

Unit 3: Maps

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Overview and Resources

President Thomas Jefferson was eager to know the lay of the land west of the Mississippi River, especially the major watershed of the Missouri River. The Pacific coastline of North America had been well charted by Spanish, Russian, British and American seafaring explorers and traders. In May 1792, Captain Robert Gray, an American merchant seaman, entered the mouth of the Columbia River in his ship, *Columbia Rediviva*, for which the river was named.

On maps in the late 1700s and early 1800s, the landscape and topography for almost two-thirds of the North American interior was blank. It was known a continental divide existed somewhere in the west. In 1725, Daniel Coxe stated the rivers were "... separated by a ridge of hills which would prove passable by horse, foot or wagon in less than a half a day." In 1772, Robert Rogers speculated one could reach the "River Ouragan" via the headwaters of the Mississippi River and a portage of 20 miles. Thomas Jefferson proposed to the American Philosophical Society in 1793 and later in 1802–1803 a plan for the exploration of a route with a "single portage" from the Missouri River to the best water course flowing to the "Western Ocean." These were all speculations which the Lewis and Clark expedition proved untrue.

In his 20 June 1803 letter of instructions to Meriwether Lewis, President Jefferson stated the need to map and document the journey of the Corps of Discovery:

"Beginning at the mouth of the Missouri, you will take observations of latitude & longitude, at all remarkable points on the river, & especially at the mouths of rivers, at rapids, at islands, & other places & objects distinguished by such natural marks & characters of a durable kind, as that they may with certainty be recognized hereafter. The courses of the river between these points of observation may be supplied by the compass the log-line & by time, corrected by the observations themselves. The variations of the compass too, in different places, should be noticed.

"The interesting points of the portage between the heads of the Missouri, & of the water offering the best communication with the Pacific ocean, should also be fixed by observation, & the course of that water to the ocean, in the same manner as that of the Missouri. Your observations are to be taken with great pains & accuracy, to be entered distinctly & intelligibly for others as well as yourself, to comprehend all the elements necessary, with the aid of the usual tables, to fix the latitude and longitude of the places at which they were taken,..."

Equipped with maps, manuals and the best instruments of the day, the Corps of Discovery set out to find what lay west of the Mississippi. Lewis carried copies of the following books to help him with:

1. Scientific work:
 - a. Kirwan's *Elements of Mineralogy*
 - b. Miller's *Sexual Systems of Linneaus* (in two volumes)
 - c. Barton's *Elements of Botany*
2. Surveying and navigation:
 - a. *Nautical Almanac*
 - b. Kelly's *Spherics*
 - c. Several ephemeris (astronomical tables)
3. Information about the land:
 - a. *History of Louisiana*
 - b. Vancouver's *Survey of the Western Coast of North America*

The members of the expedition were amazed by the landscape through which they traveled. William Clark sketched and mapped their route. Today, nearly one hundred of Clark's field sketches of the expedition's travels and his maps make up Vol. 1 of the Moulton edition of *The Journals of the Lewis and Clark Expedition*. Most of the original maps are now housed in the Beinecke Collection at the Yale University library.

Student Opportunities

1. Read selected quotes from the journals of the Lewis and Clark expedition.
2. Discover how the expedition helped to add information to blank area on the map of the North American west.
3. Practice different methods of finding the way and then documenting the route.
4. Read and compare historic and current maps.
5. Give presentations and work in teams.
6. Maintain their own journals and glossary of Lewis and Clark words and terms.
7. Find references of Native American maps in the journals.

Helpful References

In this guide:

Appendix A Route Maps and Timeline for the Lewis and Clark expedition

Appendix B: People of the expedition, Biographical sketches for: President Jefferson, Meriwether Lewis, William Clark, John Thompson

In this unit:

- Mussulman, Joseph. "Build-A-Map." Lolo: VIA Multimedia Productions, no date.
- Plamondon, Martin, II. "The Instruments of Lewis and Clark: The Team is Famous. Why Not the Instruments That Made It Possible?" *We Proceeded On*. Vol. 17, No. 1. Great Falls: Lewis and Clark Trail Heritage Foundation, Inc., February 1991.

Helpful Resources**Books and Articles:**

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- Benson, Guy Meriwether, William R. Irwin and Heather Moore. *Exploring the West From Monticello: A Perspective in Maps From Columbus to Lewis and Clark*. Charlottesville: University of Virginia, 1995.
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- Goetzmann, William H. And Glyndwr Williams. *The Atlas of North American Exploration: From the Norse Voyages to the Race to the Pole*. Norman: University of Oklahoma Press, paperback edition 1998.
- Hayes, Derek. *Historical Atlas of the Pacific Northwest: Maps of Exploration and Discovery*. Seattle: Sasquatch Books, 1999.
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- Sobel, David. *Mapmaking With Children: Sense of Place Education for the Elementary Years*. Portsmouth: Heinemann, 1998.
- Warhus, Mark. *Another America: Native American Maps and the History of Our Land*. New York: St. Marin's Press, 1997.
- Weiss, Harvey. *Maps: Getting From Here to There*. Boston: Houghton Mifflin Co., 1991.

Navigating Across the Continent

When the Corps of Discovery was traveling in areas which had not been mapped, Captains Meriwether Lewis and William Clark used instruments of navigation, surveying and measurement such as a compass, a Hadley's quadrant (also called an octant), a sextant, an artificial horizon, a chronometer, a watch, a spyglass (also called a spotting scope or a telescope), a log line and a two pole chain. By taking sightings at given times each day, Clark could plot their progress. Poor visibility due to weather conditions sometimes obscured the horizon or celestial bodies needed to take sightings. The expedition also carried along an artificial horizon. Today, we use the GPS (Global Positioning Satellite System) for locating our position. This is quite a change from Clark work.

The readings from the Hadley's quadrant or the sextant allowed the two captains to calculate their position of latitude. The chronometer indicated their position of longitude. Both latitude and longitude are measured and noted by direction and in degrees, minutes and seconds. The "zero" line for latitude is the Equator, and the "zero" line for longitude is the Prime Meridian running through Greenwich, England. Therefore, locations along the journey of the Corps of Discovery are in north latitude and west longitude.

Before the expedition was underway, Lewis took a "crash course" from the leading American astronomer and mathematician, Andrew Ellicott in Lancaster, PA. Lewis learned how to use the navigational and surveying instruments. Clark had previous experience surveying vast tracts of land in Kentucky and Tennessee. Private John Thompson had been a surveyor before he joined the army and the expedition. He may have been of help to the captains when they took sightings, made triangulation measurements and worked on the maps. While on the expedition, Clark surveyed landmarks as references for his maps. He sketched in or noted the locations of these landmarks then described them in the journals.

Lewis and Clark also learned about the land from Native Americans who used charcoal to mark on hides or a stick to draw lines in the dirt and stones or other natural objects to indicate landmarks. Piles of dirt or stones were a simple form of relief map.

Clark notes on 16 January 1805 that a Hidatsa chief visiting the expedition's winter encampment at Fort Mandan, "... gave us a Chart in his way. " In Lewis and Clark Among the Indians, historian James Ronda tell us... "As Clark explained later to Biddle [editor of the official journals published in 1814], Indian maps came in several shapes and forms. Some were flat drawings made on skins or mats while others were three-dimensional relief maps made in sand."

On their maps, Native American people often represented the relationship between key features in terms of time traveled rather than in distance over the land.

Orientation was not necessarily to the Euro-American concept of north. Despite the many differences in the presentation of the Indian "maps," this experience and shared information helped the Corps of Discovery make their way cross the North American continent and back.

“Mathematical Instruments.”
And Books Brought on the Lewis and Clark Expedition

1	Item(s) Spirit level	Cost 4	
1	Case plating Instruments	14	
1	Two pole chain	2	
1	Pocket Compass plated	5	
1	Brass Boat Compass	1	50
3	Brass Pocket Compasses	7	50
1	Magnet	1	
1	Hadleys Quadrant Wt Tangt Screw	22	
1	Metal Sextant	90	
	Microscope to index of d	7	
	Sett of Slates in a case	4	
4	oz of Talc	1	25
1	Surveying Compass wt extra needles	23	50
1	Circular Protractor & index	8	
1	Six In: Pocket Telescope	7	
1	Nautical Ephemeris	1	50
1	Requisite Tables	2	50
	Kirwan's Mineralogy	5	
1	Chronometer & Keys	250	75
1	Copy of Bartons Bottany	6	
	Kellys Spherics	3	
2	Nautical Ephemeris	4	
	Log line reel & log ship	1	95
	Parallel Glass for a Horizon	1	

(Adapted from *The Original Journals of the Lewis and Clark Expedition* Vols. 18 by Reuben Gold Thwaites.)

1. Have students read the article (found in this unit), “The Instruments of Lewis and Clark: The Team is Famous. Why Not the Instruments That Made It Possible?” by Martin Plamondon II. Discuss the different types of instruments used on the expedition. Use the following questions to help guide class participation.
 - a. What are the five surveying and cartographic achievements of the Lewis and Clark expedition?
 - b. What happened when the chronometer was not wound? Explain how this would affect navigating and mapping.
 - c. What kind of experience did the members of the expedition have in navigation and surveying?
 - d. Give a simple explanation of a sextant or octant and their use.
 - e. What was an artificial horizon used for?
 - f. Why was the equatorial theodolite ruled out for the trip?
2. Remember, students should be adding Lewis and Clark words and phrases to their spelling and vocabulary pages in their journals.
3. Divide the class into three teams. Each group will use a specific mapping technique. Each team will not know what the other teams are doing. When their map exercise is complete, then each group will share their project with the class. The class will then have a chance to see if they can find the location, recognize the place or successfully complete the task.

Team: Sticks and Stones

- a. Outside on your school grounds, make a map of your school’s neighborhood.
- b. Use only what you can find outside on the grounds, such as sticks, rocks, leaves, mounds of dirt, etc. Be sure to indicate north in some manner.
- c. The rest of the class will try to interpret your “natural” map.
- d. Teach the class how to determine where north is even if you do not have a compass.
 - 1) In a place which will have sun for several hours, plant a long stick in the ground.
 - 2) Place a rock on the end of the stick’s shadow.
 - 3) Wait several hours, then place another rock on the end of the new shadow made by the stick.
 - 4) Now stand square with your left foot touching the first rock and your right foot touching the second rock. You are facing north.

Team: Pace the Park

- a. Map a nearby community park or sports field.
- b. Learn, measure and use the length of your stride to count the paces between landmarks. Do not forget to note any changes in directions between stations. Directions can be given in right and left or by the numbers on the face of a dock with “12 o’clock” being North.
- c. Draw your pace maps and sketch in prominent features.
- d. Show the rest of the class your pace map. Can they recognize where this is? Can they retrace your steps? Is everyone’s stride the same length? Why or why not?

Team: Orienteering

- a. Research what orienteering is and how it is done. Books are available through the library system.
 - b. Outside on your school grounds, create an orienteering course.
 - c. Use a compass and a long length of rope.
 - d. Write the instructions for each station in a log book or a journal. Draw an “answer map.”
 - e. Teach the rest of your class about orienteering, then have them work the course. They will draw a map as they read the log book which tells them how to get from one station to the next. Be sure to have the north arrow on the map. Did they finish the course correctly?
 - f. Have a guest speaker from a local orienteering club come and talk to the class about orienteering.
4. Have a class discussion about being observant of your surroundings and having a sense of where you are. How is this a safety factor? Have you ever been on your own in a strange place or a foreign country? Did you have to ask directions or ask for information about where you desired to go? Did the people respond to your inquiries in a foreign language? Could you understand what they were trying to tell you? How did you feel? What helped you feel more confident and secure?

The Instruments of Lewis and Clark

*The team is famous.
Why not the instruments that made it possible?*

BY MARTIN PLAMONDON II

The western horizon was a cloudy gray, with the promise of more rain. The drenched men waited on the long keelboat and the two pirogues.

"Permission to fire a salute, sir, before we get under way?"

"Granted, Sergeant."

Clark shook the hands of well-wishers who had come out to see the party off but their voices were lost in the roar of the rifles. Spring green leaves drifted down from the cottonwoods overhead as Clark swung about the keelboat. Slowly, the men pushed their long setting poles, the heavily laden craft moved out of the small creek, crossed with Mississippi and entered the Missouri.

Thus on May 14, 1804, began the 29-month journey of The Corps of Volunteers for Northwest Discovery, better known today as the Lewis and Clark Expedition. In 1806, when the expedition returned to St. Louis, it was hailed as a great achievement in survival, and not much else. Only since the beginning of this century have we begun to comprehend and appreciate, as President Jefferson did then, the magnitude of what really was accomplished by this most comprehensive of all exploring expeditions. Five surveying and cartographic achievements are near the top of a long list of accomplishments:

1. A traverse of 4,162 miles (Clark's measurement) from St. Louis to Cape Disappointment at the mouth of the Columbia River.
2. Nearly 100 maps produced in the field showing the route of the expedition.

3. Determination of the shortest route from the Missouri across the Rocky Mountains to the Columbia, verifying the information of natives.

4. Determination of latitude for nearly all important points along the route.

5. Descriptive narrative of all important physical features along the route.

The only serious failure in the area of surveying and cartography were their sightings to determine longitude, a fault of the foibles of a chronometer.

While the expedition had a professional surveyor¹ among the enlisted men, neither of the leaders could claim the title. Meriwether Lewis had very little experience in the use of survey and navigation instruments. Most of his experience came from a few short weeks of study with noted mathematician Robert Patterson and Major Andrew Ellicott, the nation's leading surveyor of the day. Ellicott's work included laying out the capital city, Washington.

William Clark, however, had much experience as a wilderness surveyor. Having surveyed large tracts of Tennessee and Kentucky for his family, he was familiar with most surveying instruments, including the theodolite. Whether he had any previous experience with the octant and sextant is not known. If not, he took to them fairly well. There is evidence that his sightings were better than those of Lewis.

President Jefferson and the other scientific minds of the American Philosophical Society corresponded at length concerning the instruments and the geographic positioning methods to be used by the expedition. The discussions centered on four instruments: the octant, the sextant, the timekeeper or chronometer, and the equatorial

theodolite. The octant and the sextant were instruments long used for determining the latitude of a position, usually on a ship at sea. The procedure was fairly simple. A series of perhaps a dozen sightings of the sun were made just before-and-after local solar noon to measure the sun's height above the horizon. Obviously, bad sightings were discarded. Any pairs of before and after sightings with equal altitudes were used to compute the exact moment when the sun reached its highest point, the moment it crossed the local meridian, which was halfway between the times of the paired sightings. Using this information, they could determine the latitude fairly accurately from prepared tables. Their local time could also be corrected from these sightings.

