

Kenai Peninsula Fish Habitat Partnership
2022 Freshwater Conservation Plan
A Plan to Protect Fish and Fish Habitat
in the Rivers, Lakes, and Streams of the Kenai Peninsula



Image: Wikimedia / Creative Commons

Acronyms

ADEC – Alaska Department of Environmental Conservation
ADF&G – Alaska Department of Fish and Game
ADOT – Alaska Department of Transportation
AEA – Alaska Energy Authority
AKISP – Alaska Invasive Species Partnership
BMP – Best Management Practices
CES – Cooperative Extension Service
CIK – Cook Inletkeeper
CNF – Chugach National Forest
EPA – Environmental Protection Agency
FERC – Federal Energy Regulatory Commission
HEA – Homer Electric Association
HSWCD – Homer Soil and Water Conservation District
KFNP – Kenai Fjords National Park
KHLT – Kachemak Heritage Land Trust
KNWR – Kenai National Wildlife Refuge
KPB – Kenai Peninsula Borough
KP-CISMA – Kenai Peninsula Cooperative Invasive Species Management Area
KWF – Kenai Watershed Forum
ORV – Outdoor Recreational Vehicle
SWCD – Soil and Water Conservation District
USFWS – U.S. Fish and Wildlife Service

Glossary

Adaptive Management: the incorporation of deliberate learning into professional practice to reduce uncertainty in decision making. Specifically, the integration of design, management, and monitoring to enable practitioners to systematically and efficiently test key assumptions, evaluate results, adjust management decisions, and generate learning.

Conservation Standards: a set of principles and practices that guide a structured, strategic, scientifically-sound, transparent planning process developed by the Conservation Measures Partnership and supported by Miradi, a planning software.

Result Chain Diagram: a diagram that depicts the assumed causal linkage between an intervention (strategy, action) and desired impacts through a series of expected intermediate results

Strategy: a set of related actions that, when implemented, will achieve part or all of a desired condition or goal.

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Purpose, Mission, Vision, and Values of the Partnership

Purpose: The Kenai Peninsula Fish Habitat Partnership strives to create and foster effective collaborations to maintain healthy fish, healthy people, healthy habitat, and healthy economies in the Kenai Peninsula Borough.

Mission: To protect, maintain, restore, and enhance fish habitat.

Vision: To have healthy, sustainable fish and aquatic ecosystems now and in the future.

Our Values:

- Long-term stewardship of the Kenai Peninsula's diverse and abundant aquatic resources managed in trust for the public
- Respect for local communities, contemporary and traditional cultures, and the relationships they have with aquatic resources
- Integrity achieved through honesty and transparency, inclusion, sound financial management and oversight, and professional and ethical behavior
- Excellence through science-based management, outstanding service, volunteer safety, and continuous improvement
- Teamwork and partnerships fostered by listening to and respecting the views of stakeholders
- Innovation that proactively meets challenges and promotes a culture of finding solutions
- Professionalism through learning from the past to plan for the future and cultivating partnerships, collaboration, and community

Message from Partnership Coordinator

The Kenai Peninsula is uniquely positioned in the world to set an example for how a community may grow and thrive while also sustaining its relationship with wild fish. The successes of fish habitat management in our region are thanks in no small part to the many people who contributed their time to this Conservation Action Plan. We extend our heartfelt thanks to all the participants who brought their experience and wisdom to the workshop in 2022, and we look forward to continuing to work together for healthy fish habitat.

Benjamin Meyer, Interim Partnership Coordinator, August 2022



Image: Kenai Watershed Forum

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Executive Summary

The Kenai Peninsula Fish Habitat Partnership was formed to establish effective collaborations to maintain healthy fish, healthy people, healthy habitat, and healthy economies within the Kenai Peninsula Borough in southcentral Alaska. The geographic area covered by the Partnership follows the boundary of the Kenai Peninsula Borough and covers approximately 25,000 square miles, encompassing 14 major watersheds, over 20,000 miles of stream habitat, and more than 350,000 acres of wetland habitat. The Kenai Peninsula is one of Alaska's premier destinations for both Alaska residents and out-of-state visitors and is known for its world-class sport fishing and wildlife viewing opportunities.

The Kenai Peninsula Borough's freshwater fish habitat is unique nationally in that it is a road-accessible area near a major population center that continues to support robust commercial, sport, and subsistence (traditional and personal use) fisheries. These fisheries sustain the importance and significance of salmon in the cultures of Indigenous people. Additionally, the fish are an important source of food for a variety of animals including brown and black bears, bald eagles, and marine mammals, and are a key source of nutrients for both terrestrial and aquatic environments. In contrast, many wild fish populations in the contiguous forty-eight states are today either extinct or exist at a fraction of historical levels (due to loss of or damage to habitat as a result of increased human activity).

To ensure that the Kenai Peninsula Borough's freshwater fish habitat remains resilient and productive for current and future generations, partnership members and stakeholders have developed innovative strategies to address challenges such as habitat fragmentation, changes in water quality, and climate change. Together, they work towards maintaining healthy fish habitat that supports self-sustaining fish populations.

In 2022, a diverse group of interested parties including representatives from local non-governmental organizations, local government, state and federal resource agencies, and Alaska Tribes joined together to re-evaluate and update the original 2012 Freshwater Conservation Action Plan¹. That plan provided a strong basis for this update, with a list of targets, an assessment of their ecological condition, and a prioritized list of threats.

The updated plan incorporates several important additions, including:

- New information from research in ecology and conservation of fisheries and fish habitat on the Kenai Peninsula
- Refined assessment of threats
- Updated and expanded incorporation of the effects of climate change
- Updated and refined strategies

The updated plan addresses the habitat needs of freshwater and anadromous fish, species that at some point in their life cycle reside in the rivers, lakes, and estuaries of the Kenai Peninsula Borough. Conservation targets are organized by watershed type, with seven distinct watershed types intended to encompass the full spectrum of freshwater fish habitat found throughout the Partnership area.

In addressing the goals and objectives of this plan, the Kenai Peninsula Fish Habitat Partnership will be supporting the goals and objectives of the National Fish Habitat Action Plan within our region.

Introduction: Ensuring the Future of Fisheries and Fish on the Kenai Peninsula

The Kenai Peninsula Borough landscape exemplifies the social, economic, and ecological value of wild fish and the complex changes they face². The region is defined by relative ease of access to and abundance of wild fish populations. However, changing fish habitat and populations continue to pose a challenge to those seeking sustainable management, and the increased complexity of threats requires creative solutions.

The region supports several of Alaska's largest recreational salmon fisheries, major commercial gill-net and personal-use dip-net fisheries, as well as small-scale subsistence and educational fisheries^{3,4}. Sockeye (red) salmon (*Oncorhynchus nerka*) are the predominant freshwater fish species of economic and ecological concern. The region's largest watershed, the Kenai River, produces a 20-year average of 3.6 million sockeye salmon annually⁵, constituting 80% of the wild sockeye salmon produced in Cook Inlet⁶. The region is also famous for its large Chinook (king) salmon (*O. tshawytscha*), including a 44-kg (97 lb.) world record fish caught in 1985. In addition to these two prominent salmon fisheries, the region also supports fisheries for other Pacific salmon species (pink salmon *O. gorbuscha*, chum salmon *O. keta*, and silver salmon *O. kisutch*), populations of Dolly Varden (*Salvelinus malma*), rainbow trout (*O. mykiss*), hooligan (*Thaleichthys pacificus*), and others.

Recent years have seen threats to sustaining fisheries in the Kenai region. Declines in wild salmon body size⁷, total returns⁸, and ex-vessel value⁹ have helped drive challenges including fishery closures¹⁰, exacerbations of long-standing conflicts between stakeholders¹¹, and outmigration of commercial fisherman to other regions¹². These same trends have played out historically in other regions of the world that once supported socio-ecological systems that featured salmon as a keystone species, including parts of Europe, New England, and the Pacific Northwest¹³⁻¹⁵. The degree to which we can learn from and act upon past successes and failures in fish habitat management will guide the future of fisheries in the Kenai Peninsula region.

Throughout the Partnership region there are signs that communities are dedicated to ensuring wild fish habitat can thrive in the face of changes underway to the climate and landscape. Large portions of the Partnership area lie within the federally protected lands of the Chugach National Forest and the Kenai National Wildlife Refuge, and wild salmon continue to occupy a central place in local identity¹⁶. History indicates that communities that understand and remain connected to the cultural, ecological, and economic benefits of wild fish habitat are better poised to conserve and sustain it. The Kenai Peninsula Fish Habitat Partnership aims to be a resource for all those seeking to sustain the connections between wild fish and people that have endured in the Kenai region for millennia.

