Species Impacts on PNW Coastal Indigenous First Foods, for Oregon Invasive Species Council (OISC)

Authors: Jasmine Beach, Zosia Lynch, Caitlin Sharpe, Rowan Irene and Macayla Mesaros

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In the spirit of brokering and facilitating a path to equity and sovereignty for Indigenous Nations, it is essential to make way for Indigenous Traditional Ecological Knowledge (ITEK) within scientific disciplines, particularly in land management, stakeholder, and stewardship conversations. A large part of this process is recognizing, beyond symbolic gesture, the Tribal Nations and Bands that have tended the land since time immemorial. This body of research particularly acknowledges the determination of past, present, and future generations of Indigenous peoples who have been subjected to exclusion and erasure by governmental, academic, and cultural institutions. To move beyond monolithic and symbolic requires a process of two-eyed seeing that removes distinctions and finds strength in the overlap of Western science and ITEK.

The Oregon coast is home to the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw, the Confederated Tribes of Grand Ronde, the Confederated Tribes of Siletz Indians, including the Tillamook band, the Cow Creek Band of Umpqua Tribe of Indians, and the Coquille Indian Tribe (State of Oregon n.d.). These nations and peoples have lived along the Oregon coast and throughout the Willamette Valley for time immemorial. It is important to remember that there may be tribes not explicitly recognized in this list, as many communities have been stripped of tribal status. Record keeping of the boundaries of territories can also be tricky as it becomes difficult to quantify or segment the nuances of indigenous identity.

The Siletz are a federally recognized confederation of over 30 bands of Indigenous people who live throughout Northern California to Southern Washington (CTSI 2022). The bands and tribes that fall under the Siletz recognition include the Clatsop, Chinook, Klickitat, Molala, Kalapuya, Tillamook, Alsea, Siuslaw/Lower Umpqua, Coos, Coquelle, Upper Umpqua, Tututni (including all the lower Rogue River Bands and those extending up the coast to Floras Creek and down to Whales Head), Chetco (including all of the villages from Whales Head to the Winchuck River), Tolowa, Takelma (including the Illinois Valley/mid-Rogue River and Cow Creek peoples), Galice/Applegate, and Shasta bands (CTSI 2022). Each tribe has a unique history, cultural practices, and a host of traditional First Foods and resources (CTSI 2022). Coastal traditions, however, were relatively similar for many of these tribes. Tribal communities were stationary during the Winter, living in shared housing in large family units (CTSI 2022). In warmer months, communities would travel by canoe to areas where more fish and crops, such as salmon or camas, were abundant (CTSI 2022; Lewis 2011).

Indigenous people in Oregon must be acknowledged to build a more equitable landscape where Oregon natives can create more avenues to sovereignty over the land, and treaty rights must be upheld. Impacts to Tribal fisheries must be acknowledged and mitigated

by working both with Oregon State government and Tribal governments, along with Indigenous peoples and Indigenous managers.

This document aims first to provide an informative, educational resource that outlines avenues towards environmental justice concerning Indigenous communities of the Oregon coast and the invasive species that potentially threaten their access to and sustainable cultivation of First Foods. Mitigation and long-term adaptive response strategies are suggested to promote environmental justice and preserve Indigenous first foods. Suggested strategies are to build greater relationships with coastal indigenous communities and provide spaces to co-produce mitigation efforts. Second: To educate the public and environmental managers via the OISC Hub of invasive species contributing to or exacerbating biodiversity loss and climate change, thereby decimating first foods and resources.

Identifying First Foods of the coastal Pacific Northwest is central to the research herein. Still, the secondary determination is to consider which invasive species currently listed in the OISC Hub directly affect access to, cultivation of, or proliferation of First Foods. Identifying local First Foods is essential to upholding the cultural traditions, spirituality, and ecological knowledge that predate colonization.

