

MINES TO MILES

Revitalizing Communities from a Post-Industrial Landscape to a Recreation Area

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Indigenous Knowledge

The Confederated Tribes of the Warm Springs
Northern Paiute Tribe
Wascoes Tribe
Warm Springs Tribe
Western Apache Tribe
Chiricahua Apache Tribe
And many more who lived in arid climates.

Friends and Family

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Abstract

This project looks at the possibility of mined landscapes remediated into adaptive reuse spaces to provide equitable recreation opportunities for growing communities. These sites are a relic of time, and we can deploy placemaking and placekeeping practices to ensure the history of the site is not forgotten, and the character of these spaces are transformed for future generations. As a case study for one of those communities, Central Oregon should take into consideration its recreation economy and revitalize a previously strip-mined site as a new recreation park for its diametrically growing communities. This method of remediation of the Lower Bridge Mine will be broken into three phases: first, remediation through traditional ecological knowledge practices including crescent berms, branching on-contour swales, and trinchera dry stone masonry check dams. Second, creating a phyto-stabilization high desert planting plan and activation of a seedbank on the site will reduce the harmful effects of the mining industry. Finally, a monitoring program to ensure placemaking and placekeeping techniques are deployed for a successful project. By transforming a wasteland into an enjoyable and habitable site there could be a perceived illusion that the past has been erased, but through signage and other remnant relics the history of the site and the lessons learned in remediation will not be forgotten. In conclusion, the site can become a case study for placemaking and placekeeping practices for future mine remediation to create adaptable landscapes.



I. context

the background to this project, and the “why” of why projects like this one should be happening.

II. site narrative

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III. remediation and restoration

IV. remembrance

The project proposal stems from a need to create equitable spaces for communities that are impacted by environmental devastation from industrial practices. At its core this is an adaptive reuse project, envisioning new life for a brownfield site strip-mined for diatomaceous earth. This space should first and foremost be remediate any health hazards to the surrounding community. Even creating relief for communities as Central Oregon continues to grow in population and the lack of outdoor spaces decreases. This site can be reimagined into a resource for Central Oregon, to provide curated outdoor spaces for a rural community. Why should Central Oregon care about brownfield cleanup? The reason and core behind cleaning up brownfield sites are derived from the eminent health hazards that impact under served communities, the moral pull and ethical pressure

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to try and revitalize landscapes that have been previously affected by environmentally detrimental resource extraction practices in the hopes that the site in the future could better serve the community. “These neglected places, while often having a negative impact on the environment and surrounding community, are simultaneously part of our cultural heritage.”¹

As landscape architects, we are given the tools and abilities to look at the whole scope of a previously industrial impact site and create positive change. From analyzing the impact to artfully addressing the potential of those industrial forms, landscape architects should be a part of the process to create meaningful, astute and carefully designed interventions.

the why

context

¹ Putran, “Adaptive Reuse.”





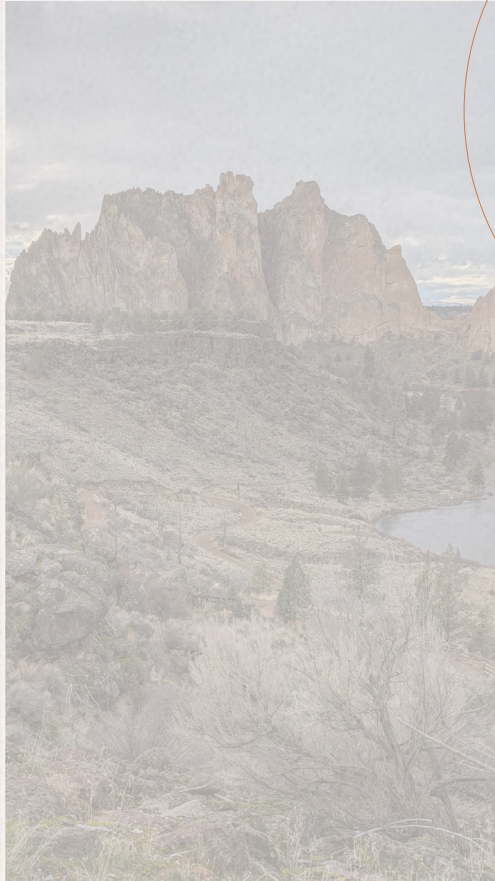
Bend Whitewater Park, McKay Park



placemaking

“a process of community development that leverages outside public, private, and nonprofit funding to strategically shape and change the physical and social character of a neighborhood using arts and cultural activities”

-USDAC



Smith Rock State Park



placekeeping

“as the active care and maintenance of a place and its social fabric by the people who live and work there. It is not just preserving [spaces] but keeping the cultural memories associated with a locale alive, while supporting the ability of local people to maintain their way of life as they choose”

-USDAC

For this project the concepts of placekeeping and placemaking, are vital to the design decisions made and the longevity of the remediation efforts on the site. The definition of placemaking is “a process of community development that leverages outside public, private, and nonprofit funding to strategically shape and change the physical and social character of a neighborhood using arts and cultural activities”² by the United States Department of Arts and Culture. This photo shows the Old Mill Building and White-Water Park in downtown Bend, a renovation project that repurposed the mill building and its dams to create a lively downtown and new recreation area.

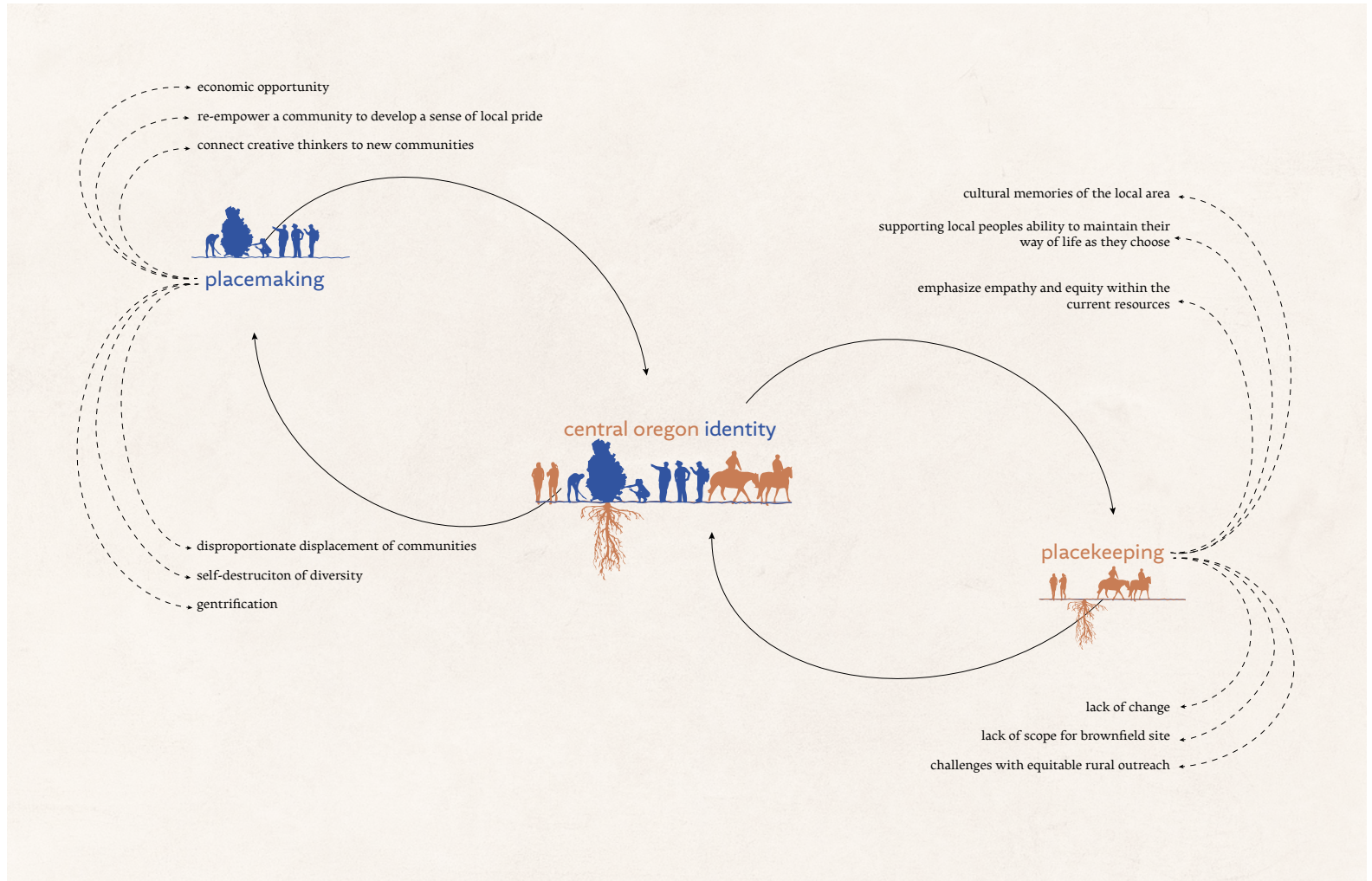
The concept of placekeeping derived from a counter movement from placemaking, addressing the negative results of gentrification and displacement well intentioned placemaking practices can create. In its definition it directly addresses displacement by stating “[placekeeping] is the active care and maintenance of a place and its social fabric by

the people who live and work there. It is not just preserving [spaces] but keeping the cultural memories associated with a locale alive, while supporting the ability of local people to maintain their way of life as they choose”.³ This photo is an iconic view of Smith Rock, or known to Indigenous peoples of the area as Animal Village, and these prominent walls have provided space for community gathering for thousands of years. Although overlapping in concepts of defining an identity, placemaking and placekeeping are different in their methods and therefore we see their outcomes diametrically distinct when applied to landscape design. The success of adaptive reuse brownfield sites are addressed by professionals the Environmental Protection Agency or the Department of Environmental Quality but its life and longevity and success of the design becoming adopted is dependent on the community that takes care of it.

