

State of Alaska

Department of Natural Resources
Division of Mining, Land, and Water

Meadow Creek and Little Meadow Creek Reservations of Water

LAS 11975 (Meadow – Reach A), LAS 30212 (Meadow – Reach A2),
LAS 28417 (Little Meadow), and LAS 30925 (Little Meadow, Additional Flows)

Applications by the Alaska Department of Fish and Game for the
Reservation of Water, Under AS 46.15, the Alaska Water Use Act

Findings of Fact, Conclusions of Law, and Decision

INTRODUCTION

On July 14, 1988, the Alaska Department of Natural Resources (ADNR, Department) accepted an application from the Alaska Department of Fish and Game (ADF&G) under AS 46.15.145 and 11 AAC 93.141, to reserve a specified portion of the stream flows within Meadow Creek (Reach A), near Big Lake, Alaska. This application proposes to reserve stream flows within Meadow Creek and its floodplain from approximately River Mile (RM) 0.0 upstream to approximately RM 4.75.

On February 13, 2012, the Department accepted a separate application from ADF&G to reserve specified portions of stream flows within Little Meadow Creek. This application proposes to reserve stream flows within Little Meadow Creek and its floodplain from its confluence with Lucille Creek to a point upstream, approximately 2.6 miles, where it is joined by an unnamed source of surface water from the north. Little Meadow Creek is included within this decision document because it is essentially an extension of Meadow Creek. On January 7, 2016, ADF&G sent in a request to amend January flows from 3.0 to 3.5 cubic feet per second. Any January flows accepted beyond the original request amount would receive the January 7, 2016 priority date.

On April 20, 2015, ADF&G submitted an additional Meadow Creek application for additional flows on Reach A (known as Reach A2). Since there was an update of data for Reach A, ADF&G requested flow increases, creating a need for a second application (Reach A2). Reach A2 proposes the stream flows within Meadow Creek and its floodplain from Big Lake upstream to its confluence with Lucille Creek, approximately 4.7 miles.

Any flows accepted beyond the original requested amounts in Reach A would receive the April 20, 2015 priority date.

The reservations of water requested here are for the purpose of protecting fish and wildlife habitat, migration, and propagation. Under 11 AAC 93.141 (1), "protection of fish and wildlife habitat, migration and propagation...means the quantity or level of water necessary to maintain suitable habitat conditions for the various life stages of fish, other aquatic organisms, and wildlife including waterfowl and mammals, and their habitat, including water quality, depth, velocity, and temperature, substrate, or streamside vegetation."

Holders of water rights junior to an established reservation of water as well as other users may be unable to divert or withdraw significant amounts of water when stream flows fall below those required by the reservation. Senior water right holders will remain unaffected by a junior reservation.

These reservation applications adequately described and quantified the requested flows. Public and agency notice of the application was given consistent with the requirements of 11 AAC 93.145, 11 AAC 93.080, and AS 46.15.133. Below, the proposed reservations are summarized and specific findings of fact and conclusions of law are described.

DESCRIPTION OF PROPOSED RESERVATIONS

LAS 11975 – Meadow Creek, Reach A

Proposed Reach Description: Meadow Creek – Reach A stream flows and its floodplain from approximately River Mile (RM) 0.0 upstream to approximately RM 4.75 (Map 1). Said portion of Meadow Creek – Reach A is located within:

| Township | Range | Sections |
|----------|--------|----------------------------|
| 17 North | 3 West | 14, 15, 16, 17, 18, 19, 20 |

All within the Seward Meridian (See Map 1).

Requested Reservation Flows:

| Time Period | Flow Rate (cfs) |
|-------------|-----------------|
| January | 10 |
| February | 10 |
| March | 10 |
| April | 10 |
| May | 14 |
| June | 24 |

| | |
|-----------|----|
| July | 24 |
| August | 24 |
| September | 24 |
| October | 24 |
| November | 14 |
| December | 10 |

cfs = cubic feet per second

LAS 30212 – Meadow Creek, Reach A2

Proposed Reach Description: Meadow Creek – Reach A2, stream flow and its floodplain from Big Lake upstream to its confluence with Lucille Creek (Map 1). Said portion of Meadow Creek – Reach A2 is located within:

| Township | Range | Sections |
|----------|--------|----------------------------|
| 17 North | 3 West | 14, 15, 16, 17, 18, 19, 20 |

All within the Seward Meridian (See Map 1).

Requested Reservation Flows:

| Time Period | Flow Rate (cfs) |
|-------------|-----------------|
| January | 6 |
| February | 6 |
| March | 6 |
| April | 30 |
| May | 35 |
| June | 26 |
| July | 23 |
| August | 22 |
| September | 27 |
| October | 18 |
| November | 13 |
| December | 10 |

cfs = cubic feet per second

LAS 28417 – Little Meadow Creek

Proposed Reach Description: Little Meadow Creek stream flows and its floodplain from its confluence with Lucille Creek to a point upstream, approximately 2.6 miles, where it is joined by an unnamed source of surface water from the north (Map 1). Said portion of Little Meadow Creek is located within:

| Township | Range | Sections |
|----------|--------|------------|
| 17 North | 2 West | 7 |
| 17 North | 3 West | 12, 13, 14 |

All within the Seward Meridian (See Map 1).

Requested Reservation Flows:

| Time Period | Flow Rate (cfs) |
|-------------|-----------------|
| January | 3.0 |
| February | 3.5 |
| March | 4.0 |
| April | 8.5 |
| May | 10 |
| June | 7.5 |
| July | 6.0 |
| August | 8.0 |
| September | 8.0 |
| October | 8.0 |
| November | 5.0 |
| December | 4.0 |

cfs = cubic feet per second

Discussion: The applicants’ requested reservation flows and corresponding time periods are based on their review and analysis of data pertaining to the periodicity of the many species of fish in the area and the effects of that flow level on fish and wildlife habitat, migration, and propagation. According to the Instream Flow Councils ‘Instream Flows for Riverine Resource Stewardship’¹,

Typically, providing a healthy aquatic community involves attention to the magnitude and duration of the natural flow regime’s seasonal patterns (Poff et al. 1997). Flow conditions that vary in a manner similar to natural conditions will establish a variety of habitats and diverse fish communities. Different flow needs can be met by providing them all-separated by time. Variable conditions allow different

¹ Annear, T., I. Chisholm, H. Beecher, A. Locke, and 12 other authors. 2004. Instream flows for riverine resource stewardship, revised edition. Instream Flow Council, Cheyenne, WY. Pp. 9, 22, 23, 101.

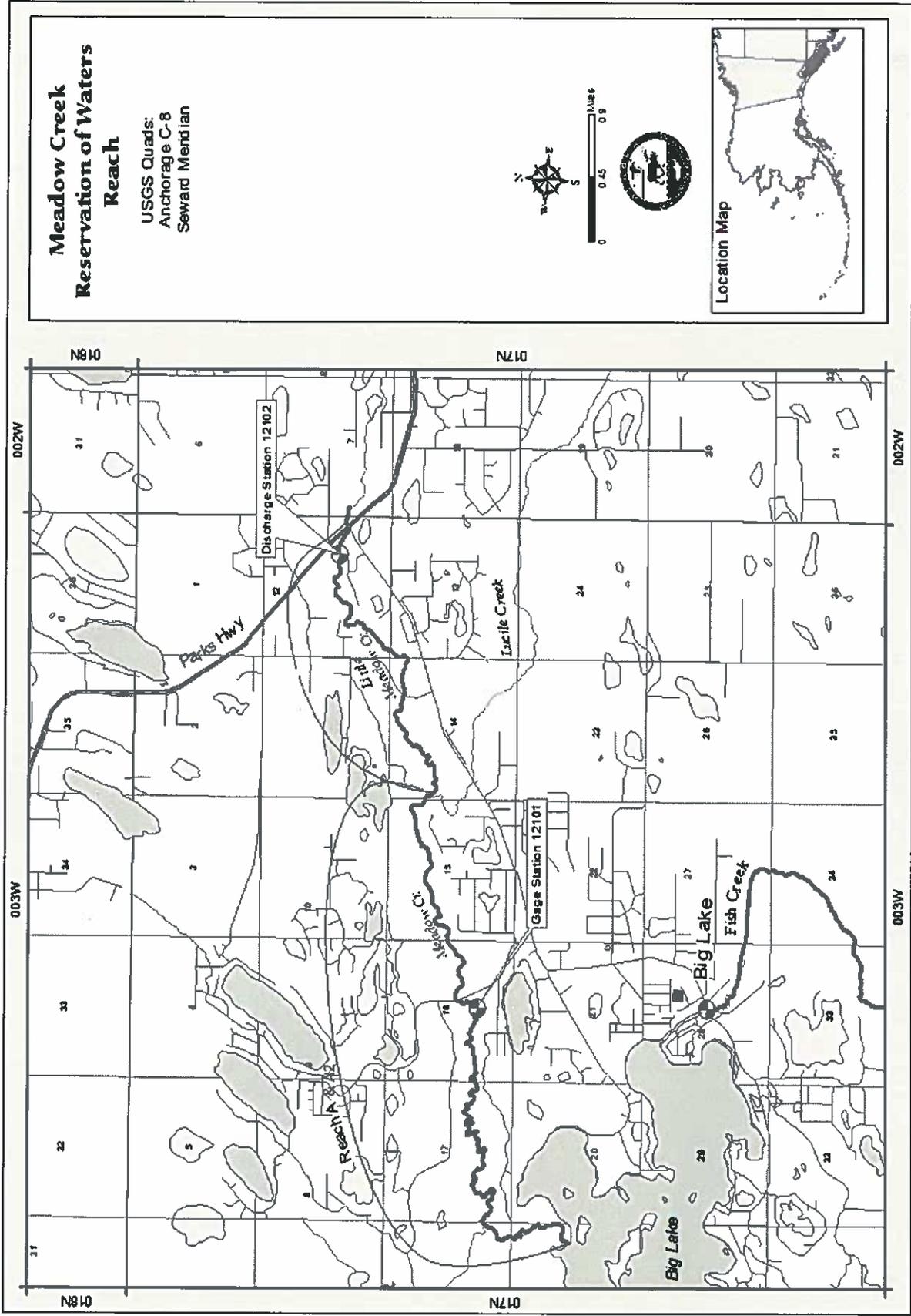
species to flourish at different times. A temporal and spatial mosaic is a necessary component of riverine ecosystem integrity.

