

# Nisqually River Delta—Humans and Nature Benefiting Together



**U.S. Department of the Interior  
U.S. Geological Survey**

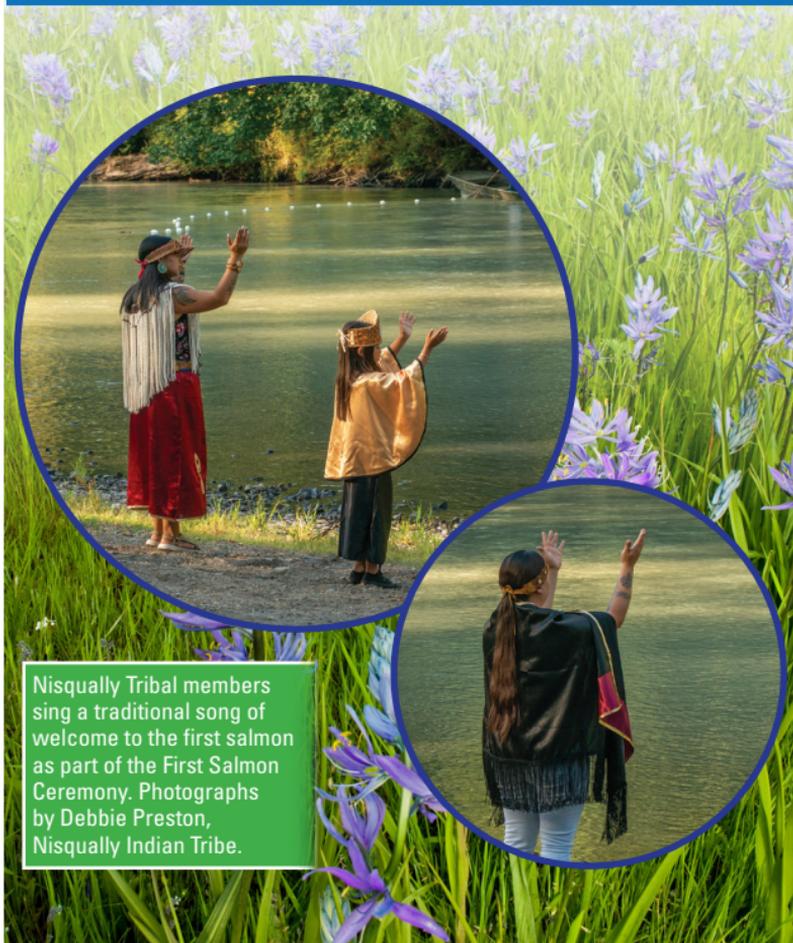
# History of Nisqually—*The River and the People*

Nisqually people were first known as the Squally-absch, meaning “people of the river, people of the grass,” referring to the many prairies that bloomed with the blue camas blossoms east of Puget Sound, Washington.

For tens of thousands of years, the traditional homeland of the Nisqually Indian Tribe extended about 2 million acres throughout the Nisqually River watershed

and the marine waters of South Puget Sound. At the mouth of the Nisqually River, abundant salmon were caught and dried, and in the upper watershed on the flanks of Mount Rainier, hunting was excellent and berries and medicinal plants were gathered.

The Nisqually people have always been a fishing people, as salmon form the foundation of the Nisqually people’s culture, heritage, and way of life.



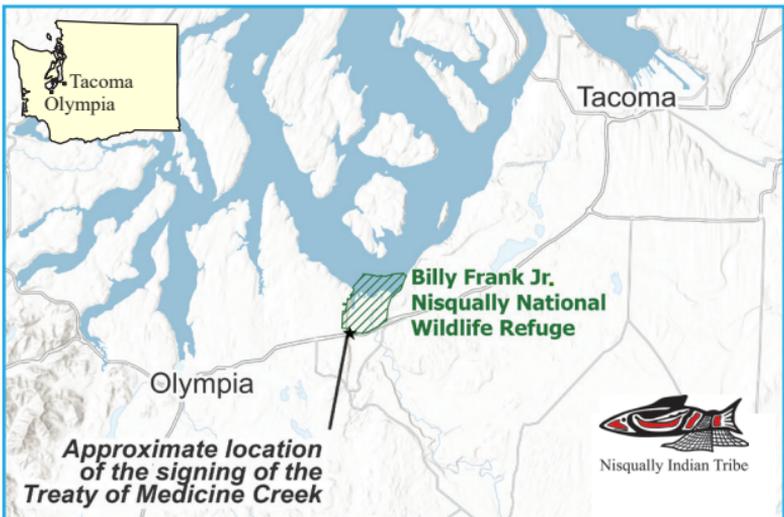
Nisqually Tribal members sing a traditional song of welcome to the first salmon as part of the First Salmon Ceremony. Photographs by Debbie Preston, Nisqually Indian Tribe.