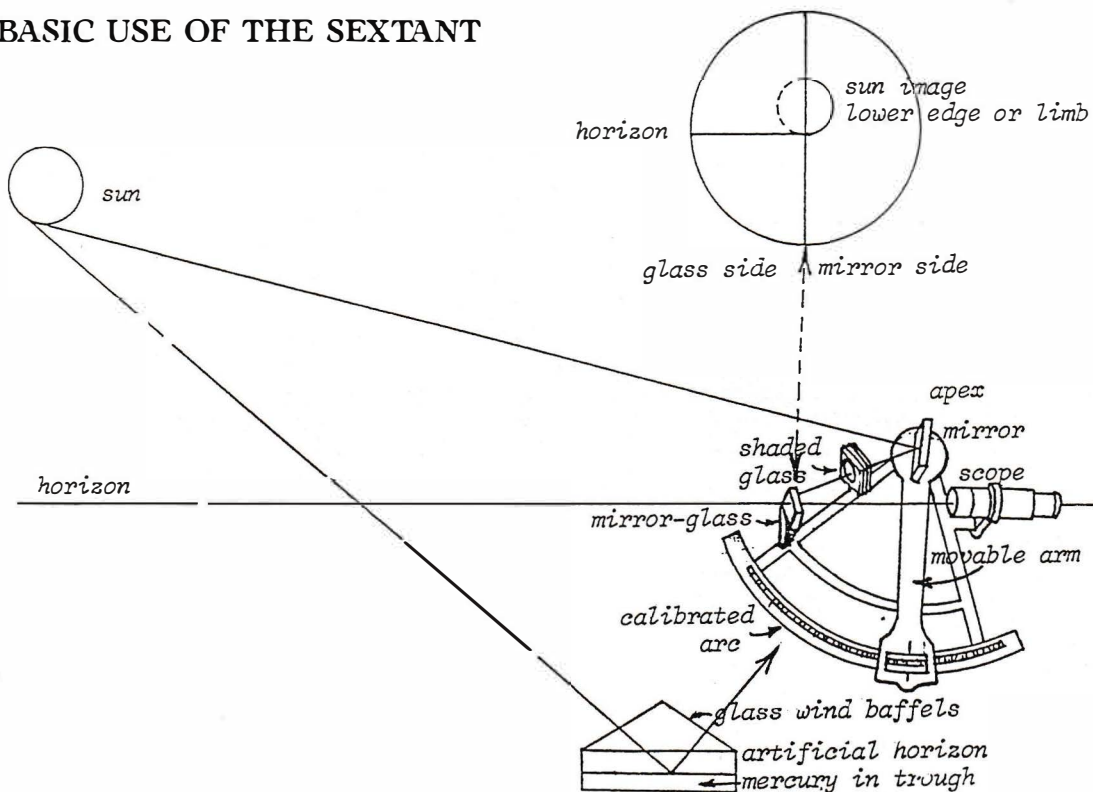
The octant and sextant were similar in construction. Two legs fixed to each other at one end, the apex, and jointed at the opposite ends by an arc, formed the body of the instrument. It was a triangle with an arc in place of the base. An index

arm pinned at the apex moved along a scale of degrees, minutes and seconds marked on the arc. A series of mirrors and a sight or small scope allowed the user to line up an upper or lower edge of the solar disc or a star with the line of the horizon (see figure). This was done by moving the index arm with one hand while the instrument was held in a steady vertical position on line with the horizon by the other hand. The instruments were provided with shaded glass for viewing the sun and usually a reverse scope for sighting the opposite horizon when the horizon under the sun or star was indistinct or obscured.

Octants were usually made of ebony, but high-quality sextants were made of brass. The additional weight helped steady the instrument during sightings, and only practice brought that about.

A distinct horizon, such as one would have from a ship at sea, was nearly impossible on land. Trees, mountains, and fog or haze usually ruled out a true horizon. In this situation, an artificial horizon

BASIC USE OF THE SEXTANT



was placed in front so that the image of the sun was reflected from the artificial horizon up to meet its image coming into the instrument's mirrors. This method resulted in an angle reading that was exactly twice the altitude of the sun. The artificial horizon consisted of a trough filled with mercury, a level reflective surface, and shielded from the wind by small panes of glass. The mercury horizon was not suitable for an extended trip into the wilderness. A number of alternatives were devised, including water, talc and mirrors. Each proved effective in varying circumstances.

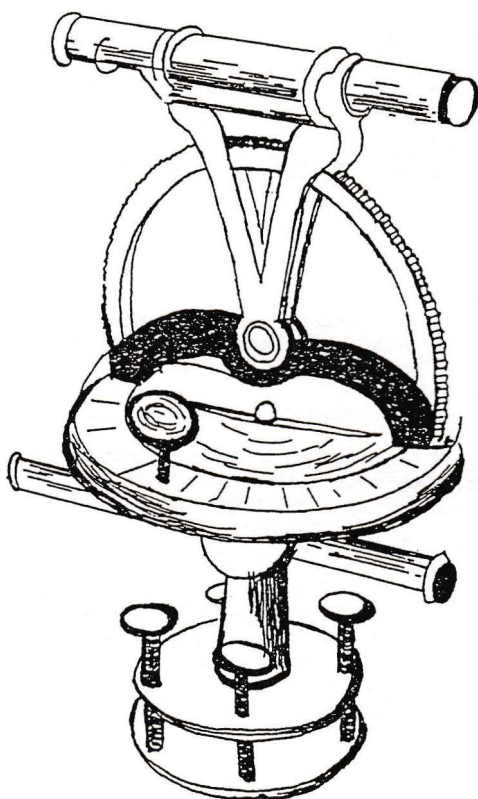
The scientific planners were left with the problem of determining longitude. At the time there were two usual methods. The first involved observing, with a telescope, the precise times when any of Jupiter's four major moons began and ended a transit of the planet's disc. The other used the

moon like the hand of a clock moving around the earth. Its time of travel was measured against various stars and planets, which for these purposes could be assumed to be stationary. In both methods the observed differences between local time and time at a known prime meridian were used to calculate the longitude. This required a timekeeper or chronometer capable of very accurate and consistent time over the many months the expedition was in the wilderness. Such time pieces were available mainly for marine navigation. No one had ever subjected such an instrument to the moisture, dust and temperature ranges of a long land journey for the purpose of navigation.

Jefferson, having ruled out tracking the moons of Jupiter, proposed using the equatorial theodolite as the instrument for measuring lunar distances. This instrument had a scope mounted on a standard leveling platform (see figure). Above the scope was a second scope mounted on a pair of circles at right angles to each other. The upper scope was used to sight a celestial body while the lower scope remained locked on some fixed point on the earth. The angular distances were read off the scales. Jefferson was convinced the use of the theodolite would eliminate the need for the chronometer. Patterson and Ellicott did not agree, but using tact with the President, argued only that the instrument was too sensitive for such an expedition.

Lewis' final list of "Mathematical Instruments" included: a brass sextant, an octant, an Arnold's chronometer, a spirit level and surveyor's compass, four pocket compasses, a case of plotting instruments, a two-pole chain (33 feet), a log line reel and log ship for measuring a ship's speed or a river's current, and a cased measuring tape with a winding crank.

Lewis, Clark and seven of the men kept journals during the expedition. Some of these journals were lost, but during this century a number have come to light and publication.² Of the two leaders, only Clark consistently kept a journal through the entire expedition. Using the log line to estimate their progress on the rivers, and the surveyor's compass to determine the bearings, Clark faithfully recorded an open-ended traverse from St. Louis to Cape Disappointment on the Pacific Ocean at the mouth



Equatorial Theodolite

of the Columbia River. He added to the record sand bars, islands, rapids, falls, cliffs, creeks, rivers, native villages and changes in vegetation. From that record Clark drew a series of maps in the field showing the route of the expedition. The maps were rough and lacking in artistic virtue, and unfortunately a number were later lost. But the maps that survived were remarkably good given the circumstances under which Clark labored. With the aid of native information and astounding geographical intuition, Clark's notes and maps left a vivid picture of the land through which they struggled for twenty-nine months.

Clark obviously expected that upon their return skilled cartographers would map what he so carefully surveyed and recorded. It never came to pass, as people lost interest in the expedition that failed to find an all-water route to the Pacific. However, Clark's notes and rough maps have provided a valuable basis for a unique historical mapping project. When completed, this project will comprise some 500 large-scale topographic maps, each showing a portion of the Lewis and Clark Trail for the period of 1804 to 1806. The maps are based on the Universal Transverse Mercator Projection. Clark's traverse is carefully fitted to those landmarks that still exist today. River channels are reconstructed according to Clark's record and all available topographical evidence. Many months of study and research have been necessary to reconstruct the Missouri River from St. Louis to North Dakota. Relief is shown by contour lines, and even these had to be reworked to fill in quarries and eliminate changes wrought by highways, railroads and the effects of river erosion. Events that involved the expedition have been noted, as well as the areas where new plants and animals were encountered. Campsites are depicted. Even Clark's traverse is shown in its best fit.

Some features that exist today have been added to help the map reader relate the two periods. Present day water features, dams, major highways, railroads, bridges, park, city and reservation boundaries are indicated by dotted lines. Notes referring to non-expedition features are shown in special lettering, with every effort made to sublimate this information. One almost has to look for it. The map that one sees first is of the country that Clark observed. Nearly one third of the maps now are completed.

But why undertake such a project at all, especial-

ly after 180 years? A number of reasons have kept this project going. The maps will document the entire trail, thereby preserving in some manner even those areas lost to the press of civilization and drowned behind the many dams. They will locate, with credible accuracy, the trail and sites in a manner never before attempted for the entire route. The maps will assist historians as they continue to unravel the complexities and details of the Lewis and Clark Expedition. Finally, there is deep personal respect and admiration by this cartographer for another who, nearly two centuries ago, with the crude instruments of the day, sought to leave an enduring record of the land we love.

NOTES

John B. Thompson recruited at Wood River, Illinois. By trade he was surveyor at Vincennes, Indiana Territory.

²In 1904, all known journals were published in original form. Editor was Reuben Gold Thwaites, LL.D. Eight volumes including an atlas of loose reproductions.

Several publishings of newly found material appeared in the fifties and sixties.

Presently being published, *The Journals of the Lewis and Clark Expedition*. Editor: Dr. Gary E. Moulton. University of Nebraska Press. Projected as ten volumes including an oversize atlas.

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Martin Plamondon II is a Clark County, Washington cartographer and serves as director of the county mapping department. He is a member of the Oregon Lewis and Clark Trail Society. He has served as a member on both the Washington and Oregon Governor's Lewis and Clark Trail Committees and continues to serve on the Washington committee. He has written a 1400 page novel on the Lewis and Clark Expedition (to be published soon, we hope) and is about one-third finished with a large scale, topographic reconstruction of the Lewis and Clark Trail. He is the program chairman for the 1992 Lewis and Clark Annual Meeting in Vancouver, Washington.

Reading Maps (Old and New)

The approximately one hundred field and compilation maps drawn by William Clark show us more about the route and experiences of the Corps of Discovery. Clark was a surveyor and map maker. He used symbols to indicate topography, landmarks, direction, water conditions, Native American communities, expedition encampments and forts. Clark also added notes to his maps making them good sources of information for research projects about the Lewis and Clark expedition.

1. Have students look at the handout of the sample of Clark's map (in this unit) showing the expedition's temporary encampment on the north side of the Columbia River at the Pacific Ocean. In order to understand what Clark's maps mean, we have to become familiar with the symbols he used.
 - a. Using the handout for "A Sampler of Clark's Map Symbols," students will find as many of the symbols on the sheet shown on this map. The students will then write on the handout what the symbols mean.
 - b. Not all of the handout symbols are on this particular map, even though they are all symbols used by Clark on his expedition maps. Have the students write down what they think the other symbols are. Discuss the symbols, their meanings and if they are effective in conveying good information.
 - c. Have the students look at or find other examples of Clark's maps in other books about the Lewis and Clark expedition. Have the students take turns reading what these other maps show us.
 - d. Students can add the sample map and map symbols handouts to their own journals.
2. Have students use a map of their community, county or state. Today, standardized symbols are used on maps in the United States. Discuss the features of the map such as north, measure of distance, scale, meanings of lines and symbols. Have the students:
 - a. Write the directions to a specified location from a given starting point.
 - b. Find examples of several features.
 - c. Learn how to use the mileage charts.
 - d. Tally the distances between points not included on the mileage charts.
 - e. Estimate how long it will take you to travel between several given points.

Example From Clark's Maps

(Showing the expedition's encampment at the mouth of the Columbia River)

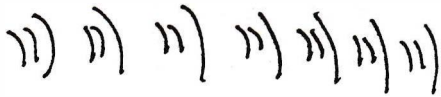
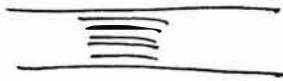


Courtesy American Philosophical Society

A Sampler of Clark's Map Symbols

Symbol

Meaning



S 41° W 7m
.....