Why a Conservation Plan?

The primary purpose of a conservation plan is to chart a path to meet habitat conservation objectives effectively, efficiently, and collaboratively. A good plan will identify a logical and efficient path forward using available resources. When a plan is done collaboratively, it can tap into the expertise and experience of staff and partners and add the most recent scientific, policy, economic, and strategic information. Revisiting a plan will reconfirm or refine goals, redevelop quantitative short-term outcomes, and reassess the most effective and efficient pathways to reach these outcomes.

The Kenai Peninsula Fish Habitat Partnership Freshwater Conservation Plan was created using a planning approach known as the Conservation Standards¹⁷ (formerly the Open Standards for the Practice of Conservation). The Conservation Standards are a set of principles and practices that guide project teams in the identification of effective conservation strategies. The structured, scientifically sound, and transparent planning process uses Miradi, a specialized software, to incorporate tools that prioritize threats and strategies; model the institutional, political, economic, social, and ecological drivers of threats; and guide the logic of the expected outcomes of strategies. The process uses an adaptive management approach to planning. The 2012 planning process used the Nature Conservancy's Conservation Action Planning process, the precursor to the Conservation Standards.

The planning process includes the following steps:

Foundational Steps

Conceptualize: determines the purpose, the spatial and/or programmatic scope of the project, the appropriate team to undertake the planning, and a vision of the desired future condition

Targets: identifies and defines the ecological (species and systems) and human wellbeing targets and benefits that are the focus of planning and develops goals to represent the desired condition for each target

Threats: identifies and ranks the factors that degrade the condition of ecological targets

Strategies

Situation Analysis: assesses the institutional, political, economic, social and ecological drivers of the threats

Identify Key Strategies: uses the situation analysis to determine what actions best maintain, improve or restore the targets

Develop Results Chains: assesses the logic, assumptions, and actions needed to obtain the desired condition of the targets

Implementation and Adaptation

Implementation: generates a short-term work plan and a project budget to initiate implementation

Evaluate and Adapt: incorporates monitoring, evaluation, and adaptive management into the planning process, revising the plan based on knowledge gained

Capture and Share

Share Findings: encourages the documentation of data and results, the sharing of results, and the creation of a learning environment

This plan for the Kenai Peninsula Fish Habitat Partnership presents the results of the first two steps of the planning process: foundational steps and strategies.

Three teams were organized for this planning effort, structured around types of threats. The teams were:

- In-stream Threats
- Terrestrial Threats
- Climate Change

The teams met twice in December 2021 to prepare for work sessions held January 10th – 13th, 2022. This report reflects the work they have done.

Equally important to the implementation of the Conservation Standards are the facilitation techniques used to lead a team through the process. In addition to presentations, there is an emphasis on interactive sessions including discussions, brainstorm sessions, breakout groups, and use of the collaborative whiteboard Miro¹⁸. An important component of conservation planning is the communication and collaboration among participants. All sessions were held via teleconference using Zoom.

What Do We Want to Conserve?

The goal of this plan is to conserve the freshwater rivers, streams, lakes, and estuaries of the Kenai Peninsula that support diverse and abundant fish species including Pacific salmon (sockeye, Chinook, coho, pink and chum) and other native species (rainbow trout, steelhead trout, hooligan, Dolly Varden, Arctic char, suckers, lake trout and stickleback). These species provide a robust regional fishery, food for local communities, and nutrients for in-stream habitat and forest systems. The plan explicitly links the health and abundance of salmon to its cultural value for Indigenous and local communities.

For fish to thrive, they require the appropriate stream and lake habitat for spawning, rearing, and migration, the timeframes of which can take from a few months to years for different species. This habitat needs to provide food and safety from predators. In-stream habitat varies widely among systems on the Kenai Peninsula; that variety is reflected in the diversity and abundance of fish species that are found. Conserving fish biodiversity requires protecting a diverse array of river, stream, and lake systems.

The conservation targets used in this plan are the same as those developed for the 2012 Strategic Plan. Those targets were based on the diverse geomorphology and in-stream characteristics of the rivers, streams, and lakes on the peninsula. Geomorphology is a primary influence on in-stream and riparian habitat, flow characteristics, water quality parameters such as turbidity, and thermal regime, all of which influence the fish species that use these reaches. The 2022 planning team accepted the target delineations that the 2012 team developed with one significant difference: the 2022 team included the estuary at the mouth of the river in the target areas. These estuaries provide habitat for juvenile and adult salmon to mature, feed, and physiologically adjust to salt water; corridors for emigration and immigration; and habitat for faunal invertebrates that are a food source for all fish species. The estuaries also support the endangered Cook Inlet beluga whale.

The seven geomorphic areas identified as conservation targets are:

- Steep Coastal Streams
- Non-glacial Mountain Rivers
- Glacial Rivers without Lakes
- Glacial Rivers with Lakes
- Lowland Groundwater/Wetland-Dominated Systems
- Closed-basin Lakes
- Clearwater Connected Lakes with Associated Streams

The targets are briefly described in Box 1. These descriptions include minor edits suggested by the 2022 planning team. More thorough descriptions are found in the original 2012 plan (<https://www.kenaifishpartnership.org/cap/>). The distribution

of conservation targets on the Kenai Peninsula is illustrated in Figure 1.

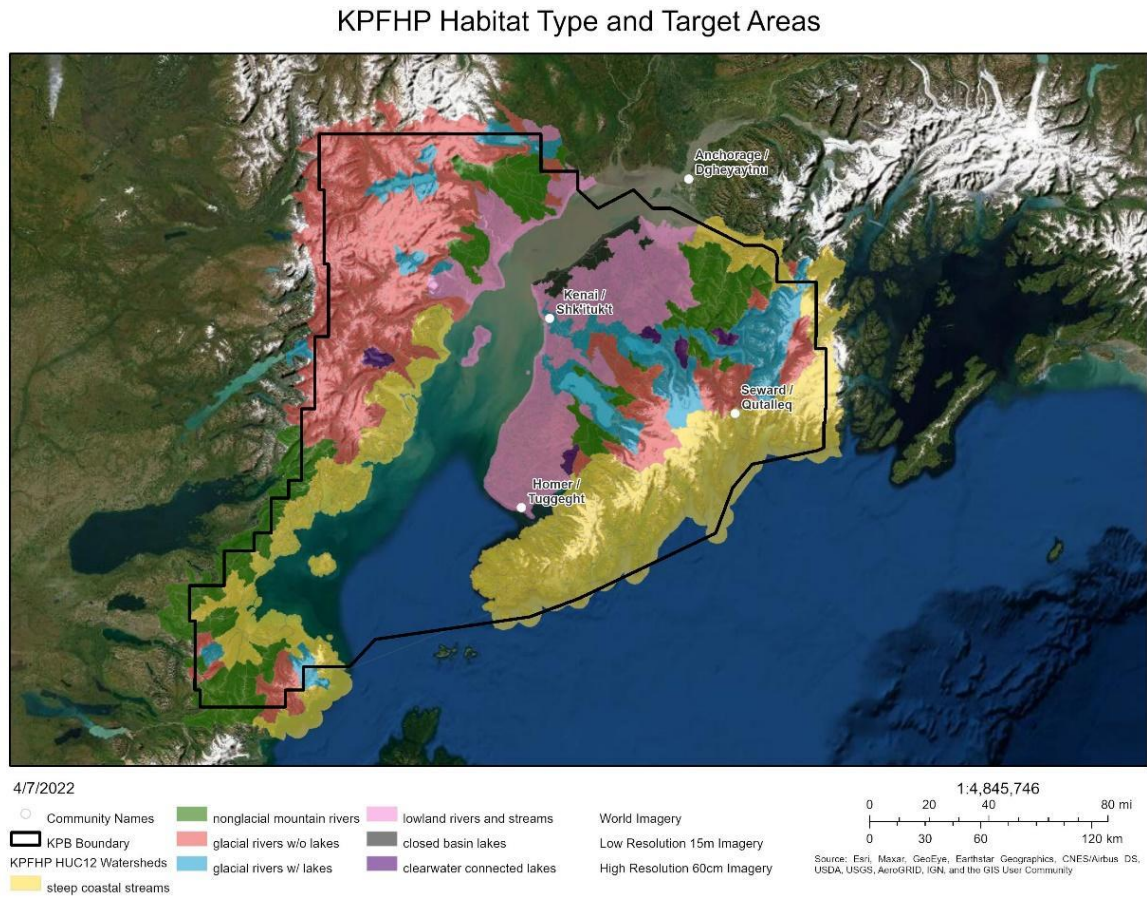
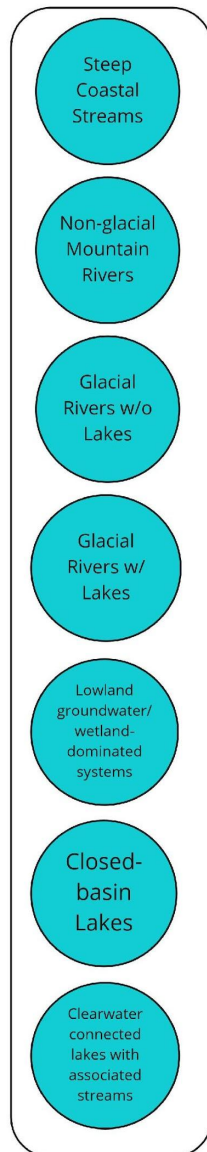


