



 NRCS Natural Resources  
Conservation Service

# 2005 Soils Planner

*Lewis & Clark Bicentennial:  
Soils and Ecology*

# Introduction

On February 28, 1803, President Thomas Jefferson received money from Congress to fund a small expedition to explore the West. He asked his Secretary, Meriwether Lewis and Lewis' friend, William Clark, to be in charge of the journey. Jefferson told them to travel and find out whatever they could about the land. This assignment would become one of the most symbolic events in agricultural and American history. During the 2003-2006 bicentennial observance of the Lewis and Clark Expedition, the Natural Resources Conservation Service and its partners continue to honor those who went on this historic journey. In keeping our national commitment to understand our soils and landscapes, this planner gives an account of the soils and native vegetation witnessed on the trail, and outlines some of the contributions of Lewis and Clark.

A farmer, President Jefferson had always wondered what rewards the western frontier could offer. He believed the area would be a region of rivers, mountains, and huge, empty, fertile spaces. Lewis and Clark headed out to explore the West and get information on the soils of the land, the wildlife, and the people.

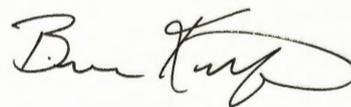
The "Corps of Discovery" worked together and formed an excellent team. Clark was a great navigator, so he spent most of his time on the boat while Lewis worked on the shore. Like a soil scientist, Lewis took notes on the characteristics and conditions of the soil. Similarly, he documented the shape of the land and the vegetation it produced. He collected birds, plants, and animals to

show to Jefferson when he returned. Meanwhile, Clark took detailed readings from the navigational instruments for map-making purposes.

In addition to the two captains, several members of the Corps kept journals and provided us with descriptive details of their epic journey.

In 1806, the "Corps of Discovery" returned with several maps and as many specimens as they could collect and carry. Having traveled thousands of miles experiencing lands, rivers, and people of great diversities, the team brought back the detailed descriptions of the flora, fauna, and general soil types of what would become the Northwestern United States.

The journey, which lasted over two and a half years, is remembered as a great American journey because it resulted in many achievements. The Natural Resources Conservation Service is pleased to participate in the bicentennial observance of this historic event. It is our hope that without any reserve, you too, will take part in honoring the achievements of Captains Meriwether Lewis and William Clark.

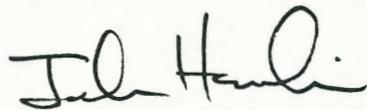


Bruce I. Knight  
Chief, Natural Resources Conservation Service

# From Our Partners

Following the purchase from the French of the enormous Louisiana Territory drained by the Mississippi and the Missouri Rivers, Meriwether Lewis was instructed by President Jefferson on June 20, 1803, to explore the Missouri river regions and the most direct and practical water passage across the continent for the purposes of commerce. From May 14, 1804, to September 23, 1806, Lewis and Clark traveled over 8,000 miles exploring the extraordinary, vast, and beautiful lands. They meticulously recorded their observations and experiences in incredible detail, documenting the cultural diversity of native peoples and the immense diversity in natural resources. Throughout their journal, Lewis and Clark often described soil properties and characteristics important to productivity. For example, in the region near present-day Mandan, ND, they wrote "...The soil appears fertile and deep; it consists generally of dark rich loam intermixed with a small proportion of fine sand." These detailed reports encouraged farmers in the Eastern United States to settle on these productive lands and grow a young nation.

The Soil Science Society of America ([www.soils.org](http://www.soils.org)) is dedicated to the discovery and application of science to understand and protect our precious soil resources that sustain agricultural productivity, environmental quality, and life on Earth. We are proud to participate with our USDA Natural Resources Conservation Service partners in celebrating the bicentennial of the "Corps of Discovery" that opened a new territory and provided detailed descriptions of the beauty and bounty of the diverse natural resources in the midwest, high plains, and western regions of the United States. We hope you enjoy the 2005 Soils Planner and participate in celebrating the Lewis and Clark bicentennial.



John L. Havlin  
President, Soil Science Society of America



The spectacular journey of Lewis & Clark 2 centuries ago traversed some of North America's most highly valued rangelands. This Natural Resources Conservation Service (NRCS) Soils Planner depicts their historic journey in the context of the animals, plants, soils, and landscapes that are found in these ecological regions. In addition, the Soils Planner includes descriptions of ecological sites and soils along the Lewis & Clark Trail. Ecological site descriptions are conceptual reports of the land and vegetation that assist range and forest land managers in conserving resources according to their limitations and capabilities.

The Society for Range Management (SRM) is the professional scientific society and conservation organization whose members are concerned with studying, conserving, managing, and sustaining the varied resources of the rangelands that comprise nearly half the land in the world. Established in 1948, SRM has over 4,000 members in 48 countries, including many developing nations. The Lewis & Clark Trail traverses territory covered by some of our SRM member sections; South Dakota, Northern Great Plains, Nebraska, Kansas, and Pacific Northwest. The Mission of the Society for Range Management is to promote and enhance the stewardship of rangelands to meet human needs based on science and sound policy. We applaud and congratulate the NRCS for commemorating the "Corps of Discovery" and for recognizing the soil resources, ecological values, and dramatic beauty of rangelands in the 2005 planner.



Dr. Mort Kothmann  
Professor of Rangeland Ecology and Management,  
Texas A & M University  
President, Society for Range Management



# Soils and Ecology on the Lewis & Clark Trail

At the turn of the 19th century, the U.S. population was growing quickly, and there was concern that there might not be enough farmland to sustain the Nation. The new immigrants from Europe were curious about the West and about the land's value for agriculture. Many land assessment surveys were being sponsored and conducted for the U.S. Government. President Thomas Jefferson instructed Lewis and Clark to report on the Western Lands of the Louisiana Purchase and their potential for agricultural purposes. Was it a garden or a desert? The Spanish explorers from the Southwest described a desert. The French of the Northwest described a garden.

At the time, most American pioneers associated good-quality soils with hardwood trees and would have regarded the interior prairies of the Great Plains as poor agricultural land. Observations along the trail by Lewis and other expedition members contradicted these views and supported the vision of the agricultural bounty that the Great Plains would later produce. In truth, the reports were that the West was both a "desert" and a potential garden.

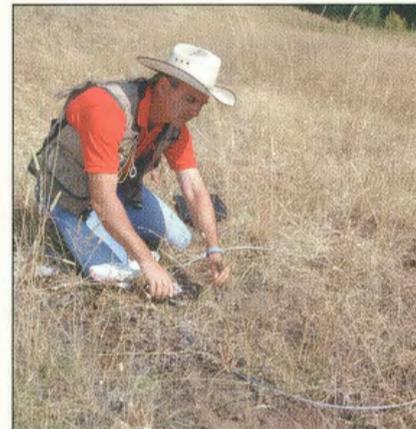


Above: Soil scientists photographing the face of a trench to produce a soil profile, near Fargo, North Dakota.

By the end of the 1800s the U.S. saw the need for a national inventory to document the potential productivity of the land. The result was the National Cooperative Soil Survey. The National Cooperative Soil Survey (NCSS) is now a joint effort by several Federal agencies, the 1862 land-grant universities' experiment stations, the National Association of Consulting Soil Scientists,

and the 1890 land-grant universities and western tribal colleges. The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, coordinates the NCSS and maintains the standards of the U.S. Soil Survey.

