GEOLOGY

Physiographic Region

The South Grand Watershed lies within the Osage Plains Subdivision of the Central Lowland Physiographic Region. The Osage Plains Subdivision is comprised of gently rolling plains with scattered escarpments, low mounds and a low relative relief of 50-150 feet (MDNR 1986). The Osage Plains were not glaciated unlike much of the Central Lowlands Physiographic Region. Elevations within the South Grand Watershed range from a maximum of approximately 1,154 feet above mean sea level (msl) in the uplands to approximately 682 feet above msl in the lower portions of the watershed. Local relief data (local relief refers to the difference in elevation between two nearby points such as a valley and an adjoining ridge top) obtained from the Missouri Department of Conservation (MDC) Fisheries Research Fish Collection Database (1998a) indicates a minimum local relief of 43 feet and a maximum of 159 feet for MDC fish collection sites within the watershed.

Soils

The South Grand Watershed occurs primarily within the Cherokee Prairies Soil Region. Allgood and Persinger (1979) describe the Cherokee Prairies Region as

"… underlain with shale, sandstone, and limestone. Soils formed in residuum from shale are deep claypan soils. Soils formed from sandstone and limestone are more loamy, but in places on the ridges soils are shallow. Narrow bands of soils formed in deep loamy alluvium are adjacent to streams."

The soils of the Cherokee Prairies have been formed primarily beneath tall and mid-tall grasses with forest located on lower slopes and along streams (Allgood and Persinger 1979).

A smaller portion of the South Grand Watershed, primarily located in the upper portions of the watershed, occurs in the Deep Loess and Drift Soils Region. Allgood and Persinger (1979) describe the soils of this region:

"These soils are located in the northwest part of Missouri. The topography is mostly rolling to hilly, but some broad ridge tops are nearly level to undulating. Areas bordering major stream valleys have the steeper slopes. Nearly level areas of bottom land are adjacent to streams."

"Soils formed in a thin loess mantle over glacial till on the upper ridges while soils are developed in glacial till or loess and glacial till on the side slopes. Soils formed in silty and clayey alluvium on the flood plains of streams."

The soils of the Deep Loess and Drift Region were formed primarily beneath tall grasses on broad ridges with forest located on lower slopes and along streams (Allgood and Persinger 1979).

The following is a list of soil associations found in the South Grand Watershed:

<u>Barco</u>-<u>Barden</u>-<u>Collinsville</u>

Bardley-Goss-Doniphan

Bardley-Goss-Gasconade

Grundy-Polo-Summit

Hartwell-Kenoma-Deepwater

Hector-Bolivar-Mandeville

Kanima-Parsons-Barden

Macksburg-Marshall-Grundy

Osage-Verdigris-Lanton

Sampsel-Polo-Snead

Summit-Eram-Catoosa

Geology

The geology of the South Grand Watershed consists primarily of limestone and sandstone of Pennsylvanian age (Figure Ge01). Upland portions of the watershed are overlain by up to six feet of loess (MDNR 1992). Pennsylvanian aged clay also occurs in smaller, more isolated areas of the watershed. In the lower portion of the watershed, Mississippian limestone, limestone shale, and Ordovician dolomite are present (Figure Ge01). Coal deposites are present within the watershed and mining has occurred in the lower portion of the watershed. The presence of barriers to groundwater infiltration such as clay and shale within the Pennsylvanian bedrock as well as the limited storage capacity of the bedrock in the area have resulted in very few springs as well as poorly sustained stream base flows in dry periods (Vineyard and Feder 1974 and MDNR 1992).

Due to the nature of the geology of the watershed, the presence of karst features is very limited. Only 6 unnamed springs are known to occur within the watershed (MDNR 2000a). Five of these springs are concentrated in an area that appears to have been heavily strip-mined. The other spring occurs near Truman Reservoir. No flow data is currently available for these springs. In addition, no streams within the watershed are designated as “losing” in the Rules of Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality (MDNR 2001).

Stream Order, Mileage and Permanency

Stream order is “a hierarchy in which stream segments are arranged” (Judson et al. 1987)

The process of stream ordering is accomplished by examining maps and assigning orders to stream segments based on other streams which flow into them. Using the Strahler/Horton method of stream ordering: when two stream segments of the same order join, the new segment they create is the next highest order. For instance, a first order stream would be a stream in which no other streams intersect it. A second order stream is created by the joining of two first order streams. A third order stream is created by the joining of two second order streams and so on. If the main channel of a stream happens to be a lower order than that of the intersecting stream, the main channel assumes the higher order. If the main

channel is a higher order stream than the intersecting stream, it maintains the higher order (Figure Ge02).

Maximum orders for streams within the South Grand Watershed have been obtained from a 1:24,000 scale Geographic Information System (GIS) hydrography coverage. There are 186 third order and larger streams within the watershed (Table Ge01 and Figures Ge03-Ge07). These streams account for a total of approximately 1,552 stream miles or 28% of the total stream miles within the watershed. Of the 186 third order and larger streams within the watershed, 138 are third order (792.9 miles), 36 are fourth order (466.3 miles), 9 are fifth order (150.8 miles), and 1 is sixth order (76.0 miles). The South Grand is 66.4 miles long and becomes seventh order at the confluence of Big Cr.

Stream mileage per order for the South Grand Watershed has been obtained from a 1:24,000 scale (GIS) hydrography coverage. A total of 5,640 miles of streams occur within the watershed. Approximately 3,250 miles (59%) are first order segments; 1,123 miles (20%) are second order; 561 miles (10%) are third order; 307 miles (6%) are fourth order; 140 miles (3%) are fifth order; 67 miles (1%) are sixth order; and 51 miles (<1%) are seventh order. Table Ge02 lists length by order for fourth order and larger streams within the South Grand Watershed. Lengths were only for mainstems of streams.

Permanent stream mileage data obtained from a 1:24,000 scale GIS hydrography coverage for the South Grand Watershed indicates that approximately 947 stream miles (17%) within the watershed have permanent water. This equals approximately 1 mile of permanent stream for every 2.2 square miles of drainage area. Estimated length of permanent flow for third order and larger streams is given in Table Ge01.

Drainage Area

Total drainage area of the South Grand Watershed is 2,046 square miles or 1,309,440 acres. The drainage area of the watershed in Missouri is 2,016 square miles or 1,290,240 acres. Drainage area for fourth order and larger streams was determined through analysis of 30 meter resolution digital elevation model of the watershed (Table Ge01 and Figure Ge08a). Fourth order and fifth order streams having the largest drainage areas are South Fork Creek (64 sq. miles) and Deepwater Creek (238 sq. miles) respectively. Big Creek, the only sixth order stream in the watershed, has a drainage area of 538 square miles. The South Grand River a seventh order stream has a drainage area of 1,329 square miles. This does not include tributaries drain flowing which today flow directly into Truman Reservoir. These have a combined drainage area of 717 square miles (excluding the South Grand) and include the drainages of Barker Creek, Tebo Creek, Little Otter Creek, Big Otter Creek, Cooper Creek, and Deepwater Creek.

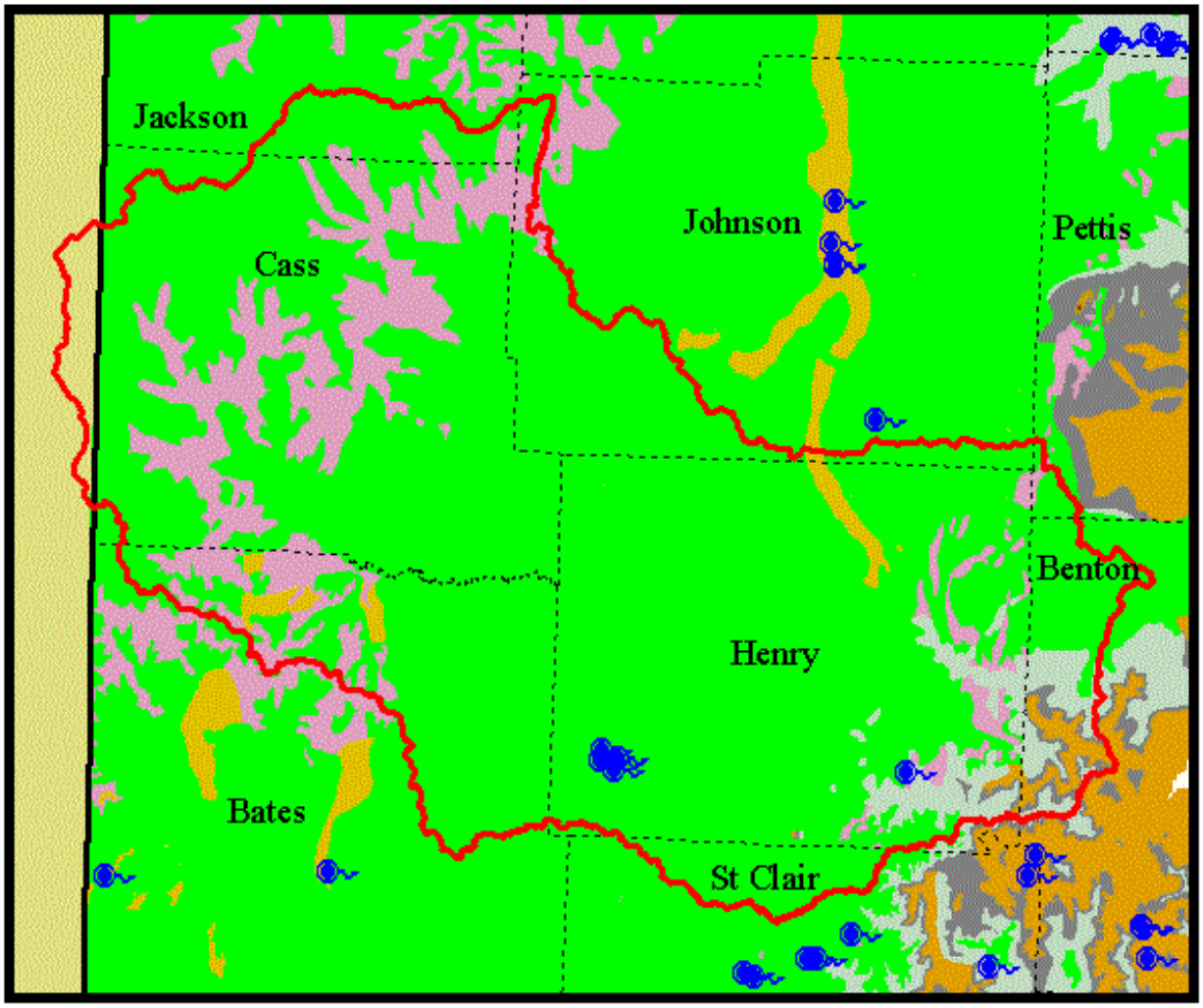
In order to facilitate analysis of various watershed characteristics within this document, the watershed was divided based on eleven digit hydrologic units (Figure Ge08b). The largest of these units is the Middle South Grand Unit which drains approximately 418 square miles (267,449 acres).

Stream Channel Gradient

Channel gradient was determined for all fourth order and larger streams within the South Grand Watershed using data digitized from USGS 7.5 minute topographic maps. Composite gradient graphs were constructed for all fifth order and larger streams within the watershed (Figures Ge09-23). Average gradients for fourth order and larger streams within the watershed range from 1.9 feet per mile to 39.4 feet per mile. The South Grand River has an average gradient of 1.9 feet/mile.

Figure Ge01. **South Grand River Watershed**

Geology



8 0 8 Miles

Legend

Geology*

- Mississippian Limestone
- Mississippian Limestone/Shale
- Ordovician Sandstone
- Ordovician Dolomite
- Pennsylvanian Clay
- Pennsylvanian Limestone
- Pennsylvanian Sandstone

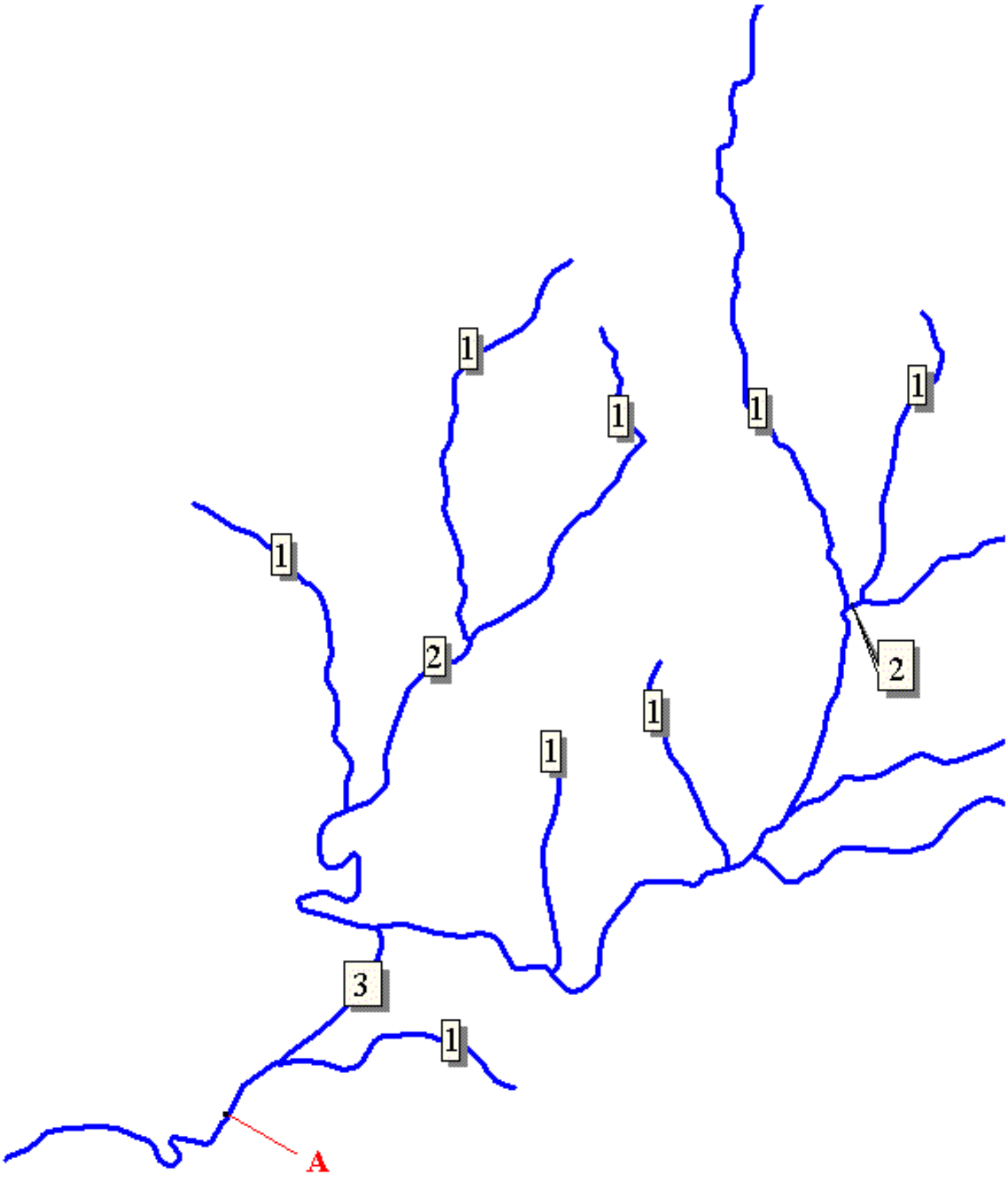
- Watershed Boundary
- Spring #
- County

#Based on MDNR 2000a.