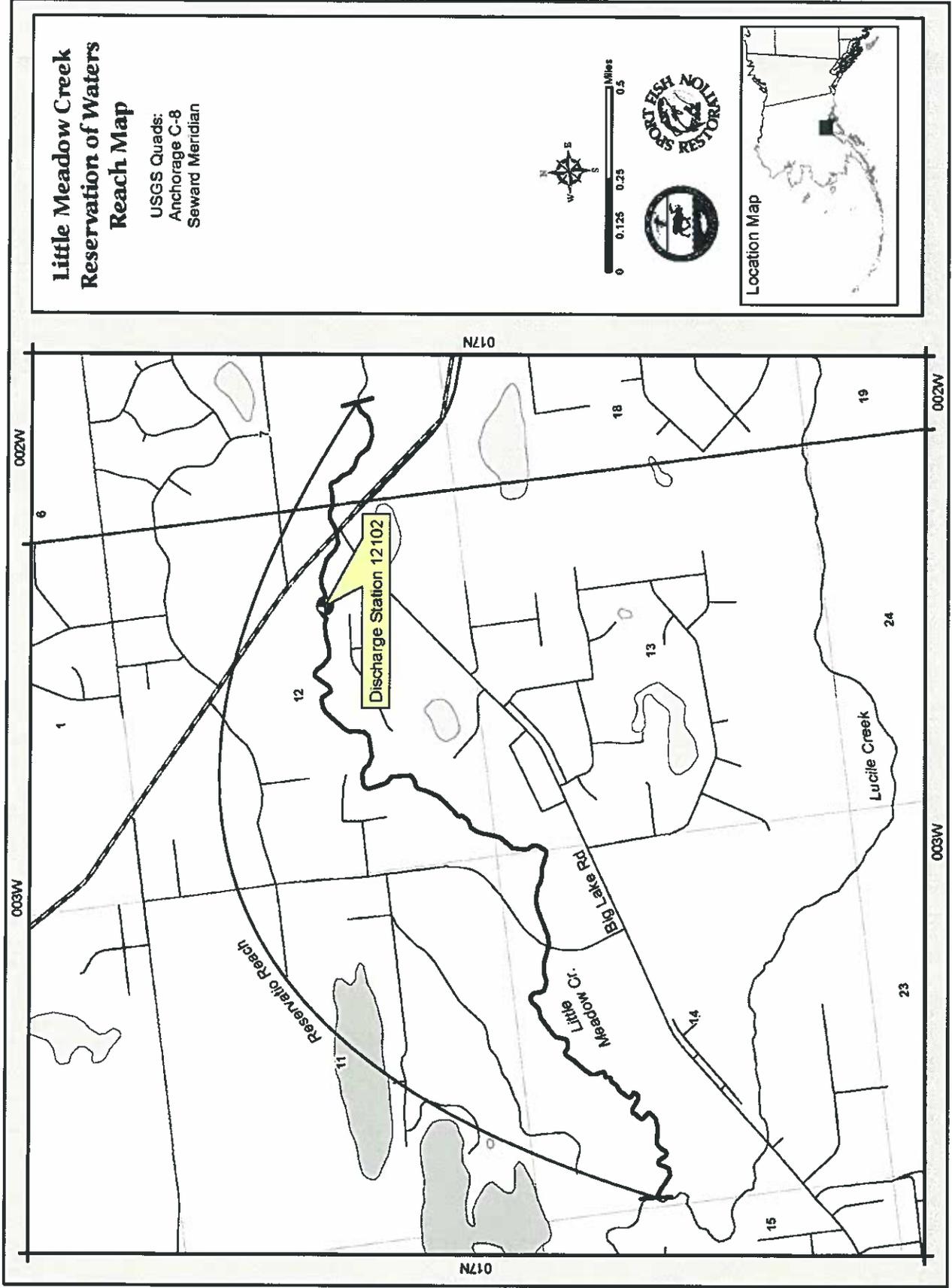
River ecosystems are complex and require variable flows. For example, high flows form and maintain the shape and characteristics of the river channel and floodplain, flush sediment from spawning gravels, maintain riparian vegetation and stream bank stability, provide habitat critical to the life history of certain fishes, and provide cues that initiate fish migration and spawning. The life history of all aquatic organisms have adapted to naturally occurring seasonal flow regimes.

Providing suitable hydraulic habitat for aquatic organisms is a necessary part of any instream flow prescription...Habitat defined through hydraulic characteristics (such as water depth and velocity) and channel characteristics (such as substrate, cover, stream width) is sometimes referred to as hydraulic habitat. Aquatic organisms select habitat based, in part, on the physical characteristics of their surroundings. To evaluate existing hydraulic conditions as they relate to aquatic organisms, the relation of stream flow to habitat must be quantified over time.

The objective of an instream flow prescription should be to sustain, rehabilitate, or restore ecosystem processes through inter- and intraannual variable flow regimes to the greatest extent possible. Instream flow prescriptions should provide inter- and intraannual variable flow patterns that mimic the natural hydrograph (magnitude, frequency, duration, timing, rate of change) to maintain or restore processes that sustain natural riverine characteristics.

Map 1. Reservation of water applications reach map (See 'Reach Description' for specific reach location) Meadow Creek Reaches A/A2 and Little Meadow Creek.





HYDROLOGIC BACKGROUND

Stream: Meadow Creek (*var. None known*)
Little Meadow Creek (*var. None known*)

Stream Basin Area: The Meadow Creek watershed (69.1 mi²) including the Little Meadow Creek watershed (36.5 mi²) drains into the northeastern corner of Big Lake in the Matanuska-Susitna Valley. The Alaska Department of Fish and Game operated a gage on Meadow Creek and Little Meadow Creek.

Meadow/Little Meadow Creek Gage location and watershed details:

| Gage and Station ID | Latitude, Longitude (NAD27) | Elevation (ft) | Drainage Area (mi ²) | Period of operation |
|--|--|--|---|-----------------------------------|
| Meadow Creek ADFG 12101 | 61.56191 -149.82677 | Approx. 147 ft | 69.1 mi ² (44,243 total acres) Meadow Creek (32,260 acres) Lucille Creek (11983 acres) (HUC 12 190204010503 and 190204010502) | ADFG (7/16/2008 to 9/30/13) |
| Little Meadow Creek ADFG 12101 Little Meadow Creek (B) ADFG 12102 | ADFG 12101 (61.56191 - 149.82677) (ADFG 12102) 61.57663 - 149.73035 | Approx. 147ft Approx. 181ft | Little Meadow Creek 36.5 mi ² (23,373 acres) (Total area HUC 12 190205051403) | ADFG (7/16/2008 to 9/30/13) |

Map Coverage: USGS 1:25,000: Anchorage B-8 NW, B-8 NE, C-8 SW

General Basin Description: Meadow Creek runs approximately 6 miles from its mouth at the northeastern edge of Big Lake to its confluence with Lucille Creek. Its tributaries include Lucille Creek and Little Meadow Creek which is the continuation of Meadow Creek above the Lucille Creek confluence. Approximately 37 named lakes and numerous smaller lakes are within the Meadow Creek watershed. The majority of the lakes are oriented from northeast to southwest, and form first order stream drainages which flow into Meadow Creek. Some of the largest lakes include Visnaw, Seymour, Lalen, Loon, Frog, and Big Beaver Lake.

Little Meadow Creek is the continuation of the mainstem of Meadow Creek above the confluence with Lucille Creek. Little Meadow Creek includes three first order streams. The northern branch of Little Meadow Creek drains from Seymour, Lalen, and Visnaw Lakes. The middle branch drains from numerous small lakes including Scott, Cloudy, Hess, Fuller, Rainbow and Beverly Lakes. Lastly, the easterly branch extends to the eastern edge of the catchment and drains through Blodgett, Lilly, Corcoran and Herkimer Lakes.

Channel Description: Meadow Creek and Little Meadow Creek drain a low-lying basin at the southern edge of the Matanuska Valley formed by repeated glacier advances and retreats during the Pleistocene epoch. Meadow Creek and its tributaries are low-gradient and wind through a watershed dominated by numerous lakes and palustrine emergent wetlands.² Meadow Creek stream gradient in reach A/A2 is approximately 2.9 ft/mile. Little Meadow Creek stream gradient in this specific reach is approximately 12 ft/mile.

Reach Description: Meadow Creek and Little Meadow Creek (all reaches) from the Ordinary High Water Mark (OHWM) of the outer bank (of the outside braid, where braided) of the left bank up to the OHWM of the outer bank (of the outside braid, where braided) of the right bank, including any sloughs, braids, or channels which carry water and are an integral part of the creeks:

Meadow Creek, Reach A/A2 – beginning from Big Lake upstream to its confluence with Lucille Creek, approximately 4.7 miles.

Little Meadow Creek – beginning from its confluence with Lucille Creek to a point upstream, approximately 2.6 miles, where it is joined by an unnamed source of surface water from the north.

These descriptions do not limit the quantity of water (flow rate) reserved by this decision and certificates to quantities (flow rates) within said OHWM boundaries.

Climate: The climate of the Meadow Creek watershed and southcentral Alaska is characterized as a subarctic climate zone with Dfc classification (D=Cold, f=Without dry season, c=Cold Summer)³ with moderate winter temperatures and cool summers. The Chugach Mountains to the south and east effectively block much of the Pacific maritime weather systems aside from air masses that penetrate from the Cook Inlet to the Southwest. Winter conditions are dominated by northeasterly flow of continental air known as “Matanuska” winds.⁴ Occasional strong Pacific air flow is associated with downsloping “Chinook” winds from the Chugach Mountains. Consequently, above-freezing temperatures and occasional rain are observed during the winter months. Summer conditions are generally cool with air flow from the southwest associated with increased cloudiness and precipitation.

Monthly average temperature and precipitation is summarized in Table 1 for the Palmer Job Corp Climate Station (ID =506870) located approximately 10 miles east of the Meadow Creek catchment.⁵ Most precipitation occurs in late fall and winter (max in September = 2.45) while less precipitation occurs in spring (min in April = 0.47). Annual average temperature ranges from a minimum of 13.0 F in January to a maximum of 58.2 F in July. A spatial interpolation and estimate of the average annual precipitation and temperature from the PRISM⁶ dataset are presented in Figure 1. Estimated average annual temperature is 35.9 F across the watershed. Additionally, estimated annual precipitation ranges from 17 to 21 inches with highest precipitation in the northern part of the drainage (Figure 1).

² Curran, J.H., and Rice, W.J., 2009, Baseline channel geometry and aquatic habitat data for selected streams in the Matanuska-Susitna Valley, Alaska: U.S. Geological Survey Scientific Investigations Report 2009–5084, 24 p.

³ Peel MT et al. 2007 Updated world map of the Koppen-Geiger climate classification. Hydrol. Earth Syst. Sci., 11, 1633–1644

⁴ Dale, RF, 1956, The Climate of the Matanuska Valley, Technical Paper #27, US Department of Commerce and Weather Bureau, 26 p.

⁵ Alaska Climate Database <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak6870> accessed 09/02/2015.

⁶ Daly C et al. 2008. Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. International Journal of Climatology 28: 2031–2064.

Table 1. Average daily climate summary for the Palmer Job Corps Climate Station (ID =506870) approximately 10 miles east of the Meadow/Little Meadow Creek watershed (61.6 N, -149.1 W).