Tribal communities along the coast farmed, fished, hunted, and gathered various coastal First Foods and resources important to their culture, spirituality, and way of life. Communities more inland hunted for deer and elk and gathered tarweed seeds, wapato, acorns, hazelnuts, and other nuts and fruits. Plants and herbs were gathered and cultivated with fire and other methods, such as camas (bulb of the wild lily) (CTSI 2022). Bark and timber were gathered to build lodges, canoes, weapons, and other tools or resources during winter when tribes were more stationary (CTSI 2022). During warmer months, when many tribes were nomadic, they focused on gathering materials, hunting, and conducting burning to aid the cultivation of plants and hunt wildlife more easily (CTSI 2022). Plants and herbs, such as dandelion or tobacco, were used as traditional medicines, food resources, or cultural offerings. These resources add to a wide expanse of traditional ecological knowledge held by indigenous peoples worldwide. Many traditional foods for coastal tribal communities are estuarine mammals and other marine species such as sea lions, whales, shellfish, ocean fishes, salmon, water birds, shellfish, oysters, crabs, lamprey, etc. Since many coastal communities depended on marine life, much of their hunting for food took place in Oregon's estuaries (CTSI 2022).

There needs to be more information about the effects of invasive species on first foods, specifically those that would directly impact tribal nations along the Oregon coast. To facilitate this need, the information synthesized in this report is meant to populate the OISC Hub while encouraging invasive species managers to engage with stakeholders, prioritize Indigenous land stewards, and ultimately co-create a removal strategy and long-term adaptive response that protects and preserves first foods and resources. Further, it encourages upholding Tribal treaty rights and provides avenues for sovereignty. In that, including Indigenous community members who hold legal treaty rights to coastal lands in Oregon is essential to ensure an equitable place in management teams to promote procedural justice.

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Profile Narratives

Terrestrial Vegetation

Common Name: Dodder vine

Scientific Name: *Cuscuta japonica*

Background: Dodder vine is a parasitic vine that possesses no chlorophyll, and receives all its energy from the host plant. Infestations of Japanese dodder vine are significant, and can spread to large areas that kill mature trees and understory growth. Dodder vine is not known to exist in Oregon, however the coastal climate, particularly in the south, is well suited for its establishment (ODA. 2015). Originally from eastern Asia, this vine has readily spread in Florida, South Carolina, Texas, and extensively on the California ranges. Dodder vine is extremely hard to manage as its seeds are dispersed by moving water, soil disturbance, and through stem fragmentation (ODA, 2015)

Impacts on First Foods from Hub Species:
Dodder vine strangles and starves understory small trees and shrubs, and in California is known to infest California buckeye, California live oak, elderberry, native plum, native willows, and fruit trees (Cal-IPC News, 2006). Woodland and riparian habitats that are home to many berry-producing first foods such as salal, huckleberry, thimbleberry shoots, elderberry, hazelnut and crabapple could be impacted (First Nations Health Authority, n.d.). These berry-producing understory plants are incredibly important first foods that continue to be harvested and preserved from early summer to late fall (Turner, 1995; First Nations Health Authority, n.d.). Western Hemlock (*Tsuga heterophylla*), and Western Red Cedar (*Thuja plicata*) are common coastal trees that grow in shaded forests that could potentially be impacted. Western hemlock cambium, mixed with highbush cranberries, has traditionally been used to make cakes in late winter when all preserved salmon has been consumed (Turner, 1995). Western Red Cedar is used to create baskets, fishing boughs, medicinal uses to purify and cleanse, or boiled and used for smudging (First Nations Health Authority, n.d.). Additionally, dodder vine has the potential to infest temperate coastal ranges in Oregon year-round due to the lack of deep freezing events in this eco-region (ODA, 2015). This in turn may affect the prevalence of large game due to a

decrease in berry producing understory shrubs and trees, and degrade riparian habitats by reducing stream shading that salmonids and invertebrates depend on for maintenance of cool stream temperatures.

