

CHAPTER 14: TRIBAL RESOURCES

This chapter summarizes the tribal resources in the study area and potential impacts that could result from the Eightmile Dam Rebuild and Restoration Project. The study area is the geographic extent of potential construction and operational impacts on tribal resources for each of the project alternatives as presented in Chapter 2. The full geographic extent of tribal resources that could be impacted likely extends well beyond the specific project area. The natural resources study area, which is being used to assess tribal resources with a natural resource component, includes the entire length of the Eightmile Creek watershed and the portion of the Icicle Creek drainage extending from its confluence with Eightmile Creek downstream to the Wenatchee River (Chapter 8, Figure 8-1). The study area extends vertically from the bottomlands of the various stream drainages, upslope to the surrounding ridgetops.

Key Findings for Tribal Resources

The term “tribal resources” refers to the collective rights and access to traditional areas and times for gathering resources associated with a tribe’s sovereignty since time immemorial.

- Tribal resources may also include archaeological or historic sites, elements of the built environment, and Traditional Cultural Properties (TCPs) associated with tribal use, and sites considered sacred by tribes.
- Tribal resources are related to other natural and cultural resources analyzed in this EIS, especially Plants and Animals (Chapter 8) and Cultural Resources (Chapter 13). Natural resources are inextricably linked with the lives of Indigenous peoples; all animal species have some connection to tribal members through traditional stories or practice.
- For this EIS, tribal resources were identified through review of publicly available published literature, scoping comments, and—in particular—information provided directly from the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) and Confederated Tribes of the Colville Reservation.
- Eightmile Lake, Eightmile Creek, Icicle Creek, and the surrounding areas are part of the study area for tribal resources.
- The study area is within the Yakama Nation Treaty Territories—representing Ceded Lands of the Wenatchipum Band of Yakama Nation. The Tribe’s Reserved Rights are protected by the 1855 Treaty between the United States and 14 tribes and bands of the Yakama Nation. The Treaty designated Reserved Rights at all Usual and Accustomed places within the Treaty Territory.
- A federal treaty is considered the supreme Law of the Land under the U.S. Constitution. Pursuant to its status as a sovereign nation and its Treaty-reserved authority, Yakama Nation acts as a co-manager of the resources upon the reservation, ceded lands, and Usual and Accustomed places.
- The study area is within the Traditional Use Area of the Wenatchi Band of the Confederated Tribes of the Colville Reservation. The Executive Orders that established reservations included brief statements with the intent to set aside a specific tract, including the Colville Reservation that was established by Executive Order in 1872.

The project area is within the Yakama Nation Treaty Territories—representing Ceded Lands of the Wenatchipum Band of Yakama Nation. The area is also within the traditional use area of the Wenatchi Band of the Confederated Tribes of the Colville Reservation. Both tribal governments provided information resources and input during the drafting of this chapter.

The Confederated Tribes of the Colville Reservation provided additional research resources and comments on an early draft of the chapter. After reviewing the draft, the Yakama Nation provided an additional formal context on its treaty rights and history of the study area. This was done as a result of the published available sources identified during the review not providing sufficient context regarding the significance of the study area to the Yakama people (YN 2022). As a result of this significant effort on the part of the Yakama Nation, and the critical difference between this context and the published materials, the chapter presents both the Yakama Nation-provided context and the context available from archival sources when applicable.

The project area is located within the Alpine Lakes Wilderness of the Okanogan-Wenatchee National Forest in Chelan County and includes Eightmile Lake and Eightmile Creek; it also includes Icicle Creek downstream to its confluence with the Wenatchee River in Leavenworth, Washington. The Alpine Lakes Wilderness is managed by the Forest Service.

The term “tribal resources” refers to the collective rights and access to traditional areas and times for gathering resources associated with a tribe’s sovereignty since time immemorial. It also includes inherent rights or formal treaty rights associated with Usual and Accustomed territories and lands formally ceded by the Yakama Nation under the 1855 Treaty between the United States and the Yakamas (“Treaty”). The term “Usual and Accustomed” represents a different understanding than traditional territory and often spans a much greater area (YN 2022). In addition, tribal resources include areas important to traditional cultural practices and the natural and cultural resources associated with those practices, including plants, wildlife, or fish used for commercial, subsistence, or ceremonial purposes. Tribal resources may also include archaeological or historic sites, elements of the built environment, and Traditional Cultural Properties (TCPs) associated with tribal use, and sites considered sacred by tribes. Archaeological sites and historic aged built environment resources are material constructs with distinct physical attributes that are protected under local, state, and federal law. TCPs are properties associated with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community, and may have physical elements, spiritual significance, and wider cultural use practices associated with them (Ecology 2022e). These resources are often found at locations associated with tribal practice, such as important fishing, hunting, and gathering locations; however, archaeological and historic sites, as well as TCPs, are considered cultural resources and are discussed in Chapter 13, *Historic and Cultural Resources*.

14.1 Resource Description

“Tribal resources” is a term that refers broadly to the places, specific resources, and knowledge and experience of Indigenous people. This resource category directly relates to collective rights, knowledge, and access to traditional use areas and times associated with a tribe’s legal and cultural sovereignty, since time immemorial (Ecology 2022e). They include the following:

- Inherent rights or formal treaty rights associated with Usual and Accustomed territories, as outlined in the Yakama Treaty on June 9, 1855, ratified in 1859.
- Areas important to traditional cultural practices and the natural and cultural resources associated with those practices, including plants, wildlife, or fish used for commercial, subsistence, and ceremonial purposes. These include areas designated by the tribes as sacred. These areas may or may not be formerly recorded.

Tribal resources were identified through review of publicly available published literature, anthropological reports, scoping comments, and information provided by tribal government. The following section has been prepared in part based on published materials by non-Native people from the 19th, 20th, and 21st centuries, as well as unpublished data provided by the Yakama Nation and published and unpublished data from the Confederated Tribes of the Colville Reservation. Separate subsections have been developed to differentiate the contextual information for the Yakama Nation and the Confederated Tribes of the Colville Reservation. The published materials from non-Native people often do not present the full and accurate understanding of tribal history and knowledge. The authors acknowledge that these sources inherently contain deficiencies, and use of them is not intended to substitute or supersede knowledge held within the tribes. Tribal communities are the best source of information about tribal resources and impacts on such resources.

Information about tribal resources is also included in Chapter 8, *Plants and Animals*; Chapter 13, *Cultural Resources*; Chapter 16, *Environmental Justice*; and CTCR (2022). Cultural resources also include non-Native American built environment and archaeological resources that would not likely be considered tribal cultural resources by the tribes; these are described in Chapter 13 and are not addressed in this tribal resources chapter.

14.1.1 Yakama Nation

The Yakama Indian Reservation was established by way of the 1855 Treaty between the United States and 14 tribes and bands including the Kah-milt-pah, Klickitat, Klinquit, Kow-was-say-ee, Li-ay-was, Oche-chotes, Palouse, Pisuose, Se-ap-cat, Shyiks, Skin-pah, Wenatshapam, Wish-ham, and Yakama (“Treaty”) (YN 2022). The Treaty reserved a 1.3-million-acre Reservation “for the exclusive use and benefit” of the Yakama people.¹ The Treaty further designated Reserved Rights for Yakamas to exercise “in common with” citizens of the United States at all Usual and Accustomed places within the Treaty Territory.² A federal treaty is considered the supreme Law of the Land under the U.S. Constitution.³ Pursuant to its status as a sovereign nation and its Treaty-reserved authority, Yakama Nation acts as a co-manager of the resources upon the reservation, ceded lands, and Usual and Accustomed places. This has been recognized and affirmed by federal courts,⁴ for the protection of all natural and cultural resources in Yakama Nation’s Treaty Territory.

The Treaty provides for both Reserved Rights, and Usufructuary Rights. Reserved Rights, as established by the Reserved Rights Doctrine, finds that the Treaty itself was not a grant of rights from the Yakama Nation to the government but a reservation of rights not granted. While Usufructuary Rights, or rights not explicitly stated in the Treaty, are those rights that are explicitly stated and are subject to specific Treaty interpretation. They are typically an action such as hunting, fishing, gathering, and so on, as explained in Article III of the Treaty, and are not the resources themselves.

Treaty-protected land rights fall into three distinct categories: Reservation Lands, Ceded Lands, and Usual and Accustomed Areas. The Yakama Nation Reservation lands are those lands set aside for the exclusive use and benefit of the Yakama Nation and its members. The Yakama Nation Ceded Lands represent a boundary of approximately 12 million acres of land in which a right of settlement was granted under provisions of the Treaty and all other rights reserved. The Yakama Nation Usual and Accustomed Places represent the traditional places utilized historically by the constituent 14 tribes and bands that comprise the Yakama Nation for fishing, hunting, and gathering.

¹ See Treaty with the Yakamas, U.S. – Yakama Nation, June 9, 1855, 12 Stat. 951, art. II, cl. 3. <https://goia.wa.gov/tribal-government/treaty-yakama-1855>.

² See *Id.* at art. III, cl. 2.

³ See U.S. Const. art. VI, cl. 2. <https://www.archives.gov/founding-docs/constitution-transcript#6>.

⁴ See *United States v. Washington*, 384 F. Supp. 312, 382 (W.D. Wash. 1974), *aff’d*, 520 F.2d 676 (9th Cir. 1975), <https://cite.case.law/f-supp/384/312/>; <https://cite.case.law/f2d/520/676/>; see also *U.S. v. State of Oregon*, 666 F. Supp. 1461 (D. Or. 1987).

The Yakama Nation's enrolled membership exceeds 11,000 people whose history, culture, and way of life are intertwined with the resources and places on the land. These include all natural resources used traditionally for food, tools, medicines, shelter, and so on. Protecting the land and associated water ways is critical for ensuring the Yakama Nation's Treaty-reserved resources and rights, and ultimately to the health and welfare of the Yakama people. **Figure 14-1** illustrates the Ceded area and Reservation boundary of the Confederated Tribes and Bands of the Yakama Nation.

14.1.2 Confederated Tribes of the Colville Reservation

The Confederated Tribes of the Colville Reservation was established by Presidential Executive Order on April 9, 1872, which reserved acreage for the "Methow, Okanogan, Sanpoil, Nespelem, Lakes, Colville, Kalispel, Spokane, Cour d'Alene, and scattered bands of the Chelan, Entiat, and Southern Okanogan" (Lahren 1998:492). A second executive order was issued in July 1872 that relocated the reservation and returned some of the land set aside to public domain (CTCR 2021a, 2023a, 2023b; Lahren 1998:492-493). In April 1879 and March 1880, the Moses Agreement established the Columbia Reservation to set aside land for Chief Moses and his people, which included Columbia, Chelan, Entiat, and Wenatchi tribes (CTCR 2021a; Lahren 1998:492). Chief Moses signed an agreement for family heads to be assigned allotments on this reservation or they could move to the Colville Reservation (Lahren 1998:492). This reservation was returned to public domain by executive order. In 1892, the north portion of the Colville Reservation was ceded to the United States by an act of Congress (27 Stat.62) (CTCR 2021a, 2023a). Today's Colville Reservation encompasses 1.4 million acres of land which include tribally owned lands held in federal trust status for the Confederated Tribes of the Colville Reservation, land owned by individual tribal members (which also include federal trust status), and land owned by other tribal or non-tribal entities (CTCR 2021a). Additionally, the CTCR "have 9,166 acres of off reservation management areas" (CTCR 2021a). Executive Order reservations did not contain any of the specific language found in those treaties that established reservations. The Executive Orders that established reservations included brief statements with the intent to set aside a specific tract, including the Colville Reservation that was established by Executive Order in 1872 (Lahren 1998:492). Today, the Twelve Bands that comprise the Confederated Tribes of the Colville Reservation include: Chelan, Chief Joseph Band of Nez Perce, Colville, Entiat, Lakes, Methow, Moses-Columbia, Nespelem, Okanogan, Palus, San Poil, and Wenatchi. Tribal enrollment is 9,520 members.

The traditional territories of the Colville Tribes extend across eastern Washington and into portions of British Columbia, Oregon, and Idaho. This expanse covered approximately 39 million acres as the homeland of the Lakes, Colville, Okanogan, Moses-Columbia, Wenatchi, Entiat, Chelan, Methow, Nespelem, Sanpoil, Chief Joseph Band of Nez Perce, and Palus Indians (**Figure 14-2**).

14.1.3 Existing Conditions

This section describes the methods used to analyze tribal resources within the study area. The analysis for tribal resources references the other natural resource analyses in the EIS and considered the tribes' unique connection to and reliance on cultural and natural resources. To honor the tribes' perspective, the analysis considered all identified impacts on natural resources and cultural resources associated with tribal use or rights. This chapter includes consideration of the unique perspectives and specific impacts on the tribes when evaluating project impacts. This analysis has identified tribal resources as plants, wildlife, and areas important to traditional cultural practices and those associated with treaty rights related to Usual and Accustomed places. EIS chapters and reports, publicly available sources, and unpublished ethnographic data provided during review and consultation with the tribes were used to develop the list of resources. The following sources were reviewed:

- Unpublished ethnographic information provided by the Yakama Nation during documentation review and consultation with Ecology.

Figure 14-1. Ceded Area and Reservation Boundary of the Confederated Tribes and Bands of the Yakama Nation



Figure 14-2. Traditional Use Areas of the Wenatchi Band of the Colville Tribes



- Confederated Tribes and Bands of the Yakama Nation website.
- Yakama Nation Museum and Cultural Center website.
- Confederated Tribes of the Colville Reservation website.
- Traditional Cultural Plant Team, History/Archaeology Program, Confederation Tribes of the Colville Reservation.
- Published ethnographic studies and historic contexts.

Potential project impacts on tribal resources with a natural resource component were assessed within the study area, as per methods established in the Plants and Animals chapter (Chapter 8). In addition to this desktop assessment, ESA conducted a vegetation survey of habitat conditions; rare, threatened, and endangered vascular plant species; and invasive plant species on September 30, 2021 (Appendix C). The vegetation survey focused on locations within the study area including the Eightmile Dam staging area and the portion of FSR 7601-116 to be directly improved or modified as a part of the project (**Figure 14-3**).

14.1.4 Impacts Methodology

The analysis of impacts on tribal resources differs in its approach when compared to the impact analysis for other natural and cultural resources. Natural resources are analyzed elsewhere in the EIS and associated reports to determine if the project would have significant impacts from a non-tribal (i.e., SEPA) perspective, and whether or not those impacts could be mitigated.

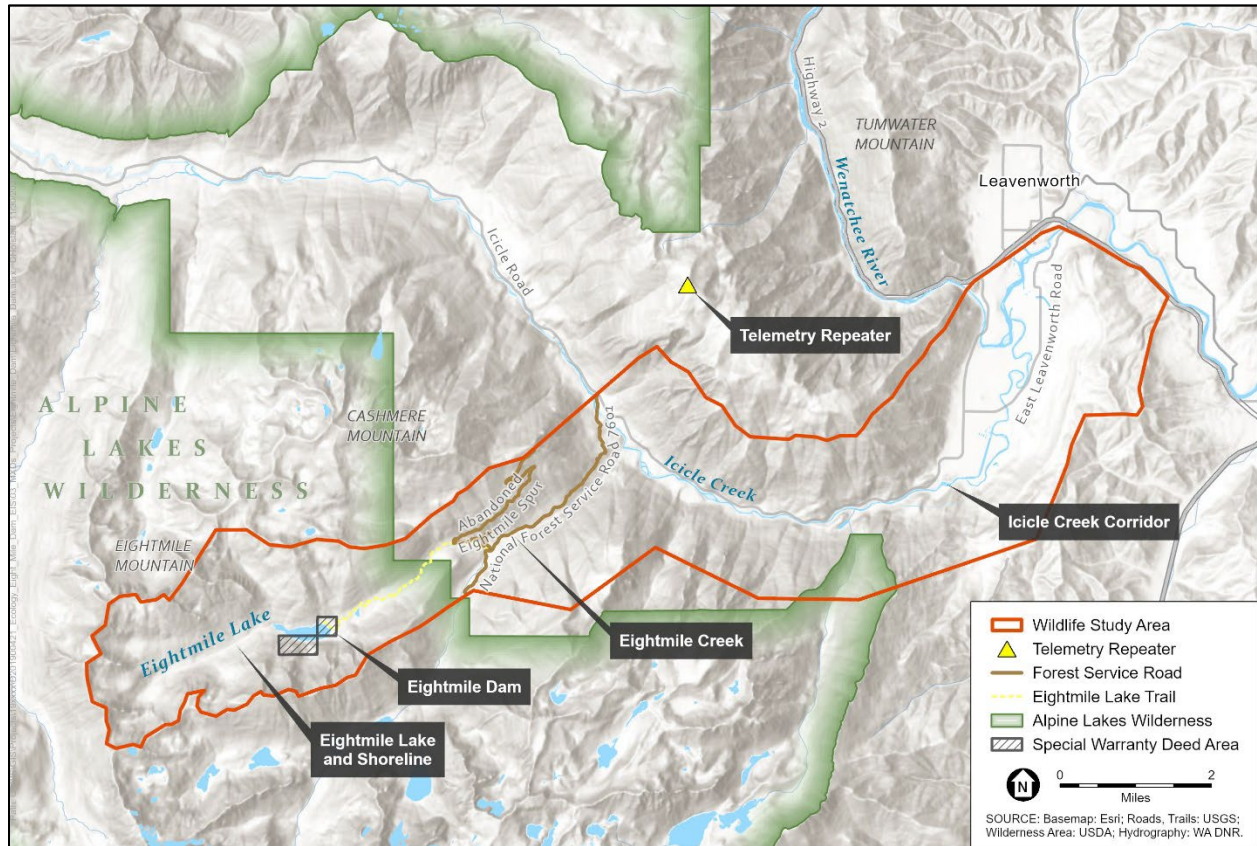
Comments from the tribes demonstrate that natural and cultural resources are highly interconnected. As a result of this connection, tribes hold a deep, inherent knowledge and understanding of the ecosystem, often referred to as Tribal Ecological Knowledge (TEK). The USFWS defines Tribal Ecological Knowledge as “*the evolving knowledge acquired by Indigenous and local peoples over hundreds or thousands of years through direct connection with and observation of the environment*” (Rinkevich et al. 2011).

The analysis for tribal resources references the other natural resource analyses in the EIS and considered the tribes’ unique and powerful connection to and reliance on cultural and natural resources. To honor the tribes’ perspective, the analysis considered all identified impacts on natural resources and cultural resources. This analysis includes consideration of the unique perspectives and specific impacts on the tribes and adds cultural context when evaluating project impacts.

This analysis has defined tribal resources as plants, wildlife, and areas important to traditional cultural practices and those associated with treaty rights related to Usual and Accustomed territories.

To identify the potential for impacts from flood inundation, a GIS map of inundation levels under the alternatives and various flood scenarios was reviewed (**Figure 12-1**). Other information was reviewed to identify impacts on water rights, transportation, and dam safety as they relate to impacts on tribal resources. Impacts are possible if tribal resources are permanently removed or altered, or if access to resources is temporarily (or permanently) limited during construction or operation. Potential sources of impacts include excavation, grading, burial, erosion, contamination, or other ground-disturbing effects; changes in setting; and temporary and/or permanent exposure to noise, dust, vibration, and general lack of access to Usual and Accustomed areas for hunting, fishing, and/or gathering.

Figure 14-3. Tribal Resources Study Area for the Eightmile Dam Rebuild and Restoration Project.



Impact Identification

The analysis of impacts on tribal resources considered the following:

- Construction and operation impacts on plant and animal species used by tribal members.
- Loss of, or modifications to, habitats of species used by tribal members.
- Indirect impacts on species and habitats used by tribal members, including fragmentation of habitats and impediments to migration.
- Loss of access to a traditional hunting, fishing, or gathering area, or to an area where other traditional practices occur.
- Loss of revenue to tribal members as a result of the project.
- Interruption of spiritual practices.
- Loss of medicinal and traditional plants and foods.
- Disruption and degradation of health and mental well-being of tribal members.

Impacts on archaeological sites, built environment resources, and TCPs are analyzed in Chapter 13, *Historic and Cultural Resources*. Additionally, information on potential impacts that relate to tribal resources is also included in Chapter 8, *Plants and Animals*, and Chapter 16, *Environmental Justice*.

Identification of Construction Impacts

Thresholds for potential significant impacts on tribal resources as a result of construction were defined and established using criteria established for natural resources (Chapter 8, *Plants and Animals*).

Impacts on natural resources could be reversible or irreversible (permanent). For example, permanent impacts could occur during construction if construction activity results in permanent damage or removal of a natural resource or the permanent alteration of a culturally significant landform associated with traditional stories or practices.

For this analysis, significant construction impacts on tribal resources are defined as follows:

- **Significant:** Significant construction impacts are defined in this analysis as those that are irreversible and permanently diminish the ability for a tribal resource to convey its significance. For natural resources, impacts would be significant if construction activities would result in a large-scale take (mortality, injury, or deleterious behavioral changes on more than a few individual organisms) on fish, wildlife, and plant species, or resulted in the permanent loss of access to hunting, fishing, or gathering areas.

Construction activities would be considered a significant impact if they eliminate, or make non-viable, a species within the study area through the loss of suitable habitat.

Identification of Operational Impacts

For this analysis, long-term (operational) impacts on tribal resources are considered significant as follows:

- **Significant:** Impacts are considered significant if they permanently diminish the integrity of essential physical features such that the resource is no longer able to convey its significance for which it is used. Impacts on natural resources would be significant if operation of the dam would result in a large-scale take (mortality, injury, or deleterious behavioral changes on more than a few individual organisms) on fish, wildlife, and plant species. Significant habitat impacts would occur if operation of the dam would eliminate, or make non-viable, a species within the study area through the loss of suitable habitat.

14.2 Regulatory Context

Tribal resources within the study area are protected by several federal, and state regulations, plans, and policies. Federal laws, regulations, and policies are presented in **Table 14-1**, and state laws, regulations, and policies are presented in **Table 14-2**.

Chelan County and the City of Leavenworth do not have formal Historic Preservation Programs. Preservation programs here are guided by federal and state laws and regulations.

Table 14-1. Federal Laws and Regulations Applicable in the Study Area

Regulation or Policy	Description
National Historic Preservation Act (NHPA) (Title 54 U.S.C.) Section 106 of the NHPA (36 CFR Part 800)	The NHPA was approved on October 15, 1966 for the management and preservation of historical and archaeological sites. Under this act, the NRHP, National Historic Landmarks List, State Historic Preservation Offices (SHPO), and Tribal Historic Preservation Offices (THPO) were created. Washington State's SHPO is the DAHP, which is the state agency that

Regulation or Policy	Description
	administers NHPA compliance in Washington. The procedures for implementing the NHPA are detailed in the Protection of Historic Places regulations. Section 106 of the NHPA requires federal agencies to consider the effects of project undertakings, project approvals, or project funding on historic properties. This process requires consultation with the relevant THPO, Native American tribes, and Native Hawaiian organizations.
Treaty with the Yakamas, U.S. – Yakama Nation, June 9, 1855, 12 Stat. 951, art. II, cl. 3.	The Yakama Indian Reservation was established by way of the 1855 Treaty between the United States and the Yakamas (“Treaty”). The Treaty reserved a 1.3-million-acre Reservation “for the exclusive use and benefit” of the Yakama people. The Treaty further designated Reserved Rights for Yakamas to exercise “in common with” citizens of the United States at all Usual and Accustomed places within the Treaty Territory. A federal treaty is considered the supreme Law of the Land under the U.S. Constitution. Pursuant to its status as a sovereign Native Nation and its Treaty-reserved authority, Yakama Nation acts as a co-manager of the resources upon the reservation, ceded lands, and Usual and Accustomed places.
Presidential Executive Order April 9 1872 as amended by Executive Orders July 2, 1872 March 6, 1880, and Feb. 23, 1883	The Colville Reservation was established by executive order 1872 for the use and occupancy of the Methow, Okanogan, San Poil, Lake, Colville, Calispel, Spokane, Coeur d’Alene, and such other Indians as the Department saw fit to locate thereon. Other tribes located on the reservation were the Snake River Palouse branch of the Yakama, the Joseph band of the Nez Perce, the Moses Columbia, and the Wenatchee band of Indians. The original Colville Reservation was in existence for less than 3 months when it was exchanged for the present reservation under Executive Order of July 2, 1872. The present reservation of approximately 2,900,000 acres was divided into the North and South halves by the Act of July 1, 1892, which restored the North Half, consisting of approximately 1,500,000 acres, to the public domain. There was a group of tribes under the leadership of Chief Moses who resided during the early 1880s on the Columbia Reservation in the State of Washington. This group of tribes included: (1) the Columbia, (2) Chelan, (3) Entiat, and (4) Wenatchee. The Columbia Reservation was established by Executive Order of April 19, 1879, as amended by Executive Orders of March 6, 1880, and February 23, 1883, “for the permanent use and occupancy of Chief Moses and his people, and such other friendly Indians as may elect to settle thereon with his consent and that of the Secretary of the Interior.” On July 7, 1883, an Agreement was made in Washington, D.C., signed by the Secretary of the Interior and the Commissioner of Indian Affairs, which contained a provision that, if the Chief Moses group of tribes and other Indians who were then residing on the Columbia Reservation would move to the Colville Reservation, the United States “will secure to Chief Moses and his people as well as to all other Indians who may go on the Colville Reservation equal rights and protection.” This Agreement was ratified by the Act of Congress of July 4, 1884 (23 Stat. 76, 79-80). Subsequently, starting in or about 1886, members of the Chief Moses tribal

Regulation or Policy	Description
	groups were moved to the Colville Reservation. Also, during the year 1885 and later years, the Government moved to the Colville Reservation members of the Joseph Band of Nez Perce Indians and members of the Palus Tribe.
Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. Chapter 32)	Enacted on November 16, 1990, NAGPRA establishes rights for lineal descendants, Native Americans and tribes, and Native Hawaiian organizations to repatriate their culturally affiliated items, including human remains, associated and unassociated funerary objects, sacred objects, and objects of cultural patrimony. NAGPRA includes provisions for unclaimed and culturally unidentifiable Native American cultural items and the intentional and inadvertent discovery of Native American cultural items on federal and tribal lands only.
American Indian Religious Freedom Act (AIRFA) (42 U.S.C. Chapter 21 Subchapter 1 § 1996)	AIRFA was enacted to protect the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rights. The intent of AIRFA has been interpreted as ensuring that Native Americans obtain First Amendment protection, but not to grant Native Americans rights in excess of the First Amendment. Because such sites may be eligible for inclusion in the National Register, any effects that may occur, as a result of providing access to them, may trigger Section 106 review under the NHPA. As a related law, the NHPA greatly strengthens the requirements for federal agencies to ensure that tribal values are taken into account. Tribes are given greater control over patrimonial objects and are allowed to establish their own culturally specific criteria of significance.
Archaeological and historical laws and Executive Orders (EO) applicable to Natural Resources Conservation Service Department of Agriculture – assisted programs Executive Order 11593 (7 CFR § 656.2) (36 CFR 8921, 3 CFR 1971 Comp. P.154)	This EO requires that the federal government provide leadership in the protection and enhancement of the cultural environment, including preserving, restoring, and maintaining the historical and cultural environment of the nation, and that federal agencies shall administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations; initiate measures necessary to direct their policies, plans, and programs in such a way that federally owned sites, structures, and objects of historical, architectural, or archeological significance are preserved, restored, and maintained.
Indian Sacred Sites Executive Order 13007	This EO requires the federal government to accommodate access to and ceremonial use of Native American sacred sites by Native American religious practitioners and for the federal government to avoid adversely affecting the physical integrity and maintaining the confidentiality where appropriate of sacred sites on federal lands.
Consultation and Coordination with Indian Tribal Governments Executive Order 13175	This EO provides guidelines for consultation between federal agencies and Native American governments. When formulating an implementing policies that have tribal implications; self-governed Native American governments will be granted the maximum administrative discretion possible; federal agencies shall encourage Native American governments to develop policies and defer to tribes to set standards, and if establishing

Regulation or Policy	Description
	federal standards, consult with tribal officials as to the need for federal standards and any alternatives that would limit the scope of the federal standards or otherwise preserve the prerogatives and author of Native American tribes.
Procedures for State, Tribal, and Local Government Historic Preservation Programs (36 CFR Part 61)	Federal regulation authorizing state and tribal historic preservation programs and certifies local governments to carry out the purpose of the NHPA. This is the basis for historic preservation programs and ordinances.

Table 14-2. State Regulations and Guidelines Applicable in the Study Area

Regulation or Policy	Description
State Environmental Policy Act (SEPA) (RCW 43.21C, WAC 197-11-330)	SEPA requires government decision-makers to consider the likely environmental consequences of a proposal and require mitigation measures.
Governor's Executive Order 21-02	Washington State Governor's Executive Order 21-02 (GEO 21-02, formerly GEO 05-05) requires that agencies consult, or delegate consultation to non-state recipients of state funds, with DAHP and affected tribes on the potential effects of projects on cultural resources proposed in state-funded construction or acquisition projects that will not undergo Section 106 review, including grant or pass-through funding that culminates in construction or land acquisitions, to determine potential effects to cultural resources. It requires that the state agency provide documentation of that consultation to DAHP.
Washington Heritage Register (Senate Bill 363; RCW 27.34.200, WAC 25-12)	Created March 19, 1971, Executive Session of the State of Washington Advisory Council on Historic Preservation and maintained by DAHP. Actions affecting resources listed in this register by any subdivision of state government or recipient of state funds must comply with SEPA and Executive Order 21-02.
Human Remains (RCW 68.50)	Relates to the protection, management, and processes in the care of human remains.
Indian Graves and Records (RCW 27.44)	Relates to the protection, management, and processes in the care of Native American cemeteries, historic graves, and related records.
Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60)	Relates to the preservation and protection of abandoned and historic cemeteries and graves including human remains.
Centennial Accord Between the Federally Recognized Indian Tribes in Washington State and the State of Washington (GOIA 1989) and its implementation plan (GOIA 1999)	Ecology consults with tribes in a government-to-government relationship to protect and manage shared natural resources.

14.3 Affected Environment

This section presents a broad overview of the tribal resources and tribal context of the study area and existing resources and is organized into two subsections based on cultural groups and bodies of ethnographic information: *Cultural Context—Wenatchapam* and *Cultural Context—Wenatchi*. The cultural contexts have been developed from two distinct bodies of knowledge. The Wenatchapam context has been adapted from contextual information provided by the Yakama Nation and is based on knowledge held by the tribe about cultural use and practice within the study area. This section represents ethnographic and historic information relevant to the cultural and legal context on a portion of Yakama Nation ceded lands. This knowledge has been shared to the extent necessary to provide context, but does not represent a complete history of the area. This knowledge shared by the tribe was on an as-needed basis, only to the extent necessary to assess impacts and significance.

The second subsection is derived from a literature review of published in 20th and 21st century ethnographic studies, histories, maps, and online resources, and is augmented by sources provided by the Confederated Tribes of the Colville Reservation. While the Confederated Tribes of the Colville Reservation have provided information to inform this section, it should not be taken as a statement by the tribe, but rather presenting a context based on publicly available literature that has then been commented on, reviewed, and supplemented by information held by the Confederated Tribes of the Colville Reservation. The ethnographic record can vary in spelling and interpretations. The context provided below utilizes spelling from the tribes when known. Information shared by the Yakama Nation was also incorporated into the Wenatchi context.

These two contexts are necessary to present a more holistic understanding of the long-term tribal use of the study area and the resulting significance to the various tribal groups that have, and continue to, utilize tribal resources in the area.

14.3.1 Cultural Context—Wenatchapam

This section has been adapted from a report prepared by the Yakama Nation and provided to Ecology on December 6, 2022 (YN 2022).

The study area is within the traditional territory of *Wenatchapam*, a signatory Band to the 1855 Treaty, and a multi-lingual group who likely used *Ichishkinsinwit* or Sahaptin as their first language. *Ichishkinsinwit* is of the land and rooted in the principles of the Creator's law *Nami Tamanwit*. This language originates from the air and water sounds created through the natural landscape and its features. This language is used in the longhouse to honor and bless the resources that sustained life. The language is interwoven into the cultural practices, the physical locations, as well as the overall understanding and connection to the land and communication with the Creator. The honoring of resources and blessings is a fundamental principle of the *Wenatchapam* people. The *Wenatchapam* people followed a practice known as, *Nami Tamanwit*, which was a practice and procedure that was distinct from that of tribes to the north and in particular those who resided in the greater Okanogan Valley and along the portions of the coastline (YN 2022).

The *Wenatchapam*, along with the *Entiatnapam*, *Chelanpam*, and *Methowpam*, are a part of the larger tribe known as the *Pisquouse*. *Pisquouse* is also shown in the ethnographic record as "Pisquouse" and "Pisquows" (Gibbs 1854; Hodge 1910:263, 932; Lahren 1998:488; Spier 1936:14). Hodge (1910: 932) notes Wenatchi as "probably a band of the Pisquows, formerly on the Wenatchee r." and were located on both the Yaka[i]ma Reservation in 1850 and with the Colville in 1910; further Hodge translates Yaka[i]ma *winātshi* to "river issuing from a canyon." Hodge (1910: 263) notes the *Pisquows* name may have been derived from the Yaka[i]ma word *pisko* meaning "bend in the river" and states the "Pisquows proper or remnant of them are now on the Yakama Reservation." Ethnographers further connect the *Pisquouse* to the Yaka[i]ma through intermarriage

(Gibbs 1854:412; Mooney 1896:736). The *Pisqious* travelled great distances including, but not limited to, along the Fraser River in British Columbia (YN 2022:6). The *Wenatchapam* followed a seasonal subsistence pattern from the Columbia River to the Crest of the Cascade Mountains (YN 2022).

The traditional territory of the *Wenatchapam* is within the Wenatchee River drainage where other tribes may maintain some level of use. However, the use they maintained was controlled traditionally and politically by the *Wenatchapam* leaders whom elected a representative to sign the Yakama Treaty of 1855 (YN 2022).

The *Pisqious* were signatory to the Yakama Treaty of 1855 (12 Stat. 951) by way of *La-hoom* (*Pisqious/Entiatnapam*) and *Tecolekun* (*Pisqious/Wenatshapam*). *Tecolekun* was elected as a representative by leadership to represent the Wenatchee, Columbia, Entiat, and Chelan. He was also recognized in this capacity by both parties present at the Walla Walla council grounds⁵(YN 2022).

Ichishkinsinwit provides further traditional description for *Wenatchapam* and *Pisqious*. The sound *Wenatcha* reflects the turbulent water that flows through the mountain, the water, and air come through a canyon (*weh*), fall (*nah*), and crash on the rocks (*tchah*). The name is used both to identify the characteristics of the river, today known as the Wenatchee, itself or to identify the *Wenatchapam* fishery, which is also known as *Speliyis Wanawish* as part of the creation story to the fishery. The suffix *pam* refers to people from the place *Wenatcha*. Specifically, its meaning is further characterized by the people that are from the water (the giver of life) that flows into the river where the water comes through a canyon and crashes on the rocks. Therefore, the *Wenatchapam* are defined by name as those from the watershed of the Wenatchee River (YN 2022). The *Pisqious* or *pítxkayús* is an *Ichishkinsinwit* name that means, “the people who go up into the mountains” (Oliver and Meninick 2022 as cited in YN 2022). Additionally, “*pítxkanus*” is associated with the mountains (Beavert and Hargus 2009 as cited in YN 2022).

