



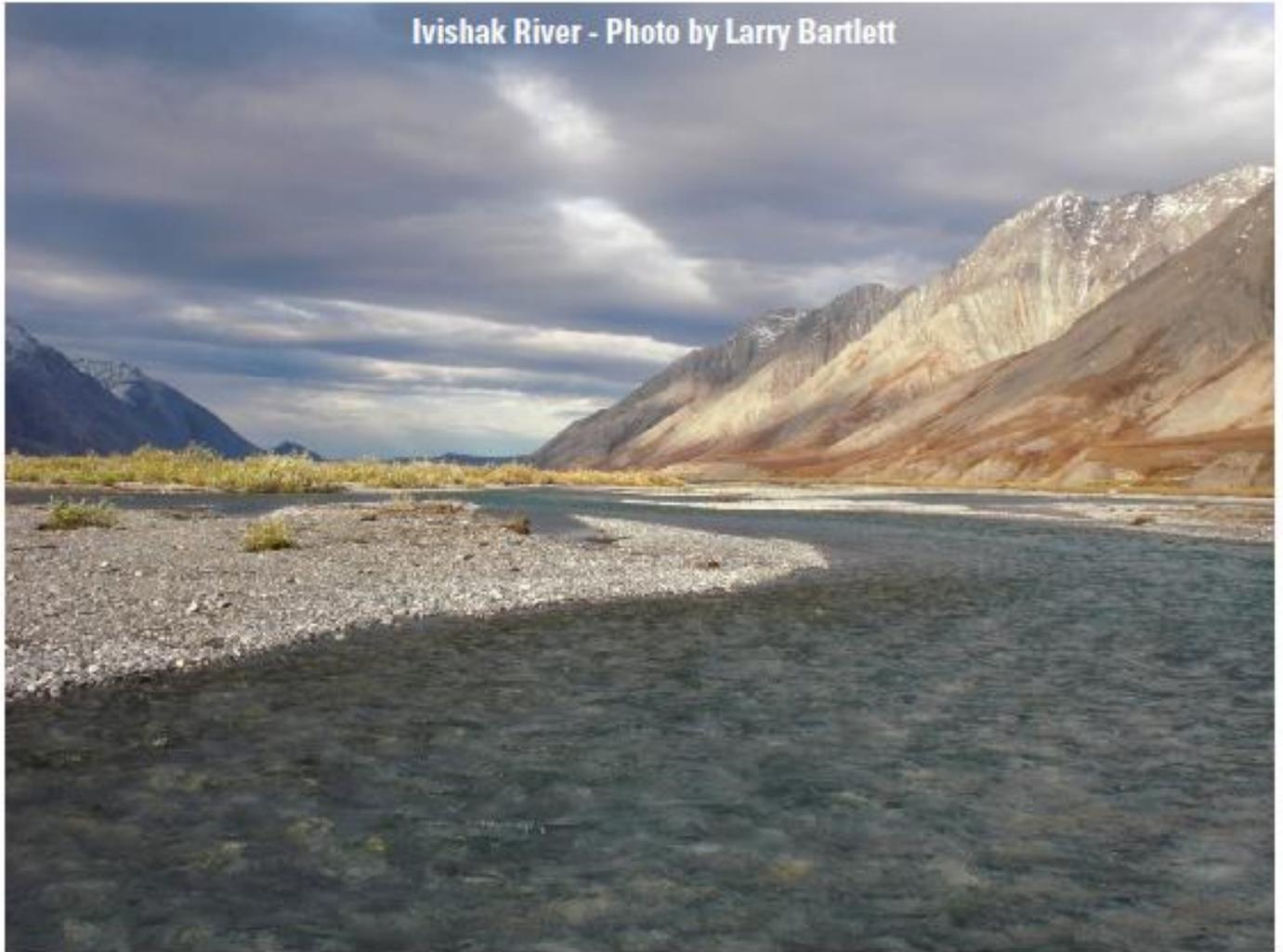
U.S. Fish & Wildlife Service

DRAFT

Wild and Scenic River Eligibility Report

Arctic National Wildlife Refuge

Ivishak River - Photo by Larry Bartlett



October 2010

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Arctic National Wildlife Refuge
Fairbanks, Alaska

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Wild and Scenic River Eligibility Report
For
U.S. Fish and Wildlife Service
Arctic National Wildlife Refuge

Prepared by:

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Fish and Wildlife Service
Arctic National Wildlife Refuge

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1. INTRODUCTION

As part of the current Comprehensive Conservation Plan (CCP) revision process being conducted by the US Department of Interior, Fish and Wildlife Service (Service), Arctic National Wildlife Refuge (Refuge), an inventory and analysis of rivers within the planning area is required to determine whether rivers or segments of rivers are “eligible” and “suitable” for consideration in the National Wild and Scenic River System (NWSRS). The Refuge has completed the eligibility phase and the results are reported herein. 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) (US Fish and Wildlife Service, 2000) including public involvement and National Environmental Policy Act compliance.

The Wild and Scenic Rivers Act, (Act) 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 National Wild and Scenic River System (NWSRS).

The Act requires us to consider all river segments that are within the planning area and/or listed in the Nationwide Rivers Inventory (NRI) (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 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 (the Act, Section 16(b) *“existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway”*) and possess at least one outstandingly remarkable values (ORV): scenic, recreational, geologic, fish and 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 outstandingly remarkable values (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, ANILCA designated numerous river throughout Alaska as wild rivers under the Act including the Ivishak, Sheenjek and Wind Rivers (within the Refuge boundary) and the Porcupine River, which was designated for study. 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.