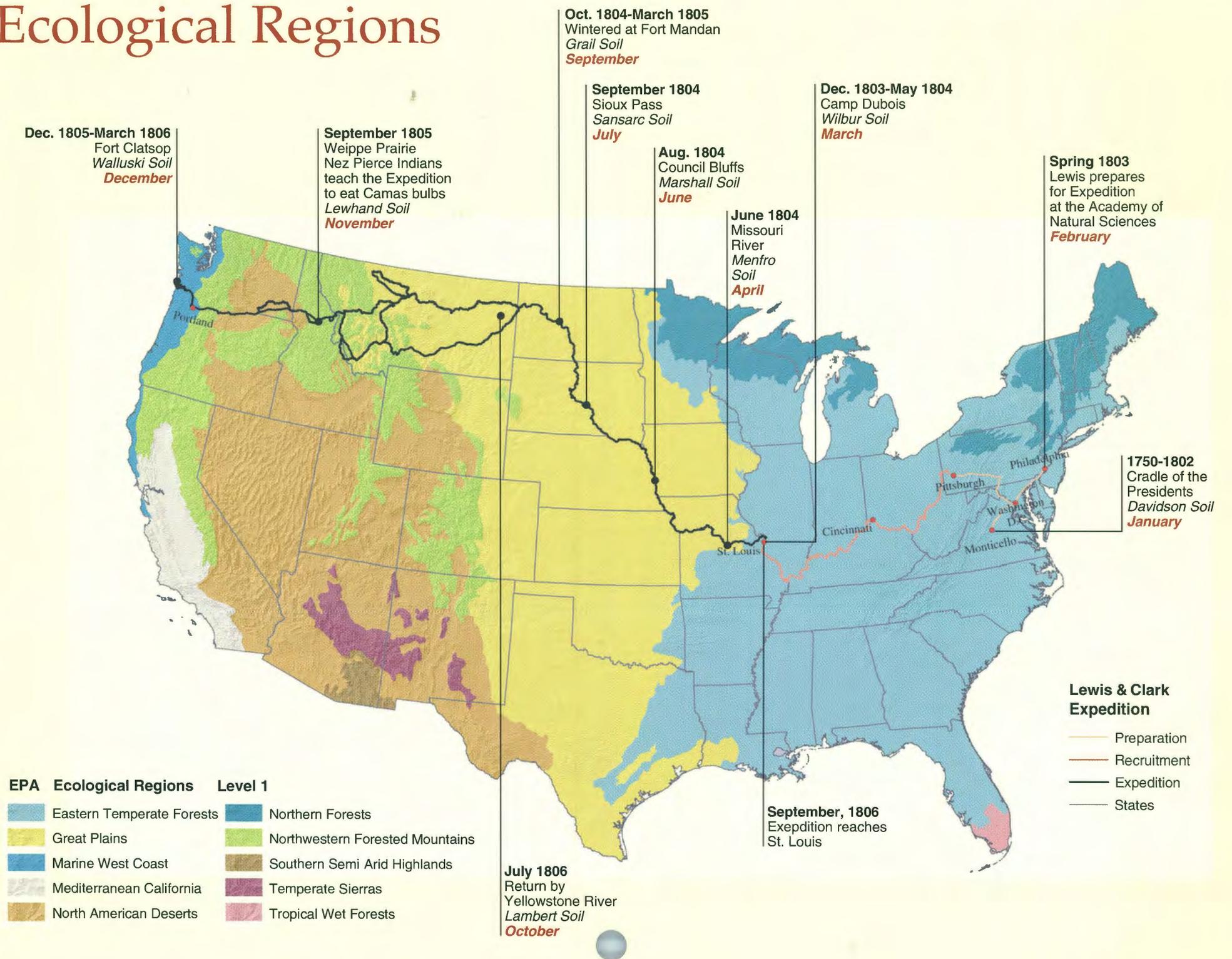
In this 2005 Soils Planner the soil scientists and range conservationists of the NRCS highlight some of the ecological relationships between soils, vegetation, animals, and land management along the Lewis & Clark Trail. Observations from the Lewis and Clark journals support and substantiate interpretations that field scientists see today. Scientists have found an inextricable link between the specific soils on the landscape and the resultant expression of the plants. Formerly called range site descriptions and woodland suitability group descriptions, ecological site descriptions contain information about the ecological dynamics of each site and are used as the standard of reference for resource evaluations and assessments such as trend, similarity index, and rangeland health. The NRCS is now developing Ecological Site Descriptions with the U.S. Soil Survey to assist land managers in sustaining rangeland, forestland, and wildland resources.



Above: NRCS employee taking grass clippings to gauge the grazing potential of rangeland.

Communities and local governments work with NRCS State Offices and local USDA Service Centers to help them protect their natural resources. For more information about natural resources and conservation in your own backyard, contact the NRCS at <http://www.nrcs.usda.gov> or volunteer locally by calling 1-888-LANDCARE.

# Ecological Regions



# Davidson Loam

Virginia

**T**he Davidson Series consists of very deep, well-drained, moderately permeable soils that formed in materials weathered from dark-colored rocks high in ferromagnesian minerals. These soils are on gently sloping to moderately steep uplands in the Piedmont. Slopes are commonly 2 to 15 percent but range up to 25 percent.

## **Use and Vegetation**

Cleared areas are used for small grain, corn, cotton, soybeans, grain sorghum, hay, and pasture. The original forest consisted of white oak, red oak, post oak, hickory, yellow-poplar, and cedar; reforested areas are in shortleaf and loblolly pine.

*Below:* Monticello, home of Thomas Jefferson, located in the Piedmont uplands of Virginia. Jefferson met with Meriwether Lewis here during the planning stages of the expedition. The area is dominated by Davidson Soil.



## **Davidson Loam Profile**

### **Taxonomic Class**

Fine, kaolinitic, thermic Rhodic Kandiudults

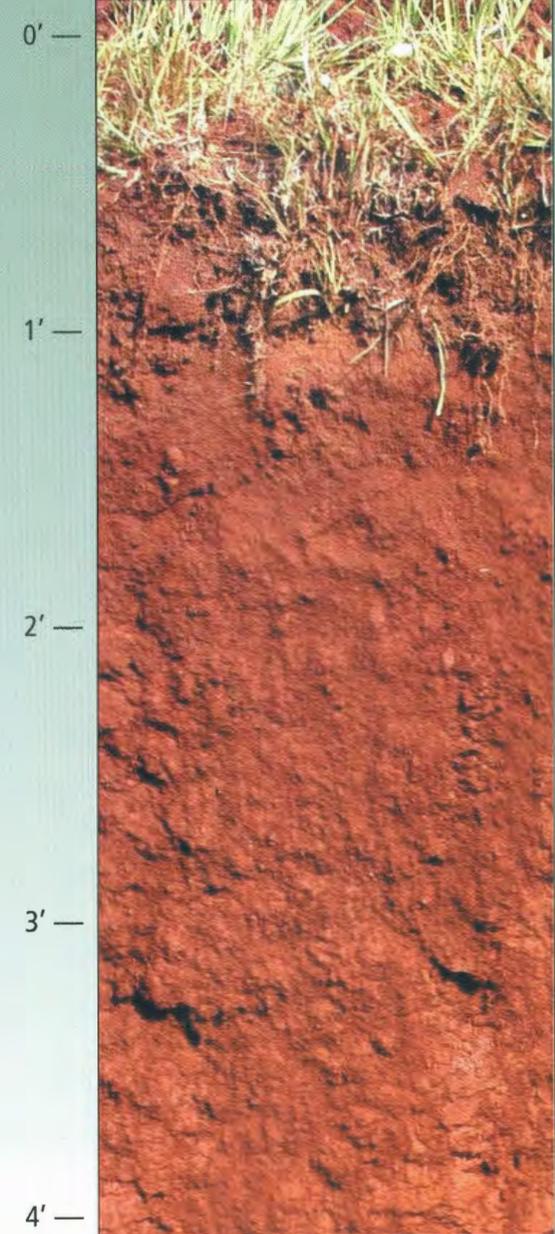
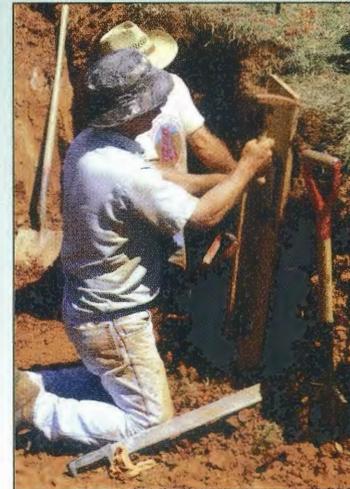
### **Surface Layer**

0 to 7 inches; dark reddish-brown (5YR 3/3) loam; weak fine granular structure; friable; strongly acid pH.

### **Subsoil Layer**

7 to 72 inches; dark-red (2.5YR 3/6, 10R 3/6) clay loam and clay; moderate medium subangular blocky structure; firm; strongly acid pH.