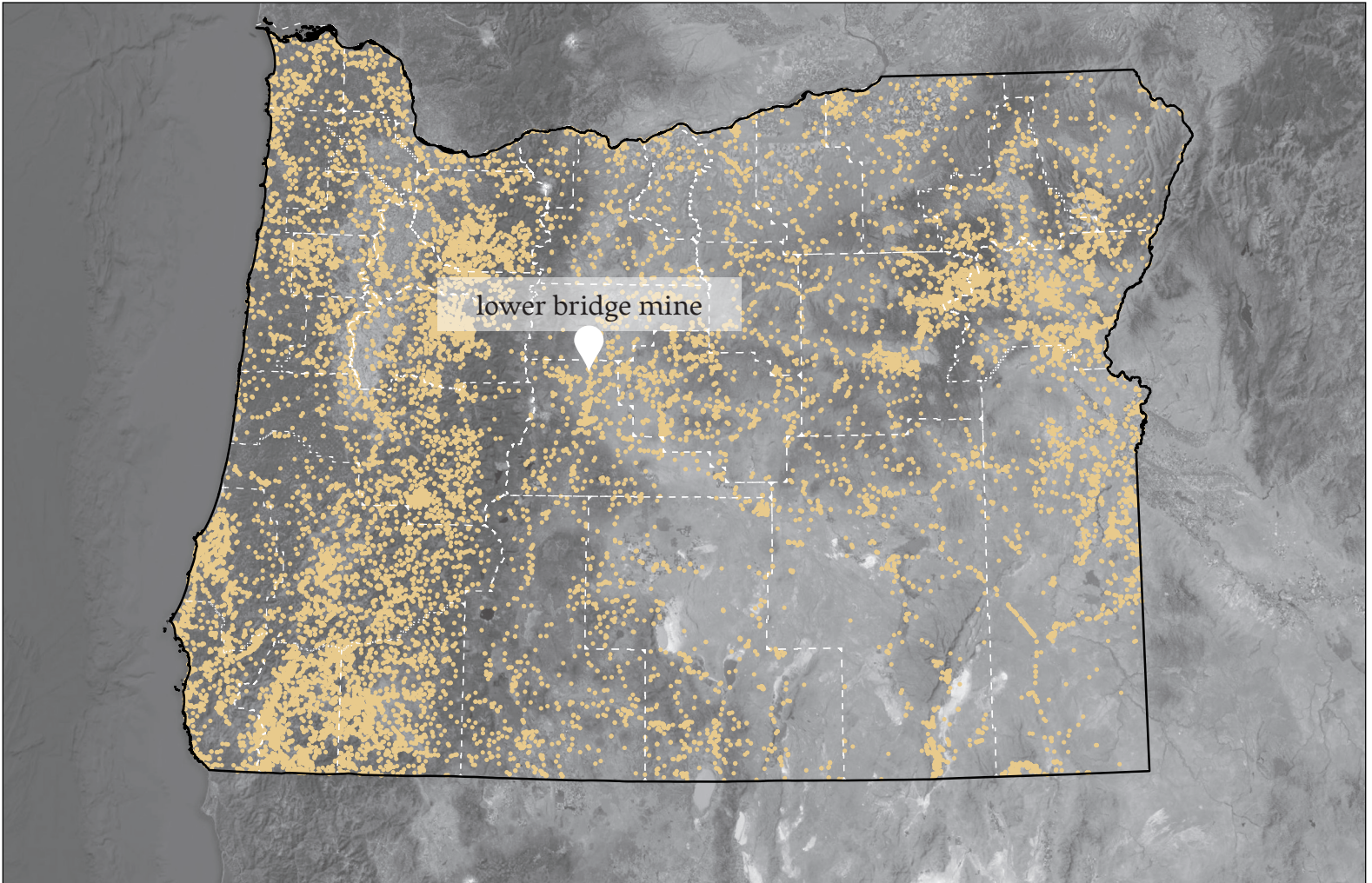
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placekeeping and placemaking

^{2,3}USDAC Citizen Artist Salon.



Within the state of Oregon, there are over 23,000 abandoned mines. These include both underground and surface mining and their impact is widely still seen today. These mines were often a conglomerate of structures, buildings, rigging equipment, excavation tools, processing structures or housing for employees. The mine complexes were located next to the resource until the majority of the resource was extracted, and then the mine site abandoned. Often these sites were left without any reclamation practices implemented and some look like ghost towns, as if the owners had picked up and walked away. Others have unique landforms that have become characteristic of the mining process, and of the site itself.





Bohemia Mountain



Opalite Mine, Oregon



McDermitt Caldera, Nevada



Ochoco Mother Lode Mine



Opalite Mine, Oregon



McDermitt Caldera, Nevada



Yreka Mine, California

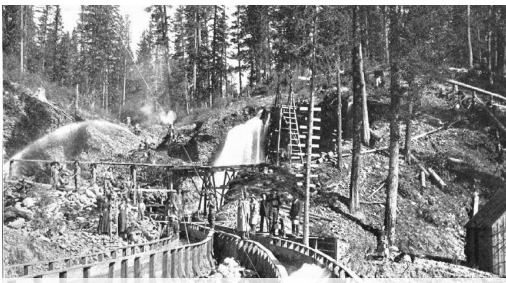


Yreka Mine, California

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oregon mines

These landscapes were mined for natural resources like precious metals, minerals, or commonly needed industrial materials. They are high impact areas that have become relics of a moment in time and can be seen as an opportunity for adaptive reuse.



Gin Lin Mining Trailhead, Oregon



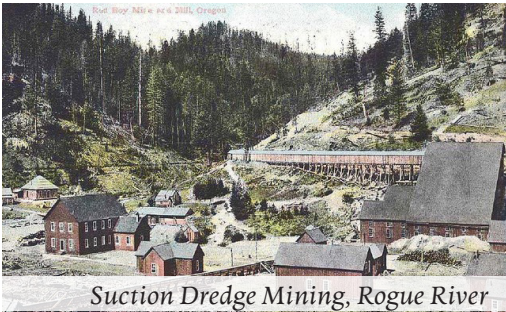
Gin Lin Mining Trailhead, Oregon



Suction Dredge Mining, Rogue River



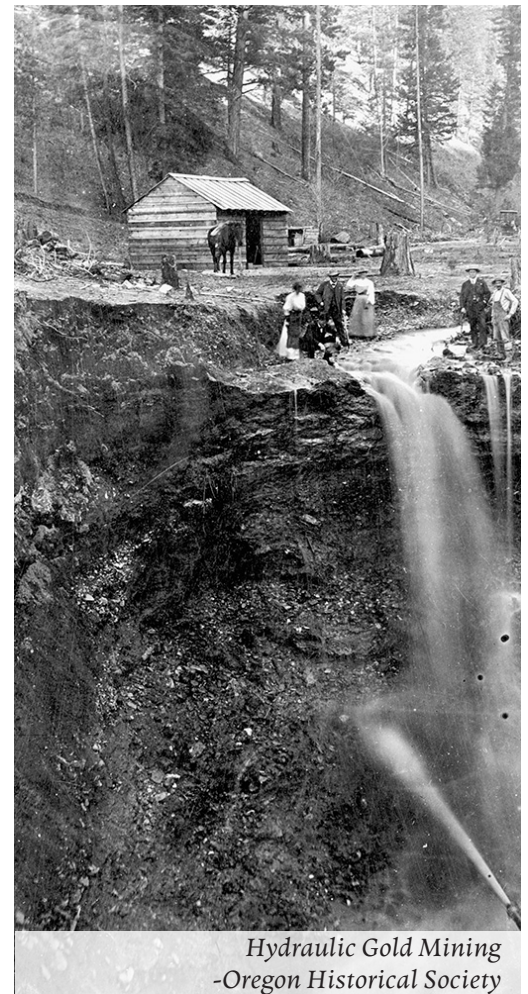
Tererro Mine Project, Oregon



Suction Dredge Mining, Rogue River



Abandoned Mine, Baker County



*Hydraulic Gold Mining
-Oregon Historical Society*

These landscapes were mined for natural resources like precious metals, minerals, or commonly needed industrial materials. The commonly extracted materials in Oregon were timber, various gemstones, bentonite, common clay, perlite and of course, diatomite. Strip mining is the process of scraping and harvesting the natural resource from the surface of the landscape and filtering the target resource from the topsoil. This process results in biproducts of mine spoils and mine tailings. Through segmented excavation practice, strip mining segments of large chunks of the surface resource effectively while also separating the product and the biproduct from each

other. These biproduct piles are called spoils piles, and are created by dropping the overburden, topsoil, or any other invaluable material into gravity formed piles. These piles were not compacted or regraded, and were determined to be reaching their maximum size once the angle of repose was too steep.⁴ These spoils piles are unstable landforms and are subject to being colonized by invasive species or fragmented by heavy erosion.

