



U.S. Fish & Wildlife Service

Wild and Scenic River Eligibility Report

Arctic National Wildlife Refuge

Ivishak River - a Designated Wild River

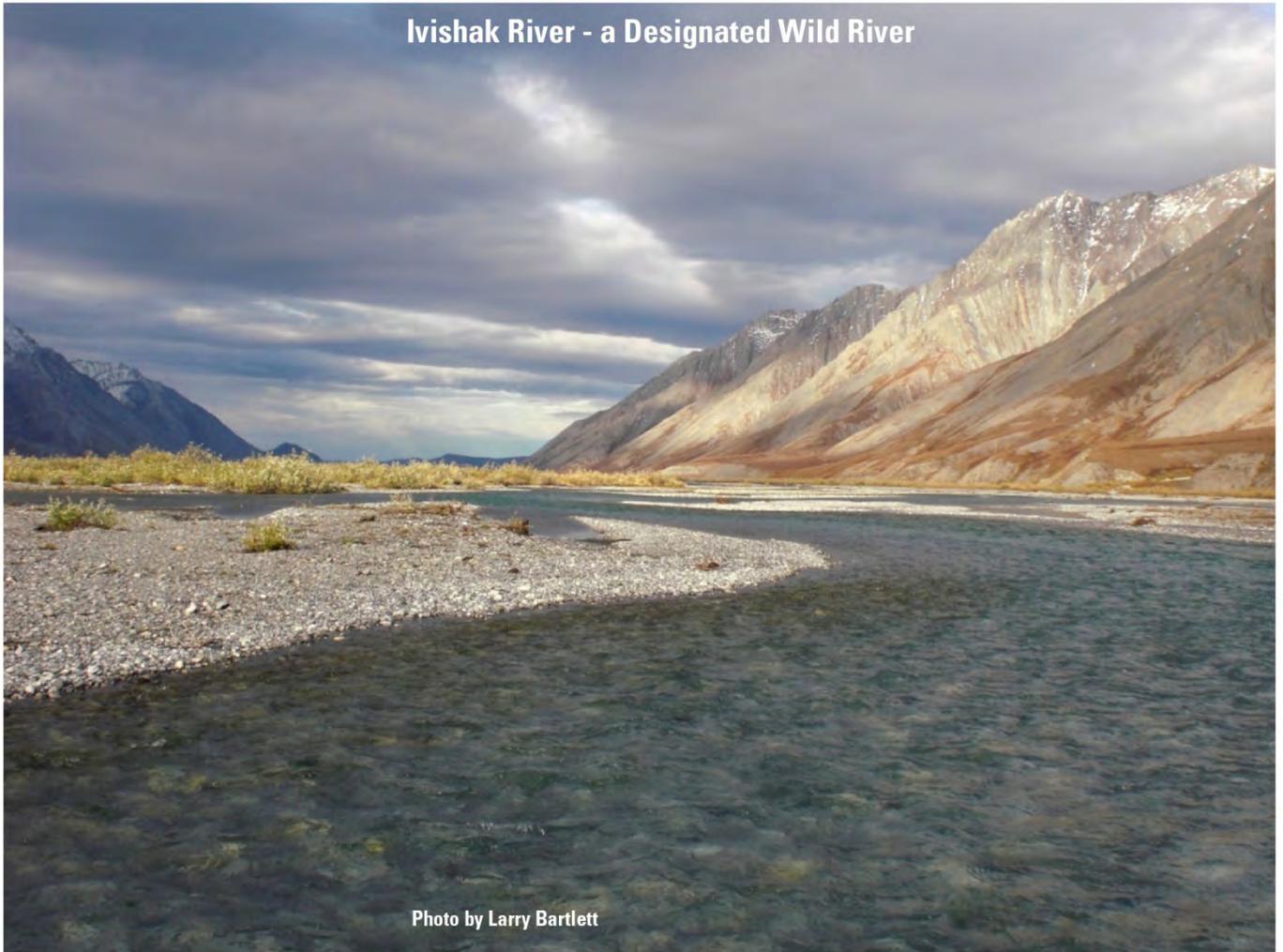


Photo by Larry Bartlett

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1. Introduction

The U.S. Fish and Wildlife Service (Service), Arctic National Wildlife Refuge (Refuge, Arctic Refuge), is conducting an inventory and analysis of Refuge rivers as part of the revised Comprehensive Conservation Plan (Plan, Revised Plan) planning process. The review of rivers in the planning area will determine whether rivers or segments of rivers are “eligible” and “suitable” for consideration in the National Wild and Scenic Rivers System (NWSRS). Wild and scenic river considerations are a required element of comprehensive conservation plans and are conducted in accordance with the refuge planning process outlined in 602 FW 3 3.4 C (1) (c) and (d) (Service 2000), including public involvement and National Environmental Policy Act compliance. The results of the eligibility phase are reported herein.

The Wild and Scenic Rivers Act (Public Law 90-542, as amended) establishes a method for providing Federal protection for certain free-flowing rivers and preserving them and their immediate environments for the use and enjoyment of present and future generations. The function of the Wild and Scenic River Review is to inventory and study the rivers and water bodies within the boundary of the Refuge to determine whether they merit inclusion in the NWSRS.

The act requires us to consider all river segments that are in the planning area and/or listed in the Nationwide Rivers Inventory (National Park Service 2008). The NRI is maintained by the National Park Service (NPS) and lists more than 3,400 free-flowing river segments in the United States that are believed to possess one or more “outstandingly remarkable” natural or cultural values judged to be of more than local or regional significance.

“In all planning for the use and development of water and related land resources, consideration shall be given by all federal agencies involved to potential national wild, scenic and recreational river areas, and all river basin and project plan reports submitted to the Congress shall consider and discuss any such potential. The Secretary of the Interior and the Secretary of Agriculture shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas within the United States shall be evaluated in planning reports by all federal agencies as potential alternative uses of the water and related land resources involved.”

1.1 Wild and Scenic Rivers Act of 1968

The Wild and Scenic Rivers Act was enacted by Congress in 1968 with the realization that, *“the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.”* Rivers that fall under this designation have to meet criteria of being free-flowing (Section 16(b) *“existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway”*) and possessing at least one outstandingly remarkable values (ORV): scenic, recreational, geologic, fish, wildlife, historic, cultural, or other. The act provides protection for included river segments so they are *“preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.”*

Rivers and river segments designated under the act are protected and managed to maintain their free-flowing character and ORVs that led to designation. Section 10 of the act mandates, *“each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values.”* Protections put in place for designated rivers are intended to protect and/or enhance the river at its current state. If a river or segment is added to the NWSRS, a specific plan based on the characteristics of the river or segment corridor would be created.

Under the authority of Section 5(a) of the act, the act has been amended to add rivers to the NWSRS and to require additional rivers and river segments to be studied for potential inclusion in the system. Enacted in 1980, the Alaska National Interest Lands Conservation Act (ANILCA) designated numerous rivers throughout Alaska as wild rivers, including the Ivishak, Sheenjek, and Wind Rivers (within the Refuge boundary). ANILCA also required that the Porcupine River be studied for potential designation. In 1985, the NPS completed an eligibility and suitability report for the Porcupine River and found that although the Porcupine River was eligible for the NWSRS, it was not suitable for inclusion (NPS 1984).

1.2 Steps in the Wild and Scenic River Process

The study and designation of watercourses under the act follows a multi-step process that occurs sequentially (eligibility and suitability are determined; a recommendation is made to the U.S. Department of the Interior; the President approves the recommendation and forwards it to Congress for action). The Refuge is examining the eligibility and suitability of waters during its comprehensive conservation plan revision process. The eligibility portion begins with an inventory of all potential rivers (Section 1.5) utilizing multiple sources (including public input) to identify all potential rivers. These rivers are then evaluated to determine if they meet the criteria set forth in the act. The rivers must be free-flowing and possess one or more ORVs (Section 2). Generally, the area surveyed for ORVs includes one-half mile on each side of the river (ANILCA 605 and 606). Rivers determined eligible are then classified as one of three tentative categories (wild, scenic, or recreational), depending on the level of development in the river corridor. This report covers these steps and details the reasoning behind finding a river segment eligible (Appendices A and B). A separate report studies and determines the preliminary suitability of rivers found eligible (see “Wild and Scenic River Suitability Report” in this appendix). The final decision on the suitability of a given river segment will be made in the record of decision (ROD) for the Refuge Revised Plan.

1.3 Protection of Eligible Rivers

Rivers determined eligible in this report are subject to protection until the suitability stage is finalized at the ROD. Following suitability determinations, river segments determined non-suitable return to the underlying management prescribed in the effective Plan, while suitable rivers are managed to maintain their free-flowing character and ORVs per the alternative selected in the Final Revised Plan.

1.4 Refuge Wild and Scenic Evaluation Team

The interdisciplinary study team is made up of specialists covering resources and programs under the Refuge's jurisdiction. This team compiled the initial inventory list, outlined resource concerns, determined and executed the evaluation process, and assessed ORVs based on knowledge of their assigned resource and/or program. The eligibility study relies on data and professional judgment, making the collective knowledge and experience of this team critical to the eligibility determination.

Table 1-1. Wild and Scenic River Review Team

| Team Member | Title |
|-------------------------|---|
| Heather Bartlett | Law Enforcement Officer/Pilot – Team Leader |
| Alan Brackney | Wildlife Biologist/GIS Specialist |
| Jennifer Reed | Park Ranger/Visitor Services Specialist |
| Sharon Seim | Natural Resource Planner |

1.5 Inventory Determination and Results

The team identified a comprehensive list of all named Refuge rivers and river segments from the U.S. Geological Survey (USGS) Geographic Names Information System and the National Hydrography Dataset (USGS 2010). A total of 160 named rivers and creeks were identified, all of which are free-flowing.

With 160 named rivers and creeks identified on the Refuge, and a general lack of information about most of these named waterways, the team decided to focus on a subset of these rivers at this time. Reviewing a subset does not preclude other waters from being reviewed at a future date, nor does it preclude the same waters from being reviewed again if they are found to not be eligible, suitable, and/or recommended for designation. The act recognizes that river values are not static in time and therefore allows for additional reviews to occur either at a particular site or across a conservation unit. At this time, the intent is not a comprehensive and final Wild and Scenic River Review.

The act was established to protect free-flowing rivers against threats such as damming, water pollution, and natural resource extraction, but it also provides land managers mechanisms to protect resources and values. Due to the isolated location of the Refuge and the difficulty in accessing the Refuge's lands and waters, the issue with the greatest potential to affect the river-related ORVs is visitor use. Therefore, visitor use is the greatest management concern. For these reasons, the team decided to focus on named

waters with visitor use and reliable flow. (The team did not review intermittent or unnamed waters.) The team used data about commercially supported visitor use (visitors that access the Refuge using a commercial operator—an air service and/or a guide) because data about independent visitor use (i.e., people who access the Refuge by private means—private airplane, via foot, etc.) is not available.

The data revealed that 32 waters receive commercially-supported visitor use, but 12 of those 32 waters receive visitor use that is not river related (e.g., mountaineering access, hunting outside the river corridor, etc.). Because the act states that ORVs must be directly river related, the team decided not to evaluate eligibility for those 12 waters. Therefore, 20 waters were identified as having river-related visitor use and were evaluated for eligibility (Table 1-2, Map 1-1).