The earliest known recorded use of the word *Wanatcha* was from the notes of the Lewis and Clark Expedition in October of 1805; maps also included the spelling *Wah na á chée* (Clark 1805). Tribal leaders, including the Great Chief *Cutsanim* who resided near the confluence of today’s Wenatchee River, provided the translation. *Cutsanim* or *paxat-sa-nim* relates to the five sacred figures known as part of the traditional oral story of the history of the *Shyikes* and *Wenatchapam* (YN 2022).

The *Wenatchapam* often intermarried with the *Pshwanwapam* who occupied the upper portions of the Yakima River watershed and the western shores of the Mid-Columbia. In particular, the gathering place known as *Teanaway* or *Teanawins* was a place where many *Pshwanwapam* and *Wanatchapam* found their significant others. This gathering place was hosted by the *Pshwanwapam* in their traditional territory. This relation is further described in oral history as it relates to the *Wáwpu* or goat people/hunters (YN 2022).

Researchers have presented this understanding, finding that the *Pisqious* were heavily intermarried with the Yakama as discussed above (Mooney 1896:736; Gibbs 1854:412) to the extent it was observed they “have almost lost their nationality” (Gibbs 1854:412).

The traditional use area of the *Wenatchapam* extended into the Yakima River watershed on the relationship held by *Wenatchapam* and *Pshwanwapam* who often participated in traditional use and festival events in a way that overlaps. The *Wanatshapam* maintained close ties with the neighboring *Pshwanapam* through marriage and shared language (Ray 1936; Schuster 1998; Anasatsio 1972). The *Pshwanwapam* (often discussed as Yakama, Kittitas, or Upper Yakama) are the people who are from the water where the rocks fall into the river, the name and description referring to the Yakima River watershed, whose fishery was controlled and managed by the *Pshwanwapam* (YN 2022).

⁵ See *Yakima Tribe v. the United States* July 29, 1963.

Traditional use or Usual and Accustomed places define a different understanding than traditional territory and span a much greater area. This distinction is important for intertribal use of an area; traditional territory refers to an area under a group's exclusive political control while traditional use area defines an area a group may have used as a guest (YN 2022). Ray (1936:21) states: "...Thus, the hunting territory of one group might be quite open to use by another even though the bounds be highly specific. This freedom of use was the rule among many of the Salish groups. But among the Yakima [sic], for example, outsiders were required to obtain formal permission from a chief before hunting grounds might be used and even then the length of time was definitely limited." Specific practices, ceremonies, and covenants were conducted before entering or using another tribe's land. In the case of the Pshwanwapam and Wenatchapam, they were bands of different tribes (YN 2022).

During the Yakama Wars in 1855, a Wenatchapam leader, *Sulktalthscosum* (Chief Moses), led a diverse group of followers, including some from well outside of the Wenatchapam traditional homelands (Northern Salish Tribes and Paiute). Chief Moses went against many of the established leaders at the time, and his style was considered nontraditional (YN 2022).

Chief Moses refused to recognize the Treaty with the Yakama in 1855 and petitioned the United States government for the establishment of a reservation. In 1879, the Columbia Reservation was established on his behalf (Miller 1998). Chief Moses later relinquished the Columbia Reservation and relocated to the Colville Reservation.

The Yakama Nation considers the project area to be within at least two separate TCPs, which the tribe has not been afforded the opportunity to document formally.

14.3.2 Cultural Context – Wenatchi

According to the Confederated Tribes of the Colville Reservation, the study area is within the traditional lands of the šnṗəšqʷáwšəxʷ or Wenatchi (meaning "People in the between") (Bouchard et al. 1988:135-145; CTCR 2021a). Ethnographic records also list Wenatchi known as the Wenatchee / Wenatshapam / P'Squosa people, who according to Miller (1998) speak a Columbian *nxaʔamxcin* Interior Salish language; (Bouchard et al. 1988:135-145; CTCR 2021a; Kincade et al. 1998:51; Miller 1998:253; Spier 1936:14). The šnṗəšqʷáwšəxʷ are considered part of the Middle Columbia River Salishan culture group, of which several distinct tribes of the Plateau Culture share similarities in subsistence patterns, structures, and other cultural practices (Miller 1998:253-270; Spier 1936). Descendants of the šnṗəšqʷáwšəxʷ include but are not limited to members of today's federally recognized Confederated Tribes of the Colville Reservation and the Confederated Tribes and Bands of the Yakama Nation. Indigenous peoples of this region have been using the study area and its vicinity for various levels of habitation, resource gathering, travel, and other traditional cultural practices since time immemorial.

Villages associated with šnṗəšqʷáwšəxʷ were located along Icicle Creek, the Wenatchee and middle Columbia rivers, along with other permanent and seasonal campsites ideal for resource gathering, hunting, and travel. The šnṗəšqʷáwšəxʷ village located at the mouth of Icicle Creek, within the Downstream / Indirect Effects portion of the study area, was a large trade center and included a significant fishery known for its abundance of salmon. At the height of fishing season, thousands of šnṗəšqʷáwšəxʷ and neighboring tribes would congregate here to share in its bounty (CTCR 2021a; Miller 1998; Ray 1936). Tribal members recall the description of Icicle Creek "running red" due to its plentiful salmon runs (Thompson 2002). This traditional fishery, also known as the Wenatshapam Fishery, or Wenatcha, or Spelyis Wanawish, as discussed above along with nearby rivers, tributaries, valleys, and mountain ranges, continue to be important resources for subsistence, teachings, and practice of traditional cultural lifeways for area tribes. The Confederated Tribes of the Colville Reservation confirmed there are named places within the project area not available for public record (personal communication, Downes 2022). Additionally, along with the fishery, published documents

identified the following named place within the Upstream / Direct Effects and Downstream /Indirect Effects study areas: *Na'sik-elt* is a named used for what is known today as Icicle Creek; the original word means “narrow bottom canyon, or gorge” (Sylvester 1943 as cited in personal communication, Downes 2022). Ethnographic records can include information that may have been misinterpreted or imprecisely documented when initially recorded. It is possible that the locations known today as, Eightmile Lake and Eightmile Creek, along with surrounding geographical features, may have associated place names. The Wenatchee River is named for the people that resided along its course. As discussed above, *Wenatcha* and “*Wah-na á chée*” were used in records from the Lewis and Clark Expedition in October of 1805. Additionally, Wenatchee in Yakama is “winatshi,” meaning “river issuing from a canyon” (YN 2022). Archival resources indicate it was also known as “Pisquouse,” “Wenatshapan[m],” and “Wah-na-a-cha” (Judge 1925:20). The villages of *sčəmə́w's* (meaning “narrow in the middle”) and *šnpűsqǫ́isoḥ* were located at and near the present location of Leavenworth (Miller 1998:254 [no. 112]; Ray 1936:119, 142[no. 8]; Spier 1936:14 [no. 5]; Teit 1928). These names may refer to the same or related place, and additional unpublished named places may be present in the study area and its vicinity.

Tribes do not limit use or significance on the natural world. Animals, plants, geological, atmospheric, and astrological features play a role in traditional oral stories and cultural practices. Thousands of species have documented use. The traditional *šnpűsqǫ́áwűšəx* diet is based on fishing, hunting, and gathering of roots, bulbs, and berries. Salmon is a dietary staple; traditionally, the First Salmon Ceremony includes several days of rites connected to the materials used to create the weirs, the river, the catch, and the processing of the salmon (Miller 1998). Other water resources include sturgeon, suckers, Pacific lamprey, trout, roe, and shellfish (Miller 1998). Seasonal camps would be set up in the mountains and foothills for hunting and gathering, with some families staying through the winter months (Miller 1998). Mountain goat, deer, elk, and other alpine game supplemented fishing resources throughout the year. Several species also hunted for use (but not for consumption) include but are not limited to coyote, mink, wolf, and land otter. A wide variety of plants serve many purposes in traditional practices; these include but are not limited to willow shoots, cedar roots, bast, tules, cattails, Oregon grape, birch, fir, cottonwood, pine, sagebrush, and hemp. One of the *šnpűsqǫ́áwűšəx* traditional camas and root gathering places and campsites located within present-day Leavenworth has been recorded as a TCP (Leavenworth Camas Harvesting Area–45CH928). Important cultural plants for the Confederated Tribes of the Colville Reservation include but are not limited to: huckleberries, foamberry or soapberry, bitterroot, white camas, chuckluse or Canby's biscuitroot, Indian potatoes or lance-leaf spring-beauty, Indian carrots or yampah, cous-cous or Canby's lovage, black camas, Indian hemp or hemp dogbane, tule or hardstem bulrush, little white camas or northern biscuitroot, and Western sweet-cicely or sweet-root (CTCR 2022).

Mountain pass trails ran throughout the Cascade Mountains and allowed for trade and access among the interior tribes and those west of the mountain range (CTCR 2021b; Gibbs 1877:167). These trails were also used by non-Indigenous groups as settlement in the valley increased. Surveyor records from the late 19th and early 20th centuries show trails along Eightmile and Icicle creeks as well as leading from the Wenatchee River and dotting the Cascades (USGS 1904; U.S. Surveyor General 1892, 1907, 1913, 1917, 1924).

The 1855 Treaty of Yakama, held at Walla Walla, established the Yakama Reservation (Lahren 1998:488). In addition to establishing the Yakama Reservation, the Treaty, as ratified on April 15 1859 in article 10 specified, “*a tract of land not exceeding in quantity one township situated at the forks of the Pisquouse or Wenatshapan Fishery; which reservation was to be surveyed and marked out whenever the President may direct subject to the provisions and restrictions the same as other Indian reservations*” (as quoted in Judge 1925: 20). In a 1910 letter to the Honorable Commission of Indian Affairs, Department of the Interior, Washington D.C. John Hermilt and Louis Judge, wrote to recognize the tract thus referred to in the treaty, “*would have been located below the forks of what are now the Wenatchee and Icicle Rivers, just at or below the present town of Leavenworth, and that*

treaty should have made it clear that this was for the Pisuouse of Wenatchee Indians” (Hermilt and Judge 1910 as cited Judge 1925: 22).

Boundaries were never properly surveyed or recognized for the Wenatchi Reservation, and the šnḡḡšqʷáwšəxʷ were encouraged to relocate to the Moses-Columbia Reservation, created under executive order and later revoked (CTCR 2021a; Lahren 1998; Mass 1983; Thompson 2002). The study area is within the area that was to have been included in the reservation land for the šnḡḡšqʷáwšəxʷ located at the forks of the Wenatchee and Icicle rivers (Judge 1925:22; Miller 1998; WDFW 2017). Many šnḡḡšqʷáwšəxʷ remained on their land, applying for homesteads, but fees and taxes forced many to relocate to the Colville Reservation (CTCR 2021a; Thompson 2002).

According to the Confederated Tribes of the Colville Reservation, they have registered Icicle Creek (nsi'qəl 't) as a TCP from Johnny Creek to the confluence with the Wenatchee River (personal communication, Downes 2022).

14.3.3 Existing Resources

Natural Resources Associated with Tribal Use

Natural resources are inextricably linked with the lives of Indigenous peoples. All animal species from a tick to a moose have some connection to native people through traditional stories or practice. Plant gathering is an essential subsistence and cultural activity that is documented in ethnographic literature, tribal legend and stories, and archaeological sites. Plants were historically and are currently gathered for food, medicine, and ritual uses, as well as raw material for tools, clothing, basketry and mats, and other uses. Participation by tribal members in those gathering activities is a part of cultural identity.

The site around the dam and staging area is dominated by fir trees with subcanopy vegetation dominated by Oregon boxwood, currant, elderberry, thimbleberry, and various grass species. The upper and lower portions of FSR 7601-116 have montane habitat with grand fir forest associations, but the lower portion of the road also has subalpine fir forest associations. The lower portion of FSR 7601-116 has a higher density of alders with a lower density of pines than the upper portion of the road.

Aquatic and terrestrial habitats in the study area support a variety of wildlife species; however, the degraded ecosystem both within and outside of the study area has reduced the vigor of some of these populations. Table 8-4 (Chapter 8) provides a list of protected wildlife species likely to occur in the study area.

Eightmile Lake is one of the Alpine Lakes, which are characterized by naturally low productivity and provide relatively limited habitat for fish, primarily because of cold water from melting snow or glaciers, a short growing season, the lake location at the head of the watershed, and a general lack of inputs of organic material. The Alpine Lakes are relatively pristine compared to downstream habitats. Eightmile Lake drains to Eightmile Creek, which drains to Icicle Creek. Icicle Creek provides approximately 29 river miles of spawning and rearing habitat to native salmon and trout species, including the ESA-listed Upper Columbia spring-run Chinook salmon Evolutionarily Significant Unit (ESU), listed as endangered. However, spring-run Chinook salmon produced at the LNFH are not included in the listed Upper Columbia spring-run Chinook ESU, as this stock is more closely related to lower Columbia River stocks (Muir et al. 2020).

The project area is within the Ceded Lands of the Yakama Nation and traditional use area of the Confederated Tribes of the Colville Reservation for hunting, fishing, and gathering resources. These tribes target non-listed spring-run Chinook salmon returning to the LNFH (with known fishing areas including the plunge pool immediately downstream of the LNFH channel spillway). Since the reintroduction of coho salmon to the Icicle Creek drainages, tribal subsistence fisheries for coho

salmon have been opened when runs are large and surplus fish are available. Additional fish present in Icicle Creek are listed in Table 8-5 in Chapter 8.

A list of culturally significant plants developed during work in nearby Okanogan County is presented in CTCR (2022). A culturally significant plant study is not available for the specific project area. Specific knowledge on significant plants and related practice is retained within the tribes, and continued consultation is required to continually assess potential impacts for this resource type.

14.4 Construction Impacts

Construction (short-term) impacts would be related to the specific footprint of disturbance required to allow access for materials, equipment, and work crews. For access routes, this is defined as the footprint of disturbance required to improve existing roads or temporarily reroute non-motorized trails. The footprint of disturbance necessary for staging areas or landing pads at the construction zone is also a construction impact and will require the removal of vegetation. The final construction impact is the footprint of disturbance necessary for the demolition of the existing dam facility, installation of the Icicle Ridge repeater station, and the construction of the selected alternative.

The No Action Alternative would not have a construction phase, and as a result would not have any short-term construction related impacts on tribal resources. The impacts for Alternative 1 (Narrow Spillway with Automated Gates), Alternative 2 (Wide Spillway without Gates), and Alternative 3 (Narrow Spillway without Gates) would be similar, and the action-specific discussions found below can be applied to all three dam alternatives.

14.4.1 Construction Activities

The construction activities, including demolition of the existing facility, would result in the destruction of the existing Eightmile Dam. No features or elements of the current built environment structure, other than its location and course of the spillway, would be retained.

Site preparation would involve site clearing, including the removal of up to 30 trees and understory vegetation, leveling of the staging area using the existing excavator on site, and removal of wood and debris from the lake edge within the work area.

Dam construction would disturb wildlife throughout the construction period in an area surrounding the east end of Eightmile Lake, and may extend out to the remaining portion of the Eightmile Lake basin. Helicopter use would disturb most wildlife species, displacing those that have ability to flee from the area. The presence of humans and use of heavy equipment and other tools would displace wildlife from this area during construction. Due to the relatively small scale of the construction, limited areas of disturbance, and limited time frame, it would have **less-than-significant adverse impacts** on wildlife and wildlife habitats in and around the study area.

All action alternatives would require in-water work in Eightmile Lake to construct the earthen dam and spillways, potentially affecting the resident trout species in the lake. The shoreline area where work occurs will be isolated in the lake by construction of a cofferdam consisting of bulk bags placed by an excavator. Dewatering the isolated work area using pumps may also be necessary. Under all action alternatives, any dewatering pumps used would have fish-friendly screens on the intake hoses (to prevent fish impingement or entrainment). The in-water work and associated fish removal may result in some minor mortality, injury, or behavioral disturbance in the immediate work area (individual fish could be harmed or killed and larvae of some species could be entrained). However, the vast majority of fish in the lake would be unaffected and would likely avoid the work areas of active construction due to increased turbidity. For all action alternatives, the magnitude and extent of turbidity as a result of construction actions are expected to be minor, short-term, and localized based on the use of the BMPs described in Chapter 8, *Plants and Animals*. Although some

behavioral impacts on fish would likely occur, such as avoidance and temporary behavioral changes, no substantial mortality is expected to result. Deposition of sediment on the lake bed from construction-generated suspended sediment would not be substantial and would be comparable to the natural deposition from sediment in the lake. For all action alternatives, impacts from turbidity and sedimentation associated with dam removal on resident fish would be **less-than-significant**.

Construction of the project is not expected to affect any known TCPs associated with Indigenous peoples. Unknown or unrecorded TCPs may exist within the project area. Access would be restricted around the immediate construction area for safety reasons; however, the remainder of the lake and the wilderness would remain open. Because of the relatively small area and limited construction duration, these actions would result in **less-than-significant adverse impacts** on tribal resources and access.

14.4.2 Helicopter Access

Helicopter access would not directly or indirectly impact any known tribal resources significant to tribal communities. The environment surrounding Eightmile Lake is predominantly comprised of active talus slopes and seasonal channels for melt drainage with minimal vegetation. As noted in Chapter 2, up to 30 trees will be removed at the staging area immediately adjacent to the dam. This environment is where helicopter takeoff and landing could occur at Eightmile Lake. Because of the existing nature of the area, and the relatively small number of trees proposed for removal, this action is expected to have **less-than-significant impacts** on tribal resources.

Helicopters would also likely be used to transport required materials to the repeater location on Icicle Ridge. That portion of the project area was surveyed for cultural resources and none were identified (Ostrander et al. 2023). Helicopter use would temporarily increase noise in the general area. No activities sensitive to noise, such as hunting or spiritual practice, were identified during research or presented during tribal consultation. Use of helicopters is expected to have **no significant impacts** on tribal resources.

Impacts on wildlife habitat from helicopter use would be minimal if landing zones do not need to be substantially altered from current conditions. Propwash, which would be strong from both types of helicopters but particularly strong from the double-rotor Chinook, would not damage vegetation to the point that it is fundamentally unusable by wildlife. Helicopter use would have **less-than-significant impacts** on wildlife habitat and vegetation significant to tribes.

Helicopter use would disturb all avian species and terrestrial mammals, including those with state and/or federal protections. Protected bat species, which may roost near the loading and unloading areas, may also be disturbed and stressed by helicopters as cargo is shuttled during construction. Therefore, use of helicopter may have significant adverse impacts on individual bats locally if present, but would have **less-than-significant adverse impacts** on wildlife throughout the study area.

The multiple helicopter trips required for transport of construction equipment and material would not affect aquatic species, including fish. Refueling of helicopters would occur in designated areas away from streams and outside of the wilderness area. **No significant adverse impacts** on fish or fish habitat would occur from helicopter use under any of the action alternatives.

14.4.3 Overland Motorized Access

Overland motorized access is not expected to result in a direct or indirect impact on known TCPs associated with tribal practice. Unknown or unrecorded TCPs may exist within the project area. Use of the road segment would require vegetation removal and road grading with heavy equipment and hand crews. These activities would cause localized noise disturbance from the presence of humans and equipment, and alter wildlife habitats along the segment. Noise would displace wildlife species able to flee the area, which would likely occur prior to the associated physical habitat changes.

Human presences, largely associated with the heavy equipment, would further disturb wildlife in the area. However, due to the small scale of the construction for the road segment, it would have **less-than-significant adverse impacts** on wildlife and wildlife habitats and tribal resources in and around the study area.

The roadway has several existing culvert crossings of small fish-bearing streams that drain to Eightmile Creek. The roadwork could increase runoff from road sediments, which in some cases could enter streams. However, road design will meet Forest Service standards and incorporate appropriate sediment and erosion control measures near stream crossings, potentially including water bars to route and disperse runoff on vegetated slopes, to minimize or eliminate stream sedimentation. **No significant adverse impacts** on fish or fish habitat would occur from repairing and improving the road under any action alternative.

14.4.4 Non-motorized Wilderness Access

The use of a non-motorized wilderness access path along the route of the existing Eightmile Lake Trail, 4th of July Creek Trail, and Icicle Ridge Trail would not result in direct or indirect impacts on any resources connected to tribal practice. The existing Eightmile Lake Trail was surveyed for cultural resources under the Programmatic EIS (Anchor QEA 2018c). The 4th of July Creek Trail and Icicle Ridge Trail segments needed for access to the repeater location on Icicle Ridge were surveyed as a part of this project (Ostrander et al. 2023). All trail access will generally be maintained during construction, except immediately adjacent to Eightmile Dam. The Eightmile Lake Trail may be temporarily closed for safety reasons if blasting with explosives is required (refer to Chapter 2).

14.5 Operational Impacts

Operational (long-term) impacts are those effects that would occur as a result of the selected alternative. Operational (long-term impacts) on tribal resources are considered fairly consistent for all of the action alternatives. **No impacts are anticipated for areas associated with tribal practice.** Each action alternative would have short-term effects on plants and wildlife, but would likely not persist as habitats recover from the alterations and disturbance abates to pre-project levels. Following active construction, full access to the area will be allowed for hunting, fishing, and gathering.

The only significant impact possible as a result of long-term operation of the dam facility would be if the dam structure were to fail, and a high-energy flood inundation were sent down from Eightmile Lake into Eightmile and Icicle creeks. A dam failure event would have significant impacts. However, this failure is most likely to occur under the No Action Alternative, as the upgrades under the action alternatives greatly reduce the likelihood of this occurring.

Changes in lake level would occur as a result of operation under each of the action alternatives. These seasonal changes are not expected to impact tribal resources and will not hinder access in any way. No areas associated with tribal practice have been identified within or in close proximity to the lake margin. The environments at the edge of the lake are active talus slopes, bedrock exposures, or areas heavily disturbed as a result of construction or operation of the Eightmile Dam.

Operational impacts of the project would have short-term effects on wildlife and wildlife habitat, but would likely not persist as habitats recover from the alterations and disturbance abates to pre-project levels.

Unlike construction activities, the operational aspects of the project could beneficially affect fish and fish habitat both within Eightmile Creek and downstream of the lake in Eightmile Creek and Icicle Creek, extending to the confluence of Icicle Creek with the Wenatchee River as a result of additional instream flows in those water bodies.

14.5.1 No Action Alternative

As described in Chapter 8, *Plants and Animals*, removal of the dam—either due to failure or active removal—would result in a decrease of its capacity and surface water height, but would not cause the demise of the lake. The reduction in the size of Eightmile Lake would, therefore, result in **less-than-significant adverse impacts** on wildlife and wildlife habitat because the lake would persist and habitats would not be fundamentally degraded or reduced.

The No Action Alternative may present a significant risk to tribal resources due to the risk of catastrophic dam failure and resulting high-energy flooding along the downstream portion of the study area. Catastrophic failure would likely result in a high-energy flood to flow down from Eightmile Lake into Eightmile and Icicle creeks. This flooding poses a risk to tribal resources.

Overbank flooding poses a risk to tribal resources along the waterway until Icicle Creek meets its confluence with the Wenatchee River. The near-bank environment that would be impacted by the high-energy flow in the event of a dam failure likely contains resources associated with tribal practice.

High-energy erosive flows from a dam failure may cause a short-term significant impact on tribal resources by altering the physical and natural environment where traditional practices such as resource procurement and spiritual pursuits occur. Locations within and adjacent to Eightmile and Icicle creeks are advantageous for fishing and gathering, and the alteration of the physical landscape and its resulting role in the local ecosystem could impact tribal communities by altering the viability of commercial, substance, and spiritual activities at a given location.

Dam failure would result in downstream flooding on Eightmile and Icicle creeks. This flooding would alter vegetation and habitat, to some extent, including Little Eightmile Lake, wetlands, and riparian areas. Little Eightmile Lake would likely be altered because it is relatively shallow and may become scoured during a flood event. Flooding farther downstream would also result in some vegetation removal, scouring, and sediment deposition, likely altering habitat along Eightmile and Icicle creeks. These alterations, however, would emulate those from natural flooding events, and the ecosystem would fully recover over one to two decades. Impacts from a dam failure flood event on vegetation and habitat downstream of Eightmile Lake would, therefore, be **less-than-significant**.

Hydrologic changes from dam failure or removal are predicted to reduce summer streamflows by up to 75 percent, which could affect amphibians, reptiles, and other species that depend on the current flow regime from Eightmile Lake. During the summer dry season, such a reduction in flow would result in less availability of water and aquatic habitat, as well as a reduction in the quality and diversity of aquatic habitat. Together, losing substantial flow during the dry season, when many wildlife species rely on it the most, would be expected to result in adverse impacts on some individuals that are directly associated with these aquatic habitats. However, because of the small affected area, **less-than-significant adverse impacts** would be expected to occur to wildlife species throughout the study area.

Should dam removal be required, the lake outlet elevation would likely be lowered to an elevation of 4,648 feet. This would reduce available habitat for fish in Eightmile Lake, and would also have an effect on downstream streamflow, where reduced water storage capacity would decrease the amount of water available for summer water releases. Reduced summer flows would reduce the habitat quality and quantity for all fish species that utilize Eightmile Creek and the Icicle Creek mainstem downstream of the confluence. Dam removal would be expected to cause **significant adverse impacts** on fish and fish habitat in both Eightmile and Icicle creeks.

Catastrophic failure of the dam under the No Action Alternative would also affect fish and wildlife resources. If such failure occurred, it would likely be during spring rain-on-snow events when streamflow is at its highest. A partial or total dam failure would have substantial negative effects,

both immediately and perpetuating into the future. A catastrophic failure would quickly drain the lake, resulting in up to 1,375 acre-feet of water being suddenly released in an uncontrolled manner. The lake would be drained and the majority of the resident fish within the lake would likely be killed as they became entrained in the downstream flows. Partial or total dam failure could result in debris torrents that would destroy downstream infrastructure, likely including infrastructure at the LNFH; cause severe channel scour (potentially to bedrock); denude riparian areas; mobilize, transport, and ultimately deposit large volumes of sediment; cause widespread flooding; and potentially lead to debris jams and stream avulsions. A large-scale or total failure would likely result in mortality to the vast majority of the fish present in Eightmile Lake, Eightmile Creek, and in Icicle Creek downstream of the Eightmile Creek confluence, and could also have substantial negative effects in the Wenatchee River. Other long-term effects on fisheries resources would be expected to occur with the absence of the dam related to summer flow reductions, similar to those described above for dam removal. Catastrophic dam failure would cause **significant adverse impacts** on fish and fish habitat in both Eightmile and Icicle creeks, which could have direct economic impacts on any tribal members who utilize the fishery.

14.5.2 **Alternative 1: Narrow Spillway with Automated Gates**

The Narrow Spillway with Automated Gates alternative poses no long-term operational impacts on tribal resources. The operation of the facility would not impact any known tribal resources, and the threat to unrecorded tribal resources would be substantially lower than current conditions as the risk of failure from the dam structure and the resulting erosive flows would be mitigated. The primary risk from long-term operation would continue to be associated with the erosion of streambanks due to water flow, resulting in the degradation of habitat. Changes in surface water elevation and flows through the riparian corridor would support wildlife species and habitats in these areas. Revegetation and removal of invasive plant species may result in habitat enhancement above existing conditions, if executed effectively. Therefore, operation of Alternative 1 would result in **less-than-significant adverse impacts** on wildlife and wildlife habitat and associated tribal resources.

Alternative 1 would increase the storage capacity of Eightmile Lake, while adding safety features that drain the lake during extreme storm events. In addition, Alternative 1 has a smaller footprint than under Alternative 2 and also allows the lake to be drawn down to 4,636 feet during drought conditions to provide water for both downstream water supply and instream flow needs. Alternative 1 has a maximum WSEL of 4,671 feet, which would produce a lake surface area of 81.4 acres. Compared to existing conditions (and the No Action Alternative), this alternative provides a WSEL 4 feet higher, which equates to 4.8 acres more lake surface area. These increases in the horizontal and vertical profile of the lake under Alternative 1 would provide an increase in total maximum lake volume of 310 acre-feet and an increase of usable storage volume of approximately 460 acre-feet. This increase in storage capacity would provide more water for both irrigation and for summer instream flow supplementation, which would provide benefits to fish downstream of the lake in Eightmile and Icicle creeks, benefiting tribal resources. The additional flow supplementation would consist of cooler water from below the lake surface, potentially providing lower temperatures downstream and higher dissolved oxygen levels, which also would benefit these fish species. Compared to existing conditions, where the lake is drawn down annually to the lowest level, Alternative 1 would only reach low levels during drought conditions (approximately once every 5 years).

Additionally, Alternative 1 includes an automated 464-foot-long low-level outlet pipe draining the lake into Eightmile Creek. The pipe inlet in the lake for Alternative 1 would be at elevation 4,636 feet, where the water is likely substantially cooler than the surface water temperature. The automated nature of the outlet pipe would allow IPID to remotely provide a relatively consistent source of colder water for summer instream flow supplementation and irrigation, as compared to the No Action Alternative. The resulting relatively dependable (as compared to existing conditions) summer flow

augmentation would benefit those anadromous and resident salmonid species that utilize Eightmile Creek and the Icicle Creek mainstem downstream of the confluence. This includes providing more wetted aquatic habitat in the summer, as well as potential improvements to stream temperatures and increased dissolved oxygen levels.

Alternative 1 would allow the lake to fill to a level that provides 4.8 acres more lake surface area than existing conditions, and would also allow the lake to be drawn down to a level that provides a lake area of 2.5 acres less than could occur under existing conditions. Although the lake area (and volume) has the potential for larger fluctuations as compared to existing conditions, the relatively small increases and decreases would not substantially alter lake biology, and would have a minimal effect on aquatic species within the lake. The current lake has relatively steep side slopes consisting of bedrock, talus slopes, and scattered coniferous trees. Slight alterations in the lake level will not impact the existing levels of riparian function. Similarly, ecological processes in the lake that affect fish abundance and species biodiversity (such as fish densities, nutrient and insect recruitment, sediment transport and deposition, and functioning of the lacustrine riparian zone) would not be substantially altered under Alternative 1, and no detectable changes in fish abundance, species composition, or lake water quality would occur, compared to existing conditions, resulting in **less-than-significant adverse impacts** on fish, fish habitat, and tribal resources.

14.5.3 **Alternative 2: Wide Spillway without Gates**

The Wide Spillway without Gates alternative poses no long-term operational impacts on tribal resources. The impacts and analysis for this alternative are largely the same as for Alternative 1. The primary differences from Alternative 1 are the design of the spillways, including spillway size, and the absence of gates to control WSEL. With the earthen embankment and reinforced concrete dam proposed under Alternative 2, the primary spillway length of 180 feet is 120 feet longer than under Alternative 1. The construction of Alternative 2 would require about 10,000 cubic yards of material to be excavated from elsewhere on the site and used to build the dam. The primary spillway would be fixed and completely passive, with the lake draining over the primary spillway when the lake fills to an elevation above 4,671 feet. Alternative 2 has only the single primary spillway, and does not include any gates or automatic equipment that would control the spillway or adjust the spillway crest elevation. As with Alternative 1, water would be released from the lake through a new 30-inch diameter low-level outlet pipe/siphon. The operation and configuration of the low-level outlet pipeline would be essentially the same as described for Alternative 1. The fixed spillway would provide slightly less control of high-water surface elevations as compared to Alternative 1, and would require some additional disturbance to adjacent areas for construction of the larger earthen dam structure, but overall would essentially function the same and provide equivalent benefits to downstream summer flows to fish in Eightmile and Icicle creeks. As with Alternative 1, Alternative 2 would not result in substantive changes in the fish resources or fish habitat in Eightmile Lake, and would be expected to result in **less-than-significant adverse impacts** on tribal resources.

14.5.4 **Alternative 3: Narrow Spillway without Gates**

The Narrow Spillway without Gates alternative poses no long-term operational impacts on tribal resources. The impacts and analysis for this alternative are largely the same as Alternative 1. However, the pumping required by IPID at low-water levels would require the site to be accessed by a work crew, either by foot or helicopter, at times during operations when additional water is required downstream. Such an action would disturb wildlife species in the area due to noise and human presence. Species impacted include those described under dam construction (Chapter 8, Section 8.4.2). Because the expected use of pumping would be infrequent, operation of Alternative 3 would result in **less-than-significant adverse impacts** on wildlife and associated tribal resources around the dam site during pumping activities.

Alternative 3 would be designed to store water up to a maximum WSEL of 4,667 feet, which is 4 feet lower than Alternatives 1 and 2. The maximum volume of water that could be stored for release by the dam would be less for this alternative than for the other action alternatives. The total lake volume at maximum WSEL for Alternative 3 is 1,698 acre-feet, approximately 312 acre-feet less than under Alternatives 1 and 2. Similarly, the usable storage volume under Alternative 3 is 302 acre-feet less than the two other action alternatives.

The pumping required by this alternative would involve flying pumping equipment to the dam site, likely including the use of diesel or gasoline to power a pump or generator. The use of such equipment would slightly increase the potential for spills of hazardous materials. In addition, in drought conditions and without pumping, water storage available for release to enhance downstream flows would be less than under Alternatives 1 and 2, resulting in potentially less benefit to fish habitat, water quality, and tribal resources in downstream reaches of Eightmile and Icicle creeks.

14.6 Avoidance, Minimization, and Mitigation Measures

The project would avoid and minimize impacts on tribal resources by focusing the project impacts from construction and operations within previously disturbed areas to the extent possible. The construction and operations footprints for the dam alternatives are largely within an area that has historically contained the existing Eightmile Dam or original construction materials. The use of these previously disturbed areas minimizes the risk that the project will impact Native American traditional practices or tribal resources. Access to most of the area will be maintained during construction, with limitations only adjacent to the active dam construction area, and in the event that blasting with explosives is needed. Following construction, native vegetation will be replanted in disturbed areas, following a plan approved by the Forest Service. Vegetation management will include the removal and monitoring of noxious weeds disturbed by the project. Access to all areas will be fully restored following the completion of construction.

14.7 Significant Unavoidable Adverse Impacts

There are no significant unavoidable impacts on known tribal resources expected under the action alternatives. The No Action Alternative has the highest potential to cause significant impacts on tribal resources, should the dam fail. The action alternatives would result in **no significant impacts** on tribal resources, and would result in **benefits** to downstream summer flows to fish species in Eightmile and Icicle creeks.

CHAPTER 15: AGRICULTURE, DEVELOPMENT, AND OTHER ECONOMIC ACTIVITIES

This section describes the economic activities within the study area and evaluates how they may be affected by the project alternatives. While analysis of economics is not a SEPA requirement, Ecology has opted to include an economic analysis that focuses both on the effects in terms of regional economic productivity and values of economic activities (e.g., recreation, agriculture), as these are important factors for decision making.

Agriculture, recreation, and development are key drivers of both the local and regional economies in the study area. These activities are dependent upon the natural resources in the area, including water resources from Eightmile Lake and Icicle Creek, fish and wildlife, and the natural beauty of the environment. The project alternatives affect the quantity of water that can be stored at a given time in Eightmile Lake and would be physically available from the system. IPID holds a water right on Eightmile Lake, and their agricultural customers are the primary beneficiaries of stored lake water. Other users and industries with diversionary water rights in Icicle Creek that experience secondary benefits from water released from Eightmile Lake include the City of Leavenworth and the LNFH.