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Common Name: Cape ivy, German ivy

Scientific Name: *Delairea odorata*

Background:
Cape ivy is a hardy perennial vine native to South Africa (ODA, 2015). It can reach up to 5 m in height during the growing season, and primarily grows in coastal forests and riparian zones of Oregon, but its range is limited to Curry County currently; however, the entire Oregon coast is considered a suitable range for establishment (ODA 2015; USDA 2013). Stem, rhizome and other vegetative fragments can resprout if left in the ground after treatment (CALIPC, 2023).

Impacts on First Foods from Hub Species:
The potential to seriously impact coastal forest ecosystems in Oregon Is high, and is especially problematic in California coastal ranges, riparian forests, and salt marshes. Cape ivy threatens native trees and understory vegetation of all varieties by creating a dense mat of vines that smothers vegetation, blocking out all light (USDA 2013; Robison & DiTomaso, 2010). Stem, rhizome and stolon fragments resprout if left in the ground after treatment, and it can occasionally reproduce by seeds in some areas. Due to its vigorous growth rate to develop into thick mats of vegetation, entire coastal forest ecosystems are at risk, including important

berry-producing small trees such as cascara, serviceberry, hazelnut, and shrubs such as huckleberry and salal, and riparian willows and alders (USDA 2013). Berry and nut producing understory plants such as salal and huckleberry are culturally important to coastal indigenous tribes, and are often preserved in jams (Turner, 1995). Cape ivy is toxic to animals and fish, so large game and salmon are potential first foods that can be impacted by the establishment of cape ivy (CALIPC, 2023) In California, where its range is significantly larger than in Oregon, coastal scrub ecosystems experienced an 88% reduction in native biodiversity, and 92% reduction in riparian habitats (Robison et al. 2010).

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Common Name: Garlic mustard

Scientific Name: *Alliaria petiolata*

Background:
Garlic mustard was originally introduced to the east coast of America by Europeans to supplement their diet, but quickly escaped cultivation, eventually spreading to 30 eastern and

midwestern states, and the pacific northwest. It has a very high seed dispersal of up to 8,000 seeds that can stay viable for over 5 years. This plant can establish rapidly in forested environments, including forest edges, roadsides, streamside, trails, and in shaded oak woodlands. Due to its rapid spread and long seed viability, garlic mustard can be difficult to manage in preventing its spread (OISC, 2021; ODA, 2015).

Impacts on First Foods from Hub Species:
Garlic mustard has demonstrated an ability to adapt to a multitude of environments, particularly wet, temperate forests of the Pacific Northwest (Harrington et al. 2007). It is shade-tolerant and can easily invade forests and semi-shaded floodplains. Garlic mustard establishes dominance partly by inhibiting the growth of understory vegetation and the establishment of large tree seedlings by interfering in arbuscular mycorrhizal fungal root colonizations (Stinson et al. 2006; Anthony et al. 2019). This allelopathic quality has been observed more in deciduous hardwood forests, largely affecting big leaf maples and oak trees (Munger, 2001). Big Leaf Maple lumber and leaves are often used as a base to dry berries, and small tender shoots can be boiled and eaten (Turner, 1995). Oak trees are especially important for their acorns, which are cultivated and harvested, and historically have been mixed with hazelnuts and cooked camas (Confederated Tribes of Grand Ronde Cultural Resources, 2016). It has been shown that establishment of *A. petiolata* results in a reduction in forb and herb native plant diversity (Stinson et al 2007; Oregon Department of Agriculture 2015). It is projected that garlic mustard will continue to colonize the northwest portions of Oregon ecosystems, including temperate coastal ranges (Harrington et al. 2007). The reduction in native understory vegetation is possible, which may affect higher trophic level actions such as reductions in bird and large game foraging, but more studies centered in the Pacific Northwest need to be undertaken to establish all impacts of garlic mustard in coastal ranges (Portland Environmental Services 2017)

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Intertidal Vegetation

Common Name: Smooth cordgrass, Saltmarsh cordgrass

Scientific Name: *Spartina alterniflora*

Background:
One of four Spartina species that are noxious weed threats to Oregon, smooth cordgrass is regarded as an ecosystem engineer, with the ability to alter hydrologic, biogeochemical, and food web dynamics in mud-flat estuary ecosystems (ODA, 2011; Neira et al., 2007). First introduced to the Pacific Northwest from the east coast of America. It is considered one of the

more aggressive varieties of Spartina cordgrasses (ODA, 2011).