These sites are high impact areas that have become relics of a moment in time and can be seen as an opportunity for adaptive reuse. What is left at these mining sites varies from the industrial

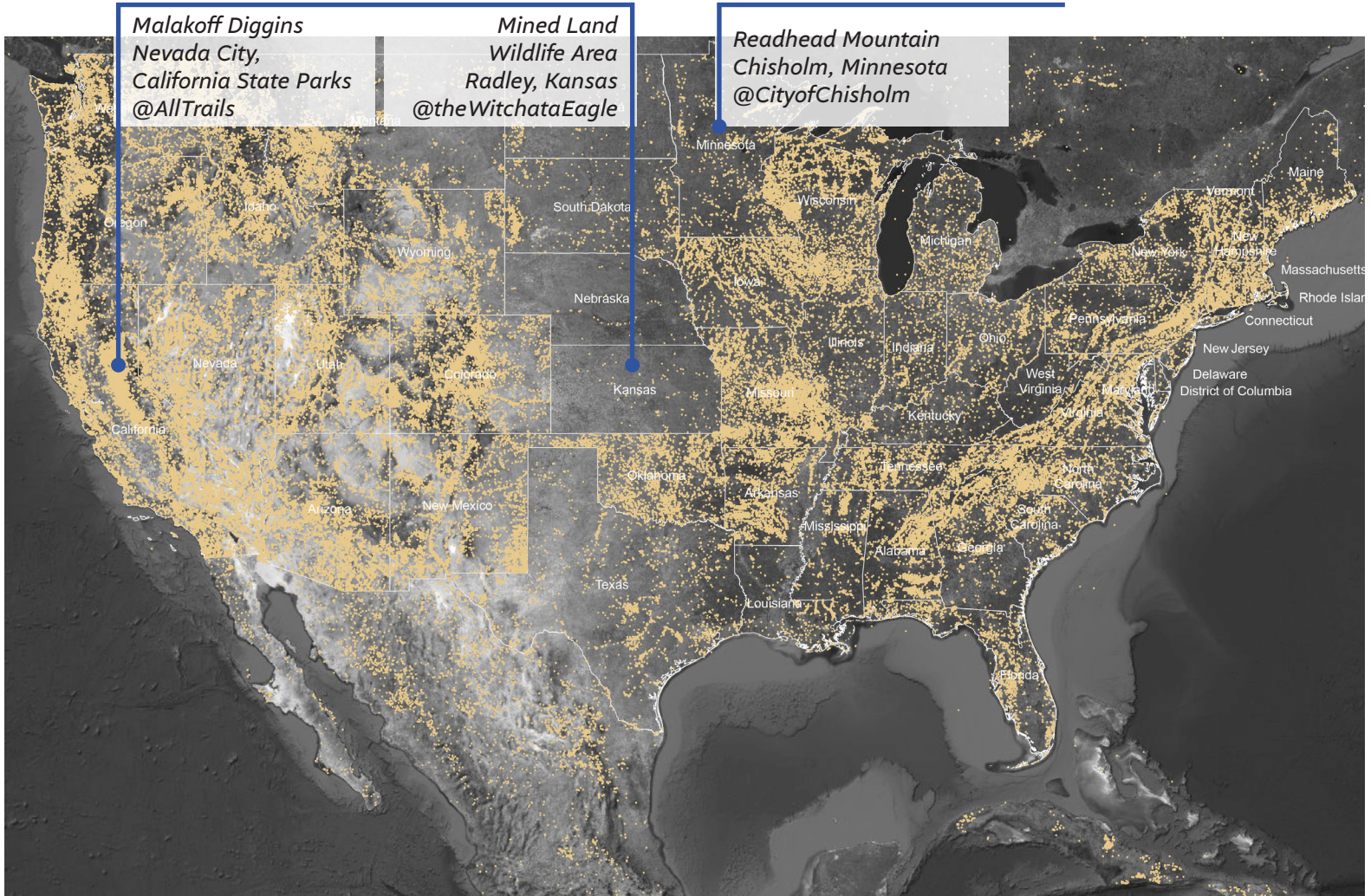
⁴*“Surface Mining Control and Reclamation Act - Energy and Minerals Management (U.S. National Park Service).”*

practice and the amount of degradation over time. Some impacts are extremely detrimental to the environment and include toxic chemicals leaking into the surrounding water, soil and air. These sites have critical clean ups zones and have been deemed by the U.S. Environmental Protection Agency as high priority sites to remediate. Sometimes, these sites are invisible contaminants that to an untrained or naked eye, are impossible to see. On the other hand some sites have less malignant impacts on their surrounding environments but have more visually reactionary features. Deep pits scrapped out of the earth, large tunnels carved through mountains, and

clear-cut forests are perceived by any general citizen or lay man as devastating tragedies. Both impacts effects are viable and important sites for remediation but it is important to understand the perceived and inconspicuous health hazards that make up the many layers of a site.



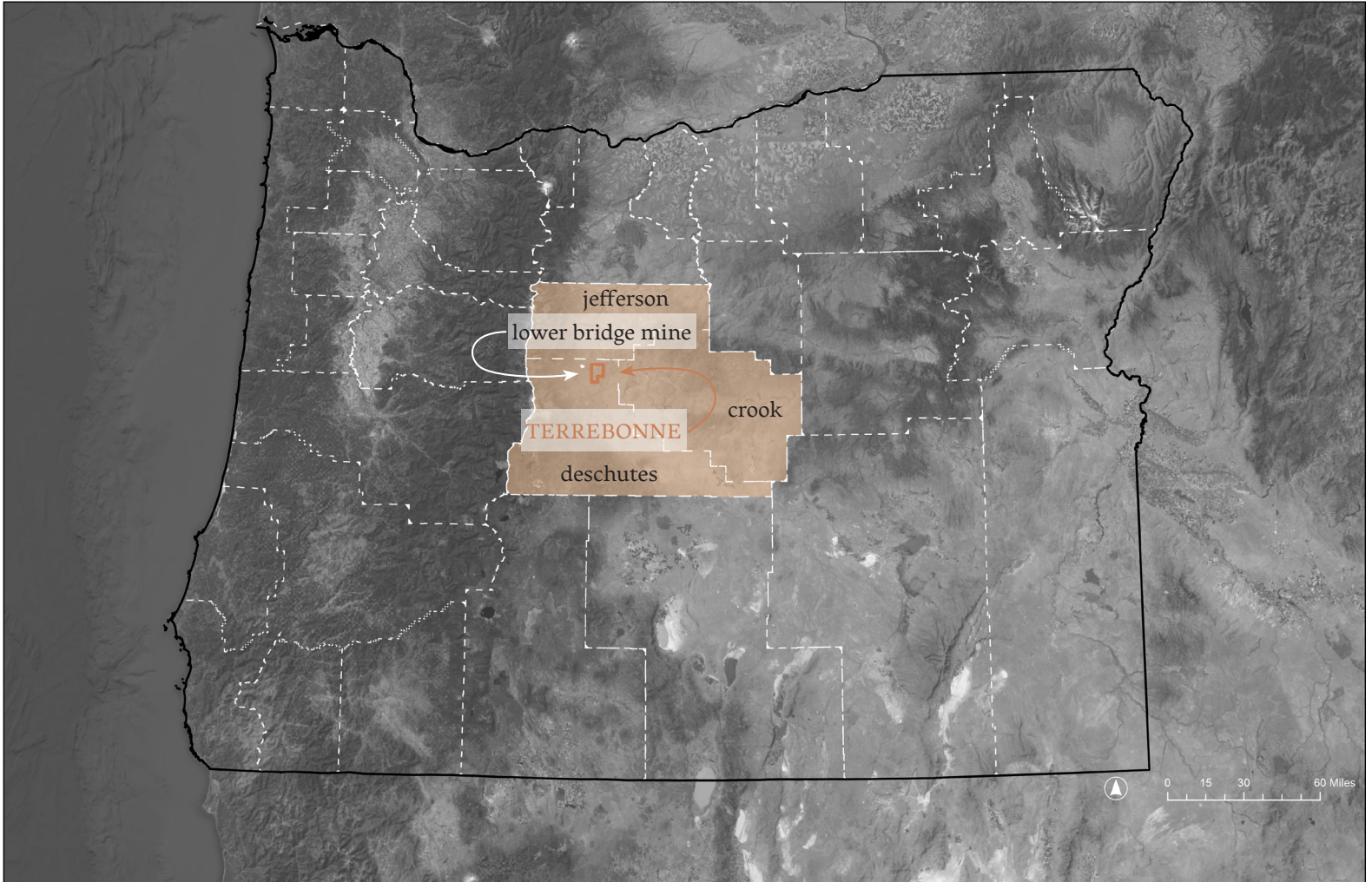
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These are precedent rural communities across the country that were a part of these boom-and-bust industries. These towns developed a rural economic revival plan through recreation and decided to redesign their abandoned mines into public recreation opportunities. A precedent in northern California, Malakoff Diggins, celebrates its mining history by allowing visitors to pass underneath its unique landforms cut from hydrological mining. The State park provides its visitors with scenic redwood groves coupled with well adapted historic mining relics. Redhead Mountain in Minnesota was once an open iron-ore pit, filled with ground water and is now home to world-class mountain biking. This park

brings a tourism economy through the mountain bike park with millions of dollars in revenue for the town of Chisholm, an unimaginable economic opportunity before the park was established. Finally, another precedent is the Mined Land Wildlife Area in Kansas, formerly strip mined for coal. This 8 thousand acre site was an eyesore of environmental deprivation until revegetation efforts began with plantings of native grasses, trees and shrubbery. All of these sites have been transformed into destinations that stimulate recreation and tourism economies in the surrounding towns.