# History of Nisqually—*The River and the People*

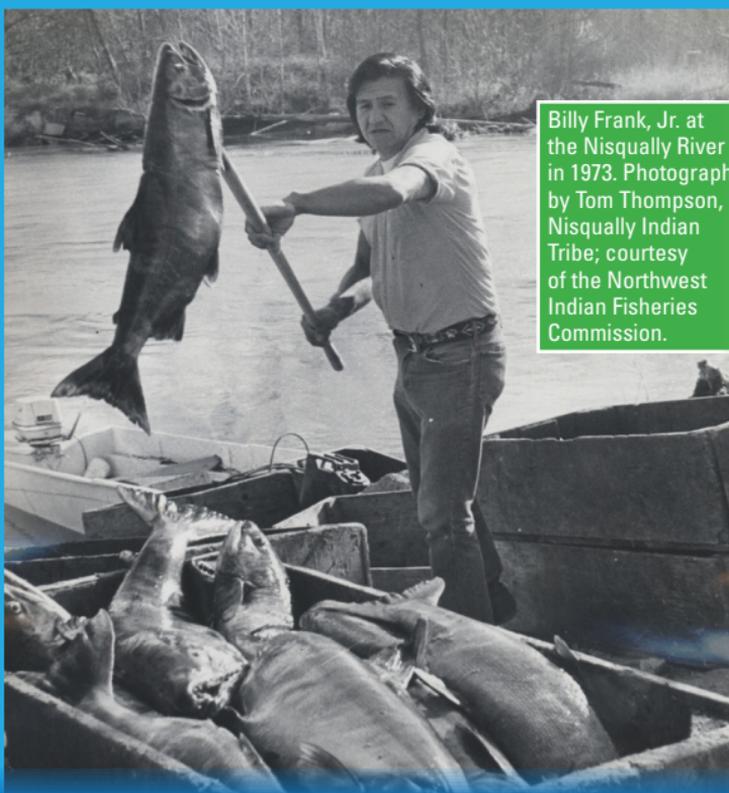
The way of life for Tribal Nations changed dramatically with Euro-American settlement. The U.S. Government made treaties—legally binding contracts between sovereign nations—through which Tribes ceded title to vast amounts of land to the United States in exchange for protection, services, and, in some cases, cash payments. In 1854, the Treaty of Medicine Creek was signed on lands now within the Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge) by the U.S. Government and nine Tribal Nations in Puget Sound. Under this treaty, the Tribes would retain the rights for themselves and future generations to

hunt, fish, and gather as they always had in exchange for thousands of acres of land.

Nisqually Chief Leschi refused to sign a first draft of the Medicine Creek Treaty, which did not include the critical cultural lands associated with the Nisqually River. The Tribe later ceded thousands of acres of land to white settlers in return for maintaining their fishing, hunting, and gathering rights and locating their reservation along the Nisqually River. Local governments later condemned two-thirds of the Tribal reservation of Nisqually land for what became Fort Lewis, now known as Joint Base Lewis-McChord.



# History of Nisqually—*The River and the People*



Billy Frank, Jr. at the Nisqually River in 1973. Photograph by Tom Thompson, Nisqually Indian Tribe; courtesy of the Northwest Indian Fisheries Commission.

In the 1960s, the Nisqually Indian Tribe joined with the Nisqually Delta Association and other groups to prevent a port from being built at the mouth of the Nisqually River, which would have doomed most of the species of fish and threatened the Tribe's reserved treaty rights. This was also the period of time when Tribes throughout the region fought for recognition of their treaty fishing rights, also known as the Fish Wars. Billy Frank, Jr., a

Nisqually Tribal member and the namesake of the refuge, was a leader of this civil rights movement.

