishments of the Spanish
 - c. He was able to locate the source of the Red River
 - d. He was able to contact with the Comanche people

11. How long was Zebulon M. Pike second expedition?
 - a. From March, 1801- March, 1807
 - b. From July, 1806- June, 1807
 - c. From July, 1810- June, 1811
 - d. From March, 1999- March, 2001

12. Where was Zebulon M. Pike taken into custody by the Spanish?
 - a. At the head waters of the Mississippi River, Spanish Territory
 - b. On the Rio del Norte, Spanish Territory
 - c. On the Columbia River, Spanish Territory
 - d. On the Colorado River, British Territory

13. What made Pike's trip so difficult when winter came?
 - a. They only had gear for the summer
 - b. They only brought enough food for two years
 - c. They forgot to bring summer clothing
 - d. They didn't have snow tires

14. Why did it take Pike so long to take the Osage to their village?
 - a. Delayed by weather and having to move so many people
 - b. Decided to take a round-about way to get to the village
 - c. Got lost on the way to the Osage village
 - d. The wheels on the wagons fell off and had to be repaired

15. When did General Wilkinson expect Pike to be back from the southwest expedition?
- He was given until 1809
 - He was expected to be back before winter set in
 - He was given 24 hours
 - He was to return by the New Year
16. What was the name that Zebulon M. Pike called Pikes Peak?
- The Blue Rock
 - Red Rock
 - Grand Peak
 - Pikes Peak
17. What did Zebulon M. Pike build at Pueblo, CO?
- A house for his father
 - A reservation for the Native Americans
 - CFI steel mill
 - defensive stockade of logs (Breastworks)
18. Who was Zebulon M. Pike married to?
- Martha Washington in 1801
 - Dolly Madison in 1801
 - Clarissa Harlow Brown in 1801
 - Mary Todd Lincoln in 1801
19. Why did Zebulon M. Pike leave two of his men behind in the Colorado Mountains in the middle of winter?
- As a punishment for falling asleep on duty
 - As a punishment for eating more than their share of the food
 - Because they didn't want to travel anymore and wanted to quit the army
 - Their feet were frostbitten and were too severely injured to travel
20. How did the two men left behind in the mountains remind Pike that they were still alive?
- They pulled out the bones from their frostbitten toes and sent them to Pike
 - They wrote a note that said "Don't forget us."
 - They sent a message through the Iroquois asking for help
 - They sent a message saying they didn't need to be rescued they resigned from the military

Key to Pre and Post Tests

1. d
2. a
3. d
4. c
5. b
6. a
7. b
8. d
9. a
10. b
11. b
12. b
13. a
14. a
15. b
16. c
17. d
18. c
19. d
20. a



Exploring the West

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

Bi-centennial CANADA commemoration

CLARK

LEWIS

LOUISIANA

MISSISSIPPI

PIKE

PIKES PEAK

PUEBLO

PURCHASE

RIVER

ROCKY MOUNTAINS

THOMAS JEFFERSON

12 of 12 words were placed into the puzzle. *Created by Puzzlemaker at DiscoverySchool.com*

Exploring the West Solution

A M + + + C + + P + R + + L N
D + I + + + L I + E + + + O +
A + + S + + K A V + + + S U P
N + + + S E + I R + + R + I I
A + + + S I R O + K E + + S K
C + + P + + S + L F + + + I E
+ + E + + + + S F B + + + A +
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K + + + + + J + + P + U + A +
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+ + E S A H C R U P + I + + +
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+ R O C K Y M O U N T A I N S
+ H + + + + + + + + + + + +
T + + + + + + + + + + + +

(Over, Down, Direction)

CANADA (1, 6, N)

CLARK (6, 1, SE)

LEWIS (5, 12, E)

LOUISIANA (14, 1, S)

MISSISSIPPI (2, 1, SE)

PIKE (15, 3, S)

PIKESPEAK (9, 1, SW)

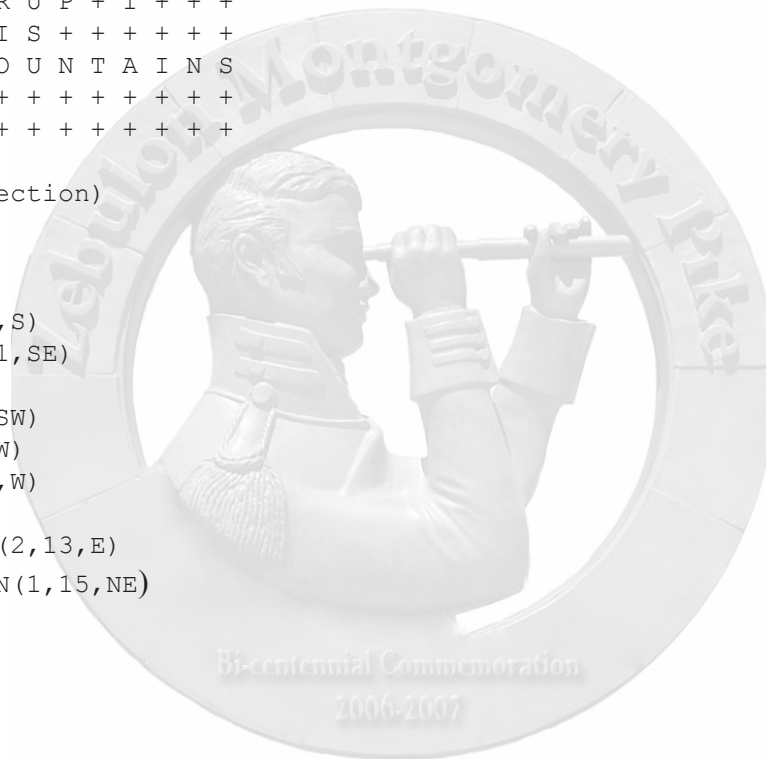
PUEBLO (13, 10, NW)

PURCHASE (10, 11, W)

RIVER (7, 5, NE)

ROCKYMOUNTAINS (2, 13, E)

THOMASJEFFERSON (1, 15, NE)



Vocabulary Worksheet #1

Louisiana Purchase _____

Mississippi River _____

Thomas Jefferson _____

Pueblo, CO _____

Pikes Peak _____

Rocky Mountains _____

Canada _____

Zebulon M. Pike _____

Meriwether Lewis _____

William Clark _____

Vocabulary Worksheet #1--Key

Louisiana Purchase: A territory of the western United States extending from the Mississippi River to the Rocky Mountains between the Gulf of Mexico and the Canadian border. It was purchased from France on April 30, 1803, for \$15 million.

Mississippi River: a major North American river and the chief river of the United States; rises in northern Minnesota and flows southward into the Gulf of Mexico.

Thomas Jefferson: Third President of the United States; chief drafter of the Declaration of Independence; made the Louisiana Purchase in 1803 and sent out the Lewis and Clark Expedition to explore it (1743-1826).

Pueblo CO: Is a city located in Pueblo County in southeastern Colorado. The City of Pueblo is situated on the confluence of the Arkansas River and Fountain Creek. The area is considered to be semi-arid with approximately 14 inches of precipitation annually.

Pikes Peak: A mountain, 4,303.6 m (14,110 ft) high, in the Front Range of the Rocky Mountains in central Colorado. It was discovered in 1806 by Zebulon M. Pike and is noted for the spectacular view from its summit.

Rocky Mountains: A major mountain system of western North America extending more than 4,827 km (3,000 mi) from northwest Alaska to the Mexican border. The system includes numerous ranges and forms the Continental Divide. Sections of the mountains were explored by Coronado, Lewis and Clark, Zebulon Pike, Sir Alexander Mackenzie, and Simon Fraser.

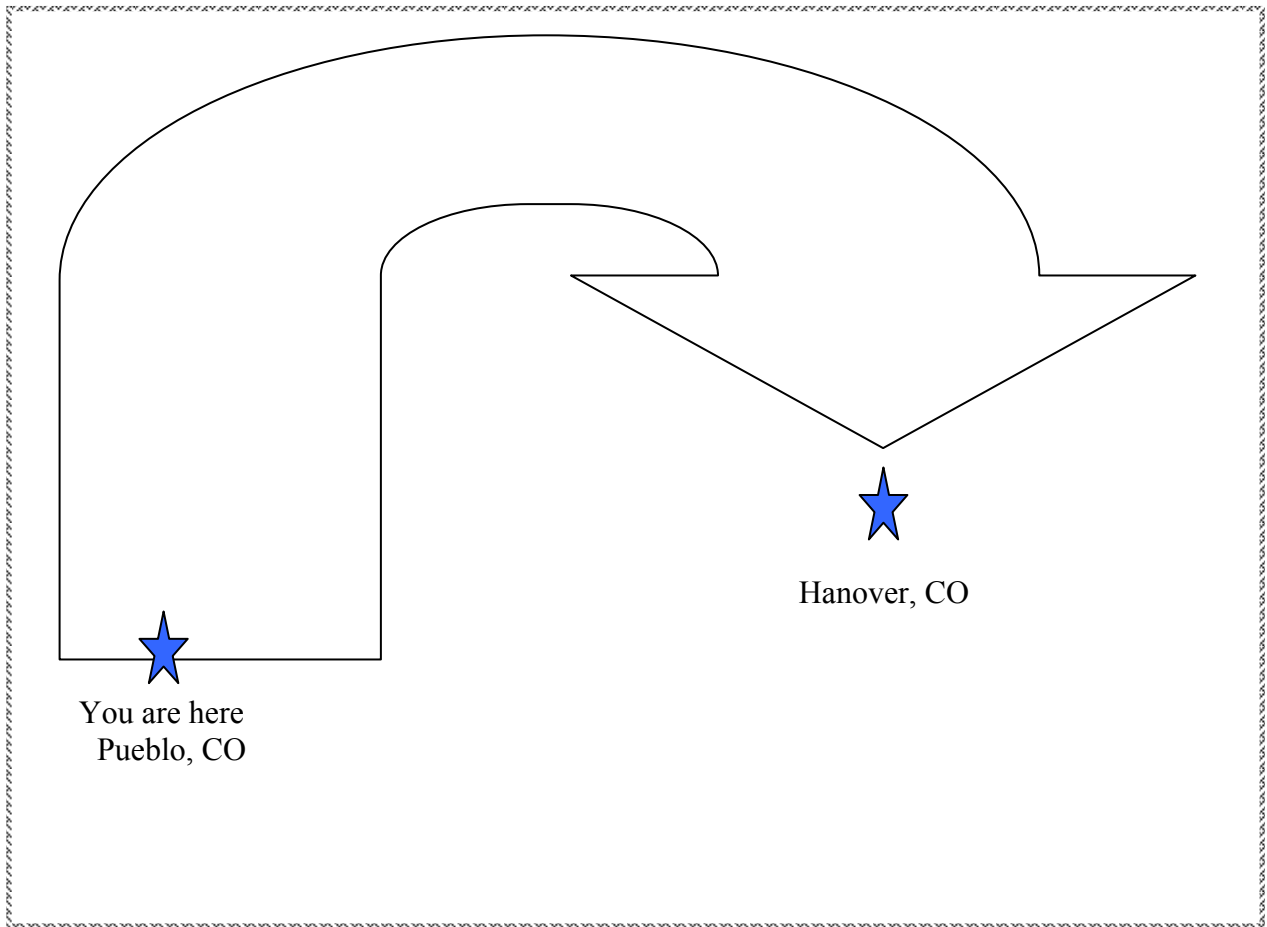
Canada: A nation in northern North America; the French were the first Europeans to settle in mainland Canada; "The border between the United States and Canada is the longest unguarded border in the world".

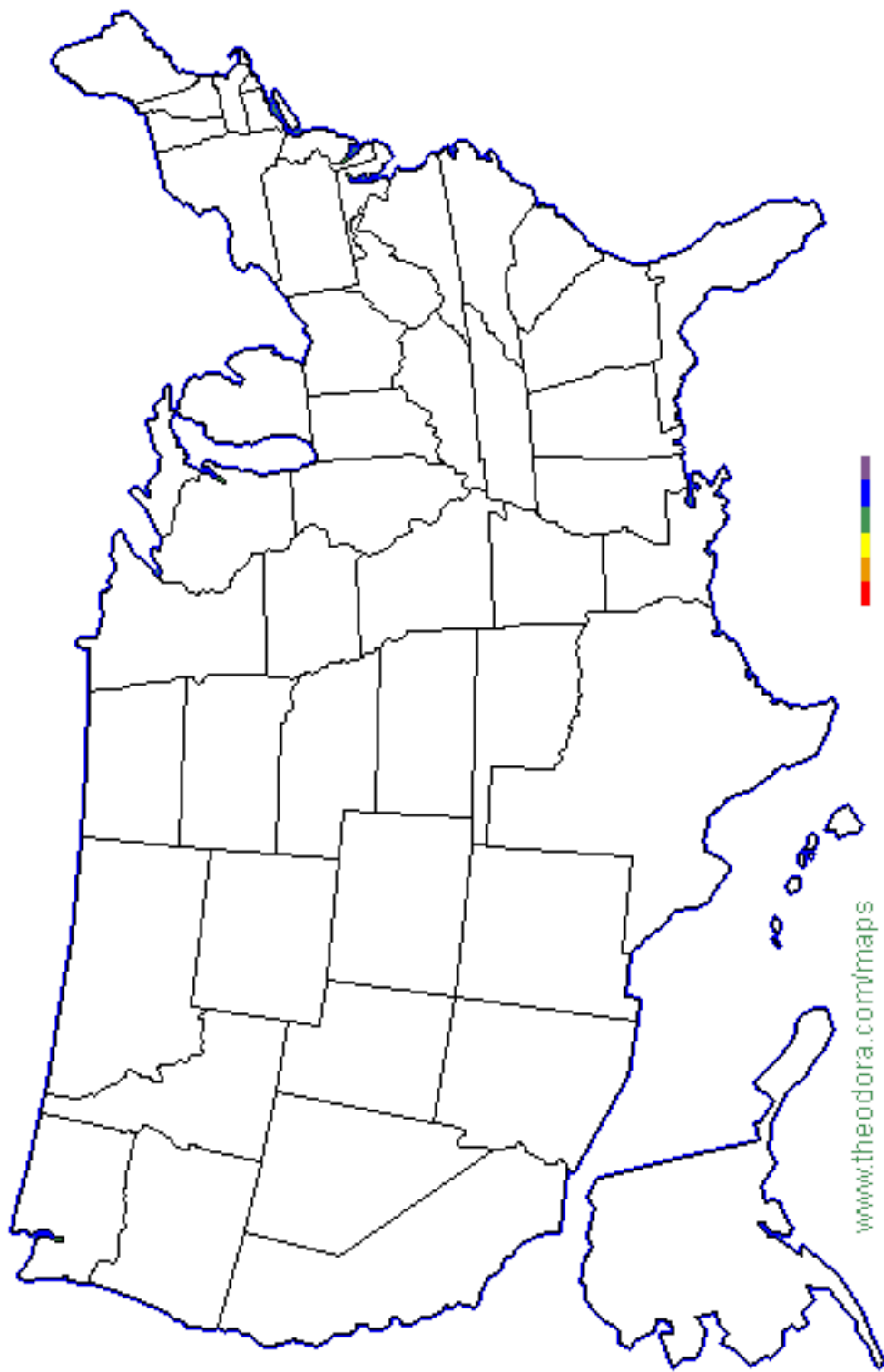
Zebulon M. Pike: 1779–1813, American explorer, an army officer, born Lambertton (now part of Trenton), N.J. He joined the army (c.1793) and was commissioned second lieutenant in 1799. He was sent on an expedition (1806–7) to explore the headwaters of the Arkansas and Red rivers and to reconnoiter Spanish settlements in New Mexico. Pike and his men went up the Arkansas River to the site of Pueblo, Colorado, and explored much of the country, sighting the peak that is named after him, Pikes Peak. When he and a small party went to the Rio Grande, they were taken into custody by the Spanish who brought them to Santa Fe and then to Chihuahua and finally released them at the border of the Louisiana Territory.

Meriwether Lewis: 1774–1809, American soldier and explorer who led the Lewis and Clark expedition (1803-1806) from St. Louis to the mouth of the Columbia River and served as governor of the Louisiana Territory (1806-1809).

William Clark: 1770–1838, American explorer who joined Meriwether Lewis in an expedition to the Pacific Ocean (1804-1806). Clark was responsible for the careful mapmaking en route.

Examine modern maps of the United States to locate our position on the map.
Discuss the key components needed on any map.





Lesson One - Science

Lesson Title: What were the Medical Practices of the Early 1800's

Standard with Benchmarks:

Science Standard 3.3 (9-12)

Students know and understand how the human body is structured and its functions, the factors that influence its structures and functions, and how these structures and functions compare with those of other organisms.

Compare and contrast characteristics of and treatments for various types of medical problems.

Language Arts Standard 5

Students read to locate, select and make use of relevant information from various media, reference and technological sources.

Use technology to access information, conduct research, and produce a carefully documented product.

Enduring Understanding:

What general medical practices were common in the Early 1800's?

What was the availability and reliability of common medical practices?

Where the medical personnel using sound scientific method in deciding treatment?

Essential Questions:

How legitimate would a modern physician consider the medical practices of the 1800's?

What were the regulations on medical claims/practices in the 1800's?

Would the medical practices of the 1800's withstand the scientific scrutiny applied in modern medical practice?

Are any of the medicines or medical practices of the 1800's still in use?

Content Objectives:

Students will:

- Utilize the constructivist approach to learning and describe the medical beliefs and practices of the 1800's.
- Identify the degree of proof required for medical practices or medicines.
- Identify medicinal drugs that are derived from plants and the uses of these drugs.

Language/Technology Objectives:

Students will utilize computers and the internet in order to research the past.

Students will use summarizing and evaluation skills to create a list of materials to take on their journey.

Students will write a summary to justify their choices.

Key Vocabulary:

Allopathic -refers to medicine, which focuses on drugs to actively kill cells or smother symptoms. Allopathic medicine also focuses on surgery to cut portions of the body in an attempt to heal dysfunction and disease.

Purgative – 1) a purging medicine: cathartic 2) a substance that causes the evacuation of substances (as from the bowels); to make free of something unwanted.

Phlebotomy - the letting of blood for transfusion, diagnosis or experiment, and especially formerly in the treatment of disease.

Emetic - causing vomiting.

Diuretic - tending to increase the flow of urine.

Impurities - mixed or impregnated with an extraneous and usually unwanted substance; something that is not pure or makes something else impure

Copious - present in large quantity : taking place on a large scale.

Lesson Overview:

Explore the medical practices of the Early 1800's as you contemplate joining Zebulon Pike's Southwestern exploration. Your task is to decide what medical supplies are available in that era to take in order to ensure the success of the journey.

Lesson Setting

The teacher will introduce the topic of exploration and the materials needed to have a successful and comfortable journey.

Teacher may ask students to make a list of materials to take on a one-day trip to the beach, to pack for a babies diaper bag, and a one-week trip. Does the list vary? In what respect?

Task 1: The students will work with a partner to complete the worksheet found in this section.

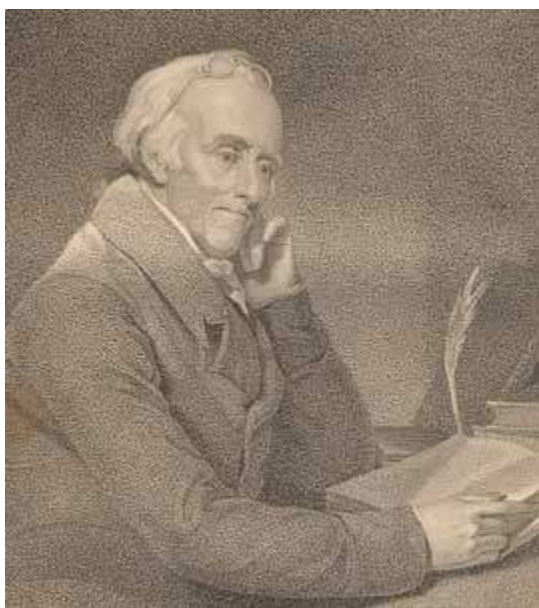
Task 2: Students will then work in groups to discuss and compile a list of supplies to be taken on their journey west.

Enrichment: Students will make a poster showing plants and their eighteenth-century uses based on the research from the completed worksheet “

Thomas Jefferson and Medicine

Thomas Jefferson believed that colonial medicine was based on theory, rather than hard science, and strongly disapproved of the medical profession's overuse of purging, cathartics, and bloodletting therapies. Instead, Jefferson's medical theory rested on preserving good health. He advocated eating little red meat but great quantities of vegetables, drinking only weak wines, abstaining from tobacco products, and engaging in daily exercise. To treat disease, Jefferson reasoned that the body could better restore itself if left alone.

Jefferson was a great believer in natural remedies, and at Monticello he grew a variety of herbal plants to use as medicines. Jefferson believed herbs could be utilized to establish a natural balance of the body with its environment. Lavender, marjoram, sage, thyme, wormwood, rosemary, and chamomile are a few herbs Jefferson planted.



Benjamin Rush
From *American Medical Biography* by James Thacher (1828).

Benjamin Rush

“Capt. Lewis is brave, prudent, habituated to the woods, & familiar with Indian manners & character. He is not regularly educated, but he possesses a great mass of accurate observation on all the subjects of nature which present themselves here & will therefore readily select those only in his new route which shall be new.” —Thomas Jefferson to Benjamin Rush, February 8, 1803

During Meriwether Lewis's lifetime, Benjamin Rush was the premiere physician in America. At fifteen Rush graduated from college and for the next five years served as a medical apprentice to a leading Philadelphia physician. Wishing to further his medical education, Rush traveled to Edinburgh and studied under the renowned medical teacher, William Cullen. Completing his thesis on the digestion of food, Rush graduated at the age of twenty-two and returned in 1769 to Philadelphia, where he received a professorship of chemistry at the College of Philadelphia.

Rush quickly became a prominent and leading citizen in America as he wrote and spoke on nearly every medical, social, or political matter. During his lifetime, Rush sought to improve the health care needs of the poor, studied the causation of yellow fever, and explored mental illness for which he is called the "Father of American psychiatry." Socially he advocated the restriction of alcohol and tobacco, the abolition of slavery, and universal education. Politically he was active in the revolution against Great Britain. Rush aided Thomas Paine in the writing of Common Sense, and he was one of five physicians to sign the Declaration of Independence.

“In his theory of bleeding..., I was ever opposed to my friend Rush...”

—Thomas Jefferson, October 7, 1824

Although Rush could never completely convince Jefferson of the efficacy of physicians, Benjamin Rush and Thomas Jefferson were good friends. Therefore, it is not surprising that Jefferson sent Meriwether Lewis to Philadelphia in the spring of 1803 to solicit medical advice from Rush. Rush no doubt lectured Lewis on his theory that all disease was related to tension in the blood vessels. As a result, Rush's prescribed therapy for all disease was bloodletting. Rush proposed that bleeding would help a slow or fast pulse, open or close the bowels, decrease fever as well as chilling, and relieve a coma but also induce sleep. Rush was never concerned about removing too much blood, in fact, he believed as much as four-fifths of the body's blood could be removed. Rush was impressed with Lewis and wrote Jefferson, "His mission is truly interesting. I shall wait with great solicitude for its issue. Mr. Lewis appears admirably qualified for it. May its advantages prove no less honorable to your administration than to the interest of science."

Rush's Pills

Fifty dozen "Rush's Pills" were included in the medical pharmacy taken on the Lewis and Clark expedition. "Rush's Pills," otherwise known as "Thunderclappers," combined calomel and jalap into an explosive cathartic. Calomel (six parts mercury to one part chlorine) was used as a purgative and jalap as a laxative. The depleting aspect of this medication was thought to rid the body of any "morbid" elements contained mainly in the blood. Lewis and Clark used the pills to treat malaria, an accidental arsenic poisoning, pleurisy, and dysentery.

Rush's Rules

Rush submitted to Lewis ten health commandments to subscribe to for the Corps of Discovery.

1. Flannel worn next to the skin, especially in wet weather.
2. Always to take a little raw spirits after being very wet or much fatigued; and as little as possible at any other time.
3. When you feel the least indisposition, fasting and rest; and diluting drinks for a few hours, take a sweat, and if costive take a purge of two pills every four hours until they operate freely.
4. Unusual costiveness is often the sign of an approaching disease. When you feel it, take one or two of the opening pills.
5. Where salt cannot be had with your meat, steep it a day or two in common lye.
6. In difficult and laborious enterprises or marches, eating sparingly will enable you to bear them with less fatigue and more safety to your health.
7. Washing feet with spirit when chilled, and every morning with cold water.
8. Molasses or sugar with water with vit. [victuals] and for drink with meals.
9. Shoes without heels.
10. Lying down when fatigued.

Medicine On the Lewis & Clark Expedition

Herbal Medicine: The Choke Cherry



Choke Cherry
Painting by Karen Pearson.

On occasion, Lewis's knowledge about herbs proved helpful on the expedition. Having broken off from the main party to search for the Great Falls, Lewis was without the Corps' medical supplies. Weak with violent intestinal pain and a high fever, Lewis relied on herbal medicine. He ordered his men to gather twigs of the choke cherry, a shrub first discovered in Virginia. Lewis removed the poisonous leaves and cut the twigs into two inch pieces. Boiling the twigs in water produced "a strong black decoction of an astringent bitter tast[e]." Lewis drank two pints, one at sunset and one an hour later, and found that he was able to have "a comfortable and refreshing nights rest." Rising early the next morning, Lewis downed another pint and, feeling revived, set out on a twenty-seven mile hike.

Lancets



Lancet, c. 1800s
Historical Collections & Services, CMHSL.

Lewis and Clark were equipped for the expedition with “six best lancets.” The lancet, a small sharp knife, was used to penetrate a vein without severing or nicking the pulsating artery beneath it. A strategically placed bowl collected the blood flowing from the incision.

Medical Supplies Taken



Typical nineteenth century medical chest
Historical Collections & Services, CMHSL.

The task of preparing for the expedition must have been mind-boggling. Meriwether Lewis had to anticipate everything from the essential firearms, to the mundane, fishhooks. Countless supplies needed to be obtained — enough to last for an indefinite period of time and for an indeterminate number of men. Lewis spent much of the spring of 1803 in Philadelphia purchasing supplies such as scientific instruments, dry goods, camping gear, oiled linens, and presents to give to the Indians. One stop he made on May 26, 1803, was to a store owned by George Gillaspay and Joseph Strong. Here Lewis spent a grand total of \$90.60 on medical supplies for the expedition.

