Identifying and Visualizing the Stratigraphy and Hydrology of a Loess Landscape in Southeastern Minnesota

A Thesis SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE

Jay Bell, Edward Nater

October 2012

Abstract

A total of 44 soil cores were collected and described across a hillslope (approximately 20 hectacres) in southeastern Minnesota within the Major Land Resource Area 105. In 2007, 2008 and 2009, ten piezometers collected water table depths every two hours continuously throughout the growing season. The hydrologic monitoring of the study site was used to associate water depth and duration of saturation to the soil morphology and stratigraphy. This study's objectives are (1) to describe soil profiles and identify redoximorphic features and link them with actual zones of saturation, (2) develop a landscape model of water table depth across the entire hillslope and (3) determine if predictions of water table elevations can be made using certain attributes (slope, plan curvature and profile curvature) of the landscape along with precipitation data. The soil landscape model is a 3-dimensional image of how soil stratigraphy and bedrock interact and influence subsurface hydrologic processes. The prediction of water table elevations are shown by an animation of a selection of data that were generated and manipulated using Avizo, a general-purpose visualization, analysis and 3D reconstruction software. This project is a prelude to a new approach for communicating soil survey information. It was found that the redoximorphic features found on site were contemporary features that were associated with an active hydrology. Animations of the site can provide a tool for education for non-soil scientists to understand landscapes in time and space.

Acknowledgements

There are many people to thank for all their help while completing this thesis. I would like to thank the members of my committee: Drs. Jay Bell, Carrie Jennings, and Ed Nater for all of the help and assistance throughout this project. Above all, I would like to thank Jay Bell and Ed Nater for all the encouragement, mentoring and inspiration throughout my time as a student of the University of Minnesota, both as a graduate and undergraduate student. It is through both of their teachings that I have become the scientist that I am today.

I would like to thank those who worked directly on the project; Joel Nelson for all his GIS support and pep talks and Nancy Rowe for all of her time donated to completing the Super Computer animations. I also would like to thank the Eagle Bluff Environmental Learning Center Executive Director, Joe Deden and Sarah Sturgis, Education Director, for their willingness to allow the instrumentation to be installed on-site.

I would like to thank John Beck for implementing the instrumentation and for explaining the project site and data collection procedures to me.

I would like to thank my friends for all their support throughout the years; specifically, David Bell, Melissa Wilson, and An-Min Wu for assisting with research and writing.

Lastly, I wish to thank my family; My parents for their encouragement of education and research from a young age and assisting me in any way possible to achieve my goals; Lesley, Andy and Jeff for all of their moral support and buying countless meals and drinks throughout school; and finally Micah for everything he has done and without whom I might not have survived graduate school.

Dedication

As promised, 18 years ago, this thesis is dedicated to Linda T. Linker.

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Chapter 1

Introduction

Water's interaction with soil particles influences land use. The timing and duration of water saturation impacts chemical, biological and morphological properties of the soil which help predict soil behavior for selected land use characterizations. Understanding the interaction between water and soil is key to predicting a soil's suitability for various land uses including septic system suitability, contaminant movement and remediation, civil construction and land restoration. Understanding how shallow groundwater moves within a landscape allows land managers to make informed decisions on both land and water use.

This study investigates soils across a landscape and explores their interrelation with the water table. By installing a series of piezometers along a hillslope, a hydrologic continuum is correlated with a soil catena's stratigraphy and morphology. Soils within the landscape are related through common formation and development, allowing for predictable water-soil interactions within a sequence. These linkages are critical for land managers to understand in order to correctly interpret and land use classifications in a given landscape.

Justification

Soil surveys are used to map and describe soils while also explaining management approaches that are best suited for those soils. Soil surveys are likely the most utilized source for obtaining information pertaining to the behavior and movement of water in the soil. Soil series descriptions include general information on the depth and degree of saturation within the soil profile but contain no temporal or spatial information.

Redoximorphic features are formed in a soil when water is present in the upper part of the soil for a long enough period during the growing season that anaerobic conditions occur (Vepraskas, 1995). In order for a soil to develop anaerobic conditions it must be saturated so that all of the pores are filled with water. When this occurs, any dissolved oxygen that may be present in the soil water is consumed through respiration of micro-organisms and roots rendering it no longer present in soils. The removal of oxygen from the soil takes roughly 24-48 hours. After that time period, organisms consume nitrogen, manganese, iron and sulfur in a chemical reaction known as reduction. The reduction of both iron and manganese result in distinct soil morphological changes. Iron reduction is seen in the soil by characteristics known as redoximorphic features. These features appear bright red where iron has concentrated and grey/colorless where iron has been depleted.

The soils in southeastern Minnesota formed mainly in deep loess that was deposited beyond the margin of the last ice sheet to occupy the region. In this region many upland soils are described by the Natural Resource Conservation Service (NRCS) as containing redoximorphic and other hydromorphic features pertaining to zones of seasonal saturation. However, within the soil series descriptions found in the soil surveys, these soils are described as “well drained with no seasonal water table”. The NRCS explains these zones as relict, that is, no longer hydrologically active (USDA-NRCS, 2008).

In order for a redoximorphic feature to be considered relict, there must be an increase in precipitation to a site or an increase in drainage. The best way to determine if a soil meets this criterion is through monitoring the hydrology (Vepraskas, 2005). In past studies conducted by NRCS personnel, hydrology of the area was monitored using piezometers or wells installed on the hillslopes where redoximorphic and other hydromorphic features were present in the soil profile. After installation, these instruments were monitored at regular intervals for three to five years. Readings of the piezometers or wells were collected every two to four weeks. The readings showed the hillslope to be generally devoid of water, signifying no active hydrology (Beck, 2008).

Piezometers are a means of measuring actual zones of saturation, by measuring the gravitational head of the soil to determine at what depth the soil is saturated. When outfitted with pressure transducers and dataloggers, piezometers have the ability to continuously collect water table data and so are able to provide a temporal aspect to the landscape not reflected in a soil survey (Vepraskas, 2005). The piezometers installed and monitored by the NRCS indicated that the upland loess soils were well drained with no significant zones of saturation. The redoximorphic features found in these soils were considered to not have formed under current climatic conditions and were therefore explained as relict.

Morphological clues can be used to separate relict features from their contemporary redoxomorphic counterparts. The most commonly used clue involves investigating the boundaries of the features, as sharp boundaries are commonly interpreted as relict while diffuse boundaries are considered modern. While it is true that relict redoxomorphic features occur in Minnesota, they are not considered common. Because of glaciations, most of the state has relatively young landscapes compared to other parts of the world. It is also true that the general climate of the state has gotten wetter since the deposition of loess in southeast Minnesota (Mason, 1992). For these reasons it would be most likely for one to either find modern redoxomorphic features, or none at all.

To confirm this theory, an experiment was designed with nested piezometers equipped with dataloggers that would be installed at five different hillslope positions on a catena in southeastern Minnesota. Readings were collected every two hours. That way the exact duration and amount of saturation could be deciphered and interpreted. Once data were collected, they were correlated with the soil stratigraphy of the catena to better understand the temporal variability of water in the soil. The collected data can provide a guide for making informed land use decisions.

Literature Review

Site Setting

This investigation is located in Fillmore County in southeastern Minnesota. This region, sometimes (albeit, incorrectly) referred to as the driftless area, was by-passed by the last (Wisconsinan) continental glacier. The landscape consists of mainly flat uplands and steep-sided valleys cut into limestone deposits. Limestone forms the most prominent features of the landscape (Mason, 1992).

The shallow bedrock areas are characterized by karst topography with caves and sinkholes. The Prairie Du Chien Group, Shakopee Formation, Willow River Member is the uppermost bedrock unit and is underlain by the New Richmond Member of the same formation. (See Figure 1.1). The Willow Member consists of a dolostone and is generally thinly bedded. The underlying New Richmond Member of the Shakopee Formation consists of a sandstone and minor dolostone (Mossler, 1995. Geologic Atlas Fillmore County, MN). Sinkholes are common in the karst limestone and dolostone bedrock of the region. Because of this, surface water will drain into underground channels in various locations.

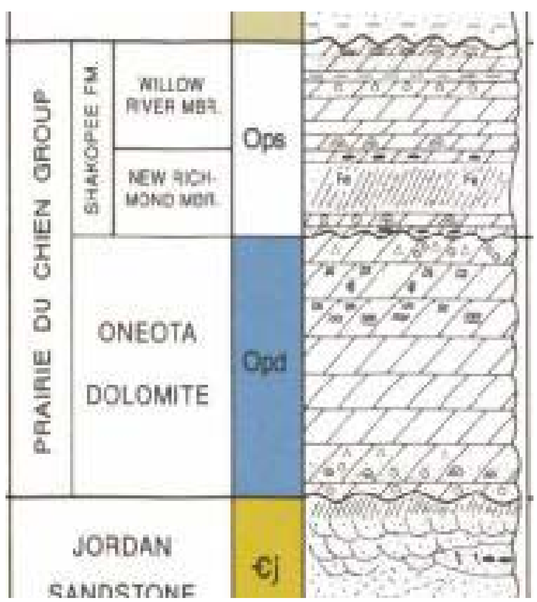


Figure 1.1. A portion of the geologic column (Mossler, 1995. Geologic Atlas Fillmore County, MN)

The landscapes of the region are bedrock controlled and old. Rivers and streams in southeastern Minnesota are usually better developed than those in areas of more recent glaciations. This results in a more efficient drainage system and more advanced erosion (Mason, 1992). On steep valley slopes where geologic erosion has been active, the bedrock is exposed or the layer of loess are very thin (Fillmore County Soil Survey, 1958). The Shakopee Formation, Oneota Dolomite, and Jordan Formation together form an aquifer (a body of geologic material that stores and allows movement of economic quantities of water within it). The aquifer is called the Prairie du Chien-Jordan aquifer, and it supplies most of the household water used in southeast Minnesota (Mossler, 1999).

Atop the limestone, soil parent materials of the region were deposited mainly by wind. Any till that was present in the region during prior glaciations was for the most part, eroded by these processes. An extensive layer of loess (Peorian), ranging from a few inches to more than 6 meters deep, was deposited by wind from the west during the retreat of the Des Moines lobe (Mason, 1992). Although Foss and Rust (1962) concluded that the source of the loess in this region was mainly from the Mississippi River and its major tributaries, Mason (1992) showed that the Peoria loess thins and fines eastward, and therefore that the loess originated from a western source. Deposition of loess ended about 12,000 years ago when growth of vegetation in the source regions associated with the warming climate greatly decreased wind erosion (Mason, 1992).

In some instances, an old gray till has been found beneath the loess cap. These occurrences are mainly patchy and discontinuous. There has also been note of some red clayey material that is considered to be highly weathered pre-Illinoian till (Hobbs, 1994). It is important to note these instances as they drastically alter the hydrologic properties of the landscape compared to their no-till counterparts.

In Fillmore County, soils are generally silt or silt loam textures. They are usually calcareous in nature and grey or grey-buff in color. Soils of the Fayette series are the most prevalent in the county. These soils contain little organic matter but are highly productive (Fillmore County Soil Survey, 1958).

Fillmore County is in the broad ecological tension zone where the western prairie and the eastern forest regions converge. A considerable part of the county was originally forested, however only a small percentage remains wooded today. Presently, most of the county has been converted to row crop agriculture. The remaining forests are primarily mixed hardwood with over 60% of the stands being composed of red and white oak (Soil Survey, 1958). Climate in Fillmore County is reasonably uniform and is considered a typical climate for the region with wide variations in temperature and ample precipitation. The average growing season is 137 days and the average temperature is 6.5^{o} C (NOAA.gov). The average precipitation is about 851 millimeters (Soil Survey, 1958).

Relict Features

The hydrologic status of a soil can be determined through multiple methods. Perhaps the most common method is determining the presence of redoximorphic features. When redoximorphic features are found within a soil profile, they can be reliably used to predict the occurrence of a zone of seasonal saturation. Once created, the soil may retain morphological characteristics indicating wetness in the soil long after the water has left the profile (Richardson and Vepraskas, 2001). When periodic saturation of the soil no longer occurs due to a change in climate or hydrology, redoximorphic features may persist in the soil but are not signs of current soil wetness. Such redoximorphic features are termed "relict redoximorphic features". They are defined as soil morphological features that reflect past hydrologic conditions of saturation and anaerobiosis. Because the soil is no longer wet, it can be an indication that the soil will no longer qualify as a jurisdictional wetland and is therefore now suitable for onsite waste disposal or other land uses that might otherwise be restricted by jurisdictional wetland status. Identifying whether a feature is a relict or a contemporary redoximorphic feature can be difficult. The identification of redoximorphic features that might be relict cannot be done with certainty using morphology alone, and therefore hydrologic data are necessary to confirm that the current hydrology is different that the features suggest (Richardson and Vepraskas, 2001).

Project History

In spring of 2007, John Beck began work within the Major Land Resource Area 105 (MLRA 105). He selected a site located within the MLRA 105 based on observations he noted in the soils and hydrology of the region. He, along with a team from the NRCS, cored and described over 40 soil profiles over the hillscape. He installed ten piezometers in five transect positions and collected hydrologic data from the piezometers every two hours for a growing season using dataloggers (Beck, 2007). The growing season was determined using thermocouples at the site. Thermocouples are a widely used type of temperature sensor, by measuring a voltage which was produced by two conductors of different materials. This voltage is dependent on the difference of temperature of the junction to other parts of those conductors (Hanks, 1992).

During 2007, the location experienced a relatively dry season with one major exception. Every month except for August and September in 2007 was drier than the 30 year average (NOAA.gov). During the month of August, however, the site experienced the largest rainfall total ever recorded with rainfall amounts totaling 37.79 cm.

John Beck determined that for the 5 hillslope positions with piezometers, all but one recorded a significant period of saturation beneath the soil surface for two or more days. Because of these findings, he concluded that the features found on this site are not relict and are in fact modern features (Beck, 2008). Interestingly, the one piezometer that did not indicate saturation was the furthest down the hillslope, the second shoulder position. Beck explained that the lack of water in the lower part of the landscape was due to a fracture in the limestone expected from the karstic nature of the geologic surface.

Materials and Methods

Site Description

The study site is located at Eagle Bluff Environmental Learning Center near the town of Lanesboro in Fillmore County in southeastern Minnesota, directly east of the Root River as shown in Figure 1.2. This site was chosen by John Beck and Jay Bell because it is located in a bedrock controlled, loess landscape. The Minnesota Department of Natural Resources (DNR) manages most of the land within the study site, while a small fraction is managed by the Eagle Bluff Environmental Learning Center. The study site and the surrounding area are dominated by thick loess deposited during the Late Wisconsinan glacial.

Figure 1.2. Location of Eagle Bluff Environmental Learning Center, Fillmore County in southeastern Minnesota

The majority of soils on the study site are mapped as Fayette series (Figure 1.3) (Farnham, 1958), with small inclusions of other soils. The Fayette soils are the most extensive soils in Fillmore County and have developed under a mixed hardwood forest from deposits of Peorian loess (Farnham, 1958). These soils are deep and contain little organic matter excluding surface horizons. Redoximorphic features are commonly found within the typical Fayette pedon although the series description explains that the soils are "well drained with no seasonal water table" (Farnham, 1958).

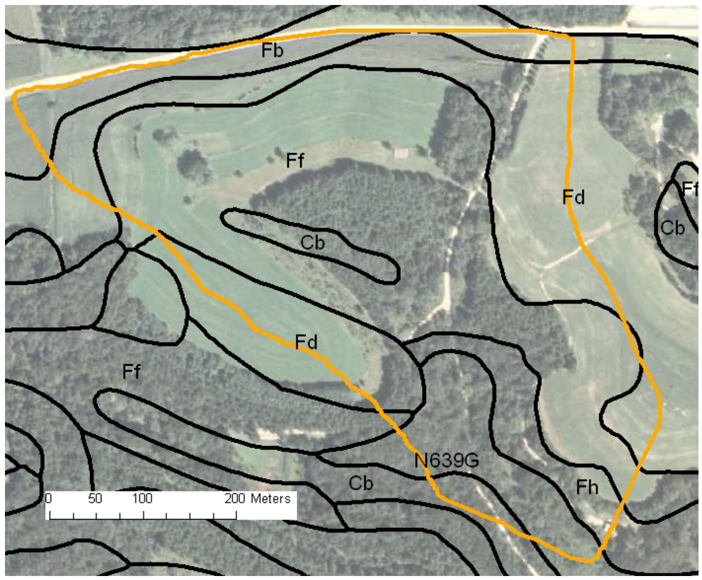


Figure 1.3. The current soil survey for the study site.
The yellow line delineates the project boundary.
Fayette soils on increasingly steeper slopes: Fb (Fayette silt loam: 2-6%), Fd (Fayette silt loam: 7-11%), Ff (Fayette silt loam: 12-17%), Fh (Fayettle silt loam: 18-45%). Cb (Chaseburg and Judson silt loams,), N639G (Frontenac-Lacrescent Complex: 30-70%)

A description of each of the mapping units can be found in Appendix A.