A Sampler of Clark's Map Symbols

(Answer Sheet)

Symbol

Meaning



Direction of the current



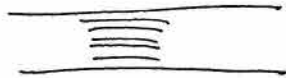
River



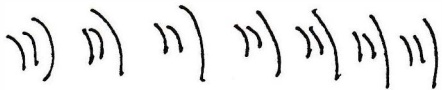
North



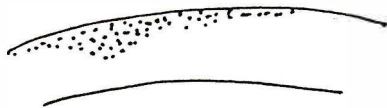
Overland route



Falls, cascades or cataracts



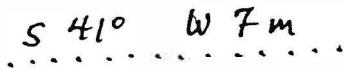
Ridge, bluff or high ground



Sand bar or shallows



Site of a Native American group



Line of sighting to a landmark



Expedition camp site



Anchorage



Expedition fort

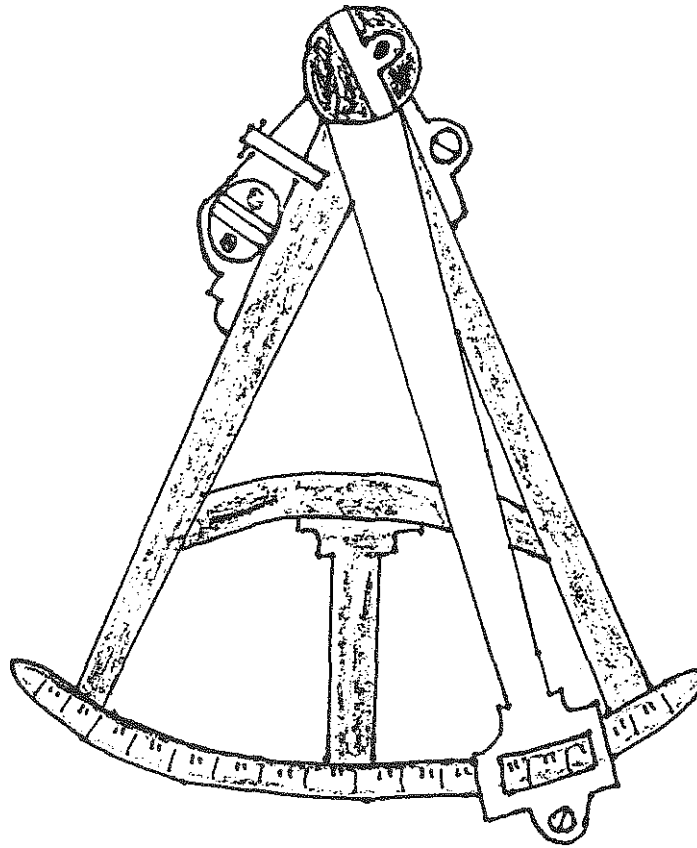
Where Have We Been?

During the 1805-1806 winter encampment at Fort Clatsop, William Clark drew a large compilation map based on all the of maps, field notes and journals he made on the outward journey. Later, he also included information from traders returning to St. Louis from the Upper Missouri and Yellowstone Rivers, and the Rocky Mountains.

1. Have students randomly select a paper with a type of geological feature or landmark written on it. (Master sheet in this unit) There will be two papers for each feature. Students will find the other person with the same feature and form partners to research their feature. Students will give presentations to the class about the feature or landmark, how it relates to the adventures of the Lewis and Clark expedition, locate it on a map, find out the Native American name and legends associated with the feature, and what it is like today.
2. The following maps are four sections of Clark's compilation map. Divide the class into four groups and assign one section to each group. The star pages which follow each map section indicate the route of the Lewis and Clark expedition through that particular section. Make a mylar transparency of the star pages to be superimposed over their respective sections.
 - a. Students will use the maps and tell the class what is significant about the landmarks, Native American groups and village locations, or expedition events located in their section.
 - b. Students will compare their section of Clark's compilation map with a modern map of the same area. Students will list:
 - 1) The similarities.
 - 2) The differences.
 - c. Students will try to find out why there are differences in those areas today. Explain.
3. Have students complete the "Places of the Expedition" word match handout.

Answers:	1. d	2. g	3. i	4. l
	5. h	6. a	7. m	8. j
	9. k	10. e.	11. b	12. n
	13. f	14. c		

4. Have the students mark the “Places of the Expedition” from the handout on to a map showing the route of the Corps of Discovery.



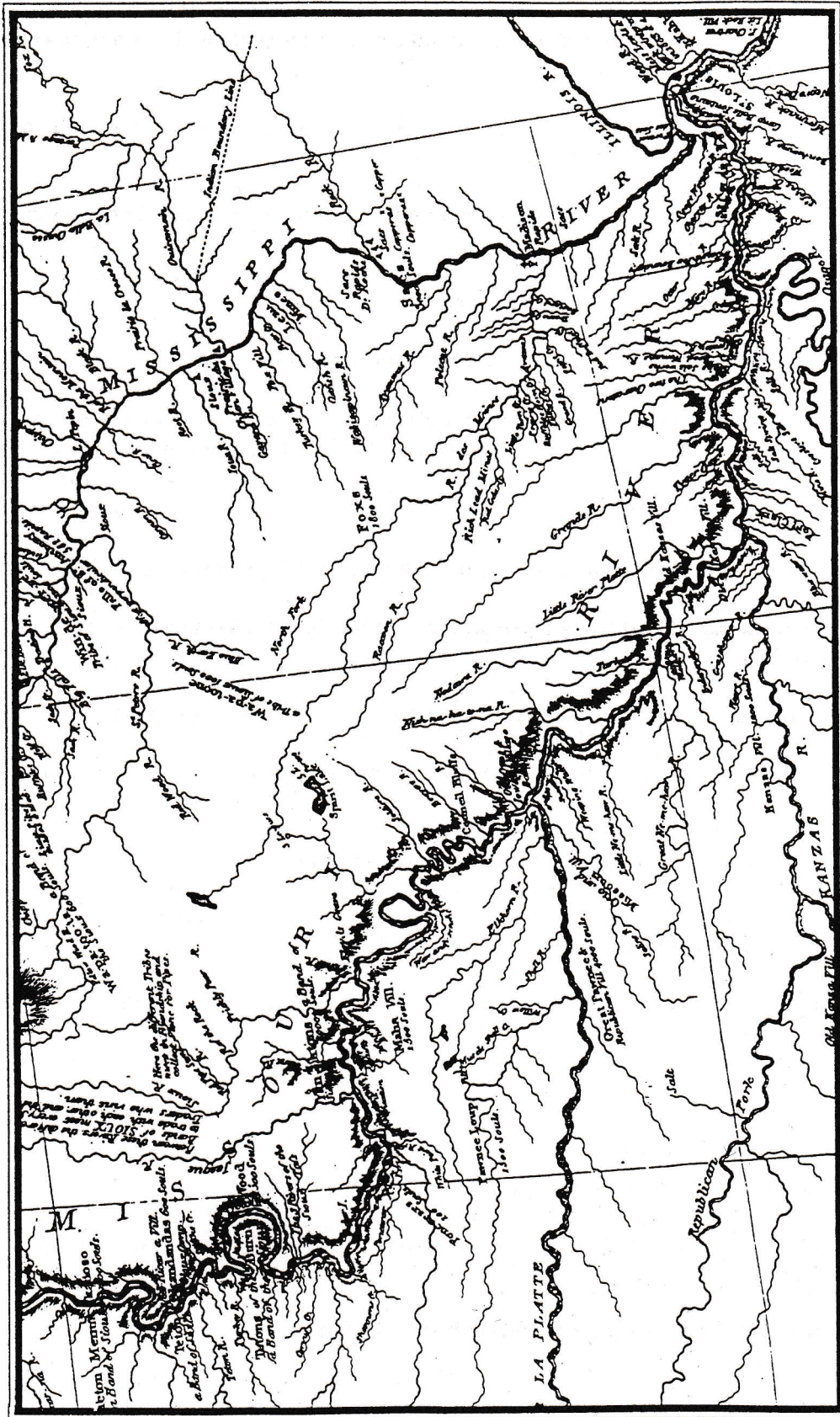
Hadley's Quadrant (also called an octant)

Pompey's Pillar	Beaverhead Rock
Rocky Mountains and Continental Divide	White Cliffs of the Missouri River
Great Falls of both the Missouri and Columbia Rivers	Northern Plains with tall and short grass prairies
Volcanoes, Mt. St. Helens and Mt. Hood	Spirit Mound
Estuary of the Columbia River	Yellowstone River
Gates of the Mountains	Columbia Plateau
Bitterroot Mountain Range	Cascade Mountains

Places of the Expedition Word Match

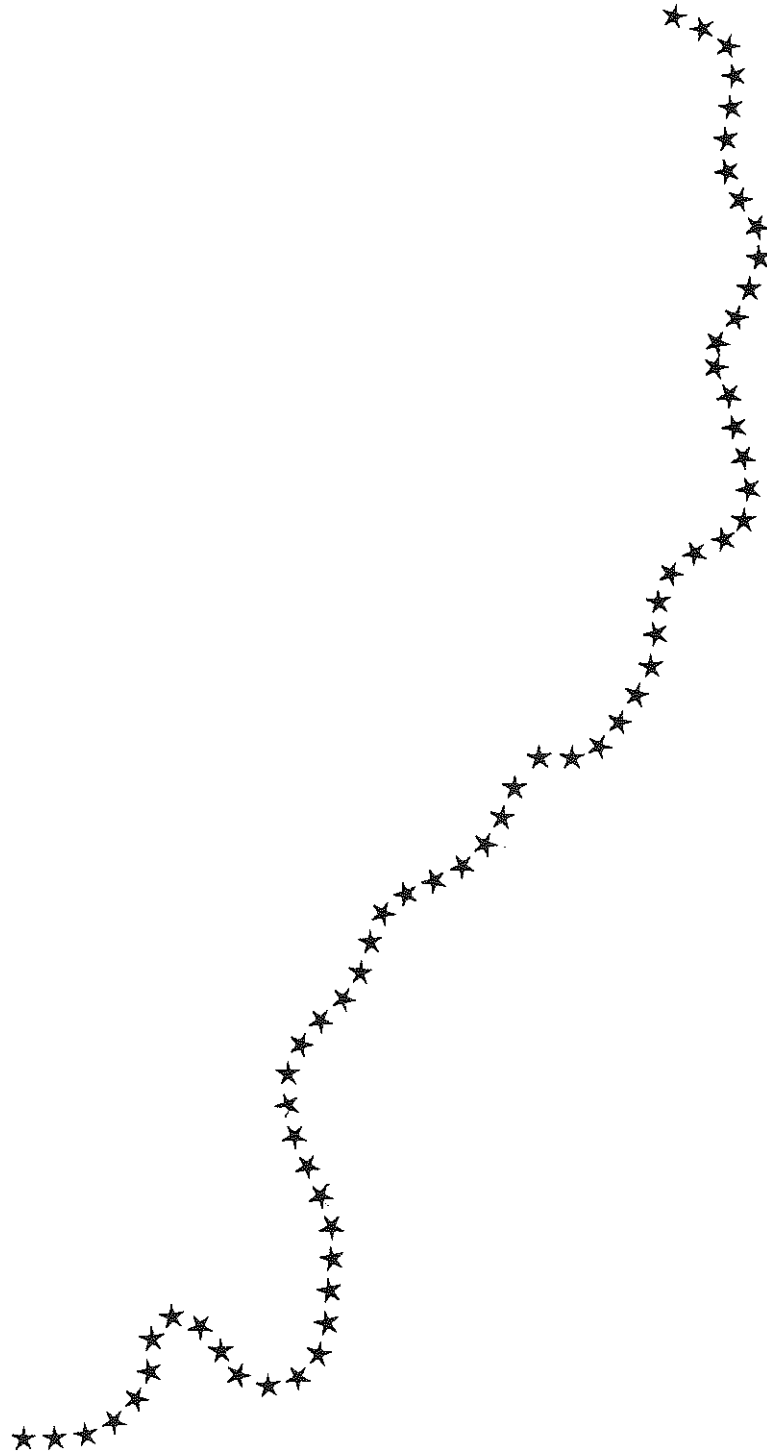
Name: _____ Date: _____

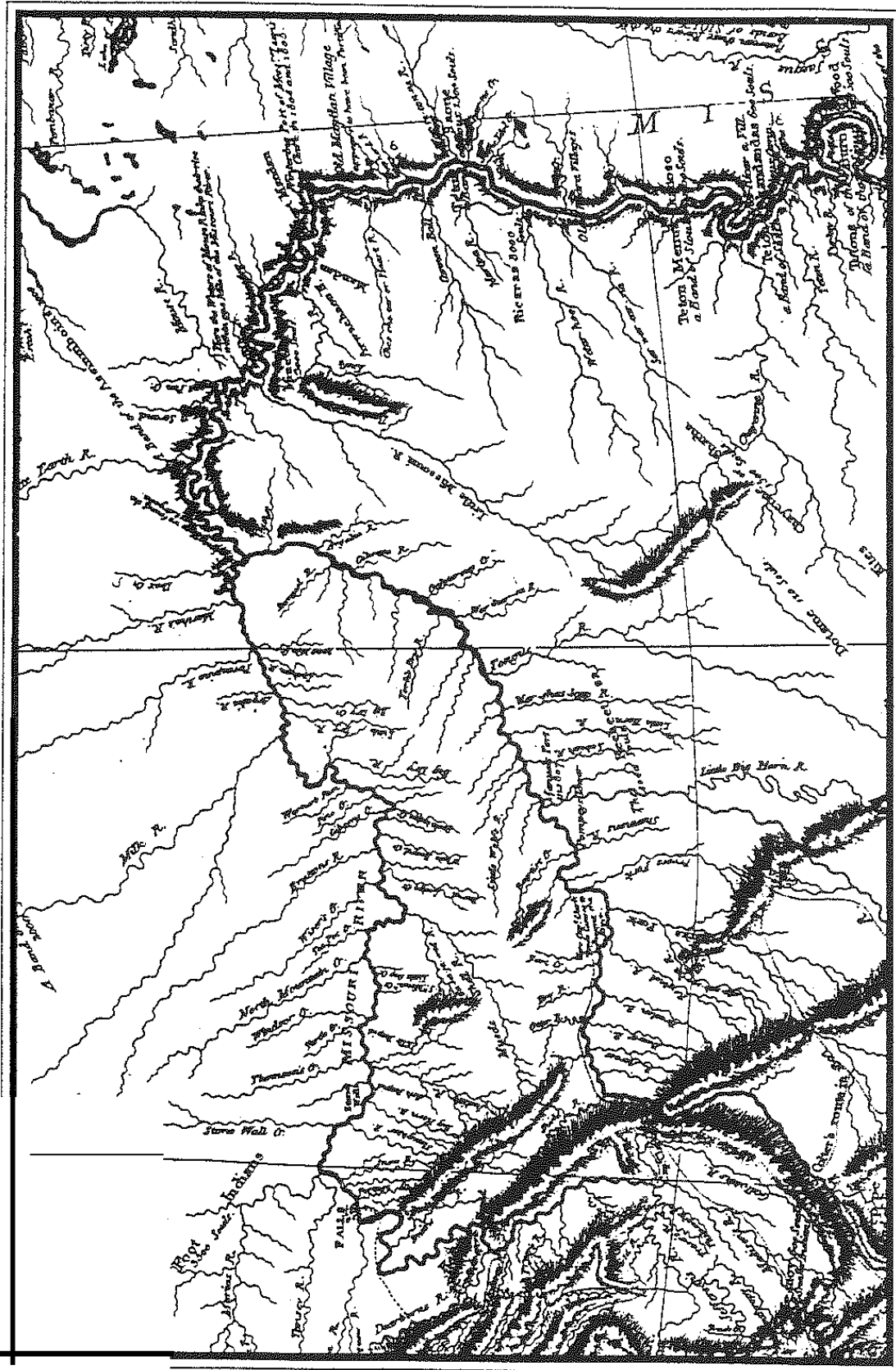
- | | | | |
|-----|-----------------|----|---|
| 1. | Fort Mandan | a. | Very difficult |
| 2. | St. Louis | b. | Winter camp 1805-1806 |
| 3. | Lemhi Pass | c. | Named for Jean Baptiste Charbonneau |
| 4. | Beaverhead Rock | d. | Winter camp 1804-1805 |
| 5. | Columbia River | e. | Expedition separated into two parties here |
| 6. | Lolo Trail | f. | Near expedition's first winter camp |
| 7. | Marias River | g. | Expedition's last stop |
| 8. | Great Falls | h. | River which flows to the Pacific Ocean |
| 9. | Bitterroots | i. | Where the expedition crossed the continental divide |
| 10. | Three Forks | j. | The Corps of Discovery portaged around them |
| 11. | Fort Clatsop | k. | The Lolo Trail crosses them |
| 12. | Weippe Prairie | l. | Near Sacagawea's home |
| 13. | Wood River | m. | Explored by Lewis on return trip |
| 14. | Pompey's Pillar | n. | Where the expedition met the Nez Perce |