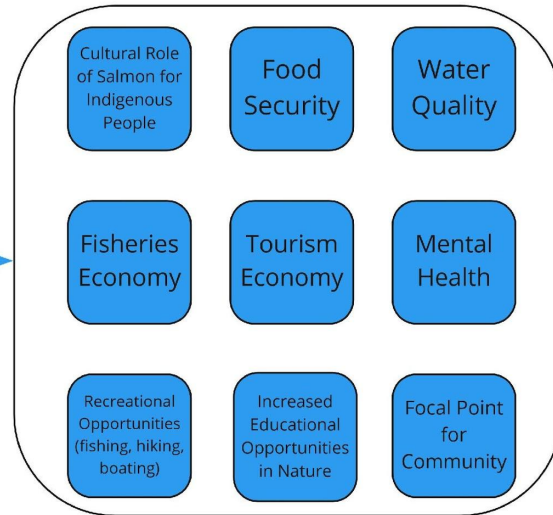
Figure 1. Kenai Peninsula Fish Habitat Partnership HUC12 watersheds classified by conservation target type. Community names are listed as English / Indigenous names; either Dena'ina, or Sugt'stun. Access the online interactive version of this map at bit.ly/kpfhp_map.

The plan also identifies the benefits of conserving the river and stream systems on the peninsula for human and environmental wellbeing (Figure 2). While there are no specific actions related to these benefits, they are all influenced by strategies to protect the different river and stream systems.

Conservation Targets



Human Wellbeing Benefits



Ecological/Environmental Benefits

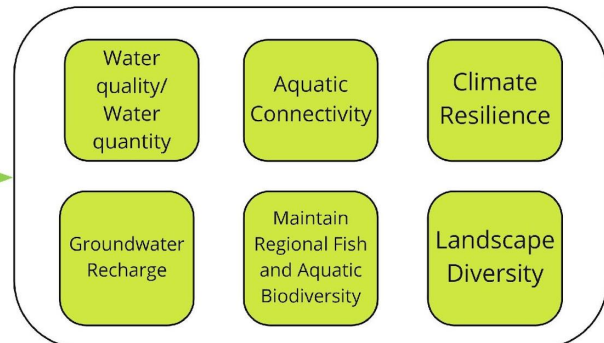


Figure 2. Diagram of the relationship among conservation targets and human well-being and ecological/environmental benefits.

Threat Assessment

The 2012 team completed a review of the ecological condition of each conservation target (the rivers and streams of the Kenai Peninsula) and the threats that impact the ecological condition. The 2022 team reviewed the assessment of existing conditions and updated the ranking of the threats. The results are summarized in Table 1. Several threats were renamed from the 2012 document to be more precise in their definition, and two previously separate categories were combined into one. Even with updated information, the top threats for further planning efforts did not change. The threats identified in 2012 and reviewed in 2022 were consistent with the threats outlined in the recent USGS publication *Summary of Recent USGS Salmon Research Related to Declines in our Nation's Pacific Salmon Species*¹⁹.

While the ranking of threats is valuable for management planning purposes, the categories do not exist in isolation. For example, the Aquatic Invasive Species threat (rank #1) is compounded by a warming thermal regime (rank #2) in that an expanded thermal envelope may allow species to persist in the Kenai region that may have previously been excluded by a cooler thermal regime. These two threats, as well as others, are interrelated, thus the list should not be interpreted in a strictly linear fashion.

The following are comments on the top eight overall threats as ranked by the planning team (Table 1). Threat levels that have changed are highlighted in bold.

Top Ranked Threats

1. Aquatic Invasive Species
 - a. Remains the highest ranked threat. The team added ranks for aquatic invasive species to all targets and increased the rank for one target.
 - b. The increase in the spatial extent of the threat and its severity for one of the targets resulted in a change in the overall threat rank.
 - i. **Previous Threat Rank: High**
 - ii. **Overall Threat Rank: Very High**
2. Warming Thermal Regime
 - a. This is a renaming of the “Warmer Climate” threat category.
 - i. Previous Threat Rank: Medium
 - ii. Overall Threat Rank: Medium
3. Incompatible Commercial and Residential Development
 - a. Refers to development both within and outside of riparian zones.
 - i. Previous Threat rank: Medium
 - ii. Overall Threat Rank: Medium
4. Incompatible Road Development
 - a. Rank maintained at Medium; captures the water quality issues related to roads.
 - i. Previous Threat Rank: Medium

- ii. Overall Threat Rank: Medium
- 5. Barriers to Fish Passage
 - a. This is a renaming of “Incompatible Hydropower Development.”
 - b. This threat has increased in both likelihood and spatial extent, resulting in a change to the overall threat rank.
 - i. **Previous Threat Rank: Low**
 - ii. **Overall Threat Rank: Medium**
- 6. Incompatible Mining
 - a. Rank increased to Medium based on the greater spatial extent of the threat.
 - i. **Previous Threat Rank: Low**
 - ii. **Overall Threat Rank: Medium**
- 7. Catastrophic Spills
 - a. This is a restructuring of the “Pipeline/Tank Farm Spill” threat from the 2012 plan to reflect spills that could affect wetland and freshwater aquatic habitat.
 - i. Previous Threat Rank: Low
 - ii. Overall Threat Rank: Low
- 8. In-stream Sedimentation
 - a. This is a renaming and broader inclusion of the “Incompatible ORV (outdoor recreational vehicle) Use” threat category.
 - b. Encompasses sedimentation threats from incompatible recreational use (boats and ORVs), incompatible logging, and wildfire.
 - i. Previous Threat Rank: Low
 - ii. Overall Threat Rank: Low

Table 1. Freshwater potential threats ranking table (top eight threats). Threats are ranked for each conservation target, and also given an overall ranking. Arrows indicate increase in threat level since previous CAP.

		Conservation Targets							
		Steep Coastal Streams	Non-glacial mountain rivers	Glacial Rivers w/o lakes	Glacial rivers w/ lakes	Lowland groundwater/ wetland dominated systems	Closed-basin lakes	Clearwater connected lakes with associated streams	Overall Threat Rank
Threat Rank	Threats								
1	Aquatic Invasive Species	Low	Low/Medium(↑)	Medium (↑)	Medium/High (↑)	High	High	High	Very High (↑)
2	Warming Thermal Regime		Medium		Low	Medium	Medium	Medium	Medium
3	Incompatible Commercial and Residential Development				Medium	Medium			Medium
4	Incompatible Road Development	Low	Low	Low	Low	Medium	Low	Low	Medium
5	Barriers to Fish Passage	Low	Medium	Low	Low			Low	Medium (↑)
6	Incompatible Mining	Low	Low			Medium			Medium (↑)
7	Catastrophic Spill (vehicle, tank farm, pipeline)				Low	Medium			Low
8	In-stream Sedimentation					Medium			Low
Threat Status for Conservation Targets		Low	Medium	Low	Medium	High	Medium	Medium	

Box 1. Descriptions of Conservation Targets (pg 1 of 2)

Steep Coastal Streams

Non-glacial high gradient streams and tributaries that flow directly into the ocean, including in-stream and riparian habitat, associated wetlands, and the immediate estuary. These streams are usually relatively short (< 20 km) with a high gradient (>5%). They usually have a short low-gradient reach near tidewater that provides spawning habitat for pink and chum salmon with some streams having a short reach with gradients less than 3% that provides spawning and rearing habitat for coho salmon. Although individual streams support small populations of salmon, collectively these coastal streams produce sizable runs of pink, chum, and coho salmon.