Soil Sampling

John Beck collected and described forty-four soil profiles using an ATV mounted Giddings probe in the summer of 2007. These soil cores were selected across the entire sub-watershed and extended from the soil surface to the restrictive (limestone) layer. The locations of the borings, depicted in Figure 1.4 were selected to ensure multiple cores were collected for each landform position. The location of these borings were recorded with a GPS device. Additional soil cores were taken using a bucket auger or spade shovel.

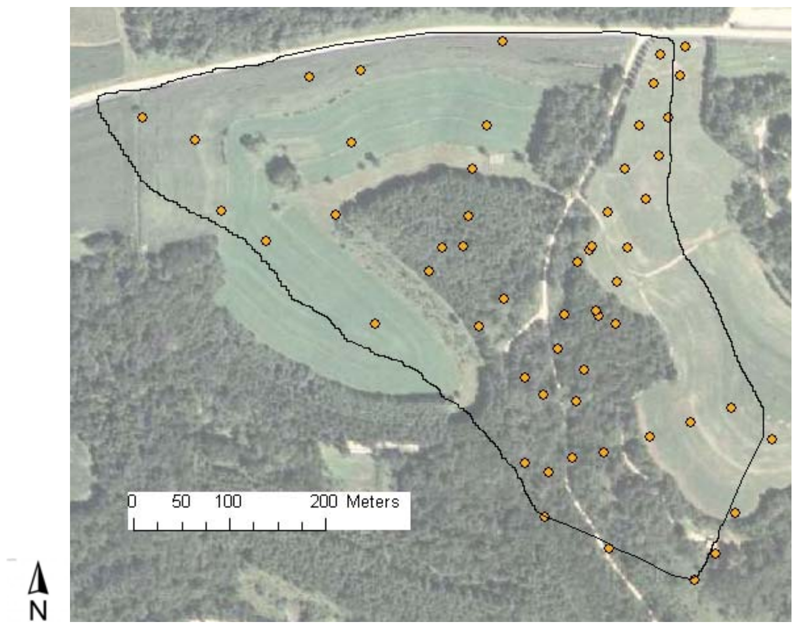


Figure 1.4. Locations of soil borings around the field site.

A soil catena was selected for water table monitoring. The summit of the slope is located in the northeast corner of the sub-watershed and faces southwest. Along this transect, a total of approximately twenty soil profiles were described. Five locations were selected for piezometer instrumentation. The soil continuum along the hillslope at the piezometer sites is illustrated in Figure 1.5.

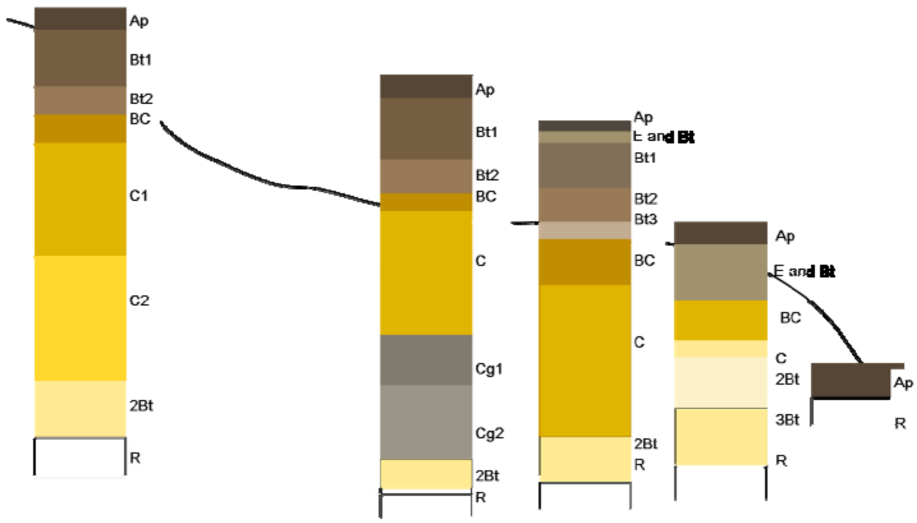


Figure 1.5. Soil continuum on the hillslope.

Both Beck and I found the hillslope atop an old red till. The summit position on the site has a till remnant of Pre-Wisconsinan age that has a well developed soil in it and is buried beneath a 3 to 6 m layer of loess. The loess cap thins in a down-slope direction and the loess-till contact at the lower backslope position is typically between 1.2 to 1.8 m deep (Beck, 2008). This is consistent with earlier findings in which loess thickness appears to decrease systematically from summits to slopes (Mason, 1992). It is probable that the underlying till drastically alters the hydrology of the site because it aids in accumulative lateral flow. This means that despite the high slopes and high permeability of the soils, saturation may locally occur, producing the observed redoximorphic features.

Piezometer Schema

Piezometers quantify changes in water pressure beneath the surface of the soil by measuring the hydraulic head of the groundwater. Piezometers are monitoring “wells” that are perforated only at one end of the pipe. Typically, they are fit with an impermeable bentonite seal above the perforated zone to ensure that water cannot flow down the outside of the pipe into the well screen (Mikkelsen and Green, 2003). The resulting water levels within the pipe occur due to water pressure at the bottom of the pipe. Using Darcy’s Law (an equation that describes the flow of a fluid through a porous medium) and its mathematical extensions, groundwater depth can be calculated and subsequently evaluated (Hanks, 1992).

To quantify the direction of groundwater flow, hydraulic heads from at least two piezometers at the same location are required (nested piezometers). Piezometers installed at two or more depths in a single location can have differing water levels due to changes in hydraulic head. If waters levels are higher in deeper piezometers than in the shallow ones at a given location, the groundwater is moving upward, indicating a rising water table or groundwater discharge is occurring. If the reverse is true, water flow is downward, indicating groundwater recharge (Vepraskas, 2005). See Figure 1.6.

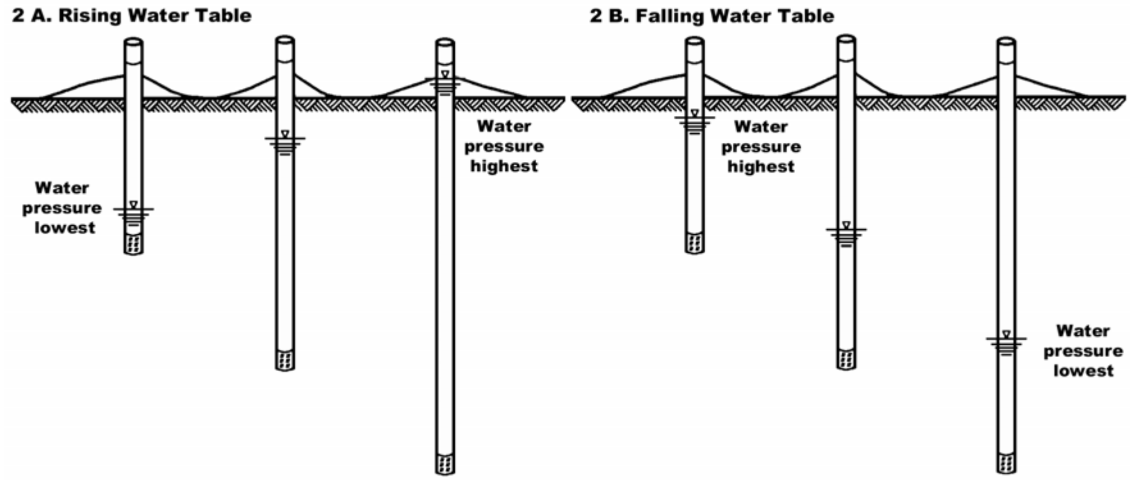


Figure 1.6. Example of water levels in piezometers. (Sprecher, 2000)
A. Water tables rising from below (discharge system). B. Water tables dropping from above (recharge system)

Piezometers were installed on this site and instrumentation was fully operational by March, 2007. Ten piezometers were installed along this soil continuum in five hillslope positions: summit, upper backslope, middle backslope, lower backslope and second shoulder. These piezometers were installed using the standard procedure identified for installing equipment for the hydric soil standard (Vepraskas, 2005). Three backslope positions were identified as instrument locations due to a significant difference in concentration and depth of redoximorphic features in the profile descriptions. Figure 1.7 depicts the locations and depths of the ten piezometers installed.

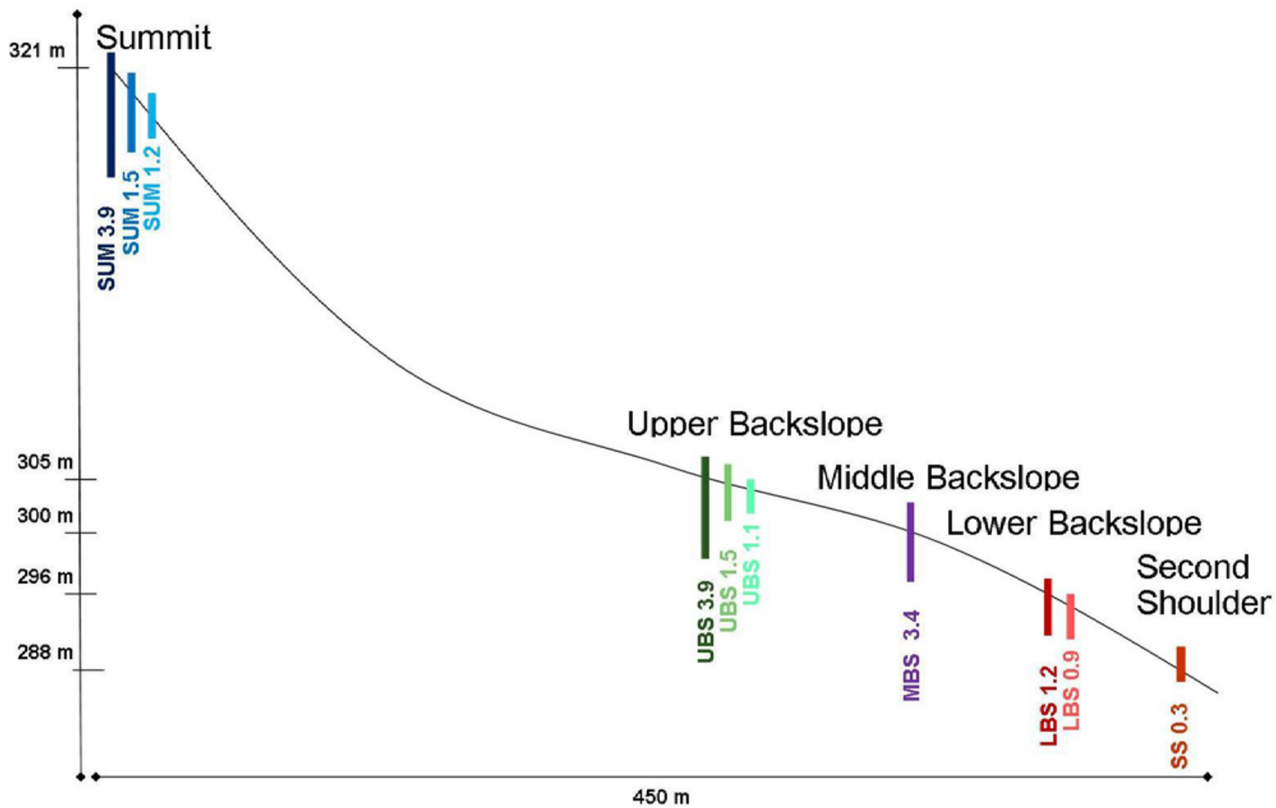


Figure 1.7. Depth and location of piezometers in meters.
Length of pipes in ground are exaggerated

The depth of each piezometer was selected based on the first encounter with redoximorphic features in the soil profile and the depth to the underlying till or bedrock. Landscape positions and the correlating piezometer depths are summarized in Figure 1.7 and Table 1.1. At the summit position, a nest of three piezometers was installed with the following depths: 1.2 meters, 1.5 meters and 3.9 meters. On the upper backslope position, there was a similar set up with piezometer depths of 1.1 meters, 1.5 meters and 3.9 meters. At the middle backslope position only one piezometer was installed because two shallow piezometers had been previously installed. This piezometer was installed at 3.4 meters, just above the contact with the underlying till layer. On the lower backslope position, two piezometers were installed at: 0.9 meters and 1.2 meters. Only one piezometer was installed at the second shoulder position, just above the underlying bedrock, because the soil descriptions did not reveal any zones of saturation.

	Summit	**Upper Backslope**	**Middle Backslope**	**Lower Backslope**	**Second Shoulder**
Depth to Bt Horizon (m)	0.89	1.07	0.78	2	--
Depth to RedoximorphicFeatures (m)	0.89	1.07	1.14	0.86	--
Depth to Till (m)	3.47	4.99	3.55	1.38	--
Depth to Bedrock (m)	4.87	5.32	4.41	2.57	0.48
Piezometers and Depths (m)	SUM 1.2 SUM 1.5 SUM 3.9	UBS 1.1 UBS 1.5 UBS 3.9	MBS 3.4	LBS 0.9 LBS 1.2	SS 0.3

Table 1.1. Summary of Landscape positions and correlating piezometers.

Piezometer data loggers were set to take a reading every two hours. Each piezometer was equipped with a pressure transducer which correlates the actual pressure to the expected pressure if water were present. This allows for depth-to-groundwater in each piezometer to be measured. Data were then continuously collected for 2.5 years from March 2007 to November 2009.

Results and Discussion

This study was conducted from March 2007 to November of 2009 (three growing seasons). A total of ten piezometers were installed to monitor water table fluctuations. These piezometers are distributed across the hillslope at 5 landscape positions: Summit (SUM), Upper Backslope (UBS), Middle Backslope (MBS), Lower Backslope (LBS) and Second Shoulder (SS) (Figure 1.8). Data were collected from the piezometers every two hours over the course of the study. Appendix B contains all hillslope positions soil profile descriptions.

Figure 1.8. Location of Piezometers around the field site.

Precipitation data for the site were measured by the National Oceanic and Atmospheric Administration (NOAA). Daily, monthly and annual precipitation data were collected and investigated for Preston, MN (located at 43°40'N / 92°04'W, approximately 18 km from the project site), the closest recording site. For this project, I used the daily precipitation totals as a reference on rainfall amounts and piezometer readings. Monthly precipitation amounts are compared with the 30-year average in Figure 1.9 and daily precipitation is included in each piezometer graph (Figure 1.10- Figure 1.14) for ease of reference to each piezometer site.

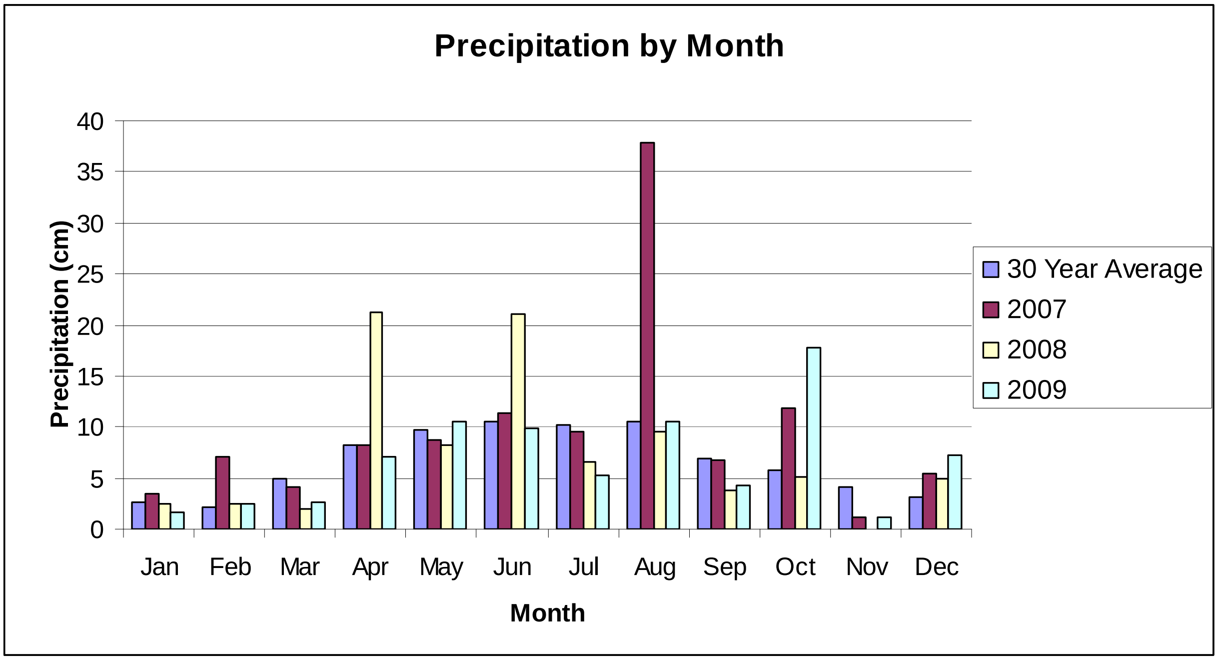


Figure 1.9. Monthly precipitation compared to the 30 year average in Preston, Minn.

