

United States Department of the Interior



BUREAU OF LAND MANAGEMENT
Alaska State Office
222 West Seventh Avenue, #13
Anchorage, Alaska 99513-7504
www.blm.gov/alaska



In Reply Refer To:
2990 (LLAK9410)

OCT 04 2018

Kristine Hess
Division Operations Manager
Division of Mining, Land and Water
Alaska Department of Natural Resources
550 West Seventh Avenue, Ste. 1070
Anchorage, Alaska 99501-3579

Dear Ms. Hess:

Enclosed you will find a report dated October 4, 2018 documenting the Bureau of Land Management's findings of navigability on the West Fork of the Dennison Fork and the Dennison Fork of the Fortymile River. This report is based on our historical research and fieldwork this past summer. The conclusions in this report have overturned our previous finding of non-navigability to both water bodies being navigable. In light of our new findings, we encourage the State to consider filing for a recordable disclaimer of interest on these water bodies.

Sincerely,

Katherine Van Massenhove
Acting Chief, Branch of Lands and Realty

Attachment: (1)

cc:

Mark Fink, Access Defense Program Manager
Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, Alaska 99518-1599



United States Department of the Interior



BUREAU OF LAND MANAGEMENT
Alaska State Office
222 West Seventh Avenue, #13
Anchorage, Alaska 99513-7504
www.blm.gov/alaska

OCT 04 2018

In Reply Refer To:
2651 (LLAK9410)

To: DSD, Division of Lands and Cadastral Survey

From: Jack Frost, Navigable Waters Specialist *J. Frost*

Subject: Reconsideration of the Navigability Report Dated June 29, 1983, Regarding the West Fork of the Dennison Fork and the Dennison Fork of the Fortymile River in the Upper Yukon Region, Alaska

Background

The State of Alaska (State) filed a 180-day notice of intent to file a quiet title action on April 3, 2018 with the Bureau of Land Management (BLM).¹ This notice included the submerged lands of the Middle Fork of the Fortymile River (Middle Fork); North Fork of the Fortymile River (North Fork) upstream of the Kink; West Fork of the Dennison Fork (West Fork); and Dennison Fork of the Fortymile River (Dennison Fork). In response to this action, the BLM gathered new physical and historical evidence related to the navigability of each segment within the notice. The BLM's position on these water bodies has been that they are non-navigable.²

As an initial step in the review process, the BLM floated approximately 140 miles of river gathering the necessary historical and physical evidence to reassess our position on each of the four water bodies detailed in the notice. This report focuses on two of the water bodies in the 180-day notice, the West Fork of the Dennison Fork (West Fork) and the Dennison Fork of the Fortymile River (Dennison Fork).e

Location

The Fortymile Region is located approximately 180 miles east of Fairbanks, Alaska and about 325 miles northeast of Anchorage, Alaska. This region is bordered on the north by the Yukon

¹ State of Alaska Department of Law to the Honorable Ryan Zinke, Secretary of the Interior, "Re: Middle Fork of the Fortymile River; North Fork Fortymile River; West Fork of the Dennison Fork; and Dennison Fork of the Fortymile River AGO No. AN2011103815," April 3, 2018, BLM records.

² Deputy State Director for Conveyance Management (960) to Acting Assistant Deputy State Director for Conveyance Management (960), "Navigability Determination for the Fortymile River Basin," June 29, 1983, BLM records.

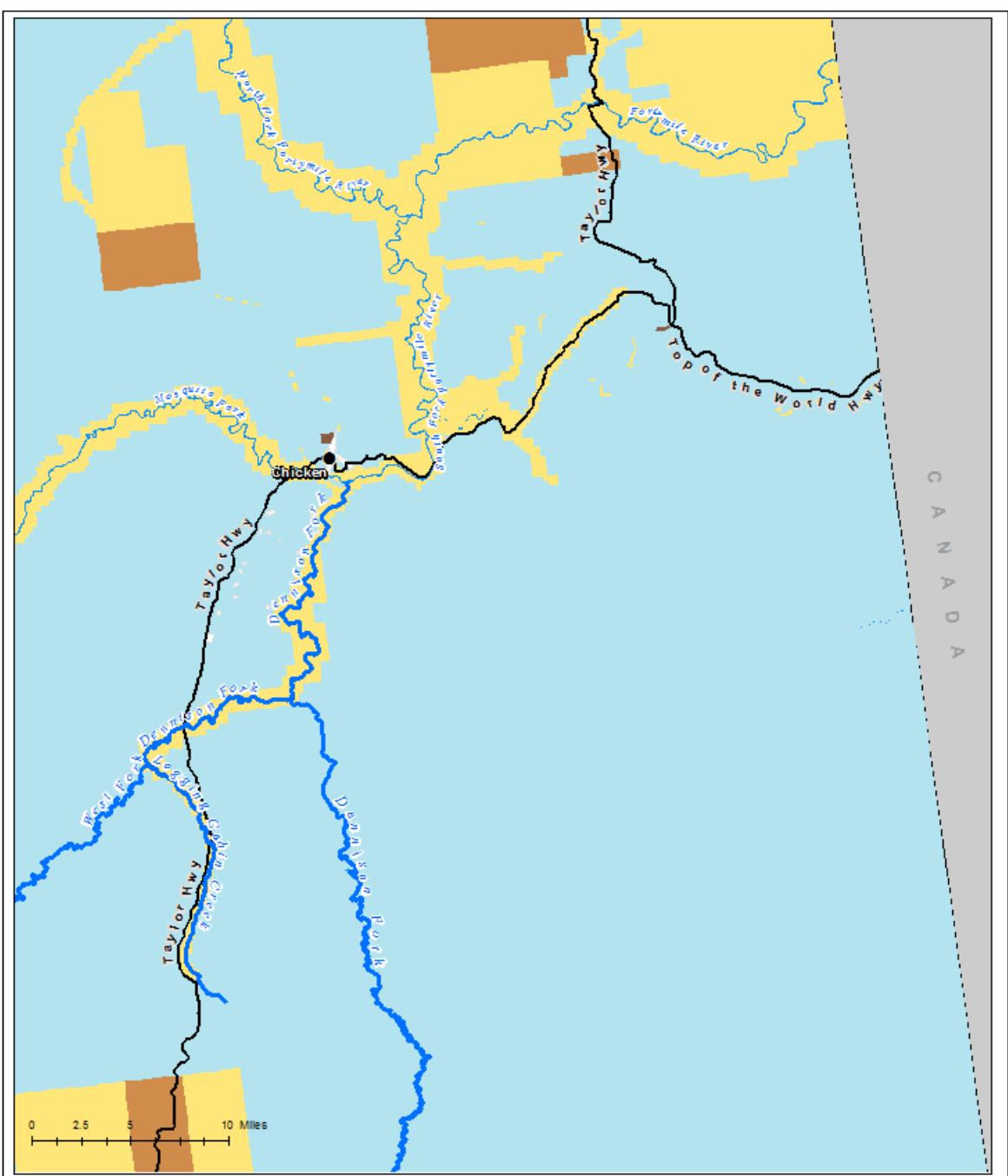
River, while the ancient highly dissected Yukon-Tanana Upland Region surrounding the remainder of the Fortymile River basin is an area of undulating low divides with rounded, even-topped ridges and gentle slopes. These unglaciated ridges become more rugged along the United States-Canada border where elevations exceed 6,000 feet.³ Temperatures in this region of Alaska can range from as much as 90 degrees in the summer to 50-60 degrees below Fahrenheit in the winter. Annual precipitation is about 11 inches with about 30% being snowfall. Thunderstorms are most common in July and August. Rivers are usually frozen from October to April with breakup occurring in late April or May.⁴

³ Bureau of Outdoor Recreation, Alaska Task Force, "Fortymile River and Tributaries, Alaska," April 10, 1973, p. 12, BLM records.

⁴ *Ibid*, p. 14.

WEST FORK AND DENNISON FORK

U.S. DEPARTMENT OF THE INTERIOR | BUREAU OF LAND MANAGEMENT | ALASKA



Administered Lands (SMA)

- Alaska Native Allotment
- Alaska Native Lands Patented or Interim Conveyed

Land Management

- Bureau of Land Management
- Private
- State
- Water

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.



Authority

Typically, the BLM may reconsider the navigability of a river if additional evidence warrants it. The exception to this policy occurs when a BLM navigability determination becomes finalized through incorporation into a conveyance action pursuant to Alaska Native Claims Settlement Act (ANCSA). The “Alaska Submerged Lands Act of 1988 (SLA 1988)”⁵ subsection (c)(1) provides:

The execution of an interim conveyance or patent, as appropriate, by the Bureau of Land Management which conveys an area of land selected by a Native or Native Corporation which includes, surrounds, or abuts a lake, river, or stream, or any portion thereof, shall be the final agency action with respect to a decision of the Secretary of the Interior that such lake, river, or stream is or is not navigable, unless such decision was validly appealed to an agency or board of the Department of the Interior on or before December 2, 1980.

Because the submerged lands for the West Fork and Dennison Fork are within a wild and scenic corridor and not part of a conveyance action pursuant to ANCSA, the BLM retains its authority to reconsider its past navigability finding based on the new evidence that was collected during the summer of 2018.

Land Status

The submerged lands of the West Fork and the Dennison Fork are within a designated wild and scenic corridor. The National Wild and Scenic Rivers System Act was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Wild and Scenic Rivers Act safeguards the special character of these rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection. Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a federal or a state agency. Designated segments need not include the entire river and may include tributaries. For federally administered rivers, the designated boundaries generally average one-quarter mile landward from either bank in the lower 48 states and one-half mile from riverbanks outside national parks in Alaska in order to protect river-related values.⁶

⁵ Public Law 100-395.102 Stat. 979, 43 U.S.C. § 1631.

⁶ Title VI-National Wild and Scenic Rivers System, of Public Law 96-487 Alaska National Interest Lands Conservation Act, December 2, 1980, amended Public Law 90-542 specifically for Alaska including the Fortymile region.

Past Navigability Determinations

The BLM reviewed the Fortymile River region for navigability in a report dated June 29, 1983, “Navigability Determination for the Fortymile River Basin.” Though not specifically described in the report by name, the West Fork and the Dennison Fork were lumped in with a group of water bodies that were considered non-navigable due to “the sparseness or complete absence of use information coupled with the physical characteristics of the water bodies.”⁷

Physical Character

West Fork: From the confluence of Logging Cabin Creek (West Fork River Mile 0), the West Fork flows northeast about 10 miles through wide valleys with numerous swamps, abandoned meanders, and occasional low gradient riffles and rapids with no major obstructions. The lower West Fork, from about river mile 10 to the confluence with the main stem Dennison Fork, river mile 11.7, flows east through a somewhat narrower valley confined by grassy hills, steep banks and rock bluffs, with a steeper gradient, few sand and gravel bars and infrequent riffle and rapids with no major obstructions. Channel width varies generally 80-120 feet, with a difference between ordinary high and low water about 3-4 feet.⁸ On July 14, 2018, we measured water depths averaging about 2 feet deep and a discharge at the Taylor Highway Bridge of 265 cubic feet per second (cfs).⁹ Historical hydrological data at the bridge are summarized in Attachment 3, BLM Water Resources Report, dated May 16, 1995.

Dennison Fork: From the confluence of the West Fork (Dennison Fork River Mile 0) much of the upper the Dennison Fork flows northward through wide valleys with numerous swamps, abandoned meanders, and occasional riffles and rapids with no major obstructions. Similar to the West Fork, the lower few miles of the Dennison Fork to the confluence of Mosquito Fork at river mile 17.7, has a somewhat narrower valley with steeper banks, fewer meanders and a higher gradient. Channel width varies, generally 140-200 feet, with a difference between ordinary high and low water about 3-4 feet.¹⁰ On July 14, 2018, we measured water depths averaging over 3 feet deep and a discharge of 665 cfs.

Based on comparison of channel location shown on the current 2018 USGS National Maps and channel location on older 1956 USGS 1:63,360 Topographic Map Tanacross (D-3), Alaska and July 2018 field measurements, we conclude that the river's current physical characteristics (e.g. width, depth, sinuosity, gradient) and general channel location are not materially different from

⁷ Deputy State Director for Conveyance Management (960) to Acting Assistant Deputy State Director for Conveyance Management (960), “Navigability Determination for the Fortymile River Basin,” June 29, 1983, p. 1, BLM records.

⁸ Ben Kennedy, BLM Hydrologist, “West Fork Dennison and Dennison Fork of Fortymile River Navigability Float Trip,” July 14-15, 2018, p.6, BLM records.

⁹ Jack Frost, BLM Navigable Waters Specialist, “Fortymile Region Field Trip, July 9-23, Part 2, West Fork of the Dennison Fork and Dennison Fork of the Fortymile River,” BLM records.

¹⁰ *Ibid*, p. 6.

its physical condition at the time of statehood, 1959.¹¹ Therefore, the West Fork and the Dennison Fork are considered to be in their natural and ordinary condition.

Taylor Highway

The 137-mile long Taylor Highway, numbered Alaska Route 5, starting at Tetlin, Alaska, was built in 1953 to provide access to Eagle, Chicken, and the historic Fortymile Mining District.¹² The road also connects to the Top of the World Highway allowing road access to Dawson City, Yukon. The Taylor Highway provides access to the upper portion of the West Fork at its bridge at about mile 49. At mile 75, the Taylor Highway crosses the South Fork of the Fortymile River just about five miles downstream from the mouth of the Dennison Fork.¹³ Both bridges have established boat ramps allowing for easy access of boats and trailers to use these water bodies.

Evidence/Susceptibility of Use

The BLM has promoted the use of the boat ramp adjacent to its campground near the bridge at the West Fork. Information regarding either the campground or the boat ramp can be found online at <https://www.blm.gov/visit/west-fork-campground>. Annually, recreationalists launch rafts, canoes, and motor boats there to either camp, hunt, fish, or recreate by traveling either upstream or downstream. For example, a popular road based float trip begins at the West Fork boat ramp and continues downstream about 30 miles to the boat ramp at the bridge crossing the South Fork.

Historically, pole boats were used in the Fortymile Region of Alaska before statehood. One area in particular where they were used is upstream on the Fortymile River and continuing up the South Fork to at least Chicken Creek, a tributary of the Mosquito Fork, taking supplies to miners.¹⁴ Sizes of pole boats varied but they were built to meet the needs of the user. Two examples of pole boats are a 20-foot long boat in Picture 1 to the exceedingly large boat in Picture 2 that each carried very large amounts of freight (1,000 pounds or more). While this commercial activity ceased prior to Alaska's statehood, the susceptibility of the physical character of the West Fork and Dennison Fork have not changed, and this activity could occur in the future.

Additionally, the physical character of the Dennison Fork is such that these pole boats could have easily continued upstream at least to the confluence with the West Fork with a commercial load of at least 1,000 pounds. Pole boats travelling farther upstream on the West Fork would have been a little more difficult but not impossible due to the character of the river and

¹¹ *Ibid*, p. 1.

¹² Bureau of Outdoor Recreation, Alaska Task Force, "Fortymile River and Tributaries, Alaska," April 10, 1973, p. 22, BLM records.

¹³ Measurements of the West Fork bridge location and distance downstream of the mouth of the Dennison Fork were measured using Google Earth "ruler" feature.