Impacts on First Foods from Hub Species:
Smooth cordgrass is a bio-engineering species, changing nutrient and hydrological cycles and displacing open mud-flat and eelgrass habitat (ODA 2011). This spartina species has the greatest range compared to other species and can colonize low, middle and upper intertidal zones of estuaries, and tolerates higher water inundation (ODA 2011). Growing in thick vegetative patches, natural mud-flat habitat is quickly replaced by invasive salt marsh meadows that destroy essential habitat for native clams and mussels, and eelgrass habitat for salmon and crabs. Bird foraging is also reduced due to destroyed eelgrass and mud-flat habitat (ODA, 2015). A positive feedback loop is created that benefits the expansion of *S. alterniflora* by colonizing mud-flat habitat for native oysters and clams. Channelization of the once open mudflats eliminates substrate for eelgrass beds, thus erasing essential nursery habitat for native salmon, crabs and benthic invertebrate (ODA 2011; Morgan & Sytsma 2010). This in turn can negatively impact indigenous coastal economies that rely on fishing of salmon, and the harvesting of clams, mussels, chitons, and other inshore shellfish varieties. Other first foods such as varieties of Ulva seaweed, eelgrass rhizomes, and tidal root vegetables could also be impacted if *S. alterniflora* becomes established in Oregon estuaries (Turner, 2020). Many coastal tribes harvest dungeness crab, red rock crab, and kelp crabs, which rely on habitat provided by eelgrass to thrive (Kuhnlein & Humphries, 2017). Because smooth cordgrass can colonize lower intertidal zones, these native crabs could experience a major impact to habitat availability if *S. alterniflora* is not managed.

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Common Name: Denseflower cordgrass

Scientific Name: *Spartina densiflora*

Background:
One of four Spartina species that are noxious weed threats to Oregon, this species was introduced to the Pacific Northwest from South America (Morgan & Sytsma, 2010). Dense-flowered cordgrass is a perennial salt-tolerant aquatic grass that grows in dense tussocks with large biomass above and below ground, and has a distinct bunchgrass-like growth form. It is regarded as an ecosystem engineer, with the ability to alter hydrologic, biogeochemical, and food web dynamics in mud-flat estuary ecosystems (ODA, 2011; Neira et al., 2007). Spartina species have an aggressive seed dispersal strategy, so it is highly likely that without continued management, *S. densiflora* could continue to spread to all coastal regions of Oregon (Morgan & Sytsma 2010).

Impacts on First Foods from Hub Species:
Denseflower cordgrass was likely introduced for erosion control in California and Oregon, where it now is considered highly invasive to salt marsh habitat due to its tolerance to salt, and difficulty removing both manually and chemically (ODA 2015). *S. densiflora* was first identified in Coos Bay, Oregon, where it thrives in middle to high tidal zones in rocky shores to mud flats. This cordgrass is considered an ecological engineer, and upon establishment to an area, will change hydrologic, biogeochemistry and food web dynamics (ODA 2011). This spartina species can also spread vigorously, taking over entire shores via large clonal mats and aggressive seed dispersal, which has been documented in California (ODA 2011; Neira et al., 2007). Cordgrass replaces essential mud-flat habitat by trapping sediments deposited through tidal movement, and slowly raising the level of the shore. A positive feedback loop is created that benefits the expansion of *S. densiflora* by colonizing mud-flat habitat for native oysters and clams. Channelization of the once open mudflats eliminates substrate for eelgrass beds, thus erasing essential nursery habitat for native salmon, crabs and benthic invertebrate habitat (ODA 2011; Morgan & Sytsma 2010). This in turn can negatively impact indigenous coastal economies that rely on fishing of salmon, and the harvesting of clams, mussels, chitons, and other inshore shellfish varieties. Other first foods such as varieties of Ulva seaweed species, eelgrass rhizomes, and tidal root vegetables could also be impacted if S. Densiflora becomes established in Oregon estuaries (Turner, 2020)