1.2. Steps in the Wild and Scenic River Process

The study and designation of watercourses under the Act follows a multi step process (eligibility → suitability → recommendation → agency, DOI and Presidential approval → congressional action). The Refuge is examining the eligibility and suitability of watercourses during its CCP Revision. The eligibility portion begins with an inventory of all potential rivers (Chapter 2), 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 (Chapter 3). Generally the area surveyed for ORVs includes a half mile on each side of the river (ANILCA 605 and 606). Rivers determined eligible are then classified under three tentative categories (wild, scenic, and 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 (Chapter 5). The next step will be to examine the suitability (Chapter 6) of rivers determined eligible and report these findings in the Draft CCP and Draft Environmental Impact Statement (EIS), and Final CCP and Final EIS. The final decision on the suitability of a given river segment will be made in the Record of Decision (ROD) for the Refuge CCP. ANILCA amended the WSR Act on this issue.

1.3. Protection of Eligible Rivers

Rivers determined eligible in this report are subject to protection until the suitability stage is completed. Following suitability determinations, river segments determined non-suitable return to the underlying management prescribed in the effective CCP, while suitable rivers are managed to maintain their free flowing character and ORVs as per the alternative selected in the Final CCP. Interim management guidelines for protecting eligible rivers will only be developed if the timeline for suitability is not concurrent with the CCP.

1.4. Refuge Wild and Scenic Evaluation Team

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

Team Member	Title
Heather Bartlett	Law Enforcement Officer/Pilot
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 (United States Geological Survey, 2010) and the National Hydrography Dataset (United States Geological Survey, 2010). A total of 160 rivers and creeks were identified, all of which are free flowing.

With 160 named rivers and creeks identified on the Refuge, and considering the dearth of information about most of these named waterways, the team decided to focus on a subset of these rivers. Due to the isolated location of the Refuge and the difficulty in accessing the Refuge's lands and waters, public use is currently the biggest threat to a waterway's natural integrity and is the greatest management concern. For these reasons, the team decided to focus on waters with public use, the team did not review intermittent waters or those waters that are unnamed. The team relied on data about commercially supported public use (those users that hire a commercial operator for all or a portion of their trip to the Refuge), since there is not a method in place to track independent public use (i.e., people who enter and leave the Refuge on their own).

Based on the data mentioned above, thirty-two waters are known to receive commercially supported public use. The team decided not to study for eligibility those rivers with public use that is not river related (e.g., mountaineering access, hunting outside the river

corridor, etc.). Twenty waters were identified as having river-related use, (Table 1-1 Review Rivers and further illustrated on Figure 1-2).

Table 1-1 Review Rivers

-
- | | |
|--------------------------------------|---|
| • Aichilik River | • Joe Creek |
| • Atigun River | • Junjik River |
| • Canning River | • Spring Creek |
| • Marsh Fork of the Canning River | • Kongakut River |
| • Coleen River | • Okpilak River |
| • East Fork of the Chandalar River | • Sadlerochit River |
| • Middle Fork of the 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 revision of the CCP on April 7, 2010 and 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, 55 mentioned Wild and Scenic Rivers. A majority of comments regarding Wild and Scenic Rivers express either support or opposition for the study of specific rivers to designate as part of the NWSRS. Several comments refer to personal experiences on specific rivers and point out particular characteristics as reasons why such rivers should or should not be considered as a Wild and Scenic River. Multiple river specific comments were also generated by the public in regard to an increase in public use, watershed protection, physical and social setting character, development, wilderness character and resource protection.

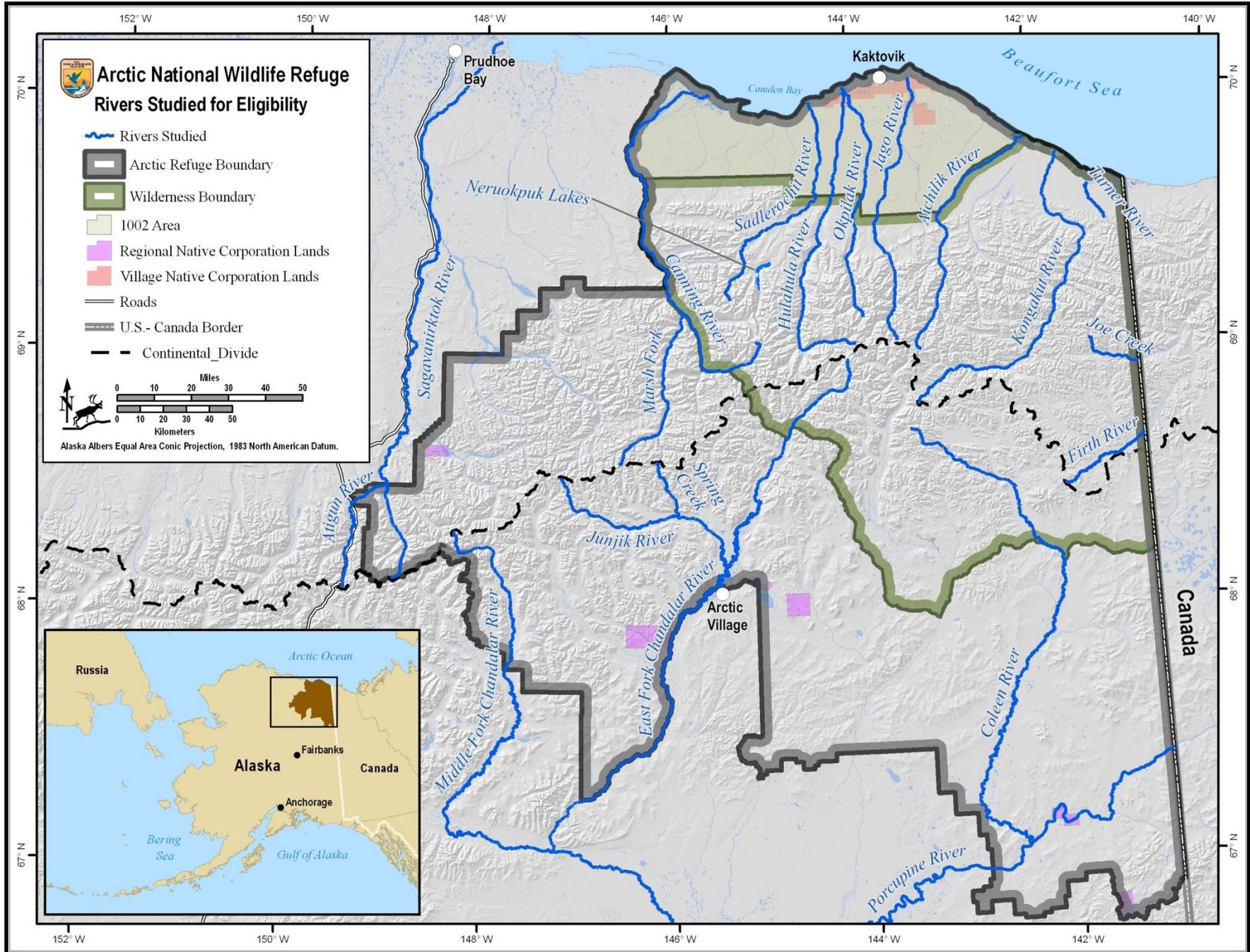
Comments opposing designation assert that rivers within the refuge receive adequate protection under refuge mandates and policies. Many commenters indicate that the focus for Wild and Scenic River designation should be on rivers outside of designated Wilderness. Others indicate WSR designations could impact subsistence activities. A few comments were made regarding legal authority to regulate or manage uplands within the river corridors.