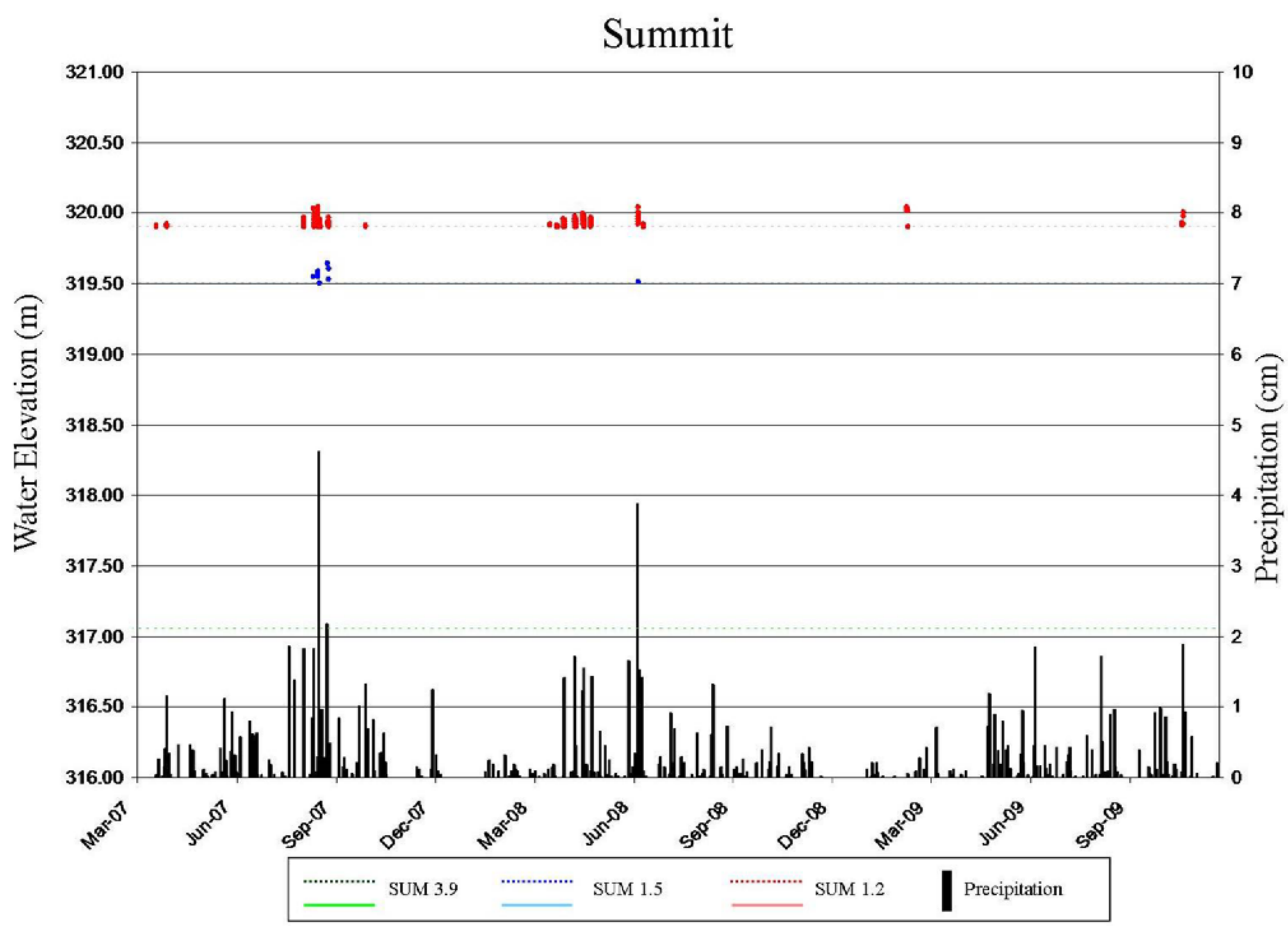
In August of 2007 the study site received the largest rainfall total ever recorded. The month's totals were recorded as 37.79 cm of precipitation. As seen in Figure 1.9, the 30 year average month precipitation for August is 10.61 cm. The hydrology associated with this unusual rainfall event was recorded on the Eagle Bluff site by the installed piezometers.

Water table data collected by the piezometers for the three growing seasons are summarized for each landscape position in Figures 1.10 to 1.14. Each graph is explained below.

Summit:

The summit position was mapped as Fayette silt loam mapping unit. The soil morphology observed at this position fits most closely with the description of the Tama series because of the dark color (10YR 3/2) and thickness (29 centimeters) of the A horizon as well as the 2% slope. The summit position soil contains redoximorphic features occurring between 89 cm and 409 cm, within the depth required to meet the qualifications of oxyaquic criteria (Appendix C).

There are three piezometers at the summit position with their openings installed at depths of 1.2 meters, 1.5 meters and 3.9 meters. Data gathered from these piezometers are illustrated in Figure 1.10. Water was recorded in the 1.2 meter and 1.5 meter piezometers briefly each year, with the most pronounced water levels occurring in August 2007. These piezometer depths and saturation occurrences are concurrent with the redoximorphic features identified at 0.89 m below the ground surface. This occurrence indicates that while the summit position is being saturated for an adequate amount of time to create redoximorphic features, the zone of saturation moves downward quickly from SUM 1.2 (shallowest) to SUM 1.5 (middle) but does not make it to the SUM 3.9 (deepest) piezometer.



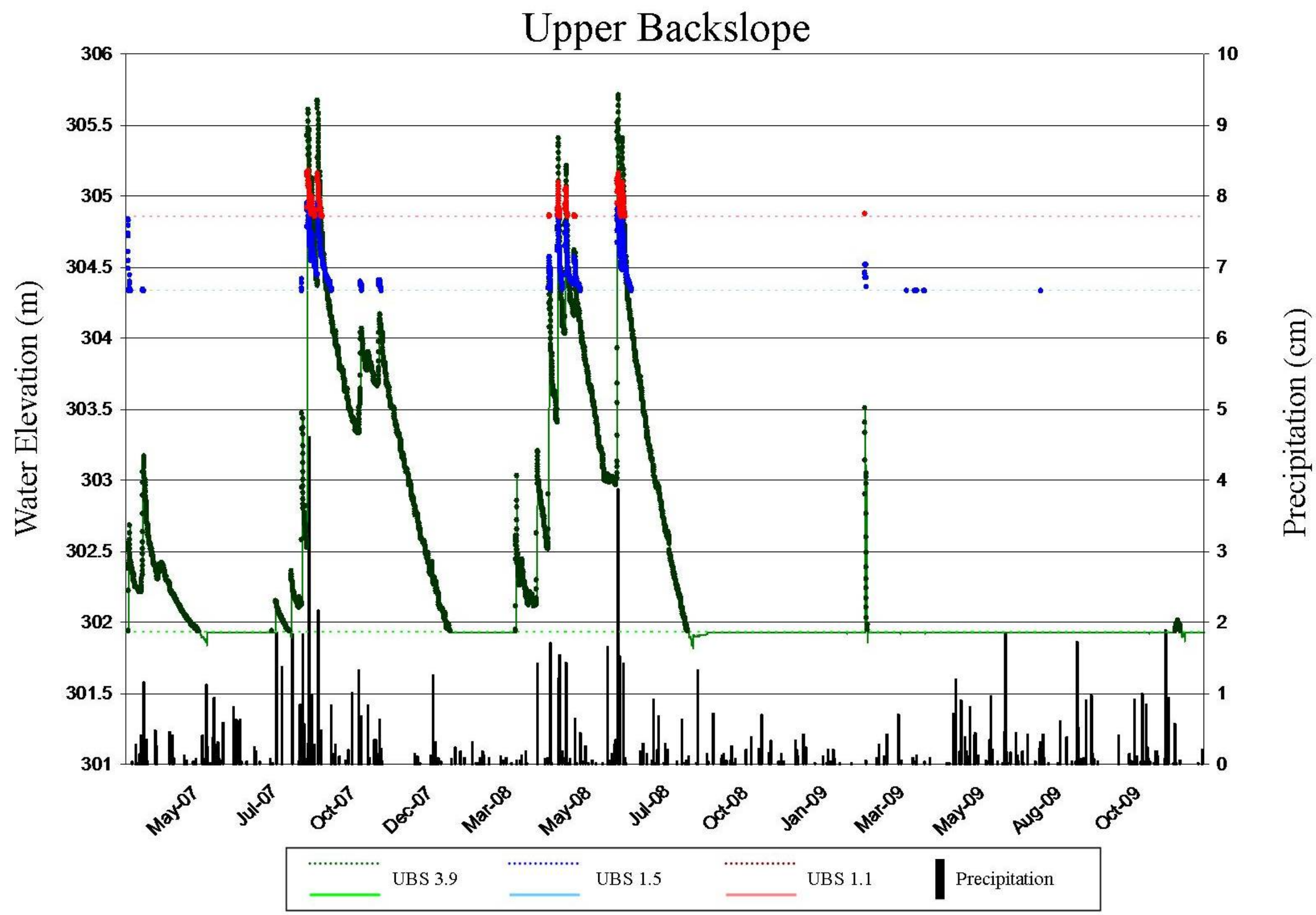
Dashed dark colors represent where water registered in the piezometer while solid light colors represent the maximum depth the piezometer is capable of capturing data.

Figure 1.10. The summit position hydrograph.

Upper Backslope:

The upper backslope position was mapped as Fayette silt loam mapping unit. The soil morphology observed at this position fits most closely with the description of the Downs series because of the color (10YR 3/2) and thickness (20 centimeters) of the A horizon. The upper backslope position soil contains redoximorphic features occurring between 107 cm and 422 cm, within the depth required to meet the qualifications of oxyaquic criteria (Appendix C).

There are three piezometers at the upper backslope installed at depths of 1.1 meters, 1.5 meters and 3.9 meters. The data collected by these piezometers is illustrated in Figure 1.11. Redoximorphic features are found here beginning at 107 cm below the ground surface. It is important to note that water was recorded in all three of the piezometers concurrently which indicates that most of the water at this position is coming from above, as precipitation. Another important detail is UBS 3.9, the deepest piezometer, recorded the highest water levels, indicating that the water table is rising at the Upper Backslope position. It is likely the water levels are rising due to precipitation from above and lateral movement from higher locations in the landscape. Figure 1.11 also illustrates how quickly the water rose and fell after each recharge event.



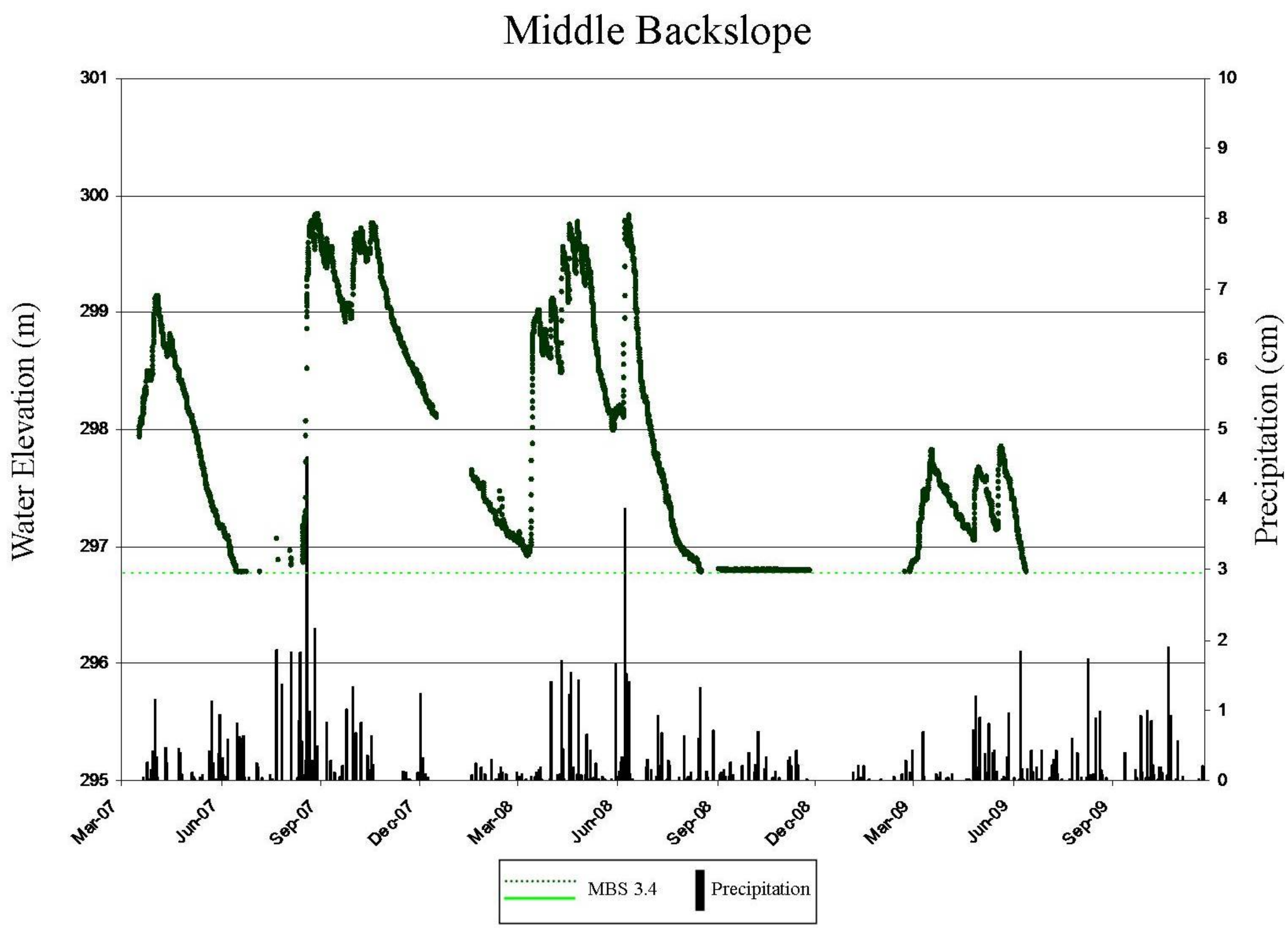
Dashed dark colors represent where water registered in the piezometer while solid light colors represent the maximum depth the piezometer is capable of capturing data.

Figure 1.11. The upper backslope position hydrograph.

Middle Backslope:

The middle backslope position was mapped as Fayette silt loam mapping unit. The soil morphology observed at this position fits most closely with the description of the Hersey series because of the color (10YR 3/1) and thickness (20 centimeters) of the A horizon as well as its 16% slope. The middle backslope position soil contains redoximorphic features occurring between 117 cm and 356 cm, within the depth required to meet the qualifications of oxyaquic criteria (Appendix C).

There is one piezometer at the middle backslope: 3.4 meters. The data collected by this piezometer is illustrated in Figure 1.12. Because there is only one piezometer here, it is difficult to determine if the water table is rising or falling. The sharpness of the rise and fall of the water table has decreased here as compared to that observed in the Upper Backslope, suggesting that water is likely pooling at this location. This is also apparent because although water levels rise and fall, saturation of the soil remains fairly constant throughout the three year's growing seasons.