*Below:* Soil Scientists take a profile of Davidson Loam (right) near Monticello.



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<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>16</b>	<b>17</b>  Martin Luther King, Jr.'s Birthday	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>
<b>23/30</b>	<b>24/31</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>

## EVENTS

**28-31**  
International  
Conference on  
Soil, Water, and  
Environmental  
Quality  
New Delhi, India

## CRADLE OF THE PRESIDENTS

The correlation of the Davidson soils in central Virginia to the homes of U.S. Presidents and other prosperous farmer/planters is quite strong. Jefferson at the time of the Lewis & Clark expedition had been farming the Davidson soil at Monticello for many years. It is no accident that three of the first five U. S. presidents came from Virginia farms with Davidson soil. Davidson soils possessed favorable qualities for agriculture in an era when external fertilizers were scant. Successful farming in the 18th century depended on the natural fertility of the soil.

*Douglas Helms, Historian, NRCS*

# January 2005

# The Philadelphia Connection

In the spring of 1803, Meriwether Lewis began preparation for the expedition in Philadelphia where he met with leading scientists of the day and bought more than 3,500 pounds of supplies. It was important for Lewis to gain certain scientific skills and to buy equipment that would be needed on the journey. Andrew Ellicott taught Lewis map making and surveying. Benjamin Smith Barton tutored Lewis in botany and biological collection, Robert Patterson in mathematics, Caspar Wistar in anatomy and fossils, and Benjamin Rush in medicine. Barton's book, *Elements of Botany* (published in 1803), was amongst Lewis's essential supplies during the expedition. Lewis arranged for a wagon and driver to haul all the items to Pittsburgh, PA, where it would be loaded onto a keelboat.

Right: From the Lewis & Clark Herbarium preserved in the Philadelphia Academy of Natural Sciences. At right, a colored engraving published in the first comprehensive catalog of American plants by Frederick Pursh in 1813. The plant is *Clarkia pulchella*, named for William Clark. A pressed specimen, or *lectotype*, of the same plant, appears in the accompanying photograph.

327. CLARCKIA. Pursh in *linn. soc. trans.* v. 11.  
*pulchella*. 1. Clarkia. Pursh l. c.  
 On the Kootenokooy and Clark's rivers. M. Lewis. 3. June. v. s. Flowers beautiful rose-coloured or purple.  
*Caulis* erectus, teres, superne subramosus, pedalis et ultra. *Folia* alterna, linearia, integerrima, glabra.  
 [page break]  
*Florae* ex axillis superioribus, solitariae, subsessiles, magnae, aeternae purpureae. *Calyx* aenotherae. *Petalae* imbricatae, exteriora laciniis lateralibus



Above: Description of *Clarkia pulchella* from Meehan's 1898 study of the Lewis & Clark Herbarium.



Above: *Penstemon fruticosus*, one of the engravings from the Pursh catalog, with a pressed specimen, or *lectotype*, at right. Pursh said the species grows in "great abundance in the pine-forests of the Rocky mountains." The lectotype was collected along the Lolo Trail in Idaho Co., Idaho, on June 15, 1806.



Sunday							Monday							Tuesday							Wednesday							Thursday							Friday							Saturday																		
January 2005														March 2005														<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>																												
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							Presidents' Day																																																					
<b>27</b>							<b>28</b>																																																					

## EVENTS

**Black History Month**

**1-4**  
NRCS State Soil Scientists/Soil Data Quality Specialists National Training Workshop  
Laughlin, NV

**5-11**  
Society for Range Management Annual Meeting  
Ft. Worth, TX

**14-18**  
NRCS MLRA Region Leaders Meeting  
Charleston, SC

**17-21**  
American Association for Advancement of Science Annual Meeting  
Washington, DC

## THE LEWIS & CLARK HERBARIUM

Philadelphia played a prominent role in the disposition of material brought back by the Corps of Discovery. The American Philosophical Society, founded by Benjamin Franklin in 1743, became the repository for the journals kept by Lewis and Clark. This is the origin of the Lewis & Clark Herbarium now housed in Philadelphia's Academy of Natural Sciences.

The Academy's Lewis & Clark Herbarium includes 226 sheets of dried, pressed specimens, derived from two sets of plants: 179 that were transferred to the Academy in 1897 for curation by the American Philosophical Society and 47 others from different sources.

# February 2005

**T**he Wilbur Series consists of very deep, moderately well drained soils that formed in alluvium redeposited from loess. Wilbur soils are on nearly level floodplains and floodplain steps. These soils are subject to brief periods of flooding. Mean annual temperature ranges from about 50 to 57 degrees F., mean annual precipitation from about 35 to 46 inches, and the frost-free period ranges from 150 to 210 days.

### **Use and Vegetation**

Most areas are used to grow corn and soybeans. Some of the narrow floodplains are used for forest or pasture. The native vegetation is deciduous forest, chiefly of beech, elm, hickory, hackberry, buckeye, sugar maple, oak, and sycamore.

*Below:* Wilbur is a common soil at the site of Camp DuBois, Lewis & Clark's first encampment. This is a photo of soybeans planted on Wilbur soils. The field is located below a bluff (in the distance) and depicts the landscape and a common agricultural use of land in the area.



### **Wilbur Silt Loam Profile**

#### **Taxonomic Class**

Coarse-silty, mixed, superactive, mesic Fluvaquentic Eutrudepts

#### **Surface Layer**

0 to 7 inches; brown (10YR 4/3) silt loam, moderate medium granular structure; friable; neutral pH.

#### **Subsoil Layer**

7 to 32 inches; dark yellowish brown (10YR 4/4) and brown (10YR 5/3) silt loam; weak medium subangular blocky structure; friable; neutral pH.

#### **Substratum Layer**

32 to 60 inches; light brownish gray (10YR 6/2) silt loam; massive; friable; many fine prominent brown (7.5YR 4/4) and common fine distinct dark yellowish brown (10YR 4/4) masses of iron accumulation in the matrix; neutral pH.



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	April 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>  Girl Scout Day
<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>
<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>
<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>	<b>31</b>		

## EVENTS

**Women's History Month**

**Mar 31- Apr 2**  
**National Science Teachers' Association Convention**  
Dallas, TX

**Mar 29-Apr 6**  
**Global Soil Change Conference**  
Mexico City, Mexico

## CAMP DUBOIS— THE EXPEDITION'S BEGINNING AND END

Lewis and Clark embarked on and returned from their epic journey across the American West from Camp DuBois, north of St. Louis in Illinois. On today's maps, Camp DuBois is located in Wood River, IL.



Janis Lang, 2004

# March 2005

# Menfro Silt Loam

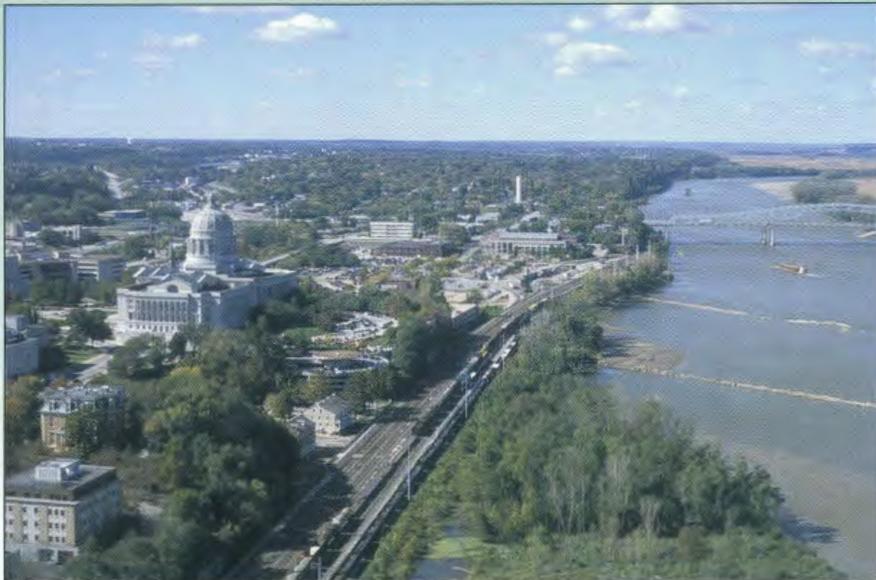
Missouri

**T**he Menfro Series consists of very deep, well-drained, moderately permeable soils formed in thick loess deposits on upland ridgetops, backslopes, and benches adjacent to the Missouri and Mississippi Rivers and their major tributaries. Slopes range from 2 to 60 percent. Mean annual temperature is 56 degrees F, and mean annual precipitation is 36 inches. Menfro soils formed in loess deposits ranging from 6 to 20 feet or more thick.

