Climate Change Effects for Hub Species, for Rachel Gregg, ESA Associates & for OISC

Authors: Meg Waller, Bre Stewart, Ashley Payne, Emma Ferguson

---

Profile Narratives:

Common name: Emerald Ash Borer

Scientific name: *Agrilus planipennis*

Sector relevance:
- Forestry/timber
- Public health
- Basketry/Traditional crafts
- Ecosystem services, specifically wetlands
- Indigenous lifeways

Potential impact(s) of climate change on species:
- Warmer winters may facilitate further range expansion
- Increases in unpredicted cold snaps and/or more extreme temperature fluctuations between seasons could curtail range expansion temporarily
- Range expansion of ash trees will likely not happen as quickly as EAB range expansion; divergence of ash range and EAB range possible
- Biocontrol parasitoids used to control EAB (*Spathius galinae* and *Tetrastichus planipennisi*) do not survive temperatures as low as EAB does; warmer winters could increase viability of these biocontrol species
- Studies show the ideal June temperatures for EAB are between 44℉ and 66℉; warmer winters will likely drive EAB northward, leaving stands of Ash in southern regions relatively protected

Impact on First Foods:
- EAB spread threatens the future of black ash stands which are vital to Indigenous basketry traditions
- Black ash is a culturally important focal point of Wabanaki and Mohawk creation stories

Management implications and strategies:

- Biocontrol agents such as larval parasitoids *Tetrastichus planipennisi* and *Spathius galinae* have established and spread in Michigan and Connecticut
- Curtailing of long distance spread via infested timber, firewood and nursery stock by instating and strengthening local and federal regulations
- Removing and quarantining infected ash stands
- Attracting EAB for destruction
- Removal of some ash tree to reduce food source for EAB
- Insecticides

Research needs:
- Assessing the overwintering potential of parasitoids *S. galinae* and *T. planipennisi* in newly exposed regions such as the Pacific Northwest
- In general, more specific research focused on the Pacific Northwest is needed

---

Common name: Reed Canary Grass

Scientific name: *Phalaris arundinacea*

Sector relevance:
- Biofuel
- Agriculture

Potential impact(s) of climate change on species:
- Potential movement of populations due to changes in precipitation; *P. arundinacea* grows and establishes more slowly in consistently flooded conditions, particularly during spring
- Populations near coastal waterways or salted roadways could risk damage due to increased salinity; cultivars vary but most adapt quickly to high salinity conditions
- Higher temperatures may increase above-ground biomass and increase spread
- *P. arundinacea* is highly adaptable to most climate change impacts due to phenotypic plasticity and numerous cultivars

Impact on First Foods:

Management implications and strategies:
- Live willow stake planting at 0.60 and 0.91 meters may limit *P. arundinacea* above-ground biomass growth
- Increased nitrogen levels (often due to agricultural runoff) suppress growth but decrease quality of *P. arundinacea* as biofuel
- Lowering soil inorganic nitrogen in restored wetlands would allow establishing sedge meadow communities to suppress *P. arundinacea* invasions

- Physical and chemical methods, coupled with hydrological management, produce most successful results

Research needs:
- Increased research on landscape-scale management strategies
- Oregon specific studies needed

Common name: Spartina

Scientific name: *Spartina spp.*

Sector relevance:
- Ecosystem services

Potential impact(s) of climate change on species:
- Different *Spartina* species exhibit different vulnerabilities and ability to expand range
- *Spartina angelica* likely to expand range northward to escape rising temperatures; *Spartina alterniflora* showed low levels of range expansion
- Increased CO2 acts synergistically with increased temperatures, limiting plants ability to cope with higher temperatures
- Rising sea levels likely to drive *Spartina* upland in areas where it currently grows
- Increased salinity likely to affect most species except *S. densiflora*

Impact on First Foods:

Management implications and strategies:
- Construction of barriers to prevent migration of *Spartina* populations upland
- Glyphosate and imazapyr herbicides reduce growth and spread of *S. alterniflora* but results differ greatly depending upon application method and whether surfactant or wetting agents are used
- Cutting and smothering reduce growth and spread of *S. angelica*

Research needs:
- Research focused on U.S. Pacific coast, specifically Oregon
- Potential biological control agents should be explored
- Vigor/growth/spread of various hybrids of native and non-native *Spartina* should be explored

---

Common name: Sudden oak death, Ramorum canker and blight

Scientific name: *Phytophthora ramorum*

Sector relevance:

- Timber
- Horticulture industry
- Restoration

Potential impact(s) of climate change on species:

- Increased fire frequency likely to reduce spread of SOD due to reduced bay laurel cover
- Drought decreases spread of SOD though it can remain dormant in some species until precipitation allows it to sporulate
- Each lineage has a different ability to disperse across long distances; some lineages are more abundant. These factors will determine specific climatic effects for each lineage
- All lineages spread most rapidly in warm, wet conditions

Impact on First Foods:

- First Food species salal, huckleberry and Oregon grape recently found to be SOD hosts
- Tanoak has traditionally been utilized for acorns, a staple food
- California bay laurel leaves used as seasoning, medicine, food and for ceremonial uses

Management implications and strategies:

- Destruction of infected trees/stands
- Add newly discovered host species to USDA-APHIS list to reduce spread
- Identify high-risk areas
- Focus management during dry years when natural survival of *P. ramorum* is lowest
- Current treatment includes herbicide treatment on host stems followed by felling, piling, and burning on site
- Selective thinning or removal of bay laurel around oak and tanoak trees to prevent oak infection

Research needs:

- Interesting research paths could include change in *P. ramorum* spread due to other climate factors such as increased pollution

---

Common name: Asian giant hornet

Scientific name: *Vespa mandarinia*

Sector relevance:

- Forestry
- Agriculture
- Public health

Potential impact(s) of climate change on species:

- *V. mandarinia* favors warm, wet climates, with much of the Pacific Northwest, including Oregon, already deemed suitable for *V. mandarinia*. Warmer winters may facilitate overwintering of queens, range expansion, longer mating season, and extended colony cycle, which could lead to increased survival rates and facilitate population growth and spread (Norderud ED et al. 2021). Once established, *V. mandarinia* poses a serious threat to honeybee populations in Oregon, as their main survival strategy is to attack and take over active honeybee hives. They feed mainly on bees and sap from fruiting trees such as oak, but as higher temperatures may facilitate populations of invasive insects that threaten native tree populations, like the gold spotted oak borer, *V. mandarinia* may turn to sap from crops, which poses a threat to the agricultural sector as well.