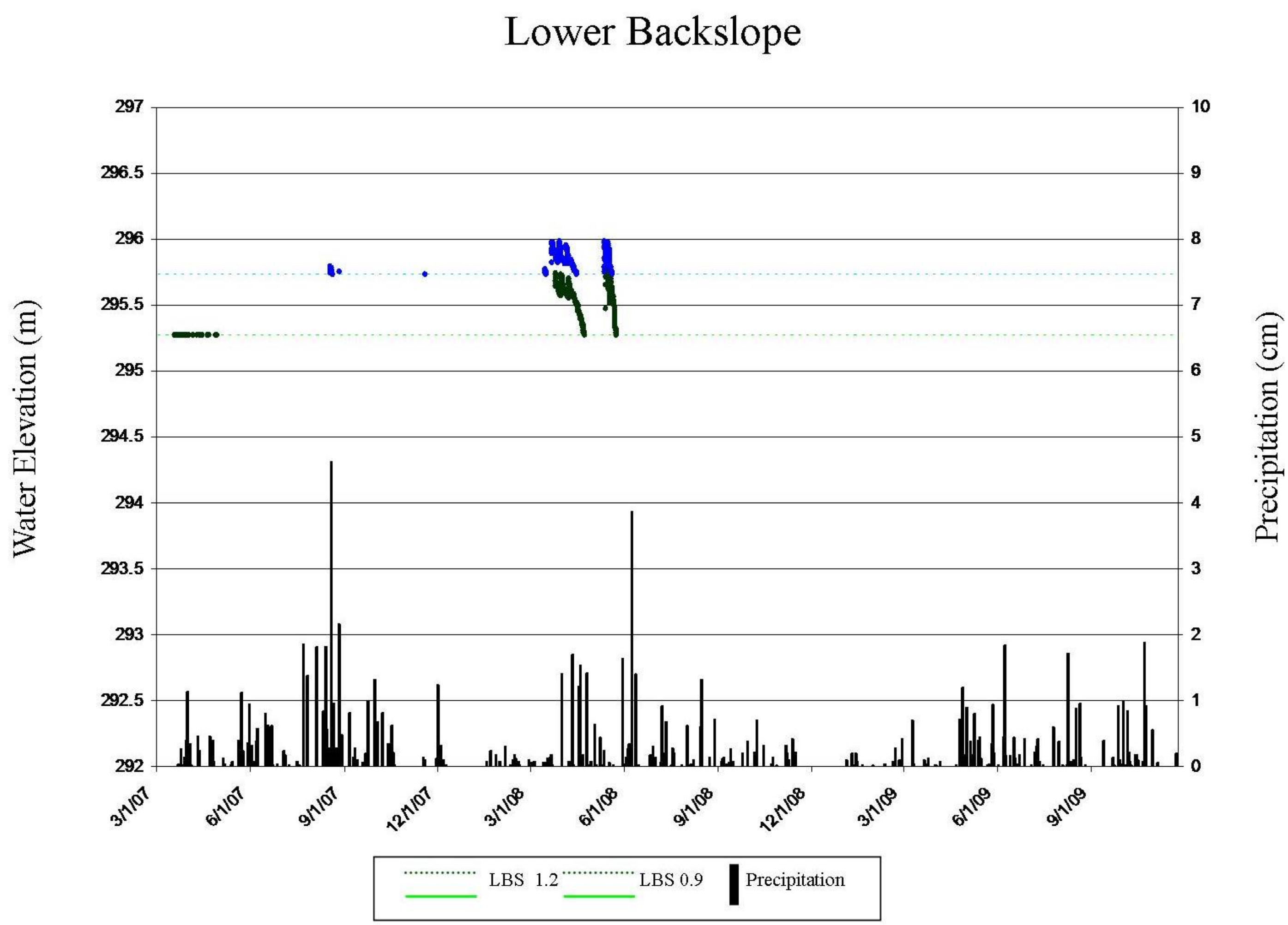
Dashed dark colors represent where water registered in the piezometer while solid light colors represent the maximum depth the piezometer is capable of capturing data.

Figure 1.12. The middle backslope position hydrograph.

Lower Backslope:

The lower backslope position was mapped as Fayette silt loam mapping unit. The soil morphology observed at this position fits most closely with the description of the Hersey series because of the color (10YR 3/2) and thickness (15 centimeters) of the A horizon as well as it has a rock fragment content of 2 to 15 percent in the lower third of the series control section and is on an 18% slope. The lower backslope position soil contains redoximorphic features occurring between 86 cm and 137 cm, within the depth required to meet the qualifications of oxyaquic criteria (Appendix C).

There are two piezometers at the lower backslope: 0.9 meters and 1.2 meters. The data collected by these piezometers is illustrated in Figure 1.13. Another important detail is that LBS 0.9, the shallowest piezometer, recorded the highest water levels. This means that the water table is falling at the Lower Backslope, or the accumulated water from higher up in the hillslope is starting to make its way off of landscape either by run-off into surface waters or into bedrock karst



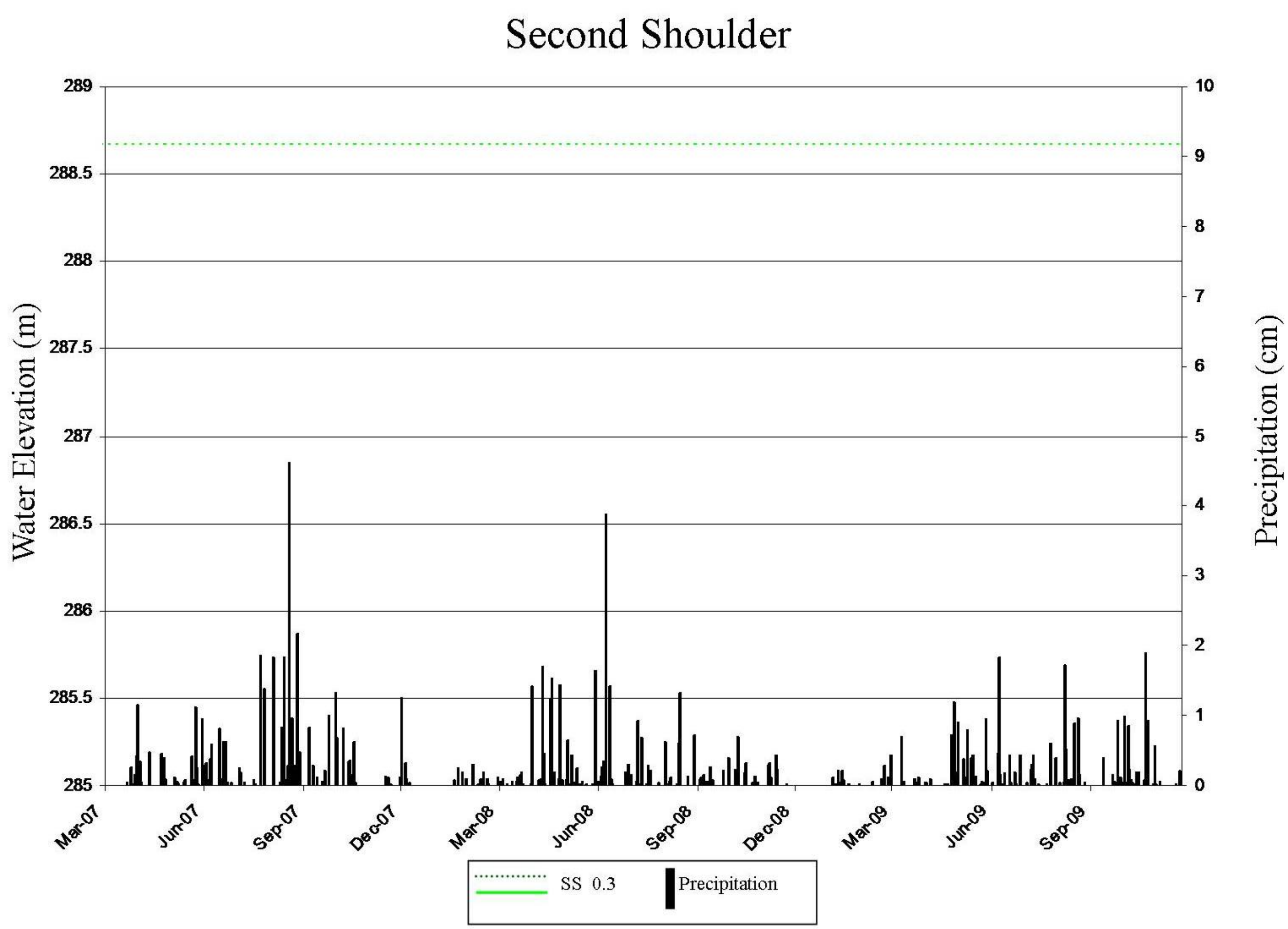
Dashed dark colors represent where water registered in the piezometer while solid light colors represent the maximum depth the piezometer is capable of capturing data.

Figure 1.13. The lower backslope position hydrograph.

Second Shoulder:

The second shoulder position was mapped as Fayette silt loam mapping unit. The soil morphology observed at this position fits most closely with the description of the Elizabeth series because of the color (10YR 3/1) and thickness (28 centimeters) of the A horizon as well as the abrupt transition from A horizon to bedrock and lack of redoximorphic features at this landscape position. This landscape position is the only one in the hillslope not to contain redoximorphic features.

There is one piezometer at the second shoulder, set at a depth of 0.3 meters. As can be seen in Fig 1.14, this piezometer never registered water during the three years of data collection. This lack of hydrologic activity indicates that neither precipitation nor water from higher in the landscape reaches this position.



Dashed dark colors represent where water registered in the piezometer while solid light colors represent the maximum depth the piezometer is capable of capturing data.

Figure 1.14. The second shoulder position hydrograph.

Discussion of Results

At the summit position, water moves mainly downward in the profile due to gravity. Water moves quickly through the silty soils and saturation is only for a couple of days at a time during heavy rainfall or snowmelt events. By the time the water reaches the upper backslope, it has started to accumulate in the soil profile due to lateral flow. This phenomenon is most likely a result of the change in relative permeability that inhibits the continued downward flow of water through the till. It is at this location that we see a rising water table which is a characteristic of lateral flow. At both the middle backslope and the lower backslope there is still a lot of lateral flow contributing to the saturation zone. But at the lower backslope position we see a falling water table indicating that the water either emerges and becomes part of the surface water or moves downward because the restrictive till layer is no longer present.

According to the piezometeric readings the general trend down the hillslope indicates that the depth to water table moves upward, towards the soil surface. Similarly, when soil profiles are compared the depth to till and bedrock lessens towards the bottom of the hillslope. This suggests that rainfall hits the surface of the soil and moves downward due to gravity much like most silty soils. This concept is illustrated in Figure 1.15.

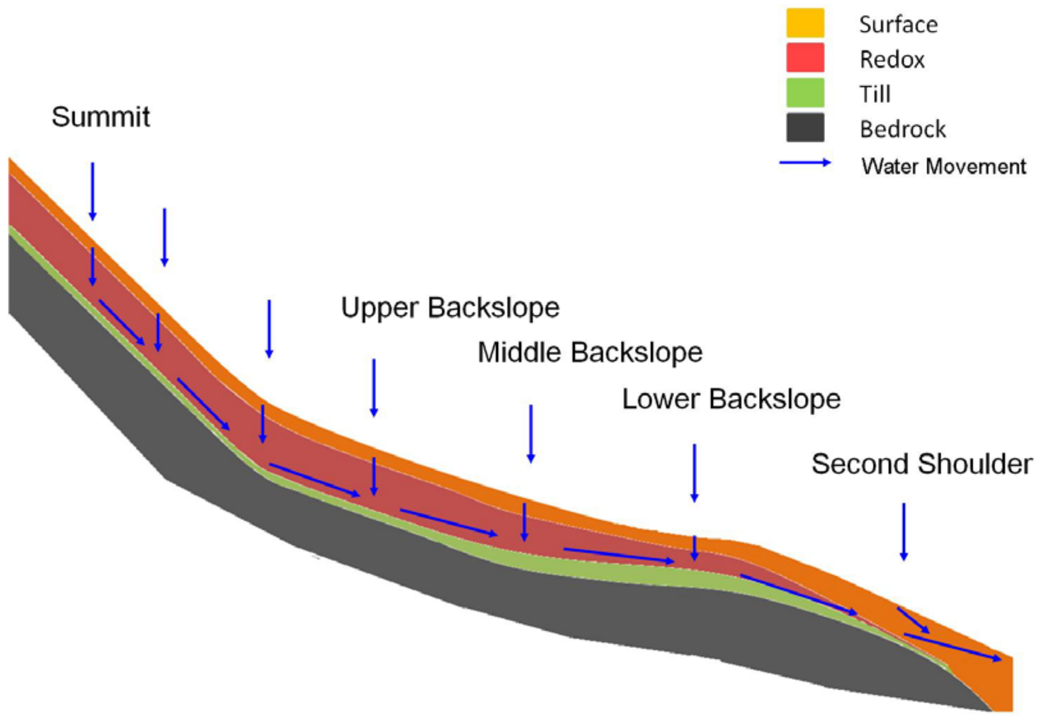


Figure 1.15.Water movement into and through the hillslope.

As we continue down the profile, we encounter a dense till layer. Texture change here makes it difficult for water to continue downward and because water follows the path of least resistance it begins to move laterally across the top of the till layer (Hanks, 1992). This is shown through the series of the three backslope positions. At the upper backslope the water table is rising, likely collecting water from further up in the hillslope. At the middle backslope position we see even more water accumulation, due to the same processes. The lower backslope has a greater slope than the previous two positions and so water begins to move away quicker, this is why the water table is falling. By the second shoulder, the water is gone. This is likely due to one or both of the following explantations. (1) The landscape is a convex-convex shape and there is little soil (less than 0.3 meter). The water is likely flowing quickly and draining into a nearby drainage waterway. Or (2) due to the karst nature of the bedrock, it is likely there is a hole where water is draining through, never reaching the second shoulder position.

The redoximorphic features found at this site are consistent with the water table. Especially at the summit hillslope position, water moving downward is stalled slightly before continuing downward in the profile and reaching the dense till layer. This first stalling is because of a texture change from fine silty loess to coarse silty loess. The water is slowed long enough to create anaerobic conditions, resulting in the redoximorphic features found here. As we move down the slope, the other sites exhibit lateral flow which causes the water table to be maintained for longer periods of time. This creates anaerobic conditions creating redoximorphic features. This research indicates that the zones of redoximorphic features (depletions and concentrations) are due to the presence of a contemporary, active water table.

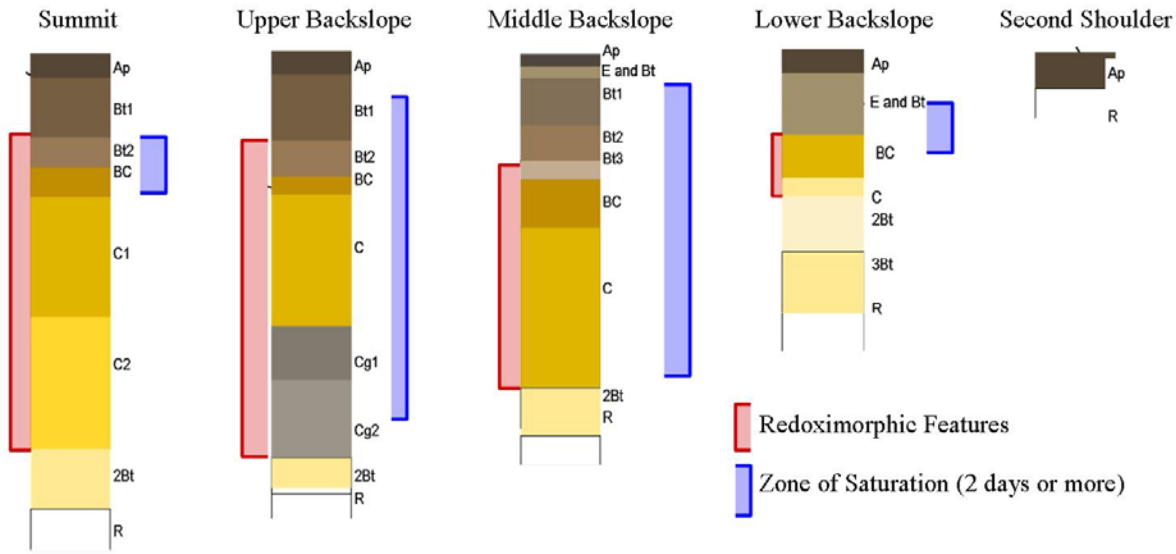


Figure 1.16. Correlation of redoximorphic features and the zones of saturation (minimum of 2 days) in each of the soil profiles moving down the hillslope.

