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# Water Resources of Beaver Creek National Wild River

## Stream Gaging Data from 1993 to 2000 with Summary Statistics

Jon Kostohrys

BLM

Alaska

**Cover Photo**
Beaver Creek flows past the limestone bluffs at Big Bend on a frosty, autumn morning. (All photos by the author, unless noted)

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## Abstract

When Beaver Creek was designated a National Wild River on December 2, 1980, the proposed management objectives included maintaining the pristine, free-flowing condition of the river, optimum and long-term utilization of the fish and wildlife resources, and high-quality primitive recreational opportunities. To support and maintain these values, the BLM initiated a water rights quantification project for that portion of Beaver Creek National Wild River that is in the White Mountains National Recreation Area. This original quantification was the basis for an application for water rights, which was granted by the State of Alaska on May 26, 1989. However, since the streamflow values used in the application were estimated from synthesized mean monthly hydrographs and regional flood-frequency relationships, the State requested that the BLM document the streamflow for a 10-year period prior to any statutory review. BLM began stream gaging at three sites in 1988–1989, and the streamflow data collected through 1992 was published previously. This report includes the data collected from 1993 to 2000, as well as statistical analysis of all data collected from 1988 to 2000. Recommendations from this analysis include submitting an amendment to the original application for an instream flow reservation with the State to reflect the increased streamflow documented in this report; quantification of instream flow at the larger springs, since they appear to contribute an inordinate share of viable over-wintering aquatic habitat; and continued resurveys of the riparian reference sites, as well as snow and climatic monitoring, to document long-term changes in the Wild River corridor. Since it is the primary access for float boating on Beaver Creek, the instream flow also needs to be quantified on lower Nome Creek.

## Acknowledgments

Many people have been involved with this project during the decade and a half it has taken to complete. Current BLM staff who participated in the field work, often during difficult winter conditions, included Lon Kelly, Eric Yeager, Collin Cogley, Tim Dupont, Craig McCaa, Randy Tracy, Ed Lee, Randy Goodwin, Sandy Westcott, and Mike Kunz. Former BLM staff included Bunny Sterin, Dick Bouts, Nate Collin, Roger Evans, Rod Everett, Jerry Wyse, Brian Lubinski, Lisa Ragland, Anna McGlinn, Tanja Runkel, Verena Grüner, Eva Weithmann, and George Rogers. Kristine Kosnik and Tim Hammond worked on the GIS analysis and produced the watershed map. Special thanks to contract pilot Sandy Hamilton, whose flying skills brought us back at times when things looked grim. Stan Bloom and Craig McCaa provided a wizard's touch on the entire document.

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# Introduction

Beaver Creek was designated a National Wild River on December 2, 1980 when Congress amended the Wild and Scenic Rivers Act (P.L. 90-542) as part of the Alaska National Interest Lands Conservation Act (P.L. 96-487). For Beaver Creek, the management objectives cited in the designation include maintaining the pristine, free-flowing condition of the river, optimum and long-term utilization of the fish and wildlife resources, and high-quality primitive recreational opportunities (USDI 1974). While National Wild and Scenic River status requires that each component be administered to maintain and enhance those values for which it was included in the system, it does not necessarily protect the streamflow of the river.

BLM Manual Section 7250 states that the BLM will cooperate with State governments to protect all water use on public lands, including those identified for Federal reserved and state appropriative water rights. Because wild and scenic river designation does not automatically reserve a specific flow regime, the optimum amount of water necessary to fulfill the primary purpose of the reservation must be determined to define the water rights needs.

The BLM, in its *River Management Plan for the Beaver Creek National Wild River* (USDI 1983), proposed "a reservation of minimum water flows sufficient for public recreation and to support the values for which the area was designated will be determined in cooperation with the Alaska Department of Natural Resources, Division of Land and Water Management."

In April 1985, BLM initiated a water rights quantification project for that portion of Beaver Creek National Wild River in the White Mountains National Recreation Area (Figure 1). This project culminated in the report, *Water Rights Assessment for Beaver Creek National Wild River, Alaska* (Van Haveren et al. 1987). These streamflow estimates, used in the application for the instream flow reservation, were calculated from mean monthly flows at nearby U.S. Geological Survey (USGS) gaging sites, adjusted by the area exponent of the mean annual discharge and a composite of the regional flood-frequency relationships listed in Parks and Madison (1985).

On May 26, 1989 the Alaska Department of Natural Resources, Division of Land and Water Management (DNR) issued a Certificate of Reservation for Beaver Creek (LAS 11997). The water right issued to BLM by DNR is at three locations on Beaver Creek: Wild River Mile (WRM) 6, WRM 36.5 and WRM 110.5. These mileages are referenced to the designated Wild River Corridor, which begins at the confluence of Bear and Champion Creeks, WRM 0. In granting this right, the DNR required that this reservation be reviewed at least once every 10 years to determine if the reservation is still needed. Part of this review process includes documentation of the streamflow during the 10-year period. To achieve the best estimates possible for annual streamflow on Beaver Creek, the DNR requested that hydrologic monitoring be done at all three locations noted above and that winter as well as summer flows be determined.

BLM began stream gaging at these sites in 1988–1989, and the streamflow data collected up through 1992 was published in a previous report (Kostohrys and Sterin 1994). The current report includes the data collected from 1993 to 2000, as well as statistical analysis of all data collected from 1988 to 2000. Also included are a number of miscellaneous discharge and water quality measurements that have been made on tributary streams, groundwater springs, and lakes during this period. A riparian survey of channel geometry and bankfull characteristics, done in 2003, is also included. Additional background information can be found in the *Proposed Beaver Creek National Wild River Alaska* (USDI 1974) and *River Management Plan for the Beaver Creek National Wild River* (USDI 1983).

# Basin Characteristics

The Beaver Creek watershed is located in east-central interior Alaska. As described in Wahrhaftig (1965), the basin is part of the Yukon-Tanana upland, an area characterized by rounded, even-topped ridges with moderate to gentle side slopes. The wide river valleys, often heavily forested, are separated by more sparsely vegetated, compact rugged mountains 4,000–5,000 feet in altitude (Figure 2). Some of the upland valleys, especially in the vicinity of Cache and Victoria Mountains, the north side of the White Mountains, and Mount Prindle experienced limited alpine glaciation during the Pleistocene (Weber et al. 1988). Streams originating in these areas have typical U-shaped valleys in their upper reaches, while the unglaciated tributaries flow in narrow, V-shaped canyons. The Beaver Creek valley widens downstream within a few miles of the headwaters, but remnants of a prominent terrace, cut by glacial meltwaters, remains evident in a few places, most notably near Big Bend. The flat, alluvium-floored valley contains wide, looping meanders, abandoned cut-off channels (sloughs), and extensive riparian and wetland areas. The floodplain, consisting largely of

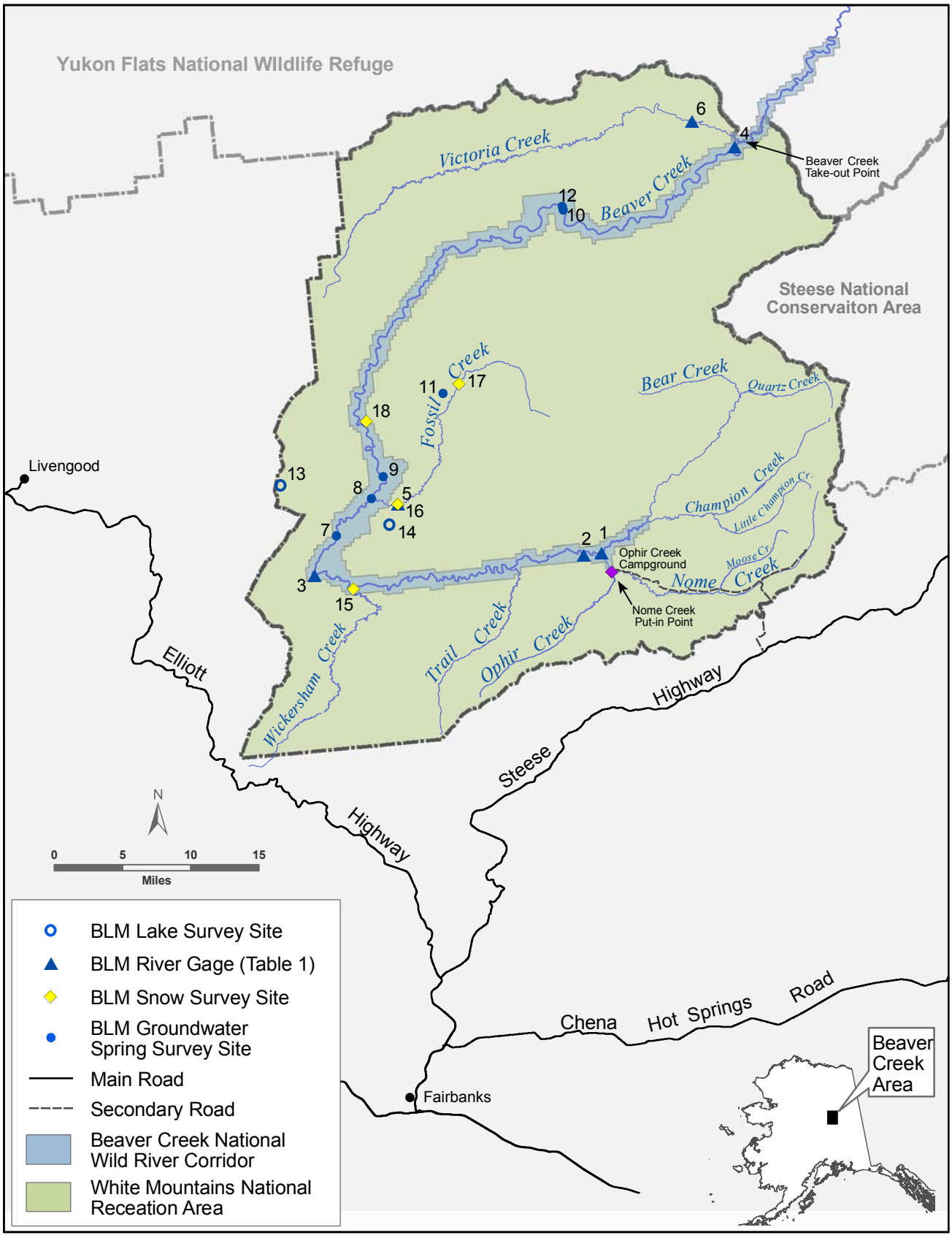


**Figure 1**. Map of the White Mountains and Beaver Creek area.

**Figure 2.** The Beaver Creek National Wild River corridor is highlighted by the limestone peaks of the White Mountains. (Photo by Mike Greene)

reworked outwash gravel, silt, and organic materials is poorly drained and often underlain by discontinuous permafrost. Ice wedge polygons are visible in many locations (Weber et al. 1988). The numerous flowing springs that occur in the basin, especially in the area downstream of Big Bend, contribute significantly to winter streamflow. The region is drained ultimately by the Yukon River.

The basin lies in the subpolar continental climatic zone, typified by long, cold winters and short, hot summers. Seasonal temperature extremes range from –70˚F to +90˚F, and variations are great due to surrounding topography. The valley bottoms adjacent to Beaver Creek are often 30˚ colder than surrounding ridge tops during the winter. Precipitation is also strongly affected by topography. Snowfall is moderate, with an average depth in early April of 29 inches on the ground, about 5.3 inches of water equivalent (USDA 2001). Break-up usually begins in late April to early May, and high streamflow may persist well into June. Periods of low water typically occur in July, while infrequent high flows from rainstorms can occur in August or September. A rain gage operated since 1998 during the summer in Nome Creek, a headwaters tributary of Beaver Creek, recorded an average of about 12 inches of rainfall for the summer period. Freeze-up on streams often begins at higher elevations in mid- September, although larger streams lower in the basin may remain open until November. Ice cover on streams is usually continuous for the winter, except in the vicinity of springs, and freezing to the bottom of the channel may occur in some places (Figure 3).

## Methods

Stream gages were installed by BLM at three primary sites on Beaver Creek (Table 1). The gages were located as near as possible to the locations specified by DNR in LAS 11997. An automated water-level recorder (data logger and pressure transducer) was installed in 1988 at the site above Victoria Creek (WRM 110.5). This gage recorded water level data for the summer periods (generally mid-May to late September). Crest-stage gages were installed in 1989 at the other two sites, at Big Bend (WRM 36.5) and above Nome Creek (WRM 6). These are non-automated gages that record the peak water level whenever it exceeds a pre-set minimum (base) level.

At each visit to the site, both types of gages were surveyed to the referenced elevation (bench) marks and

**Figure 3.** Beaver Creek is normally ice-covered for most of the winter, but groundwater springs keep a few reaches of the creek open all winter.

to the current water level. Cross-sectional discharge (streamflow) measurements were made using a Price AA current meter to measure water velocity and a top-setting wading rod and tag line to measure depth and width (Figure 4). At least once a year, the stream banks, high-water marks and water surface profiles were surveyed using a level and stadia rod. Multi-cross-section surveys, used to quantify flood peaks, were done with a total-station theodolite (Figure 5). Water-quality readings were taken in-situ with single parameter meters (Figure 6).

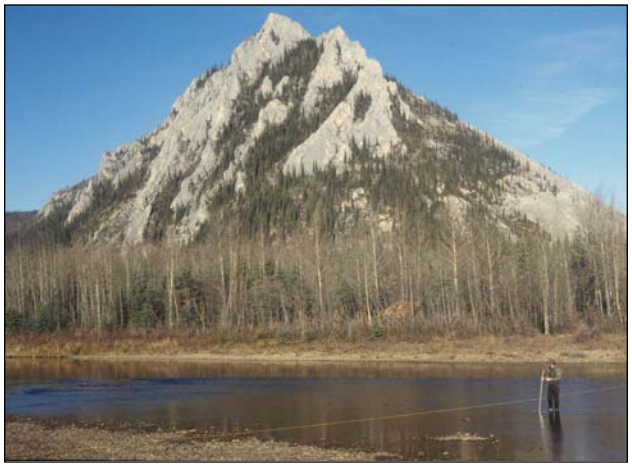

**Figure 4.** Streamflow measurements are an integral component of the stream gaging process.

A water level vs. discharge rating was developed by combining the direct discharge measurements (Rantz et al. 1982) and computer-simulated peak flows using the slope-area method (Dalrymple and Benson 1967). These rating curves—actually log-log regression models—were then used to compute discharge from the recorded water level and crest-stage data.

By comparing differences in discharge measurements and peak flows at the three sites using regression analysis, data from the automated gage was used as the independent variable to compute monthly average flows for the non-automated gaging sites (dependent variable). Thomas (1967) states that the nearby gaging station with the most reliable and longest period of streamflow record is to be used as the reference site. During periods when water level data was unavailable, such as during spring break-up, fall freeze-up, or recorder malfunction, the data was estimated from regression analysis with the USGS data from the gage on the Salcha River (USDI 1996 to 2001) as the reference site.

For the winter period, when the water level recording is not possible due to ice formation in the river, under-ice discharge measurements were made at the three primary gaging sites, as nearly simultaneously as possible, two to three times during the winter. These

**Table 1.** Location of Water Resources Survey Sites in the White Mountains National Recreation Area

| Site No. | Stream survey site | Decimal degrees latitude | Decimal degrees longitude | At Wild River Mile | Drainage Area ($mi^2$) |
|---|---|---|---|---|---|
| | **Mainstem** | | | | |
| 1 | Beaver Creek above Nome Creek | 65.3895 | –147.1067 | 6.0 | 219 |
| 2 | Beaver Creek below Nome Creek | 65.3893 | –147.1515 | 7.5 | 348 |
| 3 | Beaver Creek At Big Bend | 65.3957 | –147.8345 | 36.5 | 710 |
| 4 | Beaver Creek at Victoria Creek | 65.8015 | –146.6578 | 110.5 | 1,287 |
| | **Tributaries** | | | | |
| 5 | Fossil Creek below Limestone Gulch | 65.4620 | –147.6067 | NA | 80 |
| 6 | Victoria Creek below Squaw Creek | 65.8335 | –146.7585 | NA | 221 |
| | **Groundwater Springs** | | | | |
| 7 | Beaver Creek At Hermans Landing | 65.4350 | –147.7697 | 40.5 | NA |
| 8 | Beaver Creek At Shebals Landing | 65.4710 | –147.6727 | 46.7 | NA |
| 9 | Beaver Creek below Fossil Creek | 65.4928 | –147.6370 | 48.5 | NA |
| 10 | Beaver Creek below Willow Creek | 65.7547 | –147.1130 | 89.0 | NA |
| 11 | Upper Windy Creek | 65.5740 | –147.4670 | NA | NA |
| 12 | Unnamed Creek below Willow Creek | 65.7580 | –147.1130 | NA | NA |
| | **Lake survey sites** | | | | |
| 13 | Colorado Creek Lake | 65.4933 | –147.8980 | NA | NA |
| 14 | Borealis Lake | 65.4416 | –147.6331 | NA | NA |
| | **Snow survey sites** | | | | |
| 15 | Borealis Snow Gage | 65.3777 | –147.7383 | NA | NA |
| 16 | Fossil Snow Gage | 65.4619 | –147.6070 | NA | NA |
| 17 | Windy Gap Snow Gage | 65.5826 | –147.4220 | NA | NA |
| 18 | Wolf Snow Gage | 65.5527 | –147.6655 | NA | NA |

measurements were made by drilling a series of holes in the ice to define the cross-section, then measuring the depth and velocity in each hole using a USGS vertical-axis, vane type current meter mounted on a graduated rod (Figure 7).