Impact on First Foods:

- fruits + berries (via honeybee decimation and feeding on sap of various fruiting plants)

Management implications and strategies:

- chemicals/ pesticides; physical elimination; mechanical devices (regarding beehives)
- Diligent monitoring

Research needs:

- Importance of certain biotic factors in establishment + spread
- Impact of temperature on life cycle

Common name: Goldspotted oak borer

Scientific name: *Agrilus auroguttatus*

Sector relevance: Forested areas, particularly oak stands

Potential impact(s) of climate change on species:

- *A. auroguttatus* is well adapted to warm, dry oak forests of southern Arizona and California, and may be well suited for parts of southern and central Oregon as temperatures rise. Two oak species that are primary hosts for *A. auroguttatus*, canyon live

oak and California black oak, are found in southern Oregon, and models have suggested that oak woodlands in southern and central Oregon may be at risk, with highest risk in Southwestern Oregon. Establishment in Oregon could be devastating to oak populations, as oak species in Oregon have already been rapidly declining due to habitat loss, invasive species, and fire suppression, and a changing climate may further affect dwindling populations. Because the range of *A. auroguttatus* is small, further research is needed on what factors are most important for facilitating establishment.

Impact on First Foods:

Management implications and strategies:

- Careful removal of infested wood
- Covering infested wood with plastic to trap and kill adults + larvae
- Wood chipping of infested logs

Research needs:

- Insecticide success
- Risk assessment for Oregon
- Further research on host range

Common name: Spotted Lanternfly

Scientific name: *Lycorma delicatula*

Sector relevance: Agriculture, particularly fruits

Potential impact(s) of climate change on species:

- *L. delicatula* appears to be more adapted to temperate climates (15 to 30℃), meaning warmer temperatures may facilitate not only establishment but spread as yearly temperatures rise. Rapid range expansion of *L. delicatula* has been linked to warmer winter temperatures in South Korea, and similar effects may occur in Oregon as winter temperatures rise. Though *L. delicatula* seems to favor the tree-of-heaven, a common invasive tree here in Oregon, as its main host plant, it has also been associated with a wide range of host trees in other areas so it may not be limited by tree species survival in a changing climate. MAXENT modeling using several climatic factors including temperature, precipitation, and elevation predicts *L. delicatula* has the potential to spread throughout significant portions of Oregon and Washington, including the entire Willamette Valley and the Columbia River Basin. *L. delicatula* poses a serious threat to

agriculture, in particular apple orchards and grape and hop vineyards, all of which are prominent sectors in Oregon.

Impact on First Foods: berries

Management implications and strategies:

- Removal of tree-of-heaven (main host tree)
- Egg scraping
- Insecticide on tree-of-heaven

Common name: Whirling disease

Scientific name: *Myxobolus cerebralis*

Sector relevance: Aquatic/Riverine systems

Potential impact(s) of climate change on species:

- *M. cerebralis* is a complex parasite, requiring 2 hosts - a species of oligichaete worm *tubifex tubifex* as well as a host species of fish. It has been found in 25 states since the mid 1950s and warmer water temperatures and decreased snowpack from climate change is predicted to facilitate both increased survival rates of myxospores and increased risk of infection due to higher interaction with trout and salmon susceptible to the disease, via earlier emergence of both fish and tubifex worms due to increasing water temperatures. Decreased snowpack and stream discharge may also facilitate higher populations of the parasite, which have been found to have increased survival rates and infection rates of fish at lower velocities. However, it is predicted that warming temperatures may also limit interaction between fish and the parasite, if earlier migration of salmon occurs due to warmer water.

Impact on First Foods: Salmon

Management implications and strategies:

- Prophylaxis + chemicals
- Stocking of more resistant fish at hatcheries
- Selective breeding
- Monitoring efforts

Research needs:

- Effect on water chemistry changes (DO); nutrients

Common name: Green Crab, European Shore Crab, Harbour crab

Scientific name: *Carcinus maenas*

Sector relevance: relevant to crab and shellfish industry and marine biodiversity

Potential impact(s) of climate change on species:

- Green crabs are considered generalists and a resilient invasive species. They are able to adapt well to the impacts of climate change, including temperature, ocean acidification, and changes to the food web. They are eurythermic, so warming temperatures may have a minimal impact due to their broad thermal range (10°C to 35°C). They are highly tolerant to aquatic hypoxia (low oxygen levels) by utilizing metabolic depression and anaerobic glycolysis, making it easy to adjust to sudden oxygen level changes in water. Similarly, they have an osmoregulatory capacity that allows them to adapt to fluctuating salinity levels; adult green crabs have a range of 4-52 ppt. With warming temperatures, their larval development and spread increases in the spring resulting in a high reproductive output.

Impact on First Foods:

- Seafood (clams, Dungeness crabs, oysters, mussels)
- Water quality

Management implications and strategies:

- Models predicted that a 2°C global increase may result in further poleward expansion… i.e. further up into Alaska / British Columbia. So, preventative measures may be needed in these areas.

Research needs:

- Effects from change in shipment routes in the North Passage
- Species interaction and established persistence

Common name: Northern pike

Scientific name: *Esox lucius*

Sector relevance:

- Sport and recreation
- commercial fisheries

Potential impact(s) of climate change on species:

- *Esox lucius* is a **generalist** and a keystone predator, and its adaptability puts it at an advantage when it comes to climate change. Northern pike can switch their prey if their preferred prey densities change or decrease. With increasing water temperatures, Northern pike have shown the ability to adapt, and even increase body growth rates in coastal waters, which leads to an increase in the need for food. However, this is population specific. They also have broad tolerance for shifts in oxygen, salinity, temperature, and turbidity where others are not as quick to adapt.

Impact on First Foods:

- Salmon
- Water quality

Management implications and strategies:

- Rotenone, used in the Alaskan invasions, is a naturally-derived piscicide (fish pesticide) but there are still many concerns regarding its use.

Research needs:

- Population-specific and location-specific research for responses as invasions happen

---

Common name: Gorse, common gorse

Scientific name: *Ulex europaeus*

Sector relevance:

- Forestry
- Recreation
- Farming (pastures)

Potential impact(s) of climate change on species:

- *U. europaeus* survive in broad climate ranges that may enhance its survivability and its worldscale distribution, and suggests a potentially broad niche when it comes to the effects of climate change, which may result from adaptive plasticity or genetic evolution. While gorse thrives in full sunlight, experiments have shown it has the potential to increase seed production in moderate shade than in full daylight. Common gorse occurs and adapts in most soil types. It's a nitrogen-fixer, which allows it to survive in low-nutrient soils, such as Oregon's coastal sand dunes, as well as withstand low pH levels (3.5-4.5). They have a hard, impermeable seed coat, so seeds can survive in soil for up to 30 years and germinate in temperatures from 0 °C to 26 °C. Warmer temperatures

may facilitate greater biomass production and vegetative growth size of common gorse, as well as seed survivability and germination.
- Common gorse can establish in disturbed areas, and occurs in early success post fire or logging in Douglas-fir forests, common in Oregon. With an increase of fires/wildfires from climate change, common gorse may continue to establish and thrive in fire-distrubed areas because their seeds need scarification or heat to begin germination, Additionally, gorse are highly flammable and are an extreme fire hazard, thus beginning a competitive cycle when compared to native species in the same area.