Comments supporting Wild and Scenic River designation point out unique characteristics of specific rivers (e.g., Ramparts of Porcupine River) as well as the wildlife supported by the river systems, and recommend that the CCP outline protection measures for WSR characteristics and values, especially those threatened with increased 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 recommend an inventory of all rivers within the refuge to identify unique characteristics and values as well as published methods and selection criteria for determining Wild and Scenic River designation.

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

Many comments provide ideas about how to gather information about potential WSRs on the refuge. For example, some comments indicate that tribal watershed management could provide important information regarding scenic river management. Others point out the importance of continued monitoring of waters within the refuge for water quality and quantity.

Figure 1-1 Rivers Studied for Eligibility



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 (ORVs) and Region of Comparison

Section 1(b) of the Act identifies the 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, geological, 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 & 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 (IWSRCC). The IWSRCC (Council, 1999) offers eligibility criteria for establishing the presence of an ORV, but does not specifically define what each ORV means.

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

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. IWSRCC (Council, 1999) guidance says the ROC is not fixed and that it should provide for meaningful comparative analysis. 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)

The team reviewed each ORV separately and used their best professional judgment to determine the most appropriate ROC. For example, the Scenic 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. Scenic in north of the Brooks Range is drastically different in form, line, color and texture than Scenic south of the Brooks Range. Due to this dramatic variation, two ROCs were selected for Scenic. 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. See the ORV definitions for their individual ROCs.

2.3. Potential Classifications

Following the determination that a river is eligible, that river must be classified. 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

The Team gathered information on each of the twenty rivers, whether narrative (qualitative), numerical (quantitative), or a combination thereof, and presented our research to the full team. In many, if not all cases, other team members identified additional resources and datasets. In the end, data gathered from all possible known resources, 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 within 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 for us to include a dataset that had the same result for all the rivers or datasets 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 in the way to assess each ORV:

- 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 data sets, 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 DOI guidance (DOI/USDA 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% of the total possible points was assigned that ORV.

3.1. Eligibility Results

The eligibility study for the Refuge identified ten rivers that met the criteria of free-flowing and possessed at least one ORV. The locations of inventoried and eligible rivers are shown in Table 3-1 and on Figure 3-1, Figure 3-2, Figure 3-3 and Figure 3-4.

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

Table 3-1 Eligible Rivers

River System	Description	River Length	*Segment Length	**Preliminary Classification	Remarkable Values
Atigun River	The Atigun River flows into the refuge from bordering State and BLM lands and can be accessed by the Dalton Highway. The portion that's on the refuge is often referred to as Atigun Gorge. The Gorge ends just before the confluence with the Sagavanirktok River.	43	11	Wild	Geologic
Canning River	The Canning River is the longest north flowing river within the Refuge. It forms the western boundary of the Refuge as it flows through mountains, to foothills, to the coastal plain, and finally to the arctic coast.	125	125	Wild	Wildlife, Fish
Marsh Fork-Canning River	The Marsh Fork begins and ends in the precipitous Phillip Smith Mountains, flowing through spectacular vistas of rocky peaks. Just before reaching the foothills, the Marsh Fork joins the main stem of the Canning.	54	54	Wild	Recreational
East Fork-Chandalar River	The East Fork has its headwaters near the Romanzof Mountains in the eastern Brooks Range. It's surrounded by Refuge until Arctic Village, where it then forms the Refuge's southern boundary. The East Fork eventually flows into the main stem of the Chandalar River.	223	204	Wild	Cultural
Hulahula River	The Hulahula begins in glaciers of the Romanzof Mountains, flows west and then about 100 miles north, through valleys between Mt. Chamberlin and Mt. Michelson, onto the coastal plain, and ending in Camden Bay.	97	97	Wild	Recreational

Eligible Rivers (continued)