1. Segment of Captain William Clark's Map of the Expedition's "Track," published in 1814.

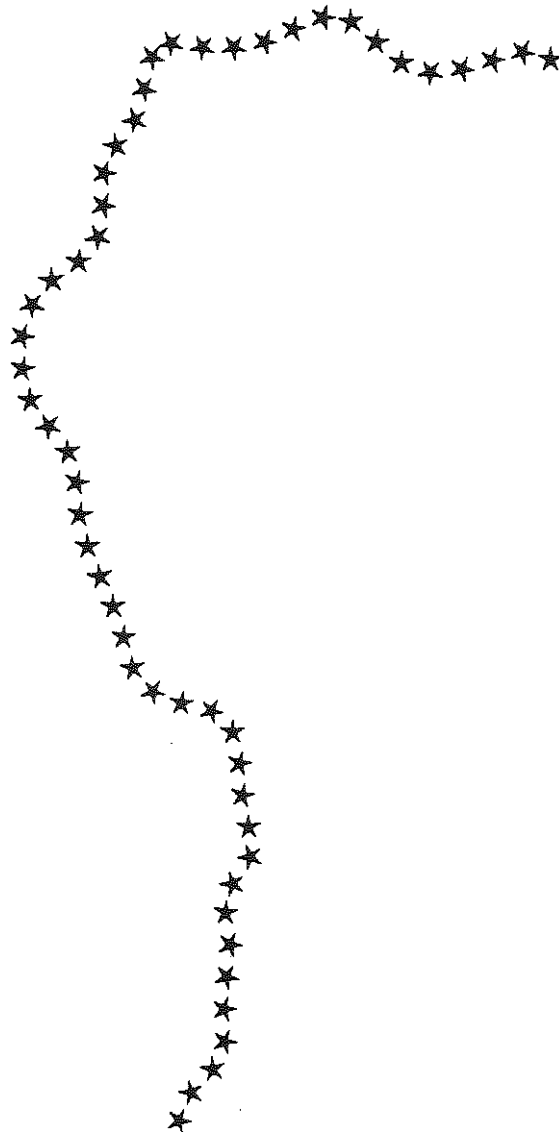
1. *From Camp Wood to the Teton River*

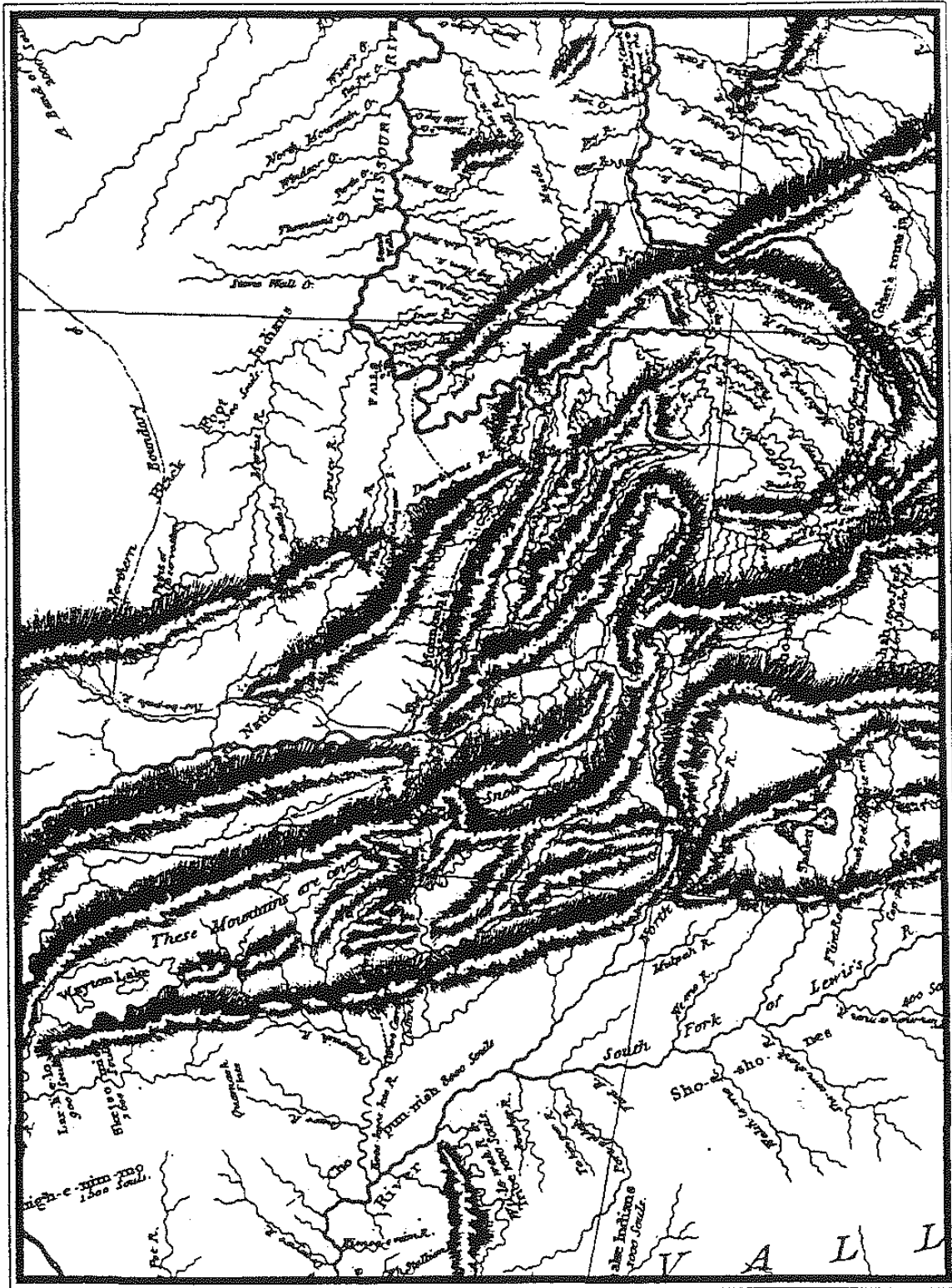




2. Segment of Captain William Clark's Map of the Expedition's "Track," published in 1814.

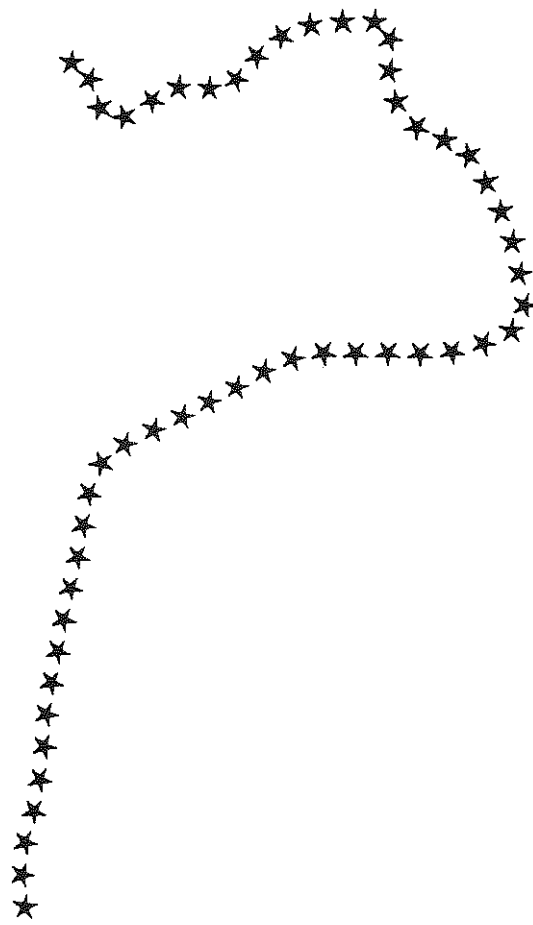
2. *From the Teton River to the Great Falls of the Missouri*

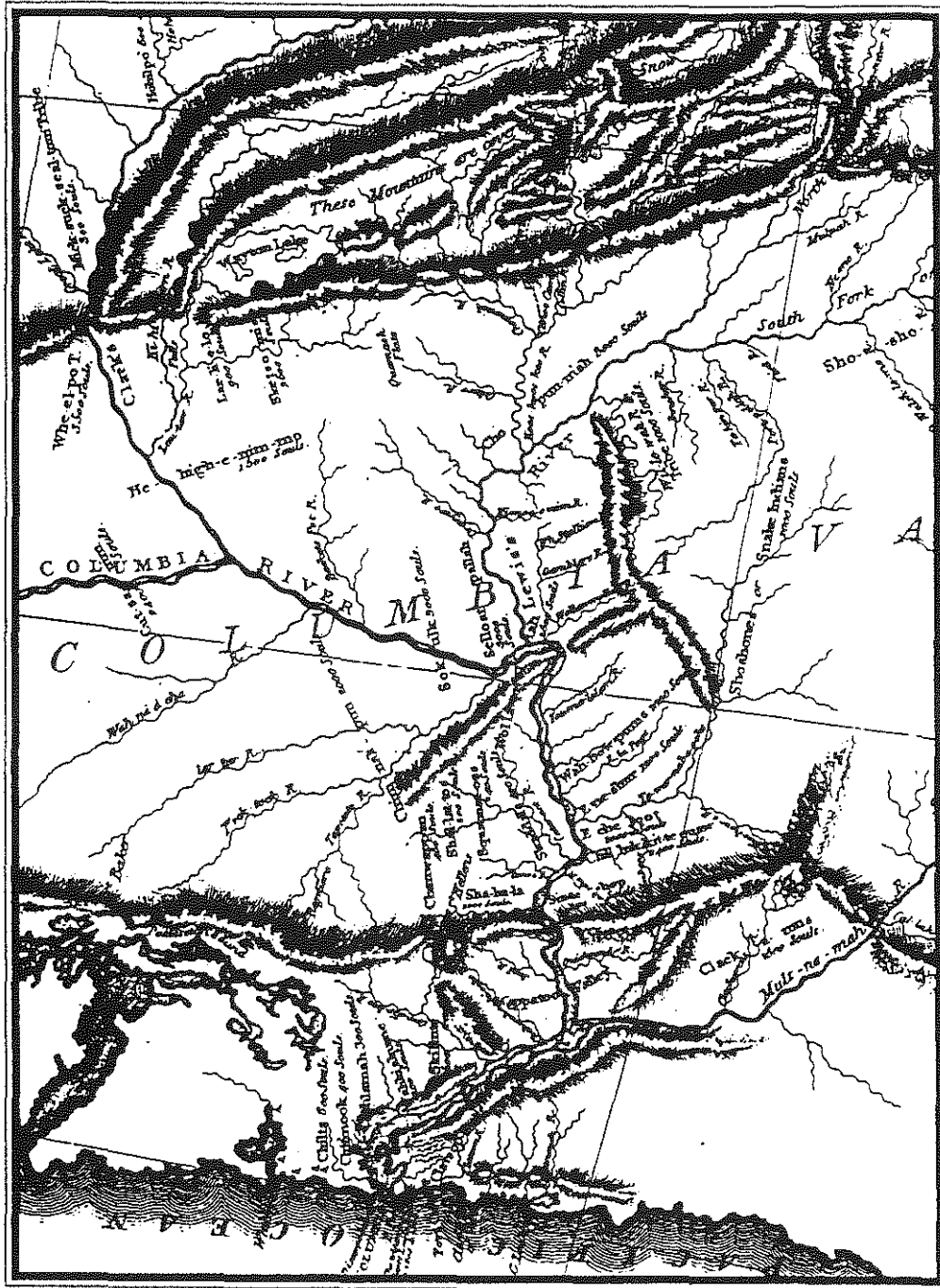




3. Segment of Captain William Clark's Map of the Expedition's "Track." published in 1814.

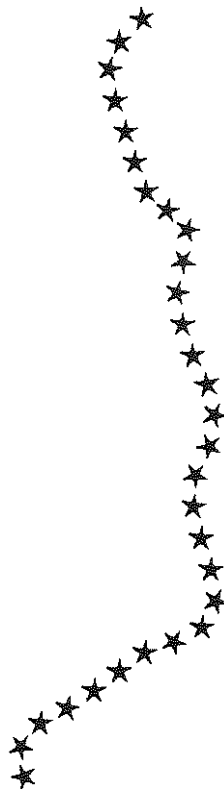
3. *From the Great Falls of the Missouri to the Clearwater River*





4. Segment of Captain William Clark's Map of the Expedition's "Track," published in 1814.

4. *From the Clearwater River to the Pacific Ocean*



Build-A-Map

The sixteen maps on the following pages were created by Dr. Joseph Mussulman. These maps can be used by the educator and the students for any projects or activities in any of the interdisciplinary units in this guide.