Accuracy of winter flows is low; as discharge approaches zero, flow measurements become unreliable as the water velocity diminishes below the measuring range of the mechanical meter. Variability in the basin can occur as flows diminish downstream from the headwaters due to storage as ice. Streamflow may cease altogether if additional groundwater sources are not available. A flow measurement at one site may have little relationship to other sites in the basin unless geological conditions remain constant. Flow in unconfined alluvial channels is greater and shows more uniformity than in a basin where bedrock confines the aquifer and groundwater sources are non-continuous (Nelson 1978). Because of these factors, discharges less than about 10 cubic feet per second should be considered estimates.

Once ice and snow cover isolate the stream from precipitation and temperature changes, the flow to the stream recedes uniformly as the water table in the aquifer is lowered by reduction of water volume in the aquifer (Rogers and Armbruster 1990). Where the

**Figure 5.** While most surveying employed a level and stadia rod, multi-cross-section surveys were often done with a total-station theodolite.

measurements were sufficiently accurate to represent the winter flow conditions, streamflow was computed directly by regressing discharge on time (date) for the periods covered for each site. This assumes that since flow recession curves often take the form of exponential decay, discharge can be expressed as a constant times the initial discharge raised to a negative power of the time interval (Chow et al. 1988).

Where no data was available at any of the sites, i.e., during periods of variable back water from ice, spring break-up, and fall freeze-up, the regression correlation to the USGS Salcha River data set was used as the reference site. Wherever regression equations were used to compute mean monthly discharge, the estimated values have been identified in the tables with italics.

## Results and Discussion

Appendix A contains discharge data, listed by site location for each year's data from 1993 to 2000. A summary table at the beginning of each year's data lists maximum, minimum, and mean monthly streamflows computed from a combination of the recorded daily values table, the regression equations determined from winter under-ice measurements, and the comparisons to other sites on Beaver Creek or the Salcha River. A table of the discharge ratings and regression equations used in the computations is also listed for each site.

A mean monthly data summary for the entire period of record, computed for the three Beaver Creek sites, is plotted as an annual hydrograph in Figure 8. An interesting feature is the bimodal nature of the high-flow periods, which can occur during both spring snow melt and late summer rainfall events.

**Figure 6.** Water-quality readings were taken in-situ with single parameter meters.

**Figure 7.** Winter discharge measurements were needed to document under-ice flows, critical to over-wintering fish.

As noted earlier (Kostohrys and Sterin 1994), the flow estimates used in the water-rights application, (Van Haveren et al. 1987), significantly under-estimated the actual flows on Beaver Creek. For the data covering the entire period of record from 1988 to 2000, this averaged about 81 percent low (ranging from 19 to 100 percent, Table 2). While the reasons for this are numerous (as discussed in Kostohrys and Sterin 1994) it was the lack of representative, long-term gaging data from the Beaver Creek watershed that ultimately resulted in the significant under-reservation in the water rights application.

Peak flow statistics were computed from the annual peak discharge data, listed in Appendix A by year and site. Using a log- Pearson III flood-frequency relationship, the computed recurrence interval discharges are listed in Table 3. The current values exceeded those used in the original estimates (Van Haveren et al. 1987) derived from regional flood-frequency relationships, by an average of 36% (Table 3) and also those presented in the earlier data report (Kostohrys and Sterin 1994).

Appendix B contains miscellaneous discharge measurements and water quality data at groundwater springs, lakes and rivers, collected intermittently during the period 1989 to 2000, but not previously reported. The most notable is the groundwater spring that discharges into Beaver Creek below Fossil Creek, listed in Table B-1. For this spring, located at WRM 48.5, the winter streamflow showed a much more uniform flow pattern for the period of record, as compared to the higher variability of the winter flows measured at the three primary gaging sites (Table 4). While the maximum and mean values follow similar trends, the

**Table 2.** Beaver Creek Mean Monthly Discharge Compared to Discharge Used in the Water Rights Application

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Above Nome Creek WRM 6 | | | | | | | | | | | | |
| Gaging data from 1989–1999 | 23 | 16 | 11 | 92 | 602 | 573 | 300 | 514 | 551 | 209 | 94 | 39 |
| Estimated data in water rights* | 0.1 | 0.1 | 0.1 | 6.6 | 233 | 158 | 77 | 71 | 67 | 13 | 1.3 | 0.2 |
| Percent difference | 100% | 99% | 99% | 93% | 61% | 72% | 74% | 86% | 88% | 94% | 99% | 99% |
| At Big Bend WRM 36.5 | | | | | | | | | | | | |
| Gaging data from 1989–1999 | 55 | 37 | 27 | 177 | 1,454 | 1,375 | 682 | 1,233 | 1,350 | 568 | 203 | 94 |
| Estimated data in water rights* | 0.4 | 0.4 | 0.4 | 29 | 1,019 | 691 | 346 | 314 | 295 | 55 | 5.9 | 1.0 |
| Percent difference | 99% | 99% | 98% | 84% | 30% | 50% | 49% | 75% | 78% | 90% | 97% | 99% |
| Above Victoria Creek WRM 110.5 | | | | | | | | | | | | |
| Gaging data from 1988–2000 | 94 | 65 | 49 | 309 | 2,665 | 2,213 | 1,160 | 1,997 | 2,144 | 959 | 348 | 157 |
| Estimated data in water rights* | 0.9 | 0.9 | 0.9 | 60 | 2,106 | 1,428 | 696 | 649 | 609 | 115 | 13 | 1.9 |
| Percent difference | 99% | 99% | 98% | 81% | 21% | 35% | 40% | 68% | 72% | 88% | 96% | 99% |

* Van Haveren et al. 1987
ND - Not determined

**Table 3.** Log Pearson Type III Recurrence-interval (years) and Discharge (cfs) for Beaver Creek from Gaging Data Compared to Water Rights Estimates

| | 1.5 Years | 2 Years | 5 Years | 10 Years | 25 Years | 50 Years | 100 Years | Mean Annual** |
|---|---|---|---|---|---|---|---|---|
| Above Nome Creek WRM 6 | | | | | | | | |
| Gaging data from 1989–1999 | 2,500 | 3,150 | 4,470 | 5,090 | 5,670 | 5,980 | 6,210 | 249 |
| Estimated data in water rights* | ND | 867 | ND | 2,224 | 3,318 | 4,407 | 5,596 | 68 |
| Percent difference | ND | 72% | ND | 56% | 41% | 26% | 10% | 73% |
| At Big Bend WRM 36.5 | | | | | | | | |
| Gaging data from 1989–1999 | 6,500 | 7,900 | 11,100 | 13,000 | 15,000 | 16,400 | 17,600 | 597 |
| Estimated data in water rights* | ND | 3,114 | ND | 7,037 | 9,923 | 12,816 | 15,603 | 297 |
| Percent difference | ND | 61% | ND | 46% | 34% | 22% | 11% | 50% |
| Above Victoria Creek WRM 110.5 | | | | | | | | |
| Gaging Data from 1988–2000 | 9,500 | 11,500 | 16,000 | 18,700 | 21,800 | 24,000 | 26,000 | 985 |
| Estimated data in water rights* | ND | 5,851 | ND | 12,424 | 17,040 | 21,704 | 25,881 | 614 |
| Percent difference | ND | 49% | ND | 34% | 22% | 10% | 0% | 38% |

* Van Haveren et al. 1987
ND - Not determined
**Gaging data is average of mean monthly values; estimated data used regression equation.

minimum discharge at the spring is 24 times greater. This indicates that these springs may contribute an inordinate share of water to the over-wintering aquatic habitat in the Beaver Creek watershed. The depth of snowpack appears to have a significant impact on the minimum winter flow, as the lowest measured discharges occurred during the lower snow depths, especially when snow is below normal early in the winter. Conversely, the highest winter streamflows were measured during the periods of highest snowfall (Table 4).

The channel geometry data, collected early in the study, was originally intended to determine peak discharges and bankfull characteristics. These cross-sections were then compared to riparian surveys done in 2003. This data, summarized in Table 5, is plotted along with the resurveys shown in Appendix C, Figures C-2, C-4, and C-6. The intent of the resurveys was to see if significant erosion or deposition had altered riparian conditions during the study period and if this could be tied to specific events or activities within the corridor. The site at Beaver Creek above Nome Creek (Figure C-2) clearly shows the greatest change as the thalweg, or deepest portion of the stream channel, shifts completely, from the left to the right side of the creek. This is thought to be due to the large number of trees that eroded into this portion of the watershed during the floods from 1994 to 1998. The stream laterally adjusts the hydraulics and sediment flow when the large, woody debris is first deposited, partially buried, and then eventually flushed out of the reach on succeeding high-flow events. This could be the result of normal channel migration or some response to long-term changes in climate or riparian vegetation within the watershed.

While surveying channel cross-sections on lower Beaver and Victoria Creeks, a number of debris avalanche scars were observed on the steep, narrow valley side slopes near Victoria Mountain. A multiple cross-section survey done on a recent avalanche located near the confluence of Victoria and Squaw Creeks

**Table 4.** Late Winter Discharge Measurements (cfs) and Snow Depths (in) on Beaver Creek

| Stream Site | Maximum | Minimum | Mean |
|---|---|---|---|
| Above Nome Creek WRM 6 | 22 | 0 | 11 |
| At Big Bend WRM 36.5 | 55 | 0 | 27 |
| Above Victoria Creek WRM 110.5 | 92 | 1 | 49 |
| Below Fossil Creek Spring WRM 48.5 | 69 | 24 | 41 |
| Borealis Snow Survey (depth) | 47 | 12 | 29 |

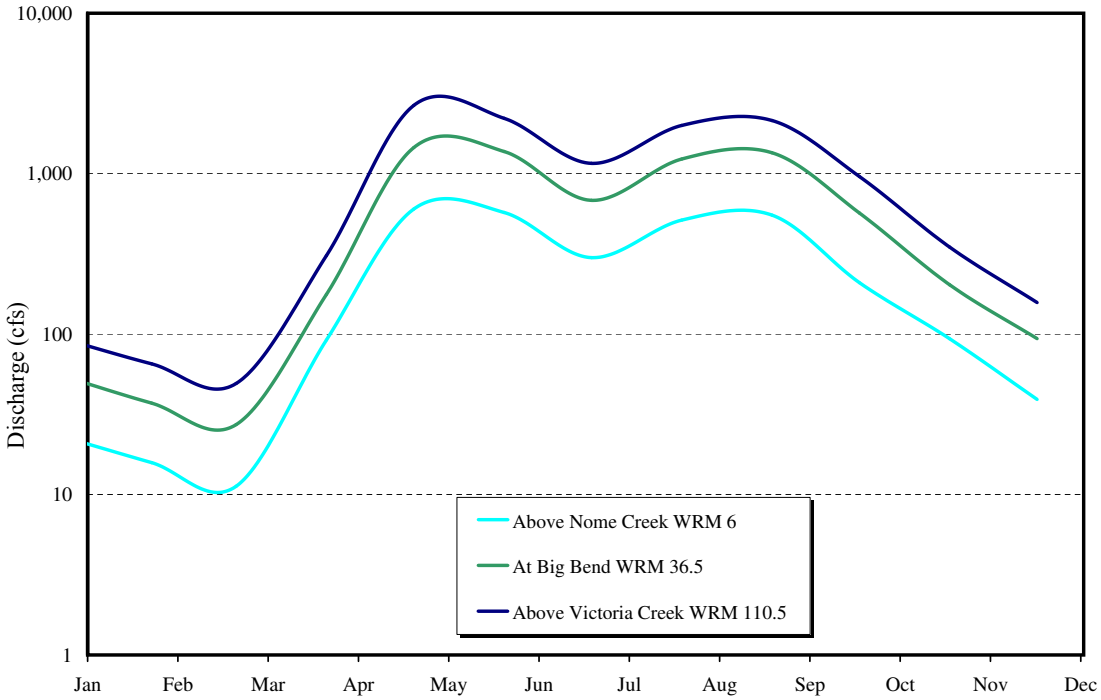


**Figure 8.** Monthly mean discharge hydrograph for Beaver Creek Basin.

determined that the slide was over a quarter-mile long and ranged in width from about 20 feet near the head to almost 100 feet at the base. Over 2,000 cubic yards of material was eroded from the hillside and subsequently deposited into Victoria Creek (Figure 9).

## Recommendations

BLM should request that the DNR Commissioner review the water-rights application for the original three locations on Beaver Creek to reflect the increase in streamflow documented in this report.

Because the springs appear to contribute an inordinate share of viable over-wintering aquatic habitat during extreme low flow in the Beaver Creek watershed, an instream flow reservation for these areas should be quantified and submitted to DNR.

As noted in Van Haveren et al. (1987), Nome Creek is an integral part of the Beaver Creek Wild River, since it is the primary access route and put-in for float boating. The streamflow should be quantified at several points on lower Nome Creek and an instream flow reservation submitted to DNR.

The resurveys of the riparian and channel-morphology sites, as well as snow and climatic monitoring, should be continued to assess long-term riparian and channel geometry changes in the Beaver Creek Wild River corridor.

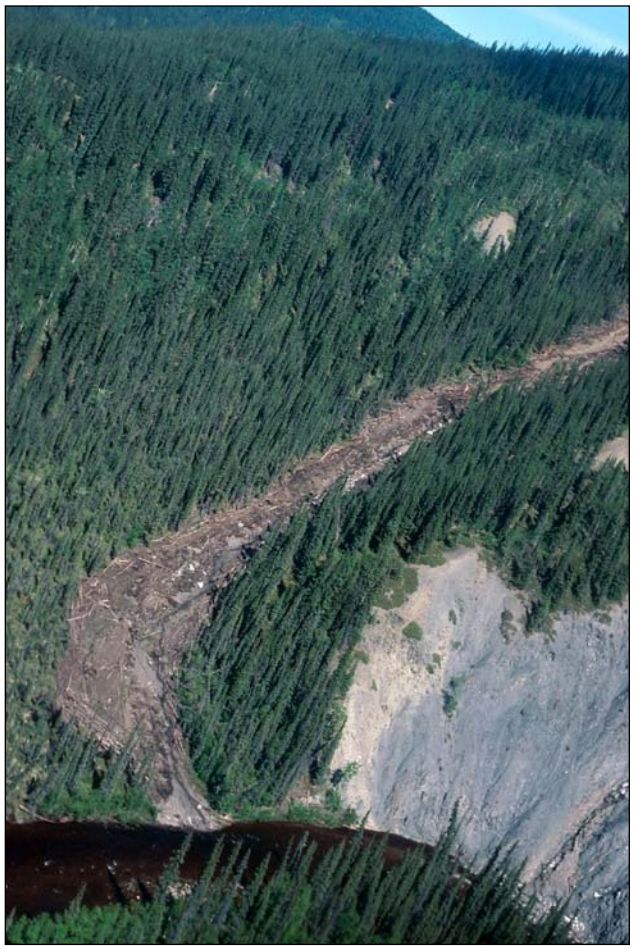

**Figure 9.** Debris flow observed on Victoria Creek in June 1989. The flow deposited more than 2,000 cubic yards of debris into the creek.

**Table 5.** Bankfull Channel Characteristics for Beaver Creek and Tributaries

| Stream Site | Channel substrate | Bankfull Discharge (cfs) | Bankfull Max. Depth (ft) | Bankfull Mean Depth (ft) | Bankfull Width (ft) | Bankfull Width/ Depth | 1.5 Year Discharge (cfs) |
|---|---|---|---|---|---|---|---|
| Beaver Creek Mainstem | | | | | | | |
| Above Nome Creek WRM 6 | Sand, gravel | 3,800 | 5.3 | 3.4 | 174 | 51 | 2,500 |
| Below Nome Creek WRM 7.5 | Gravel | 4,000 | 5.3 | 3.2 | 207 | 65 | ND |
| At Big Bend WRM 36.5 | Gravel, cobbles | 4,500 | 6.5 | 4.3 | 232 | 54 | 6,500 |
| Above Victoria Creek WRM 110.5 | Cobbles, boulders | 12,000 | 10.0 | 7.3 | 341 | 47 | 9,300 |
| Tributaries | | | | | | | |
| Fossil Creek below Limestone Gulch | Gravel, cobbles | 1,500 | 5.5 | 2.5 | 190 | 76 | ND |
| Victoria Creek below Squaw Creek | Gravel, cobbles | 650 | 4.6 | 2.6 | 77 | 30 | 1,800 |

ND - Not determined

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# Appendix A. Principal Gaging Site Descriptions and Annual Discharge Data

## Beaver Creek above Nome Creek WRM 6


**Figure A-1.** Looking upstream at the crest-stage gage at Beaver Creek above Nome Creek. The gage was installed in 1989 and discontinued September 1999.