Medicines Purchased

Item	Description	Cost
15 lbs. pulverized Cort. Peru [Peruvian Bark or Cinchona]	Quinine/fever reducer	\$30.00
1/2 lb. pulverized Jalap	Laxative/purgative	\$ 0.67
1/2 lb. pulverized Rhubarb	Laxative/purgative	\$ 1.00
4 oz. pulv. Ipecacuan	Emetic/purgative	\$ 1.25
2 lb. pulv. Cream Tartar	Purgative/diuretic	\$ 0.67
2 oz. Gum Camphor	Stimulant/diaphoretic	\$ 0.40
1 lb. Gum Assafoetid[Assafoetic/ Assafoedita]	Purgative	\$ 1.00
1/2 lb. Gum Opii Turk. opt.	Opium/pain killer	\$ 2.50
1/4 lb. Tragacanth	Gum used to bind pills	\$ 0.37
6 lb. Sal Glauber	Purgative	\$ 0.60
2 lb. Sal Nitri [saltpetre]	Treatment for fevers	\$ 0.67
2 lb. Copperas	Metal used in making inks	\$ 0.10
6 oz. Sacchar. Saturn. opt.[Sugar of lead/lead acetate]	Treatment for eye problems	\$ 0.37
4 oz. Calomel [Mercurous chloride]	Purgative	\$ 0.75
1 oz. Tartar Emetic	Emetic	\$ 0.10
4 oz. Vitriol Alb. [White Vitriol (Zinc Sulfate)]	Treatment for eye problems	\$ 0.12
1/2 lb. Rad. Columbo [Root of columbo]	Tonic for indigestion and diarrhea	\$ 1.00
1/4 lb Elix. Vitriol [Elixir of vitriol (ethylsulfuric acid)]	Tonic for stomach problems	\$ 0.25
1/4 lb. Es. Ment. pip. [Essence of menthol or peppermint]	Treatment for digestive problems	\$ 0.50
1/4 lb. Bals. Copaiboe [Balsam of Copaiba]	Treatment for rheumatism	\$ 0.37
1/4 lb. Bals Traumat [Compound tincture of Benzoin]	Treatment for cuts and abrasions	\$ 0.50
2 oz. Magnesia	Purgative	\$ 0.20
4 oz. Laudanum [Tincture of opium]	Pain reliever	\$ 0.50

2 lb Ung. Basilic [Compound of pine resin, yellow wax, and lard]	Ointment or salve	\$ 1.00
1 lb. Ung. Calimin	Astringent	\$ 0.50
1 lb. Ung. Epispastric	Blistering agent	\$ 1.00
1 lb. Ung. Mercuriale [Mercury]; diaphoretic	Ointment or salve	\$ 1.25
1 Emplast. Diach. S. [Diachylon simple]	Plaster or salve made of the juices of several plants	\$ 0.50
50 doz. Bilius Pills to order of B. Rush [Combination of calomel (mercurous chloride) and jalap]	Purgative/laxative	\$ 0.10 per dozen or \$5 total
2 oz Nutmegs	Flavoring for oral medicines	\$ 0.75
2 oz. Cloves	Flavoring for oral medicines	\$ 0.31
4 oz. Cinnamon	Flavoring for oral medicines	\$ 0.20

The lists of medicines and medical equipment procured accurately reflect the state of the medical profession in the early nineteenth century. One third of the total cost was spent on fifteen pounds of Cinchona bark, containing quinine, an effective treatment for malaria. Another effective drug purchased was laudanum, a tincture of opium, used as a pain killer and sleeping aid. The rest of the items acquired deal with purging through vomiting or enemas. Lewis took 600 of “Rush’s pills” on the expedition as a means to generate a powerful and explosive purgative. Clover, nutmeg, and cinnamon were also purchased to add to the medicine in an attempt to conceal its foul taste.

Medical Equipment

Item	Description	Cost
1 Set Pocket Insts. small		\$9.50
1 Set Teeth Insts. small		\$2.25
1 Clyster Syringe	Used for administering enemas	\$2.75
4 Syringes	Used for treatment of disease	\$1.00
3 Best Lancets	Used for bleeding or blood-letting	\$0.80 ea. or \$2.40 total
1 Tourniquet	For amputations	\$3.50
2 oz. Patent Lint	Linen or fleece-like material for poultices and dressing wounds	\$0.25
6 Tin Canisters		\$0.25 each or \$1.50 total
3 8 oz. Gd. Stopd. bottles		\$0.40 each or \$1.20 total
5 4 oz. Tinctures bottles		\$1.85
6 4 oz. Salt Mo.		\$2.22
1 Walnut Chest		\$4.50
1 Pine Chest		\$1.20
1/4 lb. Indian Ink	Black pigment in the form of sticks used for writing	\$1.50
2 oz. Gum Elastic	Rubber from the buckhorn plant; bark has some medicinal qualities, however; not soluble in water, and may have been used to seal containers	

Medicines and Their Uses

Glauber's Salt - Perhaps only one chemical drug significant to the Lewis and Clark expedition was produced in North America: Glauber's salt--sodium sulfate. While Lewis ordered a few ounces of some other chemical drugs, such as magnesia, tartar emetic, and white vitriol, he asked for salts.

Cream of Tartar - A large quantity--2 pounds--of Cream of Tartar (potassium bitartrate) appears on the drug list. Derived from the tartar deposited on wine casks, cream of tartar was a common ingredient in laxative preparations, often combined with senna, jalap, or scammony. Physicians also prescribed it alone as a mild laxative. As one authority put it, "there are few medicines more commonly employed."³ Today, cream of tartar is no longer a medicine but it comprises a prime ingredient of baking powder. Therefore it continues to be "commonly employed!"

Tartar Emetic -- A potent derivative of cream of tartar was called tartar emetic for its swift and reliable inducement of vomiting. The single ounce of potassium antimony tartrate carried by the captains was enough for one or two hundred doses. Emetics were usually given to help the patient eliminate any noxious substance that might be producing imbalance.⁴

Elixir of Vitriol -- A wide variety of recipes exist for this mixture of sulfuric acid, alcohol, and aromatics (usually ginger and cinnamon). Whatever the preparation, this elixir was prescribed as a tonic and for stomach disorders.⁵

Saltpetre (nitre) -- The nitrates have had a long and fascinating history as medicines and chemicals. Valued as fertilizers, nitrates have been sought by farmers for hundreds of years.⁶ The medicinal nitrate of choice, saltpetre (potassium nitrate) was both mined as a mineral and extracted from plant and animal matter. Private George Gibson returned to Fort Clatsop from the salt-makers' camp with a persistent fever; Captain Lewis treated him with both Dr. Rush's bilious pills and nitre.

Magnesia -- Like some of the other chemical drugs carried along by the Corps, Magnesia (magnesium oxide) has continued to be used in modern medicine for the same purpose--as an antacid.⁸

Eye Wash as Currency (Sugar of Lead and White Vitriol) -- Oddly enough, one could argue that the small quantities of sugar of lead (lead acetate) and white vitriol (zinc sulfate) carried by the Corps were among their most precious cargo. Whelan (a member of the Lewis and Clark expedition) spent less than a dollar on these ingredients, which were dissolved in water to make eye wash, or "eye water," but their value skyrocketed when it came to bargaining for food and horses to get them back across the Rockies in the spring of 1806. By that time the captains had no more than a handful of bona fide trade goods left, and medical ministrations were all they could offer. On the Columbia River below the mouth of the Snake, the captains gave the Walula Indians some eye water which, Clark believed, would "render them more essential Sirvece than any other article in the Medical way which we had in our power to bestow on them."⁹ Lewis concluded, after they reached Nez Perce territory again a few days later, "sore eyes is an universal complaint with all the natives we have seen on the west side of the Rocky mountains."¹⁰

External Remedies (USA from imported ingredients) -- At first glance, the several external preparations purchased for the Corps seem like an afterthought. However, on a journey of back-breaking labor with scores of cuts and scrapes, blisters and rope burns looming ahead, they were sensible purchases. And while today we stock up on sterile bandages and antibiotic cremes, military medicine around 1800 called for far cruder pharmaceuticals such as Uguent Basilicon a greasy mixture of eight parts hog lard, five parts white resin, and two parts yellow wax.¹² Another was Diachylon Plaster, a sticky mixture of oil and litharge (lead monoxide), which was ordered by physicians from the time of Galen (AD 131-201) up into the 1950s. A third long-standing favorite, Balsam Traumaticum or Compound Benzoin Tincture, was used both externally and internally. This aromatic remedy had many recipes, the most common consisting of small amounts of benzoin (resin from genus *Styrax*), balsam of Peru, and aloes dissolved in alcohol.¹³ Calamine ointment, a final soothing remedy, was used in ways similar to our own calamine lotion.

At the other end of the therapeutic spectrum sat Unguentum Epispastic or blistering plaster, which contained as its active ingredient *Cantharides* or Spanish Flies. These dried insects, when pounded into a greasy base (wax, suet, lard, or a mixture), yielded a preparation that according to the *Edinburgh New Dispensatory* of 1797 “never fails of producing blisters.”¹⁴ The theory was simple: the fluid in blisters could carry away the toxins causing illness in the patient.

Gregory J. Higby, 02/06

Haynes, *American Chemical Industry*, 187.

2. *Edinburgh New Dispensatory* (1791), 396.

3. *Ibid.*, (1797), 254.

4. *Ibid.*, (1791), 419.

5. *Ibid.*, (1797), 494-496.

6. Aaron Ihde, *The Development of Modern Chemistry* (New York: Harper & Row, 1964), 449-451.

7. Moulton, *Journals*, February 16, 1806.

8. David B. Troy, ed., *Remington: The Science and Practice of Pharmacy* (Philadelphia: Lippincott, 2006), p 1296.

9. Moulton, *Journals*, April 29, 1806.

10. *Ibid.*, May 5, 1806.

11. *Edinburgh New Dispensatory* (1797), 572.

12. Robert A. Buerki & Gregory J. Higby, “History of Dosage Forms and Basic Preparations,” *Encyclopedia of Pharmaceutical Technology* (New York: Marcel Dekker, 1993), 7:325-326; *Edinburgh New Dispensatory* (1797), 478-479. See recipe in *Remington: The Science and Practice of Pharmacy*, ed. David B. Troy (Philadelphia: Lippincott, 2006), 1280.

14. *Edinburgh New Dispensatory* (1791),

Plants and Their Medicinal Uses

Cinchona Bark (Peru and Bolivia) -- It was no accident that the largest single medicine purchased by Whelan for the Lewis and Clark expedition was fifteen pounds of "Pulv. Cort. Peru" otherwise known as cinchona bark or simply bark. One of the great panaceas of the era, cinchona bark arrived in Europe from South America in the early 1600's as a specific cure for intermittent fevers (malaria). As a specific it rocked traditional medical theories, which maintained that disease came from humoral imbalances within the body. As one of the few drugs that actually cured a disease, cinchona was soon tried against other fevers and many other constitutional ailments even though it had little if any effect.²

Quinine, the main active ingredient of cinchona bark was not isolated until 1820 by French pharmacists Pelletier and Caventou.³ Only ten or twelve ounces of this alkaloid would have equaled the medicinal power of the Corps' bulky container of powdered Bark. The cinchona probably arrived in Philadelphia via London merchants, rather than directly from South America.

Opium and Laudanum (Middle East) -- From the list of drugs, opium and its tincture (laudanum), filled a niche still required in today's therapeutics, i.e., opiate pain reliever.

(Four of the top 100 drugs prescribed in 2002 were derived in part from opium, including the number one medicine, hydrocodone with acetaminophen.) And while opium and its preparations were used for the relief of pain, they were also the sedatives and hypnotics of choice two hundred years ago. About the same time as the Lewis and Clark Expedition, German pharmacist Friedrich Sertürner was developing the method to extract morphine from crude opium, thereby beginning the era of alkaloidal chemistry. As in the case of cinchona and quinine, however, this discovery would come too late for the Corps, which was required to take the bulkier crude drug along for the 8,000-mile journey.⁴

Lewis, as Jefferson's private secretary, may have read the following from the *Edinburgh New Dispensatory*, a book in the president's library:

Egypt, Persia, and some other provinces of Asia, have hitherto supplied us with this commonly: in those countries, large quantities of poppies are cultivated for this purpose.... Opium, when taken into the stomach...gives rise to a pleasant serenity of mind, in general proceeding to a certain degree of languor and drowsiness....no substance can have a

***Papaver somniferum* L.**



Opium is produced by incising the unripe seed capsules of *Papaver somniferum*, L. The name of the genus is the Latin word for poppy; *somniferum* means sleep-inducing.

better title to the appellation of sedative than opium....Indeed there is hardly any affection, in which it may not, from circumstances, be proper; and in all desperate cases, it is the most powerful means of alleviating the miseries of patients.⁵

Hypodermic syringes were a half-century in the future, so physicians of the early 19th Century administered opium orally, often in the form of a simple rolled pill. As a valuable drug, opium was often adulterated, therefore druggists like Gillaspay and Strong carefully examined each shipment that arrived. Their reputation as dealers in quality drugs depended largely on the potency of their opium.⁶

Ipecac (Brazil) -- A drug sometimes combined with opium was ipecac, one of the most versatile medicines of the early modern period. Introduced into Western therapeutics in the late 1600's from South America, ipecacuanha quickly gained stature as a treatment for dysentery and as a reliable emetic and diaphoretic. Intentionally inducing vomiting or sweating was viewed at the time as a good way to alter the body's balance and encourage the restoration of health. Ipecac remains an official drug, although its status as an emergency emetic has declined in recent years. In 1803, most ipecac roots were dug in Brazil for exportation.⁷

Camphor (Sumatra) -- Another exotic carried along by Lewis and Clark that is still official is camphor. One contemporary author described it as "a very peculiar substance...chiefly extracted from the wood and roots of a tree growing in Sumatra." The collection of camphor was described by Marco Polo and in the Arabian Nights. Considered a concrete essential oil, the drug was administered orally to combat fevers through inducing perspiration.⁸

Copaiba (Brazil and Venezuela) -- Buried in the usual lists of medicines carried by the Corps of Discovery is "Balsam of Copaiba." This soothing liquid came from tapped trees in the Amazon basin. copaiba (pron. co-pie-buh)

Asafetida (Iran and Afghanistan) -- Of all the imported drugs, perhaps the most notorious was asafetida, also known as "devil's breath." This nasty smelling drug from Persia was known since ancient times. Widely consumed on the theory that anything that smelled that bad had to be good

Cephaelis ipecacuanha



The distinctive, knobby, dark-brown roots of *Cephaelis ipecacuanha* Brotero,⁹ were greatly prized by physicians and pharmacists. The low shrubby plant was not especially easy to find in the tropical rain forests of South America. *Cephaelis* refers to those little "heads" on the root; *ipecacuanha* is a Portuguese transliteration of a compound Tupi Indian name for the "low vine that makes one vomit."

for something, asafetida's serious use by 1800 had declined to the treatment of nervous complaints and flatulence. Its folk use to ward off colds and flu continued into the twentieth century. Why the Corps took an entire pound of this smelly substance is unclear. There is no apparent record of it being used during the journey.

Columbo Root (Mozambique) -- When Gillaspay and Strong packed up half a pound of columbo root for the Corps, they probably thought the drug came from Ceylon (modern Sri Lanka). For decades, Portuguese traders had a monopoly on this drug and hid its origins. Portuguese ships would stop on the East coast of Africa, purchase the roots from local gatherers, and then carry them along to India on their journeys before returning home to Europe. At first called kalumb, the drug's name shifted to variations of "colombo," the capital city of Ceylon. In the 1820's its origins were clarified. No matter what its name, columbo was never an important drug, and was probably included by Lewis as a tonic and restorative.¹¹

Cinnamon (Sri Lanka), Nutmeg and Cloves(Moluccas) -- Ceylon was the source for cinnamon, which like other spices were carried in the same ships, exchanged by the same dealers, and sold by apothecaries along with drugs.

For centuries there had been a fine line between these precious items. In both regular and folk medicine, pungent spices were taken to improve digestion. Some authors have speculated that Lewis bought the cinnamon, nutmegs, and cloves to flavor their drug preparations. It is just as likely that the captains bought them for culinary purposes. They could also have been used to prepare bait for beaver traps.¹²

Rhubarb (China) -- Often conflated with the common culinary plant called rhubarb, Rheum or China Rhubarb was a botanical laxative with a long and distinguished history. Used as medicine since ancient times in China, the roots and rhizomes of rheum arrived in the West in the second century BC. Throughout the Middle Ages up to modern times, medicinal rhubarb was an active item of trade.¹³ By the time of Lewis and Clark, medicinal rhubarb was viewed as "a mild cathartic, which operates without violence or irritationIn some people, however, it always occasions severe griping. Besides its purgative quality, it is celebrated for an astringent one, by which it strengthens the tone of the stomach and instines, and proves useful in diarrhoea." It was for this apparent dual activity that physicians valued rhubarb.¹⁴ Rhubarb remained an officially recognized drug for the next 150 years.¹⁵

Tragacanth(Persia) -- A plant derivative that still finds use 200 years later is tragacanth. The dried gummy exudation from *Astragalus gummifer* or other species of *Astragalus*, tragacanth is used today as a "suspending agent in lotions, mixtures, and extemporaneous preparations and prescriptions."¹⁶ The captains could have used it as well to make up pill masses.¹⁷



***Mentha x piperita* L.**



Robert H. Mohlenbrock @ USDA_NRCS PLANTS Database / USDA NRCS. 1995

Ess. Menth (Essence of Peppermint) -- Of all the botanical drugs purchased by Whelan, only peppermint, *Mentha x piperita* L. ("peppery mind") and other species, grow in North America. Physicians of the time prescribed essence of peppermint for stomach complaints or for "chills." As one book put it, mint "diffuses a glowing warmth through the whole system."¹⁸ On 24 August 1805, Lewis found that one of his men, Peter Weiser, "very ill with a fit of the cholic" and administered "a doze of the essence of Peppermint and laudinum which in the course of half an hour so far recovered him that he was enabled to ride my horse and I proceeded on foot and rejoined the party."¹⁹ While this essence, or alcoholic solution containing the "essential oil" of peppermint, was probably imported, it could have been produced from domestic mint. Photo: Northeast wetland flora: Field office guide to plant species. Northeast National Technical Center, Chester, Pennsylvania. Gregory J. Higby, 02/06

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1. Haynes, *American Chemical Industry*, 212.
 2. Saul Jarcho, *Quinine's Predecessor: Francesco Torti and the Early History of Cinchona* (Baltimore: Johns Hopkins University Press, 1993). [Andrew Duncan] [WorldCat says William Lewis], *The Edinburgh New Dispensatory* (Philadelphia, T. Dobson, 1791), 250-254.
 3. Friedrich A. Flückiger & Daniel Hanbury, *Pharmacographia* (London: Macmillan and Co., 1874), 320-321.
 4. "2002 Rx Market: A Look in the Rear View Mirror," *Drug Topics* 147 (March 17, 2003): 37-38, 40, 44, 60, 62. Aaron J. Ihde, *The Development of Modern Chemistry* (New York: Harper & Row, 1964), 167.
 5. *Edinburgh New Dispensatory* (1791), 240-243.
 6. Jacob Bigelow, *A Treatise on the Materia Medica, Intended as a Sequel to the Pharmacopoeia of the United States* (Boston: Charles Ewer, 1822): 271-272; Freedley, *Principal Trades*, 149.
 7. John Uri Lloyd, *Origin and History of all the Pharmacopoeial Vegetable Drugs, Chemicals and Preparations*, Volume 1 (Cincinnati: Caxton Press, 1921): 168-176; *Edinburgh New Dispensatory* (1791), 211-213; Bigelow, *Materia Medica*, 232-234.
 8. Lloyd, *Pharmacopoeial Vegetable Drugs*, 39-40; *Edinburgh New Dispensatory* (1791), 156-157.
 9. Felix Brotero (1744-1828) was the Portuguese botanist who published the first official description of *Cephaelis ipecacuanha*.
 10. Lloyd, *Pharmacopoeial Vegetable Drugs*, 110-116; Bruce Paton, *Lewis & Clark: Doctors in the Wilderness* (Golden, CO: Fulcrum, 2001), 50-51.
 11. Flückiger & Hanbury, 22-24; *Edinburgh New Dispensatory* (1791) 175-176.
 12. Flückiger & Hanbury, *Pharmacographia*, 466-474, 451-456, 249, 255. Moulton, *Journals*, January 7, 10, 1806. Mace and vanilla were also said to be effective for this purpose. *Ibid.*, January 10, 1806.
 13. Flückiger & Hanbury, 442-451.
 14. *Edinburgh New Dispensatory* (1791), 263-4.
 15. *National Formulary*, 10th ed. (Washington, DC: American Pharmaceutical Association, 1955): 493. For an excellent study of this drug, see Clifford Foust, *Rhubarb: The Wondrous Drug* (Princeton, NJ: Princeton University Press, 1992).

Chemical Compounds

Complete the chart by finding the medicinal use for the chemical compound listed in the first column and recording the use and class of medicine to which each item belongs.

CHEMICAL	MEDICINAL USES
Glauber's Salt	
Cream of Tartar	
Tartar Emetic	
Elixir of Vitriol	
Saltpetre	
Magnesia	
Non-chemical Items	

Plants and Their Medicinal Uses

Complete the chart by finding the main medicinal use for the medicinal plant listed in the first column and recording the use and class of medicine to which each item belongs.

PLANT	COUNTRY OF ORIGIN	MEDICINAL USES
Opium and Laudnum		
Ipecac		
Camphor		
Copaiba		
Columbo Root		
Cinnamon, Nutmeg, & Clove		
Rhubarb		

Lesson One - Math

Essential Question: How can a map be used to estimate the distance Pike and his men traveled?

Standards with Benchmarks:

Colorado Mathematics Standard 5: Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems.

Benchmark: Read and interpret various scales including those based on number lines, graphs and maps.

Content Objective:

Language Objective:

- Discuss the implications of being able to travel in a straight line as opposed to the route that Pike took.

Key Vocabulary:

Scale: the ratio of length used in a drawing, map, or model to the length of the object in reality.

Estimate: to find a number close to an exact amount.

Lesson Overview:

1. Give students background information by reading an overview of Zebulon Pike's expedition. One can be found at www.zebulonpike.org. Click on Pike Expedition Overview. Be sure to emphasize the hardships encountered along the way.
2. Hand out copies of the distance chart and map.
3. Have students use the string and the map to estimate the distance between the cities listed on the distance chart. The map does not have a scale so assume that 1-inch is 200 miles. (The map is not very accurate; hence this is a very rough estimate.) This data should be filled in under the "Estimated Distance" column.
4. After students have made their estimates, have them use the online distance calculator at www.indo.com/distance/index.html. It is important to note that this calculator accepts various formats for the location. These include city and state and latitude and longitude. It may be helpful to hand out slips of paper with the web address written on them.
5. If Internet access is not available, you will need to find these distances for the students.
6. Discuss what latitude and longitude are. Then invite students to discuss the difference in distance between St. Louis, Missouri (where Pike began his journey) and 38.8N -105.01W (the latitude and longitude of Pike's Peak) in terms of Pike's route and "as the crow flies." How much time could have been saved if Pike could have traveled in a straight line? What would this have changed?

Strategies for Differentiation:

1. Students may be asked what an acceptable range of differences in actual and estimated distances should be. This number may vary from student to student.
2. A follow-up lesson that addresses student interest may include a whole class discussion of the distance to particular students' spring break destinations.

Materials/Resources:

- Copies of distance chart
- Copies of a map showing Pike's route THIS IS STILL NEEDED!!!!
- String (the string should be somewhat thin)
- Computers with Internet access (optional)

Name: _____ key _____

Date _____

Hour _____

Are We There Yet?

Starting Location	Ending Location	Estimated Distance	Straight Line Distance
St. Louis, MO	Pueblo, CO		779 miles
Pueblo, CO	Conejos, CO		112 miles
Conejos, CO	Santa Fe, NM		97 miles
Santa Fe, NM	El Paso, TX		265 miles
El Paso, TX	Presidio, TX		200 miles
Presidio, TX	San Antonio, TX		353 miles

1. Pike did not follow a straight line as he traveled. Why not (be as specific as possible)?

2. How might history have been changed if Pike could have used a more direct path?

Lesson One - Reading/Writing

Standards with Benchmarks: Reading

- Standard 1:** Students read and understand a variety of materials.
- b. make connections between their reading and what they already know, and identify what they need to know about a topic before reading about it
 - e. use information from their reading to increase vocabulary and enhance language usage
- Standard 4:** Students apply thinking skills to their reading, writing, speaking, listening, and viewing.
- c. recognize, express, and defend points of view orally and in writing
 - d. identify the purpose, perspective, and historical and cultural influences of a speaker, author, or director
 - e. evaluate the reliability, accuracy, and relevancy of information
- Standard 6:** Students read and recognize literature as a record of human experience.
- c. read literature to understand places, people, events, and vocabulary, both familiar and unfamiliar
 - d. read literature that reflects the uniqueness and integrity of the American experience

Essential Questions: What is the difference between letter writing and writing a military order? How does the use of language affect comprehension?

Content Objectives:

1. We will examine the subtle differences in wording.
2. We will look at various words meanings from the 18th Century and compare them with the 21st Century.
3. We will read the Louisiana Purchase Treaty

Language Objectives:

1. We will define key vocabulary words.
2. We will read a historical entry from Zebulon Pike's Journal and identify wording differences.

Key Vocabulary:

Subtle	Pike's Peak
Journal	Pueblo, CO
Diary	
Zebulon Pike	

Lesson Overview: (20 – 30 minutes)

(Activities, procedure for delivery of instruction)

1. Discuss the word subtle with the students.
2. Draw a Venn Diagram on the board with the words journal and diary in either circle. Students will need to record into their notes. Brainstorm with the student's ways in which the two are different.
3. Lead the students in a quick discussion as to why journal would be chosen instead of diary when the Pike Journals were published.
4. Hand out Reading One and read with the students.
5. Discuss the wording differences between the 18th Century and the 21st Century.
6. Hand out booklet "My week long adventure with Zebulon Montgomery Pike" and have students make first entry.
7. Collect journals

Materials/Resources:

1. Journal vs. Diary – journal is more free writing and is more reflective in nature. A diary is more observational in nature. Entries are more to the point when recorded.
2. Reading Example One – The Louisiana Purchase Treaty
3. Journal booklet

Assessment:

1. Oral questioning
2. Participation
3. Journal entry

Evaluation/Reflection:

Reading Lesson One

The Louisiana Purchase Treaty

(Three documents are included here: the formal treaty of cession, a convention for payment of 60 million francs (\$11,250,000) and a second convention for claims of 20 million francs (\$3,750,000) made by American citizens against France.)

TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE FRENCH REPUBLIC

The President of the United States of America and the First Consul of the French Republic in the name of the French People desiring to remove all Source of misunderstanding relative to objects of discussion mentioned in the Second and fifth articles o f the Convention of the 8th Vendémiaire and 9/30 September 1800 relative to the rights claimed by the United States in virtue of the Treaty concluded at Madrid the 27 of October 1795, between His Catholic Majesty & the Said United States, & willing to Strengthen the union and friendship which at the time of the Said Convention was happilyreestablished between the two nations have respectively named their Plenipotentiaries to wit The President of the United States, by and with the advice and consent of the Senate of the Said States; Robert R. Livingston Minister Plenipotentiary of the United States and James Monroe Minister Plenipotentiary and Envoy extraordinary of the Said States near the Government of the French Republic; And the First Consul in the name of the French people, Citizen Francis BarbéMarbois Minister of the public treasury who after having respectively exchanged their full powers have agreed to the following Articles.

Art: I

Whereas by the Article the third of the Treaty concluded at St Ildefonso the 9th Vendémiaire an 9/1st October 1800 between the First Consul of the French Republic and his Catholic Majesty it was agreed as follows.

“His Catholic Majesty promises and engages on his part to cede to the French Republic six months after the full and entire execution of the conditions and Stipulations herein relative to his Royal Highness the Duke of Parma, the Colony or Province of Louisiana with the Same extent that it now has in the hand of Spain, & that it had when France possessed it; and Such as it Should be after the Treaties subsequently entered into between Spain and other States.”

And whereas in pursuance of the Treaty and particularly of the third article the French Republic has an incontestible title to the domain and to the possession of the said Territory-
-The First Consul of the French Republic desiring to give to the United States a strong proof of his friendship doth hereby cede to the United States in the name of the

French Republic for ever and in full Sovereignty the said territory with all its rights and appurtenances as fully and in the Same manner as they have been acquired by the French Republic in virtue of the above mentioned Treaty concluded with his Catholic Majesty.

Art: II

In the cession made by the preceeding article are included the adjacent Islands belonging to Louisiana all public lots and Squares, vacant lands and all public buildings, fortifications, barracks and other edifices which are not private property.--The Archives, papers & documents relative to the domain and Sovereignty of Louisiana and its dependances will be left in the possession of the Commissaries of the United States, and copies will be afterwards given in due form to the Magistrates and Municipal officers of such of the said papers and documents as may be necessary to them.

Art: III

The inhabitants of the ceded territory shall be incorporated in the Union of the United States and admitted as soon as possible according to the principles of the federal Constitution to the enjoyment of all these rights, advantages and immunities of citizens of the United States, and in the mean time they shall be maintained and protected in the free enjoyment of their liberty, property and the Religion which they profess.

Art: IV

There Shall be Sent by the Government of France a Commissary to Louisiana to the end that he do every act necessary as well to receive from the Officers of his Catholic Majesty the Said country and its dependances in the name of the French Republic if it has not been already done as to transmit it in the name of the French Republic to the Commissary or agent of the United States.