Impact on First Foods: Trees and herbs (gorse outcompetes herbs and shrubbery)

Management implications and strategies:
- Biological control has been relatively unsuccessful in mature common gorse (less palatable due to spines/spikes), however, goat/sheep/chickens are useful in destroying gorse seedlings and in early stages of growth
- Fire treatment alone and once will not work - must be consistent and paired with an herbicide. However, gorse is highly flammable, so caution with fire, as well as with herbicide use regarding second have effects, but be used.

Research needs:
- Gong *et al.* (2020) suggests investigating scenario specific impacts as invasions occur

---

Common name: Elodea, Curly waterweed, Oxygen weed

Scientific name: *Lagarosiphon major*

Sector relevance:
- Recreation
- Fishing

Potential impact(s) of climate change on species:
- In experimental settings, *L. major* showed resilience to warming temperatures within a max range of ~25 °C. As temperatures rise the growing season can lengthen for invasive plants, specifically during the spring; *L. major* may experience lengthened growing seasons and stimulated growth during these seasons in areas they have invaded from the effects of climate change. With higher abundance of *L. major* in temperate waters, nutrient levels may shift creating unhealthy water quality and community fish and plant species may be flushed out.

Impact on First Foods:

- Water quality
- Fish

Management implications and strategies:

- Dyes or biological control (i.e. grass carp) may have trophic effects

Research needs:

- Research into mitigation strategies for Oregon climate and potential invasion locations

---

Common name: Alder Phytophthora

Scientific name: *Phytophthora x alni species complex (P. × alni)*

Sector relevance:

- Forests
- Agriculture
- Salmon and Salmon recovery

Potential impact(s) of climate change on species:

- Increased spreading may be seen as intensity and frequency of fires and flooding increase. This fungus is not a strong pathogen and may only be capable of causing damage to trees already subjected to environmental stress such as in areas disturbed by fire (Webber *et al.* 2004). Infection appears to be exacerbated after flood periods, when trees are stressed and flood-damage to roots and stems may be substantial (Strnadová *et al*., 2010). As water is the main pathway of spread, flooding increases the chance of spread in infected waterways. Infection also appears to be exacerbated after flood periods, when trees are stressed and flood-damage to roots and stems may be substantial (Strnadová *et al*., 2010). Milder winters that may be seen in Oregon with climate change also pose a risk of spread of this fungus as *P. ×alni* has been found to be favored by mild winters (Schumacher *et al.*, 2006).

Impact on First Foods:

- Water quality
- Fish

Management implications and strategies:

- Considering the absence of curative means to manage the disease, the main tool is prevention. As infection of healthy waterways is often caused from planting infected plants, it is critical to avoid introducing the pathogen to watercourses this way. Avoiding

alder planting along watercourses as much as possible is a highly suggested prevention strategy (CABI, 2022).

Research needs:

- In the context of climate change, the susceptibility of P. ×alni to high summer temperatures may be critical for this area and still remains insufficiently documented

---

Common name: White nose syndrome fungus (WNS)

Scientific name: *Pseudogymnoascus destructans*

Sector relevance:

- Wildlife

Potential impact(s) of climate change on species:

- Temperature may prove to be an important factor to consider when looking at impacts of climate change on the White nose syndrome fungus. Warmer temperatures in the southern U.S hibernacula (12.5 - 15.8 °C) have resulted in faster fungal growth rates seen in tri-colored bats (Lutsch, 2019). Observations from laboratory studies show that little brown bats kept at lower temperatures (4 °C) have higher survival than those kept at warmer temperatures (Grieneisen, 2015). It has also been reported that relatively warm hibernacula temperatures in the southeast may explain the high mortality rates observed in this region (>90%) (Loeb, 2022). Although WNS has not yet been detected in Oregon, it was first detected in Washington State in a little brown bat. It is highly likely that WNS will eventually be introduced into bat populations in Oregon. As climate change brings the chance of warmer, milder winters, bats could be at risk of higher mortality rates in our region if hibernacula temperatures rise to temperatures observed along higher mortality rates.

Impact on First Foods:

- If this fungus is spread to bats in Oregon, the ramifications it would have on the bat population could impact ecosystems, that could have cascading effects on first foods of the area.

Management implications and strategies:

- It has been suggested that management actions that maintain or even lower temperatures in hibernacula could be used as an option for improving the survival of bats in areas with WNS. Disruption to cold areas that bats already use as hibernacula should be avoided and or mitigated. Because *Pseudogymnoascus destructans* spores can last a long time on shoes, clothes, and equipment the fungus can also be spread by means of human

transport. Proper cleaning of gear and clothes by civilians and scientists entering sites where bats hibernate is essential to decreasing the spread of WNS.

Research needs:

- Further research is needed in order to better characterize winter ecology and to determine the extent of the disease for bats roosting in different types of winter habitats (Cheng, 2021).

Common name: Giant Hogweed

Scientific name: *Heracleum mantegazzianum*

Sector relevance:

- Forestry
- Recreation

Potential impact(s) of climate change on species:

- Giant Hogweed favors moist soil with available sunlight with some shade and is commonly found in riparian areas. Giant Hogweed is known to initially spread along rivers or streams as the seeds are able to be dispensed longer distances (NYS Dept. of Environmental Conservation, 2022). Therefore, increased flooding poses a risk of increased spread in areas in which Giant Hogweed already exists in Oregon.

Impact on First Foods:

- Invasive species such as the Giant Hogweed benefit from abiotic changes, and in turn, likely exert secondary effects on native species. As Giant Hogweed thrives in riparian areas, this could prove to impact native plants and waters that are first foods of indigenous tribes of the area.

Management implications and strategies:

- The main controls for this plant is removal prior to it setting seed. However, as this plant's sap is toxic it is important that protective clothing and gloves are worn when removal is conducted.

Research needs:

- Further research needs to be done to display how Giant Hogweed will react with changing temperatures and in response to wildfire.

Common name: Kudzu vine, East Asian arrowroot

Scientific name: *Pueraria lobata*

Sector relevance:

- Natural ecosystems
- Forests
- Agricultural lands
- Recreation

Potential impact(s) of climate change on species:

- Seeds of *Pueraria lobata (P. lobata)* are known to be dormant, requiring special treatment for germination. However, it has been found that through heat-treating at 90°C that the germination rates of *P. lobata* seeds saw a significant increase in germination (Takahashi, 1986). Therefore, there is a chance that increased wildfires could increase germination rates, facilitating Kudzu. Parts of Oregon are rated to currently be marginally climatically suited for Pueraria lobata (Follak, 2011). Kudzu is currently moving northwards as winter temperatures warm. Higher minimum temperatures, a decrease in the number of frost days and higher precipitation favors establishment and spread of *P. lobata* (Coiner, 2018). Found to become tolerant of cold temperatures as it has demonstrated to have sufficient winter cold tolerance north of its current range (Coiner, 2018).