**Table A-1.** Discharge Measurements for Beaver Creek above Nome Creek WRM 6

| Date | Stage (ft) | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg.Velocity (fps) | Avg.Depth (ft) |
|---|---|---|---|---|---|---|
| 03/19/93 | ND | 22 | 48 | 40 | 0.6 | 0.8 |
| 09/23/93 | 2.72 | 694 | 163 | 228 | 3.0 | 1.4 |
| 12/23/93 | ND | 74 | 61 | 91 | 0.8 | 1.5 |
| 02/08/94 | ND | 52 | 60 | 73 | 0.7 | 1.2 |
| 03/17/94 | ND | 21 | 48 | 29 | 0.7 | 0.6 |
| 05/21/94 | 2.73 | 778 | 154 | 241 | 3.2 | 1.6 |
| 06/24/94 | 6.20* | 4,000 | 218 | 897 | 4.5 | 4.1 |
| 07/22/94 | 2.32 | 339 | 120 | 144 | 2.4 | 1.2 |
| 09/01/94 | 2.45 | 530 | 103 | 163 | 3.3 | 1.6 |
| 09/28/94 | 1.67 | 165 | 89 | 89 | 1.9 | 1.0 |
| 12/13/94 | ND | 62 | 59 | 70 | 0.9 | 1.2 |
| 03/09/95 | ND | 18 | 38 | 38 | 0.5 | 2.6 |
| 05/31/95 | 1.91 | 261 | 77 | 128 | 2.1 | 2.1 |
| 07/19/95 | 2.01 | 201 | 74 | 111 | 1.8 | 1.7 |
| 09/27/95 | 3.20 | 851 | 108 | 249 | 3.5 | 2.5 |
| 11/22/95 | ND | 91 | 61 | 76 | 1.2 | 1.1 |
| 03/21/96 | ND | 0 | (Creek frozen solid to bottom) | | | |
| 05/29/96 | 3.10 | 597 | 105 | 209 | 1.2 | 1.1 |
| 07/24/96 | 2.07 | 121 | 94 | 86 | 1.2 | 1.1 |
| 08/23/96 | 2.17 | 213 | 75 | 116 | 1.2 | 1.1 |
| 09/26/96 | 2.17 | 202 | 76 | 112 | 1.2 | 1.1 |
| 11/22/96 | ND | 60 | 67 | 62 | 1.2 | 1.1 |
| 02/03/97 | ND | 5.7 | 34 | 10 | 0.6 | 0.3 |
| 03/14/97 | ND | 3.8 | 30 | 13 | 0.3 | 0.4 |
| 05/19/97 | 3.10 | 460 | 81 | 148 | 3.1 | 1.8 |
| 08/19/97 | 2.61 | 402 | 82 | 151 | 2.7 | 1.8 |
| 09/26/97 | 2.51 | 312 | 80 | 139 | 2.2 | 1.7 |
| 11/24/97 | ND | 74 | 70 | 73 | 1.0 | 1.0 |
| 01/27/98 | ND | 0 | (Creek frozen solid to bottom ) | | | |
| 05/21/98 | 2.59 | 351 | 81 | 141 | 2.5 | 1.7 |
| 07/31/98 | 2.58 | 314 | 81 | 137 | 2.3 | 1.7 |
| 08/18/98 | 5.56* | 3,800 | 174 | 592 | 6.4 | 3.4 |
| 09/11/98 | 2.58 | 324 | 80 | 142 | 2.3 | 1.8 |
| 09/29/98 | 2.39 | 309 | 90 | 96 | 3.2 | 1.1 |
| 11/24/98 | ND | 73 | 72 | 67 | 1.1 | 0.9 |
| 02/23/99 | ND | 2.9 | 30 | 11 | 0.3 | 0.4 |
| 07/29/99 | 2.45 | 281 | 80 | 130 | 2.2 | 1.6 |
| 07/01/03 | ND | 215 | 62 | 104 | 2.1 | 1.7 |

*Slope-area indirect discharge measurement
ND Not Determined

**Table A-2.** Peak and minimum discharges (cfs) from 1993 to 1999 for Beaver Creek above Nome Creek WRM 6

| Peak Date | Peak discharge | Minimum date | Min. discharge |
|---|---|---|---|
| 09/21/93 | 2,820 | 03/19/93 | 22 |
| 06/24/94 | 4,050 | 03/17/94 | 48 |
| 06/28/95 | 3,450 | 03/09/95 | 18 |
| 06/12/96 | 2,020 | 03/21/96 | 0.0 |
| 05/05/97 | 920 | 03/14/97 | 3.8 |
| 08/18/98 | 3,800 | 01/27/98 | 0.0 |
| 08/10/99 | 1,330 | 02/23/99 | 2.9 |

**Table A-3.** 1989–1999 Mean Monthly Discharge (cfs) for Beaver Creek above Nome Creek WRM-6

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg. Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | *17* | *16* | *16* | *162* | *474* | *920* | *205* | *173* | *155* | *74* | *54* | *39* | *192* |
| 1990 | *8.1* | *4.5* | *3.6* | *55* | *461* | *272* | *215* | *275* | *1,086* | *244* | *104* | *45* | *231* |
| 1991 | *34* | *26* | *19* | *72* | *1,195* | *761* | *290* | *971* | *405* | *264* | *107* | *43* | *349* |
| 1992 | *32* | *22* | *16* | *165* | *474* | *989* | *224* | *209* | *202* | *85* | *58* | *40* | *210* |
| 1993 | *35* | *28* | *23* | *187* | *721* | *508* | *230* | *421* | *1,439* | *383* | *166* | *74* | *351* |
| 1994 | *61* | *42* | *24* | *132* | *613* | *1,344* | *511* | *576* | *321* | *133* | *89* | *60* | *325* |
| 1995 | *39* | *25* | *17* | *132* | *741* | *441* | *254* | *917* | *1,151* | *415* | *120* | *25* | *356* |
| 1996 | *4.0* | *1.0* | *0.0* | *25* | *521* | *351* | *278* | *428* | *345* | *135* | *90* | *29* | *184* |
| 1997 | *11* | *5.0* | *4.0* | *16* | *346* | *178* | *170* | *306* | *312* | *196* | *92* | *8.5* | *137* |
| 1998 | *0.5* | *0.0* | *0.0* | *35* | *764* | *316* | *683* | *891* | *408* | *205* | *92* | *42* | *286* |
| 1999 | *12* | *4.0* | *1.5* | *31* | *307* | *221* | *235* | *482* | *240* | *167* | *56* | *25* | *148* |
| Mean | *23* | *16* | *11* | *92* | *602* | *573* | *300* | *514* | *551* | *209* | *94* | *39* | *252* |

Figures in italics were estimated from regression analysis of discharge measurements at this gaging site, at other gages on Beaver Creek, or the Salcha River (USGS data).

**Beaver Creek at Big Bend WRM 36.5:**

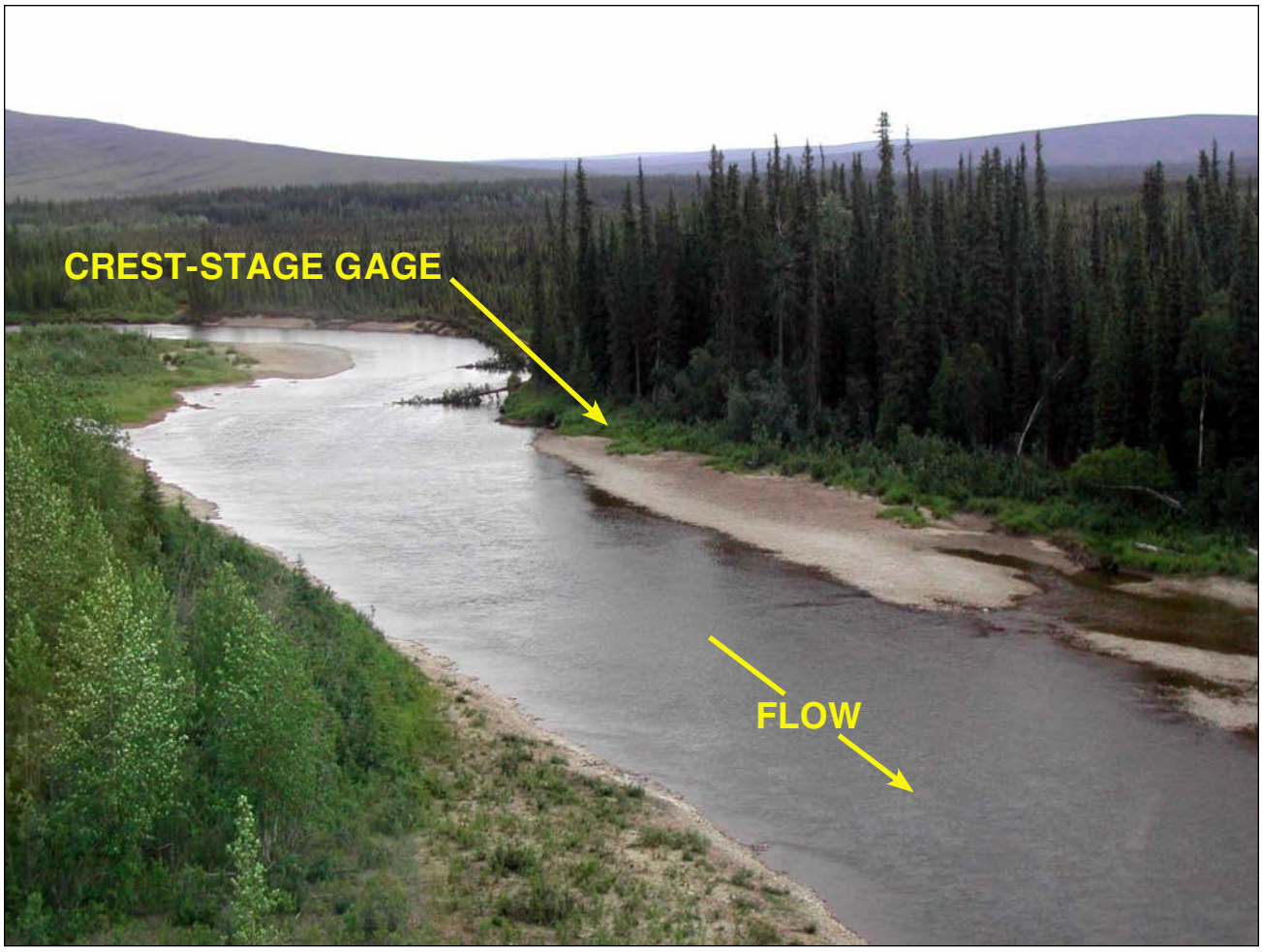


**Figure A-2.** Looking upstream at the crest-stage gage at Beaver Creek at Big Bend. This site was selected in June 1989, and a crest-stage gage was installed on the left bank. Data was collected until 2000, when the gaging project was discontinued. The gage was removed in July 2003.

**Table A-4.** Discharge Measurements for Beaver Creek above Big Bend WRM 36.5

| Date | Stage (ft) | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg. Velocity (fps) | Avg. Depth (ft) |
|---|---|---|---|---|---|---|
| 03/22/93 | ND | 55 | 100 | 209 | 0.3 | 2.1 |
| 08/16/93 | 3.24 | 643 | 168 | 343 | 1.9 | 2.0 |
| 12/01/93 | ND | 230 | 135 | 251 | 0.9 | 1.9 |
| 02/01/94 | ND | 90 | 95 | 150 | 0.6 | 1.6 |
| 03/14/94 | ND | 30 | 85 | 71 | 0.4 | 0.8 |
| 05/21/94 | 3.94 | 1,326 | 260 | 463 | 2.9 | 1.8 |
| 06/26/94 | 9.89* | 10,500 | 260 | 1,770 | 5.9 | 6.8 |
| 07/22/94 | 3.69 | 945 | 263 | 386 | 2.4 | 1.5 |
| 09/28/94 | 2.82 | 390 | 108 | 187 | 2.1 | 1.7 |
| 12/02/94 | ND | 139 | 90 | 125 | 1.1 | 1.4 |
| 03/19/95 | NA | 52 | 75 | 81 | 0.6 | 1.1 |
| 05/31/95 | 3.21 | 661 | 152 | 226 | 2.9 | 1.5 |
| 07/19/95 | 2.91 | 468 | 148 | 192 | 2.4 | 1.3 |
| 11/24/95 | NA | 140 | 90 | 123 | 1.1 | 1.4 |
| 03/12/96 | ND | 0 | (Creek frozen solid to bottom ) | | | |
| 07/24/96 | 2.61 | 343 | 114 | 167 | 2.1 | 1.5 |
| 08/23/96 | 3.02 | 517 | 153 | 254 | 2.0 | 1.7 |
| 09/26/96 | 2.91 | 516 | 118 | 199 | 2.6 | 1.7 |
| 11/26/96 | ND | 99 | 80 | 98 | 1.0 | 1.2 |
| 03/25/97 | ND | 8.8 | 30 | 9.9 | 0.9 | 0.3 |
| 06/06/97 | 3.34 | 692 | 153 | 243 | 2.8 | 1.6 |
| 08/19/97 | 3.86 | 1,148 | 160 | 299 | 3.8 | 1.9 |
| 09/26/97 | 3.24 | 651 | 148 | 238 | 2.7 | 1.6 |
| 11/20/97 | ND | 133 | 95 | 118 | 1.1 | 1.2 |
| 02/11/98 | ND | 7.6 | 75 | 28 | 0.3 | 0.4 |
| 03/27/98 | ND | 0.9 | 35 | 6.8 | 0.1 | 0.2 |
| 05/21/98 | 3.37 | 746 | 155 | 249 | 3.0 | 1.6 |
| 09/29/98 | 3.59 | 900 | 170 | 353 | 2.5 | 2.1 |
| 12/04/98 | ND | 95 | 75 | 110 | 0.9 | 1.5 |
| 03/10/99 | ND | 2.7 | 22 | 11 | 0.2 | 0.5 |
| 09/10/99 | 3.03 | 472 | 107 | 191 | 2.5 | 1.8 |
| 07/01/03 | 2.64 | 339 | 102 | 183 | 1.9 | 1.8 |

ND - Not Determined

**Table A-5.** Peak and Minimum Discharges (cfs) from 1993 to 1999 for Beaver Creek at Big Bend WRM 36.5

| Peak Date | Peak discharge | Minimum date | Minimum discharge |
|---|---|---|---|
| 09/21/93 | 8,560 | 03/22/93 | 55 |
| 06/24/94 | 10,500 | 03/14/94 | 30 |
| 09/01/95 | 7,900 | 03/09/95 | 18 |
| 06/12/96 | 5,380 | 03/12/96 | 0.0 |
| 05/10/97 | 3,500 | 03/25/97 | 8.8 |
| 08/18/98 | 8,050 | 03/27/98 | 0.9 |
| 08/10/99 | 3,670 | 03/10/99 | 2.7 |

**Table A-6.** 1989–1999 Mean Monthly Discharge (cfs) Beaver Creek at Big Bend WRM 36.5

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg. Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | *43* | *41* | *41* | *278* | *1,034* | *2,032* | *372* | *302* | *264* | *197* | *155* | *100* | *405* |
| 1990 | *19* | *17* | *16* | *125* | *998* | *525* | *394* | *533* | *2,475* | *563* | *239* | *102* | *500* |
| 1991 | *78* | *59* | *45* | *159* | *2,777* | *1,840* | *569* | *2,165* | *853* | *514* | *270* | *142* | *789* |
| 1992 | *82* | *56* | *38* | *155* | *1,034* | *2,218* | *414* | *381* | *366* | *194* | *135* | *123* | *433* |
| 1993 | *96* | *74* | *58* | *430* | *1,851* | *1,267* | *538* | *1,033* | *3,910* | *1,410* | *427* | *186* | *940* |
| 1994 | *116* | *59* | *33* | *294* | *1,551* | *3,631* | *1,275* | *1,450* | *770* | *298* | *182* | *123* | *815* |
| 1995 | *93* | *70* | *54* | *294* | *1,905* | *1,085* | *597* | *2,400* | *3,069* | *1,490* | *238* | *22* | *943* |
| 1996 | *4.0* | *1.0* | *0* | *49* | *1,302* | *847* | *659* | *1,050* | *833* | *309* | *133* | *67* | *438* |
| 1997 | *36* | *19* | *11* | *29* | *835* | *406* | *387* | *731* | *747* | *376* | *154* | *56* | *316* |
| 1998 | *19* | *6.5* | *1.5* | *69* | *1,970* | *756* | *1,745* | *2,328* | *998* | *522* | *181* | *63* | *722* |
| 1999 | *20* | *6.5* | *2.5* | *62* | *734* | *513* | *548* | *1,196* | *561* | *379* | *117* | *48* | *349* |
| Mean | *55* | *37* | *27* | *177* | *1,454* | *1,375* | *682* | *1,233* | *1,350* | *568* | *203* | *94* | *605* |

Figures in italics were estimated from regression analysis of discharge measurements at this gaging site, at other gages on Beaver Creek, or the Salcha River (USGS data).

**Beaver Creek above Victoria Creek WRM 110.5**


**Fig A-3.** Looking downstream at the data logger site on Beaver Creek above Victoria Creek. This site was selected in June 1988, and a data logger and pressure transducer gage were installed on the left bank. Data was collected until 2000, when the gaging project was discontinued. The gage was removed in September 2000.