Regional distribution: Southeastern section of the Kenai Peninsula draining into the Gulf of Alaska and northern slopes draining into and west of Turnagain Arm

Specific examples include Rocky River, Humpy Creek, Jakalof Creek, Seldovia River, Granite Creek

Non-glacial Mountain Rivers and Streams

Rivers and streams that do not arise from glacial meltwater drain, including in-stream and riparian habitat, associated wetlands, and the immediate estuary. Some shorter (< 20 km) mountain streams and rivers become tributaries of larger glacial rivers and some longer (> 20 km) rivers flow directly into the ocean. These rivers and streams typically provide spawning and rearing habitat for Chinook and coho salmon.

Regional Distribution: North-central section of the peninsula

Examples include the Chuit River, Sixmile Creek, Quartz Creek, Resurrection Creek, Ptarmigan Creek, Juneau Creek

Glacial Rivers Without Lakes

Rivers and streams that arise from glacial meltwater and are not associated with lakes, including in-stream and riparian habitat, adjacent wetlands, and the immediate estuary. These systems typically provide spawning and rearing habitat for sockeye and coho salmon, although individual spawning populations are generally small. Estuaries and sloughs are extremely important for fish production because of the general lack of good quality rearing habitat; fish in many of these systems likely complete some of their freshwater rearing in estuaries.

Regional Distribution: Central and northeastern sections of the peninsula at high elevations

Examples include Fox River, Placer River, Sheep Creek, Battle Creek

Glacial Rivers with Lakes

Rivers and streams fed by glacial meltwater that are associated with lakes, including in-stream and riparian habitat, adjacent wetlands and the immediate estuary. These rivers provide spawning and rearing habitat for Chinook, coho, and sockeye salmon.

Box 1. Descriptions of Conservation Targets (pg 2 of 2)

Regional Distribution: Central to northeast section of the peninsula

Examples include Kenai River, Kasilof River, Crescent River (west side Cook Inlet), Bradley River

Lowland Groundwater/Wetland-dominated Systems

Lowland streams and rivers whose hydrology is primarily influenced by complex wetland and groundwater interactions. The target includes in-stream and riparian habitat, associated wetlands and the immediate estuary. These streams and rivers provide spawning and rearing habitat for most salmonid species.

Regional Distribution: Western lower slope of the peninsula draining into Cook Inlet

Examples include Anchor River, Chickaloon River, Swanson River, Deep Creek, Ninilchik River, Stariski Creek

Closed-basin Lakes

Lakes, ponds, and open-water wetlands whose water levels are primarily influenced by complex wetland and groundwater interactions. This target includes in-lake and shoreline habitat and short connective stream segments. These small lakes and ponds provide habitat for numerous endemic fish species including Arctic char, rainbow trout, longnose sucker, and stickleback.

Regional Distribution: Kenai Peninsula lowlands

Examples include lakes in the Swanson and Swan River canoe systems and many named and unnamed lakes on the northern Kenai Peninsula lowlands

Clearwater Connected Lakes with Associated Streams

Clearwater lakes that are part of a larger watershed that ultimately drains to the ocean, including in-lake and shoreline habitat and short connective stream segments. Water levels in these lakes and ponds are primarily influenced by annual snowmelt. These lakes provide spawning and rearing habitat for sockeye salmon and lake trout and provide rearing habitat for coho salmon.

Regional Distribution: Central peninsula at high elevations

Examples include Hidden Lake/Creek, Fuller Lakes, Juneau Lake, Crescent Lake, Fox Creek, Chenik Creek, Upper and Lower Russian Lakes

Strategies to Address Threats

The three teams (In-stream Threats, Terrestrial Threats, and Climate Change) each developed strategies by assessing the situation analysis completed for each of eight threats described in the previous section. Determinations of benefits and feasibility were made by group consensus. Strategies to address these threats are outlined here.

1. Threat: Aquatic Invasive Species

a. Strategy: Develop informed and cohesive invasive species messaging at a statewide level to reduce the burden on individual organizations/projects

- **Description:** Organizing at the state level will reduce redundancy of efforts, standardize messaging, and free up time and funding for other tasks.
- **Justification:** At present, individual organizations are often repeating efforts in messaging (e.g. outreach and education); this drains staff time and funding.
- **Threats reduced:** Injurious aquatic invasive species; incompatible uses.
- **Targets improved:** High impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, clearwater connected lakes with associated streams, glacial rivers with lakes; medium impact to glacial rivers without lakes, non-glacial mountain rivers; low impact to steep coastal streams.
- **Proposed first actions:** Partnerships collaborate to financially support a social science graduate student or researcher to assist partners with identifying research needs and data gaps and to conduct a literature review and/or research project to address these needs. Subsequently, partners can create informed messaging (education and outreach) products and strategies to implement statewide.
- **Potential intermediate results:** Outreach and education gaps are identified, and strategies for addressing gaps are determined. Consequently, state-wide messaging reduces the burden on individual organizations and may allow for a wider audience to be reached.
- **Key players:** Alaska Fish Habitat Partnerships (FHPs), Alaska Invasive Species Partnership (AKISP), Cooperative Invasive Species Management Areas (CISMAs), social scientists
- **Benefit/Impact:** Very high
- **Feasibility:** Medium (*unprecedented)

b. Strategy: Collaborate with the Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA) and statewide partnerships to promote prevention strategies

- **Description:** Highly coordinated efforts to educate stakeholders on the importance of invasive species prevention and the most important tactics for reducing the spread of invasive species.

- **Justification:** There are still many potential advocates who have yet to be educated (and empowered to take action and disperse information) on the importance of invasive species prevention in overall habitat resilience.
- **Threats reduced:** Injurious aquatic invasive species; incompatible recreational and ORV use; potentially incompatible forms of development.
- **Targets improved:** High impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, clearwater connected lakes with associated streams, glacial rivers with lakes; medium impact to glacial rivers without lakes, non-glacial mountain rivers; low impact to steep coastal streams
- **Proposed first actions:** Targeted education and outreach to stakeholders who can have the most impact. For the public, this means education and outreach tools that can lead to value shifts. For professionals, this means education and training of Best Management Practices (BMPs).
- **Potential intermediate results:** An increased number of stakeholders are empowered to increase their own invasive species prevention practices and then share those strategies with others. Increased awareness and sense of stewardship from the public, including increased use of boot brush stations, cleaning gear, and invasive species reporting. BMPs are implemented by a wide variety of entities, including comprehensive adoption of clean equipment standards and use of weed-free materials.
- **Key players:** Homer Soil and Water Conservation District Invasive Species Personnel (HSWCD), Kenai Watershed Forum (KWF) Invasive Species Program & Personnel, Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA), Alaska Invasive Species Partnership (AKISP)
- **Benefit/Impact:** Very high
- **Feasibility:** Very high

c. Strategy: Fill survey and monitoring gaps through research, expansion of science tools, and increased capacity for Early Detection and Rapid Response

- **Description:** Develop and promote tactics that expand Early Detection and Rapid Response (EDRR) efforts, their economic efficiency, and their overall effectiveness.
- **Justification:** There is a lack of variety in the tools currently being used on the Kenai Peninsula to detect new populations and effectively implement restoration strategies.
- **Threats reduced:** Injurious invasive species.
- **Targets improved:** High impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, clearwater connected lakes with associated streams, glacial rivers with lakes; medium impact to glacial rivers without lakes, non-glacial mountain rivers; low impact to steep coastal streams.
- **Proposed first actions:** Outreach to potential partners for new development/implementation. Financially support and provide resources

for EDRR, expansion of strategic plans to include additional taxa, and capacity building for monitoring and management.