1. Photocopy any single page on paper for class or individual assignments.

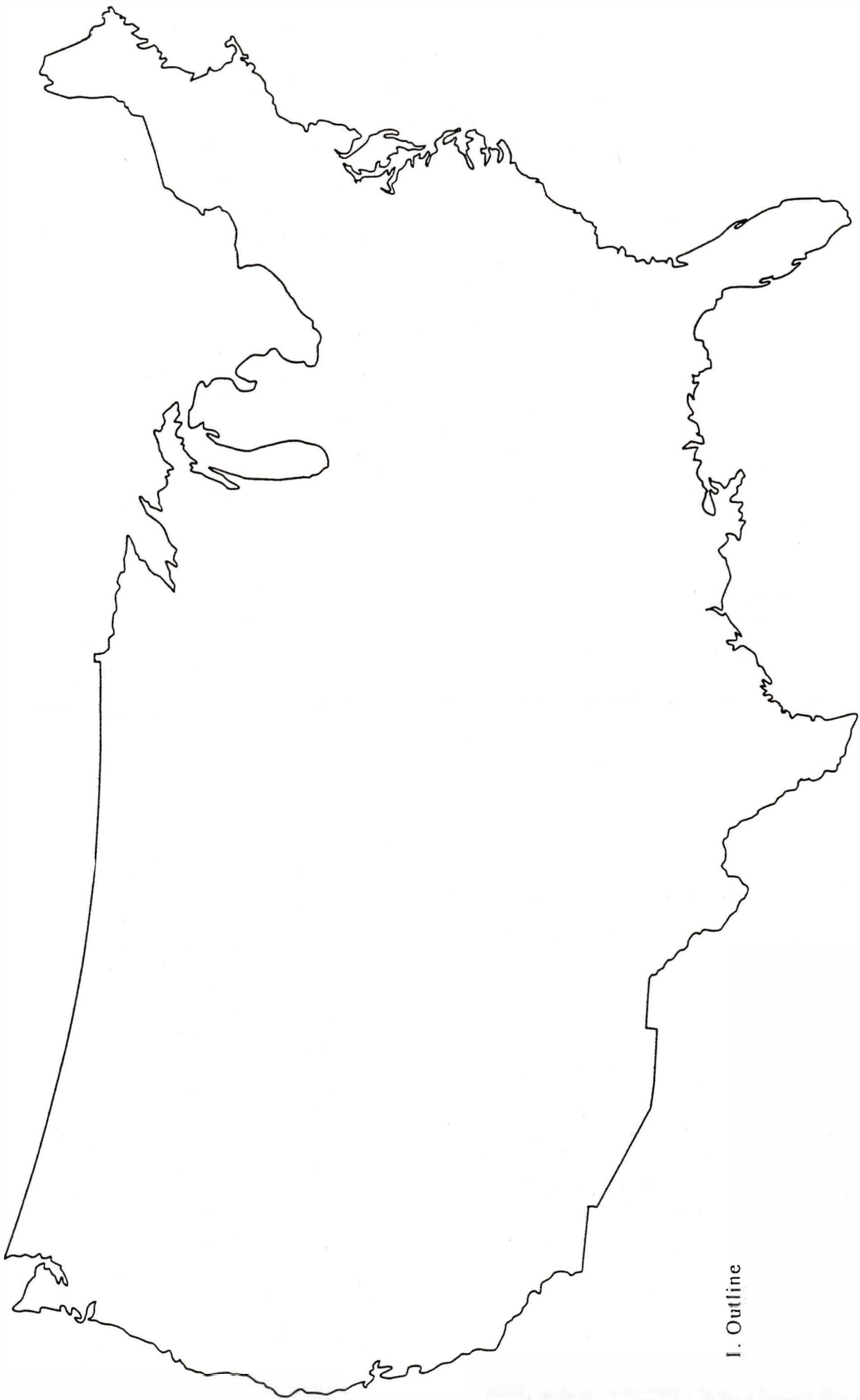
Example: Copy #1, (the Outline). Have the class or individual fill in the major rivers of the West, the boundaries of the western territories, and the Lewis and Clark expedition's westbound route.

2. Create a composite of any two or more maps. To do this:
 - a. Photocopy any two or more pages onto a mylar transparency.
 - b. Line them up by the dots in the upper left and lower right corners.
 - c. Tape them together.

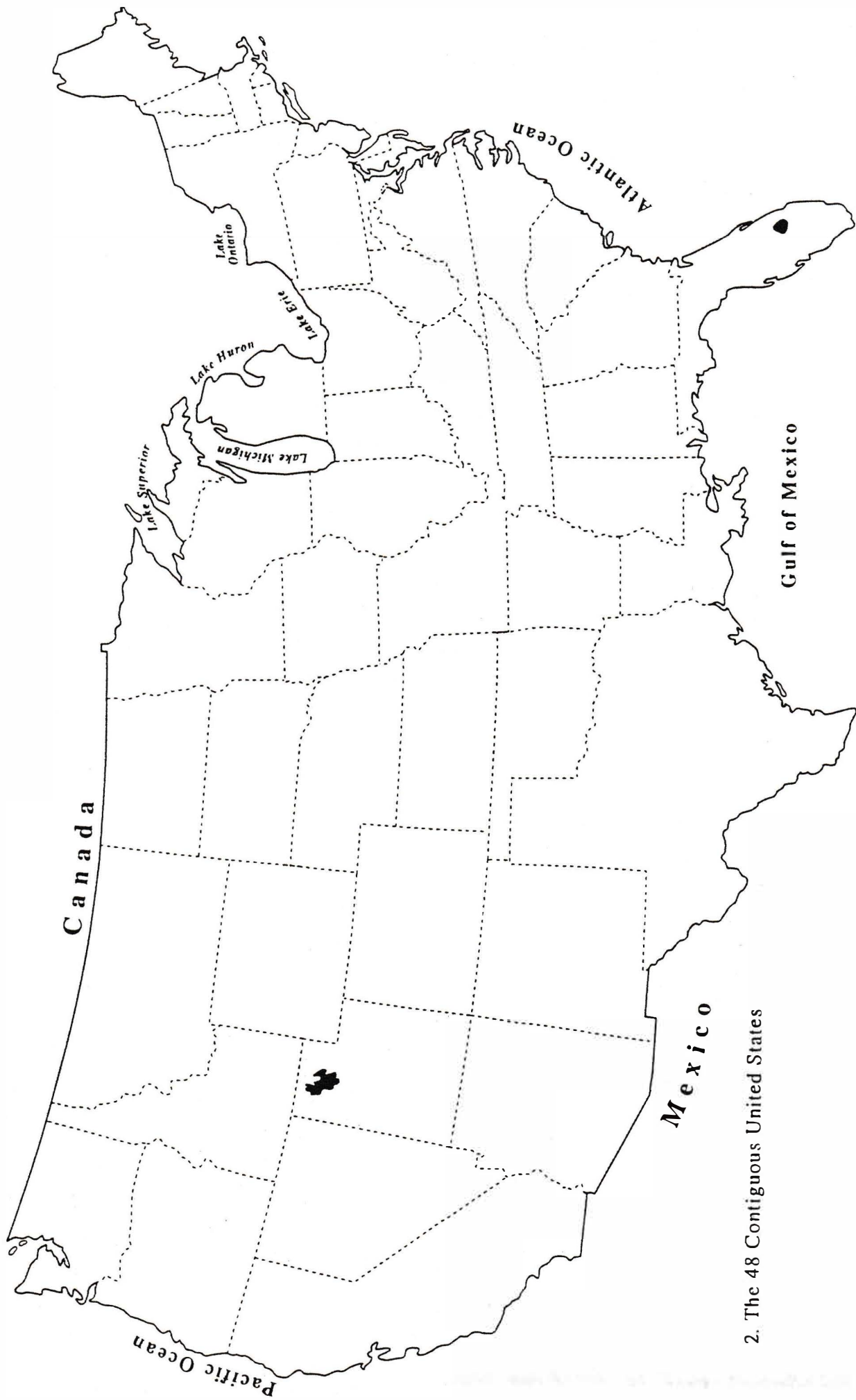
Example: Copy #5, #7, #8 and #13 on to mylar transparencies. Align them carefully and tape them together. The composite will be a map of the U.S. plus the territories in 1803 with the westbound Lewis and Clark Trail.

3. A composite mylar transparency can be used in two ways:
 - a. Display any composite on a screen using an overhead projector.
 - b. Photocopy a composite on paper for class or individual assignments.
4. Key to the maps:

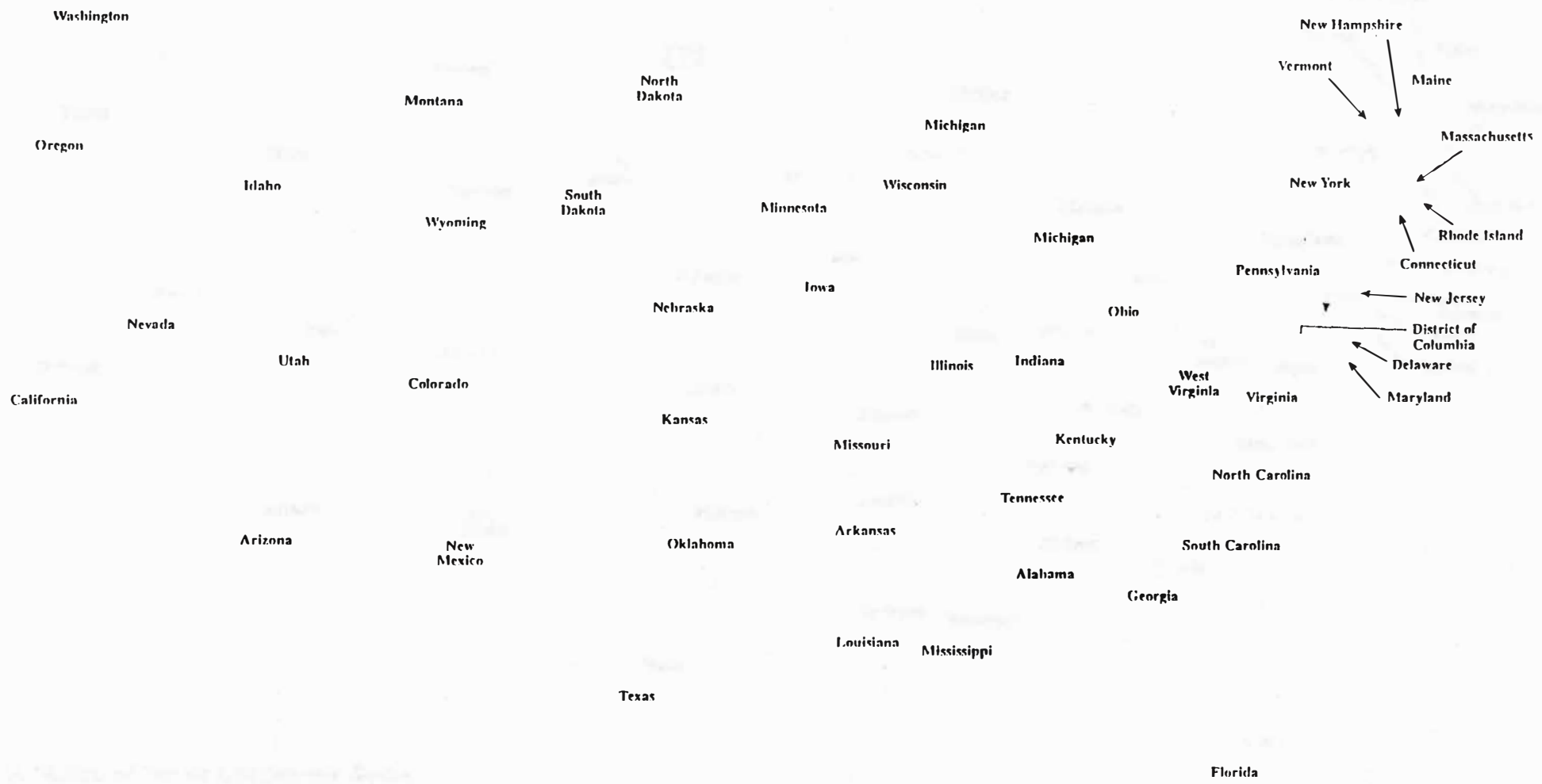
1. Outline	9. Major Rivers of the West
2. The Contiguous United States	10. Names of the Rivers
3. Names of 48 Contiguous States	11. The Continental Divide
4. Modern Cities Along the Lewis and Clark Trail	12. Latitude and Longitude
5. The United States in 1803	13. Westbound Trail
6. Names of the States, 1803	14. Eastbound Trail
7. Louisiana Territory	15. Indian Tribes Met by Lewis and Clark
8. Names of the Territories	16. Wildlife Along the Trail