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Common Name: Saltmeadow cordgrass, salt hay

Scientific Name: *Spartina patens*

Background:
One of four Spartina species that are noxious weed threats to Oregon, it was introduced to Oregon from the east coast of America (Morgan & Sytsma, 2010). S. patens has limited distribution in Oregon, and while not as aggressive as other species, still grows robustly by rhizomes and seed dispersal (Strong & Ayers, 2013). Spartina species are bio-engineers that exert considerable influence on the environment they invade; Their stiff, erect stems attenuate waves, reduce current velocity, and retain sediments which displace important eelgrass and mud-flat habitats in the Pacific Northwest (Strong & Ayres, 2013).

Impacts on First Foods from Hub Species:
S. patens has the most limited tidal range of the spartina species in Oregon, and grows only in the upper tidal zones of estuaries (ODA 2011). *S. patens* colonizes open mud-flats and sand marshes and converts these habitats to elevated salt marsh grass fields. This displaces nursery habitats for crabs, clams and mussels, migratory bird nesting habitat, and outcompetes native vegetation in the upper intertidal zone (ODA, 2015). Cordgrass replaces essential mud-flat habitat by trapping sediments deposited through tidal movement, and slowly raises the level of the shore. A positive feedback loop is created that benefits the expansion of *S. patens* but

destroys mud-flat habitat for native oysters and clams. Channelization of the once open mudflats eliminates substrate for shellfish species, thus erasing essential nursery habitat for native crabs and benthic invertebrate (ODA 2011; Morgan & Sytsma 2010). This in turn can negatively impact indigenous coastal economies that rely on the harvesting of clams, mussels, chitons, and other inshore shellfish varieties. Other first foods such as varieties of Ulva seaweed species, eelgrass rhizomes, and tidal root vegetables could also be impacted (Turner, 2020).

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Aquatic Vegetation

Common Name: Water primrose

Scientific Name: *Ludwigia hexapetala, Ludwigia peploides*

Background:
Ludwigia hexapetala and *Ludwigia peploides* are native to Uruguay and Brazil, but have become widespread in the United States (ODA 2015). They are perennial and can reproduce both through seeds and through fragmentation (ODA 2015). They form dense monocultures in freshwater ecosystems if left unchecked (ODA 2015).

Impacts on First Foods from Hub Species:
Large populations of water primrose are present in the Willamette Slough. As of 2018, large populations were also present in the Columbia Slough and the Rogue River. Water primrose spreads rapidly through waterways, reducing available space and nutrients for native plants. Wapato, wocus, cattail, and cranberry populations could all potentially be reduced by the spread of water primrose. When populations of native plants decrease, populations of waterfowl that rely on these plant species are likely to decrease as well. Water primrose also reduces dissolved oxygen levels, making it impossible for salmon to survive in severely affected waterways.

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Insects

Common Name: Starry Night Beetle / Asian Longhorn Beetle

Scientific Name: *Anoplophora glabripennis*

Background:
Native to East Asia, this insect has spread to North America and other countries through international trade. They lay their eggs in the wood of trees, where the larvae develop and later emerge as adult beetles. If the infested tree is then imported to be used to produce products and shipped internationally, they can spread (Lovett, 2022). So far, they have primarily impacted the East Coast, and haven't been detected in Oregon yet, but the Oregon Invasive Species Council states that there is still active monitoring in place.

