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The Ili'i Is Améewi:
Recovering Indigenous Environments of the Willamette Valley

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I am an Indigenous researcher, a descendant of several western Oregon tribes—the Santiam Kalapuyans, Chinook, Molalla, and Takelma—and a citizen of the Confederated Tribes of Grand Ronde. Growing up in Oregon, I never heard how the tribes lost their lands, were removed to the reservation, were terminated and then later restored. During my inquiry into the history and culture of the Kalapuya tribes, I realized there are many silences about the environmental changes that settlers made to the Willamette Valley, the lands where my people lived for more than 16,000 years.[1] In 1856, federal Indian agents removed the valley tribes and placed them on the Grand Ronde Indian Reservation. For more than 100 years, thirty-two tribes lived and integrated at the reservation, only to be federally terminated in 1954. In 1983, through federal recognition, the Confederated Tribes of Grand Ronde were restored.[2]

This research is based on anthropological methodology. Ethnographic and archival records were primary sources of information. Archival primary documents from local collections and federal archives constitute the bulk of this information. But anthropology alone is not enough, because many of the early sources of scholarship are full of inaccuracies, errors, and bias. Therefore, I have worked extensively with elders of many regional tribes, learning ways of perceiving our history and culture, lessons not available in any text. My work, then, is decolonizing, as it corrects previous histories, fills voids of knowledge, and lifts up Indigenous cultural practitioners. In this process, I have taken a practitioner role within the local tribal communities—helping guide recovery of knowledge and traditions. Due to Native community experiences with assimilation, which affected our families deeply, many elders are reviving their culture and history, seeking to understand better who we are as tribal people. There is no manual for the best way to revive a culture or recover from generations of colonization. This is an individual struggle that each tribal member feels deeply.

The Willamette Valley today does not look at all like the valley of my people, the Santiam Kalapuya, when they lived and thrived here. For many thousands of years, we lived well in this valley, a "wealthy" life with plenty of food from the plants and animals who shared this land with us. Today the valley is an arid landscape, filled with agriculture and cities; only 1 percent of the valley has retained traditional landscapes.

This is the valley that I grew up in. Living in Salem, Oregon, most of my life, the valley all around the city has always been dry, flat, with rolling agricultural fields. One area to the north of Salem, Lake Labish, has never been a lake in my lifetime, only an expanse of onion fields growing in black soils.[3]

Parallel with my experiences, tribal members have discovered that much of the traditional landscape is radically changed from its "traditional" character, and so are working to find ways to restore portions of the land. Where to begin is a big issue, but this question is related to others, about what was the original character of the land before colonization—an environment no living person has experienced. This essay addresses the original character of the land and the settler forces that changed and still change the valley. Indigenous cultural knowledge has been applied to studies of plants and their environments. Archival and historical evidence of the reengineering of the valley gives us clues as to what the land was like before colonization. This reconstruction then gives significant clues as to what has to happen to decolonize and restore the original character of the valley.

What Changed?

Lakes and wetlands were major resource areas for all tribes and bands of this valley, yet most are now gone. The earliest General Land Office survey maps of the valley (1852–55) show vast areas of wetlands and swales—several named by period surveyors as "Camas Swale" (at Creswell) or "Camas Prairie" (at Rickreall), noting extensive fields of camas (*anti'p* in Kalapuya—*Camassia quamash; C. leichtlinii; C. quamash maxima)* that grew in the wetland prairies.[4] Camas is a well-recorded keystone food resource for regional tribes, including the Kalapuyans, the oldest inhabitants of the valley.[5] The Kalapuyans called Chemeketa (now Salem), located on the east bank of the Willamette River, "the camas place."[6] The majority of the Native prairies of the valley (along with their ecosystem of cultural food plants and Native fauna) are now gone, replaced by aggressive agricultural development over the past 180 years. Camas still exists in small fields that have not been plowed or developed.

Lakes in the valley were primary resource areas for the Kalapuyans, and Lake Labish was one of the largest. Before 1900, the Lake Labish complex was a vast expanse of wetlands, swales, and marshes, a perpetually shallow lake that expanded and contracted with the rains. The lake was described by farmers as a tangle of wetland plants, reeds, juncus (*Juncus effusus*), cattail (*Typha latifolia*), willow (*Salix lucida*), Oregon white oak (*Quercus garryana*), hazel (*Corylus cornuta*), and many associated animal species: deer, Roosevelt elk (*Cervus canadensis*), beaver, bear, cougar, ducks, geese, and freshwater fishes. Wapato (*mamptu* in Kalapuya—*Sagittaria latifolia*), an edible tuber of the arrowleaf family, was found there, as were many other principal

foods of the area tribes.[7] Wapato was highly desirable and harvested by bands of Chinookan, Kalapuyan, and Molallan peoples in the Portland Basin and south into the Willamette Valley to Lake Labish in its greatest abundance.[8]