Key Findings for Agriculture, Development, and Economics

- Key drivers of the local and regional economies (including agriculture, recreation, and development) are dependent upon the natural resources in the study area, including water resources from Eightmile Lake and Icicle Creek, fish and wildlife, and the natural beauty of the environment.
- These economic activities have the potential to be negatively affected by the action alternatives and No Action Alternative to the extent that they result in the impairment or curtailment of water rights, or in the loss of life or property.
- IPID is the only entity legally entitled to water released from Eightmile Lake. Other entities with junior diversionary water rights in Icicle Creek are secondary beneficiaries of water released from Eightmile Lake but are not legally entitled to that water.
- During severe drought conditions, construction activities under all action alternatives may result in impairment of primary water rights of IPID and subsequent impacts on the agriculture sector (a significant adverse impacts) and have the potential to result in curtailment of the junior water rights of the City of Leavenworth and the LNFH (a less-than-significant impact on associated economic activities).
- If status quo operations continue under the No Action Alternative, curtailment of the junior water rights of the City of Leavenworth and LNFH and economic impacts on associated activities are possible but are not considered significant because that water is not guaranteed to those users in a given year. Any possible curtailment would be limited to low water years. Delivery of water to IPID and its agricultural customers could be significantly adversely affected in years of low water.
- Should the dam fail under the No Action Alternative, impairment of IPID's water rights and significant adverse impacts on the agriculture industry are possible during years of severe drought. Dam failure may result in other significant adverse impacts on economic activities, including threats to the safety of residents, recreationists, and tribal fisheries; loss of residential structures; loss or damage to hatchery facilities; fish kills that limit or eliminate tribal fishing opportunities; and closures of recreational areas.
- Significant adverse impacts are not anticipated under any of the action alternatives.

15.1 Methodology

The analysis of economic activity focuses on key economic drivers within the region, as well as the economic activities dependent upon resources potentially directly or secondarily affected by the alternatives as follows:

- Agriculture
- Growth and Development
- Recreation
- Fisheries and Hatcheries

This analysis evaluates the potential effects on these economic activities due to both the operational changes at Eightmile Dam on the supply and delivery of water from Icicle Creek, and resulting from the dam construction activities. This analysis focuses on Chelan County, the site of Eightmile Dam, and the IPID service area and the City of Leavenworth's water system, both of which are reliant upon surface water from Icicle Creek. The analysis also considers neighboring Douglas County given that some portion of the potentially affected populations (e.g., farm workers) likely resides there. Together, Chelan and Douglas counties are identified by the U.S. Census as the Wenatchee Metropolitan Statistical Area (MSA). This MSA includes the population centers of Wenatchee, East Wenatchee, Cashmere, and Leavenworth, among others (see Appendix D, *Environmental Justice*, for a map of the MSA).

IPID is the only entity legally entitled to water released from Eightmile Lake. Adverse impacts resulting from the project are only considered significant if the alternative results in impairment of the water rights of senior water rights holders. Other entities with water rights in Icicle Creek are secondary beneficiaries of water released from Eightmile Lake but are not legally entitled to that water. Although the alternatives may result in impacts on these entities in the form of curtailment of their own water rights in Icicle Creek (i.e., reduced water availability), those impacts are not considered significant because that water is not guaranteed to those users under their respective water rights in a given year. Delivery of water to IPID and its agricultural customers is not likely to be affected by the operation of any of the Action Alternatives, but could be significantly adversely affected during construction and under the No Action Alternative during years of low water. For more information on water rights, see Chapter 6.

15.1.1 Threshold for Significant Adverse Impacts (Short-Term)

Short-term (i.e., construction) impacts would be considered significant under the following circumstances:

- **Agriculture:** Construction would cause impairment of existing water rights of IPID, resulting in an inability to meet the demands of existing agricultural customers.¹
- **Recreation:** Significance determinations to recreation are made within Chapter 10, *Recreational Resources*, and this chapter does not develop separate definitions for significant impacts with respect to the value of recreation. This chapter describes the economic implications of impacts presented in Chapter 10.
- Dam failure results in loss of life or property.

¹ There are no circumstances in which the Cascade Orchard Irrigation Company (COIC) senior water right would be impaired. As a result, COIC is not considered in this impact analysis.

This analysis also considers the potential effects on other economic activities due to curtailment of water rights to junior water rights holders resulting from the No Action Alternative or any of the action alternatives. However, these effects are not considered significant adverse impacts because only IPID has the right to rely on the release of water stored at Eightmile Lake (see Chapter 6, *Water Rights*). This analysis evaluates the potential for non-significant adverse impacts on the following activities:

- **Growth and Development:** Construction results in curtailment in delivery of water to fulfill the City of Leavenworth's existing diversionary water rights due to insufficient streamflow or increase the number of days that instream flow within Icicle Creek cannot be met, resulting in an inability to meet the demands of customers in the water service area from the interruptible portion of their water right portfolio.
- **Fisheries and Hatchery Operations:** Impacts caused by reduced water delivery would result in the closure of commercial or tribal ceremonial and subsistence fisheries or a closure of hatchery operations. Chapter 14, *Tribal Resources*, evaluates the potential impacts of the alternatives on the cultural value of tribal ceremonial and subsistence fisheries.

15.1.2 Threshold for Significant Adverse Impacts (Long-Term)

Long-term (i.e., operational) impacts would be considered significant under the following circumstances:

- **Agriculture:** Long-term operation of the new facility would cause impairment to existing water rights of IPID due to insufficient streamflow, resulting in an inability to meet the demands of existing agricultural customers.
- **Recreation:** Significance determinations to recreation are made within Chapter 10, *Recreational Resources*, and this chapter does not develop separate definitions for significant impacts with respect to the value of recreation. This chapter describes the economic implications of impacts presented in Chapter 10.
- Dam failure results in loss of life or property.

This analysis evaluates the potential for non-significant adverse impacts on the following activities:

- **Growth and Development:** Long-term operation of the replaced dam facility would curtail the delivery of water to fulfill existing diversionary water rights of the City of Leavenworth due to insufficient streamflow or increase the number of days that instream flows within Icicle Creek cannot be met, resulting in an inability to meet the demands of existing customers, or the inability to accommodate anticipated population growth and development within the planning horizon.
- **Fisheries and Hatchery Operations:** Impacts would result in a reduction in the number of fish available for harvest in commercial or tribal ceremonial and subsistence fisheries or a reduction in hatchery operations. Chapter 14, *Tribal Resources*, evaluates the potential impacts of the alternatives on the cultural value of tribal ceremonial and subsistence fisheries.

15.2 Regulatory Context

Numerous programs, plans, policies, and regulations focus on water quantity, water quality, fish and wildlife, proposed land use, and practices within wilderness areas that have bearing on how these economic activities may affect, or be affected by, the project alternatives. These regulations and

policies are described in greater detail in Chapters 4 (*Surface Water Resources*), 6 (*Water Rights*), and 8 (*Plants and Animals*).

In particular, Chelan County's Comprehensive Plan outlines the community's goals and policies for economic development for the next 20 years (Chelan County 2017). The County aims to accommodate and support efforts to diversify the agricultural economy, encourage the retention and growth of recreational and tourist-based industries, and encourage efforts to diversify the existing economic base to focus on long-term sustainable economic development.

Additionally, the City of Leavenworth's Comprehensive Plan specifies the City's goals and policies for economic development for the next 20 years (City of Leavenworth 2017b). The City seeks to foster a balanced, diversified, and sustainable local economy; maintain and enhance year-round opportunities for sustainable tourism; enhance commercial districts as an active and economically viable place to shop; and build upon the City's many recreational, cultural, and historical amenities.

15.3 Affected Environment

Note – this analysis was conducted using some data collected before the COVID-19 pandemic. The pandemic has likely affected the analyzed metrics.

Population growth can stimulate regional economic activity through increased spending and production. The American Community Survey (ACS; U.S. Census Bureau 2009a and 2019a) reports that the total population in the Wenatchee MSA was 118,252 in 2019, a 10.7 percent increase in population since 2009. Both counties in the MSA saw growth individually between 2009 and 2019.

Overall, Chelan and Douglas counties experienced economic growth between 2009 and 2019, including growth in gross domestic product (GDP), income, and employment. Growth in GDP in both counties outpaced GDP growth nationwide but was less than the growth experienced by the State of Washington. While per capita income in Chelan County increased more substantially than at the state and national levels, per capita income increases in Douglas County were less. The *Agriculture, Development and Other Economic Activities Discipline Report* (IEc 2023) provides more detailed information regarding recent trends in economic growth.

Before the COVID-19 pandemic, Chelan and Douglas counties experienced unemployment rates (4.9 and 5.7 percent, respectively) slightly above the Washington State rate of 4.2 percent. The pandemic led to a shrinking labor force in 2020, with the Wenatchee MSA's unemployment rate increasing from 4.9 percent in November 2019 to 6.6 percent in November 2020 (Washington ESD 2021).

In both Chelan and Douglas counties, the government sector was among the largest employers in 2019, accounting for 13 percent of total employment in Chelan County and 14 percent in Douglas County. Farms were the largest employer in 2019 in Douglas County, accounting for 14 percent of total employment. Farms accounted for 8 percent of employment in Chelan County. However, farm industry employment contracted by 9 percent (Chelan County) and 7 percent (Douglas County) between 2009 and 2019. The accommodation and food services sector experienced the highest growth in both counties over the last 10 years, reflecting the expanding view of the region as a desirable tourism destination.² However, the tourism sector was affected by the COVID-19 pandemic, with Chelan and Douglas counties experiencing a drop in per capita direct travel and tourism spending of approximately 19 percent from 2019 to 2020 (Eastern Washington University 2021). IEc

² The U.S. Census Bureau and ACS also provide data on employment by sector. However, those data do not allow us to isolate employment in the agricultural sector specifically because the defined sector includes agriculture with other industries including fishing, forestry, hunting, and mining. Additionally, they generally exclude employment in crop production. For these reasons, and for consistency and comparison with wage data, this analysis relies instead upon data from the Bureau of Economic Analysis (BEA) to characterize employment broadly in the study area.

(2023) provides a more detailed accounting of the top employment sectors in these counties, and trends in employment between 2009 and 2019.

In Chelan County, the sectors associated with the highest wages were the government and health care sectors, representing 24 percent and 20 percent, respectively, of all total wages paid. In Douglas County, the government sector represents the highest proportion of wages paid, at 31 percent. Wage growth was seen across both Chelan and Douglas counties from 2009 to 2019, with the accommodations, wholesale trade, and forestry sectors experiencing the greatest changes.

Water from Icicle Creek supports many of the key economic activities within the region, including the following:

- Orchards, fruit storage, and other agricultural operations providing employment and wages (Anchor QEA 2018b).
- Municipal and domestic use (including residences and businesses, particularly those serving tourists) (City of Leavenworth 2018).
- The Leavenworth National Fish Hatchery (LNFH), which produces spring Chinook salmon that support important recreational and tribal fisheries, and contribute to commercial fisheries in the Columbia River and Pacific Ocean (USFWS 2016).
- Recreational, commercial, and tribal ceremonial and subsistence fisheries for Chinook salmon and other species.

The remainder of this section describes the values, activity levels, and trends in economic activities dependent upon Icicle Creek water.

15.3.1 **Agriculture**

This section characterizes the agricultural entities that rely on water from Icicle Creek, as well as the broader agriculture industry in the region.

Agriculture Supported by Icicle Creek Water

Table B-2 of Appendix B (*Water Rights*) lists the entities with surface water rights to Icicle Creek (Anchor QEA and IPID 2021). Approximately 93 percent of the irrigation water is allocated for use by the IPID, which then delivers water to local farmers and other users of irrigation water. One other organization supplies water to farmers (COIC). The number of growers and farms supported by these water rights arrangements is unknown. IPID reports 4,314 shares in the Icicle District and 3,723 shares, although not all of these shares are necessarily dedicated to agricultural use (Anchor QEA and IPID 2021). There were 2,140 land parcels within IPID district boundaries as of 2018; individual farms may consist of multiple parcels (Anchor QEA and IPID 2021). For reference, 835 farms were recorded in Chelan County in 2017 (NASS 2017).

The total area of agricultural land irrigated with water from Icicle Creek is unknown, but estimates from IPID provide some clarity. **Table 15-1** describes IPID's estimate of irrigated acres across orchards and pasture based on their 2018 Comprehensive Conservation Plan (Anchor QEA 2018b). Of a total of approximately 8,247 agricultural acres irrigated via IPID's water rights, IPID reports that 6,322 acres are under orchard crops and 1,925 acres are pasture. Additionally, COIC estimates that they irrigate approximately 400 acres (Anchor QEA and IPID 2021).³ Together, IPID and COIC water

³ Current irrigated acreage under COIC's water right has not been determined as their water right is pending review as part of an ongoing change application.

rights from Icicle Creek irrigate up to approximately 36 percent of all irrigated agricultural acreage in Chelan County.⁴

Table 15-1. IPID Total Irrigable Acreage

Irrigation District	Orchards	Pastures	Total
Icicle Irrigation District (IID)	3,755	1,137	4,892
Peshastin Irrigation District (PID)	2,567	788	3,355
IPID Total	6,322	1,925	8,247

Source: Anchor QEA (2018b), Table 3-1.

Note: Estimates of total irrigable acreage provided through review of assessment rolls, aerial photography, and consultation with IPID regarding lands that are irrigated by IPID water that are not located in assessed parcel boundaries (Anchor QEA 2018b).

Table 15-2 identifies the major crops and crop groups grown within IPID district boundaries. Pear is the major crop in the area, representing about 83 percent of agricultural land within IPID’s boundaries (WSU Extension nd). Other important orchard crops include apple, cherry, and pasture/hay. **Figure 15-1** shows their geographic distribution and identifies the proximity of irrigated agricultural land to Icicle Creek and its tributaries. The crop mix maintained by other entities with direct or indirect water rights to Icicle Creek is likely similar to the crop mix within IPID’s district boundaries. Table 15-2 also describes the contribution of acreage within IPID district boundaries to Chelan County broadly by crop. The acreage of pears grown within IPID’s boundaries represents 68 percent of all acreage under pear cultivation across Chelan County. In contrast, acres of apple and cherry in IPID’s boundaries represent only 5 percent and 4 percent, respectively, of all land for these same crops in Chelan County.

Table 15-2. Total Acreage by Primary Crop, IPID District and Chelan County

Primary Crop	Within IPID District	All Chelan County	Percent IPID District Relative to Chelan County
Pear	5,253	7,693	68%
Apple	311	6,141	5%
Cherry	225	6,312	4%
Other orchard crops ¹	2	114	2%
Forage/hay ²	232	1,712	14%
All other ³	295	2,821	10%
TOTAL	6,318	24,793⁴	25%

Notes:

1/ Includes peaches, nectarines, apricots, prunes, and plums.

2/ Includes hay/silage and pasture.

3/Includes berries, vegetables, cereal grain, floriculture, herbs, commercial trees, turfgrass, fallow, and developed irrigated areas.

4/The total irrigated acreage calculated in this table relies upon 2019 data from the Washington Department of Agriculture. The total irrigated acreage used for calculation in footnote 3 relies upon 2017 data from the Census of Agriculture (NASS 2017). The total irrigable acreages presented in Table 15-1 are calculated using estimates from Anchor QEA (2018b). Therefore, the acreages presented across multiple sources differ from one another.

Source: Washington State Department of Agriculture (2019) Agricultural Land Use GIS Data; IPID district boundaries provided by Anchor QEA.

⁴ Chelan County is home to 23,819 irrigated acres of farmland (NASS 2017).

Demand for Irrigation Water

In this region, irrigation activities start between April 15 and May 1 each year, and it generally takes an individual grower between 12 and 21 days to irrigate their entire orchard with water supplied at a typical rate of 0.015 cfs (Anchor QEA 2018b). Farmers who rely on water from IPID paid \$118 per share in 2017, an increase over the \$110 per share per year paid between 2013 and 2016, where one share of water irrigates approximately one acre (Anchor QEA 2018b).⁵

The water volumes presented in Chapter 6 (*Water Rights*) represent contractor estimated water right volumes and may not necessarily correspond with water demand.⁶ IPID has evaluated irrigation water needs among its existing water users by considering general water requirements of currently planted crops as well as the efficiency of currently installed irrigation systems (Anchor QEA 2018b). IPID estimates that the average orchard requires 6.84 gallons per minute (gpm) per acre for efficient micro-spray systems and more than 7 gpm per acre for less-efficient systems, which are both more than the maximum 6.75 gpm IPID currently delivers to its water users during normal years. IPID explains that IPID growers have adapted to the small deficit irrigation of 6.75 gpm level of water delivery through efficiency measures (e.g., irrigating at different times of day, rotating sprinkler sets, etc.) (Anchor QEA and IPID 2021).

IPID is not seeking to increase their water rights through the rebuild of Eightmile Dam. Overall, IPID's assessment of water needs among its growers does not identify an expected increase in the demand for irrigation water beyond recent levels.

Economics of Agricultural Production

Based on Census of Agriculture sales data for Chelan County and the crop acreage from the Washington State Department of Agriculture described in Table 15-2, the average sale value for orchard and berry crops within Chelan County is \$13,000 per acre, or an approximate total sales volume of up to \$90 million.⁷

Recent challenges faced by growers in the fruit tree industry include:

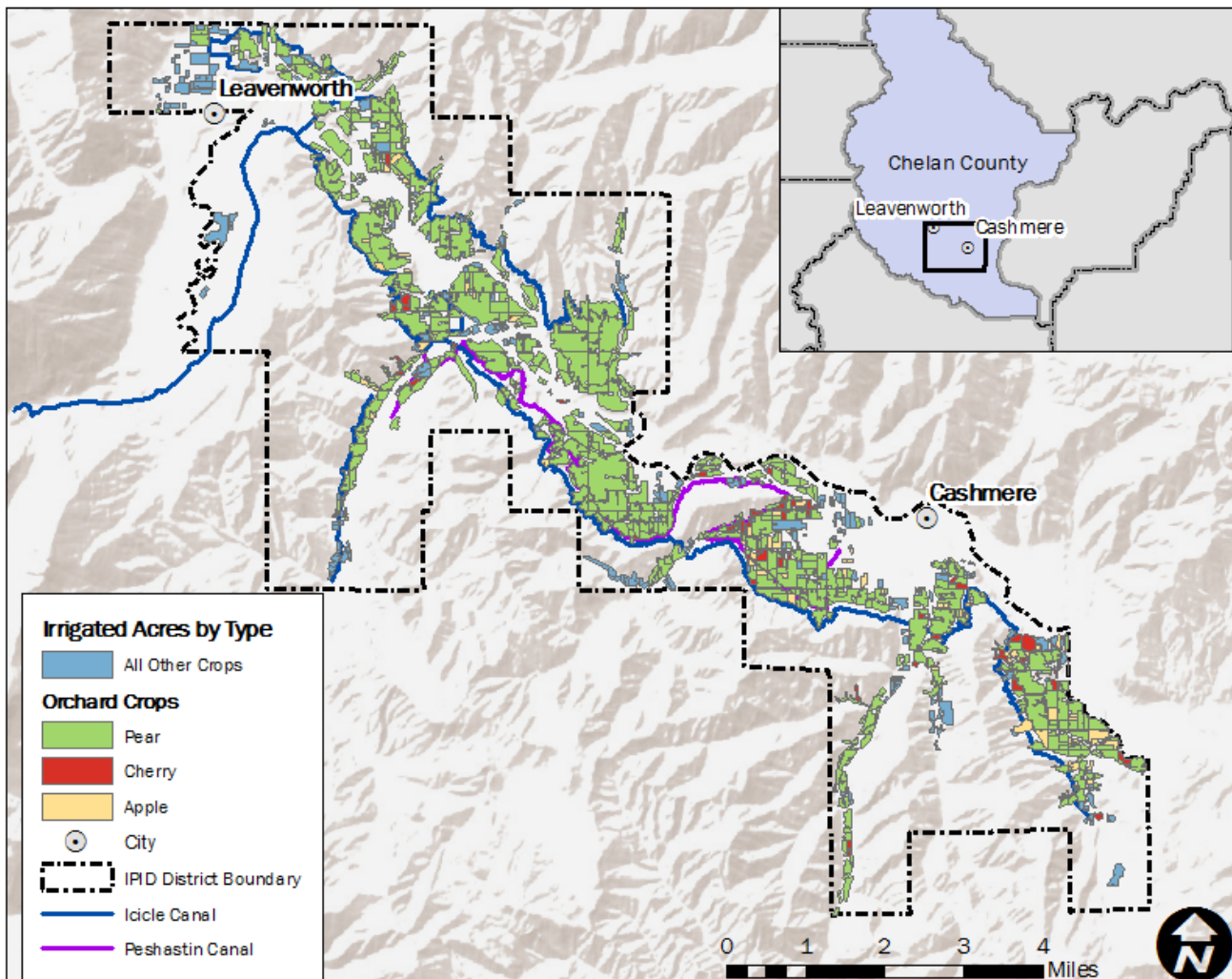
- High production volume but only break-even profitability conditions for pear farmers due to lackluster demand and rising production costs (Northwest FCS 2019a).
- For cherries, concerns over disease in cherry trees, leading to reductions in supply (Northwest FCS 2019b).
- Among apple growers, slight profitability, but elevated trade tensions resulting in diminishing exports (Northwest FCS 2019c). Effects from COVID-19, such as reduced number of workers in fields due to protective measures, reduced productivity and increased labor costs and labor supply bottlenecks due to border closures and reduced availability of temporary housing for a workforce largely consisting of migratory laborers (Gallardo 2020).
- Uncertainty in export markets and impacts on trade from currency fluctuations (Northwest FCS 2020a).

⁵ All dollar values reported in this section are expressed in real 2021 dollars and were adjusted using the Bureau of Labor Statistic's "CPI Detailed Report Data" for January 2021 (BLS 2021).

⁶ The water volumes presented in Chapter 6 do not represent a determination of the validity and extent of the rights (as further described in Chapter 6) and may not necessarily correspond with water demand.

⁷ The \$13,000 per acre value was applied to the 6,322 acres of orchard in the IPID service area (see Table 15-1) and approximately 400 acres supported by COIC's water rights to calculate total sales volume. The relevant per-acre sales value for the 1,925 acres of pasture in IPID's service area is less certain. Note that sales may vary significantly between years given seasonal variability in supply (e.g., resulting from weather conditions and disease outbreaks) and demand (e.g., given international trade conditions and domestic demand relative to substitute fruits).

Figure 15-1. Distribution of IPID Irrigated Acres by Crop Type



However, domestic demand for orchard fruits has increased. Individuals are going to the grocery store less frequently and buying more shelf-stable fruit, like apples, in larger quantities (Northwest FCS 2020a). Despite the unique obstacles due to the pandemic, apple, pear, and cherry growers in Washington State were expected to see above-normal profits during the pandemic years due mostly to strong domestic demand (Northwest FCS 2020a, 2020b, 2020c).

Employment in the Agricultural Sector

The Census of Agriculture reports that 65 percent of farms in Chelan County hire farm labor (NASS 2017). The Bureau of Economic Analysis reports about 4,800 workers under the “farm worker” classification in Chelan County (8 percent of the work force) (Bureau of Economic Analysis 2019a). These same jobs account for 5 percent of total wages (Bureau of Economic Analysis 2019b).

The agriculture industry in Chelan County is also supported by workers who reside in other counties. Data from the Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES) identify about 5,600 people residing in Chelan County who report agriculture, forestry, fishing, and hunting as their primary occupation (LODES 2018). However, about 7,800 people report working in Chelan County in the aforementioned industries, suggesting a net influx of about 2,200 workers who reside outside Chelan County who work in the agriculture industry within the county (LODES 2018). In addition to commuters from nearby counties, Chelan County also relies on labor from the H-2A visa guest worker program, particularly during harvest time (EcoNorthwest 2017).

The Washington Employment Security Department (ESD) describes that the agriculture, forestry, and fishing sector (representing a broader industry than the BEA data described above) accounts for 21.4 percent of all employment in Chelan County but only provided 14.7 percent of total wage income (Washington State ESD 2021).⁸ According to the Bureau of Labor Statistics, the mean hourly wage for workers in farming, fishing, and forestry across the Wenatchee MSA was \$15.00 in May 2019 relative to \$15.42 at the national level (BLS 2019). These data sources demonstrate that agricultural workers garner relatively low wages relative to other industries in the state and in comparison to the same industry in other states. As previously mentioned, between 2009 and 2019, farm industry employment in Chelan and Douglas counties contracted by 9 percent and 7 percent, respectively. Declining employment and low wages could signal a pattern of inconsistent economic growth in the future of the Chelan and Douglas County agriculture industries.

15.3.2 Growth and Development

Water from Icicle Creek and wells in continuity with the Wenatchee River support municipal use for the City of Leavenworth (Ecology 2019a). The City of Leavenworth’s water system serves businesses and residences within the city limits, as well as within adjacent areas of unincorporated Chelan County (City of Leavenworth 2018). Growth in Chelan County led to higher demand for housing within Leavenworth, as well as in the surrounding Urban Growth Area (UGA) and broader Water Service Area, shown in **Figure 15-2** (City of Leavenworth 2017a). Housing development beyond the city administrative limits may connect to the City of Leavenworth’s water system, meaning that the City’s water budget must consider areas beyond city limits (City of Leavenworth 2018). Therefore, the main concerns regarding the water supply are as follows:

- Currently, the City’s Icicle Creek water rights are composed of roughly half interruptible rights, meaning a dry year can leave the City with a shortage of municipal water.

⁸ More recent data available from the Bureau of Labor Statistics and cited earlier in this section suggest that the proportion of employment and wages in the agricultural sector in the county have become more even in recent years.

- The City’s long-term water use projections (beyond 20 years, referred to as “ultimate demands”) indicate an insufficient supply to maintain expected future growth.

In light of these concerns, the City sought to clarify the annual quantity (Qa) of its uninterruptible water rights from Icicle Creek through a lawsuit with Ecology (City of Leavenworth v. Department of Ecology 2011), specifically seeking clarification on Surface Water Certificate 8105 (S4-16124CWRIS). The City asserts that the Qa should be based on the amount of water that would be used if the Qi is diverted on a continuous basis, which is 1,085 afy, while Ecology asserts the correct Qa is 275 afy based on a “reasonable quantity” relating to actual per capita demand for water. The City and Ecology have agreed to leave the lawsuit on hold while they work collaboratively with each other and other Icicle Work Group members on a non-litigious solution to meet future demands as part of the broader Icicle Strategy.

Property Values and Development Pressures

Leavenworth, and Chelan County more broadly, has become a popular tourist destination for visitors. Regional tourism has expanded in the past decade, constituting a larger portion of the local economy and placing pressures on further development to accommodate continued growth. As detailed in **Table 15-3**, key metrics of tourism tracked by the Economic Census all indicate positive and substantial growth between 2012 and 2017 (U.S. Census Bureau 2012, 2017; FAA 2012, 2017). Commercial assets associated with transportation, lodging, and food services contribute to the tax revenues and employment levels of the area. However, tourism decreased markedly in 2020, most likely attributed to the COVID-19 pandemic (Eastern Washington University 2021).

Table 15-3. Tourism Metrics for Chelan County

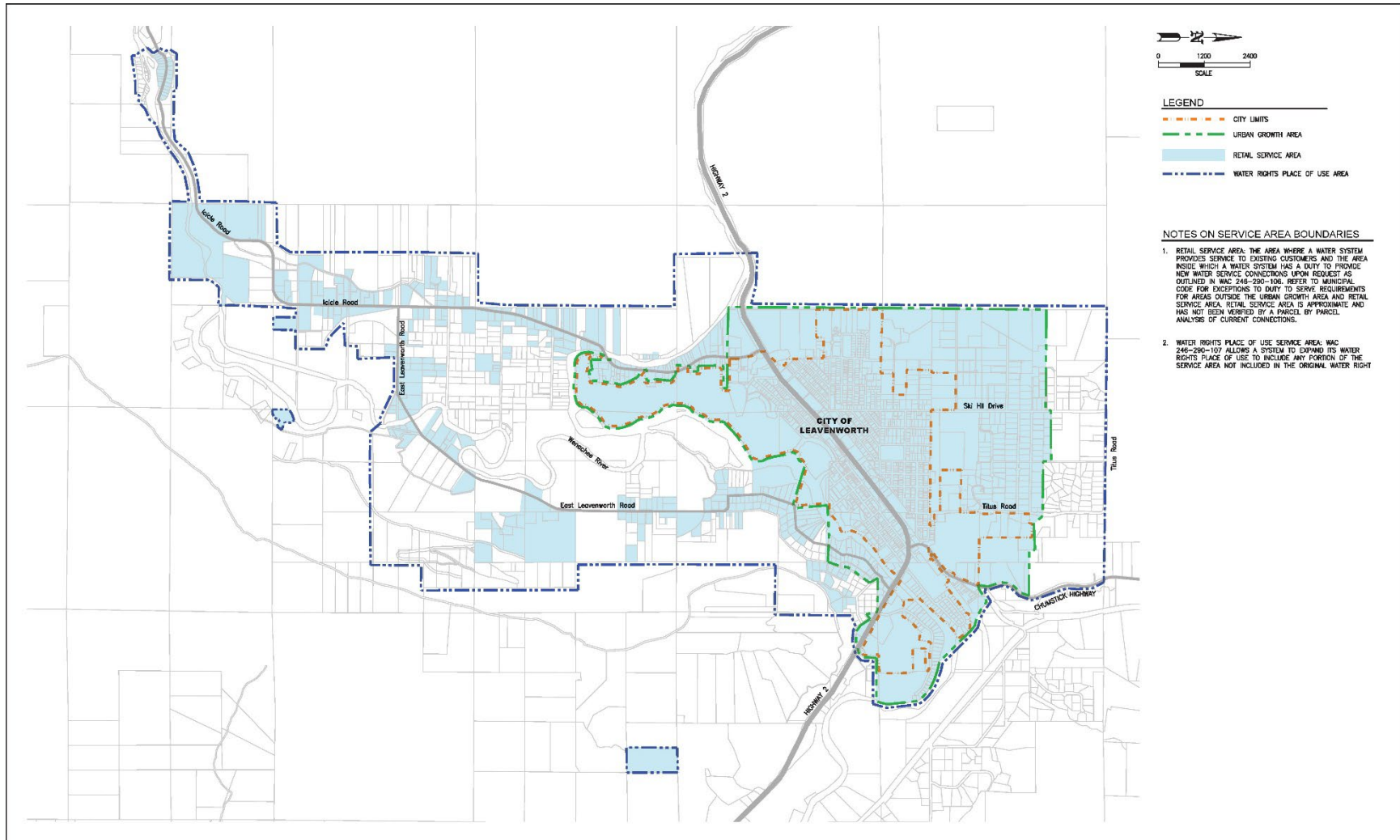
Metric	2012	2017	Absolute Change	% Change
Chelan County Accommodation Revenues (\$1,000)	\$88,073	\$118,508	\$30,435	+35%
Chelan County Accommodation Employment	1,039	1,247	208	+20%
Chelan County Food and Drink Revenues (\$1,000)	\$136,554	\$190,514	\$53,960	+40%
Chelan County Food and Drink Employment	2,325	2,942	617	+27%
Wenatchee Airport Annual Passengers	51,347	60,335	8,988	+18%

Note: All dollar values reported in this section are expressed in real 2021 dollars and were adjusted using the Bureau of Labor Statistic’s “CPI Detailed Report Data” for January 2021.

Source: U.S. Census Bureau (2012 & 2017); FAA (2012 & 2017)

Chelan County, and cities including Leavenworth, Plain, and Lake Wenatchee, have become increasingly popular sites for recreational and retirement properties (Chelan County 2017). The median home value in 2019 (reported in 2021\$) for owner-occupied housing units in Chelan County was \$299,700, while the median home price in Leavenworth was \$363,800 (U.S. Census Bureau 2019b). The corresponding values from 2009 reveal significant price increases in the past decade, with the Chelan County median home price rising by 9 percent and Leavenworth city median home prices rising by 16 percent between 2009 and 2019 (U.S. Census Bureau 2009b). More recently, home prices have increased even further, with Chelan County median home prices rising to \$552,000, and Leavenworth city home prices rising to \$629,500 between June 2021 and June 2022 (Rocket Homes 2022a, 2022b).

Figure 15-2. Map of Leavenworth, the Urban Growth Area, and Water Service Area



Source: City of Leavenworth (2018a)

In 2019, the U.S. Census Bureau (2019b) reported a total of 37,693 housing units across Chelan County and 1,422 housing units in the City of Leavenworth, further broken down in IEC (2023). Compared to 2009, Chelan County saw an increase in housing units of 14 percent, while the City of Leavenworth saw an increase of 9 percent.

Leavenworth's status as a tourism and recreation destination has increased the proportion of second homes within the area, resulting in roughly 15 percent of the housing market being homes being used for seasonal, recreational, or occasional visits and 11 percent being vacant for any other reason (U.S. Census Bureau 2019b).

The lack of available housing has driven up the average home price over the past decade within Chelan County and Leavenworth, as described previously and further detailed in IEC (2023). This trend ultimately excludes low- and middle-income residents looking to become homeowners or seeking a long-term rental. The County expects the population of the city and the Leavenworth UGA, shown in **Figure 15-2**, to grow by approximately 200 people from 2017 to 2037, requiring another 91 dwellings. They anticipate that this need can be met with existing land use and development plans within the existing UGA (Chelan County 2017). The growth and development goals regarding the housing supply are designed to align with the city's current and expected population. As mentioned previously, however, the City must also factor in housing development occurring within the Water Service Area but outside the City's jurisdiction to develop an accurate water budget. This results in slightly higher growth projections that estimate an annual population increase of around 0.47 percent (City of Leavenworth 2018).

An updated analysis from the 2020 Housing Needs Assessment indicates that the City is on track to meet its 20-year planning targets in the near term (City of Leavenworth 2020). Development outside city limits also falls beyond the purview of City administrators, meaning the rate of future development within the Water Service Area is not necessarily within Leavenworth's purview, and initial population projections could underestimate the future population growth of the city if greater housing availability draws more new residents than anticipated. However, City officials have consistently built strategies for manageable growth into their water, sewage, transportation, and other public systems plans that are expected to handle reasonable deviations in expected population growth.

Development Along Icicle Creek

About 5 miles south of the Leavenworth downtown area, 50 private lots sit along Icicle Creek, forming a small community known as the Icicle Island Club. The homes were built after Eightmile Dam's original construction in the 1930s (Chelan County Assessor 2022). The houses are not significantly above the highest water level of the creek, meaning that failure of Eightmile Dam would put most or all the houses at significant risk of being severely damaged or destroyed. Employing market values calculated by the Chelan County Tax Assessor's Office in January 2021, the homes have a median value of about \$448,000, a mean value of about \$485,000 (ranging from \$70,000 to \$1.89 million), and a total market value of about \$24.3 million.