¹⁴ The headwaters of the South Fork are located at the confluence of the Mosquito Fork and Dennison Fork. The South Fork is a tributary to the Fortymile River. See map on page 3 "West Fork and Dennison Fork."

surrounding landscape. The depth of the West Fork was shallower (just a little over 2 feet deep) than the Dennison Fork (more than 3 feet deep) during average flows that the BLM specialists encountered in their field inspection of July 2018. However, BLM Hydrologist Ben Kennedy concluded that ordinary high water depths for the West Fork and Dennison Fork are higher than what the BLM observed during this July trip.¹⁵



Picture 1- An example of a pole boat (approximately 20' long by 4.5' wide) used in the Fortymile Region located at Fort Egbert, in Eagle, Alaska. Photograph taken by Jack Frost, BLM, July 2018.

¹⁵ Ben Kennedy, BLM Hydrologist, "West Fork Dennison and Dennison Fork of Fortymile River Navigability Float Trip," July 14-15, 2018, BLM records.



Picture 2- Photograph of a historical picture showing a very large pole boat used in the Fortymile Region to haul freight. Photograph taken at Fort Egbert, by Jack Frost, BLM, July 2018.

Criteria

The federal test of navigability is found in *The Daniel Ball*, 77 U.S. (10 Wall.) 557 (1870). There, the U.S. Supreme Court stated: “Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.”

In assessing the navigability of inland water bodies, the BLM relies upon this test as well as federal statutes, federal case law, and the advice of the Department of the Interior’s Office of the Solicitor. Relevant federal statutes include the Submerged Lands Act of 1953 and the Submerged Lands Act of 1988. The Supreme Court’s most recent decision on title navigability, *PPL Montana, LLC v. Montana*, 132 S. Ct. 1215 (2012), summarizes and explains the proper interpretation of *The Daniel Ball* criteria. Additional guidance is provided in *Alaska v. Ahtna, Inc.*, 891 F.2d 1401 (9th Cir. 1989), *cert. denied*, 495 U.S. 919 (1990) [Gulkana River]; *Alaska v. United States*, 754 F.2d 851 (9th Cir. 1983), *cert denied*, 474 U.S. 968 (1985) [Slopbucket Lake]; and *Appeal of Doyon, Ltd.*, Alaska Native Claims Appeal Board RLS 76-2, 86 I.D. 692 (1979) [Kandik and Nation Rivers].


Conclusion

Based on observations and measurements during the BLM July 2018 float trip, we found that the West Fork Dennison and Dennison Fork of the Fortymile River are boatable at moderate or higher water levels. More importantly, we concluded that both rivers were capable of supporting two-way travel of low-draft boats similar to those in customary use for trade and travel in the region at or prior to statehood with respect to draft, load and capacity with few or no portages

required. Depths of both the West Fork and the Dennison Fork are more than two and one half feet deep at ordinary high water levels.

Accordingly, the West Fork of the Dennison Fork, beginning within the E ½ of section 16, township 24 north, range 16 east, Copper River Meridian, Alaska downstream to its confluence with the Dennison Fork of the Fortymile River; and the Dennison Fork of the Fortymile River from its confluence with the West Fork of the Dennison Fork downstream to its confluence with the Mosquito Fork of the Fortymile River are found to be navigable because they were physically susceptible to travel, trade, and commerce at the time of statehood using customary, regionally available watercraft.

I concur (sign and date):

 10/4/18

Acting, Branch Chief Lands & Realty

Attachments:

- West Fork Dennison and Dennison Fork of Fortymile River Navigability Float Trip
- Fortymile Region Field Trip, July 9-23, Part 1, West Fork of the Dennison Fork and Dennison Fork of the Fortymile River
- Streamflow and Channel Characteristics at Selected Sites on the Fortymile River, Alaska, September 2018

cc:

Kristine Hess
 Division Operations Manager
 Division of Mining, Land and Water
 Alaska Department of Natural Resources
 550 West Seventh Avenue, Ste. 1070
 Anchorage, Alaska 99501-3579

Mark Fink, Access Defense Program Manager
 Alaska Department of Fish and Game
 333 Raspberry Road
 Anchorage, Alaska 99518-1599

F00- District Manager

F02- Field Manager

F02- Hydrologist, Ben Kennedy

West Fork Dennison and Dennison Fork of Fortymile River Navigability Float Trip

DATE: July 14-15, 2018

LOCATION: Float West Fork Dennison from Taylor Highway Bridge to Mosquito Fork

PERSONNEL: Ben Kennedy, Jack Frost, Keven Cooper, Kate Cronin

PURPOSE:

Assess navigability potential of West Fork Dennison and Dennison Fork Fortymile River.

OBSERVATIONS:

West Fork: From the confluence of Logging Cabin Creek (West Fork River Mile 0), the West Fork flows northeast about 10 miles through wide valleys with numerous swamps and abandoned meanders with occasional low gradient riffles and rapids with no major obstructions. The lower West Fork, from about river mile 10 to the confluence with the main stem Dennison Fork, river mile 11.7, flows east through a somewhat narrower valley confined by grassy hills, steep banks and rock bluffs, with a steeper gradient, few sand and gravel bars and infrequent riffle and rapids with no major obstructions. Channel width generally varied from 80 to about 120 feet and channel depth averaged about 2 feet during the July 14, 2018 float trip on the West Fork.

Dennison Fork: From the confluence of the West Fork (Dennison Fork River Mile 0) much of the upper the Dennison Fork flows northward through wide valleys with numerous swamps and abandoned meanders with occasional riffles and rapids with no major obstructions. Similar to the West Fork, the lower few miles of the Dennison Fork to the confluence of Mosquito Fork at river mile 17.7, has a somewhat narrower valley with steeper banks, fewer meanders and a higher gradient. Channel width generally varied from about 140 to about 200 feet and channel depth averaged about 3 feet or greater during the July 14-15, 2018 float trip.

Based on comparison of channel location shown on the current 2018 USGS National Maps and channel location on older 1956 USGS 1:63,360 Topographic Map Tanacross (D-3), Alaska and July 2018 field measurements, the river's current physical characteristics (e.g. width, depth, sinuosity, gradient) and general channel location are not materially different from its physical condition at the time of statehood, 1959.

See Attachment I, Summary of Current Physical Characteristic for additional details.

Background

On April 3, 2018, the State of Alaska provided notice to the Secretary of the Interior of its intent to file a quiet title action to the submerged lands of three river sections, described below, within the Fortymile National Wild and Scenic River System.

The State of Alaska provided notice of its intent to sue not less than one hundred and eighty days before bringing the quiet title action. If these water bodies are navigable, title to the submerged lands passed to Alaska at statehood based on the equal footing doctrine, the Submerged Lands Act, 43 U.S.C. § 1301 *et seq.*, and the Alaska Statehood Act, 72 Stat. 339, 48 U.S.C. note preceding § 21.

(Reference: AGO No. AN2011103815).

1) **West Fork of the Dennison Fork** beginning within the E1/2 Section 16, Township 24 North, Range 16 East, Copper River Meridian, Alaska downstream to its confluence with the Dennison Fork of the Fortymile River; **and the Dennison Fork of the Fortymile River** from its confluence with the West Fork of the Dennison Fork downstream to its confluence with the Mosquito Fork of the Fortymile River: This includes all lands between the ordinary high water lines of the left and right banks of the West Fork Dennison Fork and the Dennison fork of the Fortymile River in T. 24 N., R 16 E., CRM; T. 25 N., R 16 E., CRM; T. 24 N., R 17 E., CRM; T. 25 N., R 17 E., CRM; T. 26 N., R 17 E., CRM; and T. 26 N., R 18 E., CRM.

2) **North Fork of the Fortymile River** from its headwaters downstream to the Kink: This includes all lands between the ordinary high water lines of the left and right banks of the North Fork of the Fortymile River in T. 3 S., R 27 E., FM; T. 3 S., R. 28 E., FM; T 4 S., R. 28 E., FM; T. 5 S., R. 28 E., FM.; 5 S., R. 29 E., FM.; 6 S., R. 29 E., FM.

3) **Middle Fork of the Fortymile River** from Joseph Village downstream to its confluence with the North Fork of the Fortymile River: This includes all lands between the ordinary high water lines of the left and right banks of the Middle Fork of the Fortymile River within the following townships: T. 6 S., R. 23 E., FM; T. 6 S., R. 24 E., FM; T. 6 S., R. 25 E., FM; T. 5 S., R.25 E., FM; T. 5 S., R. 26 E., FM; T. 5 S., R. 27 E., FM; T. 5 S., R 28 E., FM.

Attachment I

West Fork Dennison and Dennison Fork of the Fortymile River.

Part A: West Fork of the Dennison Fork of the Fortymile River

Name of Waterbody:

West Fork of Dennison Fork from its confluence with Logging Cabin Creek downstream to the confluence with Dennison Fork of the Fortymile River, approximately 11.7 river miles.

Upstream Extent:

Confluence of Logging Cabin Creek and West Fork of the Dennison Fork of the Fortymile River.
E1/2 Section 16, Township 24 North, Range 16 East, Copper River Meridian.
Latitude: 63° 52' 06" N, Longitude: 142° 17' 59" W, WGS84.

Downstream Extent:

Confluence of West Fork of the Dennison Fork with Main Stem of the Dennison Fork of the Fortymile River.
S1/2 Section 34, Township 25 North, Range 17 East, Copper River Meridian.
Latitude: 63° 54' 06" N, Longitude: 142° 02' 51" W, WGS84.

Part B: Dennison Fork of Fortymile River

Name of Waterbody:

Dennison Fork of the Fortymile River from its confluence with West Fork Dennison downstream to the confluence with Mosquito Fork of the Fortymile River, approximately 17.7 river miles.

Upstream Extent:

Confluence of Dennison Fork of the Fortymile River with West Fork of the Dennison Fork.
S1/2 Section 34, Township 25 North, Range 17 East, Copper River Meridian.
Latitude: 63° 54' 06" N, Longitude: 142° 02' 51" W, WGS84.

Downstream Extent:

Confluence of Dennison Fork with the Mosquito Fork of the Fortymile River.
N1/2 Section 8, Township 26 North, Range 18 East, Copper River Meridian.
Latitude: 64° 03' 14" N, Longitude: 141° 54' 36" W, WGS84.

Physical Characteristics:

West Fork: From the confluence of Logging Cabin Creek (West Fork River Mile 0), the West Fork flows northeast about 10 miles through wide valleys with numerous swamps and abandoned meanders with occasional low gradient riffles and rapids with no major obstructions. The lower West Fork, from about river mile 10 to the confluence with the main stem Dennison Fork, river mile 11.7, flows east through a somewhat narrower valley confined by grassy hills, steep banks and rock bluffs, with a steeper gradient, few sand and gravel bars and infrequent riffle and rapids with no major obstructions.

Channel width generally varied from 80 to about 120 feet and channel depth averaged about 2 feet during the July 14, 2018 float trip on the West Fork.

Dennison Fork: From the confluence of the West Fork (Dennison Fork River Mile 0) much of the upper the Dennison Fork flows northward through wide valleys with numerous swamps and abandoned meanders with occasional low gradient riffles and rapids with no major obstructions. Similar to the West Fork, the lower few miles of the Dennison Fork to the confluence of Mosquito Fork at river mile 17.7, has a somewhat narrower valley with steeper banks; fewer meanders and a higher gradient. Channel width generally varied from about 140 to about 200 feet and channel depth averaged about 3 feet or greater during the July 14-15, 2018 float trip.

Table 1. West Fork Dennison and Dennison Fork of the Fortymile Stream Gradients

Stream Reach	Gradient (feet/mile)	Distance River (miles)	Elevation Change (feet)	Distance Valley (miles)	Sinuosity River/Valley Miles (Ratio)
West Fork at Logging Cabin Creek to Taylor Highway Bridge	10.3	3.9	40	2.6	1.5
West Fork at Taylor Highway Bridge to 2.2 mi above Dennison Fork	10.7	5.6	60	3.96	1.4
West Fork at 2.2 miles above Dennison Fork to Dennison Fork	13.6	2.2	30	1.96	1.1
West Fork Totals from Logging Cabin Creek to Dennison Fork	11.1	11.7	130	8.5	1.4
Dennison Fork at West Fork to Mosquito Fork	9.9	17.7	175	13.1	1.35

Source 2018 USGS Nation Maps and Elevation Data available at <https://viewer.nationalmap.gov/>

Table 2. West Fork Dennison and Dennison Fork Stream Flow Measurements July 2018

Stream Reach	Measured Discharge (cfs)	Date	Wire Weight Gage (feet)	Width (feet)	Mean Depth (feet)
West Fork at Taylor Highway Bridge	265	07-14-2018	5.67	80	1.8
West Fork at 2.5 miles above Dennison Fork	294	07-14-2018		114	1.2
Dennison Fork above (at) West Fork Confluence	371	07-14-2018			
Dennison Fork below (at) West Fork Confluence	665	07-14-2018		140	2.4
Dennison Fork Discharge ~ 2.5 greater than West Fork Discharge at Bridge (265 cfs x 2.5 = 663 cfs)					

Source BLM July 14, 2018 field measurements

Table 3. Mean Monthly Discharge at West Fork Dennison Bridge 1991-1995

Month	Discharge (cfs)	Stage (ft)
May	918	6.8
June	612	6.5
July	403	6.3
August	274	5.9
September	212	5.7

Source BLM Alaska Open File Report 75 (Kostohrys and others, 1999)

Table 4. Peak and Minimum Discharge at West Fork Dennison Bridge 1991-1995

Year	Date	Peak Discharge (cfs)	Date	Minimum Discharge (cfs)
1991	May 1	3,600	June 26	71
1992	June 10	4,640	Sept 16	192
1993	May 12	4,480	Aug 20	121
1994	May 10	3850	Aug 24	26
1995	May 15	5320	July 23	99

Source BLM Alaska Open File Report 75 (Kostohrys and others, 1999)

Range between ordinary high and ordinary low water:

Based on July 2018 channel cross-section measurements and West Fork Dennison stream gage data (Attachment II), the elevation range between typical low flow and high flow conditions is generally 3 to 4 feet for both the West Fork and Dennison Fork of the Fortymile River.

Description of Changes in River Condition

Based on observations during the BLM July 2018 float trip and comparison between current 2018 USGS National Maps and the USGS 1:63,360 Topographic Map Tanacross (D-3), Alaska 1956, the river's current physical characteristics (e.g. width, depth, sinuosity, gradient) and channel location are not materially different from its physical condition at the time of statehood, 1959.

Nature and location of significant obstructions to navigation in portions of the waterbody

West Fork Dennison and Dennison Fork of the Fortymile River are continuous channels unobstructed by waterfalls, large rapids, or other hazards to navigation during periods of moderate to high water.

List of known survey documents or reports describing the waterbody:

Kostohrys, J., Sterin, B. and Hammond, T. "Water Resources of the Fortymile National Wild and Scenic River, Alaska". BLM-Alaska Open File Report 75-99/016. September 1999. 64pp.

U.S. Department of Interior, Bureau of Land Management. 1973. Final Environmental Statement,
Proposed Fortymile National Wild and Scenic River, Alaska. 93 pp,

U.S. Department of Interior, Bureau of Land Management, Fairbanks District, Alaska. 1983.
River Management Plan for the Fortymile River National Wild and Scenic River, Alaska. 58 pp.