River System	Description	River Length	*Segment Length	**Preliminary Classification	Remarkable Values
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 arctic coast.	84	84	Wild	Wildlife
Kongakut River	The Kongakut is the only major refuge river whose entire course is within designated wilderness. Originating high in the mountains of the eastern Brooks Range, the river flows generally north through miles of rugged mountains to the coastal plain and emptying into Beaufort Sea.	116	116	Wild	Recreational, Scenic, Geologic
Okpilak River	The silt-laten Okpilak begins in the heart of the most active glacial area of the Refuge. The river churns as it flows north through a classic U-shaped valley containing moraines, fans, sand dunes and other glacial features. The water then abruptly flattens as it flows onto the coastal plain to the arctic coast.	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 a historically important travel route. The Refuge portion begins at the Canada/US border and flows downstream for approximately 85 miles.	476	85	Wild	Historic, Cultural, Geologic, Wildlife

*Segment Length is approximate

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

Figure 3-1 Eligible Rivers – North Slope

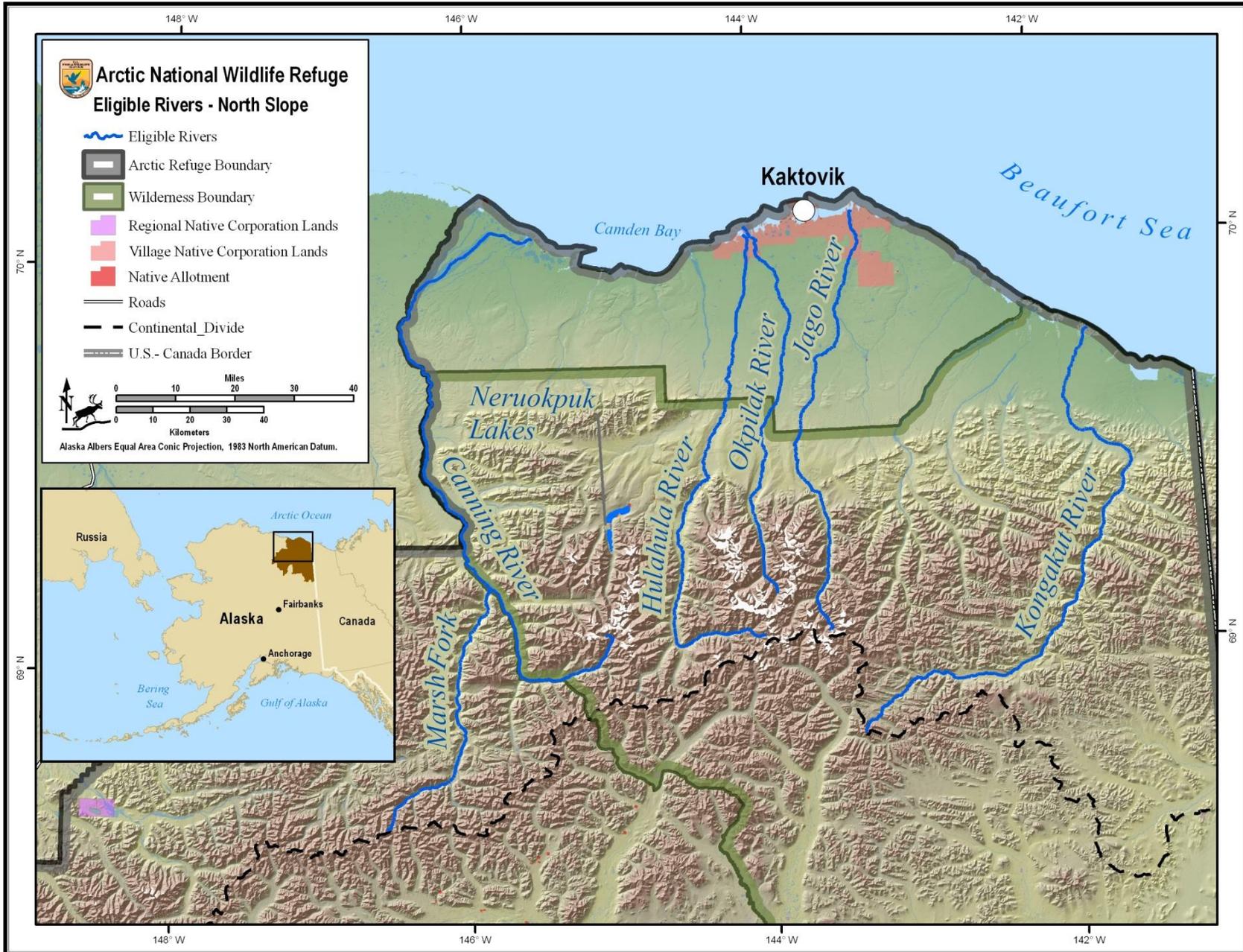


Figure 3-2 Eligible River - Southeast

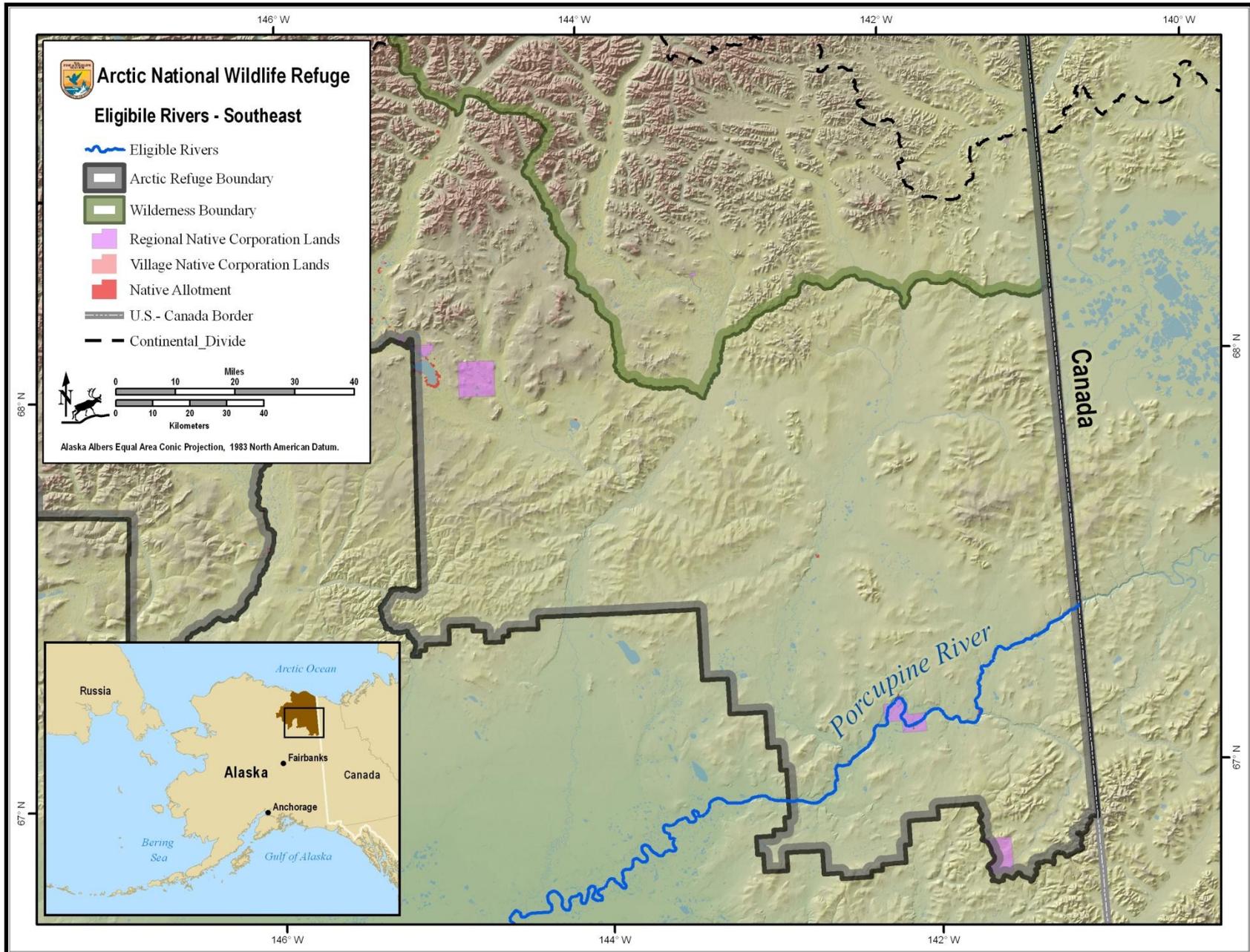
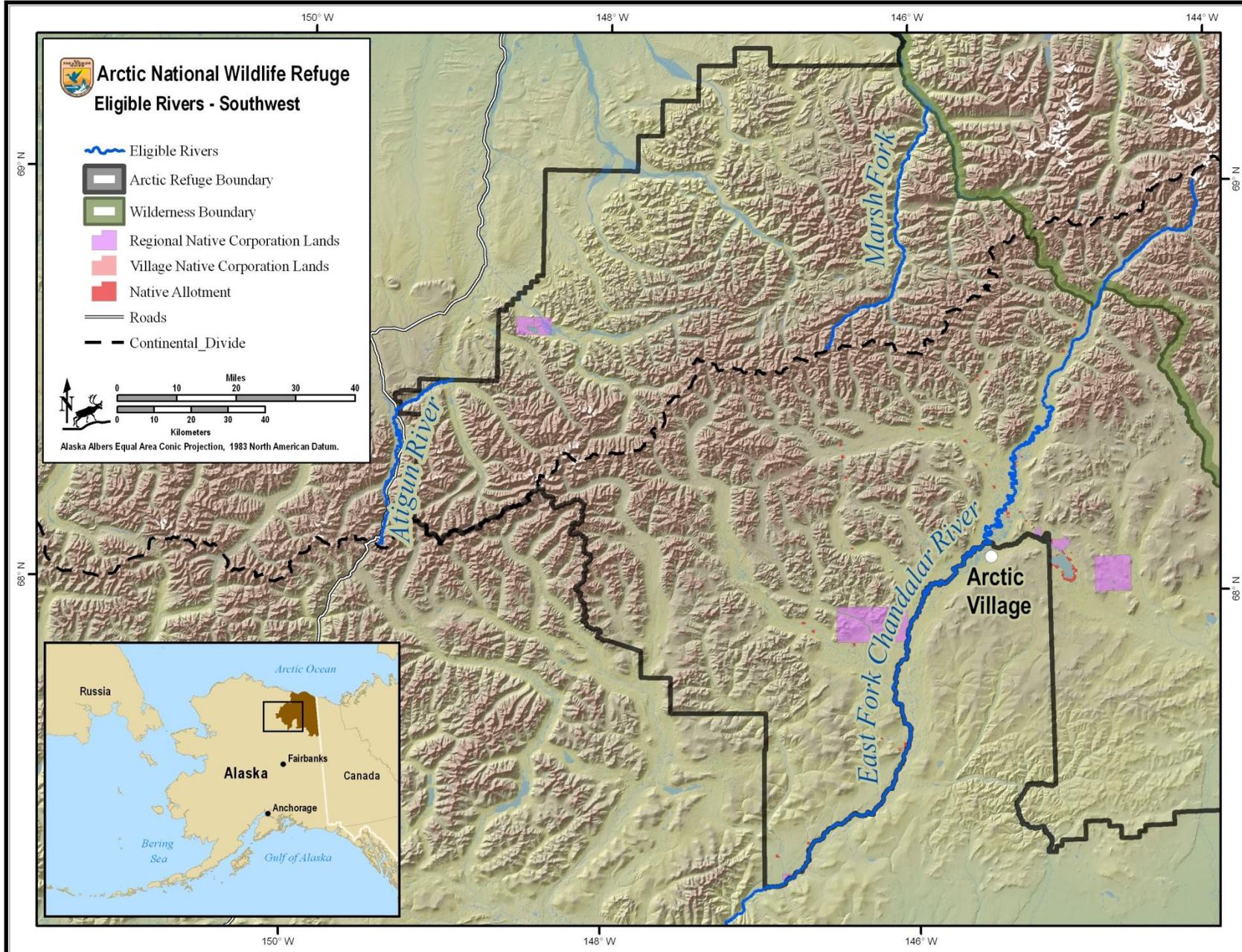