Art: V

Immediately after the ratification of the present Treaty by the President of the United States and in case that of the first Consul's shall have been previously obtained, the commissary of the French Republic shall remit all military posts of New Orleans and other parts of the ceded territory to the Commissary or Commissaries named by the President to take possession--the troops whether of France or Spain who may be there shall cease to occupy any military post from the time of taking possession and shall be embarked as soon as possible in the course of three months after the ratification of this treaty.

Art: VI

The United States promise to execute Such treaties and articles as may have been agreed between Spain and the tribes and nations of Indians until by mutual consent of the United States and the said tribes or nations other Suitable articles Shall have been

agreed upon.

Art: VII As it is reciprocally advantageous to the commerce of France and the United States to encourage the communication of both nations for a limited time in the country ceded by the present treaty until general arrangements relative to commerce of both nations may be agreed on; it has been agreed between the contracting parties that the French Ships coming directly from France or any of her colonies loaded only with the produce and manufactures of France or her Said Colonies; and the Ships of Spain coming directly from Spain or any of her colonies loaded only with the produce or manufactures of Spain or her Colonies shall be admitted during the Space of twelve years in the Port of New-Orleans and in all other legal ports-of-entry within the ceded territory in the Same manner as the Ships of the United States coming directly from France or Spain or any of their Colonies without being Subject to any other or greater duty on merchandize or other or greater tonnage than that paid by the citizens of the United. States.

without being Subject to any other or greater duty on merchandize or other or greater tonnage than that paid by the citizens of the United. States.

During that Space of time above mentioned no other nation Shall have a right to the Same privileges in the Ports of the ceded territory--the twelve years Shall commence three months after the exchange of ratifications if it Shall take place in France or three months after it Shall have been notified at Paris to the French Government if it Shall take place in the United States; It is however well understood that the object of the above article is to favour the manufactures, Commerce, freight and navigation of France and of Spain So far as relates to the importations that the French and Spanish Shall make into the Said Ports of the United States without in any Sort affecting the regulations that the United States may make concerning the exportation of the produce and merchandize of the United States, or any right they may have to make Such regulations.

Art: VIII

In future and for ever after the expiration of the twelve years, the Ships of France shall be treated upon the footing of the most favoured nations in the ports above mentioned.

Art: IX

The particular Convention Signed this day by the respective Ministers, having for its object to provide for the payment of debts due to the Citizens of the United States by the French Republic prior to the 30th Sept. 1800 (8th Vendémiaire an 9) is approved and to have its execution in the Same manner as if it had been inserted in this present treaty, and it Shall be ratified in the same form and in the Same time So that the one Shall not be ratified distinct from the other.

Another particular Convention Signed at the Same date as the present treaty relative to a definitive rule between the contracting parties is in the like manner approved and will be ratified in the Same form, and in the Same time and jointly.

Art: X

The present treaty Shall be ratified in good and due form and the ratifications Shall be During that Space of time above mentioned no other nation Shall have a right to the Same privileges in the Ports of the ceded territory--the twelve years Shall commence three months after the exchange of ratifications if it Shall take place in France or three months after it Shall have been notified at Paris to the French Government if it Shall take place in the United States; It is however well understood that the object of the above article is to favour the manufactures, Commerce, freight and navigation of France and of Spain So far as relates to the importations that the French and Spanish Shall make into the Said Ports of the United States without in any Sort affecting the regulations that the United States may make concerning the exportation of the produce and merchandize of the United States, or any right they may have to make Such regulations.

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Another particular Convention Signed at the Same date as the present treaty relative to a definitive rule between the contracting parties is in the like manner approved and will be ratified in the Same form, and in the Same time and jointly.

Art: X

The present treaty Shall be ratified in good and due form and the ratifications Shall be As it is reciprocally advantageous to the commerce of France and the United States to encourage the communication of both nations for a limited time in the country ceded by the present treaty until general arrangements relative to commerce of both nations may be agreed on; it has been agreed between the contracting parties that the French Ships

coming directly from France or any of her colonies loaded only with the produce and manufactures of France or her Said Colonies; and the Ships of Spain coming directly from Spain or any of her colonies loaded only with the produce or manufactures of Spain or her Colonies shall be admitted during the Space of twelve years in the Port of New-Orleans and in all other legal ports-of-entry within the ceded territory in the Same manner as the Ships of the United States coming directly from France or Spain or any of their Colonies exchanged in the Space of Six months after the date of the Signature by the Ministers Plenipotentiary or Sooner if possible.

In faith whereof the respective Plenipotentiaries have Signed these articles in the French and English languages; declaring nevertheless that the present Treaty was originally agreed to in the French language; and have thereunto affixed their Seals.

Done at Paris the tenth day of Floreal in the eleventh year of the French Republic; and the 30th of April 1803.

Robt R Livingston [seal]

Jas. Monroe [seal]

BarbéMarbois [seal]

Texts: The National Archives at <http://nara.gov/exhall/orgianls>

My week long adventure



with
**Zebulon
Montgomery
Pike**


By _____

AN ACCOUNT OF EXPEDITIONS
TO THE
Sources of the Mississippi,
AND THROUGH THE
WESTERN PARTS OF LOUISIANA,
TO THE SOURCES OF THE
ARKANSAW, KANS, LA PLATTE, AND PIERRE
JAUN, RIVERS;
PERFORMED BY ORDER OF THE
GOVERNMENT OF THE UNITED STATES
DURING THE YEARS 1805, 1806, AND 1807.
AND A TOUR THROUGH
THE
INTERIOR PARTS OF NEW SPAIN,
WHEN CONDUCTED THROUGH THESE PROVINCES,
BY ORDER OF
THE CAPTAIN-GENERAL,
IN THE YEAR 1807.
By Major Z. M. PIKE.
(ILLUSTRATED BY MAPS AND CHARTS.)

PHILADELPHIA:
PUBLISHED BY C. & A. CONRAD, & CO. NO. 35. CHEESNUT STREET. SOLE
SELLERS, PETERSBURGH, HONSAI, CONRAD, & CO. NORFOLK,
AND FIELDING LUCAS, JR. BALTIMORE.
John Bowers, Printer, 1846.

Day 3:


Day 4:



The page is a worksheet for a 4-day project. It features a blue background with a yellow, torn-edge border decorated with purple stars and yellow stars. The central area is divided into two sections, each with 10 horizontal lines. The top section is labeled 'Day 3:' and the bottom section is labeled 'Day 4:'. A photograph of a man in a top hat is placed in the bottom section.


Day 2:

Day 3:



My week in review: _____

My day 1: _____



The page is a notebook-style writing sheet with a blue border decorated with yellow and purple stars. The central area is lined for writing. On the left side, there are two sections: 'My week in review:' followed by a blank line, and 'My day 1:' followed by a blank line. On the right side, there is a photograph of a person riding a white horse in a grassy field. The page is framed by a blue border with a pattern of yellow and purple stars.

Lesson One - Physical Education

Lesson Title: Preparing for Pike's trip westward.

Students will:

1. Research the size, weight and general health of military soldiers.
2. Instruct students to compile lists of what they believe Pike and his men would need. Compare the student list to the actual list.

Standards with Benchmarks:

#4: Students demonstrate knowledge of the benefits and risks associated with involvement in physical activity.

- d. demonstrate the ability to evaluate risks and safety factors that may affect participation in physical activity throughout life.
- e. demonstrate and/or describe health benefits that result from regular safe participation in physical activity.

#5: Recognition of the role of physical activity and its unique contributions to social, emotional, mental, and physical development.

- b. demonstrate willingness to share individual strengths and knowledge with others.
- c. demonstrate proficiency in a new or advanced level of physical activity.

#6: Recognition of the role of competitive activity in developing physically active lifestyles.

- a. demonstrate cooperative participation when engaged in competitive physical activities
- b. demonstrate according to their ability, leadership and/or fellowship while participating in group activities.

Health:

#6: Students demonstrate the ability to use goal-setting and decision-making skills to enhance health.

c. analyze health concerns that require collaborative decision making and demonstrate the ability to practice health-enhancing behaviors and reduce health risks.

Benchmarks

- Analyze the role of individual responsibility for enhancing health.
- Benefits and risks associated with involvement in physical activity.
- How participation in physical fitness activities contributes to the potential to become a highly productive citizen.

Pike's Pack Inventory – Lt. Pike

Canvas pack – The army pack of this era was canvas, probably painted to waterproof it, blue in color with a red “US” lettered inside a white oval on the flap.

Brass mechanical pencil – the “lead” in these pencils actually were lead metal!

Soldiers pocket knife – probably a single-blade folding style.

Sewing kit – known as a “soldier’s housewife”.

Pint tin cup.

Wooden drum-style canteen w/canvas strap.

Forged awl – handy for punching holes in heavy fabrics and leather.

Steel Striker – commonly called a “firesteel,” it was used with flint chips to start fires.

Flint chips – struck against the firesteel to cause sparks.

Char cloth – a type of tinder used along with the steel and flint to start fires.

Hinged brass box – for keeping the char cloth in.

Polished steel or brass tobacco box w/burning lens – although Pike didn’t use tobacco, he would have found this oval-shaped container with a built-in magnifying glass handy for keeping the firesteel and flint in.

Brass telescope and case – one of Pike’s most oft-mentioned pieces of equipment.

Trade knife and sheath – these were belt knives with a 5-8 inch blade, similar to the type carried by all frontiersmen and Indians.

Tomahawk – frontiersmen and soldiers frequently carried tomahawks stuck in their belts like their Indian compatriots.

Box compass – probably similar to the compass in a protective wood carrying case used by Lewis and Clark.

Camp blanket – probably army-issue white wool with blue or black stripes at each end.

Journal – Pike carried both leather and pasteboard covered journals.

Traveling ink stand – containing ink and a quill pen.

Muslin bags – for keeping incidentals in.

Book of French grammar or military science – Pike was an avid reader, and largely self-taught. He carried books through even the roughest parts of the expedition.

Extra Shirt – white linen or cotton, pullover style with drop sleeves and a one- or two-button front. An officer would have been expected to set an example of personal appearance for his men.

Woolen socks – Pike’s men eventually had to cut up blankets when their socks wore out, but Pike makes no mention of resorting to such measures.

Wooden or horn comb.

Wooden shaving box and straight razor – the Army of Pike’s day were required to be clean-shaven. While there is no mention of Pike requiring his men to shave once they were in the wilderness, a man with Pike’s strong sense of duty would certainly have practiced shaving daily “per regulations”.

Small wood- or brass-framed pocket mirror – used to shave and check personal appearance.

Castile soap with a small washcloth – a man like Pike would have made sure he kept up a clean personal appearance, as would have been expected of an officer in the Republic’s army.

Pike's "Possibles" Bag and Gun Accoutrements

Leather "possibles" bag and sling – a vital part of any rifleman's equipment, the possibles bag kept a variety of shooting accessories at the shooter's disposal, and the flap front kept them protected against the elements. Because Pike carried his own personal rifle instead of a military issue musket, he probably carried a possibles bag, rather than a regulation cartridge box.

Extra gun flints – guns of that period were flintlocks, and the flints usually had to be replaced at least every 40 shots.

Vent pick and pan whisk – because guns of the period fired black powder, they often required cleaning between shots to prevent misfires.

Gun worm – a corkscrew-shaped tool that fastened to the gun's ramrod, and was used to pull objects from the bottom of the gun barrel, and to hold cleaning patches used to clean the inside of the barrel after the shooter was finished firing for the day.

Cloth patches and grease – used to wrap around the bullet before placing it in the barrel. The patch ensured a tight bullet fit and accuracy, and the grease that was put on the patch lubricated and cleaned the barrel with each shot.

Patch knife – Pike may have carried one to cut the patches to size, although he may have carried a wad of pre-cut patches made to fit the caliber of his particular gun.

Shot bag and rifle balls – Pike probably did not use army-issue ammo for his personal gun, so he would have carried the round lead bullets for his rifle in a bag inside the possibles bag.

Powder horn, carrying strap, and powder measure – it is known that Pike and his men were issued powder horns to carry gunpowder for their rifles and muskets. These were hollow cow's horns, capped at the wide end and cut open at the tip end. The tip end had a removable plug, and when the horn was full of powder, the shooter poured it into the attached powder measure, and then dumped it down the barrel of his gun. The horn was usually slung on the shoulder along with the possibles bag.

Pike's Pack Inventory compiled by Clive Siegle, Executive Director, The Santa Fe Trail Association.

Pike's Pack of Indian Presents

Along with exploring, one of Zebulon Pike's most important missions was diplomacy. Like Lewis and Clark, Pike was to meet with important tribal leaders and inform them of the Louisiana Purchase and their new relationship with the United States. Trade was also an important subject, and Pike was to present gifts that would showcase the quality of U.S. made goods, as well as honor their recipients—an important aspect of Indian diplomacy. Pike would be traveling through the lands of the Kanza (Kaw), Osage, and particularly, the Pawnee and Comanches, two powerful tribes considered very important to U.S. interests in the new territory. In the strictest sense, these were not “trade goods,” but presents to be given away.

Unlike Lewis and Clark, we do not have a list of goods Pike purchased. We do know, however, that he had to buy them from local merchants in St. Louis. The following would probably have been included in his assortment of gifts.

Flags – We know that Pike had American flags along, because he gave one to the Pawnee elders that he met with in what is now southern Nebraska. Colorful flags were a symbolic prestige item, and most European nations used them to indicate favor to a tribe.

Peace Medals – It is doubtful that Pike had any of the new Jefferson peace medals that Lewis and Clark took along, but he could have carried a few of the older versions left over from government stores with pictures of George Washington on them. Peace medals were immensely popular items with Indians, and conferred great prestige on those who received them. They were therefore reserved for leading chiefs and important head men.

Trade beads – Beads were one of the most popular trade items among Indians. Pike would have included both bags of loose single beads, and “fathoms” of beads temporarily strung on measured pieces of string. In this era, the beads would have been larger than the tiny “seed” beads used today, types with names like “crow,” “pony” and “padre” beads. The most popular colors were light blue and white, although red and yellow were also popular. Again, these would be given away, rather than traded.

Brooches – These were round silver or German silver rings that pinned to clothing for decoration.

Brass thimbles – These were used for both sewing and, when a hole was drilled in the top of them and sinew or thread run through it, as an embellishment for clothing.

Brass buttons – Indians rarely used them to button clothing together, but rather as rows of ornaments on shirts and dresses.

Needles – An important gift for women, Pike would have not forgotten to take some.

Steel awls – Used to punch holes in leather, awls were one of the most popular gift items among Indian women

Firesteels – Steel strikers used with flint chips to start fires. A very popular gift item on most occasions, but not when Pike presented them to a Pawnee war party he met. A number of them threw away their gifts in disgust, thinking them too “cheap” for their “important” status.

Wool blankets – S useful and prestige gift item. Pike probably took either “point” blankets of the type used in the fur trade, which were marked with stripes woven into an edge to denote their size (and hence their cost in pelts), or white blankets with stripes at each end of the type used by the Army. Unlike the army models, however, some of the Indian gift blankets might have been in colors like red, blue, or green. By winter, Pike’s men were forced to cut up at least part of the blankets for clothing and socks.

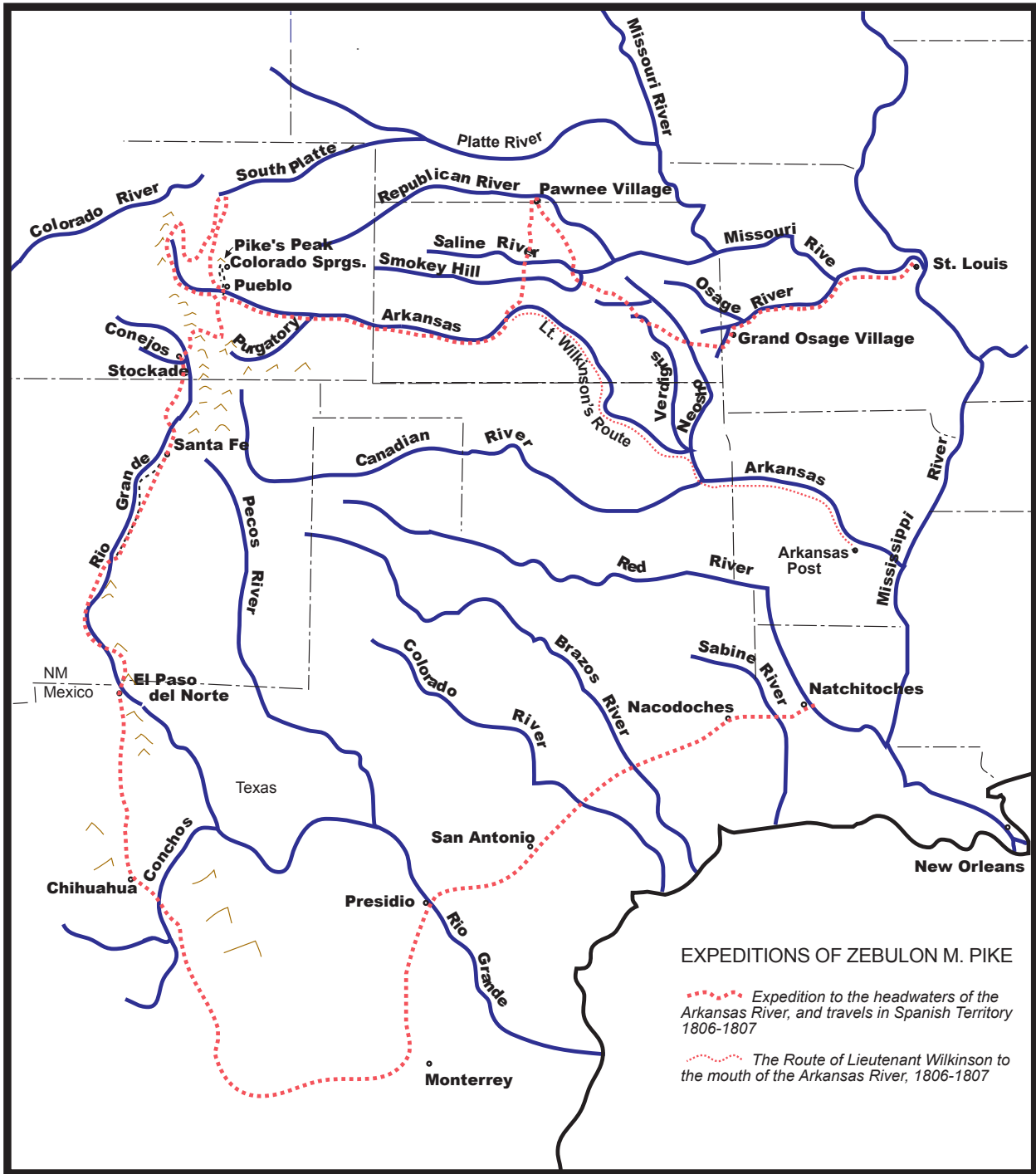
“Scalping” knives – A term used to denote a wood-handled butcher knife style belt knife that was a constant companion of all warriors and most women as well. Despite their name, most did little scalping and much work cutting up meat and chores around camp and on the trail. These were immensely popular gifts and items of trade. They were given without sheaths, and Indian women were renowned for crafting beautifully quilled or beaded ones for their family members.



SECTION 2 | THE JOURNEY BEGINS



PHOTOGRAPHY CREDIT -
HARP FOUNDATION, PHOTOS BY APS PHOTOGRAPHY



Members of the second Pike Expedition, 1806-07:

Lt. Zebulon Pike

Lt. James B. Wilkinson

Antoine Baronet Vasquez (civilian interpreter)

Dr. John H. Robinson

Sgt. Joseph Ballinger (sent back with Wilkinson party)

Cpl. Jeremiah R. Jackson

Cpl./Sgt. William C. Meek (killed Pvt. Theodore Miller while captive in Mexico)

Pvt. John Boley (was also on Lewis and Clark expedition; sent back with Wilkinson party; deserted)

Pvt. Samuel Bradley (sent back with Wilkinson party; deserted)

Pvt. John Brown

Pvt. Jacob Carter

Pvt. Thomas Daugherty (Pike's waiter; one of those who sent toe bones to Pike)

Pvt. William Gordon

Pvt. Solomon Huddleston (sent back with Wilkinson party; deserted)

Pvt. Henry Kennerman (deserted in Missouri)

Pvt. Hugh Menaugh (frostbitten but returned to stockade)

Pvt. Theodore Miller (killed in Mexico by Meek)

Pvt. John Mountjoy

Pvt. Alexander Roy

Pvt. Patrick Smith

Pvt. John Sparks (hunter; one of those who sent toe bones to Pike)

Pvt. Freegift Stout

Pvt. John Wilson (sent back with Wilkinson party)

This article is a contribution to the Zebulon Pike Bicentennial by Bob Moore, Park Historian of the Jefferson National Expansion Memorial National Park, St. Louis, MO.

Lesson Two – History/Geography

Standards with Benchmarks:

History 1.2 Students use chronology to organize historical events and people.

As students in grades 5-8 extend their knowledge, what they know and are able to do includes

- construction tiered timelines to show how different series of events happened simultaneously and
- illustrating the time structure of events in historical narratives

Geography 1.1 Students know how to use maps, globes, and other geographic tools to acquire, process, and report information from a spatial perspective

- c. interpret maps and other geographic tools, through the analysis of case studies and using data
- d. use geographic tools to represent and interpret Earth's physical and human systems

Geography 5.2 Students know how physical systems affect human systems

- b. analyze how humans perceive and react to natural hazards

Geography 6.1 Students know how to apply geography to understand the past

- b. analyze the fundamental role that places and environments have played in history

Essential Question: What difference does a detailed and relevant map make for an explorer?

Content Objectives:

1. We will compare and contrast the expeditions between Lewis & Clark and Zebulon Pike

Language Objectives:

1. We will read historical accounts of expeditions of Lewis & Clark and Zebulon Pike
2. We will write in a Venn diagram to compare and contrast the expeditions between Lewis & Clark and Zebulon Pike

Key Vocabulary:

Louisiana Purchase
Mississippi River
Thomas Jefferson
Pueblo, CO
Pikes Peak

Canada
Zebulon M. Pike
Merriweather Lewis

Rocky Mountains
Canada
Zebulon M. Pike

Lesson Overview:

(Activities, procedure for delivery of instruction)

1. Write on the board
 - If you were going a trip for the summer approximately 8 weeks what would you take with you.
 - Discussion.
2. Pike and Lewis and Clark
 - Divide the class into two groups—give them 30 minutes to complete the assignment.
 - Research Pike (internet or reference) - What information can they find on Pike?
 - Reserach Lewis and Clark (internet or reference) - What information can they find on Lewis and Clark?
3. Have students display their lists on the board.
4. Compare and contrast the two expeditions.
5. Closure—write a short paragraph—your opinion which expedition would you like to have been on and why using examples from your Venn diagram.

Strategies for differentiation:

- Have students use the shorten list for Lewis & Clark expedition.
- Have students draw out a Venn diagram.
- Compare and contrast the two expeditions as a class.

Materials/Resources:

1. Internet/reference (including writing from this curriculum guide).
2. Butcher paper (for student lists).

Assessment:

1. Oral questioning
2. Participation
3. Venn diagram
4. Written assignment for bell work & closure

Evaluation/Reflection:

Getting Underway

By Clive G. Siegle

Zebulon Pike set out on July 15, 1806 with an assortment of nineteen enlisted men and Non-Commissioned Officers from the First Infantry Regiment; his second-in-command, Lt. Wilkinson; a volunteer physician, Dr. John H. Robinson; and Baronet Vasquez, an interpreter from St. Louis. The group made their way across Missouri, returning the Osage people to their villages (in the area of today's Lake of the Ozarks), and moving out diagonally across Kansas.

Pike talked a band of Pawnee Indians into hauling down a Spanish flag which flew above their village, and replacing it with the Stars and Stripes, despite the fact that a troop of Spanish cavalry 300 strong had recently visited.

Upon reaching the Arkansas River, Lt. Wilkinson left the party with five men, returning successfully to St. Louis despite three desertions. Pike and the fifteen others started up the Arkansas on October 28, following the trail of a troop of Spanish cavalry. On November 11, Pike made a bold decision; despite the fact that his party did not have the clothing, equipment or supplies for a winter expedition, they would press on. Proceeding nearly due west, they reached the site of modern-day Pueblo, Colorado on November 23.

The Blue Mountain

Fascinated with a blue peak in the Rocky Mountains to the west that he had first sighted on November 15, Pike set out to explore it with two soldiers and Dr. Robinson, leaving the bulk of the men at a base camp. Pike spent several days in trying to reach the peak (which would later bear his name), but the lack of winter clothing and food eventually drove him back to the base camp near present day Pueblo, Colorado.



Lesson Two – Science

Lesson Title: Westward Expansion and the Discovery of New Species

Standard with Benchmarks:

Colorado Science Standard 3.1 – Students know and understand the characteristics of living things, the diversity of life, and how living things interact with each other and their environment.

Benchmarks 5-8: Describe how an environment's ability to provide food; water, space, and essential nutrients place limitations on populations.

Objectives Students will understand the following:

Classification is the arrangement of objects, ideas, or information into groups, the members of which have one or more characteristics in common.

Classification makes things easier to find, identify, and study. Scientific classification groups all plants and animals on the basis of certain characteristics they have in common. Scientific classification uses Latin and Greek words to give each animal and plant two names (similar to a first and last name) that identify the animal or plant.

For this lesson, you will need:

- pictures of a variety of animals;
- general research materials on animals (e.g., biology books, encyclopedia)
- computer with Internet access.

As background information, let students know that, beginning in ancient times, scientists tried to develop a system of classifying animals and plants. The system we use today was developed by the Swedish naturalist Carolus Linnaeus (1707-1778), who separated animals and plants according to certain physical similarities and gave identifying names to each species.

Without introducing Linnaeus's system, simply let students know that animals are classified by their physical characteristics. Then have them do simple classification activities with objects around the classroom.

Essential Questions:

How did exploration and the movement westward affect the established populations of native animals in particular the prairie dog?

What is the current standing of prairie dog populations?

What are some examples of everyday words that name groups or classes of things? Think about subjects you study in school such as grammar, math, and social studies. What problems would arise if words such as noun (a word for a class of words) and fraction (a word for a class of numbers) did not exist?

How do we use classification to make our everyday lives easier? For example, how would you use classification to do the following: organize your desk, organize your drawers or closet, plan a meal, decide what clothes to take on a trip?

Linnaeus's system of animal classification is based on common physical characteristics. Can you devise a system of animal classification based on some other idea—behavior or habitat, for example? In your new system, what animals would be classed together that are not classed together in Linnaeus's system?

We classify people in many ways; for example, by race, religion, physical appearance, ethnic origin, profession, life style, and so on. In which ways can classification of human beings be helpful? In which ways can it be harmful?

Evaluation

Evaluate each group's classification system on the basis of whether it adequately identifies the objects classified, eliminating all other objects.

NewSpecies

Have students work in pairs or groups to create new animal species. Invite students to imagine that they have discovered a new species of animal, never before seen. They should draw a picture of their animal, describe its physical and behavioral characteristics, describe its habitat, and make up a name for it that would fit into the system of binomial nomenclature. Encourage students to use their imaginations when creating their new species.

Enduring Understanding:

Humans have the greatest potential for impacting ecosystems and biodiversity than any other species on earth whether the act of man are intentional or unintentional.

Content Objective:

Students will explore the role of the prairie dog as it pertains to sustaining life. Students will explore human impact on biodiversity.

Language Objectives:

Students will collaboratively share their classification chart by presenting them to the class.

Pike and the Prairie Dog

Zebulon Pike was among the first to describe the prairie dog in a published document. His cautious presentation of the legend that the animal lived in the same burrow with the rattlesnake and the horned toad was in the contemporary tradition. The following is the excerpt from his journal regarding the black tailed prairie dog (*Cynomys ludovicianus*).

October 25, Friday. – We ascended the right branch [Pawnee River] about five miles, but could not see any sign of the Spanish trace; this is not surprising, as the river bears south west, and they do doubt kept more to the west from the head of one branch to another. We returned and on our way, killed some prairie squirrels, or Wishtonwishes, and nine large rattle snakes, which frequent their villages.