Impact on First Foods:

- As Kudzu can often outcompete native plants it poses a risk to many native species of plants in our region if established and therefore has the potential to impact many first foods such as roots and berries. Due to its ability to alter ecosystem functions it could also display trophic changes which could impact salmon and big game as well.

Management implications and strategies:

- Main risk arises from gardeners who cultivate *P. lobata* and then leave uncontrolled, allowing them to encroach upon edge habitats (Establishment of seeds in North America is rare, therefore new kudzu populations must thereby be established via asssexual means (Coiner, 2018). Therefore, public outreach and education is imperative. In areas which have already been invaded upon, management strategies include containment of naturalized populations to their local distribution and surveillance (Follak, 2011). Control and eradication programs have been explored to manage spread in the U.S but because of its extensive rooting, repeated physical removal or herbicide application is required (Harrington, 2003)

Research needs:

- Although Kudzu is not currently believed to be established in Oregon it still poses a serious threat and further research should be aimed towards studying its behavior in the Northwestern U.S as it is expected to migrate northward with warming climate.

References

Alexander, J. D., & Bartholemew, J. L. (2020). 20 Myxoboliosis (Myxobolus cerebralis). *Climate Change and Infectious Fish Diseases*, 381.

Anderson, M., Jacobsen, L., GrønjkÆr, P. and Skov, C. (2008). Turbidity increases behavioural diversity in northern pike, *Esox lucius L*., during early summer. *Fisheries Management and Ecology,* 15: 377-383. https://doi.org/10.1111/j.1365-2400.2008.00635.x

Apfelbaum, S., & Sams, C. (1987). Ecology and Control of Reed Canary Grass (Phalaris arundinacea L.). *Natural Areas Journal*, 7.

Arsan, E. L. (2006). Potential for dispersal of the non-native parasite Myxobolus cerebralis: qualitative risk assessments for the State of Alaska and the Willamette River basin, Oregon. https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/j098zc893?locale=en

Atlan A, Hornoy B, Delerue F, Gonzalez M, Pierre JS, et al. (2015). Phenotypic Plasticity in Reproductive Traits of the Perennial Shrub *Ulex europaeus* in Response to Shading: A Multi-Year Monitoring of Cultivated Clones. *PLOS ONE,* 10(9): e0137500. https://doi-org.proxy.lib.pdx.edu/10.1371/journal.pone.0137500

Bartholomew, J. L., Lorz, H. V., Atkinson, S. D., Hallett, S. L., Stevens, D. G., Holt, R. A., & Amandi, A. (2007). Evaluation of a management strategy to control the spread of Myxobolus cerebralis in a lower Columbia River tributary. *North American Journal of Fisheries Management*, *27*(2), 542-550.

Bjelke, U., Boberg, J., Oliva, J., Tattersdill, K., & McKie, B. G. (2016). Dieback of riparian alder caused by the Phytophthora alni complex: projected consequences for stream ecosystems. *Freshwater Biology*, *61*(5), 565–579. https://doi-org.proxy.lib.pdx.edu/10.1111/fwb.12729

Borges, F. O., Santos, C. P., Paula, J. R., Mateos-Naranjo, E., Redondo-Gomez, S., Adams, J. B., Caçador, I., Fonseca, V. F., Reis-Santos, P., Duarte, B., & Rosa, R. (2021). Invasion and Extirpation Potential of Native and Invasive Spartina Species Under Climate Change. Frontiers in Marine Science. https://doi.org/10.3389/fmars.2021.696333

CABI (2022). Phytophthora alni species complex (alder Phytophthora). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc

Carim, Kellie J.; Dysthe, Joseph Caleb; McLellan, Holly; Young, Michael K.; McKelvey, Kevin S.; Schwartz, Michael K. (2019). Using environmental DNA sampling to monitor the invasion of nonnative Esox lucius (northern pike) in the Columbia River basin, *USA. Environmental DNA*, 1, 215-226.

Castillo, J. M., Gallego‐Tévar, B., Figueroa, E., Grewell, B. J., Vallet, D., Rousseau, H., Keller, J., Lima, O., Dréano, S., Salmon, A., & Aïnouche, M. (2018). Low genetic diversity contrasts with high phenotypic variability in heptaploid *Spartina densiflora* populations invading the Pacific coast of North America. *Ecology and Evolution*, 8(10), 4992–5007. https://doi.org/10.1002/ece3.4063

Carleson, N. C., Daniels, H. A., Reeser, P. W., Kanaskie, A., Navarro, S. M., LeBoldus, J. M., &

Grünwald, N. J. (2021). Novel Introductions and Epidemic Dynamics of the Sudden Oak Death Pathogen *Phytophthora ramorum* in Oregon Forests. *Phytopathology®*, 111(4), 731–740. https://doi.org/10.1094/PHYTO-05-20-0164-R

Crosby, S. C., Angermeyer, A., Adler, J. M., Bertness, M. D., Deegan, L. A., Sibinga, N., & Leslie, H. M. (2017). *Spartina alterniflora* Biomass Allocation and Temperature: Implications for Salt Marsh Persistence with Sea-Level Rise. *Estuaries and Coasts,* 40(1), 213–223. https://doi.org/10.1007/s12237-016-0142-9

Cathcart, C.N., Dunker, K.J., Quinn, T.P. *et al.* (2019). Trophic plasticity and the invasion of a renowned piscivore: a diet synthesis of northern pike (*Esox lucius*) from the native and introduced ranges in Alaska, *U.S.A.*. *Biol Invasions,* 21, 1379–1392. https://doi-org.proxy.lib.pdx.edu/10.1007/s10530-018-1909-7

Cheng, Tina L., et al. (2021). The scope and severity of white-nose syndrome on hibernating bats in North America *Conservation Biology*. 35, 1586– 1586. https://doi.org/10.1111/cobi.13739

Christianson, L. D. E., & Venette, R. C. (2018). Modest Effects of Host on the Cold Hardiness of Emerald Ash Borer †. Forests, 9(6), Article 6. https://doi.org/10.3390/f9060346

Coiner, H. A., Hayhoe, K., Ziska, L. H., Van Dorn, J., & Sage, R. F. (2018). Tolerance of subzero winter cold in kudzu (Pueraria montana var. lobata). *Oecologia*, 187(3), 839–849. https://doi.org/10.1007/s00442-018-4157-8

Cook, R. T., Ward, S. F., Liebhold, A. M., & Fei, S. (2021). Spatial dynamics of spotted lanternfly, *Lycorma delicatula*, invasion of the Northeastern United States. *NeoBiota*, *70*, 23.