<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ak6870>

| PALMER (1948-2015) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Avg/ Total |
|-----------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-------------------|
| Average Maximum Temperature (F) | 20.6 | 27 | 34.7 | 46.7 | 58.3 | 65 | 67.1 | 64.7 | 56.6 | 41.9 | 27.5 | 22.5 | 44.4 |
| Average Temperature (F) | 13 | 18.8 | 25.7 | 37.5 | 48.1 | 55.4 | 58.2 | 56 | 48.3 | 34.5 | 20.3 | 15.3 | 35.9 |
| Average Minimum Temperature (F) | 5.5 | 10.4 | 16.2 | 28.4 | 38 | 45.7 | 49.2 | 47.2 | 40 | 27 | 13.1 | 8.1 | 27.4 |
| Average Total Precipitation (in.) | 0.91 | 0.83 | 0.72 | 0.47 | 0.67 | 1.31 | 2.06 | 2.36 | 2.45 | 1.52 | 1.26 | 1.15 | 15.73 |
| Average Total Snowfall (in.) | 8.7 | 9.5 | 7.4 | 2.9 | 0.1 | 0 | 0 | 0 | 0 | 5.3 | 9.5 | 12.8 | 56.1 |
| Average Snow Depth (in.) | 6 | 6 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 5 | 2 |

Available Streamflow Data: The Alaska Department of Fish and Game operated a gage on Meadow Creek from July 16, 2008 to September 30, 2013. The daily discharge summary shows a bimodal flow distribution with high monthly average flows in May (mean = 42 cfs) during snowmelt as well as September (mean = 41 cfs) in response to fall rain events. Average daily flow is lowest from January through March and ranges from 7-8 cfs. Minimum daily flow is highest in May (min = 14 cfs) and lowest from January through March (min = 2 cfs) while maximum flow was highest in September (max = 244 cfs) and lowest in January (min = 22 cfs).

Table 2. Daily discharge data summary for Meadow Creek (ADFG 12101). This summary table includes complete water years only from October 1 2008 to September 30, 2013. Monthly means are calculated from daily mean discharge records. Minimum and maximum monthly flows are based on daily discharge records for the entire period of record. [Monthly mean in ft³/s = cfs = cubic feet per second]

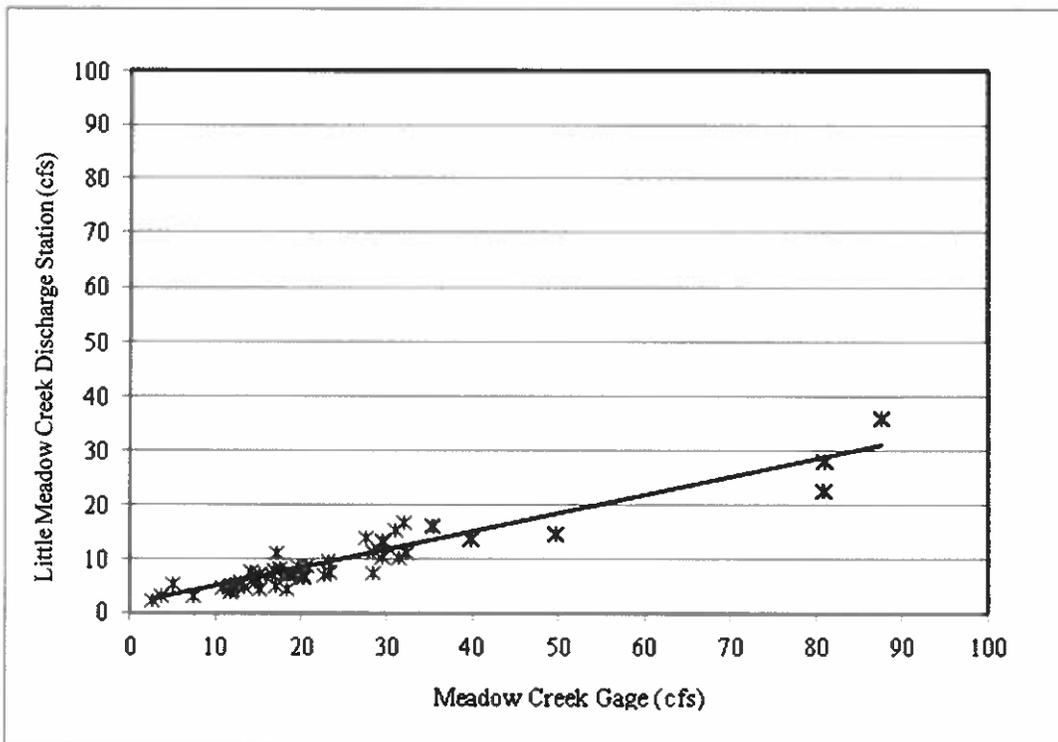
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|
| Total Months | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | - |
| Minimum (cfs) | 2 | 2 | 2 | 6 | 14 | 12 | 10 | 10 | 13 | 12 | 6 | 3 | 2 |
| Mean (cfs) | 7 | 8 | 7 | 36 | 42 | 27 | 19 | 21 | 41 | 36 | 14 | 11 | 22.5 |
| Maximum (cfs) | 22 | 26 | 23 | 225 | 125 | 83 | 37 | 49 | 244 | 183 | 38 | 26 | 244 |

Along with the continuous stream gage on Meadow Creek (ADFG 12101), a discharge measurement station on Little Meadow Creek (12102) was in operation during the same period. Instantaneous discharge measurements at Little Meadow Creek were regressed against same-day discharge measurements at Meadow Creek (See chart below). This relationship was used to convert daily flows at the Meadow Creek gage to estimate mean daily flows at Little Meadow Creek.

Results of a simple linear regression of discharge measurements taken at Meadow Creek gaging station and Little Meadow Creek discharge station.

| <i>Regression Statistics</i> | |
|------------------------------|------|
| Multiple R | 0.94 |
| R Square | 0.88 |
| Adjusted R Square | 0.88 |
| Standard Error | 2.16 |
| Observations | 52 |

| | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> |
|--------------|---------------------|-----------------------|---------------|----------------|------------------|------------------|
| Intercept | 1.79 | 0.51 | 3.50 | 0.00 | 0.76 | 2.82 |
| X Variable 1 | 0.34 | 0.02 | 19.42 | 0.00 | 0.30 | 0.37 |



Data Adequacy: The streamflow record of 5 years (along with synthetic data) is considered adequate to adjudicate the reservation of water applications for Meadow Creek and Little Meadow Creek.

Map 2. Map of Meadow Creek and Little Meadow Creek watershed

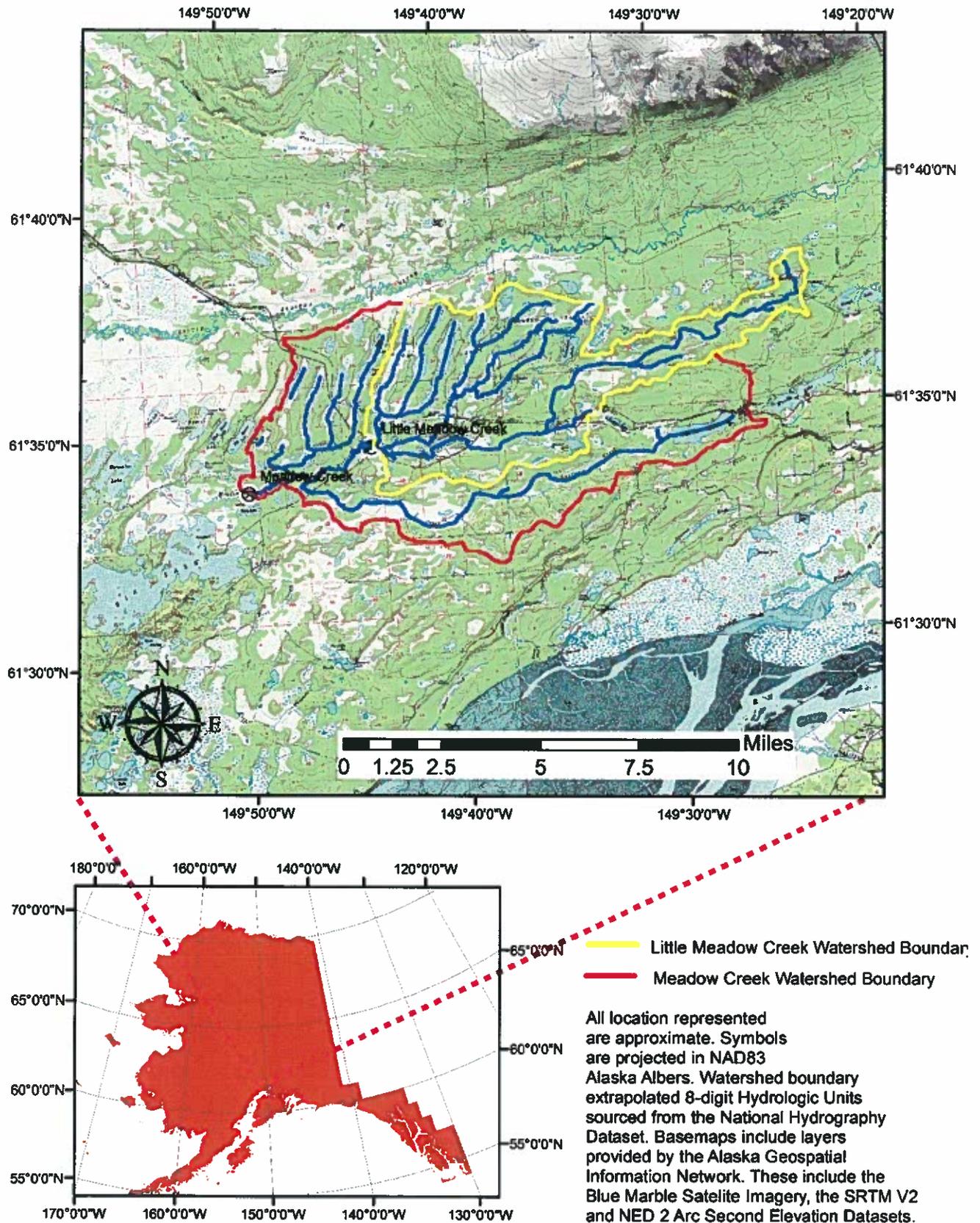
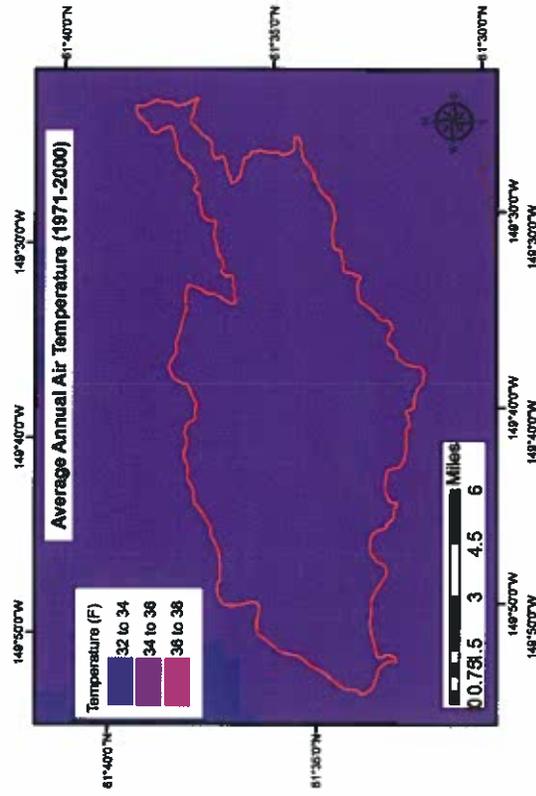