Table 1-2. Reviewed Rivers

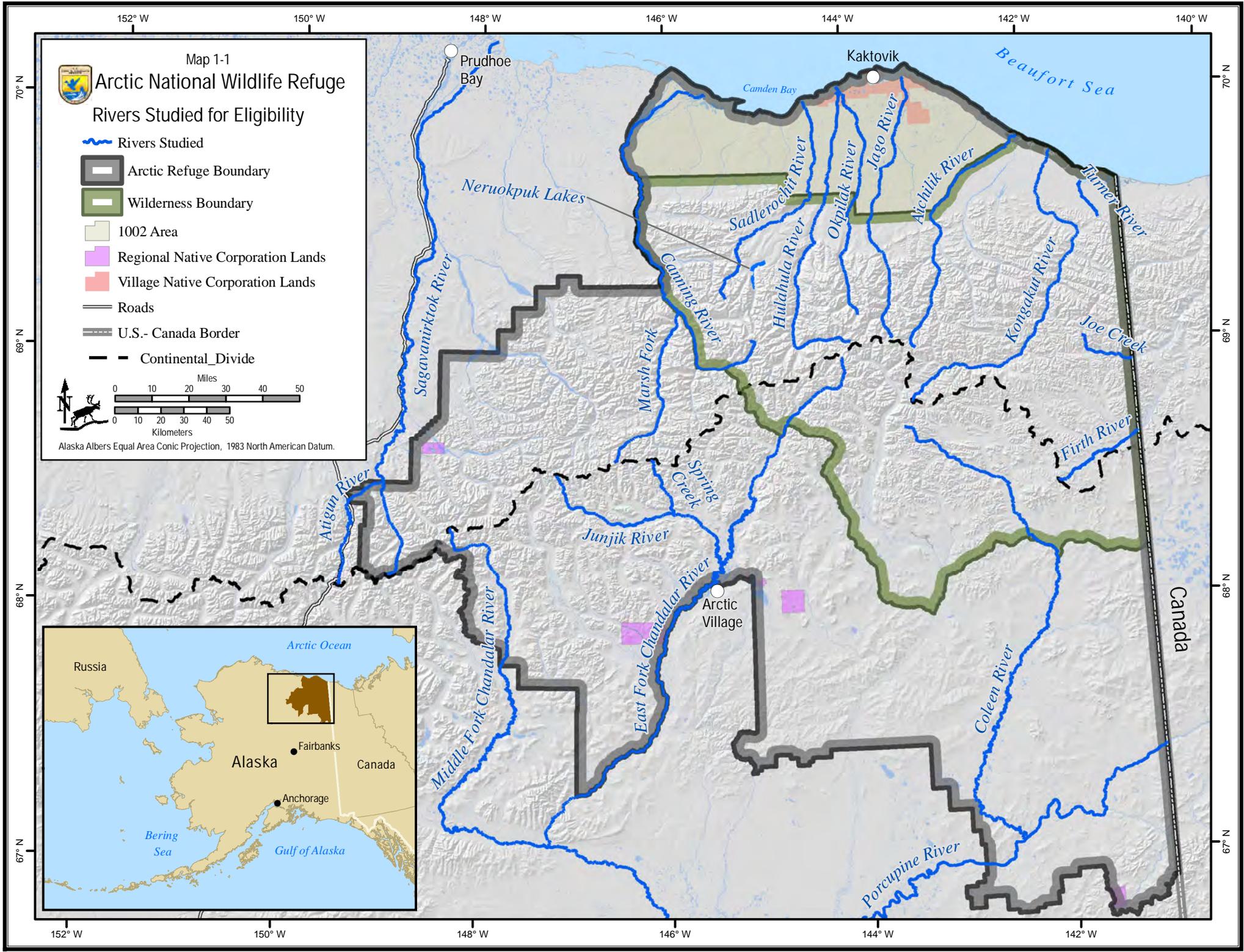
| | |
|-------------------------------|---|
| ▪ Aichilik River | ▪ Joe Creek |
| ▪ Atigun River | ▪ Junjik River |
| ▪ Canning River | ▪ Spring Creek |
| ▪ Marsh Fork Canning River | ▪ Kongakut River |
| ▪ Coleen River | ▪ Okpilak River |
| ▪ East Fork Chandalar River | ▪ Sadlerochit River |
| ▪ Middle Fork Chandalar River | ▪ Neruokpuk Lakes (Peters and Schrader Lakes) |
| ▪ Firth River | ▪ Porcupine Rivers |
| ▪ Hulahula River | ▪ Sagavanirktok River |
| ▪ Jago River | ▪ Turner River |

1.6 Other Agency and Public Input

The Refuge initiated a formal comment period for the Revised Plan on April 7, 2010, that ended on June 7, 2010. The Service received 94,061 responses, consisting of 1,480 substantive original responses and 92,581 form letters. Of these, 54 mentioned wild and scenic rivers. A majority of comments regarding wild and scenic rivers expressed either support or opposition for the study of specific rivers to designate as part of the NWSRS. Several comments referred to personal experiences on specific rivers and pointed out particular characteristics as reasons why such rivers should or should not be considered for designation. Multiple river specific comments were also generated by the public in regard to an increase in visitor use, watershed protection, physical and social setting character, development, wilderness character, and resource protection.

Comments opposing designation asserted that rivers in the Refuge receive adequate protection under Refuge mandates and policies. Many commenters indicated that the focus for wild and scenic river designation should be on rivers outside of designated wilderness. Others indicated wild and scenic river designations could affect subsistence activities. A few comments were made regarding legal authority to regulate or manage uplands in the river corridors.

Comments supporting wild and scenic river designation pointed out unique characteristics of specific rivers (e.g., ramparts on the Porcupine River), as well as the wildlife supported by the



river systems, and recommended that the Revised Plan outline protective measures for wild and scenic river characteristics and values, especially those threatened with increased visitor use or development. Several other characteristics, ranging from cultural and historical significance to bioacoustics of specific rivers, were specified as criteria for designation. Many commenters recommended an inventory of all rivers in the Refuge to identify unique characteristics and values, as well as published methods and selection criteria for determining wild and scenic river designation.

Others commented on the importance of management approaches to maintain the integrity and purposes of designated rivers, and that these should be outlined in the Revised Plan.

Many comments provided ideas about how to gather information about potential wild and scenic rivers on the Refuge. For example, some comments indicated that tribal watershed management could provide important information regarding river management. Others pointed out the importance of continued monitoring of waters in the Refuge for water quality and quantity.

2. Eligibility Criteria

2.1 Determination of Free-Flowing

The term “free-flowing” is defined as:

“Existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway....”

2.2 Outstandingly Remarkable Values and Region of Comparison

Section 1(b) of the act identifies outstandingly remarkable values (ORVs) in the following manner:

“It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.”

While the spectrum of resources that may be considered is broad, ORVs must be directly river related. They should:

1. Be located in the river or on its immediate shore lands (within one-half mile on either side of the river);
2. Contribute substantially to the functioning of the river ecosystem; and/or
3. Owe their location or existence to the presence of the river.

2.2.1 Defining ORVs

The Refuge evaluated the seven ORVs mentioned in the act: scenic, recreational, geologic, fish and wildlife, historic, and cultural or some other similar value. The team clearly defined each ORV in advance of the eligibility evaluation to encourage an unbiased assessment. To provide consistency with other wild and scenic river reviews across the nation, the team looked at ORV definitions developed by other agencies and guidance provided by the Interagency Wild and Scenic Rivers Coordinating Council. The council offers eligibility criteria for establishing the presence of an ORV but does not specifically define what each ORV means (Interagency Wild and Scenic Rivers Coordinating Council 1999).

Both the U.S. Forest Service (U. S. Forest Service 2006) and the Bureau of Land Management (Bureau of Land Management et al. 1992) have developed a standard set of definitions for the seven ORVs identified by the act. The Bureau of Land Management definitions sometimes reference their agency policy, whereas definitions from the U.S. Forest Service are not tied to policy. In the State of Utah, Federal land managers took these definitions one step further (Bureau of Land Management et. al. 1996). They developed sub-definitions (also called “components”) for each ORV and explained how each sub-definition would be rated.