*Based on digitized version of 1979 1:500,000 scale state geologic map (Missouri Spatial Data Information Service-MSDIS 1998).

N

Figure Ge02. Example of Stream Order

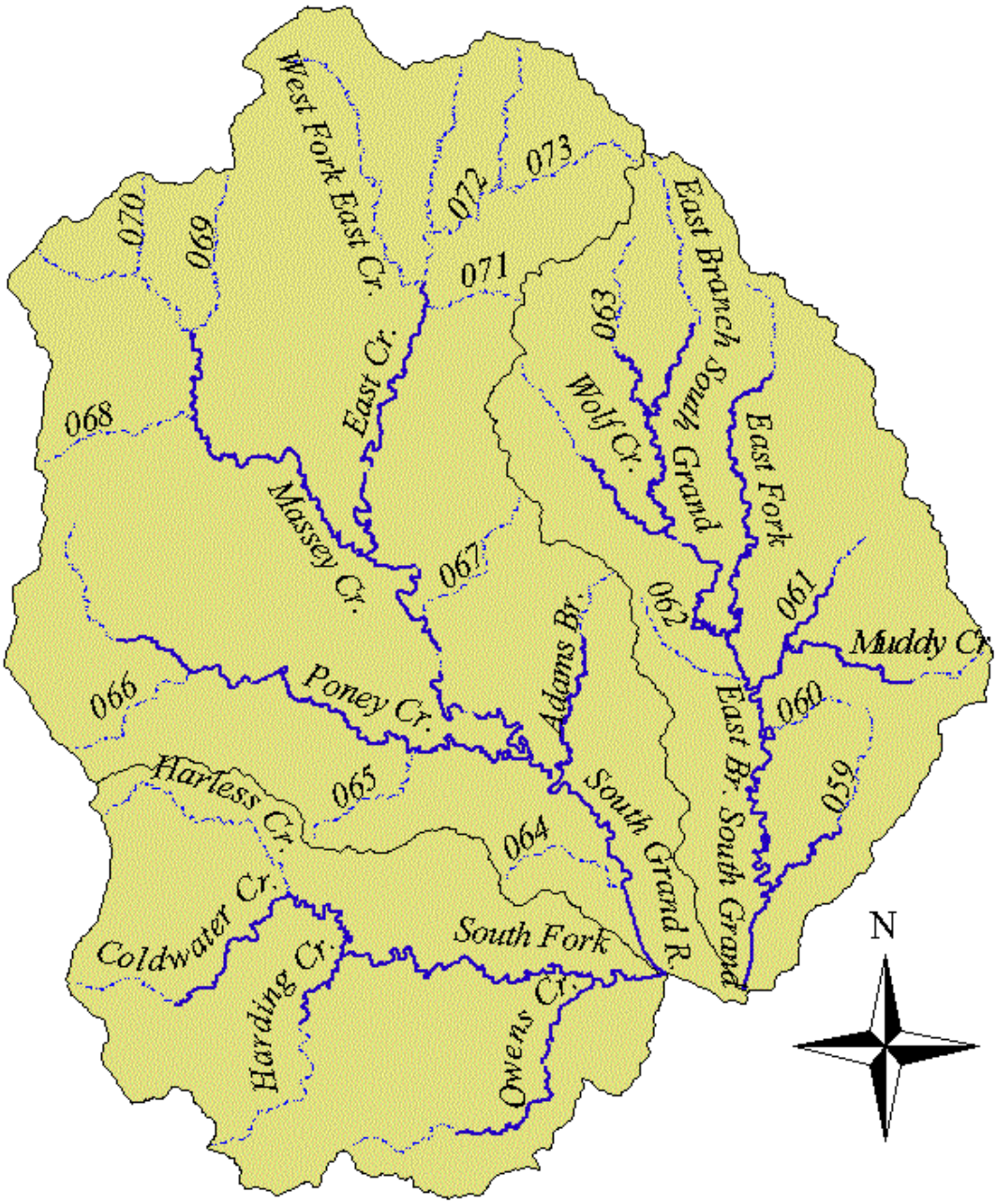


The stream order at point "A" is 3.

Figure Ge03.

South Grand River Watershed

Third Order and Larger Streams



2 0 2 Miles

Legend

Permanent Stream*

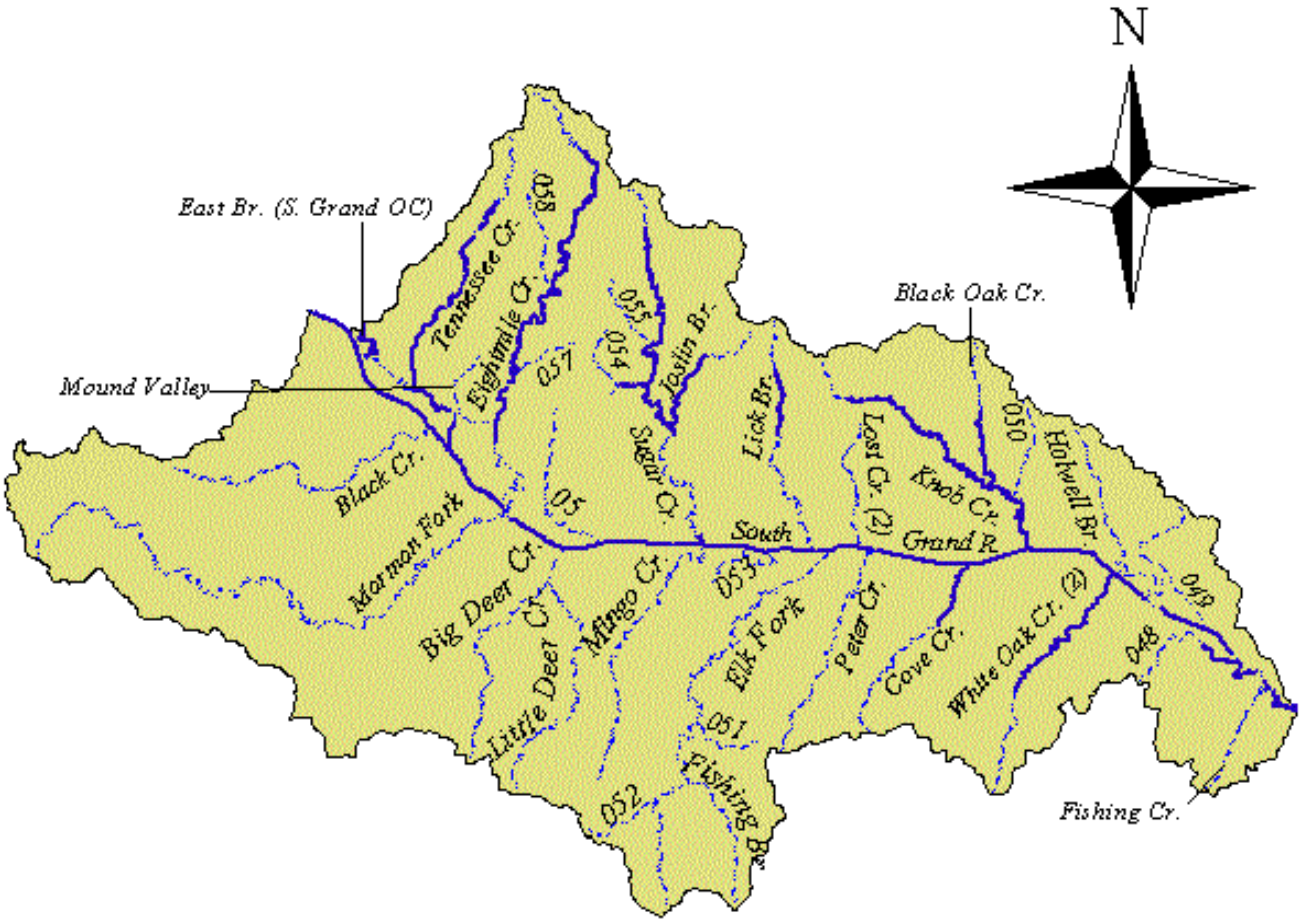
Intermittent Stream*

*Based on 1:24,000 GIS State Hydrography Layer.

Key Map

Figure Ge04.

South Grand River Watershed
Third Order and Larger Streams



4 0 4 Miles

Legend

Permanent Stream*

Intermittent Stream*

*Based on 1:24,000 GIS State Hydrography Layer.

Key Map

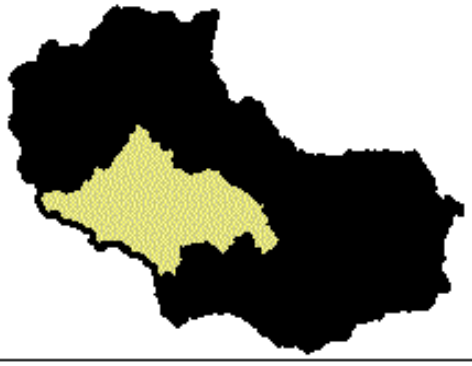
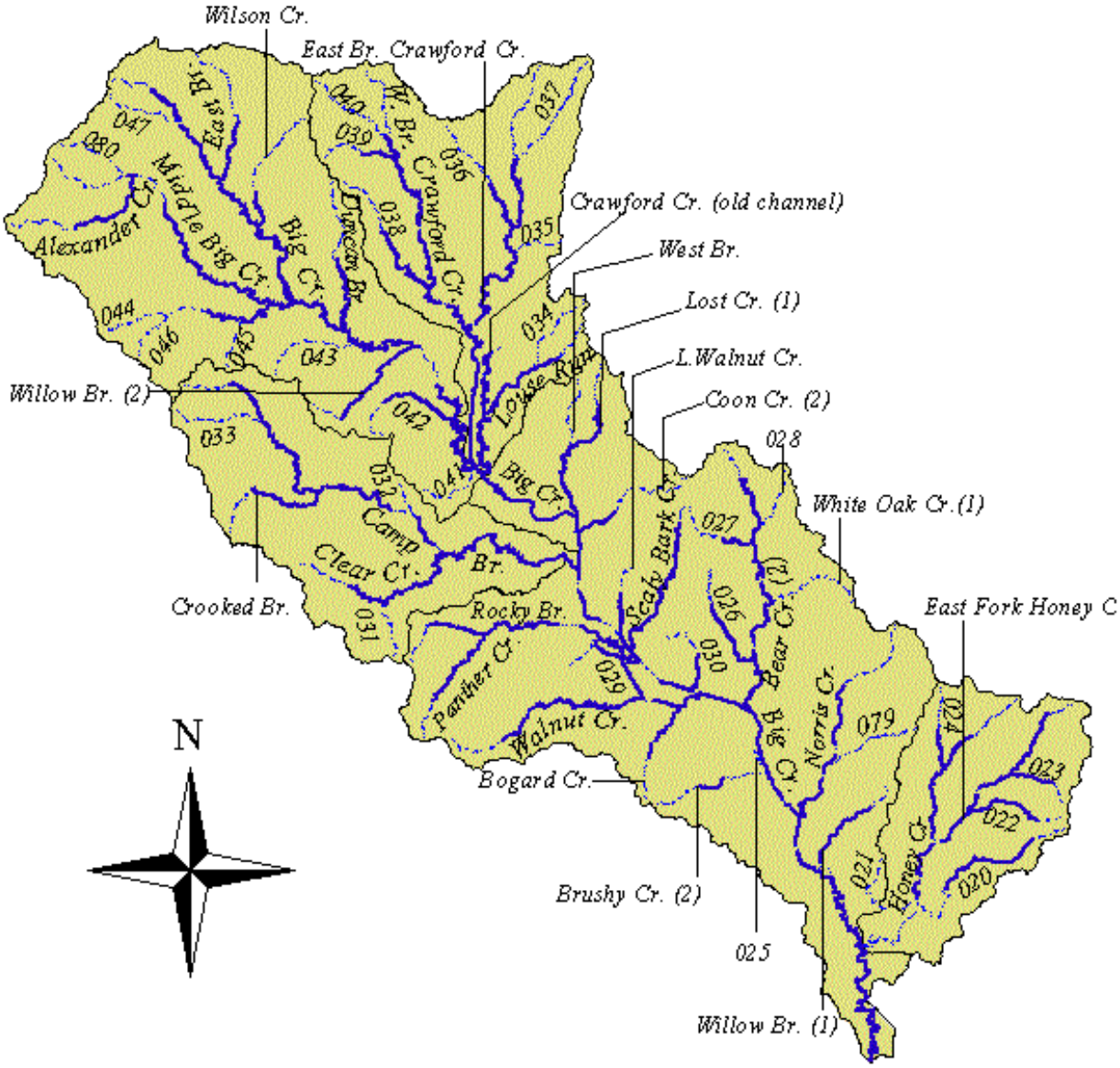


Figure Ge05.