## **Use and Vegetation**

Natural vegetation is deciduous hardwoods. The cleared areas are cropped to soybeans, small grain, corn, hay, and pasture. Most of the steeper areas remain in timber.

*Below:* The Missouri Capitol and Governor's Mansion. Many of the upland areas of Kansas City, St. Louis, Jefferson City, Hermann, Hannibal and Cape Girardeau are located on Menfro soil.



## **Menfro Silt Loam Profile**

### **Taxonomic Class**

Fine-silty, mixed, superactive, mesic Typic Hapludalfs

### **Surface Layer**

0 to 6 inches; dark-brown (10YR 3/3) and brown (10YR 4/3) silt loam, moderate medium and fine granular structure; very friable; slightly acid pH.

### **Subsoil Layers**

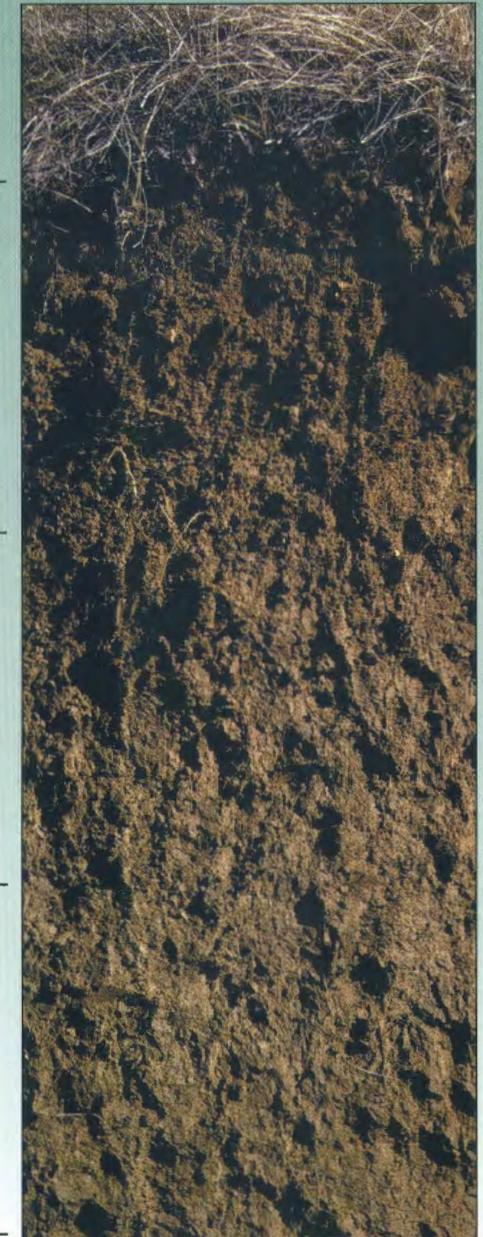
6 to 80 inches; dark yellowish brown and yellowish brown (10YR 4/4, 4/6, 5/4) silt loam and silty clay loam; moderate medium subangular blocky structure parting to moderate medium granular; very friable; moderately acid pH.

0' —

1' —

2' —

3' —





# A Great Number of Wolves

A great number of wolves of the small kind, hawks and some polecats were to be seen. ...Found the country in every direction, for about three miles, intersected with deep ravines and steep irregular hills 100 to 200 feet high. At the tops of these hills, the country breaks off as usual into a fine level plain extending as far as the eye can reach. From this plain I had an extensive view of the river below, and the irregular hills which border the opposite sides of the river and creek. ...The surrounding country had been burnt about a month before, and young grass had now sprung up to a height of 4 inches, presenting the live green of the spring; to the west a high range of hills stretch across the country from N. to S., and appeared distant about 20 miles. They are not very extensive, as I could plainly observe their rise and termination. No rock appeared on them, and the sides were covered with verdure similar to that of the plains. This scenery, already rich, pleasing, and beautiful, was still further heightened by immense herds of buffalo, deer, elk, and antelopes, which we saw in every direction, feeding on the hills and plains. I do not think I exaggerate when I estimate the number of buffalo which could be comprehended at one view to amount to 3,000.

*Captain Lewis, September 17, 1804*



Above: Painting made with soil pigments—  
*Wolf and Hawk by the River*, by Janis Lang, 2004

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30 Memorial Day	31				

### EVENTS

**13-15**  
World Congress of  
World Agriculture  
Forum  
St. Louis, MO

**22-27**  
National  
Cooperative Soil  
Survey Conference  
Corpus Christi, TX

April 2005							June 2005						
S	M	T	W	T	F	S	S	M	T	W	T	F	S
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3	4	5	6	7	8	9	6	7	8	9	10	11	12
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17	18	19	20	21	22	23	20	21	22	23	24	25	26
24	25	26	27	28	29	30	27	28	29	30			

## SOILS IN ECOLOGY, ECOLOGY IN SOILS

Almost all features of terrestrial ecology are shaped directly or indirectly by processes and organisms that are found in the soil. The response of grasses to droughts depends in part on the storage of water in the soil. The ability of an antelope to outrun a wolf depends on the overall health of the antelope, which depends in large part on the quantity and quality of food consumed by the antelope, which in turn is a function of the plant community's interactions with soil. Dependent interactions between soils, plants, and animals were recognized and appreciated by scientists before we had names for the scientific disciplines of ecology and soils.

*Dan Binkley, Colorado State University, 2004*

# May 2005

# Marshall Silty Clay Loam

Nebraska

**T**he Marshall Series consists of very deep, well-drained soils formed in loess. These soils are on interfluves and side slopes on uplands and on risers and treads on stream terraces in eastern Nebraska. Slopes range from 0 to 20 percent. Mean annual air temperature is about 11 degrees C (51 degrees F). Mean annual precipitation is about 76 centimeters (30 inches).

## Use and Vegetation

Most areas are cultivated. The principal crops are corn, soybeans, small grains, clover, and alfalfa. The native vegetation is big bluestem, little bluestem, indiagrass, and other grasses of the tall grass prairie.

*Below:* The Lewis & Clark landing site called "Council Bluff" as it appears today. A floodplain now separates the bluff from the Missouri River.



## Marshall Silty Clay Loam Profile

### Taxonomic Class

Fine-silty, mixed, superactive, mesic Typic Hapludolls

### Surface Layer

0 to 22 inches; black and very dark brown (10YR 2/1, 2/2) silty clay loam; moderate fine and medium subangular blocky structure; friable; slightly and moderately acid pH.

### Subsoil Layer

22 to 65 inches; brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silty clay loam; moderate medium subangular blocky structure; friable; moderately acid pH.

### Substratum Layer

65 to 71 inches; grayish brown (2.5Y 5/2) silt loam; weak coarse prismatic structure; friable; neutral pH.