The map shows the potential of mine reclamation across the US. The dots represent thousands of active and past mineral mining sites. Three examples are highlighted of reclamation projects that have taken a wasteland site and retrofitted the space to active recreation programming.



Originally populated by many Indigenous tribes, the culture of Central Oregon begins in time immemorial, with the Indigenous tribes of the area stewarding the landscape. These tribes were masterful in their understanding of the high desert landscape, and their connection to the ecosystem is deeper than most of us outside of that culture could imagine. Contemporarily, the Confederated Tribes of the Grande Ronde remember “the Warm Springs bands moved between winter and summer villages, and depended more on game, roots and berries. However, salmon was also an important staple for the Warm Springs bands and, like the Wascoes, they built elaborate scaffolding over waterfalls which allowed them to harvest fish with long-handled dip

nets.”⁵ The homesteaders and settlers traveled across the lands and navigated through waterways in the mid-1800s, brought with them a new relationship to the land. In such a place as the high desert, with vast landscapes and open skies, the homesteaders saw select landscape features such as sagebrush steeps or ponderosa pine forests as viable crop lands and timber stands. They disconnected the carefully curated relationship between all animals, plants, ecosystems that the Native Americans so dedicatedly tended to. A culture of honor was brought from the American Southeast, with certain families establishing themselves as professions of crop growers and fields men. This culture is a complex set of beliefs, in which honor is protected with strength and toughness.⁶

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⁵*Confederated Tribes of the Warm Springs, “History.”*

⁶*Oregon Desert Land Trust, “Culture Keepers: A Conversation with Rod and Cindy Hoagland Owners of Calderwood Ranch Fields Oregon.”*

creation of central oregon

Reliability in government intervention in the Central Oregon region was minimal and the conflict between Native Americans and homesteaders grew into regional wars. From a certain perspective, this struggle and tension has never gone away. The reality is that white settlers grabbed land they deemed available and according to their cultural perspectives of farmable and cultivatable land. The indigenous peoples were pushed to parcels of land away from the viable natural resources (rivers, forests,

precious metals), then to reservations. There loss of connection to the native landscape is something incomprehensible to many and reparations to amend the transgressions allotted to the native peoples is a drop in the bucket.

The homesteaders who saw the land as valuable for natural resource extraction grew and the infrastructure to support industrial extraction economy flourished. The building of the Oregon and California Railroad (O&C) railroad was monumental

to the success of Central Oregon business as it brought an ability to globalize the goods from Central Oregon across the country.⁷ That railroad was placed cutting through the small town of Terrebonne, Oregon, located close to the rare source of diatomite. Throughout the 1900s natural resource extraction was plentiful and unregulated in Central Oregon, and remnants of their practices can still be seen today. Population increase was rapid as a strong economy around mining, milling and agricultural production

grew.⁸ A strong sense of personal capability and grit became a cultural norm. This boom and bust economy came to a fall in the 1950s and 1960s when the natural resources were extracted and they had depleted all their resources. Legally they were not obligated to conduct reclamation practices and so these sites were left as wastelands and abandoned.

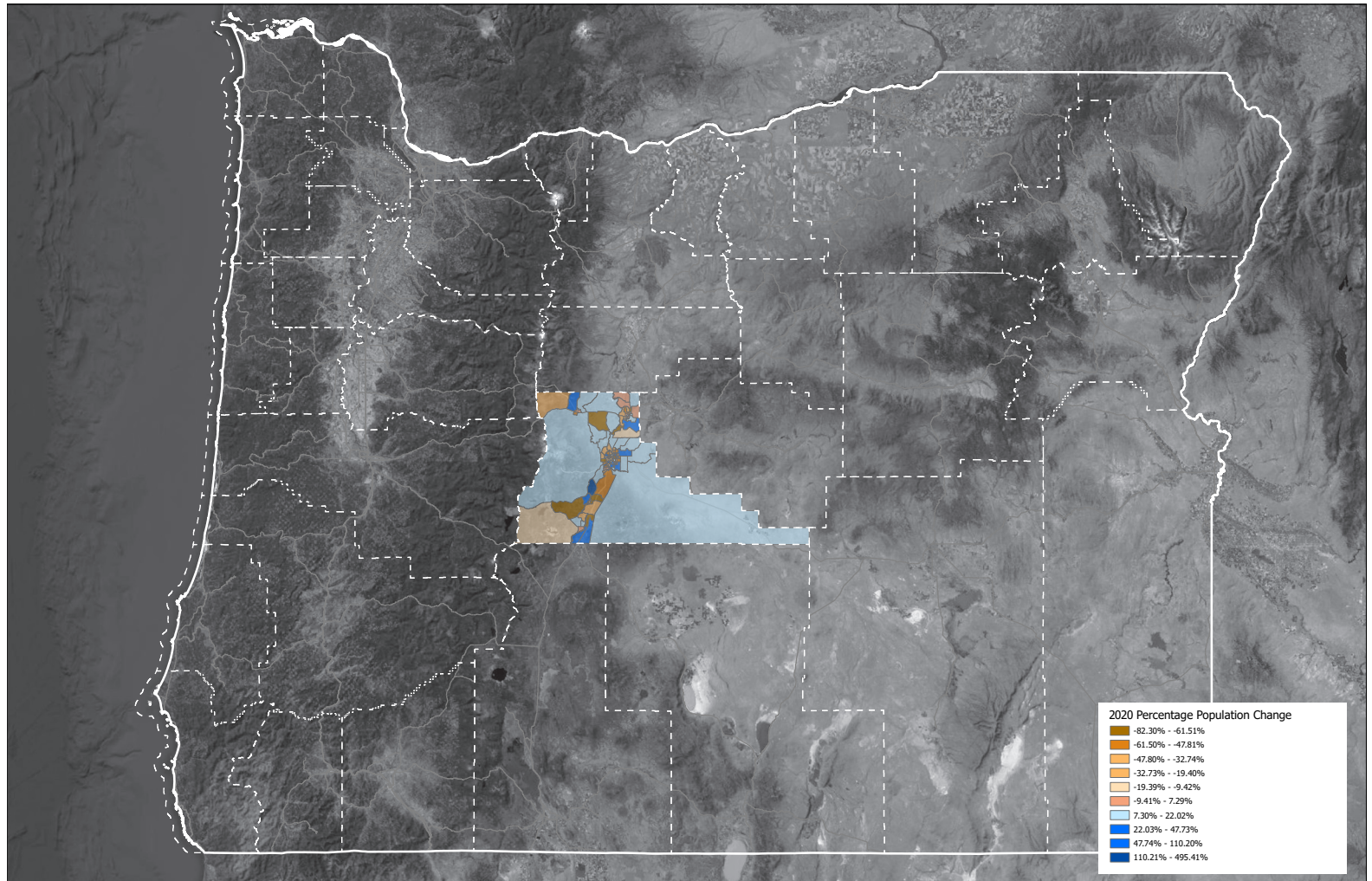
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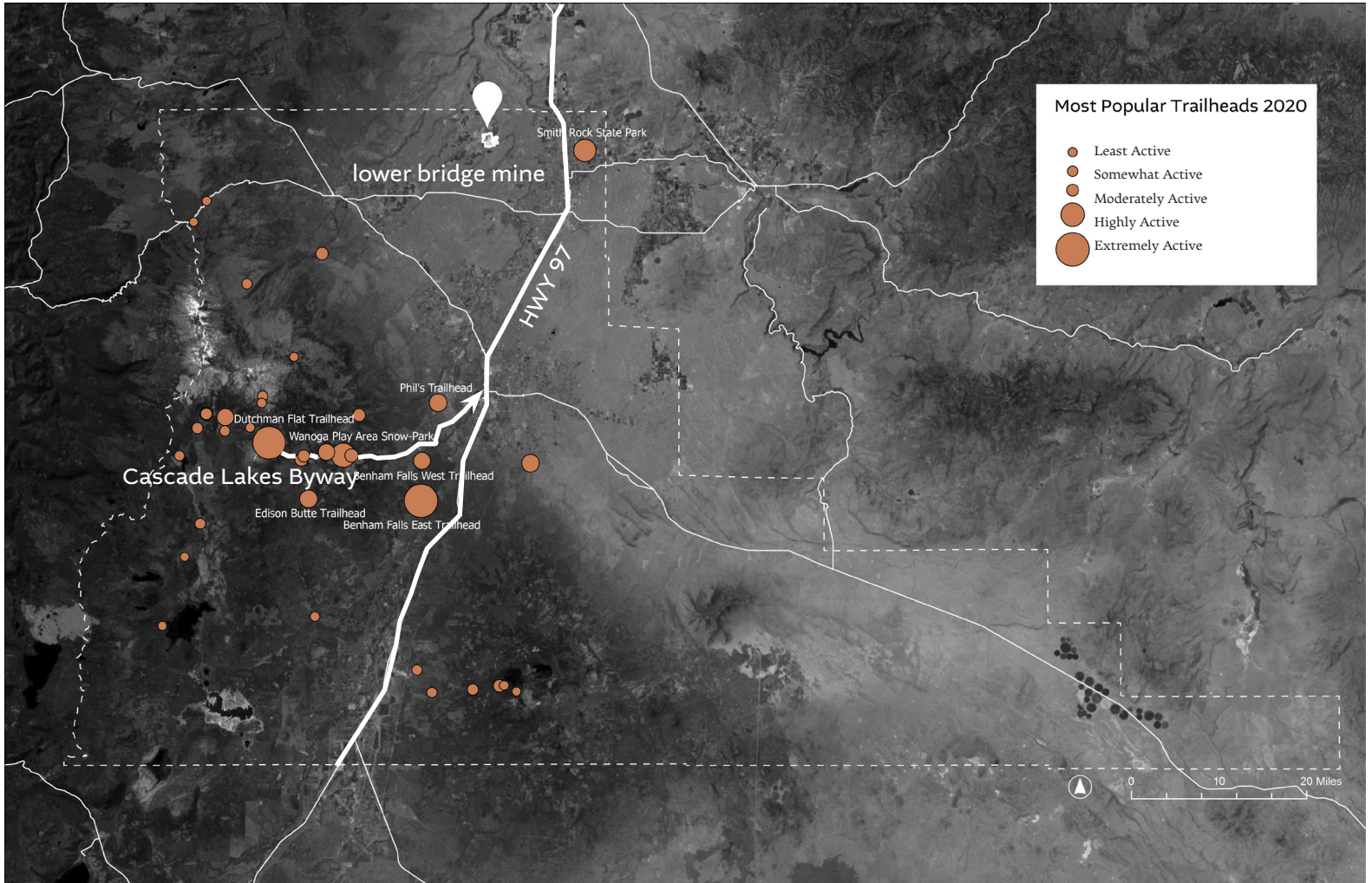
⁷Oregon History Project, "Natural Resources and the Railroad."