The Wishtonwish of the Indians, prairie dogs of some travelers; or squirrels as I should be inclined to denominate them; reside on the prairies of Louisiana in towns or villages, having an evident police established in their communities, The sites of their towns are generally on the brow of a hill, near some creak or pond, in order to be convenient to water, and that the high ground which they inhabit, may not be subject to inundation. Their residence, being under ground, is burrowed out, and the earth which answers the double purpose of keeping out the water, and affording an elevated place in wet seasons to repose on, and to give them a further and more distinct view of the country. Their holes descend in a spiral form, therefore I could never ascertain their depth; but I once had 140 kettles of water pored into one of them in order to drive out the occupant, but without effect, In the circuit of the villages, they clear off all the grass, and leave the earth bare of vegetation; but whether it is from an instinct they possess inducing them to keep the ground thus cleared, or weather they make use of the herbage, as food, I cannot pretend to determine. The latter opinion, I think entitled to a preference, as their teeth designates them to be of the granivorous species, and I know of no other substance which is produced in the vicinity of their positions, on which they could subsist; and they never extend their excursions more than half a mile from the burrows. They are of a dark brown color, except their bellies, which are white. Their tails are not so long as those of our grey squirrels, but are shaped precisely like theirs; their teeth, head, nails, and body, are the perfect squirrel, except that they are generally fatter than that animal. Their villages sometimes extend over two and three miles square, in which there must be innumerable host of them, as there is generally a burrow every ten steps in which there are two or more, and you see new ones partly excavated on the borders of the town. We killed great numbers of them with our rifles and found them excellent meat, after they were exposed a night of two to the frost, by which means the rankness acquired by subteranneous dwelling is corrected. As you approach their towns, you are saluted on all sides by the cry of Wishtonwish, from which they derive their name with the Indians, uttered in a shrill and piercing manner. You then observe them all retreating to the entrance of their burrows, where they post themselves, and regard every, even the slightest movement that you make. It requires a very nice shot with a rifle to kill them, as they must be killed dead, for as long as life exists, they continue to work into their cells. It is extremely dangerous to pass through their towns, as they abound

with rattles snakes, both of the yellow and black species; and strange as it may appear, I have seen the Wishtonwish, the rattle snake, the horn frog, of which the prairie abounds, (termed by the Spaniards the cammellion, from their taking no visable sustenance) and a land tortoise all take refuge in the same hole. I do not pretend to assert, that it was their common place of resort, but I have witnessed the above facts more than in one instance. their cells. It is extremely dangerous to pass through their towns, as they abound with rattles snakes, both of the yellow and black species; and strange as it may appear, I have seen the Wishtonwish, the rattle snake, the horn frog, of which the prairie abounds, (termed by the Spaniards the cammellion, from their taking no visable sustenance) and a land tortoise all take refuge in the same hole. I do not pretend to assert, that it was their common place of resort, but I have witnessed the above facts more that in one instance.

Jackson, Donald - The Journals of Zebulon Pike; Univeristy of Oklahoma Press, 1966.
Page 238

Animal Classification Worksheet

Use field guides, textbooks, and other resources to classify three familiar wild animals other than the giant panda (which is the example shown below). Enter your findings on this worksheet. Example:

Common Name:

Giant Panda

Domain:

Eucarya (includes animals, fungi, protists, and plants)

Kingdom:

Animalia (animals)

Phylum:

Chordata (vertebrates)

Class:

Mammalia (mammals)

Order:

Carnivora (bears, dogs, cats, weasels, etc.)

Family:

Ursidae (bears)

Genus:

Ailuropoda

Species:

melanoleuca

Common Name

I.

II.

III.

Domain

Kingdom

Phylum

Class

Order

Family

Genus

Species

Prairie Dog Geography – Range

Throughout most of the western United States from Canada to Mexico -- Montana, the Dakotas, Nebraska, Kansas, Oklahoma, Texas, New Mexico, Colorado, Arizona, Utah, and Wyoming -- including higher elevations of the Mojave, Great Basin and Chihuahuan deserts.

Related Species

Prairie Dogs are the most social members of the Squirrel Family and are closely related to ground squirrels, chipmunks and marmots. There are 5 species of Prairie Dogs (genus *Cynomys*):

Black-tailed Prairie Dog (*C. ludovicianus*) occupies narrow bands of dry plains stretching from central Texas to Canada.

White-tailed Prairie Dog (*C. leucurus*) inhabits Western US: Colorado, Utah, Wyoming, and Montana.

Gunnison's Prairie Dog (*C. gunnisoni*) has a much shorter tail than other Prairie Dogs, and it is uniquely colored and centers around the Four Corners from 5000-11000 feet.

Mexican Prairie Dog (*C. mexicanus*) is an endangered species with a limited distribution only within parts of Mexico.

Utah Prairie Dog (*C. parvidens*) is the smallest of all Prairie Dogs and threatened.

Comparisons

Of the two main species of Prairie Dogs, the Black-tailed (*C. ludovicianus*) has a black-tipped tail and is much more widespread, occurring sparsely over the Great Plains and throughout the Great Basin. Black-tailed are the Prairie Dogs normally sold in pet shops and may either be a baby caught in the wild or from a breeder.

The other main species, the White-tailed Prairie Dog (*C. leucurus*), has a white-tipped tail and inhabits higher altitudes than the Black-tailed. It hibernates in winter and is less colonial in habit.



Description

Prairie Dogs are robust rodents, slightly grizzled and fat. They have broad, rounded heads, hairy tails and short legs. The skull has 22 teeth.

Prairie Dogs weigh 1 1/2 to 3 lbs. The head and body are 11 to 13 inches long, with a tail length of 3 to 4 inches. They are yellowish in color, with darker ears and a pale buff to whitish belly. Prairie Dogs have whitish or buffy patches on the sides of their nose, their upper lips and around their eyes in the form of a ring.

Vital Stats

Weight: 1.5-3 lbs.
Length with tail: 3-5"
Shoulder Height: 3-4"
Sexual Maturity: 1 year
Mating Season: March-April
Gestation Period: 28-32 days
No. of Young: 3-8, 5 avg.
Birth Interval: 1 year
Lifespan: 3-5 years in the wild

Class:

Class: Mammalia
Order: Rodentia
Sub Order: Sciurognathi
Family: Sciuridae
Sub Family: Sciurinae
Genus: Cynomys
Species: 5 in North America

Socialization

Prairie Dogs have a high-pitched, bark-like call. Recent studies suggest that Prairie Dogs possess the most sophisticated of all natural animal languages. They apparently issue different sounds identifying various predators, which include hawks, owls, eagles, ravens, coyotes, badgers, ferrets and snakes. Prairie Dogs can run up to 35 miles per hour for short distances. The Prairie Dog has only one defense that works -- raising the alarm and disappearing quickly.

Tail

Prairie Dog tails are generally short and bushy, but vary considerably in length and color between species.

Ears

Prairie Dogs' ears are very short and often hidden in the fur.

Eyes

Prairie Dogs' eyes, which are positioned on the sides of the head, appear to be adapted for detecting movement over a wide arc; this allows the detection of predators with greater success.

Feet

Prairie Dog's feet are usually a creamy color.

Behavior

All Prairie Dogs are diurnal. While most may be dormant for short periods of cold weather, the White-tailed species is a true hibernator in winter.

Prairie Dogs have an intricate social system composed of one male and several close-kin females and their offspring. Populations vary from 5 to 35 per acre.

The Prairie Dog digs its own burrows. There is a well-constructed and frequently reinforced dike against flooding from sudden rains. The entrance holes themselves are funnel-shaped, from 3 to 4 inches in diameter.



These tunnels lead down a steeply slanting corridor 15 or 16 feet before leveling off for another 20 to 50 feet. There are side chambers for storage, for nesting and for escape should the tunnel be invaded by predators or flooding. They may extend 100 feet or more.

When a predator approaches, the first alert Prairie Dog gives a sharp warning call, bobs up and down in excitement, calls again and then plunges below. The danger signal is a 2-syllable bark, issued at about 40 per minute. Other sentinels farther from the danger zone take up the watch, monitoring the course of the predator.

Short and medium grass prairies and plateaus of the American West.

Food & Hunting

Although Prairie Dogs are almost exclusively vegetarian, nursing females have been observed both cannibalizing and communally nursing each other's pups. The various native plants of the Great Plains make up the Prairie Dog's primary diet, comprising all kinds of grasses, roots, weeds, forbs and blossoms. They acquire all of their water from the food they eat. Sometimes insects are also eaten.

Curious Prairie Dog Facts

Prairie Dogs are stout, burrowing rodents among the many varieties of ground squirrels.

Prairie Dog burrows are called “towns.”

Most Prairie Dogs hibernate during the winter.

Settlers called them “dogs” and “sod poodles” because of their high-pitched, bark-like call.

As members of the genus *Cynomys* (Greek for “mouse dog”), all 5 species of Prairie Dogs belong to the Squirrel Family (Sciuridae).

Prairie Dogs issue different sounds identifying various predators, which include hawks, owls, eagles, ravens, coyotes, badgers, ferrets and snakes.

At the turn of the century, as many as 5 billion Prairie Dogs occupied millions of acres of grass prairies across the West.

In 1900, a huge Prairie Dog settlement, 100 miles by 250 miles, was reported on the high plains of Texas containing an estimated 400 million Prairie Dogs!

Breeding

One litter is born to the Prairie Dog female each year. During a 4- or 5- hour estrus, a female Prairie Dog may mate with as many as 5 different males, allowing pups from the same litter to have different fathers.

For the Black-tailed, mating generally occurs in late January, with the young being born in March and April (a gestation period of 28 to 32 days). The White-tailed mates in March or April, with the young being born in May. These youngsters hibernate with their parents October through March in the north and in high mountain valleys.

How did exploration and the movement westward affect the established populations of native animals in particular the prairie dog?

What is the current standing of prairie dog populations?



There are usually 3 to 5 youngsters in a litter, but sometimes as many as 8. The young are blind and hairless. Their eyes don't open for 33 to 37 days. At about 6 weeks, they begin to appear above ground and are ready to be weaned. They probably separate from the mother by early fall.

During May and the early part of June, the young begin to emerge from their burrows for the first time. At this time, yearlings (young from the previous year) and some adults may relocate, leaving the young pups to feel secure both socially and environmentally in the old burrow. When Prairie Dogs relocate, they take over abandoned holes or dig new holes at the edge of the town. A few may travel miles in search of new areas, but once away from the communal warning system, most are easy prey for predators.

Conservation

Common predators of the Prairie Dog include coyotes, bobcats, eagles, hawks, badgers and weasels.

Because they eat as much as 7 percent of a ranch's forage, Prairie Dog eradication programs have been underway for decades in the American West. But a growing number of experts argue that Prairie Dogs may actually be beneficial, that they are natural fertilizers who also increase the protein content and digestibility of rangeland grasses.

Today, after decades of eradication by federal, state, and local governments, devastation from disease, poisoning, recreational shooting and habitat destruction, Prairie Dogs are rapidly disappearing. More have been exterminated than remain, inhabiting only about 2 percent of their former range. Colonies are being preserved, however, in Wind Cave National Park, Devils Tower National Monument and in the Wichita Mountains Wildlife Reserve. The city of Santa Fe, New Mexico maintains a municipal park with a resident colony of Gunnison's Prairie Dogs.

Cautions

Prairie Dogs are very susceptible to bubonic plague, acquiring it from fleas infected with plague bacteria. Most public health officials believe the chance of contracting plague from Prairie Dog fleas is very low, but flea-borne disease can wipe out a colony. Prairie Dogs have lived up to 8 1/2 years in captivity.

Lesson 2 – Math

Standards with Benchmarks:

Colorado Mathematics Standard 2: Students use algebraic methods to explore, model, and describe patterns and functions involving numbers, shapes, data and graphs in problem-solving situations and communicate the reasoning used in solving these problems.

Benchmark a: represent, describe and analyze patterns and relationships using hands-on materials, tables, graphs, verbal rules and standard algebraic notation.

Essential Question: How can we represent Zebulon Pike’s progress through his expedition graphically?

Content Objective:

Students will analyze graphical information that applies to Zebulon Pike’s Expedition.

Language Objective:

Students will write definitions for vocabulary words.
Students will draw pictures for vocabulary words.

Key Vocabulary:

graph- a pictorial representation of a set of data.
x-axis- the horizontal number line of a coordinate system.
y-axis- the vertical number line of a coordinate system.
origin- the point (0,0) on a coordinate system where the x and y axis’ intersect.

Lesson Overview:

1. Have students work in pairs to complete the vocabulary pictures and definitions.
2. Switch pairs and have students refine and add to their answers.
3. As a class, go over definitions and possible pictures for each word.
4. Review how to make a bar graph.
5. Allow students time to complete the graphing exercise, individually or with a partner.
6. To wrap up the lesson, as students to stand up one by one and state one thing or reason why the progress varied so significantly from day to day.

Strategies for Differentiation:

1. Allow for flexible grouping.
2. More advanced students can be given sets of ordered pairs and asked to estimate extrapolate data points or find the mean, median and mode.
3. Follow up lessons might include a similar lesson that relates to student interests.

Materials/Resources:

Vocabulary worksheet, Pike Progress worksheet.

Assessment:

Students will correctly graph Zebulon Pike's Progress and identify conceivable reasons for changes in progress.

Evaluation/Reflection:

Name _____

Date _____

Hour _____

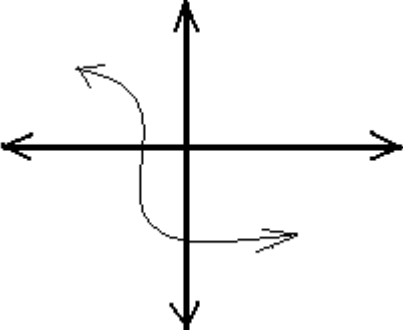
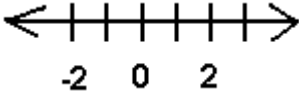
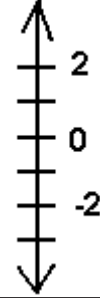
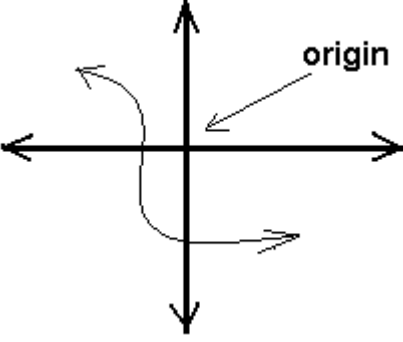
Word	Definition	Picture
Graph		
X-axis		
Y-axis		
Origin		

Name _____

Name _____ key _____

Date _____

Hour _____

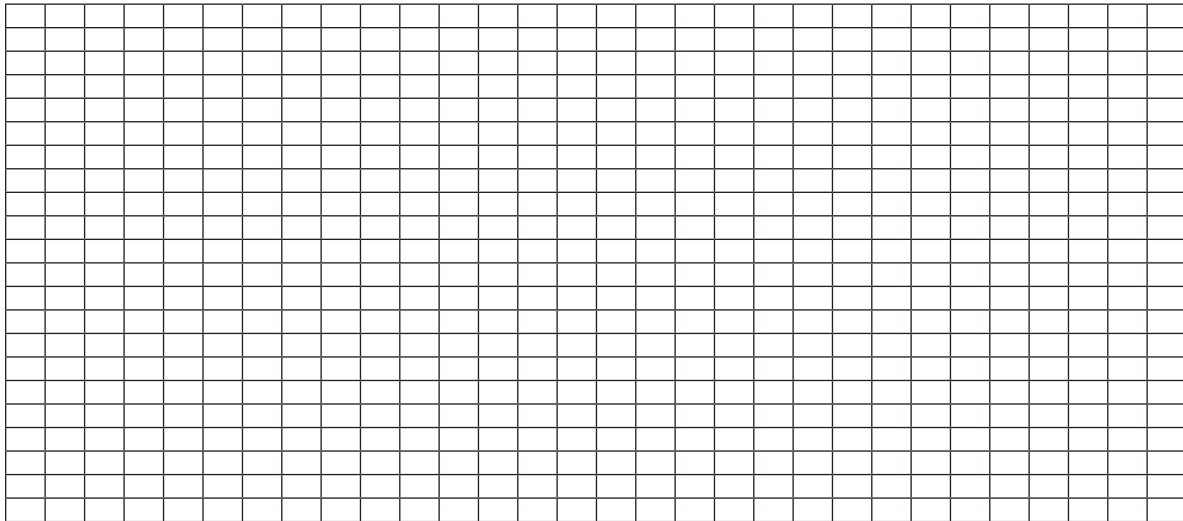
Word	Definition	Picture
Graph	A pictorial representation of a set of data.	
X-axis	The horizontal number line of a graph.	
Y-axis	The vertical number line of a graph.	
Origin	The point (0,0) where the x and y axis intersect.	

Date _____

The chart below shows the progress Pike's expedition made on various dates.

Date	Progress (miles)
July 21, 1806	6
July 30, 1806	5
August 6, 1806	15
August 12, 1806	0
October 22, 1806	5
December 22, 1806	12
December 23, 1806	13
January 18, 1807	0
January 29, 1807	17
January 30, 1807	24

1. In the space provided below, graph the expedition's progress in miles for each day listed in the chart.



2. According to the chart, there were several days when no progress was made. Can you think of any reasons why the expedition was not moving?

Lesson Two – Reading/Writing

Lesson Title: Zebulon Pike and Exploring the Southwest

Standards with Benchmarks: Reading

Standard 1: Students read and understand a variety of materials.

- f. make connections between their reading and what they already know, and identify what they need to know about a topic before reading about it.
- f. use information from their reading to increase vocabulary and enhance language usage.

Standard 4: Students apply thinking skills to their reading, writing, speaking, listening, and viewing.

- g. recognize, express, and defend points of view orally and in writing.
- h. identify the purpose, perspective, and historical and cultural influences of a speaker, author, or director.
- i. evaluate the reliability, accuracy, and relevancy of information.

Standard 6: Students read and recognize literature as a record of human experience.

- e. read literature to understand places, people, events, and vocabulary, both familiar and unfamiliar.
- f. read literature that reflects the uniqueness and integrity of the American experience.

Essential Question: What were Zebulon Pike's orders? Who gave the orders?

Content Objectives:

1. We will read and discuss Pike's military orders.
2. We will utilize visualization questions in conjunction with the reading.

Language Objectives:

1. We will read excerpts from *Zebulon Pike Explorer and Soldier* by Robin Doak.
2. We will define vocabulary words as they appear in the reading.

Lesson Overview: (20 – 30 minutes)

(Activities, procedure for delivery of instruction)

1. Hand out Reading Two and read with the students asking visualization questions as the material is read.
2. Have the students record any teacher designated vocabulary words into their notes.
3. Hand out journals and have the students make an entry. Prompt: Would you want to make such a journey as Pike?

Materials/Resources:

1. Reading handout Example Two for students
2. Journal booklet.

Assessment:

1. Oral questioning
2. Participation
3. Journal entry

Evaluation/Reflection***Vocabulary and Meaning:***

Cantonment -

Deputation -

Phrases and Meaning:

...proceed without delay -

...embark the late Osage Captives -

...transport the whole -

...constitutes the primary object of your expedition -

...move with such caution, as may prevent surprise -

...to repel with your utmost force –

Additional vocabulary:

Reading Lesson Two

The objectives of Pike's expedition are set forth in the following letter of instruction from Gen. Wilkinson, by whose command the expedition was undertaken:

St. Louis, June 24, 1806.

To Lieut. Z. M. Pike:

Sir -- You are to proceed without delay to the cantonment on the Missouri, where you are to embark the late Osage captives, and the deputation recently returned from Washington with their presents and baggage, and are to transport the whole up the Missouri and Osage Rivers to the town of the Grand Osage. The safe delivery of this charge, at the point of destination, constitutes the primary object of your expedition, and therefore, you are to move with such caution as may prevent surprise from any hostile band, and are to repel with your utmost force any outrage that may be attempted. Having safely deposited your passengers and their property, you are to turn your attention to the accomplishment of a permanent peace between the Kansas and Osage nations, for which purpose you must effect a meeting between the head chiefs of those nations, and are to employ such arguments, deduced from their own obvious interests, as well as the inclinations, desires and commands of the President of the United States, as may facilitate your purpose, and accomplish the end. A third object of considerable magnitude will then command your attention; it is to effect and interview, and establish a good understanding with Setans or Tamanches. For this purpose, you must interest White Hair, of the Grand Osage, with whom, and a suitable deputation, you will visit the Pawnee Republic, where you may find interpreters, and inform yourself of the most feasible plan by which to bring the Tamanches to a conference. Should you succeed in this attempt, and no pains must be spared to effect it, you will endeavor to make peace between us and them, particularly the Osage; and, finally, you will endeavor to induce eight or ten of their distinguished chiefs to make a visit to the seat of government next September, and you may attach to this deputation four or five Pawnees, and the same number of Kansas chiefs. As your interview with the Tamanches will probably lead you to the head branches of the Arkansas and Red Rivers, you may find yourself approximated to the settlements, and therefore it will be necessary you should move with great circumspection to keep clear of any hunting or reconnoitering parties from that province, and to prevent alarm or offence, because the affairs of Spain and the United States appear to be on the point of amicable adjustment; and, moreover, it is the desire of the President to cultivate the friendship and harmonious intercourse of all the nations of the earth, and particularly our nearest neighbors--the Spaniards.

In the course of your tour, you are to remark particularly upon the geographical structure, the natural history and population of the country through which you pass, taking particular care to collect and preserve specimens of everything curious in the mineral and botanical worlds, which can be preserved and are portable. Let your courses be regulated by your compass, and your distances by your watch, to be noted in a field book; and I would advise you, when circumstances permit, to protract and lay down in a separate book, the march of the day at every evening's halt.

The instruments which I have furnished will enable you to ascertain the variations of the magnetic needle, and the latitude, with exactness; and at every remarkable point I wish you to employ your telescope in observing the eclipses of Jupiter's satellites, having previously regulated and adjusted your watch by your quadrant, taking care to note with great nicety the periods of immersion and emersion of the eclipsed satellite. These observations may enable us, after your return, by application to the appropriate tables, which I cannot now furnish you, to ascertain the longitude. It is an object of much interest with the executive, to ascertain the direction, extent and navigation of the Arkansas and Red Rivers; as far, therefore, as may be compatible with these instructions, and practicable to the means you may command, I wish you to carry your views to those subjects, and should circumstances conspire to favor the enterprise, you may detach a party, with a few Osages, to descend the Arkansas, under the orders of Lieut. Wilkinson or Sergt. Ballinger, properly instructed and equipped, to take the courses and distances; to remark on the soil, timber, etc., and to note the tributary streams. This party will, after reaching our post on the Arkansas, descend to Fort Adams, and there wait further orders. And you yourself may descend the Red River, accompanied by a party of the most respectable Comanches, to the post of Natchitoches, and thus receive further orders. To disburse your necessary expense, and to aid your negotiations, you are herewith furnished six hundred dollars' worth of goods, for the appropriation of which you are to enter a strict account, vouched by documents to be attested by one of your party.

Wishing you a safe and successful expedition,

I am, Sir, with much respect and esteem,

Your very obedient servant,

JAMES WILKINSON.

Lesson Two - Physical Education

Students will decide what training and preparation the soldiers would have needed for the trip westward.

- Demonstration of competency in physical fitness through health related fitness and performance related/motor skill fitness.
- Demonstrate cardiovascular fitness by sustaining and maintaining a moderate aerobic activity at target working heart rate for 30-40 minutes.
- Demonstrate thorough knowledge and implementation, principles of training, including overload, progression and specificity of training, in all areas of health related fitness.

Standards with Benchmarks:

#4: Students demonstrate knowledge of the benefits and risks associated with involvement in physical activity.

- d. Demonstrate the ability to evaluate risks and safety factors that may affect participation in physical activity throughout life.
- e. Demonstrate and/or describe health benefits that result from regular safe participation in physical activity.

#5: Recognition of the role of physical activity and its unique contributions to social, emotional, mental, and physical development.

- b. Demonstrate willingness to share individual strengths and knowledge with others.
- c. Demonstrate proficiency in a new or advanced level of physical activity.

#6: Recognition of the role of competitive activity in developing physically active lifestyles.

- a. Demonstrate cooperative participation when engaged in competitive physical activities.
- b. Demonstrate according to their ability, leadership and/or fellowship while participating in group activities.

Health:

#6: Students demonstrate the ability to use goal-setting and decision-making skills to enhance health.

- c. Analyze health concerns that require collaborative decision making

Benchmarks

- Analyze the role of individual responsibility for enhancing health.
- Benefits and risks associated with involvement in physical activity.
- How participation in physical fitness activities contributes to the potential to become a highly productive citizen.



SECTION 3 | PIKE AND FAMILY



PHOTO TOP: COLORADO HISTORICAL SOCIETY ZEBULON PIKE-
BOTTOM: PIKE FAMILY ASSOCIATION CREST
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Lesson Three – Social Studies

Standards with Benchmarks:

Geography 5.2 Students know how physical systems affect human systems.

b. analyze how humans perceive and react to natural hazards.

Geography 6.1 Students know how to apply geography to understand the past.

b. analyze the fundamental role that places and environments have played in history.

History 3.2 Students understand the history of social organization in various societies.

b. explain how social organization has been related to distributions of privilege and power.

Essential Question: How much influence do friends and family have over your life?

Content Objectives:

1. We will analyze written historical writings to determine what influence family and friends have on who would lead the western exploration expeditions.

2. We will create a family tree for Zebulon Pike.

Language Objectives:

1. We will read short excerpts from historical documents to determine what influence family and friends had on who would lead the western exploration expeditions.

2. We will write out a family tree for Zebulon Pike.

Key Vocabulary:

Thomas Jefferson

Zebulon M. Pike

Meriwether Lewis

William Clark

General James Wilkinson

1. Discuss — How do you think Zebulon Pike viewed his family.

Handout **Pedigree Chart**

– Have students fill out their own information—they become #1 person on the family tree.

2. Written assignment — How much influence did family and friends have on who would lead the western exploration expeditions?

a. Evaluate from the chart—use examples.

3. Closure — Have students briefly state how much influence their friends have on their life — their families.

Strategies for differentiation:

- Students can do in small groups or individual work.
- Highlight parts of the reading to make it easier for students to find.

ZEBULON MONTGOMERY PIKE

Zebulon Montgomery Pike was born in Lambertton (Somerset County), New Jersey on January 5, 1779. He was the second of eight children, and the only one to grow to robust adulthood. Four of his siblings died in infancy, the other three were hopeless tuberculosis cases, invalids throughout their lives. At the time that he was born, Pike's father, also named Zebulon Pike, was an officer in George Washington's army, then engaged in fighting the British for American Independence. The elder Pike continued to serve in the military at the conclusion of the war, and young Zebulon grew up on frontier military posts as a result.

By 1799, when he was 20 years old, Pike was commissioned a first lieutenant in the First Infantry Regiment, stationed in western Pennsylvania. He was a zealous and efficient soldier, not above hiding in the bushes outside the fort to catch his men drinking and causing disturbances, and not above turning them in for harsh punishment. A fellow officer described him as having a military appearance, with the exception of a peculiar habit of cocking "his head to one side so that the tip of his chapeau touched the right shoulder on parade." Pike stood 5'8" tall, with a ruddy complexion, blue eyes and light hair. He liked outdoor sports, was a crack shot and had great physical endurance, probably the result of his childhood on the frontier.

In the early 1800s, Pike fell in love with his cousin, Clarissa (Clara) Brown of Kentucky. Although Clara's father, Pike's uncle, refused to give his permission to marry, Pike persisted. In 1801, he and 18-year-old Clara eloped to Cincinnati. After Clara's marriage, her father refused to see or speak to the pair, and he and his daughter never completely reconciled. Five children were born to the union of Pike and Clara, however, Clarissa (February 24, 1803) was to the only one of the five to survive childhood.

A CHANCE FOR ADVENTURE

On April 3, 1803, President Thomas Jefferson purchased a huge area of land west of the Mississippi River from France. With one stroke of a pen - and \$15 million - Jefferson double the size of the United States. The purchase of the property created problems between the United States and Spain. Prior to the purchase, the Louisiana Territory had been controlled by the Spanish, Spain and the United States disagreed on the exact boundaries of the Louisiana Territory. The southern and western boundaries in particular had not been specified in the treaty between the United States and France.