South Grand River Watershed

Third Order and Larger Streams



4 0 4 Miles

Legend

Permanent Stream*

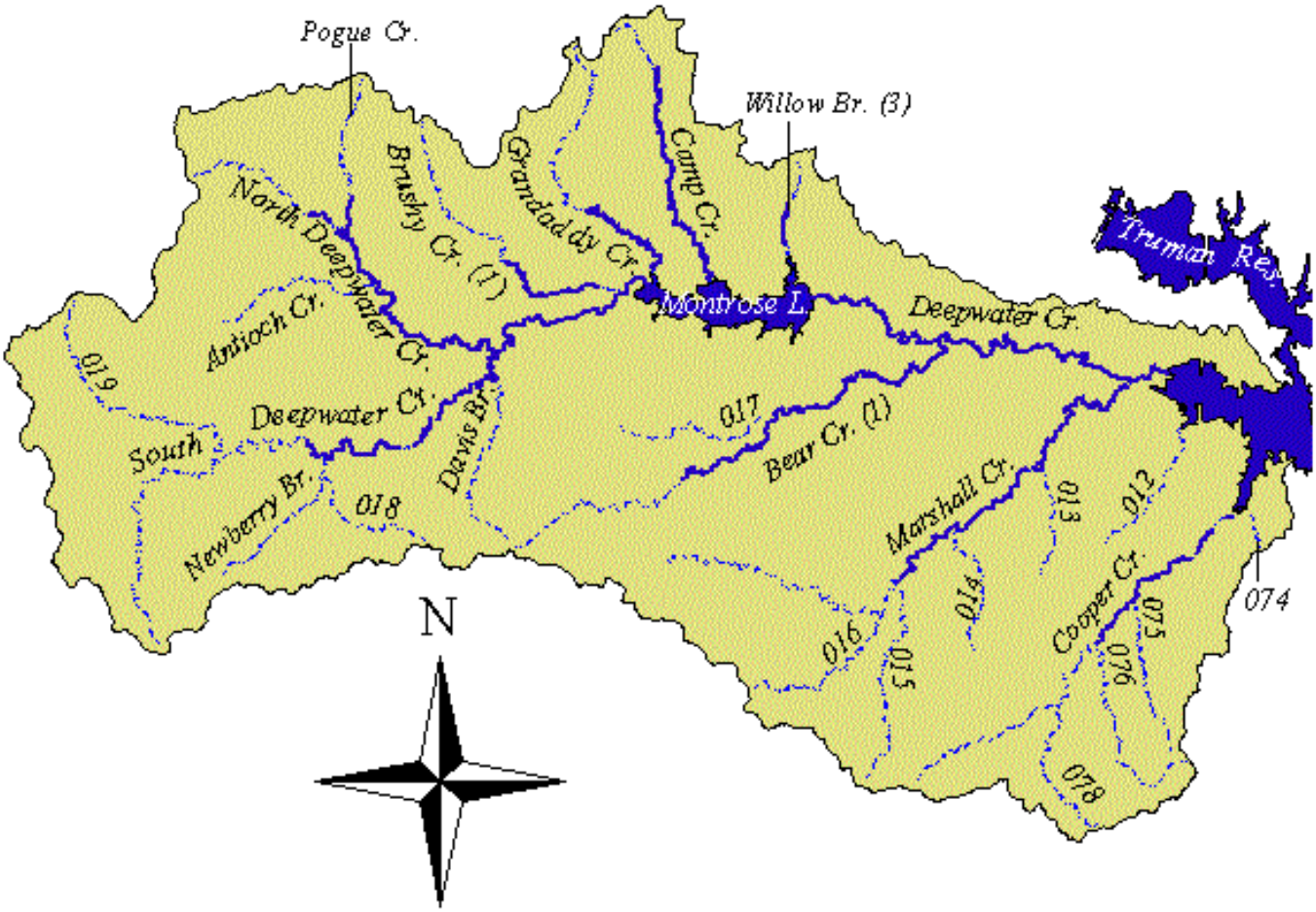
Intermittent Stream*

*Based on 1:24,000 GIS State Hydrography Layer.

Key Map

Figure Ge06.

South Grand River Watershed
Third Order and Larger Streams



3 0 3 Miles

Legend

Permanent Stream*

Intermittent Stream*

*Based on 1:24,000 GIS State Hydrography Layer.

Key Map

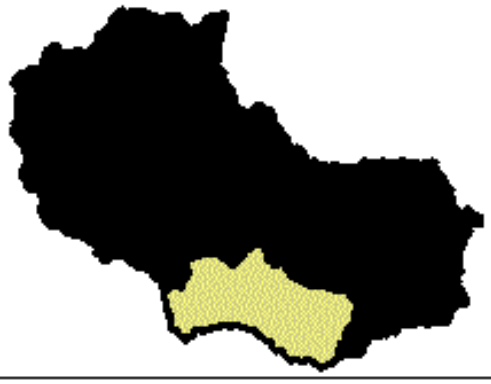
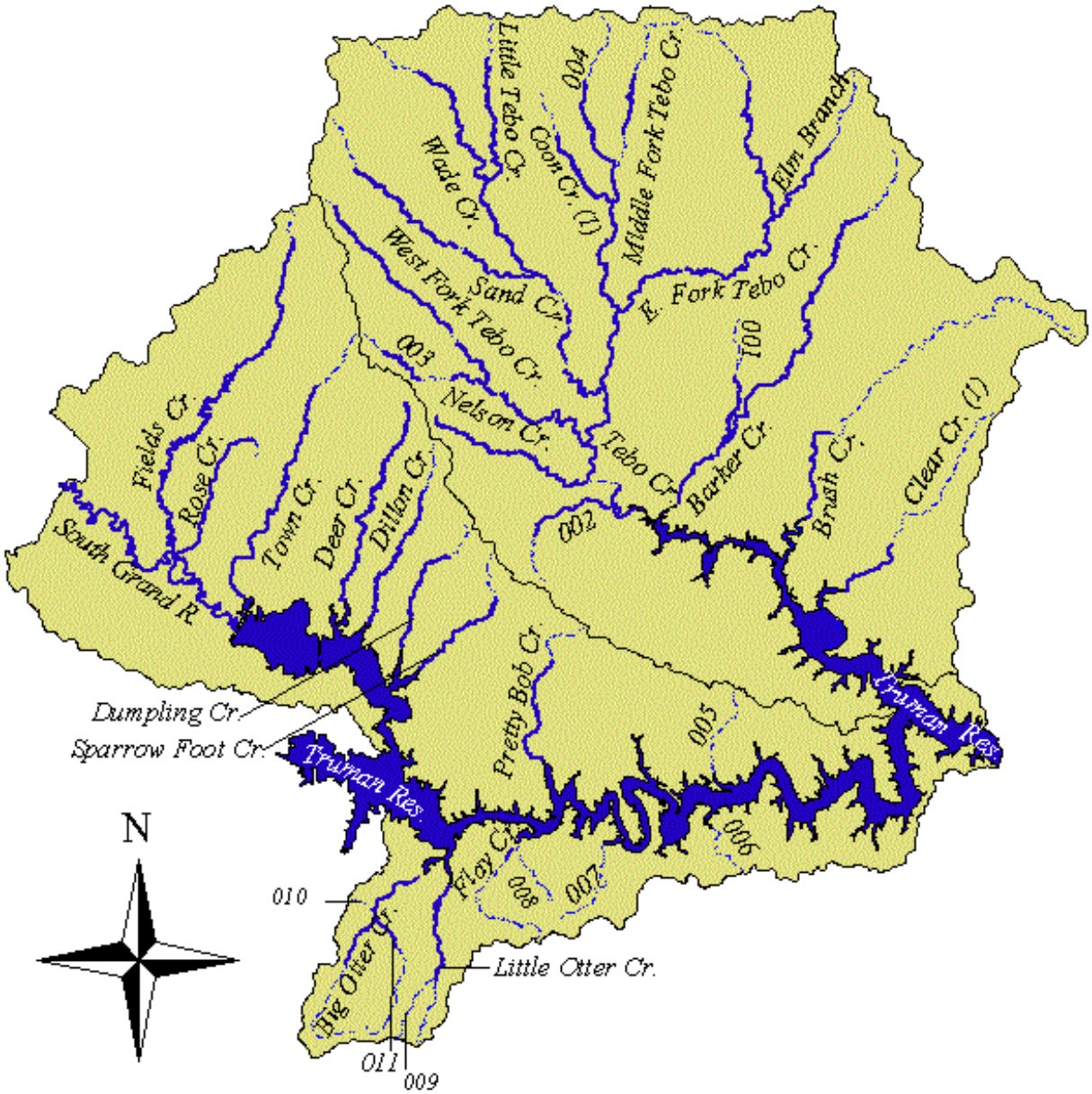


Figure Ge07.

South Grand River Watershed

Third Order and Larger Streams



4 0 4 Miles

Legend

Permanent Stream*

Intermittent Stream*

*Based on 1:24,000 GIS State Hydrography Layer.

Key Map

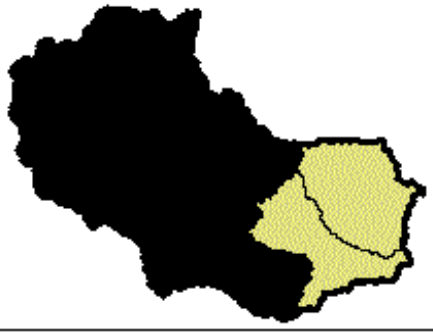


Figure Ge08.

South Grand River Watershed
Subwatersheds and Hydrologic Units

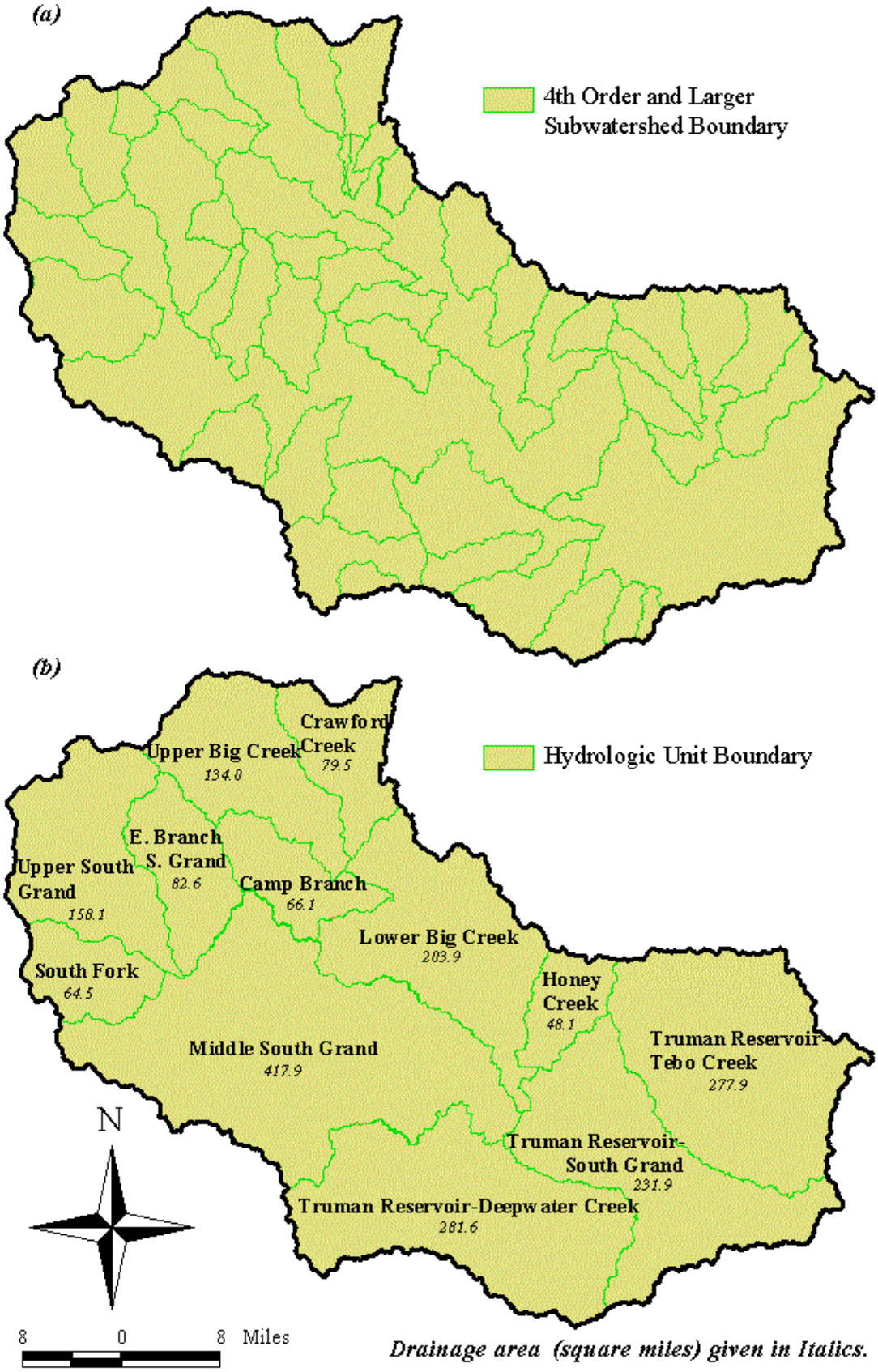


Figure Ge09

Gradient Plot for Tributaries of Upper Truman Reservoir

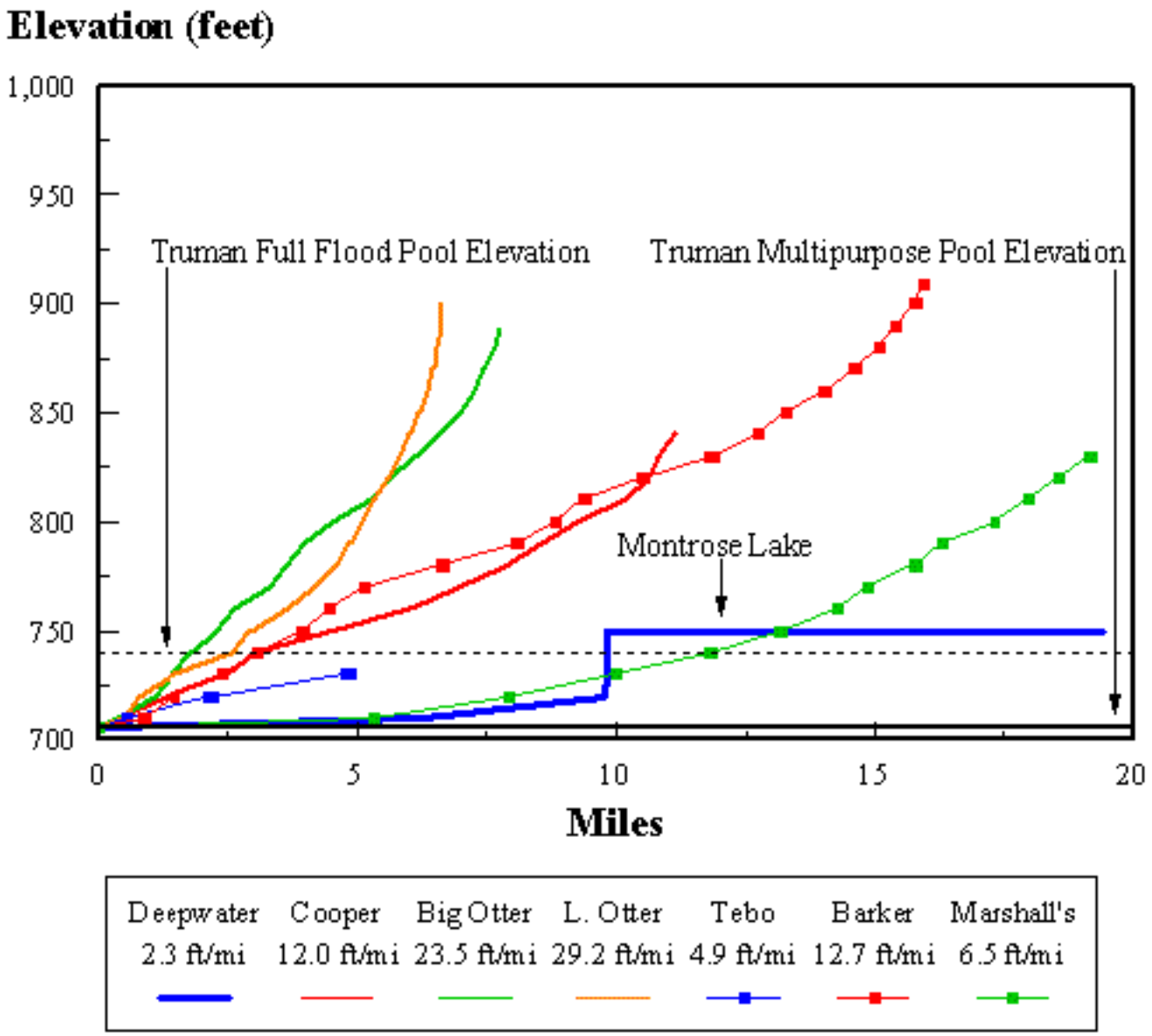


Figure Ge10.