Maps of West Fork Dennison and Dennison Fork of the Fortymile River

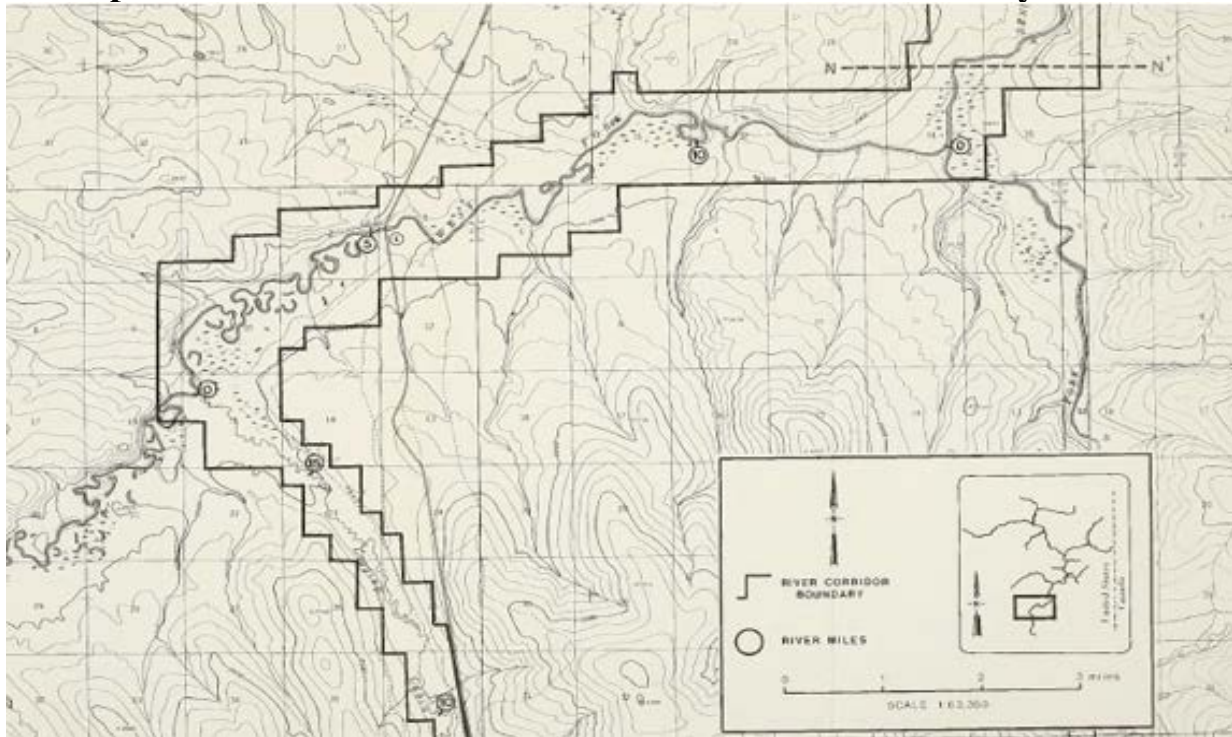


Figure 1a. USGS 1:63,360 Topographic Map Tanacross (D-3), Alaska 1956 base map showing West Fork of the Dennison Fork of the Fortymile River and WSR corridor boundary, BLM 1983 Fortymile River Management Plan.

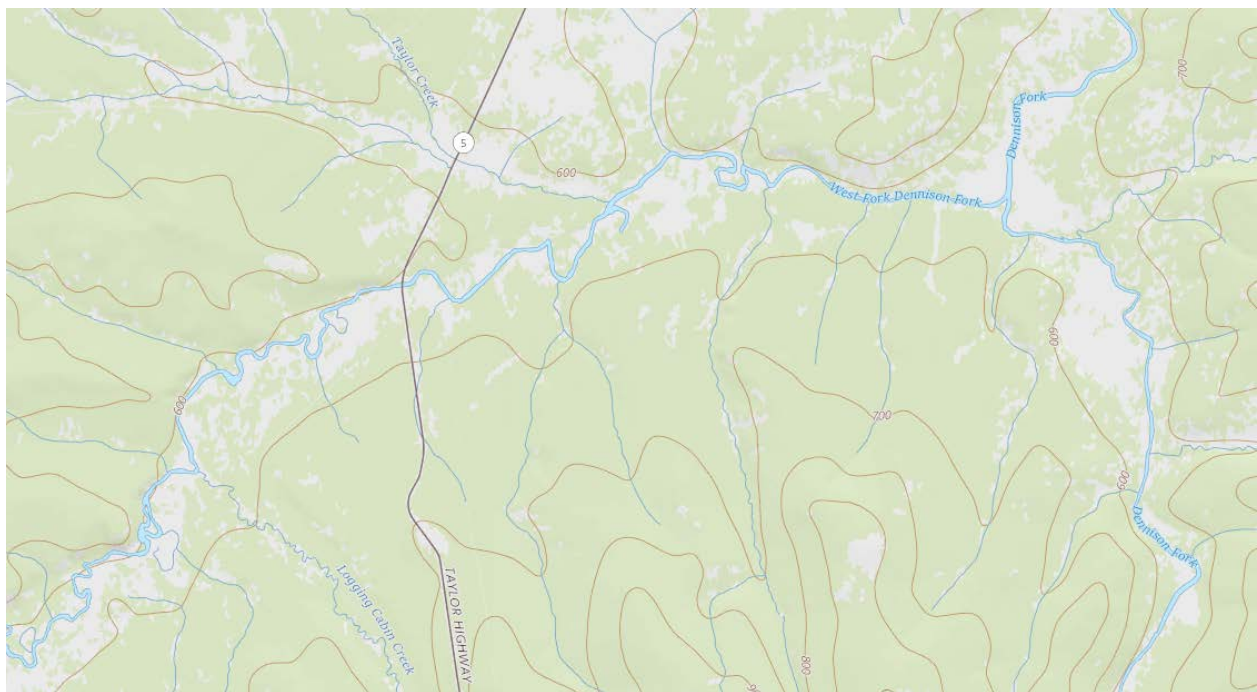


Figure 1b. USGS National Map and Elevation Data available at <https://viewer.nationalmap.gov/> (Last Modified: 26-Jun-18) showing West Fork of the Dennison Fork of the Fortymile River.

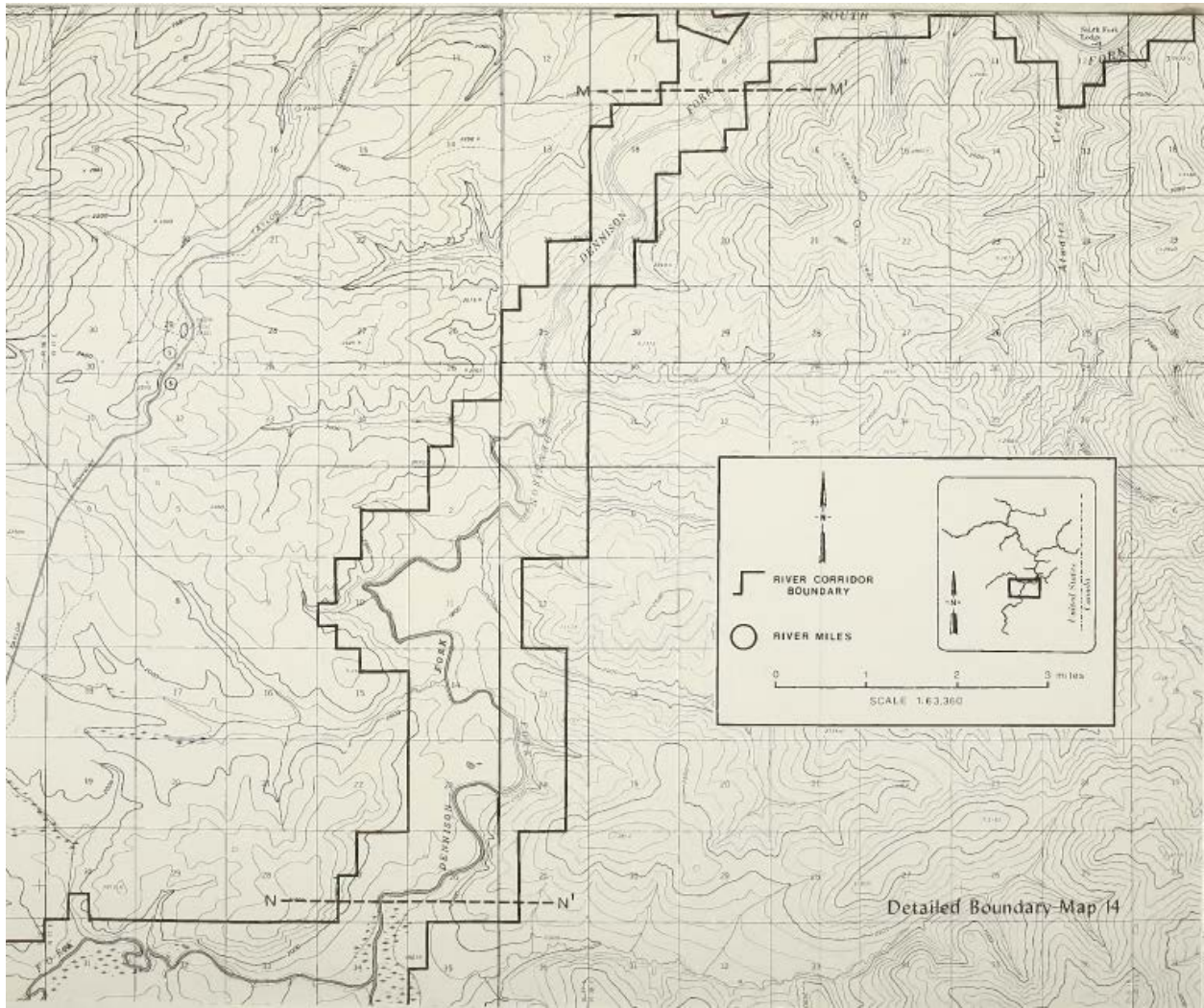


Figure 2a. USGS 1:63,360 Topographic Map Tanacross (D-3), Alaska 1956 base map showing Dennison Fork of the Fortymile River and WSR corridor boundary, BLM 1983 Fortymile River Management Plan.

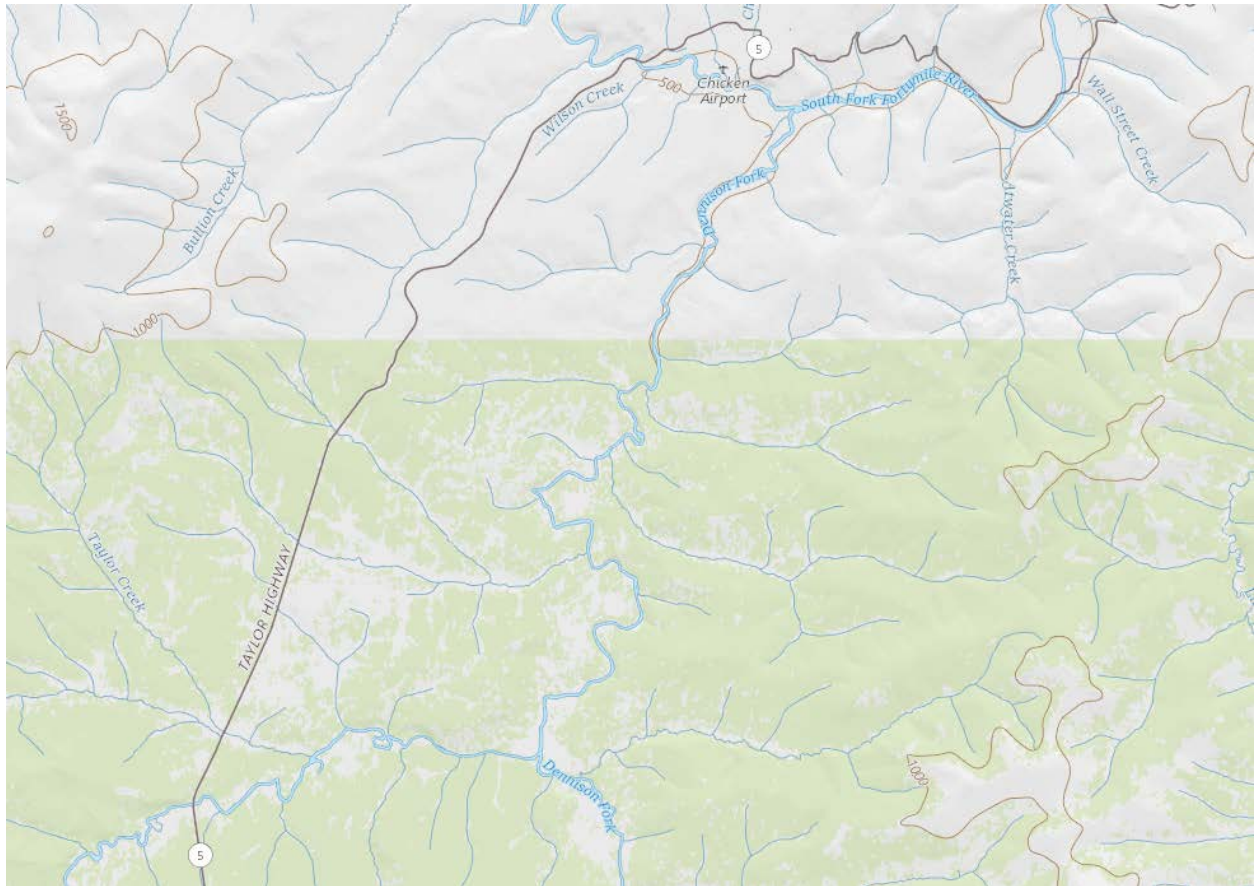


Figure 2b. USGS National Map and Elevation Data available at <https://viewer.nationalmap.gov/> (Last Modified: 26-Jun-18) showing Dennison Fork of the Fortymile River.

Attachment II

Stream Gage Water Surface Elevations and Photographs at West Fork Dennison Bridge, Taylor Highway MP49, July-August 2018.

This attachment includes photographs and stream gage water surface elevations measured at low, moderate, and high stream flows in July and August of 2018 at West Fork Dennison Bridge, Taylor Highway MP49 (Table 1).

Table 1. West Fork Dennison Water Surface Elevations, Flow Conditions, July-August, 2018

Figure	Date	Flow Condition	Water Surface Elevation (feet)	Discharge (cfs)	River Travel Rating
Figure 1	July 29, 2018	Low	4.6 feet	26	Very Difficult
Figure 2*	July 14, 2018	Moderate	5.7 feet	265	Fair
Figure 3	August 22, 2018	High	7.7 feet	1750	Good
		Flood	Overbank		Very Difficult

**BLM navigability float trip, July 14-15, 2018*

The flow conditions and associated travel ratings in Table 1 are broad generalizations intended to provide a better understanding of typical flow conditions for West Fork Dennison as well as Dennison Fork of the Fortymile River. They are not intended to represent more specific features such as the Ordinary High Water Mark, Bankfull Elevation, or average monthly low or high flow water surface elevations.

Vegetation features on gravel bars upstream and downstream of the bridge are annotated in Figures 1-3 to provide additional visual reference for changes in water surface elevation.



Figure 1a. Upstream view of West Fork Dennison channel at low flow, stream gage water level = 4.6 feet. Taylor Highway Bridge MP49, 1715 hours, July 29, 2018.



Figure 1b. Downstream view of West Fork Dennison channel at low flow, stream gage water level = 4.6 feet. Taylor Highway Bridge MP49, 1715 hours, July 29, 2018.



Figure 2a. Upstream view of West Fork Dennison channel at moderate flow, stream gage water level = 5.7 feet. BLM navigability float trip, Taylor Highway MP49, 1000 hours, July 14, 2018.