Conclusion

Soils described in the 20 ha sub-watershed within MLRA 105 at Eagle Bluff Environmental Learning Center were used as a means to examine the soil stratigraphy in relation to water movement. When water moves through a landscape it influences the chemical, biological and morphological properties of the soil. These properties are responsible for the genesis of soil profiles, hillslopes and landscapes. The flow paths of water within a soil is key to determining the practical application of soils for various land uses including septic system suitability, contaminant movement and remediation, civil construction and land restoration.

The soils at the site thin towards the Second Shoulder position, likely due to erosion. Because the soils here are primarily deposited from loess, thickest deposits of the loess are along the summit and thin down the hillslope. The depth to bedrock, and perhaps more importantly a layer of till, lessens as this blanket of loess thins. Ground water flows atop this layer of till, unable to penetrate the dense layer. This makes this site peculiar in comparison to most other loess landscapes in Minnesota. This is likely why it is assumed that the redoximorphic features found here are relict.

Traditionally, in loess soils, rainfall hits the surface and moves downward toward the water table. In soils underlain directly by karstic bedrock, water moves downward through the soil profile and into the karst system. However, in this case, downward drainage is impeded and water moves laterally across the top of the bedrock higher in the profile because of an impermeable till layer. This layer creates a perched water table. The installed piezometers collected data that indicate that water is present long enough period during the growing season that anaerobic conditions occur, resulting in the formation of redoximorphic concentrations.

Most of the piezometers installed at this site showed readings of periods of saturation lasting at least two days, indicating the site has an active hydrology. This signifies that the redoximorphic features found at this site are modern. This conclusion is based upon soil taxonomy of the NRCS and the defined oxyaquic criteria.

Chapter 2

Introduction:

In this study we investigate if, by knowing the soil stratigraphy, landscape attributes, and precipitation, it is possible to estimate accurately where the water table will be within a soil profile. A secondary goal of this project is to use scientific visualization techniques to animate the movement of subsurface water in the deep loess region of southeastern Minnesota. This project is a prelude to the next generation of communicating soil survey information and will be a prototype for how similar scientific visualizations can be developed for other areas.

Justification

Understanding water movement within a soil can be complex, especially for individuals who do not study it. However, it is not only the people who study soils and water that depend on the soil. Communicating science to land developers is crucial in order for them to make sound decisions about soil suitability for a number of land uses including septic system suitability, contaminant movement and remediation, civil construction, and land restoration.

Three dimensional visualizations of soils and landscapes can educate people about the formation of soils and landscapes, the layers and composition of soil and the pathways of subsurface water movement. Hall and Olson (1991) state that “Landscapes must be defined in three dimensions and the soils developed on these must be studied with the entire landscape in mind.” A model of the landscape’s soils and associated water paths conveys an otherwise difficult concept to users of soils information.

Geographic Information Systems (GIS) help scientists produce accurate and useful maps. The utilization of GIS products in soil mapping have aided in the progress, usefulness and availability of land maps of many scales. These maps aid in the interpretation of data and the visualization of the relationship of soils to the landscape and other factors. The availability of GIS products, as well as increasing availability of high resolution Digital Elevation Models (DEM's), has encouraged the creation of quantitative soil-landscape modeling as a means to provide high-resolution information about soil properties on the landscape.

This project studies the use of water table data (collected in the field by piezometers), DEMs (and the associated terrain attributes) and basic statistics to create animations and models of water table dynamics within a particular landscape.

Literature Review

Water Table and Landscape Dynamics

Soils are dynamic. Their chemical, biological and morphological properties change as the influences on the soil change. The key properties of a soil will change as a function of time, landscape position and depth from surface. However, topography is the most important feature of a landscape that influences soil development. Water movement and its relationship to soils is probably the second most important factor and is highly dependent on topography. Milne (1936) was the first to document the important relationships between water movement, topography and soil genesis with his development of the catena concept. This concept explains that soils along a hillslope will be related to each other due to similarities in the factors which formed those soils .

Thompson et al. (1998) explored this idea in a landscape in southeastern Minnesota and concluded that climate factors such as precipitation, temperature and evapotranspiration along with topography were the most important factors affecting water table dynamics.

Traditionally, graphs of water table depth vs. time are used to describe water movement across a landscape. However, these two-dimensional hydrographs are often confusing to those who do not work with them regularly. Landscape modeling is used to visually explore the relationship of soils and topographic attributes that influence soil properties in a less complicated manner.

Animation of a landscape model is a slightly newer idea. As a result of dynamic daily, seasonal and annual changes in climatic and vegetative conditions, Thompson and others (1998) concluded that hydrologic models need to more effectively incorporate temporal change. This idea has lead to several studies seeking to develop methods to accurately depict a landscape's water table movement.

Swanson (2003) developed a "statistical soil-landscape model to provide high-resolution, site-specific, soil drainage class information and explored scientific visualization as a means to dynamically represent both the spatial and temporal variations in water table fluctuations". This study used terrain attributes that were derived from a DEM to model soil drainage classes across a landscape in south-central Minnesota. After classification of soil drainage was determined, 3D and 4D animations were created from data collected during hydrologic monitoring of the site.

DEM development and Utilization

Traditionally, soils are displayed in maps known as soil surveys and, in the U.S., are produced by the National Resources Conservation Service (NRCS). However, these maps are limited in useable information beyond the scales for which they are intended. Generally, soil surveys provide information on the kinds of soils that can be seen on a site and can be used to make decisions on the best management and utilizations of those soils. The NRCS has developed and released digital soil surveys for online versions of the maps (Soil Data Mart, http://soildatamart.nrcs.usda.gov/) at two different. SSURGO (Soil Survey Geographic Database, scale of 1:12,000 to 1:24,000) and STATSGO2 (State Soil Survey Database/ U.S. General Soil Map, 1:250,000) contain information on soil types and land use classifications, and both use the "map unit" concept where inclusions and exclusions may occur (NRCS, http://soils.usda.gov).

The limitations of the soil survey have prompted discussion concerning the need for more detailed site-specific soil information. Research by Hall and Olsen, Ruhe and others has indicated that at the landscape scale, topography controls much of the spatial variability observed in soils (Ruhe, 1968; Hall and Olson, 1991). Because of these and similar studies, landscape modeling has become a popular method of representing soil landscapes. Most landscape models are completed using a GIS. By obtaining elevation points across a landscape, a DEM can be created to link those soils and make assumptions based on their properties.

The constant increases in computing power together with the increasing availability of GIS on the desktop have made new and exciting applications of digital soil survey products possible. Additionally, recent advances in LiDAR (Light Detection And Ranging) technology have enabled users to obtain high accuracy DEM's across broad landscapes, enabling finer-scale understanding of topography. According to the Minnesota Geospatial Information Office, LiDAR-derived high-resolution elevation data products are available for many areas of Minnesota including the Red River Basin and independent counties within southern Minnesota. In the fall of 2008, nine counties (Dodge, Fillmore, Freeborn, Houston, Mower, Olmsted, Steele, Wabasha and Winona County) were selected to be flown to collect LiDAR information. LiDar-based DEM's of these counties are available on the State of Minnesota Department of Natural Resources (DNR) ftp site. (MN Geospatial Information Office, http://www.mngeo.state.mn.us/chouse/elevation/lidar.html#available)

Representing the complex dynamical relationships between soils, landscapes and hydrology is particularly challenging. Graphs of water table elevations over time are useful tools to convey the information, but their effectiveness is limited with the general public due to unfamiliarity. The solution to this problem can be resolved by using animations to represent the complicated system.

Animation development

Animation is a highly effective method to convey ideas and principles, especially in complicated and dynamic systems. However the use of such technology in the practice of soil science has been limited. A team of researchers from the University of England has developed an instructional multimedia program called "Oz Soils" to be used as an additional learning aid (Lockwood and Daniel, 1997), but few other such visualizations exist.

Materials and Methods

Selecting the correct DEM

A 3-meter lateral resolution LiDAR image of Fillmore County was obtained from the Minnesota DNR (The Minnesota Geospatial Information Office, http://www.mngeo.state.mn.us/chouse/elevation/lidar). To ensure the data is correctly smoothed, a series of filter tests were conducted and the best one was selected. First, a resampling of the DEM pixel size was done to 3m, 4m and 5m. Each of these DEM resolutions was then filtered either 0, 1, 2 or 3 times. After all this was completed the resulting 12 DEM maps were compared.

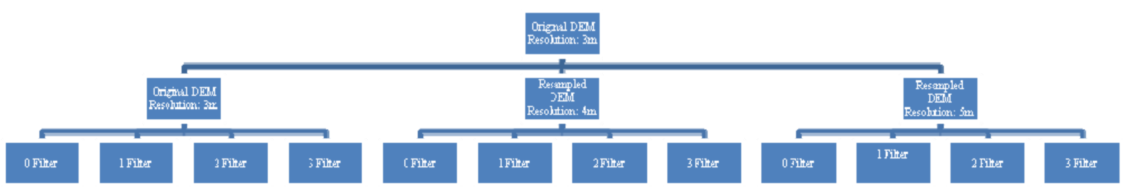


Figure 2.1. A representation of the created DEM's through a series of filtering.

In order to determine the usefulness of the map, each of the above twelve versions was then used to derive four terrain attributes: Slope, Plan Curvature, Profile Curvature and Flow Accumulation. These terrain attributes were calculated using ESRI's ArcMap GIS software.

The 3m resolution that was smoothed once was chosen for the study because the hydraulic mapping of the site, as seen in the Flow Accumulation output, was the most accurate representation of water movement as measured (see Chapter 1). The idea of using the 1m resolution data from the DNR was investigated, but the resolution was too fine to be easily manipulated for a large areas.

Statistics

In statistics, linear regression is an approach to modeling the relationships between a dependent variable "*y*" and one or more independent variables denoted *"x"*. The case of one explanatory variable is called *simple regression*. Linear regression is common, and is often used extensively in practical applications and models. This is because models which depend linearly on their unknown parameters are easier to fit than models which are non-linearly related to their parameters and because the statistical properties of the resulting estimators are easier to determine (Cohen, 2003).

In order to determine the best spatial and terrain attributes to use for this anaylsis, slope (percent slope), plan curvature, profile curvature and flow accumulation were all fit against groundwater elevation in a simple linear regression (as collected through a series of piezometers). The attributes that were the most highly correlated to groundwater elevation were then selected to be used in a multiple linear regression model. This analysis was conducted using Statistix 9, a statistical software package. Three of the terrain attributes that were related to depth to water table (surface elevation, plan curvature and profile curvature) produced an R^2 value (the coefficient of determination, used for predicting future outcomes on the basis of related information) of over 0.80.

Creating Water Table Maps

Once terrain attributes were derived from the DEM, they were statistically correlated to geographically documented water table elevations, producing a quantitative soil-landscape model across a catena. In doing this, water table depths at 10 points on the landscape were correlated to their terrain attributes (surface elevation, plan curvature and profile curvature) to create a constant variable for each day. These statistical relationships were then extrapolated across the surrounding landscape, using the terrain attributes (surface elevation, plan curvature and profile curvature). A total of 23,935 predicted data points were generated in this way and were used to create a water table elevation for a single day. This process was repeated for every day during the growing season.

Using ArcGIS mapping software, a 3-meter grid of the site was created and each cell was characterized by its surface elevation, plan curvature and profile curvature. This file was exported to Statistix 9 and a multiple linear regression of these three attributes was calculated to predict the elevation of watertable. Outputs were converted into maps.

To predict water table elevation across the Major Landscape Resource Area (MLRA), a multiple regression equation was developed to mathematically calculate a likely water table elevation. This regression line was:

$$\blacktriangledown = C + (X_1 \text{ *Plan}) + (X_2 \text{*Profile}) + (X_3 \text{ * Surface Elevation})$$

Where ▼ is the water elevation on any specific day, C is a constant calculated for each day and X_1, X_2 and X_3 are classification functions evaluated for each terrain attribute (Plan Curvature, Profile Curvature, and Surface Elevation).

This process was then repeated for every day of the growing season in 2008. These grids were then given to the Supercomputing Institute for modeling and animation. These data can be found in Appendix D. Each line was applied to the 23,935 points within a grid. Once a best-fit regression equation was developed for a specific day, it was used to predict water table elevation for all 23,935 data points within a grid representing the MLRA.

Figure 2.2. Grid pattern used. Each dot represents a predicted water table depth.

Because the water table elevations changed on a day-to-day basis, these three attributes were used to create an individual regression equation for each day of the 2008 growing season. The growing season was from April 29th to November 30th, as determined by the measured soil temperature. The five piezometers at the site collected data every two hours from March of 2007 to November of 2009. Water table maps for 2008 were selected because it was the wettest of the measured years and was most similar to an average year according to historical precipitation data.

Data collected at 12:00 AM (first reading of the day) on each day of the growing season from the deepest piezometer at each landscape position in 2008 were selected to create the single regression equation. The piezometers are named as follows (Name-Depth): Summit- SUM3.9; Upper Backslope-UBS3.9; Middle Backslope-MBS3.4, Lower Backslope-LBS1.2, Second Shoulder – SS0.3. After creating a regression line for every day using the above 5 piezometers, the regression equation was applied across the 3m grid (Figure 2.2).

Super Computer/Animation

A program was written in the C programming language (a general-purpose computer programming language) to convert the original data to PSI (a scientific and engineering data analysis and technical plotting software that can read multiple formats and perform mathematical transforms and statistical analyses) format for Avizo. Avizo from VSG3D, a general-purpose visualization, analysis and 3D reconstruction software, was used to develop a four-dimensional animation.

All water elevation measurements that showed water elevation higher than ground surface at the same point were reset to be the same height as the ground surface. This was done because it was not the purpose of the research to predict water depth above the surface and it would take much more information to verify the results. For each date, one data set was written for each of the four layers, rock, till, water elevation and surface. Each layer for a date was input into Avizo.

Using the Avizo Transformation Editor, the Z-axis was exaggerated three times to highlight the variation in topology for each layer. In addition, to more clearly see the difference between layers, till, water elevation and surface elevation were translated along the Z-axis. Rock, being the lowest layer was delegated to be the base and no translation was applied to the rock layer. The till layer was translated along the Z axis by 50, the water elevation layer was translated along the Z-axis by 100, and the surface layer was translated along the Z-axis by 150. Each layer was depicted as a cluster of points. A cluster difference was calculated between rock and till, till and water elevation and water elevation and surface. The cluster difference vector between rock and till was colored green. The cluster difference vector between till and water elevation was colored blue. The cluster difference vector between water elevation and surface was colored brown. The vector diameter for the cluster vectors was increased by 10 to enhance the smoothness of the model.

To display a smooth surface, the Avizo Delaunay triangulation module was applied to the surface data. The output was displayed using the Avizo Surface View module. Water elevation data were used as the color field.

A clipping plane was used to move through the layers (Rowe, 2011).

Results and Discussion

The water table as described in the following paragraphs refers to a calculated estimate of where the water table would be located based on the statistical analysis preformed to predict its elevation.

Animations were developed for August 2007 and the growing season of 2008. August 2007 was selected for visualization because a large and unique series of rainfall events (37.79cm for the entire month of August, while historical average is 10.61cm). occurred and was recorded by the piezometers and a visualization of this might be a useful exaggeration of a typical rainfall event. Water table maps for 2008 were selected because it was the wettest year of all the years of the study and it was most similar to the median of a typical year according to historical precipitation data. See Appendix D for climate data of the site.

The animations begin with a 360^{o} rotation of the Major Land Resource Area (MLRA) showing the stratigraphy of the rock, till, soil and surface layers. The animation then begins to vertically slice through the three dimensional model in an upslope direction towards a pre-determined location along the hillslope. That elevation was selected because the water table elevation at this location rises with rainfall events. When a light rain event occurs, it is absorbed relatively evenly on the soil surface and moves downward through the soil. However, if a heavy rainfall event occurs, the water falls too fast for the soil to absorb it, so run-off occurs across the soil surface. Due to the steepness of the slope at this location, the water will flow down the hill and accumulate at the footslope. However, a drainageway exists at the footslope, so the water accumulation and absorption is limited (see chapter 1). The animations then show the daily movements of the water table.