Gradient Plot for Tebo Creek
&
Major Tributaries

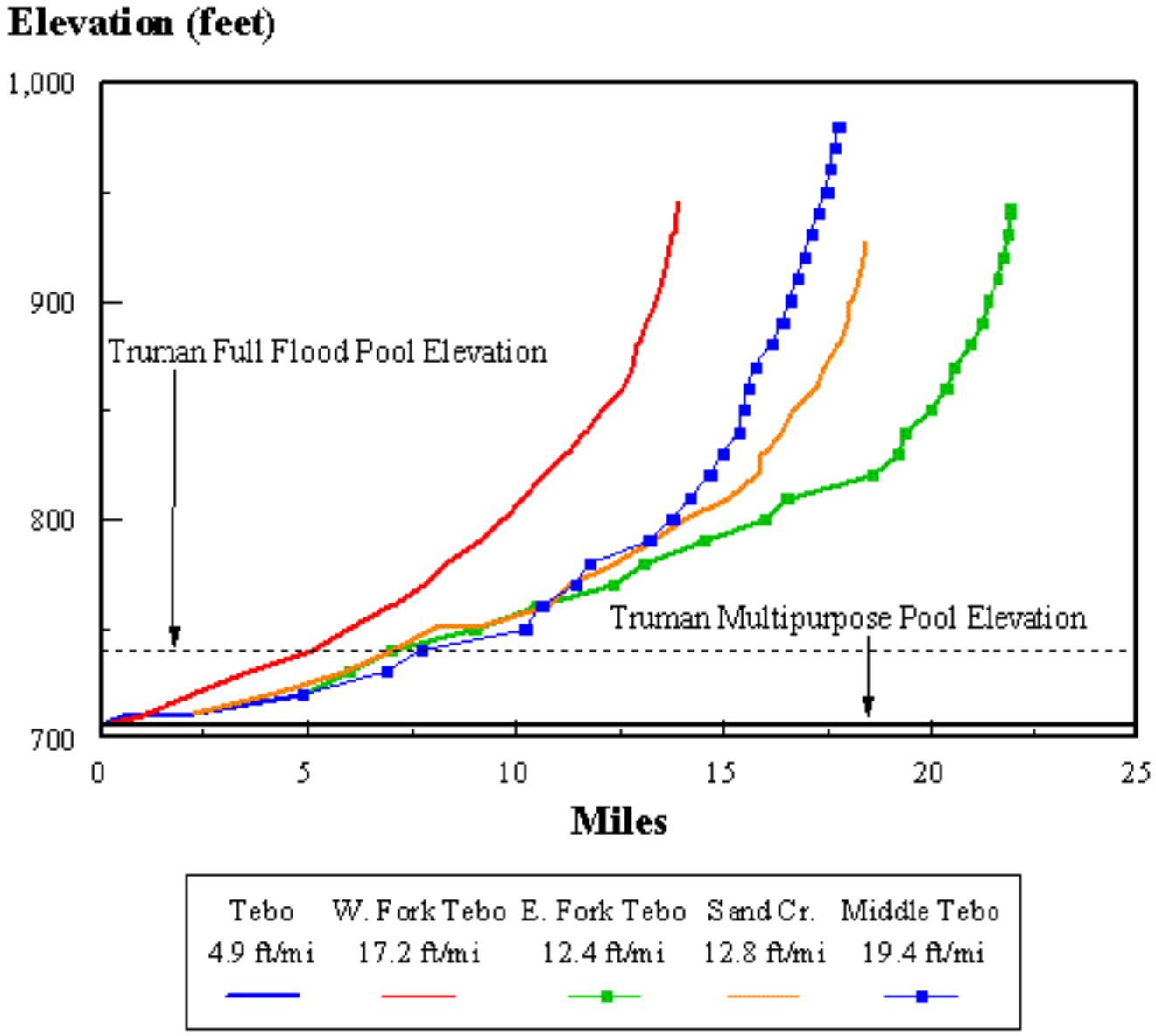


Figure Ge11.

Gradient Plot for Sand Creek
&
Major Tributary

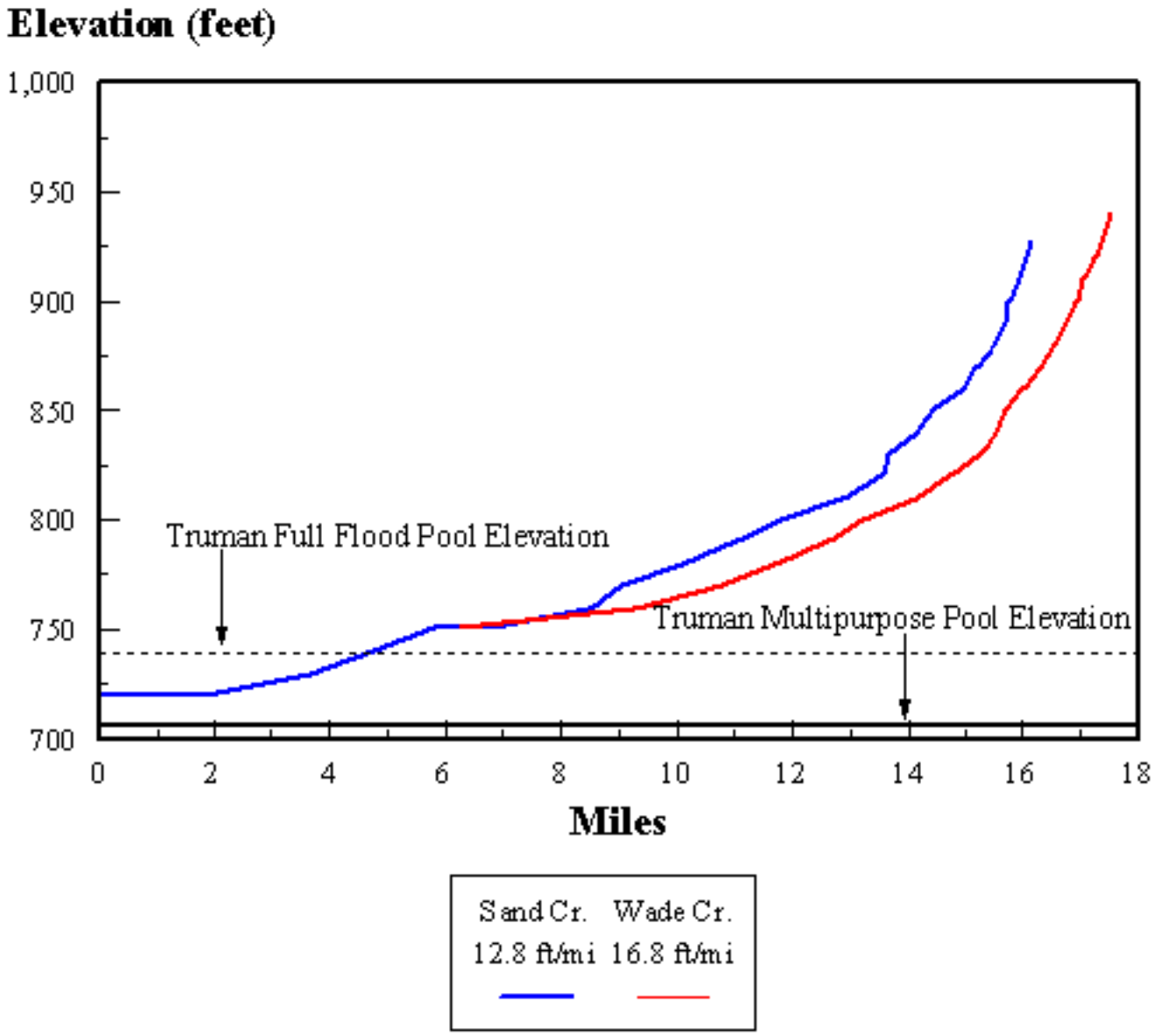


Figure Ge12.

Gradient Plot for Deepwater Creek
&
Major Tributaries

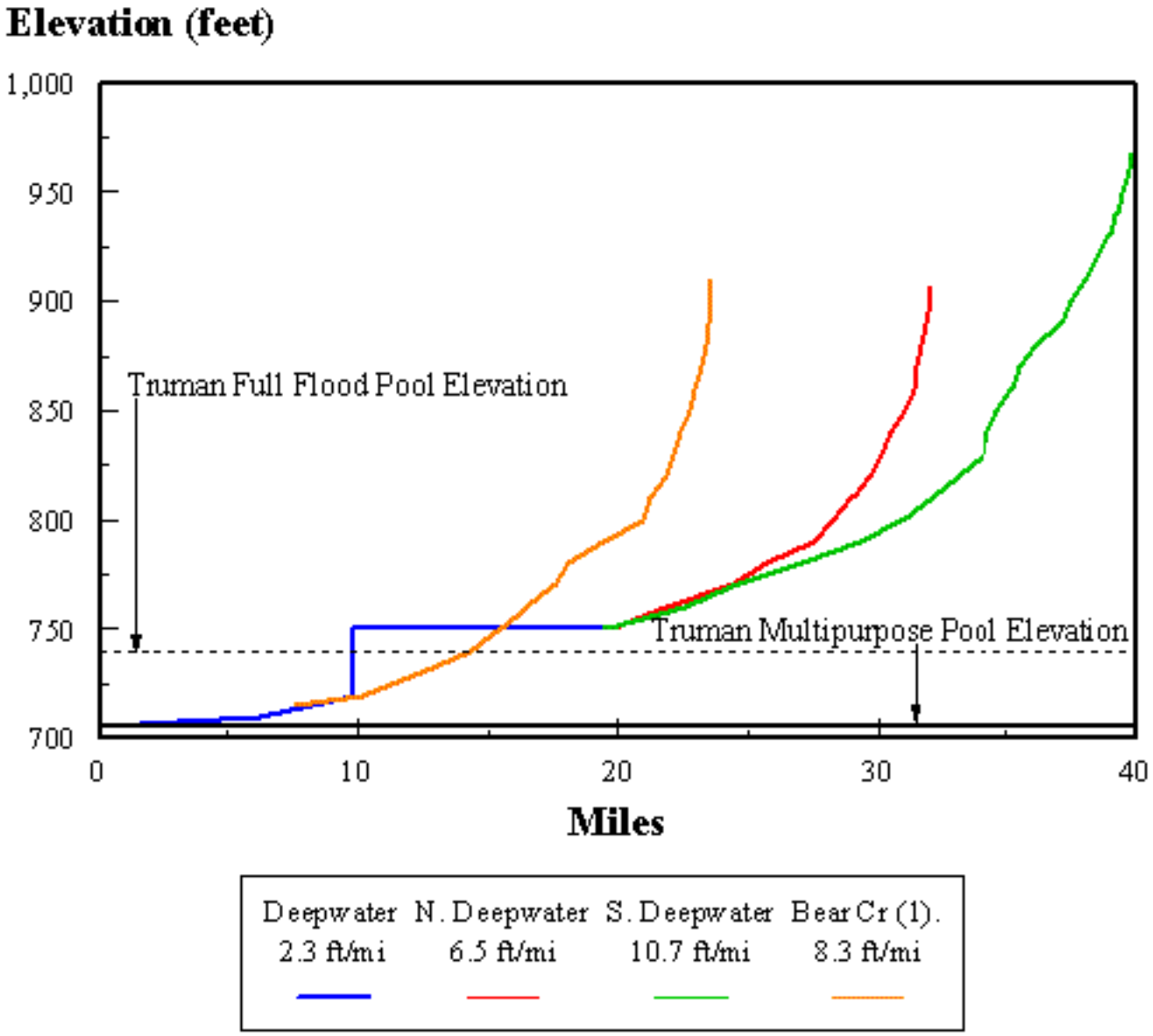


Figure Ge13.