### Ecological Site

Silty - Veg. zone 4  
R107XY075NE

0' —

1' —

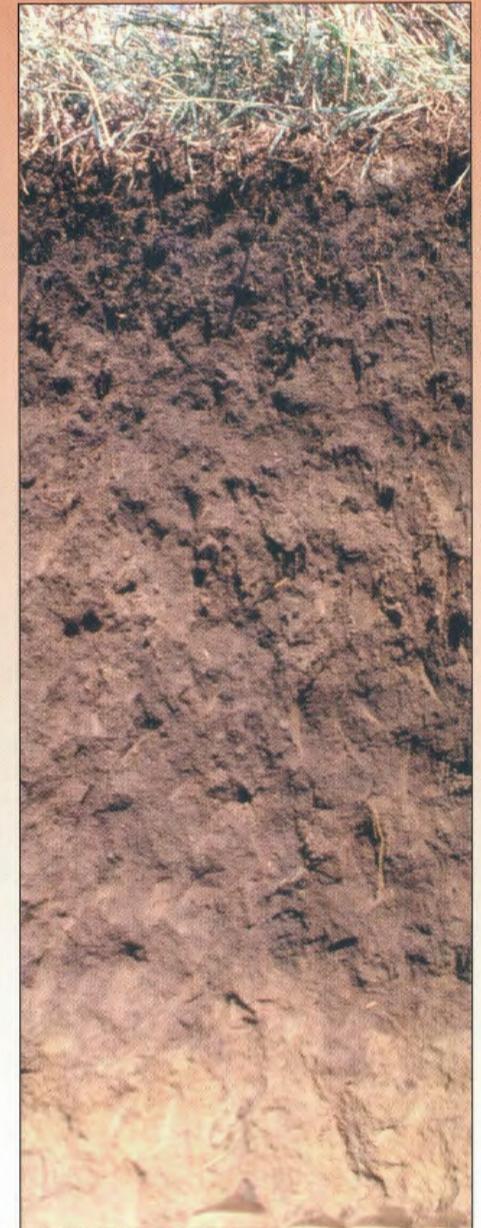
2' —

3' —

4' —

5' —

6' —



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<p>May 2005</p> <p>S M T W T F S</p> <p>1 2 3 4 5 6 7</p> <p>8 9 10 11 12 13 14</p> <p>15 16 17 18 19 20 21</p> <p>22 23 24 25 26 27 28</p> <p>29 30 31</p>	<p>July 2005</p> <p>S M T W T F S</p> <p>1 2</p> <p>3 4 5 6 7 8 9</p> <p>10 11 12 13 14 15 16</p> <p>17 18 19 20 21 22 23</p> <p>24/31 25 26 27 28 29 30</p>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>5</b>  World Environment Day	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>
<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>
<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>		



Above: *Bluffs and River*, by Janis Lang, 2004

## COUNCIL BLUFF

The Lewis and Clark Expedition held its first official council with Native Americans on August 3, 1804, at a site in what is now Washington County, Nebraska. Clark's map of the Missouri River in this area identifies this site as "Councell Bluff."

Clark's journal entry for July 30 identifies the various levels of the landscape at Council Bluff. It also identifies the kind of vegetation, including grasses that are 10 to 12 inches tall on a "high Prarie" above their camp and 5 to 8 feet tall on a prairie below the camp. The journal indicates that the soil is "of good quality." (*The Journals of the Lewis and Clark Expedition*, Gary E. Moulton, ed., 1987, University of Nebraska Press, vol. 2, pp. 430 and 434).

# June 2005

# Sansarc Clay

South Dakota

**T**he **Sansarc Series** consists of shallow, well-drained soils formed in clay residuum weathered from shale within the dissected shale plain in central South Dakota. Slopes range from 2 to 60 percent or more. Mean annual precipitation is about 17 inches, and mean annual air temperature is about 47 degrees F.

## Use and Vegetation

These soils are mostly in native range. Native vegetation is little bluestem, western wheatgrass, sideoats grama, green needlegrass, blue grama, big bluestem, sedges, and forbs.

*Below:* Lewis and Clark passed by here on Sept 19, 1804. They described this area as the "Seoux pass of the 3 rivers." Elsewhere, the journals call them creeks, and the notes indicate that these became, in ascending order, Crow Creek, Wolf Creek, and Campbell Creek. Wolf Creek was later often called Thompson Creek. Clark says that the area is "of peace for all of the Sioux Nations." It was apparently an area of asylum.



## Sansarc Clay Profile

### Taxonomic Class

Clayey, smectitic, calcareous, mesic, shallow Typic Ustorthents

### Surface Layer

0 to 4 inches; light brownish gray (2.5Y 6/2) clay; moderate very fine granular structure; hard, friable; many fine roots; slight effervescence; slightly alkaline.

### Substratum Layer

4 to 14 inches; light brownish gray (2.5Y 6/2) clay; weak medium subangular blocky structure; slightly hard, friable, fragments of shale; slight effervescence; slightly alkaline pH.

### Soft Bedrock

14 to 50 inches; light olive gray (5Y 6/2) and olive gray (5Y 5/2) bedded shale; slight effervescence; slightly alkaline pH.

### Ecological Site

Shallow Clayey  
MLRA 063A  
R063AY017SD

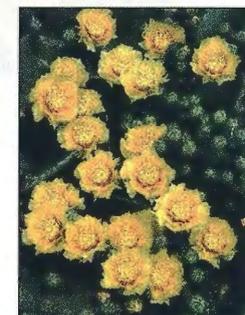


Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
June 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	August 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31				<b>1</b>	<b>2</b>
<b>3</b>	<b>4</b>  Independence Day	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>
<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>
<b>24/31</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>

### EVENTS

**July 25-Aug 3**  
**2005 National Scout Jamboree**  
Caroline Co., VA

**25-29**  
**ESRI International User Conference**  
San Diego, CA



Above: Prickly Pear

### PRICKLY PEARS

The hills extend through the gorge and are about 200 feet above the water. In the bend as also the opposite sides, both above and below the bend, is a beautiful inclined plain, in which there are great numbers of buffalo, elk, and goats in view, feeding and sipping on those plains. Grouse, larks, and the prairie bird are common in those plains. ...We proceeded on, past a willow island below the mouth of a small river, called Tylor's River, about 35 yards wide, ...The shore on each side is lined with hard rough gulley stones of different sizes, which have rolled from the hills and out of small brooks. Cedar is common here. This day is warm. The wind, which is not hard, blows from the S.E. ...The prairies in this quarter contain great quantities of prickly pears.