Figure 3-3 Eligible River - Southwest



4. Suitability Analysis

4.1. Timing and Process for the Suitability Phase

Eligible rivers will undergo a suitability study during the CCP planning process. The final decision on the suitability of a given river or river segment will be made in the ROD for the revised Refuge CCP. This determination does not designate a river as part of the NWSRS – only Congress can designate a river. If a river is found not suitable in the ROD, it will be removed from further wild and scenic consideration and will be subject to management objectives in the CCP.

The IWSRCC (1999) indicated that the suitability evaluation should answer three questions:

- 1) Should the river's free-flowing character, water quality, and ORVs be protected, or are one or more other uses important enough to warrant doing otherwise?
- 2) Will the river's free-flowing character, water quality, and ORVs be protected through designation? Is it the best method for protecting the river corridor? In answering these questions, the benefits and impacts of WSR designation must be evaluated, and alternative protection methods considered.
- 3) Is there a demonstrated commitment to protect the river by any nonfederal entities that may be partially responsible for implementing protective management? Input from designated stakeholder groups and from comments upon issuing the Draft CCP/EIS will be incorporated in the suitability determination.

4.2. Criteria Used in the Next Step

The IWSRCC (1999) outlines eleven criteria to be considered in a suitability study:

1. Characteristics that do or do not make the area a worthy addition to the NWSRS.
2. Status of landownership, minerals (surface and subsurface), use in the area, including the amount of private land involved, and associated or incompatible uses. Jurisdictional consideration (administrative role and/or presence) must be taken into account to the extent that management would be affected.
3. Reasonably foreseeable potential uses of the land and related waters that would be enhanced, foreclosed, or curtailed if the area were included in the NWSRS, and the values that could be foreclosed or diminished if the area is not protected as part of the NWSRS.
4. Federal, public, state, tribal, local, or other interests in designation or nondesignation of the river, including the extent to which the administration of the river, including the costs thereof, may be shared by state, local, or other

agencies and individuals. Also, the federal agency that will administer the area should it be added to the National System.

5. Estimated cost, if necessary, of acquiring lands, interests in lands, and administering the area if it is added to the NWSRS.
6. Ability of the agency to manage and/or protect the river area or segment as a Wild and Scenic river, or other mechanisms (existing and potential) to protect identified values other than designation.
7. Historical or existing rights which could be adversely affected.
8. Adequacy of local zoning and other land use controls in protecting the rivers ORVs by preventing incompatible development.
9. Consistency of designation with other agency plans, programs, or policies and in meeting regional objectives. Designation may help or impede the “goals” of other tribal, federal, state, or local agencies.
10. Contribution to a river system, watershed, or integrity of a basin. Numerous benefits are likely to result from managing an entire river or watershed, including the ability to design a holistic protection strategy in partnership with other agencies and the public.
11. Other concerns, if any.

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CULTURAL

The river, or area within 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 within the Athapaskan language region in Alaska north of the Alaska Range. Inupiat cultural values were evaluated within 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 within the archaeological record, are rare, or represent an area where a culture was first identified. Rare, notable, unique or unusual sites or features within 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 pre-historic 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 within the region of comparison. 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 have the ability to attract visitors. River corridors that contain the best representative examples of Alaska Native or other pre-historic culture in the region of comparison 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 region of comparison. 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 within the region of comparison 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 have the ability to attract visitors. River corridors that contain the best representative examples of historic events in the region of comparison are of higher value.

RECREATIONAL

The Arctic National Wildlife 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 region of comparison or are unique or rare within 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 Arctic National Wildlife 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 within 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 to engage in expedition-style or epic-length trips. Consider the comparative number or percent of similar experiences available within the region of comparison. 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.

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 as compared to rivers that are visually monotonous, or developed.

Region of Comparison

Within the Arctic National Wildlife 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; 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.

FISH

Fish populations on the Refuge remain wild and retain their natural population dynamics and cycles. Within 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 within two sub regions within 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.

GEOLOGICAL

The river corridor contains geologic features, processes, or phenomena that are unique, rare, or representative within the region of comparison. 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 Arctic National Wildlife 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 region of comparison. 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/hydrologic features clearly and graphically reveal interesting/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 region of comparison are of higher value.

WILDLIFE

Wildlife populations on the Refuge retain their natural interactions, population dynamics and cycles. Within 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 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.

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 within two sub regions within 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, 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

River with the greatest number of wildlife within the river corridor are of higher value.

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 that have worked for the Refuge for more than ten years or those that have a great deal of on-the-ground experience within 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 were totaled. For north side rivers, the number of special features ranged from one to nine. The number of features were 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 within 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 within a corridor and the greater

diversity among the plant communities, the more diverse the seasonal changes of color and pattern would likely be within the corridor. Because the number of vegetation and habitat types is highly correlated with the length of each river, the number of types were 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 twenty rivers, rather than looking at north side rivers separately from south side rivers.