Municipal Water Demand

Since 1989, the City of Leavenworth water usage has averaged around 800 to 1,200 afy, with a subtle downward trend largely attributed to efficiency improvements (City of Leavenworth 2018). These ranges are significantly below the current level of water rights claimed by the City (Chapter 6, *Water Rights*). The City of Leavenworth's existing and pending water rights are served by both surface water from Icicle Creek and groundwater from wells along the Wenatchee River. The City of Leavenworth reports that the existing needs for water within the city limits are being met by existing water rights (City of Leavenworth 2021). However, development in the UGA that lies in

unincorporated Chelan County has resulted in new and increasing demands for water. Although this area lies outside of the jurisdiction of the City of Leavenworth, the City has committed to providing water to meet these demands through its own water system (City of Leavenworth 2018).

The 2018 Leavenworth Water System Plan indicates that it will “oversize some of the water system infrastructure improvements...to meet ultimate demands.” The plan expects to incorporate significant capacity overhauls in the next 20 years to keep up with anticipated increased water usage.

A primary component in the calculation of “ultimate demands” (i.e., beyond 20 years) centers on the Leavenworth area’s status as a tourism hub, with annual increases in expected water usage outpacing expected population growth due to the high demands on both the residential and commercial infrastructure from seasonal visitors. This water use projection “equates to an increase of approximately 24 percent over the next 10 years and 55 percent over the next 20 years” (City of Leavenworth 2018). Existing and future infrastructure is expected to serve the current and future developments, but currently relies on or is expected to heavily rely on Icicle Creek, in addition to groundwater sources.

The City’s current continuous and interruptible rights can meet demand in the current and 20-year time horizons, but not the ultimate time horizon.⁹ To cover this gap, the City is currently involved in the aforementioned litigation with Ecology regarding the annual quantity of surface water certificate 8105 (S4-*16124CWRIS) (City of Leavenworth 2018; see Chapter 6, *Water Rights*). Concurrently, both Ecology and the City are also working on alternate new water supply options for the City as part of the larger Icicle Strategy.

15.3.3 Recreation

As described in Section 10.3 of Chapter 10, the project area provides numerous opportunities for solitude or primitive, unconfined recreation. This is a popular destination for hiking and camping, fishing, horseback riding, swimming, skiing/snowshoeing, and nature watching that draws people from across Washington State and beyond. Recreational visitation to the Eightmile/Caroline Zone (see Figure 10-1) in 2019 and 2020 is presented in Table 10-4 (Chapter 10). Day use visitation ranged from 4,379 to 5,689 users (USFS 2019b, 2020).¹⁰ Overnight use totaled 1,516 users in 2020, while the information for 2019 is unavailable (USFS 2019b, 2020). Recreational visitation produces economic activity and benefits, measured in terms of expenditures and value to recreationists themselves. As visitors travel to and from recreation sites, they spend money in local communities on food, gas, lodging, and other trip-related expenses, contributing to the regional economy by supporting jobs and income for residents. The economic value of recreation is the difference between the maximum amount a recreationist would be willing to pay to participate in a recreational activity and the actual cost of participating in that activity, referred to as consumer surplus or net economic value. Put simply, this is a recreationist’s value of a trip after all expenses have been paid. Additional description regarding recreational value is provided in IEc (2023).

The sections below present the estimated expenditures, regional economic contributions, and net economic value associated with recreation in the Eightmile/Caroline Zone, where the project is located.

⁹ As of 2017, the City uses roughly 983 afy, with demand expected to increase to 1,519 afy in 20 years and 2,903 afy in the ultimate demand time horizon (City of Leavenworth 2018). The City currently holds rights to 2,275.95 afy, although this quantity is under ongoing dispute and litigation.

¹⁰ Day use is estimated by the Forest Service using self-issued permits at the trailhead. The Forest Service estimates 70 percent compliance with day use permitting. The numbers in Table 10-4 were adjusted to reflect this compliance rate and estimate total day use.

Recreational Expenditures and Regional Economic Contributions

The Forest Service estimates recreational expenditures and the associated regional economic contributions at the National Forest level.¹¹ Estimates are not available at a more specific geographic scale, such as the Eightmile/Caroline Zone. The most recent report available for the Okanogan-Wenatchee National Forest, which contains the Alpine Lake Wilderness, is from 2016 (USFS 2016a). Total recreational visitation to in 2016 was 1.34 million visits, which generated \$98.8 million in expenditures (Table 1 in USFS 2016a; 2021 dollars).^{12,13} These expenditures supported 1,080 jobs and \$46.3 million in labor income (Tables 2 and 3 in USFS 2016a; 2021 dollars).¹⁴ Approximately 84 percent of the expenditures and associated jobs and labor income contributions were supported by non-local recreational visitors, while the remaining portion was supported by local visitors (USFS 2016a; White 2017).

Non-local visitors bring new money into the regional economy and spend more per visit because they come from a greater distance. Local recreationists spend less per visit, and the standard assumption is that the money they spend would be spent on something else in the local economy if not for recreation. Both local and non-local visitation effects are included by the Forest Service to estimate regional economic contributions.¹⁵ The methods used by the Forest Service to estimate visitation, expenditures, and regional economic contributions are described in multiple reports (e.g., English et al. 2020; White 2017; Horsch et al. 2017).

As recreational expenditures and regional economic contributions are not available for the Eightmile/Caroline Zone, this analysis relies on approximations based on the percentage of visitation to the Okanogan-Wenatchee National Forest that occurs in the Eightmile/Caroline Zone (about 0.6 percent).¹⁶ This results in an annual contribution of \$610,000 in expenditures, 6.7 jobs, and \$286,000 in labor income (Table 15-4). As expenditure patterns and local economic effects vary throughout the Okanogan-Wenatchee National Forest, these annual estimates reflect approximate contributions.

Table 15-4. Okanogan-Wenatchee National Forest and Eightmile/Caroline Zone Annual Recreational Visitation, Expenditures, and Regional Economic Contributions (2021 Dollars)

Metric	Okanogan-Wenatchee National Forest	Eightmile/Caroline Zone
Visits	1.34 million	8,267
Expenditures	\$98.8 million	\$610,000
Jobs	1,080.0	6.7
Labor Income	\$46.3 million	\$286,000

Sources: USFS 2016a, 2017b.

¹¹ Reports by National Forest are available online at: <https://www.fs.fed.us/emc/economics/at-a-glance/jobs-income.shtml>.

¹² All dollars in this section have been adjusted to 2021 dollars using the Consumer Price Index (CPI; BLS 2021).

¹³ Detailed visitation estimates by National Forest can be downloaded from <https://www.fs.usda.gov/about-agency/nvum/>.

¹⁴ These job and income effects include direct contributions that come from recreational expenditures and secondary contributions that result from ripples of economic activity stimulated by the direct economic activity (USFS 2016a). Total contributions are the sum of direct and secondary contributions. Job estimates represent the average annual sum of portions of jobs, including part time, full time, seasonal, and temporary.

¹⁵ An economic impact analysis would exclude expenditures by local visitors. The Forest Service tends to focus on economic contributions rather than economic impacts (Horsch et al. 2017).

¹⁶ 2016 visitation data for the Eightmile/Caroline Zone were from USFS (2017b).

Net Economic Value

The net economic value of recreation in the Eightmile/Caroline Zone is estimated in two steps. First, annual recreational visits are converted to annual recreational visitor days to account for the fact that some visits last longer than one day. Second, annual visitor days are scaled by a net economic value per day to estimate the annual net economic value.

The number of days per visit varies by recreational activity. The distribution of activities for the Eightmile/Caroline Zone is adapted from information for the Wenatchee National Forest, the most specific information available, which are presented in detail in IEC (2023) based on USFS (2016b). These data show that 19.9 percent of visits are for hiking/walking, 11.5 percent for viewing natural features, 9.8 percent for hunting, and smaller percentage for other activities. The estimated days per visit are reported for Forest Service Region 6 (Pacific Northwest), the most specific information available (Rosenberger et al. 2017), which range from 1.0 to 2.8 depending on the activity (see IEC 2023). The overall average days per visit, weighted by activity type, is 1.40. To be consistent with the information presented in IEC (2023), recreation visitor days for the Eightmile/Caroline Zone are calculated for 2016, which is 11,608 days. Repeating the exercise for 2020 visitation yields 8,277 recreation visitor days.

The average net economic value per day is also reported for Forest Service Region 6 (Pacific Northwest), the most specific information available (Rosenberger et al. 2017), which ranges from \$36.13 to \$118.72 depending on the activity (IEC 2023).¹⁷ The overall average value per day, weighted by activity type, is \$68.49. Multiplying recreation days by net economic value per day yields an annual net economic value of recreation in the Eightmile/Caroline Zone of \$795,000 in 2016 and \$567,000 in 2020.

15.3.4 Fisheries and Hatchery Operations

Water supply to support fish propagation at the LNFH includes water from Icicle Creek, Snow Lake, and Nada Lake, and from seven wells (USFWS 2016). Certificate 1824¹⁸ specifically provides an instantaneous withdrawal right to 42 cfs from Icicle Creek through the hatchery's diversion dam and intake at RM 4.5. Chapter 8, *Plants and Animals*, describes the fish resources of the study area, including those populations that are supported by hatchery production at the LNFH. Fish from this system support recreational, commercial, and tribal fisheries both immediately in the vicinity, as well as (in the case of anadromous fish) farther downstream into the Wenatchee and Columbia rivers, and in the Pacific Ocean. Commercial and recreational fisheries for these fish resources, as well as the operation of the hatchery itself, contribute to the economy of the region. As described in Chapter 14, *Tribal Resources*, ceremonial and subsistence harvest by the Yakama Nation and Confederated Tribes of the Colville Reservation is critically important to the culture of those tribes. The recreational fisheries in the study area are described in Chapter 10, and their economic contribution to the regional economy is discussed in Section 15.3.3. This section focuses on the commercial fisheries supported by fish from the study area, the economic contribution of the hatchery to the regional economy, and the tribal cultural importance of these fish resources.

¹⁷ Rosenberger et al. (2017) uses meta-regression analysis to develop average per person user day values by primary activity and Forest Service region (see Table 3 in that report). The regression specified the value per person day as a function of region, activity, resource type, and other factors. The estimated coefficients were used to predict average value estimates by activity and region.

¹⁸ This certificate is referred to as CS4-01824C@2 in Chapter 6 (*Water Rights*).

Economic Value and Contributions of Hatchery Operations and Icicle Creek Fish

The anadromous fish returning to Icicle Creek consist primarily of returns of spring Chinook produced by the LNFH (Ecology 2019a).¹⁹ LNFH-produced fish contribute to recreational fisheries in Icicle Creek and other nearby freshwater areas, as well as in the Columbia River and Pacific Ocean (further addressed in Section 15.3.3), and to important tribal ceremonial and subsistence fisheries in Icicle Creek (described later in this section).²⁰ Tribal and non-tribal commercial fisheries target these fish within the Columbia River, while they also contribute to non-tribal commercial fisheries in the Pacific Ocean (USFWS 2016).²¹ **Table 15-5** reports the estimated average annual harvest and ex-vessel value or sport angler spending of harvest of LNFH-produced spring Chinook salmon in commercial and recreational fisheries. Fish produced at LNFH provide \$22,570 in tribal and non-tribal commercial ex-vessel value annually, and support 0.5 job and \$25,152 in personal income in the fishing industry (2021\$) (USFWS 2016).²² LNFH-produced fish targeted in recreational fisheries also contributed \$637,906 in sport angler spending and \$463,636 in personal income, as well as 12.2 jobs. The hatchery program for coho salmon at the LNFH, run cooperatively by USFWS and the Yakama Nation, also provides economic benefits to the region, but data on the distribution and economic impacts of that harvest are not available (USFWS 2016).

Table 15-5. Estimated Distribution of Anadromous Fish Produced by the LNFH and Associated Economic Impacts (2021 Dollars)

Fishery	Number of Fish Harvested	Ex-Vessel Value/Sport Angler Spending	Jobs	Personal Income
Sport (Icicle Creek/Freshwater Vicinity)	587	\$307,780	6.2	\$223,452
Tribal Ceremonial and Subsistence	1,982	N/A	N/A	N/A
Hatchery Surplus	1,947	N/A	N/A	N/A
Tribal Commercial (Columbia River)	187	\$8,534	0.3	\$13,699
Non-Tribal Commercial (Columbia River)	191	\$13,587	0.2	\$10,330
Sport (Columbia River)	631	\$330,126	6	\$240,183
Non-Tribal Commercial (Pacific Ocean)	8	\$449	0	\$1,123
Total	5,533	\$660,476	12.7	\$488,788

Source: USFWS (2016)

¹⁹ In addition to the spring Chinook salmon production that is the cornerstone of the hatchery's operation, the LNFH supports the Yakama Nation's coho restoration program. Fish produced by this program contribute to a variety of commercial, recreational, and ceremonial and subsistence fisheries in the Columbia River and Pacific Ocean (Yakama Nation 2017). The Tribe's Mid-Columbia Coho Master Plan anticipates a dramatic reduction in coho salmon production and releases to Icicle Creek over the next 5 to 10 years (Yakama Nation 2017).

²⁰ In addition to the value derived from commercial fisheries targeting fish produced by the LNFH, and from hatchery operations and maintenance, hatchery surplus fish are provided directly to Columbia River tribes and local food banks. USFWS estimates that approximately 2,000 spring Chinook salmon and steelhead are provided as a free source of protein annually (USFWS 2016).

²¹ Tribes participating in commercial fisheries for these fish include the Yakama Nation, the Warm Springs Tribe, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation (USFWS 2016).

²² "Ex-vessel" value refers to the price per pound of commercial landings at initial purchase multiplied by the pounds landed (NOAA 2022).

The operation of the hatchery itself also contributes to the economy of the region through spending on goods and services. The USFWS estimates that the spring Chinook and steelhead production hatchery operations provide 30.9 jobs and \$2.5 million in personal income annually. These benefits are mostly concentrated within the City of Leavenworth, where the LNFH is located, and in Wenatchee, which offers a greater variety of goods and services to residents and businesses (USFWS 2016).

Tribal Ceremonial and Subsistence Fisheries

The fishery known as “Wenatchapam” is a place of great historical and present-day importance to the Yakama Nation and Confederated Tribes of the Colville Reservation. The Wenatchapam salmon fishery occurs annually between May and July (Chelan County 2016). It is centered around the confluence of Icicle Creek and the Wenatchee River, in the vicinity of the LNFH. After a legal dispute between the Yakama Nation and the Confederated Tribes of the Colville Reservation, the 9th District Court found in 2010 that “*We...construe the 1855 Treaty and the 1894 Agreement as conferring on the parties similar non-exclusive fishing rights at Wenatchapam that they share “in common with” non-treaty and non-agreement fishermen*” (*U.S. v. Tribes of Colville Indian*, 606 F.3d 698 (9th Cir. 2010)).

The project area is within the Yakama Ceded Lands, to which the Yakama Nation exercises its Treaty Reserved Rights, and traditional use area of the Confederated Tribes of the Colville Reservation for hunting, fishing, and gathering resources. These tribes target non-listed spring-run Chinook salmon returning to the LNFH. Since the reintroduction of coho salmon to the Icicle Creek drainages, tribal subsistence fisheries for coho salmon have been opened when runs are large and surplus fish are available. The smolts produced by the LNFH account for the vast majority of returning adult spring Chinook salmon harvested in the fishery (USFWS 2016). The USFWS (2016) estimates that the tribes collectively harvest approximately 2,000 spring Chinook annually on average for ceremonial and subsistence use. Fish from this hatchery also provide a limited contribution (approximately 200 fish annually) to tribal commercial fisheries in the Columbia River (see Table 15-5 above).

In addition to harvest of the spring Chinook produced by the USFWS at the LNFH, the Yakama Nation conducts a Mid-Columbia Coho Restoration Program aiming to re-establish naturally spawning coho populations in the area to sustainable levels.²³ This program is distributed across several hatchery facilities, including the LNFH. Since the reintroduction of coho to the upper Wenatchee River and Icicle Creek, both the Yakama Nation and the Confederated Tribes of the Colville Reservation have participated in ceremonial and subsistence fisheries when run size supports a fishery (Ecology 2019a). Tribal members may also harvest resident fish such as whitefish, sucker, and pikeminnow, and other non-native species year-round unless otherwise restricted (Ecology 2019a).

15.3.5 Summary

Agriculture, development, recreation, and fisheries and hatchery production are the primary economic activities that rely upon water from Eightmile Lake and Icicle Creek and the related natural resources that may be affected, either directly or indirectly, by the project alternatives. Water supply from Eightmile Lake is important to the substantial agricultural activities in the region. Led by the production of fruit including pears and apples, production costs can exceed revenues in certain years. Although the water supply currently available to the City of Leavenworth and the growth areas outside of the city limits is sufficient to meet current demand, it is not expected to meet the demands anticipated under long-term population growth projections, and may limit development in the future. Recreation and tourism are regional economic drivers, with tourists and recreationists

²³ Specifically, the program goal is “to re-establish naturally spawning coho populations in mid-Columbia tributaries to biologically sustainable levels which provide significant harvest in most years” (Yakama Nation 2017).

drawn to the natural beauty of the area. Water from Eightmile Lake eventually flows into Icicle Creek via Eightmile Creek, supporting a fishery of great cultural and subsistence importance to the Yakama Nation and the Confederated Tribes of the Colville Reservation. Icicle Creek water also provides a substantial portion of the water needed for fish production at the LNFH, with fish production supporting both tribal ceremonial and subsistence, as well as recreational fishing.

15.4 Construction Impacts

This section evaluates the extent to which the short-term construction period for the action alternatives affects agriculture and other economic activities, focusing on both the transportation of equipment and materials, and the implementation of the construction activities. As described in Section 15.1.1, significant adverse impacts would only occur to the extent that construction activities result in impairment of senior water rights.

Agriculture

The dam construction will require a drawdown of Eightmile Lake to well below the current low-level outlet in order for construction work to be performed “in the dry.” As described in Chapter 6 (Water Rights), active storage in the lake would be reduced and the IPID’s storage right would be unavailable during the construction period. Effects on delivery of water to rights holders would therefore largely depend on the prevailing precipitation rates and the ability of IPID to utilize their full diversionary right without access to their storage right. During average precipitation conditions, there may be no impacts at all on diversionary water rights in the form of impairment of senior rights (a significant adverse impact) or curtailment of junior rights. Even if climatic conditions result in below-average rainfall during mid to late summer and into early fall, impairment of IPID’s water rights, and significant adverse impacts on their agricultural customers, are unlikely. However, in the case of a very severe drought, there is the potential that IPID would not be able to fulfill the water needs of all of their agricultural customers, resulting in **significant adverse impacts** on the agriculture industry.

Growth and Development

As described previously, the City of Leavenworth is not legally entitled to water released by IPID from Eightmile Lake but does receive secondary benefits from released water. Dam construction would involve the temporary lowering of lake water levels below the existing low-level outlet. As described in Chapter 6, *Water Rights*, active storage in the lake would be reduced for the duration of the construction process, which would cause downstream flow quantities to be more reliant on prevailing precipitation rates and could lead to the curtailment of junior diversionary water rights, including those of the City of Leavenworth. If climatic conditions result in below-average rainfall, there is the potential that the City of Leavenworth would not have access to the amount of water they typically receive from Icicle Creek to fulfill their water supply obligations to residents and businesses, potentially forcing the City to rely upon alternative water sources in the short term (e.g., groundwater). The potential for this outcome would be even greater during severe drought conditions. However, these effects are limited to the relatively short time period surrounding construction and could potentially be mitigated through reliance on the City’s groundwater rights. Thus, construction is unlikely to have any impact on the City’s growth and development.

Recreation

The transportation of equipment and materials is **not anticipated to have a significant impact** on recreation in the area (Chapter 10, *Recreational Resources*). There may be higher noise levels associated with helicopter use in the Eightmile Lake and Caroline Lake Trail areas (Chapter 9,

Noise), which may affect the experience of some recreationists and reduce the value they experience for those trips. Some recreationists may find the noise levels disruptive enough that they choose to spend their time and overnight in other areas of the Enchantment Permit Area or elsewhere. In other parts of the Enchantments Permit Area, noise levels are unlikely to exceed regular ambient noise levels (Chapter 9, *Noise*). Altogether, some visitors may experience reduced value for trips taken to the area. However, as the impacts of transportation of equipment and materials by helicopter would be temporary, and recreational options with similar attributes are readily available in the area, the transportation of equipment and materials is unlikely to result in changes in recreational visitation and spending in the region.

Reopening of FSR-7601 to accommodate transportation of equipment would not have any effect on recreation other than the visibility of construction equipment at the trailhead and some audible road noise at the beginning of the trail during what are expected to be very limited trips to transport equipment along the road. Thus, **impacts on recreation would be less-than-significant** (Chapter 10, *Recreational Resources*). The minor disruptions associated with the visibility of construction equipment and road noise may reduce the value some recreationists hold for their visits to the area, but are not likely to result in reduced recreational visitation or spending in the region more broadly.

Although the Eightmile/Caroline Zone would remain open for recreational activities throughout the dam construction process, construction would lead to some short-term disruptions to recreation in the Eightmile Lake and Caroline Lake Trail areas, mainly consisting of higher noise levels and more frequent visibility of construction equipment and workers. However, as no recreational areas would be closed and construction is not expected to extend beyond a single season, **impacts on recreation due to construction would be less-than-significant** (Chapter 10, *Recreational Resources*).

The annual net economic value of recreation in the Eightmile/Caroline Zone was \$567,000 in 2020, while the regional economic contribution of recreation in the zone included \$610,000 in expenditures, 6.7 jobs, and \$286,000 in labor income (2021 dollars). The impacts of construction described above may detract from some recreationists' experience, with some experiencing disruptions substantial enough to result in their electing to use other areas. This, in turn, could result in increased congestion in other areas, detracting from recreationists' experience in those areas. Altogether, in the event that recreationists still elect to travel to the immediate area, they may experience some reduction in value held for their trips. To the extent that the construction activities deter recreationists from traveling to the region at all, the previously described net economic value and regional economic contributions would be lost.

Fisheries and Hatchery Operations

Equipment transportation would not significantly impact fish or fish habitat within Eightmile Lake, Eightmile Creek, or Icicle Creek (Chapter 8, *Plants and Animals*). Thus, commercial and tribal ceremonial and subsistence fisheries would not experience any meaningful change in the number of fish available for harvest. Although there may be higher noise levels in the area due to helicopter use, which may affect tribal community members fishing at Icicle Creek, noise levels along Icicle Creek are unlikely to consistently exceed or significantly disrupt regular ambient noise levels in the area (Chapter 9, *Noise*). Therefore, the transportation of equipment and materials would **not result in significant adverse impacts** on tribal communities reliant on the aquatic resources of Icicle Creek, or to commercial fisheries farther downstream.

As described previously, LNFH does not have any legal right to water released from Eightmile Lake, but does receive secondary benefits from these releases that could be affected by construction. Dam construction would involve the temporary lowering of lake water levels below the existing low-level outlet. As described in Chapter 6, *Water Rights*, active storage in the lake would be reduced during construction, resulting in downstream flow quantities being more reliant on precipitation rates. If below-average rainfall occurs during the construction season, there is the potential for

curtailment of junior diversionary water rights, and LNFH may not receive delivery of its entire water right, potentially resulting in a temporary reduction in operations. If the reduction in available water results in the complete closure of LNFH operations, dam construction has the potential to cause effects on hatchery operations and their economic contributions to the local economy, but the contributions from the dam construction **are not considered significant**.

Dam construction would result in higher levels of noise in the vicinity of Eightmile Lake (Chapter 9, *Noise*), visibility of construction activities and personnel in the area (Chapter 11, *Visual Resources*, and Chapter 10, *Recreational Resources*), and some minimal disruption to fish in the lake from increased turbidity and fish removal/relocation (Chapter 8, *Plants and Animals*). Construction activities are generally limited to the immediate surroundings of Eightmile Lake. As tribal communities primarily fish on Icicle Creek, heightened noise levels at the lake are unlikely to significantly affect their activities. No impacts are identified for fish populations in Icicle Creek; therefore, dam construction **would not result in significant adverse impacts** on downstream fishing opportunities in Icicle Creek for tribal communities, or for commercial fisheries farther downstream.

15.5 Operational Impacts

This section describes the operational impacts on agriculture and other economic activities from the fluctuating lake levels, changes in instream flow, and water delivery under the project alternatives. As described previously, impacts are only considered significant if the alternative results in the impairment of senior water rights.

15.5.1 No Action Alternative

Agriculture

The current conditions associated with the No Action Alternative reflect lake elevation levels that do not meet IPID's stated water storage needs, making IPID heavily dependent on favorable hydrological conditions to meet their expected water needs (Chapter 6, *Water Rights*). Under the No Action Alternative, assuming the dam remains intact and current operations continue, IPID could likely still exercise their full diversionary water right (potentially requiring increased reliance on storage rights in other alpine lakes) and meet all agricultural customer demands during years of average or even slightly below-average precipitation conditions (Chapter 6, *Water Rights*). Should precipitation rates fall significantly below what is needed to meet the stated water needs of IPID, as during a severe drought year, impairment of IPID water rights is possible, and IPID's agricultural customers would likely need to find an alternative water source to maintain their current agricultural output or risk water shortages that would threaten their crop production and expected revenues. Therefore, the agriculture industry may experience **significant adverse impacts** under the No Action Alternative in years of severe drought.

In the event of a dam failure, senior water rights holders, including IPID, could experience significant adverse impacts due to the reduction in available irrigation water to support the agriculture industry during severe drought conditions (Chapter 6, *Water Rights*). In the immediate aftermath, the dam failure and ensuing flood wave could cause significant damage to structures associated with the IPID and COIC water intake facilities downstream (Anchor QEA 2019).²⁴ Following the immediate effects of downstream flooding, the dam and outlet pipe infrastructure would be destroyed, meaning that controlled releases of stored water in the future would not be possible without significant construction. The inability to control releases of stored lake water would exacerbate IPID's

²⁴ COIC has historically shared the water intake facility associated with the LNFH, although plans to relocate the COIC intake facility downstream are currently in process. It is unclear whether the new location is operational and would avoid flood-induced damages associated with a catastrophic dam failure (Bureau of Reclamation 2020).

dependence on the prevailing precipitation rates, and during years of severe drought, even with releases of stored water from other alpine lakes, impairment of senior water rights is possible (Chapter 6, *Water Rights*). The effects of a dam failure would therefore have **significant adverse impacts** on the availability of irrigation water, which would jeopardize the agriculture industry's ability to sufficiently and consistently irrigate cropland and generate revenues.

Growth and Development

The City of Leavenworth receives secondary benefits from water stored and released from Eightmile Lake, but is not legally entitled to this water. Assuming the dam remains intact and current operations continue, the No Action Alternative may affect water supply supporting the growth and development of the City of Leavenworth due to curtailment of their junior water rights. Continuation of the status quo under the No Action Alternative would mean lake storage levels that, during dry years, could fall below what is required to meet IPID's demand. Consequently, junior water rights holders, including the City of Leavenworth, may receive less water, particularly in dry years. The City of Leavenworth currently relies in part on water from Icicle Creek to provide municipal services to its residents and businesses. Curtailment of delivery of water to fulfill these diversionary water rights would result in adverse impacts on the City's ability to maintain its current population and level of economic productivity, let alone fulfill previous expectations regarding population growth and economic development. However, these impacts **are not considered significant**.

Failure of the dam under the No Action Alternative would result in **significant adverse impacts** on downstream infrastructure (Chapter 12, *Public Safety*). Dam failure could also affect the delivery of Icicle Creek water to the City of Leavenworth, which may force the City to reevaluate its projected rates of economic development and expansion unless an alternative water supply is secured. These impacts would not be considered significant, as they represent a curtailment of junior water rights and a reduction in delivery of water to which the City is not legally entitled.

According to Anchor QEA's 2019 Dam Break Analysis, a total of at least 60 residential and public buildings could face partial or complete inundation due to the resulting flood wave (see Chapter 12, *Public Safety*). The 50 residential buildings facing the threat of partial or total inundation, primarily including residences belonging to the Icicle Island Club, have a total market value of approximately \$24.3 million (Chelan County 2021b). Overall, an estimated 130 to 150 residences and lots sit along Icicle Creek, approximately 50 of which support structures vulnerable to flooding, according to Chapter 12, *Public Safety*. Flood waters could also directly affect roads and bridge crossings, including FSR 7601 and FSR 112, a bridge over Icicle Creek at RM 7, two bridge crossings near Icicle Island, a bridge crossing near the downstream end of the LNFH channel, and the bridge at Leavenworth Road (Anchor QEA 2019).

Beyond the impacts on buildings and transportation infrastructure, a complete dam failure would likewise inhibit the ability to control future releases of water, making flow predictions highly uncertain. In combination with the lowered lake water elevation associated with a dam failure, the City of Leavenworth would likely experience impacts based on the reduced amount of water received as a secondary benefit of water released from Eightmile Lake, although these impacts would not be considered significant. The City has based their current growth projections in part on their current diversionary water rights in Icicle Creek, which benefit secondarily from water released from Eightmile Lake. If that water is not available, it would hinder the City's ability to provide water to future residents and businesses that the City hopes to attract. Further economic development opportunities would therefore require an alternative water source to maintain similar levels of expected growth.

Recreation

Under the No Action Alternative, recreational opportunities are unlikely to change so long as dam operations continue. In the long term, emergency repairs or dam failure are likely, which would result in **significant adverse impacts** on recreation (Chapter 10, *Recreational Resources*). Flooding in the case of dam failure would endanger the safety of recreationists (Chapter 12, *Public Safety*). Emergency repairs would likely result in intermittent closures of recreational areas and increased levels of construction and noise. Both dam failure and disruptions due to emergency repairs could result in reduction in values held by individuals for trips to the Eightmile/Caroline Zone. If such disruptions result in recreationists deciding to travel to other regions instead, the net economic value of trips to the area, and regional economic contributions of that recreational activity could be lost.

Fisheries and Hatchery Operations

Under the No Action Alternative, current operations would continue, resulting in some limited impacts on the water supply provided via a secondary benefit from Eightmile Lake storage and releases supporting LNFH's diversionary water rights (Chapter 6, *Water Rights*). Lake levels would continue to fall short of what is required to ensure that all existing water rights are fulfilled, and availability of water to rights holders, including LNFH, would continue to be highly dependent on hydrological conditions and above-average precipitation. During low-precipitation years, curtailment of junior water rights such as those held by LNFH are possible, and LNFH may not have access to sufficient water to support existing levels of production. Reduced operational capacity at LNFH during dry years could result in reductions in the contribution of the hatchery to the local economy. However, these **impacts are not considered significant**. Dam failure under the No Action Alternative could result in the destruction of or significant damage to hatchery facilities (Chapter 12, *Public Safety*), resulting in closure of the hatchery and **significant adverse impacts** on both hatchery operations and tribal ceremonial and subsistence fisheries.

Continued operation of the dam under status quo conditions would not affect fish resources or habitats (Chapter 8, *Plants and Animals*). Thus, commercial and tribal ceremonial and subsistence fisheries are unlikely to be affected. However, dam failure is a likely outcome of the No Action Alternative (see Chapter 2, *Alternatives*). As described in Chapter 8 (*Plants and Animals*), dam failure would kill the majority of fish in Eightmile Lake, Eightmile Creek, and Icicle Creek. This outcome would result in **significant adverse impacts** on the Yakama Nation and Confederated Tribes of the Colville Reservation members who exercise fishing rights in Icicle Creek. Because Icicle Creek fish comprise a very small proportion of commercial fisheries in the Columbia River and Pacific Ocean, commercial fisheries **would not experience significant adverse impacts**.

15.5.2 Alternative 1: Narrow Spillway with Gates

Agriculture

Alternative 1 would restore the active storage capacity within Eightmile Lake and allow for controlled releases of water, making more water available for supporting diversionary water rights and instream flows (Chapter 6, *Water Rights*). Under this alternative, IPID would likely be able to meet demand for irrigation water and retain the ability to control releases of stored water within the limits of their water rights. The improvements in lake water storage quantity and controlled release capability due to the reduction in dependence on uncertain precipitation rates to fulfill water needs under Alternative 1 would result in benefits to the agriculture industry. Alternative 1 would **not result in significant adverse impacts** on the agriculture industry.

Growth and Development

Alternative 1 involves replacement of the existing dam with upgraded infrastructure that would ultimately restore the lake water elevation back to historical conditions and allow for controlled releases of water, which provides a secondary benefit to junior water rights holders, including the City of Leavenworth (Chapter 6, *Water Rights*). This upgrade has the potential to reduce the impacts of drought conditions on entities with junior diversionary water rights that benefit secondarily from releases of Eightmile Lake water, including the City of Leavenworth, and on instream flows. Because a considerable portion of the Icicle Creek water rights belonging to the City of Leavenworth consists of interruptible rights, drought conditions could directly affect the City's growth and development by limiting the delivery of water during those times. Therefore, reductions to the risk of drought conditions lowering instream flow may provide secondary benefits to the growth and development of the City of Leavenworth. Alternative 1 would **not result in significant adverse impacts** on growth and development in the City of Leavenworth.

Recreation

Alternative 1 would not meaningfully alter existing recreational features around Eightmile Lake (i.e., trails, campsites, and lake access) (Chapter 10, *Recreational Resources*). Alternative 1 may lead to minor changes in recreational opportunities affecting shoreline and informal lake access trail availability depending on water levels, drought years, and the possibility of both lake drawdowns and increased water level elevation. Impacts would differ depending on conditions, and given varying potential lake levels, could mean improved fishing access and larger campsites, or reductions in those attributes. Altogether, however, differences from existing conditions would be minor, and Alternative 1 would **not result in significant adverse impacts** on recreation (Chapter 10, *Recreational Resources*). Recreationists would experience very limited changes in their experience under Alternative 1, and thus Alternative 1 would not change the value recreationists hold for trips to the area, or to result in any change in recreational spending in the region.

Fisheries and Hatchery Operations

Alternative 1 has the potential to result in secondary benefits by reducing the impacts of drought conditions on entities with junior diversionary water rights, including the LNFH, and the rate of instream flow due to upgraded infrastructure that would ultimately increase the lake water elevation and allow for controlled releases of water (Chapter 6, *Water Rights*). Increased reliability of water availability for the LNFH may have beneficial effects on hatchery production and operations, and on the hatchery's contribution to the local economy. Increases in instream flow may benefit survival of hatchery-produced fish (Chapter 8, *Plants and Animals*). Thus, tribal ceremonial and subsistence fisheries may see beneficial effects of Alternative 1. Because of the relatively minor contribution of Icicle Creek fish to commercial fisheries in the Columbia River and Pacific Ocean, commercial fisheries are unlikely to be affected, or may experience minor beneficial effects, under this alternative. Alternative 1 would **not result in significant adverse impacts** on fisheries or hatchery operations.

15.5.3 Alternative 2: Wide Spillway without Gates

Agriculture

This alternative involves the same storage characteristics as Alternative 1. Accordingly, operational impacts would be the same. Alternative 2 would result in benefits to the agriculture industry due to improvements in lake water storage quantity and controlled release capability resulting from the

reduction in dependence on uncertain precipitation rates to fulfill water needs. Alternative 2 would **not result in significant adverse impacts** on the agriculture industry.

Growth and Development

Alternative 2 consists of similar outcomes as Alternative 1 with respect to increased water elevation in Eightmile Lake and enhanced control over water release that would provide secondary benefits for junior diversionary water rights holders, including the City of Leavenworth, and enhanced instream flow, particularly during drought conditions. As such, the benefits to the growth and development of the City of Leavenworth would be the same between Alternatives 1 and 2. Reductions to the risk of drought conditions resulting in curtailment of delivery of water to Leavenworth would provide benefits to the growth and development of the City of Leavenworth. Alternative 2 would **not result in significant adverse impacts** on growth and development in the City of Leavenworth.