*Captain Lewis, September 21, 1804*

# July 2005

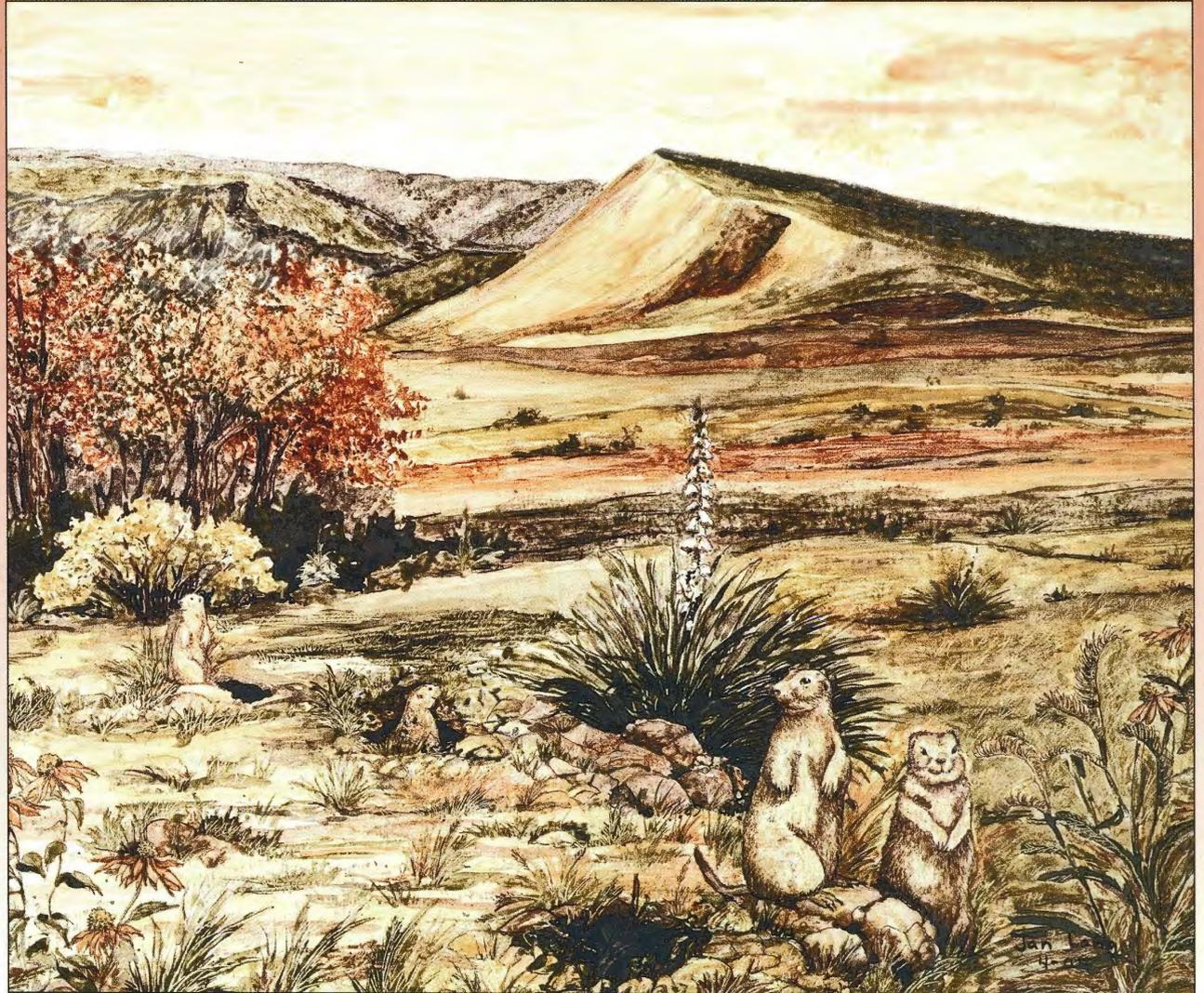
# Prairie Dogs

A very cold morning. Wind S.E. Set out at daylight. We landed after proceeding 5 1/2 miles, near the foot of a round mountain, which I saw yesterday, resembling a dome. Captain Lewis and myself walked up to the top, which forms a cone and is about 70 feet higher than the high lands around it. The base is about 300 feet. In descending this cupola, discovered a village of small animals that burrow in the ground. (Those animals are called by the French petit chien.) Killed one, and caught one alive, by pouring a great quantity of water in his hole... We attempted to dig to the beds of one of those animals. After digging 6 feet, found, by running a pole down, that we were not halfway to his lodge. ...The village of those animals covered about 4 acres of ground on a gradual descent of a hill, and contains great numbers of holes on the top of which those little animals sit erect, and make a whistling noise, and, when alarmed, step into their hole. We poured into one of the holes 5 barrels of water without filling it.

*Captain Clark, September 7, 1804*

I saw a village of barking squirrels [prairie dogs], 970 yards long and 800 yards wide, situated on a gentle slope of a hill.

*Captain Clark, September 11, 1804*



Above: Painting made with soil pigments—  
*Prairie Dogs*, by Janis Lang, 2004

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

## EVENTS

**Aug 1**  
Abstracts Due for  
18th World Soil  
Congress

**5-10**  
Lewis & Clark Trail  
Heritage  
Foundation  
Annual Meeting  
Portland, OR

**7-12**  
Ecological Society  
of America Annual  
Meeting  
Montreal, Canada

**8-11**  
Earth System  
Processes  
Calgary, Alberta,  
Canada

July 2005							September 2005						
S	M	T	W	T	F	S	S	M	T	W	T	F	S
					1	2					1	2	3
3	4	5	6	7	8	9	4	5	6	7	8	9	10
10	11	12	13	14	15	16	11	12	13	14	15	16	17
17	18	19	20	21	22	23	18	19	20	21	22	23	24
24/31	25	26	27	28	29	30	25	26	27	28	29	30	

## A VILLAGE OF SMALL ANIMALS. . .

"Discovered a Village of Small animals that burrow in the grown [ground]—those animals are Called by the french Petite Chien—Killed one and Caught one a live by poreing a great quantity of Water in his hole we attempted to dig to the beds of one of those animals, Contains great numbers of holes on the top of which those little animals Set erect make a Whistling noise and whin allarmed Step into their hole."

(The prarie-dog—*Cynomys ludovicianus*—then unknown to scientists)

Joseph Whitehouse, September 12, 1804

# August 2005

# Grail Silt Loam

North Dakota

**T**he Grail Series consists of deep and very deep, well- or moderately well-drained soils that formed in local alluvium from soft siltstone or shale in western North Dakota and eastern Montana. These soils are on terraces, fans, swales, and foot slopes on uplands and have slopes ranging from 0 to 15 percent. Mean annual air temperature is 42 degrees F, and mean annual precipitation is 15 inches.

## Use and Vegetation

Most areas are used for cultivated crops such as wheat, oats, and barley. Native vegetation includes mixed grasses such as western wheatgrass, big bluestem, green needlegrass, and needleandthread.

*Below:* On October 24, 1804, the men ran into the Mandan's and Hidatsa's villages (north of what is currently Bismarck, North Dakota) which were inhabited by an estimated 4,500 people, living in earth huts like that pictured here. Across the river from the main village, the captains built Fort Mandan.



## Grail Silt Loam Profile

### Taxonomic Class

Fine, smectitic, frigid Pachic Vertic Argiustolls

### Surface Layer

0 to 10 inches; dark grayish brown (10YR 4/2) and dark-gray (10YR 4/1) silt loam; weak coarse and medium subangular blocky structure; soft, friable; neutral pH; abrupt boundary.

### Subsoil Layer

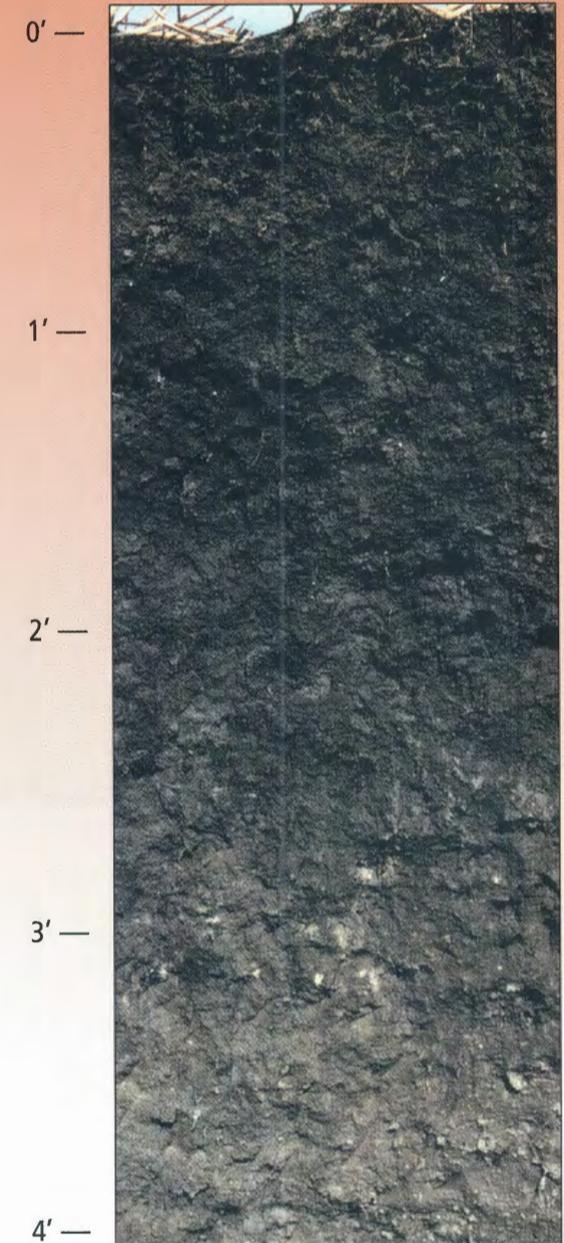
10 to 52 inches; dark-gray (10YR 4/1) silty clay loam and grayish brown silty clay; weak medium prismatic structure; strong effervescence and small masses of carbonates; moderately alkaline pH in the lower part.

### Substratum Layer

52 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; weak medium subangular blocky structure; strong effervescence; few small masses of carbonates; moderately alkaline pH.