Gradient Plot for South Deepwater Creek

&

Major Tributary

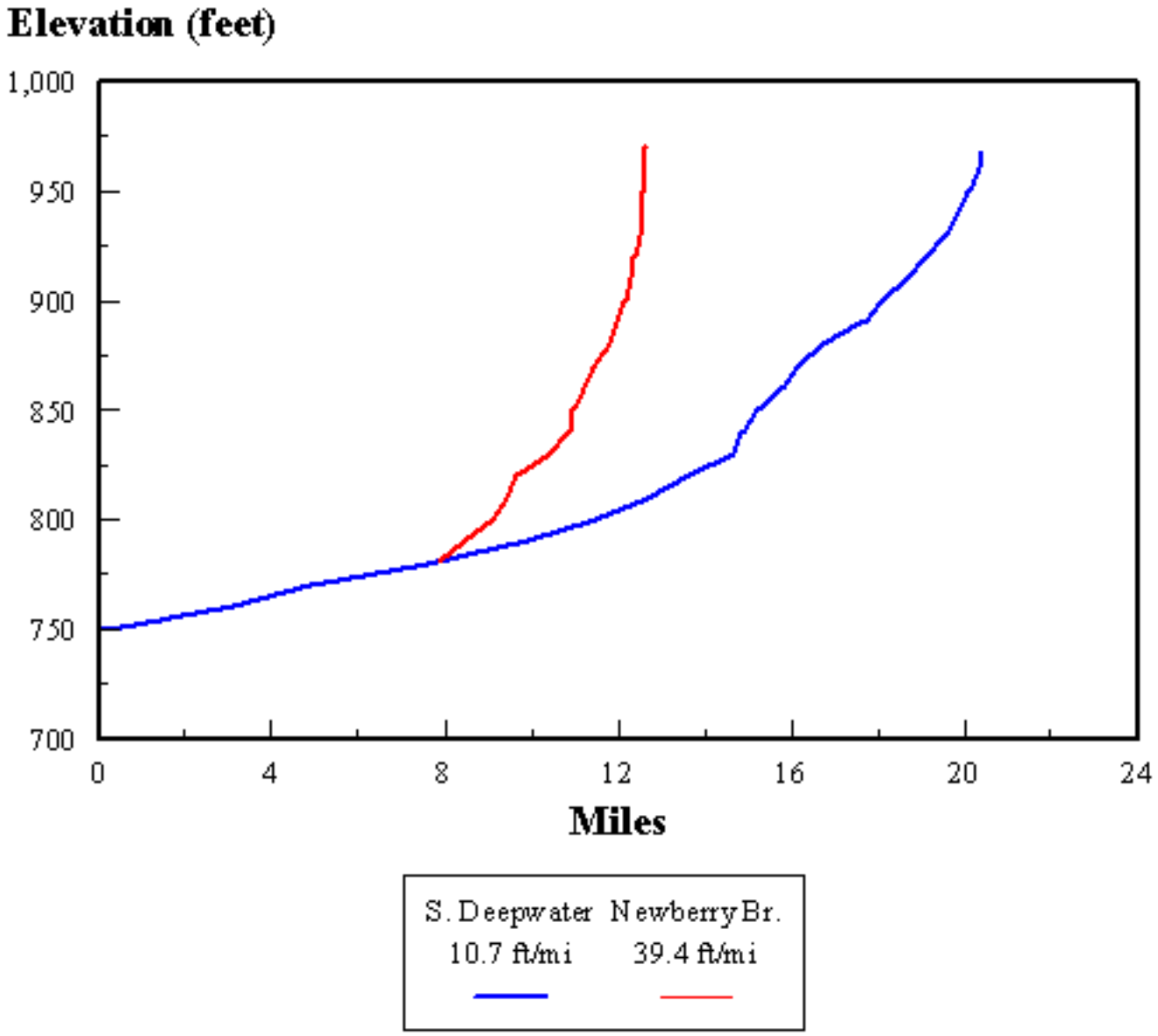
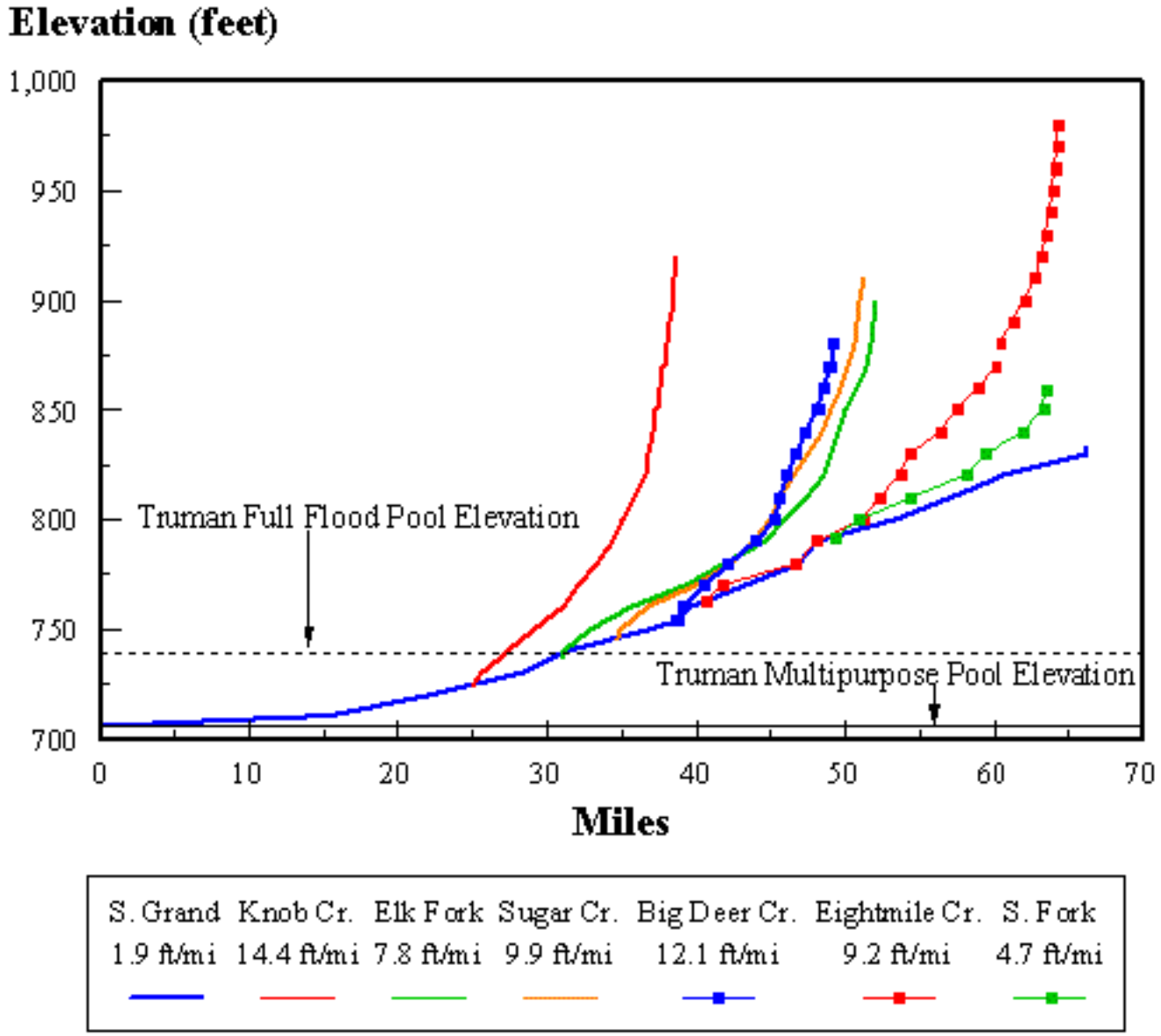


Figure Ge14.

Gradient Plot for Lower South Grand

&

Major Tributaries



FigureGe15.

Gradient Plot for Upper South Grand
&
Major Tributaries

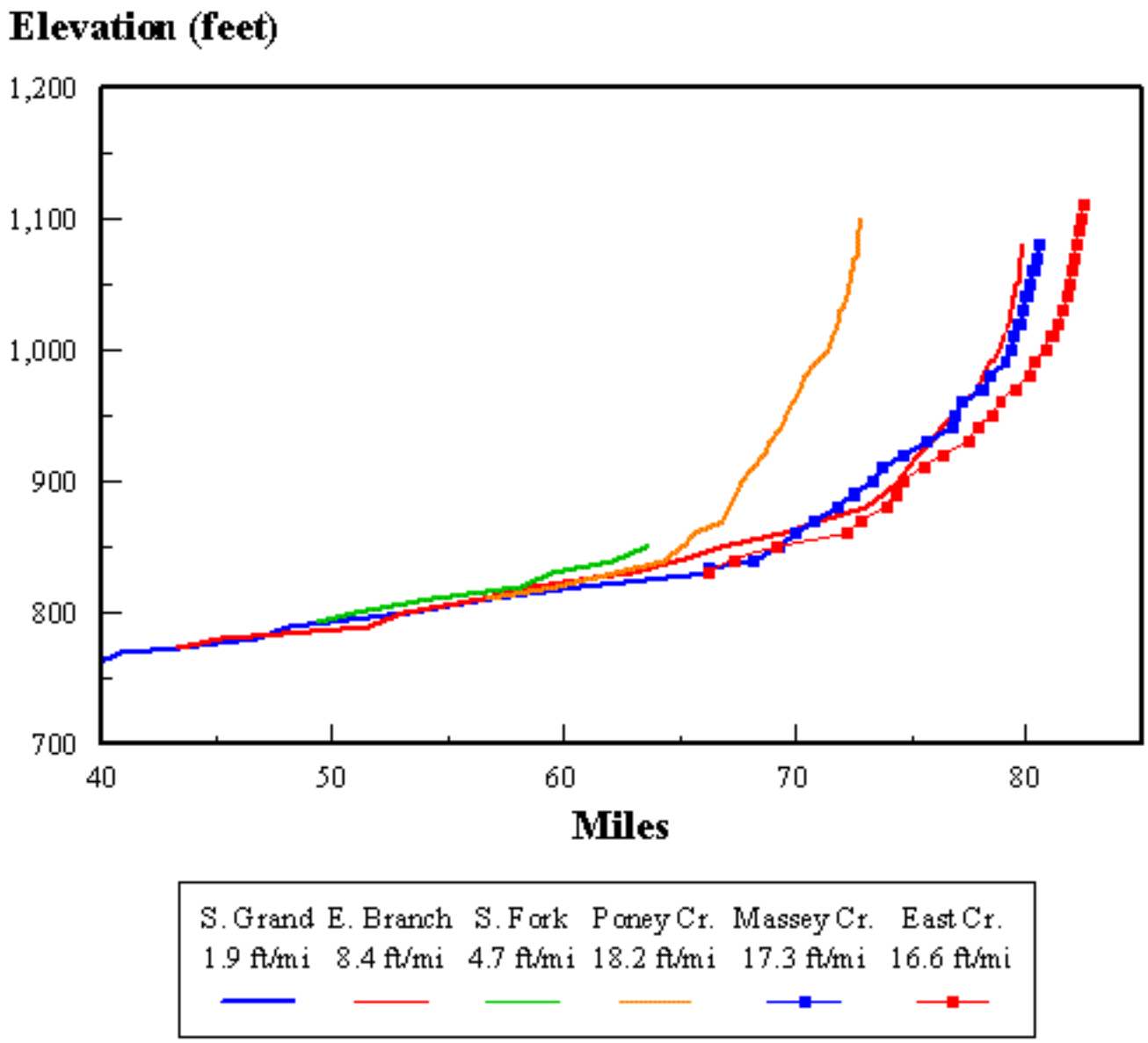


Figure Ge16.

Gradient Plot for Big Creek

&

Major Tributaries

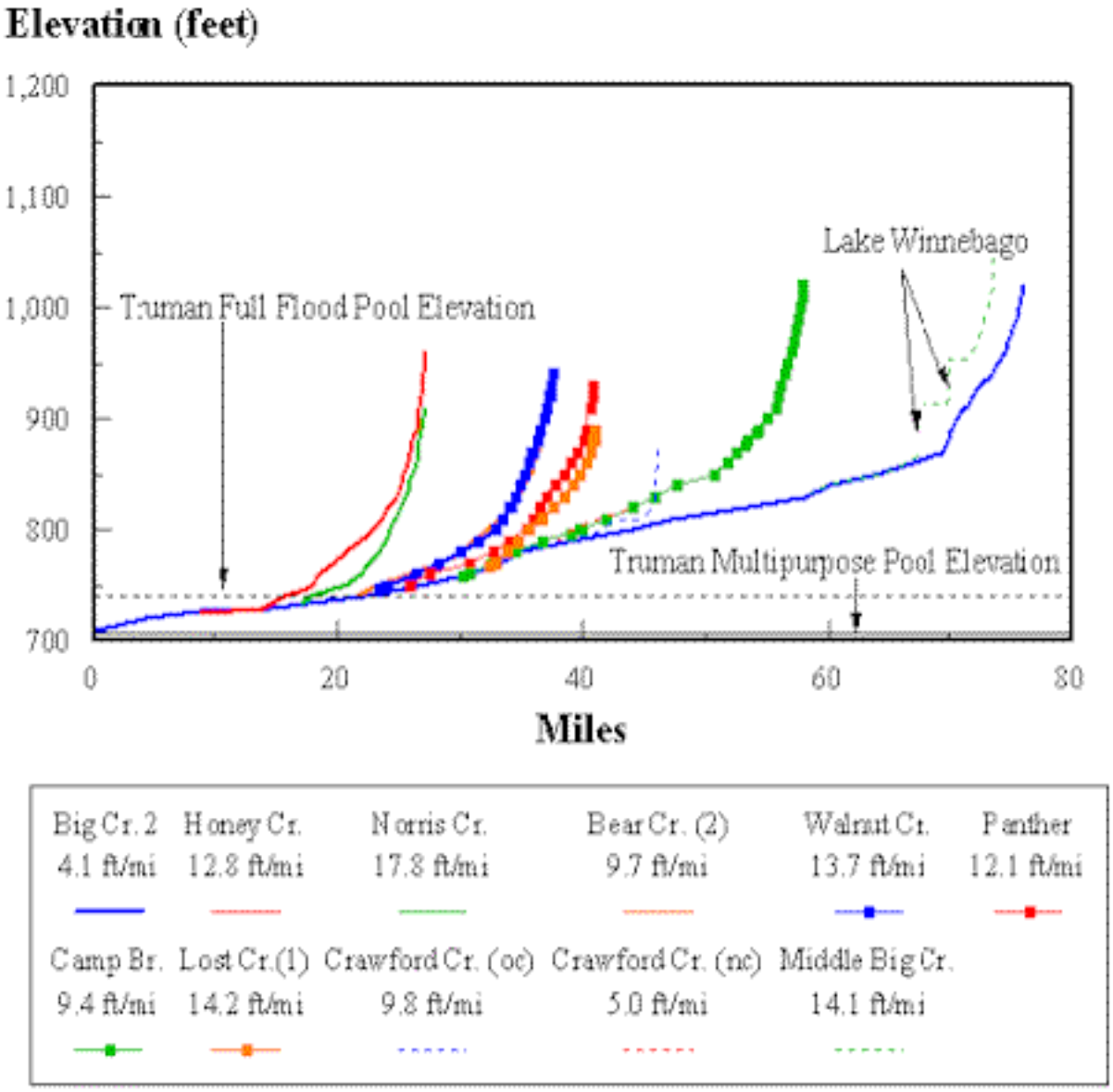


Figure Ge17.

Gradient Plot for Honey Creek
&
Major Tributary

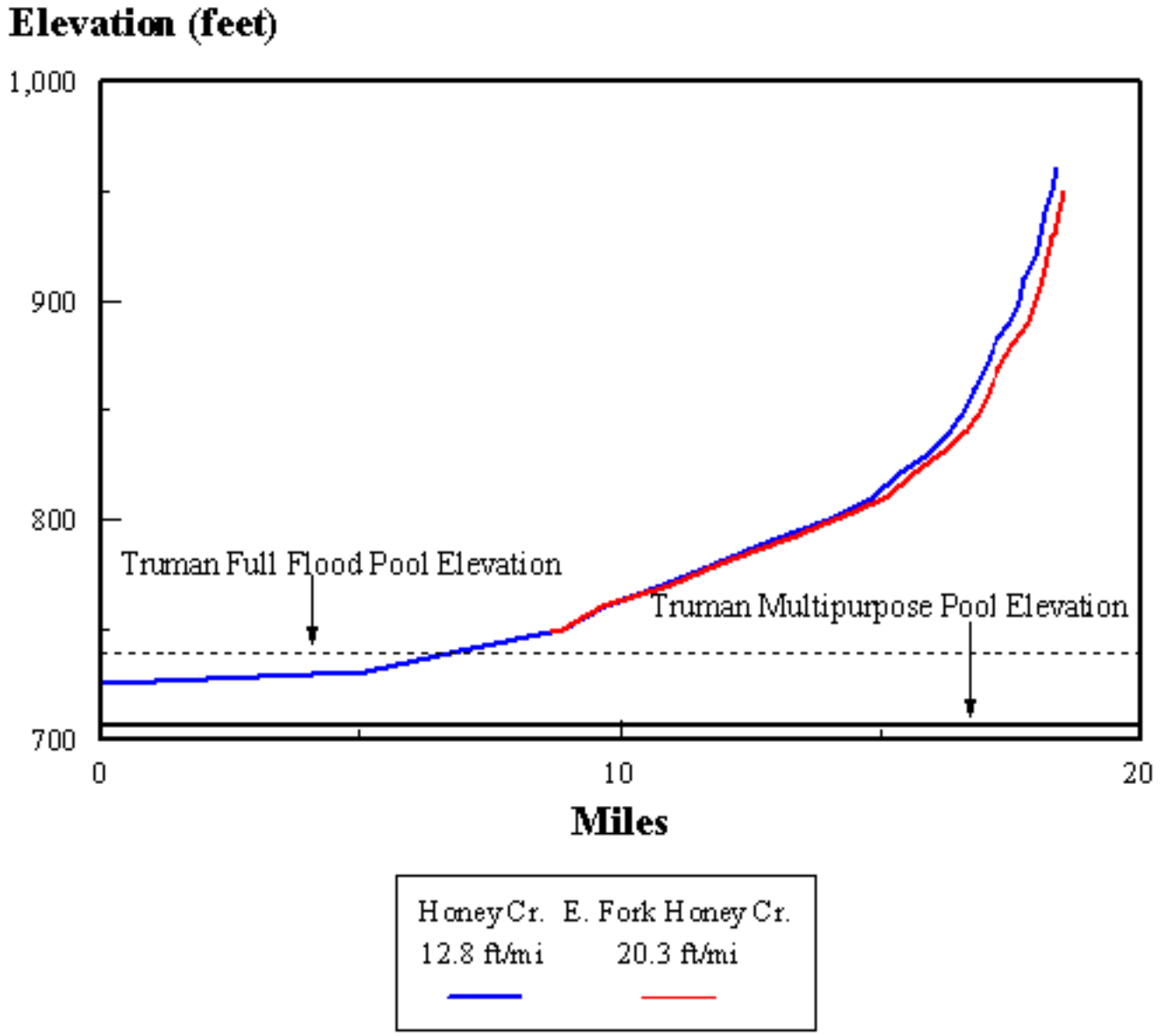


Figure Ge18.