The Tribe's rights to fish throughout its Usual and Accustomed areas was affirmed in 1974 by U.S. Federal District Court Judge George Boldt. Known as the "Boldt Decision," this ruling established Tribes as co-managers of the salmon fishery, and the decision was upheld by the U.S. Supreme Court in 1979.

# History of Nisqually—*The River and the People*

In efforts to promote salmon recovery, the Tribe purchased Ken Braget's farm at the mouth of the Nisqually River in 2003 to help restore the estuary and protect the salmon the Tribe depends on. The land is managed cooperatively with the Refuge under an agreement signed in 2005 between the sovereign Nisqually Indian Tribe and the U.S. Fish and Wildlife Service. In 2009, the Refuge, the Nisqually Indian Tribe, and Ducks Unlimited, Inc.

partnered to complete one of the largest estuary restoration projects in the Pacific Northwest, with the removal of the century-old Brown Farm Dike. Restoration of 762 acres to tidal exchange increased habitat and prey for fish that rely on the estuary.

For the Nisqually people, fishing is a vital part of their culture. The Nisqually Indian Tribe are still people of the river, people of the grass.



Nisqually Indian Tribe fishermen work their nets on the Nisqually River to catch Chinook salmon, largely produced by the Tribe's hatcheries. The Tribe fished more than 100 days per year in the 1970s and now fishes an average of 8 days per year. Photographs by Debbie Preston, Nisqually Indian Tribe.



# Nisqually Today—*The Habitat*

The Nisqually River begins in the meltwaters of Mount Rainier and empties into Puget Sound at the Nisqually River Delta. Collectively, the Billy Frank Jr. Nisqually National Wildlife Refuge, Nisqually Indian Tribe, and Washington Department of Fish and Wildlife manage the entire Nisqually River Delta for wildlife conservation and wildlife-dependent recreation. Following a series of estuarine restoration projects, the delta is a place where the freshwater river meets the saltwater of Puget Sound, creating dynamic estuarine habitats, such as tidal marshes, mudflats, and subtidal marine waters. In combination

with riparian (along the river) and upland forests, grasslands, and managed freshwater wetlands, this diverse landscape supports a variety of wildlife: salmon species and forage fishes; waterfowl, shorebirds, songbirds, and raptors; mammals such as harbor seals, beavers, coyotes, deer, otters, and minks; and more than 400 species of plants.<sup>1</sup> As one of the largest and least disturbed estuaries remaining in Puget Sound, the diversity in habitat and wildlife also provides a variety of benefits to people, including wildlife viewing, photography, environmental education and interpretative opportunities, fishing, and waterfowl hunting.



Upland



Tidal Forest



Freshwater Marsh



Brackish Marsh



High Marsh



Transitional Marsh



Mudflat



Subtidal

Habitats of the Nisqually River Delta. Figure is from Moritsch and others (2022) and is licensed under CC by 4.0 (<https://creativecommons.org/licenses/by/4.0>). Photographs are courtesy of Billy Frank Jr. Nisqually National Wildlife Refuge, Kristin Byrd, and Monica Moritsch.

# Nisqually Today—*The Visitors*



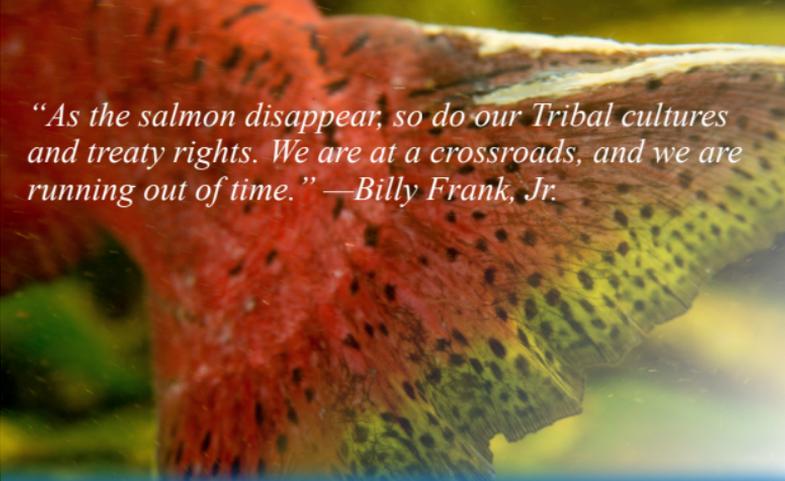
Nestled between Olympia and Tacoma and about 50 miles from Seattle, the Nisqually River Delta is located within 100 miles of more than 4 million people. More than 350,000 people visit the Refuge each year to enjoy the diversity of habitats and wildlife. Recreational opportunities are available throughout the year, including nature interpretation, environmental education, wildlife observation, and wildlife and landscape