I. Outline



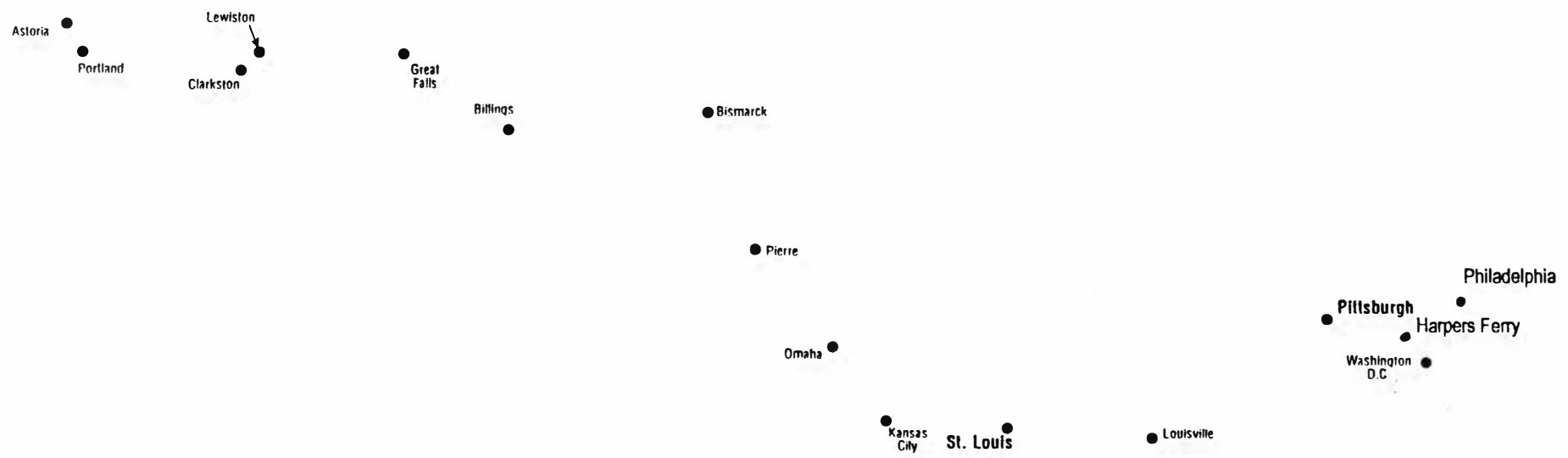
2. The 48 Contiguous United States



1
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da

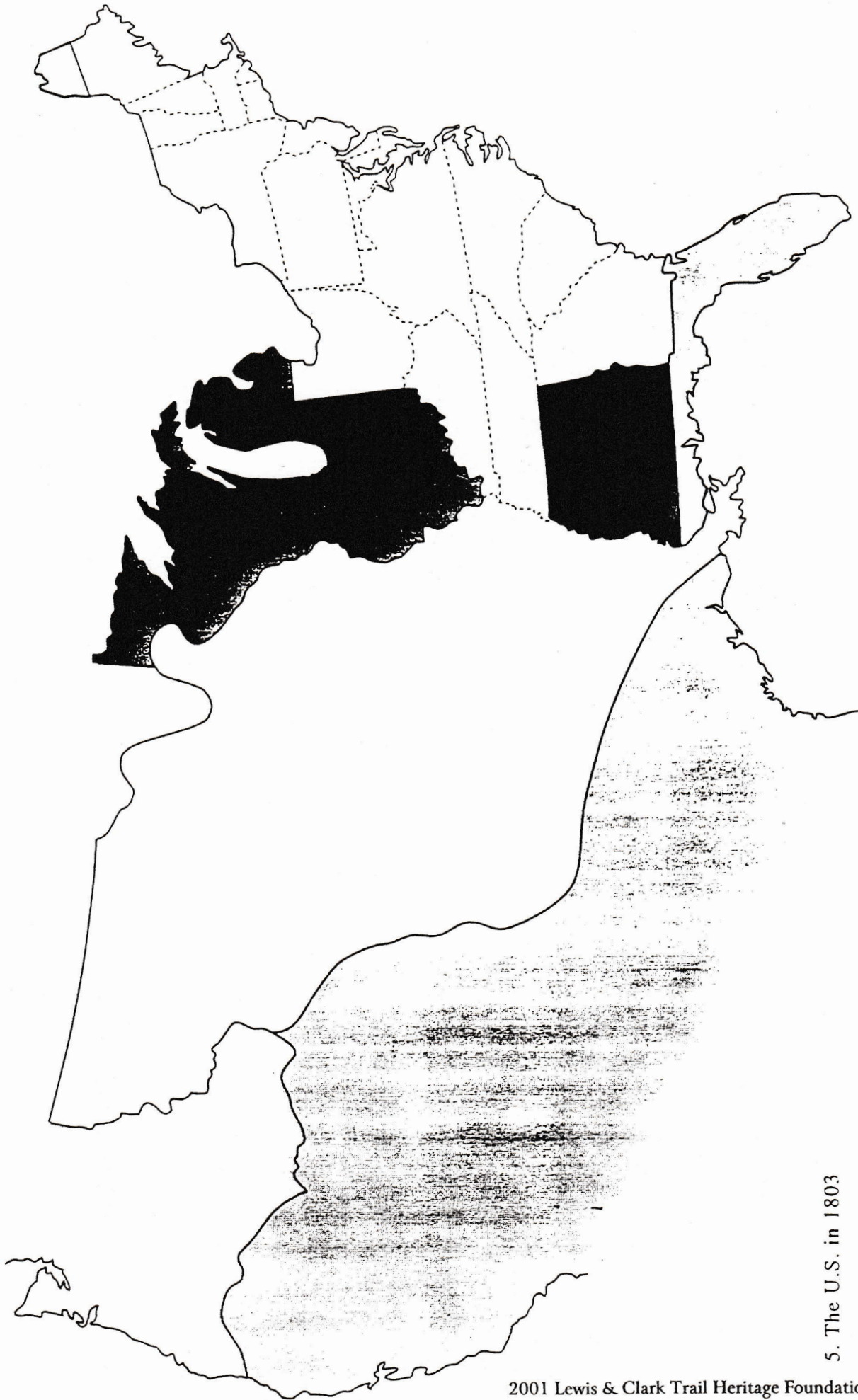
3. Names of the 48 Contiguous States



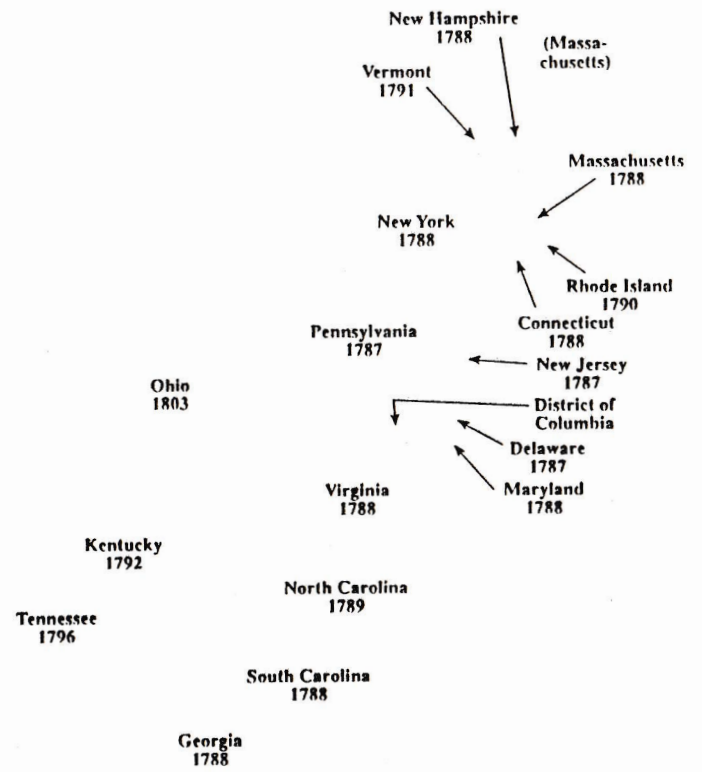


4. Modern Cities Along the Lewis & Clark Trail

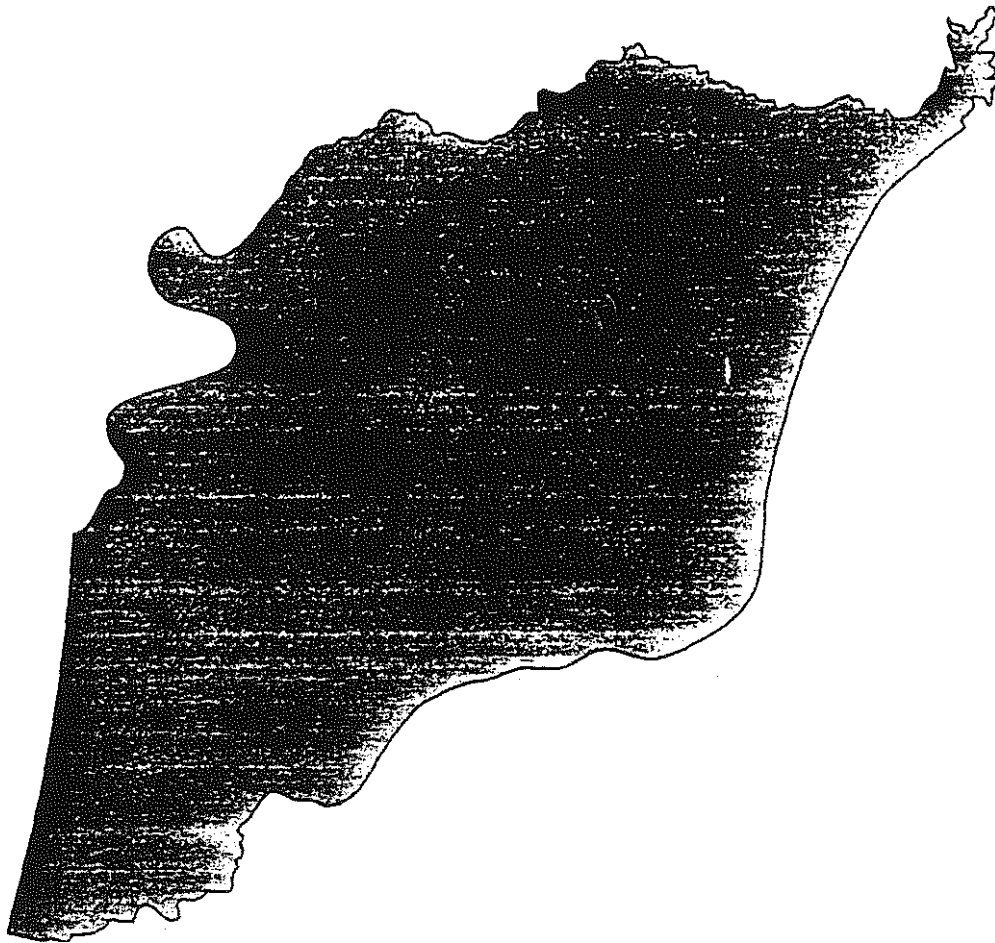




5. The U.S. in 1803



7. Louisiana Territory



**Oregon
Country**

Canada

**Louisiana
Territory**

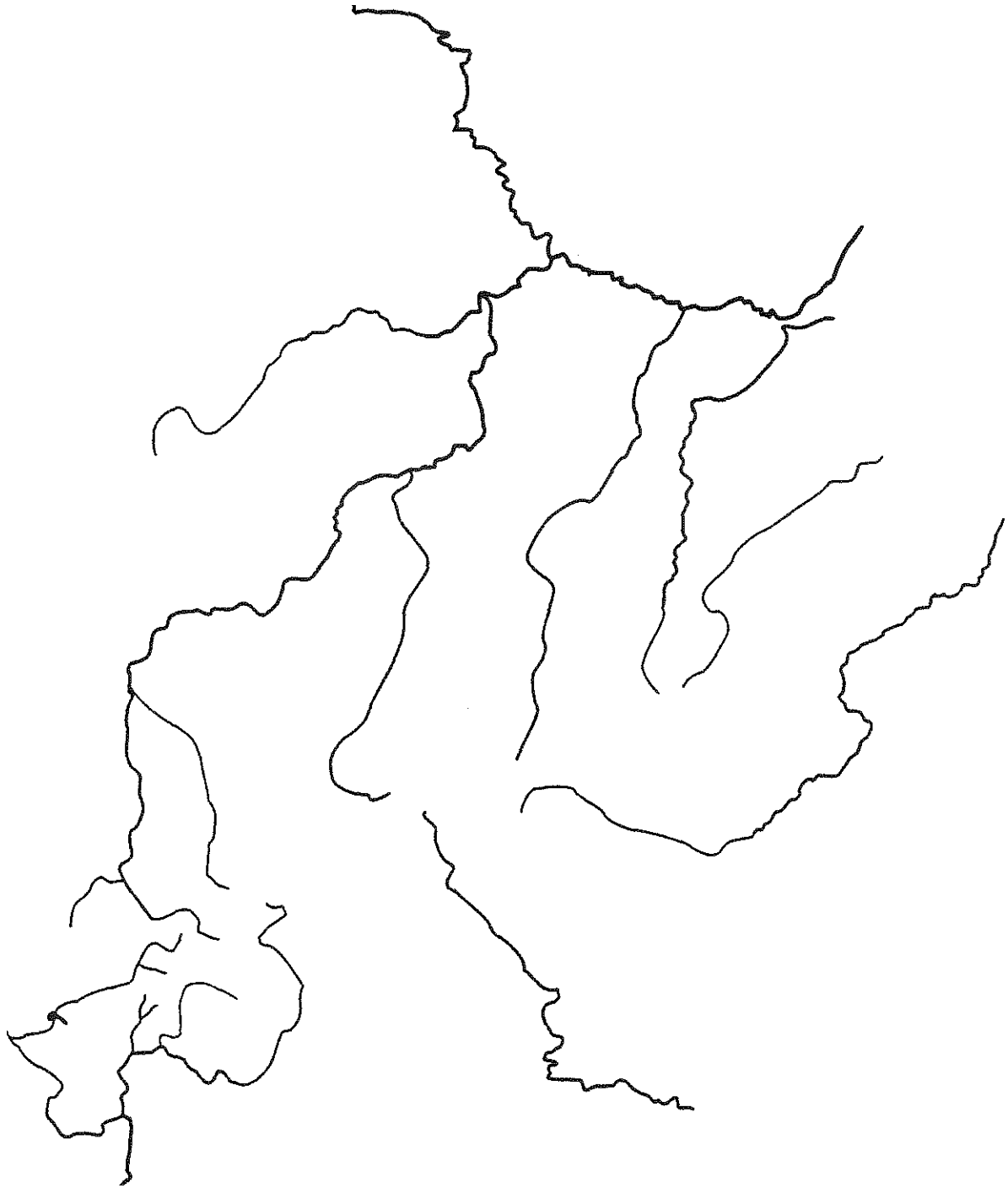
**Indiana
Territory**

Spain

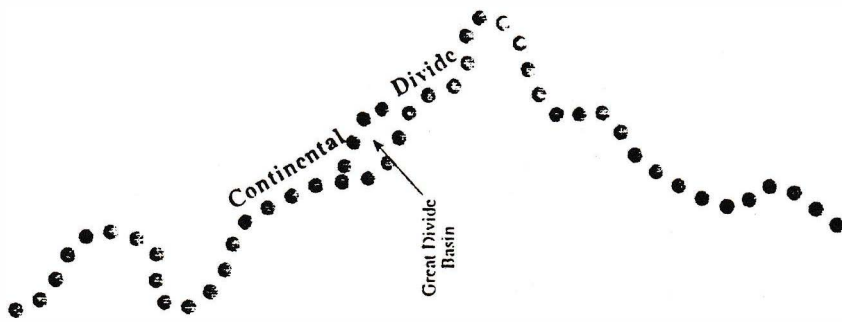
**Mississippi
Territory**

Spain

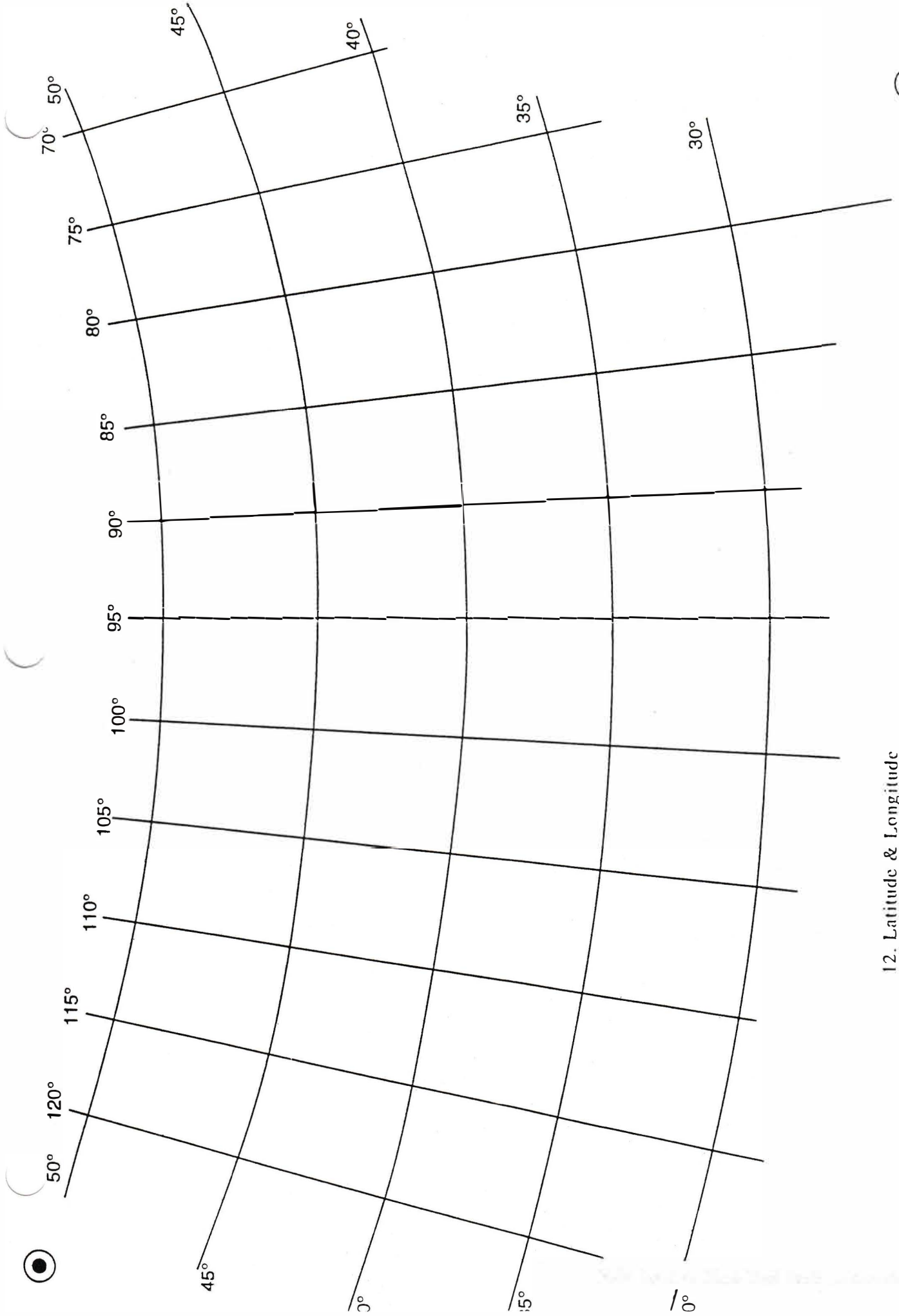
9. Major Rivers of the West



Columbia
Columbia Snake Clear-water Salmon
Clark Fork Bitterroot
Marion Missouri
Yellowstone
Snake
Mississippi
Plate
Colorado
Missouri
Ohio
Arkansas
Red
Brazos
Rio Grande

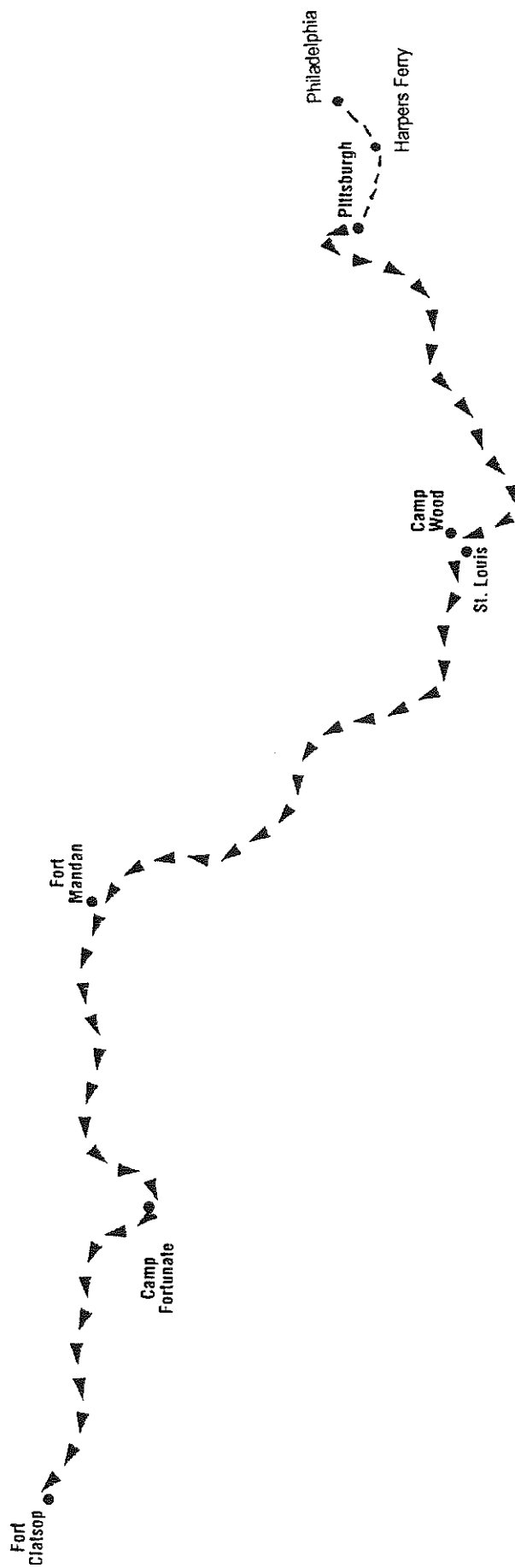


11. The Continental Divide

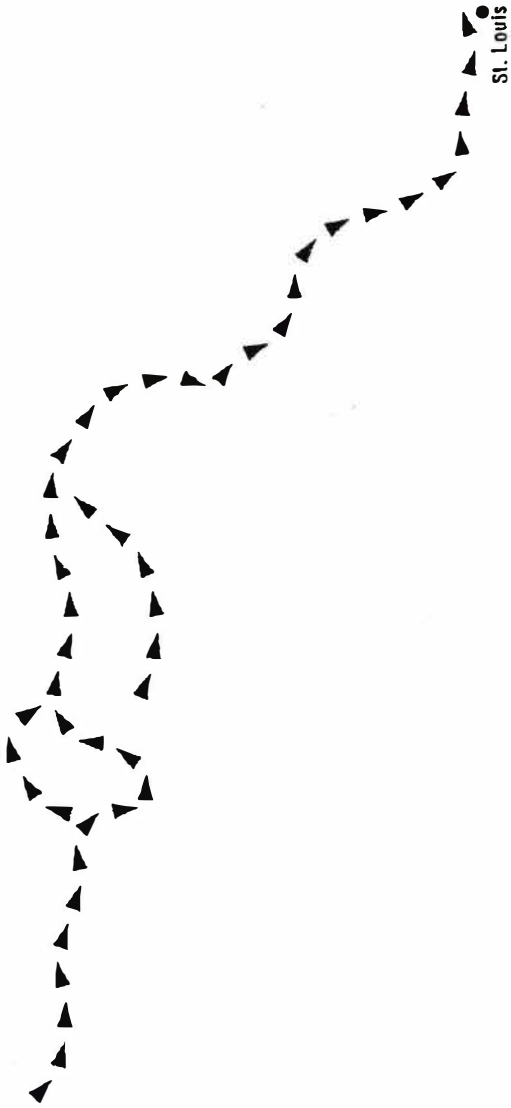


12. Latitude & Longitude

13. Westbound Trail

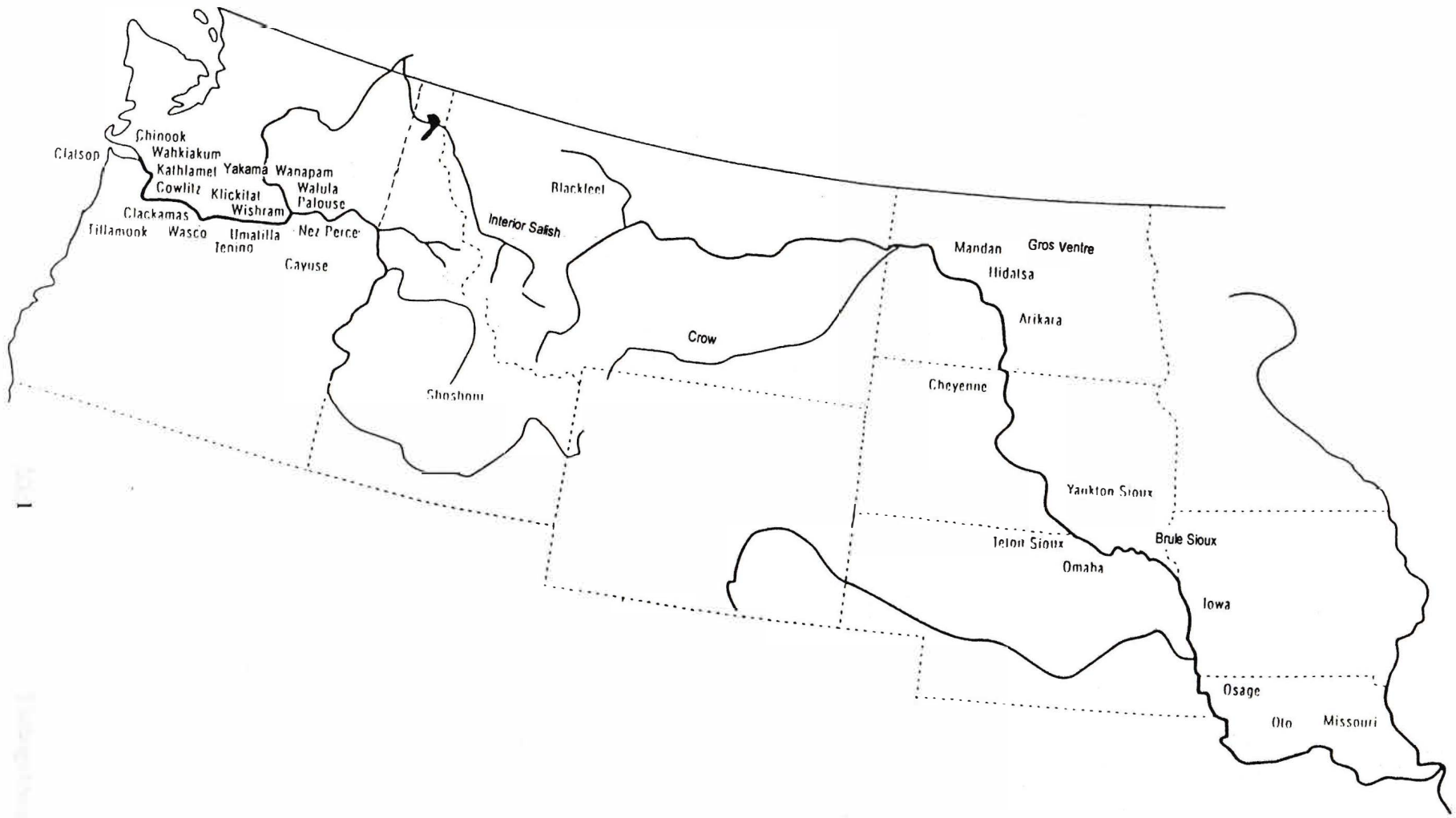


Fort
Clatsop

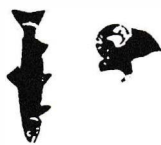


St. Louis

14. Eastbound Trail



15. Indian Tribes met by Lewis & Clark



Content Knowledge Standards by Lesson

Unit 3: Maps

The lessons in Unit 3 provide students with opportunities to develop and practice the following content knowledge standards and benchmarks which are organized by discipline (alphabetical order) *for each lesson*. However, there are a number of content knowledge standards and benchmarks which are relevant to all lessons in this unit. To save pages, these are listed first.

Behavior Studies

Group and cultural influences that contribute to human development, identity, behavior:

- Understands that the way a person views an incident reflects personal beliefs, experiences and attitudes.

Understanding that interactions among learning, inheritance, and physical development affect human behavior:

- Understands that human beings can use the memory of their past experiences to make judgements about new situations.

Geography

Understanding of characteristics and uses of maps, globes, other geographic tools and technologies:

- Knows the basic elements of maps and globes (e.g., title, legend, cardinal and intermediate directions, scale, grid, principle parallels, meridians, projection)

Location of places, geographic features, patterns of environment:

- Knows the approximate location of major continents, mountain ranges, and bodies of water on Earth.
- Knows the relative location of size of and distances between places.
- Knows the factors that influence spatial perception (e.g., culture, education, age, gender, occupation, experience).

Characteristics and uses of spatial organization on Earth's surface:

- Understands the spatial organization of places through such concepts as location, distance,
- direction, scale, movement, and region.
- Knows different methods used to measure distance (e.g., miles, kilometers, time, cost, perception).