**Table A-7.** Discharge Measurements for Beaver Creek above Victoria Creek WRM 110.5

| Date | Stage (ft) | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg. Velocity (fps) | Avg. Depth (ft) |
|---|---|---|---|---|---|---|
| 03/22/93 | ND | 92 | 135 | 133 | 0.7 | 1.0 |
| 08/16/93 | 1.85 | 1,035 | 227 | 513 | 2.0 | 2.3 |
| 12/07/93 | ND | 349 | 171 | 195 | 1.8 | 1.1 |
| 03/14/94 | ND | 64 | 110 | 61 | 1.0 | 0.6 |
| 05/21/94 | 2.85 | 2,040 | 228 | 772 | 2.6 | 3.4 |
| 06/24/94 | 9.45* | 14,100 | 353 | 2,630 | 5.4 | 7.5 |
| 09/28/94 | 1.27 | 631 | 210 | 420 | 1.5 | 2.0 |
| 11/29/94 | ND | 2,118 | 100 | 383 | 5.5 | 3.8 |
| 03/19/95 | ND | 74 | 187 | 96 | 0.8 | 0.5 |
| 05/31/95 | 2.16 | 1,200 | 213 | 538 | 2.2 | 2.5 |
| 07/19/95 | 1.75 | 826 | 220 | 454 | 1.8 | 2.1 |
| 11/24/95 | ND | 236 | 125 | 166 | 1.4 | 1.3 |
| 03/12/96 | ND | 1.0 | 23 | 7.3 | 0.1 | 0.3 |
| 07/24/96 | 1.42 | 603 | 214 | 373 | 1.6 | 1.7 |
| 08/23/96 | 1.81 | 866 | 219 | 447 | 1.9 | 2.0 |
| 09/26/96 | 1.83 | 809 | 214 | 373 | 2.2 | 1.7 |
| 11/26/96 | ND | 160 | 144 | 148 | 1.1 | 1.0 |
| 03/25/97 | NA | 34 | 110 | 40 | 0.9 | 0.4 |
| 05/19/97 | 2.74 | 1,710 | 215 | 760 | 2.3 | 3.5 |
| 09/26/97 | 2.27 | 1,230 | 220 | 527 | 2.3 | 2.4 |
| 11/20/97 | ND | 181 | 135 | 235 | 0.8 | 1.7 |
| 02/11/98 | ND | 34 | 120 | 73 | 0.5 | 0.6 |
| 04/06/98 | ND | 41 | 104 | 46 | 0.9 | 0.4 |
| 06/29/98 | 2.48 | 1,370 | 225 | 577 | 2.4 | 2.6 |
| 07/31/98 | 2.32 | 1,460 | 220 | 544 | 2.7 | 2.5 |
| 09/11/98 | 4.12 | 1,660 | 225 | 628 | 2.6 | 2.8 |
| 12/01/98 | ND | 125 | 190 | 169 | 0.7 | 0.9 |
| 03/10/99 | ND | 8.5 | 50 | 25 | 0.3 | 0.5 |
| 05/25/99 | 2.20 | 1,280 | 225 | 530 | 2.4 | 2.4 |
| 09/28/99 | 2.23 | 1,120 | 221 | 502 | 2.2 | 2.3 |
| 12/01/99 | ND | 125 | 190 | 169 | 0.7 | 0.9 |
| 03/21/00 | ND | 15 | 65 | 35 | 0.4 | 0.5 |
| 05/25/00 | 6.47 | 8,040 | 258 | 1,490 | 5.4 | 5.8 |
| 07/26/00 | 1.73 | 713 | 210 | 398 | 1.8 | 1.9 |
| 12/12/00 | ND | 212 | 190 | 260 | 0.8 | 1.4 |
| 03/12/01 | ND | 80 | 170 | 137 | 0.6 | 0.8 |

*Slope-conveyance indirect discharge measurement
ND - Not Determined

**Table A-8.** Peak and Minimum Discharges (cfs) from 1993–2000 for Beaver Creek above Victoria Creek WRM 110.5

| Peak Date | Peak discharge | Minimum date | Minimum discharge |
|---|---|---|---|
| 09/21/93 | 13,700 | 03/22/93 | 92 |
| 06/24/94 | 15,300 | 03/14/94 | 64 |
| 09/01/95 | 10,700 | 03/19/95 | 74 |
| 06/12/96 | 6,660 | 03/12/96 | 1.0 |
| 05/10/97 | 6,560 | 03/25/97 | 34 |
| 08/18/98 | 13,700 | 02/11/98 | 34 |
| 08/10/99 | 5,290 | 03/10/99 | 8.5 |
| 08/15/00 | 10,800 | 03/21/00 | 15 |

**Table A-9.** 1988–2001 Monthly Mean Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg. Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1988 | | | | | | 1,920 | 519 | 1,764 | 1,414 | | | | |
| 1989 | *63* | *56* | *54* | *478* | 2,217 | 3,113 | 863 | 585 | 409 | *288* | *192* | *120* | 703 |
| 1990 | *32* | *28* | *27* | *248* | 2,170 | 1,318 | 940 | 1,338 | 4,686 | *967* | *390* | *157* | 1,025 |
| 1991 | *128* | *96* | *73* | *290* | 5,603 | 2,980 | 1,425 | 3,619 | 1,950 | *831* | *377* | *171* | 1,462 |
| 1992 | *123* | *92* | *69* | *508* | 2,217 | 3,810 | 1,005 | 895 | 841 | *311* | *256* | *211* | 862 |
| 1993 | *158* | *123* | *97* | *698* | 2,611 | 1,854 | 855 | 1,542 | 5,130 | *2,880* | *838* | *303* | 1,424 |
| 1994 | *176* | *103* | *63* | *495* | 2,226 | 4,799 | 1,865 | 2,094 | 1,182 | *471* | *277* | *187* | 1,162 |
| 1995 | *138* | *102* | *77* | *495* | 2,680 | 1,612 | 940 | 3,301 | 4,123 | *1,735* | *370* | *79* | 1,304 |
| 1996 | *17* | *4.0* | *1.0* | *99* | 1,900 | 1,289 | 1,028 | 1,565 | 1,270 | *488* | *214* | *125* | 667 |
| 1997 | *83* | *56* | *39* | *61* | 1,273 | 663 | 635 | 1,128 | 1,151 | *634* | *215* | *109* | 504 |
| 1998 | *59* | *34* | *38* | *134* | 2,762 | 1,163 | 2,476 | 3,212 | 1,495 | *903* | *326* | *124* | 1,061 |
| 1999 | *47* | *18* | *7.3* | *121* | 1,132 | 820 | 870 | 1,760 | 889 | *624* | *216* | *96* | 550 |
| 2000 | *53* | *29* | *17* | *75* | 5,191 | 3,132 | 1,015 | 2,927 | 2,608 | *1,380* | *507* | *205* | 1,428 |
| 2001 | *147* | *106* | *77* | | | | | | | | | | |
| Mean | 94 | 65 | 49 | 309 | 2,665 | 2,213 | 1,160 | 1,997 | 2,144 | 959 | 348 | 157 | 1,013 |

Figures in italics were estimated from regression analysis of discharge measurements at this gaging site, at other gages on Beaver Creek, or the Salcha River (USGS data).

**Table A-10.** 1993 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 2,402 | 01-Jul | 1,067 | 01-Aug | 628 | 01-Sep | 1,342 |
| 02-May | | 02-Jun | 1,865 | 02-Jul | 1,302 | 02-Aug | 625 | 02-Sep | 4,045 |
| 03-May | | 03-Jun | 1,692 | 03-Jul | 1,737 | 03-Aug | 621 | 03-Sep | 8,219 |
| 04-May | | 04-Jun | 1,561 | 04-Jul | 1,565 | 04-Aug | 618 | 04-Sep | 8,663 |
| 05-May | | 05-Jun | 1,432 | 05-Jul | 1,238 | 05-Aug | 615 | 05-Sep | 6,955 |
| 06-May | | 06-Jun | 1,398 | 06-Jul | 1,063 | 06-Aug | 611 | 06-Sep | 5,790 |
| 07-May | | 07-Jun | 1,354 | 07-Jul | 986 | 07-Aug | 964 | 07-Sep | 4,877 |
| 08-May | | 08-Jun | 1,225 | 08-Jul | 949 | 08-Aug | 1,478 | 08-Sep | 4,075 |
| 09-May | | 09-Jun | 1,605 | 09-Jul | 937 | 09-Aug | 2,087 | 09-Sep | 3,558 |
| 10-May | | 10-Jun | 1,736 | 10-Jul | 896 | 10-Aug | 1,772 | 10-Sep | 3,191 |
| 11-May | | 11-Jun | 1,636 | 11-Jul | 846 | 11-Aug | 1,478 | 11-Sep | 2,883 |
| 12-May | | 12-Jun | 2,047 | 12-Jul | 802 | 12-Aug | 1,313 | 12-Sep | 2,658 |
| 13-May | | 13-Jun | 2,204 | 13-Jul | 760 | 13-Aug | 1,157 | 13-Sep | 2,489 |
| 14-May | | 14-Jun | 1,684 | 14-Jul | 734 | 14-Aug | 1,107 | 14-Sep | 2,418 |
| 15-May | | 15-Jun | 1,303 | 15-Jul | 709 | 15-Aug | 1,057 | 15-Sep | 2,602 |
| 16-May | | 16-Jun | 1,119 | 16-Jul | 687 | 16-Aug | 1,004 | 16-Sep | 2,563 |
| 17-May | | 17-Jun | 1,181 | 17-Jul | 703 | 17-Aug | | 17-Sep | 2,769 |
| 18-May | | 18-Jun | 1,519 | 18-Jul | 706 | 18-Aug | | 18-Sep | 4,140 |
| 19-May | | 19-Jun | 3,105 | 19-Jul | 757 | 19-Aug | | 19-Sep | 4,173 |
| 20-May | | 20-Jun | 4,241 | 20-Jul | 724 | 20-Aug | | 20-Sep | 8,898 |
| 21-May | | 21-Jun | 4,528 | 21-Jul | 700 | 21-Aug | | 21-Sep | 13,176 |
| 22-May | | 22-Jun | 2,997 | 22-Jul | 681 | 22-Aug | | 22-Sep | 10,681 |
| 23-May | | 23-Jun | 1,988 | 23-Jul | 661 | 23-Aug | | 23-Sep | 7,818 |
| 24-May | | 24-Jun | 1,653 | 24-Jul | 645 | 24-Aug | 2,308 | 24-Sep | |
| 25-May | 2,068 | 25-Jun | 1,581 | 25-Jul | 642 | 25-Aug | 2,257 | 25-Sep | |
| 26-May | 2,488 | 26-Jun | 1,516 | 26-Jul | 633 | 26-Aug | 1,943 | 26-Sep | |
| 27-May | 3,156 | 27-Jun | 1,375 | 27-Jul | 625 | 27-Aug | 1,669 | 27-Sep | |
| 28-May | 2,956 | 28-Jun | 1,298 | 28-Jul | 615 | 28-Aug | 1,483 | 28-Sep | |
| 29-May | 2,660 | 29-Jun | 1,236 | 29-Jul | 641 | 29-Aug | 1,318 | 29-Sep | |
| 30-May | 2,488 | 30-Jun | 1,146 | 30-Jul | 631 | 30-Aug | 1,214 | 30-Sep | |
| 31-May | 2,460 | | | 31-Jul | 628 | 31-Aug | 1,172 | | |
| Mean | 2,611 | Mean | 1,854 | Mean | 855 | Mean | 1,542 | Mean | 5,130 |
| Max. | 3,156 | Max. | 4,528 | Max. | 1,737 | Max. | 2,308 | Max. | 13,176 |
| Min. | 2,068 | Min. | 1,119 | Min. | 615 | Min. | 1,004 | Min. | 1,342 |

**Table A-11.** 1994 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 1,511 | 01-Jul | 4,228 | 01-Aug | 1,113 | 01-Sep | 2,090 |
| 02-May | | 02-Jun | 1,410 | 02-Jul | 3,492 | 02-Aug | 1,025 | 02-Sep | 1,816 |
| 03-May | | 03-Jun | 1,311 | 03-Jul | 3,016 | 03-Aug | 989 | 03-Sep | 1,731 |
| 04-May | | 04-Jun | 1,215 | 04-Jul | 2,697 | 04-Aug | 979 | 04-Sep | 1,648 |
| 05-May | | 05-Jun | 1,160 | 05-Jul | 2,567 | 05-Aug | 952 | 05-Sep | 1,566 |
| 06-May | | 06-Jun | 1,200 | 06-Jul | 2,424 | 06-Aug | 901 | 06-Sep | 1,447 |
| 07-May | | 07-Jun | 1,165 | 07-Jul | 2,239 | 07-Aug | 1,040 | 07-Sep | 1,359 |
| 08-May | | 08-Jun | 1,484 | 08-Jul | 2,103 | 08-Aug | 954 | 08-Sep | 1,273 |
| 09-May | | 09-Jun | 2,197 | 09-Jul | 1,853 | 09-Aug | 903 | 09-Sep | 1,235 |
| 10-May | | 10-Jun | 2,397 | 10-Jul | 1,664 | 10-Aug | 853 | 10-Sep | 1,214 |
| 11-May | | 11-Jun | 2,137 | 11-Jul | 1,553 | 11-Aug | 804 | 11-Sep | 1,176 |
| 12-May | | 12-Jun | 1,895 | 12-Jul | 1,422 | 12-Aug | 779 | 12-Sep | 1,121 |
| 13-May | | 13-Jun | 1,754 | 13-Jul | 1,330 | 13-Aug | 793 | 13-Sep | 1,093 |
| 14-May | | 14-Jun | 1,556 | 14-Jul | 1,364 | 14-Aug | 760 | 14-Sep | 1,065 |
| 15-May | | 15-Jun | 1,367 | 15-Jul | 1,341 | 15-Aug | 735 | 15-Sep | 1,012 |
| 16-May | | 16-Jun | 1,198 | 16-Jul | 1,250 | 16-Aug | 719 | 16-Sep | 968 |
| 17-May | | 17-Jun | 1,169 | 17-Jul | 1,195 | 17-Aug | 770 | 17-Sep | 925 |
| 18-May | | 18-Jun | 1,081 | 18-Jul | 1,411 | 18-Aug | 1,035 | 18-Sep | 882 |
| 19-May | | 19-Jun | 1,091 | 19-Jul | 1,739 | 19-Aug | 1,190 | 19-Sep | 864 |
| 20-May | | 20-Jun | 2,875 | 20-Jul | 1,802 | 20-Aug | 1,353 | 20-Sep | 823 |
| 21-May | 2730 | 21-Jun | 8,428 | 21-Jul | 2,089 | 21-Aug | 1,240 | 21-Sep | 805 |
| 22-May | 2631 | 22-Jun | 11,686 | 22-Jul | 1,837 | 22-Aug | 1,357 | 22-Sep | 788 |
| 23-May | 2564 | 23-Jun | 14,079 | 23-Jul | 1,789 | 23-Aug | 1,758 | 23-Sep | 755 |
| 24-May | 2539 | 24-Jun | 14,355 | 24-Jul | 1,641 | 24-Aug | 1,735 | 24-Sep | 723 |
| 25-May | 2,411 | 25-Jun | 11,991 | 25-Jul | 1,480 | 25-Aug | 2,003 | 25-Sep | 699 |
| 26-May | 2,279 | 26-Jun | 14,027 | 26-Jul | 1,366 | 26-Aug | 3,776 | 26-Sep | 668 |
| 27-May | 2,150 | 27-Jun | 14,355 | 27-Jul | 1,254 | 27-Aug | 5,679 | 27-Sep | 645 |
| 28-May | 2,023 | 28-Jun | 11,731 | 28-Jul | 1,185 | 28-Aug | 3,984 | 28-Sep | 614 |
| 29-May | 1,828 | 29-Jun | 6,925 | 29-Jul | 1,173 | 29-Aug | 3,149 | 29-Sep | |
| 30-May | 1,720 | 30-Jun | 5,231 | 30-Jul | 1,448 | 30-Aug | 2,719 | 30-Sep | |
| 31-May | 1,614 | | | 31-Jul | 1,395 | 31-Aug | 2,403 | | |
| Mean | 2,226 | Mean | 4,799 | Mean | 1,865 | Mean | 2,094 | Mean | 1,182 |
| Max. | 2,730 | Max. | 14,355 | Max. | 4,228 | Max. | 5,679 | Max. | 2,090 |
| Min. | 1,614 | Min. | 1,081 | Min. | 1,173 | Min. | 719 | Min. | 614 |