⁸Cox, "The Other Oregon."

Today, Central Oregon sits geographically in the middle of the state and is composed of three counties: Deschutes, Jefferson and Crook County. Central Oregon still attracts people who are pursuing nature's resources, but in contradiction to the original homesteaders, Oregonians have moved in pursuit of a high quality of life through recreation. As technology increases accessibility even in rural areas, people are given the freedom to choose where they live regardless of their work location. They can move to areas that support their values and lifestyles. In the past two decades these counties have grown significantly and become destinations to live. Central Oregon offers pristine rivers, meadows, and forests all available for a range of abilities within a small geolocation. Housing and tourism have become the primary economic drivers of the area, and industry

has been pushed overseas or scaled back significantly. With the rise of these economies come new cultures into our melting pot, peoples coming from all over the country to claim their space next to large mountains and rolling sagebrush terrain. This melding pot of cultures can be seen in its citizens and future residents of this community today, from First Nations tribes to ranchers and farmers to recreationists and second home vacationers, all of whom have found a home in Central Oregon.



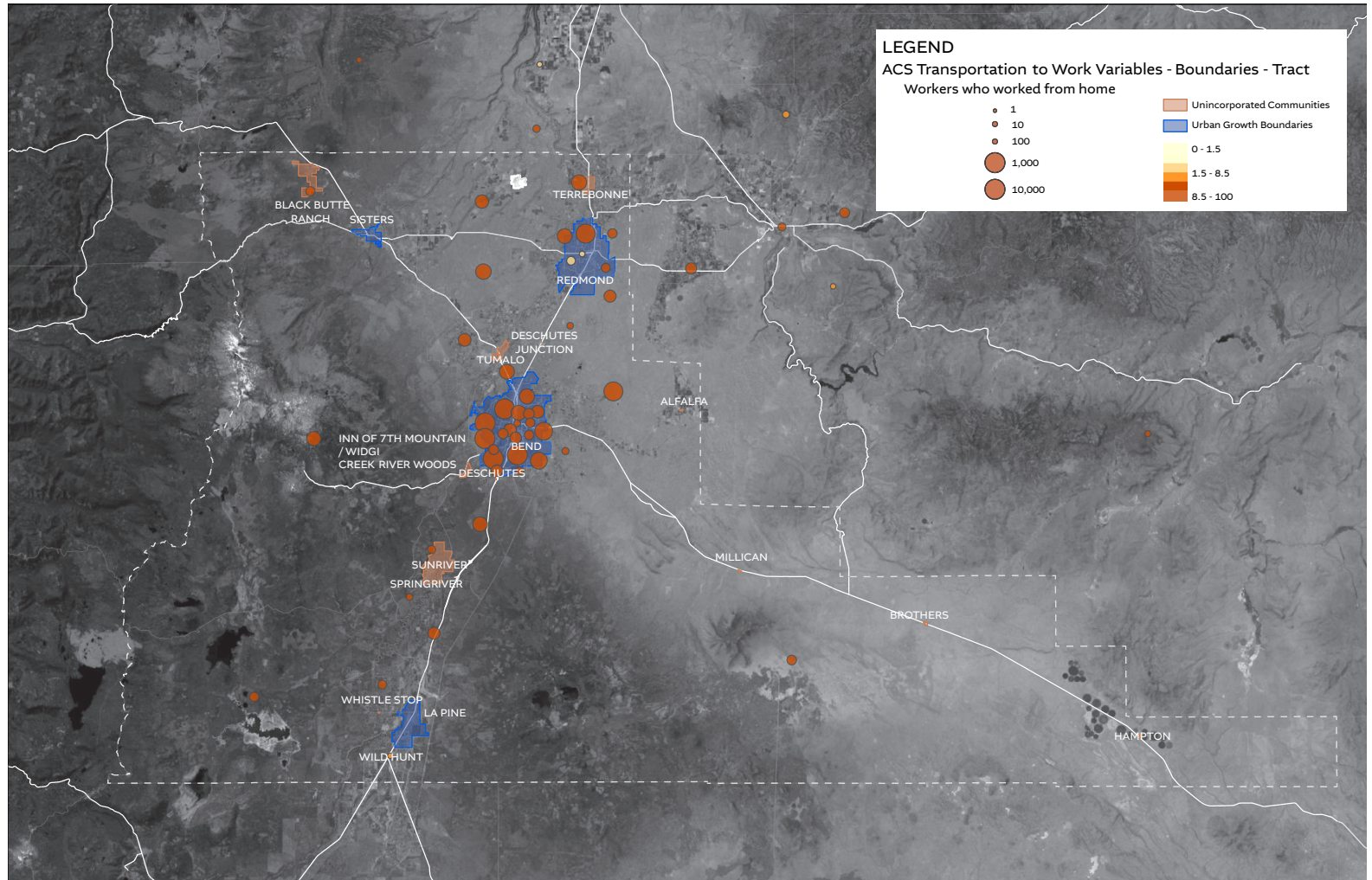


This project proposal of restoration through recreation is a good fit for this mine site because the community in Deschutes County supports recreation and values public access to nature. This map illustrates the popular destinations in Deschutes County through aggregated visitor use and the size of the dot illustrates the rough visitation numbers in 2020. As you can see, the Cascade Lakes Scenic Byway creates a bottleneck of recreation opportunities that are incredibly popular for the county. We can disperse our recreation impacts across the county by activating other sites, specifically the Lower Bridge Mine site conveniently located off of the Highway 97 corridor and adjacent to Smith Rock State Park.

These are both the urban growth boundaries towns and of the unincorporated communities present in Deschutes County today. They are remnants of boom towns of the industrial or of the homesteading era. This project proposal of reclamation through recreation is a good fit for this community because the community in Deschutes County supports recreation and values public access to trail heads. Although community members may use their outdoor spaces differently, all value Central Oregon's unique environment and actively participate or recreate regularly. Not all revitalization mine projects will fit into this proposal, as it would be inappropriate for some communities. This proposal is for communities that have shown interest in this recreation model and have a place-keeping value system within their community structure.