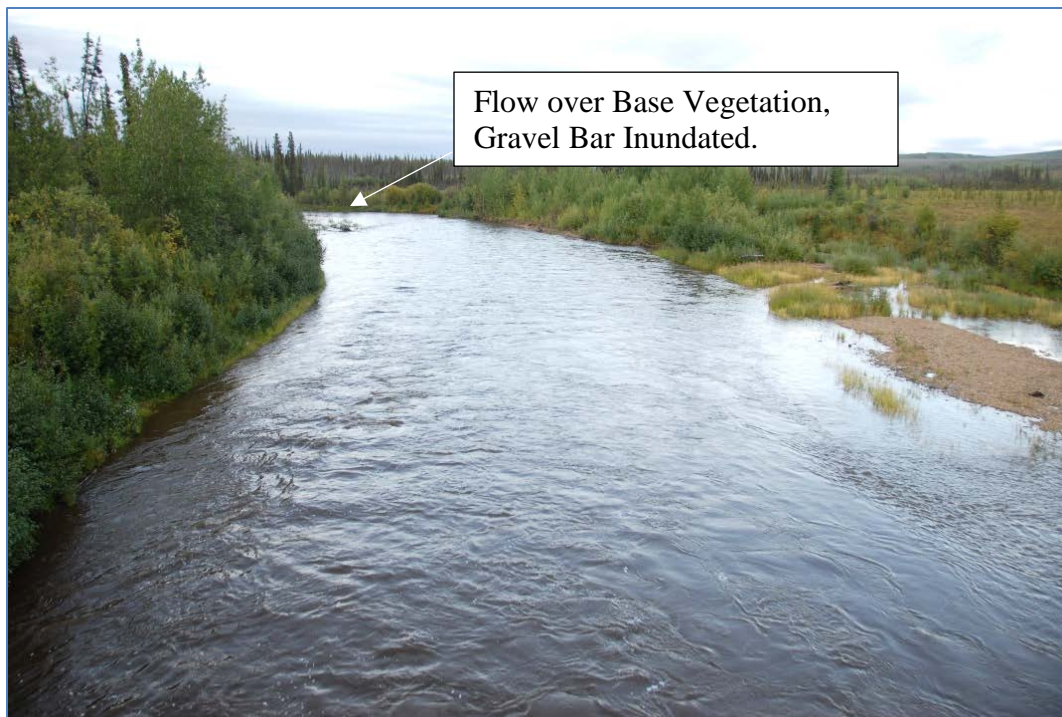


Figure 2b. Downstream view of West Fork Dennison channel at moderate flow, stream gage water level = 5.7 feet. BLM navigability float trip, Taylor Highway MP49, July 14, 2018.



Water Level above
Vegetation Line

Figure 3a. Upstream view of West Fork Dennison channel at high flow, stream gage water level = 7.7 feet. Taylor Highway Bridge MP49, 2015 hours, August 22, 2018.



Flow over Base Vegetation,
Gravel Bar Inundated.

Figure 3b. Downstream view of West Fork Dennison channel at high flow, stream gage water level = 7.7 feet. Taylor Highway Bridge MP49, 2015 hours, August 22, 2018.

Fortymile Region Field Trip, July 9-23, 2018

Part 1

West Fork of the Dennison Fork and Dennison Fork of the Fortymile River

Participants:

Ben Kennedy (Bureau of Land Management (BLM) Hydrologist, Eastern Interior Field Office), Kevan Cooper (BLM Realty Specialist, Eastern Interior Field Office, Kate Cronin (BLM Student Volunteer), and Jack Frost (BLM Navigable Waters Specialist, Alaska State Office).

Background:

The State of Alaska filed a 180-day notice of intent to file a quiet title action on April 3, 2018.¹ This notice included the submerged lands of the Middle Fork of the Fortymile River (Middle Fork); North Fork of the Fortymile River (North Fork) upstream of the Kink; West Fork of the Dennison Fork (West Fork); and Dennison Fork of the Fortymile River (Dennison Fork). In response to this action, the BLM decided to gather new physical and historical evidence related to the navigability of each segment within the notice since the BLM's position on these water bodies has been that they are non-navigable.² Therefore, the first step in this process the BLM decided to float approximately the 140 miles of river in the notice to gather the necessary evidence to reassess our position on each water body.

Trip:

The original schedule for our float trip required changing since our group encountered high water at the confluence of the Middle Fork and the North Fork where we intended to investigate the North Fork in its entirety. The North Fork was dangerously high and could not be safely floated downstream. Instead, the new plan called for a helicopter to fly in and transport us to the Chicken field camp on July 13. We planned to stay one night at the field camp and then drive over to the West Fork of the Dennison Fork on the Taylor Highway to start another float on July 14. This float would be relatively short, only about 30 miles in length that included the West Fork and the Dennison Fork. Our take out location would be at the boat launch by the Taylor Highway Bridge over the South Fork.

¹ State of Alaska Department of Law to the Honorable Ryan Zinke, Secretary of the Interior, "Re: Middle Fork of the Fortymile River; North Fork Fortymile River; West Fork of the Dennison Fork; and Dennison Fork of the Fortymile River AGO No. AN2011103815," April 3, 2018, BLM records.

² Deputy State Director for Conveyance Management (960) to Acting Assistant Deputy State Director for Conveyance Management (960), "Navigability Determination for the Fortymile River Basin," June 29, 1983, BLM records.

I planned to take periodic depth measurements using a staff marked with measurements in tenths of a foot and photographs of the river to get a general idea of the character of each water body. All of my photographs were taken with a Garmin Montana 680t gps/camera. Each photograph taken includes the latitude and longitude. Ben Kennedy would take measurements at key locations to assist him in his hydrologic investigation. Kevan Cooper was instrumental to this trip because of his knowledge of each of the water bodies we would investigate since he floats most of them annually. Kate Cronin was along to assist with the day-to-day logistics and help Ben Kennedy with his measurements.

West Fork of the Dennison Fork

The morning of July 14, we loaded up all of our gear on a truck and trailer at the Chicken field camp and drove to our put in location at the West Fork. Access is at the bridge crossing over the West Fork on the Taylor Highway (see Picture 1). While we inflated our rafts and assembled our gear on the rafts, Ben gathered some hydrological data at our put in location (see Picture 2). Ben recorded a water level of 5.67 feet from the wire-weight river gage located on the bridge and mentioned current water level was about average for mid- to late summer. Ben also noted high water events at this location were typically 2-3 feet higher than the current water level.



Picture 1- Put in location on the West Fork at the Taylor Highway Bridge.



Picture 2- Ben gathering hydrological data on the West Fork at our put in location.



Picture 3- Approximate location of first depth reading on the West Fork.

We launched our rafts and started downstream at about 10:30 a.m. Our float on the West Fork would be short, only about seven miles in length until we encountered the Dennison Fork. My first depth reading at the bridge was noted as 2.6' and no obstructions noted there (see Picture 3). As we proceeded downstream, I took many measurements but most of the depth measurements that I took on the entire length of the West Fork averaged about two feet deep and about 100 feet wide. At first, we encountered a few minor riffles that we skirted around easily but then we encountered more riffles that we had to either maneuver our way around or drag our raft for short

distances (see Picture 4). In all, we had nine times that we had to drag our raft short distances through riffles on the West Fork (see Picture 5).

If necessary, portaging around an obstruction, going either upstream or downstream, by land on the West Fork can readily be accomplished due to the low gradient and physical character of the adjacent flora. Pole boats common in the region for commerce before statehood could have reliably and for reasonable periods of the summer negotiated the West Fork taking loads of 1,000 pounds or more of freight.



Picture 4- The first minor riffle we encountered on the West Fork about one mile downstream from the Taylor Highway Bridge.



Picture 5- A riffle that required dragging through. See boat in upper right.

Once we arrived at the confluence with the Dennison Fork, Ben gathered more hydrological data on the lower West Fork for his assessment once we returned to the office (see Picture 6). This section of the West Fork was particularly shallow and rocky where it empties into the Dennison Fork but access around this short impediment can be accomplished by land. My final depth measurement at this location was noted at 1.2 feet deep.



Picture 6- Ben collecting hydrological data at the confluence of the West Fork and Dennison Fork.

Dennison Fork of the Fortymile River-

We arrived at the confluence of the West Fork and the Dennison Fork at 4:45 p.m. Ben began his work collecting data for his hydrologic research with the assistance of Kate. The Dennison Fork appeared to be at a normal flow level for the time of the year just like the West Fork. At about 6:30 p.m. we resumed floating downstream from the confluence on the Dennison Fork (see Pictures 7-8).



Picture 7- The confluence of the West Fork and Dennison Fork.



Picture 8- Looking downstream on the Dennison Fork just below the confluence with the West Fork. Also, near where I took my first depth measurement on the Dennison Fork.

The Dennison Fork near the confluence was about 130 feet wide and my first depth measurement was 4.5 feet deep (see Picture 8). Not surprisingly, the combination of the two forks increased the flow level and the overall depth of the river. The average depth of the entire length of the Dennison Fork was well over three feet deep or deeper. We did encounter some shallower sections but the distance was very short and was easily navigated. The shallowest depth reading for the Dennison Fork was 1.1 feet deep and many of my depth readings were in excess of five feet deep. Clearly, pole boats, common in the region before statehood for transporting goods that

miners needed, and 18-24' boats with a motor would be able to navigate the entire length of the Dennison Fork with at least one thousand pounds of freight.

Our only campsite on the Dennison Fork was located about halfway downstream of our take out near the bridge over the South Fork (see Picture 9). The next morning at 9:30 a.m., we began floating again downstream to our take out location at the boat ramp by the bridge over the South Fork.



Picture 9- Camp on the Dennison Fork the evening of July 14, 2018.

As stated previously, the average depth of the entire length of the Dennison Fork was over three feet deep. Ben stopped at the confluence with the Mosquito Fork to gather more hydrologic data (see Pictures 10-11). After the data was collected, we floated downstream to the boat launch on

the South Fork, and then loaded our rafts onto the boat trailer and gear in the truck and drove back to the BLM's Chicken field camp.



Picture 10- Ben and Kate gathering hydrological data near the confluence of the Dennison Fork and Mosquito Fork.



Picture 11- Confluence of the Dennison Fork and Mosquito Fork.

Notes:

I have included below some of my observations or thoughts after floating the West Fork and the Dennison Fork. First, the Taylor Highway is a pre-statehood road that provides relatively easy access to both the West Fork and South Fork for launching or retrieving boats. There is a rich history of pole boats being used upstream on the South Fork to at least Chicken Creek on the Mosquito Fork. The character of the Dennison Fork is such that these pole boats could have

easily continued upstream at least to the confluence with the West Fork with a commercial load of at least 1,000 pounds. Pole boats travelling farther upstream on the West Fork would have been a little more difficult but not impossible due to the character of the river and surrounding landscape. The physical character of the West Fork was shallower (just a little over 2 feet deep versus well over 3 feet deep) than the Dennison Fork during average flows. The West Fork also had riffles shallow enough that we had to drag our raft nine times.

Based on channel cross-section features and the West Fork Dennison stream gage data (Attachments I & II), typical high water events for both the West Fork and Dennison Fork are on the order of 2 to 3 feet higher than the moderate water levels encountered during our float trip.³

Finally, while driving back to Fairbanks on July 22 we observed that the West Fork flow level had dropped considerably where we observed rocks and much more shallow water than what we experienced July 14. Attachment II includes photographs and selected July-August, 2018 water levels showing channel variations for low, moderate, and high flows at West Fork Dennison Bridge,

This is typical during the summer season where the West Fork flow levels fluctuate throughout the season. No boats were observed on the rivers during our float except on the South Fork.

³ Ben Kennedy, BLM Hydrologist, "West Fork Dennison and Dennison Fork of Fortymile River Navigability Float Trip," July 14-15, 2018, BLM records.

Streamflow and Channel Characteristics at Selected Sites on the Fortymile
River, Alaska

September 2018



Jon Kostohrys
3349 Buffalo Ln
Fairbanks, AK 99712
907-488-2656

Table of Contents

Introduction.....	3
Notes.....	4
References.....	6
Appendix: Hydrology Data Summaries.....	7
Part 1. West Fork/Dennison Fork.....	7
West Fork.....	7
Dennison Fork.....	12
Part 2. North Fork/Middle Fork.....	17
North Fork.....	17
Middle Fork.....	30
Part 3. Main Stem Fortymile River.....	34

Introduction.

The Alaska National Interest Lands and Conservation Act of December 2, 1980, (ANILCA, P.L. 96-487) established the Fortymile River and certain tributaries, as a component of the National Wild and Scenic Rivers System. The selected segments are described in the River Management Plan for the Fortymile National Wild and Scenic River (USDI 1983).

In 1989, the Bureau of Land Management's (BLM) Steese/White Mountains District (currently Fairbanks District) initiated a water rights quantification study for the Fortymile River. This project determined the annual streamflow on the designated segments of the Fortymile River for the purposes of adjudication of water rights with the State of Alaska Department of Natural Resources, Division of Mining and Water Management.

The methodology used to monitor streamflow at the selected sites (stream gages), by recording the water level (stage) and periodically measuring streamflow (discharge), are noted in Rantz and others (1982). Cross-sectional geometry surveys and analysis followed procedures in Parsons and Hudson (1983), Benson, and Dalrymple (1967). Six of the forks and main stem had long-term stream gages installed, while additional sites in the headwaters were surveyed intermittently for cross-sectional geometry and streamflow.



Fig. 1. A BLM field technician surveys the streamflow on the North Fork of the Fortymile River. Most rivers were surveyed by wading the cross section.

The preliminary data, from 1989-1995, was presented in BLM Open File Report 75 (Kostohrys, Sterin, and Hammond 1999). The current report will summarize all the data collected by the BLM from 1989-2005 that determine channel geometry characteristics at the surveyed sites. Since all the original data was checked and reviewed for this report, any changes from previously reported data are definitive.



Fig. 2. Where the river was too deep to wade, such as the Fortymile River at the Taylor Highway Bridge, a flow meter and sounding weight were suspended by a cable and reel system to survey the river.

Notes.

Cover photo: A flood has cut off a meander loop on the West Fork Fortymile River several miles downstream of the bridge. All photos are by the author unless noted otherwise.

All the data, unless noted otherwise in the summary tables, was collected by the author or staff under his supervision, while employed as a hydrologist by the BLM.

The equipment used was a standard USGS wading rod, type AA current meter, and tag line or surveyors tape. A USGS three-wheel base, boom, and reel were used for bridge and boat measurements. A surveyor's level and fiberglass rod used for surveying stream banks and water surface profiles.

Locations in the early 1990's relied on helicopter GPS readings or were marked on a map in the field and computed in the office. From the late 1990's to 2005, a Garmin III GPS unit was used.

The FPS units (foot-pound-second system) in this report, traditional for hydrologic data for the BLM, USGS and other federal agencies, are:

Water level (stage), depth, width feet (ft) in tenths and hundredths

Streamflow (discharge) cubic feet per second (cfs)

Abbreviations used in Tables are:

u.s.	upstream
d.s.	downstream
mi.	miles
w.s.	water surface
x.s.	cross section
yds	yards
Ck	Creek
ND	Not Determined
TBM	Temporary Bench Mark
USDI	U.S. Department of Interior
AKDNR	Alaska Department of Natural Resources

References.

Benson, M.A and T. Dalrymple. 1967. General Office and Field Procedures for Indirect Discharge Measurement. In: Techniques of Water Resources Investigations, Book 3, Chapter A1. U.S. DOI, Geological Survey. 44 p.

Kostohrys, J., Sterin. B. and Hammond, T. “Water Resources of the Fortymile National Wild and Scenic River, Alaska”. BLM-Alaska Open File Report 75-99/016. September 1999. 64pp.

Parsons, S. and S. Hudson. 1985. Stream Channel Cross-Section Surveys and Data Analysis. U.S. DOI, Bureau of Land Management. BLM TR 4341-1 Denver, CO. 48 p.