photography as well as mentoring, internships, and hands-on experiential learning.

The Refuge hosts more than 10,000 school children every year, including Eye On Nature field trips with education partners. The Refuge holds a public Summer Lecture Series and hosts an annual Nisqually Watershed Festival with partners that encourages public engagement and stewardship over shared natural resources.



# Nisqually Fisheries



*“As the salmon disappear, so do our Tribal cultures and treaty rights. We are at a crossroads, and we are running out of time.” —Billy Frank, Jr.*

More than 90 species of fish have been observed in the Nisqually River Basin. Severe declines in salmon populations have spurred estuarine restoration and enhancement efforts across Puget Sound. Chinook salmon (also known as king salmon) are the largest of the Pacific salmonids and are central to the cultural heritage of the Nisqually Indian Tribe. Chinook salmon rely heavily on estuarine habitat to complete their transformation from freshwater to saltwater species and for critical food resources.

Chinook salmon are often indicators of restoration progress. In the delta, restoration of estuarine marshes has provided abundant prey for juvenile Chinook salmon and may actually bolster fish growth rates that are vital for survival.<sup>2,3</sup> Maintaining estuarine habitats into the future plays a critical role in the survival of Chinook salmon as well as in preserving the Treaty Rights and cultural foundations of the Nisqually Indian Tribe.



# Nisqually Birdwatching

One of the most popular activities in the delta is wildlife viewing; in particular, birdwatching. Mobile applications, such as eBird, are used by many birdwatchers to track trips and record the type and location of bird species they observe. The eBird app hosts a collection of birding observations submitted by amateur birdwatchers and is available to the public. The diversity of habitats is reflected by the observations

of the more than 250 bird species at the Refuge. The presence of shorebirds, ducks, seabirds, songbirds, and raptors also changes with the dynamic tides and seasons, so visitors are treated to new discoveries on each visit. Trails, such as the Twin Barns Loop and the Nisqually Estuary Boardwalk, meander through a variety of habitat types (forest, riparian, estuary, and freshwater wetlands) and provide overlooks for wildlife viewing.



# Nisqually Carbon

Tidal wetland plants pull carbon dioxide (CO<sub>2</sub>) out of the atmosphere and store carbon in their tissues for short time scales. As plant tissues decompose, they form soil. In soils, carbon can stay for hundreds to thousands of years. Carbon stored in the soil plays a vital role in offsetting greenhouse gases released to the atmosphere and helps reduce the impacts of climate change.

Management actions, such as estuarine restoration, can help offset greenhouse gases by storing soil carbon. Researchers from the U.S. Geological Survey (USGS) found that the 2009 Restoration stored about the same amount of soil carbon as a mature tidal marsh.

An estimated 13,500 metric tons of carbon was stored in the soil within the first 10 years following the 2009 Restoration.<sup>4</sup> This resulted in the equivalent of growing 224,000 tree seedlings for 10 years.

Carbon in the delta may also be consumed by invertebrates, which provide food for fish and wildlife. USGS researchers conducted invertebrate prey studies throughout the estuary, including within the area restored in 2009. They estimated that the 2009 Restoration produced up to an estimated 6,000 Megajoules of invertebrate energy during the spring and summer of 2012,<sup>3</sup> or the rough daily equivalent of energy consumed by 40 people.