Impacts on First Foods from Hub Species:
The Starry Night Beetle infests a variety of tree species, but one in particular that is important to tribes is the willow tree. The leaves and bark from willow trees have been brewed into medicinal tea. The tea was used to treat colds, fevers, arthritis, mouth sores, toothache, and general aches and pains. The active chemical principle is called salicin, which is similar to modern day aspirin tablets (Native Memory Project, n.d.). Outside of food, branches are made into arrow shafts, and twigs are turned into paint brushes. Willow trees were also used to make baskets, beds, dreamcatchers, and overall viewed as sacred (Vavrek, 2019).
Because willow trees are common along the Oregon coast, coastal tribes could be impacted by an invasion of the Starry Night Beetle if they arrived in Oregon and attacked willow trees. The willow is commonly found near shores of lakes and streams, so an invasion could reduce shade cover and warm up the water. Warmer water temperatures could then affect salmon, another key First Food for Coastal tribes.

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Common Name: Skeletonizing Beetle / Japanese Beetle

Scientific Name: *Popillia japonica*

Background:
Native to Japan and Eastern Russia, this beetle has spread to many U.S. states. It is highly destructive against over 300 ornamental and agricultural plants (USDA Animal and Plant Health Inspection Service, 2023). The "skeletonizing" part of their name comes from the way in which they skeletonize the foliage, consuming the soft mesophyll tissues between the veins, leaving skeleton-like leaves. They are easily transported to Oregon through shipments of plant material and they are able to fly quickly, which also increases their rate of spread (Oregon Department of Agriculture, n.d.).

Impacts on First Foods from Hub Species:
The beetle can have direct impacts on First Foods since they feed on and destroy fruit/berry bushes and oak trees. Oak trees produce acorns, which is a traditional food and medicinal tool for many tribes. Oak can be used as an astringent, tonic, antiseptic and emetic to treat fevers, relieve asthma, and applied to sore chapped skin when the bark is turned into tea. Outside of food, oak was used for baskets, lumber, firewood, furniture, and bowmaking (Adkins Arboretum, n.d.). Berries such as huckleberries, blueberries and trailing blackberries as well as crabapples are other key coastal tribe foods that would likely be impacted by the beetle (Maxkii, 2022 & Patton et al., 2012). Trailing blackberries specifically have been used to not just eat, but also as a medicine. They have been used to treat dysentery, diarrhea, whooping cough, toothache, anemia, sore throat and minor bleeding (Government of Oregon, n.d.). Since the beetle has already been identified in Oregon, there is the risk that they could affect First Foods along the coast and elsewhere. Oregon has been identified as an area with extensive habitat suitable for the beetles survival and reproduction.The favorable climate combined with the wide variety of host plants and lack of predators have influenced their spread into the U.S. and Oregon.

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Common Name: Spotted Lanternfly

Scientific Name: *Lycorma delicatula*

Background:
Native to China, India and Vietnam, the species arrived in the U.S. in a shipment in 2012. Two dead individuals were identified in Oregon in 2020 in shipments coming from Pennsylvania (Oregon Department of Agriculture, 2023). The species can cause serious damage to plants such as oozing sap, wilting, leaf curling and dieback. Other than plant damage, they also excrete a sugary substance when they feed that encourages the growth of black sooty mold, which is harmless to humans but harms plants (Oregon Invasive Species Council, n.d.).

Impacts on First Foods from Hub Species:
Some of the plant hosts for the spotted lanternfly include willow and maple trees. How willow

trees are used as medicinal tea is described more in depth in the species profile for the Starry Night Beetle. For maple trees, tribes were also known to make medicine for sore throats. Outside of food, tribes have used the wood of maple trees for paddles, spindle whorls (used for spinning yarn), and other tools. The large maple leaves were sometimes used as temporary containers also (Kemper, n.d.). The range suitability for Oregon includes the Coast Range, so coastal maple and willow trees could be impacted and affect the health of these trees and their ability for usage as medicinal teas and tools by tribes.