34 A study was conducted by Oregon's Statewide Comprehensive Outdoor Recreation Plan (SCORP) to understand the public's main interest in their

outdoor spaces. The negative effects of outside community areas, meaning those places that are considered "destination areas" are feeling the impacts of crowding and those local residents change their typical behavior to avoid crowding.⁹ The highly sought after areas are being loved to death and the unsought areas are being sought to compensate for an increase of people in pursuit of the solitude of the great outdoors. The ways SCORP has decided to combat this rise in attendance is to manage visitation levels, educate the public on natural resource impacts, and adapt any current infrastructure to provide a higher value to the current user groups. This adaptive reuse proposal will address these issues defined by SCORP in the design proposal to create more equitable recreation areas for the citizens of Central Oregon.





Ochoco Scablands



Burns Rabbitbrush



Deschutes River



Ochoco Ponderosa Pine



Welded Tuff Pillars



Lewis Glacier



Steens High Meadow



McKenzie Pass



Badlands

36

loved to death

context

These iconic landscapes of Central Oregon are of sensitive ecosystems that are begin loved to death by over crowding an abundance of enthusiasm in outdoor recreation.



Eagle Rock



Crooked River



Sister's Aspen Grove



Bay's Lake



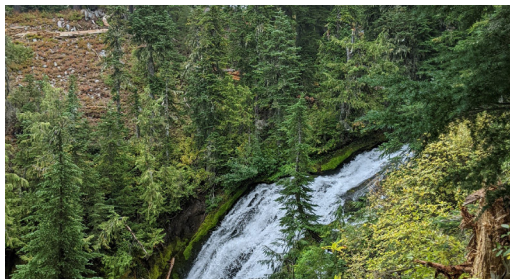
Jefferson Peak



Lower 66 Trailhead



Stein's Pillar



Waterfall in Jefferson Park

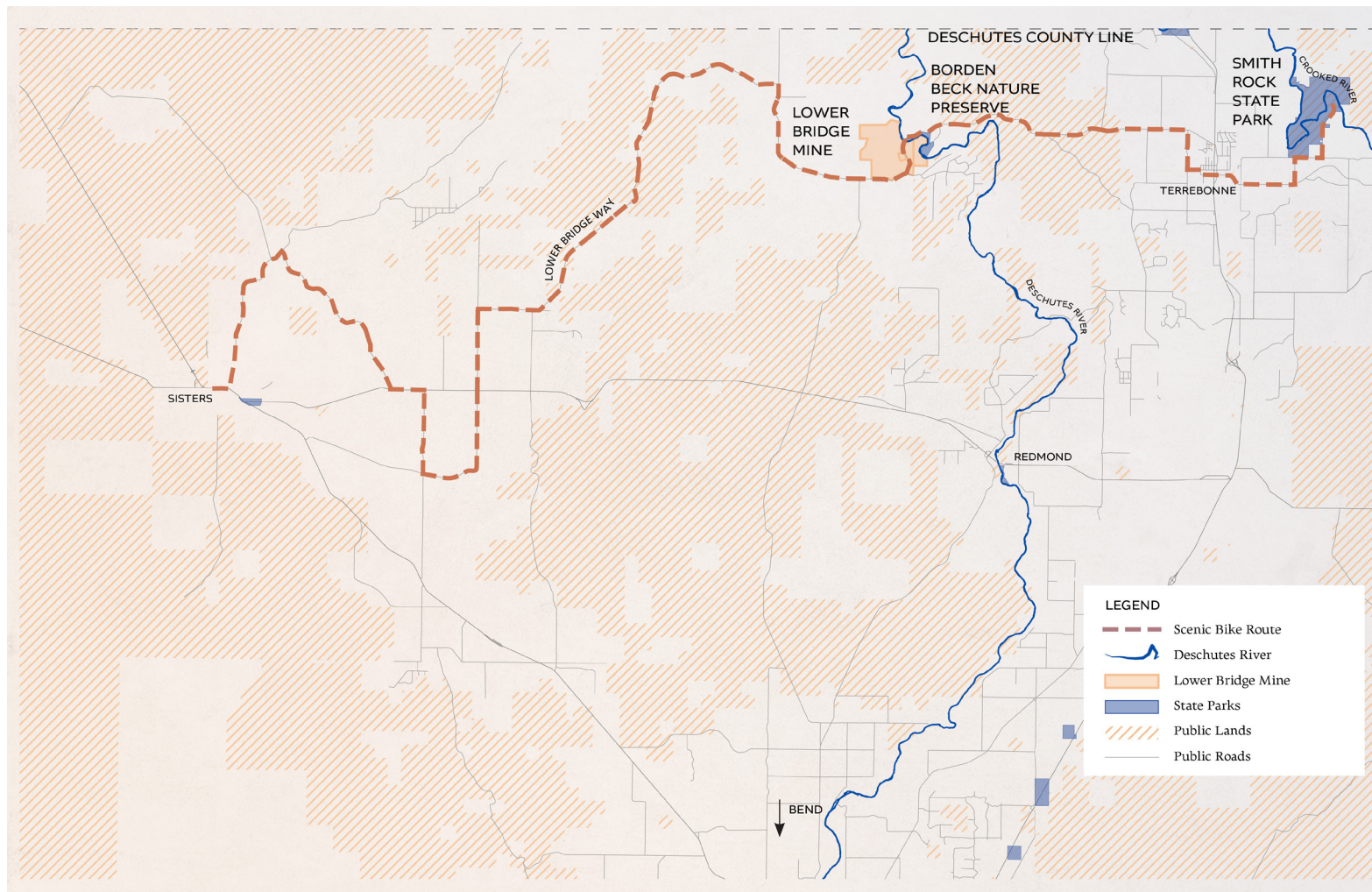


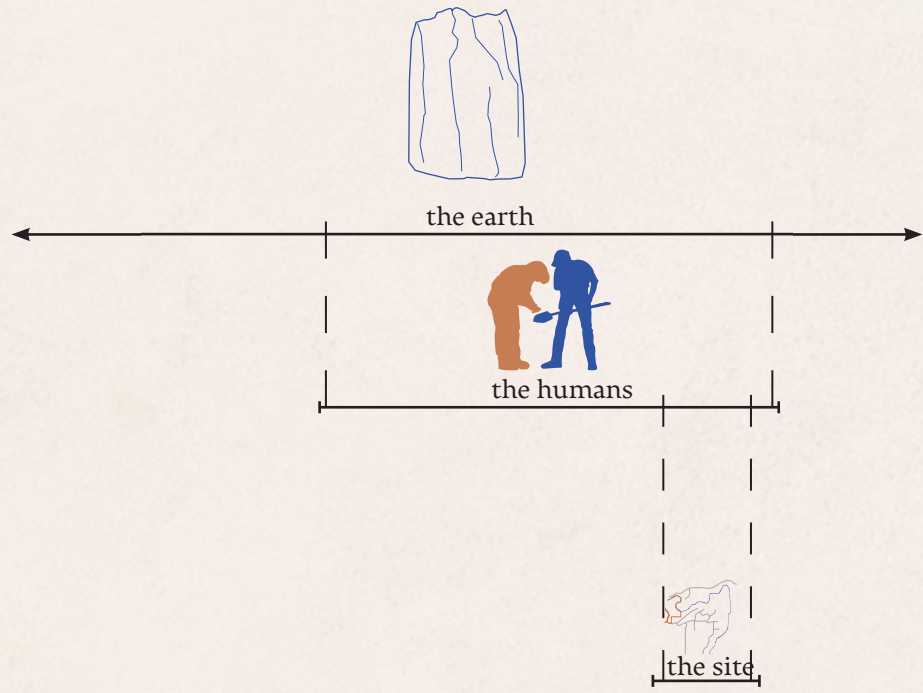
Crooked River Canyon

This is why recreation is a viable option for the site. The site is called Lower Bridge Mine. It was deemed a brownfield site by the Department of Environmental Quality in the 1980s.¹⁰ It is located off of Lower Bridge Way, an segment of a 37-mile Scenic Bike trail connecting the town of Sisters to Smith Rock. It is also directly next to the Deschutes River, which is a vital corridor for both aquatic recreation and scenic viewsheds. There are multiple state parks including Smith Rock, and Borden Beck Nature Preserve. Smith Rock is the most popular state park in the county and hod its fame for its over 1,000 sport climbing, trad and bouldering routes. Finally, the site is surrounded by public lands, either under state or federal government ownership. These public lands provide a particular value to a Central Oregonian who prefers solitude and a naturalized settings away from

¹⁰Department of Environmental Quality, "Health Consultation: Lower Bridge Mine, Terrebonne Oregon."

Sources: Oregon GEOHub, 2023
Deschutes County Data Portal, 2023
Travel Oregon: Ride with GPS, 2022





I. context

II. site narrative

located in Central Oregon, the Lower Bridge Mine site has a woven cultural, industrial and contemporary history that appears in the footprints, relics and returned native vegetation that appears on the site.