**Table A-12.** 1995 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | | **Date** | **Discharge** |
| 01-May | | 01-Jun | 1,130 | 01-Jul | 1,949 | 01-Aug | 650 | 01-Sep | 9,934 |
| 02-May | | 02-Jun | 1,136 | 02-Jul | 1,637 | 02-Aug | 639 | 02-Sep | 8,696 |
| 03-May | | 03-Jun | 1,315 | 03-Jul | 1,474 | 03-Aug | 618 | 03-Sep | 8,303 |
| 04-May | | 04-Jun | 2,096 | 04-Jul | 1,337 | 04-Aug | 596 | 04-Sep | 7,682 |
| 05-May | | 05-Jun | 2,771 | 05-Jul | 1,199 | 05-Aug | 645 | 05-Sep | 6,363 |
| 06-May | | 06-Jun | 2,059 | 06-Jul | 1,099 | 06-Aug | 747 | 06-Sep | 5,056 |
| 07-May | | 07-Jun | 1,579 | 07-Jul | 1,022 | 07-Aug | 983 | 07-Sep | 4,307 |
| 08-May | | 08-Jun | 1,303 | 08-Jul | 942 | 08-Aug | 1,163 | 08-Sep | 3,851 |
| 09-May | | 09-Jun | 1,146 | 09-Jul | 880 | 09-Aug | 1,254 | 09-Sep | 3,575 |
| 10-May | | 10-Jun | 1,085 | 10-Jul | 824 | 10-Aug | 1,119 | 10-Sep | 3,381 |
| 11-May | | 11-Jun | 1,090 | 11-Jul | 790 | 11-Aug | 1,144 | 11-Sep | 3,285 |
| 12-May | | 12-Jun | 1,047 | 12-Jul | 1,051 | 12-Aug | 1,248 | 12-Sep | 3,519 |
| 13-May | | 13-Jun | 960 | 13-Jul | 950 | 13-Aug | 1,363 | 13-Sep | 3,895 |
| 14-May | | 14-Jun | 883 | 14-Jul | 916 | 14-Aug | 1,738 | 14-Sep | 3,605 |
| 15-May | | 15-Jun | 816 | 15-Jul | 889 | 15-Aug | 3,915 | 15-Sep | 3,368 |
| 16-May | | 16-Jun | 771 | 16-Jul | 895 | 16-Aug | 4,854 | 16-Sep | 3,061 |
| 17-May | | 17-Jun | 877 | 17-Jul | 937 | 17-Aug | 3,983 | 17-Sep | 2,773 |
| 18-May | | 18-Jun | 917 | 18-Jul | 926 | 18-Aug | 3,160 | 18-Sep | 2,534 |
| 19-May | | 19-Jun | 889 | 19-Jul | 863 | 19-Aug | 2,651 | 19-Sep | 2,333 |
| 20-May | | 20-Jun | 817 | 20-Jul | 775 | 20-Aug | 2,475 | 20-Sep | 2,138 |
| 21-May | | 21-Jun | 768 | 21-Jul | 722 | 21-Aug | 2,645 | 21-Sep | 1,986 |
| 22-May | | 22-Jun | 790 | 22-Jul | 693 | 22-Aug | 2,810 | 22-Sep | 1,867 |
| 23-May | | 23-Jun | 767 | 23-Jul | 661 | 23-Aug | 2,541 | 23-Sep | 1,764 |
| 24-May | | 24-Jun | 741 | 24-Jul | 640 | 24-Aug | 2,280 | 24-Sep | 1,683 |
| 25-May | | 25-Jun | 748 | 25-Jul | 655 | 25-Aug | 2,170 | 25-Sep | 1,619 |
| 26-May | | 26-Jun | 1,921 | 26-Jul | 813 | 26-Aug | 2,372 | 26-Sep | 1,910 |
| 27-May | | 27-Jun | 5,388 | 27-Jul | 753 | 27-Aug | 2,528 | 27-Sep | 4,325 |
| 28-May | | 28-Jun | 6,328 | 28-Jul | 680 | 28-Aug | 2,301 | 28-Sep | |
| 29-May | | 29-Jun | 3,675 | 29-Jul | 630 | 29-Aug | 2,021 | 29-Sep | |
| 30-May | | 30-Jun | 2,559 | 30-Jul | 587 | 30-Aug | 3,878 | 30-Sep | |
| 31-May | 1,196 | | | 31-Jul | 619 | 31-Aug | 9,538 | | |
| Mean | | Mean | 1,612 | Mean | 940 | Mean | 3,301 | Mean | 4,123 |
| Max. | | Max. | 6,328 | Max. | 1,949 | Max. | 9,538 | Max. | 9,934 |
| Min. | | Min. | 741 | Min. | 587 | Min. | 2,021 | Min. | 1,683 |

**Table A-13.** 1996 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 1,611 | 01-Jul | 670 | 01-Aug | 548 | 01-Sep | 2,587 |
| 02-May | | 02-Jun | 1,587 | 02-Jul | 1,061 | 02-Aug | 676 | 02-Sep | 2,413 |
| 03-May | | 03-Jun | 1,418 | 03-Jul | 1,496 | 03-Aug | 1,164 | 03-Sep | 2,065 |
| 04-May | | 04-Jun | 1,250 | 04-Jul | 1,265 | 04-Aug | 2,184 | 04-Sep | 1,689 |
| 05-May | | 05-Jun | 990 | 05-Jul | 1,043 | 05-Aug | 2,326 | 05-Sep | 1,473 |
| 06-May | | 06-Jun | 765 | 06-Jul | 996 | 06-Aug | 1,886 | 06-Sep | 1,329 |
| 07-May | | 07-Jun | 669 | 07-Jul | 953 | 07-Aug | 1,510 | 07-Sep | 1,197 |
| 08-May | | 08-Jun | 665 | 08-Jul | 1,040 | 08-Aug | 1,330 | 08-Sep | 1,097 |
| 09-May | | 09-Jun | 667 | 09-Jul | 831 | 09-Aug | 1,284 | 09-Sep | 1,018 |
| 10-May | | 10-Jun | 650 | 10-Jul | 696 | 10-Aug | 2,588 | 10-Sep | 992 |
| 11-May | | 11-Jun | 1,214 | 11-Jul | 1,301 | 11-Aug | 5,235 | 11-Sep | 1,060 |
| 12-May | | 12-Jun | 5,033 | 12-Jul | 2,703 | 12-Aug | 4,083 | 12-Sep | 1,130 |
| 13-May | | 13-Jun | 4,562 | 13-Jul | 1,811 | 13-Aug | 2,889 | 13-Sep | 1,173 |
| 14-May | | 14-Jun | 2,696 | 14-Jul | 1,255 | 14-Aug | 2,211 | 14-Sep | 1,176 |
| 15-May | | 15-Jun | 1,923 | 15-Jul | 1,032 | 15-Aug | 1,751 | 15-Sep | 1,111 |
| 16-May | | 16-Jun | 1,587 | 16-Jul | 1,516 | 16-Aug | 1,494 | 16-Sep | 1,043 |
| 17-May | | 17-Jun | 1,407 | 17-Jul | 2,004 | 17-Aug | 1,351 | 17-Sep | 986 |
| 18-May | | 18-Jun | 1,269 | 18-Jul | 1,518 | 18-Aug | 1,280 | 18-Sep | 963 |
| 19-May | | 19-Jun | 1,213 | 19-Jul | 1,153 | 19-Aug | 1,223 | 19-Sep | 899 |
| 20-May | | 20-Jun | 1,055 | 20-Jul | 922 | 20-Aug | 1,151 | 20-Sep | 950 |
| 21-May | | 21-Jun | 932 | 21-Jul | 784 | 21-Aug | 1,057 | 21-Sep | 1,065 |
| 22-May | | 22-Jun | 834 | 22-Jul | 678 | 22-Aug | 954 | 22-Sep | 1,102 |
| 23-May | | 23-Jun | 733 | 23-Jul | 619 | 23-Aug | 899 | 23-Sep | 1,006 |
| 24-May | | 24-Jun | 649 | 24-Jul | 580 | 24-Aug | 834 | 24-Sep | 953 |
| 25-May | | 25-Jun | 592 | 25-Jul | 543 | 25-Aug | 848 | 25-Sep | 874 |
| 26-May | | 26-Jun | 555 | 26-Jul | 499 | 26-Aug | 1,151 | 26-Sep | 836 |
| 27-May | | 27-Jun | 536 | 27-Jul | 469 | 27-Aug | 2,650 | 27-Sep | |
| 28-May | | 28-Jun | 553 | 28-Jul | 446 | 28-Aug | 3,150 | 28-Sep | |
| 29-May | 2,066 | 29-Jun | 539 | 29-Jul | 449 | 29-Aug | 2,563 | 29-Sep | |
| 30-May | 1,953 | 30-Jun | 528 | 30-Jul | 494 | 30-Aug | 2,056 | 30-Sep | |
| 31-May | 1,829 | | | 31-Jul | 526 | 31-Aug | 2,192 | | |
| Mean | 1,949 | Mean | 1,289 | Mean | 1,028 | Mean | 1,565 | Mean | 1,270 |
| Max. | 2,066 | Max. | 5,033 | Max. | 2,703 | Max. | 3,150 | Max. | 2,587 |
| Min. | 1,829 | Min. | 528 | Min. | 446 | Min. | 834 | Min. | 899 |

**Table A-14.** 1997 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 829 | 01-Jul | 310 | 01-Aug | 497 | 01-Sep | 1,050 |
| 02-May | | 02-Jun | 699 | 02-Jul | 301 | 02-Aug | 472 | 02-Sep | 1,149 |
| 03-May | | 03-Jun | 646 | 03-Jul | 296 | 03-Aug | 456 | 03-Sep | 1,212 |
| 04-May | | 04-Jun | 709 | 04-Jul | 275 | 04-Aug | 443 | 04-Sep | 1,170 |
| 05-May | | 05-Jun | 870 | 05-Jul | 289 | 05-Aug | 446 | 05-Sep | 1,083 |
| 06-May | | 06-Jun | 980 | 06-Jul | 308 | 06-Aug | 465 | 06-Sep | 1,015 |
| 07-May | | 07-Jun | 1,067 | 07-Jul | 313 | 07-Aug | 472 | 07-Sep | 979 |
| 08-May | | 08-Jun | 962 | 08-Jul | 322 | 08-Aug | 520 | 08-Sep | 925 |
| 09-May | | 09-Jun | 840 | 09-Jul | 332 | 09-Aug | 562 | 09-Sep | 882 |
| 10-May | | 10-Jun | 750 | 10-Jul | 337 | 10-Aug | 575 | 10-Sep | 838 |
| 11-May | | 11-Jun | 690 | 11-Jul | 335 | 11-Aug | 592 | 11-Sep | 849 |
| 12-May | | 12-Jun | 782 | 12-Jul | 321 | 12-Aug | 594 | 12-Sep | 900 |
| 13-May | | 13-Jun | 853 | 13-Jul | 410 | 13-Aug | 612 | 13-Sep | 999 |
| 14-May | | 14-Jun | 781 | 14-Jul | 1,380 | 14-Aug | 641 | 14-Sep | 1,069 |
| 15-May | | 15-Jun | 809 | 15-Jul | 958 | 15-Aug | 637 | 15-Sep | 1,139 |
| 16-May | | 16-Jun | 783 | 16-Jul | 874 | 16-Aug | 698 | 16-Sep | 1,150 |
| 17-May | | 17-Jun | 716 | 17-Jul | 761 | 17-Aug | 955 | 17-Sep | 1,083 |
| 18-May | | 18-Jun | 643 | 18-Jul | 633 | 18-Aug | 1,425 | 18-Sep | 1,018 |
| 19-May | 1707 | 19-Jun | 566 | 19-Jul | 618 | 19-Aug | 2,020 | 19-Sep | 1,126 |
| 20-May | 1650 | 20-Jun | 514 | 20-Jul | 998 | 20-Aug | 1,970 | 20-Sep | 1,456 |
| 21-May | 1629 | 21-Jun | 488 | 21-Jul | 1,069 | 21-Aug | 1,570 | 21-Sep | 1,868 |
| 22-May | 1819 | 22-Jun | 462 | 22-Jul | 1,149 | 22-Aug | 1,322 | 22-Sep | 1,794 |
| 23-May | 1653 | 23-Jun | 456 | 23-Jul | 1,150 | 23-Aug | 1,091 | 23-Sep | 1,506 |
| 24-May | 1379 | 24-Jun | 524 | 24-Jul | 1,026 | 24-Aug | 900 | 24-Sep | 1,372 |
| 25-May | 1,136 | 25-Jun | 510 | 25-Jul | 898 | 25-Aug | 842 | 25-Sep | 1,316 |
| 26-May | 994 | 26-Jun | 473 | 26-Jul | 823 | 26-Aug | 855 | 26-Sep | 1,263 |
| 27-May | 912 | 27-Jun | 423 | 27-Jul | 731 | 27-Aug | 1,007 | 27-Sep | |
| 28-May | 876 | 28-Jun | 385 | 28-Jul | 662 | 28-Aug | 994 | 28-Sep | |
| 29-May | 902 | 29-Jun | 358 | 29-Jul | 608 | 29-Aug | 944 | 29-Sep | |
| 30-May | 1,002 | 30-Jun | 333 | 30-Jul | 558 | 30-Aug | 977 | 30-Sep | |
| 31-May | 888 | | | 31-Jul | 515 | 31-Aug | 968 | | |
| Mean | 1,273 | Mean | 663 | Mean | 635 | Mean | 1,128 | Mean | 1,151 |
| Max. | 1,819 | Max. | 1,067 | Max. | 1,380 | Max. | 2,020 | Max. | 1,868 |
| Min. | 876 | Min. | 333 | Min. | 275 | Min. | 637 | Min. | 838 |

**Table A-15.** 1998 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 1,360 | 01-Jul | 1,065 | 01-Aug | 1,329 | 01-Sep | 2,128 |
| 02-May | | 02-Jun | 1,190 | 02-Jul | 2,370 | 02-Aug | 1,234 | 02-Sep | 2,135 |
| 03-May | | 03-Jun | 988 | 03-Jul | 2,593 | 03-Aug | 1,145 | 03-Sep | 1,988 |
| 04-May | | 04-Jun | 853 | 04-Jul | 2,022 | 04-Aug | 1,147 | 04-Sep | 1,859 |
| 05-May | | 05-Jun | 765 | 05-Jul | 1,537 | 05-Aug | 1,406 | 05-Sep | 1,791 |
| 06-May | | 06-Jun | 707 | 06-Jul | 1,292 | 06-Aug | 1,460 | 06-Sep | 1,699 |
| 07-May | | 07-Jun | 697 | 07-Jul | 3,422 | 07-Aug | 1,611 | 07-Sep | 1,611 |
| 08-May | | 08-Jun | 667 | 08- Jul | 5,518 | 08-Aug | 1,942 | 08-Sep | 1,580 |
| 09-May | | 09-Jun | 633 | 09-Jul | 7,829 | 09-Aug | 2,050 | 09-Sep | 1,546 |
| 10-May | | 10-Jun | 609 | 10-Jul | 4,594 | 10-Aug | 2,672 | 10-Sep | 1,484 |
| 11-May | | 11-Jun | 585 | 11-Jul | 4,151 | 11-Aug | 2,858 | 11-Sep | 1,545 |
| 12-May | | 12-Jun | 574 | 12-Jul | 4,591 | 12-Aug | 2,644 | 12-Sep | 1,484 |
| 13-May | | 13-Jun | 571 | 13-Jul | 3,680 | 13-Aug | 3,204 | 13-Sep | 1,406 |
| 14-May | | 14-Jun | 550 | 14-Jul | 2,842 | 14-Aug | 4,161 | 14-Sep | 1,345 |
| 15-May | | 15-Jun | 545 | 15-Jul | 2,433 | 15-Aug | 3,068 | 15-Sep | 1,268 |
| 16-May | | 16-Jun | 625 | 16-Jul | 1,890 | 16-Aug | 2,969 | 16-Sep | 1,231 |
| 17-May | | 17-Jun | 951 | 17-Jul | 1,724 | 17-Aug | 5,515 | 17-Sep | 1,231 |
| 18-May | | 18-Jun | 2,053 | 18-Jul | 1,861 | 18-Aug | 11,758 | 18-Sep | 1,343 |
| 19-May | | 19-Jun | 2,114 | 19-Jul | 1,992 | 19-Aug | 10,006 | 19-Sep | 1,379 |
| 20-May | | 20-Jun | 1,632 | 20-Jul | 2,124 | 20-Aug | 6,076 | 20-Sep | 1,314 |
| 21-May | 1603 | 21-Jun | 1,370 | 21-Jul | 1,820 | 21-Aug | 4,616 | 21-Sep | 1,250 |
| 22-May | 1505 | 22-Jun | 1,379 | 22-Jul | 1,411 | 22-Aug | 3,879 | 22-Sep | 1,215 |
| 23-May | 2787 | 23-Jun | 1,573 | 23-Jul | 1,352 | 23-Aug | 3,786 | 23-Sep | 1,237 |
| 24-May | 4719 | 24-Jun | 2,426 | 24-Jul | 1,639 | 24-Aug | 3,597 | 24-Sep | 1,237 |
| 25-May | 2,605 | 25-Jun | 2,053 | 25-Jul | 1,696 | 25-Aug | 3,171 | 25-Sep | 1,283 |
| 26-May | 2,311 | 26-Jun | 1,681 | 26-Jul | 1,497 | 26-Aug | 2,828 | 26-Sep | 1,469 |
| 27-May | 4,989 | 27-Jun | 1,544 | 27-Jul | 1,474 | 27-Aug | 2,609 | 27-Sep | 1,472 |
| 28-May | 4,072 | 28-Jun | 1,671 | 28-Jul | 1,517 | 28-Aug | 2,692 | 28-Sep | 1,421 |
| 29-May | 2,489 | 29-Jun | 1,435 | 29-Jul | 1,690 | 29-Aug | 2,536 | 29-Sep | 1,398 |
| 30-May | 1,820 | 30-Jun | 1,076 | 30-Jul | 1,685 | 30-Aug | 2,371 | 30-Sep | |
| 31-May | 1,485 | | | 31-Jul | 1,451 | 31-Aug | 2,345 | | |
| Mean | 2,762 | Mean | 1,163 | Mean | 2,476 | Mean | 3,312 | Mean | 1,495 |
| Max. | 4,989 | Max. | 2,426 | Max. | 7,829 | Max. | 11,758 | Max. | 2,135 |
| Min. | 1,485 | Min. | 545 | Min. | 1,065 | Min. | 1,145 | Min. | 1,215 |