Costanza, K., Livingston, W., Kashian, D., Slesak, R., Tardif, J., Dech, J., Diamond, A., Daigle, J., Ranco, D., Neptune, J., Benedict, L., Fraver, S., Reinikainen, M., & Siegert, N. (2017). The Precarious State of a Cultural Keystone Species: Tribal and Biological Assessments of the Role and Future of Black Ash. *Journal of Forestry*, 115. https://doi.org/10.5849/jof.2016-034R1

Crosthwaite, J. C., Sobek, S., Lyons, D. B., Bernards, M. A., & Sinclair, B. J. (2011). The overwintering physiology of the emerald ash borer, Agrilus planipennis Fairmaire (Coleoptera: Buprestidae). *Journal of Insect Physiology*, 57(1), 166–173. https://doi.org/10.1016/j.jinsphys.2010.11.003

Daniels, H. A., Navarro, S. M., & LeBoldus, J. M. (2022). Local Eradication of *Phytophthora ramorum* Is Effective on Both NA1 and EU1 Lineages in Oregon Tanoak Forests. *Plant Disease*, 106(5), 1392–1400. https://doi.org/10.1094/PDIS-07-21-1588-RE

Deng, Y., Zeng, L., Fu, Q., & Li, H. (2021, May). Tracing Asian Giant Hornet: From a Data-Driven Perspective. In *2021 4th International Conference on Artificial Intelligence and Big Data (ICAIBD)* (pp. 237-241). IEEE.

de Rivera, C., & Heath, C. (2022). Effects of climate change and multiple stressors on *Carcinus maenas*. [Manuscript submitted for publication]. For Ecophysiology of the green shore crab *Carcinus maenas* and closely related species. Elsevier.

Donovan, G. H., Butry, D. T., Michael, Y. L., Prestemon, J. P., Liebhold, A. M., Gatziolis, D., & Mao, M. Y. (2013). The Relationship Between Trees and Human Health. American *Journal of Preventive Medicine*, 44(2), 139–145. https://doi.org/10.1016/j.amepre.2012.09.066

Duan, J. J., Bauer, L. S., Van Driesche, R., Schmude, J. M., Petrice, T., Chandler, J. L., & Elkinton, J. (2020). Effects of Extreme Low Winter Temperatures on the Overwintering Survival of the Introduced Larval Parasitoids Spathius galinae and Tetrastichus planipennisi: Implications for Biological Control of Emerald Ash Borer in North America. *Journal of Economic Entomology*, 113(3), 1145–1151. https://doi.org/10.1093/jee/toaa048

El-Matbouli, M., McDowell, T. S., Antonio, D. B., Andree, K. B., & Hedrick, R. P. (1999). Effect of water temperature on the development, release and survival of the triactinomyxon stage of *Myxobolus cerebralis* in its oligochaete host. *International Journal for Parasitology*, *29*(4), 627-641.

Elliott, M., Rollins, L., Bourret, T., & Chastagner, G. (2021). First Report of Leaf Blight Caused by *Phytophthora ramorum* on Periwinkle (Vinca minor) in Washington State, U.S.A. *Plant Disease*, 105(7), 2023. https://doi.org/10.1094/PDIS-08-20-1721-PDN

Elliott, M., Rollins, L., Bourret, T., Hulbert, J. M., & Chastagner, G. (2021). Three New Hosts for *Phytophthora ramorum* Confirmed in Washington State: Salal, Oregon Grape, and Red Huckleberry. *Plant Health Progress,* 22(3), 389–391. https://doi.org/10.1094/PHP-01-21-0003-FI

Farmer, J. (2016). The Tanoak Tree: An Environmental History of a Pacific Coast Hardwood. *Agricultural History*, 90(1), 139–140.

Fettig, C. J., Reid, M. L., Bentz, B. J., Sevanto, S., Spittlehouse, D. L., & Wang, T. (2013). Changing Climates, Changing Forests: A Western North American Perspective. *Journal of Forestry*, 111(3), 214–228. https://doi.org/10.5849/jof.12-085

Follak, S. (2011). Potential distribution and environmental threat of *Pueraria lobata. Open Life Sciences*, *6*(3), 457-469. https://doi.org/10.2478/s11535-010-0120-3

Foster, R. D., & Wetzel, P. R. (2005). Invading Monotypic Stands of *Phalaris arundinacea*: A Test of Fire, Herbicide, and Woody and Herbaceous Native Plant Groups. *Restoration Ecology*, 13(2), 318–324. https://doi.org/10.1111/j.1526-100X.2005.00040.x

Frumkin, H. (2013). The Evidence of Nature and the Nature of Evidence. *American Journal of Preventive Medicine*, 44(2), 196–197. https://doi.org/10.1016/j.amepre.2012.10.016

Gallego-Tévar, B., Grewell, B. J., Futrell, C. J., Drenovsky, R. E., & Castillo, J. M. (2020). Interactive effects of salinity and inundation on native *Spartina foliosa*, *invasive S. densiflora* and their hybrid from San Francisco Estuary, California. *Annals of Botany,* 125(2), 377–389. https://doi.org/10.1093/aob/mcz170

Ge, Z.-M., Zhou, X., Kellomäki, S., Peltola, H., Biasi, C., Shurpali, N., Martikainen, P. J., & Wang, K.-Y. (2012). Measured and modeled biomass growth in relation to photosynthesis acclimation of a bioenergy crop (Reed canary grass) under elevated temperature, CO2 enrichment and different water regimes. *Biomass and Bioenergy*, 46, 251–262. https://doi.org/10.1016/j.biombioe.2012.08.019

Ge, Z.-M., Zhou, X., Kellomäki, S., Peltola, H., Martikainen, P. J., & Wang, K. Y. (2012).

Acclimation of photosynthesis in a boreal grass (*Phalaris arundinacea L.*) under different temperature, CO2, and soil water regimes. *Photosynthetica,* 50(1), 141–151. https://doi.org/10.1007/s11099-012-0014-x

Gill, C., Jack, C., & Lucky, A. (2020). Asian Giant Hornet *Vespa mandarinia* Smith (1852) (Insecta: Hymenoptera: Vespidae): ENY-574/IN1281, 05/2020. *EDIS*, *2020*(3), 5-5.