Rantz, S.E., and others, 1982, Measurement and computation of streamflow—Volume 1, measurement of stage and discharge; Volume 2, Computation of Discharge: U.S. Geological Survey Water-Supply Paper 2175, 631 p.

U.S. Department of Interior, Bureau of Land Management, Fairbanks District, Alaska. 1983. River Management Plan for the Fortymile River National Wild and Scenic River, Alaska. 58 pp.

Appendix: Hydrology Data Summaries

Part 1. West Fork / Dennison Fork Fortymile River

West Fork Fortymile River

Location. Latitude: 63.8904 Longitude: -142.2345
Surveys taken at the Taylor Highway Bridge near Milepost 51.

Site Description.



Fig. 3. The channel is relatively straight upstream of the bridge with few riffles or obstructions. The stream is confined by a low ridge to the north with a lower bank and wide floodplain to the south



Fig. 4. Downstream of the bridge, the channel is wider, shallower, and has more obstructions from islands and boulders (rock gardens), than upstream of the bridge

Cross Section

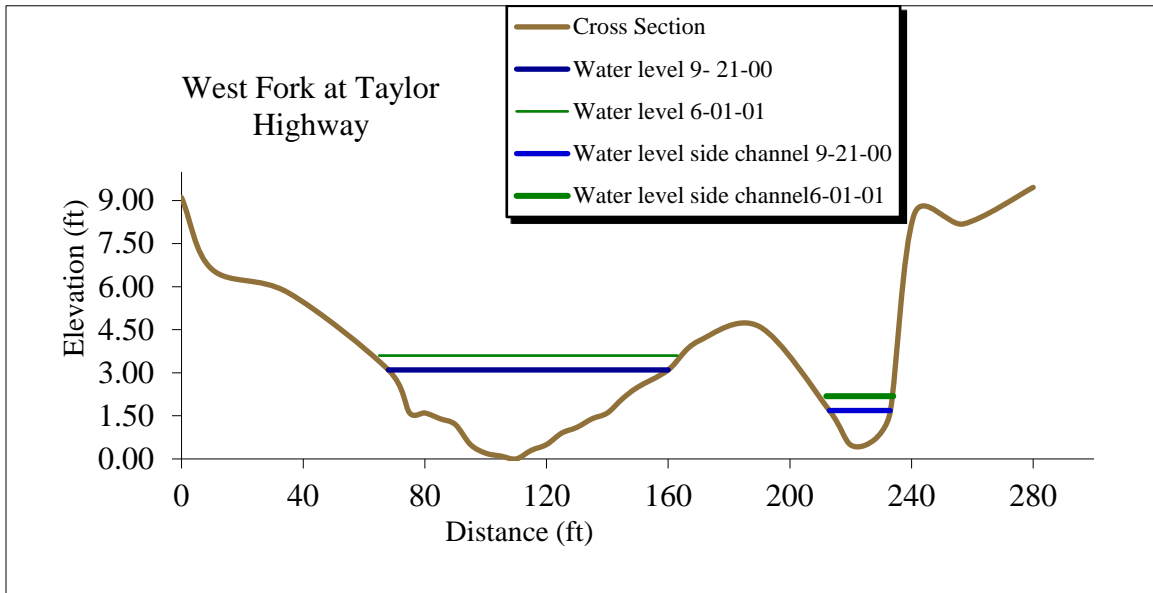


Fig.5 Channel cross section of the West Fork Fortymile River downstream of the bridge

Table 1. Summary of hydrological data at West Fork Fortymile River

Date	Water Level	Discharge	Width	Max Depth	Remarks
	(ft)	(cfs)	(ft)	(ft)	
9/28/89	1.87	382	115	3.1	100' u.s. bridge
5/10/90	3.88	<u>1,992</u>	115	5.0	At bridge
8/21/90	1.48	225	90	3.05	100' u.s. bridge
5/14/91	1.69	232	102	2.3	D.S. at split channel
7/1/91	1.26	125	87	3.6	150' u.s. bridge
5/22/92	2.60	886	112	4.3	Shore Ice At Bridge
6/25/93	2.26	451	114	4.0	200' u.s. bridge
5/13/94	1.96	301	125	2.95	200' u.s. bridge
7/29/94	1.13	93	60	1.6	100' u.s. bridge
9/22/94	0.83	51	55	1.25	200' d.s.bridge
5/16/95	3.54	1,640	<u>114</u>	5.5	At bridge
6/30/95	1.69	249	83	1.95	200' d.s.bridge
9/22/95	1.51	192	79	1.9	150' d.s.bridge
12/13/95	ND	1.3	29	0.6	Ice and overflow
5/23/96	1.04	84	70	1.4	200' d.s.bridge
7/13/96	1.54	216	82	1.9	100' d.s.bridge
9/19/96	0.29	19	41	0.8	Same location
6/27/97	2.24	500	151	2.9	Same location
7/3/97	1.27	123	77	1.2	Same location
9/15/97	1.85	366	159	2.6	Same location
11/17/97	ND	5.5	35	0.7	Ice 30' downstream
5/15/98	2.29	554	151	2.9	100' d.s..bridge
6/18/98	2.42	637	150	3.0	Same location
8/19/98	1.20	118	77	1.2	200' d.s.bridge
11/18/98	ND	0.4	6.0	1.0	Ice 110' d.s.bridge
5/18/99	3.37	1,334	119	4.3	At bridge
9/21/99	1.99	393	143	2.3	2 channels d.s.bridge
11/22/99	ND	4.5	27	0.6	Ice 150' d.s.bridge
5/15/00	2.49	708	160	2.9	150' d.s.bridge
9/21/00	2.83	474	92	3.1	100' d.s.bridge
11/15/00	ND	8.6	48	1.2	Ice 150' d.s.bridge
6/1/01	3.13	763	118	5.0	At bridge
8/14/01	1.60	156	80	2.0	100' d.s.bridge
9/17/01	2.10	311	90	2.05	150' d.s.bridge
11/27/01	ND	8.5	48	0.9	Ice 200' d.s.bridge
5/29/02	1.72	268	85	2.5	100' d.s.bridge
8/5/02	1.30	145	73	2.2	Same location

9/18/02	2.76	706	113	3.6	150' u.s..bridge
12/4/02	ND	4.8	31	1.0	Ice 150' u.s.bridge
6/10/03	1.36	146	79	2.1	100' d.s.bridge
9/29/03	0.67	30	65	1.2	150' d.s.bridge
12/4/03	ND	1.8	12	0.8	Ice 150' upstream
8/5/04	1.36	169	80	2.05	60' d.s.bridge
9/21/04	1.06	90	77	1.9	100' d.s.bridge
11/18/04	ND	3.1	36	0.9	Ice 150' u.s..bridge
5/25/05	2.10	419	88	2.9	60' d.s.bridge
9/14/05	2.38	528	118	3.0	150' u.s..bridge

Revised value

West Fork Fortymile River above Logging Cabin Creek

Location. Latitude: 63.8133 Longitude: -142.4170
Upstream of Logging Cabin Creek near WRM 0.

Site Description.

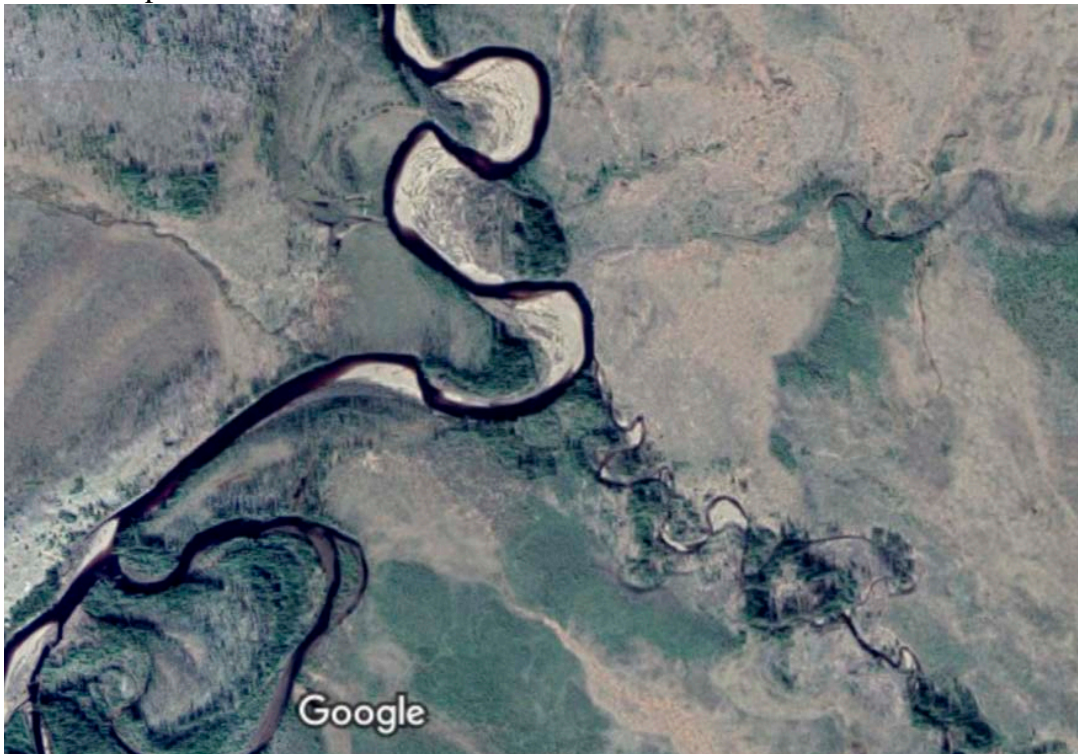


Fig.6 The channel meanders extensively near Logging Cabin Creek, but has a few straight reaches upstream. A large boulder was noted in the channel during the August survey (Photo courtesy of Google Maps)

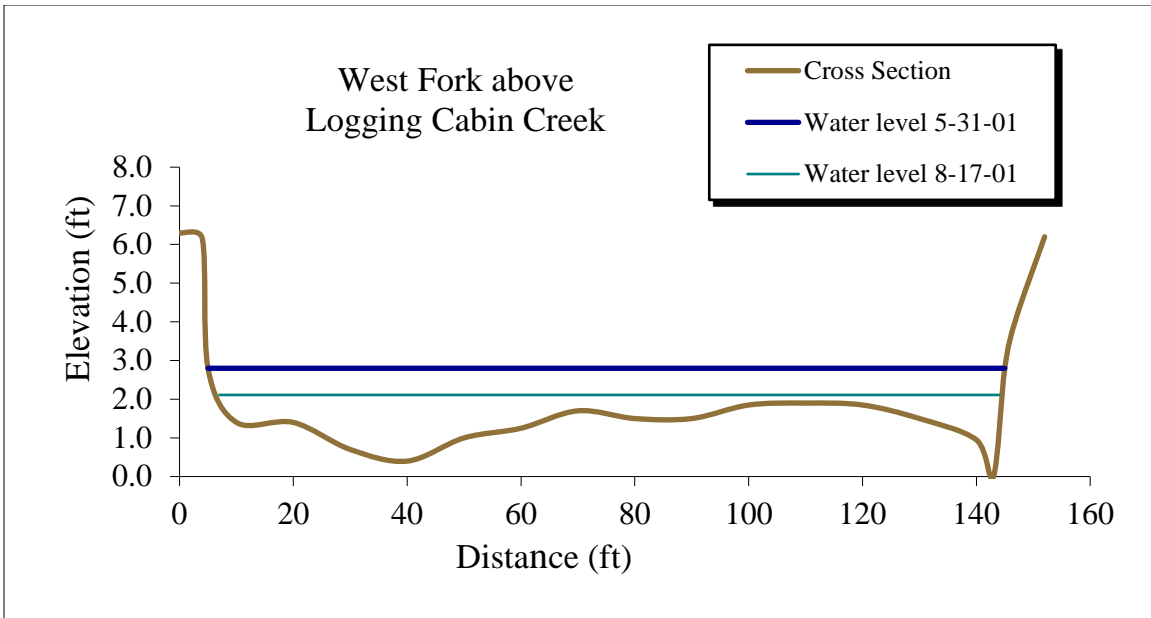


Fig. 7 Cross Section of West Fork Fortymile River above Logging Cabin Creek

Table 2. Summary of hydrologic data at West Fork above Logging Cabin Creek

Date	Water Level	Discharge	Width	Max Depth	Remarks
	(ft)	(cfs)	(ft)	(ft)	
5/31/01	2.80	605	140	2.8	u.s. Logging Cabin Creek
8/17/01	2.11	122	90	1.4	25 ft u.s. x.s.1

Dennison Fork Fortymile River

Location. Latitude: 64.0524 Longitude: -141.9114
Survey site 500 'upstream of mouth at Mosquito Fork.

Site Description.



Fig. 8 Dennison Fork of the Fortymile River looking upstream of the mouth. The channel is relatively wide and braids out into two channels at low water. The 1991 cross section is the straight reach near the center of the center photo



Fig. 9 Dennison Fork looking downstream to the mouth. Most streamflow measurements were near the center of the photo, where there was a single low water channel

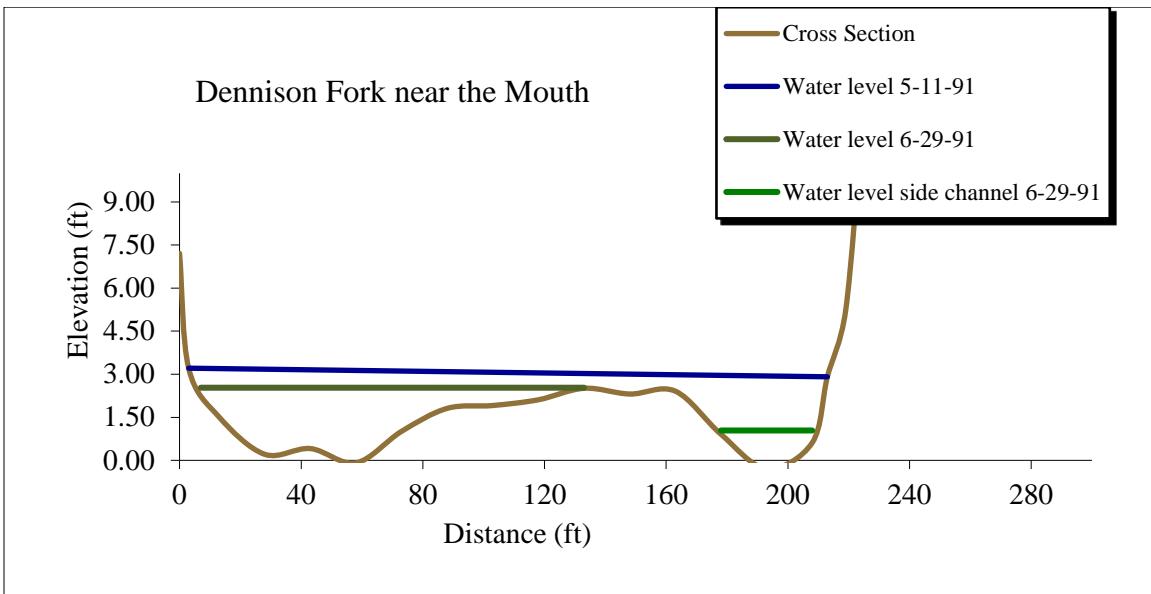


Fig. 10 Channel cross section for Dennison Fork near the mouth

Table 3. Summary of hydrologic data at Dennison Fork near the mouth

Date	Water Level	Discharge	Width	Max Depth	Remarks
	(ft)	(cfs)	(ft)	(ft)	
5/16/91	3.20	1,184	210	3.2	500 ft u.s. of mouth
6/29/91	2.53	276	139	2.7	Same location
8/7/92	3.55	1,768	177	4.6	100 ft d.s. of x.s.1
9/20/95	ND	547	114	3.8	300 ft d.s. of x.s.1
8/17/01	2.74	405	120	2.9	Same location

ND--Not Determined

Dennison Fork above West Fork Fortymile River

Location. Latitude: 63.9008 Longitude: -142.0285

Survey site 50 'upstream of an island, about 1 mile above West Fork.