**Table A-16.** 1999 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 858 | 01-Jul | 791 | 01-Aug | 1,274 | 01-Sep | 707 |
| 02-May | | 02-Jun | 774 | 02-Jul | 638 | 02-Aug | 1,124 | 02-Sep | 685 |
| 03-May | | 03-Jun | 721 | 03-Jul | 545 | 03-Aug | 1,006 | 03-Sep | 664 |
| 04-May | | 04-Jun | 691 | 04-Jul | 479 | 04-Aug | 934 | 04-Sep | 650 |
| 05-May | | 05-Jun | 684 | 05-Jul | 432 | 05-Aug | 878 | 05-Sep | 671 |
| 06-May | | 06-Jun | 667 | 06-Jul | 399 | 06-Aug | 785 | 06-Sep | 805 |
| 07-May | | 07-Jun | 662 | 07-Jul | 376 | 07-Aug | 804 | 07-Sep | 1,231 |
| 08-May | | 08-Jun | 663 | 08-Jul | 354 | 08-Aug | 1,516 | 08-Sep | 1,240 |
| 09-May | | 09-Jun | 674 | 09-Jul | 339 | 09-Aug | 3,294 | 09-Sep | 1,117 |
| 10-May | | 10-Jun | 672 | 10-Jul | 324 | 10-Aug | 5,056 | 10-Sep | 1,012 |
| 11-May | | 11-Jun | 655 | 11-Jul | 309 | 11-Aug | 4,754 | 11-Sep | 940 |
| 12-May | | 12-Jun | 652 | 12-Jul | 296 | 12-Aug | 3,407 | 12-Sep | 868 |
| 13-May | | 13-Jun | 618 | 13-Jul | 350 | 13-Aug | 2,959 | 13-Sep | 807 |
| 14-May | | 14-Jun | 596 | 14-Jul | 365 | 14-Aug | 3,680 | 14-Sep | 766 |
| 15-May | | 15-Jun | 572 | 15-Jul | 325 | 15-Aug | 3,480 | 15-Sep | 770 |
| 16-May | | 16-Jun | 541 | 16-Jul | 313 | 16-Aug | 2,653 | 16-Sep | 802 |
| 17-May | | 17-Jun | 523 | 17-Jul | 504 | 17-Aug | 2,137 | 17-Sep | 987 |
| 18-May | | 18-Jun | 577 | 18-Jul | 884 | 18-Aug | 1,779 | 18-Sep | 1,040 |
| 19-May | | 19-Jun | 1,728 | 19-Jul | 1,038 | 19-Aug | 1,526 | 19-Sep | 979 |
| 20-May | | 20-Jun | 2,292 | 20-Jul | 934 | 20-Aug | 1,347 | 20-Sep | 907 |
| 21-May | | 21-Jun | 1,531 | 21-Jul | 824 | 21-Aug | 1,209 | 21-Sep | 850 |
| 22-May | | 22-Jun | 1,142 | 22-Jul | 846 | 22-Aug | 1,104 | 22-Sep | 794 |
| 23-May | | 23-Jun | 944 | 23-Jul | 1,236 | 23-Aug | 1,008 | 23-Sep | 765 |
| 24-May | | 24-Jun | 803 | 24-Jul | 1,676 | 24-Aug | 985 | 24-Sep | 752 |
| 25-May | 1,054 | 25-Jun | 712 | 25-Jul | 1,629 | 25-Aug | 972 | 25-Sep | 779 |
| 26-May | 1,166 | 26-Jun | 650 | 26-Jul | 1,493 | 26-Aug | 946 | 26-Sep | 962 |
| 27-May | 1,232 | 27-Jun | 620 | 27-Jul | 1,723 | 27-Aug | 891 | 27-Sep | 1,174 |
| 28-May | 1,238 | 28-Jun | 709 | 28-Jul | 2,282 | 28-Aug | 837 | 28-Sep | 1,172 |
| 29-May | 1,168 | 29-Jun | 723 | 29-Jul | 2,118 | 29-Aug | 774 | 29-Sep | |
| 30-May | 1,094 | 30-Jun | 940 | 30-Jul | 1,708 | 30-Aug | 737 | 30-Sep | |
| 31-May | 973 | | | 31-Jul | 1,447 | 31-Aug | 707 | | |
| Mean. | 1,132 | Mean | 820 | Mean | 870 | Mean | 1,760 | Mean | 889 |
| Max. | 1,238 | Max. | 2,292 | Max. | 2,282 | Max. | 5,056 | Max. | 1,240 |
| Min. | 973 | Min. | 523 | Min. | 296 | Min. | 707 | Min. | 650 |

**Table A-17.** 2000 Mean Daily Discharge (cfs) for Beaver Creek above Victoria Creek WRM 110.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 4,824 | 01-Jul | 1,064 | 01-Aug | 626 | 01-Sep | 2,210 |
| 02-May | | 02-Jun | 5,279 | 02-Jul | 962 | 02-Aug | 608 | 02-Sep | 2,155 |
| 03-May | | 03-Jun | 5,225 | 03-Jul | 912 | 03-Aug | 588 | 03-Sep | 2,380 |
| 04-May | | 04-Jun | 5,304 | 04-Jul | 908 | 04-Aug | 569 | 04-Sep | 2,663 |
| 05-May | | 05-Jun | 5,167 | 05-Jul | 908 | 05-Aug | 562 | 05-Sep | 2,515 |
| 06-May | | 06-Jun | 4,889 | 06-Jul | 849 | 06-Aug | 559 | 06-Sep | 2,316 |
| 07-May | | 07-Jun | 4,589 | 07-Jul | 787 | 07-Aug | 575 | 07-Sep | 2,301 |
| 08-May | | 08-Jun | 4,187 | 08-Jul | 731 | 08-Aug | 611 | 08-Sep | 2,327 |
| 09-May | | 09-Jun | 3,983 | 09-Jul | 700 | 09-Aug | 623 | 09-Sep | 2,486 |
| 10-May | | 10-Jun | 4,351 | 10-Jul | 785 | 10-Aug | 613 | 10-Sep | 2,697 |
| 11-May | | 11-Jun | 4,660 | 11-Jul | 1,117 | 11-Aug | 616 | 11-Sep | 2,508 |
| 12-May | | 12-Jun | 3,779 | 12-Jul | 1,516 | 12-Aug | 649 | 12-Sep | 2,451 |
| 13-May | | 13-Jun | 3,026 | 13-Jul | 2,603 | 13-Aug | 1,460 | 13-Sep | 2,671 |
| 14-May | | 14-Jun | 3,156 | 14-Jul | 2,496 | 14-Aug | 7,126 | 14-Sep | 2,878 |
| 15-May | | 15-Jun | 3,126 | 15-Jul | 1,746 | 15-Aug | 10,216 | 15-Sep | 2,657 |
| 16-May | | 16-Jun | 4,206 | 16-Jul | 1,337 | 16-Aug | 6,367 | 16-Sep | 2,467 |
| 17-May | | 17-Jun | 4,343 | 17-Jul | 1,114 | 17-Aug | 4,154 | 17-Sep | 2,329 |
| 18-May | | 18-Jun | 3,031 | 18-Jul | 969 | 18-Aug | 3,323 | 18-Sep | 2,068 |
| 19-May | | 19-Jun | 2,340 | 19-Jul | 914 | 19-Aug | 3,952 | 19-Sep | 1,887 |
| 20-May | | 20-Jun | 2,015 | 20-Jul | 952 | 20-Aug | 4,787 | 20-Sep | 1,749 |
| 21-May | | 21-Jun | 1,855 | 21-Jul | 908 | 21-Aug | 3,960 | 21-Sep | 1,646 |
| 22-May | | 22-Jun | 1,633 | 22-Jul | 847 | 22-Aug | 3,514 | 22-Sep | 1,957 |
| 23-May | | 23-Jun | 1,472 | 23-Jul | 802 | 23-Aug | 4,014 | 23-Sep | 3,095 |
| 24-May | | 24-Jun | 1,356 | 24-Jul | 753 | 24-Aug | 4,916 | 24-Sep | 4,732 |
| 25-May | 8,223 | 25-Jun | 1,214 | 25-Jul | 713 | 25-Aug | 4,623 | 25-Sep | 4,421 |
| 26-May | 7,389 | 26-Jun | 1,086 | 26-Jul | 705 | 26-Aug | 4,605 | 26-Sep | 3,609 |
| 27-May | 5,276 | 27-Jun | 990 | 27-Jul | 693 | 27-Aug | 4,559 | 27-Sep | 3,199 |
| 28-May | 4,056 | 28-Jun | 931 | 28-Jul | 687 | 28-Aug | 3,798 | 28-Sep | 2,804 |
| 29-May | 3,651 | 29-Jun | 934 | 29-Jul | 667 | 29-Aug | 3,127 | 29-Sep | 2,462 |
| 30-May | 3,701 | 30-Jun | 1,016 | 30-Jul | 654 | 30-Aug | 2,674 | 30-Sep | |
| 31-May | 4,042 | | | 31-Jul | 651 | 31-Aug | 2,371 | | |
| Mean | 5,191 | Mean | 3,132 | Mean | 1,015 | Mean | 2,927 | Mean | 2,608 |
| Max. | 8,223 | Max. | 5,304 | Max. | 2,603 | Max. | 10,216 | Max. | 4,732 |
| Min. | 3,651 | Min. | 931 | Min. | 651 | Min. | 559 | Min. | 1,646 |

## Beaver Creek below Nome Creek WRM 7.5

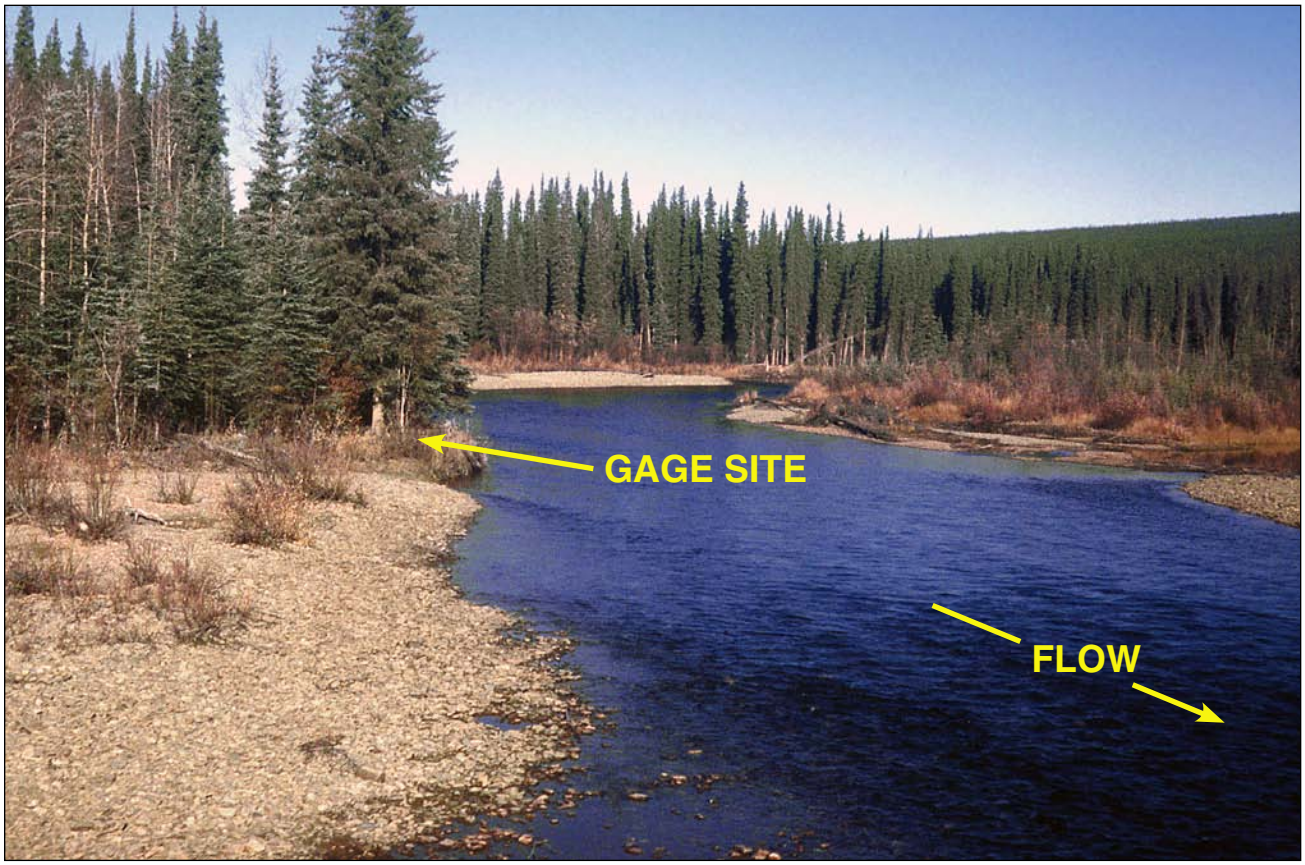


**Figure A-4.** Looking upstream at Beaver Creek below Nome Creek (WRM 7.5 ). This site was selected in September 1997. A data logger and pressure transducer gage were installed in June 1998 on the right bank. Data was collected until 2000, when the gaging project was discontinued. The gage was removed in September 2000.

**Table A-18.** Discharge Measurements for Beaver Creek below Nome Creek WRM 7.5

| Date | Stage (ft) | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg. Velocity (fps) | Avg. Depth (ft) |
|---|---|---|---|---|---|---|
| 09/26/97 | 2.73 | 427 | 88 | 145 | 2.9 | 1.6 |
| 06/28/98 | 2.57 | 370 | 92 | 149 | 2.5 | 1.6 |
| 07/31/98 | 2.75 | 442 | 96 | 168 | 2.6 | 1.8 |
| 08/17/98 | 5.70* | 5,000 | 211 | 738 | 6.8 | 3.5 |
| 09/11/98 | 2.80 | 470 | 93 | 175 | 2.7 | 1.9 |
| 09/29/98 | 2.67 | 449 | 95 | 171 | 2.6 | 1.8 |
| 05/25/99 | 2.72 | 506 | 96 | 174 | 2.9 | 1.8 |
| 07/29/99 | 2.72 | 452 | 91 | 164 | 2.8 | 1.8 |
| 09/10/99 | 2.37 | 272 | 91 | 138 | 2.0 | 1.5 |
| 07/01/03 | 2.33 | 237 | 94 | 127 | 1.9 | 1.4 |

*Slope-conveyance indirect discharge measurement

**Table A-19.** Peak Discharges (cfs) from 1998 to 2000 for Beaver Creek below Nome Creek WRM 7.5

| Date of Peak | Peak discharge |
|---|---|
| 08/18/98 | 5,000 |
| 08/10/99 | 2,240 |
| 08/15/00 | 4,000 |

**Table A-20.** 1998 Mean Daily Discharge (cfs) Beaver Creek below Nome Creek WRM 7.5

| June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-Jun | | 01-Jul | 566 | 01-Aug | 420 | 01-Sep | 691 |
| 02-Jun | | 02-Jul | 1,434 | 02-Aug | 389 | 02-Sep | 655 |
| 03-Jun | | 03-Jul | 733 | 03-Aug | 390 | 03-Sep | 623 |
| 04-Jun | | 04-Jul | 527 | 04-Aug | 480 | 04-Sep | 605 |
| 05-Jun | | 05-Jul | 441 | 05-Aug | 499 | 05-Sep | 582 |
| 06-Jun | | 06-Jul | 430 | 06-Aug | 552 | 06-Sep | 552 |
| 07-Jun | | 07-Jul | 868 | 07-Aug | 643 | 07-Sep | 541 |
| 08-Jun | | 08-Jul | 2,497 | 08-Aug | 670 | 08-Sep | 529 |
| 09-Jun | | 09-Jul | 1,706 | 09-Aug | 818 | 09-Sep | 507 |
| 10-Jun | | 10-Jul | 1,262 | 10-Aug | 860 | 10-Sep | 489 |
| 11-Jun | | 11-Jul | 1,254 | 11-Aug | 811 | 11-Sep | 472 |
| 12-Jun | | 12-Jul | 907 | 12-Aug | 1,239 | 12-Sep | 462 |
| 13-Jun | | 13-Jul | 822 | 13-Aug | 1,608 | 13-Sep | 449 |
| 14-Jun | | 14-Jul | 730 | 14-Aug | 907 | 14-Sep | 436 |
| 15-Jun | | 15-Jul | 625 | 15-Aug | 885 | 15-Sep | 419 |
| 16-Jun | | 16-Jul | 549 | 16-Aug | 2,083 | 16-Sep | 438 |
| 17-Jun | | 17-Jul | 507 | 17-Aug | 4,324 | 17-Sep | 468 |
| 18-Jun | | 18-Jul | 535 | 18-Aug | 3,672 | 18-Sep | 451 |
| 19-Jun | | 19-Jul | 554 | 19-Aug | 2,263 | 19-Sep | 434 |
| 20-Jun | | 20-Jul | 489 | 20-Aug | 1,783 | 20-Sep | 420 |
| 21-Jun | | 21-Jul | 457 | 21-Aug | 1,500 | 21-Sep | 439 |
| 22-Jun | | 22-Jul | 438 | 22-Aug | 1,464 | 22-Sep | 450 |
| 23-Jun | | 23-Jul | 539 | 23-Aug | 1,391 | 23-Sep | 434 |
| 24-Jun | | 24-Jul | 554 | 24-Aug | 1,226 | 24-Sep | 475 |
| 25-Jun | | 25-Jul | 487 | 25-Aug | 853 | 25-Sep | 510 |
| 26-Jun | | 26-Jul | 479 | 26-Aug | 803 | 26-Sep | 481 |
| 27-Jun | | 27-Jul | 493 | 27-Aug | 822 | 27-Sep | 474 |
| 28-Jun | | 28-Jul | 552 | 28-Aug | 786 | 28-Sep | 465 |
| 29-Jun | 374 | 29-Jul | 551 | 29-Aug | 748 | 29-Sep | 446 |
| 30-Jun | 365 | 30-Jul | 496 | 30-Aug | 741 | 30-Sep | |
| | | 31-Jul | 453 | 31-Aug | 689 | | |
| Mean | 370 | Mean | 740 | Mean | 1,172 | Mean | 496 |
| Max. | 374 | Max. | 2,497 | Max. | 4,324 | Max. | 691 |
| Min. | 365 | Min. | 430 | Min. | 389 | Min. | 419 |