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Common Name: Northern Giant Hornet / Asian Giant Hornet

Scientific Name: *Vespa mandarinia*

Background:
Native to Northern India to East Asia, these hornets attack honeybee hives and can kill an entire hive in just a matter of hours (Oregon Invasive Species Council, n.d.). Although not found in Oregon yet, this species has been spotted in Washington and the Oregon Insect Pest Prevention & Management program is monitoring them.

Impacts on First Foods from Hub Species:
Since the hornet directly impacts honeybees, the efficiency of pollination services of the honeybees can be decreased if there are less honeybees to pollinate First Foods such as berries. As explained in the profile for the Skeletonizing Beetle, trailing blackberries have been used by tribes to eat and as a medicinal tool, so an invasion of the Northern Giant Hornet could leave similar impacts on berries in the region. Furthermore, the hornets sometimes feed on the sap of fruiting trees such as oak trees, another important First Food for tribes since oak is used for its acorns and brewed into medicinal tea (Oregon Invasive Species Council, n.d.).

Sources:

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Fungi

Common Name: Oak Wilt

Scientific Name: *Ceratocystis fagacearum*

Background:
Oak Wilt is caused by the fungal pathogen *Bretziella fagacearum*. The origin of the fungus is unknown but it likely came from Mexico, Central America and South America. Oak Wilt has invaded over 24 states in the Midwest. Oak Wilt occurs from *B. fagacearum* establishing in the sapwood of the host, which signals for the tree to produce protective tissues that fatally restrict the flow of nutrients and water throughout the host tree, causing the characteristic wilting before dying (Pedlar et al., 2020). Transmission can occur through local spread such as root grafting as well as insect vectors. Additionally, oak wilt can spread If an infected Oak tree is in close proximity to healthy oak trees via the infected xylem to the root system of a healthy tree. Depending on the type of Oak species death can occur as fast as 4-6 weeks (*Oak Wilt - US Forest Service*).

Impacts on First Foods from Hub Species:
Oregon White Oak (*Quercus garryana*) is native to Oregon, and is ecologically and culturally significant to coastal Indigenous communities. Every part of the White Oak is valuable, including the bark, leaves, branches and acorns. Mature Oak Trees provide an abundance of acorns that are used by Indigenous communities; however, the acorns are bitter when raw due to the presence of tannins, so they are traditionally steamed, roasted, or boiled to make them palatable. The acorns can also be pounded down and sifted into a fine flour, which is used in bread, soups and cakes. Traditionally, acorns would be preserved by drying to prevent molding, then stored in outdoor granaries, deerskin bags, or baskets (*Indigenous Uses, Management, and Restoration of Oaks of the Far Western United States*, 2007). Medicinally, White Oak acorns could also be used medicinally to treat asthma, diarrhea, as an antiseptic, and to reduce fever (Omeka RSS). The burning of White Oak wood has historically been used as firewood, and to deter pests from damaging wild flowers and plants (*Indigenous Uses, Management, and Restoration of Oaks of the Far Western United States*, 2007). The wood would also be cut into

splints and used for basket weaving, woven chairs, and furniture.
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Common Name: Ash Dieback

Scientific Name: *Hymenoscyphus fraxineus*

Background:
Hymenoscyphus fraxineus is a fungus from eastern Asia that causes ash dieback disease. It is most prevalent in Europe beginning in the 1990's, but It has not been detected in the United States or Oregon, but is continuously being monitored (Forestry, 2023). *H.fraxineus* harms the vascular tissue of Ash trees, weakening it by cutting off their water and nutrient supply, and ultimately killing the tree. The fungus spreads by producing small white fruiting bodies that

release spores, which then attach to other ash tree leaves to begin the infecting cycle again (Marçais et al., 2023).