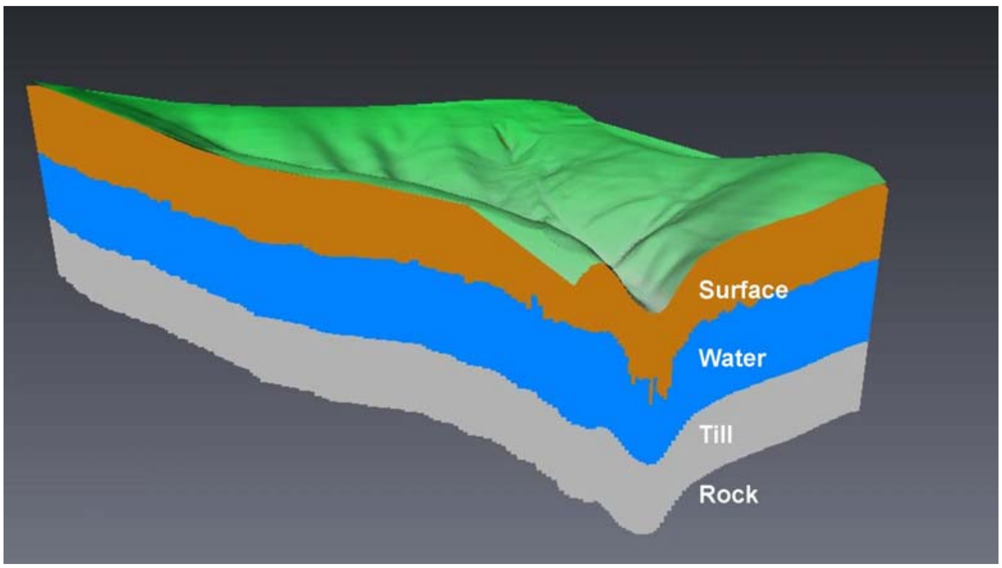


Figure 2.3. Rock, till, water table and soil surface elevation as represented in the animation.

The animation of the growing season of 2008 begins with a dry May. On June 8th, there was a rain event which was large enough (12.74 cm) to trigger a noticeable rise in water table elevation. This is the first significant phenomenon shown in the animation. This rainfall is also the biggest of the growing season. From here, June stays fairly wet, and the water table elevation remains high with two more noticeable rainfall events occurring on June 12th and 27th. The rest of the year is then fairly dry with several insignificant rainfall events occurring in August and early September. The animation presents each of these events roughly 24 hours after the beginning of the rainfall by exhibiting a rise in water table elevation. As discussed above, this is due to the landscape position of the clipping plane through the hillslope.

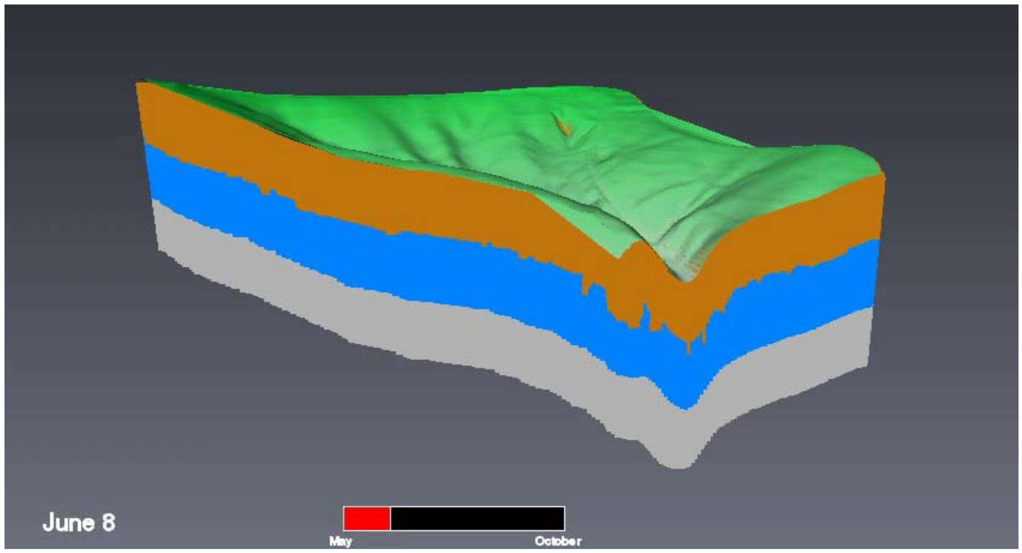


Figure 2.4. Water table elevation within the landscape on June 8, 2008 as represented in the animation.

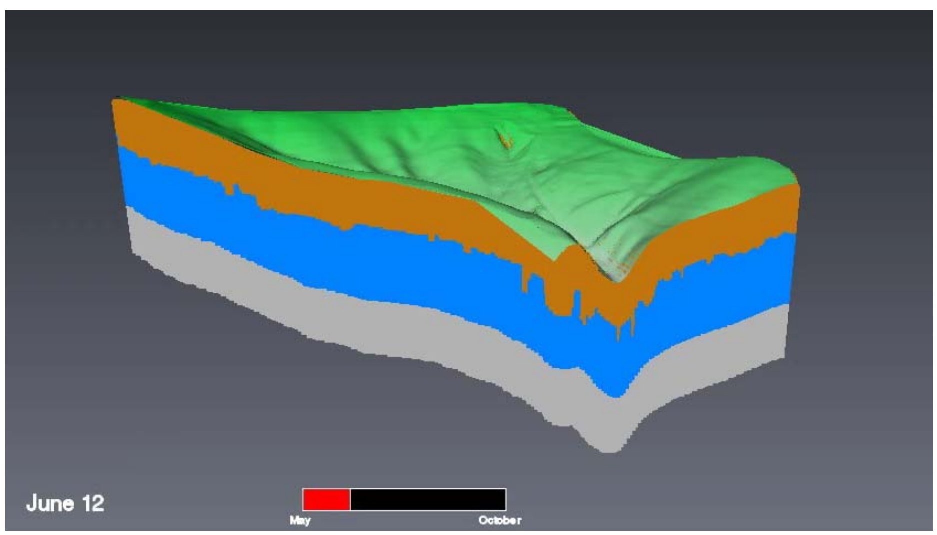


Figure 2.5. Water table elevation within the landscape on June 12, 2008 as represented in the animation.

The animation for August of 2007 also begins with a dry landscape, indicated by low water table elevations. The animation for the first half of the month shows little to no water table movement. However, as the second half of the month continues, there is a substantial rise in water table elevation due to a series of extremely heavy rainfall events (37.79 cm) which occurred in much of southern Minnesota from August 18th-20th. Starting on August 19th, the animation begins to show the highest water table elevation that occurred in either of the two animations. This rise is large enough that the water table only begins to drop towards the end of the month.

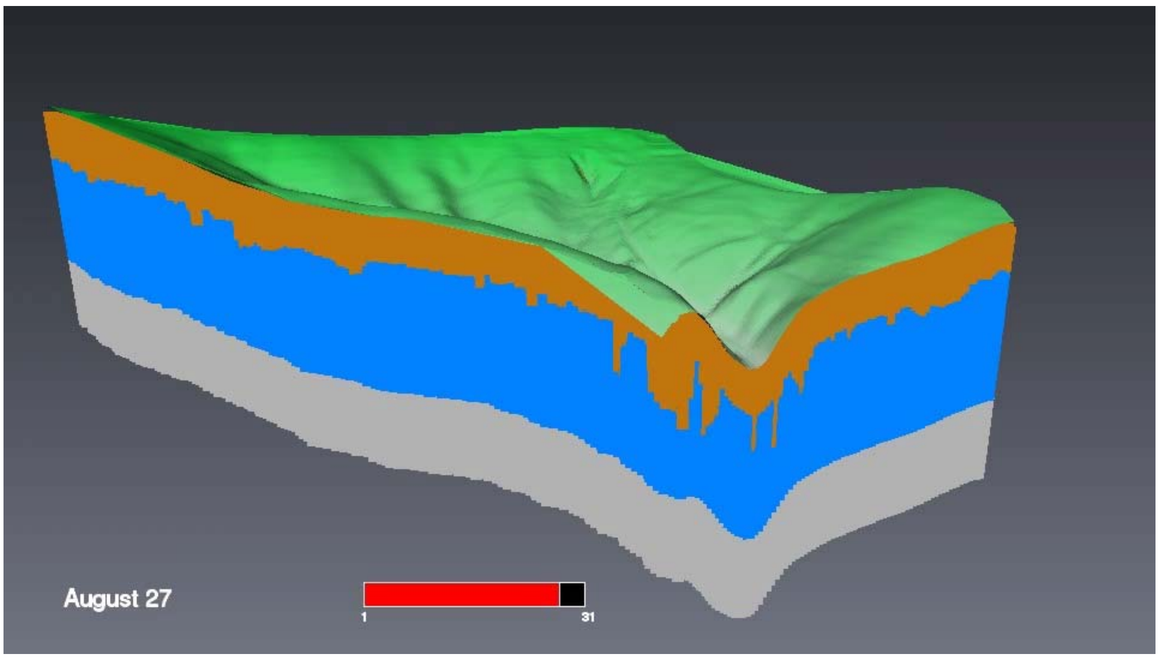


Figure 2.6. Water table elevation within the landscape on August 27, 2007 as represented in the animation.

Complete animations are available for viewing in the supplementary files.

Although the animations produced through this study are visually striking, they are limited in their ability to truly convey the day-to-day changes because of the scale of presentation. In order to show day-to-day changes more clearly, the vertical exaggeration would have to be exaggerated more than the 3-fold exaggeration used in this visualization. However, this may be confusing to some users and viewers unless they are fully aware of the reasoning behind that exaggeration.

Using the Avizo program is the best way to view and manipulate the models and understand the data because the user can zoom through space and position the model exactly where they wish. The program also allows the user to change the scale as well as manipulate where one is in the landscape and how one is viewing it (N, S, E, W) in order to best suit the needs of the user. However, the program is expensive and thus accessibility is low. The Supercomputing institute invites all who are interested to contact them to come in and use the data on your own.

Conclusion

This study used piezometers to measure water table elevations across a catena in southeastern Minnesota. Using the collected water table information, in combination with terrain attributes, a model of projected water table elevations across a larger landscape was calculated. From those calculations, Nancy Rowe at Supercomputing Institute at the University of Minnesota animated the data so it can be seen and understood by more individuals, scientists and students. This animation helps explain how water table dynamics work in conjunction with precipitation events.

Animations are useful tools for conveying many types of complicated systems, especially those in the natural world. The animations developed in this study are a good example of informative tools to teach, manage and research water table dynamics across a landscape. The Avizo package along with the data allows a user to interact with the soils and hydrology in a new way. This model provides a means to demonstrate that water movements across a landscape varies.

Although this model is useful and interesting, its ability to be replicated across a larger scale will be limited to several factors. This study is site specific, and quite dependent on the soil texture and underlying till found in this setting. Although similar formulas and models could be developed, it is time-consuming. For this project, it was key to have piezometers measuring water table elevations over an extended period of time. The cost of implementing this for a broader scale would be expensive.

The use of the Supercomputing Institute and the Avizo Suite was advantageous to the project. Similar programs would likely work as well as Avizo to manipulate and create a model of the landscape. However, if this project was proposed for a larger scale, availability of a software product would have to be examined.

The usefulness and potential accessibility of a landscape model and animation could be unparalleled for landscape management, environmental education and research. This project is the first step in striding toward creating new methods of conveying spatial information to many people. This study is a prelude to the next generation of communicating natural resource information and can be a prototype for how similar scientific visualizations can be developed for other areas.

Bibliography

Beck, John F. "Scientific Visualization of the Genesis and Hydrology of a Loess Landscape in Southeastern Minnesota." Thesis. University of Minnesota, 2008. Print.

Boersma, L., G.H. Simonson, and D.G. Watts. 1972. Soil Morphology and Water Table Relations: I. Annual Water Table Fluctuations. Oregon Agricultural Experiment Station, Corvallis. Technical Paper 3272.

Cohen, J., Cohen P., West, S.G., & Aiken, L.S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences.* (2nd ed.) Hillsdale, NJ: Lawrence Erlbaum Associates

Dijkerman, J.C., 1974. Pedology as a Science: The Role of Data, Models and Theories in the Study of Natural Soil Systems. Geoderma, 11 (1974):73-93.

Dokuchaev, V.V. 1883. Russian Chernozem. In Selected Works of V.V. Dokuchaev, Vol. 1, p. 14–419. Moscow, 1948. Israel Program for Scientific Translations Ltd. (for USDA-NSF), S. Monson, Jersalem, 1967. (Translated from Russian into English by N. Kaner).

Farnham, 1958. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions [Online WWW]. Available URL: http://soils.usda.gov/technical/classification/osd/index.html [Accessed 20 May 2008]. USDA-NRCS, Lincoln, Nebraska.

Hall, G.F. and C.G. Olson. 1991. Predicting Variability of Soils from Landscape Models. Soil Science Society of America. Spatial Variabilities of Soils and Landforms. Special Publication no. 28.

Hanks, R.J. 1992. Applied Soil Physics, Soil Water and Temperature Applications. 2nd edition. Springer-Verlag.

Hobbs, H,C. 1995. Fillmore County, Minnesota County Atlas C-8m Part A, Plate 3-Surficial Geology. University of Minnesota.

"LiDAR Elevation Data for Minnesota." *LiDAR Information*. Minnesota Geospatial Information Office, n.d. Web. 10 May 2010. <http://www.mngeo.state.mn.us/chouse/elevation/lidar.html>.

Lockwood, Peter, and Heiko Daniel. "Computer-assisted Teaching in Soil Science." Agronomy and Soil Science, University of New England, Armidale, New South Wales, Australia

Mason, J.A. 1992. Loess Distribution and Soil Landscape Evolution, Southeastern Minnesota. University of Minnesota, St. Paul.

Mikkelsen, P.E. & Green, G.E. 2003. Piezometers in fully grouted boreholes. In F. Myrvoll (ed.), Field Measurements in Geomechanics, Proc. of the 6th International Symposium, Oslo: 545–554. Lisse: Swets & Zeitlinger

Mossler, J.H., 1995. Geologic Atlas Fillmore County, Minnesota. 1995. Minnesota County Atlas C-8, Part A, Plate 2-Bedrock Geology. University of Minnesota.

Richardson, J. L., and Michael J. Vepraskas. *Wetland Soils: Genesis, Hydrology, Landscapes, and Classification*. Boca Raton, FL: Lewis, 2001. Print.

Rowe, Nancy. "Methods for Animation of Southeastern Minnesota Data." Personal interview. 08 July 2011.

Ruhe, R.V. and P.H Walker. 1968. Hillslope models and soil formation. Open Systems. *Trans .9th Int. Conf. Soil Sci. IV* 246p.

Soil Survey Staff. 2006. Keys to Soil Taxonomy, tenth edition. United States Department of Agriculture, Natural Resources Conservation Service.

Soil Survey Staff, 2006. U.S. Department of Agriculture Handbook 296, 2006. Major Land Resource Area (MLRA) Land Resource Regions and Major Land Resource Ares of the United Stated, the Caribbean, and the Pacific Basin. USDA, Natural Resources Conservation Service.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey [Online WWW]. Available URL: http://websoilsurvey.nrcs.usda.gov/app [Accessed 18 May 2008]. USDA-NRCS, Lincoln, Nebraska.

Sprecher, S. W. (2000). “Installing monitoring wells/piezometers in wetlands,” WRAP Technical Notes Collection (ERDC TN-WRAP-00-02), U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/wrap

Swanson, H.A. 2003. Using Quantitative Landscape Modeling and Scientific Visualization to Characterize Soil Hydrologic Dynamics. A Thesis Submitted to the Faculty of the Graduate School of the University of Minnesota.

Thompson, J.A. and J.C. Bell. 1998. Division S-10-Wetland Soils. Hydric Conditions and Hydromorphic Properties within a Mollisol Catena in Southeastern Minnesota. Soil Science Society of America Journal. 62:1116-1125.

Thompson, J.A., J.C. Bell, and C.W. Zanner. 1998. Hydrology and Hydric Soil Extent within a Mollisol Catena in Southeastern Minnesota. Soil Science Society of America Journal. 62:1126-1133.

U.S. Department of Commerce. National Oceanic & Atmospheric Administration. National Environmental Satellite, Dada, and Information Service. National Climatic Data Center. 151 Patton Avenue. Asheville, North Carolina 28801. www.ncdc.noaa.gov

Vepraskas, M.J. 1995(revised). Redoximorphic Features for Identifying Aquic Conditions. Tech. Bull. 301, North Carolina State University, Raleigh, NC.

Vepraskas, M.J. 2005. Installing Equipment for the Hydric Soil Technical Standard. North Carolina State University.

Zobeck, T.M. and A. Ritchie, Jr. 1983. Analysis of Long-Term Water Table Depth Records from a Hydrosequence of Soils in Central Ohio. Soil Science Society of America Journal. 48:119-125.