**Table A-21.** 1999 Mean Daily Discharge (cfs) Beaver Creek below Nome Creek WRM 7.5

| May | | June | | July | | August | | September | |
|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** | **Date** | **Discharge** |
| 01-May | | 01-Jun | 336 | 01-Jul | 207 | 01-Aug | 288 | 01-Sep | |
| 02-May | | 02-Jun | 302 | 02-Jul | 169 | 02-Aug | 294 | 02-Sep | |
| 03-May | | 03-Jun | 323 | 03-Jul | 147 | 03-Aug | 327 | 03-Sep | |
| 04-May | | 04-Jun | 315 | 04-Jul | 134 | 04-Aug | 284 | 04-Sep | |
| 05-May | | 05-Jun | 288 | 05-Jul | 125 | 05-Aug | 246 | 05-Sep | |
| 06-May | | 06-Jun | 277 | 06-Jul | 120 | 06-Aug | 226 | 06-Sep | |
| 07-May | | 07-Jun | 306 | 07-Jul | 116 | 07-Aug | 348 | 07-Sep | |
| 08-May | | 08-Jun | 317 | 08-Jul | 111 | 08-Aug | 1,540 | 08-Sep | |
| 09-May | | 09-Jun | 315 | 09-Jul | 107 | 09-Aug | 1,642 | 09-Sep | |
| 10-May | | 10-Jun | 321 | 10-Jul | 103 | 10-Aug | 1,880 | 10-Sep | |
| 11-May | | 11-Jun | 285 | 11-Jul | 98 | 11-Aug | 1,122 | 11-Sep | |
| 12-May | | 12-Jun | 272 | 12-Jul | 98 | 12-Aug | 788 | 12-Sep | |
| 13-May | | 13-Jun | 258 | 13-Jul | 100 | 13-Aug | 1,037 | 13-Sep | |
| 14-May | | 14-Jun | 236 | 14-Jul | 115 | 14-Aug | 1,049 | 14-Sep | |
| 15-May | | 15-Jun | 212 | 15-Jul | 112 | 15-Aug | 768 | 15-Sep | |
| 16-May | | 16-Jun | 199 | 16-Jul | 115 | 16-Aug | 627 | 16-Sep | |
| 17-May | | 17-Jun | 206 | 17-Jul | 222 | 17-Aug | 524 | 17-Sep | |
| 18-May | | 18-Jun | 867 | 18-Jul | 321 | 18-Aug | 459 | 18-Sep | |
| 19-May | | 19-Jun | 858 | 19-Jul | 226 | 19-Aug | 417 | 19-Sep | |
| 20-May | | 20-Jun | 493 | 20-Jul | 192 | 20-Aug | 384 | 20-Sep | |
| 21-May | | 21-Jun | 370 | 21-Jul | 222 | 21-Aug | 355 | 21-Sep | |
| 22-May | | 22-Jun | 303 | 22-Jul | 250 | 22-Aug | 331 | 22-Sep | |
| 23-May | | 23-Jun | 258 | 23-Jul | 512 | 23-Aug | 322 | 23-Sep | |
| 24-May | | 24-Jun | 226 | 24-Jul | 443 | 24-Aug | 321 | 24-Sep | |
| 25-May | 549 | 25-Jun | 246 | 25-Jul | 387 | 25-Aug | 311 | 25-Sep | |
| 26-May | 629 | 26-Jun | 215 | 26-Jul | 430 | 26-Aug | 291 | 26-Sep | |
| 27-May | 556 | 27-Jun | 184 | 27-Jul | 827 | 27-Aug | 274 | 27-Sep | |
| 28-May | 569 | 28-Jun | 440 | 28-Jul | 590 | 28-Aug | 261 | 28-Sep | |
| 29-May | 532 | 29-Jun | 443 | 29-Jul | 451 | 29-Aug | 251 | 29-Sep | |
| 30-May | 429 | 30-Jun | 283 | 30-Jul | 385 | 30-Aug | 242 | 30-Sep | |
| 31-May | 358 | | | 31-Jul | 336 | 31-Aug | 232 | | |
| Mean | 518 | Mean | 332 | Mean | 251 | Mean | 563 | Mean. | |
| Max. | 629 | Max. | 867 | Max. | 827 | Max. | 1,880 | Max. | |
| Min. | 358 | Min. | 184 | Min. | 98 | Min. | 226 | Min. | |

## Victoria Creek below Squaw Creek


**Figure A-5.** The site at Victoria Creek below Squaw Creek was selected in September 1989. A crest-stage gage was installed in June 1990 on the right bank. Data was collected until 1995, when the gaging project was discontinued. The gage was removed in September 2000.

**Table A-22.** Discharge Measurements for Victoria Creek below Squaw Creek

| Date | Stage (ft) | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg. Velocity (fps) | Avg. Depth (ft) |
|---|---|---|---|---|---|---|
| 06/25/89 | 9.18* | 3,500 | 95 | 616 | 5.7 | 6.5 |
| 10/07/89 | 2.34 | 55 | 43 | 41 | 1.3 | 1.0 |
| 09/21/90 | 2.80 | 185 | 72 | 74 | 2.5 | 1.0 |
| 09/24/91 | 2.75 | 160 | 65 | 89 | 1.8 | 1.4 |
| 09/28/94 | 2.52 | 59 | 66 | 50 | 1.2 | 0.8 |
| 07/19/95 | 2.72 | 105 | 70 | 65 | 1.6 | 0.9 |

*Slope–area indirect discharge measurement

**Table A-23.** Victoria Creek below Squaw Creek Peak Discharges and Recurrence Intervals

| Date | Discharge* (cfs) | Recurrence Interval* (yrs) | Recurrence Interval** (yrs) | Discharge** (cfs) |
|---|---|---|---|---|
| 06/25/89 | 3,500 | 13.8 | 1.5 | 1,800 |
| 09/08/90 | 1,500 | 1.2 | 2 | 2,070 |
| 08/20/91 | 1,800 | 1.5 | 5 | 2,770 |
| 06/01/92 | 2,900 | 5.9 | 10 | 3,270 |
| 09/21/93 | 2,300 | 2.6 | 25 | 3,930 |
| 06/24/94 | 2,100 | 2.1 | 50 | 4,440 |
| 06/28/95 | 1,400 | 1.1 | 100 | 4,970 |

* Calculated at gage.

** Calculated from Log Pearson III analysis

## Miscellaneous Discharge Data

**Table A-24.** Discharge Measurements for Fossil Creek above Fossil Gap

| Date | Stage (ft) | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg. Velocity (fps) | Avg. Depth (ft) |
|---|---|---|---|---|---|---|
| 06/24/94 | 5.47* | 1,700 | 190 | 464 | 3.7 | 2.4 |
| 09/01/94 | 2.40 | 94 | 50 | 60 | 1.6 | 1.2 |

*Slope-conveyance indirect discharge measurement

**Table A-25.** Discharge Measurements for Beaver Creek below Yellow Creek

| Date | Stage (ft) | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg. Velocity (fps) | Avg. Depth (ft) |
|---|---|---|---|---|---|---|
| 06/20/96 | 2.46 | 1,020 | 218 | 363 | 2.8 | 1.7 |
| 06/30/96 | 2.10 | 550 | 193 | 245 | 2.2 | 1.3 |
| 07/24/96 | 2.16 | 635 | 213 | 302 | 2.1 | 1.4 |

**Table A-26.** Discharge Regressions Used to Compute Beaver Creek Data

| Type of Regression | Parameters | | | |
|---|---|---|---|---|
| | m | b | $r^2$ | se |
| Regressions from Discharge Measurements | | | | |
| Above Nome Creek WRM 6 | 2.976 | 3.028 | 0.979 | 0.153 |
| At Big Bend WRM 36.5 | 2.597 | 3.437 | 0.996 | 0.090 |
| Above Victoria Creek WRM 110.5 | 1.744 | 5.661 | 0.998 | 0.063 |
| Regressions from Comparative Data | | | | |
| WRM 6 compared to WRM110.5 | 1.022 | -1.460 | 0.955 | 0.294 |
| WRM 36.5 compared to WRM110.5 | 1.107 | -1.188 | 0.974 | 0.248 |
| WRM 110.5 compared to Salcha River* | 1.352 | -3.222 | 0.900 | 0.430 |

m Slope of regression line
b Y-intercept of regression line
$r^2$ Coefficient of determination
se Standard error
* USGS data

# Appendix B. Discharge and Water Quality Data from Groundwater Springs, Streams, and Lakes

**Table B-1.** Discharge Measurements for Beaver Creek below Fossil Creek Spring (WRM 48.5)

| Date | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg. Velocity (fps) | Avg. Depth (ft) |
|---|---|---|---|---|---|
| 04/02/91 | 67 | 125 | 91 | 0.7 | 0.7 |
| 03/31/93 | 69 | 80 | 37 | 1.9 | 0.5 |
| 04/06/94 | 74 | 89 | 121 | 0.6 | 1.4 |
| 04/19/94 | 82 | 87 | 124 | 0.7 | 1.4 |
| 04/06/95 | 49 | 67 | 33 | 1.5 | 0.5 |
| 04/02/96 | 24 | 64 | 28 | 0.9 | 0.4 |
| 04/02/97 | 29 | 62 | 24 | 1.2 | 0.4 |
| 02/26/98 | 25 | 51 | 37 | 0.7 | 0.7 |
| 04/01/98 | 24 | 54 | 20 | 1.2 | 0.4 |
| 02/25/99 | 28 | 40 | 22 | 1.3 | 0.6 |
| 04/01/99 | 26 | 43 | 26 | 1.0 | 0.6 |
| 03/30/00 | 31 | 52 | 24 | 1.3 | 0.5 |
| 03/01/01 | 50 | 69 | 40 | 1.3 | 0.6 |
| 02/27/03 | 49 | 49 | 25 | 2.0 | 0.5 |

**Table B-2.** Discharge Measurements at Miscellaneous Groundwater Spring Sites

| Date | Discharge (cfs) | Width (ft) | Area (sq ft) | Avg.Velocity (fps) | Avg.Depth (ft) |
|---|---|---|---|---|---|
| Site: Beaver Creek at WRM 40.5 near Hermans Landing | | | | | |
| 04/17/96 | 13 | 35 | 11 | 1.18 | 0.3 |
| 04/09/99 | 18 | 37 | 19 | 0.95 | 0.5 |
| Site: Beaver Creek at WRM 46.7 near Shebals Landing | | | | | |
| 04/05/95 | 33 | 92 | 26 | 1.27 | 0.3 |
| 04/02/96 | 0 | (Frozen solid at riffle) | | | |
| 02/26/98 | 4.9 | 40 | 11 | 0.45 | 0.3 |
| Site: Beaver Creek at WRM 89 below Willow Creek | | | | | |
| 04/26/96 | 47 | 42 | 28 | 1.68 | 0.7 |
| Site: Windy Creek | | | | | |
| 04/03/96 | 0.4 | 4.0 | 1.4 | 0.25 | 0.3 |
| Site: Unnamed Creek near Willow Creek | | | | | |
| 04/26/96 | 4.7 | 6.5 | 2.3 | 2.04 | 0.4 |

**Table B-3.** Water Quality Readings from Groundwater Springs on Beaver Creek

| Spring Site | Date | Air Temp. (°C) | Water Temp. (°C) | Specific Conductance (ms/cm) |
|---|---|---|---|---|
| Below Fossil Creek WRM 48.5 | 04/19/94 | 0 | 1.2 | 223 |
| Below Fossil Creek WRM 48.5 | 04/06/95 | 0 | 1.8 | 194 |
| Below Fossil Creek WRM 48.5 | 04/02/96 | –4 | 2.2 | 220 |
| Below Fossil Creek WRM 48.5 | 04/01/99 | –6 | 2.3 | 228 |
| Below Fossil Creek WRM 48.5 | 03/30/00 | 7 | 1.8 | 236 |
| Below Fossil Creek WRM 48.5 | 03/01/01 | –26 | 0.3 | 182 |
| Below Fossil Creek WRM 48.5 | 02/27/03 | –11 | 0.7 | 192 |
| At Hermans Landing WRM 40.5 | 04/17/96 | 3 | 3.2 | 208 |
| At Hermans Landing WRM 40.6 | 04/09/99 | –11 | 2.7 | 116 |
| At Shebals Landing WRM 46.7 | 04/05/95 | 0 | 0.5 | 175 |
| Windy Creek | 04/08/96 | 3 | 3.2 | 131 |
| Windy Creek | 02/28/03 | –11 | 0.7 | 192 |
| Below Willow Creek WRM 89 | 04/26/96 | –1 | 0.7 | 85 |
| Tributary near Willow Creek | 04/26/96 | –1 | 4.8 | 537 |

**Table B-4.** Water Quality Readings for Beaver Creek above Victoria Creek WRM 110.5

| Date | Air Temp. (°C) | Water Temp. (°C) | Specific Conductance (ms/cm) | Turbidity (NTU) |
|---|---|---|---|---|
| 07/31/98 | 27 | 15.5 | 125 | ND |
| 09/28/99 | 2 | 1.4 | 148 | 1.5 |
| 05/25/00 | 21 | 4.7 | 52 | 65 |
| 07/26/00 | 30 | 12 | 134 | 2 |
| 09/29/00 | 3 | 0.5 | 105 | 1.5 |

ND - Not determined

**Table B-5.** Paired Water Quality Readings from Beaver Creek Sites

| Stream Site | Date | Water Temp. (°C) | Specific Conductance (ms/cm) | Turbidity NTU |
|---|---|---|---|---|
| Above Nome Creek WRM 6 | 07/31/98 | 11.1 | 76 | ND |
| Below Nome Creek WRM 7.5 | 07/31/98 | 10.6 | 79 | ND |
| | | | | |
| Above Nome Creek WRM 6 | 09/11/98 | 6.3 | 85 | ND |
| Below Nome Creek WRM 7.5 | 09/11/98 | 6.2 | 76 | ND |
| | | | | |
| Above Nome Creek WRM 6 | 09/29/98 | 2.7 | 89 | ND |
| Below Nome Creek WRM 7.5 | 09/29/98 | 2.6 | 81 | ND |
| | | | | |
| Above Nome Creek WRM 6 | 05/25/99 | 5.2 | 57 | 1.6 |
| Below Nome Creek WRM 7.5 | 05/25/99 | 5.5 | 57 | 2.0 |
| | | | | |
| Above Nome Creek WRM 6 | 09/28/99 | 0.7 | 102 | 0.9 |
| Below Nome Creek WRM 7.5 | 09/28/99 | 0.8 | 96 | 0.6 |
| | | | | |
| Above Nome Creek WRM 6 | 05/25/00 | 1.8 | 25 | 13.3 |
| Below Nome Creek WRM 7.5 | 05/25/00 | 2.1 | 30 | 15.0 |
| | | | | |
| Above Nome Creek WRM 6 | 07/26/00 | 8.5 | 79 | 0.5 |
| Below Nome Creek WRM 7.5 | 07/26/00 | 8.4 | 80 | 0.7 |
| | | | | |
| Above Nome Creek WRM 6 | 09/29/00 | 1.0 | 74 | 0.5 |
| Below Nome Creek WRM 7.5 | 09/30/00 | 1.0 | 67 | 0.5 |

ND - Not determined

**Table B-6.** Water Quality of WMNRA Lakes

| Lake Site | Date | Depth (ft) | Ice Thickness (ft) | Water Temp. (°C) | Specific Conductance (ms/cm) | Dissolved Oxygen (mg/L) |
|---|---|---|---|---|---|---|
| Colorado Creek Lake* | 04/17/90 | 7 | 5 | 0 | ND | 0.7 |
| Borealis Lake*-NE | 09/06/95 | 6.9 | 0 | 6.5 | 22 | ND |
| Borealis Lake*-SW | 09/06/95 | 4.9 | 0 | 6.8 | 20 | ND |