III. remediation and restoration

IV. remembrance

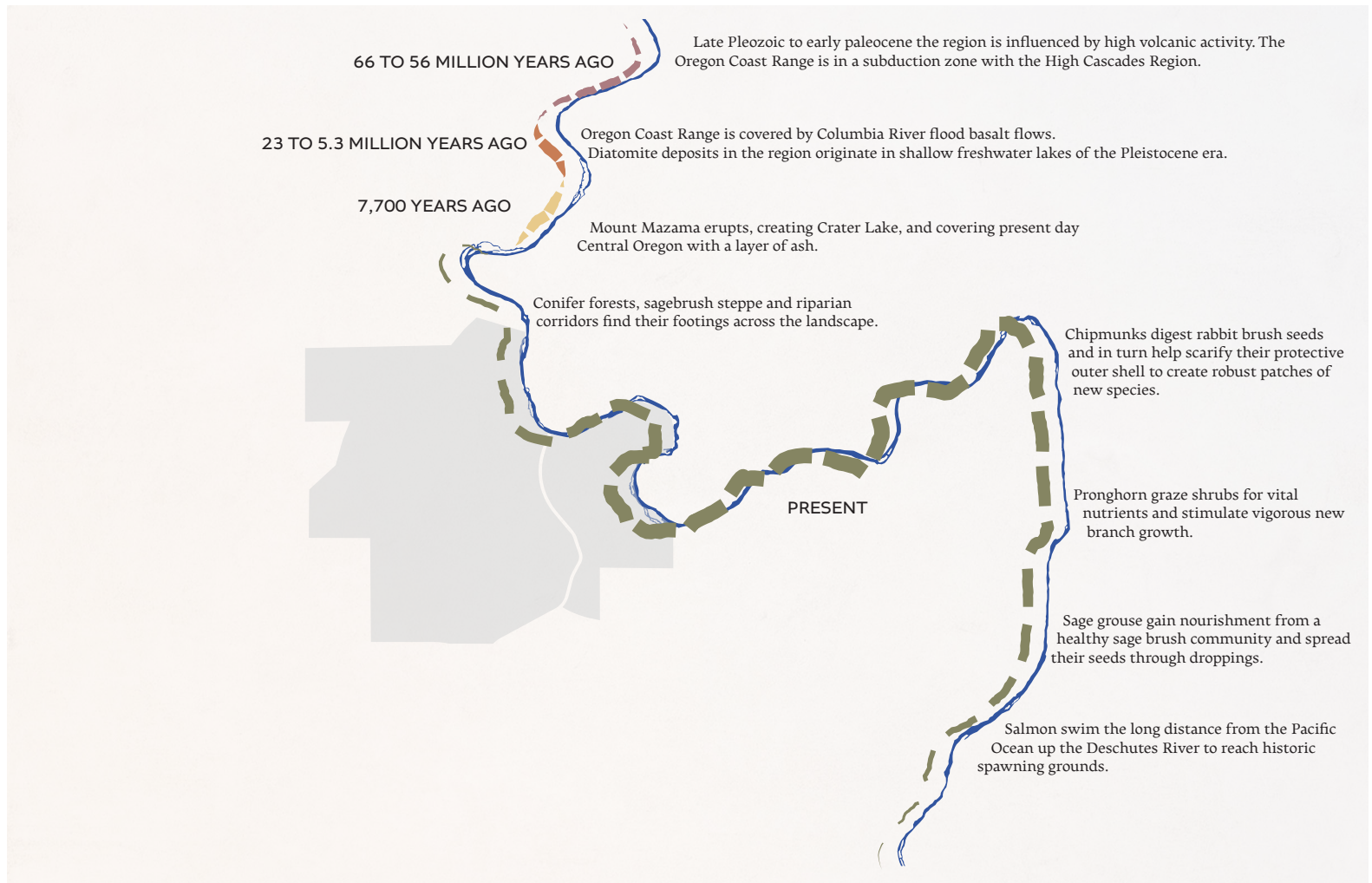
The site was formed through geologic processes millions of years ago. Born from the Pleistocene era 65 million years ago, the Lower Bridge Mine site was most likely created from a pluvial lake in the Cascade subduction zone. The rock mined here, diatomaceous earth, is created from compression of fossilized algae and fresh water aquatic plant life from dried lake beds. Diatomite is a siliceous sedimentary rock composed mainly of the fossilized skeletal remains of diatoms, which are single-celled organisms genetically related to algae.¹¹ When Mount Mazama, which is the eruption that created modern day Crater Lake, exploded around 7,000 years ago and the ash deposit from that explosion covered the dried lake bed, creating the perfect culmination of compression, heat and organic material to create the material of diatomite. Diatomite is a relatively light, porous material that is distinctly characteristic for its white color. Formed through the porous igneous geology of the area, well-draining soils accumulated on top of the bedrock and vegetation took hold that was well adapted and suited to the shadow of the Cascades.

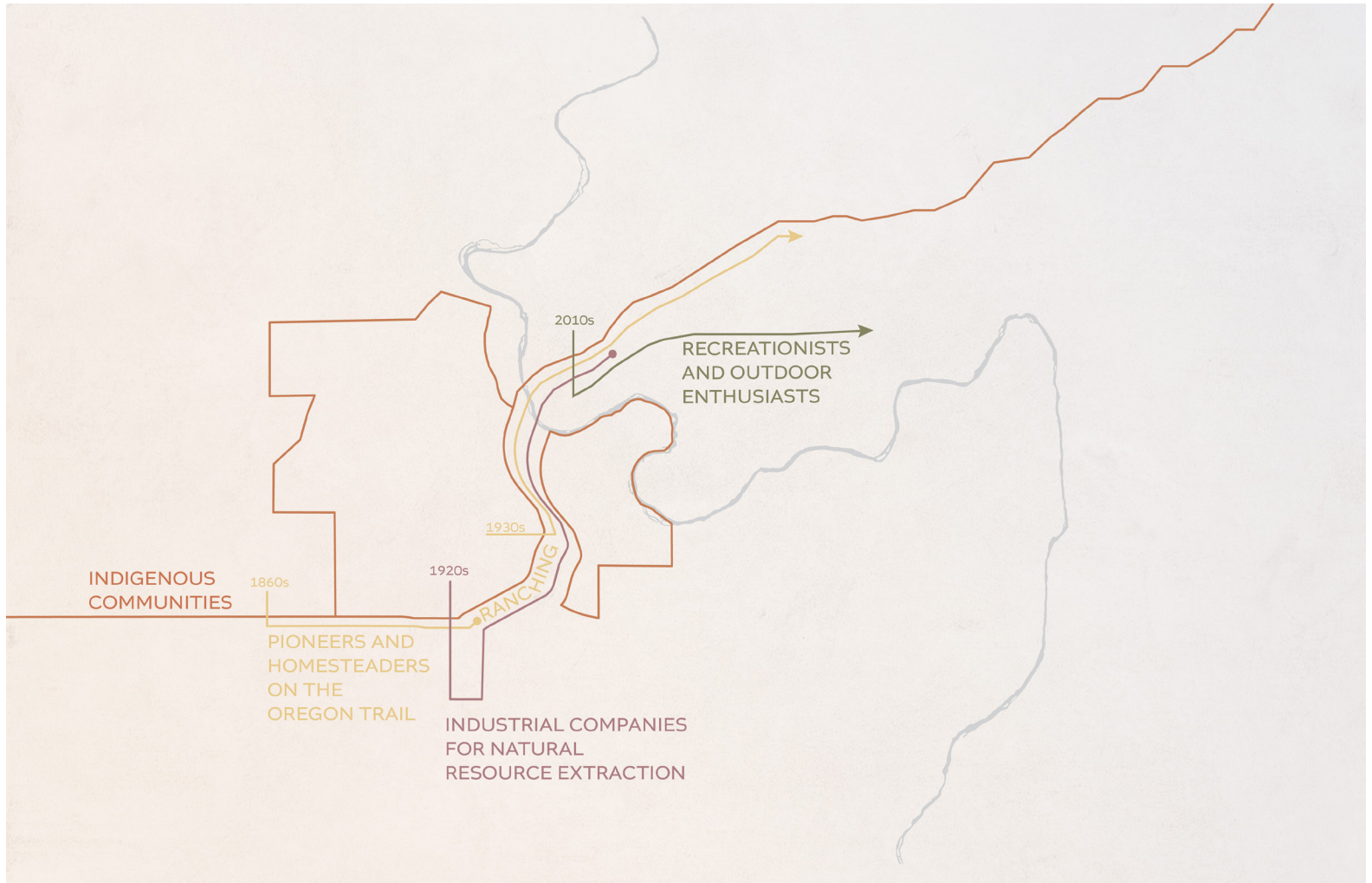
The different ecological communities of Central Oregon are distinct, with coniferous forests blending into sagebrush low lands is unique to the area (within a 40 miles radius you can pass through four different ecotones (sub-alpine, ponderosa pine forest,

juniper woodlands to sagebrush steeps)). These soils are shallow in comparison to its counterpart of Willamette Valley on the other side on the Cascades, which are composed of deep river sediment and clay deposits and allow for many vegetation types to grow. The topsoil in Central Oregon can be as shallow as a few inches. The plant life that has grown and adapted here are of a hearty stock, their tap roots are deep and require little soil nutrients or moisture. Common high desert species like sagebrush or great basin rye have roots that go down 10 feet to obtain enough moisture throughout the year and can spread just as wide.