Gradient Plot for Camp Branch
&
Major Tributary

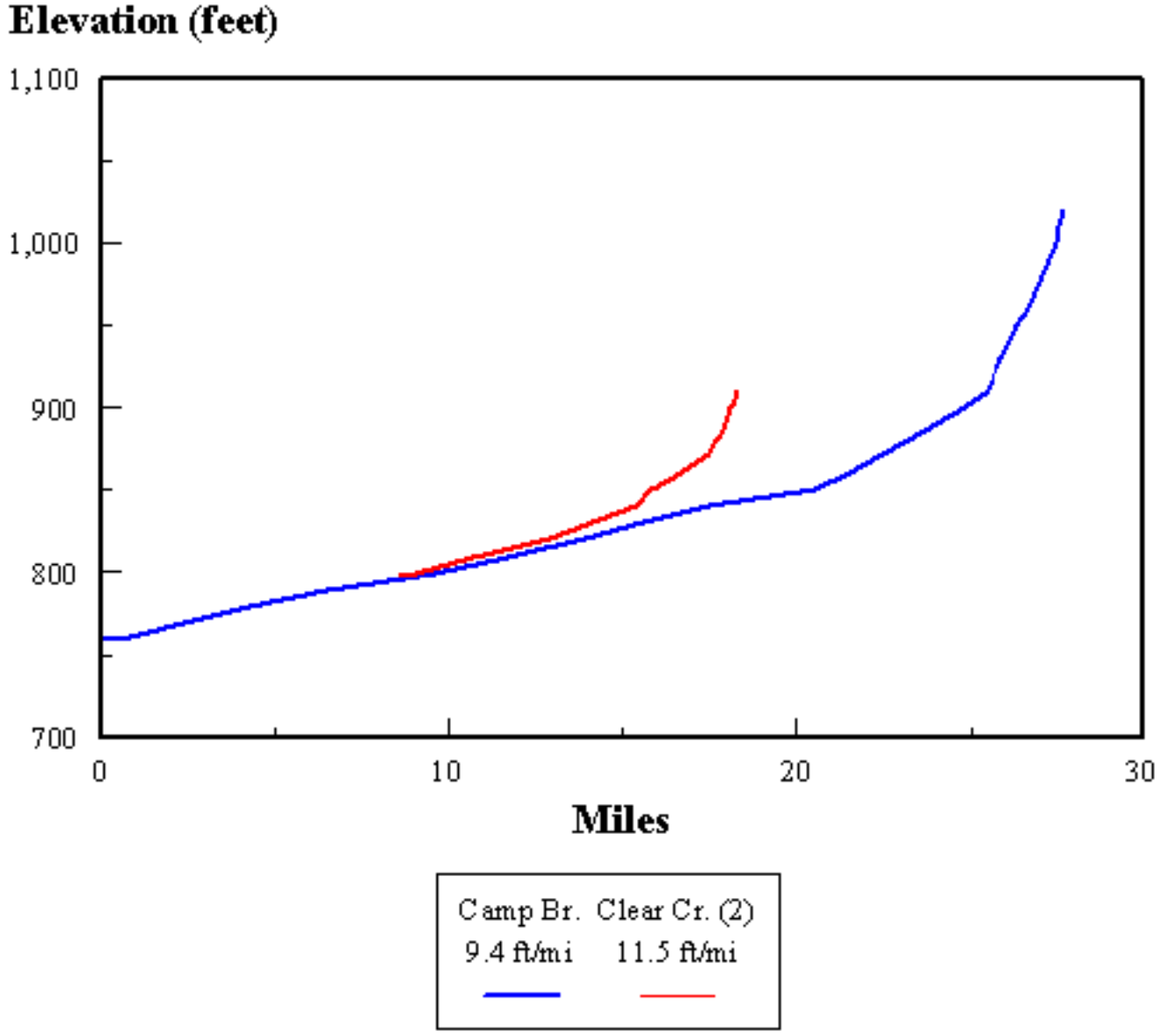


Figure Ge19.

Gradient Plot for Crawford Creek

(old channel)
&
Major Tributary

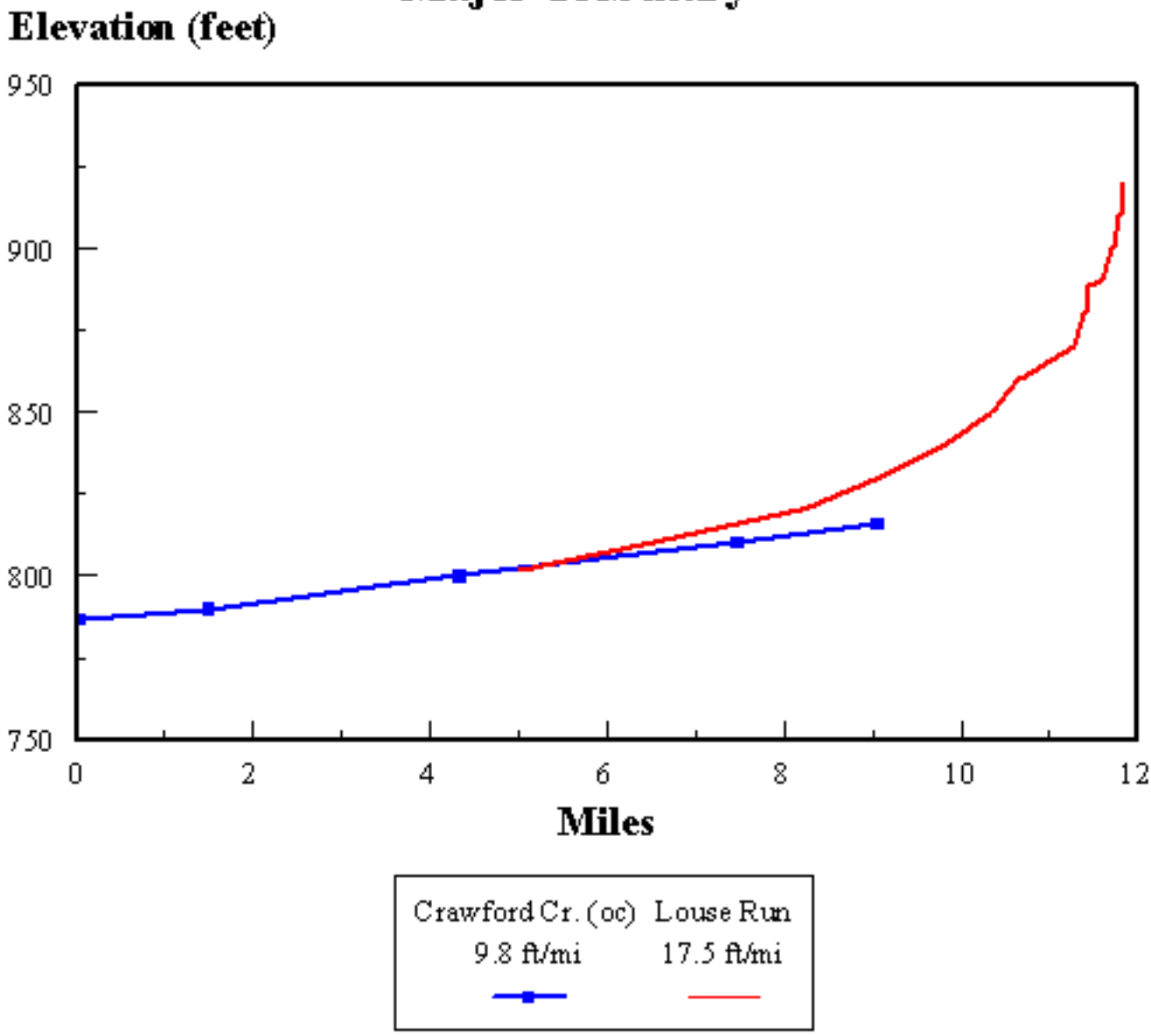


Figure Ge2C.

Gradient Plot for Crawford Creek

(new channel)

&

Major Tributaries

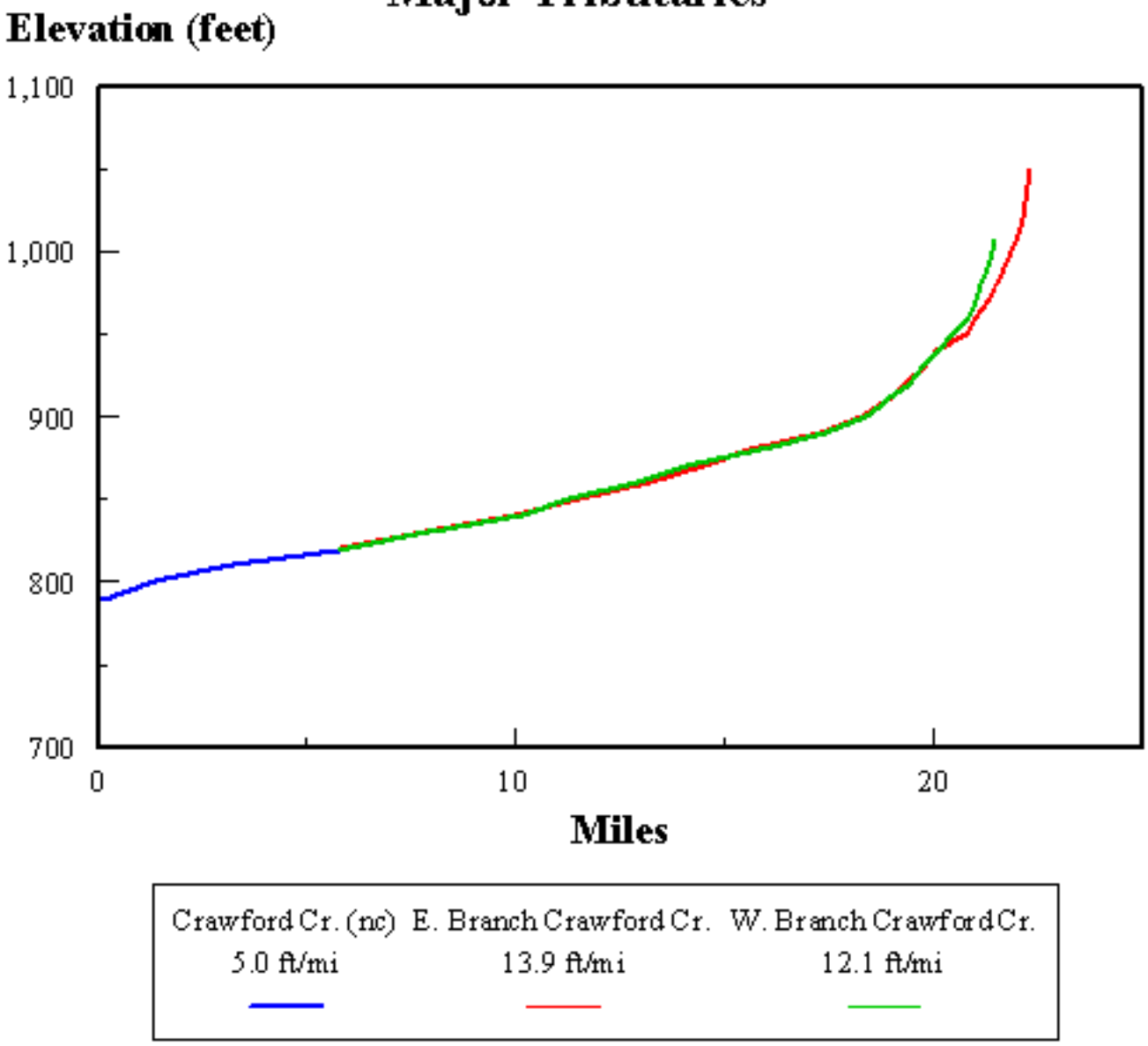


Figure Ge21.