Map 2-1

Arctic National Wildlife Refuge

Regions of Comparison for Wild & Scenic River Eligibility Analysis

A

Arctic Refuge divided into North and South Slopes



B

Interior Yukon River Basin



C

Native Alaskan Language Groups on the Arctic Slope and Upper Yukon Basin

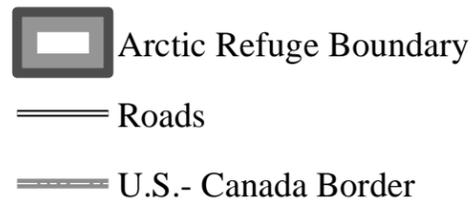


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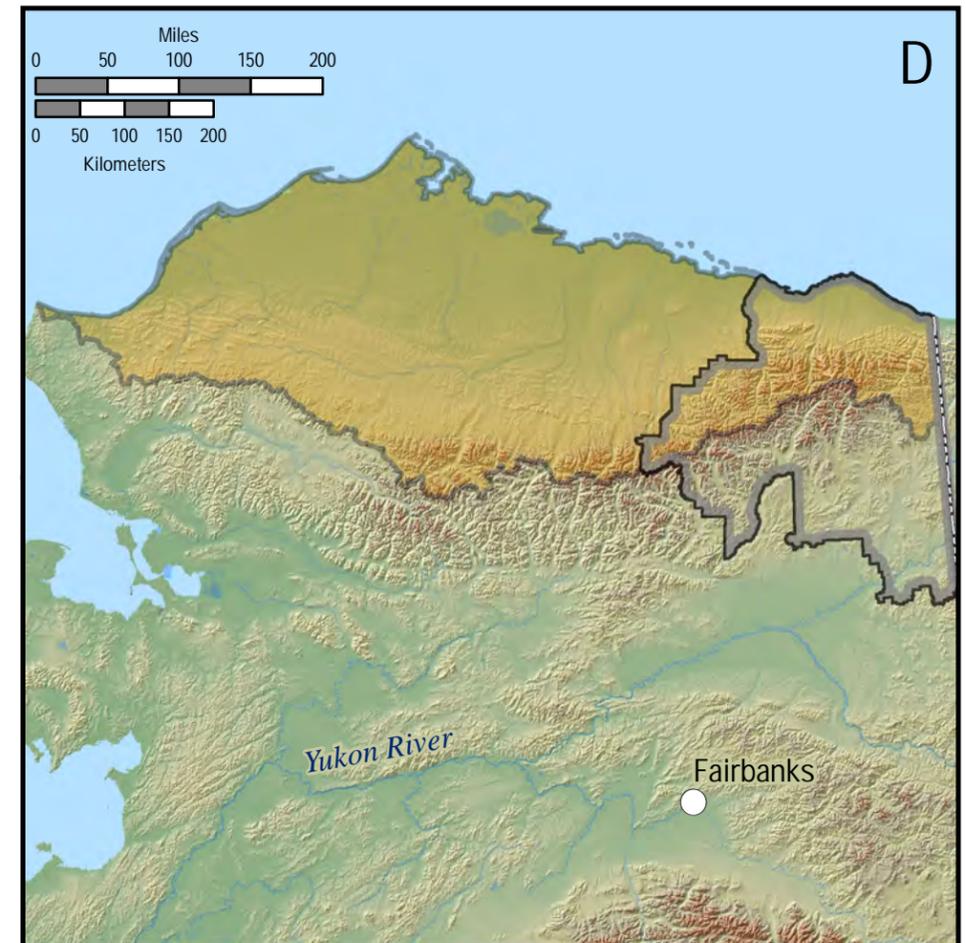
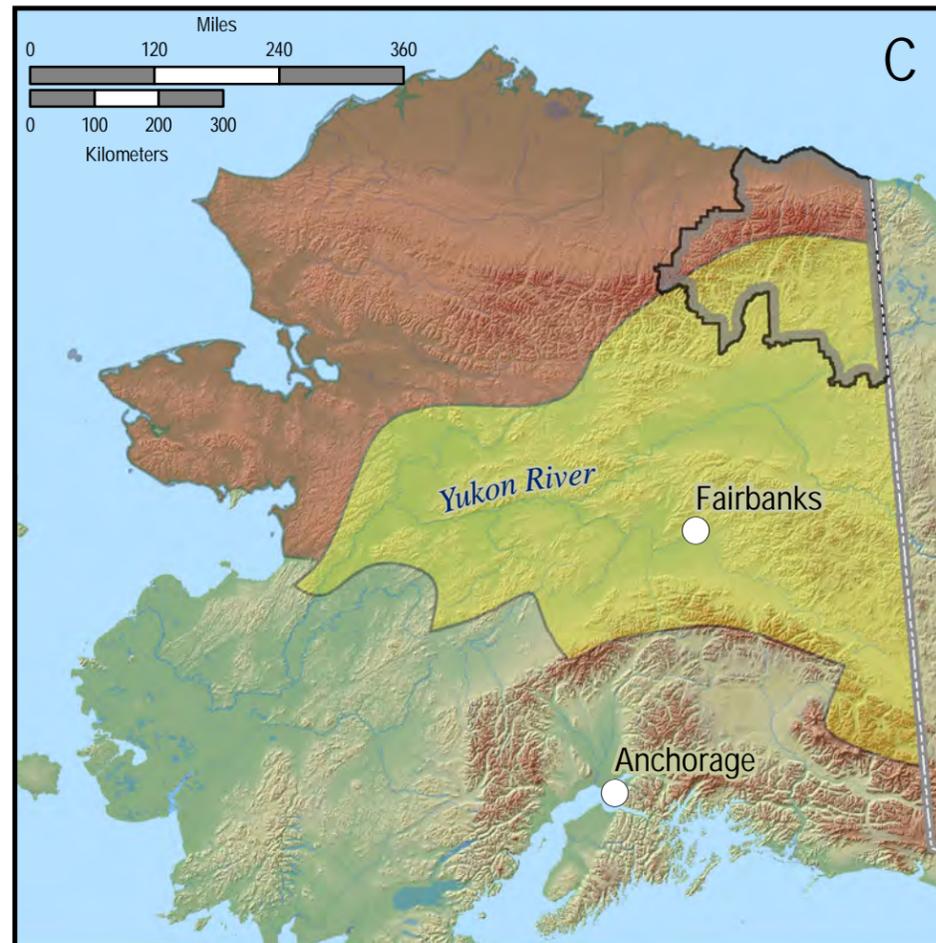
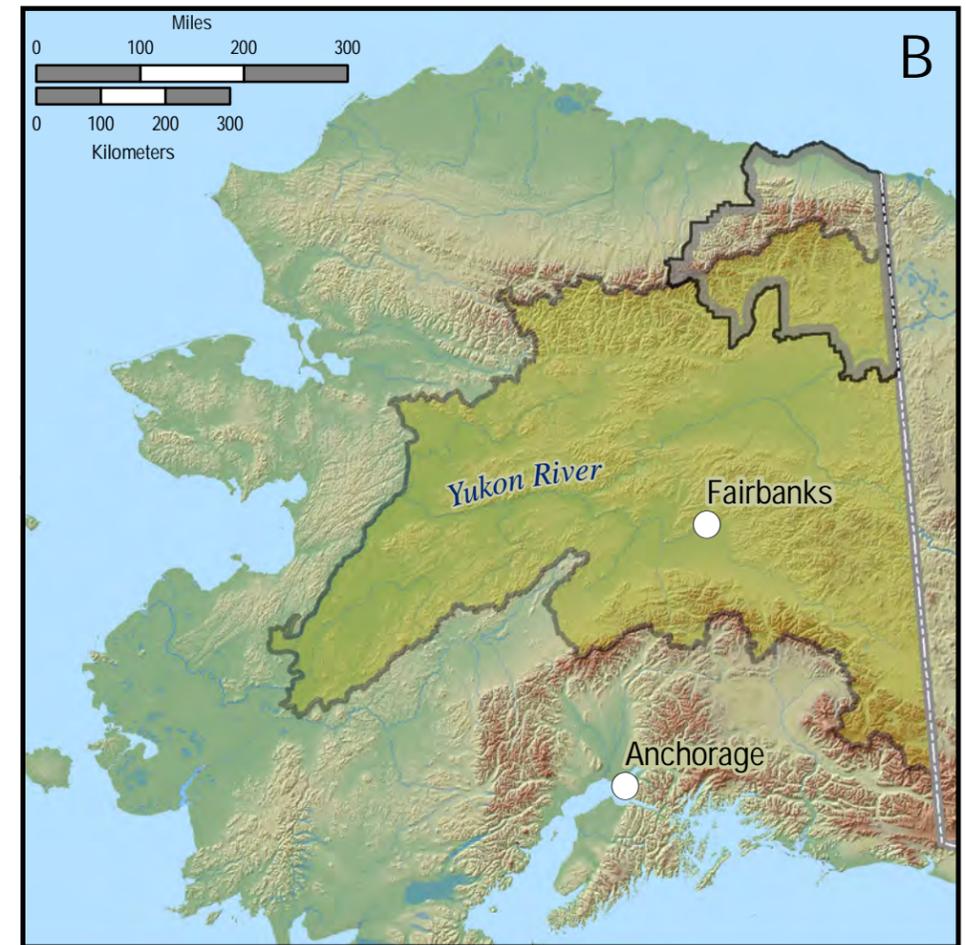
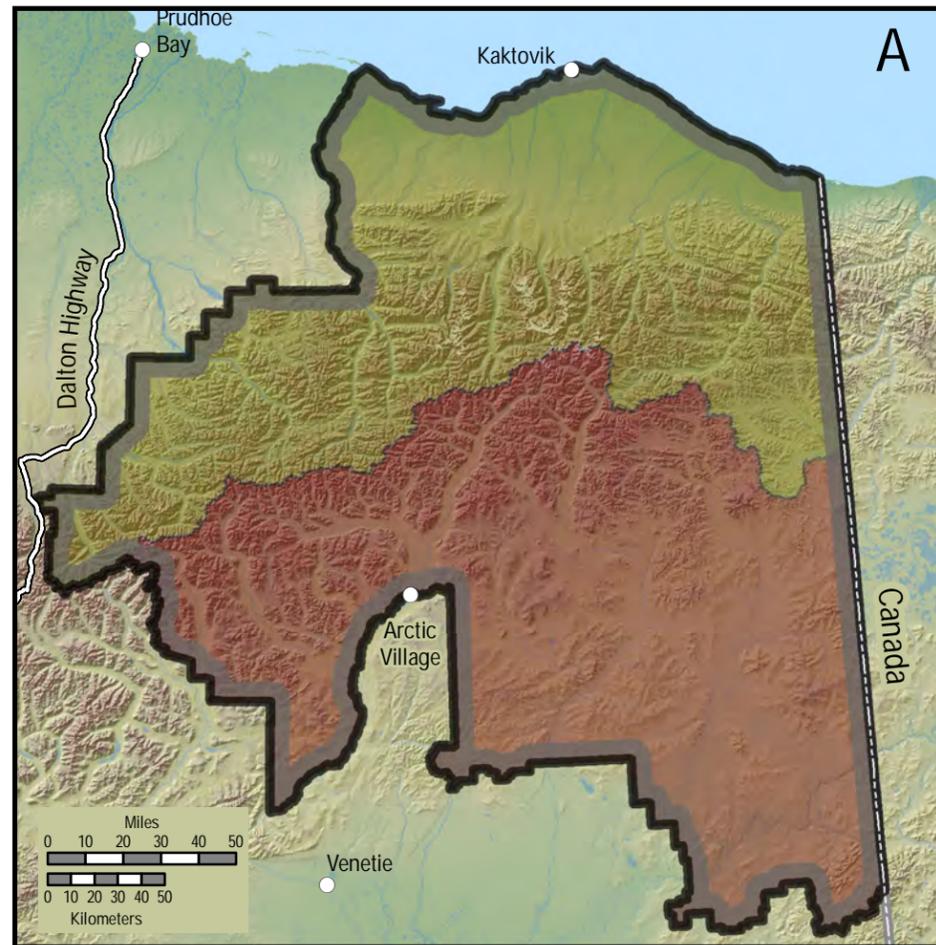
Arctic Slope of Alaska



Other Features



Alaska Albers Equal Area Conic Projection, 1983 North American Datum.



For the Refuge eligibility study, definitions and components were created for each ORV specific to Alaska resources and are included as Appendix A of this document.

2.2.2 *Defining Region of Comparison*

The next step in the process was to determine what region of comparison (ROC) would be used to evaluate each river. The Interagency Wild and Scenic Rivers Coordinating Council guidance says the ROC is not fixed and that it should provide for meaningful comparative analysis (Interagency Wild and Scenic Rivers Coordinating Council 1999). The ROC should not be so large that no river would be eligible or so small that every river would be eligible. The guidance also says the ROC does not need to be the same for each ORV. Each ORV was reviewed separately and evaluated to determine a reasonable ROC (Appendix A, Map 2-1).

For example, the scenery on the Refuge is drastically different on the north side (north of Continental Divide) versus the south side of the Brooks Range. Each ORV was reviewed separately and evaluated to determine a reasonable ROC. Scenery north of the Brooks Range is drastically different in form, line, color, and texture than scenery south of the Brooks Range. Due to this dramatic variation, two ROCs were selected for the scenic ORV.

Conversely, recreation occurs across the entire Refuge in generally the same manner (e.g., bush planes are required for access; there are no roads or trails directing travel to specific locations; the entire Refuge is extremely remote; commercial operators report visitation the same way across the Refuge). Therefore, the Refuge would serve as the Recreational ROC. The ORV definitions follow for the individual ROCs.

2.3 Potential Classifications

After a river is determined to be eligible, it must be classified using the definitions in the act. Classifications are based on the amount of development and access on and around the immediate shorelines of the river. Section 2(b) of the act defines the classifications of wild and scenic rivers in the following manner:

“Every wild, scenic or recreational river in its free-flowing condition, or upon restoration to this condition, shall be considered eligible for inclusion in the National Wild and Scenic Rivers System and, if included, shall be classified, designated, and administered as one of the following:

*1) **Wild river areas** – Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.*

*2) **Scenic river areas** – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.*

*3) **Recreational river areas** – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.”*

The classification assigned at this stage is preliminary and can be changed during the suitability study.

3. Eligibility Study

ORV Assessment

Each member of the team gathered information on each of the 20 rivers, whether narrative (qualitative), numerical (quantitative), or a combination thereof, and then presented their research to the full team. In many—if not all—cases, other team members identified additional resources and datasets. In the end, data was gathered from all possible known sources, which sometimes included institutional knowledge from other Refuge and agency staff.

The purpose of the eligibility evaluation is to compare and contrast each river to other waters in the ROC for each ORV. In some instances, datasets were rejected or component definitions were not analyzed because the available data did not allow the team to compare and contrast the rivers. It was not helpful to include a dataset that had the same result for all the rivers or a dataset that applied only to a subset of the rivers being evaluated.

As a team, each definition and sub-definition was reviewed for each ORV to make a final determination of the appropriate data to use and how each dataset would be analyzed to meet the requirements of the ORV definitions. A system was developed to rank the analytical results river-by-river for each ORV. While each of the ORVs and their components were evaluated separately using a distinct process, some commonalities exist for the assessment process:

- 1) All component scores were evaluated on a scale of zero to five, with five being the maximum number of points a component definition could score. This was to avoid weighting one component of an ORV over another.
- 2) The team used both single datasets and multiple datasets to fully evaluate each component. If multiple datasets were used, averages of the scores for each dataset were used so that the total component would score no higher than five.
- 3) A dataset was only used once across all ORVs. This was to avoid weighting certain data over others.
- 4) The team chose to use numeric (quantitative) data over narrative (qualitative) data whenever possible. For some datasets, only qualitative data were available.
- 5) The maximum number of points a river could score varied across ORVs based on the number of sub-definitions. For example, there are six components for the recreational ORV for a maximum score of 30, while the Scenic ORV has three components for a maximum score of 15.
- 6) According to Department of Interior guidance (47 FR 39453-39461 1982), “The determination of whether a river area contains ‘outstandingly remarkable’ values is a professional judgment on the part of the study team.” The study team decided to “grade” the rivers being reviewed by percent-of-total-score for each ORV. A river which received a score of at least 70 percent of the total possible points was assigned that ORV.

3.1 Eligibility Results

Of the rivers studied for eligibility at this time, 10 rivers were identified as free-flowing and possessing at least one ORV. The locations of inventoried and eligible rivers are shown in Table 3-1 and on Map 3-1.

Eligible rivers are subject to protection until the suitability study is finalized with a ROD. Following suitability determinations, rivers (or river segments) determined non-suitable return to the underlying management prescribed in the applicable Plan, while suitable rivers are managed to maintain their free-flowing character and ORVs per the alternative selected in the Final Revised Plan.