One of the nation's top priorities was to learn more about the new purchase. To accomplish this goal, he sent Army officers Meriwether Lewis and William Clark on an expedition to explore, map, and document the land. First Lieutenant Zebulon Pike received orders that he was to command a mission of exploration to find the source of the Mississippi River. Along the way he would have other missions to accomplish. Pike was to meet with and observe the native tribes he came across while traveling. He was also to buy areas of land on which the Army could later build forts. In addition, he was told to collect scientific and astronomical data.

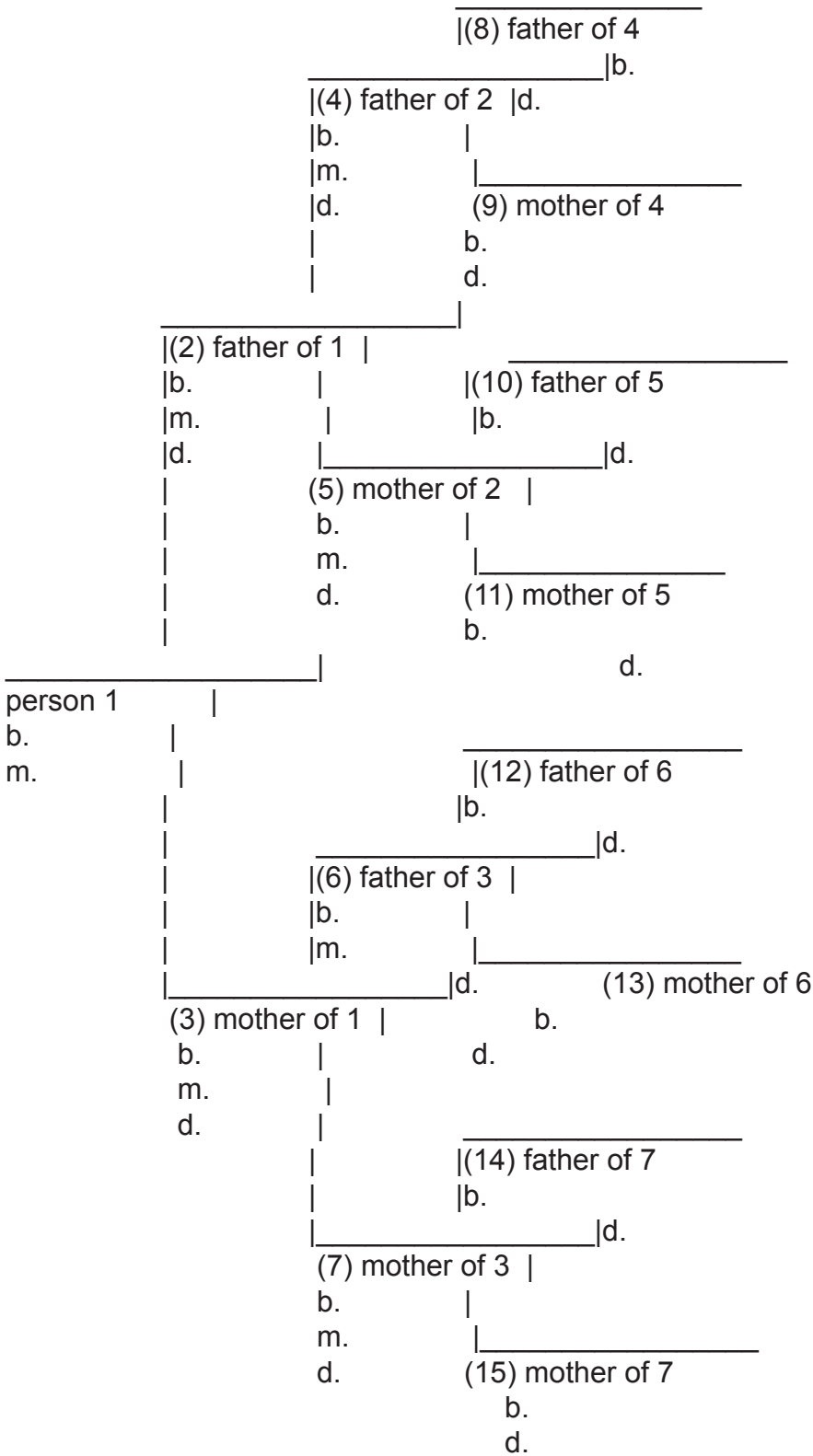
To avoid the winter weather, Pike was instructed to leave St. Louis in early August. He had little time to prepare. Pike and his men packed enough supplies to last for four months in the wilderness. Despite the lack of time to prepare, Pike was excited about the journey.

He had full trust in his own abilities and believed that this was his chance to prove his worth. Although Pike had prepared for only a four month journey, he and his men spent nearly nine months in the wilderness before returning to St. Louis believing the mission was a complete success.

References

Doak, R. (2006) Zebulon Pike Explorer and Soldier. Minneapolis, Minnesota. Compass Point Books

Pedigree Chart Family Tree #1



Lesson Three - Science

Lesson Title: Pike Family Association and DNA Profile Data

Standard with Benchmarks:

Colorado Science Standard 3.4 – Students know and understand how organisms change over time in terms of biological evolution and genetics.

Grades 5 – 8 Describe the role of chromosomes and genes in heredity

Grades 9 – 12 Describe the general structure and function of the gene (DNA) and its role in heredity

Enduring Understanding:

The Pike Family Association has embarked on a DNA profile data base that will identify various members of the Pike family including those directly related to Zebulon Pike.

Essential Questions:

What is DNA made of?

How is DNA used in genealogy?

Content Objective:

Students will learn what DNA is made of.

Students will examine DNA strands.

Students will research the Pike Family data base and examine the result of testing.

Language Objectives:

Students will read background information on the Pike Family Association DNA profile data base.

Key Vocabulary:

Chromosomes	Guinenes
Nucleums	Cytosines
DNA	Thymines
Adenines	

The Pike Family DNA Profile Project

The idea behind the Pike DNA Project is to take advantage of genetic analysis to determine the genetic signatures of various Pike Family lines. These signatures are carried in the DNA of Pike men - specifically in the male Y-chromosome, which is only passed from father to son. By determining the genetic signature of each Pike family line, we are then able to tell which Pike family lines are related and which are not.

We have so far discovered that there are at least 23 distinct Pike Family lines. Finding out which, if any, of these lines is for your family can be done with the ease of a painless DNA test (it's just like using a Q-tip to rub the inside of the mouth). One small catch though is that the test has to be done by a male Pike, so if you're not a male Pike yourself or you don't have one close by, then you might have to do some searching through your family tree to find a suitable relative to do the test.

The Blueprint of Life

Every cell in your body has the same "blueprint" or the same DNA. Like the blueprints of a house tell the builders how to construct a house, the DNA "blueprint" tells the cell how to build the organism. Yet, how can a heart be so different from a brain if all the cells contain the same instructions? Although much work remains in genetics, it has become apparent that a cell has the ability to turn off most genes and only work with the genes necessary to do a job. We also know that a lot of DNA apparently is nonsense and codes for nothing. These regions of DNA that do not code for proteins are called "introns", or sometimes "junk DNA". The sections of DNA that do actually code for proteins are called "exons".

DNA - The Double Helix





Recall that the nucleus is a small spherical, dense body in a cell. It is often called the "control center" because it controls all the activities of the cell including cell reproduction and heredity. Chromosomes are microscopic, threadlike strands composed of the chemical DNA (Short for deoxyribonucleic acid). In simple terms, DNA controls the production of proteins within the cell. These proteins in turn form the structural units of cells and control all chemical processes within the cell. Think of proteins as the building blocks for an organism, proteins make up your skin, your hair, parts of individual cells. How you look is largely determined by the proteins that are made. The proteins that are made is determined by the sequence of DNA in the nucleus.

Chromosomes are composed of genes, which is a segment of DNA that codes for a particular protein which in turn codes for a trait. Hence you hear it commonly referred to as the gene for baldness or the gene for blue eyes. Meanwhile, DNA is the chemical that genes and chromosomes are made of. DNA is called a nucleic acid because it was first found in the nucleus. We now know that DNA is also found in organelles, the mitochondria and chloroplasts, though it is the DNA in the nucleus that actually controls the cell's workings.

In 1953, James Watson and Francis Crick established the structure of DNA. The shape of DNA is a double helix (color the title black), which is like a twisted

ladder. The sides of the ladder are made of alternating sugar and phosphate molecules. The sugar is deoxyribose. Color all the phosphates pink (one is labeled with a "p"). Color all the deoxyribose blue (one is labeled with a "D").

The rungs of the ladder are pairs of 4 types of nitrogen bases. The bases are known by their coded letters A, G, T, C. These bases always bond in a certain way. Adenine will only bond to thymine. Guanine will only bond with cytosine. This is known as the "Base-Pair Rule". The bases can occur in any order along a strand of DNA. The order of these bases is the code that contains the instructions. For instance ATGCACATA would code for a different gene than AATTACGGA. A strand of DNA contains millions of bases. (For simplicity, the image only contains a few.)

Color	the	thymines	orange.	
Color	the	adenines	green.	
Color	the	guanines	purple.	
Color	the	cytosines	yellow.	

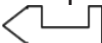
Note that the bases attach to the sides of the ladder at the sugars and not the phosphate.

The DNA helix is actually made of repeating units called nucleotides. Each nucleotide consists of three molecules: a sugar (deoxyribose), a phosphate which links the sugars together, and then one of the four bases. Two of the bases are purines - adenine and guanine. The pyrimidines are thymine and cytosine. Note that the pyrimidines are single ringed and the purines are double ringed. Color the nucleotides using the same colors as you colored them in the double helix.

The two sides of the DNA ladder are held together loosely by hydrogen bonds. The DNA can actually "unzip" when it needs to replicate - or make a copy of itself. DNA needs to copy itself when a cell divides, so that the new cells each contain a copy of the DNA. Without these instructions, the new cells wouldn't have the correct information. The hydrogen bonds are represented by small circles. **Color the hydrogen bonds grey.**

Messenger RNA

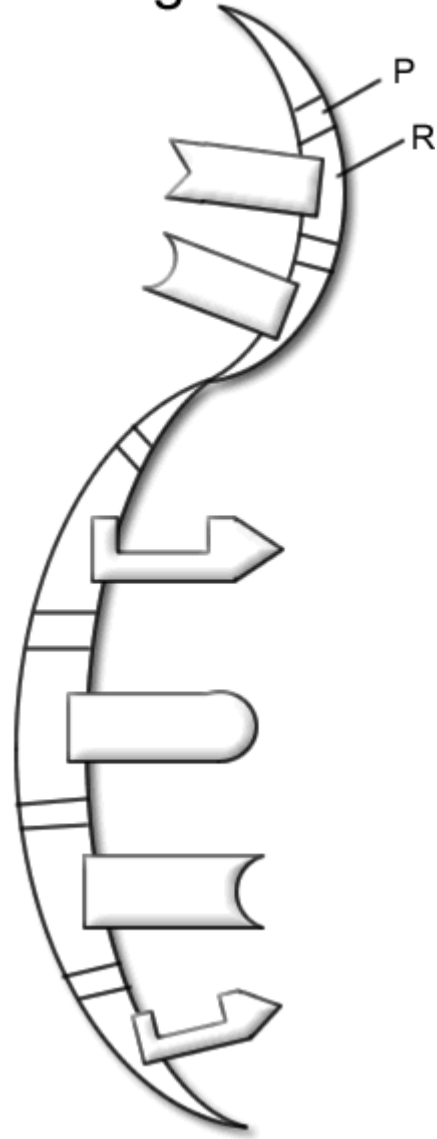
So, now, we know the nucleus controls the cell's activities through the chemical DNA, but how? It is the sequence of bases that determine which protein is to be made. The sequence is like a code that we can now interpret. The sequence determines which proteins are made and the proteins determine which activities will be performed. And that is how the nucleus is the control center of the cell. The only problem is that the DNA is too big to go through the nuclear pores. So a chemical is used to read the DNA in the nucleus. That chemical is messenger RNA. The messenger RNA (mRNA) is small enough to go through the nuclear pores. It takes the "message" of the DNA to the ribosomes and "tells them" what proteins are to be made. Recall that proteins are the body's building blocks. Imagine that the code taken to the ribosomes is telling the ribosome what is needed - like a recipe.

Messenger RNA is similar to DNA, except that it is a single strand, and it has no thymine. Instead of thymine, mRNA contains the base Uracil. In addition to that difference, mRNA has the sugar ribose instead of deoxyribose. RNA stands for **Ribonucleic Acid**. Color the mRNA as you did the DNA, except: **Color the ribose a DARKER BLUE, and the uracil brown.** 

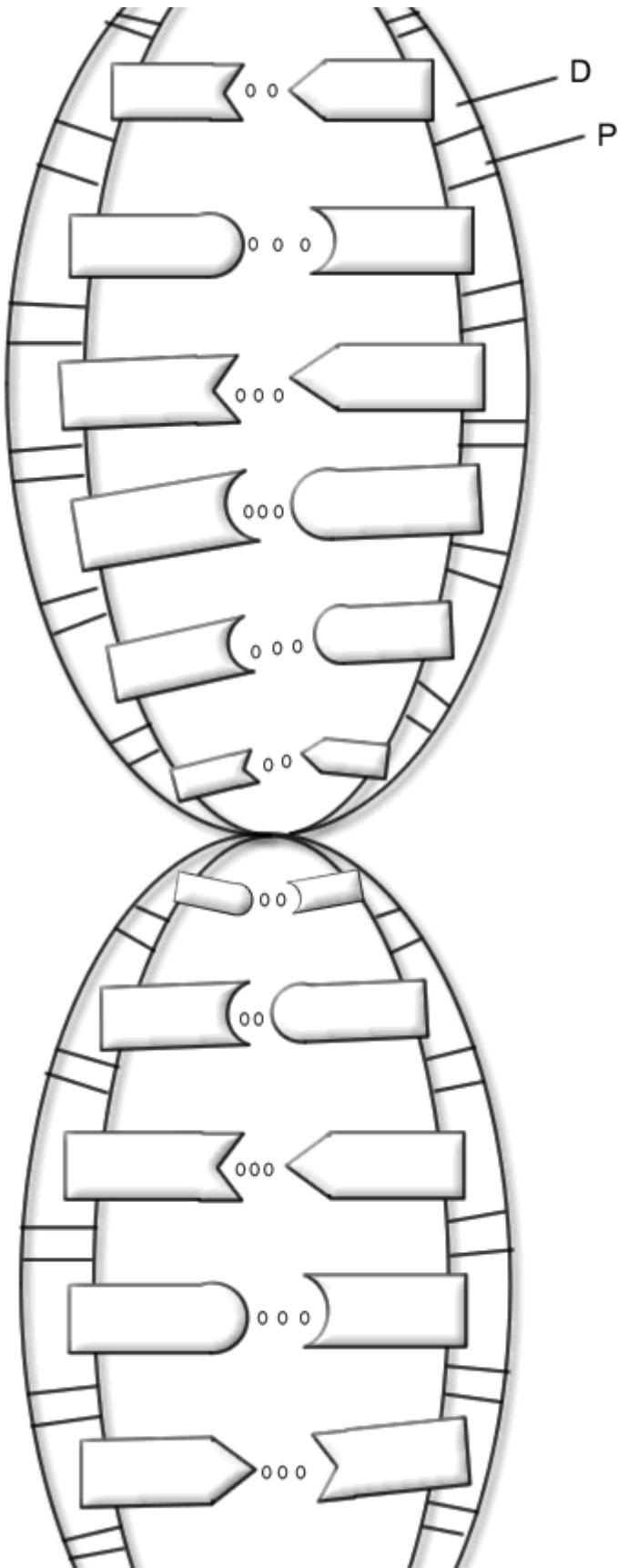
Name _____

Color the images according to the instructions.

Messenger RNA



DNA - The Double Helix



Lesson Three – Math

Lesson Title; Zebulon Pike and Mean, Median and Mode

Students will use a collection of data from Pike’s exploration to find measures of central tendency in the data.

Standards with Benchmarks:

Colorado Mathematics Standard 3: Students use data collection and analysis, statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems.

Benchmark f: Display and use measures of central tendency, such as mean, median and mode, and measures of variability such as range and quartiles.

Essential Question: What does the mean, median and mode tell you about Zebulon Pike’s Expedition?

Content Objective:

Students will evaluate central tendency for given data sets.

Students will apply concepts of central tendency to Pike’s Expedition.

Language Objective:

Students will speak in pairs about the vocabulary words.

Students will write about how the vocabulary words relate to Pike’s Expedition.

Key Vocabulary:

Mean- The sum of a set of numbers divided by the number of elements in the set, often called the average.

Median-The middle number, when a set of numbers is arranged in order from least to greatest.

Mode-The mode is the number that appears most frequently in a set of numbers. There may be one, more than one or no mode.

Lesson Overview:

1. Have students perform a dyad. They will pair up and discuss what they know about the mean, median and mode for 2 minutes each while their partner stays silent. This should only take about 5-7 minutes.
2. Evenly distribute cards to the class that read: “mean”, “median”, “mode”, “the sum of the elements divided by the number of elements”, “the middle number when the numbers are arranged in order from least to greatest”, “the number that occurs the most often”, and a set of numbers where the mean is given, where the median is given and where the mode is given. Extra example cards can be made to accommodate larger classes.
 - a. Example cards may read:
 - i. (0, 1, 2, 3, 3, 9, 8, 7, 6, 5, 6), **4.5** (This card would belong with the

- mean cards.)
- ii. (0, 1, 2, 3, 3, 9, 8, 7, 6, 5, 6), **5** (This card would belong with the median cards.)
- iii. (0, 1, 2, 3, 3, 9, 8, 7, 6, 5, 6), **6 and 3** (This card would belong with the mode cards.)
3. Students should be given about 10 minutes to find all the other students whose cards match theirs. All the mean cards, all the median cards and all the mode cards should be together.
 4. As a class, have students show which cards went together and discuss the main ideas of mean, median and mode. For example, how do we find them and what do they mean.
 5. Work a couple of examples of how to find the mean, median and mode.
 6. Have students complete the worksheet Zebulon Pike and the 3 M's. They can take it home to complete if they can't do so in class.

Strategies for Differentiation:

1. Flexible groupings will help students who are not comfortable speaking about the topic.
2. A follow up lesson may include finding the mean, median and mode of points in a football game, or syllables in each line of a poem to gain student interest.
3. More advanced students may be paired together to discuss in depth, the applications of the mean, median and mode.

Materials/Resources:

Pike and the 3 M's worksheet
Vocabulary cards, definition cards and example cards.

Brown, Stew. Captain ZEBULON M. PIKE'S- EXPEDITION INTO THE LOUISIANA TERRITORY

Name_____

Date_____

Zebulon Pike and the 3 M's

1. Given the set of numbers (9, 1, 5, 4, 2, 1, 7, 6, 10, 1, 2, 3, 1):
 - a. Find the sum of the numbers.
 - b. How many numbers are in the set?
 - c. Divide the sum by how many numbers are in the set. This is called the mean.
 - d. Arrange the numbers from least to greatest.
 - e. Which number is in the middle when the set is arranged from least to greatest? This is called the median.
 - f. Which number occurs the most in the set? This is called the mode.

2. Use the following table to answer the following questions.

Date	Progress (miles)
July 21, 1806	6
July 30, 1806	5
August 6, 1806	15
August 12, 1806	0
October 22, 1806	5
December 22, 1806	12
December 23, 1806	13
January 29, 1807	17
January 30, 1807	24

- a. Find the mean. What does the value of the mean tell you about Pike's expedition?

b. Find the median. What does the value of the median tell you about Pike's expedition?

c. Find the mode. What does the value of the mode tell you about Pike's expedition?

d. Do you think that the mean, the median or the mode is the most valuable source of information?

Name _____ **key** _____

Date _____

Zebulon Pike and the 3 M's

2. Given the set of numbers (9, 1, 5, 4, 2, 1, 7, 6, 10, 1, 2, 3, 1):

a. Find the sum of the numbers.

52

b. How many numbers are in the set?

13

c. Divide the sum by how many numbers are in the set. This is called the mean.

4

d. Arrange the numbers from least to greatest.

1, 1, 1, 1, 2, 2, 3, 4, 5, 6, 7, 9, 10

e. Which number is in the middle when the set is arranged from least to greatest? This is called the median.

3

f. Which number occurs the most in the set? This is called the mode.

1

2. Use the following table answer the following questions.

Date	Progress (miles)
July 21, 1806	6
July 30, 1806	5
August 6, 1806	15
August 12, 1806	0
October 22, 1806	5
December 22, 1806	12
December 23, 1806	13
January 29, 1807	17
January 30, 1807	24

a. Find the mean. What does the value of the mean tell you about Pike's expedition? 9.22,

Answers may vary. The mean is the average distance traveled over these nine days. This represents an estimate of how far Pike and his expedition could travel in a single day.

b. Find the median. What does the value of the median tell you about Pike's expedition? 12,

Answers may vary. This is the middle number in the data set. In this case the median is relatively far from the mean. This means that the data values vary significantly.

c. Find the mode. What does the value of the mode tell you about Pike's expedition? 5,

Answers may vary. The significance of the mode is different for different types of data sets. In this example, it may mean that there were several days when only 5 miles of progress could be made due to weather or other conditions.

d. Do you think that the mean, the median or the mode is the most valuable source of information?

Answers may vary.

Lesson Three - Reading/Writing

Lesson Title: Zebulon Pike and Exploring the Southwest (3)

Standards with Benchmarks: Reading

Standard 1: Students read and understand a variety of materials.

- j. make connections between their reading and what they already know, and identify what they need to know about a topic before reading about it
- g. use information from their reading to increase vocabulary and enhance language usage

Standard 4: Students apply thinking skills to their reading, writing, speaking, listening, and viewing.

- k. recognize, express, and defend points of view orally and in writing
- l. identify the purpose, perspective, and historical and cultural influences of a speaker, author, or director
- m. evaluate the reliability, accuracy, and relevancy of information

Standard 6: Students read and recognize literature as a record of human experience.

- g. read literature to understand places, people, events, and vocabulary, both familiar and unfamiliar
- h. read literature that reflects the uniqueness and integrity of the American experience

Essential Question: What was the start of the Southwest expedition like for Pike?

Content Objectives:

1. We will examine writings as to the start of Pike's southwest expedition.

Language Objectives:

1. We will writings about Zebulon Pike's expedition set up and start of travels.
2. We will define vocabulary words as they appear in the reading.

Lesson Overview:

(Activities, procedure for delivery of instruction)

4. Hand out Reading Three and read with the students asking visualization questions as the material is read. (What do you picture for...)
5. Have the students record teacher designated vocabulary words into their notes.
6. Hand out journals and have the students make an entry. Prompt: Would you want to make such a journey as Pike? Explain your answer.

Materials/Resources:

1. Reading handout number three.
2. Journal booklets.

Assessment:

4. Oral questioning, participation, and journal entry.

Lesson Three Physical Education

Lesson Title: Packing and checking soldiers' equipment for Pike's trip westward.

Standards with Benchmarks:

Physical Education:

#3: Students demonstrate knowledge of the benefits and risks associated with involvement in physical activity.

- d. demonstrate the ability to evaluate risks and safety factors that may affect participation in physical activity throughout life.
- e. demonstrate and/or describe health benefits that result from regular safe participation in physical activity.

#4: Recognition of the role of physical activity and its unique contributions to social, emotional, mental, and physical development.

- b. demonstrate willingness to share individual strengths and knowledge with others.
- c. demonstrate proficiency in a new or advanced level of physical activity.

#5: Recognition of the role of competitive activity in developing physically active lifestyles.

- a. demonstrate cooperative participation when engaged in competitive physical activities
- b. demonstrate according to their ability, leadership and/or fellowship while participating in group activities.

Health:

#6: Students demonstrate the ability to use goal-setting and decision-making skills to enhance health.

- c. analyze health concerns that require collaborative decision making
- d. implement a plan for attaining a personal health goal and evaluate progress toward achieving personal health goals.

#7: Students demonstrate the ability to advocate for personal, family, and community health.

- e. demonstrate the ability to influence and support others in making positive health choices.
- f. demonstrate the ability to work cooperatively when advocating for health communities.

Essential Question: Will the soldiers' pack be easy enough to maintain and carry throughout this trip?

Content Objectives: All equipment will be packed and double checked to the authentic list of Pike's soldiers' travels.

Language Objectives: Read and write lists of equipment.

Key Vocabulary: Belt bag, awl, brazier, capote, ink well and quill, pieces of eight.

Lesson Overview: Students will try on and carry 40 pound pack while doing small activities.

Strategies for Differentiation: If a student is in a wheelchair a pack will be designed for the wheelchair, or if a student is physically unable to carry the 40 pound pack it will be modified and the student will simulate the authentic pack on the walk.

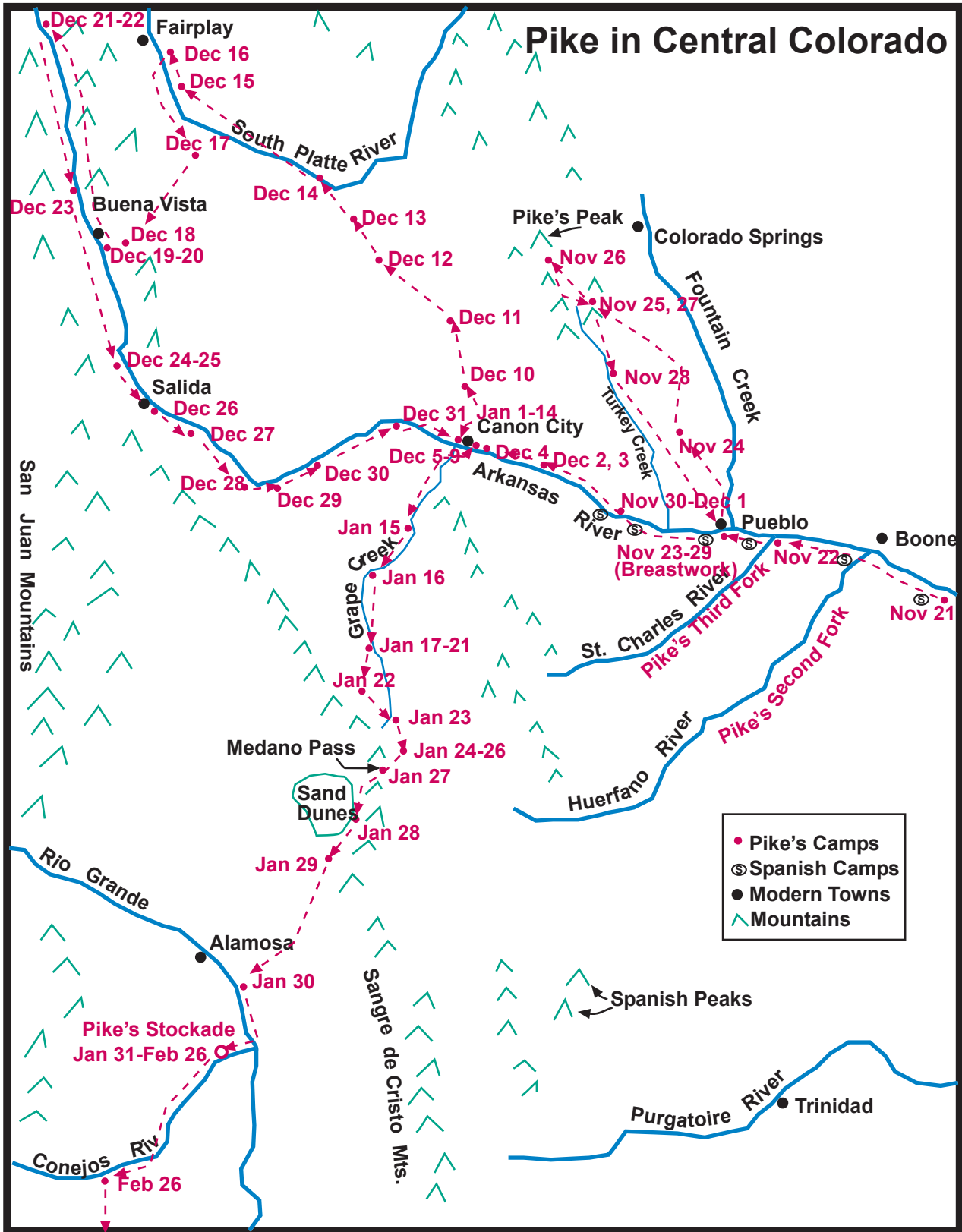
Materials/Resources: Paper, pens, pencils, magic markers for signs, and poster board.