- **Potential intermediate results:** Through the development and implementation of new EDRR tactics and tools, a wider variety of partners will become involved in active EDRR efforts on the Kenai Peninsula. These efforts will be more coordinated, cost-effective, and efficient at detecting and managing new populations of invasive species.
- **Key players:** Homer Soil and Water Conservation District (HSWCD), U.S. Fish and Wildlife Service (USFWS), University of Alaska (UA), University of Alaska Cooperative Extension Service (CES), Kenai Watershed Forum (KWF)
- **Benefit/Impact:** Very High
- **Feasibility:** Medium

d. Strategy: Synthesize geospatial data and best available science (and anecdotal data) across partnership to inform landscape scale prioritization for Early Detection and Rapid Response and restoration efforts

- **Description:** Create/encourage transparency with available data across the partnership and synchronize said data to inform Early Detection and Rapid Response (EDRR) and restoration efforts.
- **Justification:** Limited financial and capacity resources exist for detecting new populations and engaging in restoration efforts; they must be used in the most effective and efficient manner.
- **Threats reduced:** Injurious invasive species; potentially incompatible ORV and recreational use.
- **Targets improved:** High impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, clearwater connected lakes with associated streams, glacial rivers with lakes; medium impact to glacial rivers without lakes, non-glacial mountain rivers; low impact to steep coastal streams.
- **Proposed first actions:** Financially support and coordinate with partners to create a repository for meta-data from across the Kenai Peninsula.
- **Potential intermediate results:** Increased probability of early detection, eradication, and effective restoration.
- **Key players:** Federal and non-federal landowners on the Kenai Peninsula (KNWR, CNF, KFNP, USFWS, KPB, AK State Parks), Homer Soil and Water Conservation District (HSWCD)
- **Benefits/Impacts:** Very High
- **Feasibility:** High

e. Strategy: Continued support of Early Detection and Rapid Response efforts across the Kenai Peninsula (emphasis on eradication where possible)

- **Description:** Ensure that resources and funding are continually allocated to Early Detection and Rapid Response efforts on the Kenai Peninsula.

- **Justification:** There is a lack of continuity in EDRR efforts, a lack of preparedness to evaluate and manage new infestations, and a lack of resources and capacity for surveys and monitoring.
- **Threats reduced:** Injurious aquatic invasive species
- **Targets improved:** High impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, clearwater connected lakes with associated streams, glacial rivers with lakes; medium impact to glacial rivers without lakes, non-glacial mountain rivers; low impact to steep coastal streams.
- **Proposed first actions:** Financially support and provide resources for EDRR efforts, such as monitoring for new invasive taxa or populations; support expansion of strategic plans, and prepare for novel species invasions with rapid response drills and capacity building. Where feasible, use integrative pest management techniques to eradicate populations, and establish monitoring programs and follow-up treatment schedules.
- **Potential intermediate results:** Skilled and functional rapid response teams are available for quickly responding to newly discovered invasives, and new EDRR monitoring tools are developed which increase efficiency and cost effectiveness of efforts. This will lead to an increased probability of early detection, and therefore increased chances of eradication.
- **Key players:** Kenai Peninsula Fish Habitat Partnership (KPFHP), Kenai Peninsula Cooperative Invasive Species Management Area (KP-CISMA)
- **Benefit/Impact:** Very high
- **Feasibility:** Very high

2. Threat: Warming Thermal Regime, or Climate Change

Special Note

There has been a wide range of responses to climate change on the Kenai Peninsula, some through management and research efforts, others through grassroots social change. In addition to the broad yet actionable short-term goals below, a supplemental document with this report, "[Climate Change and the Future of Freshwater Fish Habitat on the Kenai Peninsula](#)"²⁰ provides an expanded perspective on the topic and addresses threats "nested" within the category of climate change (e.g., changing intrinsic water quality conditions, changes in ecosystem composition, etc.).

- a. **Strategy: Research and Monitoring; Identify and encourage efforts to fill critical data gaps, share scientific information, and coordinate management related to climate change on the Kenai Peninsula**
 - **Description:** Support research to fill critical data gaps like water temperature, surface and groundwater quantity and quality, and understanding of changing baselines. Broaden our understanding of physical drivers to climate change and how those drivers directly and

indirectly impact fish and fish habitat; prioritize projects that seek demonstrations of impact/no impact.

- **Justification:** Historical datasets as well as new and ongoing monitoring efforts are essential to understanding how climate threats and effects change over time.
- **Threats reduced:** Uncertainty in planning efforts and unidentified threats for the threat of Warming Thermal Regime
- **Targets improved:** High impact for all targets identified in Table 1
- **Proposed first actions:** Financially support and provide resources for monitoring, analysis, and knowledge-sharing efforts related to changing conditions in fish habitat.
- **Potential intermediate results:** Centralized communication for locally-focused research funding opportunities; succession plans are put in place for key staff involved in long-term monitoring efforts; continued funding for monitoring and analysis efforts.
- **Key players:** Kenai Peninsula Fish Habitat Partnership (KPFHP), University of Alaska (UA), U.S. Fish and Wildlife Service (USFWS), Kachemak Bay National Estuarine Research Reserve (KBNERR); Alaska Department of Fish and Game (ADF&G)
- **Benefit/Impact:** High
- **Feasibility:** High

b. Strategy: Education, Outreach, and Policy; Increase access to water quality and quantity data and ecological data

- **Description:** Increase access to water quality and quantity data and ecological data.
- **Justification:** Greater accessibility to existing datasets will result in broader applications and reduced redundancy of efforts.
- **Threats reduced:** High impact; applies to all threats identified in Table 1.
- **Targets improved:** High impact; applies to all threats identified in Table 1.
- **Proposed first actions:** Host a hydrology summit/conference for local researchers to exchange resources and updates. Within partnership and among partners, recommend high-level places to uplift public data and metadata, and serve what high-level data we can.
- **Potential intermediate results:** Training on accessing and using public data portals; a lasting protocol for scientific information flow from publicly funded research projects to private, public, and Native landowners on the peninsula.
- **Key players:** Regional non-profits (Cook Inletkeeper (CIK), Kenai Watershed Forum (KWF), others); federal agencies (U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS)); academic institutions (University of Alaska (UAA, UAF))
- **Benefit/Impact:** High
- **Feasibility:** High

c. Strategy: Build resiliency in fish habitat; support and prioritize projects that can be linked to supporting long-term climate resilience for fisheries and that promote climate leadership

- **Description:** Support and prioritize projects that can be linked to supporting long-term climate resilience for fisheries. Support and prioritize proposed projects that specifically promote climate leadership with partnership members.
- **Justification:** As climate change is a threat that encompasses all conservation targets, all proposed projects should be evaluated within the context of challenges and opportunities that it presents.
- **Threats reduced:** High impact; applies to all threats identified in Table 1.
- **Targets improved:** High impact; applies to all threats identified in Table
- **Proposed first actions:** Encourage development of KPB land management plan and groundwater management plan and city-specific land management plans when appropriate. Continue to support and expand riparian setbacks at the KPB level based upon science. Support land protection and conservation acquisition or conservation designations and lasting stewardship at all government and private levels. Develop outreach and education regarding riparian setbacks and green infrastructure. Disseminate information, and intervene with green infrastructure opportunities in current and planned projects (e.g. City of Soldotna “main street”²¹). Develop a small but visible demonstration project.
- **Potential intermediate results:** Creation of city-specific green infrastructure plans; continued growth of strategically chosen conservation easements; green stormwater infrastructure demonstration project(s).
- **Key players:** Regional non-profits (Cook Inletkeeper (CIK), Kenai Watershed Forum (KWF), Kachemak Heritage Land Trust (KHLT)); federal agencies (U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS)); state agencies (Alaska Department of Environmental Conservation (ADEC), Alaska Department of Fish and Game (ADF&G)), City Councils, Kenai Peninsula Borough
- **Benefit/Impact:** High
- **Feasibility:** Medium

3. Threat: Incompatible Commercial and Residential Development

a. Strategy: Incentivize low impact development through incorporating green stormwater infrastructure on public land (recreational and industrial)

- **Description:** Support and incentivize the use of green stormwater infrastructure tools such as bioswales and buffers on developments such as parking lots, recreational facilities, and industrial facilities.
- **Justification:** Green infrastructure can limit pollutants and unwanted chemicals from entering waterways, as well as help mitigate some flooding and erosion issues.
- **Threats Reduced:** Non-point source pollution; flooding; erosion.
- **Targets Improved:** Impacts all target areas and estuarine areas.