Table 3-1. Eligible Rivers

| River System | Description | River Length | *Segment Length | **Preliminary Classification | Remarkable Values |
|----------------------------------|---|--------------|-----------------|------------------------------|--------------------------------|
| Atigun River | The Atigun River, which is a tributary of the Sagavanirktok River, flows into the Refuge from bordering lands with the State and Bureau of Land Management and can be accessed by the Dalton Highway. The Refuge's portion is often referred to as Atigun River Gorge. | 43 | 11 | Wild | Geologic, Recreational |
| Canning River | The Canning River is the longest north-flowing river in the Refuge. It forms the western boundary of the Refuge and flows through mountains, foothills, coastal plain, and empties into the Beaufort Sea. | 125 | 125 | Wild | Wildlife, Fish, Cultural |
| Marsh Fork Canning River | The Marsh Fork is the Canning River's main tributary, and it flows in from the west as it cuts through the rugged, striking landscape of the Phillip Smith Mountains. | 54 | 54 | Wild | Recreational |
| East Fork Chandalar River | The East Fork Chandalar River is a major tributary of the Chandalar River and serves as a highway to subsistence hunting, fishing, and trapping areas. From approximately Arctic Village south, the eastern half of the river, including the eastern stream bed, is not within the Refuge boundary. | 223 | 204 | Wild | Cultural |
| Hulahula River | The Hulahula River originates in glaciers of the Romanzof Mountains, flows west for a ways, and then sharply turns to the north as it flows between Mt. Chamberlin and Mt. Michelson and out to Camden Bay. | 97 | 97 | Wild | Recreational, Cultural |
| Jago River | The Jago River is flanked by the Romanzof Mountains and is fed by the McCall Glacier on Mt. Itso. It flows through the mountains to the coastal plain and finally to the Beaufort Sea. | 84 | 84 | Wild | Wildlife |
| Kongakut River | The Kongakut is the only major floatable North Slope river whose entire watershed is in designated wilderness. Originating high in the mountains of the eastern Brooks Range, the river flows north through miles of rugged mountains to the coastal plain and empties into the Beaufort Sea. | 116 | 116 | Wild | Recreational, Scenic, Geologic |

| River System | Description | River Length | *Segment Length | **Preliminary Classification | Remarkable Values |
|--|---|--------------|-----------------|------------------------------|--|
| Okpilak River | The silt-laden Okpilak begins in the heart of the most active glacial area of the Refuge. Its rugged, steep terrain and melting icy masses create a torrent of water in the headwaters that is channeled through a vertical canyon and then abruptly flattens as it flows onto the coastal plain to the Beaufort Sea. | 73 | 73 | Wild | Scenic, Geologic |
| Neruokpuk Lakes (Peters and Schrader Lakes) | These lakes are the two largest and most northern arctic alpine lakes in North America. The two large, deep, connected lakes are surrounded by steep slopes rising to some of the highest peaks in the Brooks Range. | 10 | 10 | Wild | Scenic, Geologic, Fish |
| Porcupine River | The Porcupine is one of the largest tributaries of the Yukon River and is a historically important travel route. The Refuge portion begins at the Canada/U.S. border and flows downstream for approximately 85 miles. | 476 | 85 | Wild | Historic, Cultural, Geologic, Wildlife |

**Segment length is approximate; it refers to the portion of the river that flows within the boundaries of Arctic Refuge and was evaluated. River length is the entire river. Both lengths are identified in miles.*

*** Preliminary classifications are interim classifications and can change through the Suitability, Recommendation, or Designation phases*

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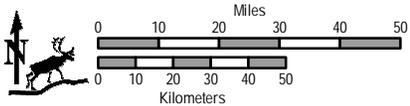
Map 3-1



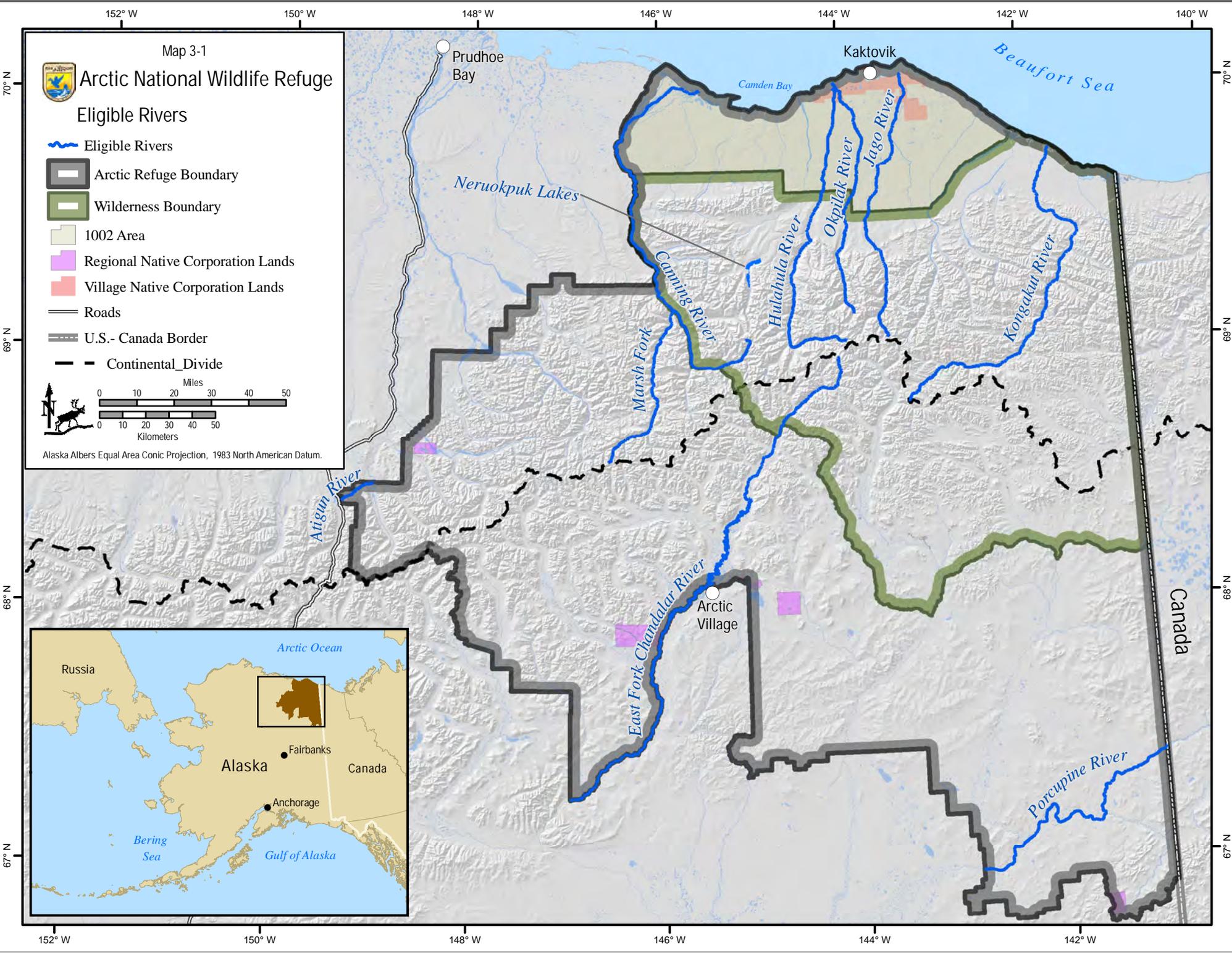
Arctic National Wildlife Refuge

Eligible Rivers

-  Eligible Rivers
-  Arctic Refuge Boundary
-  Wilderness Boundary
-  1002 Area
-  Regional Native Corporation Lands
-  Village Native Corporation Lands
-  Roads
-  U.S.- Canada Border
-  Continental Divide



Alaska Albers Equal Area Conic Projection, 1983 North American Datum.



4. Suitability Analysis

4.1 Process for the Suitability Phase

For information about the suitability phase and results, please see the “Wild and Scenic River Suitability Report” in this appendix.

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Appendix A - Definition of ORVs

SCENIC

The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions. When analyzing scenic values, additional factors such as scale and diversity of view, special features, seasonal variations in vegetation, and cultural modifications may be considered. Scenic and visual attractions may be highly diverse over the majority of the river or river segment. Highly scenic, pristine rivers are of higher value compared to rivers that are visually monotonous or developed.

Region of Comparison

In Arctic Refuge, rivers north of the Continental Divide were compared to each other (with one exception—the Firth River was grouped with south side rivers because of the spruce trees), and rivers south of the Continental Divide were compared to each other.

Diversity of View

Consider the presence of high relief; severe surface variation; rich color combinations (i.e., high variety, vivid colors); pleasing contrast in soil, rock, vegetation, and water; views that greatly enhance visual quality; and still or cascading water that is dominant in the landscape. River corridors with the greatest diversity and variety of views, both foreground and background, and those providing a sense of vastness of scale are of higher value.

Special Features

Consider outstanding natural features; landforms with unusual or outstanding topographic features (e.g., gorges, high relief, rock outcrops, canyons, falls, rapids, springs, color, vegetation, plains, permafrost, wetlands, rolling hills, ridges, mountains, tundra, glaciers, flats, tundra benches, vast valleys, pingos, aufeis, etc.). River corridors with high relief and focal points that are visually striking, particularly memorable, or rare in the region are of higher value.

Seasonal Variations

Consider diversity of vegetation types in interesting patterns, textures, color, and contrast. River corridors with the greatest seasonal variation and diversity are of higher value.

RECREATIONAL

Arctic Refuge is valued for its true wilderness recreational experience as well as other opportunities (e.g., wildlife viewing, hiking, technical ease of floating, etc.) that draw visitors. River-related recreational values are, or have the potential to be, compelling enough to attract visitors from beyond the ROC or are unique or rare in the region. Values include, but are not limited to, a wide variety of river-related dependent opportunities for remote adventure, challenge, and exploration, and immersion in vast, unaltered landscapes.

Region of Comparison:

Recreation values were evaluated across the entire Refuge.

Diversity of Use

Consider the number and variety of watercraft that can be used on the river, as well as all other recreation uses occurring in the corridor that are directly river-dependent during fall, winter, and spring seasons. Rivers allowing for the largest number and diversity of watercraft and other use types are of higher value.

Experience Dimensions

Consider opportunities to experience a sense of adventure, exploration, challenge, discovery, independence, self-reliance, unknown, and risk, and/or opportunities to engage in expedition-style or epic-length trips. Consider the comparative number or percent of similar experiences available in the ROC. Rivers that provide the most remote opportunities are of higher value.

Access

This evaluative criterion ranks the two extremes at higher value. Consider ease of access to and use of the river corridor. Rivers with the most difficult access are of higher value because they reduce crowding and/or provide opportunities for true adventure. Rivers with easiest access are also of higher value because they allow for ready recreational opportunities.

Level of Use

This evaluative criterion ranks the two extremes at higher value. Consider the number of people using the river corridor. Rivers with the least amount of use are of higher value because they have limited crowding and provide opportunities for true adventure. Rivers with the most use are of higher value because they are destination points for many Refuge visitors.

Associated Opportunities

Consider the variety, frequency, and quality of opportunities encountered along the river for hiking, photography, fishing, hunting, wildlife viewing, and other similar experiences. Rivers with opportunities for superlative associated recreation are of higher value.

Attraction

Consider the ability to attract visitors from outside the geographic region. Rivers that attract a variety of users who are willing to travel some distance with their primary intent to use the river for water-oriented recreation and rivers that provide a setting for nationally renowned opportunities are of higher value.

GEOLOGIC

The river corridor contains geologic features, processes, or phenomena that are unique, rare, or representative in the ROC. The feature(s) may be in an unusually active stage of development and/or represent a unique, rare, or representative combination of geologic or hydrologic features.

Region of Comparison

Geology values were evaluated across the entire Refuge.

Feature Abundance

Consider landforms with unusual or outstanding geologic or hydrologic features (e.g., caves, relic shoreline, waterfalls, canyons, springs, pingos, active glaciers, rare fossils, unique rock formations, and outcrops). River corridors with an abundance of unusual, unique, and distinctive geologic features are of higher value.

Diversity of Features

Consider the number and variety of special geologic or hydrologic features and the value of these features to the ROC. Consider the unique or rare combination of geologic or hydrologic features (e.g., erosional, volcanic, and glacial). River corridors with the greatest diversity of geologic or hydrologic features are of higher value.

Educational/Scientific

Geologic and/or hydrologic features clearly and graphically reveal interesting and/or unique educational or scientific aspects of Earth's history. River corridors that contain rare; one-of-a-kind; or common but the best representative example of a geologic feature in the ROC are of higher value.

FISH

Fish populations on the Refuge remain wild and retain their natural population dynamics and cycles. In that context, fish values will be judged on the relative merits of fish populations and habitat. The river contains internationally, nationally, or regionally important populations of resident and/or anadromous species of indigenous fish. Of particular significance is the presence of rare species (federally listed, State-listed, or candidate threatened or endangered species). Diversity of species is an important consideration and could, in itself, lead to a determination of outstandingly remarkable.

Region of Comparison

Fish values were evaluated in two sub-regions in the State of Alaska: the North Slope of the Brooks Range and the Yukon River Basin.

Habitat

The river provides exceptionally high quality habitat for fish of national or regional significance, or may provide unique or particularly valuable habitat for rare species (federally listed, State-listed, or candidate threatened or endangered species). Diversity of habitats is an important consideration and could, in itself, lead to a determination of outstandingly remarkable.

Habitat Quality

Consider the presence, extent, and carrying capacity of spawning areas, rearing areas, and adult habitat; and habitat for wild stocks and rare species (federally listed, State-listed, sensitive species, or candidate species). Areas with the greatest amount and best habitat, especially for wild stock and rare species, are of higher value.

Diversity of Species

Consider the number of species present and the value of these species. Rivers with greater diversity of species, including wild stocks and rare species, are of higher value.

Abundance of Fish

Rivers with more fish are of higher value.

WILDLIFE

Wildlife populations on the Refuge retain their natural interactions, population dynamics, and cycles. In that context, values shall be judged on the relative merits of populations and habitat.

Populations

The river corridor contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique or rare (federally listed, State-listed, or candidate threatened or endangered species). Diversity of species is an important consideration and could, in itself, lead to a determination of outstandingly remarkable.