Recreation

The operational impacts of Alternative 2 on recreation and recreational values are the same as the effects of Alternative 1. Alternative 2 would **not result in significant adverse impacts** on recreation (Chapter 10, *Recreational Resources*). As with Alternative 1, Alternative 2 would not change the recreational experience to an extent that changes the value of trips to the area, or changes visitation and spending in the region more broadly.

Fisheries and Hatchery Operations

This alternative involves the same benefits to LNFH in the form of increased reliability of water availability due to the secondary benefits provided by Eightmile Lake water storage and release, as well as to fish in the form of increased instream flow, as Alternative 1. The expected beneficial impacts on hatchery operations and the economic contribution of the hatchery to the local economy, and to tribal ceremonial and subsistence fisheries, would be the same. Commercial fisheries are similarly unlikely to be affected. Alternative 2 would **not result in significant adverse impacts** on fisheries or hatchery operations.

15.5.4 Alternative 3: Narrow Spillway without Gates

Agriculture

Alternative 3 involves storage characteristics below that of Alternatives 1 and 2, but above those associated with the No Action Alternative. As such, IPID would likely be able to meet their diversionary rights under this alternative, although not to the same extent as under Alternatives 1 and 2. The agriculture industry would experience benefits from the improvements in lake water storage quantity and controlled release capability since the dependence on uncertain precipitation rates to fulfill water needs would be significantly reduced, although the magnitude of benefit would be slightly less than that of the first two action alternatives. Alternative 3 would **not result in significant adverse impacts** on the agriculture industry.

Growth and Development

Alternative 3 consists of similar actions as Alternatives 1 and 2, although with reduced projected increases in water elevation in Eightmile Lake. This alternative still includes the ability for IPID to regulate stored water release and instream flow during drought conditions, resulting in secondary benefits to junior water rights holders like the City of Leavenworth. Ultimately, this alternative may provide benefits to the growth and development of the City of Leavenworth via reductions in drought-

induced water delivery interruptions compared to the No Action Alternative, albeit at a smaller scale than Alternatives 1 and 2. Alternative 3 would **not result in significant adverse impacts** on growth and development in the City of Leavenworth.

Recreation

The operational impacts of Alternative 3 on recreation are generally the same as the effects of Alternative 1 and 2. Under Alternative 3, water levels would be lowered in drought years, creating an expanded shoreline and additional camping and recreational opportunities. This alternative would **not result in significant adverse impacts** on recreation (Chapter 10, *Recreational Resources*). Given the minimal change that recreationists would experience as a result of Alternative 3, it would not change the value recreationists hold for trips to the area, or result in any change in recreational spending in the region.

Fisheries and Hatchery Operations

The outcomes from this alternative are similar to Alternatives 1 and 2, resulting in benefits to LNFH operations and economic contribution, and to tribal ceremonial and subsistence fisheries, compared with the No Action Alternative. Beneficial effects of Alternative 3 on water availability and instream flow are slightly reduced from those resulting from Alternatives 1 and 2. Alternative 3 would **not result in significant adverse impacts** on commercial or tribal ceremonial and subsistence fisheries, nor to hatchery operations.

15.6 Avoidance, Minimization, and Mitigation Measures

The agriculture industry may experience significant adverse impacts in the short term only if construction occurs during years of extremely low water due to interruptions in water delivery during construction and impairment of IPID's senior water right. Impacts on the agriculture industry and growth and development in Leavenworth are tied to the potential impacts of the alternatives on the ability for their diversionary water rights to be fulfilled. Measures to avoid, minimize, or mitigate impacts on water delivery will reduce impacts on agriculture and to the City of Leavenworth. As described in Chapter 6, *Water Rights*, these include:

- Ideally, construction occurring during a year with higher-than-average precipitation and streamflow.
- During dry years, modifying lake releases from other alpine lakes with storage water rights to meet downstream conditions (e.g., changing the timing of releases).

In addition to these mitigation opportunities, other measures may more directly address the impacts on agriculture and growth and development experienced as a result of reduced water supplies, including identifying alternate sources of water for use during the construction period and in years with below-average precipitation.

Chapter 10, *Recreational Resources*, describes methods for avoiding, minimizing, and mitigating for the potential less-than-significant short-term impacts on recreationists, which would also offset potential impacts on the value of recreation in the region. These opportunities generally include providing early and frequent notifications to recreationists of the construction activities in the area. As no long-term impacts on recreation are anticipated as a result of the action alternatives, no mitigation measures are identified.

Less-than-significant impacts on hatchery operations and tribal ceremonial and subsistence fisheries are anticipated if the reduction in available water during dam construction results in the complete closure of LNFH operations. Opportunities for mitigation or minimization of these outcomes include increasing the amount of available water to the hatchery from other sources, including groundwater.

15.7 Significant Unavoidable Adverse Impacts

The potential for significant unavoidable adverse impacts on agriculture is tied to the potential impacts on water delivery to fulfill IPID's existing senior diversionary water rights. With respect to water delivery, there are **no significant unavoidable adverse impacts under the action alternatives**. Under the No Action Alternative, if the dam were to fail, significant unavoidable impacts may occur in the form of impairment of water delivery to fulfill existing senior diversionary rights.

The potential for significant unavoidable adverse impacts on the value of recreation in the region is driven by the potential impacts on recreation. As described in Chapter 10, *Recreational Resources*, construction activities may detract from recreationists' wilderness experience, and some individuals may experience a substantial or total loss of value for this experience as a result. This impact may be an unavoidable outcome of construction activities. However, these impacts would be experienced only temporarily.

Under the dam failure scenario of the No Action Alternative, threats to safety and loss of recreational opportunities may result in unavoidable **significant adverse impacts**. Dam failure would pose a risk to the health and safety of downstream recreationists, and could result in inundation, temporary closures, or other impacts on the Eightmile Lake Trail, FSR 7601, and recreational resources downstream on Icicle Creek and the Wenatchee River.

Dam failure under the No Action Alternative could result in destruction of or significant damage to the LNFH (Chapter 12, *Public Safety*), substantially affecting the economic contribution of the hatchery to the local economy. This outcome would be a **significant unavoidable adverse impact**.

CHAPTER 16: ENVIRONMENTAL JUSTICE

The U.S. Environmental Protection Agency (EPA) defines environmental justice as “*the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies*” (EPA 2021). Building upon this definition, the Washington State law on Environmental Justice (Chapter 70A.02 RCW) defines environmental justice as:

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, rules and policies. Environmental justice includes addressing disproportionate environmental and health impacts in all laws, rules, and policies with environmental impacts by prioritizing vulnerable populations and overburdened communities, the equitable distribution of resources and benefits, and eliminating harm. (RCW 70A.02.010(8)).

Key Findings for Environmental Justice

- The study area includes communities of color, low-income communities, and overburdened communities. These communities are located primarily near Wenatchee and East Wenatchee, along Lake Chelan, south of Chelan, and north of Cashmere. None are directly adjacent to the project site. The study area also includes tribal populations that rely on resources potentially affected by the project alternatives.
- Sixty of the 84 Census block groups within the environmental justice study area are identified as a community of color, a low-income community, and/or an overburdened community. Together, the population of these block groups account for 64.8 percent of the total population of Chelan and Douglas counties.
- Neither the transportation of equipment and materials nor dam construction is expected to result in significant adverse impacts on communities of color, low-income communities, overburdened communities, or tribal populations.
- If the dam continues operating in its present condition, significant adverse impacts on communities of color, low-income communities, overburdened communities, and tribal populations are not anticipated. However, dam failure under the No Action Alternative would result in significant adverse impacts on these communities and populations. Steep declines in fish populations would significantly adversely affect tribal populations who exercise fishing rights in Icicle Creek, while damage to the LNFH could adversely affect tribal members employed by the hatchery. Reduced water availability for IPID would also significantly adversely affect members of low-income communities and communities of color working in the agriculture industry.
- The action alternatives would not result in changes in water delivery or fish resources. Therefore, the action alternatives would not result in significant adverse impacts on any of these identified communities and populations.

This chapter identifies people with low-incomes, people of color, and communities that are overburdened with respect to environmental health disparities, as well as potentially affected tribal

populations with unique connections to potentially affected resources, within the study area.^{1,2} It also addresses all significant anticipated impacts and evaluates the potential that identified populations may be disproportionately affected.

16.1 Methodology

The environmental justice analysis considers the extent to which people of color, low-income communities, and overburdened communities, as well as potentially affected tribal populations, may be disproportionately adversely or beneficially affected by the alternatives. The environmental justice analysis relies on the findings of the impact analyses described in the previous chapters of this EIS to identify the potential for impacts on vulnerable communities and evaluates whether impacts on the vulnerable communities are disproportionate relative to the impacts on other affected communities.

The environmental justice analysis involves the following general steps:

1. Identify and describe: (i) the relative presence of people of color and low-income communities at the Census block group level across the study area;³ (ii) presence of communities at the Census tract level that the state describes as having demographic and other characteristics that identify it as overburdened;⁴ and (iii) tribal populations with unique connections to the potentially affected resources.
2. Identify whether the impacts of the alternatives as described in the Construction and Operations Impacts sections of the EIS may affect the communities identified in the first step.
3. Evaluate the nature and relative intensity of impacts of the alternatives that would be experienced by the general population and compare with the anticipated impacts on the identified communities.
4. Identify and describe impacts that may disproportionately affect the vulnerable communities identified in this analysis.

This analysis identifies communities of color, low-income communities, and overburdened communities across the Wenatchee Metropolitan Statistical Area (MSA), which includes all of Chelan and Douglas counties (**Figure 16-1**). This geographic region encompasses the area over which individuals and communities may experience the impacts to the affected activities and resources (e.g., water, fish, agriculture). For example, the affected communities may be employed in affected industries, rely on the affected environmental resources for food or recreation, or hold cultural value for potentially affected resources. While this study area is broad and includes areas somewhat distant from the dam site, the major population centers within the MSA are relatively close to the dam site. Most of the communities that may be affected by the project are within Chelan County. However, the analysis includes Douglas County, as a substantial portion of the largest proximal population center (Wenatchee/East Wenatchee) lies in Douglas County.

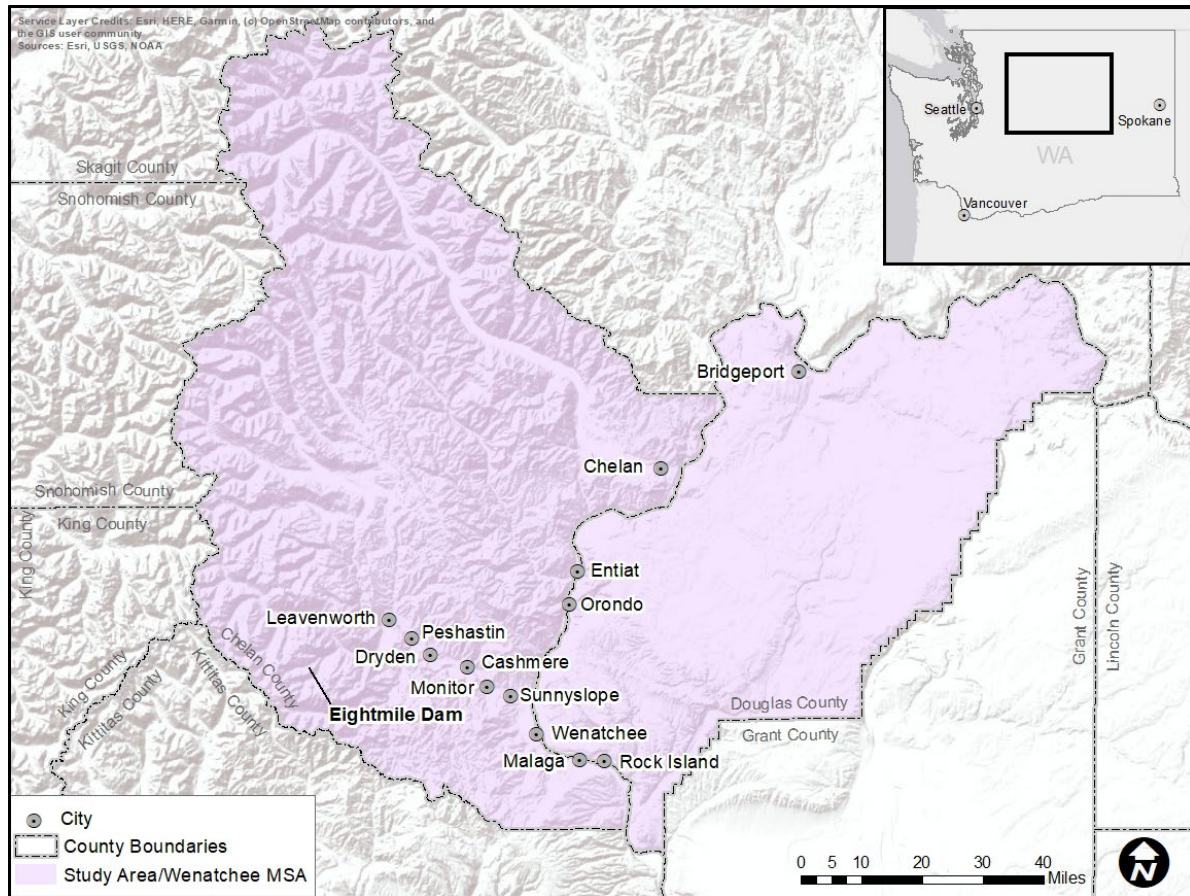
¹ This analysis collectively considers race, color, and national origin under the umbrella of “communities of color.”

² The scope of this analysis with respect to tribal populations includes those individual tribal members that may experience impacts resulting from the project alternatives due to their use of affected resources.

³ A Census block group is a subdivision of a Census tract and is the smallest geographical unit for which the Census publishes sample data.

⁴ These include the communities identified in the State of Washington’s Environmental Health Disparities mapping tool as characterized by environmental health disparities. Factors considered include environmental exposures, environmental effects, sensitive populations, and socioeconomic factors (DOH 2021).

Figure 16-1. Study Area for Environmental Justice Analysis



Source: WDNR 2022.

This analysis identifies short-term (construction) impacts on environmental justice as significant if they meet any of the following conditions:

- The effects of the alternative include impairment of senior water rights that reduce the delivery of water to communities of color, low-income communities, overburdened communities, or tribal populations;
- The effects of the alternative include impairment of senior water rights that reduce the delivery of water to industries that employ members of communities of color, low-income communities, overburdened communities, or tribal populations;
- The effects of the alternative on fish populations could result in the temporary closure of tribal fisheries, limiting or eliminating the ability for affected tribes to exercise their fishing rights; or
- Communities of color and low-income communities, overburdened communities, or tribal populations are affected by flooding.

This analysis identifies long-term (operational) impacts on environmental justice as significant if they meet any of the following conditions:

- The effects of the alternative include impairment of senior water rights that results in a persistent reduction in the delivery of water to communities of color, low-income communities, overburdened communities, or tribal populations;

- The effects of the alternative include impairment of senior water rights that results in a long-term reduction in the delivery of water to the agriculture industry, which is reliant upon individuals that are members of communities of color, low-income communities, overburdened communities, or to the LNFH, which employs members of tribal populations; or
- The effects of the alternative on fish populations result in persistent closures of tribal fisheries, limiting or eliminating the ability for affected tribes to exercise their fishing rights.

16.2 Regulatory Context

Regulations, programs, policies, and guidance that identify methods for determining environmental justice impacts of proposed actions are detailed in Appendix D; they include directives from Executive Orders (i.e., Executive Order 12898), the Council on Environmental Quality (CEQ), the Interagency Working Group on Environmental Justice & NEPA Committee (IWGEJ), and Washington State’s Environmental Justice Task Force. The State of Washington does not require environmental justice analyses of significant regulatory actions until July 1, 2023 (70A.02 RCW), and the federal guidance and policies regarding environmental justice are not required for this SEPA analysis. However, absent specific existing requirements for consideration of environmental justice within SEPA, this analysis relies on these federal policies and guidelines, recent state legislation on Environmental Justice (Chapter 70A.02 RCW), as well as the State of Washington’s Environmental Justice Task Force’s report (Environmental Justice Task Force 2020), to evaluate the potential environmental justice effects of the alternatives.

16.3 Affected Environment

This section uses demographic data to identify the existence of communities of color, low-income communities, and overburdened communities within the study area. It is based on the most recent socioeconomic statistics currently available from the U.S. Census American Community Survey (ACS) 5-year estimates from 2015 to 2019, as well as data compiled in the Washington State Department of Health’s Environmental Health Disparities (EHD) Map (United States Census 2020; DOH 2021). In addition to communities of color, low-income communities, and overburdened communities, this analysis identifies tribal populations with special interest in potentially affected resources.

16.3.1 Communities of Color

People of color are defined in this analysis as all people who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. This analysis considers two criteria for identifying communities of color:

- 1) Whether the population of color in any Census block group within the study area exceeds 50 percent, which would identify the presence of a community of color (i.e., the “50 percent analysis”); and
- 2) Whether the population of color in any remaining block group is greater than 10 percent higher than the “reference community,” which in this case is the broader relevant county.⁵

⁵ The CEQ guidance identifies areas of minority populations as being where “*minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis*” (CEQ 1997). The federal IWGEJ provides additional guidance for defining “meaningfully greater” in identifying environmental justice communities (NEPA Committee and IWGEJ 2016). IWGEJ references 10 to 20 percent thresholds as examples; this analysis uses a 10 percent threshold.

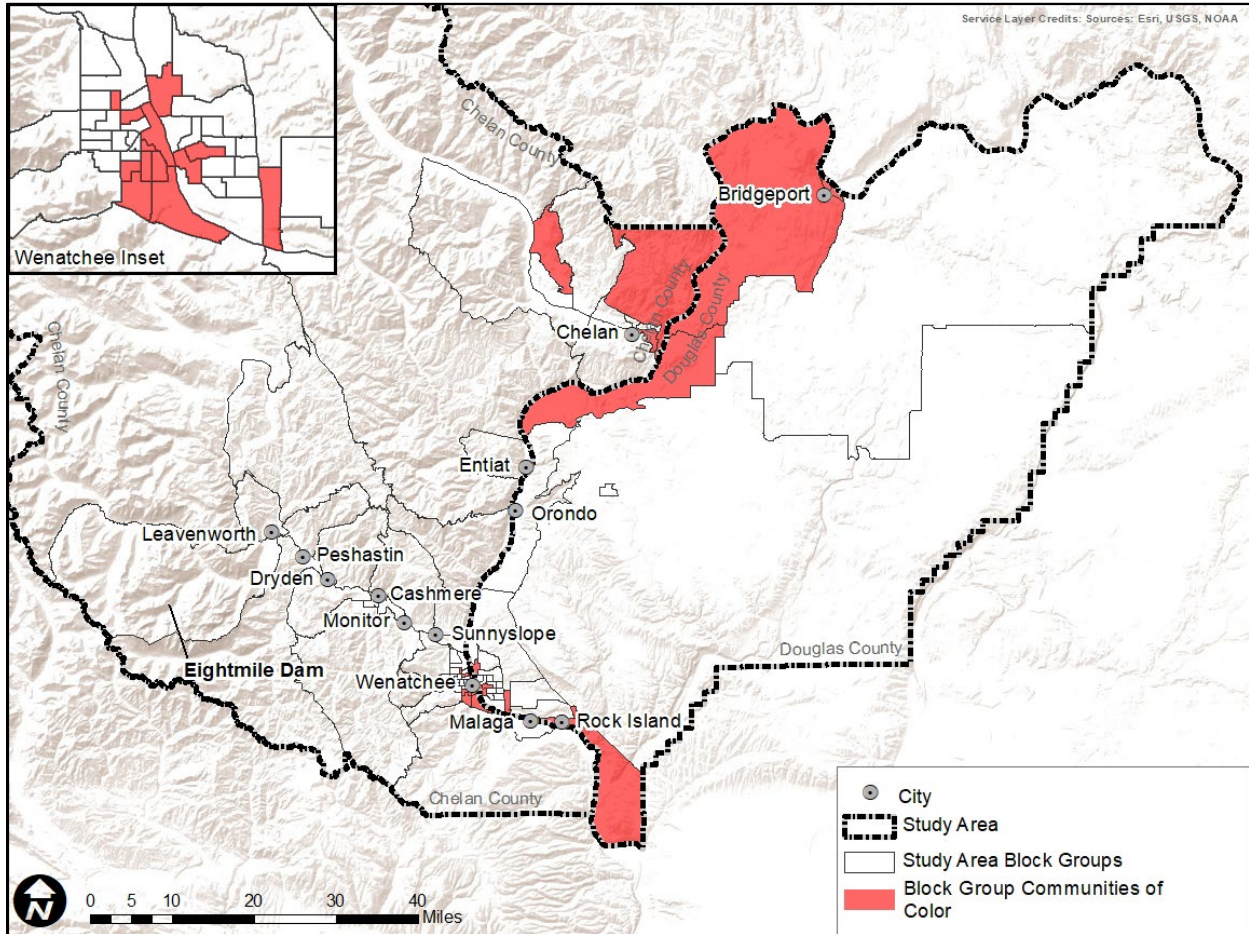
The communities that meet either of these thresholds are identified as “communities of color.”

The percentages of people of color in Chelan and Douglas counties are 32 and 36 percent, respectively (see **Table 16-1**). The population of color within these counties is slightly higher than the statewide proportion of 31 percent. Accordingly, the thresholds to identify communities of color in Chelan and Douglas counties, respectively, are 42 and 46 percent.

Twenty-one of the 84 Census block groups within the study area are identified as communities of color. These community block groups account for 24.7 percent of the total population of Chelan and Douglas counties. The populations of color in the study area are predominantly Hispanic/Latino or “other.”

This analysis identifies communities of color in the study area based on Census block group level data from the ACS 2015–2019 5-year estimates (U.S. Census 2020). The detailed results of this analysis are presented in Appendix D. The “50 percent analysis” identifies 20 block groups as communities of color. **Figure 16-2** maps these block groups identified as communities of color.

Figure 16-2. Map Identifying Locations of Communities of Color within the Study Area



Sources: WDNR 2022, U.S. Census 2020.

Table 16-1. Populations of Color in Census Area

Census Area	Total Population ¹	Total People of Color	Percentage of People of Color	Racial Groups Breakdown							Hispanic/Latino Origin – Any Race
				White (Hispanic or Non-Hispanic)	Black/African American	American Indian and Alaska Native	Asian	Native Hawaiian and other Pacific Islander	Other	Two or More Races	
Chelan County	76,229	24,413	32%	80%	1%	1%	1%	0%	13%	4%	28%
Douglas County	42,023	15,062	36%	69%	0%	1%	1%	0%	25%	3%	32%
Washington State	7,404,107	2,330,162	31%	75%	4%	1%	9%	1%	4%	6%	13%

Note:

1/ Total population refers to an estimated value based on census responses and may therefore differ across metrics.

2/ Percentages sum to 100 percent across racial groups; Hispanic/Latino category is not included in this breakdown because of overlap between Hispanic/Latino category and multiple racial categories.

Source: U.S. Census 2020.

The population of color across the MSA is predominantly Hispanic/Latino and does not include many individuals identifying as Black/African American, Asian, or Native Hawaiian/Other Pacific Islander. The populations of color are largely centered around the City of Wenatchee and East Wenatchee. In Chelan County, the communities of color generally include between 50 and 65 percent (in one case as high as 92 percent) of the population identifying as Hispanic/Latino at the block group level, and relatively large populations of color exist in and around the town of Chelan. In Douglas County, the statistics are generally similar. In addition to communities around East Wenatchee, there are block groups with relatively large populations of color near the towns of Bridgeport and Rocky Butte, in other communities moving south along the Columbia River, and in the area south of Rock Island. The population of color of the MSA includes a substantial proportion of individuals who identify their race as “other” or “two or more races,” and two block groups with relatively high proportions of the population that identify as American Indian or Alaska Native.

16.3.2 Low-Income Communities

Data from the U.S. Census Bureau ACS 5-year estimates (2015–2019) inform the assessment of low-income communities across the study area at the Census block group level. For this analysis, a block group is considered to contain a “low-income community” if the proportion of individuals living at or below twice the poverty level is greater than the proportion for the state.⁶ The federal poverty level for an individual in 2020 was \$12,760 (ASPE 2021). Thus, individuals with an income of less than \$25,520 (two times the poverty level) are considered low-income. The threshold for identifying “low-income communities” for this analysis is the state-level low-income percentage of 26 percent (Table 16-2). Of the 84 block groups within the Wenatchee MSA study area for this analysis, 58 have low-income proportions above the established threshold (see Appendix D for the detailed results of this analysis). Figure 16-3 depicts the locations of identified low-income communities graphically.

Of the 58 low-income communities, 19 are also identified as communities of color. The identified low-income communities cover a broader geographic area as compared with the communities of color. Low-income communities are in many of the same locations as the identified communities of color. Additionally, low-income block groups are located along the entirety of Lake Chelan (northwest of the town of Chelan), south of the town of Chelan, in the area to the north of Cashmere, and south of the City of Leavenworth and Eightmile Lake.

Table 16-2. Low-Income Populations in the Study Area

Census Area	Total Population ¹	Total Low-Income	Low-Income Percentage
Chelan County	75,073	24,638	33%
Douglas County	41,862	14,084	34%
Washington State	7,266,810	1,860,917	26%

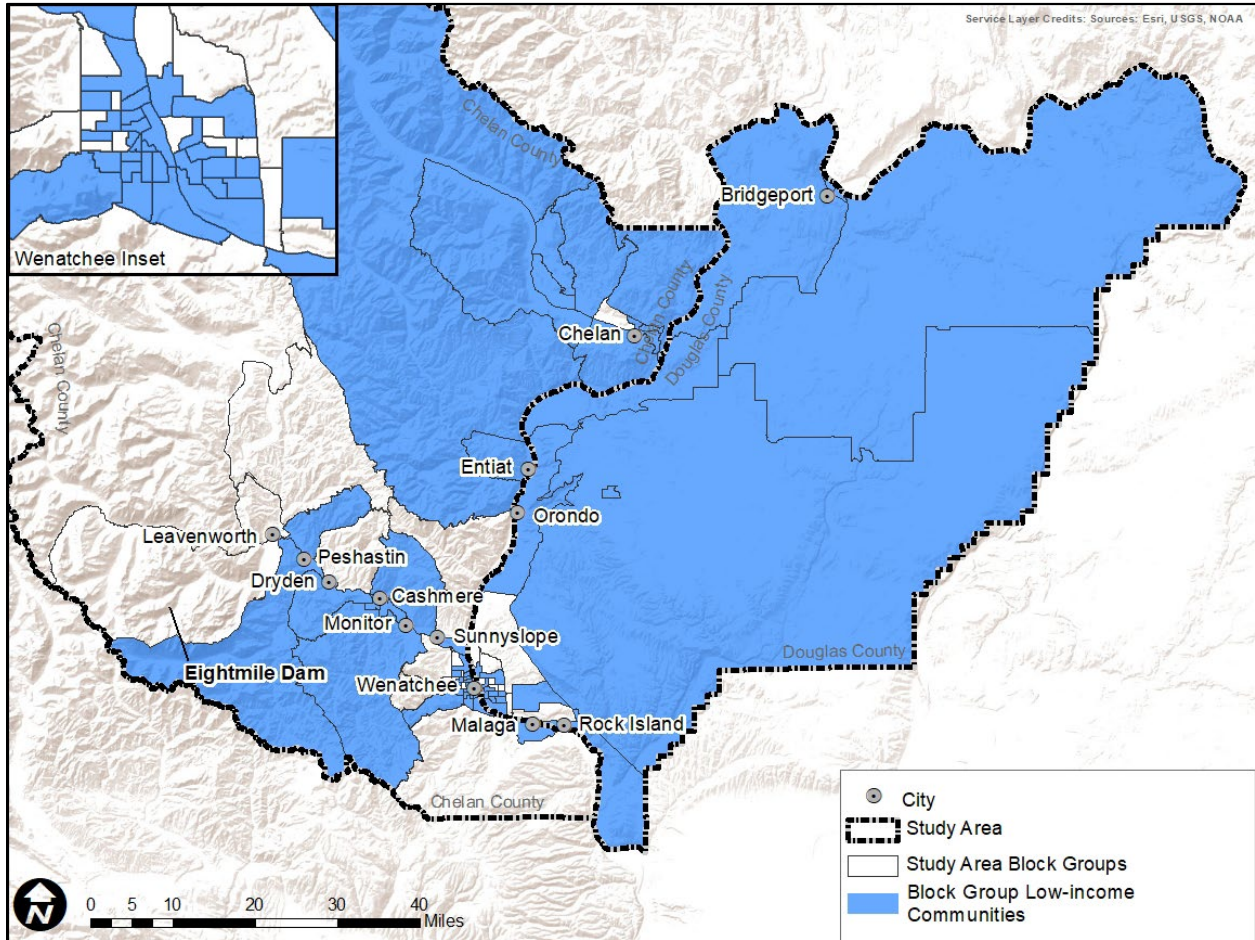
Note:

1/ Total population refers to an estimated value based on census responses and may therefore differ across metrics.

Source: U.S. Census 2020.

⁶ The methodology for the low-income analysis is derived from the SEPA analysis conducted by Ecology for the Chehalis River Basin Flood Damage Reduction Project (Ecology 2020).

Figure 16-3. Map Identifying Locations of Low-Income Communities within the Study Area



Sources: WDNR 2022, U.S. Census 2020.

16.3.3 Overburdened Communities

RCW 70A.02 directs agencies to use cumulative environmental health impact analysis, such as the Washington State DOH EHD Map, to consider the effects of a proposed action on overburdened communities. This analysis uses the Census tract-level data and overall environmental health disparities rankings from the EHD Map to identify additional overburdened communities that are experiencing environmental health disparities. The EHD Map compares communities across the state and provides descriptive information and context for the pollution measures, proximity to hazardous sites, and social vulnerabilities that may characterize certain communities within the study area. The map contains 19 indicators split across four themes as follows (descriptions of each theme can be found in Appendix D): (1) Environmental Exposures, (2) Environmental Effects, (3) Sensitive Populations, and (4) Socioeconomic Factors.

Each indicator is ranked using a set of 10 equally distributed deciles.⁷ The average ranking across all indicators under each theme constitutes the overall theme ranking (University of Washington Department of Environmental & Occupational Health Sciences 2019). Based on the Environmental Justice Task Force’s suggested interpretation of overall ranks, this analysis considers any community identified as having an overall environmental health disparities rank of 9 or 10 as “overburdened.” **Figure 16-4** identifies communities (by Census tract) identified as rank 9 or 10 with respect to environmental health disparities.

To evaluate the environmental health disparities rankings, the analysis considers whether any areas that were not identified specifically as communities of color or low-income communities are identified as overburdened using this approach.⁸ The results, presented in detail in Appendix D, indicate that all of the Census block groups that were identified as overburdened according to the EHD rankings were also otherwise identified as low-income or communities of color. The six overburdened block groups are located in Chelan County, in the City of Wenatchee.

16.3.4 Potentially Affected Tribal Populations

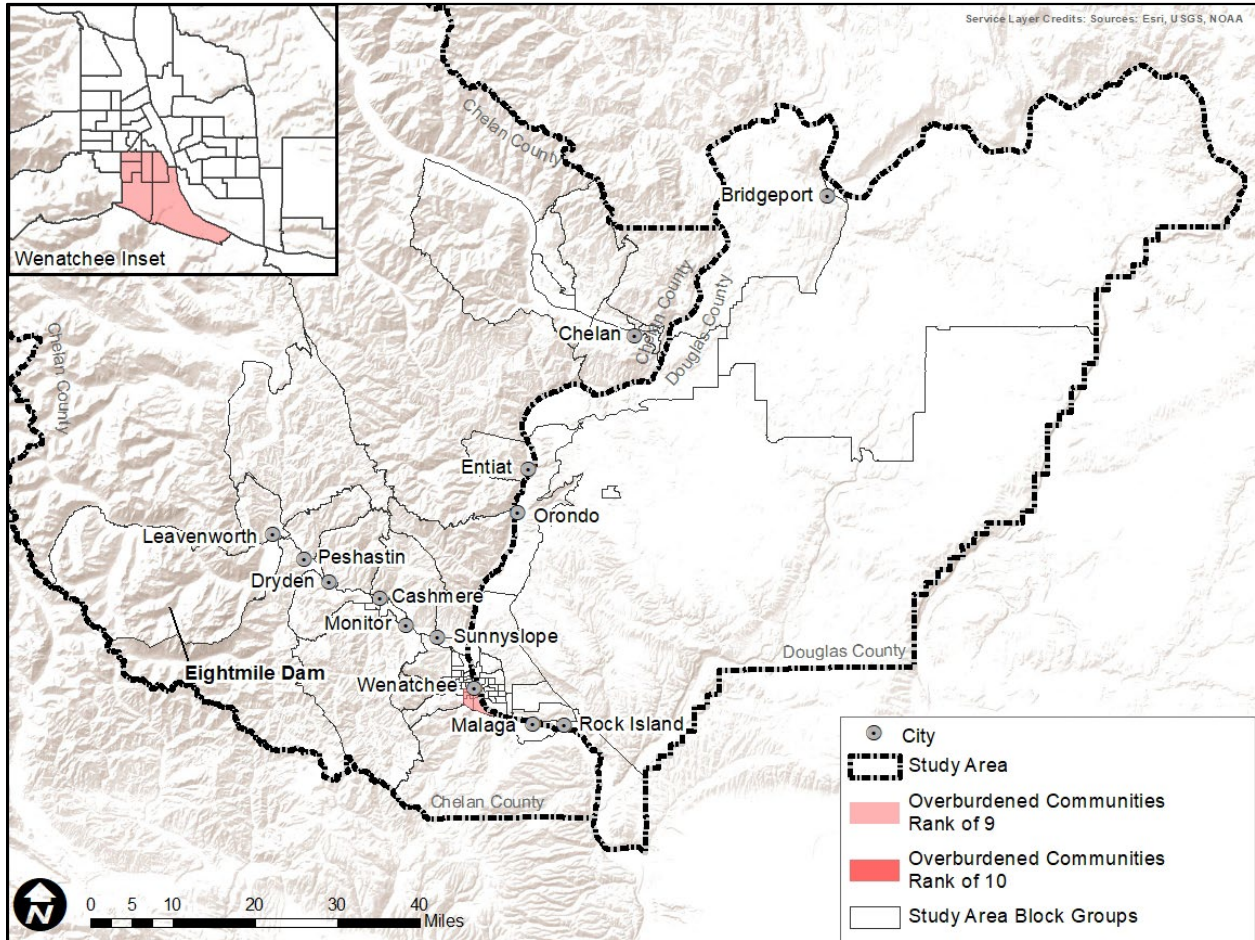
Tribal populations may be uniquely affected by the alternatives due to their connections to the potentially affected resources.⁹ The project area is within the Yakama Ceded Lands, to which the Yakama Nation exercises its Treaty Reserved Rights, and traditional use area of the Confederated Tribes of the Colville Reservation for hunting, fishing, and gathering resources. Although no federally designated Indian reservations overlap with or are in close proximity to the project area, the fish resources in the area, and in Icicle Creek specifically, as well as the wildlife and vegetation in the project area are of great importance to the Yakama Nation and the Confederated Tribes of the Colville Reservation (USFWS 2016; Corps et al. 1995). Both tribes have expressed their rights to fish in Icicle Creek. This activity is described in greater detail in Chapter 14 (*Tribal Resources*) and Chapter 15 (*Agriculture and Economics*). While the previously described Census data identify the relative presence of American Indian populations, detailed information defining where the specifically affected tribal populations reside (i.e., members of the Yakama Nation and Confederated Tribes of the Colville Reservation) is not available. Some portion of the tribal members live on the tribes’ respective reservations (i.e., outside of the study area), while others may live within the MSA, or in other locations. Within the MSA, as described in Appendix D, the analysis identifies two block groups with relatively high proportions of the population that identify as American Indian or Alaska Native, as compared to the statewide proportion of one percent for this population. These include one area in East Wenatchee where 12 percent of the population describes themselves as Native American or Alaska Native, and another directly across the Columbia River in Wenatchee where 18 percent of the population describes themselves as such. To the extent that fish resources are affected by the alternatives, the Yakama and Colville Reservation tribal members participating in these fisheries may be uniquely affected.