Cultural Stewardship

Archaeologists estimate that the Kalapuyans began setting fires in the valley at least 7,000 years ago, and by 4,400 years ago began roasting and preparing camas bulbs in underground ovens.[9] Tualatin Kalapuya oral history stipulates that everything, plants, meats, and fish, would be dried for rehydration and ingestion during the winter months.[10] Camas and wapato, both primary root crops from the valley, were prepared by being roasted in large quantities in low-heat underground ovens. Once cooked, the bulbs would be dried. Meat and fish, salmon, lamprey, smelt, and other fishes would be wind dried or smoked in a similar manner, then placed in storage for winter consumption or trade. The quantity of food preserved was often more than was needed for local consumption, with the excess traded at villages on the Willamette River, with tribes on the coast and Chinookans on the Columbia River. In this manner Kalapuyans contributed to a vast trade area, the Columbia River Trade Network, which included tribes from half of the continent trading their unique products into the Columbia system.[11]

The Kalapuyans also spent a good deal of time preparing the land for future foods. They set fire to the prairies from the middle to the end of summer, spurring new growth of foods in the next year. The fire cleared old vegetation, deposited nutrients, and cleaned up the land, then was stopped at the associated thickets on the margins of the prairies where moisture was trapped.[12] The bulb plants would survive fine underground, while fire resistant trees, like Oregon white oaks, were hardly affected, instead prompted to grow a large amount of acorns in the following years.[13] The acorns, too, were a food source for many tribes in the region.[14] The prairie grasses would begin to regrow within a month, and the new tender growth would attract deer and elk from the forests, making them easy targets for the bows of the tribes. The benefits of cultural fire are many and, on the whole, it was the most efficient way to steward the land and control the amount of fuels on the ground. A secondary benefit of regular burning was to control the severity of fires at any time of the year, nearly eliminating the possibility of destructive fires.[15] Culturally, the Kalapuyans used fire to refresh and fertilize camas and tarweed fields, to aid in the tarweed harvest, to manage game animals, and to roast grasshoppers.[16]

In the early 1840s, settlers began pushing tribes out of their lands to the margins of settler claims, and discouraging them from setting fires. Fires in the valley were recorded by explorers and settlers, but the reports nearly end in the late 1840s.[17] Scottish botanist David Douglas noted the burnt prairies of the Willamette Valley in September 1825:

> Saturday, 30th—Most parts of the country burned; only on little patches in the valleys and on the flats near the low hills that verdure is to be seen. Some of the Natives tell me it is done for the purpose of urging the deer to frequent certain parts, to feed, which they leave unburned.[18]

Members of the United States Exploring Expedition traveled south through the valley and walked through miles of burnt prairies in August and September 1841:

> August 11, 1841—All of the prairie to the west of us had been burnt, and contrasted strongly with the green patches of woods and those narrow belts bordering upon streams. (George Emmons)[19]

Entries in the journals of Henry Eld, George Emmons, and James Dana recorded a large wetland swale near the La Mali River. La Mali was an indigenous name for the present Long Tom River.[20]

> September 10, 1841 . . . about 3 p.m. in the afternoon passed what is called Lake La Mali, eighty feet in width and three-quarters of a mile in length. Continuing along the margin of this to the southward; struck Lumdumbuff or La Mali river and eventually encamped. . . . (Henry Eld)[21]

In 1841, there were few white settlers in the valley, and the expedition encountered a traditional landscape, during and after it was burnt, the prairie fires being set by the Kalapuyans. Burning was the most important Kalapuyan method of stewardship in the valley.