- **Proposed First Actions:** Conduct a feasibility study of preventative vs. mitigation costs in various areas.
- **Potential intermediate results:** Decision makers know about new practices that can yield economic benefits to their constituents/communities; installment of green infrastructure projects on new developments.
- **Key players:** Kenai Peninsula Borough (KPB), City Councils, local environmental non-profits
- **Benefit/Impact:** High
- **Feasibility:** Medium

b. Strategy: Prioritize areas of value for green infrastructure for incoming federal Department of Transportation funds

- **Description:** Determine where transportation infrastructure project funds can be put to the best use to yield the greatest outcomes and where we need to mitigate negative effects of development.
- **Justification:** Integrating green infrastructure prior to project completion can prevent damage and is more cost and energy efficient than mitigating damage later.
- **Threats Reduced:** Non-point source pollution; habitat connectivity.
- **Targets Improved:** Impacts all target areas and estuarine areas.
- **Potential First Actions:** Rank proposed private land acreage in environmentally sensitive areas to focus on (lakes and riverfront). Evaluate land owned by cities and Borough that may change status (i.e. the 2021 City of Kenai Land Management Plan)²².
- **Potential intermediate results:** Decision makers know where to focus outreach efforts and funds and have data to support these decisions. Municipalities and the state develop zoning ordinances similar to habitat ordinance.
- **Key players:** Kenai Peninsula Borough (KPB), Alaska Department of Transportation (ADOT)
- **Benefit/Impact:** High
- **Feasibility:** High

c. Strategy: Invest in "seed" green stormwater infrastructure project demonstration sites

- **Description:** Create high-visibility examples of green stormwater infrastructure to encourage public support for their more widespread application.
- **Justification:** Few examples of green infrastructure projects exist on the Kenai Peninsula. Engaging people at small-scale and local levels can help increase interest and build support for future projects.
- **Threats Reduced:** Non-point source pollution; erosion.
- **Targets Improved:** Impacts all target areas and estuarine areas

- **Proposed First Actions:** Engage with local municipalities that may soon develop land and show importance of green infrastructure (i.e., City of Soldotna's "Soldotna Main Street")²¹.
- **Potential Intermediate Outcomes:** Small-scale installment and use of green stormwater infrastructure systems.
- **Key players:** Kenai Peninsula Borough (KPB), City Councils
- **Benefit/Impact:** High
- **Feasibility:** High

d. Strategy: Expand model of the Kenai River Center to areas beyond their current area of focus to distribute landowner development Best Management Practices (BMPs)

- **Description:** Expand the range of Kenai River Center educational materials, which currently address proper development along littoral and riparian areas including coasts, rivers, and lakes, to cover other valuable habitat areas such as cold-water seeps and peatlands.
- **Justification:** Development sometimes is carried out without knowledge of local ordinances and regulations (i.e., a development along a Soldotna Creek Tributary that occurred in summer 2021)²³. It can be difficult for developers to discover BMPs for ecological resources unless they are directly addressed by local permitting ordinances and regulations.
- **Threats Reduced:** Habitat connectivity; non-point source pollution.
- **Targets Improved:** Impacts all target areas and estuarine areas.
- **Proposed First Actions:** Perform social research/social network analysis of most effective ways to reach people. Identify values of new homeowners.
- **Potential Intermediate Outcomes:** Social research report/toolkit for fish habitat partners and land managers; contract/realtor toolkit for sharing habitat and zoning ordinances.
- **Key players:** Kenai Peninsula Borough (KPB), Alaska Department of Fish and Game (ADF&G), City Councils, Kenai River Center, National Resource Conservation Service (NRCS), Soil and Water Conservation Districts, Kachemak Heritage Land Trust (KHLT), other land managers
- **Benefit/Impact:** High
- **Feasibility:** Medium/High

4. Threat: Incompatible Road Development

a. Strategy: Repair and replace existing road crossing structures for aquatic organisms and wildlife, and integrate them into new construction.

- **Description:** Ensure that all culverts/bridges/crossings are adequate to the highest requirement possible for the passage of aquatic organisms and wildlife.
- **Justification:** Barriers created by inadequate infrastructure limit habitat connectivity and can interfere with fish and wildlife movement, reproduction, and feeding patterns.

- **Threats Reduced:** Habitat connectivity
- **Targets Improved:** Impacts all target areas and estuarine areas.
- **Proposed First Actions:** Review Kenai Peninsula Borough Ordinance 2008-03²⁴. Review and update ADF&G/ADOT Memorandum of Agreement regarding fish passage. Assess wildlife crossings.
- **Potential Intermediate Outcomes:** Private landowners construct fish-friendly stream crossings; Alaska Department of Transportation (ADOT) constructs fish-friendly crossings on all streams in the ADF&G Anadromous Waters Catalog (AWC); there are fewer wildlife collisions.
- **Key players:** Alaska Department of Fish and Game (ADF&G), Alaska Department of Transportation (ADOT), private landowners
- **Benefit/Impact:** High
- **Feasibility:** High

b. Strategy: Develop green infrastructure for stormwater management

- **Description:** Develop and work toward implementation of structures that can help mitigate pollutants and chemicals that flow into waterways from impervious surfaces.
- **Justification:** There is currently a low density of structures dedicated to mitigate chemical runoff from cars and trucks along impervious surfaces that flow into local waterways^{25,26}.
- **Threats Reduced:** Non-point source pollution.
- **Targets Improved:** Impacts all target areas and estuarine areas.
- **Proposed First Actions:** Conduct early-stage outreach focused on administrators and managers. Engage with KPB/DOT road managers and developers. Pilot "Salmon Safe" road and stormwater drainage projects.
- **Potential Intermediate Outcomes:** Creation of a green infrastructure implementation plan endorsed by local agencies.
- **Key players:** Kenai Peninsula Borough (KPB), Alaska Department of Transportation (ADOT), environmental nonprofits.
- **Benefit/Impact:** High
- **Feasibility:** Medium

c. Strategy: Prioritize parcels needing protection

- **Description:** Use existing data/maps to identify areas of highest priority for conservation, specifically identifying areas of importance to climate change mitigation/adaptation, including areas identified as thermal refugia.
- **Justification:** Limited resources are most effective when directed towards conservation priorities with the largest and most integrated benefits.
- **Threats Reduced:** Non-point source pollution; habitat connectivity; unintentional modification of high-value habitat
- **Targets Improved:** Impacts all target areas and estuarine areas.
- **Proposed First Actions:** Rank high value land (i.e., riparian habitat)^{27,28}; this could be completed by the Kenai Peninsula Borough GIS department or other KPFHP partner. Get approval from borough assembly and community

organizations for this and other land management efforts to be included in future comprehensive plans.

- **Potential Intermediate Outcomes:** An inventory of lands of high conservation value on the Kenai Peninsula; community and landowner engagement in protecting these; resources that will be useful in multiple types of land use decision making and management.
- **Key players:** Kenai Peninsula Borough (KPB), Alaska Department of Transportation (ADOT), mapping partners, Kachemak Heritage Land Trust (KHLT), Kenai Peninsula Fish Habitat Partnerships (KPFHP partners)
- **Benefit/Impact:** High
- **Feasibility:** High

d. Strategy: Relocate development out of floodplain areas

- **Description:** Minimize development in known flood zones through relocation of permanent structures.
- **Justification:** Development in flood-prone areas can put people and their property at risk, disrupt fish habitat connectivity, and burden government relief and recovery services²⁹.
- **Threats Reduced:** Habitat connectivity; property value; human safety.
- **Targets Improved:** Impacts all target areas and estuarine areas, particularly those in low-elevation floodplains.
- **Potential First Steps:** Prioritize developed private parcels for purchase and human relocation based on habitat value and flood risk, following the example of the City of Seward³⁰.
- **Potential Intermediate Outcomes:** KPB spends less money on emergency relief funds related to flooding; increased habitat protection.
- **Key players:** Kenai Peninsula Borough (KPB), private landowners, Kachemak Heritage Land Trust (KHLT), Partners for Wildlife
- **Benefit/Impact:** High
- **Feasibility:** High

5. Threat: Barriers to Fish Passage (Previously Hydro Development)

a. Strategy: Adapt a fish-compatible framework for hydro development that considers the diversity of streams on the Kenai Peninsula (large-scale and micro hydro projects)

- **Description:** Synthesize known research and/or existing framework regarding fish-friendly hydro development and adapt it to watersheds on the Kenai Peninsula that are the most viable options for hydro development.
- **Justification:** As hydroelectric projects on the Kenai Peninsula continue to be developed (because of increased pressure for renewable energy sources), we must implement these projects in the most ecologically responsible way possible. At present, there is a lack of information on what defines compatible hydro development and a lack of understanding regarding hydro impacts on groundwater flow.
- **Threats reduced:** Loss of fish habitat; injurious invasive species; incompatible commercial, road, and hydro development.