⁷ For example, a ranking of 9 for “unemployment” means that approximately 10 percent of other Census tracts also experienced that level of unemployment (ranked as “9”), while 10 percent of Census tracts had higher unemployment (ranked as “10”), and 80 percent had lower unemployment (tracts ranked 1 through 8).

⁸ Because both Census tracts and block groups are used to identify communities of color, low-income communities, and overburdened communities, the analysis assumes that the tract-level environmental health disparity ranking applies to all block groups within that tract; this approach may over-estimate the block groups that may be overburdened.

⁹ Section 16.3.1 describes the communities of color within the study area that may be affected by the alternatives, which include populations identifying as American Indian or Alaska Native.

Figure 16-4. Communities Ranked 9 or 10 by the DOH Environmental Health Disparities Map in the Study Area



Sources: WDNR 2022; U.S. Census 2020; DOH 2021.

Additionally, the Yakama Nation cooperatively runs the hatchery program for coho salmon at the LNFH (USFWS 2016). Alternatives that affect operations of the LNFH have the potential to impact the tribal populations who are employed there.

16.3.5 Summary of Affected Environment

Of the 84 total block groups in Chelan and Douglas counties:

- **21 are Communities of Color:** These block groups have percentages of populations of color ranging between 47 percent and 92 percent. The communities are predominantly Hispanic/Latino or “other.”
- **58 are Low-Income Communities:** These block groups have percentages of low-income populations ranging from 26 percent to 79 percent of the total block population.
- **6 are Overburdened Communities:** These block groups are part of a census tract that is identified as rank 9 or 10 with respect to overall environmental health disparities identified by the State of Washington (DOH 2021). Of these, all are also identified as a community of color or low-income community.

Overall, 60 of the 84 total block groups in the study area are identified as a community of color, low-income community, and/or overburdened community (i.e., at least one of the three categories above). Together, the population of these block groups account for 64.8 percent of the total population of the two counties.

People of color comprise a proportion of the population in both Chelan and Douglas counties that is higher than the state average, with individuals identifying as Hispanic or Latino being the largest group of color within the study area. The cities of Wenatchee and East Wenatchee have higher percentage of people of color, and in the northwestern part of Douglas County near the town of Chelan, all of which are fairly distant from the project area. Low-income communities are distributed throughout the study area, particularly around Wenatchee, East Wenatchee, Cashmere, and well north of the project area around the town of Chelan. In Chelan County, the overburdened communities are limited to areas within the City of Wenatchee. In addition to these communities that live within the study area and that may be affected by the alternatives, members of the Yakama Nation and Confederated Tribes of the Colville Reservation exercise fishing rights within Icicle Creek and may be uniquely affected by the alternatives to the extent that they result in impacts on fish populations in the creek.

16.4 Construction Impacts

The following section identifies the potential short-term impacts associated with construction, which apply across all of the action alternatives.

16.4.1 Transportation of Equipment and Materials

Helicopter Use

Option 1: Heavy-lift Helicopter with Limited Use of Small Helicopter Throughout Construction

As described in Chapter 7 (*Plants and Animals*), the heavy-lift helicopter with limited use of a small helicopter throughout construction option is unlikely to affect fish and other aquatic resources in the study area. As described in Chapter 9 (*Noise*), helicopter activity in the Eightmile Lake area has the potential to generate increased noise levels along Icicle Creek. However, as described in Chapter 14 (*Tribal Resources*), the use of helicopters is expected to have **no significant adverse impacts** on tribal traditional cultural practices and populations, which would include tribal fishing on Icicle Creek. No other impacts on low-income communities, communities of color, or other overburdened communities are expected.

Helicopter use would occur outside of the Census tracts identified as low-income, communities of color, or overburdened communities, so these communities are unlikely to be affected by helicopter use.

Option 2: Limited Use of Heavy-lift Helicopter with Small Helicopter Use for the Majority of Materials.

Like Option 1, Option 2 would not affect aquatic resources in the study area (Chapter 7, *Plants and Animals*), and tribal populations reliant upon fishing in Icicle Creek would not be significantly adversely impacted by helicopter use (Chapter 14, *Tribal Resources*). **No significant adverse impacts** on low-income, overburdened, or communities of color, or tribal populations are expected in the area.

Road Segment

Under all action alternatives, repair and replacement of the roadway would not affect fish or aquatic resources so long as BMPs are employed for all activities, as described in Chapter 7 (*Plants and Animals*). Therefore, **no significant adverse impacts** are expected for tribal populations reliant on aquatic resources. No other impacts on low-income, communities of color, or overburdened communities due to roadway repair activities are expected.

16.4.2 Dam Construction

Dam construction would result in higher levels of noise in the vicinity of Eightmile Lake (Chapter 9, *Noise*), visibility of construction activities and personnel in the area (Chapter 11, *Visual Resources*, and Chapter 10, *Recreation*), and some minimal disruption to fish in the lake from increased turbidity and fish removal/relocation (Chapter 7, *Plants and Animals*). However, as described in Chapter 14 (*Tribal Resources*), construction activities would not affect any traditional cultural practices, which include tribal fishing activities on Icicle Creek. Therefore, dam construction **would not result in significant adverse impacts** on tribal populations. No other impacts on low-income, communities of color, or overburdened communities as a result of dam construction are expected.

16.5 Operational Impacts

This section describes the potential long-term environmental justice impacts of the project alternatives from dam operations following the construction phase on communities of color, low-income, and overburdened communities. This section also considers whether the impacts may be disproportionately borne by tribal populations.

16.5.1 No Action Alternative

Under the No Action Alternative, some impacts on communities of color and tribal populations may occur if the dam continues to operate without failing. Dam failure under the No Action Alternative may result in **significant adverse impacts** on communities of color and tribal populations.

Status Quo Operations

Under a scenario in which the dam continues to operate in its present condition, as described in Chapter 6 (*Water Rights*), IPID would not have consistent access to adequate water storage during dry years, which may affect the agriculture industry and employees, many of whom are members of nearby communities of color and low-income communities. Other water rights holders, such as the City of Leavenworth and LNFH, are not legally entitled to water stored and released from Eightmile Creek but do receive secondary benefits from that water. These junior water rights holders would also likely fall short of adequate water access, which could affect residents who rely on water from the City or tribal populations employed by the hatchery. However, as described in Chapter 6 (*Water Rights*), status quo operations are not expected to have significant adverse impacts on water rights. Status quo operations are not expected to have any effect on fish resources (Chapter 7, *Plants and Animals*). Therefore, status quo operations under the No Action Alternative are not expected to have significant adverse impacts on communities of color, low-income communities, overburdened communities, or tribal populations.

Dam Failure

Dam failure is a likely outcome of the No Action Alternative (see Chapter 2, *Alternatives*). In the event of dam failure, as described in Chapter 7 (*Plants and Animals*), most of the lake would drain, killing

most fish in Eightmile Lake, Eightmile Creek, and Icicle Creek. Dam failure may also severely damage or destroy water intakes at LNFH, reducing or eliminating hatchery operations (Chapter 7, *Plants and Animals*). This outcome would result in **significant adverse impacts** on members of the Yakama Nation and Confederated Tribes of the Colville Reservation who exercise fishing rights in Icicle Creek, or who are employed by the hatchery. In the long term, summer flow reductions would significantly adversely affect fish populations (see Chapter 7, *Plants and Animals*), leading to **significant adverse impacts** on tribal populations that exercise fishing rights in Icicle Creek.

In the event of dam failure, IPID's water rights may also be adversely affected, as the active storage capacity in Eightmile Lake would be further reduced, leading to lower levels of access to water for IPID and IPID's customers. Although IPID will likely be able to exercise their complete diversionary water rights during years of average precipitation, **significant adverse impacts** in the form of impaired water rights may occur during years of severe drought. Other junior water rights holders, including the City of Leavenworth and the LNFH, may also experience curtailment of diversionary water rights following dam failure; however, these effects are not considered significant (Chapter 6, *Water Rights*). Reduced water availability for fish propagation at the fish hatchery under this scenario could lead to additional adverse impacts on tribal populations reliant on aquatic resources, as well as those employed by the hatchery. However, because LNFH is not legally entitled to the water from Eightmile Lake, these effects are not considered significant. Although no low-income, overburdened, tribal populations, or communities of color would be affected by reduced delivery of water to Leavenworth, reduced water delivery to IPID and its customers could negatively affect the agriculture industry, which may result in **significant adverse impacts** on low-income communities or communities of color employed within that industry during years of severe drought.

Dam failure would flood areas downstream of the dam, which could threaten residences and infrastructure (Chapter 12, *Public Safety*). However, no Census block groups that meet the threshold definition of being low-income, overburdened, or communities of color are within the projected flood zone. These communities would thus not disproportionately bear the impacts of flooding under the No Action Alternative.

Overall, **significant adverse impacts** on tribal populations with fishing rights in Icicle Creek would be expected in the event of dam failure under the No Action Alternative, and closure of the hatchery following damage due to flooding could **significantly adversely affect** tribal members employed by the hatchery. The No Action Alternative may also have **significant adverse effects** on low-income communities and communities of color employed by the agriculture industry.

16.5.2 **Alternative 1: Narrow Spillway with Gates**

As described in Chapter 7 (*Plants and Animals*), the replacement of Eightmile Dam would bolster instream flow, providing dependable flows of water and improving habitat for anadromous and resident salmonid species in Eightmile and Icicle creeks. These benefits to fish populations would likely benefit tribal populations who rely on fish from Icicle Creek for subsistence use, as well as provide benefits related to the cultural significance of fishing as an activity for tribal populations in the area.

Under Alternative 1, water levels in Eightmile Lake may fluctuate seasonally. However, the seasonal filling and drawdown of the lake are unlikely to lead to corresponding fluctuations in the waters of Eightmile Creek and Icicle Creek. Therefore, fishing opportunities for tribal populations in those areas are unlikely to be affected under Alternative 1.

Alternative 1 would not change the quantity of water provided to the City of Leavenworth, LNFH, or the IPID. The agriculture industry is unlikely to face any changes in water availability under this alternative. Therefore, members of low-income communities or communities of color working in the agricultural sector are unlikely to be affected. The LNFH is similarly unlikely to experience reduced

water delivery that would affect operations, and Alternative 1 is thus unlikely to affect tribal populations employed by the hatchery.

No significant adverse impacts from the operation of Alternative 1 on low-income communities, communities of color, overburdened, or tribal populations in the Eightmile Lake area are expected.

16.5.3 **Alternative 2: Wide Spillway without Gates**

Operational impacts on low-income communities, communities of color, overburdened, or tribal populations under Alternative 2 would be the same as those described above for Alternative 1. Alternative 2 is very similar to Alternative 1, resulting in sufficient delivery of water to fulfill the existing water rights of IPID, the City of Leavenworth, and the LNFH, and providing the same level of benefits to downstream summer flows in Eightmile and Icicle creeks.

Under Alternative 2, the replacement of Eightmile Dam would bolster instream flow, providing dependable flows of water and improving habitat for anadromous and resident salmonid species in Eightmile and Icicle creeks. These benefits to fish populations would likely benefit tribal populations who rely on fish from Icicle Creek for subsistence use, as well as provide benefits related to the cultural significance of fishing as an activity for tribal populations in the area.

Under Alternative 2, water levels in Eightmile Lake may fluctuate seasonally. However, the seasonal filling and drawdown of the lake are unlikely to lead to corresponding fluctuations in the waters of Eightmile Creek and Icicle Creek. Therefore, fishing opportunities for tribal populations in those areas are unlikely to be affected under Alternative 2.

Alternative 2 would not change the quantity of water provided to the City of Leavenworth or the IPID. The agriculture industry is unlikely to face any changes in water availability under this alternative. Therefore, members of low-income communities or communities of color working in the agricultural sector are unlikely to be affected. The LNFH is similarly unlikely to experience reduced water delivery that would affect operations, and Alternative 2 is thus unlikely to affect tribal populations employed by the hatchery.

No significant adverse impacts on low-income, communities of color, overburdened, or tribal populations are anticipated under Alternative 2.

16.5.4 **Alternative 3: Narrow Spillway without Gates**

Operational impacts on low-income, communities of color, overburdened, or tribal populations under Alternative 3 differ slightly from the impacts of Alternatives 1 and 2. As described in Chapter 6 (*Water Rights*), under Alternative 3, IPID expects to be able to meet their minimum need and be able to supplement instream flows, and it is less likely that junior water rights would experience curtailment of water delivery than under the No Action Alternative. The reduced storage volume compared to Alternatives 1 and 2, however, may provide lower levels of flexibility for water storage and release to bolster downstream flows. Fewer benefits are expected for fish habitats and downstream water quality under Alternative 3, which may result in fewer benefits to tribal populations reliant on fishery resources from Icicle Creek. Although Alternative 3 may result in fewer benefits than Alternatives 1 and 2, **no significant adverse impacts** on low-income communities, communities of color, overburdened, or tribal populations are expected.

16.6 Avoidance, Minimization, and Mitigation Measures

This environmental justice analysis does not identify significant adverse impacts on communities of color, or low-income, overburdened, or tribal populations, except in the following cases:

- The No Action Alternative (under dam failure) would result in **significant adverse impacts** on the Yakama Nation and Confederated Tribes of the Colville Reservation members who exercise fishing rights in Icicle Creek.
- The No Action Alternative (under dam failure) may also **have significant adverse effects** on low-income communities and communities of color employed by the agriculture industry, and tribal populations employed by the LNFH.

Opportunities for avoidance, minimization, and mitigation of impacts on low-income communities, communities of color, or overburdened and tribal populations derive directly from offsetting the impacts on those resources that drive potential impacts on these communities. Potential impacts on these communities are primarily related to impacts from the following resources:

- Water rights.
- Terrestrial and aquatic species and habitats.

As such, all mitigation opportunities identified within those resource-specific chapters would serve to offset the potential impacts on these communities.

16.7 Significant Unavoidable Adverse Impacts

The potential for significant unavoidable adverse impacts on low-income communities, communities of color, and overburdened and tribal populations results from unavoidable adverse impacts on the resources from which impacts on those communities derive. For those resources, dam failure under the No Action Alternative would result in unavoidable adverse impacts, including curtailment of diversionary water rights, increase in days where instream flows are not met, and loss of aquatic resources and habitats. These unavoidable adverse impacts would result in corresponding unavoidable adverse impacts on tribal populations that exercise fishing rights in Icicle Creek. To the extent that the agriculture industry is adversely affected by impairment of IPID's water rights during years of severe drought, there may also be unavoidable adverse impacts on low-income communities and communities of color that are employed by that industry.

CHAPTER 17: CUMULATIVE IMPACTS

This chapter evaluates and summarizes the potential cumulative impacts of the project alternatives. Cumulative impacts are impacts that could result from the incremental consequences of an action (in this case, the project alternatives) when added to other reasonably foreseeable future actions. When impacts of an action are viewed individually, they may appear minor, but when considered collectively (cumulatively) with the impacts of other actions (especially over a period of time), the impacts can be more significant. The purpose of the cumulative impacts analysis is to ensure that decision-makers consider the full range of consequences for the proposed project, including the project's incremental contribution to cumulative impacts on the environment. The analysis includes only the elements of the environment for which cumulative impacts could occur from the reasonably foreseeable projects identified: Alpine Lakes Wilderness, Water Rights, Plants and Animals, and Recreation.

17.1 Regulatory Context

SEPA directs lead agencies to consider the direct, indirect, and cumulative impacts of proposed actions.

17.1.1 Methods

This analysis provides a broad assessment of potential cumulative impacts related to implementing the project. Past, present, and reasonably foreseeable future actions near the project site were identified and reviewed. The cumulative impact analysis used the following approach:

- Identification of geographic boundaries (i.e., the study area). The preceding chapters of this EIS describe the potential impacts of the project on elements of the environment. As described in those chapters, the study areas are the areas where the project has the potential to affect elements of the environment. In general, the study areas include the project site and surrounding areas. The cumulative impact assessment uses the same study area for each element of the environment, as the study areas represent the area where the project, in combination with other past, present, or reasonably foreseeable future actions, could result in cumulative impacts.
- Identification of reasonably foreseeable future projects and actions within the geographic and time-based boundaries. These projects were identified by reviewing existing adopted plans and funded programs for land managers in the area, including the Forest Service, IPID, and the Icicle Work Group.
- Analysis of the potentially additive or cumulative impacts of these reasonably foreseeable future projects and actions together with the direct and indirect impacts of the project.

17.1.2 Reasonably Foreseeable Future Projects

Reasonably foreseeable projects in the vicinity of the project that are known or are projected to occur during approximately the same time frame as the proposed project and are anticipated to result in a change in baseline conditions were considered in this cumulative impact analysis and are summarized below. If any of these projects were constructed at the same time as the Eightmile Dam construction, there is a potential for a cumulative impact related to construction traffic, noise, and dust in the construction vicinity, but the impact would only be during construction and temporary for the duration of the construction activity.

None of the activities described below are functionally related or interconnected to this project (i.e., one could proceed without the other). Each of the projects would be required to conduct separate, project-specific environmental review, as appropriate. Construction of the Eightmile Dam Rebuild and Restoration Project would include coordination with other projects to reduce the potential cumulative construction impacts to the extent possible. IPID, the Forest Service, and Chelan County will continue discussions and provide updates on their respective projects and timeframes. Mitigation measures for each project would also decrease the potential for cumulative impacts.

There are no cumulative construction-related impacts associated with the No Action Alternative for any element of the environment. Potential cumulative impacts would be the same for Alternatives 1, 2, and 3, as described below. Only those environmental elements with potential cumulative impacts are described.

Table 17-1. Reasonably Foreseeable Projects

Project / Sponsor	Description
<p><i>Icicle Creek Rockfall Mitigation Project</i> Forest Service, FHWA</p>	<p>The Forest Service and the Federal Highway Administration (FHWA) are partnering on a project to mitigate hazardous rockfalls along FSR 7600. Road closures will likely occur beginning in August 2023 for an estimated 10-week period. During this time, scaling of the steep slopes adjacent to FSR 7600 will occur to reduce the potential for future rockfalls. A segment of FSR 7600 is expected to be fully closed during the 10-week construction period from 8:00 am to 5:00 pm on weekdays, with a 1-hour opening between 12:00 pm and 1:00 pm, potentially limiting access for workers and some supplies. The road will be open on weekends. Excavated material from the slopes will be transported to the Forest Service fly yard for placement.</p>
<p><i>Alpine Lake Automation, Modernization, and Optimization Project</i> Icicle Work Group, IPID, USFWS, Ecology</p>	<p>Currently, water releases from the Alpine Lakes are manually controlled by IPID and USFWS staff hiking into the lakes to periodically manage release from existing infrastructure. In drought years, water is released from all of the lakes to meet IPID and LNFH demand. In non-drought years, partial release occurs, which results in water remaining in the lakes (subject to additional drawdown periods for maintenance). Automation at Colchuck, Klonauqua, Square, Snow, and Eightmile Lake dams would allow for additional release from the lakes in non-drought years in a manner that maximizes efficiency in an optimized manner. Releases could be fine-tuned in a manner that meets irrigation and LNFH needs, while also providing instream flow benefits. Automation efforts are still in the planning stages so construction efforts at each dam are not likely to overlap, but longer term flow benefits would be likely.</p>
<p><i>Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Projects</i> LNFH, U.S. Bureau of Reclamation, Icicle Work Group</p>	<p>The projects propose to rehabilitate, replace, and modernize the LNFH intake and delivery system on Icicle Creek by constructing new intake headworks, installing compliant fish screens, building a roughened channel and fishway that conforms to fish passage guidelines, and replacing/lining the surface water conveyance pipeline to the hatchery. Upgrades to the LNFH have been underway since 2021, and will continue through at least 2023. The projects will help decrease fish mortality in Icicle Creek and ensure safe, efficient, and reliable delivery of LNFH’s full surface water rights from Icicle Creek.</p>

Project / Sponsor	Description
<i>Cascade Orchards Irrigation Company (COIC) Irrigation Efficiencies and Pump Exchange Project</i> COIC, Icicle Work Group	This project consists of replacing the existing COIC system with a pressurized delivery system, relocating the point of diversion to a location near the confluence of the Wenatchee River and Icicle Creek, and intake facilities at that location. Implementation would result in increased instream flows in Icicle Creek.
<i>Enchantment Toilet Maintenance</i> Forest Service	Motorized transport, including helicopter, is prohibited in the Wilderness with limited exceptions. The Forest Service has approved the use of helicopters for servicing six vault toilets in the Alpine Lakes Wilderness, which results in approximately 13 trips annually.
<i>Smart Water Meters</i> City of Leavenworth, Icicle Work Group	The City of Leavenworth has installed smart water meters so each account holder can access and analyze water usage against weather data to promote water conservation.
<i>Lower Icicle Riparian Improvement and Sediment Reduction Project</i> Icicle Work Group	Several riparian improvement and sediment reduction projects are being designed. Upcoming projects may include riparian planting, side channel restoration, engineered log jams.
<i>Tribal Fishery Adaptive Management</i> Icicle Work Group	Projects to develop and implement actions that protect and improve the Yakama Nation and Confederated Tribes of the Colville Reservation tribal fishery on Icicle Creek (adding power to restrooms, installing fish cleaning station, exploring additional fishing locations, evaluating stream channel conditions); includes evaluating sediment dynamics in plunge pool.
<i>IPID Water Conservation Measures</i> IPID	District-funded piping and canal lining work to improve water conservation. This work is ongoing, and construction typically occurs in the canal during non-irrigation time, when water is not flowing.

17.2 Cumulative Impact Evaluation

This cumulative impact analysis is prepared in accordance with SEPA (RCW 43-21C), the SEPA Rules (WAC 197-11-060 and 197-11-792), and the SEPA Handbook (Ecology 2018b). The analysis focuses on the projects that may intersect in place and time with the Eightmile Dam Project. Only the elements of the environment that would potentially experience cumulative impacts are described below.

17.2.1 Alpine Lakes Wilderness

Eightmile dam construction is also likely to overlap with toilet maintenance in the Enchantments, contributing to additional helicopter noise. Because the number of flights associated with the toilet maintenance is low and the timeframe for dam construction disturbance is short (limited to one to two seasons). As a result, no significant cumulative impacts to the Alpine Lakes Wilderness are expected to occur from the additional helicopter noise.

17.2.2 Water Resources

As described in Chapter 1, the Eightmile Dam Rebuild and Restoration Project is one of several early actions to be implemented as part of the Icicle Creek Water Resource Management Strategy (Icicle Strategy). The Guiding Principles of the Icicle Strategy are intended to provide a comprehensive

program of integrated long-term water resource management and habitat restoration actions to achieve reliable water supplies and improve instream flows in the Icicle Creek Subbasin (see Chapter 1 for additional detail). The Icicle Strategy uses best available science to identify and support water management solutions that lead to implementation of high-priority water resource projects within the Icicle Creek Subbasin. The Icicle Strategy is a comprehensive water resource management plan designed to balance and meet out-of-stream and instream water demand and resolve habitat and fisheries issues in the Icicle Creek Subbasin. Implementation of the Eightmile Dam Rebuild and Restoration Project will result in cumulative benefits to the water resources and instream flow volumes in Icicle Creek in conjunction with the implementation of the Alpine Lake Automation, Modernization, and Optimization Project, the Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Projects, the COIC Irrigation Efficiencies and Pump Exchange Project, the Smart Meter Project in Leavenworth, and the IPID Water Conservation Measures.

The No Action Alternative could result in long-term cumulative impacts on water resource management in the area, by reducing the options available for long-term instream water management. Should Eightmile Dam have a catastrophic failure, these impacts would be intensified.

17.2.3 Plants and Animals

As described for the Alpine Lakes Wilderness, the Rockfall Mitigation project would potentially occur during the same construction time frame as the Eightmile Dam project. Additional construction noise has the potential to further impact wildlife in the vicinity as a result of the additional construction and disruption, and may result in some wildlife mortality due to increased construction traffic. Implementation of the Eightmile Dam Rebuild and Restoration Project will result in cumulative benefits to the water resources in Icicle Creek in conjunction with the implementation of the Alpine Lake Automation, Modernization, and Optimization Project, and the Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Projects and the COIC Irrigation Efficiencies and Pump Exchange Project, the Lower Icicle Riparian Improvement and Sediment Reduction project. The combination of these projects will result in cumulative benefits to instream flow volumes and fish habitat in Icicle Creek and downstream.

17.2.4 Recreation

The Icicle Creek Rockfall Mitigation Project could be ongoing during the construction period for the dam. During this time, public access to and from the Eightmile Lake Trailhead and project area would be limited due to road closures and construction activities. FSR 7600 is proposed to be closed from 8:00 am to 5:00 pm Monday through Friday, with a 1-hour opening from noon to 1:00 pm each day. The road would be open on weekends from 5:00 pm on Friday until 8:00 am on Monday to allow access for recreationists. These closures are proposed to take place for approximately 10 weeks between August 28 to November 8, 2023. Access to trailheads above the road closure will be limited, and the timing of the daily closures may result in temporary delays for recreationists to and from the area. The road closure, coupled with the construction and helicopter flights to and from Eightmile Dam, could further diminish recreational enjoyment during construction due to added noise and difficulties with access. Eightmile dam construction is also likely to overlap with toilet maintenance in the Enchantments, contributing to additional helicopter noise.

While some wilderness users may feel their experience is curtailed or is greatly diminished, the timeframe for disturbance is short (limited to one to two seasons for dam construction). As a result, no significant cumulative impacts to recreation is expected to occur from the concurrent construction activities and additional helicopter noise. Refer to Chapter 10, *Recreational Resources*, for further discussion.

17.2.5 Tribal Resources

As previously noted, the Guiding Principles of the Icicle Strategy are intended to provide a comprehensive program of integrated long-term water resource management and habitat restoration actions to achieve reliable water supplies and improve instream flows in the Icicle Creek Subbasin (see Chapter 1 for additional detail). Projects conducted as part of the Tribal Fishery Adaptive Management are intended to develop and implement actions that protect and improve the tribal fishery on Icicle Creek. Implementation of the Eightmile Dam project will improve instream flows, which will benefit tribal fisheries in Icicle Creek.

CHAPTER 18: REFERENCES

- American Whitewater. 2021a. River List. URL: <https://www.americanwhitewater.org/content/River/search>.
- American Whitewater. 2021b. Safety Code of American Whitewater.
- Ames, Kenneth M., and Alan G. Marshall. 1980. Villages, Demography and Subsistence Intensification on the Southern Columbia Plateau. *North American Archaeologist* 2(1):25-52. Farmingdale, New York.
- Ames, Kenneth M., and Herbert G. Maschner. 1999. *Peoples of the Northwest Coast: Their Archaeology and Prehistory*. Thames & Hudson, New York.
- Ames, Kenneth M., Don E. Dumond, Jerry R. Galm, and Rick Minor. 1998. Prehistory of the Southern Plateau. In *Plateau*, edited by Deward E. Walker, Jr., pp. 103-119. *Handbook of North American Indians*, Vol. 12, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
- Anastasio, A. 1972. *The Southern Plateau An Ecological Analysis of Intergroup Relations*. *Northwest Anthropological Research Notes*. University of Idaho.
- Anchor QEA. 2018a. *Eightmile Lake Storage Restoration Feasibility Study*. Prepared for Icicle and Peshastin Irrigation Districts and Chelan County Natural Resources Department. April 2018.
- Anchor QEA. 2018b. *Icicle and Peshastin Irrigation Districts Comprehensive Water Conservation Plan*. Prepared for the Icicle and Peshastin Irrigation Districts under the direction of Trout Unlimited.
- Anchor QEA. 2018c. *Icicle Creek Water Resources Management Strategy Cultural Resources Discipline Report*. Prepared for Chelan County Natural Resources Department and Washington State Department of Ecology, Wenatchee by Anchor QEA, Wenatchee. On file, Environmental Science Associates, Seattle.
- Anchor QEA. 2019. *Hydrologic and Hydraulic Analyses Report – Eightmile Lake Storage Restoration Project*. Prepared for Icicle and Peshastin Irrigation Districts. July 2019.
- Anchor QEA and Aspect Consulting, LCC. 2015. *Appraisal Study: Eightmile Lake Storage Restoration*. Prepared for Chelan County Natural Resources Department, March 2015.
- Anchor QEA and IPID (Icicle- Peshastin Irrigation District). 2021. Email conversation on February 12, 2021 and February 16, 2021 between Anchor QEA, IPID, Industrial Economics, and ESA discussing IPID's Comprehensive Water Conservation Plan.
- Anchor QEA, Aspect Consulting, and Washington Water Trust. 2015. *Alternatives Evaluations Study – Public Release Version Cascade Orchards Irrigation Company*. URL: https://www.co.chelan.wa.us/files/natural-resources/documents/Planning/icicle_work_group/current-project/COIC%20Alternatives%20Analysis%202015.pdf.
- Andonaegui, C. 2001. *Salmon, Steelhead, and Bull Trout Habitat Limiting Factors For the Wenatchee Subbasin (Water Resource Inventory Area 45) and Portions of WRIA 40 within Chelan County (Squilchuck, Stemilt and Colockum drainages)*. Prepared for the Washington State Conservation Commission. Olympia, WA.
- Arksey, Laura. 2010. *Leavenworth – Thumbnail History*. HistoryLink.org Essay 9475. URL: <https://www.historylink.org/file/9475>.

- ASPE (Office of the Assistant Secretary for Planning and Evaluation). 2021. Poverty Guidelines. U.S. Department of Health and Human Services. URL: <https://aspe.hhs.gov/system/files/aspe-files/107166/2020-percentage-poverty-tool.pdf>, accessed February 23, 2021.
- Aspect (Aspect Consulting, LCC). 2013. Wenatchee Reserve Accounting, Memorandum to Chelan County Natural Resources Department.
- Aspect (Aspect Consulting, LCC). 2019. *Draft Geotechnical Report – Eightmile Lake Storage Restoration Project*. Prepared for Anchor QEA and Icicle Peshastin Irrigation Districts. Project no. 180151. July 17, 2019 draft.
- Aspect (Aspect Consulting, LCC). 2022a. Eightmile Lake Multi-Fill Analysis. Prepared for Halverson NW Law Group. May 2022.
- Aspect (Aspect Consulting, LCC). 2022b. *Eightmile Lake Restoration – Geotechnical Engineering Progress Memorandum*. Project No. 180151. January 10, 2022.
- Aspect Consulting and Anchor QEA LLC. 2015. Appraisal Study - Eightmile Lake Storage Restoration. Report prepared for Chelan County and Icicle-Peshastin Irrigation Districts. URL: https://www.iciclenetwork.com/sites/default/files/2017-11/Appraisal%20-%20Eightmile%20Lake%20Storage%20%28March%202015%29_0.pdf.
- Bash, J., C.H. Berman, and S. Bolton. 2001. Effects of turbidity and suspended solids on salmonids. Center for Streamside Studies, University of Washington, Seattle, WA, November 2001. 72 pp.
- Berg, L., D. Lowman, and Yakama Nation Consultants. 2002. Wenatchee Subbasin summary. Draft report prepared for the Northwest Power Planning Council. 115p.
- Baugh, J., T. Krauthoefer, J. Query, and B. Reed. 1995. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS1580. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Beavert, V., and S. Hargus. 2009. *Ichíishkin Sínwit Yakama/Yakima Sahaptin Dictionary*. University of Washington Press, Seattle. As cited in YN 2022.
- Beavert, V., and S. Hargus. 2009. *Ichíishkin Sínwit Yakama/Yakima Sahaptin Dictionary*. University of Washington Press, Seattle. As cited in YN 2022.
- BLS (Bureau of Labor Statistics). 2019. Occupational Employment and Wages in Wenatchee – May 2019. Western Information Office. URL: https://www.bls.gov/regions/west/news-release/occupationalemploymentandwages_wenatchee.htm. Accessed February 23, 2021.
- BLS (Bureau of Labor Statistics). 2021. Consumer Price Index. URL: <https://www.bls.gov/cpi/tables/supplemental-files/historical-cpi-u-202101.pdf>. Accessed February 12, 2021.
- Blukis Onat, Astrida R., Maury E. Morgenstein, Philippe D. LeTourneau, Robert P. Stone, Jerre Kosta, and Paula Johnson. 2001. Archaeological Investigations at stuwe'yuuq – Site 45KI464, Tolt River, King County, WA. Prepared for Seattle Public Utilities by BOAS, Inc., Seattle. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Boreson, Keo, and Jerry R. Galm. 1997. Archeological Investigations at the Stemilt Creek Village Site (45CH302), Chelan County, Washington. Eastern Washington University Reports in Archaeology and History. Cheney.