Site Description.

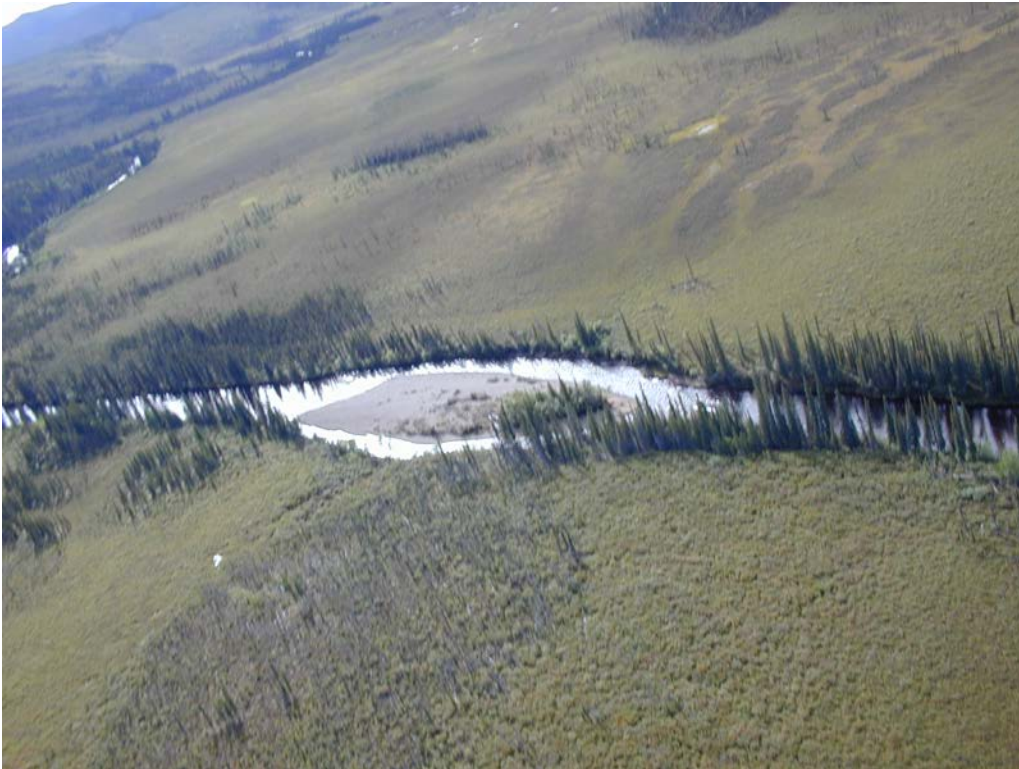


Fig. 11 Dennison Fork above West Fork, streamflow is from left to right. The surveyed cross section is to the left (upstream) of the island



Fig. 12 Dennison Fork above West Fork looking downstream. The surveyed cross section is upstream of the island. The channel is fairly uniform, deep and slow in this reach.

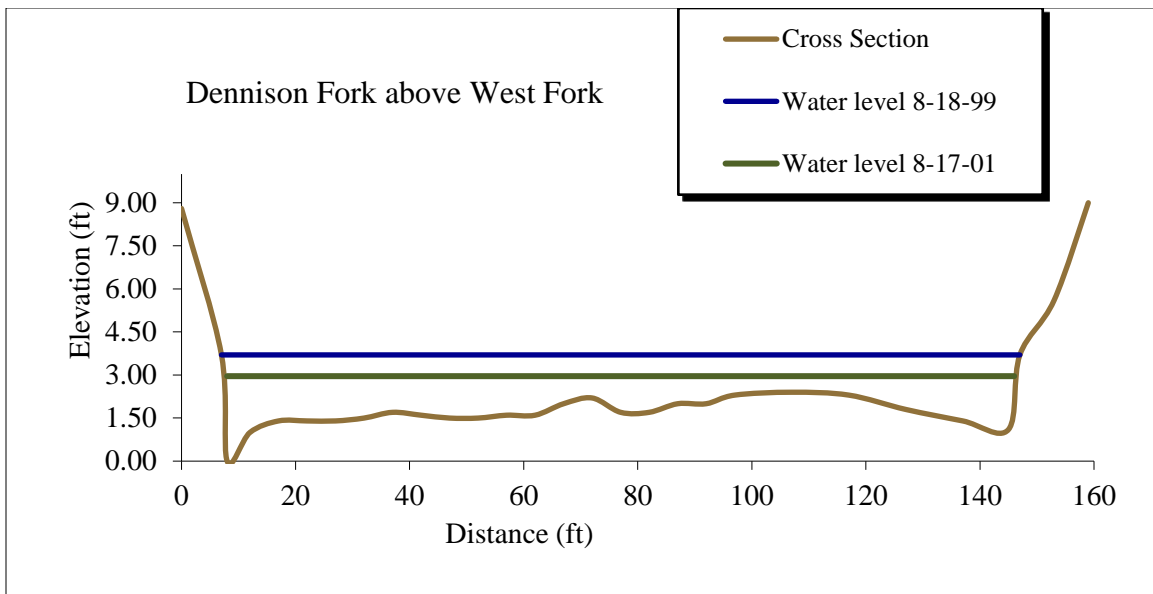


Fig. 13 Channel cross section at Dennison Fork above West Fork

Table 4. Summary of hydrologic data at Dennison Fork above West Fork

Date	Water Level	Discharge	Width	Max Depth	Remarks
	(ft)	(cfs)	(ft)	(ft)	
8/18/99	3.70	657	140	3.7	50' u.s. of island
9/6/00	3.89	647	145	3.7	Same location
8/17/01	2.96	187	131	1.7	Same location

Appendix Part 2. North Fork / Middle Fork Fortymile River

North Fork Fortymile River at South Fork Confluence

Location. Latitude: 64.2431 Longitude: -141.7541
Surveys taken approximately 0.5 mile upstream of South Fork.

Site Description.



Fig. 14 North Fork at South Fork looking upstream. The surveyed cross section is just downstream. The channel is very uniform, deep and moderately fast in this reach



Fig. 15 North Fork at South Fork looking upstream at the cross section. The channel steepens, shallows, and becomes quite fast as the river approaches the confluence with the South Fork

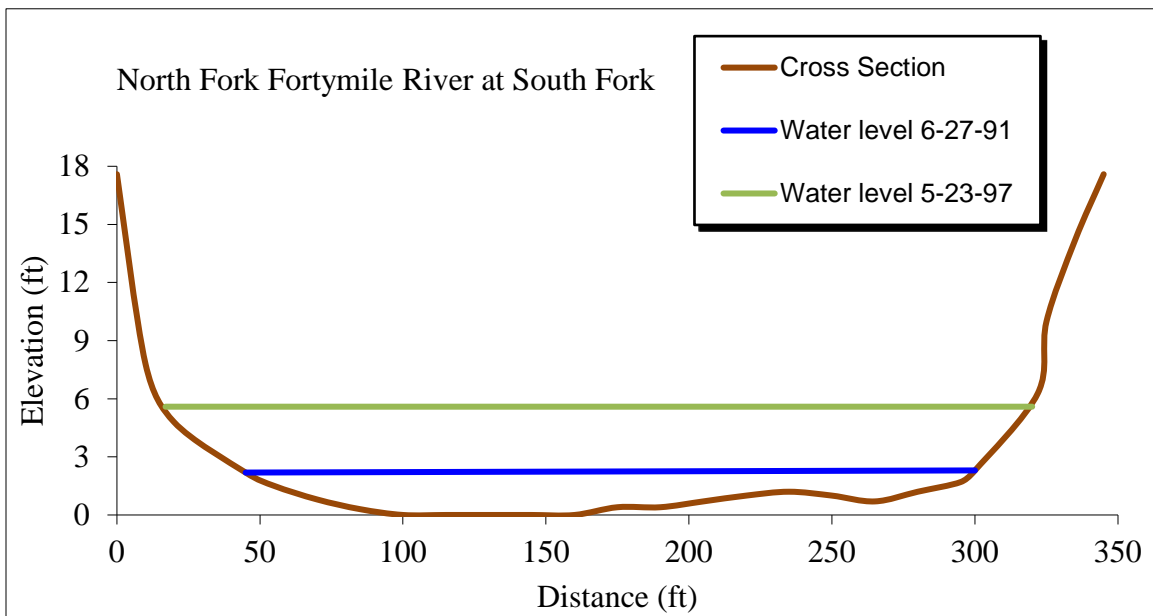


Fig. 16 Channel cross section at North Fork Fortymile River at South Fork

Table 5 Summary of hydrologic data at North Fork at South Fork

Date	Water Level (ft)	Discharge (cfs)	Width (ft)	Max Depth (ft)	Remarks
6/27/91	2.51	817	255	2.3	At x.s.1 0.5 mi. u.s. South Fork (SF).
8/9/91	3.16	1,440	281	2.9	At x.s.1
9/26/91	2.46	758	205	2.4	At x.s.1
2/20/92	ND	38	46	0.8	Ice 0.25 mi.u.s.SF.
4/14/92	ND	30	28	1.1	Same location
8/3/92	4.00	<u>2,205</u>	<u>182</u>	6.1	100' d.s. data logger
11/13/92	ND	120	65	1.6	Ice 0.25 mi.u.s.SF.
3/26/93	ND	12	19	0.9	Same location
6/23/93	3.25	1,390	280	2.7	At x.s.1
7/27/93	3.50	1,680	280	3.0	At x.s.1
3/26/94	ND	<u>1.4</u>	<u>60</u>	0.3	Ice 2 mi d.s. kink
7/26/94	2.15	450	255	1.9	At x.s.1
9/21/94	2.60	735	281	1.9	At x.s.1
12/12/94	ND	<u>59</u>	<u>130</u>	0.8	Ice 0.25 mi.u.s.SF.
6/29/95	3.58	1,830	282	3.1	At x.s.1
8/25/95	3.45	1,650	245	3.2	At x.s.1
9/21/95	3.11	1,320	276	2.8	At x.s.1
12/12/95	ND	<u>9.7</u>	<u>39</u>	0.7	Ice 0.25 mi.u.s.SF.
5/21/96	4.02	2,383	284	3.2	At x.s.1
7/11/96	3.60	1,784	255	3.0	Same location
9/17/96	1.92	355	225	1.8	Same location
5/23/97	5.62	5,383	210	7.0	Same location
6/26/97	3.62	1,768	240	3.2	Same location
9/17/97	2.60	881	242	2.4	Same location
11/19/97	ND	<u>165</u>	110	1.4	Ice 0.25 mi u.s. SF.
2/9/98	ND	46	23	1.2	Ice 100 yds u.s. SF.
4/7/98	ND	28	36	1	Same location
5/14/98	4.20	2,820	240	3.6	100' d.s. data logger
6/16/98	3.47	1800	245	3.3	300' d.s. data logger
9/24/98	2.94	1140	230	2.8	Same location
11/19/98	ND	58	90	0.9	Ice 0.25 mi.u.s.SF
3/12/99	ND	0.1	14	0.5	Ice 100 yds u.s. SF
5/19/99	4.05	2660	244	3.9	300' d.s. data logger
6/24/99	2.68	1040	231	2.7	Same location
8/18/99	3.25	1660	244	3.3	Same location
9/22/99	2.24	649	220	2.3	Same location
11/13/99	ND	127	90	1.3	Ice 0.25 mi.u.s.SF
3/20/00	ND	3.0	12	0.5	Ice 100yds u.s. SF

5/17/00	3.62	1770	243	3.2	300' d.s. data logger
9/19/00	3.31	1590	240	3.1	Same location
11/16/00	ND	279	200	2.7	Ice, same location
3/21/01	ND	41	85	0.9	Ice 3 mi.u.s.SF.
8/15/01	2.95	1110	238	2.8	300' d.s. data logger

8/8/91 Discharge measurement by AKDNR staff

ND Not Determined

Revised value

North Fork Fortymile River below Kink at Hilda Creek

Location. Latitude: 64.3333 Longitude: -141.9667

Survey taken just upstream of Hilda Creek.

Site Description.

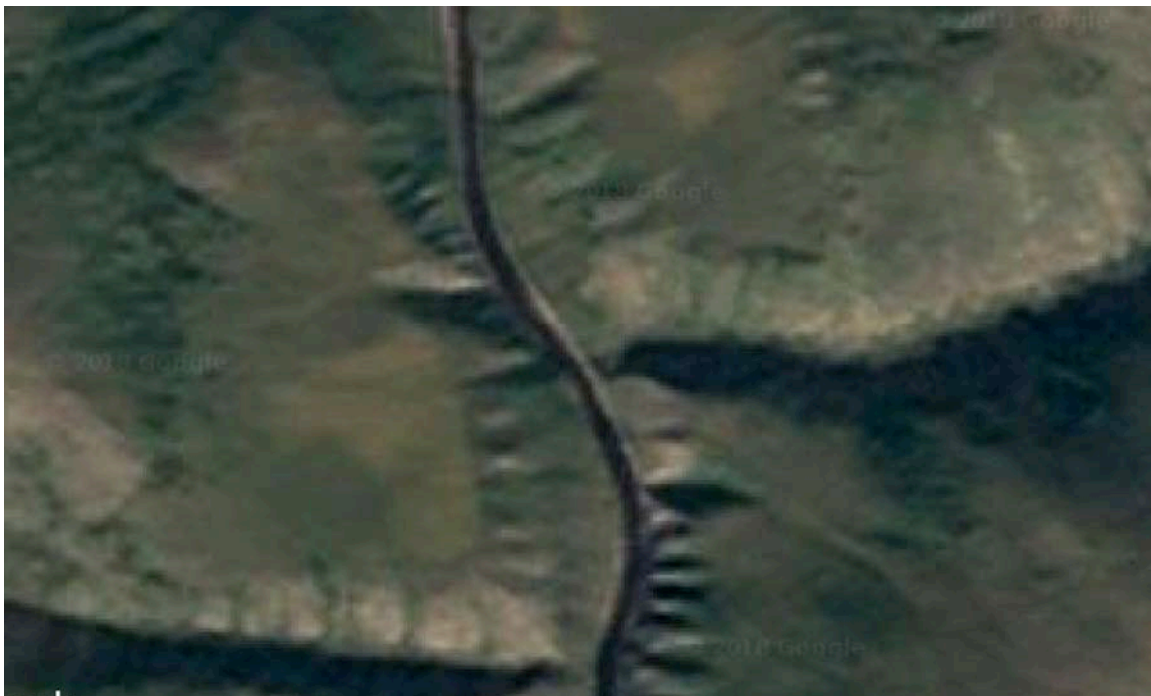


Fig. 17 The North Fork Fortymile at Hilda Creek (on the right) is a fairly straight uniform reach with no obstructions or constricted areas. (Photo courtesy of Google Maps)

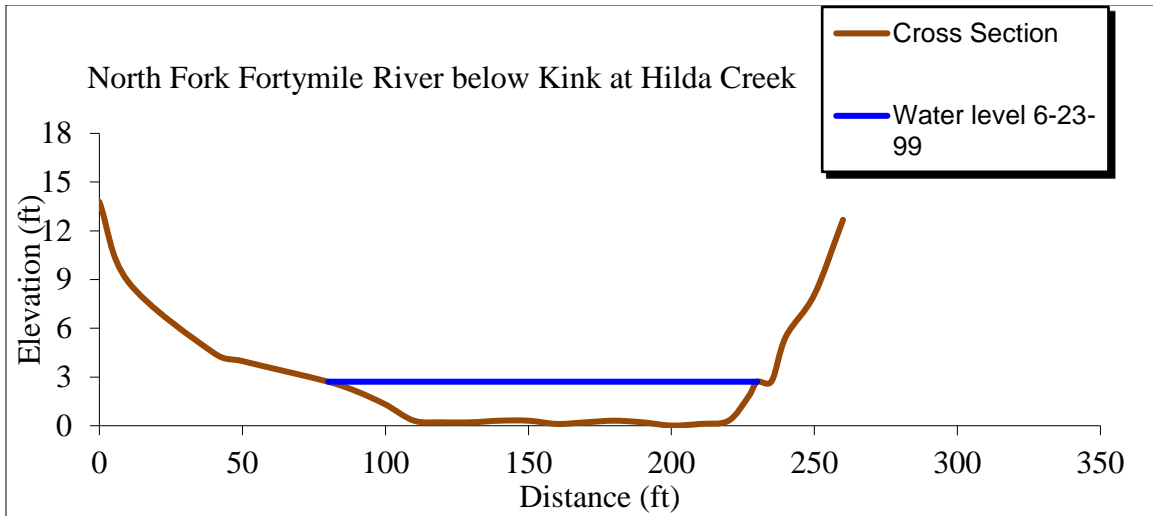


Fig. 18 The surveyed cross section on North Fork Fortymile at Hilda Creek.