Goberville, E., Hautekèete, N.-C., Kirby, R. R., Piquot, Y., Luczak, C., & Beaugrand, G. (2016). Climate change and the ash dieback crisis. *Scientific Reports*, 6, 35303. https://doi.org/10.1038/srep35303

Green, E. K., & Galatowitsch, S. M. (2002). Effects of *Phalaris arundinacea* and nitrate-N addition on the establishment of wetland plant communities. *Journal of Applied Ecology,* 39(1), 134–144. https://doi.org/10.1046/j.1365-2664.2002.00702.x

Grewell, B. J., Castillo, J. M., Skaer Thomason, M. J., & Drenovsky, R. E. (2016). Phenotypic plasticity and population differentiation in response to salinity in the invasive cordgrass *Spartina densiflora*. *Biological Invasions*, 18(8), 2175–2187. https://doi.org/10.1007/s10530-015-1041-x

Grieneisen, L. E., Brownlee-Bouboulis, S. A., Johnson, J. S., & Reeder, D. M. (2015). Sex and hibernaculum temperature predict survivorship in white-nose syndrome affected little brown myotis (Myotis lucifugus). *Royal Society open science*, *2*(2), 140470. https://doi-org.proxy.lib.pdx.edu/10.1098/rsos.140470

Haiminen, N., Klaas, M., Zhou, Z., Utro, F., Cormican, P., Didion, T., Jensen, C. S., Mason, C. E., Barth, S., & Parida, L. (2014). Comparative exomics of *Phalaris cultivars* under salt stress. *BMC Genomics,* 15. https://doi.org/10.1186/1471-2164-15-S6-S18

Hanson, A., Johnson, R., Wigand, C., Oczkowski, A., Davey, E., & Markham, E. (2016). Responses of *Spartina alterniflora* to Multiple Stressors: Changing Precipitation Patterns, Accelerated Sea Level Rise, and Nutrient Enrichment. *Estuaries and Coasts,* 39(5), 1376–1385. https://doi.org/10.1007/s12237-016-0090-4

Harrington T.B., Rader-Dixon L.T., Taylor Jr J.W., (2003). Kudzu (*Pueraria montana*) community responses to herbicides, burning, and high density loblolly pine, *Weed Sci.*, 1, 965-974.

Harvey, B. (2009). A biological synopsis of northern pike (*Esox lucius*). *Can. Manuscr. Rep. Fish. Aquat. Sci.,* 2885(1), 31.

He, Z., Bentley, L. P., & Holaday, A. S. (2011). Greater seasonal carbon gain across a broad temperature range contributes to the invasive potential of *Phalaris arundinacea* (Poaceae; reed canary grass) over the native sedge *Carex stricta* (Cyperaceae). *American Journal of Botany*, 98(1), 20–30. https://doi.org/10.3732/ajb.1000179

Jenkins, N. J., Yeakley, J. A., & Stewart, E. M. (2008). First-year responses to managed flooding of lower Columbia River bottomland vegetation dominated by *Phalaris arundinacea*. *Wetlands*, 28(4), 1018–1027. https://doi.org/10.1672/06-145.1

Jia-zhuang, S., Ping-ping, L. I., & Wei-guo, F. U. (2012). Effect of water stress and rewatering on the physiological and biochemical characteristics of *Phalaris arundinacea*. *Acta Prataculturae Sinica*, 21(2), 62.

Kätterer, T., Andrén, O., & Pettersson, R. (1998). Growth and nitrogen dynamics of reed canarygrass (*Phalaris arundinacea L.*) subjected to daily fertilization and irrigation in the field. *Field Crops Research*, 55(1), 153–164. https://doi.org/10.1016/S0378-4290(97)00075-0

Kim, K. D., Ewing, K., & Giblin, D. E. (2006). Controlling *Phalaris arundinacea* (reed canarygrass) with live willow stakes: A density-dependent response. *Ecological Engineering*, 27(3), 219–227. https://doi.org/10.1016/j.ecoleng.2006.02.007

Klaas, M., Haiminen, N., Grant, J., Cormican, P., Finnan, J., Arojju, S. K., Utro, F., Vellani, T., Parida, L., & Barth, S. (2019). Transcriptome characterization and differentially expressed genes under flooding and drought stress in the biomass grasses *Phalaris arundinacea* and *Dactylis glomerata*. *Annals of Botany*, 124(4), 717–730. https://doi.org/10.1093/aob/mcz074

Kozanitas, M., Metz, M. R., Osmundson, T. W., Serrano, M. S., & Garbelotto, M. (2022). The Epidemiology of Sudden Oak Death Disease Caused by *Phytophthora ramorum* in a Mixed Bay Laurel-Oak Woodland Provides Important Clues for Disease Management. *Pathogens*, 11(2), Article 2. https://doi.org/10.3390/pathogens11020250

Kreitman, D., Keena, M. A., Nielsen, A. L., & Hamilton, G. (2021). Effects of temperature on development and survival of nymphal *Lycorma delicatula* (Hemiptera: Fulgoridae). *Environmental Entomology*, *50*(1), 183-191.

Janousek, C., Buffington, K., Thorne, K., Guntenspergen, G., Takekawa, J., & Dugger, B. (2016). Potential effects of sea-level rise on plant productivity: Species-specific responses in northeast Pacific tidal marshes. Marine Ecology Progress Series, 548, 111–125. https://doi.org/10.3354/meps11683

Lavergne, S., & Molofsky, J. (2004). Reed Canary Grass (*Phalaris arundinacea*) as a Biological Model in the Study of Plant Invasions. *Critical Reviews in Plant Sciences*, 23(5), 415–429. https://doi.org/10.1080/07352680490505934

Lavergne, S., & Molofsky, J. (2006). Control Strategies for the Invasive Reed Canarygrass (*Phalaris arundinacea L.*) in North American Wetlands: The Need for an Integrated Management Plan. *Natural Areas Journal*, 26(2), 208–214. https://doi.org/10.3375/0885-8608(2006)26[208:CSFTIR]2.0.CO;2

Lee, J. S., Kim, I. K., Koh, S. H., Cho, S. J., Jang, S. J., Pyo, S. H., & Choi, W. I. (2011). Impact of minimum winter temperature on *Lycorma delicatula* (Hemiptera: Fulgoridae) egg mortality. *Journal of Asia-Pacific Entomology*, *14*(1), 123-125.

Liu, H., & Hartlieb, R. J. (2020). Spatial distribution of Lycorma delicatula (Hemiptera: Fulgoridae) egg masses on tree-of-heaven, black walnut, and Siberian elm in North America. *Journal of Economic Entomology*, *113*(2), 1028-1032

Liu, H., Qi, X., Gong, H., Li, L., Zhang, M., Li, Y., & Lin, Z. (2019). Combined Effects of Global Climate Suitability and Regional Environmental Variables on the Distribution of an Invasive Marsh Species *Spartina alterniflora*. *Estuaries and Coasts*, 42(1), 99–111. https://doi.org/10.1007/s12237-018-0447-y

Loeb, S. C., & Winters, E. A. (2022). Changes in hibernating tricolored bat (*Perimyotis subflavus*) roosting behavior in response to white-nose syndrome. *Ecology and Evolution*, 12, e9045. https://doi-org.proxy.lib.pdx.edu/10.1002/ece3.9045

Lutsch, K. (2019). Assessment of culverts and bridges as roosting habitat for *Perimyotis subflavus* (tri-colored bat) and disease transmission corridors for Pseudogymnoascus destructans. M. S. Thesis *Department of Ecology, Evolution, and Organismal Biology* Kennesaw State University.