Appendix A

Official Series Descriptions for project site

Fb—Fayette silt loam, 2 to 6 percent slopes

Map Unit Setting

- *Elevation:* 700 to 1,500 feet
- *Mean annual precipitation:* 30 to 38 inches
- *Mean annual air temperature:* 43 to 50 degrees F
- *Frost-free period:* 145 to 205 days

Map Unit Composition

- *Fayette and similar soils:* 85 percent

Description of Fayette

Setting

- *Landform:* Loess hills
- *Landform position (two-dimensional):* Backslope
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Parent material:* Loess

Properties and qualities

- *Slope:* 2 to 6 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):*Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 15 percent
- *Available water capacity:* High (about 11.6 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e

Typical profile

- *0 to 12 inches:* Silt loam
- *12 to 53 inches:* Silt loam
- *53 to 60 inches:* Silt loam

Ff—Fayette silt loam, 12 to 17 percent slopes, moderately eroded

Map Unit Setting

- *Elevation:* 700 to 1,500 feet
- *Mean annual precipitation:* 30 to 38 inches
- *Mean annual air temperature:* 43 to 50 degrees F
- *Frost-free period:* 145 to 205 days

Map Unit Composition

- *Fayette, moderately eroded, and similar soils:* 85 percent

Description of Fayette, Moderately Eroded

Setting

- *Landform:* Loess hills
- *Landform position (two-dimensional):* Backslope
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Loess

Properties and qualities

- *Slope:* 12 to 17 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):*Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 15 percent
- *Available water capacity:* High (about 11.4 inches)

Interpretive groups

- *Land capability (nonirrigated):* 4e

Typical profile

- *0 to 8 inches:* Silt loam
- *8 to 40 inches:* Silt loam
- *40 to 60 inches:* Silt loam

Fb—Fayette silt loam, 2 to 6 percent slopes

Map Unit Setting

- *Elevation:* 700 to 1,500 feet
- *Mean annual precipitation:* 30 to 38 inches
- *Mean annual air temperature:* 43 to 50 degrees F
- *Frost-free period:* 145 to 205 days

Map Unit Composition

- *Fayette and similar soils:* 85 percent

Description of Fayette

Setting

- *Landform:* Loess hills
- *Landform position (two-dimensional):* Backslope
- *Down-slope shape:* Convex
- *Across-slope shape:* Linear
- *Parent material:* Loess

Properties and qualities

- *Slope:* 2 to 6 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):*Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 15 percent
- *Available water capacity:* High (about 11.6 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e

Typical profile

- *0 to 12 inches:* Silt loam
- *12 to 53 inches:* Silt loam
- *53 to 60 inches:* Silt loam

Cb—Chaseburg and Judson silt loams, 2 to 6 percent slopes

Map Unit Setting

- *Elevation:* 700 to 1,400 feet
- *Mean annual precipitation:* 30 to 38 inches
- *Mean annual air temperature:* 43 to 50 degrees F
- *Frost-free period:* 145 to 205 days

Map Unit Composition

- *Judson, very rarely flooded, and similar soils:* 45 percent
- *Chaseburg, very rarely flooded, and similar soils:* 45 percent

Description of Chaseburg, Very Rarely Flooded

Setting

- *Landform:* Drainageways
- *Down-slope shape:* Concave
- *Across-slope shape:* Linear
- *Parent material:* Alluvium and/or colluvium

Properties and qualities

- *Slope:* 2 to 6 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):*Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* Very rare
- *Frequency of ponding:* None
- *Available water capacity:* Very high (about 12.3 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e

Typical profile

- *0 to 10 inches:* Silt loam
- *10 to 60 inches:* Silt loam

Description of Judson, Very Rarely Flooded

Setting

- *Landform:* Drainageways
- *Down-slope shape:* Concave
- *Across-slope shape:* Linear
- *Parent material:* Alluvium and/or colluvium

Properties and qualities

- *Slope:* 2 to 6 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Moderately well drained
- *Capacity of the most limiting layer to transmit water (Ksat):*Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches

- *Frequency of flooding:* Very rare
- *Frequency of ponding:* None
- *Calcium carbonate, maximum content:* 15 percent
- *Available water capacity:* Very high (about 13.2 inches)

Interpretive groups

- *Land capability (nonirrigated):* 2e

Typical profile

0 to 25 inches: Silt loam
25 to 48 inches: Silty clay loam
48 to 72 inches: Silt loam

Appendix B

Hillslope positions soil profile descriptions

Summit position, on 2 percent slope, following is the soil profile description:

Lat/Long: latitude 43.75962794 º and longitude -92.00786043 º
UTM: 4845653.203 m Northing and 579865.1034 m Easting

Ap - 0 to 25 centimeters; very dark grayish brown (10YR 3/2) moist, silt loam.

Bt1 - 25 to 89 centimeters; brown (10YR 4/3) moist, silt loam.

Bt2 - 89 to 117 centimeters; brown (10YR 4/3) moist, silt loam; 2 percent (common) fine faint dark gray (10YR 4/1), moist, iron depletions and 10 percent (common) fine distinct yellowish brown (10YR 5/6), moist, masses of oxidized iron.

BC - 117 to 142 centimeters; grayish brown (2.5Y 5/2) moist, silt loam; 2 percent (common) medium faint light olive brown (2.5Y 5/3), moist, masses of oxidized iron.

C1 - 142 to 269 centimeters; olive brown (2.5Y 4/3) moist, silt loam; 10 percent (common) medium distinct light olive brown (2.5Y 5/6), moist, masses of oxidized iron and 10 percent (common) medium distinct gray (2.5Y 5/1), moist, iron depletions; slightly effervescent. 18

C2 - 269 to 409 centimeters; olive brown (2.5Y 4/3) moist, silt loam; 10 percent (common) medium distinct light olive brown (2.5Y 5/6), moist, masses of oxidized iron and 10 percent (common) medium distinct gray (2.5Y 5/1), moist, iron depletions; strongly effervescent.
2Bt - 409 to 467 centimeters; yellowish red (5YR 4/6) moist, sandy clay; subrounded 2 millimeters mixed rock fragments.

R - 467 centimeters.

Upper backslope position, on 7 percent slope, following is the soil profile description:

Lat/Long: latitude 43.75781836 ^{o} and longitude -92.00831656 ^{o}
UTM: 4845451.7841 m Northing and 579830.7921 m Easting

Ap - 0 to 20 centimeters; very dark grayish brown (10YR 3/2) moist, silt loam.

Bt1 - 20 to 107 centimeters; brown (10YR 4/3) moist, silty clay loam; 10 percent (few) patchy distinct gray (10YR 6/1), moist, silt coats between sand grains and 30 percent (common) discontinuous faint dark grayish brown (10YR 4/2), moist, clay films on all faces of peds.

Bt2 - 107 to 163 centimeters; dark yellowish brown (10YR 4/4) moist, silt loam; 30 percent (common) patchy distinct dark grayish brown (10YR 4/2), moist, clay films on all faces of peds; 15 percent (common) fine distinct light olive brown (2.5Y 5/6), moist, masses of oxidized iron and 20 percent (many) medium distinct light brownish gray (2.5Y 6/2), moist, iron depletions. 19

BC - 163 to 196 centimeters; light olive brown (2.5Y 5/4) moist, silt loam; 10 percent (common) fine distinct light olive brown (2.5Y 5/6), moist, masses of oxidized iron and 20 percent (many) medium distinct gray (2.5Y 5/1), moist, iron depletions; noneffervescent.

C - 196 to 292 centimeters; light olive brown (2.5Y 5/4) moist, silt loam; 10 percent (common) medium prominent yellowish brown (10YR 5/8), moist, masses of oxidized iron, 10 percent (common) fine distinct gray (2.5Y 5/1), moist, iron depletions and 15 percent (common) medium distinct gray (2.5Y 5/1), moist, iron depletions; slightly effervescent.

Cg1 - 292 to 335 centimeters; gray (2.5Y 5/1) moist, silt loam; 10 percent (common) medium prominent light olive brown (2.5Y 5/6), moist, masses of oxidized iron and 25 percent (many) coarse prominent yellowish brown (10YR 5/8), moist, masses of oxidized iron; strongly effervescent.

Cg2 - 335 to 422 centimeters; gray (2.5Y 6/1) moist, silt loam; 5 percent (common) medium prominent black (N 2.5/), moist, manganese masses and 25 percent (many) coarse prominent strong brown (7.5YR 5/8), moist, masses of oxidized iron; slightly effervescent.

2Bt - 422 to 447 centimeters; 50 percent olive brown (2.5Y 4/3) moist and 50 percent weak red (5R 4/3) moist, clay loam; 10 percent subrounded 2 to 10 millimeters mixed rock fragments; noneffervescent.

R - 447 centimeters; limestone bedrock.

Middle backslope position, on 16 percent slope, following is the soil profile description:

Lat/Long: latitude 43.75769456 º and longitude -92.00897101 º
UTM: 4845437.4041 m Northing and 579778.2737 m Easting

Ap - 0 to 20 centimeters; very dark gray (10YR 3/1) moist, silt loam; weak very fine granular and moderate fine granular structure.

E and Bt - 20 to 30 centimeters; 50 percent brown (10YR 4/3) moist and 50 percent dark grayish brown (10YR 4/2) moist, silt loam silty clay loam; weak fine platy and moderate medium subangular blocky structure.

Bt1 - 30 to 79 centimeters; dark yellowish brown (10YR 4/4) moist, silty clay loam; moderate fine subangular blocky and strong medium subangular blocky structure.

Bt2 - 79 to 117 centimeters; yellowish brown (10YR 5/4) moist, silt loam; moderate fine subangular blocky and moderate coarse prismatic structure.

Bt3 - 117 to 132 centimeters; brown (10YR 5/3) moist, silt loam; moderate fine subangular blocky and moderate coarse prismatic structure; 5 percent (common) medium grayish brown (2.5Y 5/2), moist, iron depletions and 3 percent (common) medium strong brown (7.5YR 5/6), moist, masses of oxidized iron.
BC -132 to 183 centimeters; light olive brown (2.5Y 5/3) moist, silt loam; null percent sand; null percent silt; 17 percent clay; moderate fine subangular blocky and moderate medium subangular blocky structure; 3 percent (common) fine prominent strong brown (7.5YR 5/6), moist, masses of oxidized iron and 10 percent (common) coarse faint grayish brown (2.5Y 5/2), moist, iron depletions.

C - 183 to 356 centimeters; gray (2.5Y 6/1) moist, silt loam; structureless structure; 3 percent (common) fine distinct strong brown (7.5YR 5/8), moist, masses of oxidized iron and 10 percent (common) coarse light olive brown (2.5Y 5/3), moist.

2Bt - 356 to 396 centimeters; yellowish brown (10YR 5/6) moist, clay loam; structureless; strongly effervescent.

Lower backslope position, on 18 percent slope, following is the soil profile description:

Lat/Long: latitude 43.75717757 ^{o} and longitude -92.00871089 ^{o}
UTM: 4845380.2358 m Northing and 579799.9004 m Easting

A - 0 to 15 centimeters; very dark grayish brown (10YR 3/2) moist, silt loam.

B and E -15 to 86 centimeters; 60 percent brown (10YR 4/3) moist and 40 percent light brownish gray (10YR 6/2) moist, silt loam; 30 percent (common) discontinuous faint dark grayish brown (10YR 4/2), moist, clay films on all faces of peds and 10 percent (few) patchy distinct light brownish gray (2.5Y 6/2), moist, silt coats on vertical faces of peds.

BC - 86 to 114 centimeters; olive brown (2.5Y 4/3) moist, silt loam; 10 percent (common) medium distinct light brownish gray (2.5Y 6/2), moist, iron depletions and 25 percent (many) medium distinct brown (7.5YR 4/4), moist, masses of oxidized iron.

C - 114 to 137 centimeters; light olive brown (2.5Y 5/3) moist, silt loam; 5 percent (common) fine distinct light olive brown (2.5Y 5/6), moist, masses of oxidized iron and 10 percent (common) medium prominent yellowish brown (10YR 5/8), moist, masses of oxidized iron.

2Bt - 137 to 203 centimeters; yellowish brown (10YR 5/6) moist, clay loam; 5 percent subrounded 2 to 10 millimeters mixed rock fragments.

3Bt - 203 to 257 centimeters; olive gray (5Y 5/2) moist, clay loam; 7 percent subrounded 2 to 10 millimeters mixed rock fragments.

R - 257 centimeters; limestone bedrock; strongly effervescent.

Second shoulder position, on 9 percent slope, following is the soil profile description:

Lat/Long: latitude 43.75668069 º and longitude -92.00890663º
UTM: 4845324.8619 m Northing and 579784.8036 m Easting

A --- 0 to 28 centimeters; very dark gray (10YR 3/1) moist, silt loam.

R --- 28 to 40 centimeters; limestone bedrock.

Appendix C

Qualifications of oxyaquic criteria

Following are descriptions of the horizons and characteristics diagnostic for both mineral and organic soils.

Aquic Conditions

Soils with aquic (L. aqua, water) conditions are those that currently undergo continuous or periodic saturation and reduction. The presence of these conditions is indicated by redoximorphic features, except in Histosols and Histels, and can be verified by measuring saturation and reduction, except in artificially drained soils. Artificial drainage is defined here as the removal of free water from soils having aquic conditions by surface mounding, ditches, or subsurface tiles to the extent that water table levels are changed significantly in connection with specific types of land use. In the keys, artificially drained soils are included with soils that have aquic conditions. Elements of aquic conditions are as follows:

1. Saturation is characterized by zero or positive pressure in the soil water and can generally be determined by observing free water in an unlined auger hole. Problems may arise, however, in clayey soils with peds, where an unlined auger hole may fill with water flowing along faces of peds while the soil matrix is and remains unsaturated (bypass flow). Such free water may incorrectly suggest the presence of a water table, while the actual water table occurs at greater depth. Use of well sealed piezometers or tensiometers is therefore recommended for measuring saturation. Problems may still occur, however, if water runs into piezometer slits near the bottom of the piezometer hole or if tensiometers with slowly reacting manometers are used. The first problem can be overcome by using piezometers with smaller slits and the second by using transducer tensiometry, which reacts faster than manometers.

Soils are considered wet if they have pressure heads greater than -1 kPa. Only macropores, such as cracks between peds or channels, are then filled with air, while the soil matrix is usually still saturated. Obviously, exact measurements of the wet state can be obtained only with tensiometers. For operational purposes, the use of piezometers is recommended as a standard method.

The duration of saturation required for creating aquic conditions varies, depending on the soil environment, and is not specified.

Three types of saturation are defined:

a. Endosaturation.—The soil is saturated with water in all layers from the upper boundary of saturation to a depth of 200 cm or more from the mineral soil surface.

b. Episaturation.—The soil is saturated with water in one or more layers within 200 cm of the mineral soil surface and also has one or more unsaturated layers, with an upper boundary above a depth of 200 cm, below the saturated layer. The zone of saturation, i.e., the water table, is perched on top of a relatively impermeable layer.

c. Anthric saturation.—This term refers to a special kind of aquic conditions that occur in soils that are cultivated and irrigated (flood irrigation). Soils with anthraquic conditions must meet the requirements for aquic conditions and in addition have both of the following:

(1) A tilled surface layer and a directly underlying slowly permeable layer that has, for 3 months or more in normal years, both:

(a) Saturation and reduction; and

(b) Chroma of 2 or less in the matrix; and

(2) A subsurface horizon with one or more of the following:

(a) Redox depletions with a color value, moist, of 4 or more and chroma of 2 or less in macropores; or

(b) Redox concentrations of iron; or

(c) 2 times or more the amount of iron (by dithionite citrate) contained in the tilled surface layer.

2. The degree of reduction in a soil can be characterized by the direct measurement of redox potentials. Direct measurements should take into account chemical equilibria as expressed by stability diagrams in standard soil textbooks.

Reduction and oxidation processes are also a function of soil pH. Obtaining accurate measurements of the degree of reduction in a soil is difficult. In the context of this taxonomy, however, only a degree of reduction that results in reduced iron is considered, because it produces the visible redoximorphic features that are identified in the keys. A simple field test is available to determine if reduced iron ions are present. A freshly broken surface of a field-wet soil sample is treated with alpha, alpha-dipyridyl in neutral, 1-normal ammonium-acetate solution. The appearance of a strong red color on the freshly broken surface indicates the presence of reduced iron ions. A positive reaction to the alpha,alpha-dipyridyl field test for ferrous iron (Childs, 1981) may be used to confirm the existence of reducing conditions and is especially useful in situations where, despite saturation, normal morphological indicators of such conditions are either absent or obscured (as by the dark colors characteristic of melanic great groups). A negative reaction, however, does not imply that reducing conditions are always absent. It may only mean that the level of free iron in the soil is below the sensitivity limit of the test or that the soil is in an oxidized phase at the time of testing. Use of alpha,alphadipyridyl in a 10 percent acetic-acid solution is not recommended because the acid is likely to change soil conditions, for example, by dissolving CaCO3.