Following the immigration of 1843, waves of settlers began changing the Willamette Valley to fit their notions of "worthwhile" lands. Settlers arrived in Oregon under the perception that the valley was already ready for farming: well cleared, with lush prairies, good soils, water, and plenty of sunlight. The white farmers had no understanding that the tribes had stewarded this land for millennia using cultural fire.[22] Those who knew about tribal traditions disavowed that these traditions had any useful purpose for civilized societies and considered them actions of simple "savage Indians." Valley conditions seemed perfect for agriculture, to the point that early Methodist missionary Jason Lee called the valley an "Eden" as a way to attract more settlement.[23]

A generation of settlers followed this vision of an Eden to the west on the Oregon Trail, taking expansive land claims (mile-square parcels for each white family) away from the tribal occupants years before tribal land cessions were legally validated. Foods that had sustained the Kalapuyans for millennia—camas and wapato roots, tarweed (*Madia sativa*), berries, hazelnuts, and acorns—were not recognized as staple foods by the settlers, who began modifying the prairies by plowing, planting crops, and introducing livestock. Using Native labor, settlers installed farms, fenced their claims, drained wetlands, and modified water sources, creating mill races for powering sawmills and gristmills.[24]

By 1855, the majority of the valley was completely claimed by settlers, leaving tribes living on the margins of these claims in "Indian encampments."[25] The tribes became nuisances to the settlers, begging for food because their traditional Native foods, managed by countless generations of Kalapuya families, had been destroyed under the plows or eaten by hogs.[26] Settler suppression of tribal culture transformed the character of the area forests, prairies, and wetlands. Removing tribal cultural fire

traditions and introducing a new settler philosophy of agricultural land management completely changed the ecology of the region.[27]

In 1855, the Willamette Valley Treaty was signed by the tribes and ratified in less than two months by Congress.[28] Beginning in March of that year, Indian agents moved the Kalapuyans and Molallans onto temporary reserves, and by April 1856 the majority of Kalapuyans and Molallans had been removed to the Grand Ronde Indian Reservation.[29]

Changing Wetlands in the Valley

From the 1840s to the 1940s, most of the valley went under the plow, and so the original diverse ecosystems gave way to monocropped areas devoid of ecological diversity. The settler vision for the valley was a landscape of wealth-generating farms. Most of the harvested crops would not stay in the valley but instead were ferried to Oregon City and Portland and processed in mills and then exported to other regions with large or growing populations: Asia, San Francisco, Seattle, the East Coast.

By the end of the 1800s, farmers seeking to use all of their land or crops complained that much of their land was too wet or seasonally flooded. The Cascade Range to the east has a large snow pack, and as the weather warms, the snow melt streams into the valley. The Coast Range contributes to the moisture runoff on the west side of the valley. Accompanied by sometimes-daily rainfall, water pools in the valley in a series of wetlands over clay-rich soils.

While spring floods refreshed the Kalapuyans' productive wetlands (the lands the Kalapuyans called *améewi*), wetlands caused problems for farmers, who needed to grow their crops in arid soils.[30] In the late nineteenth century, farmers began seeking ways to expand their fields further into wetland areas. The initial solution was to dig drainage ditches to continually drain wetlands into creeks. Ditches were combined with underground ceramic drain tiles placed in rows throughout fields to constantly drain excess water.

The drain tile systems were being continually improved and installed throughout the twentieth century, using state and federal funding and support. They are still being installed today. As farming has expanded and dominated the valley, most lands are now agricultural.

Case Study: Lake Labish

As research unveils the history of change made to the Willamette Valley, it has become clear that several sites were particularly significant to Native peoples. Generations of our people were forced into boarding schools and day schools where they were forced to forget, or never learn, much of their culture, language, and history, erasing their past from their memories. Tribal descendants are today relearning where and how their Kalapuyan and Molallan ancestors lived and what resources they utilized. The Kalapuyan villages of Chemeketa (*Chamigidi*) and Chemaway (*Tcamewa*) to the south and north of Lake Labish would have accessed the resources at the lake.[31] The Northern Molalla neighbors to the east had villages in the foothills of the Cascades. Cultural

Figure 1. *Wapato tuber at Lake Labish, Salem, Oregon. Photo courtesy David Lewis, 2025.*

information collected from Molalla Kate Chantell by anthropologist Philip Drucker states that the Molalla had a name for Lake Labish and harvested wapato there:

> Wat/gudi—Indian potatoes—some sort of tubers on water— lily—tramped out of the mud by women. Don't dry, just stored . . . Got at Tcint/Qaluq (lake near Chemawa) in fall time.[32]

The collected tribal ethnography around the lake is very thin, but the lifeways of the Kalapuyans in other regions of the valley, like at Wapato Lake, suggest that the neighboring villages seasonally visited this swampy lake for thousands of years, gathering foods such as wapato, cattails, and trout while hunting waterfowl, elk, and other game.[33] Therefore, it is assumed that the tribes near Lake Labish would have the same cultural practices.