Mårtensson, L.-M., Carlsson, G., Prade, T., Kørup, K., Lærke, P. E., & Jensen, E. S. (2017). Water use efficiency and shoot biomass production under water limitation is negatively correlated to the discrimination against 13C in the C3 grasses *Dactylis glomerata*, *Festuca arundinacea* and *Phalaris arundinacea*. *Plant Physiology and Biochemistry*, 113, 1–5. https://doi.org/10.1016/j.plaphy.2017.01.021

Mathias Christina, Céline Gire, Mark R Bakker, Alan Leckie, Jianming Xue, Peter W Clinton, Zaira Negrin-Perez, José Ramon Arevalo Sierra, Jean-Christophe Domec, Maya Gonzalez, (2022). Native and invasive seedling drought-resistance under elevated temperature in common gorse populations, *Journal of Plant Ecology*, rtac097, https://doi.org/10.1093/jpe/rtac097

Mateos-Naranjo, E., López-Jurado, J., Mesa-Marín, J., Luque, C. J., Castellanos, E. M., Pérez-Romero, J. A., & Redondo-Gómez, S. (2021). Understanding the impact of a complex environmental matrix associated with climate change on the European marshes engineer species *Spartina martima*. *Environmental and Experimental Botany*, 182, 104304. https://doi.org/10.1016/j.envexpbot.2020.104304

McKee D., Hatton K., Eaton J.W., Atkinson D., Atherton A., Harvey I., Moss B. (2002). Effects of simulated climate warming on macrophytes in freshwater microcosm communities. *Aquat. Bot.*, 74: 71-83

Miller, R. C., & Zedler, J. B. (2003). Responses of native and invasive wetland plants to hydroperiod and water depth. P*lant Ecology*, 167(1), 57–69. https://doi.org/10.1023/A:1023918619073

Moo-Llanes, D. A. (2021). Inferring Distributional Shifts of Asian Giant Hornet *Vespa mandarinia* Smith in Climate Change Scenarios. *Neotropical Entomology*, *50*(4), 673-676.

Moss, B. (2010), Climate change, nutrient pollution and the bargain of Dr Faustus. *Freshwater Biology*, 55: 175-187. https://doi.org/10.1111/j.1365-2427.2009.02381.x

Nelson, M. F. (n.d.). Experimental and simulation studies of the population genetics, water relations, and vegetative growth of *Phalaris arundinacea* [Ph.D., University of Minnesota]. Retrieved November 27, 2022, from https://www.proquest.com/docview/1560685346/abstract/F59004278F734B72PQ/1

Nelson, M. F., & Anderson, N. O. (2016). Adaptive responses to water stress in *Phalaris arundinacea*, an invasive wetland grass. In Invasive Species (pp. 1–20). Nova Science Publishers, Inc. http://www.scopus.com/inward/record.url?scp=85029944150&partnerID=8YFLogxK

New York State Department of Environmental Conservation. (2022). *Giant Hogweed Biology*. Giant Hogweed Biology - NYS Dept. of Environmental Conservation. Retrieved November 26, 2022, from https://www.dec.ny.gov/animals/72934.html

Norderud, E. D., Powell, S. L., & Peterson, R. K. (2021). Risk Assessment for the Establishment of Vespa mandarinia (Hymenoptera: Vespidae) in the Pacific Northwest, United States. *Journal of Insect Science*, *21*(4), 10.

Nuñez-Penichet, C., Osorio-Olvera, L., Gonzalez, V. H., Cobos, M. E., Jiménez, L., DeRaad, D. A., & Soberon, J. (2021). Geographic potential of the world's largest hornet, Vespa mandarinia Smith (Hymenoptera: Vespidae), worldwide and particularly in North America. *PeerJ*, *9*, e10690.

Ober, G. T., & Martin, R. M. (2018). Sea-level rise and macroalgal blooms may combine to exacerbate decline in *Spartina patens* and *Spartina alterniflora* marshes. *Hydrobiologia*, 823(1), 13–26. https://doi.org/10.1007/s10750-018-3689-6

Oregon Department of Agriculture (n.d.) "B" Rated Weeds - Gorse. https://www.oregon.gov/oda/shared/Documents/Publications/Weeds/GorseProfile.pdf

Oregon State University. (n.d.). *Common Trees of the Pacific Northwest: Oak Species*. Oak species: Common trees of the Pacific Northwest. Retrieved December 10, 2022. https://treespnw.forestry.oregonstate.edu/broadleaf_genera/species/oak_spp.htm

Perry, L. G., Galatowitsch, S. M., & Rosen, C. J. (2004). Competitive control of invasive vegetation: A native wetland sedge suppresses *Phalaris arundinacea* in carbon-enriched soil. *Journal of Applied Ecology*, 41(1), 151–162. https://doi.org/10.1111/j.1365-2664.2004.00871.x

Population Dynamics of Aerial and Terrestrial Populations of *Phytophthora ramorum* in a California Forest Under Different Climatic Conditions. (n.d.). From https://doi.org/10.1094/PHYTO-11-12-0290-R

Prasser, N., & Zedler, J. B. (2010). Salt Tolerance of Invasive *Phalaris arundinacea* Exceeds That of Native Carex stricta (Wisconsin). *Ecological Restoration*, 28(3), 238–240.

Riis T., Olesen B., Clayton J.S., Lambertini C., Brix H., Sorrell B.K. (2012). Growth and morphology in relation to temperature and light availability during the establishment of three invasive aquatic plant species. *Aquatic Botany*, 102: 56-64. https://doi.org/10.1016/j.aquabot.2012.05.002.

Rizzo, D. M., Garbelotto, M., & Hansen, E. M. (2005). PHYTOPHTHORA RAMORUM: Integrative Research and Management of an Emerging Pathogen in California and Oregon Forests. *Annual Review of Phytopathology*, 43, 309–335.

Roberts, P. D., & Pullin, A. S. (2008). The effectiveness of management interventions for the control of Spartina species: A systematic review and meta-analysis. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 18(5), 592–618. https://doi.org/10.1002/aqc.889

Sage, R. F., & Kubien, D. S. (2007). The temperature response of C3 and C4 photosynthesis. *Plant, Cell & Environment*, 30(9), 1086–1106. https://doi.org/10.1111/j.1365-3040.2007.01682.x

Silveira M.J. & Thiébaut G. (2017) Impact of climate warming on plant growth varied according to the season. *Limnologica*, 65: 4-9 https://doi.org/10.1016/j.limno.2017.05.003.

Simler, A. B., Metz, M. R., Frangioso, K., Rizzo, D. M., & Meentemeyer, R. K. (2020). Wildfire limits the occurrence, frequency, and impacts of *Phytophthora ramorum* in the coastal forests of Big Sur, California.