The duration of reduction required for creating aquic conditions is not specified.

3. Redoximorphic features associated with wetness result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. The reduced iron and manganese ions are mobile and may be transported by water as it moves through the soil. Certain redox patterns occur as a function of the patterns in which the ion-carrying water moves through the soil and as a function of the location of aerated zones in the soil. Redox patterns are also affected by the fact that manganese is reduced more rapidly than iron, while iron oxidizes more rapidly upon aeration. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redox processes in a soil may result in redoximorphic features that are defined as follows:

a. Redox concentrations.—These are zones of apparent accumulation of Fe-Mn oxides, including:

(1) Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure. Boundaries commonly are diffuse if formed in situ and sharp after pedoturbation. Sharp boundaries may be relict features in some soils; and

(2) Masses, which are noncemented concentrations of substances within the soil matrix; and

(3) Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.

b. Redox depletions.—These are zones of low chroma (chromas less than those in the matrix) where either Fe-Mn oxides alone or both Fe-Mn oxides and clay have been stripped out, including:

(1) Iron depletions, i.e., zones that contain low amounts of Fe and Mn oxides but have a clay content similar to that of the adjacent matrix (often referred to as albans or neoalbans); and

(2) Clay depletions, i.e., zones that contain low amounts of Fe, Mn, and clay (often referred to as silt coatings or skeletans).

c. Reduced matrix.—This is a soil matrix that has low chroma in situ but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

d. In soils that have no visible redoximorphic features, a reaction to an alpha,alpha-dipyridyl solution satisfies the requirement for redoximorphic features. Photo 35 shows a pedon from Alaska with aquic conditions close to the surface. When snow begins to melt in the spring, the subsoil remains frozen and perches water in the gleyed zone. Photo 36 shows peds from the gleyed horizon and the horizon directly below. The gleyed horizon has redoximorphic concentrations lining pores and redoximorphic depletions in the matrix. The horizon below has redoximorphic depletions lining pores and redoximorphic concentrations in the matrix. Field experience indicates that it is not possible to define a specific set of redoximorphic features that is uniquely characteristic of all of the taxa in one particular category. Therefore, color patterns that are unique to specific taxa are referenced in the keys.

Anthraquic conditions are a variant of episaturation and are associated with controlled flooding (for such crops as wetland rice and cranberries), which causes reduction processes in the saturated, puddled surface soil and oxidation of reduced and mobilized iron and manganese in the unsaturated subsoil.

Appendix D
Climate Data - http://www.ncdc.noaa.gov/cdo-web/search

STATION	STATION_NAME	State	ELEVATION	LATITUDE	LONGITUDE	DATE	MDSF	PRCP	SNWD
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070301	23	18	432
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070302	117	163	559
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070303	38	76	584
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070304	0	0	533
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070305	0	0	533
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070306	0	0	508
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070307	0	0	508
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070308	0	0	483
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070309	0	0	457
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070310	0	0	406
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070311	0	0	381
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070312	0	0	356
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070313	0	0	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070314	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070315	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070316	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070317	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070318	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070319	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070320	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070321	0	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070322	13	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070323	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070324	69	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070325	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070326	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070327	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070328	51	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070329	36	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070330	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070331	142	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070401	183	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070402	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070403	64	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070404	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070405	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070406	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070407	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070408	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070409	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070410	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070411	114	30	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070412	46	51	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070413	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070414	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070415	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070416	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070417	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070418	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070419	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070420	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070421	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070422	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070423	114	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070424	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070425	86	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070426	28	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070427	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070428	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070429	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070430	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070501	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070502	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070503	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070504	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070505	20	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070507	10	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070512	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070513	46	0	0

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070515	15	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070516	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070517	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070518	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070522	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070523	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070524	315	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070527	8	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070529	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070530	112	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070602	51	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070604	99	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070611	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070612	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070613	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070614	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070615	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070616	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070617	234	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070621	107	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070622	140	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070626	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070627	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070629	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070630	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070701	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070702	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070703	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070704	13	0	0

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070709	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070710	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070711	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070712	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070716	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070717	135	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070719	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070720	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070721	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070722	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070723	599	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070724	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070725	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070726	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070727	409	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070729	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070730	0	0	0

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070801	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070803	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070804	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070805	432	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070807	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070810	76	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070816	81	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070818	89	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070821	38	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070825	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070826	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070827	732	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070828	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070829	97	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070830	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070831	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070901	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070902	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070903	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070904	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070905	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070906	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070907	277	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070908	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070909	3	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070911	81	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070912	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070913	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070914	33	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070916	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070917	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070918	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070919	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070920	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070921	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070923	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070924	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070925	234	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070926	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070927	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070928	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070929	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20070930	33	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071001	371	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071002	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071003	231	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071004	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071005	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071006	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071007	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071008	180	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071010	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071011	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071012	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071013	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071014	69	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071015	94	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071016	25	0	0

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071018	140	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071019	56	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071020	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071021	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071022	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071023	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071024	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071025	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071027	33	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071028	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071029	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071031	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071101	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071102	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071103	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071104	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071107	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071108	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071110	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071111	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071112	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071113	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071114	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071115	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071116	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071117	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071118	30	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071119	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071120	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071121	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071122	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071123	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071124	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071125	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071201	0	0	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071202	297	122	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071203	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071204	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071205	89	119	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071206	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071207	38	51	203

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071208	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071209	10	8	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071210	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071211	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071212	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071213	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071214	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071215	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071216	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071217	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071218	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071219	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071220	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071221	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071222	8	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071223	25	41	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071224	10	10	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071225	0	0	127
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071227	10	20	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071228	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071229	25	20	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071230	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20071231	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080101	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080102	0	0	127

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080103	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080104	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080105	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080106	0	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080107	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080108	33	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080109	0	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080110	0	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080111	3	5	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080112	0	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080113	8	13	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080114	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080115	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080116	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080117	46	56	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080118	25	51	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080119	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080120	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080121	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080122	58	127	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080123	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080124	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080125	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080126	30	43	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080127	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080128	0	0	127

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080129	5	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080130	8	20	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080131	0	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080201	0	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080202	0	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080203	3	5	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080204	0	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080205	66	64	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080206	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080207	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080208	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080209	3	5	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080210	10	13	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080211	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080212	25	36	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080213	13	15	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080214	36	46	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080215	33	38	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080216	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080217	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080218	25	25	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080219	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080220	5	5	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080221	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080222	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080223	0	0	254

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080224	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080225	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080226	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080227	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080228	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080229	23	33	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080301	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080302	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080303	18	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080304	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080305	15	30	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080306	0	5	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080307	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080308	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080309	3	3	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080310	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080311	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080312	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080313	0	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080314	9999	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080315	9999	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080316	9999	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080317	9999	9999	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080318	33	0	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080319	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080320	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080321	33	51	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080322	64	33	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080323	8	8	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080324	0	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080325	0	0	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080326	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080327	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080328	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080329	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080330	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080331	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080401	345	8	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080402	3	3	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080403	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080404	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080405	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080406	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080407	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080408	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080409	28	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080410	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080411	429	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080412	122	10	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080413	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080414	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080415	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080416	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080417	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080418	193	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080419	340	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080420	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080421	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080422	48	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080423	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080424	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080425	315	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080426	56	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080427	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080428	23	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080429	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080430	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080501	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080502	28	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080503	183	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080505	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080507	130	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080510	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080511	71	0	0

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080513	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080514	8	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080516	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080517	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080519	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080520	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080521	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080522	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080523	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080524	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080525	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080526	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080527	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080529	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080602	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080603	28	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080611	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080615	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080616	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080617	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080619	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080627	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080628	79	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080629	53	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080630	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080701	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080702	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080703	28	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080706	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080707	36	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080710	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080711	165	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080713	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080715	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080716	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080723	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080724	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080725	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080726	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080727	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080728	3	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080729	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080730	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080731	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080801	147	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080803	13	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080804	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080805	94	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080807	46	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080808	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080809	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080810	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080811	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080812	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080813	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080814	53	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080816	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080817	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080818	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080819	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080820	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080821	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080822	36	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080823	8	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080824	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080826	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080827	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080828	132	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080829	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080830	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080831	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080901	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080902	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080903	43	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080904	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080905	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080906	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080907	9999	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080909	9999	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080910	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080911	20	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080914	15	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080916	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080917	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080918	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080919	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080920	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080921	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080922	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080923	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080924	56	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080925	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080926	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080927	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080928	9999	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080929	9999	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20080930	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081001	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081003	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081005	25	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081007	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081008	132	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081010	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081011	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081012	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081013	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081014	51	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081015	81	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081016	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081017	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081020	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081021	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081022	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081024	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081026	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081027	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081028	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081029	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081031	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081102	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081108	25	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081109	0	0	0

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081120	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081121	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081122	3	5	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081123	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081125	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081126	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081130	33	33	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081201	46	74	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081202	0	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081203	41	81	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081204	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081205	8	8	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081206	8	18	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081207	5	10	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081208	10	10	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081209	127	165	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081210	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081211	0	0	9999
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081212	0	0	9999
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081213	0	0	9999

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081215	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081216	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081217	46	76	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081218	0	0	127
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081219	81	127	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081220	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081221	56	135	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081222	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081223	28	30	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081224	13	25	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081225	18	15	279
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081227	5	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081228	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081229	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081230	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20081231	8	20	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090101	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090102	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090103	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090104	28	10	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090105	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090106	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090107	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090108	8	13	152

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090110	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090114	9999	9999	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090115	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090116	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090117	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090118	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090119	10	20	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090120	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090121	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090122	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090123	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090124	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090125	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090126	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090127	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090128	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090129	8	8	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090130	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090131	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090201	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090202	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090203	0	0	254
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090205	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090206	0	0	254

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090208	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090209	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090210	15	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090211	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090212	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090213	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090214	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090215	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090216	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090217	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090218	20	8	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090219	5	5	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090220	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090221	71	97	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090222	3	3	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090223	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090224	0	0	76
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090225	23	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090226	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090227	94	76	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090228	0	0	51
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090301	0	0	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090302	0	0	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090303	0	0	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090304	0	0	25

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090306	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090307	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090308	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090309	152	8	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090310	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090311	18	3	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090312	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090313	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090314	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090315	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090316	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090317	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090318	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090319	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090320	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090321	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090322	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090323	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090324	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090325	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090326	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090327	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090328	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090329	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090330	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090331	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090401	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090402	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090403	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090404	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090405	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090406	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090407	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090408	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090409	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090410	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090411	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090412	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090413	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090414	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090415	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090416	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090417	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090418	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090419	23	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090420	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090421	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090422	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090423	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090424	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090425	165	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090426	104	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090427	323	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090428	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090429	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090430	51	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090501	28	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090502	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090503	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090504	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090505	23	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090506	127	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090507	41	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090508	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090512	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090513	107	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090514	99	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090515	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090516	99	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090517	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090518	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090519	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090520	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090521	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090522	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090523	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090524	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090525	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090526	84	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090527	180	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090531	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090601	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090602	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090603	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090604	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090605	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090606	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090607	140	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090608	673	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090609	41	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090610	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090611	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090612	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090613	46	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090614	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090615	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090616	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090617	114	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090618	33	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090619	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090620	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090621	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090622	28	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090623	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090624	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090625	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090626	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090627	36	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090629	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090630	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090701	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090702	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090703	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090704	36	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090705	13	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090706	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090707	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090708	71	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090709	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090710	114	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090711	38	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090712	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090713	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090714	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090715	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090716	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090717	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090718	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090719	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090720	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090721	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090722	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090723	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090724	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090725	234	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090726	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090727	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090728	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090729	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090730	122	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090731	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090801	13	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090802	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090803	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090804	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090806	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090807	8	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090808	427	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090810	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090811	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090812	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090813	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090814	38	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090815	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090816	224	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090817	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090818	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090819	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090820	267	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090822	38	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090823	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090824	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090825	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090826	15	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090827	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090828	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090829	38	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090830	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090831	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090901	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090902	0	0	0

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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090904	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090905	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090906	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090907	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090908	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090910	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090911	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090912	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090913	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090914	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090915	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090916	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090917	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090918	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090920	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090921	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090922	48	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090923	43	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090924	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090925	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090926	178	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090927	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090928	25	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090929	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20090930	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091001	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091002	267	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091003	25	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091004	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091005	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091006	150	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091007	109	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091008	13	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091009	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091010	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091011	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091012	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091013	51	38	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091014	33	20	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091015	53	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091016	41	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091017	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091018	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091019	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091020	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091021	23	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091022	462	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091023	132	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091024	244	13	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091025	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091026	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091027	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091028	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091029	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091030	109	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091031	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091101	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091102	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091103	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091104	18	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091105	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091106	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091107	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091108	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091109	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091110	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091111	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091112	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091113	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091114	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091115	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091116	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091117	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091118	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091119	8	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091120	8	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091122	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091123	53	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091124	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091125	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091126	30	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091128	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091129	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091130	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091201	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091202	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091203	3	3	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091204	13	20	25
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091205	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091206	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091207	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091209	9999	9999	356
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091214	9999	9999	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091215	10	8	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091216	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091217	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091218	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091219	0	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091220	0	0	152

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091221	13	15	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091222	56	76	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091223	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091224	94	56	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091225	206	33	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091226	51	18	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091227	3	8	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091228	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091229	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091230	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20091231	23	25	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100101	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100102	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100103	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100104	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100105	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100106	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100107	43	64	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100108	8	38	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100109	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100110	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100111	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100112	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100113	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100114	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100115	0	0	254

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100116	0	0	254
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100118	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100119	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100120	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100121	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100122	13	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100123	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100124	109	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100125	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100126	5	13	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100127	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100128	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100129	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100130	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100131	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100201	0	0	178
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100202	46	51	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100203	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100204	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100205	8	5	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100206	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100207	0	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100208	25	41	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100209	79	91	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100210	10	25	305

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100211	0	0	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100212	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100213	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100214	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100215	20	36	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100216	5	10	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100217	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100218	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100219	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100220	15	25	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100221	0	0	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100222	0	0	305
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100223	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100224	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100225	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100226	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100227	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100228	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100301	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100302	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100303	0	0	279
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100304	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100305	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100306	0	0	254
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100307	15	0	229
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100308	0	0	203

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100309	0	0	203
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100310	56	0	152
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100311	41	0	102
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100312	107	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100313	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100314	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100315	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100316	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100317	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100318	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100319	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100320	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100321	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100323	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100324	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100325	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100326	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100327	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100328	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100330	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100331	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100401	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100402	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100403	84	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100404	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100405	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100406	9999	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100407	9999	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100408	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100409	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100410	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100412	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100413	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100414	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100415	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100416	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100417	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100418	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100419	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100420	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100421	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100422	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100423	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100424	13	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100425	122	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100426	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100427	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100428	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100429	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100430	196	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100502	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100503	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100504	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100505	28	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100506	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100507	15	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100508	193	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100510	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100516	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100517	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100518	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100519	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100520	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100521	36	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100522	5	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100524	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100525	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100526	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100527	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100528	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100530	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100604	213	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100606	122	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100607	5	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100610	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100611	69	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100614	41	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100615	559	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100616	41	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100617	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100618	152	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100619	8	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100620	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100621	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100622	617	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100623	508	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100625	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100626	91	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100627	236	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100629	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100630	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100701	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100702	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100703	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100704	13	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100705	94	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100706	56	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100707	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100708	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100709	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100710	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100711	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100712	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100713	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100714	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100715	216	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100716	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100717	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100718	234	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100719	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100720	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100721	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100722	231	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100724	307	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100725	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100726	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100727	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100729	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100730	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100731	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100801	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100803	9999	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100804	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100805	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100806	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100807	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100808	51	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100810	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100811	94	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100812	0	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100813	188	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100814	13	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100815	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100816	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100817	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100818	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100819	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100820	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100821	117	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100822	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100823	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100824	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100825	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100826	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100827	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100828	0	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100831	173	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100901	264	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100902	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100903	137	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100904	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100905	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100906	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100907	226	0	0

GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100908	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100909	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100910	25	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100911	61	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100913	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100914	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100915	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100916	737	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100917	5	0	0
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GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100919	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100920	3	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100921	20	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100922	10	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100923	739	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100924	406	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100925	5	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100926	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100927	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100928	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100929	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20100930	0	0	0
GHCND:USC00214563	LANESBORO	MN	291.1	43.7203	-91.9718	20101001	0	0	0