Habitat

The river corridor provides exceptionally high-quality habitat for wildlife of national or regional significance, or may provide unique habitat or a critical link in habitat conditions for rare species (federally listed, State-listed, or candidate threatened or endangered species). Contiguous habitat conditions are such that the biological needs of the species are met.

Region of Comparison

Wildlife values were evaluated in two sub-regions in the State of Alaska: the North Slope of the Brooks Range and the Yukon River Basin.

Habitat Quality

Consider the presence, extent, and carrying capacity of a variety of wildlife habitats, including winter range, summer range, transition zones, and travel corridors, and calving, denning, or nesting areas. Consider unique habitats or critical links in habitat for rare species (federally listed, State-listed, sensitive species, or candidate species). Areas with the greatest and best habitat, contiguous habitat, and habitat for rare species are of higher value.

Species Diversity

Consider the number and variety of species present and the value of these species. Rivers with the greatest diversity of species, including rare species, are of higher value.

Species Abundance

Rivers with the greatest number of wildlife in the river corridor are of higher value.

HISTORIC

The river corridor contains a site(s) or feature(s) associated with a notable event, an important person, or a cultural activity of the past that was rare; one-of-a-kind; or common but the best representative example in the ROC. Many such sites are listed on the Alaska Heritage Resources Survey or on the National Register of Historic Places. A historic site(s) and/or features(s) is 50 years old or older in most cases.

Region of Comparison

Historic values were evaluated across the State of Alaska.

Historical Importance

Consider river corridors that contain a site or feature associated with a historically important event, person, or activity of the past. Rare, unique, or unusual sites or features in the ROC are of higher value

Site Integrity

Consider the presence of exceptional examples of historic sites that are unmodified and retain their original character. River corridors that contain exceptional sites in exceptional condition are of higher value.

Listing/Eligibility

Consider sites or features that are currently listed in, or are eligible for, the National Register of Historic Places or that have been nominated for or designated as National Historic Landmarks. Rivers with such features, particularly in abundance, are of higher value.

Educational/Interpretation

Consider sites that have regional or national importance for interpreting notable historic events, sites, or people; sites that clearly and graphically reveal an interesting or unique history; and/or sites that have the ability to attract visitors. River corridors that contain the best representative examples of historic events in the ROC are of higher value.

CULTURAL

The river, or area in the river corridor, contains a site(s) where there is evidence of occupation or use by Alaska Natives. Sites must have unique or rare characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; may have been used by cultural groups for rare or sacred purposes; and/or may have exceptional subsistence value. Sites may be listed on the Alaska Heritage Resources Survey or on the National Register of Historic Places.

Region of Comparison

Athabascan cultural values were evaluated in the Athapaskan language region in Alaska, north of the Alaska Range. Inupiat cultural values were evaluated in the Inupiaq language region in Alaska.

Notable Occupation

Consider evidence of important occupation and use by Alaska Natives or other prehistoric cultures (i.e., Inupiat or Athabascan prehistory sites, prehistoric sites, ceremonial areas, fishing areas, sacred religious sites). Consider sites that are notable in the archaeological record, are rare, or represent an area where a culture was first identified. Rare, notable, unique, or unusual sites or features in the Region are of higher value.

Cultural/Subsistence Importance

Consider areas of exceptional human interest values. River corridors with notable quality, quantity, or variety of cultural or subsistence uses; or river corridors used for rare or sacred purposes are of higher value.

Number of Cultures

River corridors that represent more than one culture or cultural period that may have been used concurrently by more than two culture groups are of higher value.

Site Integrity

Consider the presence of exceptional examples of Alaska Native or prehistoric features or remains from an important period in history; sites that are unmodified and retain their original character; and features that are in excellent condition and provide an exceptional example in the ROC. River corridors that contain exceptional sites in exceptional condition are of higher value.

Listing/Eligibility

Consider corridors that contain sites or features that are currently listed in, or are eligible for, the National Register of Historic Places of National Historic Landmarks. Rivers with such features, particularly in abundance, are of higher value.

Educational/Interpretation

Consider sites that have Regional or National importance for interpreting significant prehistoric events, sites, or people; sites that clearly and graphically reveal an interesting or unique history; and/or sites that have the ability to attract visitors. River corridors that contain the best representative examples of Alaska Native or other prehistoric culture in the ROC are of higher value.

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Appendix B - Detailed Analysis by ORV

Scenic ORV

The Scenic ORV has three components: diversity of view, special features, and seasonal variations. Data were gathered for each component, and each component was analyzed separately. For each component, north-side rivers were evaluated separately from south-side rivers to reflect the ROC for the Scenic ORV.

Diversity of View: The sub-definition for Diversity of View identifies that river corridors with the greatest diversity and variety of views have the highest value. The team gathered narrative descriptions for each river from a variety of published literature and agency reports. Institutional knowledge was solicited from staff members by interviewing those who have worked for the Refuge for more than 10 years or those who have a great deal of on-the-ground experience in the Refuge, especially on its rivers. Individual team members then ranked each river on a scale of zero (no scenic diversity) to five (outstanding scenic diversity) based on the overall sense of diversity of view from literature, staff descriptions, and the personal knowledge of team members. The final ranks were averaged across the team. If a staff member had mentioned one or more of the rivers as their choice for most scenically diverse, then those mentions were included in the final average.

Special Features: The sub-definition for Special Features states that corridors with high relief and focal points that are visually striking, particularly memorable, or rare in the region have the highest value. This component of the Scenic ORV was interpreted to be the superlative features associated with Scenic in each river corridor. Using narratives from the literature, staff descriptions, and personal knowledge, the team collectively listed each superlative scenic feature in each river corridor. Examples of features included in the component definition have been used as a guide for the type of features to include in the list.

Once the list was compiled, the number of superlative features was totaled. For north-side rivers, the number of special features ranged from one to nine. The number of features was ranked according to the following scale: five points for nine or more features; four points for seven to eight features; three points for five to six features; two points for three to four features; one point for one to two features; and zero points for zero features. For south-side rivers, the number of special features ranged from zero to 15. However, 15 was considered an outlier—it was magnitudes higher than the next highest number. The ranking used for south-side rivers was equal to the number of special features in each river corridor: rivers with five or more features received five points, rivers with four features received four points, etc.

Seasonal Variations: The component definition for Seasonal Variations explains that river corridors with the greatest seasonal variation and diversity are of higher value. The number of vegetation and habitat types provided insight as to the visual diversity afforded by seasonal changes—the more vegetation types in a corridor and the greater diversity among the plant communities, the more diverse the seasonal changes of color and pattern would likely be in the corridor. Because the number of vegetation and habitat types is highly correlated with the

length of each river, the number of types was divided by river miles to have a more reliable measure of vegetational variety.

The number of habitat or vegetation types per river mile ranged from a low of 0.07 to a high of 1.26. Rivers received five points for one or more habitat types per mile; four points for 0.75 to 0.99 habitat types per mile; three points for 0.5 to 0.74 types per mile; two points for 0.25 to 0.49 types per mile; one point for 0.1 to 0.24 types per mile; and zero points for less than 0.1 habitat or vegetation types per river mile.

Final Score: Once all three components had been ranked, the scores for the components were compiled for each river. From this point forward, the analysis encompassed all 20 rivers, rather than looking at north-side rivers separately from south-side rivers.

Total scores for the Scenic ORV ranged from 4 to 13 points. The highest possible score for the Scenic ORV was 15 points, and 70 percent of 15 is 10.5. Thus, any river with a score greater than 10.5 was considered to have the Scenic ORV. While other evaluated waters certainly have scenic value, the results of the analysis using currently available data identify the following as having the Scenic ORV.

| Scenic ORV Results | | | | |
|-----------------------------|-------------------|-------------------------|---------------------|-----------|
| | Components | | | ORV Score |
| | Diversity of View | <i>Special Features</i> | Seasonal Variations | |
| Aichilik River | 2.0 | 1 | 1 | 4.0 |
| Atigun River | 2.8 | 2 | 5 | 9.8 |
| Canning River | 3.4 | 3 | 1 | 7.4 |
| Marsh Fork Canning River | 4.6 | 2 | 2 | 8.6 |
| Coleen River | 3.6 | 1 | 0 | 4.6 |
| East Fork Chandalar River | 3.2 | 1 | 0 | 4.2 |
| Middle Fork Chandalar River | 4.0 | 1 | 2 | 7.0 |
| Firth River | 3.3 | 2 | 2 | 7.3 |
| Hulahula River | 4.4 | 2 | 1 | 7.4 |
| Jago River | 2.1 | 1 | 1 | 4.1 |
| Joe Creek | 2.8 | 1 | 3 | 6.8 |
| Junjik River | 2.6 | 1 | 1 | 4.6 |
| Spring Creek | 2.3 | 0 | 4 | 6.3 |
| Kongakut River | 5.0 | 5 | 1 | 11.0 |
| Okpilak River | 4.6 | 5 | 1 | 10.6 |
| Sadlerochit River | 2.8 | 2 | 1 | 5.8 |
| Neruokpuk Lakes | 5.0 | 3 | 5 | 13.0 |
| Porcupine River | 3.0 | 5 | 1 | 9.0 |
| Sagavanirktok River | 3.5 | 1 | 2 | 6.5 |
| Turner River | 1.3 | 1 | 4 | 6.3 |

Recreational ORV

The Recreational ORV has six components: diversity of use, experience dimensions, access, level of use, associated opportunities, and attraction. Data were gathered and analyzed for each component separately. Recreational values were evaluated across the Refuge for each component, reflecting the ROC for the Recreational ORV.

Diversity of Use: The component definition for Diversity of Use indicates that rivers allowing for the largest number and diversity of watercraft and other use types are of higher value. Two datasets were analyzed for this component: 1) type of watercraft used, and 2) an inventory of other use types occurring in each river corridor.

The types of watercraft that are currently used on the Refuge rivers are raft, motorboat, packraft, sea kayak, river kayak, and canoe. Although some of the Refuge's rivers could accommodate airboats, airboats are not allowed on Refuge lands, so they were treated like motorboats for the purposes of this evaluation. The different types of watercraft used on each river was identified and counted. Five points were assigned to rivers capable of supporting five or more watercraft types, four points were given to rivers supporting four watercraft types, etc.

The team listed the types of directly river-dependent primary uses occurring in the Refuge's river corridors: boating, hiking, general hunting, general fishing, boat-based polar bear viewing, and dog mushing. The team listed the uses occurring on individual rivers and then tallied them. Five points were assigned to rivers accommodating five or more uses, four points were given to rivers supporting four uses, etc.

The points generated for "type of watercraft used" and "other use types occurring in each river corridor" were then averaged for each river to arrive at a component score for Diversity of Use. Scores for this component ranged from 2.5 to five points.

Experience Dimensions: Many people visit the Refuge not because it has the best whitewater and the easiest river access, or can accommodate the widest variety of river-related uses; rather, people visit the rivers in this Refuge because of the holistic recreational opportunities they provide. People float the rivers or hike in the river corridors seeking a particular experience—a sense of adventure, exploration, challenge, discovery, independence, self-reliance, and risk—in conjunction with the beauty and wildlife-viewing opportunities for which the Refuge is renowned. Three datasets were identified to quantify this component: 1) the percent of visitors on the river, 2) whitewater classification, and 3) interview results from a subset of the Refuge's permittees.

The assumption was made that recreationists seeking true adventure would be attracted to rivers with the highest potential for solitude and sense of remoteness. The commercially-supported visitor use database, which is the only comprehensive dataset on visitation, was used to determine the percent of visitors in each river corridor. The data represent the average amount of use during the past nine years. On average, 24 percent of all commercially-supported visitors to Arctic Refuge in any given year use the Kongakut River corridor. By contrast, less than 0.5 percent use the Firth River. More points were given to rivers with the smallest percentage of use, which provide the opportunity for the most solitude. Fewer points were given to rivers with a high percentage of use because solitude is more difficult to

experience. The scale used to rank this dataset was five points for one percent or less of Refuge users in the river corridor; four points for two to six percent of users; three points for 7 to 12 percent; two points for 13 to 18 percent; and one point for 19 percent or more of Refuge visitors using the river corridor.

Adventure-seeking recreationists are generally attracted to challenging whitewater rather than flatwater. Therefore, each river was assigned a single whitewater classification reflecting the highest degree of difficulty in each corridor. Five points were given to rivers with Class V whitewater, four points for rivers with Class IV whitewater, etc.

To gain a sense of where visitors go when they are seeking true adventure, challenge, and independence, three of our longest-serving guides and air-taxi operators were interviewed. Each interviewee was asked two questions:

- 1) What five Arctic Refuge rivers do clients seeking solitude, remoteness, and adventure most often request?
- 2) What rivers are included in known expedition-style and/or epic-length trips? In other words, what rivers are included in the start, end, or interim points of such trips, and/or in what river corridors are requests made for the drop-off of additional food and supplies?