- Bouchard, Randy, Dorothy Kennedy, and Mark Cox. 1988. Ethnography and Ethnohistory of the National Forest Lands Proposed for Exchange to Plum Creek Timber Company I-90 Land Exchange Project. Prepared for The U.S. Forest Service, Wenatchee and Plum Creek Timber Company, Seattle, by British Columbia Indian language Project Victoria, British Columbia, Canada. On file, Environmental Science Associates, Seattle.
- Brown, L.G. 1992. Draft management guide for the bull trout *Salvelinus confluentus* (Suckley) on the Wenatchee National Forest. Wenatchee, WA: Washington Department of Wildlife. 75pp.
- Bruce, Robin, Susan Carter, Stephen Emerson, Mark Garris, Craig Holstine, Charles T. Luttrell, and Chris McCarthy-Ryan. 1994. An Historical Overview of the Wenatchee National Forest, Washington. Craig Holstine, editor. Prepared for the Wenatchee National Forest, Wenatchee by Archaeological and Historical Services, Eastern Washington University, Cheney, Washington. On file, Environmental Science Associates, Seattle.
- Bundy, Barbara. 2016. Washington State Archaeological Site Inventory Form: Eightmile Lake Water Release System, Temp ID ICS-1. In Appendix A of Icicle Creek Water Resource Management Strategy Cultural Resources Discipline Report. Prepared for Chelan County Natural Resources Department and Washington State Department of Ecology by Anchor QEA (May 2018). On file, Environmental Science Associates, Seattle, Washington.
- Bureau of Economic Analysis. 2019a. Total Full-Time and Part-Time Employment by NAICS Industry, 2009 and 2019. URL: <https://apps.bea.gov/iTable/iTable.cfm?reqid=70&step=1&acrdn=5>.
- Bureau of Economic Analysis. 2019b. Compensation of Employees by NAICS Industry, 2009 and 2019 – CAEMP25N. URL: <https://apps.bea.gov/iTable/iTable.cfm?reqid=70&step=1&acrdn=5>.
- Bureau of Reclamation. 2020. Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Project Environmental Impact Statement. Page 3. U.S. Department of the Interior. URL: <https://www.usbr.gov/pn/programs/leavenworth/swisp/pdf/waterre.pdf>. November 2020.
- Burke Museum. 2021. Collections & Research; Biology. Accessed: 4 February 2021. URL: <https://www.burkemuseum.org/collections-and-research/biology/herpetology>.
- Capellini, M.M.J. 2001, Movements of bull trout (*Salvelinus confluentus*), spring Chinook (*Oncorhynchus tshawytscha*), and steelhead (*O. mykiss*) in Icicle Creek, Washington, July 7, 2001.
- Carie, D.G. 1995. Evaluation of two-year rearing program for summer steelhead at Leavenworth National Fish Hatchery. U.S. Fish and Wildlife Service, Leavenworth, Washington.
- Carter, Susan. 1978. Archaeological Reconnaissance Wenatchee Group of the Selected Alpine Lakes Wilderness Exchange Lands. Prepared by Mt. Baker-Snoqualmie National Forest. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.
- CEQ (Council on Environmental Quality). 1997. Environmental Justice: Guidance Under the National Environmental Policy Act. Accessed at: https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-EJGuidance.pdf, February 23, 2021.
- Chapman, D., C. Peven, T. Hillman, A. Giorgi, and F. Utter. 1994. Status of summer steelhead in the mid-Columbia River. Don Chapman Consultants Inc., Boise, Idaho.

- Chatters, James C., and David L. Pokotylo. 1998. Prehistory: Introduction. In Plateau, edited by Deward E. Walker, Jr., pp. 73-80. Handbook of North American Indians, Vol. 12, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
- Chelan County. 2016. Icicle Strategy: Tribal Fisheries Preservation and Enhancement Project. URL: http://www.co.chelan.wa.us/files/natural-resources/documents/Planning/icicle_work_group/SEPA%20Open%20House/Handouts/TribalFisheries_final_reduced.pdf.
- Chelan County. 2017. *Chelan County Comprehensive Plan 2017-2037*. Accessed February 11, 2021. URL: <https://www.co.chelan.wa.us/community-development/pages/comprehensive-plan-2017-2037>.
- Chelan County. 2019. *Chelan County Shoreline Master Program*. Accessed February 11, 2021. URL: <https://www.co.chelan.wa.us/community-development/pages/shoreline-master-program>.
- Chelan County. 2020. Chelan County Comprehensive Emergency Management Plan. June 2020. URL: <https://www.co.chelan.wa.us/files/emergency-management/Documents/Chelan%20County%202020%20CEMP%20Plan.pdf>.
- Chelan County. 2021a. Chelan County Noxious Weed List. Accessed: September 27, 2021 from URL: <https://www.co.chelan.wa.us/files/noxious-weed/documents/2021%20Chelan%20County%20Weed%20List.pdf>.
- Chelan County. 2021b. Chelan County Parcel Search. URL: <https://maps.co.chelan.wa.us/GIS/>.
- Chelan County. 2022. Chelan Citizen Notification System. URL: <https://public.alertsense.com/signup/?regionid=1184>.
- Chelan County Assessor. 2022. 30008 Icicle Island Club for Year 2022 – 2023. URL: https://pacs.co.chelan.wa.us/PropertyAccess/Property.aspx?cid=91&year=2022&prop_id=30008.
- Chelan County Natural Resources. 2020. Chelan County Climate Resilience Strategy. [https://www.co.chelan.wa.us/files/natural-resources/documents/FINAL%20Chelan%20Climate%20Resiliency%20Strategy%202020\(1\).pdf](https://www.co.chelan.wa.us/files/natural-resources/documents/FINAL%20Chelan%20Climate%20Resiliency%20Strategy%202020(1).pdf).
- Christensen, B. S. Steinmetz, J. Baugh, and T. Krauthoefer. 1995. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS1572. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- CIG (Climate Impacts Group). 2009. The Washington Climate Change Impacts Assessment. Climate Impacts Group, University of Washington, Seattle. URL: <https://cig.uw.edu/wp-content/uploads/sites/2/2020/12/wacciareport681-3.pdf>.
- City of Leavenworth v. Department of Ecology. 2011. Chelan County Superior Court Case No. 09-2-00748-3.
- City of Leavenworth. 2017a. Leavenworth Housing Needs Assessment. March.
- City of Leavenworth. 2017b. City of Leavenworth Comprehensive Plan. June.
- City of Leavenworth. 2018. City of Leavenworth Water System Plan. February.
- City of Leavenworth. 2020. Leavenworth Housing Needs Assessment. February.

- City of Leavenworth. 2021. Telephone conversation on February 26, 2021 between Industrial Economics, the City of Leavenworth City Administrator discussing water use and needs in Leavenworth
- Clark, William. 1805. Journals of the Lewis and Clark Expedition. URL: <https://lewisandclarkjournals.unl.edu/item/lc.jrn.1805-10-18#ln23101805>.
- Corps (U.S. Army Corps of Engineers), Reclamation (Bureau of Reclamation), and Bonneville (Bonneville Power Administration). 1995. Columbia River System Operation Review/Final Environmental Impact Statement. Portland, OR.
- CREW (Cascadia Region Earthquake Workgroup). 2013. *Cascadia Subduction Zone Earthquakes: A Magnitude 9.0 Earthquake Scenario, Update*. URL: http://crew.org/sites/default/files/cascadia_subduction_scenario_2013.pdf.
- CTCR (Confederated Tribes of the Colville Reservation). 2021a. A Brief History. URL: <https://colvilletribes.maps.arcgis.com/apps/MapJournal/index.html?appid=ac4721130e424df786eb06dbbb4a5880>.
- CTCR (Confederated Tribes of the Colville Reservation). 2021b. Facts. URL: <https://www.cct-hsy.com/facts>.
- CTCR (Confederated Tribes of the Colville Reservation). 2022. Eightmile Dam Traditional Plants, including Top TC Plants. Information provided by Guy Moura, Manager/Tribal Historic Preservation Officer, History/Archaeology Program, Confederated Tribes of the Colville Reservation. Email dated August 22, 2022.
- CTCR (Confederated Tribes of the Colville Reservation). 2023a. Department of Fish and Wildlife. Fish History. URL: <https://www.cct-fnw.com/ct-fish-history>.
- CTCR (Confederated Tribes of the Colville Reservation). 2023b. Proclamation. URL: <https://www.cct-cbc.com/proclamation>.
- DAHP (Department of Archaeology and Historic Preservation). 2020, 2022. Washington Information System for Architectural and Archaeological Records Data (WISAARD). Secure database. URL: <http://www.dahp.wa.gov/>.
- Dethier, D.P., P. Heller, and S. Safioles. 1979. Reconnaissance Data on Lakes in the Alpine Lakes Wilderness Area, Washington. U.S. Geological Survey Open-File Report 79-1465. Prepared in cooperation with the U.S. Forest Service and the Washington Department of Fish and Game.
- Dion N.P., G.C. Bortleson, J.B. McConnell, and L.M. Nelson. 1976. Reconnaissance on Lakes in Washington. Volume 5. Chelan, Ferry, Kittitas, Klickitat, Okanagan, and Yakima Counties. Prepared in cooperation with United States Geological Survey.
- DOH (Washington State Department of Health). 2021. "Washington Environmental Health Disparities Map." Accessed at: <https://fortress.wa.gov/doh/wtn/WTNIBL/>, March 3, 2021
- Dominguez, L., P. Powers, E.S. Toth, and S. Blanton. 2013. Icicle Creek Boulder Field Fish Passage Assessment. Prepared for Trout Unlimited-Washington Water Project. Wenatchee, WA.
- Dorpat, Paul, and Genevieve McCoy. 1998. Building Washington: A History of Washington State Public Works. Tartu Publications, Seattle.

- Downes, M. Personal Communication. 2022. Personal communication by email with Melissa Downes, Office of Columbia River, Washington State Department of Ecology with Lisa Adolfson, Regional Business Group Director Water Group, Environmental Science Associates, on September 30, 2022.
- Drzymkowski, R.E., and C.H. Swift. 1992. Water Quantity and Quality Data, September-October 1991, for Source Water to the Leavenworth National Fish Hatchery, Washington. US Geological Survey Open-file Report 92-93.
- Duncan, Bonita, and Ann Fink. 1997. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS01571. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Eastern Washington University. 2021. Institute for Public Policy and Economic Analysis. "Chelan-Douglas Trends – Culture & Leisure." URL: http://chelandouglastrends.com/graph.cfm?cat_id=1&sub_cat_id=2&ind_id=1. Accessed November 20, 2021.
- Ecology (Washington State Department of Ecology (Ecology)). 1999c. Water Resources Program Policy 5701, Emergency Response Procedures by Dam Safety Office. URL: <https://apps.wa.gov/ecology/docs/WaterRights/wrwebpdf/pol5701.pdf>.
- Ecology (Washington State Department of Ecology), 1993. *Dam Safety Guidelines Part IV: Dam Design and Construction*. Publication No. 92-55D. July 1993.
- Ecology (Washington State Department of Ecology). 1992. *Dam Safety Guidelines Part 2 – Project Planning and Approval of Dam Construction and Modification*. Publication number 92-55b. Dam Safety Office. July 1992 (Revised 2008).
- Ecology (Washington State Department of Ecology). 1995a. *Reconnaissance Inspection of Eightmile Lake Dam*, Dam Safety Section, December 7, 1995.
- Ecology (Washington State Department of Ecology). 1995b. *Eightmile [Field Notes]*, Dam Safety Section, September 25, 1995.
- Ecology (Washington State Department of Ecology). 1999a. Water Resources Program Policy 5102, Applicability of Dam Safety Policies and Procedures. Dam Safety Office. URL: <https://apps.wa.gov/ecology/docs/WaterRights/wrwebpdf/pol5102.pdf>.
- Ecology (Washington State Department of Ecology). 1999b. Water Resources Program Policy 5406, Older Dams Which Were Constructed Many Years Ago Without DSO Approval of Plans and Specifications. Dam Safety Office. URL: <https://apps.wa.gov/ecology/docs/WaterRights/wrwebpdf/pol5406.pdf>.
- Ecology (Washington State Department of Ecology). 2007a. *Groundwater Data Summary for the Wenatchee River Watershed Total Maximum Daily Load Study*. URL: <https://apps.wa.gov/ecology/publications/documents/0503018.pdf>.
- Ecology (Washington State Department of Ecology). 2007b. *Wenatchee River Watershed Temperature Total Maximum Daily Load*. Water Quality Improvement Report. July 2007. Publication No. 07-10-045.
- Ecology (Washington State Department of Ecology). 2009. *Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load*. Water Quality Improvement Report. Revised August 2009. Publication No. 08-10-062.

- Ecology (Washington State Department of Ecology). 2012. Municipal Water Law Interpretive and Policy Statement. Policy 2030. URL: <https://apps.wa.gov/ecology/docs/WaterRights/wrwebpdf/pol2030.pdf>.
- Ecology (Washington State Department of Ecology). 2018a. EPA-approved 2018 Water Quality Assessment. Approved by EPA on August 26, 2022. Accessed at <https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d>.
- Ecology (Washington State Department of Ecology). 2018b. State Environmental Policy Act (SEPA) Handbook. 2018 Updates. URL: <https://ecology.wa.gov/DOE/files/4c/4c9fec2b-5e6f-44b5-bf13-b253e72a4ea1.pdf>.
- Ecology (Washington State Department of Ecology). 2019a. Icicle Strategy - Icicle Creek Water Resource Management Strategy, Final Programmatic Environmental Impact Statement. Publication # 18-12-016. January 2019. URL: <https://www.co.chelan.wa.us/natural-resources/pages/environmental-review>.
- Ecology (Washington State Department of Ecology). 2019b. *Plan Review of Eightmile Lake Dam*, Office of Dam Safety letter, October 7, 2019.
- Ecology (Washington State Department of Ecology). 2020. State Environmental Policy Act Draft Environmental Impact Statement - Proposed Chehalis River Basin Flood Damage Reduction Project. Publication No.: 20-06-002. Shorelines and Environmental Assistance Program. February 2020.
- Ecology (Washington State Department of Ecology). 2021a. Water Rights Search. Accessed April 8, 2021 and June 30, 2022, from URL: <https://secureaccess.wa.gov/ecy/waterrighttrackingssystem/WaterRights/WaterRightSearch.aspx>.
- Ecology (Washington State Department of Ecology). 2021b. Map Search of Washington State Well Report Viewer. Accessed April 8, 2021, from URL: <https://apps.wa.gov/ecology/wellconstruction/map/WCLSWebMap/WellConstructionMapSearch.aspx>.
- Ecology (Washington State Department of Ecology). 2021c. Geographic Water Information System (GWIS). Accessed January 20, 2021, from URL: https://fortress.wa.gov/ecy/gispublic/DataDownload/wr/GWIS_Data/.
- Ecology (Washington State Department of Ecology). 2021d. Scoping Summary Report, Ecology Publication No. 21-12-008, URL: <https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-supply-projects-EW/Icicle-Creek-strategy/Eightmile-Dam>.
- Ecology (Washington State Department of Ecology). 2021e. Ecology Flow Monitoring Data Network Online Data for Station ID# 45W003 - Eightmile Creek Below Dam. URL: <https://fortress.wa.gov/ecy/eap/flows/station.asp?sta=45W003#block2>. Accessed January, 2020.
- Ecology (Washington State Department of Ecology). 2021f. Map Search of Washington State Well Report Viewer. Retrieved April 8, 2021, from <https://apps.wa.gov/ecology/wellconstruction/map/WCLSWebMap/WellConstructionMapSearch.aspx>.
- Ecology (Washington State Department of Ecology). 2022a. River & Stream Monitoring Program. Data from URL: <https://apps.ecology.wa.gov/continuousflowandwq/>.

- Ecology (Washington State Department of Ecology). 2022b. Environmental Information Management Database. Data from URL: <https://ecology.wa.gov/Research-Data/Data-resources/Environmental-Information-Management-database>.
- Ecology (Washington State Department of Ecology). 2022c. Water Quality Atlas. URL: <https://apps.ecology.wa.gov/waterqualityatlas/wqa/map>.
- Ecology (Washington State Department of Ecology). 2022d. Chapter 173-201A WAC (Natural Conditions), from Ecology's website. URL: <https://ecology.wa.gov/Regulations-Permits/Laws-rules-rulemaking/Rulemaking/WAC-173-201A-Natural-Conditions>.
- Ecology (Washington State Department of Ecology). 2022e. Proposed Goldendale Energy Storage Project State Environmental Policy Act Draft Environmental Impact Statement. Ecology Publication No. 22-06-006. June 2022.
- Ecology (Washington State Department of Ecology). 2022f. Station 45W003 Stream Flow Data. Retrieved July 6, 2022, from <https://apps.ecology.wa.gov/continuousflowandwg/StationDetails?sta=45W003>.
- Ecology (Washington State Department of Ecology) and Chelan County. 2019. Final Programmatic Environmental Impact Statement (FPEIS) for the Icicle Creek Water Resource Management Strategy (Icicle Strategy). February 2019.
- EcoNorthwest. 2017. Economic Contributions of Washington H-2A Workers. Prepared for WAFLA. URL: <https://www.wafla.org/resources/Documents/Press%20Releases/2017/Econ.%20Contrib.%20of%20WA%20H-2A%20Workers%205-2017.pdf>.
- English, D.B.K., E.M. White, J.M. Bowker, and S.A. Winter. 2020. A Review of the Forest Service's National Visitor Use Monitoring (NVUM) Program. *Agricultural and Resource Economics Review*: 49 (1), 64–90.
- Environmental Justice Task Force. 2020. Report to the Washington State Governor and Legislature: Recommendations for Prioritizing EJ in Washington State Government. Fall. Accessed at [https://healthequity.wa.gov/Portals/9/Doc/Publications/Reports/EJTF%20Report_FINAL\(1\).pdf](https://healthequity.wa.gov/Portals/9/Doc/Publications/Reports/EJTF%20Report_FINAL(1).pdf), February 23, 2021.
- EPA (U.S. Environmental Protection Agency). 2021. "Environmental Justice." Accessed at <https://www.epa.gov/environmentaljustice>. March 1, 2021.
- EPA (U.S. Environmental Protection Agency). 2022. Washington NPDES Permit. URL: <https://www.epa.gov/npdes-permits/washington-npdes-permits>.
- ESA (Environmental Science Associates). 2021. Vegetation Survey for the Eightmile Dam Staging Area and FS Road 7601-116. Technical Memorandum. November 24, 2021.
- ESRI. 2020. Light Gray Canvas Map. URL: https://services.arcgisonline.com/ArcGIS/rest/services/Canvas/World_Light_Gray_Base/MapServer. Accessed July 2022.
- Executive Order 12898. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. February 11, 1994.
- FAA (Federal Aviation Administration). 2012. Enplanements at All Commercial Service Airports (by Rank). URL: https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/previous_years/.

- FAA (Federal Aviation Administration). 2017. Enplanements at All Commercial Service Airports (by Rank). URL: https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/previous_years/.
- FEMA (Federal Emergency Management Agency). 2015. Federal Guidelines for Dam Safety Risk Management. FEMA P-1025. January 2015. URL: https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_risk-management_P-1025.pdf.
- Fenger, M., T. Manning, J. Cooper, S. Guy, and P. Bradford. 2006. *Wildlife & Trees in British Columbia*. Lone Pine Publishing. Vancouver, British Columbia. August 15, 2006. 336 pg.
- FHWA (Federal Highway Administration). 2008. Roadway Construction Noise Model (RCNM) version 1.1. December 8, 2008.
- Find A Grave. 2020. Mountain View Cemetery, Leavenworth, WA. URL: <https://www.findagrave.com/cemetery/76956/mountain-view-cemetery>. Accessed 14 December 2020.
- Fink, Ann. 1996a. Cultural Resources Survey Report for the Eightmile Recovery Project, Report# R1996061707001. On file, Okanogan Wenatchee National Forest, Wenatchee.
- Fink, Ann. 1996b. U.S. Forest Service Cultural Resources Site Update: 45WF388. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Franklin, J.F., and C.T. Dyness. 1973. *Natural Vegetation of Oregon and Washington*. Gen. Tech. Rep. PNW-8. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station.
- FTA (Federal Transit Administration). 2018. Transit Noise and Vibration Impact Assessment. September 2018.
- Furr, Kathryn. 2021. Conversation with Brigitte Ranne, Botanist. Email message to Lisa Adolfson and Jeff Barna, ESA. August 31, 2021.
- Gallardo, R.K. 2020. COVID-19 and the Washington Apple Industry. Washington State University, IMPACT Center. URL: http://ses.wsu.edu/wp-content/uploads/2020/04/IMPACT_Tree-Fruit-Covid.pdf.
- Galm, Jerry R., and Ruth A. Masten (editors). 1985. *Avey's Orchard: Archaeological Investigations of a late Prehistoric Columbia River Community*. Eastern Washington University, Archaeological and Historical Services Reports in Archaeology and History 100-142. Cheney.
- Galm, Jerry R., Glenn D. Hartmann, Ruth A. Masten, and Garry O. Stephenson. 1981. *A Cultural Resource Overview of Bonneville Power Administration's Mid-Columbia Project*. Central Washington. Archaeological and Historical Services, Eastern Washington University. Reports in Archaeology and History 100-116. Cheney.
- Gibbs, George. 1854. Report of Mr. George Gibbs to Captain McClellan on the Indian Tribes of the Territory of Washington. In *Reports of Explorations and Surveys, To Ascertain the Most Practical and Economical Route for a Railroad from the Mississippi river to the Pacific Ocean 1853-4*, Volume 1. Washington 1855, pp. 402- 436. Beverly Tucker, Printer, Washington.

- Gibbs, George. 1877. Tribes of Western Washington and Northwestern Oregon. In Contributions to North American Ethnology, Vol. 1, Part II, pp. 8-42 and 157-241. Department of the Interior, U.S. Geographical and Geological Survey of the Rocky Mountain Region, J.W. Powell, Geologist in Charge. Government Printing Office, Washington, D.C.
- GOIA (Governor's Office of Indian Affairs). 1989. Centennial Accord Between the Federally Recognized Indian Tribes in Washington State and the State of Washington. URL: <https://goia.wa.gov/relations/centennial-accord>. Accessed October 2021.
- GOIA (Governor's Office of Indian Affairs). 1999. Centennial Accord Between the Federally Recognized Indian Tribes in Washington State and the State of Washington. Government-to-Government Implementation Guidelines. URL: <https://goia.wa.gov/relations/millennium-agreement/implementation-guidelines>.
- Griffith, J. S. 1988. Review of competition between cutthroat trout and other salmonids. American Fisheries Society Symposium 4. 4:134-140.
- Harrison, Robin T., Roger N. Clark, and George H. Stankey. 1980. Predicting Impact of Noise on Recreationists. US Forest Service, Equipment Development Center, San Dimas, CA. April 1980. Accessed from URL: <https://www.fs.fed.us/eng/pubs/pdfimage/80231202.pdf>.
- Hermilt, John, and Louise Judge. 1910. Letter to the Honorable Commissioner of Indian Affairs, Department of the Interior dated July 3, 1910. In Wenatchee Indians Ask Justice, in *The Washington Historical Quarterly* Vol XVI pp. 20-28, 1925, Edmond S. Meany, managing editor, The Washington University State Historical Society, University Stations, Seattle, WA.
- Hildenbrand, J.F. 2019. *Leavenworth National Fish Hatchery, Leavenworth, Washington, Phosphorus Study*. Prepared by Robinson Noble, Inc. for the U.S. Fish and Wildlife Service.
- Hillman, T., and coauthors. 2014. Monitoring and Evaluation of the Chelan and Grant County PUDs Hatchery Programs: 2013 Annual Report. June 1, 2014. Report to the HCP and PRCC Hatchery Committees, Wenatchee, Washington. 625p.
- Hillman, T., M. Miller, M. Johnson, M. Hughes, C. Moran, J. Williams, M. Tonseth, C. Willard, S. Hopkins, B. Ishida, C. Kamphaus, T. Pearsons, and P. Graf. 2018. Monitoring and evaluation of the Chelan and Grant County PUDs hatchery programs: 2017 annual report. Report to the HCP and PRCC Hatchery Committees, Wenatchee and Ephrata, WA.
- Hobbs, W., and M. Friese. 2016. Wenatchee River PCB and DDT Source Assessment. Washington State Dept. of Ecology. Olympia, WA. Publication No. 16-03-029. URL: <https://fortress.wa.gov/ecy/publications/summarypages/1603029.html>.
- Hodge, F. 1910. Handbook of American Indians North of Mexico, Part 2. Smithsonian Institute Bureau of American Ethnology. Government Printing Office, Washington, D.C.
- Horsch, E., C. Leggett, C. Smith, and R. Unsworth. 2017. Estimating the Economic Benefits of Recreational Visitation to Federally-Managed Lands. Final Report. September. Prepared for the U.S. Department of the Interior Office of Policy Analysis.
- IEc (Industrial Economics, Incorporated). 2022. Discipline Report: Agriculture, Development and Other Economic Activities. Draft Report. prepared for Washington State Department of Ecology. Prepared by IEc, Cambridge, MA.
- IID (Icicle Irrigation District). 1927a. Notice of Beginning of Construction to State Supervisor of Hydraulics. July 22, 1927. On file, Icicle Irrigation District, Cashmere, Washington.

- IID (Icicle Irrigation District). 1927b. Eight Mile Lake Outlet Dam: Cross Section of Dam, Profile of Dam, Cross Section of Spillway, Profile of Spillway. On file, Icicle Irrigation District, Cashmere, Washington.
- IID (Icicle Irrigation District). 1929. Notice of Completion of Construction to State Supervisor of Hydraulics. October 10, 1929. On file, Icicle Irrigation District, Cashmere, Washington.
- IID (Icicle Irrigation District). 1973. Meeting Minutes from May 31, 1973 Directors Meeting. On file, Icicle Irrigation District, Cashmere, Washington.
- Innes, Robin J. 2011. *Oreamnos americanus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Accessed: 11 February 2021. URL: www.fs.fed.us/database/feis/animals/mammal/oram/all.html.
- Innes, Robin J. 2013. *Odocoileus hemionus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). URL: www.fs.fed.us/database/feis/animals/mammal/odhe/all.html.
- IPID (Icicle and Peshastin Irrigation Districts). 2021. *Photos and Videos from IPID personnel showing FSR 7601-116*, August 11, 2021.
- Irving, D.B. 2015. Addendum to the USFWS Supplemental Biological Assessment – Water Use at Leavenworth National Fish Hatchery: A Plan for Interim and long-term actions to further improve stream flows. May 11, 2015. U.S. Fish and Wildlife Service, Leavenworth, Washington.
- ISO (International Organization for Standardization). 1996. 9613-2:1996. Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation.
- Jantzer, Anthony. 2020. Personal communication. Statement by Tony Jantzer, IPID, to Environmental Science Associates and Robinson Noble on October 21, 2020.
- Jantzer, Anthony. 2021. Personal email communication between Tony Jantzer (Secretary and Manager, Icicle & Peshastin Irrigation Districts) with Chanda R. Schneider (ESA Cultural Resources). January 5, 2021.
- Judge, Louis. 1925. Wenatchee Indians Ask Justice. In *The Washington Historical Quarterly* Vol XVI pp. 20-28, Edmond S. Meany, managing editor, The Washington University State Historical Society, University Stations, Seattle, WA.
- Kidd, Robert. 1964. A Synthesis of Western Washington Prehistory from the Perspective of Three Occupation Sites. Unpublished Master's Thesis. Department of Anthropology University of Washington, Seattle.
- Kincade, Dale M. William W. Elmendorf. Bruce Rigsby, and Haruo Aoki. 1998. Languages. In *Plateau*, edited by Deward E. Walker Jr., pp. 49-72, *Handbook of North American Indians* Vol. 12, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.
- Kondo, E. 2017. Memo to File - LNFH Information Request to WDFW. September 5, 2017. NMFS, Portland, Oregon. 6p.
- Kopperl, Robert, Charles Hodges, Christian Miss, Johonna Shea, and Alecia Spooner. 2016. *Archaeology of King County, Washington: A Context Statement for Native American Archaeological Resources*. Prepared by SWCA Environmental Consultants, Seattle. Prepared for the King County Historic Preservation Program, Seattle.

- Krauthoefer, Tracie, and Shawn Steinmetz. 1995. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS01573. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Lahren, Sylvester L. Jr. 1998. Reservations and Reserves. In Plateau, edited by Deward E. Walker Jr., pp. 484-498, Handbook of North American Indians Vol. 12, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.
- Lancaster, Kim J. 2017. State of Washington Archaeological Site Inventory Form: 45CH00935. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Lancaster, Kim J. 2018. Trout Unlimited Icicle Boulder Field IPID COL Project, Chelan County, WA. Prepared for Trout Unlimited Washington Water Project by Cascadia Conservation District, Wenatchee, WA. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Landres, Peter, Chris Barns, Steve Butcher, Tim Devine, Peter Dratch, Adrienne Lindholm, Linda Merigliano, Nancy Roeper, and Emily Simpson. 2015. *Keeping it wild 2: an updated interagency strategy to monitor trends in wilderness character across the National Wilderness Preservation System*. Gen. Tech. Rep. RMRS-GTR-340. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Lindholdt, Paul. 2019. Alpine Lakes Wilderness. historyLink.org Essay 20940. URL: <https://www.historylink.org/File/20940>.
- LODES (Longitudinal Employer-Household Dynamics [LEHD] Origin-Destination Employment Statistics). 2018. URL: <https://onthemap.ces.census.gov/>. Accessed on February 8, 2021.
- Maitland, T. Personal Communication. 2021. Personal communication by email with Travis Maitland, District 7 Fish Biologist, Washington Department of Fish and Wildlife with Pete Lawson, Fisheries Biologist, Environmental Science Associates, on January 29, 2021, and February 1, 2021.
- Marsh, Kevin R. 2007. *Drawing Lines in the Forest: Creating Wilderness Areas in the Pacific Northwest*. University of Washington Press, Seattle and London.
- Mass, Johnathan. 1983. Cultural Resources Reconnaissance of the Proposed Icicle Creek Hydropower Development near Leavenworth, Chelan County, Washington. Prepared for and by the U.S. Army Corps of Engineers, Seattle District. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.
- Matson, R. G., and Gary Coupland. 1995. *The Prehistory of the Northwest Coast*. Academic Press, San Diego.
- Mauger, G.S., S.Y. Lee, and J.S. Won. 2017. Changing Streamflow in Icicle, Peshastin, and Mission Creeks. Climate Impacts Group, University of Washington, Seattle. URL: https://data.cig.uw.edu/picea/mauger/2017_03_IcicleCreekWG/pub/TechReport_IWG_ChelanCounty_20170510_FINAL.pdf.
- McMillen Jacobs Associates and DJ Warren Associates. 2016. *Leavenworth Fisheries Complex Planning Report*. URL: <https://www.fws.gov/leavenworthfisheriescomplex/pdfs/LFC%20Planning%20Report%20Volume%201.pdf>.
- Miller, Jay. 1998. Middle Columbia River Salishans. In Plateau, edited by Deward E. Walker, Jr., pp. 253-270, Handbook of North American Indians Vol. 12, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

- Mooney, J. 1896. The Ghost Dance Region and the Sioux Outbreak of 1890. University of Nebraska Press, Lincoln.
- Mooney, J. 1896. The Ghost Dance Region and the Sioux Outbreak of 1890. University of Nebraska Press, Lincoln.
- Moscoso, L. (USFS). Email from Leslie Moscoso, District Recreation Program Manager, U.S. Forest Service, Okanogan-Wenatchee National Forest, Wenatchee River Ranger District, to Lisa Adolfson, ESA, Seattle, WA. March 8, 2021.
- Mote, P., A. Hamlet, M. Clark, and D. Lettenmaier. 2005. Declining Mountain Snowpack in Western North America. *Bulletin of the American Meteorological Society*. 86:1.
- Muir, H., M. Maxey, T. Becker, and M. Cooper 2020. Monitoring and Evaluation of the Leavenworth National Fish Hatchery Spring Chinook Salmon Program, 2019. U.S. Fish and Wildlife Service, Leavenworth WA.
- Mullan, J.W., K.R. Williams, G. Rhodus, T.W. Hillman, and J.D. McIntyre. 1992. Production and habitat of salmonids in Mid-Columbia River tributaries. Monograph 1, U.S. Fish and Wildlife Service, Leavenworth, WA.
- NASS (National Agricultural Statistics Service). 2017. Census of Agriculture, Chelan County, Washington Profile. United States Department of Agriculture. URL: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Washington/cp53007.pdf.
- National Park Service. 2013. Director's Order #41: Wilderness Stewardship. Effective date: May 13, 2013. URL: https://www.nps.gov/policy/DOrders/DO_41.pdf
- National Park Service. 2016. Management Policies 2006. URL: https://www.nps.gov/subjects/policy/upload/MP_2006.pdf.
- NatureServe. 2021. Explorer online guide. Accessed: 10 February 2021. URL: <https://explorer.natureserve.org/>.
- Nelson, Charles M. 1990. Prehistory of the Puget Sound Region in Northwest Coast. In Northwest Coast, edited by Wayne Suttles, pp. 481-484. Handbook of North American Indians, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.
- Nelson, M.C, A. Johnsen, and R.D. Nelle. 2011. Seasonal movements of adult fluvial bull trout and redd surveys in Icicle Creek, 2009 Annual Report. U.S. Fish and Wildlife Service, Leavenworth Washington.
- Nelson, M.C, A. Johnsen, D. Pearson, and R.D. Nelle. 2009. Seasonal movements of adult fluvial bull trout in Icicle Creek, WA 2008 Annual Report. U.S. Fish and Wildlife Service, Leavenworth, WA.
- NEPA Committee and IWGEJ (Federal Interagency Working Group on Environmental Justice). 2016. Promising Practices for EJ Methodologies in NEPA Reviews. EPA 300B16001. March 2016. Accessed at https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf, February 23, 2021.
- NETROnline.2021. 1963, 1998, 2006, 2009, 2011, 2013, 2013, 2015, 2017 Aerial Coverage. URL: www.HistoricAerials.com.

- NMFS (National Marine Fisheries Service). 2005. Endangered and threatened species; designation of critical habitat for 13 evolutionarily significant units of Pacific salmon (*Oncorhynchus* spp.) and steelhead (*O. mykiss*) in Washington, Oregon, and Idaho; Final Rule. September 2, 2005. Federal Register 70(170):52630–52858.
- NMFS (National Marine Fisheries Service). 2017. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation - Leavenworth National Fish Hatchery Spring Chinook Salmon Program (Reinitiation 2016). NMFS Consultation Number: WCR-2017-7345. September 2017.
- NOAA (National Oceanic and Atmospheric Administration). 2001. Global Surface Hourly Integrated Dataset for 2011–2020 at Cashmere-Dryden Airport. NEI (National Centers for Environmental Information). Accessed October 2021.
- Northwest FCS (Northwest Farm Credit Services). 2019a. Market Snapshot: Pears. Released March 31, 2019.
- Northwest FCS (Northwest Farm Credit Services). 2019b. Market Snapshot: Cherries. Released December 31, 2019.
- Northwest FCS (Northwest Farm Credit Services). 2019c. Market Snapshot: Apples. Released June 30, 2019.
- Northwest FCS (Northwest Farm Credit Services). 2020a. Market Snapshot: Apples: Released December 31, 2020.
- Northwest FCS (Northwest Farm Credit Services). 2020b. Market Snapshot: Pears: Released December 31, 2020.
- Northwest FCS (Northwest Farm Credit Services). 2020c. Market Snapshot: Cherries: Released September 30, 2020.
- NPS (National Park Service). 1997. How to Apply the National Register Criteria for Evaluation. National Register Bulletin No. 15, U.S. Department of Interior, National Park Service Cultural Resources. Government Printing Office, Washington, D.C.
- NPS (National Park Service). 2017. North Cascades National Park: Mountain Goats. Accessed: 11 February 2021. URL: <https://www.nps.gov/noca/learn/nature/mountain-goats.htm>.
- NRCS (USDA Natural Resources Conservation Service). 2022. Web Soil Survey (WSS). Accessed: 12 December 2022. Available: <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.
- NWFSC (Northwest Fisheries Science Center). 2015. Status Review Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest. December 21, 2015.
- NWIFC (Northwest Indian Fisheries Commission). 2020. Statewide integrated fish distribution web map. URL: <https://geo.nwifc.org/swifd/>. Accessed: December 2020.
- NWPCC (Northwest Power and Conservation Council). 2004. Wenatchee Subbasin Plan, Prepared by Chelan County and the Yakama Nation for the NPCC, May 28, 2004.
- Oliver, N., and J. Meninick. 2022. Governmental Introductory Presentation prepared in partnership with Yakama Nation Fisheries, Yakama Nation Cultural Resources, and the Yakama Nation Office of Legal Counsel: Cultural Resource Section: The Pisqjouse. For further information see Keenan et al. (2022) on file with Yakama Nation Office of Legal Counsel. As cited in YN 2022.