In the late nineteenth century, farmers at Lake Labish complained that the lake flooded over its banks and drown their crops after freshets. They wanted access to the rich peat soils of the lake bed, called "beaversoils" in Oregon.[34] Crops grown in the black peat do exceedingly well, and the nutrient content remains high even after

years of constant use.[35] Laws in Oregon protected lakes from being destroyed, but not swamps and marshes (which is what the lake looked like in midsummer), which could be drained under the Oregon State Swamp Act (1860).[36] Although teeming with thousands of animals, fishes, and birds, the Labish "swamp" was described in 1900 as "wasted land," a dense, unusable morass with oaks, willows, wetland plants, and mosquitoes.

Land speculators Jay O. Hayes and Abraham F. Hayes invested in a thousand acres of land at Lake Labish in 1913, buying the "worthless" land for about a dollar an acre. The brothers worked with the farmers to construct a series of drainage ditches with their own money, about $150,000, to drain the lake.[37] In the end, a long, six-mile ditch was excavated from Lake Labish west to the Willamette River. This ditch today is named Labish Creek. By 1918, the lake was drained. Flooding continued into the 1950s until the Parkerville Dam and the pumping station were completed in 1962.[38]

During this period, numerous land reclamation projects were funded nationally by federal money, with millions going to Oregon because of the agricultural growth in the Willamette Valley. Despite protection of lakes in state law, land reclamation was seen as a way to greatly expand the extent of agriculture lands in many regions. Lake Labish was supposed to be protected, but its destruction was allowed—to increase crop land productivity in arid soils. The benefits: jobs for Americans and more food for the valley and for export.

Today, the former Lake Labish is an extremely productive landscape for Walla Walla onions, blueberries, and hazelnut orchards. In 2021, after posting a blog essay about the "Draining of Lake Labish," Sam Lea, a third-generation onion farmer with more than seventy acres on the lakebed, contacted me. In about 2000, he had stopped farming and put his land into conservation, and a few years later wapato began to return to the land, without him planting it. He now has four large patches of wapato. The land is recovering with many Native plants, animals, birds, and lots of frogs. The lakebed is now thought to have a seed bank of wapato that, once plowing ended, allowed the plant to return. On Lea's invitation, employees of the Grand Ronde Tribe and I visited the property to assess the health and viability of the land for restoration. We have now seeded an area with camas, dug healthy wapato, and are working on further plans to study the history of the lake and its potential for restoration. Core sampling of the lakebed took place in summer 2024 under the direction of archaeologists Loren Davis and Molly Carney of Oregon State University. We found at least fifteen feet of peat soils before having to stop the drill rig because of high water. Davis suggested that the cores had reached below the Missoula floods that had deposited soils 16,000 to 11,000 years ago. It is evident that the potential for learning more about this place—its long-term history, the older civilization of the Kalapuyans—is in the deeper soils, with at least nineteen feet of peat reported by Lea.[39]

Case Study: Wapato Lake

After Lake Labish was drained in 1918, and with the practice now proven to work, land speculator Abraham F. Hayes and farmer G. Blaine Brown invested in land at

Figure 2. *Camas bulb at Smithfield Oaks, Rickreall, Oregon. Photo courtesy David Lewis, 2025.*

Wapato Lake. In the late nineteenth century, farmers at Wapato Lake planted flax in the peat "beaversoils" and regularly had their crops flooded by summer freshets. Early twentieth century newspapers mention thousands of canvasback ducks who seasonally stopped in the lake, feeding on the wapato.[40] Sportsmen from valley towns would come to Wapato Lake on weekend excursions, setting up duck blinds and shooting the ducks. Farmers complained that the hunters would leave many dead ducks to rot. The speculators, Hayes and Brown, began digging drainage ditches to the Tualatin River north of the lake. By 1936 the lake was completely drained, the ditches and drain tiles doing their work to continuously drain the valley of "excess" water for decades after.[41]

Wapato Lake is a well-known historic wapato gathering site of the Tualatin Kalapuyans. Chief Kiakuts of the Tualatin had his home village on the southeast side of the lake, with about a dozen other villages within a few miles of the lake. All the Tualatins had the right to harvest wapato every fall, but since settlement, their root foods have been plowed under; introduced livestock also reduced their food supplies.[42] In 1854, Joel Palmer, Indian superintendent of Oregon, was moved to make a treaty with the Tualatin. Palmer had become friends with the Tualatin in the vicinity of his land claim in Dayton, Oregon, and had talks with them in 1854 about their degrading root crops, due in large part to the impact pigs had on camas and wapato. The resulting 1854 Tualatin Treaty was never ratified by Congress.