Five points were given to rivers mentioned three times; three points were given to rivers mentioned twice; one point was given to rivers mentioned once; and zero points were given to rivers that were not mentioned.

The points generated for percent of visitors on the river, whitewater classification, and the interview results were then averaged for each river to arrive at a component score for Experience Dimension. Scores for this component ranged from two to 3.7 points.

Access: This component definition considers ease of access to, and use of, the river corridor, which directs us to value most highly the two extremes for access. Rivers with the most difficult access have high recreation value because they tend to reduce crowding and/or provide opportunities for true adventure, and rivers with the easiest access also have high recreation value because they allow for ready recreational opportunities. Two datasets were used to evaluate this component: 1) primary means of accessing each river, and 2) the number of commercially guided trips offered.

The primary mode of access for all rivers in the Refuge is via bush plane. However, two of the rivers evaluated (Atigun and Porcupine Rivers) can be accessed by road some distance off the Refuge, and the Sadlerochit River can be accessed only by foot. There are three primary types of bush planes used in the Refuge: float planes, medium-sized single-engine planes (e.g., Cessna 185, Cessna 206, Helio Courier, etc.), and small single-engine planes (e.g., Super Cub, Husky, Scout, etc.). A bimodal ranking system was used to rank the primary means by which each river is accessed. Five points were assigned to rivers that can be accessed only by foot and for those that can be accessed from roads. Three points were assigned to waters accessed by small planes and those accessed by float planes, and one point was assigned to waters accessed by medium-sized planes.

The team equated “use of rivers” with the number of opportunities provided by commercial guides. The opportunity for a commercially guided trip is not available for all the rivers. Some users seek out commercial guides, while others do not. The assumption was made that commercial trip offerings equated with access opportunities. The dataset was the number of trip offerings commercial guides presented in their 2009 commercial permit applications. A bimodal ranking system was applied. Five points were assigned to rivers with no commercially guided trips offered and to rivers with more than 12 commercially guided trips offered. Four points were given to rivers with 1 or 11 trips; three points were assigned to rivers with 2–3 or 9–10 trips offered; two points went to rivers with 4–5 or 7–8 trips offered; and one point was given to rivers with 6 trips offered.

The points for the two access datasets were totaled to arrive at a component score for Access. Component scores ranged from 1.5 to five points.

Level of Use: This is another component for which a bimodal distribution was used. Rivers with the lowest level of visitor use were ranked high because they have limited crowding and provide opportunities for true adventure. Rivers with the most use also received a high score because they are destination points for many Refuge visitors. A single dataset was used for Level of Use: the number of people using the river corridor for river-related activities each year, averaged over a nine-year period (2001–2009). Rivers used by more than 100 people each year and those used by 10 or fewer people each year received five points. Rivers with 91–100 people and 11–20 people received four points; rivers with 81–90 people and 21–30 people received three points; rivers with 71–80 and 31–40 users were given two points; rivers with 61–70 and 41–50 users got one point; and rivers with 51–60 users received zero points.

Associated Opportunities: The team considered the types of activities recreationists engage in while in the river corridors and determined which of these associated recreation opportunities are truly superlative—specific reasons why people come to Arctic Refuge. Five superlative opportunities associated with rivers were identified: polar bear viewing, Porcupine caribou herd viewing, trophy hunting, a visit to “see the Refuge before oil development occurs,” and unique birding activities (gray-headed chickadees and Smith’s longspurs—the premier bird species associated with the Refuge). The number of opportunities was tallied and component scores were assigned: five points for five opportunities, four points for four opportunities, etc.

Attraction: This component definition considers a river’s ability to attract visitors from outside the geographic region. Rivers that attract visitors from afar and offer nationally renowned recreational opportunities are of higher value.

Two datasets were researched for use in the analysis of the Attraction component: 1) the most commonly requested rivers, and 2) the percent of users from distant locations. Detailed river-specific information about where visitors originated from was unavailable. However, through interviews with three of our longest-serving permittees, general visitation patterns are available: 1–10 percent of the Refuge’s users are international residents, 35–75 percent come from areas of the United States outside of Alaska, and 15–60 percent of Refuge users are Alaska residents. The ranges are broad because different permittees cater to different clientele. The Arctic Refuge Visitor Use Survey (Bureau of Land Management 2005) says two percent of use is international, 61 percent is from the United States outside of Alaska, and 37

percent of users are Alaska residents. Although the Refuge is an international destination, specific visitor surveys would need to be completed to determine visitor use origination patterns. Thus, Attraction was evaluated using a single dataset.

The interviews identified the five rivers visitors most commonly request. A river scored five points if it was mentioned three times, three points if it was mentioned twice, one point for a single mention, and zero points for no mentions.

Final Score: The six components were ranked, and scores were assigned for each river. Total scores for the Recreational ORV ranged from 11.3–24.8 points. The highest possible score for the Recreational ORV was 30 points, and 70 percent of 30 is 21. Thus, any river with a score greater than 21 was considered to have the Recreational ORV. Using this criteria, the only river to have the Recreational ORV is the Kongakut River (24.8 points). The next highest river scored fewer than 19 points.

The team reviewed the results using what is known about recreational use of the Refuge's rivers. Three rivers were notably absent: the Atigun River, the Hulahula River, and the Marsh Fork Canning River.

The Refuge portion of the Atigun is commonly called Atigun Gorge and flows into the Refuge from bordering State and Bureau of Land Management lands. The river can be accessed via the Dalton Highway and flows into the Refuge approximately three-fourths of a mile from the highway. Atigun Gorge is uniquely accessible, compared to other Refuge rivers with recreational attributes, and boasts some of the most challenging road-accessible whitewater in northern Alaska. Whether seeking whitewater boating adventures; riparian habitat for excellent roadside birding; a relatively rapid route to hunting grounds away from the road; spring skiing, mushing, and ice climbing opportunities in an arctic setting; or the visual drama of a scenic backdrop for a holistic wilderness hiking experience, Atigun Gorge is clearly increasingly valued by an ever broadening range of visitors as a recreational treasure.

The number of commercial operators offering day-hiking trips in Atigun Gorge has increased during the past 10 years. However, visitors using the area are not reliant upon commercial service providers for access, so the Refuge currently has no way to accurately measure the total amount of visitation this river corridor receives. We believe the unrecorded portion of the Refuge's overall visitation that originates in Atigun Gorge makes up a notable portion of the Refuge's overall visitation, possibly exceeding the amount of visitation hosted by the Kongakut River drainage annually. Atigun Gorge was identified during the scoping phase of the Revised Plan planning effort as an important resource that is being compromised by the level of visitation it is currently sustaining. Although it is hard to capture through numerical ratings the true value of Atigun Gorge relative to other Refuge rivers, our best professional judgment is that the Atigun River has a Recreational ORV.

The Hulahula River is an exciting Class III river that attracts visitors, despite its extremely remote location. The Hulahula offers visitors a variety of vast landscape views: from broad mountainous valleys in its upper reaches, to the expanse of the coastal plain, to coastal lagoons and barrier islands at its mouth. The Hulahula receives the third highest level of visitation (after the Kongakut and Sheenjok Rivers), and many commercial operators offer trips to the Hulahula. People who visit the Hulahula come for the holistic experience it offers, which is hard to capture through numerical ratings. The Hulahula River was identified during the scoping phase of the Revised Plan planning effort as an important resource. The number of

public comments combine with the team's best professional judgment to support a Recreational ORV for the Hulahula River.

The Marsh Fork of the Canning River flows through tall, precipitous mountains that stretch to the river's edge. Its striking beauty attracts photographers and painters, as well as many recreationists, from across the country and around the world—despite its extremely remote location. Hillside springs add to the beauty, supporting clusters of green vegetation in stark contrast to the grey rocks and the clear blue river water. This river holds enough interest for experienced boaters yet is also mellow enough for relatively novice boaters to navigate. Its distinct north-side character affords a holistic recreation experience hard to capture through numerical ratings. Much of the numeric visitor use data for the Marsh Fork Canning River, which was used to evaluate the Recreational ORV, is lumped with the Canning River. Thus, it is believed the numeric values generated by our analysis are inexact for this river. Further, the Marsh Fork received several mentions during the scoping phase of the Revised Plan planning effort. Our best professional judgment and public comments combine to support a Recreational ORV for the Marsh Fork Canning River.

Therefore, four rivers were determined to have a Recreational ORV. While other evaluated waters certainly have recreational value, the results of our analysis and best professional judgment indicate that the Atigun, Kongakut, Hulahula, and Marsh Fork Canning rivers have outstandingly remarkable recreational opportunities.

| Recreational ORV Results | | | | | | | |
|------------------------------------|------------------|-----------------------|--------|--------------|--------------------------|------------|-----------|
| | Components | | | | | | |
| | Diversity of Use | Experience Dimensions | Access | Level of Use | Associated Opportunities | Attraction | ORV Score |
| Aichilik River | 4.0 | 3.0 | 3.0 | 2.0 | 4.0 | 0.0 | 16.0 |
| Atigun River | 4.0 | 2.7 | 5.0 | 2.0 | 1.0 | 0.0 | 14.7 |
| Canning River | 5.0 | 2.0 | 1.5 | 1.0 | 4.0 | 0.0 | 13.5 |
| Marsh Fork Canning River | 2.5 | 1.7 | 1.5 | 4.0 | 2.0 | 3.0 | 14.7 |
| Coleen River | 3.5 | 3.0 | 3.0 | 1.0 | 1.0 | 3.0 | 14.5 |
| East Fork Chandalar River | 4.5 | 3.7 | 2.5 | 4.0 | 0.0 | 0.0 | 14.7 |
| Middle Fork Chandalar River | 4.5 | 2.7 | 3.0 | 5.0 | 1.0 | 0.0 | 16.2 |
| Firth River | 3.0 | 3.0 | 3.0 | 5.0 | 1.0 | 0.0 | 15.0 |
| Hulahula River | 5.0 | 2.3 | 2.5 | 4.0 | 3.0 | 1.0 | 17.8 |
| Jago River | 4.0 | 3.3 | 2.0 | 0.0 | 3.0 | 1.0 | 13.3 |
| Joe Creek | 2.5 | 4.0 | 2.0 | 4.0 | 0.0 | 0.0 | 12.5 |
| Junjik River | 3.0 | 2.0 | 4.0 | 4.0 | 0.0 | 0.0 | 13.0 |
| Spring Creek | 2.5 | 2.3 | 2.5 | 4.0 | 0.0 | 0.0 | 11.3 |
| Kongakut River | 4.5 | 2.3 | 3.0 | 5.0 | 5.0 | 5.0 | 24.8 |
| Okpilak River | 4.5 | 3.3 | 3.0 | 5.0 | 3.0 | 0.0 | 18.8 |
| Sadlerochit River | 4.5 | 2.3 | 4.5 | 5.0 | 2.0 | 0.0 | 18.3 |
| Neruokpuk Lakes | 2.5 | 2.3 | 4.0 | 5.0 | 0.0 | 0.0 | 13.8 |
| Porcupine River | 4.5 | 2.3 | 5.0 | 5.0 | 0.0 | 0.0 | 16.8 |
| Sagavanirktok River | 4.5 | 2.3 | 4.0 | 5.0 | 1.0 | 0.0 | 16.8 |
| Turner River | 3.5 | 2.3 | 3.0 | 4.0 | 3.0 | 0.0 | 15.8 |

Geologic ORV

The Geologic ORV has three components: feature abundance, diversity of features, and educational and/or scientific importance. Both quantitative and qualitative data were used to evaluate geology in the river corridors. Data were gathered for each component, and each component was analyzed separately. Geologic values were evaluated across the Refuge for each component, reflecting the ROC for the Geologic ORV.

Feature Abundance: The component definition considers landforms with unusual or outstanding geologic or hydrologic features and river corridors with an abundance of unusual, unique, and distinctive geologic features to be of higher value. Sufficient data is not available to analyze both the abundance and diversity of features in each river corridor. The ability to identify the types of features in or near each river (e.g., pingos, springs, etc.) but not the total number of each feature type for each river (e.g., two pingos, five springs, etc.) limits Feature Abundance to the number of feature types rather than the true abundance of these features.

Using narrative descriptions of river geology and hydrology from published literature and unpublished agency reports, along with institutional knowledge, the types of unusual, unique, and distinctive geologic and hydrologic features in each river corridor were identified. Five points were assigned for 10 or more feature types; four points for 8–9 feature types; three points for 6–7 feature types; two points for 4–5 feature types; one point for 2–3 feature types; and zero points for 0–1 feature types.