- OpenStreetMap. 2019. OpenStreetMap North America, online at <http://download.geofabrik.de/north-america.html>. Accessed July 2022.
- OSHA (Occupational Safety and Health Administration). 2005. Fact Sheets on Natural Disaster Recovery: Flood Cleanup. Accessed October 12, 2022 from URL: <https://www.osha.gov/sites/default/files/publications/OSHA3471.pdf>.
- Ostrander, Tom, Kathy Cleveland, Chanda Schneider, and Katie Wilson. 2023. DRAFT Eightmile Dam Rebuild and Restoration Project, Chelan County, Washington, Cultural Resources Assessment. On file, ESA, Seattle.
- Peven, C.M. 1994. Spring and summer chinook spawning ground surveys on the Wenatchee River basin, 1993. Chelan County Public Utility District, Wenatchee, WA.
- Peven, C. 2003. Population Structure, Status and Life Histories of Upper Columbia Steelhead, Spring and Summer/fall Chinook, Sockeye, Coho Salmon, Bull Trout, Westslope Cutthroat Trout, Non-migratory Rainbow Trout, Pacific Lamprey, and Sturgeon. Prepared by Peven Consulting, Inc.
- Polly, Kris. 2018. Tony Jantzer of Icicle and Peshastin Irrigation Districts. Interview with Irrigation Leader Magazine, May 2018. URL: <http://irrigationleadermagazine.com/tony-jantzer-of-icicle-and-peshastin-irrigation-districts/>.
- Potter, H. 2016. Memo: Assessing Fish Passage at Leavenworth National Fish Hatchery using DIDSON Sonar. U.S. Fish and Wildlife Service, Leavenworth, Washington.
- Potter, H. 2017. Memo: Snorkel survey results for adult spring Chinook Salmon and Bull Trout in Icicle Creek, 2017. U.S. Fish and Wildlife Service, Leavenworth, Washington.
- Potter, H. 2018. Memo: Snorkel survey results for adult spring Chinook Salmon and Bull Trout in Icicle Creek, 2018. U.S. Fish and Wildlife Service, Leavenworth, Washington.
- Potter, H., J. Bednarek, T. Becker, M. Cooper, and T. Collier. 2018. Leavenworth National Fish Hatchery Annual Report, 2017. U.S. Fish and Wildlife Service, Leavenworth WA.
- Proebstel, D.S., R.J. Behnke, and S.M. Noble. 1998. Identification of salmonid fishes from tributary streams and lake of the mid-Columbia Basin. 171pp.
- Query, J., J. Baugh, and S. Steinmetz. 1995b. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS01570. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Query, Juliane, J. Baugh, and S. Steinmetz. 1995a. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS01569. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Ray, Verne F. 1933. The Sanpoil and Nespelem: Salishan Peoples of Northeastern Washington. University of Washington Publications in Anthropology, Vol 5. Seattle. University of Washington Press.
- Ray, Verne F. 1936. Native Villages and Groupings of the Columbia Basin. Pacific Northwest Quarterly 27(2):99-152.

- Reclamation (U.S. Bureau of Reclamation). 2010. *Groundwater Conditions at the Leavenworth National Fish Hatchery, Leavenworth, Washington*. URL: [http://www.co.chelan.wa.us/files/natural-resources/documents/Planning/icicle_work_group/Icicle_Studies/140-218%20LNFH%20groundwater%20report%20\(Feb%202010\)%20\(2\).pdf](http://www.co.chelan.wa.us/files/natural-resources/documents/Planning/icicle_work_group/Icicle_Studies/140-218%20LNFH%20groundwater%20report%20(Feb%202010)%20(2).pdf).
- Reed, C. (USFS). Email from Carly Reed, Wilderness & Climbing Program Manager/Outfitter & Guide Enchantments Permit Administrator, Forest Service, Wenatchee River Ranger District to Madeline Remmen, ESA, Seattle, WA, April 27, 2022.
- REI (Recreational Equipment Inc.). 2021. Climbing and Bouldering. Accessed February 19, 2021. URL: <https://www.rei.com/learn/expert-advice/climbing-bouldering-rating.html>.
- Riley S., Brown J., Sikich J., Schoonmaker C., Boydston E. 2014. Wildlife Friendly Roads: The Impacts of Roads on Wildlife in Urban Areas and Potential Remedies. In: McCleery R., Moorman C., Peterson M. (eds) *Urban Wildlife conservation*. Springer, Boston, MA. https://doi.org/10.1007/978-1-4899-7500-3_15.
- Ringel, B.K. 1997. Analysis of Fish Populations in Icicle Creek, Trout Creek, Jack Creek, Peshastin Creek, Ingalls Creek, and Negro Creek, Washington - 1994 and 1995. Prepared by the Mid-Columbia River Fishery Resource Office. Leavenworth, Washington. September 1997.
- Rinkevich, S., K. Greenwood, and C. Leonetti. 2011. Traditional Ecological Knowledge for Application by Service Scientists Fact Sheet. U.S. Fish and Wildlife Service, Native American Program. URL: <https://portal.azoah.com/oedf/documents/17-001-WQAB/SCAT-17-USFWS.TEK-fact-sheet.2011.BATES.pdf>.
- Rocket Homes. 2022a. Chelan County Housing Market Report. URL: <https://www.rockethomes.com/real-estate-trends/wa/chelan-county>. Accessed: July 5, 2022.
- Rocket Homes. 2022b. Leavenworth Housing Market Report. URL: <https://www.rockethomes.com/real-estate-trends/wa/leavenworth>. Accessed: July 5, 2022.
- Rosenberger, R.S., E.M. White, J.D. Kline, and C. Cvitanovich. 2017. Recreation Economic Values for Estimating Outdoor Recreation Economic Benefits From the National Forest System. Gen. Tech. Rep. PNW-GTR-957. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Runnoe, V. 2006. Helicopter Use in Wildlife Management. Press Release. Idaho Department of Fish and Game. March 27, 2006. URL: <https://idfg.idaho.gov/press/helicopter-use-wildlife-management>.
- Schalk, Randall F. 1983. Cultural Resource Investigations for the Lyons Ferry Fish Hatchery Project, near Lyons Ferry, Washington. Washington State University, Laboratory of Archaeology and History, Pullman.
- Schuster, Helen H. 1998. Yakima and Neighboring Groups. In Plateau, edited by Deward E. Walker, Jr., pp. 327-351, *Handbook of North American Indians Vol. 12*, William C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.
- Seattle Audubon. 2021. BirdWeb. Seattle Audubon Society for Birds and Nature. Accessed: 4 February 2021. URL: <http://www.birdweb.org/BIRDWEB/birds>.
- Sherrod, B.L., R.J. Blakely, and C.S. Weaver. 2015. *LIDAR helps identify source of 1872 Earthquake near Chelan, Washington*; Abstract, American Geophysical Union Fall Meeting, San Francisco, California, December 2015.

- Skalicky, J.J., D. Hines, D. Anglin, and N. Jones. 2013. Icicle Creek Instream Flow and Fish Habitat Analysis for the Leavenworth National Fish Hatchery. U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office, Vancouver, WA.
- Speulda, Lou Ann. 1996. Historic Properties Identification Report of the Salmon Carcass Disposal Pits for the Leavenworth National Fish Hatchery, Chelan County, WA. Prepared by U.S. Fish and Wildlife Service, Sherwood, OR. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Speulda, Lou Ann. 1997. State of Washington Historic Property Inventory Form: Leavenworth National Fish Hatchery. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Spier, Leslie. 1936. Tribal Distribution in Washington. American Anthropological Association General Series in Anthropology No. 3. George Banta, Menasha, Wisconsin.
- Spokesman-Review, 1918. Transfer Canal System: Private Company's Assets Taken over by District. September 6, 1918.
- Steinmetz, S., B. Christensen, and B. Reed. 1995a. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS1574. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Steinmetz, S., B. Christensen, and B. Reed. 1995b. Cultural Resource Site Report, Region 6, U.S. Forest Service: 45FS01584. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Superior Court of the State of Washington. 1929. No. 8252 Report of Referee, in the matter of the determination of the rights of the use of the waters of Icicle Creek and its tributaries in Chelan County, Washington. Signed by R.K. Tiffany, State Supervisor of Hydraulics. April 18, 1929.
- Sylvester A.H. 1943. Place-Naming in the Northwest. *American Speech*, 18 (4): 241-252. As cited in personal communication Downes 2022.
- Tabor, R.W., R.B. Waitte, V.A. Fizzell, D.A. Swanson, G.R. Byerly, and R.D. Bentley. 2017. *Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington*. U.S. Geological Survey, Miscellaneous Investigations Series Map I-1311. URL: <https://pubs.usgs.gov/imap/i1311/>.
- Tabor, R.W., V.A. Fizzell, Jr., J.T. Whetten, R.B. Waitt, D.A. Swanson, G.R. Byerly, D.B. Booth, M.J. Hetherington, and R.E. Zartman. 1987. *Geologic Map of the Chelan 30-minute by 60-minute Quadrangle, Washington*. U.S. Geological Survey, Miscellaneous Investigations Series Map I-1661. URL: <https://pubs.usgs.gov/imap/i1661/>.
- Tarman, Sylvia. 2018a. State of Washington Archaeological Site Inventory Form: 45CH00943. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Tarman, Sylvia. 2018b. State of Washington Archaeological Site Inventory Form: 45CH00944. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- Taylor, Amanda, and F. Scott Pierson. 2018. Archaeological Survey for Leavenworth and Lower Wenatchee Reach Potential Pump Test Pit Locations, Chelan County, WA. Prepared for Yakama Nation Fisheries by Willamette Cultural Resources Associates, Ltd., Seattle, WA. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.

- Teit, James H. 1928. The Middle Columbia Salish. University of Washington Publications in Anthropology 2(4):83-128. Franz Boas, editor. University of Washington Press, Seattle.
- Therrell, Lisa, David Cole, Victor Claassen, Chris Ryan, and Mary Ann Davies. 2006. *Wilderness and Backcountry Site Restoration Guide*. USDA Forest Service Technology and Development Program, Missoula, MT. September 2006.
- Thompson, Rustin. 2002. False Promises, The Lost Land of the Wenatchi, Newly Updated posted 2019. Documentary. URL: <https://www.cct-hsy.com/wenatchi-indians/>.
- U.S. Census Bureau. 2009a. Race and Population, 2005-2009 American Community Survey 5-year estimates. Retrieved from Steven Manson, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles. IPUMS National Historical Geographic Information System: Version 15.0 [dataset]. Minneapolis, MN: IPUMS. 2020. URL: <http://doi.org/10.18128/D050.V15.0>.
- U.S. Census Bureau. 2009b. Selected housing characteristics, 2005-2009 American Community Survey 5-year estimates. Retrieved from Steven Manson, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles. IPUMS National Historical Geographic Information System: Version 15.0 [dataset]. Minneapolis, MN: IPUMS. 2020. URL: <http://doi.org/10.18128/D050.V15.0>.
- U.S. Census Bureau. 2012. Accommodation and Food Services: Summary Statistics for the U.S., States, and Selected Geographies: 2012. URL: <https://data.census.gov/cedsci/table?q=ec1272&g=0500000US53007&n=N0300.00&tid=ECNBASIC2012.EC1272A1&hidePreview=true>.
- U.S. Census Bureau. 2017. Accommodation and Food Services: Summary Statistics for the U.S., States, and Selected Geographies: 2017. URL: <https://data.census.gov/cedsci/table?q=EC1772BASIC%3A%20Accommodation%20and%20Food%20Services%3A%20Summary%20Statistics%20for%20the%20U.S.%20States,%20and%20Selected%20Geographies%3A%202017&g=0500000US53007&n=N0300.00&tid=ECNBASIC2017.EC1772BASIC&hidePreview=true>.
- U.S. Census Bureau. 2019a. Race and Population, 2015-2019 American Community Survey 5-year estimates. Retrieved from Steven Manson, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles. IPUMS National Historical Geographic Information System: Version 15.0 [dataset]. Minneapolis, MN: IPUMS. 2020. URL: <http://doi.org/10.18128/D050.V15.0>.
- U.S. Census Bureau. 2019b. Selected housing characteristics, 2015-2019 American Community Survey 5-year estimates. URL: <https://data.census.gov/cedsci/table?t=Vacancy&g=1600000US5338845&y=2019&tid=ACSDP5Y2019.DP04&hidePreview=false>.
- U.S. Census Bureau. 2020. American Community Survey (ACS) 2015–2019 5-Year Data Release. Accessed at <https://www.census.gov/newsroom/press-kits/2020/acs-5-year.html>, March 2, 2021.
- U.S. Department of Housing and Urban Development. 1972. Aircraft Noise Impact—Planning Guidelines for Local Agencies.
- U.S. Department of the Interior. 2017. Interactive Viewer - Monitoring Trends in Burn Severity. Accessed: 17 February 2021. URL: <https://www.mtbs.gov/viewer/index.html>.
- U.S. Surveyor General. 1892. Township 24 North, Range 17 East. URL: https://www.blm.gov/or/landrecords/survey/yPlatView1_2.php?path=PWA&name=t240n170e_001.jpg.

- U.S. Surveyor General. 1907. Township 24 North, Range 17 East. URL: https://www.blm.gov/or/landrecords/survey/yPlatView1_2.php?path=PWA&name=t240n170e_002.jpg.
- U.S. Surveyor General. 1913. Township 23 North, Range 16 East. URL: https://www.blm.gov/or/landrecords/survey/yPlatView1_2.php?path=PWA&name=t230n160e_001.jpg.
- U.S. Surveyor General. 1917. Township 24 North, Range 16 East. URL: https://www.blm.gov/or/landrecords/survey/yPlatView1_2.php?path=PWA&name=t240n160e_001.jpg.
- U.S. Surveyor General. 1924. Township 23 North, Range 16 East. URL: https://www.blm.gov/or/landrecords/survey/yPlatView1_2.php?path=PWA&name=t230n160e_002.jpg.
- UCSRB (Upper Columbia Salmon Recovery Board). 2007. Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan. 352p.
- University of Washington Department of Environmental & Occupational Health Sciences. 2019. Washington Environmental Health Disparities Map: technical report. Seattle.
- USACE (United States Army Corps of Engineers). 1982. Operational Noise Data for UH-60A and CH-47C Army Helicopters. Integrated Installation Noise Contour System. Construction Engineering Research Laboratory. Technical Report N-131. June 1982. URL: http://www.chinook-helicopter.com/Technical_Reports/Operational_Noise_Data_for_UH-60A_and_CH-47C_Army_Helicopters.pdf.
- USFS (U.S. Department of Agriculture Forest Service). 1962. Wenatchee National Forest. Map on file, University of Washington, Seattle.
- USFS (U.S. Department of Agriculture Forest Service). 1966. Wenatchee National Forest. Map on file, University of Washington, Seattle.
- USFS (U.S. Department of Agriculture Forest Service). 1969. Wenatchee National Forest, Trail Bike Trips. Map on file, University of Washington, Seattle.
- USFS (U.S. Department of Agriculture Forest Service). 1975a. Aerial Image. Line 36001. 53037 1575 140. On file, University of Washington, Seattle.
- USFS (U.S. Department of Agriculture Forest Service). 1975b. Aerial Image. Line 35004. 53037 1575 103. On file, University of Washington, Seattle.
- USFS (U.S. Department of Agriculture Forest Service). 1979. Alpine Lakes Area Acquisitions, Final Environmental Impact Statement. Wenatchee, Colville, and Mt Baker-Snoqualmie National Forests, Pacific Northwest Region. On file, Environmental Science Associates, Seattle.
- USFS (U.S. Department of Agriculture Forest Service). 1981. *Alpine Lakes Area Land Management Plan*. Selected Alternative from the Final Environmental Impact Statement.
- USFS (U.S. Department of Agriculture Forest Service). 1984. *Alpine Lakes Area Land Management Plan*.
- USFS (U.S. Department of Agriculture Forest Service). 1990. *Land and Resource Management Plan*. Wenatchee National Forest. Accessed at https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_053595.pdf.
- USFS (U.S. Department of Agriculture Forest Service). 1995. Icicle Creek Watershed Assessment. Okanogan and Wenatchee National Forest, Leavenworth Ranger District. Wenatchee, WA.

- USFS (U.S. Department of Agriculture Forest Service). 2010. List of Invasive Plants on National Forests in the PNW Region. Accessed September 27, 2021 from URL: <https://www.fs.usda.gov/detail/r6/forest-grasslandhealth/invasivespecies/?cid=stelprdb5302157>.
- USFS (U.S. Department of Agriculture Forest Service). 2016a. Jobs and Income. Economic Contributions in 2016 at a Glance. Okanogan-Wenatchee National Forest. URL: <https://www.fs.fed.us/emc/economics/contributions/documents/at-a-glance/published/pacificnorthwest/AtaGlance-OkanoganWenatchee.pdf>. Accessed February 18, 2021.
- USFS (U.S. Department of Agriculture Forest Service). 2016b. NVUM Results Application. Wenatchee National Forest, 2016, Activity Participation. URL: <https://www.fs.usda.gov/about-agency/nvum/>. Accessed February 19, 2021.
- USFS (U.S. Department of Agriculture Forest Service). 2017a. *Post-Fire BAER Assessment Burned Area Emergency Response (BAER) Information Brief, Jack Creek Fire 2500-8 Summary*. URL: <http://centralwashingtonfirerecovery.info/2017/wildfire-reports/jack-creek-fire/>.
- USFS (U.S. Department of Agriculture Forest Service). 2017b. *Enchantment Permit Area Visitor Use Data Analysis 2007-2017*. Prepared by Gabrielle Snider, Recreation Planner, Forest Service Washington Office, Business Operations, Enterprise Program for Wenatchee River Ranger District, Okanogan Wenatchee National Forests.
- USFS (U.S. Department of Agriculture Forest Service). 2018a. Letter from Michael Williams, Forest Supervisor, to Joe Witczak, Ecology. February 20, 2018.
- USFS (U.S. Department of Agriculture Forest Service). 2018b. Letter from Michael Williams, Forest Supervisor, Anthony Jantzer, Manager, Icicle Peshastin Irrigation District. March 30, 2018.
- USFS (U.S. Department of Agriculture Forest Service). 2019a. Enchantment Permit Lottery Statistics. URL: https://www.fs.usda.gov/detail/okawen/passes-permits/recreation/?cid=fsbdev3_053607.
- USFS (U.S. Department of Agriculture Forest Service). 2019b. Enchantments 2019 Use Numbers. Emailed from Leslie Moscoso, USFS to Lisa Adolfson, ESA on February 2, 2021.
- USFS (U.S. Department of Agriculture Forest Service). 2020. 2020 Enchantments Use Summary. Emailed from Leslie Moscoso, USFS to Lisa Adolfson, ESA on February 2, 2021.
- USFS (U.S. Department of Agriculture Forest Service). 2021a. *Alpine Lakes Wilderness Character Narrative*. May 2021.
- USFS (U.S. Department of Agriculture Forest Service). 2021b. *Okanogan-Wenatchee National Forest Wilderness Regulations*. Accessed February 11, 2021. URL: <https://www.fs.usda.gov/detail/okawen/specialplaces/?cid=stelprdb5405234>.
- USFS (U.S. Department of Agriculture Forest Service). 2021c. *Okanogan-Wenatchee National Forest Enchantment Permit Area Rules and Regulations*. Accessed February 11, 2021. URL: <https://www.fs.usda.gov/detail/okawen/passes-permits/recreation/?cid=stelprdb5405903>.
- USFS (U.S. Department of Agriculture Forest Service). 2021d. Okanogan-Wenatchee National Forest Alpine Lakes Wilderness: Okanogan-Wilderness. Accessed on February 11, 2021. URL: [Okanogan-Wenatchee National Forest - Alpine Lakes Wilderness: Okanogan-Wenatchee \(usda.gov\)](https://www.fs.usda.gov/detail/okawen/specialplaces/?cid=stelprdb5405234).
- USFS (U.S. Department of Agriculture Forest Service). 2021e. Okanogan-Wenatchee National Forest Enchantment Area Wilderness Permits. Accessed February 11, 2021. URL: https://www.fs.usda.gov/detail/okawen/passes-permits/recreation/?cid=fsbdev3_053607.

- USFS (U.S. Department of Agriculture Forest Service). 2021f. Enchantments Permit Lottery Statistics by Zone. Accessed April 6, 2022. URL: https://www.fs.usda.gov/detail/okawen/passes-permits/recreation/?cid=fsbdev3_053607.
- USFS (U.S. Department of Agriculture Forest Service). 2021g. Jack Creek Fire (2500-8) Soil Burned Area Emergency Response Information Brief Summary and Jack Creek Fire Severity Map. URL: <http://centralwashingtonfirerecovery.info/2017/wildfire-reports/jack-creek-fire/>. Accessed January 30, 2021.
- USFS (U.S. Department of Agriculture Forest Service). 2021h. Alpine Lakes Wilderness Web Site, Accessed: 1 February 2021. URL: <http://www.wilderness.net/index.cfm?fuse=NWPS&sec=wildView&WID=8>.
- USFS (U.S. Department of Agriculture Forest Service). 2022. *Enchantment Permit Area* (webpage). Accessed June 7, 2022. URL: <https://www.recreation.gov/permits/233273>.
- USFS (U.S. Department of Agriculture Forest Service). n.d. Alpine Lakes Wilderness Area regulations and restrictions.
- USFWS (U.S. Department of Fish and Wildlife). 1997. National Register of Historic Places Registration Form: Leavenworth National Fish Hatchery 45CH582. On file, Washington State Department of Archaeology and Historic Preservation, Olympia.
- USFWS (U.S. Fish and Wildlife Service). 2016. Leavenworth Fisheries Complex: Planning Report. Prepared by McMillen Jacobs Associates and DJ Warren Associates. August.
- USFWS (United States Fish and Wildlife Service). 1999. Endangered and threatened wildlife and plants; determination of threatened status for bull trout in the coterminous United States. Final rule November 1, 1999. Federal Register 64(210):58910-58933.
- USFWS (United States Fish and Wildlife Service). 2005. Endangered and threatened wildlife and plants; Designation of critical habitat for the Klamath River and Columbia River Populations of Bull Trout (*Salvelinus confluentus*). Final Rule. Federal Register 69(193):56211-56311.
- USFWS (United States Fish and Wildlife Service). 2009. Memorandum to files re: Snorkel survey results for adult spring Chinook salmon and bull trout in Icicle Creek. August 6, 2009. Mid-Columbia River Fishery Resource Office, Leavenworth, Washington.
- USFWS (United States Fish and Wildlife Service). 2011. Biological Assessment for the Operation and Maintenance of Leavenworth National Fish Hatchery. Prepared by the USFWS, Leavenworth Fisheries Complex, Leavenworth, Washington.
- USFWS (United States Fish and Wildlife Service). 2015. Recovery Plan for the Coterminous United States Population of Bull Trout (*Salvelinus confluentus*). Portland, Oregon. xii + 179 pages.
- USFWS (United States Fish and Wildlife Service). 2016. Snorkel survey results for adult spring Chinook Salmon and Bull Trout in Icicle Creek, 2016, Memorandum to interested parties, from Hayley Potter, USFWS, Mid-Columbia Fish and Wildlife Conservation Office, Leavenworth, Washington.
- USFWS (United States Fish and Wildlife Service). 2021a. Endangered Species Act, Species County Report. Listed Species believed to or known to occur in Chelan, Washington. Accessed: 4 February 2021. URL: <https://www.fws.gov/endangered/?ref=topbar>.

- USFWS (United States Fish and Wildlife Service). 2021b. Environmental Conservation Online System (ECOS) Information for Planning and Consultation (IPaC) tool. Accessed: January 2021. URL: <https://ecos.fws.gov/ipac/>.
- USFWS (United States Fish and Wildlife Service). 2022. National Wetlands Inventory. Accessed August 8, 2022 from URL: <https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>.
- USGS (U.S Geological Survey). 2021. The StreamStats program for Washington, URL: <http://water.usgs.gov/osw/streamstats/washington.html>. Accessed July 2022.
- USGS (U.S. Geological Survey). 1904. *Chiwaukum, WA*. 30' Series Quadrangle. U.S. Geological Survey, Reston, Virginia.
- USGS (U.S. Geological Survey). 1966. *Leavenworth, WA*. 15' Series Quadrangle. U.S. Geological Survey, Reston, Virginia.
- USGS (U.S. Geological Survey). 1967. *Chiwaukum Mts, WA*. 15' Series Quadrangle. U.S. Geological Survey, Reston, Virginia.
- USGS (U.S. Geological Survey). 1977. *Chelan, WA*. Intermediate Series Quadrangle. U.S. Geological Survey, Reston, Virginia.
- USGS (U.S. Geological Survey). 2021. Terrain data from the USGS National Map website. Accessed December 2021 from URL: <https://apps.nationalmap.gov/downloader/>.
- USGS (U.S. Geological Survey). 2022. USGS Gage 12458500 Icicle Creek Near Leavenworth, WA Stream Site. Accessed June 28, 2022, from URL: https://nwis.waterdata.usgs.gov/wa/nwis/inventory/?site_no=12458500&agency_cd=USGS.
- USGS (U.S. Geological Survey) and NSHM (National Seismic Hazard Mapping Project). 2021 (accessed). Quaternary Fault and Fold Database for the United States. Web application. Accessed March 2, 2021. URL: <https://www.usgs.gov/natural-hazards/earthquake-hazards/faults>.
- Valenta, Jared. 2012. The Identification and Historic Context of Mining Archaeology of the Wenatchee Mountains within the Alpine Lakes Wilderness. Thesis presented to Central Washington University. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.
- Varela & Associates, Inc. 2018. City of Leavenworth Water System Plan. URL: <https://cityofleavenworth.com/col-assets/uploads/2018/02/14-10-01-Leavenworth-WSP-final-2018.pdf>.
- Washington State Department of Agriculture. 2019. Agricultural Land Use GIS Data. URL: <https://agr.wa.gov/departments/land-and-water/natural-resources/agricultural-land-use>.
- Washington State ESD (Employment Security Department). 2021. Chelan and Douglas County profiles. URL: <https://esd.wa.gov/labormarketinfo/county-profiles/chelan-douglas#labor>, November 22, 2021.
- Washington State Noxious Weed Control Board. 2021. Washington State Noxious Weed List. Accessed: September 27 2021 from URL: https://www.nwcb.wa.gov/pdfs/2021-State-Weed-List_Common_Name-8.5x11.pdf.
- WBWG (Western Bat Working Group). 2021. Species Info. Accessed: 10 February 2021. URL: <http://wbwg.org/western-bat-species/>.

- WDF (Washington Department of Fisheries) and WWTIT (Western Washington Treaty Indian Tribes). 1993. 1992 Washington State salmon and steelhead stock inventory (SASSI). Internal Report to Washington Department of Fisheries and Wildlife, Olympia, WA, 212 p. plus 5 regional volumes.
- WDFW (Washington Department of Fish and Wildlife). 1997. Washington State salmonid stock inventory: Bull trout/Dolly Varden.
- WDFW (Washington Department of Fish and Wildlife). 2005. Management of Washington's High Lakes. December 2005.
- WDFW (Washington Department of Fish and Wildlife). 2015. State Wildlife Action Plan Update: Appendix A-1 Species of Greatest Conservation Need Fact Sheet. URL: https://wdfw.wa.gov/sites/default/files/publications/01742/10_A1_Mammals.pdf.
- WDFW (Washington Department of Fish and Wildlife). 2016. Washington State Mule Deer Management Plan, Wildlife Program, Washington Department of Fish and Wildlife, Olympia, WA, USA. 144 p.
- WDFW (Washington Department of Fish and Wildlife). 2017. Tribal Ceded Areas in Washington State. Washington Department of Fish and Wildlife Interpretation Map. URL: https://wdfw.wa.gov/sites/default/files/201812/tribal_ceded_areas_in_washington_state.pdf.
- WDFW (Washington Department of Fish and Wildlife). 2020a. Priority Habitats and Species Report and GIS Package. Olympia, Washington. Received on 15 December 2020.
- WDFW (Washington Department of Fish and Wildlife). 2020b. SalmonScape fish database and mapping application. URL: <http://wdfw.wa.gov/mapping/salmonscape/index.html> Accessed December 2020.
- WDFW (Washington Department of Fish and Wildlife). 2021a. Eightmile Fish Stocking Information. Accessed February 11, 2021. URL: [High lakes | Washington Department of Fish & Wildlife](https://wdfw.wa.gov/highlakes/).
- WDFW (Washington Department of Fish and Wildlife). 2021b. Fishing regulations. Accessed February 12, 2021. URL: <https://wdfw.wa.gov/fishing/regulations>.
- WDFW (Washington Department of Fish and Wildlife). 2021c. Species and Habitats; Species in Washington. Accessed: 4 February 2021. URL: <https://wdfw.wa.gov/species-habitats/species>.
- WDFW (Washington Department of Fish and Wildlife). 2021d. WDFW Stocking History Records for Eightmile Lake (Chelan County) - 1933 to 2005.
- WDNR (Washington Department of Natural Resources). 2020. DNR Hydrography – Watercourses – Forest Practices Regulation. Washington Geospatial Open Data Portal. URL: <https://data-wadnr.opendata.arcgis.com/datasets/816586b10c6c4954883b236f9fff208f/explore?location=47.191238%2C-120.754300%2C7.68>. Accessed July 2022.
- WDNR (Washington Department of Natural Resources). 2021. WDNR GIS Open Data: Washington Large Fires 1973-2020. URL: <https://data-wadnr.opendata.arcgis.com/>. Accessed: 27 September 2021.
- WDNR (Washington Department of Natural Resources). 2022. *Washington Geologic Information Portal*. URL: <https://geologyportal.dnr.wa.gov/>.
- White, E. 2017. Spending Patterns of Outdoor Recreation Visitors to National Forests - DRAFT. Gen. Tech. Rep. PNW-GTR. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

- Wilderness Connect. 2022. Alpine Lakes Wilderness. URL: <https://wilderness.net/visit-wilderness/?ID=8#atdModal>. Accessed December 8, 2022.
- WSDOT (Washington State Department of Transportation). 2017. Guidance for NEPA and SEPA Project-Level Climate Change Evaluations. WSDOT Environmental Services Office.
- WSU Extension (Washington State University Extension). nd. Tree Fruit Overview. URL: https://extension.wsu.edu/chelan-douglas/agriculture/treefruit/horticulture/tree_fruit_overview/. Accessed February 22, 2021.
- Wydoski R.S., and R.R. Whitney. 2003. Inland Fishes of Washington. University of Washington Press, Seattle, Washington.
- Yakama Nation. 2017. Mid-Columbia Coho Restoration Master Plan. February.
- Yakama Treaty. June 9, 1855 12 Stat., 951. Ratified Mar. 8, 1859. Proclaimed Apr. 18, 1859. <https://www.yakama.com/about/treaty/>.
- Yakima Tribe v. the United States (Defendant) 1963. Confederated Tribes of the Colville Reservation, et al. (Intervenor). (July 29, 1963). Before the Indian Claims Commission, Docket 161. In Indian Claims Commission Decisions. Vol. 12; Part A. Native American Rights Fund. Boulder CA.
- YN (Confederated Tribes and Bands of the Yakama Nation). 2022. Report to address ongoing concerns in ethnographic, historic, and contextual reporting standards related to the Eightmile Dam EIS. Prepared by Noah Oliver based on information obtained from tribal members and the Yakama Nation Atlas. Submitted to the Washington State Department of Ecology. December 1, 2022 Document Draft.

CHAPTER 19: LIST OF PREPARERS

Washington State Department of Ecology
Tom Tebb
Melissa Downes
Ingrid Ekstrom
Gary Myers
Consultant Team
Lisa Adolfson, Project Manager, Reviewer, ESA
Peter Carr, Technical Editor, ESA
Molly Adolfson, Senior Advisor, Reviewer, ESA
Alpine Lakes Wilderness
Mark Johnson, ESA
Water Resources
Hannah Snow, ESA
Greg Woloveke, ESA
John Vlastelicia, ESA
Joe Becker, Robinson Noble
Water Rights
Joe Becker, Robinson Noble
Jim Hay, Robinson Noble
Geology
Rick Powell, Robinson Noble
Plants and Animals
Jeff Barna, ESA
Pete Lawson, ESA

Noise
Kurt Richman, ESA
Recreation
Spencer Easton, ESA
Madeline Remmen, ESA
Visual
Mark Johnson, ESA
Madeline Remmen, ESA
Public Safety
Madeline Remmen, ESA
Historic & Cultural Resources
Tom Ostrander, ESA
Kathy Cleveland, ESA
Chanda Schneider, ESA
Tribal Resources
Stacy Bumback, ESA
Tom Ostrander, ESA
Chanda Schneider, ESA
Agriculture and Economics
Maura Flight, Industrial Economics, Inc.
Eric Horsch, Industrial Economics, Inc.
Jen Kassakian, Industrial Economics, Inc.
Environmental Justice
Maura Flight, Industrial Economics, Inc.
Jen Kassakian, Industrial Economics, Inc.

CHAPTER 20: DISTRIBUTION LIST

Type	Name
Tribes	Confederated Tribes and Bands of the Yakama Nation
	Confederated Tribes of the Colville Reservation
Federal Agencies	United States Forest Service
	U.S. Fish and Wildlife Service – Leavenworth Fisheries Complex
	National Oceanic and Atmospheric Association – National Marine Fisheries Service
	United States Army Corps of Engineers
	United States Bureau of Reclamation - Yakima Office
State Agencies	Washington Department of Archaeology and Historic Preservation (DAHP)
	Washington Department of Fish and Wildlife (WDFW) Region 2
	Washington Department of Agriculture
	Washington Department of Commerce
	Washington Department of Corrections
	Washington Department of Ecology - SEPA Register
	Washington Department of Ecology – Office of Columbia River
	Washington Department of Ecology – Central Region Office
	Washington Department of Ecology – Southwest Regional Office, Shoreline
	Washington Department of Fish and Wildlife
	Washington Department of Health
	Washington Department of Natural Resources
	Washington Department of Social and Health Services
	Washington Department of Transportation - North Central Region
	Washington Department of Transportation
	Energy Facility Site Evaluation Council (EFSEC)
	Parks and Recreation Commission
	Puget Sound Partnership
	Puget Sound Regional Council
	Washington Governor Policy Advisor
Local Agencies	Chelan County
	Chelan County Natural Resources
	Chelan County Commissioner
	City of Leavenworth
	Leavenworth Public Library
	City of Cashmere

Type	Name
Organizations	Alpine Lakes Foundation
	Alpine Lakes Protection Society
	American Rivers
	Cascade Orchard Irrigation Company
	Cascadia Conservation District
	Center for Environmental Law and Policy
	Friends of Leavenworth
	Friends of the Enchantments
	Icicle Creek Watershed Council
	Icicle Fund
	Overlake Fly Fishing Club
	Sierra Club
	The Mountaineers
	The Wilderness Society
	Trout Unlimited
	Washington Trails Association
	Washington Wild
	Wilderness Watch
	Wise Use Movement
	Icicle & Peshastin Irrigation Districts
Peshastin Irrigation District	