- **Targets improved:** High impact to glacial rivers without lakes, non-glacial mountain rivers, steep coastal streams, glacial rivers with lakes.
- **Proposed first actions:** Meet at a statewide level (among Fish Habitat Partnerships) to determine a course of action for the adaptation of this framework. Recruit stakeholders and a planning facilitator to host a workshop to synthesize existing research and knowledge with the goal of creating a draft framework.
- **Potential intermediate results:** Consensus reached statewide that an Alaska-specific framework for hydro power is needed.
- **Key players:** Fish Habitat Partnership entities, agencies engaged in FERC (Federal Energy Regulatory Commission) process, energy sector (Homer Electric Association (HEA), Alaska Energy Authority (AEA), Chugach Electric
- **Benefit/Impact:** Very high
- **Feasibility:** Medium (*unprecedented)

b. Strategy: Remain informed on hydro development projects on the Kenai Peninsula (specifically, their impact on fish habitat); share knowledge internally and externally

- **Description:** Remain informed on potential hydro projects as well as potential impacts to fish habitat. Expand external visibility to be a source of information to the public as the need for renewable energy resources grows.
- **Justification:** Hydro power as a source of energy is likely to increase on the Kenai Peninsula. We must ensure that this development causes the least amount of harm to fish habitat and that the full effects of hydro development are understood by the public (expansion of human footprint, alterations to cold water streams, impacts to seasonal hydrograph, etc.). An uninformed public may advocate for hydro implementation without a fish-friendly framework.
- **Threats reduced:** Injurious invasive species; incompatible commercial, roads, and hydro development.
- **Targets improved:** High impact to glacial rivers without lakes, non-glacial mountain rivers, steep coastal streams; medium impact to glacial rivers with lakes.
- **Proposed first actions:** KP-FHP takes a more active role in synthesizing available data and proposed projects, in part by creating a resource library geared toward the public and conducting community outreach when comment periods open.
- **Potential intermediate results:** Increased access to reliable fish-compatible hydro information for both developers and the public; the general public becomes more informed and more actively participates in comment periods when projects are proposed.
- **Key players:** Kenai Peninsula Fish Habitat Partnership (KPFHP), agencies engaged in FERC process
- **Benefit/Impact:** High
- **Feasibility:** Very high

6. Threat: Incompatible Mining

a. Strategy: Incentivize low-impact management and development of peatlands through increased awareness of and advocacy for these systems

- **Description:** Through outreach and incentives, create a framework that informs developers of Best Management Practices for minimizing impact to peatlands, and encourage their role in carbon offsets.
- **Justification:** Peatlands serve a critical role in groundwater storage, carbon storage, and filtration and are threatened by mining and uninformed development.
- **Threats Reduced:** Non-point source pollution; incompatible mining
- **Targets Improved:** Impacts lowland groundwater/wetland dominated systems.
- **Proposed First Actions:** Coordinate meeting with developers and contractors who work in peatland areas. Research possible structural property tax changes (search for precedent) and work to develop a carbon market. Create outreach materials emphasizing the importance of this resource. Facilitate on-site visits with larger landowners to articulate the significance of carbon sequestration by peatlands and discuss potential economic benefits of land conservation and ecosystem services.
- **Potential Intermediate Results:** Landowners/developers earn income for changes in land use; landowners/developers adopt practices that are more ecologically sound; carbon project funds provide an extra source of funding for future projects.
- **Key players:** Kenai Peninsula Aggregate and Contractors Association, private/public landowners who may bear increased costs from contractors, third party agency or nonprofit that will coordinate outreach materials, regulatory organization for the carbon market.
- **Benefit/Impact:** High
- **Feasibility:** Medium

b. Strategy: Advocate for gravel pit development that includes reclamation (and recreational) potential and lower impact to surrounding habitat

- **Description:** The Partnership advocates for the reduction of long-term damage to fish habitat resulting from gravel mining on the Kenai Peninsula, including increased adherence to reclamation standards for gravel mines and designated “no development” zones.
- **Justification:** Gravel mines can alter the groundwater flow of an area and are often left “as is” when mining is complete, though feasible reclamation measures often exist (i.e. connection of an anadromous stream to a retired gravel pit to in order to create a new lake and new sockeye habitat)³¹.
- **Threats Reduced:** Non-point source pollution; settling pond failure; habitat connectivity; injurious invasive species.
- **Targets Improved:** Impacts lowland groundwater/wetland dominated systems.

- **Proposed First Actions:** Research feasibility of changing minimum reclamation requirements. Identify "no development" zones where gravel mines cannot be placed regardless of what reclamation efforts are adopted. Showcase gravel conservation/reclamation efforts. Conduct groundwater flow research in areas near existing or proposed gravel pits.
- **Potential Intermediate Outcomes:** Creation of a guidance document/map/flow chart for distribution to developers about Best Management Practices (BMPs); reclamation requirements are changed.
- **Key players:** Alaska Department of Transportation (ADOT), Soil and Water Conservation Districts, Kenai Peninsula Borough (KPB), Kachemak Bay National Estuarine Research Reserve (KBNERR)
- **Benefit/Impact:** High
- **Feasibility:** Medium

7. **Threat: Catastrophic Spills**

a. **Strategy: Evaluate most effective manner to dispose of oil and chemicals spilled into a freshwater system on the Kenai Peninsula to guide future remediation efforts**

- **Description:** Study disposal methods for inland, freshwater spills that could occur on the Kenai Peninsula and evaluate components of effective remediation, which differs greatly depending on geographic area and ecosystem factors.
- **Justification:** Inland spills occur more often than marine spills, but often with less volume entering the system³². Disposal methods for freshwater spills haven't been extensively studied, and less is known about remediation when weighed against the impact that mitigation would have on the adjacent riparian and wetland habitat.
- **Threats Reduced:** Alterations in water quality from point source pollution.
- **Targets Improved:** Low impact to glacial rivers with lakes; medium impact to lowland groundwater/wetland dominated systems.
- **Proposed First Actions:** Acquire funding for project. Initiate study by establishing a framework for rapid response to the next inland freshwater spill. Perform literature review on current methods of chemical disposal in freshwater systems.
- **Potential Intermediate Outcomes:** Identification of most effective method of removal for various systems; creation of BMPs for future spills.
- **Key Players:** Alaska Department of Environmental Conservation (ADEC), Alaska Department of Transportation (ADOT), Environmental Protection Agency (EPA), third party nonprofit
- **Benefit/Impact:** High
- **Feasibility:** Medium (*unprecedented)

b. **Strategy: Advocate for green infrastructure in areas of high risk for spills**

- **Description:** Encourage installation or preservation of buffer spaces to increase chances for remediation if and when a spill occurs.

- **Justification:** Waterways with proximity to known or potential spill sites are at greater risk of having contaminants enter. Contamination from inland spills alters valuable habitat needed for aquatic organisms and poses a threat to human safety.
- **Threats Reduced:** Alterations in water quality from point source pollution; threats to human health and safety.
- **Targets Improved:** Low impact to glacial rivers with lakes; medium impact to lowland groundwater/wetland dominated systems.
- **Proposed First Actions:** Create “sites of interest” standards for use in GIS analysis to determine possible areas of future spills. Identify valuable areas depending on proximity to anadromous waterways, wetlands, and other valuable ecologic resources
- **Potential Intermediate Outcomes:** Creation of up-to-date GIS database of possible point source pollution sites; creation of outreach materials to hazardous waste managers/operators about how green infrastructure could benefit them in case of spill.
- **Key Players:** Alaska Department of Environmental Conservation (ADEC), Alaska Department of Transportation (ADOT), U.S. Department of Transportation (USDOT), Environmental Protection Agency (EPA), Kenai Peninsula Borough (KPB), third party nonprofit
- **Benefit/Impact:** Medium/High
- **Feasibility:** Medium (*unprecedented)

8. Threat: In-Stream Sedimentation

a. Strategy: Support education involving a variety of stakeholders (community leaders, decision makers, and members) on the relationship between human development/activity and in-stream sedimentation

- **Description:** Engage a variety of stakeholders on the Kenai Peninsula in educational opportunities focused on understanding the relationship between the human footprint and in-stream sedimentation; the relationship between increased sedimentation and fish health; and how humans can help mitigate the worst effects of in-stream sedimentation.
- **Justification:** There is a lack of community support for mitigative policy and a lack of public knowledge about the relationships between human activity and in-stream sedimentation, which can affect fish habitat quality via changes to dissolved oxygen and water flow.
- **Threats reduced:** Incompatible ORV and recreational use; insufficient community knowledge regarding value of riparian habitat.
- **Targets improved:** High impact to clearwater connected lakes with associated streams, glacial rivers with lakes, glacial rivers without lakes, non-glacial mountain rivers; medium/low impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, steep coastal streams
- **Proposed first actions:** Host community site visits to engage landowners and stakeholders. Standardize messaging regarding in-stream sedimentation and its impacts of fish habitat, i.e. “Baby Salmon Live Here!”