Figure 1. Estimates of average monthly and annual mean temperature (1971-2000) for the Meadow Creek and Little Meadow Creek watershed using the PRISM model (Daly et al. 1998)

Meadow Creek:



Little Meadow Creek:

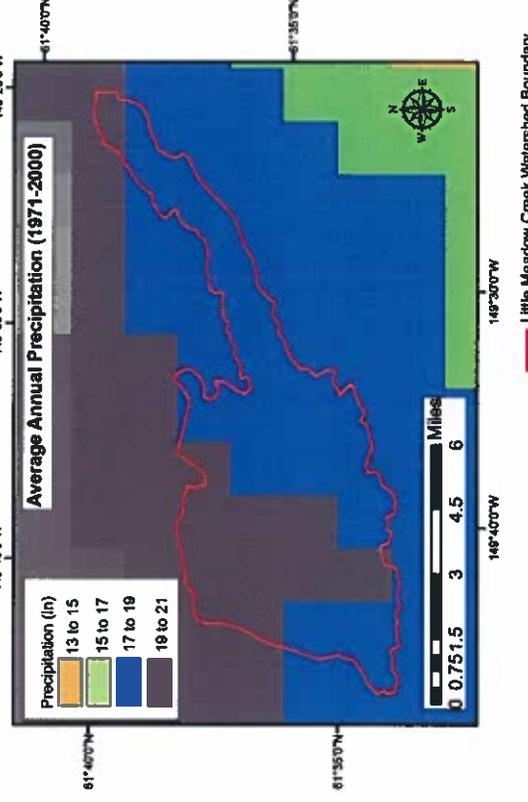
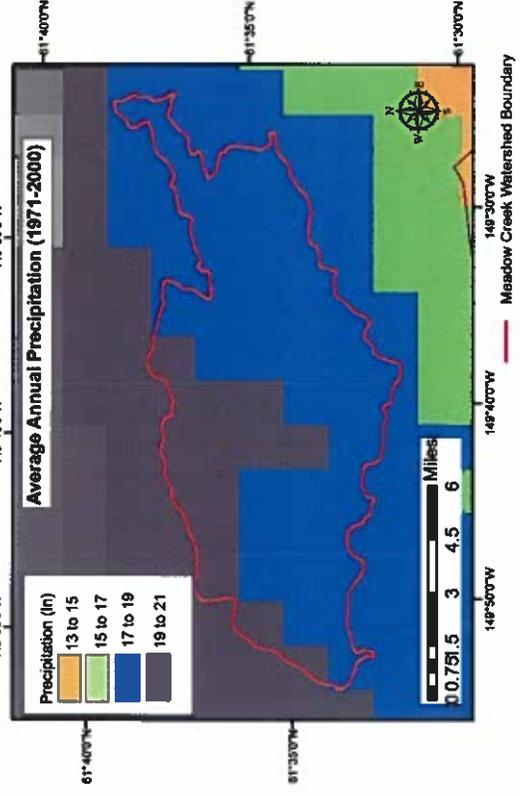
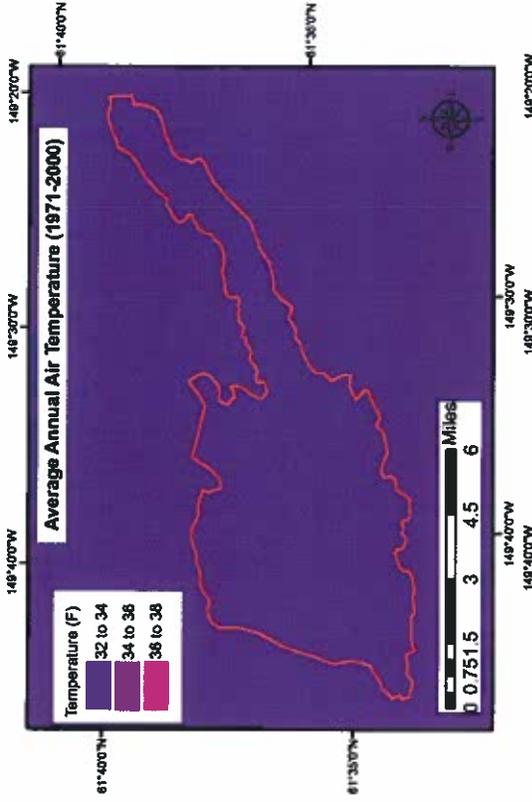
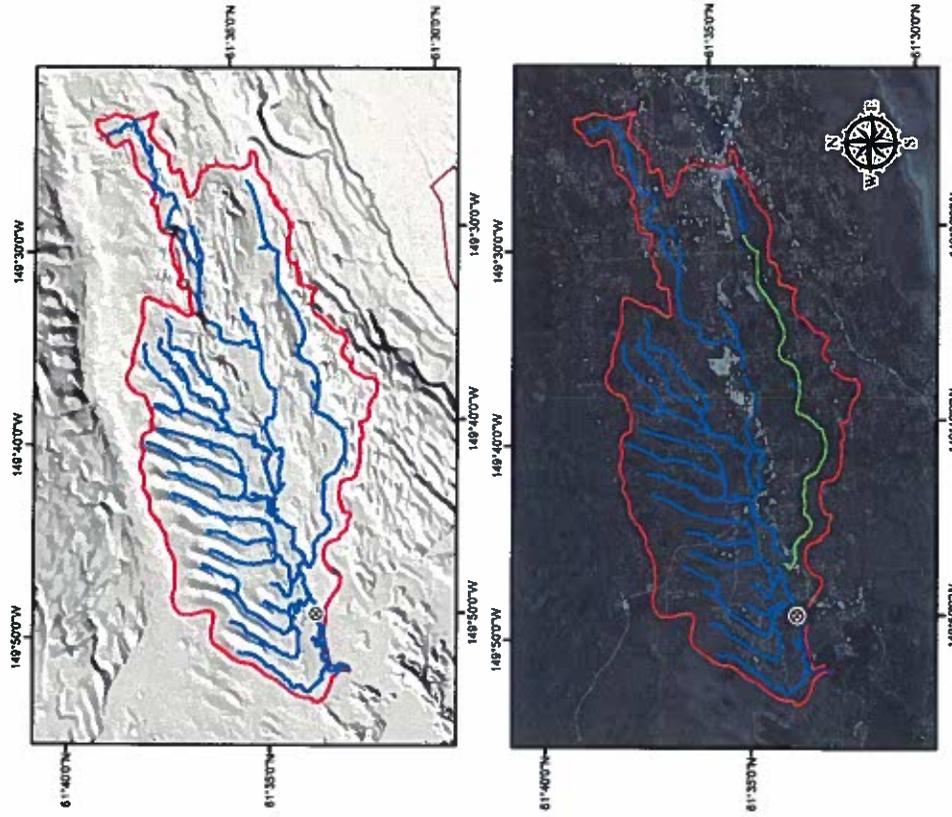


Figure 2. Shaded relief (top panel) and hydrography (bottom panel) for the Meadow Creek and Little Meadow Creek watersheds.

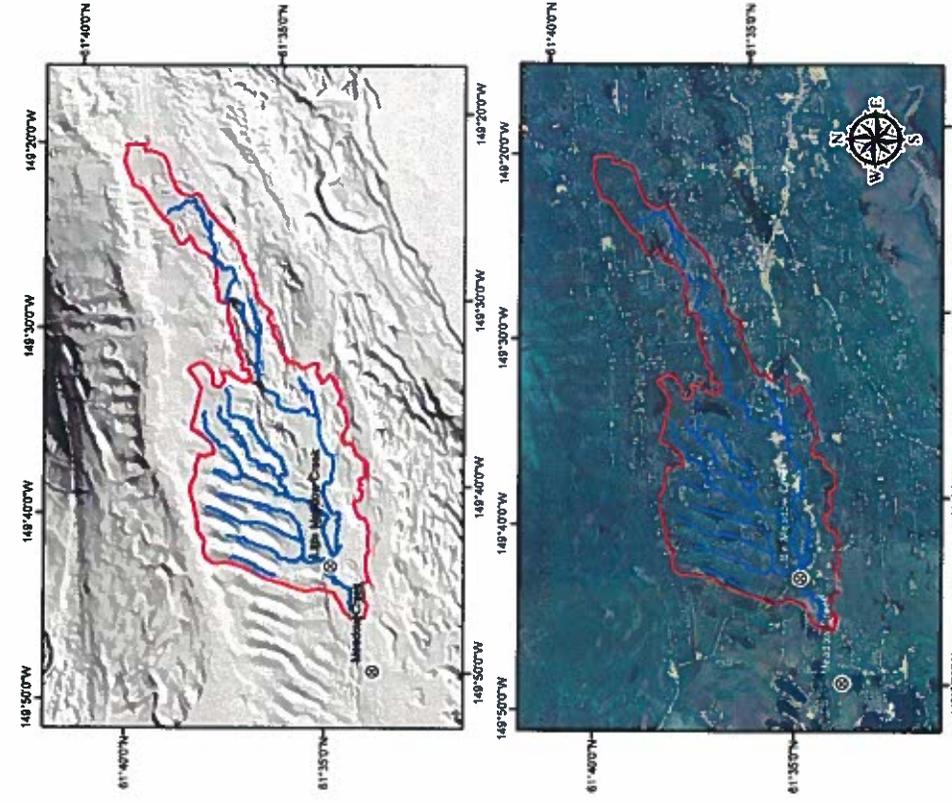
Meadow Creek:



All locations represented are approximate. Symbols and basemaps are projected in NAD 83 Alaska Albers. Basemaps were provided by the Alaska Geospatial Information Network, including digitized and hill-shaded USGS topographic map at 1:250k scale, Blue Marble Satellite Imagery Mosaic, and SRTM V2 Elevation Dataset. Flowlines provided by the National Hydrography Dataset.

- ⊗ Meadow Creek Gage (ADFG 12101)
- Meadow Creek Watershed Boundary
- Alaska DNR Navigable Waters

Little Meadow Creek:



All locations represented are approximate. Symbols and basemaps are projected in NAD 83 Alaska Albers. Basemaps were provided by the Alaska Geospatial Information Network, including digitized and hill-shaded USGS topographic map at 1:250k scale, Blue Marble Satellite Imagery Mosaic, and SRTM V2 Elevation Dataset. Flowlines provided by the National Hydrography Dataset.

- ⊗ Little Meadow Creek Gage (ADFG 12102)
- ⊗ Meadow Creek Gage (ADFG 12101)
- Little Meadow Creek Watershed Boundary

Navigability: Meadow Creek and Little Meadow Creek are considered unknown for navigability according to the State of Alaska (for Title purposes). Please contact the Alaska Department of Natural Resources, Division of Mining, Land, and Water's Public Access, Assertion, and Defense Unit for more information.⁷

EXISTING LAND USE PLANS, VALUES, AND USES

Discussion: Staff reviewed area plans, development plans. Recommendations provided in these documents were considered in determining if the flows and time periods for the reservation of water requested are in the public's best interest. ADNR uses the criteria in AS 46.15.080 and AS 46.15.145 to help determine the appropriate balance of the proposed reservation with those of other existing and potential users. These plans help ADNR have a better understanding of potential future water needs.