### Ecological Site

Clayey  
R054XY020ND



**EVENTS**

**12-14**  
Frontiers in  
Pedometrics  
Conference  
Naples, FL

“...the Soil  
is very rich,  
producing  
Indian Corn,  
pumpkins,  
Squashes &  
beans in  
abundance”

*Joseph Whitehouse  
on the soil near the  
Mandan village,  
April 7, 1805*

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
August 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	October 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23/30 24/31 25 26 27 28 29			1	2	3
4	5  Labor Day	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

**MANDAN VILLAGES**

We are situated in a point of the Missouri, north side, in a cottonwood timber. This timber is tall and heavy, containing an immense quantity of water; brittle and soft. Fine food for horses to winter, as is said by the Indians. The Mandans graze their horses in the day on grass, and at night, give them a stick [an armful] of cottonwood boughs to eat. Horses, dogs, and people all pass the night in the same lodge, or round house, covered with earth, with a fire in the middle. Great number of wild geese passed to the south. Flew very high.

*Captain Clark, November 9, 1804*

# September 2005

# Lambert Silt Loam

Montana

The Lambert Series consists of very deep, well-drained soils formed in alluvium on uplands, fans, and terraces in eastern and central Montana. They are on 0 to 65 percent slopes. Mean annual precipitation is about 14 inches and mean annual air temperature is about 42 degrees F. The climate is semiarid.

## Use and Vegetation

The moderately sloping areas are cropland and native pasture. The steep areas are all range. Uncultivated areas are chiefly in western wheatgrass, blue grama, threadleaf sedge and needleandthread grass.

*Below: "The plains are butifull and leavel but the Soil is but thin Stoney and in many parts of the plains & bottoms there are great quantity of prickly pears." Clark, July 21, 1806*  
Profile and landscape pictures are of a Lambert soil in Yellowstone County, Montana, just above the Yellowstone River.



## Lambert Silt Loam Profile

### Taxonomic Class

Fine-silty, mixed, superactive, calcareous, frigid Typic Ustorthents

### Surface Layer

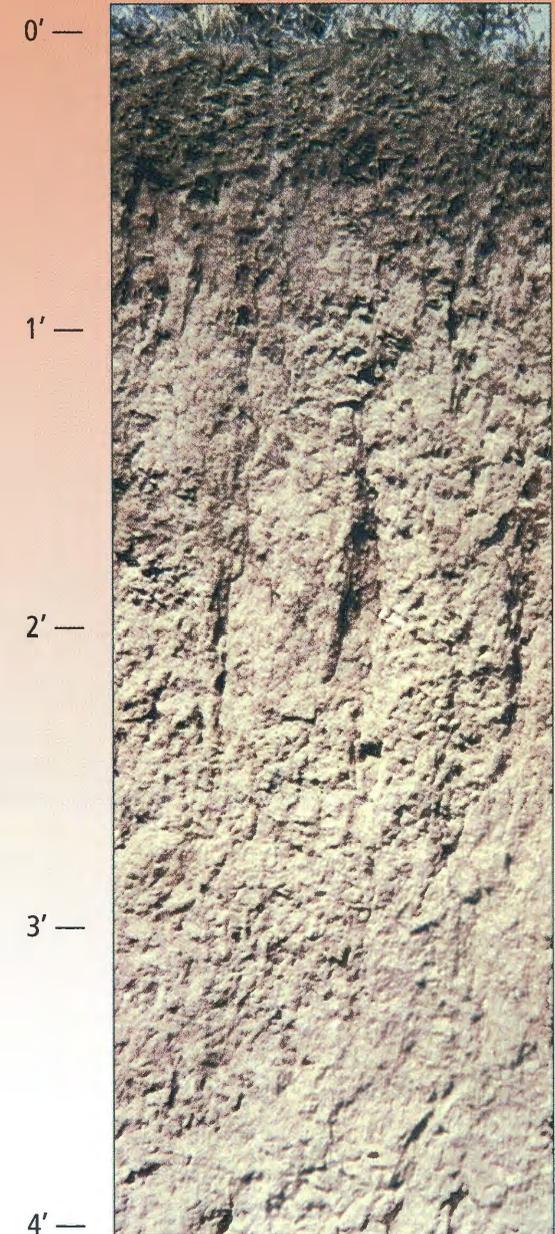
0 to 5 inches; grayish brown (2.5Y 5/2) silt loam; fine granular structure; slightly effervescent carbonates; moderately alkaline pH.

### Substratum Layer

5 to 60 inches; light brownish gray (2.5Y 6/2) to light olive gray (5Y 6/2) silt loam and very fine sandy loam; prismatic structure; strongly effervescent carbonates; moderately alkaline pH.

### Ecological Site

Silty-Steep  
10 to 14 inch Ppt zone  
R058AE004MT



**EVENTS**

16-17  
Geological Society  
of America  
Salt Lake City, UT



Above: Rancher and NRCS employee on the range.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
September 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	November 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30					<b>1</b>
<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>9</b>	<b>10</b>  Columbus Day	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>
<b>23/30</b>	<b>24/31</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>

**WHAT IS AN ECOLOGICAL SITE?**

Ecological sites are the subdivisions of forest land and rangeland landscapes, which are used for inventory and analysis. Each ecological site description will contain information about physiographic features, climatic features, soils, associated hydrologic features, and plant communities that occur on the site. Plant community dynamics, annual production estimates, growth curves, associated wildlife communities, and interpretations for use and management of the site are also part of each site description.

**October**  
2005

# Lewhand Ashy Silt Loam

Idaho

The Lewhand Series consists of poorly drained hydric soils, formed in mixed alluvium and volcanic ash in north-central Idaho. They are in drainage-ways and basins at elevations of 2,900 to 3,400 feet. These soils are subject to frequent flooding. Slopes range from 0 to 3 percent. The average annual precipitation is about 35 inches. The frost-free season is 50 to 110 days.

## Use and Vegetation

Used mainly for livestock grazing, watershed and some crop production. The main crops are hay and oats. Potential native vegetation is camas, black hawthorn, scattered lodgepole pine, snowberry, sedges and rushes.

Below: Camas in a silty alluvial soil near Smith Meadows, in Latah County, Idaho. Areas of the Weippe Prairie probably appeared like this prior to clearing for crop production.



## Lewhand Ashy Silt Loam Profile

### Taxonomic Class

Fine-silty, mixed, active, frigid Vitrandic Fragiudalfs

### Surface Layer

0 to 18 inches; very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) ashy silty clay loam over a very pale brown and gray (10YR 7/3, 7/2) silt loam; strong, very fine subangular blocky structure; strongly acid (pH 5.2-5.4).

### Fragipan Layer

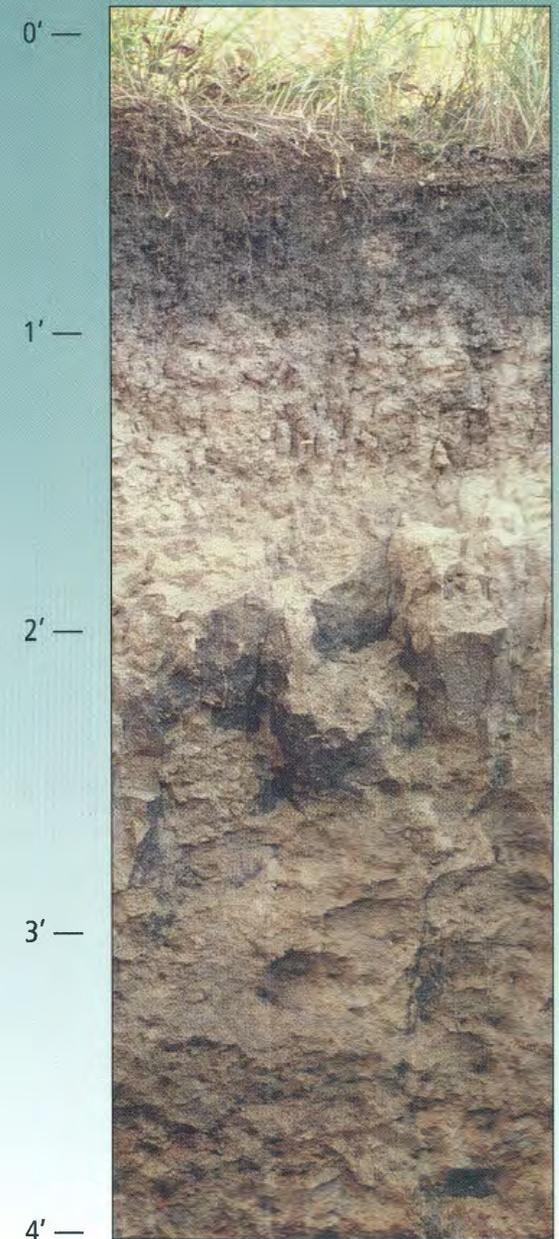
18 to 32 inches; very pale brown (10YR 7/3) silty clay loam; strong coarse and very coarse prismatic structure; extremely hard, very firm; moderately acid (pH 5.8).