> The wapato, kammas, and other nutritious roots around their principal residence and constituting their chief means of subsistence have, since the increase of swine in the country, gradually diminished in quantity, and must soon entirely fail. (Joel Palmer)[43]

In January 1855, the Tualatin signed the Willamette Valley Treaty; they were removed from their villages to the Grand Ronde Indian Reservation by April 1856. The Grand Ronde Passbook recorded that they periodically returned to the lake for wapato harvesting.[44]

In the 1990s, because of constant maintenance problems, farmers in the former lakebed began abandoning the ditches and drainage. Crop production was not enough to pay the bills, and many communities began to consider alternative uses. The Tualatin National Wildlife Refuge began a project to buy back the lakebed lands and restore the former lake. Collaborating with teams of volunteers from the Grand Ronde Tribe, the refuge is now working to refill the lake and restore the wapato beds. They are replanting wapato, but restoration will take a decade or more to accomplish. In 2023, the new Wapato Lake Wildlife Refuge was opened to the public.

Land Reclamation Policies in Oregon

When Lake Labish was being drained, the governor of Oregon was James Withycombe, a proponent of draining lands to make more "worthwhile" soils for agriculture. Before he was governor, Withycombe built a reputation in Hillsboro for his farming practices. He was appointed director of the Oregon College of Agriculture's (now part of Oregon State University) experimental division, where he helped develop the technology for draining soils. A 1914 report quotes James Withycombe (as "an authority" on tile drainage as a way to increase crops):

> In the Willamette Valley proper, the principal areas badly in need of drainage are found from Oregon City southward, notably centered about Salem and Albany. . . . West of the river there are thousands of acres from Eugene northward in the Long Tom section and in the Little Muddy and Mary's watersheds south of Corvallis, the successful farming of which awaits installation of drainage systems. . . . At present, a large project is under way by which Lake Wapato, near Gaston, will be drained by diking and pumping plant.[45]

With support for drainage and land reclamation at every level, and without anyone (including Native people) to speak for the valley's lakes and wetlands and their associated flora and fauna, the whole of the valley was eventually reengineered to conform with the American agricultural ideal. It is this landscape that the present residents of the valley have grown up with and cannot imagine any differently.

Discussion

For descendants of the Kalapuyans, most of the significant resources in the Willamette Valley—formerly rich wetlands with great diversity of species—have been so changed that today it is no longer possible to experience the traditional environments in which the Kalapuya and Molalla cultures developed. Efforts to restore oak savanna in the valley are ongoing but have been sporadic. Most restoration projects have been urban-based and normally do not include agreements with tribal members to allow the traditional food or fiber plants to be harvested. Federal forests regularly enter into memorandums of understanding for planning, harvesting, and stewardship with tribes, and the State of Oregon issues permits for gathering of Native foods. Federally administered lands offer better options for costewardship of significant resources through cultural fire projects as well as cultural resource management programs. Many state-level programs, however, are beginning to accept tribal stewardship practices.

Cultural fire is a tribal tradition that is experiencing revival, with teams of trained tribal and allied practitioners burning small test plots throughout western Oregon. Much of the interest in cultural fire is fueled by an interest in finding methods of managing catastrophic fire in the government-administered forests of the West. Traditional forest management policies seeking to preserve timber for harvest by eliminating fires have increased the buildup of fuels, increasing wildfire danger and damage.[46] Traditional tribal stewardship practices of setting frequent, low-intensity cultural fires, to manage landscapes, and control and revitalize plant communities is now being looked at as a potential answer to the dilemma. The Grand Ronde Tribe has practiced setting cultural fires since the early 1990s, and their members are regular participants in fire projects throughout the valley.

Water, too, needs to be allowed to remain in the land. In the Willamette Valley, wetland resources were important in the fire-managed prairies, when fires were being set by Kalapuyans. However, there are as yet few projects to restore the natural hydrologic system of the valley.

When land reclamation and drainage was the standard philosophy in the valley, there were warnings that water managers and engineers were not fully taking into account the effects of their actions. In 1939, naturalist William Finley criticized the Willamette Valley Project for not studying the effects of damming and the draining of wetlands on native fauna. Finley was the sole voice of opposition in this period; tribes were rarely listened to off the reservation.