There are two documents used in the Meadow Creek and Little Meadow Creek watershed to better assess the needs of current and future plans. They are:

1. *Southeast Susitna Area Plan – Alaska Department of Natural Resources (April 2008)*
2. *Matanuska-Susitna Borough Comprehensive Development Plan (Updated) – Matanuska-Susitna Borough Planning and Land Use Department (2005)*

The lands surrounding Meadow Creek and Little Meadow Creek are owned by numerous groups, including the State of Alaska, Matanuska Susitna Borough, and/or other private and public parties. According to the Southeast Susitna Area Plan (SSAP), the portions of state land that Meadow Creek run through are designated as "Rp" (Public Recreation), which the management intent is for "recreational uses and to protect the entranceway of Meadow Creek into Big Lake. A 200' riparian buffer affects Meadow Creek. Authorizations are to avoid wetland areas." Additionally, there is also a designation of "Se" (Settlement) which allows for land disposal within this area; however, "Development within the area of the Meadow Creek floodplain and its adjoining wetlands shall be avoided. Protect anadromous stream and provide buffering from adjacent residential structures. Maintain a 200' protection area adjacent to Meadow Creek."

Additionally, the SSAP continues on to directly address "Instream Flow" goals as:

*"Instream Flow. Maintain water quantity and quality sufficient to protect the human, fish, and wildlife resources and uses of the region."*⁸

SSAP additionally addresses priorities from the land management perspective,

"B. Priorities. Instream flow reservations should be established over the planning period for Kashwitna, Sheep, Montana, Little Willow, Lily, Fish, Meadow, Wasilla, Spring, Threemile, Lucille, and Goose creeks, as well as the inlet stream of Nancy Lake."

⁷ Alaska Department of Natural Resources, Navigable Waters Web Map. <http://navmaps.alaska.gov/navwatersmap/>

⁸ Southeast Susitna Area Plan (April 2008); P. 2-19

Area plans usually cover large areas and establish goals, management intent, and guidelines for the Department's management of the use of state land. However, even though an area plan for state lands may make general statements regarding the need for reservations of water, the Alaska Water Use Act and its implementing regulations authorize any person to apply for a reservation of water at any time. ADNR will review and adjudicate those applications as required by law.

While the Matanuska-Susitna Borough Comprehensive Plan (MSBCP) covers a wide range of plans, it undertakes planning in several ways, including participating in state and federal plans, community based plans, borough-wide and regional plans, and functional plans. The Borough purposefully left the MSBCP more generalized to accommodate the varying plans.

FINDINGS OF FACTS AND CONCLUSIONS OF LAW

Under Article VIII of the Alaska Constitution and Alaska Statute AS 46.15.030, naturally occurring water, except mineral and medicinal waters, is reserved to the people for common use and is subject to appropriation and beneficial use; AS 46.15.030 and AS 46.15.145 further provides for the reservation of instream flows in rivers and water levels in lakes. The Alaska Water Use Act, AS 46.15, and Title 11, Chapter 93 of the Alaska Administrative Code, contains the statutes and regulations under which ADNR manages the State's water resources.

A reservation of water is issued pursuant to the following authorities, including but not limited to:

Under AS 46.15.145 (c),

"The commissioner shall issue a certificate reserving the water applied for under this section if the commissioner finds that,

- (1) The rights of prior appropriators will not be affected by this reservation;
- (2) The applicant has demonstrated that a need exists for the reservation;
- (3) There is unappropriated water in the stream or body of water sufficient for the reservation; and
- (4) The proposed reservation is in the public interest."

Under 11 AAC 93.146 (a),

"The commissioner will issue a certificate of reservation of water if the commissioner finds that the reservation meets the requirements of AS 46.15.145."

Under 11 AAC 93.145 (d),

"The commissioner's decision to grant, conditionally grant, or deny an application for a reservation of water will be summarized by written findings of fact and conclusions of law, including justification of any special conditions to which the reservation is subject. In determining whether the proposed

appropriation is in the public interest, the commissioner will consider the criteria set out in AS 46.15.080 (b).”

ADNR makes the following findings of fact and conclusions of law in response to the above requirements:

AS 46.15.145 (c)(1): The rights of prior appropriators will not be affected by this reservation.

Discussion and Determination: Based on a search of ADNR’s water rights records, there are no direct prior appropriators within the specified reaches of Meadow Creek and Little Meadow Creek. There are prior water rights that are removing water from Big Lake; however, a water balance report of Big Lake was conducted to determine if instream flows from Meadow Creek, following through to Fish Creek would impact these prior water rights. According to this report, “Overall, domestic surface or groundwater water usage in the vicinity of Big Lake likely has a small effect on the overall water balance of Big Lake and stream flow volumes in Fish Creek [*downstream*] at its outlet.”⁹

Therefore, according to the Water Balance Report of Big Lake and research findings of prior water right records, it is determined that prior water right holders will not be impacted.

The reservations of water established by the Department’s decision and certification does not affect other valid water rights with a senior priority date including water rights with senior priority date that may be issued after the date the certificates reserving water are issued.

AS 46.15.145 (c)(2): The applicant has demonstrated that a need exists for the reservation.

Discussion: Under Title 16 of the Alaska Statutes, ADF&G is the state agency charged with managing Alaska’s fish and wildlife. The primary purpose of these reservation applications is for the protection of fish and wildlife habitat, migration, and propagation. ADF&G has staff who are dedicated to the research, development and implementation of priority applications for Reservation of Water. As part of this process, ADF&G staff identified Meadow Creek and Little Meadow Creek as a priority for establishment of instream flow reservations. Further, the applications have provided credible information that demonstrates the granting of these reservations of water is needed to help protect and maintain fish production within Meadow Creek and Little Meadow Creek. Meadow Creek and Little Meadow Creek serve as a fish passage corridor between the marine environment and other portions of its watershed utilized for fish production.

Both Meadow Creek and Little Meadow Creek support sockeye salmon (*Oncorhynchus nerka*), coho salmon (*O. kisutch*), rainbow trout (*O. mykiss*), longnose sucker (*Catostomus catostomus*), and lamprey (*Lampetra spp.*) for a portion of, or all of their spawning, incubation, rearing, and passage life phases.

Meadow Creek is cataloged within the Anadromous Waters Catalog as #247-50-10330-2050. Little Meadow Creek is cataloged as #247-50-10330-2050-3050.

⁹ Memorandum to Kim Sager, Natural Resource Specialist from Kevin Petrone, Ph.D., Hydrologist; SUBJECT: Water Balance of Big Lake, AK; Dated February 5, 2015

Meadow Creek and Little Meadow Creek, along with other area watershed rivers, are considered an important source for fish and contributes to significant commercial, subsistence, and sport fish use. In the judgment of the state's fish and wildlife management agency, the proposed reservations are needed to maintain the fish production within Meadow Creek and Little Meadow Creek and will aid ADF&G in carrying out its duty of managing and protecting the states fish and wildlife. The State of Alaska's policy for management of sustainable salmon fisheries provides that salmon spawning, rearing, and migratory habitats "should not be perturbed beyond natural boundaries of variation."¹⁰ It further provides that "all essential salmon habitat in marine, estuarine, and freshwater ecosystems and access of salmon to these habitats should be protected."¹¹ A reservation of water can protect fish production while still allowing for other appropriation of river flows in excess of the reservation amounts.

Additionally, the experience of other western states demonstrates the importance of protecting necessary instream flows for fish production early to ensure that these flows – and the uses that depend on these flows – are fully considered later when available water may be more scarce.¹² "Fish and wildlife agencies face several critical underlying challenges to effectively manage water for fish and wildlife. The primary challenge is the fact that in the majority of situations (*except Alaska* and parts of Canada) most stream and lake water has already been committed to uses other than fish and wildlife. This situation has come about because most water laws were crafted by (and for) consumptive user groups over a century ago."¹³

In the International Instream Flow Program Initiative's (IIFPI) 'Protecting and Restoring Rivers and Lakes in North America' Summary, Estes (an Alaskan co-author) states:

Alaska is at a stage of development where the rest of America was approximately 170 years ago. When water was initially extracted from mighty rivers like the Colorado, dammed on the Columbia, and confined between levees on the Mississippi, our predecessors had little idea what was going to happen to fish and wildlife. But just as development pressures have taken and continue to take their toll on rivers and lakes in the lower 48 states, Alaska is in danger of moving along a similar path if preventative actions aren't taken.¹⁴

Determination: In light of the above factors, it is determined that ADF&G, as applicants, have demonstrated that a need exists for the proposed reservations of water and that these reservations of water will assist ADF&G in fulfilling its duties as State of Alaska's manager of the fisheries and wildlife resources.

¹⁰ 5 AAC 39.222(c)(A)(i).

¹¹ 5 AAC 39.222(c)(a)(iv).

¹² Annear, T., I. Chisholm, H. Beecher, A. Locke, and 12 other authors. 2004. Instream flows for riverine resource stewardship, revised edition. Instream Flow Council, Cheyenne, WY.

¹³ Annear, T., D. Lobb, C. Coomer, M Woythal, C. Hendry, C. Estes, and K. Williams. 2009. International Instream Flow Program Initiative, A status Report of State and Provincial Fish and Wildlife Agency Instream Flow Activities and Strategies for the Future, Final Report for Multi-State Conservation Grant Project WY M-7-T. Instream Flow Council, Cheyenne, WY

¹⁴ Madson, C., T. Annear, and D. Lobb. Protecting and Restoring Rivers and Lakes in North America: Trends, challenges, and opportunities for doing a better job. <http://www.instreamflowcouncil.org/node/65>.

AS 46.15.145 (c)(3): There exists unappropriated water within the stream sufficient for the reservation.

Discussion: The gage records for Meadow Creek and Little Meadow Creek, ADF&G gage #12101 and 12102, have been analyzed to help determine whether there is sufficient unappropriated stream flows in the creeks to accommodate the proposed reservations.

The following tables show the flows available after the proposed reservation flows are met for each specified reach, during each listed period of the year, based on ADF&G flow data:

Table 3. Flow Table* [cfs = cubic feet per second; gpd = gallons per day]

Meadow Creek Reach A/A2:

| Time Period | Mean Time Period Discharge (cfs) | 7/14/88 Reach A Original Requested Flows (cfs) | 04/20/2015 Reach A2 Requested Flows (cfs) | Combined Reach A & A2 Reservation Flows (cfs) | Remaining Flows For Future Appropriations (cfs) | Remaining Flows For Future Appropriations (gpd) |
|-------------|----------------------------------|--|---|---|---|---|
| January | 7.1 | 10 | 6 | 4.8 | 2.3 | 1,486,426 |
| February | 7.5 | 10 | 6 | 4 | 3.5 | 2,261,952 |
| March | 7.1 | 10 | 6 | 4.1 | 3 | 1,938,816 |
| April | 36 | 10 | 30 | 16 | 20 | 12,925,440 |
| May | 42 | 14 | 35 | 25 | 17 | 10,986,624 |
| June | 27 | 24 | 26 | 17 | 10 | 6,462,720 |
| July | 19 | 24 | 23 | 12 | 7 | 4,523,904 |
| August | 21 | 24 | 22 | 19 | 2 | 1,292,544 |
| September | 38 | 24 | 27 | 17 | 21 | 13,571,712 |
| October | 36 | 24 | 18 | 15 | 21 | 13,571,712 |
| November | 14 | 14 | 13 | 11 | 3 | 1,938,816 |
| December | 11 | 10 | 10 | 7.4 | 3.6 | 2,326,579 |

* For perspective, 1 cubic foot per second is equal to 646,272 gallons per day. An average family of four (for domestic use) is allotted 500 gallons per day.