### Subsoil Layer

32 to 60 inches; light gray (10YR 7/2) stratified silty clay loam to sandy loam; weak, very coarse prismatic structure; lightly to moderately acid (pH 5.7-6.1).

### Ecological Site

Wet Meadow  
R009XY018ID



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
October 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23/30 24/31 25 26 27 28 29	December 2005 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b> Veterans Day	<b>12</b>
<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>
<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b> Thanksgiving Day	<b>25</b>	<b>26</b>
<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>			

## EVENTS

**6-10**  
ASA-CSSA-SSSA  
Annual Meetings  
Salt Lake City, UT



Above: Camas flower

## CAMAS

*Right:* A camas bulb growing about 2 inches below the soil surface in the A horizon of the Lewhand soil. The bulb is about 1 inch in diameter. These bulbs were collected by the Indians, roasted in pits, and eaten as a delicacy. The Corps of Discovery lived on Camas bulbs for a lengthy period after the difficult crossing of the Bitterroot Mountains.



# November 2005

# Walluski Silt Loam

Oregon

The Walluski Series consists of very deep, moderately well drained soils in Clatsop County, Oregon, on stream terraces at elevations of 20 to 100 feet. Slopes are 0 to 20 percent. The climate has cool, wet winters and cool, moist summers. The annual precipitation is about 85 inches and the annual temperature is about 50 degrees F. The frost-free period is 145 to 245 days.

## Use and Vegetation

These soils are used for pasture, home sites, timber production, recreation, and wildlife habitat. Native vegetation includes western hemlock, Sitka spruce, Douglas-fir, red alder with an understory of vine maple, salmonberry, and western swordfern.

Below: This is the point along the Lewis and Clark River, which is a tributary of the Columbia River, where the Corps of Discovery landed their canoes while searching for the site to build their winter shelter. This winter shelter became known as Fort Clatsop.



## Walluski Silt Loam Profile

### Taxonomic Class

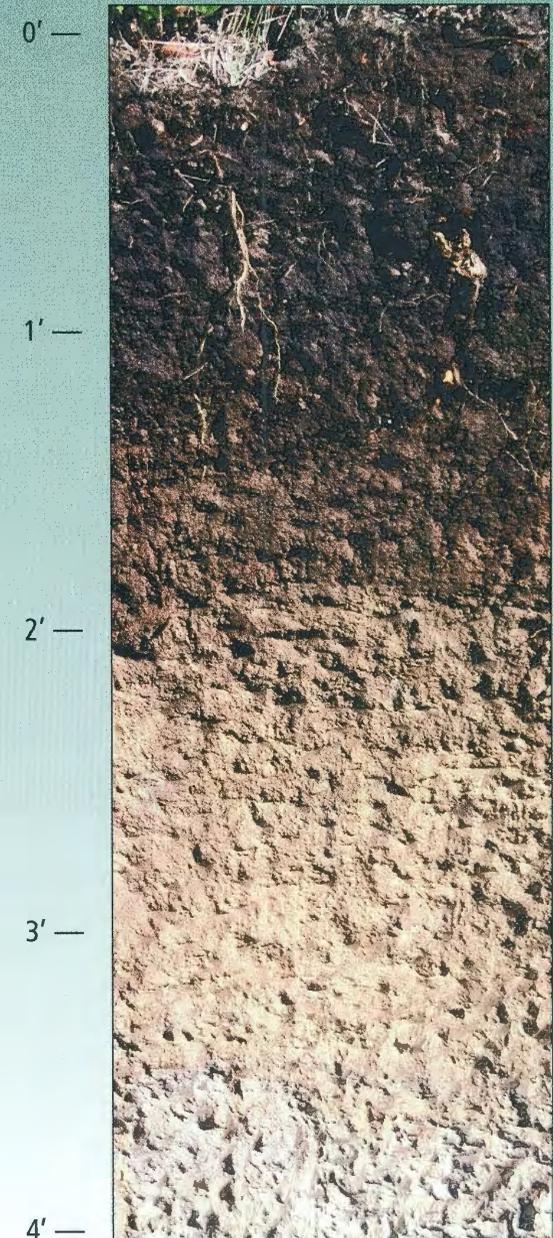
Fine-silty, isotic, isomesic Oxyaquic Dystrudepts

### Surface Layer

0 to 15 inches; loose litter of slightly decomposed needles, twigs, and leaves over very dark grayish brown (10YR 3/2) silt loam, extremely acid (pH 4.4).

### Subsoil Layer

15 to 61 inches; dark-brown (10YR 4/3) and yellowish brown (10YR 4/4, 5/4) silt loam, silty clay loam and clay, extremely acid (pH 4.4).





# Calendar 2006

## January 2006

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

## February 2006

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

## March 2006

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

## April 2006

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24	25	26	27	28	29

## May 2006

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

## June 2006

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

## July 2006

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24/31	25	26	27	28	29

## August 2006

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

## September 2006

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

## October 2006

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

## November 2006

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

## December 2006

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24/31	25	26	27	28	29	30

# Painting With Soil

All paintings featured in this planner were produced by Janis Lang, a Physical Science Technician with the NRCS's Soil Survey Laboratory in Lincoln, Nebraska. Janis took her inspiration from photographs she had seen and from descriptions of soils and landscapes that NRCS soil scientists had discovered in the Lewis and Clark journals.

The color and texture of soil painting is fascinating and a creative opportunity for all ages of students. Samples of soils of many colors are gathered. The basic material is dried and crushed with a mallet. The soil is then ground with a mortar and pestle until it becomes a fine powder. This powder is then sifted to refine it further. The pigment is now ready to mix with clear acrylic paint, producing a paint whose colors derive directly from the natural landscape.

*"The trick with painting with landscapes is that it's normally hard to get the color right. But when I paint with soil, the color comes right from nature—and it's exactly right."  
—Janis Lang*



Above: *Still Life with Pot and Squash*,  
by Janis Lang, 2003

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The PBS Lewis and Clark Archives available at:  
<http://www.pbs.org/lewisandclark/>

The USDA Plants Database available at:  
<http://plants.usda.gov/>

The NRCS Soils website available at:  
<http://soils.usda.gov/>

The NRCS Painting with Soils website, available at:  
<http://www.nrcs.usda.gov/feature/lewisandclark/paintingwith-soil.html>

For more information about natural resources and conservation in your own backyard, contact the NRCS at <http://www.nrcs.usda.gov> or volunteer locally by calling 1-888-LANDCARE.

# Photo Credits

Except where otherwise noted, all photos are credited to NRCS staff.

## January

Cephas Hobbs, NRCS  
Jeff Vanuga, NRCS

## February

National Academy of Sciences, Philadelphia, PA

## March

NRCS Staff, Illinois State Office

## April

NRCS Staff, Missouri State Office

## June

Pat McGrane, Patrick Cowsert, Zacharias Riggs, Luis A. Hernandez, NRCS Staff, Nebraska State Office

## July

NRCS Staff, South Dakota State Office, and USDA Plants Database

## September

NRCS Staff, North Dakota State Office

## October

NRCS Staff, Montana State Office

## November

NRCS Staff, Idaho State Office, and USDA Plants Database

## December

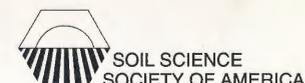
NRCS Staff, Oregon State Office

## Soils and Ecology

Hari Eswaran, NRCS Staff, Washington, D.C.  
Stanley Anderson, NRCS Staff, National Soil Survey Center  
NRCS Staff, Iowa and Montana State Offices



Above: Painting made with soil pigments—  
*Bears Feeding on Salmon*, by Janis Lang, 2004



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October 2004