> Finley cited the draining of lakes and swamps. This practice, while reclaiming land for agriculture, has too often defeated its own end by lowering the water table

> and rendering other land less usable, . . . depriving fish, game, and fur-bearing animals refuge.[47]

A recent report from the US Fish and Wildlife Service stated that "more than half of the wetlands in the lower forty-eight states are gone, and losses continue," but this comes half a century too late for the most significant wetlands of the West.[48] The United Nations released a report in 2019, stating that at least "eighty-five percent of wetlands present in 1700 had been lost by 2000—loss of wetlands is currently three times faster, in percentage terms, than forest loss.[49]

The extent of the damage to Willamette Valley wetland ecosystems is still not fully known. The natural hydrology is consistently under attack by generations of drainage agriculturalists. There have not been enough historical studies of the changes wrought by white settlers, and the damage to wetlands is extensive to resident floral and faunal communities as well as native fish populations. I estimate there are extensive effects of this drainage to water quality, and conversations are beginning with biologists as to what the effects could be. In order to restore the traditional landscape, it is necessary to continue historical reconstructions of the traditional environment so we know what we have to restore it *to*.

A more complete understanding concerning the effects of the return of fire and water to the Willamette Valley and its ecosystems is a goal for future research.[50] It is clear in the Willamette Valley, and likely many other agricultural areas, that without the return of water, fire alone is not the answer to restoring landscapes. Restoration of natural water systems in the Willamette Valley has yet to become a major topic in discussions of traditional landscape restoration. The normity of agriculture today shrouds the true character of the land in many agricultural regions; there are few histories of reengineered water systems, and so it will take time to recover this information. Finally, researchers seeking to interpret tribal culture and history need to account for the colonization of the land when describing tribal peoples. Adding a wetland character to the ethnohistory of the Kalapuya tribes significantly changes how the culture is thought to have been before settlement.

Notes

1. Estimate based on the Kalapuya oral histories of Missoula floods in Melville Jacobs, *Kalapuya Texts* (Seattle: University of Washington Press, 1945). The floods are estimated to have occurred 16,000 to 11,000 years ago.

2. David G. Lewis, "Termination of the Confederated Tribes of the Grand Ronde Community of Oregon: Politics, Community, Identity" (PhD diss., University of Oregon, 2009).

3. Lake Labish was named by Métis fur traders in the early nineteenth century from the French word for a female deer, *la biche*. The river to the east that traditionally drained the lake is the Little Pudding River. "Pudding" relates to when early nineteenth century fur trappers once made blood pudding when encamped by the river, likely from the blood of an elk.

4. Alternate linguistic spelling is *andi'p*.

5. Molly Carney and Thomas Connolly, "Scales of Plant Stewardship in the Precontact Pacific Northwest, USA," *The Holocene* 34, no. 8 (2024): 1112–27.

6. Melville Jacobs, *Notebook 46* (University of Washington Special Collections, 1928), 46:74.

7. Albert Gatschet, *Tualatin Kalapuya Calendar* (National Anthropological Archives, 1877); Henry Zenk, "Contributions to Tualatin Ethnography: Subsistence and Ethnobiology" (MA thesis, Portland State University, 1976); David G. Lewis, "Draining Lake Labish," *Quartux Journal* (December 19, 2021), https://ndnhistoryresearch.com/2021/12/19/draining-lake-labish/; David G. Lewis, "Draining Wapato Lake," *Quartux Journal* (December 24, 2021), https://ndnhistoryresearch.com/2021/12/24/draining-wapato-lake/.

8. Zenk, "Contributions to Tualatin Ethnography"; Melissa Darby, "Wapato for the People: An Ecological Approach to Understanding the Native American Use of *Sagittaria latifolia* on the Lower Columbia River" (MA thesis, Portland State University, 1996).

9. C. Melvin Aikens, Thomas J. Connelly, and Dennis L. Jenkins, *Oregon Archaeology* (Corvallis: Oregon State University Press, 2011); Brian L. O'Neill, Thomas J. Connolly, and Dorothy E. Freidel, "A Holocene Geoarchaeological Record for the Upper Willamette Valley, Oregon: The Long Tom and Chalker Sites" (University of Oregon Anthropology Papers 61, 2004).

10. Jacobs, *Kalapuya Texts*, 187–91.

11. Theodore Stern, "Columbia River Trade Network," in *Handbook of North American Indian, Volume 12: Plateau* (Washington, DC: Smithsonian Institution, 1998).

12. See the journals of James Dana, Henry Eld, and George Emmons (all unpublished), which record the behavior of fire in the Willamette prairies in 1841, stopping at the thickets: James Dana, *Journal of James Dana*, James J. Dana Papers, 1841–1890 (Newberry Library, 1841); Henry Eld, *Journal of Henry Eld*, Beinecke Special Collections (Yale University, 1841); George Emmons, *Journal of George Emmons*, George F. Emmons Papers, July 25–Sept. 16, 1841, Beinecke Special Collections (Yale University, 1841).