U.S. Geological Survey (USGS) scientists Judy Drexler and Jim Orlando collecting a soil core at the Billy Frank Jr. Nisqually National Wildlife Refuge. The core photos show sediment accumulation in the marshes over time. Photographs by Judy Drexler.



## Challenges at Nisqually— *Climate and Sea Level Rise*

Over the past thousands of years, sea level has increased in small amounts each year. The elevation of tidal wetlands relative to the sea has increased at the same time by the building up of their soil with sediment and plant material. The elevation of the delta and its tidal wetlands greatly influences the types of habitats that are present and how much carbon they can store. As wetland soils increase in depth, so does the carbon that is sequestered. The rate of

sea level rise is increasing as a result of climate change. If the rate of sea level rise outpaces the rate of wetland elevation gain, wetland plant communities will flood more often, and habitats may change.

One opportunity for tidal wetlands is for them to migrate or move inland where elevations are more suitable. Another challenge wetlands face is human development and engineered barriers, such as roads and levees, that prevent this migration from occurring.

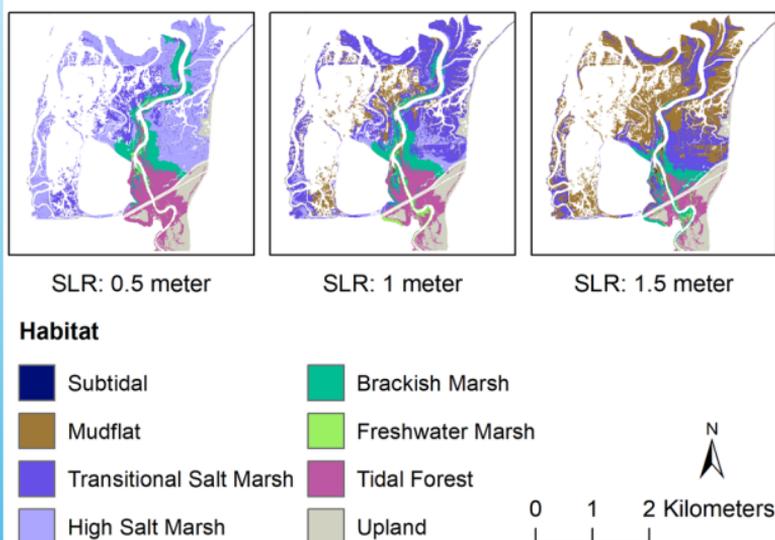
Tidal marsh channel bank erosion at the Billy Frank Jr. Nisqually National Wildlife Refuge. Photograph by Isa Woo, U.S. Geological Survey.



# Challenges at Nisqually— *Climate and Sea Level Rise*

The USGS and the Refuge completed a study in 2022 to model how Nisqually habitats and carbon accumulation may change with sea level rise. Using a wetland elevation model, a habitat model, and many types of data collected in wetlands, scientists found that with more than 1 meter of sea level rise, most salt marsh may transition to sparsely vegetated marsh or mudflat and that the rate of carbon accumulation would

decline.<sup>5</sup> Without management intervention, the projected loss of tidal marsh and forested habitat resulting from sea level rise could also affect the base of the salmon food web and salmon growth throughout the estuary. Because Chinook salmon are one of the most estuarine-dependent salmonids, substantial declines in estuarine habitat would imperil this native and highly prized cultural resource.



Modeled change in habitat and soil carbon accumulation in the Nisqually River Delta after 100 years for three different rates of sea level rise (SLR). Figure modified from Moritsch and others (2022).

# Resilience and the Future of Nisqually



Resilience is defined as an ability to recover from or adjust easily to misfortune or change. Climate-associated threats, such as sea level rise, warmer temperatures, and reduced snowpack all threaten the resilience of Nisqually estuary habitats for native fishes, waterbirds, wildlife, and people alike. The resilience of the Nisqually River Delta relies on how land managers can address these challenges through habitat acquisition, restoration, and enhancement, and through integrated fisheries, waterbird, and recreation management.

The Nisqually Indian Tribe manages two fish hatcheries to help salmon populations recover. Using multiple strategies

together—for example, managing when fish are released from the hatchery and restoring critical habitats—can synergistically promote fishery resilience. Likewise, for birds, managing for a diversity of habitats into the future may help sustain bird populations. Short-term management for fish, waterbirds, and recreation may focus on improving existing habitat, whereas long-term planning may consider opportunities for future tidal marshes to expand inland.