Table 6 Summary of hydrologic data at North Fork at Hilda Creek

Date	Water Level (ft)	Discharge (cfs)	Width (ft)	Max Depth (ft)	Remarks
6/23/99	2.70	921	150	2.7	x.s. 200 ft. u.s. Hilda Ck.

North Fork Fortymile River at Hutchinson Creek

Location. Latitude: 64.3955 Longitude: -142.0242
Survey taken about 500 ft below Hutchinson Creek.

Site Description.

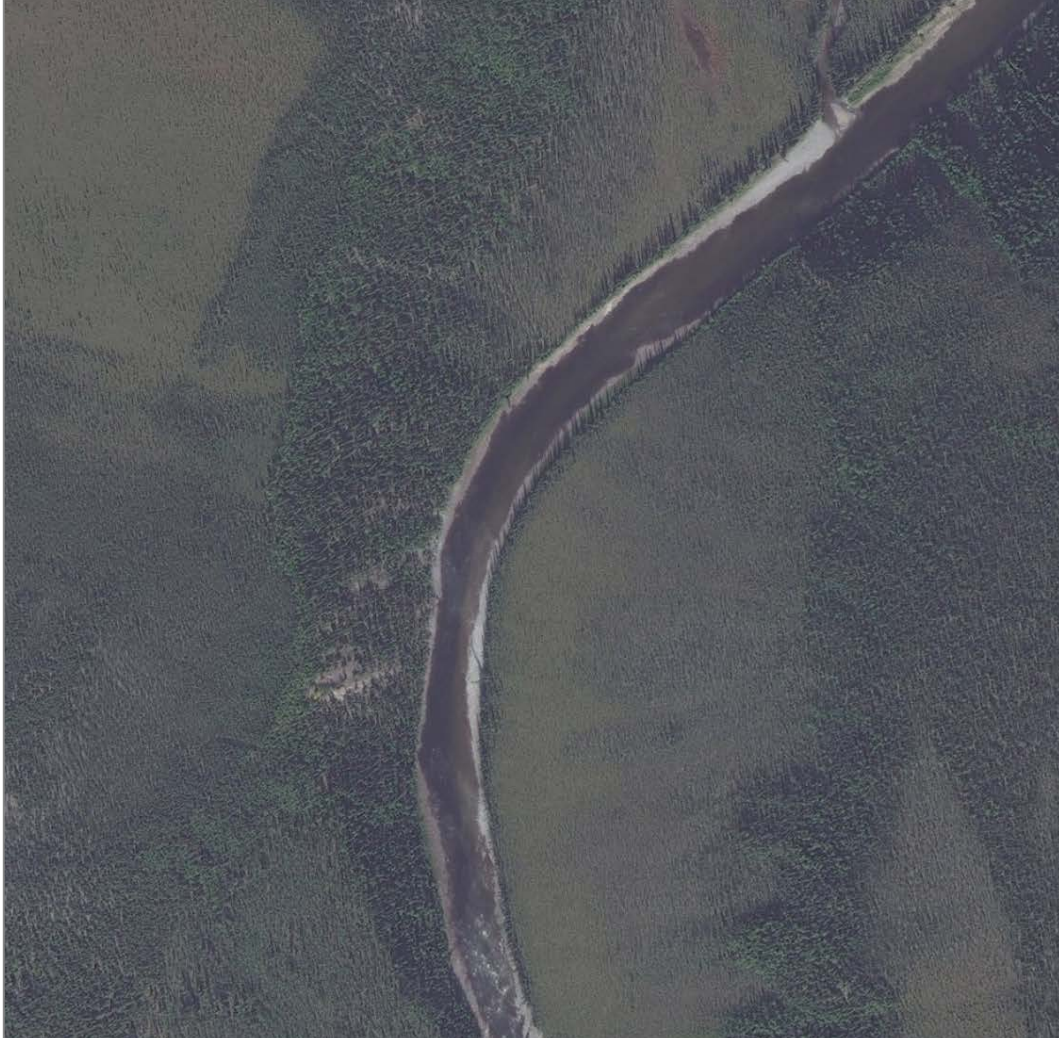


Fig. 19 The North Fork Fortymile River at Hutchinson Creek is a fairly straight, uniform reach with no obstructions or constrictions. The class V rapids at the Kink begin at the bottom of the photo (Photo courtesy of Apple Maps)

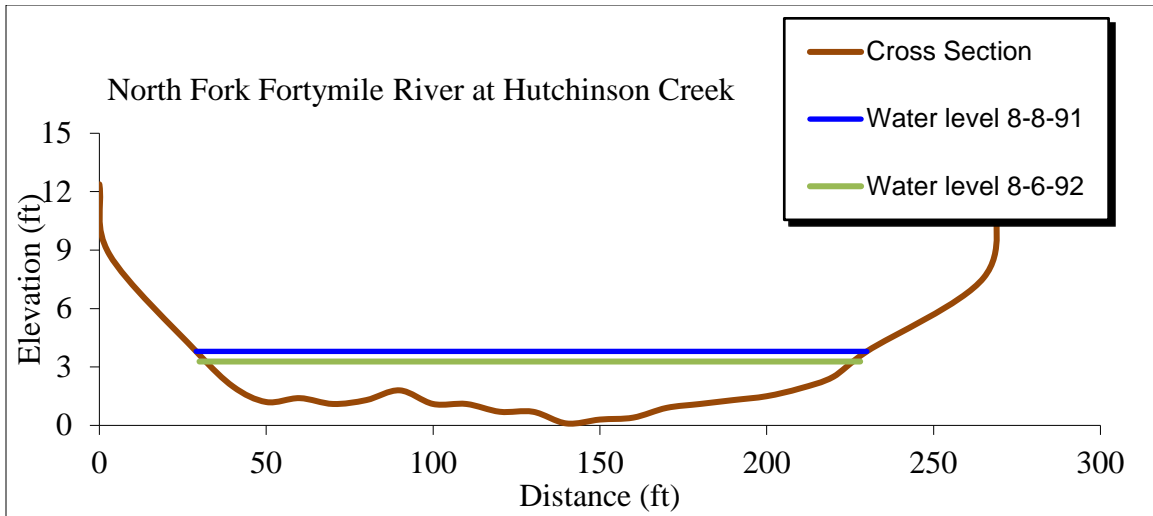


Fig. 20 The surveyed cross section on North Fork Fortymile River at Hutchinson Creek.

Table 7 Summary of hydrologic data at North Fork Fortymile River at Hutchinson Creek

Date	Water Level (ft)	Discharge (cfs)	Width (ft)	Max Depth (ft)	Remarks
8/8/91	3.78	1,683	201	3.7	500 ft. d.s. Hutchinson Ck.
8/6/92	3.28	<u>1,355</u>	200	3.4	Same location

8/8/91 Discharge measurement by AKDNR staff

Revised value

North Fork Fortymile River at Middle Fork Confluence

Location. Latitude: 64.4691 Longitude: -142.2096

Surveys taken approximately 500 ft. upstream of Middle Fork confluence.

Site Description.



Fig. 21 The North Fork Fortymile River at Middle Fork looking upstream, with the Middle Fork on the left and North Fork on the right. There is a series of boulder bed rapids (rock gardens) just upstream and class III rapids downstream of the confluence



Fig. 22 The North Fork Fortymile River at Middle Fork looking downstream is a fairly straight, uniform reach with no obstructions or constricted areas

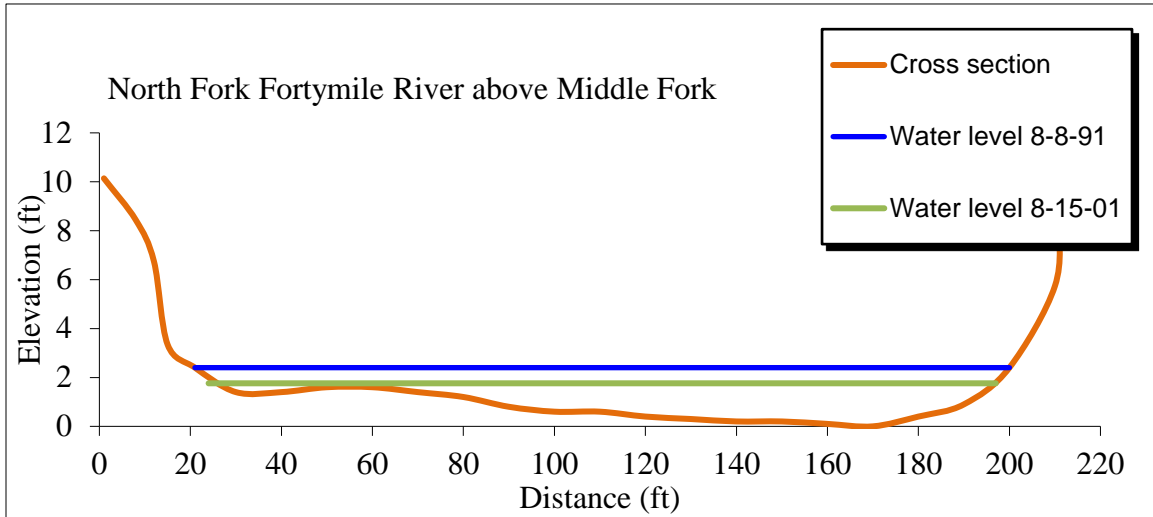


Fig. 23 The surveyed cross section on North Fork Fortymile River at Middle Fork

Table 8 Summary of hydrologic data at North Fork Fortymile River at Middle Fork

Date	Water Level (ft)	Discharge (cfs)	Width (ft)	Max Depth (ft)	Remarks
8/8/91	2.42	870	179	2.4	500 ft.u.s. Middle Fork
8/5/92	1.90	467	139	2.0	300 yds u.s. confluence
8/23/95	2.17	569	176	2.1	Same location
7/26/99	ND	330	157	2.4	No levels to w.s.
8/18/99	1.81	416	171	2.0	300 yds u.s. confluence
8/15/01	1.76	428	165	2.0	Same location

8/8/91 Discharge measurement by AKDNR staff

7/26/99 Discharge measurement by BLM Fisheries staff

North Fork Fortymile River above Champion Creek

Location. Latitude: 64.5666 Longitude: -142.1365

Survey taken just upstream of Champion Creek.

Site Description.



Fig. 24 North Fork Fortymile River above Champion Creek cross section is the relatively straight reach near the bottom of the photo



Fig. 25 North Fork Fortymile River above Champion Creek is a meandering stream with wide gravel bars and occasional islands

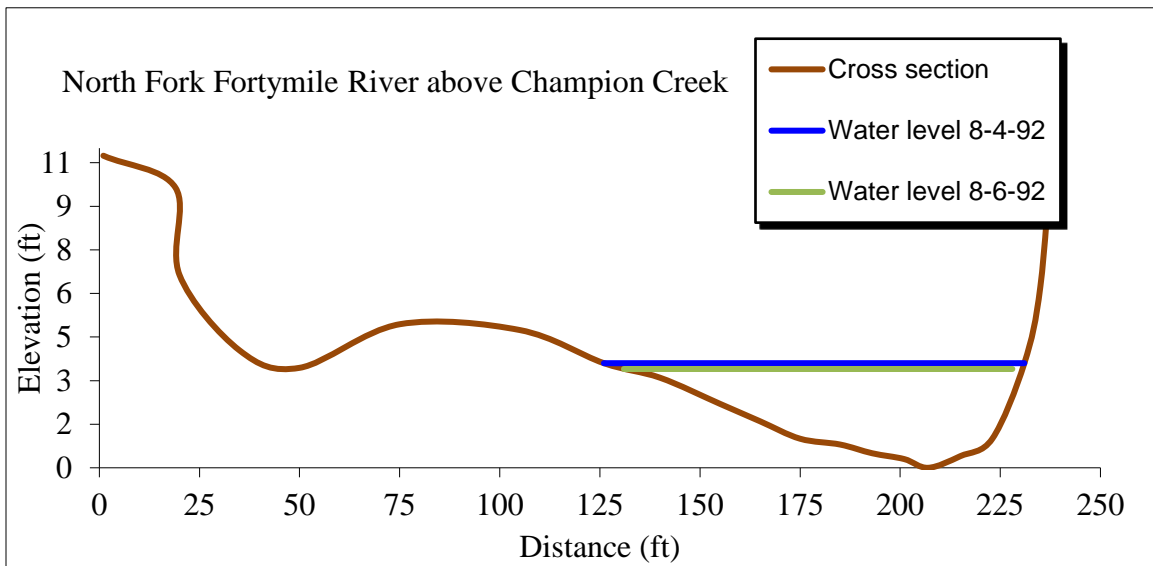


Fig. 26 The surveyed cross section on North Fork Fortymile River above Champion Creek

Table 9 Summary of hydrologic data at North Fork Fortymile River above Champion Creek

Date	Water Level	Discharge	Width	Max Depth	Remarks
	(ft)	(cfs)	(ft)	(ft)	
8/4/92	3.60	355	105	3.6	1 mi. u.s. Champion Ck
8/6/92	3.40	262	97	3.3	At TBM x.s.1
8/16/99	2.80	633	120	2.8	Lost TBM-1 new TBM-2
8/16/01	2.13	343	103	2.5	50' d.s. TBM-2

North Fork Fortymile River above Little Bonanza Creek

Location. Latitude: 64.6266 Longitude: -142.2960

Survey taken about a mile upstream of Little Bonanza Creek.

Site Description.