Impacts on First Foods from Hub Species:
Native Oregon ash *(Fraxinus latifolia*) is of cultural and historical importance. For generations indigenous communities have relied on Oregon Ash for its versatile and durable wood, which is used to make baskets, firewood, and canoe paddles (*Oregon Ash Tree – Forestry.com*, 2023). If Ash dieback establishes in Oregon, ash tree stands could be significantly impacted, which could diminish harvesting of ash wood for Oregon's Indigenous communities. This species has traditionally been used for medicinal purposes as the bark of Oregon ash is anthelmintic. These practices include pulverizing the roots to treat harsh wounds, and soaking the branches in water in a cold infusion process for the treatment of fevers (Fern, 2012).

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Vertebrates

Common Name: Mute Swan

Scientific Name: *Cygnus olor*

Background:
Mute swans are native to Eurasia (Boatner 2010). They are an introduced species in North America, where they have established populations in the Northeastern United States, the Midwest, California, and the Pacific Northwest (Marks 2018, Brady & Weaver 2023). Mute swans are omnivores, but primarily feed on vegetation. One mute swan can eat up to 8 pounds of submerged aquatic vegetation a day, while uprooting as much as 20 additional pounds a day

(Rhode Island DEM, 2006). They lay 4-10 eggs per year and have few natural predators once they reach adulthood (Boatner 2010).

Impacts on First Foods from Hub Species:

Mute swans are present in Oregon in low numbers, with less than 50 counted in 2010 (Boatner 2010). However, in states where mute swans have become established in recent decades, their numbers have grown rapidly (Boatner 2010). In California, the mute swan population grew by 251% from 2022 to 2023, increasing the risk that this population could spread into Oregon (Brady & Weaver 2023). Mute swans feed primarily on submerged aquatic vegetation, including eelgrass (Rhode Island DEM, 2006). Beds of common eelgrass along the Pacific Northwest coast provide many species with shelter and protection against predators including Dungeness crab (Fernandez et al. 1993), Chinook salmon, Pacific herring, and surf smelt (Rubin et al. 2018). In shallow waters, mute swans have been able to reduce the biomass of submerged aquatic vegetation by 95% (Allin & Husband 2003). Mute swans also feed on plants in the Sagittarius genus, which includes wapato (Bailey et al. 2008).

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Crustaceans

Common Name: Japanese shore crab

Scientific Name: *Hemigrapsus sanguineus*

Background:
The Japanese shore crab is indigenous to the western Pacific Ocean from Russia, along the Korean and Chinese coasts to Hong Kong and the Japanese archipelago. The Asian shore crab has a square-shaped shell with 3 spines on each side of the carapace. The carapace color ranges from green to purple to orange-brown to red. It has light and dark bands along its legs and red spots on its claws. Male crabs have a distinctive fleshy, bulb-like structure at the base of the moveable finger on the claws (USGS).

Impacts on First Foods from Hub Species:
Although *H. sanguineus* has not been detected in Oregon yet, this crab has had a significant impact on the rocky intertidal coastal ranges of the East coast (Epifanio 2013). *H. sanguineus* has the ability to outcompete native and invasive crabs for habitat and food, and exerts a negative impact on native mussels, snails, and mud-crabs, and algal mats (Lord 2017; Kreamer et al. 2023). This crab has demonstrated a greater appetite, more aggressive behavior, and

greater claw strength than the highly competitive *Carcinus maenas,* and dominates in higher rocky intertidal zones on the northeast coast of America (Lord & Williams 2017). *H. sanguineus* is considered a generalist predator, with a voracious appetite that has imposed significant reductions in invertebrates, snails, native mud-crabs, and algae on the east coast. In Long Island Sound, a 25% reduction in mussels, 95% reduction in native mud-crabs, and an 80% reduction in periwinkle were all found to be directly attributed to H. *sanguineus* (Lord & Williams 2017; Kraemer et al. 2023). First foods important to Indigenous fishing economies such as dungeness crab, oysters, mussels, clams, barnacles and native algal mats will could all be significantly impacted if *H. sanguineus* is detected in Oregon (First Nations Health Authority (n.d.); Turner, 2020).

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