ND - Not determined
*Informally named

# Appendix C. Channel Geometry

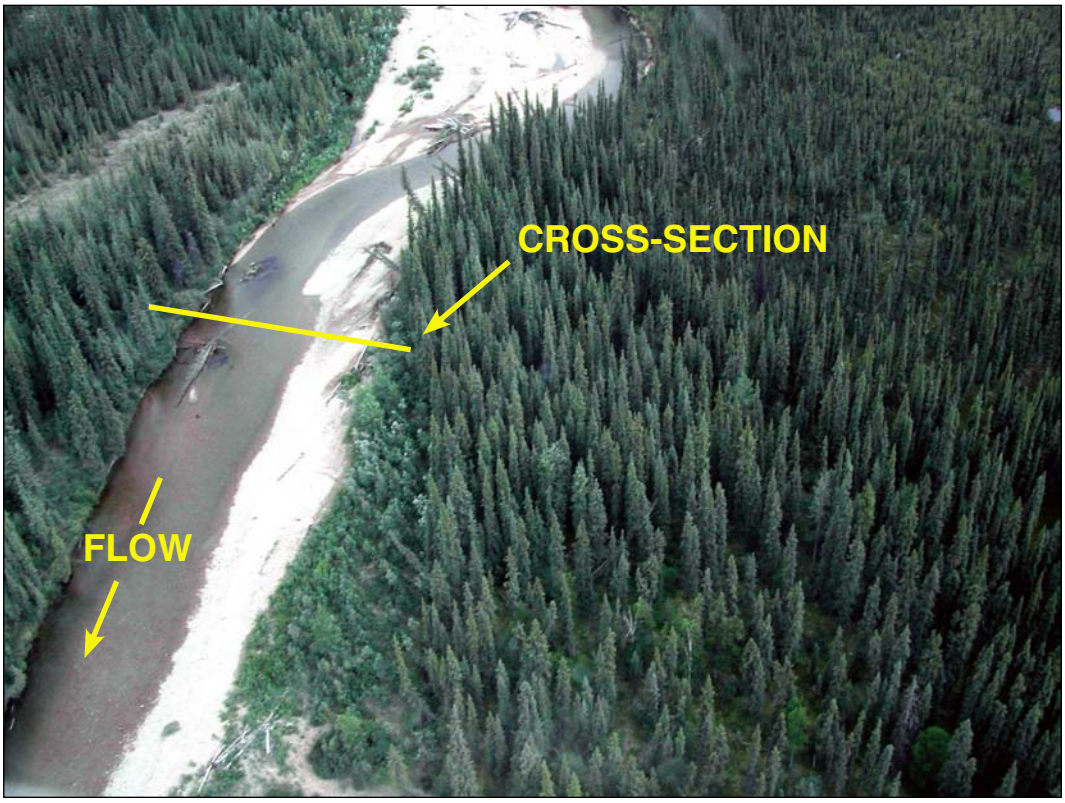


**Figure C-1.** View of stream channel for Beaver Creek above Nome Creek in July 2003.

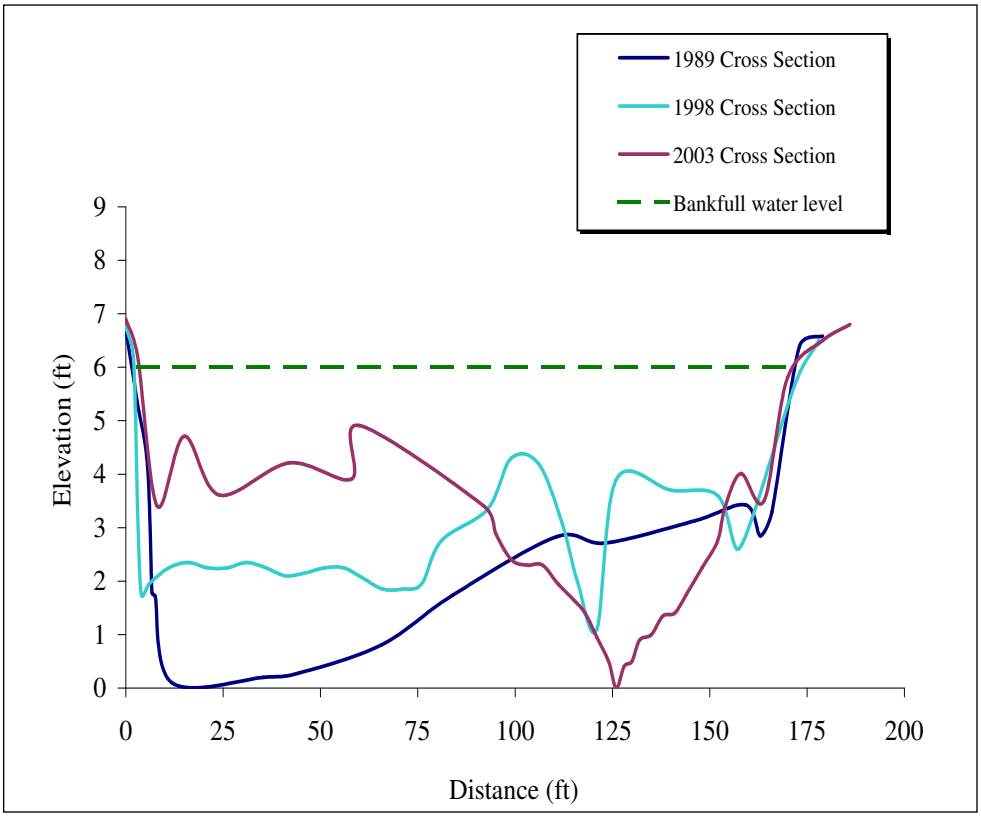


**Figure C-2.** Channel cross-section for Beaver Creek above Nome Creek (WRM 6). The cross-section has changed radically from the original survey.

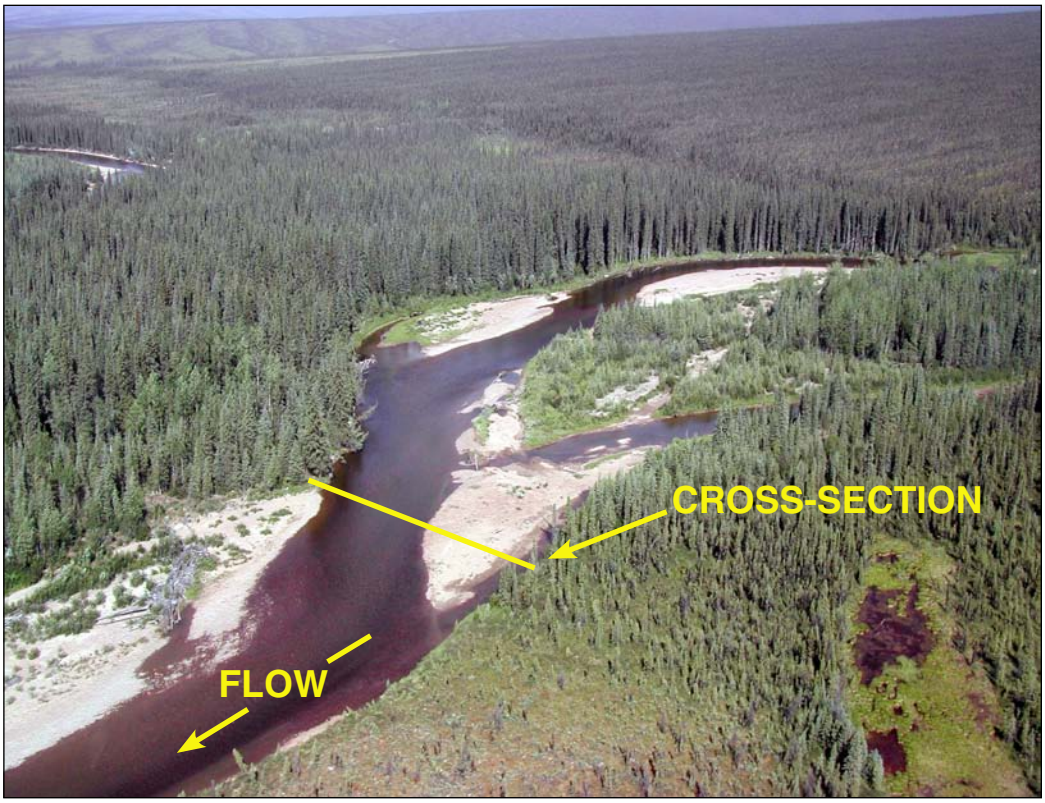


**Figure C-3.** View of stream channel for Beaver Creek below Nome Creek in July 2003.

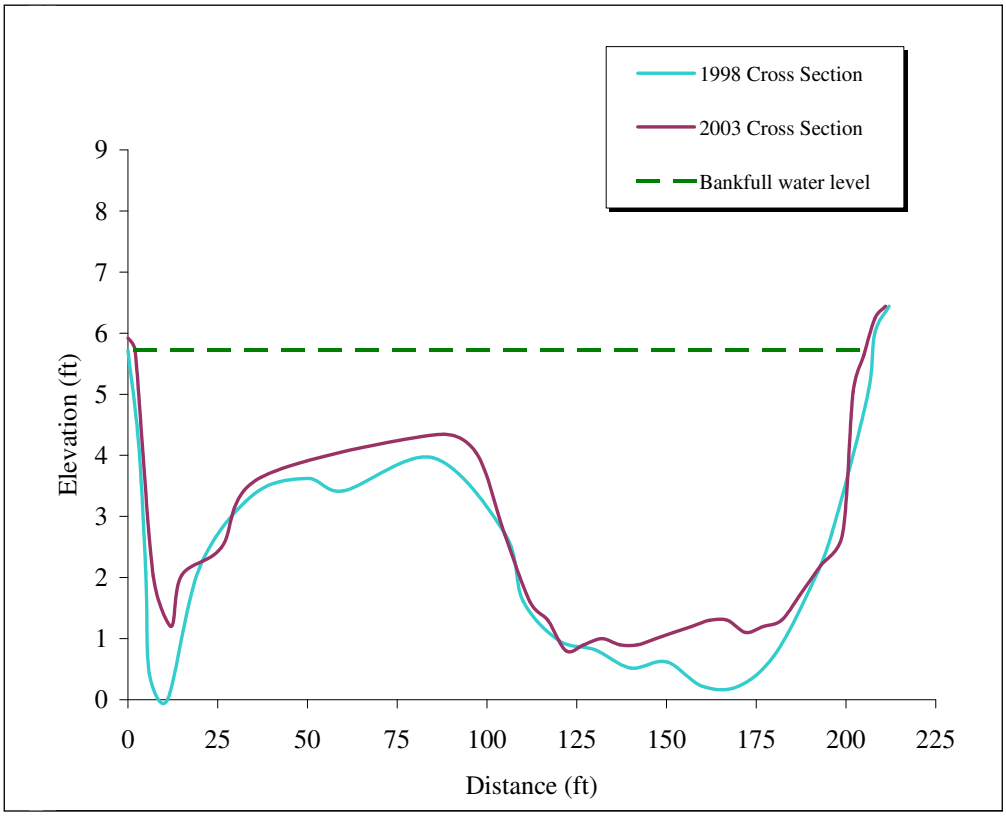


**Figure C-4.** Channel cross section for Beaver Creek below Nome Creek (WRM 7.5). The cross section has changed only slightly from the original survey.

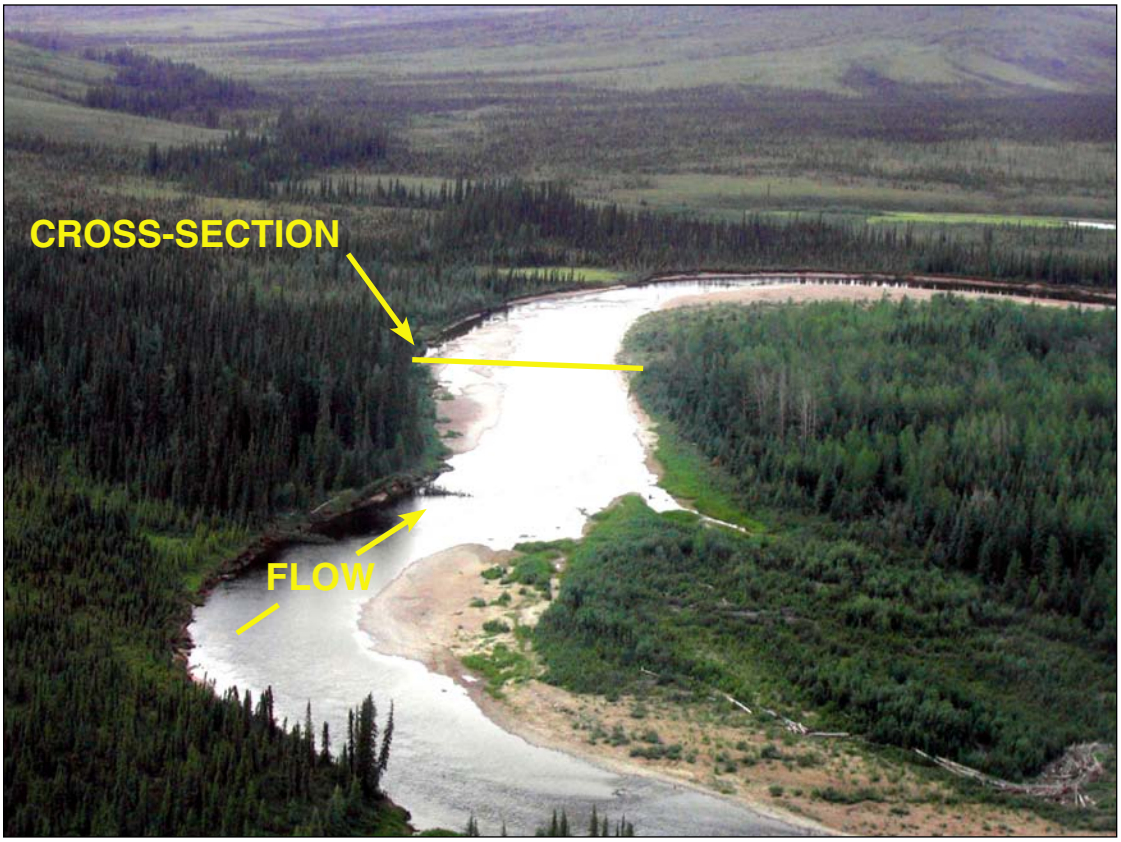


**Figure C-5.** View of stream channel for Beaver Creek at Big Bend in July 2003.

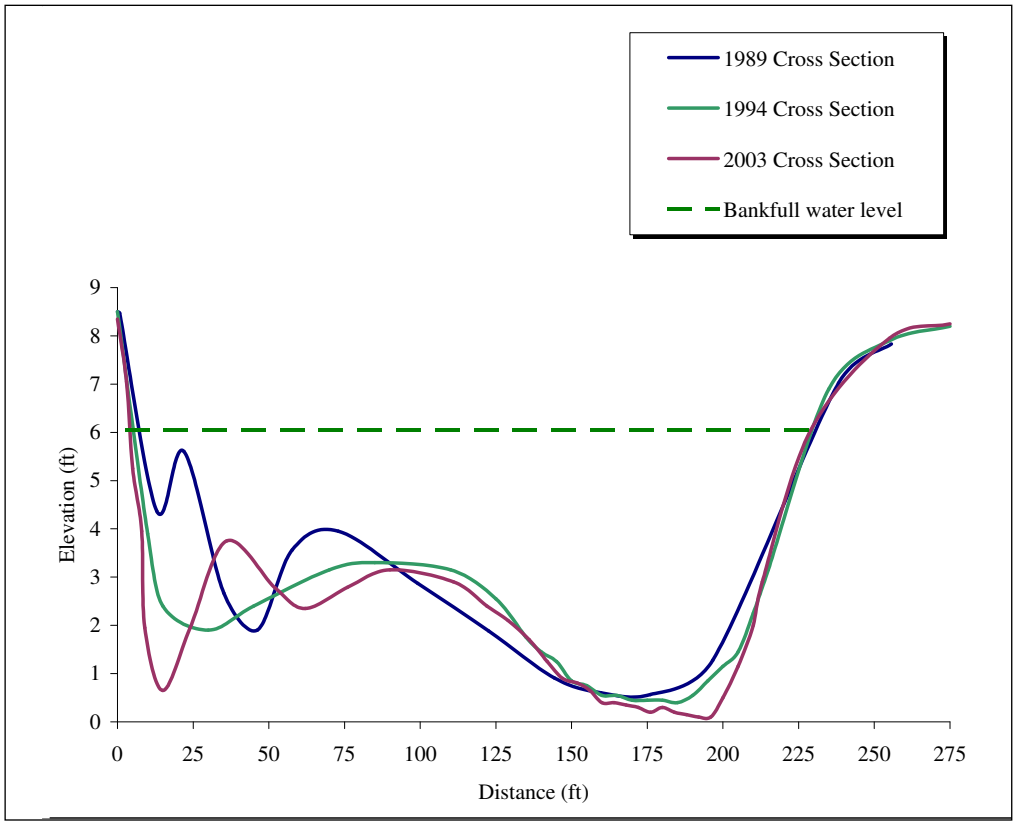


**Figure C-6.** Channel cross-section for Beaver Creek at Big Bend. The channel has changed only slightly from the original survey.