13. Kat Anderson, *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources* (Oakland: University of California Press, 2005).

14. Zenk, "Contributions to Tualatin Ethnography," 60, suggests that acorns were not a major food source, but archaeologically they are found in cultural deposits associated with pit ovens; see O'Neill, Connolly, and Freidel, "A Holocene Geoarchaeological Record for the Upper Willamette Valley, Oregon." Jacobs, *Kalapuya Texts*, lists acorn pits for the Tualatin peoples. My estimation is that the plentiful variety of food resources of the region made acorns a food of less significance, compared to tribes in acorn-rich regions such as California.

15. There was at least one incident in Oregon history of a fire set in the prairie by settlers that became catastrophic, in 1845; see David Lewis, "Nestucca Accounts of the Great Fire of 1845 and First Encounters with White Men," *Quartux Journal* (November 11, 2021), https://ndnhistoryresearch.com/2021/11/11/nestucca-accounts-of-the-great-fire-of-1845-and-first-encounters-with-white-men/. It is probable the tribes experienced this as well within their history—likely one reason why they set fires in late summer, when conditions were better.

16. David G. Lewis, *Tribal Histories of the Willamette Valley* (Portland: Ooligan Press, 2023); Robert Boyd, *Indians, Fire, and the Land in the Pacific Northwest* (Corvallis: Oregon State University Press, 2021).

17. Jesse Applegate, *Recollections of My Boyhood* (Roseburg: Press of Review Publishing Company, 1914); David Douglas, *Journal Kept by David Douglas During His Travels in North America, 1823–1827: Together with a Particular Description of Thirty-Three Species of American Oak and Eighteen Species of Pinus, with Appendices Containing a List of the Plants Introduced by Douglas and an Account of His Death in 1834* (Royal Horticultural Society, 1914); Charles Wilkes, *Narrative of the United States' Exploring Expedition: During the Years 1838, 1839, 1840, 1841, 1842, Volume 4* (Whittaker, 1845); James Dana, *Journal of James Dana*, James J. Dana Papers, 1841–1890 (Newberry

Library, 1841); Henry Eld, *Journal of Henry Eld*, Beinecke Special Collections (Yale University, 1841); George Emmons, *Journal of George Emmons*, George F. Emmons Papers, July 25–Sept. 16, 1841, Beinecke Special Collections (Yale University, 1841).

18. Douglas, *Journal Kept by David Douglas*.

19. Emmons, *Journal of George Emmons*.

20. Zenk writes the name linguistically as /ala'malii/; Henry Zenk, "Notes on Native American Place-Names of the Willamette Valley Region," *Oregon Historical Quarterly* 109, no. 1 (2008).

21. Eld, *Journal of Henry Eld*.

22. Cultural fire is the traditional way the tribes used fire to manage their lands; this is different from the term "proscribed fire," which tends to remove the native cultural elements.

23. Lewis, "Termination of the Confederated Tribes of the Grand Ronde Community of Oregon."

24. Lewis, *Tribal Histories of the Willamette Valley*; Melinda Marie Jetté, *At the Hearth of the Crossed Races: A French-Indian Community in Nineteenth-Century Oregon, 1812–1859* (Corvallis: Oregon State University Press, 2015).

25. David Lewis, "Native Peoples Histories from Eugene and Land County" (Whittaker Community Council Report, 2023).

26. Lewis, *Tribal Histories of the Willamette Valley*; Joel Palmer, "Letter of March 27, 1854," 1854.

27. James D. Johnston, Micah R. Schmidt, Andrew G. Merschel, William M. Downing, Michael R. Coughlin, and David G. Lewis, "Exceptional Variability in Historical Fire Regimes across a Western Cascades Landscape, Oregon, USA," *Ecosphere* 14, no. 12 (December 2023).

28. Joel Palmer, "Treaty with the Kalapuya, etc., 1855, Ratified" (known alternatively as "Willamette Valley Treaty, 1855") (Washington, DC: US National Archives and Records Administration, 1855)

29. Lewis, "Termination of the Confederated Tribes of the Grand Ronde Community of Oregon"; Lewis, "Exceptional Variability in Historical Fire Regimes."

30. *Illi'i* (also written *illihee*) is a word for *land* in Chinuk Wawa, also used by Kalapuyans. The Kalapuya word *améewi means wetland or swale, as recorded from John Mose Hudson, Jacobs Notebook 33 (Seattle: University of Washington Special Collections, 1928), 53;* Zenk, "Notes on Native American Place-Names of the Willamette Valley Region."