Little Meadow Creek:

| Time Period | Mean Time Period Discharge (cfs) | 2/13/2012 Requested Flows (cfs) | 01/07/2016 Amended Request Flows (cfs) | Combined Reservation Flows (cfs) | Remaining Flows For Future Appropriations (cfs) | Remaining Flows For Future Appropriations (gpd) |
|-------------|----------------------------------|---------------------------------|--|----------------------------------|---|---|
| January | 4.2 | 3 | 3.5 | 3.5 | 0.7 | 452,390 |
| February | 4.3 | 3.5 | | 3.5 | 0.8 | 517,018 |
| March | 4.2 | 4 | | 3.5 | 0.7 | 452,390 |
| April | 14 | 8.5 | | 7.2 | 6.8 | 4,394,650 |
| May | 16 | 10 | | 10 | 6 | 3,877,632 |
| June | 11 | 7.5 | | 7.5 | 3.5 | 2,261,952 |
| July | 8.1 | 6 | | 6 | 2.1 | 1,357,171 |
| August | 8.9 | 8 | | 8 | 0.9 | 581,645 |
| September | 15 | 8 | | 8 | 7 | 4,523,904 |
| October | 14 | 8 | | 6.9 | 7.1 | 4,588,531 |
| November | 6.6 | 5 | | 5 | 1.6 | 1,034,035 |
| December | 5.4 | 4 | | 4 | 1.4 | 904,781 |

* For perspective, 1 cubic foot per second is equal to 646,272 gallons per day. An average family of four (for domestic use) is allotted 500 gallons per day.

| Priority Date/Flow Breakout | | | | | |
|-----------------------------|---------------------------------|----------------------------------|--------------------------------|--------------------------------|-----|
| Time Period | Meadow Creek, Reach A 7/14/1988 | Meadow Creek, Reach A2 4/20/2015 | Little Meadow Creek 02/13/2012 | Little Meadow Creek 01/07/2016 | |
| January | 4.8 | | 3 | 0.5 | |
| February | 4 | | 3.5 | | |
| March | 4.1 | | 3.5 | | |
| April | 10 | | 6 | | 7.2 |
| May | 14 | | 11 | | 10 |
| June | 17 | | 7.5 | | |
| July | 12 | | 6 | | |
| August | 19 | | 8 | | |
| September | 17 | | 8 | | |
| October | 15 | | 6.9 | | |
| November | 11 | | 5 | | |
| December | 7.4 | | 4 | | |

Table 4. Duration chart showing the percent of time streamflows are equaled or exceeded and the mean monthly flow in cfs.

Meadow Creek Reach A/A2:

| % Time exceeded | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 22 | 26 | 23 | 225 | 125 | 83 | 37 | 49 | 244 | 183 | 38 | 26 |
| 5 | 16 | 21 | 20 | 115 | 105 | 67 | 32 | 31 | 161 | 146 | 36 | 25 |
| 10 | 13 | 17 | 15 | 78 | 96 | 54 | 30 | 28 | 77 | 117 | 32 | 23 |
| 15 | 12 | 12 | 12 | 58 | 80 | 38 | 29 | 26 | 63 | 75 | 21 | 15 |
| 20 | 10 | 11 | 9.5 | 49 | 65 | 33 | 26 | 25 | 54 | 32 | 16 | 14 |
| 25 | 9.0 | 11 | 8.0 | 44 | 51 | 32 | 25 | 24 | 37 | 29 | 14 | 13 |
| 30 | 8.0 | 9.6 | 7.4 | 39 | 41 | 31 | 25 | 23 | 31 | 27 | 13 | 12 |
| 35 | 6.2 | 8.6 | 7.4 | 33 | 38 | 28 | 24 | 23 | 29 | 21 | 13 | 10 |
| 40 | 6.0 | 6.0 | 6.7 | 30 | 35 | 26 | 23 | 22 | 27 | 18 | 13 | 9.9 |
| 45 | 5.2 | 6.0 | 5.8 | 28 | 34 | 23 | 19 | 21 | 25 | 17 | 12 | 9.0 |
| 50 | 5.0 | 5.0 | 5.0 | 25 | 32 | 22 | 16 | 21 | 22 | 17 | 12 | 9.0 |
| 55 | 5.0 | 5.0 | 5.0 | 22 | 28 | 19 | 14 | 20 | 21 | 16 | 12 | 8.0 |
| 60 | 5.0 | 4.5 | 4.6 | 19 | 26 | 19 | 13 | 20 | 19 | 16 | 11 | 8.0 |
| 65 | 4.8 | 4.0 | 4.1 | 16 | 25 | 17 | 13 | 20 | 17 | 15 | 11 | 7.4 |
| 70 | 4.5 | 3.5 | 4.0 | 15 | 24 | 16 | 12 | 19 | 15 | 15 | 10 | 7.0 |
| 75 | 4.5 | 3.0 | 4.0 | 13 | 23 | 16 | 12 | 18 | 15 | 15 | 10 | 6.8 |
| 80 | 4.0 | 2.9 | 3.9 | 12 | 21 | 14 | 11 | 17 | 14 | 14 | 9.0 | 6.6 |
| 85 | 4.0 | 2.6 | 2.5 | 9.8 | 19 | 14 | 11 | 15 | 14 | 14 | 7.4 | 6.2 |
| 90 | 3.6 | 2.5 | 2.5 | 7.8 | 18 | 14 | 11 | 14 | 13 | 13 | 6.9 | 6.0 |
| 95 | 3.0 | 2.0 | 2.0 | 6.8 | 16 | 13 | 10 | 13 | 13 | 13 | 6.2 | 5.6 |
| 100 | 2.0 | 1.5 | 2.0 | 6.0 | 14 | 12 | 9.7 | 10 | 13 | 12 | 6.0 | 3.0 |
| Mean | 7.1 | 7.5 | 7.1 | 36 | 42 | 27 | 19 | 21 | 38 | 36 | 14 | 11 |

Little Meadow Creek:

| % Time exceeded | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 9.2 | 11 | 9.5 | 77 | 44 | 30 | 14 | 18 | 84 | 63 | 15 | 11 |
| 5 | 7.2 | 8.8 | 8.5 | 40 | 37 | 24 | 13 | 12 | 56 | 51 | 14 | 10 |
| 10 | 6.1 | 7.5 | 6.8 | 28 | 34 | 20 | 12 | 11 | 28 | 41 | 13 | 9.5 |
| 15 | 5.8 | 5.8 | 5.8 | 21 | 28 | 15 | 11 | 11 | 23 | 27 | 8.8 | 6.8 |
| 20 | 5.1 | 5.5 | 5.0 | 18 | 24 | 13 | 11 | 10 | 20 | 13 | 7.3 | 6.5 |
| 25 | 4.8 | 5.3 | 4.5 | 17 | 19 | 13 | 10 | 9.8 | 14 | 12 | 6.5 | 6.1 |
| 30 | 4.5 | 5.0 | 4.3 | 15 | 16 | 12 | 10 | 9.5 | 12 | 11 | 6.1 | 5.8 |
| 35 | 3.9 | 4.7 | 4.3 | 13 | 15 | 11 | 9.8 | 9.3 | 11 | 8.7 | 6.1 | 5.1 |
| 40 | 3.8 | 3.8 | 4.1 | 12 | 14 | 11 | 9.5 | 9.1 | 11 | 7.9 | 6.1 | 5.1 |
| 45 | 3.5 | 3.8 | 3.7 | 11 | 13 | 9.6 | 8.2 | 8.9 | 10 | 7.5 | 5.8 | 4.8 |
| 50 | 3.5 | 3.5 | 3.5 | 10 | 13 | 9.0 | 7.0 | 8.8 | 9.3 | 7.4 | 5.8 | 4.8 |
| 55 | 3.5 | 3.5 | 3.5 | 9.2 | 11 | 8.2 | 6.5 | 8.6 | 8.8 | 7.2 | 5.8 | 4.5 |
| 60 | 3.5 | 3.3 | 3.3 | 8.2 | 11 | 8.0 | 6.3 | 8.5 | 8.2 | 7.1 | 5.5 | 4.5 |
| 65 | 3.4 | 3.1 | 3.2 | 7.2 | 10 | 7.6 | 6.0 | 8.3 | 7.6 | 6.9 | 5.5 | 4.3 |
| 70 | 3.3 | 3.0 | 3.1 | 6.8 | 9.7 | 7.3 | 5.9 | 8.1 | 7.0 | 6.8 | 5.1 | 4.1 |
| 75 | 3.3 | 2.8 | 3.1 | 6.1 | 9.4 | 7.0 | 5.8 | 7.7 | 6.7 | 6.6 | 5.1 | 4.1 |
| 80 | 3.1 | 2.8 | 3.1 | 5.8 | 8.9 | 6.6 | 5.6 | 7.4 | 6.5 | 6.5 | 4.8 | 4.0 |
| 85 | 3.1 | 2.7 | 2.6 | 5.1 | 8.3 | 6.5 | 5.6 | 6.8 | 6.3 | 6.4 | 4.3 | 3.9 |
| 90 | 3.0 | 2.6 | 2.6 | 4.4 | 7.8 | 6.3 | 5.4 | 6.5 | 6.3 | 6.2 | 4.1 | 3.8 |
| 95 | 2.8 | 2.5 | 2.5 | 4.1 | 7.1 | 6.1 | 5.2 | 6.2 | 6.2 | 6.1 | 3.9 | 3.7 |
| 100 | 2.5 | 2.3 | 2.5 | 3.8 | 6.4 | 5.6 | 5.0 | 5.3 | 6.1 | 5.9 | 3.8 | 2.8 |
| Mean | 4.2 | 4.3 | 4.2 | 14 | 16 | 11 | 8.1 | 8.9 | 15 | 14 | 6.6 | 5.4 |

The data described in Table 4 shows flows which support the amount of water in these reservation applications. While almost any allocation of water may experience periods of time during which the natural variability in flow will result in unavailability of water, there will be a reasonable proportion of time when Meadow Creek and Little Meadow Creek flows will be sufficient for the proposed reservations.

Determination: It is determined that there exists unappropriated water within Meadow Creek and Little Meadow Creek sufficient for these reservation requests. Further, the granted reservation flows stated in Table 3 are reasonable amounts for these reservations. Based on the applications and ADF&G’s professional judgment,

‘Sufficient flows are needed to support riverine habitats used by fish and to provide fluvial processes that maintain these habitats. To maintain seasonal uses of habitats by each life history stage,’ the applicants recommend ‘maintaining a flow regime that mimics the magnitude and timing of the natural flow regime. This approach is necessary to meet the needs of species life history stages that have coevolved and exhibited biological adaptations to the rivers flow regime.’