Proceedings of the Seventh Sudden Oak Death Science and Management Symposium: Healthy Plants in a World with Phytophthora. *Gen. Tech. Rep.* PSW-GTR-268, 268, 37–38.

Simler-Williamson, A. B., Metz, M. R., Frangioso, K. M., & Rizzo, D. M. (2021). Wildfire alters the disturbance impacts of an emerging forest disease via changes to host occurrence and demographic structure. *Journal of Ecology,* 109(2), 676–691. https://doi.org/10.1111/1365-2745.13495

Sinks, I. A., Borde, A. B., Diefenderfer, H. L., & Karnezis, J. P. (2021). Assessment of Methods to Control Invasive Reed Canarygrass (*Phalaris arundinacea*) in Tidal Freshwater Wetlands. *Natural Areas Journal,* 41(3), 172–185. https://doi.org/10.3375/043.041.0303

Schumacher, J., Leonhard, S., Grundmann, B. M., Roloff, A. (2006). New Alder disease in Spreewald biosphere reserve - causes and incidental factors of an epidemic. *Nachrichtenblatt des Deutschen Pflanzenschutzdienstes*, 58(6), 141-147.

Schumacher, J., Leonhard, S., Grundmann, B. M., Roloff, A. (2006). New Alder disease in Spreewald biosphere reserve - causes and incidental factors of an epidemic. *Nachrichtenblatt des Deutschen Pflanzenschutzdienstes,* 58(6), 141-147.

Sunde, J., Larsson, P. & Forsman, A. (2019). Adaptations of early development to local spawning temperature in anadromous populations of pike (*Esox lucius*) *BMC Evol Biol,* 19, 148 https://doi-org.proxy.lib.pdx.edu/10.1186/s12862-019-1475-3

Takahashi, M., & Kikuchi, T. (1986). THE HEAT EFFECT ON SEED GERMINATION OF SOME SPECIES IN THE INITIAL STAGE OF A POST-FIRE VEGETATION*. *Ecological Review = Seitaigaku Kenyku, 21*(1), 11-14. http://stats.lib.pdx.edu/proxy.php?url=http://search.proquest.com.proxy.lib.pdx.edu/scholarly-journals/heat-effect-on-seed-germination-some-species/docview/747781587/se-2

Terese Berggren, Ulf Bergström, Göran Sundblad, and Örjan Östman. (2021). Warmer water increases early body growth of northern pike (Esox lucius), but mortality has larger impact on decreasing body sizes. *Canadian Journal of Fisheries and Aquatic Sciences.* 79(5): 771-781. https://doi.org/10.1139/cjfas-2020-0386

TreeGirl–California Bay Laurel – Umbellularia californica. (n.d.). Retrieved December 7, 2022, from https://www.treegirl.org/california-bay-laurel.html

UC Riverside Center for Invasive Species Research (n.d.). The Goldspotted Oak Borer. *The Department of Entomology*. https://cisr.ucr.edu/invasive-species/goldspotted-oak-borer

U.S. Geological Survey. (n.d.). Invasive Green Crabs Pose Threat to Washington's Shellfish Industry and Tribal Culture. from www.usgs.gov website: https://www.usgs.gov/news/science-snippet/invasive-green-crabs-pose-threat-washingtons-shellfish-industry-and-tribal#:~:text=Green%20crabs%20readily%20feed%20on

USDA APHIS | Sudden Oak Death. (n.d.). Retrieved December 5, 2022, from https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/sudden-oak-death

Vega, A., & Castro, L. (2019). Impact of climate change on insect–human interactions. *Current Opinion in Allergy and Clinical Immunology*, *19*(5), 475-481.

Venette, R. C., Coleman, T. W., & Seybold, S. (2015). Assessing the risks posed by goldspotted oak borer to California and beyond. *Gen. Tech. Rep. PSW-GTR-251. Berkeley, CA: US Department of Agriculture, Forest Service, Pacific Southwest Research Station:* 317-329, 251, 317-329.

Wakie, T. T., Neven, L. G., Yee, W. L., & Lu, Z. (2020). The establishment risk of Lycorma delicatula (Hemiptera: Fulgoridae) in the United States and globally. *Journal of economic entomology*, 113(1), 306-314.

Watson, E. B., Szura, K., Wigand, C., Raposa, K. B., Blount, K., & Cencer, M. (2016). Sea level rise, drought and the decline of Spartina patens in New England marshes. *Biological Conservation*, 196, 173–181. https://doi.org/10.1016/j.biocon.2016.02.011

Weinberg, W. C., Suoja, J. R., Kerhoulas, L. P., Maberry, R. J., Lee, C. A., Baston, D. S., & Marshall, S. E. (2021). PHYTOPHTHORA RAMORUM FOLIAR INFECTION REDUCES LEAF-LEVEL PRODUCTIVITY IN TANOAK AND CALIFORNIA BAY: A PILOT STUDY FROM REDWOOD NATIONAL PARK. *Madroño*, 68(2), 99–108. https://doi.org/10.3120/0024-9637-68.2.99

Wu, W., Huang, H., Biber, P., & Bethel, M. (2017). Litter Decomposition of *Spartina alterniflora* and *Juncus roemerianus:* Implications of Climate Change in Salt Marshes. *Journal of Coastal Research*, 33(2), 372–384. https://doi.org/10.2112/JCOASTRES-D-15-00199.1

Xiang Gong, Youjun Chen, Tao Wang, Xianfeng Jiang, Xiaokang Hu, Jianmeng Feng. (2020). Double-edged effects of climate change on plant invasions: Ecological niche modeling global distributions of two invasive alien plants, *Science of The Total Environment*, 740: 139933, https://doi.org/10.1016/j.scitotenv.2020.139933.

Zavalloni, C., Gielen, B., De Boeck, H. J., Lemmens, C. M. H. M., Ceulemans, R., & Nijs, I. (2009). Greater impact of extreme drought on photosynthesis of grasslands exposed to a warmer climate in spite of acclimation. *Physiologia Plantarum*, 136(1), 57–72. https://doi.org/10.1111/j.1399-3054.2009.01214.x

Zhu, G., Gutierrez Illan, J., Looney, C., & Crowder, D. W. (2020). Assessing the ecological niche and invasion potential of the Asian giant hornet. *Proceedings of the National Academy of Sciences*, *117*(40), 24646-24648.

Zhu, X., Meng, L., Zhang, Y., Weng, Q., & Morris, J. (2019). Tidal and Meteorological Influences on the Growth of Invasive *Spartina alterniflora*: Evidence from UAV Remote Sensing. Remote Sensing, 11(10). https://doi.org/10.3390/rs11101208

Zouhar, Kris. (2005). *Ulex europaeus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/shrub/uleeur/all.html.