Gradient Plot for Middle Big Creek
&
Major Tributary

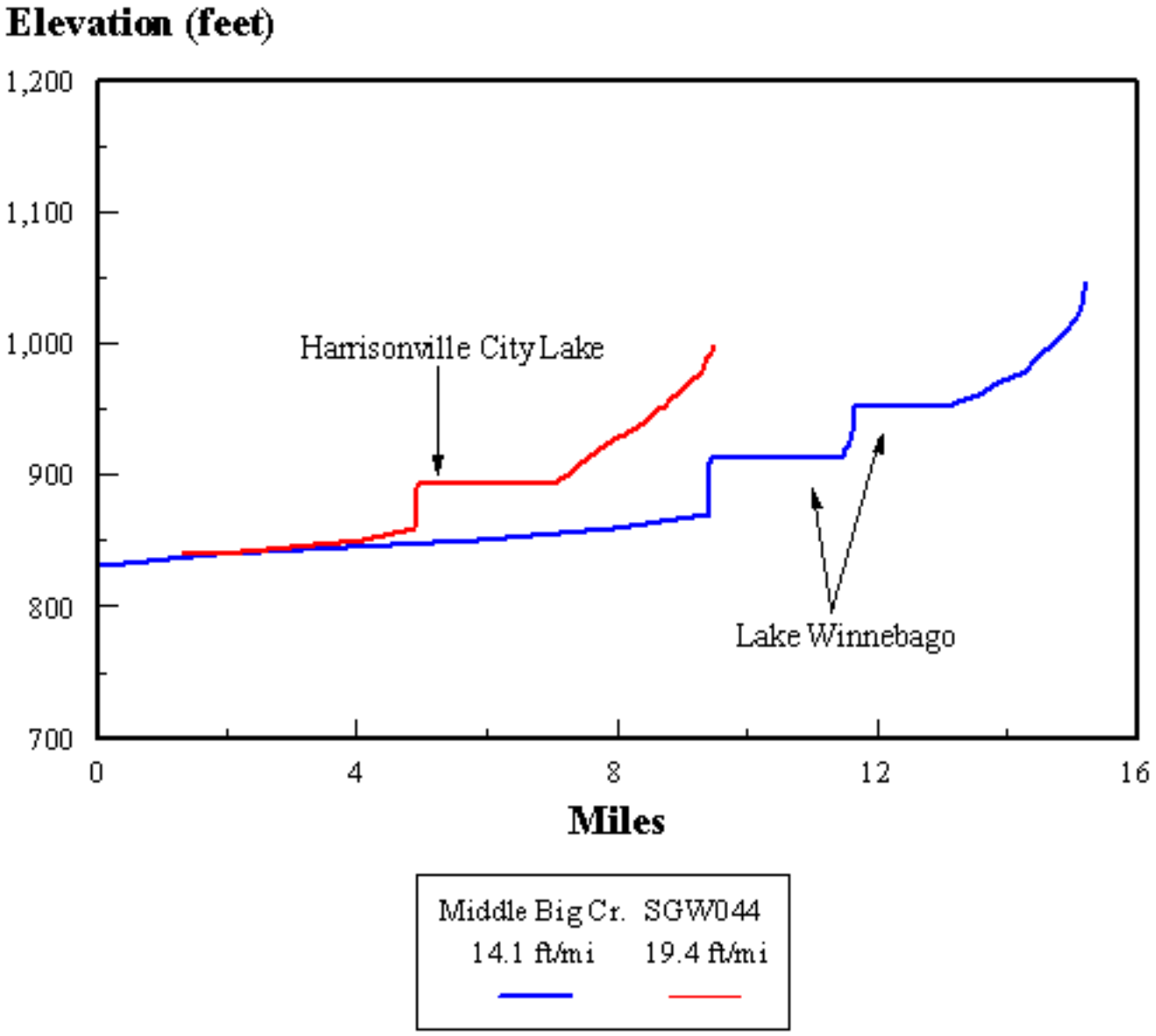


Figure Ge22.

Gradient Plot for East Branch South Grand & Major Tributary

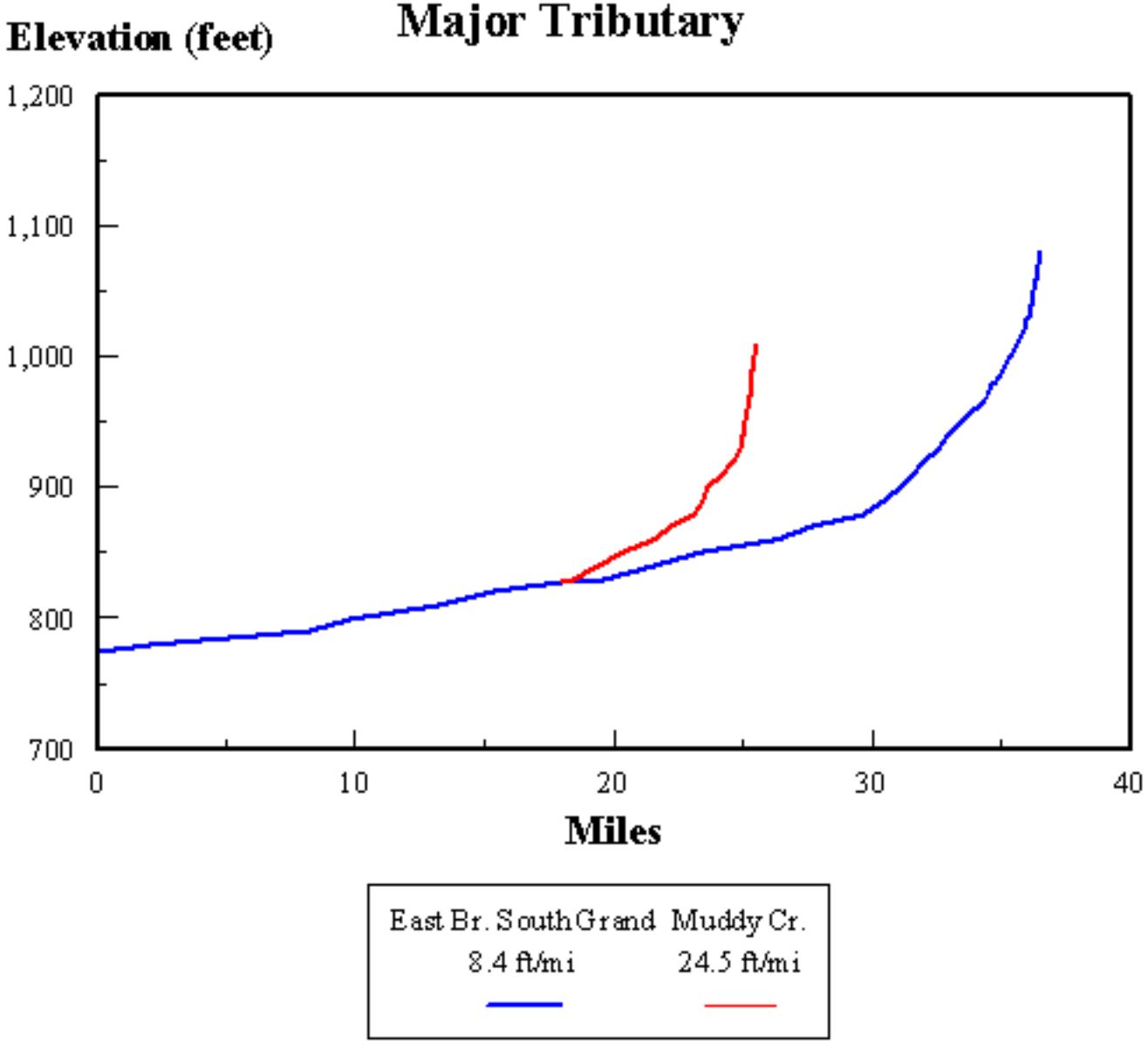


Figure Ge23.

Gradient Plot for Big Creek
&
Major Tributaries

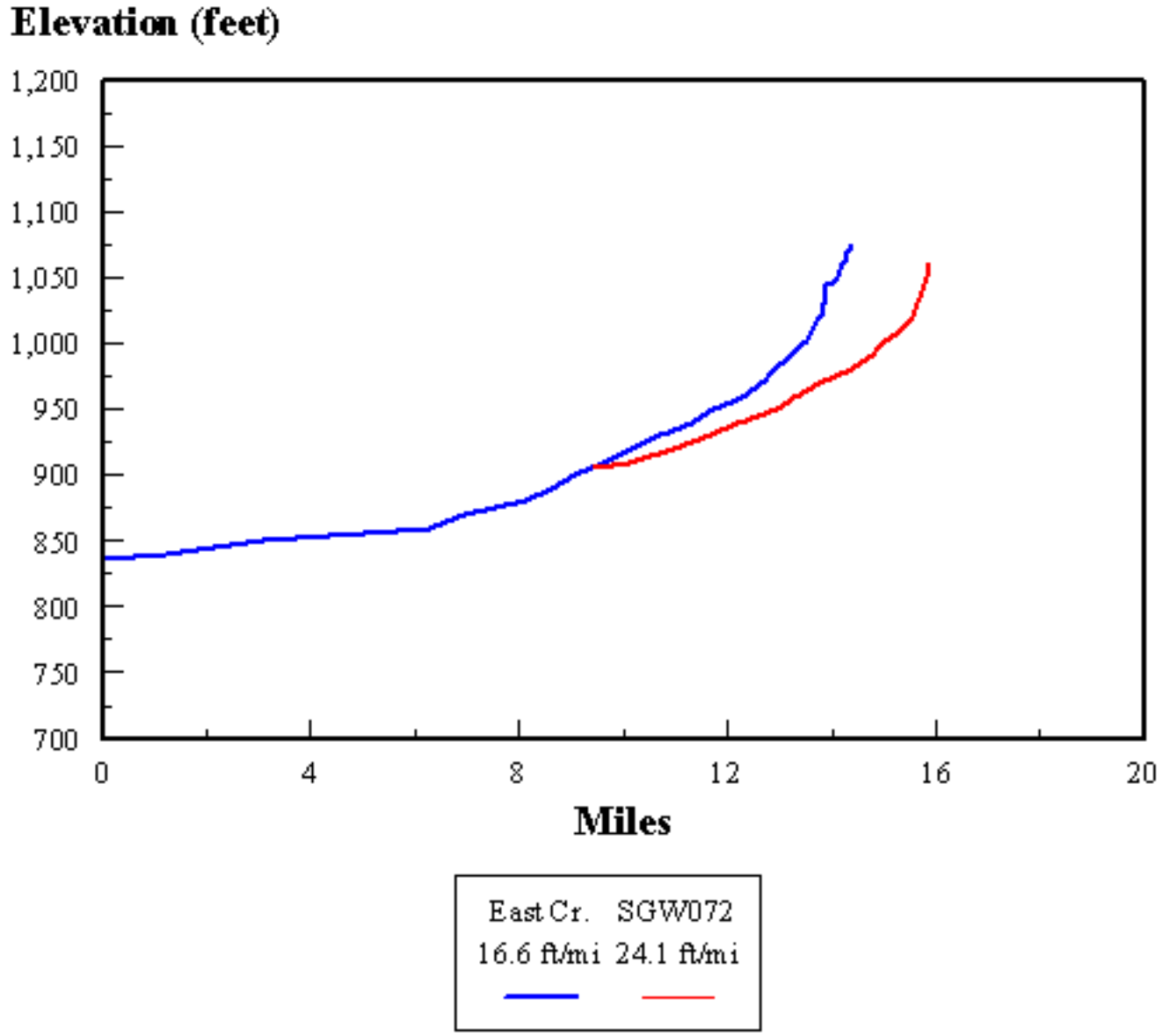


Table Ge01. Third order and larger streams of the South Grand Watershed.

(1 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
Truman Reservoir						
Clear Cr. (1)	3	Leesville	Truman Reservoir		2.4	11.3
Brush Cr.	3	Calhoun East	Truman Reservoir		3.2	15.3
Barker Cr.	4	Calhoun East	Truman Reservoir	35.9	13.4	16.9
SGW001	3	Calhoun East	Barker Cr.-4		2.7	4.8
Tebo Cr.	5	Calhoun East	Truman Reservoir	156.1	7.9	9.2
SGW002	3	Calhoun East	Tebo Cr.-5		3.8	14.7
Nelson Cr.	3	Calhoun East	Tebo Cr.-5		7.0	7.0
West Fork Tebo Cr.	4	Calhoun East	Tebo Cr.-5	20.1	13.1	13.9
SGW003	3	Calhoun West	W. Fork Tebo Cr.-4		3.6	5.5
Sand Cr.	4	Calhoun East	Tebo Cr.	46.5	12.8	16.2
Wade Cr.	4	Calhoun West	Sand Cr.–4	26.3	9.5	11.3
Little Tebo Cr.	3	Leeton	Wade Cr.-4		5.5	7.0
M. Fork Tebo Cr.	4	Calhoun East	Tebo Cr.-5	31.6	8.3	12.9
Coon Cr. (1)	3	Windsor	M. Fork Tebo Cr.-4		3.7	5.2
SGW004	3	Windsor	M. Fork Tebo Cr.-4		3.1	5.6
East Fork Tebo Cr.	4	Calhoun East	Tebo Cr.-5	34.2	14.1	17.1
Elm Br.	3	Windsor	E. Fork Tebo Cr.-4		3.4	6.4
SGW005	3	Leesville	Truman Reservoir		0.0	3.1
SGW006	3	Leesville	Truman Reservoir		0.0	1.9
SGW007	3	Valhalla	Truman Reservoir		0.0	3.3
Pretty Bob Cr.	3	Gaines	Truman Reservoir		4.3	9.8
SGW008	3	Lowry City	Truman Reservoir		0.0	2.2
Flay Cr.	3	Lowry City	Truman Reservoir		0.4	4.8
Little Otter Cr.	4	Lowry City	Truman Reservoir	5.9	4.1	6.7

P-Permanent Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge01. Third order and larger streams of the South Grand Watershed.

(2 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
SGW009	3	Lowry City	L. Otter Cr.-4		0.0	2.3
Big Otter Cr.	4	Lowry City	Truman Reservoir	11.0	3.9	7.7
SGW074	3	Lowry City	Truman Reservoir		0.0	1.1
Cooper Cr.	4	Lowry City	Truman Reservoir	30.8	4.3	12.2
SGW075	3	Ohio	Cooper Cr.-4		0.0	4.9
SGW076	3	Ohio	Cooper Cr.-4		0.0	6.1
SGW078	3	Ohio	Cooper Cr.-4		0.0	4.4
SGW010	3	Lowry City	Big Otter Cr.-4		<0.1	0.8
SGW011	3	Lowry City	Big Otter Cr.-4		1.2	4.8
SGW012	3	Clinton South	Truman Reservoir		0.0	3.9
Deepwater Cr.	5	Clinton South	Truman Reservoir	237.5	21.6	21.6
Marshall's Cr.	4	Clinton South	Deepwater Cr.-5	46.2	10.3	19.2
SGW013	3	Clinton South	Marshall's Cr.-4		0.0	3.1
SGW014	3	Ohio	Marshall's Cr.-4		0.0	4.3
SGW015	3	Monegaw Spr.	Marshall's Cr.-4		0.0	6.2
SGW016	3	Monegaw Spr.	Marshall's Cr.-4		0.0	5.6
Bear Cr. (1)	4	Clinton South	Deepwater Cr.-5	27.0	10.6	16.2
SGW017	3	Montrose	Bear Cr.-5		0.0	4.7
Willow Br. (1)	3	Montrose	Deepwater Cr.-5		3.2	4.7
Camp Cr.	3	Montrose	Deepwater Cr.-5		8.5	11.5
Grandaddy Cr.	3	Montrose	Deepwater Cr.-5		3.7	10.0
Brushy Cr. (1)	3	Montrose	Deepwater Cr.-5		3.2	9.4
North Deepwater Cr.	4	Johnstown	Deepwater Cr.-5	32.8	8.4	12.6
Antioch Cr.	3	Johnstown	N. Deepwater-4		0.0	4.9
Pogue Cr.	3	Johnstown	N. Deepwater-4		1.2	4.5

P-Permanent Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge01. Third order and larger streams of the South Grand Watershed.