Fig. 27 North Fork Fortymile River above Little Bonanza Creek cross section #1 surveyed in 1992 is a shallow, uniform reach with a bed of cobbles and small boulders



Fig. 28 North Fork Fortymile River above Little Bonanza Creek is a shallow stream with gravel bars and occasional constrictions at bends

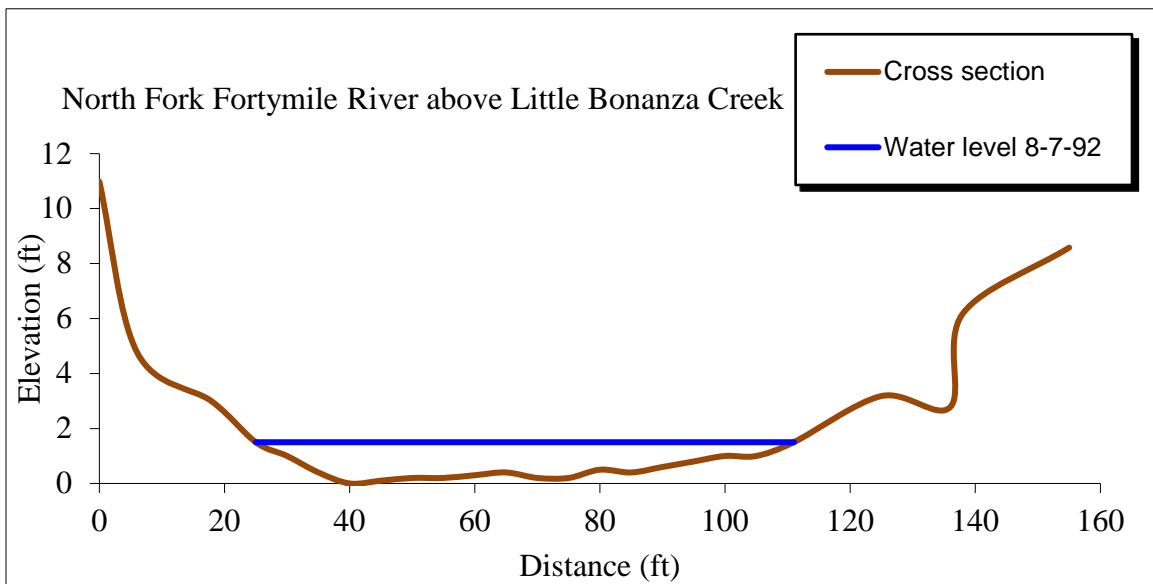


Fig. 29 The surveyed cross section on North Fork Fortymile River above Little Bonanza Creek

Table 10 Summary of hydrologic data at North Fork Fortymile River above Little Bonanza Creek

Date	Water Level	Discharge	Width	Max Depth	Remarks
	(ft)	(cfs)	(ft)	(ft)	
8/6/92	1.49	<u>147</u>	86	1.5	1 mi u.s. Little Bonanza Ck
8/16/99	1.80	135	79	1.8	Unable to old find TBM, new TBM and x.s.
9/7/00	2.71	494	95	2.6	At new TBM
8/16/01	2.13	192	98	2.0	50 ft. d.s. new TBM

Middle Fork Fortymile River at North Fork Confluence

Location. Latitude: 64.4696 Longitude: -142.2207

Surveys taken approximately 500 ft. upstream of Middle Fork confluence.

Site Description.



Fig. 30 Middle Fork Fortymile River (left) at North Fork (right) is a uniform, moderately deep channel with narrow gravel bars. Just downstream are the class II/III Eagle Rapids

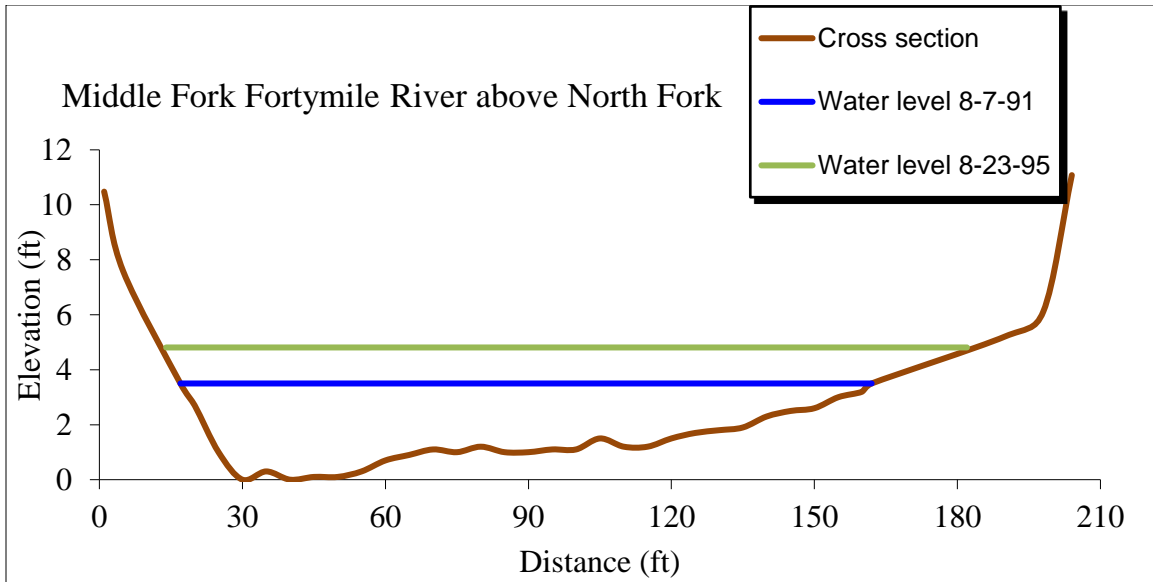


Fig. 31 The surveyed cross section on Middle Fork Fortymile River at North Fork

Table 11 Summary of hydrologic data at Middle Fork Fortymile River at North Fork

Date	Water Level (ft)	Discharge (cfs)	Width (ft)	Max Depth (ft)	Remarks
8/7/91	3.50	801	145	3.5	1 mi. u.s. North Fork
8/5/92	3.85	<u>911</u>	164	3.2	Same location
3/26/93	ND	16	46	1.3	Ice at TBM
8/23/95	4.81	1,095	<u>147</u>	3.9	1 mi. u.s. North Fork
2/9/98	ND	14	55	0.8	Ice 200' u.s. TBM
7/26/99	ND	315	108	3.2	No w.s. survey
8/15/01	5.00	502	147	2.5	50' d.s. TBM

8/7/91 Discharge measurement by AKDNR staff

7/22/99 Discharge measurement by BLM fisheries staff

Revised value

Middle Fork Fortymile River at Joseph airstrip

Location. Latitude: 64.3755 Longitude: -142.0602

Surveys taken near river rafting access (put-in) adjacent to airstrip.

Site Description.



Fig. 32 Middle Fork Fortymile River downstream of Joseph airstrip is a moderately deep, meandering stream with sloughs and islands

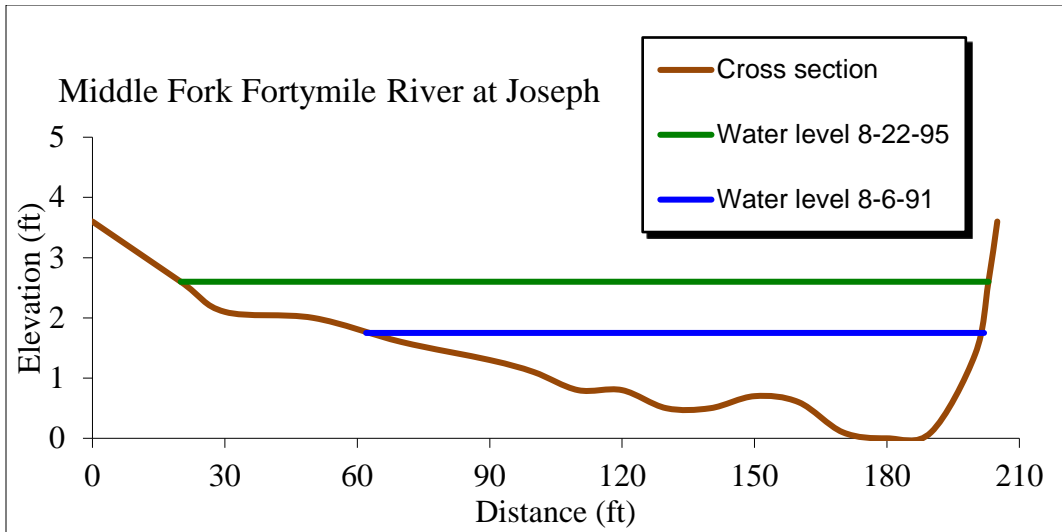


Fig. 33 The surveyed cross section on Middle Fork Fortymile River at Joseph airstrip

Table 12 Summary of hydrologic data at Middle Fork Fortymile River at Joseph airstrip

Date	Water Level (ft)	Discharge (cfs)	Width (ft)	Max Depth (ft)	Remarks
8/6/91	1.75	481	171	1.8	300'd.s. boat launch at riffle
8/6/91	2.75	444	128	2.8	50'd.s. boat launch
8/5/92	2.00	586	191	2.0	300'd.s. boat launch at riffle
8/22/95	2.88	836	183	2.6	Same location
7/22/99	ND	175	85	2.1	No levels run
8/15/01	1.81	323	130	3.0	50'd.s. boat launch

8/6/91 Discharge measurement by AKDNR staff

7/22/99 Discharge measurement by BLM fisheries staff

Appendix Part 3. Main Stem Fortymile River

Fortymile River at Taylor Highway Bridge

Location. Latitude: 64.3091 Longitude: -141.4037
Surveys taken at bridge and approximately 1.5 miles downstream.

Site Description.



Fig. 34 The Fortymile River looking downstream of the bridge. The river is deep and fast in this reach, but widens out and is shallower and somewhat slower downstream of the bend



Fig. 35 The class II/III falls of the Fortymile River are about three miles upstream of the bridge

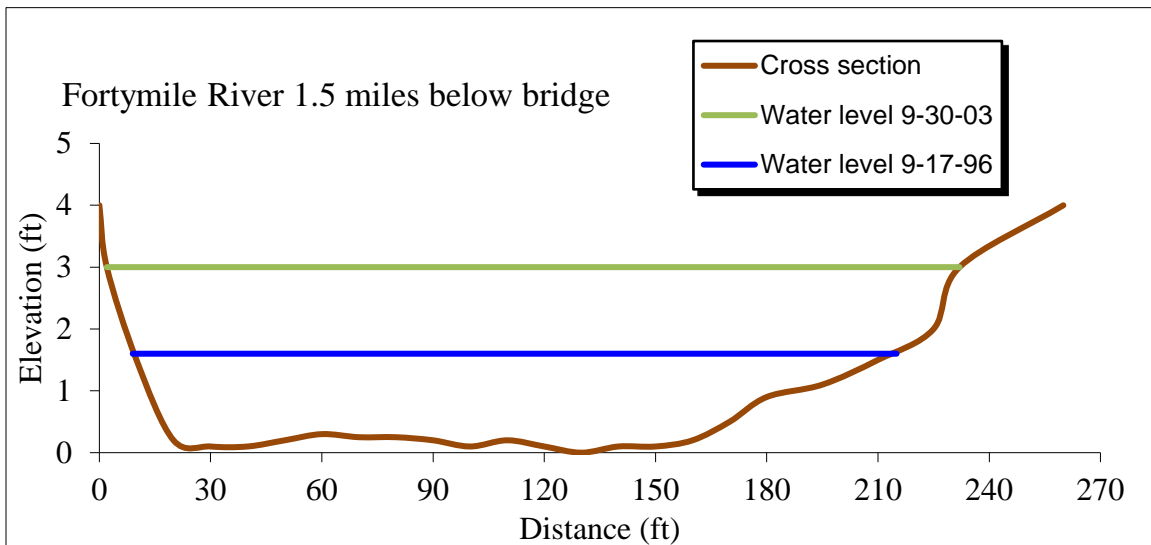


Fig. 36 The surveyed cross section at the Fortymile River approximately 1.5 miles downstream of the bridge

Table 13 Summary of hydrologic data at Fortymile River at Taylor Highway Bridge

Date	Water Level	Discharge	Width	Max Depth	Remarks
12/21/91	ND	<u>98</u>	125	4.4	Ice. 0.5 mi d.s.
2/20/92	ND	39	<u>90</u>	3.7	Same location
4/14/92	ND	<u>30</u>	45	1.4	Same location
11/13/92	ND	185	110	3.4	Same location
3/26/93	ND	12	55	3.1	Same location
7/28/93	72.57	3,163	231	7.5	Survey at bridge
12/8/93	ND	177	118	3.8	Ice 20 mi d.s.
3/26/94	ND	3.5	50	2	Ice. 0.5 mi d.s.
5/12/94	75.92	8,824	294	10.9	Survey at bridge
7/27/94	70.67	<u>1,131</u>	185	5.5	Same location
12/12/94	ND	171	150	3.8	Ice 2 mi d.s.
5/18/95	76.48	10,190	300	11.7	Survey at bridge
9/19/95	72.88	<u>3,540</u>	248	7.3	Same location
12/12/95	ND	8.3	<u>40</u>	0.4	Ice 1.5 mi d.s.
5/21/96	4.46	4,490	276	8	Survey at bridge
7/9/96	73.32	4,220	255	8.1	Same location
9/17/96	70.01	574	211	1.6	Survey 1.5 mi d.s.
12/9/96	ND	12	14	1.2	Ice 1.5 mi d.s.
5/24/97	76.03	9,175	290	106	Survey at bridge
9/17/97	72.05	2,475	210	6.6	Same location
11/18/97	ND	189	95	1.4	Ice 1.5 mi d.s.
2/9/98	ND	15	18	1.2	Same location
4/7/98	ND	14	18	1.2	Same location
5/14/98	76.18	10,100	300	11	Survey at bridge
9/23/98	72.28	2,850	260	6.9	Same location
11/19/98	ND	71	91	1.5	Ice 1.5 mi d.s.
3/12/99	ND	0.2	14	1.0	Same location
5/20/99	74.63	6,410	275	9	Survey at bridge
9/23/99	72.63	<u>3,160</u>	235	7.2	Same location
11/23/99	ND	130	100	1.7	Ice 1.5 mi d.s.
3/20/00	ND	3.6	10	0.8	Ice-1.5 mi d.s.
5/18/00	77.08	<u>12,500</u>	310	12.3	Survey at bridge
9/20/00	73.78	5,180	270	8.6	Same location
11/16/00	ND	397	210	3.1	Ice-1.5 mi d.s.
3/21/01	ND	11	45	0.7	Ice-1.5 mi d.s.
9/18/01	72.77	<u>3,550</u>	260	7.7	Survey at bridge
11/28/01	ND	237	100	1.8	Ice-1.5 mi d.s.

4/4/02	ND	0.3	21	0.6	Ice-1.5 mi d.s.
Date	Water Level	Discharge	Width	Max Depth	Remarks
5/30/02	72.44	2,940	235	7.4	Survey at bridge
9/17/02	74.68	<u>6,900</u>	285	9.8	same
12/4/02	ND	307	160	8.0	Ice-at bridge
4/1/03	ND	37	44	1.7	Ice-1.5 mi d.s.
6/12/03	72.54	2,930	230	7.3	Survey at bridge
9/30/03	70.81	1,090	230	3.0	Survey 1.5 mi d.s.
12/5/03	ND	134	73	1.5	Ice-1.5 mi d.s.
4/2/04	ND	4.1	22	1.0	Ice-1.5 mi d.s.
9/22/04	70.20	768	187	4.7	Survey at bridge
11/19/04	ND	112	178	1.3	Ice-1.5 mi d.s.
2/25/05	ND	1.1	18	0.8	Ice-1.5 mi d.s.
5/26/05	76.25	9,450	300	10.7	Survey at bridge
9/15/05	73.44	4,150	265	8.0	Same location

Revised value