Diversity of Features: Sufficient data to analyze both the diversity and abundance of geologic and hydrologic features in each river corridor is not available, so bedrock data as depicted in the Generalized Geologic Map of the Arctic National Wildlife Refuge (Imm et al. 1993) was analyzed. The rivers evaluated originate in the Brooks Range, cutting through steep, mountainous areas with minimal vegetation. Bedrock is frequently exposed. Further, vegetation that is present is highly correlated with the underlying geology in the river corridor, including the lower reaches of rivers that extend outside the Brooks Range.

The number of different bedrock types occurring in each corridor was identified as one measure of geologic diversity. Because patchiness also provides a measure of diversity, the number of bedrock patches was also identified. However, the number of patches was divided by river miles to remove any correlation between the number of bedrock patches and the length of each river.

The number of bedrock types ranged from 1 to 12 per river. Rivers with 11 or more bedrock types were given five points; rivers with 9–10 types received four points; 7–8 types received three points; 5–6 types got two points; 3–4 bedrock types were given one point; and 0–2 types received zero points. The number of bedrock patches per mile ranged from 0.05–0.59. Rivers with 0.36 or more patches per mile received five points; rivers with 0.29–0.35 patches per mile received four points; 0.22–0.28 patches per mile received three points; 0.15–0.21 patches per mile received two points; 0.08–0.14 patches per mile received one point; and rivers with 0.07 or fewer patches per mile received zero points.

The scores for number of bedrock types and the number of bedrock patches per mile were averaged to obtain a final score for the Diversity of Features component. Scores ranged from zero to 4.5 for this component.

Educational/Scientific: The component definition considers geologic and hydrologic features that clearly and graphically reveal interesting or unique educational or scientific aspects of Earth's history. River corridors that contain rare, one-of-a-kind, or common but representative examples of a geologic feature in the region of comparison are of higher value. The team used the narrative information evaluated under the Feature Abundance component to extract superlative or exceptional geologic values. The team then collectively ranked the rivers' educational and scientific merits using best professional judgment. Those rivers with truly exceptional, rare, one-of-a-kind, or representatively common geologic or hydrologic features received a score of five points. Rivers with moderate educational or scientific values were given a score of three points; rivers with low educational or scientific geologic values were given a single point; and rivers without any superlative or exceptional geologic or hydrologic values received zero points.

Final Score: Once all three components had been ranked, the scores for the components were added up river by river. Total scores for the Geologic ORV ranged from 1–12 points. The highest possible score for the Geologic ORV was 15 points, and 70 percent of 15 is 10.5. Thus, any river with a score equal to or greater than 10.5 was considered to have the Geologic ORV.

| Geologic ORV Results | | | | |
|------------------------------------|--------------------------|------------------|-----------------------------|------------------|
| | Components | | | ORV Score |
| | Feature Abundance | Diversity | Education/Scientific | |
| Aichilik River | 1 | 3.5 | 0 | 4.5 |
| Atigun River | 3 | 3.0 | 5 | 11.0 |
| Canning River | 3 | 1.5 | 5 | 9.5 |
| Marsh Fork Canning River | 1 | 3.0 | 0 | 4.0 |
| Coleen River | 2 | 2.0 | 1 | 5.0 |
| East Fork Chandalar River | 0 | 2.0 | 3 | 5.0 |
| Middle Fork Chandalar River | 1 | 1.5 | 3 | 5.5 |
| Firth River | 1 | 0.0 | 1 | 2.0 |
| Hulahula River | 5 | 3.0 | 1 | 9.0 |
| Jago River | 4 | 2.5 | 3 | 9.5 |
| Joe Creek | 0 | 2.0 | 0 | 2.0 |
| Junjik River | 0 | 2.0 | 0 | 2.0 |
| Spring Creek | 0 | 3.0 | 0 | 3.0 |
| Kongakut River | 4 | 4.5 | 3 | 11.5 |
| Okpilak River | 5 | 1.0 | 5 | 11.0 |
| Sadlerochit River | 2 | 2.5 | 3 | 7.5 |
| Neruokpuk Lakes | 4 | 3.0 | 5 | 12.0 |
| Porcupine River | 3 | 2.5 | 5 | 10.5 |
| Sagavanirktok River | 1 | 2.5 | 0 | 3.5 |
| Turner River | 0 | 0.0 | 1 | 1.0 |

Fish ORV

The definition for the Fish ORV considers fish population and habitat data for resident and anadromous fish species, including rare species. There are three components to the Fish ORV: habitat quality, diversity of species, and abundance of fish.

Fish data is limited for the Refuge. The locations of some overwintering and spawning sites are known, as are the number of fish species and the sizes of the populations for some of these species; however, limited data is available for rare or endangered species. Further, the type and reliability of data varies between rivers. The Fish ORV was rated using best professional judgment, supported by available data on the primary fish species in each drainage; abundance; and what is known about species diversity in each river corridor. Rivers that flow north from the Continental Divide were evaluated relative to other freshwater bodies on the North Slope of the Brooks Range in Alaska. Rivers that flow south from the Continental Divide were evaluated relative to other waters in interior Alaska.

Two water bodies were determined to have the Fish ORV: Neruokpuk Lakes and the Canning River. Neruokpuk Lakes support what is probably the largest, healthiest population of lake trout north of the Brooks Range. The Canning River has high species diversity relative to other waters on the North Slope, as well as a large run of Dolly Varden char.

Wildlife ORV

The definition for the Wildlife ORV considers wildlife population and habitat data, including those species that are considered to be unique, rare, State-listed, federally listed, threatened, or endangered. There are three components to the Wildlife ORV: habitat quality, diversity of species, and species abundance. Rivers that flow north from the Continental Divide were evaluated relative to other water bodies on the North Slope of the Brooks Range in Alaska. Rivers that flow south from the Continental Divide were evaluated relative to other waters in the interior Alaska.

Habitat Quality: Three datasets were used to evaluate Habitat Quality: 1) miles of potential polar bear habitat in each river corridor, 2) number of raptor nesting sites, and 3) the number of habitat types in each corridor. Because polar bear habitat is only found north of the Continental Divide, north-side rivers were evaluated for polar bear habitat, raptor nests, and the number of habitats in each corridor. For south-side rivers, only raptor nests and the number of habitat types were used to evaluate habitat quality.

The Refuge contains more than 53 percent of polar bear critical denning habitat. Polar bear critical habitat correlates with the topography, wind patterns, and soil development in river corridors. The total miles of polar bear denning habitat along the length of each river and within one-half mile of either side of ordinary high water was calculated using Geographic Information System (GIS). Rivers received five points for 61 or more miles of polar bear denning habitat in the corridor; four points for 46–60 miles; three points for 31–45 miles; two points for 16–30 miles; one point for 1–15 miles; and zero points for zero miles of polar bear denning habitat in the river corridor.

At a statewide level, the Refuge has notable nesting raptor habitat. In some locations, raptor nesting densities are among the highest in the State. Raptor nests tend to be concentrated in the river corridors of the Refuge, especially if cliffs or cliff-like geologic features are found in the corridor. The number of known nest sites was totaled for each river. A river received five points for 50 or more nest sites; four points for 25–49 nests; three points for 10–24 nests; two points for 5–9 nest sites; one point for 1–4 nests; and zero points if there are no known raptor nests in the river corridor.

The number of habitats in each river corridor was calculated using scientific procedures (Homer, et al. 2004) and GIS. A river scored five points for 19–21 habitat types; four points for 17–18 habitats; three points for 14–16 habitats; two points for 12–13 habitats; and one point for 10–11 habitat types in the river corridor.

Three datasets were averaged for north-side rivers, and two datasets were averaged for south-side rivers, to arrive at the component scores for Habitat Quality. Scores ranged from 0.3 to four points.

Diversity of Species: Two datasets were used for the Diversity of Species component score: 1) total number of species and 2) the number of rare, sensitive, threatened, or endangered species. Both datasets were generated by considering the known range and distribution of mammals and birds across the Refuge and using best professional judgment to decide whether the rivers under consideration were included in these distributions. If a species was known to use a river corridor for all or a portion of its life cycle, that species was included in the count.

North-side rivers were ranked according to the total number of species occupying each corridor using the following scale: five points for rivers with 90 or more species; four points for 80–89 species; three points for 70–79 species; two points for 60–69 species; and one point for 50–59 species. South-side rivers had very similar totals for the number of species, ranging from 122–128 species and, as a result, were all assigned a score of three points. The team assumed that these species were typical for the ROC.

Twelve of the species either listed as threatened under the Endangered Species Act (U.S. Fish and Wildlife Service 2010a), species on the Audubon Watchlist (Audubon 2010), species on the IUCN red list (International Union for Conservation of Nature 2010), or species of special concern by the State of Alaska (Alaska Department of Fish and Game 2010), are known to occur on the North Slope of the Brooks Range: red-throated loon, yellow-billed loon, arctic peregrine falcon, whimbrel, red knot, dunlin, buff-breasted sandpiper, arctic tern, Smith's longspur, spectacled eider, polar bear, and tiny shrew. North-side rivers were given five points if nine or more of these rare, sensitive, threatened, or endangered species use all or a portion of any of the evaluated rivers. Four points were awarded to rivers with seven to eight species; three points for five to six species; two points for three to four species; one point for one to two species; and zero points if no rare, sensitive, threatened, or endangered species use a river corridor.

Twelve of the species either listed as threatened under the Endangered Species Act (U.S. Fish and Wildlife Service 2010), species on the Audubon Watchlist (Audubon 2010), species on the IUCN redlist (International Union for Conservation of Nature 2010), or species of special concern by the State of Alaska (Alaska Department of Fish and Game 2010) are known to occur south of the Continental Divide in the Yukon River basin of interior Alaska: horned grebe, peregrine falcon, solitary sandpiper, lesser yellowlegs, upland sandpiper, whimbrel,

Hudsonian godwit, red knot, short-billed dowitcher, olive-sided flycatcher, Smith's longspur, and rusty blackbird. South-side rivers were given five points if seven or more of these species use all or a portion of any of the evaluated rivers. Four points were given for five to six species; three points for three to four species; two points for two species; one point for one species; and zero points if no rare, sensitive, threatened, or endangered species use a river corridor. The ranks for the two datasets were averaged for north-side rivers and for south-side rivers. Component scores for Species Diversity ranged from 0.5 to five points.

Species Abundance: This component was not evaluated. No data are available that describe species abundance in the Refuge in each river corridor.

Final Score: The results for the two evaluated components were compiled. From this point forward, the analysis combined north-side rivers with south-side rivers. Total scores for the Wildlife ORV ranged from 0.8 to nine points. The highest possible score for the Wildlife ORV was 10 points, and 70 percent of 10 is seven. Thus, any river with a score greater than seven was considered to have the Wildlife ORV.

| Wildlife ORV Results | | | |
|------------------------------------|------------------------|-----------------------------|------------------|
| | Components | | |
| | Habitat Quality | Diversity of Species | ORV Score |
| Aichilik River | 3.0 | 3.5 | 6.5 |
| Atigun River | 1.3 | 1.0 | 2.3 |
| Canning River | 4.0 | 5.0 | 9.0 |
| Marsh Fork Canning River | 1.3 | 0.5 | 1.8 |
| Coleen River | 2.5 | 3.5 | 6.0 |
| East Fork Chandalar River | 2.0 | 3.5 | 5.5 |
| Middle Fork Chandalar River | 1.5 | 3.5 | 5.0 |
| Firth River | 1.0 | 1.5 | 2.5 |
| Hulahula River | 2.3 | 4.5 | 6.8 |
| Jago River | 3.3 | 4.0 | 7.3 |
| Joe Creek | 0.3 | 0.5 | 0.8 |
| Junjik River | 1.5 | 3.0 | 4.5 |
| Spring Creek | 1.5 | 2.5 | 4.0 |
| Kongakut River | 2.7 | 4.0 | 6.7 |
| Okpilak River | 2.3 | 4.0 | 6.3 |
| Sadlerochit River | 2.3 | 4.0 | 6.3 |
| Neruokpuk Lakes | 0.3 | 4.0 | 4.3 |
| Porcupine River | 4.0 | 4.0 | 8.0 |
| Sagavanirktok River | 0.7 | 1.0 | 1.7 |
| Turner River | 1.0 | 2.0 | 3.0 |

Historic ORV

The definition for the Historic ORV considers historic sites or features in each river corridor that are associated with a notable event, an important person, or a cultural activity of the past. Sites or features should be rare, one-of-a-kind, or the best representative of a common site or feature. There are four component definitions: historical importance, site integrity, listing or eligibility, and educational and/or scientific importance.