(3 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
South Deepwater Cr.	5	Johnstown	Deepwater Cr.-5	57.4	8.2	20.3
Davis Br.	3	Johnstown	S. Deepwater Cr.-5		0.0	5.3
Newberry Br.	4	Johnstown	S. Deepwater Cr.-5	9.6	0.0	4.8
SGW018	3	Johnstown	Newberry Br.-4		0.0	3.6
SGW019	3	Spruce	S. Deepwater Cr.-4		0.0	7.9
Sparrow Foot Cr.	3	Gaines	Truman Reservoir		4.1	5.8
Dumpling Cr.	3	Gaines	Truman Reservoir		4.3	5.6
Dillon Cr.	3	Gaines	Truman Reservoir		6.1	7.9
Deer Cr.	3	Gaines	Truman Reservoir		9.0	9.0
Town Cr.	3	Clinton South	Truman Reservoir		8.9	11.2
South Grand R.	7	Clinton South	Truman Reservoir	1,328.8	63.3	66.4
Rose Cr.	3	Clinton South	South Grand R.-7		6.5	7.1
Fields Cr.	3	Clinton South	South Grand R.-7		16.9	18.1
Big Cr.	6	Hartwell	South Grand R.-7	537.8	68.1	76.0
Honey Cr.	5	Hartwell	Big Cr.-6	47.4	7.6	15.8
SGW020	3	Clinton North	Honey Cr.-5		5.3	9.0
SGW021	3	Clinton North	Honey Cr.-5		0.0	4.1
East Fork Honey Cr.	4	Clinton North	Honey Cr.-5	16.8	7.9	9.9
SGW022	3	Chilhowee	E. Fork Honey Cr.-4		3.4	4.4
SGW023	3	Chilhowee	E. Fork Honey Cr.-4		2.2	3.0
SGW024	3	Chilhowee	Honey Cr.-4		1.9	3.7
Willow Br. (2)	3	Hartwell	Big Cr.-6		4.9	5.3
Norris Cr.	4	Blairstown	Big Cr.-6	23.6	6.1	10.6
SGW079	3	Blairstown	Norris Cr.-4		<0.1	4.2
Brushy Cr. (2)	3	Blairstown	Big Cr.-6		1.3	5.3

P-Permanent Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge01. Third order and larger streams of the South Grand Watershed.

(4 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
SGW025	3	Blairstown	Big Cr.-6		0.0	1.3
Bear Cr. (2)	4	Blairstown	Big Cr.-6	35.2	12.8	15.1
SGW026	3	Blairstown	Bear Cr.-4		3.6	5.2
White Oak Cr. (1)	3	Blairstown	Bear Cr.-4		0.0	4.5
SGW027	3	Holden	Bear Cr.-4		1.8	4.3
SGW028	3	Holden	Bear Cr.-4		0.0	3.0
Walnut Cr.	4	Quick City	Big Cr.-6	22.0	11.1	14.2
Bogard Cr.	3	Quick City	Walnut Cr.-4		2.6	4.7
SGW029	3	Quick City	Walnut Cr.-4		2.8	4.5
SGW030	3	Quick City	Big Cr.-6		1.7	3.6
Panther Cr.	4	Quick City	Big Cr.-6	22.6	12.3	14.9
Rocky Br.	3	Garden City	Panther Cr.-4		2.6	4.6
Scaly Bark Cr.	3	Quick City	Big Cr.-6		7.9	8.6
Little Walnut Cr.	3	Quick City	Big Cr.-6		1.8	3.1
Camp Br.	5	Kingsville	Big Cr.-6	66.8	23.1	26.5
Clear Cr. (2)	4	East Lynne	Camp Br.-5	14.8	7.0	9.7
SGW031	3	Garden City	Clear Cr.-4		0.0	2.7
SGW032	3	East Lynne	Camp Br.-4		0.0	1.5
Crooked Br.	3	Harrisonville	Camp Br.-4		4.1	6.6
SGW033	3	Harrisonville	Camp Br.-4		0.0	4.4
Coon Cr. (2)	3	Kingsville	Big Cr.-6		2.1	6.1
Lost Cr. (1)	4	Kingsville	Big Cr.-6	12.6	6.7	8.7
West Br.	3	Kingsville	Lost Cr.-4		0.0	3.3
Crawford Cr. (OC)	4	East Lynne	Big Cr.-6	13.6	8.0	8.7
Louse Run	4	East Lynne	Crawford Cr. (OC)-4	8.8	4.9	6.8

P-Permanent Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge01. Third order and larger streams of the South Grand Watershed.

(5 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
SGW034	3	Kingsville	Louse Run-4		0.0	4.1
Crawford Cr. (NC)	5	East Lynne	Big Cr.-6	66.7	5.6	5.8
East Branch. Crawford Cr.	4	Strasburg	Crawford (NC)-5	33.0	11.3	16.5
SGW035	3	Strasburg	E.Br. Crawford-4		0.0	2.3
SGW036	3	Strasburg	E.Br. Crawford-4		2.5	5.9
SGW037	3	Strasburg	E.Br. Crawford-4		0.0	12.1
West Branch. Crawford Cr.	4	Strasburg	Crawford (NC)-5	31.3	11.5	15.6
SGW038	3	Strasburg	W.Br. Crawford-4		3.8	7.2
SGW039	3	Strasburg	W.Br. Crawford-4		1.7	3.7
SGW040	3	Strasburg	W.Br. Crawford-4		0.0	4.2
SGW041	3	East Lynne	Big Cr.-5		0.0	3.0
SGW042	3	East Lynne	Big Cr.-5		3.7	5.5
Willow Br. (3)	3	East Lynne	Big Cr.-5		1.4	6.2
SGW043	3	Strasburg	Big Cr.-5		0.0	4.0
Duncan Br.	3	Strasburg	Big Cr.-5		4.1	8.0
Middle Big Cr.	5	Pleasant Hill	Big Cr.-5	50.8	10.0	15.2
SGW044	4	Pleasant Hill	Middle Big Cr.-5	19.2	3.8	8.2
Alexander Cr.	3	Raymore	Middle Big Cr.-4		4.1	7.5
SGW080	3	Raymore	Middle Big Cr.-4		0.0	3.0
SGW045	3	Pleasant Hill	SGW044-4		0.0	2.3
SGW046	3	Pleasant Hill	SGW044-4		0.0	2.1
Wilson Cr.	3	Pleasant Hill	Big Cr.-4		1.7	5.9
East Br.	3	Pleasant Hill	Big Cr.-4		2.8	6.3
SGW047	3	Pleasant Hill	Big Cr.-4		0.0	3.6

P-Permanent Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge01. Third order and larger streams of the South Grand Watershed.

(6 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
Fishing Cr.	3	Hartwell	South Grand R.-6		0.0	4.8
SGW048	3	Hartwell	South Grand R.-6		1.4	4.8
SGW049	3	Hartwell	South Grand R.-6		0.0	5.6
Holwell Br./South Grand (OC)	3	Hartwell	South Grand R.-6		0.0	9.0
White Oak Cr. (2)	3	Hartwell	South Grand R.-6		7.0	10.9
Knob Cr.	4	Creighton	South Grand R.-6	24.9	11.8	13.6
SGW050	3	Creighton	Knob Cr.-4		0.0	3.8
Black Oak Cr.	3	Creighton	Knob Cr.-4		3.1	5.3
Cove Cr.	3	Creighton	South Grand R.-6		2.5	8.9
Peter Cr.	3	Creighton	South Grand R.-6		0.0	9.1
Lost Cr. (2)	3	Dayton	South Grand R.-6		0.0	5.1
Elk Fork	4	Dayton	South Grand R.-6	37.6	0.0	21.0
SGW051	3	Dayton	Elk Fork-4		0.0	2.4
Fishing Br.	3	Spruce	Elk Fork-4		0.0	5.2
SGW052	3	Spuce	Elk Fork-4		0.0	3.0
Lick Br.	3	Dayton	South Grand R.-6		2.5	10.3
SGW053	3	Dayton	South Grand R.-6		0.0	3.8
Mingo Cr./South Grand (OC)	3	Dayton	South Grand R.-6		0.0	12.1
Sugar Cr.	4	Dayton	South Grand R.-6	35.1	10.3	18.3
Joslin Br.	3	Garden City	Sugar Cr.-4		3.6	5.7
SGW054	3	Garden City	Sugar Cr.-4		1.3	3.9
SGW055	3	Garden City	Sugar Cr.-4		0.0	3.0
SGW056/South Grand (OC)	3	Adrian	South Grand R.-6		0.0	6.6

P-Permanent Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge01. Third order and larger streams of the South Grand Watershed.

(7 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
Big Deer Cr.	4	Adrian	South Grand R.-6	30.9	0.0	10.4
Little Deer Cr.	3	Adrian	Big Deer Cr.-4		0.0	10.3
Eightmile Cr.	4	Adrian	South Grand R.-6	32.1	15.1	23.7
Mound Valley	3	Austin	Eightmile Cr.-4		0.0	3.3
SGW057	3	Austin	Eightmile Cr.-4		0.0	2.4
SGW058	3	Austin	Eightmile Cr.-4		0.0	4.8
Mormon Fork	3	Adrian	South Grand R.-6		0.0	28.9
East Br. S. Grand (OC)	5	Adrian	South Grand R.-6	99.4	4.5	7.6
Tennessee Cr.	3	Austin	E.Br. S. Grand (OC)-5		7.9	11.2
East Br. South Grand	5	Everett	E.Br. S. Grand (OC)-5	83.0	24.0	28.8
SGW059	3	Everett	East Br.-5		3.4	6.8
SGW060	3	Everett	East Br.-5		0.0	2.3
Muddy Cr.	4	Peculiar	East Br.-5	13.0	5.5	7.5
SGW061	3	Peculiar	Muddy Cr.-4		2.3	3.7
SGW062	3	Peculiar	East Br.-5		0.0	3.7
East Fork	3	Peculiar	East Br.-5		9.3	11.5
Wolf Cr.	3	Peculiar	East Br.-5		3.2	5.8
SGW063	3	Peculiar	East Br.-5		2.4	5.4
Black Cr.	3	Adrian	South Grand R.-5		0.0	13.9
South Fork	4	Everett	South Grand R.-5	64.3	14.2	14.2
Owens Cr.	3	Everett	South Fork-4		6.2	9.1
Harding Cr.	3	Freeman	South Fork-4		2.5	6.9
Harless Cr.	3	Freeman	South Fork-4		0.0	7.1

P-Permanent Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge01. Third order and larger streams of the South Grand Watershed.

(8 of 8)

Stream Name	Order	7.5' Quad at Stream Mouth	Name and Order Receiving Stream	Area	Length	
					P	T
Coldwater Cr.	3	Freeman	South Fork-4		4.6	7.3
SGW064	3	Everett	South Grand-5		0.0	3.6
Adams Br.	3	Everett	South Grand-5		4.5	6.4
Poney Cr.	4	Everett	South Grand-5	33.2	12.8	16.1
SGW065	3	Freeman	Poney Cr.-4		0.0	3.9
SGW066	3	West Line	Poney Cr.-4		0.0	3.6
SGW067	3	West Line	South Grand R.-5		0.0	4.2
Massey Cr.	4	West Line	South Grand R.-5	38.1	9.4	14.3
SGW068	3	West Line	Massey Cr.-4		0.0	4.1
SGW069	3	West Line	Massey Cr.-4		0.0	4.4
SGW070	3	West Line	Massey Cr.-4		0.0	2.4
East Cr.	4	West Line	South Grand R.-5	51.6	8.1	14.4
SGW071	3	West Line	East Cr.-4		0.0	2.3
West Fork	3	West Line	East Cr.-4		0.0	8.5
SGW072	4	Belton	East Cr.-4	12.8	0.0	6.4
SGW073	3	Raymore	SGW072		0.0	4.3

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T-Total Stream Miles (Determined from 1:24,000 scale GIS hydrography coverage)

Area-Watershed Area (square miles)

Abbreviations: Br.-Branch, Cr.-Creek, R-River, (NC)-New Channel, (OC)-Old Channel

Table Ge02. Stream length for order and total length for fourth order and larger streams in the South Grand Watershed. Only the main stem of streams is included.

Stream Name	Length for Order (miles)							Total Length
	7	6	5	4	3	2	1	
Barker Cr.				2.7	3.6	9.5	1.0	16.8
Tebo Cr.			8.9					8.9
West Fork Tebo Cr.				5.5	4.8	1.3	2.3	13.9
Sand Cr.				6.3	8.0	1.4	0.4	16.1
Wade Cr.				3.8	4.1	2.1	1.3	11.3
M. Fork Tebo Cr.				6.1	1.3	2.8	2.6	12.8
East Fork Tebo Cr.				8.9	6.3	0.6	1.3	17.1
Little Otter Cr.				4.1	0.8	1.7	0.1	6.7
Big Otter Cr.				2.1	3.5	0.6	1.5	7.7
Cooper Cr.				7.7	2.1	1.8	0.6	12.2
Deepwater Cr.			21.6					21.6
Marshall's Cr.				11.8	4.0	2.2	1.3	19.3
Bear Cr.				7.0	7.3	0.9	1.0	16.2
N. Deepwater Cr.				7.3	2.2	2.4	0.7	12.6
S. Deepwater Cr.			7.7	4.1	3.6	3.0	1.8	20.2
Newberry Cr.				0.6	0.7	2.6	0.8	4.7
South Grand R.	13.8	29.6	23.0					66.4
Big Cr.		37.8	20.6	13.2	1.0	2.7	0.7	76.0
Honey Cr.			8.0	3.3	0.9	2.9	0.8	15.9
E. Fork Honey Cr.				5.0	1.6	2.4	0.8	9.8
Norris Cr.				3.3	6.2	0.5	0.5	10.5
Bear Cr. (2)				10.6	2.9	0.4	1.1	15.0
Walnut Cr.				2.5	7.2	2.0	2.4	14.1
Panther Cr.				8.6	4.5	0.8	1.0	14.9
Camp Br.			8.6	13.4	1.0	2.7	0.9	26.6
Clear Cr. (2)				4.8	1.1	3.0	0.7	9.6
Crawford Cr. (OC)				5.0		3.2	0.4	8.6
Lost Cr. (1)				3.5	1.9	2.7	0.5	8.6
Louse Run				3.5	1.5		1.9	6.9
Crawford Cr. (NC)			5.8					5.8
East Br. Crawford Cr.				11.6	1.9	1.9	1.2	16.6
West Br. Crawford Cr.				12.0	0.4	2.4	0.9	15.7
Middle Big Cr.			1.3	10.4	1.7	0.5	1.4	15.3
SGW044				5.4	1.1	0.9	0.8	8.2
Knob Cr.				3.9	6.8	1.3	1.6	13.6

Elk Fork				16.7	3.5	0.2	0.6	21.0
Sugar Cr.				11.2	2.6	2.8	1.7	18.3
Big Deer Cr.				1.1	5.8	2.5	1.1	10.5
Eightmile Cr.				12.4	8.8	1.1	1.4	23.7
East Br. S. Grand (OC)			7.6					7.6
East Br. S. Grand R.			10.3	10.7	3.5	3.4	0.9	28.8
Muddy Cr.				1.2	3.3	2.1	0.9	7.5
South Fork				14.2				14.2
Poney Cr.				11.0	1.9	2.7	0.5	16.1
Massey Cr.				11.8	1.1	1.1	0.3	14.3
East Cr.				9.4	2.8	1.4	0.7	14.3
SGW072				2.1	2.9	0.9	0.5	6.4