Assessment: The packs will be weight for authentic weight and accuracy and all packs will have the same equipment.

Evaluation/Reflection: Diary updates and feelings and thoughts of how they think the 40 pack will feel on a 1 mile walk.



SECTION 4 | PIKE'S COLORADO



Zebulon Pike in Colorado

Pike's Crisis in Colorado~ by Clive G. Siegle

The Pike expedition's adventures in the modern state of Colorado proved to be the crucible that tested their mental resolve and physical stamina as no other segment of the journey. Within its borders, events conspired on several occasions to bring them to near disaster, yet the time they were in Colorado also proved in many ways to be their finest hour. Appropriately, Colorado also contains Pikes Peak, a monument grand enough to recognize the magnitude of their achievements.

The expedition entered the state on November 11, 1806, and made their first Colorado camp near the present-day town of Holly. Pike was still seeking the source of the Arkansas River and was pressing ever westward, following both its sandy valley floor and the trail of a large Spanish force under Lt. Facundo Melgares. The Americans had seen Spanish and Indian campsites of considerable size recently, although Pike's journal indicated that they had not sighted a soul for quite some time. That, however, was soon to take a dramatic turn.

On that same crisp November day, Pike made a decision that was to have momentous consequences. "Finding the impossibility of performing the voyage in the time proposed," he confided to his journal, "I determined to spare no pains to accomplish every object even if should oblige me to spend another winter in the desert." In the pursuit of "every object" of his voyage, he would soon discover that the plains of his "desert" would soon rise up to become the Rockies, and the last whispers of Indian Summer would soon turn into the frigid blasts of a Colorado winter—events formidable enough in their own right without the fact that in order to cut down on excess baggage, Pike had ordered all winter uniforms be left back in Missouri.

A Glimpse at Immortality

The heretofore uninhabited landscape soon changed as well. On the 12th, Pike's hunters cut a trail with very fresh signs of Indians, and one was spotted briefly in the distance. But three days later, an even more significant sighting was made.



Pike's party was forced from the river bottom up these bluffs. From this elevation a short distance from here, he first sighted what would become Pikes Peak.

On Saturday, November 15, the expedition encountered bluffs in a bend of the Arkansas that forced them out of its valley on the south side of the river and up onto the prairie above. As they made their way along this higher ground, a "small blue cloud" on the horizon caught Pike's eye. A glance through his spyglass heightened his suspicion that the cloud was actually a mountain. Thirty minutes later, his suspicion was confirmed as a snow-covered peak materialized from the prairie floor, followed later by the outlines of the outliers of the front range of the Rockies. Pike always referred to the mountain he first saw as the "Grand Peak," or the "blue mountain," but later, others would formally name it in honor of the first U.S. citizen to lay eyes on it; Pikes Peak. While its soaring mass seemed deceptively close on that November day, he was still some 120 miles from the mountain that would immortalize his name.



Gazing west from this spot, Pike first saw a hint of the "Grand Peak." Today's atmospheric conditions make such sightings rare.

An Unwelcome Welcoming Committee

The subject of mortality may have loomed a bit larger a week later, as the expedition's westward travels uncovered increasingly more frequent and recent signs of Indian activity, and the prospect of an eventual meeting brought both feelings of anticipation and worry. On November 22, the probable source of all the signs suddenly appeared in the form of sixty Pawnee warriors who rushed the expedition from out of the brush along the river.



Near here on the Arkansas, Pawnee swarmed the expedition from the brush.

The Pawnees were a war party returning from an unsuccessful campaign against the Comanches, and were in a sour mood. An official parlay ceremony was arranged and Pike passed out gifts, but a number of the warriors wanted more. As the situation became increasingly tense, Pike decided to pack up and leave, but as they mounted up, the Indians mobbed them, snatching items from the soldiers and their packs. Only when threats were made to open fire on them did the warriors disengage and vanish back into the brush. It had been a close call, and with only sixteen men in Pike's party confronting sixty Pawnee, a shooting incident would have resulted in a bloodbath.

Pike Challenges the Mountain

By November 23, Pike felt that he was close enough to the Grand Peak to attempt an ascent. The Arkansas River appeared to be dividing into smaller streams, and it was felt that once atop a lofty peak, the countryside and its rivers could be traced for great distances.

In the middle of what is today's city of Pueblo the expedition built a defensive stockade of logs. From this base camp, a small party would make the ascent, while the rest would remain to guard the horses and supplies. Pike, fooled by the optical illusions of distances on the western plains, estimated that the march to the base of the mountain and its ascent could be accomplished in two days.

The four-man climbing party, which consisted of Pike, Dr. Robinson, and two privates, left camp on November 24 for the ascent. Due to Pike's distance miscalculations, the party took no provisions.

Pike decided to follow the trail of the Spanish cavalry and head up the north fork of the Arkansas, called Four-Mile Creek. This branch soon dwindled, as did the Spanish trail, so Pike turned overland due northward, discovering a river on December 12 which he correctly determined was the south fork of the South Platte.

Crossing over a mountain pass, he came to another river which he thought was the Red. In reality, the expedition was back on the Arkansas, seventy miles upstream from where they had left it two weeks earlier. Snow began to deepen, and Pike was disappointed that he could not reach the source of the river. The men spent Christmas eating buffalo meat near the modern-day city of Salida, Colorado. They worked their way down the river, the ice solid enough to support their horses, the huge vertical walls of the Royal Gorge towering above them on both sides. They were soon frustrated to find that they had traveled in a big circle. In order to reach the Red River, the mountains would have to be crossed on foot.

The interpreter Vasquez and Pvt. Patrick Smith were detailed to stay with the horses in a small wooden stockade on the Arkansas, while Pike set out with the others on January 14, 1807, through the Wet Mountain Valley and howling blizzards to find the Red River. Nine men soon suffered from frostbitten feet, including Pike's best hunters. Pressing on, wading through sometimes waist-deep snow, Pike left three men behind who could not continue. Crossing the Sangre de Cristo Mountains, Pike found the area of present-day Great Sand Dunes National Monument and the headwaters of the Rio Grande, which he mistakenly thought was the Red River. A small stockade was built near modern Alamosa, Colorado.



A Guest of the Spanish

Dr. Robinson begged leave to contact the Spanish officials in Santa Fe, as he had a document which gave him authority to collect a debt there for a merchant in Kaskaskia, Illinois. Pike gave his permission, and Robinson hiked overland to reach his objective, telling Spanish Governor of New Mexico Joaquín Alencaster on his arrival that he had recently left a party of hunters. Suspicious, Alencaster reported the incident to his superiors and sent out patrols in the hope of apprehending some of the doctor's companions. Pike sent back two relief parties to bring up the three scattered men left behind with frostbite, as

well as the two left on the Arkansas with the horses. Only one of the three frostbite victims could be brought back; the others, too sick to move, actually sent bits of gangrenous toe bones to Pike in a macabre appeal not to be abandoned.

On February 16, 1807, Pike and a hunting companion were discovered by a pair of Spanish cavalymen. On February 26, a large troop of Spanish soldiers rode up to Pike's stockade and informed him that he was in Spanish territory. "I immediately ordered my flag to be taken down and rolled up," Pike wrote. He agreed to accompany them to Santa Fe with those of his men not still afield, and they departed the stockade two days later. Spanish patrols rounded up the frostbitten stragglers, and eventually escorted the rest of the party to Santa Fe. After being questioned about his mission by Governor Alencaster, Pike was sent south to Chihuahua to be examined by the Commandant General of the Internal Provinces, Nemesio Salcedo. Although Salcedo confiscated a number of Pike's papers and notebooks, neither Pike nor his men were mistreated, and the majority were returned to U.S. territory at Natchitoches on June 30, 1807. Dr. Robinson claimed asylum in Mexico, but was not allowed to stay. Five of the men were held by the Spanish for two years, and one, Sgt. William Meek, was imprisoned until 1821 after killing Pvt. Theodore Miller in a drunken scuffle. By sending Pike south to Chihuahua, Alencaster inadvertently gave Pike the opportunity to gather much valuable intelligence about largely unknown regions of northern New Spain for the United States, and he was reprimanded for it by Salcedo. Salcedo, in turn, was reprimanded by the King of Spain for releasing Pike before receiving an apology from the U.S. Government for trespassing.

Zebulon Pike was suspected of having a role in the "Burr Conspiracy" upon his return to the United States; although untrue, this tainted his career for some time. Pike was not received with a glowing welcome by President Jefferson, who considered him a competent military man but not an explorer/scientist on the level of Lewis and Clark. Unlike Lewis and Clark, neither Pike nor his men received extra pay or grants of land for their service.

Pawnee Indians

The Pawnee Indians are a native North American tribe. Sometimes known as the Paneassa, Pari, or Pariki, the Pawnees could be found along the Platte, Loup, and Republican Rivers of what is now known as Nebraska. They often called themselves “chaticks-si-chaticks,” which means “men of men.” Their tribe consisted of four bands: Chaui (Grand), Kitkehahki (Republican), Pitahauerat (Tappage), and Skidi (Wolf). The Chaui are recognized as the leading tribe.

They grew crops of corn (maize), beans, pumpkins, and squash. They also played a very important part in limiting the Spanish expansion onto the Great Plains. They sided with the French and won a very important battle against the Spanish in 1720.

The men and women of the Pawnee Indians had very distinctive roles in every day life. The mature women did most of the labor while the younger women would learn the responsibilities and what was expected of them. The older women were in charge of looking after the younger children of the tribe while the other women worked. The men were divided into three groups: the medicine men/priests, the warriors and the hunters. The Pawnee Indians practiced a religion that tried to maintain a balance between the gods and nature. To have a good crop, they planted them according to the position of the stars, as they equated the stars with the gods. They were known to sacrifice maize and other crops to the gods, but may have also sacrificed humans up until the mid-eighteenth century.

An epidemic of both smallpox and cholera were responsible for wiping out most of the Pawnee Indians in the 19th century. By 1900, there were only 600 left. However, as recently as 2005, there were about 2,500 Pawnee Indians. Today’s Pawnee Indians meet biyearly for an inter-tribal gathering and celebrate their culture through craft shows and powwows.

From Indians.org - not an official Pawnee website.



Photo source unknown

Colonial Spain

Pike Exhibit

El Pueblo History Museum

Pueblo, Colorado

Scope of Louisiana Territory

Imagine the Louisiana Territory as a huge delta emerging out of New Orleans and extending north to the present Canadian border, widening to the west as it makes its way along the Rocky Mountains. In the southernmost portion, the line of demarcation between Louisiana and Spain roughly approximated the present border of eastern Texas, made up largely by the contours of the Red River and the Sabine River. Far to the west was the Rio Grande, which the United States initially claimed—but retracted—as the southwestern line of Louisiana Territory, and north of this was the Arkansas River, which became an undisputed border between the two countries. Thus the importance of Pike’s route, which eventually followed the Arkansas River west to the Rockies—and to his mission, which was in part to find the source of the Red River. And, for that matter, to one persistent mystery—which was whether or not he mistook the Rio Grande for the Red River.

A Fateful Journey

General James Wilkinson, the governor of Louisiana Territory and commander of the U.S. Army, assigned Pike to lead an expedition supposedly to locate the sources of the Red and Arkansas Rivers. Unlike Lewis and Clark’s expedition—authorized by the president himself—Jefferson was not aware of Pike’s expedition until after the lieutenant’s departure. The journey would take Pike and his men through the southwestern portion of the Louisiana Purchase. But it would not end there. During the expedition’s eleven and a half months of travel, the men entered the northern frontier of the Spanish empire where American trappers and traders, viewed as foreigners, were received with suspicion and often imprisoned. After several months of captivity, Pike was released—but did not receive a hero’s welcome back home. Controversy clouded his return.

- Was Pike a spy sent by General Wilkinson? Was he an accomplice to the Aaron Burr plot to carve out a part of the Spanish northern territories or America’s new western territory for a new country?
- Or was he a military officer fulfilling his mission as an explorer?

- The Louisiana Purchase Treaty was made in Paris, April 30, 1803.
- President Jefferson felt that presidents did not have the authority to purchase land, but he believed in expanding American territory and trade connections.

Spanish Intelligence

For nearly three centuries the southwestern part of the present United States was the northern possession of Spain. From 1762 to 1800, Spain claimed the whole trans-Mississippi West. The Spanish Crown did not recognize the legality of the Louisiana Purchase since France had failed to abide by previous agreements related to Louisiana land transfers.

The Spanish were fully aware of Pike's expedition. Pike's journal notes "the rapid means they possessed of transmitting the information relative to the occurrences transacting on our frontier." Pike, too, was aware of Spanish surveillance, since he recorded seeing evidence of Spanish troops in Kansas and Colorado.

Before Pike set out, Spanish emissaries had already sent information through a number of sources to Nimesio Salcedo, commandant-general of the Internal Provinces of New Spain. Settlements and forts were scattered throughout present-day Texas and New Mexico where information could be relayed quickly.

Numerous encroachments into Spanish-Texas Territory by unscrupulous merchants, traders, and adventurers were ample warning to Salcedo to defend the borderlands. Correspondence from Spain to Cuba (New Orleans' seat of government) called for watchfulness concerning the movements of Burr and Wilkinson. Other communications detailed concern for American attitudes and aggression, including the intrusion of the Lewis and Clark expedition. Philip Nolan, a protégé of Wilkinson, was killed and his associates captured by the Spanish in 1801. Salcedo had halted two expeditions sent out along the Red River—that of William Dunbar (1804) and Thomas Freeman (1806).

Lieutenant Facundo Melgares from Santa Fe and a force of several hundred men marched from Santa Fe to find Pike—and to reinforce Indian allegiance to Spain. Melgares made contact with the Pawnees before Pike arrived at their village, but he did not find Pike until several months later. Wilkinson himself was another intelligence source regarding Pike, but Salcedo had already been informed. What Wilkinson warned Pike not to do—to come into contact with the Spanish—he did himself.

Empire Building

It was 1803 and the young republic of the United States was about to double in size, making it one of the largest nations in the world.

During the later years of the eighteenth century, the territory referred to as Louisiana changed hands twice between France and Spain. Originally a French possession, the area was ceded to Spain at the end of the French and Indian Wars in 1763. The vast Louisiana territory became a financial burden to Spain, so the land was traded back to Napoleon Bonaparte in exchange for the Spanish kingdom of Italy in the secret Treaty of San Ildefonso (1800). Two conditions were set: France was never to give the land to an English-speaking government, and Spain was to be notified first before France could sell or transfer the land.

Napoleon's possession of New Orleans, a major port for Americans living west of the Appalachian Mountains, alarmed President Jefferson. Before the official transfer and the exit of Spanish officials could take place, Robert T. Livingston, U.S. minister to France, began negotiations to buy New Orleans. In 1802, the port of New Orleans was closed to the United States. Ignoring public outcry for war with France, Jefferson sent James Monroe to Paris. Prepared to purchase only New Orleans, Livingston and Monroe were astonished when Napoleon's minister, Talleyrand, also offered the Louisiana Territory.

For Napoleon and France, the war chest had increased. For Spain and the United States, there were disputes over the borders of the Louisiana Territory and the legality of the Louisiana Purchase Treaty. France did not comply with either of the conditions set in the Treaty of San Ildefonso and had refused to designate the southern and western boundaries. Besides the debate over ownership of West Florida, the Spanish insisted that the territory include only the present-day states of Louisiana, Arkansas, and Missouri. The United States claimed land to the Rio Grande and Rocky Mountains, which included Texas and half of New Mexico. This dispute continued until the Adams-Onís Treaty of 1819, which delineated the border along the Red, Sabine, and Arkansas Rivers and the 42nd parallel. That treaty included the cession of Florida to the U.S.

On November 30, 1803, General James Wilkinson in New Orleans took possession of Louisiana for the United States. American troops under the general occupied the port of New Orleans on December 20.

Facts:

- The Louisiana Territory extended from New Orleans up the Missouri River to present-day Montana. It also included a strategic region—both sides of the Mississippi River below Natchez and the port of New Orleans.

Pike's Travels through New Spain

Is this where Pike's mission really begins? Did Pike want to be found and arrested in order to spy, or did he merely want to be rescued? Either choice was life or death.

Santa Fe to Chihuahua

In Santa Fe, Pike was met with suspicion by Governor Joaquin del Real Alencaster. Of special interest to Alencaster was Pike's relationship with Dr. Robinson, who was in custody. Pike and his men were ordered to Chihuahua. Alencaster treated Pike as a gentleman, a "guest" prisoner, and the two parted on good terms. Alencaster gave him a farewell dinner and a gift of a shirt and neckcloth. Pike's own clothing showed evidence of his arduous journey.

Again under escort, Pike and his men traveled down the Camino Real, the Royal Road, a centuries-old trade route to Chihuahua. This provided Pike an excellent opportunity to note the location of settlements, forts, garrison sizes, and information about the officers. In his published journal under "Geographical, statistical, and general observations made by Capt. Z. M. Pike," he recorded what he saw and what he was told. His captors and hosts shared much information. During his captivity, Spanish troops were sent out in case the U.S. decided to rescue Pike with armed troops.

Chihuahua

From El Paso del Norte (present-day Ciudad Juárez, opposite El Paso), they traveled 260 miles to Chihuahua. In March—days prior to his arrival—a two-month-old Spanish newspaper, *Gazetas de Mexico*, provided Pike with confusing information about Burr's conspiracy. The Spanish assumed Pike had ulterior motives, and General Nimesio Salcedo ordered his papers confiscated and translated. In spite of reports of a conspiracy, Salcedo did not want to antagonize the U.S. and ordered Pike's release.

Facts:

Pike's papers would not be released to the U.S. until almost one hundred years later.

While in Chihuahua, Pike met with a member of the ill-fated Nolan party and learned of Wilkinson's contacts with Viceroy Iturrigaray.

San Antonio

The man who initially hunted Pike, Lieutenant Facundo Melgares, was Pike's main escort through New Spain. Melgares warned Pike not to take notes, but added, "You have a good memory, and when you get to Cogquilla [the province of Coahuila] you can bring it all up." As a precaution, Pike pushed his papers into the barrels of his men's guns and hid others under their shirts.

Throughout the entire journey Pike was treated well, dined with his hosts, and enjoyed the occasional fandango in his honor. His arduous expedition and hospitable captivity in New Spain ended when he crossed the Sabine River at the southeastern border of Texas on June 29, 1807.

Why did the Spaniards become so lax in their treatment of Pike, when other infiltrators had been killed or imprisoned for years? Was it their intention to glean information from Pike without threatening relations between Spain and the United States?

U.S. and Spanish Relations

At Presidio Rio Grande, Pike met American Martin Henderson. Hearing his story, Pike concluded he was an agent of Burr's "and was revolving in my mind whether I should denounce him as such to the commandant, but felt reluctant from an apprehension that he might be innocent."

On June 7, Pike met Símon de Herrera, former governor of Nuevo León, and Antonio Cordero, governor of Texas. Pike commented, "[T]hey exhibited an astonishing knowledge of the political character of our executive, and the local interests of the different parts of the union."

Pike also learned the U.S. and Spain almost erupted into war on the Sabine River. Herrera had sent messages to General Wilkinson warning him of a pending attack if U.S. troops crossed the Rio Hondo. In November 1806, Wilkinson and Herrera entered into the Neutral Ground Agreement regarding disputed frontier boundaries. The viceroy and General Salcedo later approved the agreement.

Pueblo Indians

On his journey through New Spain, Pike encountered Pueblo and Plains Indian groups.

Pike stayed at the Santo Domingo Pueblo and described it as “a large village, the population being about 1,000 natives, generally governed by their own chiefs.” Another pueblo in which he was received was Sandia Pueblo.

Fact: The Santo Domingo and Sandia Pueblos are part of the Eastern Pueblo groups. The Pueblo people built adobe villages. They were farmers who actively engaged in trade. Spanish contact with the Indians in the 1500’s resulted in periods of subjugation and rebellion. Eventually intermarriage, mixed households, and cultural traditions became common.

The Apache

The Apaches that Pike saw were in the El Paso region, near the present-day Mexican and American border. The Apache tribes were under treaty with Spain, yet Pike observed, “These people appeared to be perfectly independent in their manners, and were the only savages I saw in the Spanish dominions, whose spirit was not humbled.” Pike documented how the Apaches kept the Spanish in a continued state of alarm in the three provinces.

Facts:

The Apache whom Pike encountered were the eastern Apaches. After 1750, several eastern Apache tribes merged into three groups: Jicarillas, Lipan, and Mescaleros. The Apaches by the Platte and Missouri Rivers in U.S. territory were the Kiowa Apaches. By Pike’s time, the eastern Apaches were a hunting society.

Pike was impressed with the Apaches’ bows and arrows and presented some arrows to Charles Willson Peale’s Philadelphia museum in 1808.

Spanish Life

Pike wrote in vivid detail about settlement locations, air and climate, mines and minerals, waterways, animals, insects, and plant life in each major area, and he discussed the Indians, antiquities, agriculture, trade, commerce, manufacturing, government, laws, towns, populations, morals and manners, military strength, religion, and history.

During his captivity, Pike usually stayed in the home of the priest or official of a settlement. There he could view their churches and religious life as well as their home life. He also was a guest of the dons at their haciendas.

Spanish Military

Of great interest to Pike was the Spanish military. Since he spent so much time in their company, he was able to gain considerable knowledge. Pike wrote, "The government of New Mexico may be termed military, in the pure sense of the word; for although they have their alcaldes or inferior officers, their judgements are subject to a reversion by the military commandants of districts. The whole male populations are subject to military duty, without pay or emolument, and are obliged to find their own horses, arms and provision."

Spanish Uniform

Pike gave one of the most accurate descriptions of the presidial cavalrymen. These were the soldiers who intercepted him.

- "The appearance of the Spanish troops is certainly (at a distance) a la militaire; their lances are fixed to the side of the saddle under the left thigh and slant about five feet above the horse.
- On the right the carbine is slung in a case to the front of the saddle (or pommel) crosswise; the breech to the right hand, and on each side of the saddle, behind the rider, is a pistol;
- Below the breech of the carbine is slung the shield which is made of a sole leather three doubled, sewed together with thongs with a band on the inside to slip the left arm through, ... [the privates' shields] are round, and are about two feet in diameter. The officers and non-commissioned officers have their shields oval, bending on both sides, in order to permit the arrow to glance, and they have ...the arms of Spain with Don Carlos IV gilt on the outside."

The uniform was a short blue coat with red cape and cuffs, leather or blue cotton breeches, black neckerchief around the throat, hat, leather leggings, and boots. A leather bandolier was worn diagonally across the chest with the presidio's name embroidered on it. A heavy leather jacket served as armor.

Spain and the Republic of Mexico

Spain demanded an apology for Pike's trespassing into Spanish territory. Refusing to acknowledge that he was a spy, merely an explorer, Secretary of State James Madison did not send an apology. As a result, the two nations broke off diplomatic relations.

Pike's secret observations in the end did not pose a direct threat to Spain; rather, internal conflicts led to colonial revolt in 1821. It would be the new Republic of Mexico that would inherit the struggle to defend its Texas borders from American infiltrators. Pike wrote of the possibility of trade and Spain's weak hold on Santa Fe, which spurred the interest of businessmen and politicians who looked westward for opportunities.

He was correct in concluding that the citizens of New Spain wanted liberation and trade. Use of the western waterways and the Santa Fe Trail brought goods and people into the regions that Pike detailed. Migration into Texas preceded Pike's expedition, but written accounts of Spanish borderlands made the region more penetrable.

Governor Alencaster sent out patrols to look for American intruders on New Mexico's eastern plains and in the southern Colorado region. These types of patrols would continue until 1821. Alencaster was reprimanded for releasing Pike and sending him even farther into Spanish territory, and he was removed from office in 1808 by the King of Spain. Lieutenant Melgares became the last Spanish governor of the Province of New Mexico prior to the opening of the Santa Fe Trail.

Mexico gained its independence from Spain in 1821. Eager to establish trade with the Americans, it opened up the borders. Pike was correct in assuming that the people of New Spain felt exploited. They paid more for goods because Spain prevented trade with other countries and impeded the development of colonial industry.

For the nation of Mexico, the forces of insurgency in the north, and too few resources, led to continued infiltration and the threat of war. In 1835, Texas won its independence from Mexico, and following the Mexican-American War of 1846–48, Mexico also lost its northern borderlands in the Treaty of Guadalupe Hidalgo.

Lesson Four - Social Studies

Lesson Title: Zebulon Pike and Exploring the Southwest

Standards with Benchmarks:

Geography 5.2 Students know how physical systems affect human systems

b. analyze how humans perceive and react to natural hazards.

Geography 6.1 Students know how to apply geography to understand the past

b. analyze the fundamental role that places and environments have played in history.

History 3.2 Students understand the history of social organization in various societies

b. explain how social organization has been related to distributions of privilege and power.

Essential Question: Who were the inhabitants of the Southwest when Pike went on his expedition there?

Content Objectives:

1. We will compare and contrast maps of the Spanish and Pike's route.
2. We will examine a brief history of Zebulon M. Pike.