There are few historic data for Arctic Refuge. This is due in part to the lack of historic use of the Refuge's lands and waters, but also from a lack of historical research completed in the area. The team relied on best professional judgment supported by qualitative information obtained from Regional Archaeologist Debbie Corbett, published literature, agency reports, and institutional knowledge to evaluate the Historic ORV. Rivers were evaluated on a high (five points), medium (three points), and low (one point) scale based on the team's assessment of how important the gathered historical information was relative to the history of the State of Alaska (the ROC for the Historic ORV).

Only the Porcupine River was determined to have a Historic ORV. The Porcupine River was (and is today) a major travel corridor that fills an important chapter in the history of Alaska and the Yukon Territory of Canada (National Park Service 1984). The Porcupine River provided Europeans a natural trade route into the Yukon River basin. The Hudson's Bay Company set up trading posts on the Porcupine River, exchanging goods such as beads and cloth for furs. Hudson's Bay Company posts also provided a means of travel for scientists and ministers to the Porcupine and Yukon River regions, and the posts represent the farthest western reach of the British monarchy. Buildings associated with the Hudson's Bay Company posts near Howling Dog Rock and the confluence of the Salmon-Trout River are still visible.

The Porcupine River was also involved in other aspects of Alaskan and arctic history, including whaling, exploration, the Klondike gold rush, and early steamboat and gas-powered river boat navigation (National Park Service 1984). The Porcupine River remains important to local people who rely on it as a means for travel and for pursuing a more traditional way of life, and it provides visitors the opportunity to experience the voyages of the explorers and fur traders of the mid-1800s. It is the most important arctic river route after the Yukon River.

Cultural ORV

The definition for the Cultural ORV considers evidence of occupation or use by Alaska Natives, with weight given to rare, unique, exceptional human interest, and/or national or regional importance for interpreting prehistory. There are six component definitions: notable occupation, cultural and/or subsistence importance, number of cultures, site integrity, listing or eligibility, and educational and/or scientific.

No systematic archaeological studies or historical research projects have been conducted across the Refuge. The information available for the eligibility analysis is derived from those studies that have been conducted and the expert knowledge of Regional Archaeologist Debbie Corbett. The data used for the Cultural ORV might not fully depict the cultural and archaeological resources in river corridors or yet-to-be-determined culturally important locations. However, it does represent the best available data. North-side rivers were evaluated separately from south-side rivers to reflect the ROC for the Cultural ORV.

Notable Occupation: The component definition considers evidence of important occupation and rates rare, unique, notable, or unusual sites higher than other sites. Regional Archaeologist Debbie Corbett provided the team with the number and type of prehistoric sites in each river corridor. The team decided to use two datasets to evaluate Notable Occupation: 1) the number of known sites, and 2) the number of different types of sites. We assumed that rivers with a large number of archaeological sites had a higher value than rivers with few or no known prehistoric sites. The other assumption made was that those sites having a variety of occupational evidence, especially those suggesting camps or housing, were of higher value than sites with fewer types of archaeological resources and no evidence of longer-term occupation.

The number of known sites in each corridor ranged from 0–67. The team decided 67 was an outlier, because the next highest number was 21. The number of sites was ranked according to the following scale: five points for 20 or more sites; four points for 15–19 sites; three points for 10–14 sites; two points for 5–9 sites; one point for 1–4 sites; and zero points for zero sites.

Types of sites ranged from flake scatters to tent rings to settlements. The number of types ranged from zero to six types, so these data were evaluated as follows: five points for six types of sites; four points for five types; three points for three to four types; two points for two types; one point for one type; and zero points if no site types have been identified.

The ranks for the two datasets were averaged for north-side rivers and for south-side rivers. Component scores for Notable Occupation ranged from zero to five points.

Cultural/Subsistence Importance: The component definition states that river corridors with notable Alaska Native quality, quantity, or variety of cultural or subsistence uses; or river corridors used for rare or sacred purposes are of higher value. The team interpreted this component to be the contemporary cultural value associated with each river corridor.

Three datasets were used to evaluate contemporary cultural values: 1) the number of subsistence uses, 2) the number of sites with current or recent historical value (e.g., cemetery sites), and 3) the presence or absence of rare, sacred, or other sites of important contemporary cultural value.

Data on the subsistence use of south-side rivers were obtained from the Yukon Flats Land Exchange Environmental Impact Statement (U.S. Fish and Wildlife Service 2010b). Rivers on the south side of the Refuge are used by residents of four villages (Arctic Village, Venetie, Fort Yukon, and Chalkyitsik) for 10 types of subsistence resources: caribou, moose, sheep, bear, wildfowl (e.g., waterfowl), small mammals, furbearers, fish, vegetation (e.g., berry picking), and woodcutting. The numbers of subsistence types were counted for each river. Five points were given to rivers with nine or more identified subsistence use types; four points for seven to eight types; three points for five to six types; two points for three to four types; one point for one to two types; and zero points if a river corridor is not used for any identified subsistence type.

Subsistence data for north-side rivers were extracted from the Draft Point Thomson EIS (Exxon Mobil Corporation 2009). North-side rivers are used by the residents of Kaktovik for caribou, fish, sheep, and furbearers. Exxon Mobil Corporation (2009) also indicates if an area is used intensively for any of the subsistence uses, and it provides the specific locations for important subsistence sites. The north-side rivers were scored using all three types of data: a point for any of the four subsistence species, a point for any specific location in a corridor, and a point if all or a portion of any river corridor is intensively used. Rivers were then ranked according to the following scale: a score of five for rivers with nine or more subsistence points; a score of four for seven to eight subsistence points; a score of three for five to six subsistence types; a score of two for three to four subsistence points; a score of one for one to two subsistence points; and a score of zero if a river corridor is not used for any identified subsistence type.

Another measure of contemporary cultural values is to look at known sites with important cultural values. These sites include cemetery sites; 14(h)(1) sites—those that Native village corporations have purchased from the Federal government because they contain important cultural values; historic sites (sites from the last 150 to 100 years) that are associated with Native culture; and the number of Native allotments in each river corridor. A point was given to each site in a river corridor. Points ranged from 0–15. Rivers were ranked according to the following scale: a score of five for rivers with nine or more sites; a score of four for seven to eight sites; a score of three for five to six sites; two points for three to four sites; one point for one to two sites; and zero points if no cemetery, 14(h)(1) sites, historic sites, or Native allotments are located in the river corridor.

A final measure of contemporary cultural value is the presence of any rare, sacred, or other highly valued cultural site in the river corridor. Refuge staff interviewed nine tribal members and elders in Arctic Village and four in Kaktovik about whether any of the Refuge’s river corridors contain important contemporary cultural values. If a site or river was mentioned, we assigned the river a yes or no, which was scored as five or zero points, respectively.

The ranks for the three datasets were averaged for north-side rivers and for south-side rivers. Component scores for Cultural/Subsistence Importance ranged from zero to five points.

Number of Cultures: The regional archaeologist provided a list of the cultures known to have used, or believed to have used, each river corridor. To evaluate Number of Cultures, the cultures identified in each corridor were counted. In some cases, both “modern” and “historic” Iñupiat or Gwich’in cultures were listed. For the purpose of this evaluation, “modern” and “historic” are being considered as one culture. For example, modern and historic Iñupiat received a single point—not two. For some of the rivers, the data identified “possible”

cultures. These possible cultures were given one-half point because the available archaeological data is inconclusive. Rivers received five points for five cultures, four points for four cultures, etc.

Listing/Eligibility: According to the regional archaeologist, all known sites are eligible for listing in the National Register of Historic Places. This component does not allow comparisons of the rivers, so it was not included in the evaluation.

Site Integrity: The regional archaeologist identified all cultural sites in the Refuge as having high site integrity. Relatively few visitors or developments in the Refuge leave most sites undisturbed. Further, arctic conditions tend to preserve archaeological remains. Some sites have been lost along the coast because of erosion, and additional sites could be lost in the future. The water column in highly braided rivers meanders back and forth and can scour and erode cultural sites. The Site Integrity component does not allow comparisons of the rivers, so it was not included in our evaluation.

Educational/Interpretation: According to the regional archaeologist, the Refuge has two types of cultural resource sites that have national, if not global, significance: caribou fences and thousands of years of intercultural exchange.

The Refuge has the biggest known concentration of caribou fences in the United States. They are known from as far south as Eagle, Alaska, and they extend east into Canada. Archaeologists do not know how far west they extend, but some caribou fences are known to exist in Kanuti National Wildlife Refuge. These fences were very central to the cultures that used them. They appeared about 1,000 years ago and are likely Athabascan. The Refuge caribou fence complex is of national significance according to the regional archaeologist, and the complex of fences would be eligible as a National Historic Landmark. A river received five points if one or more caribou fences are located in its corridor and zero points if there are no caribou fences.

The Refuge is not considered to be a center of prehistoric Eskimo culture or innovation. However, it was a site from which Eskimo culture expanded from Alaska into Canada and Greenland to the east. The other aspect of prehistory that is notable in the area of the Refuge is 10,000 years of Eskimo and Athabascan interaction. Thus, the Refuge represents a cultural crossroads: north to south and back again, as well as west to east. The cultural exchange in both directions has national, if not global, significance. A river received five points if there are one or more sites in the corridor where it has been documented that Iñupiat, Eskimo, and/or Denbigh cultures used the site, as well as Gwich'in, Athabascan, and/or Paleoindian cultures. These sites are artifacts of the cultural crossroads for which the Refuge is known. A river received zero points if there were no documented sites of intercultural use.

The two datasets were totaled, rather than averaged, because there were no rivers that had both caribou fences and sites of cultural interchange. Thus, the component total represents a yes or no dataset, with five points for yes and zero points for no.

Final Score: The results for the four evaluated components were totaled by river. From this point forward, the analysis combined the north-side and-south side rivers.

Total scores for the Cultural ORV ranged from 0–15 points. The highest possible score for the Cultural ORV was 20 points, and 70 percent of 20 is 14. Thus, any river with a score greater than 14 was considered to have the Cultural ORV.

It was striking to the team that two communities and two cultures brought up the cultural importance of the Hulahula River, yet the river was not identified as having a Cultural ORV based on points alone. We provided the regional archaeologist with the interview information we obtained, and she told us that few archaeological surveys have been conducted on the Hulahula River. It is clear from the data we provided that the river has been used for multi-cultural exchange and barter for several generations, and there are likely many archaeological sites along the river's extent. In the regional archaeologist's professional judgment, the Hulahula has cultural importance in our regions of comparison, and it does have the Cultural ORV (D. Corbett, Regional Archaeologist, pers. comm., Jan. 11, 2011).

| Cultural ORV Results | | | | | |
|------------------------------------|---------------------------|--|---------------------------|-------------------------------|------------------|
| | Components | | | | |
| | Notable Occupation | Cultural/Subsistence Importance | Number of Cultures | Educational/Scientific | ORV Score |
| Aichilik River | 2.5 | 2.7 | 1.0 | 0 | 6.2 |
| Atigun River | 4.5 | 0.0 | 2.0 | 5 | 11.5 |
| Canning River | 2.0 | 2.7 | 5.0 | 5 | 14.7 |
| Marsh Fork Canning River | 0.0 | 0.0 | 0.0 | 0 | 0.0 |
| Coleen River | 2.0 | 1.3 | 1.0 | 0 | 4.3 |
| East Fork Chandalar River | 4.0 | 5.0 | 1.0 | 5 | 15.0 |
| Middle Fork Chandalar River | 2.0 | 0.7 | 1.5 | 0 | 4.2 |
| Firth River | 0.0 | 0.0 | 0.0 | 0 | 0.0 |
| Hulahula River | 2.0 | 4.7 | 2.0 | 5 | 13.7 |
| Jago River | 1.0 | 1.3 | 1.0 | 0 | 3.3 |
| Joe Creek | 2.5 | 0.0 | 1.0 | 5 | 8.5 |
| Junjik River | 2.5 | 4.0 | 2.0 | 5 | 13.5 |
| Spring Creek | 1.0 | 1.0 | 1.0 | 5 | 8.0 |
| Kongakut River | 1.0 | 0.7 | 1.0 | 0 | 2.7 |
| Okpilak River | 1.0 | 0.7 | 2.0 | 0 | 3.7 |
| Sadlerochit River | 3.0 | 1.7 | 4.0 | 5 | 13.7 |
| Neruokpuk Lakes | 2.5 | 3.7 | 3.0 | 0 | 9.2 |
| Porcupine River | 5.0 | 2.3 | 3.5 | 5 | 15.8 |
| Sagavanirktok River | 3.5 | 0.0 | 1.0 | 0 | 4.5 |
| Turner River | 1.0 | 0.0 | 1.0 | 0 | 2.0 |

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