Total scores for the Scenic ORV ranged from four to 13 points. The highest possible score for the Scenic ORV was 15 points, and 70% 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			
	Diversity of View	Special Features	Seasonal Variations	ORV Score
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, airboat use is not authorized within the much of the Refuge and was not included under Diversity of Use. Because airboats are not allowed on refuge lands, 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 within 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, 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 a true adventure experience would be attracted to rivers for which the opportunity for solitude and the sense of remoteness is high. The commercially supported public use database, which is the only comprehensive dataset on visitation, was used to determine the percent of visitors within each river corridor. The data represent the average amount of use over the past nine years. Thus on

average, 21.5% of all commercially-supported visitors to Arctic Refuge in any given year use the Kongakut River corridor. By contrast, 0.2% use the Firth River. More points were given to rivers with the smallest percent of use, which provides the opportunity for solitude and fewer points to rivers with a high percent of use for which solitude is difficult to experience. The scale used to rank this dataset was five points for zero to 0.99 percent of Refuge users in the river corridor; four points for one to six percent of users; three points for seven 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 generally attracted to challenging whitewater rather than flatwater. Therefore each river was assigned a single whitewater classification reflecting the highest degree of difficulty within 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 for 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 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 one or 11 trips; three points were assigned to rivers with two to three or nine to ten trips offered; two points went to rivers with four to five or seven to eight trips offered; and one point was given to rivers with six 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 public 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 to 2009). Rivers used by more than 100 people each year and those used by ten or fewer people each year received five points. Rivers with 91 to 100 people and 11 to 20 people received four points; rivers with 81 to 90 people and 21 to 30 people received three points; rivers with 71 to 80 and 31 to 40 users were given two points; rivers with 61 to 70 and 41 to 50 users got one point; and rivers with 51-60 users received zero points.

Associated Opportunities: The team considered the types of other activities recreationists engage in while in the river corridors. The team determined which of these associated recreation opportunities are truly superlative – specific reasons why people come to Arctic Refuge. Five superlative opportunities associated with our 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 were tallied, compiled, 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 although through interviews with three permittees general visitation patterns are available: one to ten percent of the Refuge's users are international residents, 35 to 75 percent come from areas of the United States outside of Alaska, and 15 to 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 (2009) 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 to 24.8 points. The highest possible score for the Recreational ORV was 30 points, and 70% 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 river. Two rivers were notably absent: the Hulahula River and the Marsh Fork of the Canning River.

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 CCP planning effort as an important resource. The number of public comments combined with the team's best professional judgement 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 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 public use data for the Marsh Fork of the 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 CCP planning effort. Our best professional judgment and public comments combine to support a Recreational ORV for the Marsh Fork of the Canning River.

Therefore, three 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 indicated that the Kongakut, Hulahula, and Marsh Fork of the 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	4	0	16.0
Atigun River	4.0	2.7	5.0	1	1	0	13.7
Canning River	5.0	2.0	1.5	1	4	0	13.5
Marsh Fork-Canning River	2.5	1.7	1.5	4	2	3	14.7
Coleen River	3.5	3.0	3.0	1	1	3	14.5
East Fork-Chandalar River	4.5	3.7	2.5	4	0	0	14.7
Middle Fork-Chandalar River	4.5	2.7	3.0	5	1	0	15.8
Firth River	3.0	3.0	3.0	5	1	0	15.0
Hulahula River	5.0	2.3	2.5	4	3	1	17.8
Jago River	4.0	3.3	2.0	0	3	1	13.3
Joe Creek	2.5	3.7	2.0	4	0	0	12.2
Junjik River	3.0	2.0	4.0	4	0	0	13.0
Spring Creek	2.5	2.3	2.5	4	0	0	11.3
Kongakut River	4.5	2.3	3.0	5	5	5	24.8
Okpilak River	4.5	3.3	3.0	5	3	0	18.8
Sadlerochit River	4.5	2.3	4.5	4	2	0	17.3
Neruokpuk Lakes	2.5	2.3	4.0	5	0	0	13.8
Porcupine River	4.5	2.3	5.0	5	0	0	16.8
Sagavanirktok River	4.5	2.3	4.0	4	1	0	16.2
Turner River	3.5	2.0	3.0	4	3	0	15.5

Geologic ORV

The Geologic ORV has three components: feature abundance, diversity of features, and educational/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 as having higher value. Sufficient data is not available to analyze both the abundance and diversity of features within 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 ten or more feature types; four points for eight or nine feature types; three points for six or seven feature types; two points for four or five feature types; one point for two or three feature types; and zero points for zero to one 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 within the river corridor, including the lower reaches of rivers that extend outside the Brooks Range.

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

The number of bedrock types ranged from one to 12 per river. Rivers with 11 or more bedrock types were given five points; rivers with nine to ten types received four points; seven to eight types received three points; five to six types got two points; three to four bedrock types were given one point; and zero to two types received zero points. The number of bedrock patches per mile ranged from 0.05 to 0.59 patches per mile. Rivers with 0.36 or more patches per mile received five points; rivers with 0.29 to 0.35 patches per mile received four points; 0.22 to 0.28 patches per mile got three points; 0.15 to 0.21 patches per mile were given two points; 0.08 to 0.14 patches per mile got 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 giving river corridors that contain rare, one-of-a-kind, or common but representative examples of a geologic feature in the region of comparison to have the highest 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 got a single point; and rivers for which there were no superlative or exceptional geologic or hydrologic values mentioned 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 one to 12 points. The highest possible score for the Geologic ORV was 15 points, and 70% 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.

Geological ORV Results				
	Components			
	Feature Abundance	Diversity	Education/Scientific	ORV Score
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 Refuge. The locations of some over-wintering 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 the 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 within 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.