Reserved flows leave water available for ADNR to allocate to new applicants, and are set at an amount that will contribute to maintenance of the fish and wildlife habitat based on available information, as described by ADF&G in their applications.

For the adjudication process, the applicants submitted flow recommendations that as stated previously, mimic the natural hydrologic variability to meet the needs of species life history stages. ADNR reviewed these flows and took into consideration the requested flows along with current and future impacts. This includes any senior water appropriations and potential near future uses that may benefit the people of the State. ADNR then adjusts flows that account for any prior appropriators and maintains necessary flow for habitat maintenance and passage. If a future water use is of a significant quantity and competes with an existing reservation, then a review of the purpose and findings for the reservation of water can be performed. Lower flows, (which would be available a greater percent of the time [see Table 4]), are considered by the applicants and ADNR to be inadequate, but would be subject for review upon challenge of a competing applicant.

AS 46.15.145 (c)(4) and 11 AAC 93.145 (d): The proposed reservation is in the public interest, considering the criteria set out in AS 46.15.080 (b).

AS 46.15.080 (b)(1): The benefit to the applicant resulting from the proposed reservation.

Discussion: ADF&G has the statutory responsibility of managing the fish and wildlife resources of the State of Alaska. The applicants applied for these reservations for the primary purpose of protecting fish habitat, migration, and propagation in Meadow Creek and Little Meadow Creek. ADF&G indicates that these reservations will also assist in the management of fish resources within these creeks. The proposed reservations of water would contribute significantly to ensuring the continued viability of this resource.

Determination: The proposed reservations will benefit ADF&G in the fulfillment of its statutory responsibility to protect and manage Meadow Creek and Little Meadow Creek fish populations, a resource reserved to the people under the Alaska Constitution. The proposed reservations will contribute to the maintenance of Meadow Creek and Little Meadow Creek fish populations by providing the appropriate quantities of water needed for fish habitat, migration, and propagation.

AS 46.15.080 (b)(2): The effect of the economic activities resulting from the proposed reservation.

Discussion: Meadow Creek and Little Meadow Creek supports commercial, sport fishing, and subsistence uses. Sport fishing provides significant economic benefits to Alaska. The American Sport Fishing Association estimated that the expenditures for sport fishing in Alaska in 2007 generated 15,879 jobs, and \$545 million in

wages and salaries. Anglers in Alaska spent nearly \$1.4 billion on fishing trips, fishing equipment, and development and maintenance of land used primarily for the pursuit of sport fishing in Alaska.¹⁵

Meadow Creek and Little Meadow Creek provides the basis for subsistence, sport, and commercial fishing harvest in the watershed area. As reported by the plans and studies, this enables area residents to sustain their subsistence activities as well as stimulate elements of the local and regional economy.

Determination: While no detailed breakdown of the economic impacts of the Meadow Creek and Little Meadow Creek fishery has been submitted by the applicants, the protection of this fishery is of economic importance to the region. The proposed reservations will help protect this resource.

AS 46.15.080 (b)(3): The effect on fish and game resources and on public recreational opportunities.

Discussion: As previously described, Meadow Creek and Little Meadow Creek supports Pacific salmon species as well as other resident fishes. The primary purpose of these reservations is to protect the habitat, migration, and propagation of these fish. Reservation flows were allocated specifically to provide for the needs of fish populations at the times those populations utilize the river for their various life stage activities of spawning, incubating, rearing, and passage (See Table 5).

¹⁵ Economic Impacts and Contributions of Sportfishing in Alaska (ADF&G, 2007)

Table 5. Meadow Creek and Little Meadow Creek Fish Periodicity Chart¹⁶

| Sockeye Salmon | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Smolt Passage | | | | X | XXXX | XXXX | XXXX | | | | | |
| Adult Passage | | | | | | | XXX | XXXX | | | | |
| Spawning | | | | | | | | XXXX | XXX | | | |
| Incubation | XXXX | XXXX | XXXX | XXXX | X | | | XXXX | XXXX | XXXX | XXXX | XXXX |
| Rearing | XXXX |

| Coho Salmon | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Smolt Passage | | | | X | XXXX | XXXX | XXXX | | | | | |
| Adult Passage | | | | | | | XX | XXXX | XXXX | X | | |
| Spawning | | | | | | | | XX | XXXX | XXXX | | |
| Incubation | XXXX | XXXX | XXXX | XXXX | X | | | XX | XXXX | XXXX | XXXX | XXXX |
| Rearing | XXXX |

| Rainbow Trout | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Adult Passage | | | | XXXX | | |
| Spawning | | | | X | XXXX | XX | | | | | | |
| Incubation | | | | X | XXXX | XXXX | XX | | | | | |
| Rearing | XXXX |

| Lamprey ssp. | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Smolt Passage | | | | | | | | | | | | |
| Adult Passage | | | | ? | XXXX | XXXX | ? | | | | | |
| Spawning | | | | | XXX | XXX | | | | | | |
| Incubation | | | | | XXX | XXXX | XXXX | | | | | |
| Rearing | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? |

| Longnose Sucker | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Adult Passage | | | | ? | XXXX | XXXX | ? | | | | | |
| Spawning | | | | | XXX | XXX | | | | | | |
| Incubation | | | | | XXX | XXXX | XXXX | | | | | |
| Rearing | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? | ???? |

Smolt passage is for juvenile emigration to estuarine/marine environment

Adult passage for salmon is immigration; for trout, char, and other species, it is immigration and emigration.

Incubation life phase includes time of egg deposition to fry emergence

? = Data not available or timing is incomplete

¹⁶ Reservation of Water Application

Specific reservation quantities were requested and recommended by ADF&G. They were subsequently adjusted to better mimic the natural hydrologic and biologic requirements for Meadow Creek and Little Meadow Creek by combining statistical analyses of hydrologic variability and fish species periodicity (See Table 4, Table 5).

Adjustments were made based on these analyses and were reviewed and discussed by both the applicants and ADNR. ADNR's decision to grant the specific water quantities and time periods provided for in this decision is based on and consistent with the current level of hydrologic and biologic knowledge, as well as consideration of current water right appropriations and potential near future uses. Reservation flows granted will contribute to fish habitat, migration, and propagation within each reservation reach.

While the primary purpose of the proposed reservations is to protect fish habitat, migration, and propagation, reservations of these flows will help preserve quantities necessary for boating, sport fishing, hunting, and other recreational opportunities as well.

Determination: These proposed reservations will benefit the protection of fish resources and will enhance public recreational activities.

AS 46.15.080 (b)(4): The effect on public health.

Discussion: Maintaining flow quantities will help retain high water quality and has a positive health impact. There are no permitted surface water withdrawals from Meadow Creek and Little Meadow Creek for drinking water purposes, but significant use of the water and waterway of Meadow Creek and Little Meadow Creek occurs by residents who live in and around the requested reservation areas.

These reservations of water will help the quality of water in Meadow Creek and Little Meadow Creek, and may provide positive public health impacts in the future. Maintaining these flows will also regulate water temperature and dilute contaminants in the system.¹⁷

Determination: The proposed reservations will generally contribute to the maintenance and protection of water quality by helping to ensure the instream flows of a volume of water that can buffer extreme temperature changes and dilute concentrations and thus reduce impacts of any pollutants or contaminants that may enter the river. Therefore, there should be a positive impact on public health attributable to granting these reservations.

AS 46.15.080 (b)(5): The effect of loss of alternate uses of water that might be made within a reasonable time if not precluded or hindered by the proposed reservation.

Discussion: At this time, research by ADNR has not identified any imminent proposed alternative uses of water or alternative uses which may be made within a reasonable amount of time. By establishing these reservations of water, the amounts described will be withdrawn from the amount available for appropriation or for temporary water use authorizations. Further, while the reservations allow for economic and recreational development activities compatible with the primary uses, any future development that depends

¹⁷ Annear, T., I. Chisholm, H. Beecher, A. Locke, and 12 other authors. 2004. Instream flows for riverine resource stewardship, revised edition. Instream Flow Council, Cheyenne, WY.

upon water withdrawals may be limited if the amount of water available is not sufficient to meet reservation flows and any other senior water right holders during specified time periods. Future water right applicants may need to consider other options such as off-river storage and/or development of alternative water sources, in order to bridge the periods of flow equal to or less than reservation flows.

Nevertheless, if a project applies for a new, competing, water right for waters from Meadow Creek and/or Little Meadow Creek, the law provides for a review of the water system usage, and allows an applicant to present additional information for a review of the reservations.¹⁸ The intent of a reservation is not to prevent future developments requiring a water right, but rather to give the necessary quantities of water for protection of the purpose given, in this case, habitat, migration, and propagation of fish. Once a reservation is certificated, it is subject to AS 46.15.145 (f) and 11 AAC 93.147 (a) and (b), which provide for review and “a finding that the purpose, or part or all of the findings no longer apply to the reservation.” ADNR may issue a revocation or amendment of a certificate of reservation in appropriate circumstances, after public notice and a hearing if appropriate, and a written determination that the revocation or amendment is in the best interest of the state.

Determination: Based on reservation amounts and remaining amounts of water for appropriation, the reservation quantities granted here leave a quantity of unappropriated flows throughout the year, shown in Table 3, that ADNR believes is adequate for other uses that currently can be anticipated. Further, if the amounts of unappropriated water were to be found inadequate for any future uses of water, statutory provisions for review of these reservations could be implemented per 11 AAC 93.147. Therefore, it is determined that, at this time there are no existing or planned alternative uses of water that might be precluded or hindered by the proposed reservations.

AS 46.15.080 (b)(6): Harm to other persons resulting from the proposed reservation.

Discussion: ADNR received three comments within the commenting period during public and agency notice. There were no comments received which alleged harm related to water use and from the review of the water records, it was determined that there should not be any potential harm as a result of the proposed reservations.

Reservations of water for instream flow purposes do not preclude the simultaneous use of that water for other purposes compatible with the reservations, and the proposed reservations are likely to reinforce the current uses of Meadow Creek and Little Meadow Creek. Under 11 AAC 93.920 (b), reserved water may be used in an emergency for the protection of life and property.

Determination: The proposed reservations are not expected to harm other persons.

AS 46.15.080 (b)(7): The intent and ability of the applicant to complete the reservation.

Discussion and Determination: The applicants adequately described, justified, and quantified the proposed reservations and no further action on the part of the applicants is required to complete these reservations.

¹⁸ Should such a development alternative arise, 11 AAC 93.147 provides authority for review of a reservation of water if circumstances warrant.

AS 46.15.080 (b)(8): The effect upon access to navigable or public water.

Discussion and Determination: The proposed reservations are not expected to have any negative effect on access to navigable or public water. However, the granted reservations can be expected to have some beneficial effects of assuring that sufficient water flow remains for navigation and access to the boating and rafting opportunities available on Meadow Creek and Little Meadow Creek.

AS 46.15.080: Public interest determination.