How geography is used to interpret the past:

- Knows the ways in which the spatial organization of society changes over time.
- Knows significant physical features that have influenced historic events.

Language Arts

General skills and strategies of the reading process:

- Uses specific strategies to clear up confusing parts or text (e.g., rereads text, consults another source, draws upon background knowledge or asks for help.)

General skills and strategies for reading a variety of informational texts:

- Uses prior knowledge and experience to understand and respond to new information.
- Uses new information to adjust and extend personal knowledge.
- Evaluates the clarity and accuracy of information.

Navigating Across the Continent

Behavior Studies

Group and cultural influences that contribute to human development, identity, behavior:

- Understands that each culture has distinctive patterns of behavior that are usually practiced by most of the people who grow up in it.

Social group, general implications of groups membership, different ways that groups function:

- Understands that different groups, societies, and cultures may have different ways to meeting similar wants and needs.
- Understands that a variety of factors contribute to the ways in which groups respond differently to their physical and social environments and to the wants and needs of their members.

Understanding that interactions among learning, inheritance, and physical development affect human behavior:

- Knows that human beings have different interests, motivations, skills and talents.
- Understands roles as learned behavior patterns in group situations (e.g., team member).

Foreign Language

Different patterns to communicate and apply this knowledge to the foreign language:

- Understands how idiomatic expressions have an impact on communication and reflect culture.

Geography

Understanding that culture and experience influence people's perception of places and regions:

- Understands ways in which people view and relate to places and regions differently.
- Knows how technology affects the ways in which culture groups perceive and use places and regions.

Understanding of changes that occur in the meaning, use, distribution and importance of resources:

- Understands the relationship between resources and exploration, colonization and settlement of different regions.

Health

How to maintain mental and emotional health:

- Knows behaviors that communicate care, consideration, and respect of self and others.
- Understands how one responds to the behavior of others and how one's behavior may evoke responses in others.

History

Basics of historical perspective:

- Impact specific individuals had on history.
- Influence ideas had on a period of history.

Language Arts

General skills and strategies of the writing process:

- Uses a variety of prewriting strategies (e.g., makes outlines, uses published pieces as writing models, brainstorming, builds background knowledge).

Gathering and using information for research purposes:

- Uses a variety of strategies to identify topics (e.g., group discussion, brainstorming).
- Gathers data for research topics from interviews.

- Uses a variety of resource materials to gather information for research topics (e.g., magazines, newspapers, dictionaries, journals and atlases).
- Determines the appropriateness of an information source for a research topic.

General skills and strategies of the reading process:

- Determines the meaning of unknown words using a glossary or dictionary.
- Reflects on what has been learned after reading and formulates ideas, opinions or personal responses to text.
- Extends general or specialized vocabulary.

General skills and strategies for reading a variety of informational texts:

- Seeks peer help to understand information.
- Determines the effectiveness of techniques used to convey viewpoint.

Speaking and listening as tools for learning:

- Contributes to group discussions and asks questions to enrich classroom discussions.
- Responds to questions and comments.
- Listens to classmates and adults in order to understand speaker's topic, purpose or perspective.

Life Skills (Thinking and Reasoning)

Analyzing chronological relationships, patterns:

- Understands that personal values influence the types of conclusions people make.

Mental processes that are based on identifying similarities and differences (compares, contrasts, classifies):

- Understands that one way to make sense of something is to think how it is like something more familiar.
- Compares different sources of information for the same topic in terms of basic similarities and differences.

Basic trouble-shooting and problem-solving techniques:

- Analyzes the problems that have confronted people in the past in terms of major goals and obstacles to those goals.
- Represents a problem accurately in terms of resources, constraints, and objectives.
- Examines different options for solving problems of historical importance and determines why specific courses of action were taken.

Decision-making techniques:

- Analyzes decisions that were major turning points in history and describes how things would have been different if other alternatives had been selected.

Life Skills (Working With Others)

Contributing to the overall effort of a group:

- Demonstrates respect for others in the group.
- Identifies and uses the strengths of others.
- Engages in active listening.
- Evaluates the overall progress of a group toward a goal.
- Contributes to the development of a supportive climate in groups.

Working well with diverse individuals, in diverse situations:

- Works well with the opposite gender.
- Works well with people from different ethnic groups.

Effective interpersonal communication skills:

- Displays politeness with others.
- Communicates in a clear manner during conversations.

Leadership skills:

- Occasionally serves as a leader in groups.
- Occasionally serves as a follower in groups.

Physical Education

Basic movements:

- Uses mature form and appropriated sequence in combinations of fundamental locomotor, object control, and rhythmical skills that are components of games, sports, and dances.
- Uses intermediate skills for outdoor activities.
- Social and personal responsibility associated with participation in physical activity:
- Knows how to develop and use rules, procedures, and etiquette that are safe and effective for specific situations.
- Understands the role of physical activities in learning more about others of like and different backgrounds (e.g., gender, culture, ethnicity, and disability).
- Works with others in a physical activity to achieve a common goal.
- Understands how participation in physical activity fosters awareness of diversity (e.g., culture, ethnic, gender, physical).
- Includes persons of diverse backgrounds and abilities in physical activity.

Technology

Understanding of the relationships among science, technology, society and the individual:

- Knows that science cannot answer all questions and technology cannot solve all human problems or meet all human needs.
- Knows ways in which technology has influenced the course of history (e.g., agriculture, medicine, transportation, communication}.
- Knows ways in which technology and society influence one another.
- Nature of technological design:
- Evaluates a product or design (e.g., does design meet the challenge to solve a problem) and make modifications based on results.
- Identifies appropriate problems for technological design.

Reading Maps (Old and New)

Behavior Studies

Social group, general implications of groups membership, different ways that groups function:

- Understands that a variety of factors contribute to the ways in which groups respond differently to their physical and social environments and to the wants and needs of their members.

Understanding that interactions among learning, inheritance, and physical development affect human behavior:

- Knows that human beings have different interests, motivations, skills and talents.

Geography

How geography is used to interpret the past:

- Knows how physical and human geographic factors have influenced major historic events and movements.

Understanding of global development and environmental issues:

- Understands how the interaction between physical and human systems affects current conditions.

History

Basics of historical perspective:

- Understand that historical accounts are subject to change based on newly uncovered records and interpretations.
- Know what of primary and secondary sources are and understand the motives, interests and bias expressed in these sources (e.g., letters, journals, artifacts, oral tradition, hearsay, illustrations, photos, magazine and newspaper articles and other forms of media).

Basics of historical perspective and analyze:

- Use of maps to understand the relationship between historical events and geography.

Language Arts

Gathering and using information for research purposes:

- Uses a variety of resource materials to gather information for research topics (e.g., magazines, newspapers, dictionaries, journals and atlases).
- Evaluates the reliability of primary and secondary source information and uses information accordingly in reporting on a research topic.

Speaking and listening as tools for learning:

- Contributes to group discussions and asks questions to enrich classroom discussions.
- Responds to questions and comments.
- Listens to classmates and adults in order to understand speaker's topic, purpose or perspective.

Life Skills (Thinking and Reasoning)

Chronological relationships, patterns:

- Understands that personal values influence the types of conclusions people make.
- Mental processes that are based on identifying similarities and differences (compares, contrasts, classifies) and:

- Understands that one way to make sense of something is to think how it is like something more familiar.
- Compares different sources of information for the same topic in terms of basic similarities and differences.

Basic trouble-shooting and problem-solving techniques:

- Represents a problem accurately in terms of resources, constraints, and objectives.
- Examines different options for solving problems of historical importance and determines why specific courses of action were taken.

Decision-making techniques:

- Analyzes important decisions made by people in the past in terms of possible alternatives that were considered.
- Analyzes decisions that were major turning points in history and describes how things would have been different if other alternatives had been selected.

Technology

Understanding of the relationships among science, technology, society and the individual and:

- Knows that science cannot answer all questions and technology cannot solve all human problems or meet all human needs.
- Knows ways in which technology has influenced the course of history (e.g., agriculture, medicine, transportation, communication).

Where Have We Been?

Behavior Studies

Social group, general implications of groups membership, different ways that groups function, and:

- Understands that different groups, societies, and cultures may have different ways to meeting similar wants and needs.
- Understands that a variety of factors contribute to the ways in which groups respond differently to their physical and social environments and to the wants and needs of their members.
- Understands how language, literature, the arts, architecture, other artifacts, traditions, beliefs, values, and behaviors contribute to the development and transmission of culture.
- Understands that groups have patterns for preserving and transmitting culture even as they adapt to environmental and/or social change.

Geography

Understanding that culture and experience influence people's perception of places and regions:

- Understands ways in which people view and relate to places and regions differently.

Understanding of the nature and complexity of Earth's cultural mosaics:

- Knows the similarities and differences in characteristics of culture in different regions (e.g., in terms of environment and resources, technology, food, shelter, social organization, beliefs and customs).
- Understands how different people living in the same region maintain different ways of life (e.g., cultural differences of Native American groups and European groups).
- Knows ways in which communities reflect the cultural background of their inhabitants.

Understanding of the patterns of human settlement and their causes:

- Knows reasons for similarities and differences in the population size and density of different regions (e. g., length of settlement, environment and resources, cultural traditions, historic accessibility).

Understanding of changes that occur in the meaning, use, distribution and importance of resources:

- Understands the relationship between resources and exploration, colonization and settlement of different regions.

How geography is used to interpret the past:

- Knows how physical and human geographic factors have influenced major historic events and

movements.

Understanding of global development and environmental issues:

- Understands how the interaction between physical and human systems affects current conditions.

History

Basics of historical perspective and analyze:

- Use of maps to understand the relationship between historical events and geography.
- Significance of the Lewis and Clark Expedition including its role as a scientific expedition and its relations with Native American cultures.

Language Arts

General skills and strategies of the writing process:

- Writes, organizes and presents information that reflects knowledge about the topic.

Stylistic and rhetorical aspects of writing:

- Uses descriptive language that clarifies and enhances ideas.

Gathering and using information for research purposes:

- Uses a variety of strategies to identify topics (e.g., group discussion, brainstorming).
- Uses a variety of resource materials to gather information for research topics (e.g., magazines, newspapers, dictionaries, journals and atlases).
- Determines the appropriateness of an information source for a research topic.
- Evaluates the reliability of primary and secondary source information and uses information accordingly in reporting on a research topic.

General skills and strategies of the reading process:

- Reflects on what has been learned after reading and formulates ideas, opinions or personal responses to text.
- Extends general or specialized vocabulary.

General skills and strategies for reading a variety of informational texts:

- Seeks peer help to understand information.
- Determines the effectiveness of techniques used to convey viewpoint.
- Uses discussions with peers as a way of understanding information.

Speaking and listening as tools for learning:

- Contributes to group discussions and asks questions to enrich classroom discussions.
- Listens to classmates and adults in order to understand speaker's topic, purpose or perspective.
- Presents prepared reports to class.

Life Skills (Thinking and Reasoning)

Mental processes that are based on identifying similarities and differences (compares, contrasts, classifies):

- Understands that one way to make sense of something is to think how it is like something more familiar.
- Compares different sources of information for the same topic in terms of basic similarities and differences.

Basic trouble-shooting and problem-solving techniques:

- Analyzes the problems that have confronted people in the past in terms of major goals and obstacles to those goals.
- Represents a problem accurately in terms of resources, constraints, and objectives.
- Examines different options for solving problems of historical importance and determines why specific courses of action were taken.

Decision-making techniques:

- Analyzes important decisions made by people in the past in terms of possible alternatives that
- were considered.
- Analyzes decisions that were major turning points in history and describes how things would have been different if other alternatives had been selected.

Mathematics

Basics of numbers and geometry:

- Concept of numbers, ratio, proportion and percent and the relationships among these.
- Concept of geometry and the mathematical concepts of similarity (e.g., scale and proportion).

Build-A-Map

Behavior Studies

Social group, general implications of groups membership, different ways that groups function, and:

- Understands that affiliation with a group can increase the power of members through pooled resources and concerted action.

Civics

Understanding of how the world is organized politically into nation-states, how nations states interact with one another, issues surrounding U. S. foreign policy:

- Knows that the world is divided into nation-states that claim sovereignty over a defined territory and jurisdiction over everyone within it, and understands why the nation-state is the most powerful form of political organization at the international level.
- Knows that most important means used by nation-states to interact with one another (e.g., trade, diplomacy, cultural exchanges, treaties and agreements, humanitarian aid, economic incentives and sanctions, military force and the threat of force).

Geography

Characteristics and uses of spatial organization on Earth's surface:

- Understands principles of location, (e.g., based on costs, market, resource, transportation, climate).

Concepts of regions:

- Understands ways regional systems are interconnected (e.g., watersheds and river systems, regional connections through trade, cultural ties between regions).

Understanding of the nature, distribution, migration of human populations:

- Knows the causes and effects of human migration (e.g., European colonists, African slaves to America, the effects of physical geography on national and international migration, cultural factors).

Understanding of the patterns and networks of economic interdependence:

- Understands historic and contemporary economic trade networks.
- Understands historic and contemporary systems of transportation and communication in the development of economic activities.

Understanding of changes that occur in the meaning, use, distribution and importance of resources:

- Understands the relationship between resources and exploration, colonization and settlement of different regions.

How geography is used to interpret the past:

- Knows how physical and human geographic factors have influenced major historic events and movements.

History

Basics of historical perspective:

- Know what of primary and secondary sources are and understand the motives, interests and bias expressed in these sources (e.g., letters, journals, artifacts, oral tradition, hearsay, illustrations, photos, magazine and newspaper articles and other forms of media).

Basics of historical perspective and analyze:

- Use of maps to understand the relationship between historical events and geography.
- United States expansion after 1801 (especially the Louisiana Purchase) and
- how it affected relations with Euro-American powers and Native American cultures.
- Foreign (Euro-American) claims and traditional territories (Native American) on the North American continent in the early 1800s.

Language Arts

Gathering and using information for research purposes:

- Uses a variety of resource materials to gather information for research topics (e.g., magazines, newspapers, dictionaries, journals and atlases).
- Determines the appropriateness of an information source for a research topic.

General skills and strategies for reading a variety of informational texts:

- Determines the effectiveness of techniques used to convey viewpoint.