# Resilience and the Future of Nisqually

One way to reduce the effects of sea level rise is to increase the supply of sediment from the Nisqually River Watershed to the wetlands in the delta. Increased sediment will help wetlands continue to build soil at a faster pace and better keep up with sea level rise. One way to increase sediment is to increase the connections throughout all habitats within the delta.

Because of forward planning, an approved Refuge boundary includes lands upriver and south of Interstate 5. This allows the Billy Frank Jr. Nisqually National Wildlife Refuge,

Nisqually Indian Tribe, Nisqually Land Trust, and other partners the opportunity for future acquisitions, habitat restoration, and removal of barriers needed to improve the connections between river and delta habitats.

Acquiring and protecting the lands in the watershed from Mount Rainier to Puget Sound in perpetuity takes consistent effort from the Tribe, Refuge, and their many partners. This strong foundation provides hope for the future of the watershed and helps to protect it from evolving threats.



Measuring elevation in the tidal marsh at the Billy Frank Jr. Nisqually National Wildlife Refuge. Photograph by Anna Kennedy, U.S. Geological Survey.

# References and Acknowledgments

- <sup>1</sup>U.S. Fish and Wildlife Service, 2005, Nisqually National Wildlife Refuge final comprehensive conservation plan: Olympia, Wash., Nisqually National Wildlife Refuge Complex, 137 p. plus 14 appendixes, accessed June 23, 2023, at <https://ecos.fws.gov/ServCat/DownloadFile/1516>.
- <sup>2</sup>Woo, I., Davis, M.J., Ellings, C.S., Nakai, G., Takekawa, J.Y., and Cruz, S.D.L., 2018, Enhanced invertebrate prey production following estuarine restoration supports foraging for multiple species of juvenile salmonids (*Oncorhynchus* spp.): *Restoration Ecology*, v. 26, no. 5, p. 964–975. [Also available at <https://doi.org/10.1111/rec.12658>.]
- <sup>3</sup>Davis, M.J., Ellings, C.S., Woo, I., Hodgson, S., Larsen, K., and Nakai, G., 2018, Gauging resource exploitation by juvenile Chinook salmon (*Oncorhynchus tshawytscha*) in restoring estuarine habitat: *Restoration Ecology*, v. 26, no. 5, p. 976–986. [Also available at <https://doi.org/10.1111/rec.12643>.]
- <sup>4</sup>Drexler, J.Z., Woo, I., Fuller, C.C., and Nakai, G., 2019, Carbon accumulation and vertical accretion in a restored versus historic salt marsh in southern Puget Sound, Washington, United States: *Restoration Ecology*, v. 27, no. 5, p. 1117–1127. [Also available at <https://doi.org/10.1111/rec.12941>.]
- <sup>5</sup>Moritsch, M.M., Byrd, K.B., Davis, M., Good, A., Drexler, J.Z., Morris, J.T., Woo, I., Windham-Myers, L., Grossman, E., Nakai, G., Poppe, K.L., and Rybczyk, J.M., 2022, Can coastal habitats rise to the challenge? Resilience of estuarine habitats, carbon accumulation, and economic value to sea-level rise in a Puget Sound estuary: *Estuaries and Coasts*, v. 45, p. 2293–2309. [Also available at <https://doi.org/10.1007/s12237-022-01087-5>.]

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Additional photograph captions and credits:

Front cover: Feeding heron, hairy woodpecker, juvenile Chinook salmon, and the Nisqually River. Photographs by the U.S. Fish and Wildlife Service.

Page 1: Camas wildflowers. Photograph by the U.S. Fish and Wildlife Service.

Page 6: Top. Elementary school visit and walking tour. Photographs by Glynnis Nakai, U.S. Fish and Wildlife Service. Bottom. Watershed Festival Day at the Billy Frank Jr. Nisqually Wildlife Refuge. Photographs by Glynnis Nakai, U.S. Fish and Wildlife Service, and Christopher Ellings, Nisqually Indian Tribe Department of Natural Resources.