- **Potential intermediate results:** Increased community knowledge of negative impacts of in-stream sedimentation; community empowerment to take proactive measures to mitigate these impacts; reduction of public opposition to the 50-foot setback (and other habitat-focused policies).
- **Key players:** Nonprofits (Kachemak Heritage Land Trust, Kenai Watershed Forum, Cook Inletkeeper), Soil and Water Conservation Districts, U.S. Fish and Wildlife Service (USFWS), Alaska Department of Fish and Game (ADF&G)
- **Benefit/Impact:** Very High
- **Feasibility:** Medium

b. Strategy: Expand availability of research and data to the public through the Kenai Peninsula Fish Habitat Partnership website and beyond

- **Description:** Gather metadata on existing knowledge about in-stream sedimentation from the Kenai Peninsula and present it in a format that is easily understood and accessible by a variety of stakeholders.
- **Justification:** Currently, much of the information on local research addressing in-stream sedimentation is not readily accessible to members of the public. A value shift towards understanding the economic ties to ecological function and health (and what we can do to mitigate erosion and sedimentation) is lacking throughout broad sections of the public.
- **Threats reduced:** Incompatible ORV and recreational use.
- **Targets improved:** High impact to clearwater connected lakes with associated streams, glacial rivers with lakes, glacial rivers without lakes, non-glacial mountain rivers; medium/low impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, steep coastal streams.
- **Proposed first actions:** Gather and synthesize research addressing impacts of riparian habitat degradation on fish. Support and disseminate research showing economic ties to ecological functions (e.g., the benefits of intact riparian areas to livelihood). Highlight locally impactful/significant work and research.
- **Potential intermediate results:** Creation of a literature review concerning habitat degradation (via sedimentation as well as other sources) and its relationship to fish health; increased information flow through the Kenai Peninsula Fish Habitat Partnership (internal and external); reduction in public opposition to the 50-foot riparian setback (and other policies).
- **Key players:** Federal landowners on the Kenai Peninsula (Kenai National Wildlife Refuge, Kenai Fjords National Park, Chugach National Forest), U.S. Fish and Wildlife Service (USFWS), Alaska Department of Fish and Game (ADF&G)
- **Benefit/Impact:** Medium
- **Feasibility:** Very high

c. Strategy: Continue to support proactive measures for habitat protection.

- **Description:** Provide continued support for and stronger enforcement of existing measures for assessing and protecting fish habitat.
- **Justification:** Proactive habitat protection is often of greater value than reactive management strategies; datasets and policies are already in place but would benefit from reinforcement.
- **Threats reduced:** Incompatible ORV and recreational use.
- **Targets improved:** High impact to clearwater connected lakes with associated streams, glacial rivers with lakes, glacial rivers without lakes, non-glacial mountain rivers; medium/low impact to lowland groundwater/wetland-dominated systems, closed-basin lakes, steep coastal streams.
- **Proposed first actions:** Continue to support Mountains to Sea³⁰ and similar initiatives. Continue to support the 50-foot setback. Continue to support installation and maintenance of raised walkway structures in riparian areas with regular foot traffic. Update anadromous waters catalog.
- **Potential intermediate results:** Increased support for maintaining 50-foot riparian setback; increased compliance with and enforcement of 50-foot riparian setback; reduction in public opposition to the 50-foot riparian setback (and other policies); economic value assigned to riparian setbacks by the Kenai Peninsula Borough.
- **Key players:** Kenai Watershed Forum (KWF), Kachemak Heritage Land Trust (KHLT), Cook Inletkeeper (CIK), others
- **Benefit/Impact:** Very high
- **Feasibility:** Very high

d. **Strategy: Support research on (a) the impact of suspended sedimentation on habitat suitability for fish, and (b) a reassessment of turbidity baseline data due to climate change effects**

- **Description:** Continue, expand, and support research on the Kenai Peninsula regarding (a) sedimentation levels and impacts to fish, and (b) sources of increased sedimentation as they relate to climate change and potential future impacts to fish habitat.
- **Justification:** There will be significant changes to in-stream sedimentation rates as the climate continues to change, and there is already a lack of understanding of the sources of increased sedimentation and its impacts on fish health. It will be important to understand these changes to direct management decisions and governmental policies.
- **Threats reduced:** The threat of loss of in-stream habitat through sedimentation is reduced through increased understanding of the impacts of sedimentation on fish. Project threats reduced include warmer climate, wildfire, and incompatible recreational use.
- **Targets improved:** High impact to clearwater connected lakes with associated streams, glacial rivers with lakes, glacial rivers without lakes, non-glacial mountain rivers; medium/low impact to lowland

groundwater/wetland-dominated systems, closed-basin lakes, steep coastal streams

- **Proposed first actions:** Resume continuous turbidity monitoring on the Kenai River to capture shifting baseline and its effects on changing fishery. Compare new and historical data and reassess the need for further research.
- **Potential intermediate results:** Increased understanding of sedimentation, impacts of climate change, and intervention options as they pertain to fish and habitat health.
- **Key players:** Kenai Watershed Forum (KWF), U.S. Fish and Wildlife Service (USFWS), Alaska Department of Environmental Conservation (ADEC), Alaska Department of Fish and Game (ADF&G), National Oceanic and Atmospheric Administration (NOAA)
- **Benefit/Impact:** Unknown
- **Feasibility:** High

Additional Threats

An extensive list of additional threats was considered in the 2022 workshops. Current and emerging threats not included in the above list either received lower rankings or were less clearly within the capacity of the Kenai Peninsula Fish Habitat Partnership. Some of these threats included:

- Large-scale salmon hatchery operations
- Incompatible aspects of the tourism industry
- Shifting political regimes and regulatory environments
- Newly arrived aquatic contaminants and diseases (microplastics, 6PPD-q³³, parasites, etc.)
- Shifting baselines (e.g., expectation of ‘new normal’ in periods of declining fish population)³⁴

Implementing Strategies to Protect Fish Habitat

There is great value in preparing a strategic conservation plan: refining and reconfirming the vision and goals of an organization, developing new quantitative outcomes, and identifying a path to reach those outcomes. There also is value in the process itself: the discussions, brainstorming, decision-making, and deconstruction of barriers among agency staff.

But to take these values and make them *valuable* requires the implementation of the plan. The full value of conservation planning is only realized through its implementation. In this process, the focus shifts from goals, outcomes and strategies to actions, budgets, and leadership.

There are three steps to implementation:

1. *Develop an Annual Operating Plan and Budget*
 - a. An annual operating plan translates strategies into specific, small steps that can be implemented within a specific timeframe. These are the short-term outputs that lead to long-term outcomes. Annual plans should have the appropriate level of detail for implementation and be developed in a format that is easy to track and measure.
 - b. The specific actions needed to implement the conservation plan are included in the result chain diagrams developed for each strategy (see group [Miro board](#)¹⁸). A results chain diagram shows the link between strategies and desired outcomes, outlines intermediate results (benchmarks), assesses the logic and completeness of strategies, identifies assumptions and uncertainties, and lists implementation actions. An implementation plan that identifies initiation date, desired completion date, project lead, team members and status for every action should be generated.
2. *Manage Implementation and Change*
 - a. All strategic conservation plans, if they advance the work of an organization and improve conservation status, will induce changes. These include new skills and knowledge (green infrastructure, collaboration skills), added responsibilities (funding, outreach), increased communication across the organization (staff meetings, communication calendar), and changes in the culture of the organization (diversity and inclusion). The plan itself is a commitment to change.
 - b. Change is hard. Its acceptance is greatly enhanced if the change is understood and appreciated, if there is commitment to improving the organization and implementing the conservation plan, and if the organization embraces the concept of change.
 - c. Leadership is needed to guide the implementation of actions, manage change and clear a path for success within the organization, as well as for monitoring and evaluation.
3. *Monitor and Evaluate*
 - a. Measures are defined as the sequential collection of data on selected indicators to assess progress toward and the achievement of outcomes. They continuously track the performance of a strategy, project and/or program, providing information on the direction, pace and magnitude of change. They allow managers to verify anticipated progress and to detect unanticipated outcomes.
 - b. Measures allow an organization to:
 - i. Assess the outcomes of strategies and projects
 - ii. Adapt actions to ensure they are achieving the desired outcome
 - iii. Assess and improve the effectiveness and efficiency of strategic actions
 - iv. Assess costs and return on investment
 - v. Provide transparency and accountability
 - vi. Enable learning to better implement and develop strategies

- c.* The result chain diagrams provide a template for developing the measures for activities, intermediate results and outcomes¹⁸.
- d.* A monitoring implementation and evaluation spreadsheet, with measurable objectives, measurement indicators, monitoring methods, and analysis guidelines should be developed for the strategic plan.

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