The Refuge contains nearly 65% of all proposed critical habitat for polar bears in the State. Polar bear critical habitat correlates with the topography, wind patterns, and soil development in river corridors. The total miles of polar bear critical habitat along the length of each river and within one-half mile of either side of ordinary high water was calculated using GIS. Rivers received five points for 61 or more miles of polar bear habitat within the corridor; four points for 46 to 60 miles; three points for 31 to 45 miles;

two points for 16 to 30 miles; one point for one to 15 miles; and zero points for zero miles of polar bear habitat within 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 within the river corridors of the Refuge, especially if cliffs or cliff-like geologic features are found within 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 to 49 nests; three points for ten to 24 nests; two points for five to nine nest sites; one point for one to four nests; and zero points if there are no known raptor nests within the river corridor.

The number of habitats within each river corridor was calculated using (Homer, et.al 2004) and GIS. A river scored five points for 19 to 21 habitat types; four points for 17 to 18 habitats; three points for 14 to 16 habitats; two points for 12 to 13 habitats; and one point for ten to 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 within these distributions. If a species were known to use a river corridor for all or a portion of their life-cycle, that species was included in the count.

North side rivers were ranked according to the total number of species using each corridor using the following scale: five points for rivers with 90 or more species; four points for 80 to 89 species; three points for 70 to 79 species; two points for 60 to 69 species; and one point for 50 to 59 species. South side rivers had very similar totals for the number of species, ranging from 122 to 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 on state, federal, threatened, or endangered species lists, including those considered to be species of concern (citations) are known to occur on the North Slope of the Brooks Range: red-throated loon, yellow-billed loon, 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, etc. species use all or a portion 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 on state, federal, threatened or endangered species lists 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 within 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 ten points, and 70% of ten 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 within 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/eligibility, and educational/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 data obtained from the 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 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 Bay Company set up trading posts on the Porcupine River, exchanging goods such as beads and cloth for furs. Hudson 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 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, Arctic exploration, the Klondike gold rush, and early steamboat and gas-powered river boat navigation (NPS 1984). The Porcupine River remains important to local people who rely upon 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 pre-history. There are six component definitions: notable occupation, cultural/subsistence importance, number of cultures, site integrity, listing/eligibility, and educational/scientific.

No systematic studies of archaeology, or historical research 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 the Regional Archaeologist (Debbie Corbett). The data used for the Cultural ORV might not fully depict the cultural and archaeological resources within river corridors or as-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. The Regional Archaeologist provided the team with the number and type of prehistoric sites within 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 to 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 within each corridor ranged from zero to 67. The team decided 67 was an outlier, because the next highest number is 21. The number of sites was ranked according to the following scale: five points for 20 or more sites; four points for 15 to 19 sites; three points for ten to 14 sites; two points for five to nine sites; one point for one to four 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 (EIS) (USFWS 2010). Rivers on the south side of the Refuge are used by residents of four villages (Arctic Village, Venetie, Fort Yukon, and Chalkyitsik) for ten 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 of the identified subsistence types.

Subsistence data for north side rivers were extracted from the Draft Point Thompson EIS (citation). North side rivers are used by the residents of Kaktovik for caribou, fish, sheep, and furbearers. The citation 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 within 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 of the identified subsistence types.

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 – sites that Native Village Corporations have purchased from the Federal government because they contain important cultural values; and historic sites (sites from the last 150 to 100 years) that are associated with Native culture. A point was given to each site within a river corridor. No river had more than a single point.

A final measure of contemporary cultural value would be the presence of any rare, sacred, or other highly valued cultural site within the river corridor. The team wanted to interview Tribal members and elders to ask them whether a river corridor contained such a site. Existence of a site was determined and given a yes or no. Interviews were conducted; one person from Arctic Village and two people from Kaktovik participated. However, the team decided the interviews were not sufficiently broad to use in our analysis. Due to lack of time and resources to interview additional Tribal members, contemporary cultural values were not evaluated.

The ranks for the two datasets were averaged for north side rivers and for south side rivers. Component scores for Cultural/Subsistence Importance ranged from zero to four 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” Inupiat or Gwich’in cultures were listed. For the purpose of this evaluation, “modern” and “historic” are being considered as one culture. Modern and historic Inupiat, for example, 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, caribou fences and thousands of years of inter-cultural 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 within 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 and into Canada and Greenland to the east. The other aspect of prehistory that is significant 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 within the corridor where it has been documented that Inupiat, Eskimo, and/or Denbigh cultures used the site as well as Gwich'in, Athabaskan, 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 inter-cultural 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 data set, 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 zero to 15 points. The highest possible score for the Cultural ORV was 20 points, and 70% of 20 is 14. Thus, any river with a score greater than 14 was considered to have the Cultural ORV.

Cultural ORV Results					
	Components				
	Notable Occupation	Cultural/Subsistence Importance	Number of Cultures	Educational/Scientific	ORV Score
Aichilik River	2.5	1.5	1.0	0	5.0
Atigun River	4.5	0.0	2.0	5	11.5
Canning River	2.0	1.0	5.0	5	13.0
Marsh Fork-Canning River	0.0	0.0	0.0	0	0.0
Coleen River	2.0	3.5	1.0	0	6.5
East Fork-Chandalar River	4.0	5.0	1.0	5	15.0
Middle Fork-Chandalar River	2.0	0.5	1.5	0	4.0
Firth River	0.0	0.0	0.0	0	0.0
Hulahula River	1.0	2.5	1.0	0	4.5
Jago River	1.0	4.0	1.0	0	6.0
Joe Creek	2.5	0.0	1.0	5	8.5
Junjik River	2.5	2.0	2.0	5	11.5
Spring Creek	1.0	3.0	1.0	5	10.0
Kongakut River	1.0	3.0	1.0	0	5.0
Okpilak River	1.0	0.5	2.0	0	3.5
Sadlerochit River	2.5	2.0	4.0	5	13.5
Neruokpuk Lakes	2.5	2.0	3.0	0	7.5
Porcupine River	5.0	1.0	3.5	5	14.5
Sagavanirktok River	3.5	0.0	1.0	0	4.5
Turner River	1.0	0.0	1.0	0	2.0