Page 7: Chinook salmon. Photograph by the U.S. Fish and Wildlife Service.

Page 8: Viewing station at the Billy Frank Jr. Nisqually Wildlife Refuge, Clockwise from top, yellow warbler, greater yellowlegs, and male wood duck. Photographs by U.S. Fish and Wildlife Service.

Page 12: Marsh wetland and restoration. Photographs by the U.S. Fish and Wildlife Service.

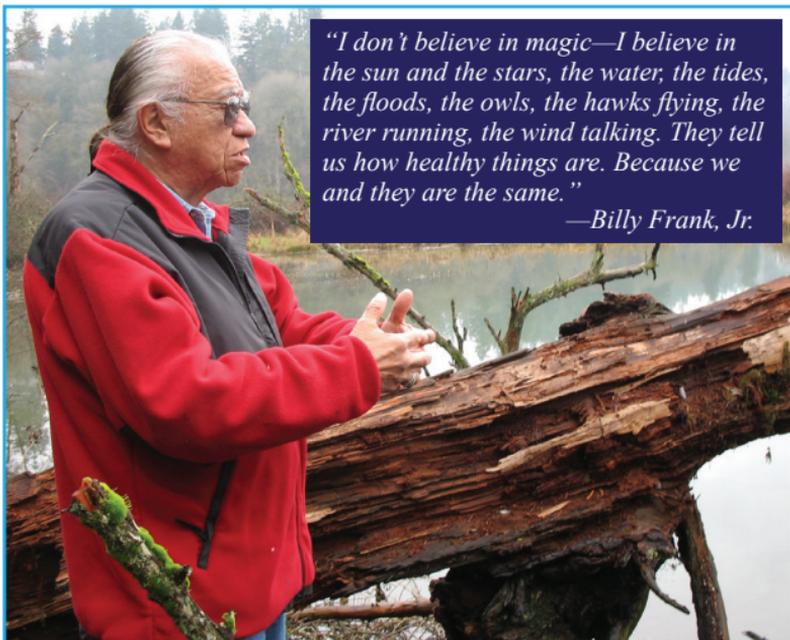
Back cover: Mt. Rainer in the distance. Photograph by the U.S. Fish and Wildlife Service.

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*“I don’t believe in magic—I believe in the sun and the stars, the water, the tides, the floods, the owls, the hawks flying, the river running, the wind talking. They tell us how healthy things are. Because we and they are the same.”*  
—Billy Frank, Jr.

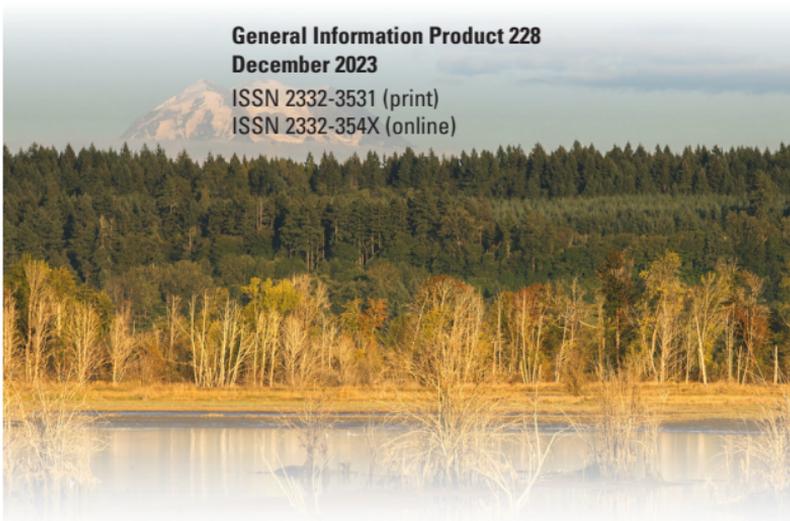
The late Billy Frank, Jr., a Nisqually Tribal member, treaty rights advocate, and fisherman, talks about the importance of the treaties at the site of the signing of the Medicine Creek Treaty. Photograph by Tony Meyer, Northwest Indian Fisheries Commission.

## Get in touch with the Billy Frank Jr. Nisqually National Wildlife Refuge

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