31. Zenk, in "Notes on Native American Place-Names of the Willamette Valley Region," suggests this word comes from *chameewi*, meaning "place of low-lying frequently overflowing soil" (some grammatical marks removed); Leo Frachtenberg, "Recently Compiled Work among the Calapooia, Santiam, Lakmiut, Ahantchuyuk, Yamel, Atfalati, etc., Grand Ronde, Oregon, 1911," Southwest Oregon Research Project Collection, University of Oregon Special Collections, 1:6:12.

32. Philip Drucker, "Drucker 4516-78, Volume 1, Coos, Tolowa, Molalla Ethnographic Notes," Series 1, Box 4, Folder 11, Southwest Oregon Research Project Collection, National Anthropological Archives (Eugene: University of Oregon, 1934), 48–49. Drucker has further notes about wapato, and the alternate spelling of Lake Labish is *tcint kalux* (page 69).

33. Zenk, "Contributions to Tualatin Ethnography."

34. Beavers also were eliminated from the land by fur traders working in the valley for some five decades. For a successful return of beavers, water would have to be allowed to return to the land and remain in ponds, which would affect farmlands.

35. Conversations with area farmers suggest that they never worry about nutrient content; the lake soils are very deep, measured at fifteen feet with a coring rig in summer 2024, and they only use the top few inches anyway.

36. Oregon State Swamp Act (1860), Oregon State Legislature, https://www.oregonlegislature.gov/bills_laws/permanentAnnos/Chapter%20273.pdf.

37. Lewis, "Draining Lake Labish"; Lewis, "Draining Wapato Lake."

38. Sons of Labish, *Lake Labish Early Owners and Events*, self-published, 2006.

39. Some three feet below the surface is a layer of light colored volcanic ash from Mount Mazama, more than 7,000 years old.

40. *Daily Oregonian* (Portland) newspaper articles: "Game Wardens Puzzled: Is Wapato a Lake or not a Lake?" October 24, 1901; "Haunt of the Canvas-Back Duck," January 11, 1904; "Canvas Backs to Lose Last Refuge," March 22, 1914; "Wapato Lake Rented: Gun Club Pays for Rights to Hunt Ducks in Marsh," October 5, 1915; "Flax Quality Is High: Wapato Lake Crop Declared Best in Oregon," September 3, 1916; "Ducks Awake Farmers: Flocks Feeding on Wapato Lake at Night Quack in Chorus," February 26, 1917; "Wapato Lake Near Gaston Rises," March 3, 1917; untitled, January 19, 1919.

41. Lewis, "Draining Wapato Lake."

42. Zenk, "Contributions to Tualatin Ethnography."

43. Joel Palmer, documents relating to the negotiation of an unratified treaty with the Kalapuya Indians, March 25, 1854 (Washington, DC: National Archives, National Archives and Record Service).

44. Twenty years' worth of passes are recorded in the passbook. Natives at Grand Ronde had to have a pass signed by the Indian agent to legally leave the reservation, with their travel and destination recorded in the *Grand Ronde Passbook* (Confederated Tribes of Siletz Collection, Oregon Historical Society Library).

45. Ira A. Williams, "The Drainage of Farm Lands in the Willamette and Tributary Valleys of Oregon," *Mineral Resources of Oregon* 1, no. 4 (1914): 9–11.

46. James K. Agee and Carl N. Skinner, "Basic Principles of Forest Fuel Reduction Treatments," *Forest Ecology and Management* 211, nos. 1–2 (2005): 83–96.

47. Author unknown, "Finley Urges Cautious Study of River Projects: Questions High Dams under Valley Plan," *Albany Democrat-Herald* (April 5, 1939).

48. "More Than Half of Wetlands in the Lower Forty-Eight States Are Gone, and Losses Continue, Mostly in the Southeast, Great Lakes and Prairie Pothole Regions," *US Fish and Wildlife Service*, March 22, 2024, https://www.fws.gov/press-release/2024-03/continued-decline-wetlands-documented-new-us-fish-and-wildlife-service-report.

49. "Nature's Dangerous Decline 'Unprecedented': Species Extinction Rates 'Accelerating,'" United Nations, 2019, https://www.un.org/sustainabledevelopment/blog/2019/05/nature-decline-unprecedented-report/.

50. Presentations given on this topic through 2023 and 2024 have gotten much interest from scholars from many disciplines: soil science, hydrology, biology, archaeology, botany, environmental sciences, and others. The forthcoming coauthored book *Kalapuyans of Western Oregon* (planned publication date 2027) will address water and fire issues in the valley.