Water rights are subject to preferences among beneficial uses, and where there are applications for competing uses of water and there is not enough water for all uses, ADNR is required to balance the interests involved and give preference to the most beneficial use under AS 46.15.090. Here, as shown by the discussion and record described herein, there is a preponderance of evidence of public benefits, and at the time of application, there was unappropriated water available.

The applicant will also be required to defend and indemnify the State against and hold it harmless from any and all claims, demands, legal actions, loss, liability and expense from injury to or death of persons and damages to or loss of property arising out of or connected with the exercise of any water right granted.

Therefore, in light of the entire record, the proposed Meadow Creek and Little Meadow Creek reservations of water are determined to be in the overall public interest of the state.

11 AAC 93.146 Issuance of a certificate of reservation of water (Standard Conditions)

In accordance with 11 AAC 93.146 (c) and (d), the following standard conditions are applied to all certificates of reservation as of September 11, 1983 and any additional special conditions will be addressed:

1. This certificate may not be voluntarily abandoned, conveyed, transferred, assigned, or converted to another use, in whole or in part, unless required as a result of review under 11 AAC 93.147.
2. This certificate does not authorize the Certificate Holder or any other person to prevent access to, on, or through the water reserved by the certificate, or to prohibit the use of the reserved water for other compatible purposes set out in AS 46.15.145(a).
3. This certificate does not grant any inherent water management duties or authorities held by the Alaska Department of Natural Resources, through the Division of Mining, Land and Water, Water Resources Section (ADNR) to the Certificate Holder. To request ADNR to pursue curtailment, or take other administrative action, the Certificate Holder must formally request ADNR to curtail or otherwise impose limits on potentially conflicting uses and must provide ADNR with data or other proof that the reservation of water is not being met, and that the proximate cause is from conflicting uses. Whether ADNR will pursue any administrative or judicial proceedings against users of water is within the sole discretion of ADNR.

4. ADNR may require the Certificate Holder to install and maintain measuring devices of a type and at a location approved by ADNR to monitor and report on the reserved instream flow or level of water. ADNR is not responsible for monitoring the reserved instream flow or level of water.
5. The Certificate Holder may participate in any administrative or judicial proceedings pursued by ADNR that may impact this certificate.
6. This certificate shall be subject to review as required under AS 46.15.145(f) and 11 AAC 93.147.
7. Pursuant to AS 46.15.145(f) and 11 AAC 93.147, this certificate may be amended to reduce the flows and/or water level reserved under this reservation of water but this certificate cannot be amended to increase the reserved flows and/or water level.
8. The Certificate Holder shall comply with all the applicable requirements of AS 46.15.010 – 46.15.270 and 11 AAC 93.010 – 11 AAC 93.970, now effective or as they might in the future be amended.
9. The Certificate Holder shall notify ADNR of any change of address.
10. Except for claims or losses arising from the sole negligence of the State, the Certificate Holder shall defend and indemnify the State against and hold it harmless from any and all claims, demands, legal actions, loss, liability and expense from injury to or death of persons and damages to or loss of property arising out of or connected with the exercise of the water right granted by this certificate.

Special Conditions: No special conditions are required.

RESPONSE TO AGENCY AND PUBLIC NOTICE

Public and agency notice was provided as required by 11 AAC 93.145, 11 AAC 93.080, and AS 46.15.133. Notice was published in the Mat-Su Valley Frontiersman on February 24, 2016 as well as ADNR's public notice online website. Notice was also sent to Alaska Department of Fish and Game, Alaska Department of Environmental Conservation, U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, Big Lake Post Office, and all interested parties that requested notification.

Three comments were received each on the proposed Meadow Creek and Little Meadow Creek Reservations of Water. The Department acknowledges the comments and further states that the comments do not change the basis of this decision.

DECISION

The case files have been found to be complete and the requirements of all applicable statutes have been satisfied. Further, upon recommendation of the Natural Resource Specialist who has adjudicated these files, and after consideration of the above analysis, by authority delegated from the Commissioner of the Alaska Department of Natural Resources, I hereby find that the Alaska Department of Fish and Game (LAS 11975 – Meadow Creek Reach A; LAS 30212 – Meadow Creek Reach A2; LAS 28417 – Little Meadow Creek; and LAS 30925 – Little Meadow Creek, Additional Flows) have satisfied the requirements of AS 46.15.145 with respect to the applications for reservation of water within Meadow Creek and Little Meadow Creek. Therefore, pursuant to 11 AAC 93.145 (a), ADNR will issue four Certificates of Reservation in the amounts, for the time periods, and for the reach descriptions as described below:

LAS 11975: Meadow Creek –Reach A

Applicant: Alaska Department of Fish and Game

Granted Reservation of Water Flows with a priority date of July 14, 1988:

| Time Period | Granted Reservation Flows (cfs) |
|-------------|---------------------------------|
| JANUARY | 4.8 |
| FEBRUARY | 4 |
| MARCH | 4.1 |
| APRIL | 10 |
| MAY | 14 |
| JUNE | 17 |
| JULY | 12 |
| AUGUST | 19 |
| SEPTEMBER | 17 |
| OCTOBER | 15 |
| NOVEMBER | 11 |
| DECEMBER | 7.4 |

cfs = cubic feet per second

Reservation of Water Reach Description: Meadow Creek – Reach A from the Ordinary High Water Mark (OHWM) of the outer bank (of the outside braid, where braided) of the left bank up to the OHWM of the outer bank (of the outside braid, where braided) of the right bank, including any sloughs, braids, or channels which carry water and are an integral part of the creek beginning from Big Lake (RM 0.0) upstream to its confluence with Lucille Creek (approximately RM 4.7). This description does not limit the quantities of water (flow rate) reserved by this decision and certificate to quantities (flow rates) within said OHWM boundaries. Said portion of Meadow Creek is located within:

| Township | Range | Sections |
|----------|--------|----------------------------|
| 17 North | 3 West | 14, 15, 16, 17, 18, 19, 20 |

All within the Seward Meridian.

LAS 30212: Meadow Creek – Reach A2

Applicant: Alaska Department of Fish and Game

Granted Reservation of Water Flows with a priority date of April 20, 2015:

| Time Period | Granted Reservation Flows (cfs) |
|-------------|---------------------------------|
| April | 6 |
| May | 11 |

cfs = cubic feet per second

Reservation of Water Reach Description: Meadow Creek – Reach A2 from the Ordinary High Water Mark (OHWM) of the outer bank (of the outside braid, where braided) of the left bank up to the OHWM of the outer bank (of the outside braid, where braided) of the right bank, including any sloughs, braids, or channels which carry water and are an integral part of the creek beginning from Big Lake (RM 0.0) upstream to its confluence with Lucille Creek (approximately RM 4.7). This description does not limit the quantities of water (flow rate) reserved by this decision and certificate to quantities (flow rates) within said OHWM boundaries. Said portion of Meadow Creek is located within:

| Township | Range | Sections |
|----------|--------|----------------------------|
| 17 North | 3 West | 14, 15, 16, 17, 18, 19, 20 |

All within the Seward Meridian.

LAS 28417: Little Meadow Creek

Applicant: Alaska Department of Fish and Game

Granted Reservation of Water Flows with a priority date of February 13, 2012:

| Time Period | Granted Reservation Flows (cfs) |
|-------------|---------------------------------|
| January | 3 |
| February | 3.5 |
| March | 3.5 |
| April | 7.2 |
| May | 10 |
| June | 7.5 |
| July | 6 |
| August | 8 |
| September | 8 |
| October | 6.9 |
| November | 5 |
| December | 4 |

cfs = cubic feet per second

Reservation of Water Reach Description: Little Meadow Creek from the Ordinary High Water Mark (OHWM) of the outer bank (of the outside braid, where braided) of the left bank up to the OHWM of the outer bank (of the outside braid, where braided) of the right bank, including any sloughs, braids, or channels which carry water and are an integral part of the creeks beginning from its confluence with Lucille Creek to a point upstream, approximately 2.6 miles, where it is joined by an unnamed source of surface water from the north. This description does not limit the quantities of water (flow rate) reserved by this decision and certificate to quantities (flow rates) within said OHWM boundaries. Said portion of Little Meadow Creek is located within:

| Township | Range | Sections |
|----------|--------|------------|
| 17 North | 2 West | 7 |
| 17 North | 3 West | 12, 13, 14 |

All within the Seward Meridian.

LAS 30925: Little Meadow Creek, Additional Flows

Applicant: Alaska Department of Fish and Game

Granted Reservation of Water Flows with a priority date of January 7, 2016:

| Time Period | Granted Reservation Flows (cfs) |
|-------------|---------------------------------|
| January | 0.5 |

cfs = cubic feet per second

Reservation of Water Reach Description: Little Meadow Creek, Additional Flows from the Ordinary High Water Mark (OHWM) of the outer bank (of the outside braid, where braided) of the left bank up to the OHWM of the outer bank (of the outside braid, where braided) of the right bank, including any sloughs, braids, or channels which carry water and are an integral part of the creeks beginning from its confluence with Lucille Creek to a point upstream, approximately 2.6 miles, where it is joined by an unnamed source of surface water from the north. This description does not limit the quantities of water (flow rate) reserved by this decision and certificate to quantities (flow rates) within said OHWM boundaries. Said portion of Little Meadow Creek is located within:

| Township | Range | Sections |
|----------|--------|------------|
| 17 North | 2 West | 7 |
| 17 North | 3 West | 12, 13, 14 |

All within the Seward Meridian.

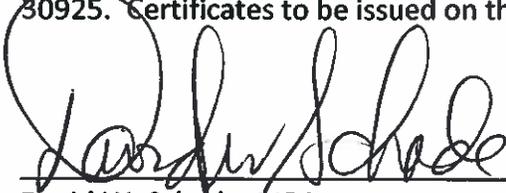
These applications are recommended for approval as described in the decision:



Kimberly Sager
Natural Resource Specialist, Water Resource Section
Reservation of Water Program
Division of Mining, Land, and Water
Alaska Department of Natural Resources

May 13, 2016
Date

Applications Approved for Meadow Creek and Little Meadow Creek – Case File LAS 11975, 28417, 30212, & 30925. Certificates to be issued on the 31st day after the decision; or, if any, after completion of all appeals:



David W. Schade, MPA
Chief, Water Resources Section
Division of Mining, Land, and Water
Alaska Department of Natural Resources

5-13-2016
Date

A person affected by this decision may appeal it, in accordance with 11 AAC 01. Any appeal must be received within 20 calendar days after the date of issuance of this decision, as defined in 11 AAC 02.040 (c) and (d), and may be mailed or delivered to Commissioner, Department of Natural Resources, 550 W. 7th Avenue, Suite 1400, Anchorage, Alaska, 99501; faxed to 907-269-8918, or sent by electronic mail to dnr.appeals@alaska.gov. If no appeal is filed by the appeal deadline, this decision becomes a final administrative order and decision of the department on the 31st day after issuance. An eligible person must first appeal this decision in accordance with 11 AAC 02 before appealing this decision to superior court. A copy of 11 AAC 02 may be obtained from any regional information office of the Department of Natural Resources.