Language Objectives:

1. We will draw in Pike's southwest route.
2. We will read a brief history of Zebulon M Pike.

Key Vocabulary:

Osages
Pawnee
Sioux
Cheyenne
Spanish

Lesson Overview:

(Activities, procedure for deliver of instruction)

1. Word search on Inhabitants of the area of the Southwest Expedition.
2. Handout map on Pike's southwest expedition. Have students draw in Pike's route and label the significant towns along the route.
5. Class discussion who was living in the Southwest area during Pike's expedition there.
6. As a class choose a journal entry and read together.
7. Closure—complete **Pike Expedition Crossword Puzzle**

Strategies for differentiation:

1. Hand out to each student a copy of Pike's southwest expedition
2. Students read a journal entry by themselves

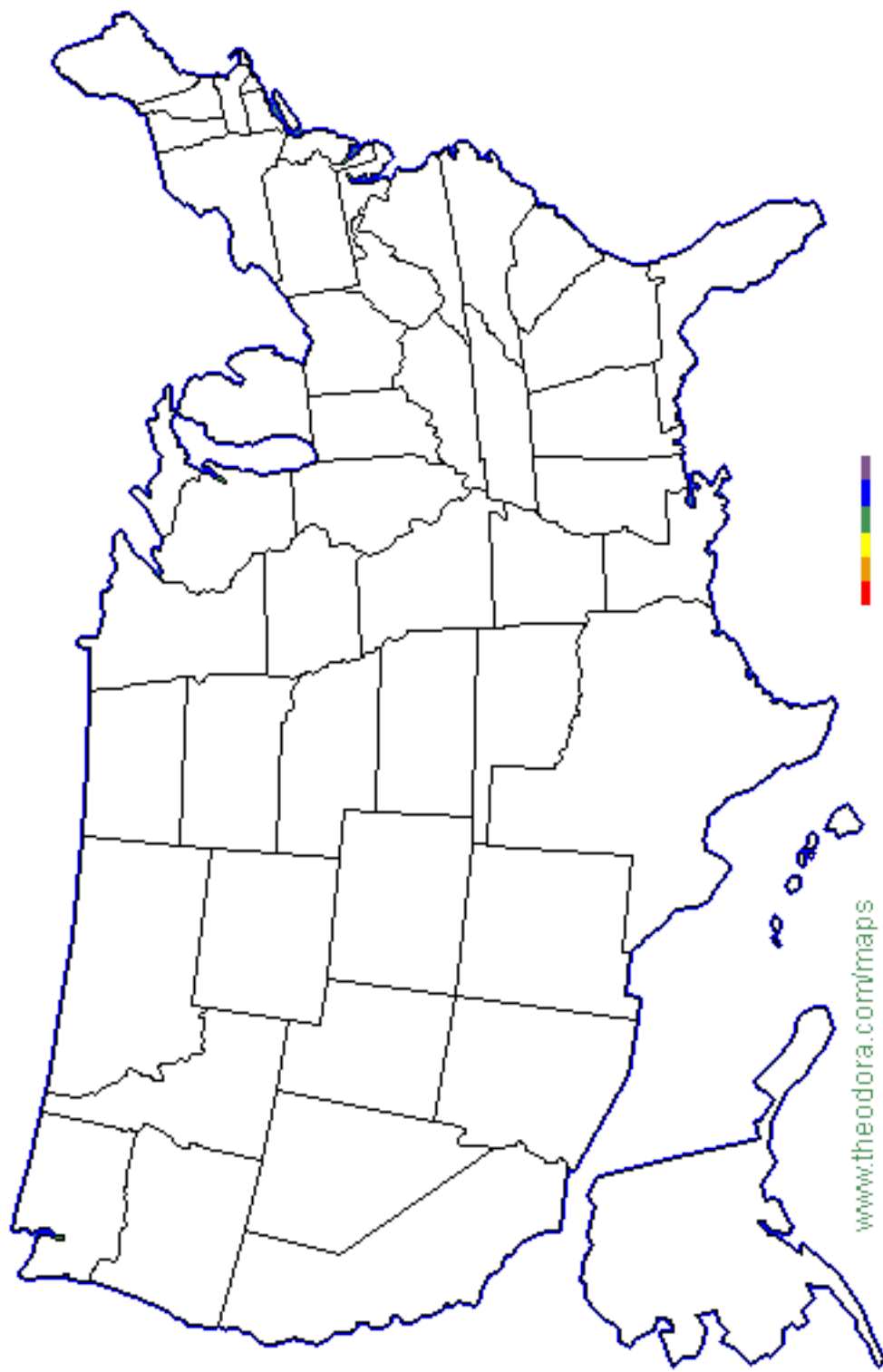
Materials/Resources:

1. Word search on Inhabitants of the area of the Southwest Expedition
2. **Map** on Zebulon M Pike's travels (transparency)
3. **Reading** brief history of Zebulon M. Pike
4. **Pike Expedition Crossword Puzzle**

Assessment:

1. Map work
2. Participation

Evaluation/Reflection:



Inhabitants of the Southwest Expedition

CZEBULONMEPIKEO
POENEDTHEESOUTH
WEMSTARNEAATOTH
OEUANIWTEDSWTAT
ESSBNAVHRSLVOFT
YTAIPCBEZUDSIE
FPPGDSHSINAPSHK
BCDOESAERFEQCNU
FLWWELLSPRWAJHH
FDEPRSQRNEPIURH
ZYTQSWDKPAQRIML
IOCHEYENNEKPACC
RSELGTJGXOROMMF
CRWJTNEEMXJYMGR
EINSRQRIXYYITSR

APACHE
CHEYENNE
COMANCHE
KANSAS
KIOWA
OSAGE
PAWNEE
SPANISH

Inhabitants of the Southwest Expedition Solution

C Z E B U L O N M E P I K E O
P O E N E D T H E E S O U T H
W E M S T A R N E A A T O T H
O E U A N I W T E D S W T A T
E S S + N A + + + + + O + +
+ + A + P C + + + + + I E
+ + + G + S H S I N A P S H K
+ + + + E + A E + + + + C + +
+ + + + + + S + + + A + + +
+ + + + + + + N + P + + + +
+ + + + + + + + A + + + + +
+ + C H E Y E N N E K + + + +
+ + + + + + + + + + + + + +
+ + + + + + + + + + + + + +
+ + + + + + + + + + + + + +

(Over, Down, Direction)

APACHE (10, 11, NE)

CHEYENNE (3, 12, E)

COMANCHE (1, 1, SE)

KANSAS (11, 12, NW)

KIOWA (15, 7, NW)

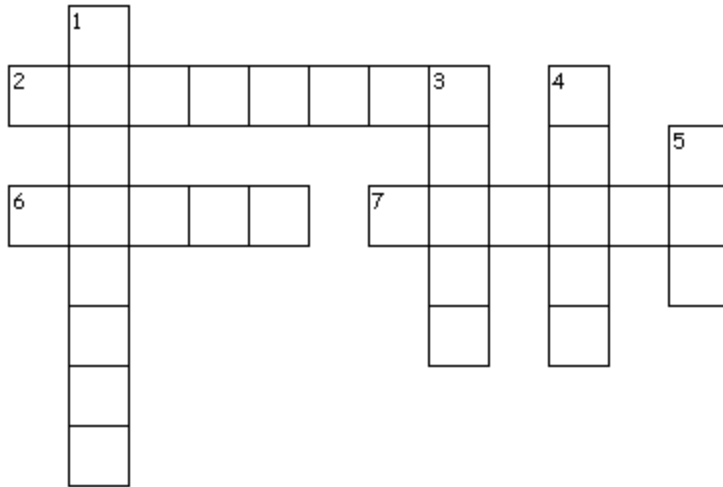
OSAGE (1, 4, SE)

PAWNEE (5, 6, NE)

SPANISH (13, 7, W)

Zebulon M Pike opened the southwest area to the United States

Pike Expedition Crossword Puzzle



Across

2. Expedition crossed into New Spain we call it today?
6. Item brought for trade with the Indians?
7. What tribe did the expedition meet with?

Down

1. Month Pike first sees "Pikes Peak"?
3. What tribe did the expedition escort home?
4. What was made out of cottonwood trees called a dugout?
5. Name one of the rivers that Pike was supposed to explore?

Created by Puzzlemaker at DiscoverySchool.com



Solution to Pike Expedition Crossword Puzzle

Across

2. Expedition crossed into New Spain we call it today? Colorado
6. Item brought for trade with the Indians? Beads
7. What tribe did the expedition meet with? Pawnee

Down

1. Month Pike first sees "Pikes Peak"? November
3. What tribe did the expedition escort home? Osage
4. What was made out of cottonwood trees called a dugout? Canoe
5. Name one of the rivers that Pike was supposed to explore? Red

Lesson 4 - Science

Lesson Title: The causes of Non-point and Point Source Water Pollution

Lesson Overview:

Water has played an important role in U.S. history, and has determined its success and survival. Water pollution affects the entire environment and all of the living inhabitants. This lesson will briefly discuss the factors that affect a watershed's health. It will explore the concepts of Point source pollutants and non-point source pollution. Students will gain a better understanding of how a watershed's health is both affected by man and how man affects the watershed.

Standard with Benchmarks:

4.3 Students know major sources of water, its uses, importance, and cyclic patterns of movement through the environment.

Benchmark 9-12 a.-identify and explain factors that influence the quality of water needed to sustain life.

Enduring Understanding:

Dependence on freshwater resources makes it essential that humans understand the impact of geologic processes and the activities of humans on the quality and availability of water.

Students will learn that by using water they are polluting it.

Students will understand that they can help prevent non-point source pollution.

Essential Question(s):

What are the geologic processes and human activities that affect the quality of freshwater?

What is non-point source pollution?

What is the difference between point and non-point pollution?

Why does non-point source pollution matter to the overall well-being of your community?

How can the individual person help reduce the effect of human activity on water quality?

Content Objectives:

- Students will explore the history of water and the impact on freshwater resources that development and exploration had on this resource.
- Students will understand how waste disposal has changed throughout history
- Students will recognize the impact that daily life has on the quality of water, and gain understanding of the impact of their personal actions on this renewable resource.

Language/Technology Objectives:

Students will read background information on the history and practices that were used

to settle the west. Using this informational narrative, they will speculate as to the impact on the quality of water resources by writing a short constructive paragraph that outlines the sources of pollution evident in the reading.

Students will then reinforce this insight by playing a board game that uses scenarios to reinforce environmentally favorable behavior from behavior that results in pollution.

Key Vocabulary:

Bacteria: The microscopic single-celled organisms that derive nourishment from dead or decaying matter.

Contaminant: The introduction of an impurity that causes air, soil, or water to be harmful to human health or the environment. Impurities may include microorganisms/ bacteria, chemicals, toxic substances, wastes, or wastewater concentrated enough to make the air, soil, or water unfit for its intended use.

Conservation: Preserving from loss, waste, or harm.

Drainage basin: An area drained by a main river and its tributaries.

Erosion: The wearing away of the earth's surface by running water, wind, ice, or other geological agents; processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is removed from the earth's surface.

Eutrophication: The process of slowly filling in a water body with sediments and organic matter.

Evaporation: The conversion of water (liquid) into a vapor (gas).

Fertilizer: Any one of a large number of natural or synthetic materials, including manure and nitrogen, phosphorus, and potassium compounds, spread or worked into the soil to increase fertility.

Freshwater: Water that is not salty.

Groundwater: The freshwater that fills the cracks and pores beneath the earth's surface, which supply wells and springs.

Impermeable: Impassable; not allowing the passage of a fluid into or through it.

Land pollution: The trash dropped on the land, such as gum, food wrappers, cans, paper, and plastic bags. It also includes pet waste and oil dripped from cars.

Non-point source Pollution (NPS): Pollution that cannot be traced to a single point, because it comes from many individual places or a widespread area (e.g. urban and agricultural runoff)

Permeable: Passable; allowing fluid to penetrate or pass through it.

Pesticide: Chemicals used to kill pests. Pests may include ants, termites, mice, rats, and agricultural pests.

Point source pollution: Pollution that can be traced to a single point, such as a pipe or culvert (e.g. industrial and wastewater treatment plant discharge)

Pollutant: An impurity (contaminant) that causes an undesirable change in the physical, chemical, or biological characteristics of the air, water, or land that may be harmful to or affect the health, survival, or activities of humans or other living organisms.

Pollution: Contaminants in the air, water or soil that cause harm to human health or the environment.

Precipitation: Water deposited on the earth as rain, hail, mist, fog, sleet, or snow.

Runoff: Water, that originates as rainfall or other precipitation, that flows across surfaces rather than soaking in. This water eventually enters a body of water, but may pick up and carry a variety of pollutants such as sediment, trash, fertilizer, oil, and detergent.

Sediment: Soil and rock materials removed by erosion and transported by water, wind, ice, and gravity....matter which settles to the bottom of a liquid. (contributes to eutrophication)

Storm water: Created when trash, cigarette butts, animal waste, pesticides, motor oil, antifreeze and other contaminants left on the ground are washed or thrown directly into storm drains. This toxic soup mixes with millions of gallons of rainwater and flows untreated into local creeks, rivers and the ocean – polluting our waterways, as well as degrading neighborhoods and other natural resources. In rural areas, storm water is referred to as polluted runoff or nonpoint source pollution.

Surface water: Precipitation that does not soak into the ground or return to the atmosphere by evaporation or transpiration. It is stored in streams, rivers, lakes, ponds, wetlands, oceans, and reservoirs.

Watershed: The land area that directs water to a drainage or river system.

Riparian: Related to or living or located on the bank of natural watercourse (like a river).

Lesson Overview:

The amount of time you have to spend on the topic will determine how in depth you choose to pursue this topic. As part of this lesson on Pike and the impact western exploration had on the environment, we have limited the lesson to one or one and one-half hours.

Introduction to Point and Non-Point pollution

This can be accomplished in a rather short time with students by reading or having students read a narrative that helps to draw a picture of the impact that western exploration had on the environment and explains point and non-point pollution. A narrative has been provided for your use from the Colorado Foundation for Agriculture – Ag in the Classroom. Make copies of the Nonpoint Source Pollution Student Activity.

Additional Reinforcement Activities:

- 1) Use a large sheet of butcher paper to create a list of ways to stop pollution, have students add to the list throughout the time frame for this lesson.
- 2) Have students use half a sheet of poster board to make a poster to inform their classmates/community/school about pollution. (Display the posters!)
- 3) Have students create litter bins complete with slogans that explain why it is important not to pollute or what can be done to stop pollution.
- 4) Have students wash the outside of a window that is easy to reach. A few days later, let them wipe the same window with a clean tissue. Discuss possible reasons the window became dirty. (air pollution)
- 5) Have a contest to design the most original bumper sticker illustrating warnings and concerning pollution. (No littering, No dumping, No burning, etc).
- 6) Arrange for fieldtrips to local companies or industries that deal with pollution prevention.
- 7) Arrange for a guest speaker on water quality, pollution prevention, health or environmental safety.

WATER POLLUTION AND SOCIETY

By

David Krantz and Brad Kifferstein

INTRODUCTION

Comprising over 70% of the Earth's surface, water is undoubtedly the most precious natural resource that exists on our planet. Without the seemingly invaluable compound comprised of hydrogen and oxygen, life on Earth would be non-existent: it is essential for everything on our planet to grow and prosper. Although we as humans recognize this fact, we disregard it by polluting our rivers, lakes, and oceans. Subsequently, we are slowly but surely harming our planet to the point where organisms are dying at a very alarming rate. In addition to innocent organisms dying off, our drinking water has become greatly affected as is our ability to use water for recreational purposes. In order to combat water pollution, we must understand the problems and become part of the solution.

POINT AND NON-POINT SOURCES

According to the American College Dictionary, pollution is defined as: "to make foul or unclean; dirty." Water pollution occurs when a body of water is adversely affected due to the addition of large amounts of materials to the water. When it is unfit for its intended use, water is considered polluted. Two types of water pollutants exist; point source and nonpoint source. Point sources of pollution occur when harmful substances are emitted directly into a body of water. The Exxon Valdez oil spill best illustrates a point source water pollution. A non-point source delivers pollutants indirectly through environmental changes. An example of this type of water pollution is when fertilizer from a field is carried into a stream by rain, in the form of run-off which in turn affects aquatic life. The technology exists for point sources of pollution to be monitored and regulated, although political factors may complicate matters. Non-point sources are much more difficult to control. Pollution arising from non-point sources accounts for a majority of the contaminants in streams and lakes.

CAUSES OF POLLUTION

Many causes of pollution including sewage and fertilizers contain nutrients such as nitrates and phosphates. In excess levels, nutrients over stimulate the growth of aquatic plants and algae. Excessive growth of these types of organisms consequently clogs our waterways, use up dissolved oxygen as they decompose, and block light

to deeper waters. This, in turn, proves very harmful to aquatic organisms as it affects the respiration ability of fish and other invertebrates that reside in water. Pollution is also caused when silt and other suspended solids, such as soil, washoff plowed fields, construction and logging sites, urban areas, and eroded river banks when it rains. Under natural conditions, lakes, rivers, and other water bodies undergo Eutrophication, an aging process that slowly fills in the water body with sediment and organic matter. When these sediments enter various bodies of water, fish respiration becomes impaired, plant productivity and water depth become reduced, and aquatic organisms and their environments become suffocated. Pollution in the form of organic material enters waterways in many different forms as sewage, as leaves and grass clippings, or as runoff from livestock feedlots and pastures. When natural bacteria and protozoan in the water break down this organic material, they begin to use up the oxygen dissolved in the water. Many types of fish and bottom-dwelling animals cannot survive when levels of dissolved oxygen drop below two to five parts per million. When this occurs, it kills aquatic organisms in large numbers which leads to disruptions in the food chain.

U N D E R S T A N D I N G

Nonpoint Source POLLUTION

STUDENT ACTIVITY - ELEMENTARY

Colorado Foundation for Agriculture – Ag in the Classroom

WATER CAN...

make things wet. It can dissolve things. Water can carry things and flow through things. Water beads up on wax paper. Paper towels absorb (soak up) water.

Water can change almost any material. Everything from tiny things you can't see to huge boulders can be moved by water.

The things about water that make it a great cleaner are the same things that allow it to become polluted.

WATER POLLUTION...

is contaminated water. Contamination can be caused by too much dirt getting in the water. It can be caused by oil that drips from a car or truck. Contamination can be caused by large amounts of tree leaves and pet waste getting in the water. When too much stuff gets into water, the natural balance of the water can be upset.



Polluted water can have too many or too few plants growing; oxygen levels can be too high or too low; fish and animals can get sick or die.



Water pollution can result from things we do or choices we make.

We can keep our water clean by learning what causes pollution. We can use the resource wisely. Understanding water can help us make good decisions and keep water clean.



My faucet leaks, but it's not very much. I'll fix it next summer.

Circle the decisions that are good for water!

My driveway needs to be cleaned. I will sweep it.



I'm done cleaning the house. I'm going to toss the bucket of dirty water in the gutter.

I'm going to paint the house. Before I start I'm going to read the paint can labels to find out how to clean up when I'm done.



Two birds with one stone! We can clean the park and recycle the cans!

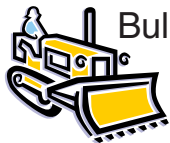


Liquid, solid and gas describe the "states" of water.



Nonpoint source pollution (NPS) is one of two types of water pollution. NPS is hard to pinpoint. It does not come from a single, easy to find source. Where do the contaminants that cause the pollution come from? If we can understand what causes NPS pollution we can work to stop it.

NPS can come from soil that washes away.



Bulldozers and tractors at construction sites can loosen soil. The soil can be picked up by rain runoff or wind and carried into a river or stream. Plowing a field to plant a crop can loosen the soil. The dirt can then

be carried by water into waterways. Pet waste, oil from cars, lawn fertilizers and poisonous cleaners can all contaminate water. Chemical waste, handled improperly, can be picked up by runoff and washed into lakes and rivers.

Urban means cities. Cities are areas where lots of people live. Urban NPS pollution comes from things we do in and around our homes and businesses. Industries can add to NPS pollution in the way they use and dispose of materials. Urban NPS includes things carried by runoff from parking lots and pavement.

Rural means country. There are fewer people in the country. Rural NPS pollution includes things that get into water from agriculture, construction, mining or logging activities. Human waste disposal systems (septic systems) in the country need to be maintained and work properly so they do not leak contaminants into the water system.

WHAT KINDS OF THINGS ARE CONTAMINANTS?

Contaminants can be anything if they enter the water in a quantity too large for the water to handle.

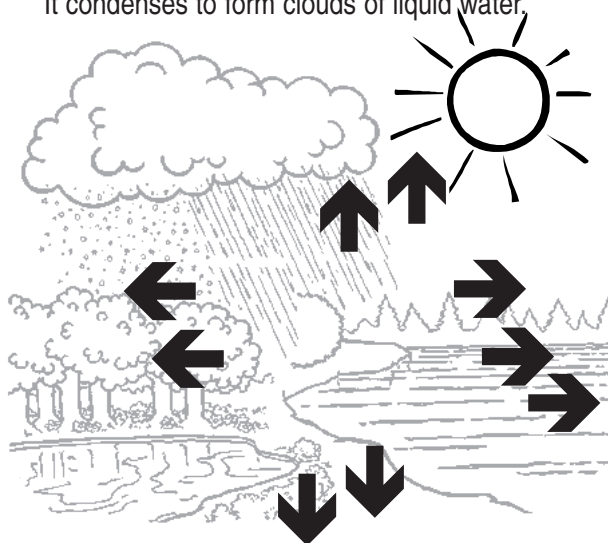
Water Cycle

Precipitation - The water in the clouds falls to the surface of earth as rain, snow, sleet or hail.

Runoff - Precipitation that hits the ground runs off into lakes or streams.

Some water stays on the surface of the ground. It is called surface water. Some water soaks into the ground. Underground water is called groundwater

Condensation - Water vapor cools and gets heavy. It condenses to form clouds of liquid water.



Evaporation - Heat from the sun evaporates water (changes water from liquid to gas - water vapor). The vapor rises into the atmosphere.

Transpiration - Plants "breathe" water in the form of vapor into the atmosphere.



The two categories of water pollution are **point source** pollution and **nonpoint source** pollution. Point source pollution can be tracked to find where it comes from. It can be identified and stopped. Nonpoint source (NPS) pollution comes from sources that are hard to locate and identify.



Dirt is soil or sediment. When too much of it gets into the water it can cause problems. What do you think might happen to a pond or a stream if a lot of dirt gets into it? Will the waterway get muddy? Can the fish and other animals that live in the water see and breathe? Motor oil and grease used in cars, lawnmowers, chainsaws and other tools with motors can be contaminants. Weed killer, bug killer and plant food used on lawns and gardens can contaminate water if they are not used properly. Cleaners, paints and paint thinner used in homes are often poisonous and can contaminate water.

LET'S MAKE A LIST...

NPS pollution can result from improper use or disposal of:

- bug killer (pesticides)
 - weed killer (herbicides)
 - plant food (fertilizers)
- Dirt stirred up by land use activities including:
- construction (building roads, houses, schools, malls, etc.)
 - logging



- agriculture
- mining
- Rubber from car and truck tires
- Oil and grease
- Copper and other metals from cars and trucks
- Chemicals from car exhaust
- Landfill (dump) runoff
- Septic system leaking

WHAT CAN WE DO TO KEEP WATER CLEAN?

There are many things we can do so that we do not add to nonpoint source pollution. Everyone needs to do their part.

1. Use less water. (This is called conservation.) Using water efficiently creates less waste water.
 - Turn the water faucet off when your brush your teeth.
 - Take short showers instead of filling the bathtub for a bath.

- Clean drive-ways and sidewalks by sweeping instead of using a hose and water.
 - Fix leaking faucets.
2. Pick up pet waste and put in the trash.
 3. Clean up spills.
 4. Learn the right way to throw away left over cleaning products and their containers.
 5. Use transportation other than cars and trucks.
 6. Join a neighborhood or community clean-up event.
 7. Look around your school to see what needs to be done. Help organize a recycling project and clean up trash and litter.
 8. Recycle cans, papers and glass containers

These are just a few ideas.

Write five things *you* can do to help stop nonpoint source pollution:

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____



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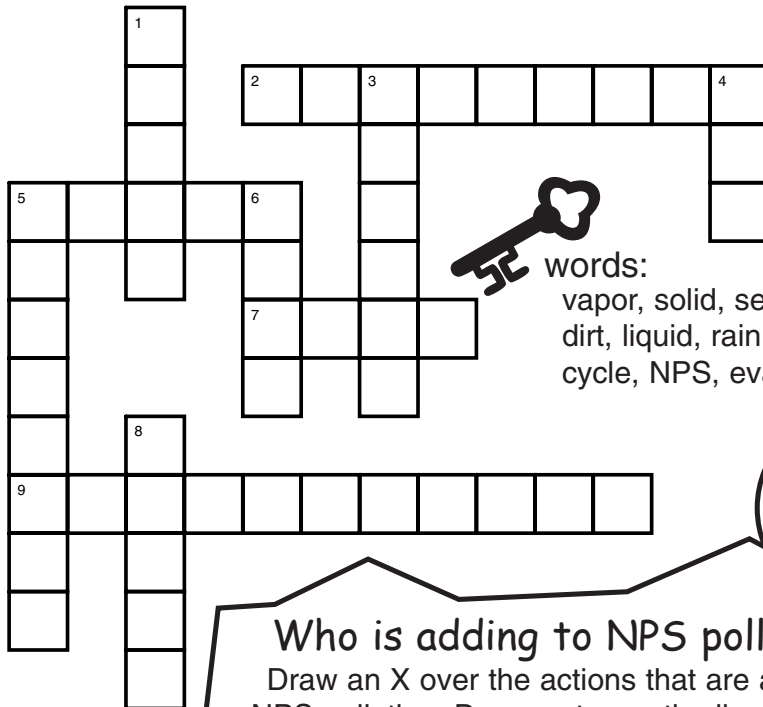
Financial support for this project has been provided by:

Colorado Department of Public Health and Environment - Water Quality Control Division

C R W O R D S S S



PUZZLE



words:
vapor, solid, sediment,
dirt, liquid, rain, pollution,
cycle, NPS, evaporation

Put the
keywords in
alphabetical
order!!

ACROSS

- Dirt, motor oil, pet waste, improperly handled paints, cleaners, plant food, etc. can all be forms of _____.
- Water in this "state" is frozen. It is snow, ice, hail, etc. What is this state?
- Water falls from clouds as precipitation. Liquid precipitation is _____.
- This occurs in the water cycle when the sun heats surface water and changes it from liquid to vapor.

DOWN

- Water changes from liquid to vapor to liquid or solid. It evaporates into the atmosphere, condenses, precipitates, then does it all again. This is called the water _____.
- Rain is water in this state. It is _____.
- Nonpoint source pollution is often referred to as _____.
- This is the most common pollutant. It is the same as dirt or soil.
- This is the most common pollutant. It is the same as sediment or soil.
- You've read clues for water in 2 of its states, solid and liquid. This is the other state of water.

Who is adding to NPS pollution?

Draw an X over the actions that are adding to NPS pollution. Draw a star on the line in front of the actions that help keep water clean.

_____ Seven-year-old Bobby has a job walking dogs for four of his neighbors. He takes the dogs to the park and walks them around the pond. He carries a plastic bag and a scooping spoon to pick up their waste. He puts the plastic bag in the litter barrel when he leaves the park.

_____ Julie likes to watch her candy wrappers fly in the wind when she tosses them out the car window.

_____ Rebecca helps her brother change the oil in his car. She dumps the old oil on the vacant lot next door.

_____ Stephanie and Janice formed a group called the Trash Trawlers. Four other students join them every other Saturday to pick up litter at the park.

_____ Mike's chore this weekend is to clean the driveway. He'd rather be riding his bike. He puts the broom aside and grabs the hose and squirts. He's done in a jiffy. He splashed his bike through the water in the gutter on the way to Bobby's house.

_____ Cindy and her mother replaced the washers in two faucets and stopped the water from leaking.



Lesson Four – Math

Build Your Own Sextant

Standards with Benchmarks:

Colorado Mathematics Standard 5: Students develop number sense, use number relationships in problem-solving situations and be able to communicate the reasoning involved

Benchmark a: Demonstrate meanings for integers, rational numbers, percents, exponents, square roots, and pi using physical materials and technology in problem solving situations.

Essential Question: How did explorers of the 1800's find altitudes of objects above the horizon?

Content Objective:

Students will build their own sextant.

Students will compare angles.

Students will identify possible reasons for variations in angle measure.

Language Objective:

Students will write about the differences in angle measure.

Students will read angles from their sextant.

Key Vocabulary:

Angle of elevation- the angle between a horizon and the line of sight. (Algebra To Go)

Plumb line- the line from which a weight is suspended to determine verticality or depth. Plumb lines directly point to the Earth's center of gravity.

Lesson Overview:

1. Have students work with a partner for this activity.
2. Tie three paper clips or a washer to the end of a piece of string. Then tape the string to the midpoint of the protractor so that the string falls at the 90-degree mark. The string is called the plumb line.
3. Tape the protractor to the end of the ruler. The protractor should be within one inch of the end of the ruler.
4. Have students take turns looking down the ruler at a specified object. The protractor should be upside down and the plumb line will hang down. Each student's partner will determine where the plumb line falls on the protractor. They should read the inner set of numbers on the protractor (between 0 and 90-degrees). Each student should record his or her measurement on a Data table. One student should use the Angle Measurement 1 column for all measurements and their partner should use the Angle Measurement 2 column.

5. Have each group report their findings with the class.
6. As a class discuss reasons for variations in the measurements.
7. Allow students to use their sextants to make 4-5 other measurements each. Students should then complete the Sextant Data Table and the questions that follow.

Strategies for Differentiation:

1. More advanced students can use the angles they found and trigonometric ratios to find heights of various objects.
2. Allow flexible groupings of students.

Materials/Resources:

30 cm wooden ruler
 Protractor
 Tape
 String
 Washer or paper clips
 Compass
 Data Table

Assessment:

Students should find the angles for the objects with reasonable accuracy as well as identify ways to make more accurate measurements.

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Names _____

Date _____

Sextant Data Table

| Object | Angle Measurement 1 | Angle Measurement 2 |
|--------|---------------------|---------------------|
| | | |
| | | |
| | | |
| | | |
| | | |

1. For which objects were you and your partners' measurements the closest? For which objects were they the most different?

2. Why do you think some measurements were more accurate than others?

3. Can you think of any ways to improve this method of measurement?

Lesson Four - Writing/Reading

Lesson Title; Journal Writing on the Expedition

Standards with Benchmarks

Standard 1: Students read and understand a variety of materials.

- n. make connections between their reading and what they already know, and identify what they need to know about a topic before reading about it
- h. use information from their reading to increase vocabulary and enhance language usage

Standard 4: Students apply thinking skills to their reading, writing, speaking, listening, and viewing.

- o. recognize, express, and defend points of view orally and in writing
- p. identify the purpose, perspective, and historical and cultural influences of a speaker, author, or director
- q. evaluate the reliability, accuracy, and relevancy of information

Standard 6: Students read and recognize literature as a record of human experience.

- i. read literature to understand places, people, events, and vocabulary, both familiar and unfamiliar
- j. read literature that reflects the uniqueness and integrity of the American experience

Essential Question: What inferences can be made as to Zebulon Pike's thoughts as he ascended the mountain?

Content Objectives:

1. We will examine journal entries which reference Pike's attempt at climbing the "Grand Mountain".

Language Objectives:

1. We will read various journal writings from *The Southwestern Journals of Zebulon Pike 1806 – 1807*
2. We will define any vocabulary words.

Lesson Overview: (20 – 30 minutes)

(Activities, procedure for delivery of instruction)

1. Have students choose a journal entry and read with the students asking visualization questions as the material is read.
2. Have the students record teacher designated vocabulary words into their notes.
3. Hand out journals and have the students make an entry. Prompt: What would Pike gain by climbing the highest peak in the area?

Materials/Resources:

1. Reading materials the Southwestern Journals of Zebulon Pike
2. Journal booklet

Assessment:

Oral questioning Participation Journal entry

Lesson Four - Physical Education

Lesson Title: Packing and checking soldiers' equipment for Pike's trip westward.

Students will use their own back packs as substitutes and simulate actual equipment and supplies, (ie: backpack filled with 35-55 pounds of weights or sports equipment).

Standards with Benchmarks:

#4: Students demonstrate knowledge of the benefits and risks associated with involvement in physical activity.

- d. demonstrate the ability to evaluate risks and safety factors that may affect participation in physical activity throughout life.
- e. demonstrate and/or describe health benefits that result from regular safe participation in physical activity.

#5: Recognition of the role of physical activity and its unique contributions to social, emotional, mental, and physical development.

- b. demonstrate willingness to share individual strengths and knowledge with others.
- c. demonstrate proficiency in a new or advanced level of physical activity.

#6: Recognition of the role of competitive activity in developing physically active lifestyles.

- a. demonstrate cooperative participation when engaged in competitive physical activities.
- b. demonstrate according to their ability, leadership and/or fellowship while participating in group activities.

Health:

#6: Students demonstrate the ability to use goal-setting and decision-making skills to enhance health.

- c. analyze health concerns that require collaborative decision making.

Benchmarks

- Analyze the role of individual responsibility for enhancing health.
- Benefits and risks associated with involvement in physical activity.
- How participation in physical fitness activities contributes to the potential to become a highly productive citizen.



SECTION 5 |

THE HISTORIC ARKANSAS RIVERWALK OF PUEBLO

Lesson Five - Social Studies

Lesson Title: Zebulon Pike and Exploring the Southwest.

Standards with Benchmarks:

Geography 5.2 Students know how physical systems affect human systems.

b. analyze how humans perceive and react to natural hazards.

Geography 6.1 Students know how to apply geography to understand the past.

b. analyze the fundamental role that places and environments have played in history.

History 3.2 Students understand the history of social organization in various societies.

b. explain how social organization has been related to distributions of privilege and power.

Essential Question: How did Zebulon Montgomery Pike make a difference to the Southwest of the U.S.?

Content Objectives:

1. We will observe and analyze the exhibits at Pike Plaza at the Historic Arkansas Riverwalk of Pueblo.

Language Objectives:

3. We will read the exhibits at Pike Plaza.
4. We will write down the answers to the questionnaire for Pike Plaza.

Key Vocabulary:

Zebulon Montgomery Pike
El Pueblo Museum

Blue Mountain
Pike Plaza

Lesson Overview: (Field Trip)

(Activities, procedure for delivery of instruction)

1. Handout questionnaire for Pike Plaza at the Historic Arkansas Riverwalk of Pueblo. View the exhibits at Pike Plaza.
2. Have students complete post-test on Zebulon Pike.

Strategies for differentiation:

1. Questionnaire for Pike Plaza in Pueblo, CO
2. Post-Test Worksheet

Assessment:

1. Questionnaire worksheet
2. Post-Test worksheet

Evaluation/Reflection:

Post-test on Zebulon M. Pike & Exploring the Southwest

1. Who was Zebulon M. Pike?
 - a. Lieutenant in the U.S. Army when he first started on the Southwest expedition
 - b. Explorer of the Southwest territories
 - c. A protégé of General Wilkinson
 - d. All of the above

2. Why was the Louisiana Purchase significant to the US?
 - a. almost doubled the size of the U.S. in 1803
 - b. almost tripled the size of the U.S. in 1803
 - c. gave all of the lands west of the Mississippi River to the U.S. from the British
 - d. gave all of the lands east of the Mississippi river to the U.S. from the Canadians

3. Who was Thomas Jefferson?
 - a. Lived in Colorado during Pike's expeditions
 - b. One of the first settlers in Pueblo, CO
 - c. One of the first to climb Pikes Peak
 - d. President of the United States

4. What are the four components that most maps have?
 - a. Roads, Title, Grid, & Color
 - b. Color, Scale, Roads & Population
 - c. Scale, Title, Compass Rose, & Key
 - d. Compass Rose, Grid, Roads, & Color

5. Who was Meriwether Lewis?
 - a. An explorer looking for the Hawaiian Islands
 - b. An explorer looking for the Northwest Passage
 - c. An explorer looking for El Dorado
 - d. An explorer looking for the Lost Dutchman Gold Mine

6. Who was William Clark?
 - a. An explorer looking for the Northwest Passage
 - b. An explorer looking for the Hawaiian Islands
 - c. An explorer looking for El Dorado
 - d. An explorer looking for the Lost Dutchman Gold Mine

7. What was General Wilkinson's role in sending Pike to the southwest?
 - a. He didn't like Pike
 - b. Commander of the U.S. Army
 - c. Pike murdered General Wilkinson's brother
 - d. The General was the travel agent for the U.S. Government

8. What was Zebulon M. Pike's assignment in the southwest?
 - a. Escort 51 Osages back to their village in Nebraska
 - b. Make contact with the Comanche people
 - c. Find the Headwaters of the Arkansas/Red Rivers and note the natural resources of the area
 - d. All of the above

9. How long did Zebulon M. Pike have to get ready for his second expedition?
 - a. Was given several weeks to get ready
 - b. Was given six months to get ready
 - c. Was given two years to get ready
 - d. Was given five years to get ready

10. Which of the following was a success for Pike?
 - a. He climbed to the top of Pikes Peak
 - b. He was able to report about the natural resources of the area and military establishments of the Spanish
 - c. He was able to locate the source of the Red River
 - d. He was able to contact with the Comanche people

11. How long was Zebulon M. Pike second expedition?
 - a. From March, 1801- March, 1807
 - b. From July, 1806- June, 1807
 - c. From July, 1810- June, 1811
 - d. From March, 1999- March, 2001

12. Where was Zebulon M. Pike taken into custody by the Spanish?
 - a. At the head waters of the Mississippi River, Spanish Territory
 - b. On the Rio del Norte, Spanish Territory
 - c. On the Columbia River, Spanish Territory
 - d. On the Colorado River, British Territory

13. What made Pike's trip so difficult when winter came?
 - a. They only had gear for the summer
 - b. They only brought enough food for two years
 - c. They forgot to bring summer clothing
 - d. They didn't have snow tires

14. Why did it take Pike so long to take the Osage to their village?
 - a. Delayed by weather and having to move so many people
 - b. Decided to take a round-about way to get to the village
 - c. Got lost on the way to the Osage village
 - d. the wheels on the wagons fell off and had to be repaired

15. When did General Wilkinson expect Pike to be back from the southwest expedition?
- He was given until 1809
 - He was expected to be back before winter set in
 - He was given 24 hours
 - He was to return by the New Year
16. What was the name that Zebulon M. Pike called Pikes Peak?
- The Blue Rock
 - Red Rock
 - Grand Peak
 - Pikes Peak
17. What did Zebulon M. Pike build at Pueblo, CO?
- A house for his father
 - A reservation for the Native Americans
 - CFI steel mill
 - defensive stockade of logs (Breastworks)
18. Who was Zebulon M. Pike married to?
- Martha Washington in 1801
 - Dolly Madison in 1801
 - Clarissa Harlow Brown in 1801
 - Mary Todd Lincoln in 1801
19. Why did Zebulon M. Pike leave two of his men behind in the Colorado Mountains in the middle of winter?
- As a punishment for falling asleep on duty
 - As a punishment for eating more than their share of the food
 - Because they didn't want to travel anymore and wanted to quit the army
 - Their feet were frostbitten and were too severely injured to travel
20. How did the two men left behind in the mountains remind Pike that they were still alive?
- They pulled out the bones from their frostbitten toes and sent them to Pike
 - They wrote a note that said "Don't forget us."
 - They sent a message through the Iroquois asking for help
 - They sent a message saying they didn't need to be rescued they resigned from the military

Key to Pre and Post Tests

1. d
2. a
3. d
4. c
5. b
6. a
7. b
8. d
9. a
10. b
11. b
12. b
13. a
14. a
15. b
16. c
17. d
18. c
19. d
20. a

Lesson Five - Science

The theme for this lesson was for the students to experience Pike by using some of the community resources of our community. The Boettcher Outdoor Education Center at the Historic Arkansas Riverwalk of Pueblo was designed to provide schools with an outdoor classroom opportunity featuring an outdoor laboratory and facilities including availability of microscopes.

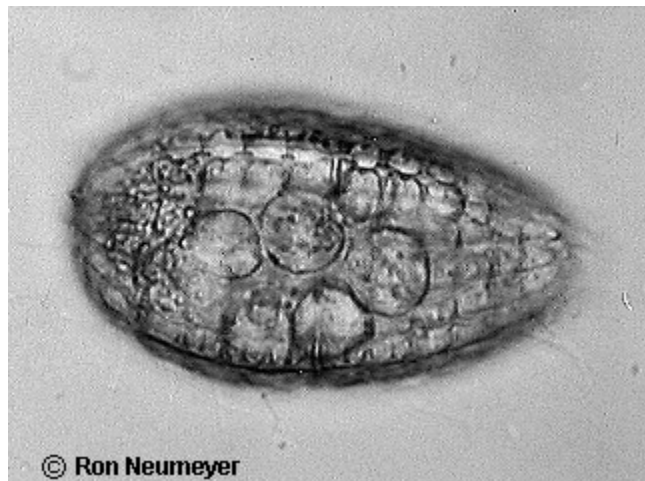
This lesson focuses on the identification of species found in a controlled waterway, and emphasizes variety in sampling location and conditions. It would be advisable to ensure that students have previous experience with microscopes, and that discussion occurs concerning the tolerance levels of different species of organisms. The focus of this lesson is on the following essential questions:

- What types of habitats will protozoa be found in?
- Do protozoa live in fast moving streams?
- Do protozoa have a higher population in the bright sunlight or in shady areas of the stream?
- Does population size indicate tolerance?

Beginners tips on collection and studying protozoa

by Mike Samworth

Since the protozoa are very diverse and varied organisms living in a number of different environments, it is difficult to give instruction on their study. However, most microscopists or interested naturalists will be encountering freshwater specimens rather than those that are parasites of man or other animals. This article will deal therefore with those types found free-living in the freshwater environment.



(Image right shows Coleps).

Most free-living protozoa ingest their food, that is they are phagotrophic, they may 'eat' bacteria, algae, small organic particles or each other. Again, though each consists of a single cell, the shape and size can differ so much that generalisations are not all that useful. They tend to be abundant in habitats where productivity is high, soft sediments supporting particularly high numbers. Unlike sampling for algae, nets are rarely of any use. Submerging a bottle of about a litre and filling it two-thirds full is a better method.

On return the catch must be looked at fairly quickly as some protozoa will only remain alive for a few hours, though this is helped if the bottle is kept cool, especially out of direct sunlight. If left overnight, many of the more fragile species will have died, but others will have accumulated on the bottom, where they are easily sucked up with a teat pipette.

A large volume of an unconcentrated sample is often easily concentrated by centrifugation. A hand-operated centrifuge is very useful and is easily made from one of those battery operated mini-fans that are available each summer. A couple of plastic centrifuge tubes are fixed to the rotor blades. An alternative is to sieve the sample through a fine nylon mesh.

Protozoa are also abundant in mosses, particularly Sphagnum moss. A small sample of moss can be squeezed into a sample bottle, and this liquor should yield both testate and naked amoebae and some of the larger flagellates.

It is always best to observe undisturbed material for as long as possible. Free-swimming types are most easily observed on glass slides with cover slips supported by blobs of Vaseline at each corner. Cavity slides can also be used, though the greater volume of water can be troublesome. Excessive movement of the organisms can be slowed by using a viscous substance such as methyl cellulose, a drop being added to the slide

Begin observations at low powers first, making observations and drawings as required, before moving on to higher powers. Both dark-field and phase contrast illumination techniques are useful if you have them available. One useful technique is to make a hanging drop preparation whereby the sample is put onto the cover-slip and then the cover-slip placed on the slide upside-down. As living cells become attached to the underside of the cover-slip they can be viewed with a high-power objective.



Paramecium

Identifying to species level is very time-consuming. However, it is often quite easy to place organisms into one of the higher levels of classification, and this is a more feasible thing to aim for when beginning study. As experience is gained and familiarity with the keys, identification to the level of genus can be reached.

~ How to collect Microscopic Pond Life



Some tips for collecting, keeping and culturing micro-organisms



The easiest way to collect micro-organisms and other small pond life is to squeeze the water from water plants or pond scum into a container.

Another method is to scrape the growth from water plants or other things that are covered by a green or brown growth. An old credit card will make an excellent scraper but be careful not to drop it in the pond!

A plankton net is recommended for free swimming (planktonic) species. This is a net made of a very fine meshed cloth with a small container at the end. You can also use the plankton net to concentrate the material squeezed out of water plants.



Desmids: These beautiful small algae are most abundant in waters without too many nutrients or acid waters. Bogs are often good collecting spots. Squeezing *Sphagnum* moss is a good method. Desmids often attach themselves to these plants.



Amoeba: These remarkable protozoa often live feeding on organic material on the bottom sediment of a pond. A good method of collecting them is to lower a jar upside down until it is positioned just above the mud surface. Then slowly let the air escape so the top layer will be sucked into the jar. You can move the jar slowly when tilting so you collect from a larger area.



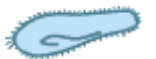
Hydra: (see [first page](#) for links) They can be collected by putting duckweed or other waterweed into a glass jar full of water. Then wait for some hours. The hydras can then be found attached to the glass.



Examining the growth scraped off surfaces with a hand lens can give a clue to the creatures present. If the growth is brown there is a good chance you will find [diatoms](#). White fluffy masses are often colonies of [bell animalcules](#).



Keeping and culturing [Algae](#) or [Protozoa](#). It is recommended to keep pond organisms in a shallow container. A large surface with only a couple of centimeters of water will ensure there is enough oxygen in the water. For culturing algae a simple method is to cook some garden soil in water. After cooling you can incubate it with the algae you want to grow.














For bacteria eating protozoa like paramecium you can boil dry grass in water. Wait for one or two weeks until a layer of bacteria grows under the surface. Then incubate it with a bit of pond water containing ciliates.

Pond Life Identification Kit ~

A simple guide to small and microscopic pond life

One of the most rewarding subjects for study with a microscope are freshwater organisms. Simple collecting methods include squeezing water plants into a jar and for free swimming species, a fine-meshed plankton net is recommended.

The table and linked pages are a guide to some common groups of smaller freshwater organisms (microscopic to a few millimetres in size)..

| Group | | Key features | Notes |
|--|---|---|-------|
| Bacteria |  | single celled, dots or strands, just visible with strongest magnification, cyanobacteria are larger | |
| <u>Protozoa</u> |  | single celled, with tiny hairs or pseudopodia | |
| <u>Algae</u> |  | single celled, mostly green, sometimes yellow-brown | |
| Rotifers |  | wheel-like, hairy appendages, transparent, free swimming or attached
0.2 - 1 mm | |
| Gastrotrichs |  | two tails, hairy, round mouth opening
0.1 - 0.5 mm | |
| <u>Worms</u> |  | long thin body, many non related forms | |
| Bryozoa |  | plant-like or jelly-like colony, crown of tentacles
individuals: 0.25 - 5 mm | |
| Hydra |  | green brown or colourless, body and tentacles contract and stretch
extended: 20 mm | |
| Water bears (Tardigrades) |  | 8 stumpy legs, slow moving
<1 mm
See gallery links on the right for some of the finest video clips on the Web of these cute critters! | |
| <u>Arthropods</u> |  | jointed limbs; many groups e.g. crustaceans ('water fleas'), mites | |
| other Arthropods: <u>Insect Stages</u> |  | wide variety of forms | |

Organisms found at the Historic Arkansas Riverwalk of Pueblo

Observe your specimen and draw as much detail as possible. Examine the visible structures and outline general shapes, then look for areas that are darker and lighter and shade your image appropriately. Object is to be drawn on high power, and you are to draw your image to where it completely fills the square provided.

Collection Location:

Group:

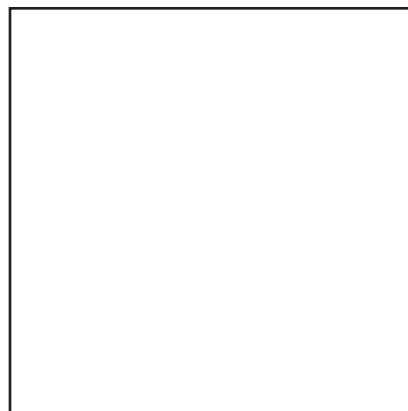
Identification (common name):

Group Classification

Brief Description: (size, shape, color)

Method of Movement:

Food Source:



Lesson Five - Math

Lesson Title: Characteristics of Trees Using Mathematics

Standards with Benchmarks:

Colorado Mathematics Standard 2: Students use algebraic methods to explore, model, and describe patterns and functions involving numbers, shapes, data and graphs in problem-solving situations and communicate the reasoning used in solving these problems.

Benchmark a: represent, describe and analyze patterns and relationships using hands-on materials, tables, graphs, verbal rules and standard algebraic notation.

Essential Question:

How can measurements and proportions be used to classify various types of trees?

Content Objective:

Students will measure length and width of leaf samples to the nearest millimeter and the circumference of trees.

Students will calculate the diameter of the same trees.

Students will calculate the height of the trees using ratios and proportions.

Language Objective:

Students will write brief tree descriptions.

Students will summarize their findings.

Students will discuss outcomes.

Key Vocabulary:

Ratio: A comparison of two numbers or measures using division.

Proportion: An equation showing that two ratios are equal.

Circumference: The perimeter of a circle.

Lesson Overview:

1. Have students imagine that they are part of Zebulon Pike's Expedition. As part of their exploration they will document the plants and animals encountered along their way.
2. Divide class into pairs.
3. Distribute copies of Using Proportion to Find Height, one for each student. Do 2-3 sample problems as part of review

4. Tell students what to collect on the outdoor specimen collection activity including:
 - a. The number of samples that need to be collected (suggested number is 3-5 samples)
 - b. The data that must be collected for each sample including the length and width of each leaf, the measurement of the circumference of the trunk where the leaf came from, the length of the shadow of the tree and the length of the students shadow and the students height.
5. Have students collect leaf samples and record required tree measurements. If time is running short, allow students to share data, but use their own height and shadow length to find the height of the trees.
6. Have students tape their leaf samples to their leaf journal and fill out their data sheet pages. If you are in an area where no leaves have fallen, have students draw the leaves in their journals.
7. Have students take turns sharing their findings. Students should try to find correlations in their data sets.

Strategies for Differentiation:

More advanced students can discuss or write about why these proportions work to find the height of the trees.

This lesson addresses a variety of the multiple intelligences.

Allow for flexible groupings.

Materials/Resources:

Outdoor classroom or wooded area

Large measuring tools (meter sticks, measuring tapes, etc.)

Tree Leaf Characteristics Journals (when making copies, turn every other sheet upside down)

Tape

Report Summary

Tree Characteristics Journal

By:

Date:



A series of ten vertical lines providing a space for writing the report summary.

Leaf Sample (tape leaf sample here)

Leaf Width: _____

Leaf Length: _____

Tree Circumference: _____

Tree's Shadow Length: _____

Calculations: _____

Height of Tree: _____

Brief tree description:

Leaf Sample
(tape leaf sample here)

Leaf Width: _____

Leaf Length: _____

Tree Circumference: _____

Tree's Shadow Length: _____

Calculations: _____

Height of Tree: _____

Brief tree description:

Leaf Sample (tape leaf sample here)

Leaf Width: _____

Leaf Length: _____

Tree Circumference: _____

Tree's Shadow Length: _____

Calculations: _____

Height of Tree: _____

Brief tree description:

Leaf Sample
(tape leaf sample here)

Leaf Width: _____

Leaf Length: _____

Tree Circumference: _____

Tree's Shadow Length: _____

Calculations: _____

Height of Tree: _____

Brief tree description:

Leaf Sample
(tape leaf sample here)

Brief tree description:

Leaf Width: _____

Leaf Length: _____

Tree Circumference: _____

Tree's Shadow Length: _____

Calculations: _____

Height of Tree: _____

Lesson Five Reading Writing

Lesson Title: Tracing Zebulon Pike at the Historic Arkansas Riverwalk of Pueblo

Standards with Benchmarks:

Students read and understand a variety of materials.

Students will make connections between their reading and what they already know, and identify what they need to know about a topic before reading about it.

Essential Question:

How is Zebulon Pike's expedition interpreted at the Riverwalk?

Content Objectives:

Students will observe and analyze the interpretive panels at the Historic Arkansas Riverwalk of Pueblo.

Language Objectives:

Students will answer questions on a scavenger hunt/questionnaire for Pike Plaza.

Welcome to Pike Plaza at the Boettcher Outdoor Education Center on the Historic Arkansas Riverwalk of Pueblo! Look around this area to find answers to the clues listed below and learn about Zebulon Pike's expedition through Southern Colorado in 1806.

1. How many men were in Pike's expedition?
2. When did Pike first view Pikes Peak?
3. What did he call Pikes Peak?
4. Name two animals they survived on?
5. Did Pike make it to the top of Pikes Peak?
6. Who arrested Pike?

Look on floor of Pike Plaza

7. Name 2 rivers located in Southern Colorado.
8. On November 13, 1806 Pike and his men killed what bird for their meal?
9. What kind of tree did Pike and his men find on the Arkansas River?
10. Pike entered Colorado from what state?
11. Pike and his found wild horses in Kansas on what date?

For the answers to the following questions find the interpretive signs located throughout the area.

12. Where are the headwaters of the Arkansas River located?
13. How many states does the Arkansas River flow through?
14. Two hundred years ago what animal was prized for their fur?
15. What did they make with beaver pelts?
16. Look at the trade list for beaver pelts. What are some items you could trade for a beaver pelt?
16. What do beavers do when they are alarmed (scared)?
17. How long can a beaver stay under water?
18. What kind of birds nest in a cattail marsh?
19. What are some animals that call a cattail marsh home?
20. Are cattails edible?
21. Pike and his men found many of this type of tree.
22. What are some uses of this type of tree?
23. Can you think of anything else?

24. Name two groups of settlers who were here before Zebulon Pike and his men.

25. Name two Native American tribes that lived here.

26. How many countries have had control over this area?

27. Find the monument to Zebulon Montgomery Pike erected by the DAR (Daughters of the American Revolution). What is the date on the monument?

Bonus Question: What is November 23, 2006?

Double Bonus Question: What did Zebulon Montgomery Pike's family call him?

Welcome to Pike Plaza at the Boettcher Outdoor Education Center on the Historic Arkansas Riverwalk of Pueblo! Look around this area to find answers to the clues listed below and learn about Zebulon Pike's expedition through Southern Colorado in 1806.

1. How many men were in Pike's expedition? Answer: 22
2. When did Pike first view Pikes Peak? Answer: November 15, 1806
3. What did he call Pikes Peak? Answer: Grand Peak
4. Name two animals they survived on? Answer: deer, buffalo, partridge
5. Did Pike make it to the top of Pikes Peak? Answer: no
6. Who arrested Pike? Answer: The Spanish

Look on floor of Pike Plaza

7. Name 2 rivers located in Southern Colorado. Answer: Huerfano River, Purgatory River, St. Charles River, Arkansas River, Fountain Creek.
8. On November 13, 1806 Pike and his men killed what bird for their meal?
Answer: A turkey
9. What kind of tree did Pike and his men find on the Arkansas River?
Answer: Cottonwood
10. Pike entered Colorado from what state? Answer: Kansas

11. Pike and his found wild horses in Kansas on what date?
Answer: October 29, 1806

For the answers to the following questions find the interpretive signs located throughout the area.

12. Where are the headwaters of the Arkansas River located?
Answer: On Mt. Elbert.

13. How many states does the Arkansas River flow through?
Answer: 5 - Colorado Kansas, Oklahoma, Arkansas, Louisiana.

14. Two hundred years ago what animal was prized for their fur?
Answer: beaver.

15. What did they make with beaver pelts? Answer: top hats.

16. Look at the trade list for beaver pelts. What are some items you could trade for a beaver pelt? Answer: blankets, socks etc...

16. What do beavers do when they are alarmed (scared)? Answer: They slap the water with their tail.

17. How long can a beaver stay under water? Answer: 15 minutes

18. What kind of birds nest in a cattail marsh? Answer: Red Wing Blackbirds

19. What are some animals that call a cattail marsh home? Answer: Frogs, turtles, salamanders, and muskrats

20. Are cattails edible? Yes, the roots were ground to make flour.

21. Pike and his men found many of this type of tree. Answer: Cottonwood

22. What are some uses of this type of tree? Answer: start a fire, build a wagon wheel?

23. Can you think of anything else? Answer: build a house etc...

24. Name two groups of settlers who were here before Zebulon Pike and his men. Answer: Native Americans and Spanish Conquistadors.

25. Name two Native American tribes that lived here. Answer: Ute, Arapahoe, Comanche.

26. How many countries have had control over this area? Answer: 5 - Spain, France, Republic of Texas, Colorado, Mexico.

27. Find the monument to Zebulon Montgomery Pike erected by the DAR (Daughters of the American Revolution). What is the date on the monument? Answer: November 23, 1806 - the day Pike entered what is now Pueblo, Colorado.

Bonus Question: What is November 23, 2006? Answer: Thanksgiving Day.

Double Bonus Question: What did Zebulon Montgomery Pike's family call him? Answer: Monty

Find a medallion on the floor of the plaza and have the kids do a rubbing. Each medallion represents one of Pike's campsites.

Thanks for visiting us today. We hope you enjoyed it!

Lesson Five - Physical Education

Lesson Title - Pike Hike at the Historic Arkansas Riverwalk of Pueblo

Objective: Students will hike around the entire Riverwalk carrying their Pike packs.

Standards with Benchmarks:

#4: Students demonstrate knowledge of the benefits and risks associated with involvement in physical activity.

- d. demonstrate the ability to evaluate risks and safety factors that may affect participation in physical activity throughout life.
- e. demonstrate and/or describe health benefits that result from regular safe participation in physical activity.

#5: Recognition of the role of physical activity and its unique contributions to social, emotional, mental, and physical development.

- b. demonstrate willingness to share individual strengths and knowledge with others.
- c. demonstrate proficiency in a new or advanced level of physical activity.

#6: Recognition of the role of competitive activity in developing physically active lifestyles.

- a. demonstrate cooperative participation when engaged in competitive physical activities
- b. demonstrate according to their ability, leadership and/or fellowship while participating in group activities.

Health:

#6: Students demonstrate the ability to use goal-setting and decision-making skills to enhance health.

- c. analyze health concerns that require collaborative decision making

Benchmarks

- Analyze the role of individual responsibility for enhancing health.
- Benefits and risks associated with involvement in physical activity.
- How participation in physical fitness activities contributes to the potential to become a highly productive citizen.