Mammals and animals that live in the high desert have also adapted to its unique ecology, sustaining life through micro-climate topography that collect sustenance like food, water or shade. Some animals hibernate through the intense months of winter or summer, avoiding the harsh conditions. There is a support system within the high desert ecology that mutually benefits each unique grouping of geology, vegetation or critters. A variety of animals thrive in this climate and have mutualistic relationships with the vegetation species. For example, pronghorn, a small native ungulate, rely on native shrubs and grasses for a food source and also stimulate new growth by browsing the branches or bunches.

ecological timeline





The human narrative of the site starts with the Indigenous peoples occupying and stewarding the landscape generations before settlers and homesteaders. The contemporary recognized tribes occupying this space include the Confederated Tribes of the Grand Ronde, the Confederated Tribes of the Siletz Indians, the Tenino tribe, the Confederated Tribes of Warm Springs, Cayuse tribe, Umatilla and the Walla Walla tribe, but it is well documented that many tribes would have occupied this area that are not recognized today.¹² As mentioned in the previous chapter, these tribes were very deeply connected with the landscape and told stories, performed ceremonies and created a rich culture around the high desert landscape.

The homesteader communities came looking for fertile land to grow agricultural crops. The boom of minerals, precious metals and timber resources brought industry, and some found success in the form of diatomaceous earth. These companies were selective and destructive in their pursuit to obtain natural resources of the region including timber, minerals and unique gemstones found only in

Central Oregon. Within the site boundary of Lower Bridge Mine, all of these timelines have existed and overlapped. Anthropological evidence is some of our best resources for this site source from Cressman, Ramsey and Wewa who documented the movement and relationships of these communities as significant archeological, architectural or infrastructure evidence was removed or dissipated with time.

Finally, in present day, many new residents come to Central Oregon for the high quality of living. Local neighbors to the Lower Bridge Mine site can remember taking walks across the barren landscape as resilient bitterbrush, sagebrush and juniper grew in. The access to the pristine Deschutes River, Smith Rock State Park, and public lands makes this site a gem for establishing a home. It is also worth noting that many choose Terrebonne or the outer boundaries of Deschutes County for its solitude, and connection to the landscape. The current owner of the site sought to buy this land to discourage a new neighborhood development and is keeping the site in line with the community guidelines of Terrebonne Community Comprehensive Plan.¹³

¹² *Native Land Digital Canadian Non-Profit, "Native Land Digital."*

¹³ *"Terrebonne Community Plan Comprehensive Plan Update."*

The timeline of the site is an amalgamation of human history and ecological context. The significant periods of the site's timeline include the Indigenous communities that inhabited and stewarded this landscape, and whose petroglyphs can be found closely off site. Anthropologist Cressman cited a "white rock" as a common landmark during the seasonal rounds and petroglyphs are found closely off site.¹⁴ It is unknown to me at this time if Indigenous peoples just used diatomaceous earth as a wayfinding tool or if it has a larger cultural meaning to the local tribes. Out of respect for those communities I have left that particular history of this site ambiguous as it may be proprietary information kept in oral traditions and any physical archeological evidence was ripped away by the later mining processes. Homesteaders dominated the landscape and created legacy sites around the Lower Bridge Mine as it was directly located next to the live sustaining source of the Deschutes River. The pioneers built a railway that brought industry to Terrebonne. The Great Lakes Carbon Company established shop from 1936 to 1961, extracting purifying and exporting the found mineral, diatomaceous earth, off site. Excavation procedures consisted of removing overburden and mining the deposits in a series of benches layers, as purity was variable within the deposit. Diatomite was commonly air and kiln dried on-site. The site was strip mined and millions of tons of material was exported to depletion. The owners established a new form of business, sanitation, and housed barrels of toxic waste for a year. The land was used as a waste disposal site

between September 1975 and February 1976. During this time the mine was owned by Deschutes Valley Farms, Inc., a corporate farm, which then formed the Deschutes Valley Sanitation Company in 1974 to over see waste disposal.¹⁶ After operations had ceased the Department of Environmental Quality (DEQ) and Department of Water Resources verified claims of improper disposal of hazardous waste material within the corridor of a highly protected freshwater ecosystem, the Deschutes River. Due to the high transmission rate of the High Desert soils, this cause for concern was taken very seriously. These toxic drums were cleaned up in 1983 and 1985. The DEQ confirmed that the contaminants within the barrels and ultimately leaked into the soil included cyanide, lead, PCBs, and chromium.¹⁵

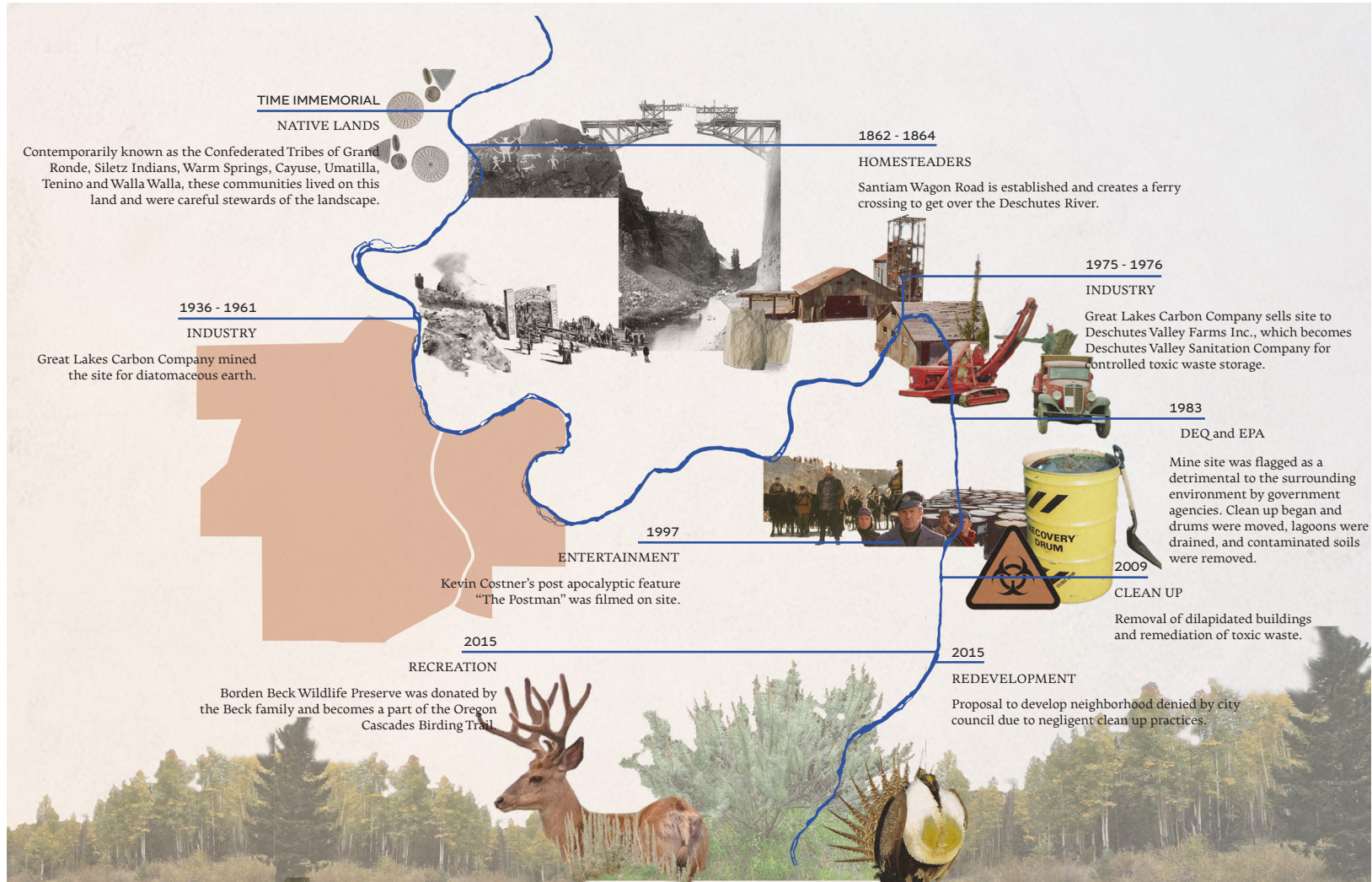
The site changed owners in the early 2000s and was prepped for redevelopment into a residential community. The plans were ultimately denied due to health hazards and negligent construction practices. Due to its proximity to the Deschutes River, the state deemed a neighboring site as the Borden Beck Wildlife preserve in 2015 for its contribution to Central Oregon habitat. The donor, Borden Beck was an avid bird watcher and hobbyist ornithologist. The significance of this local character within the site's history shows the high value of the river as a natural resource even though it is next to a brownfield site, as well as the character of the community in this area, which is dedicated to the conservation of land and the recognition of the importance of public access to natural spaces.

site timeline

¹⁴ Cressman, "Petroglyphs of Oregon."

¹⁵ Department of Environmental Quality, "Health Consultation: Lower Bridge Mine, Terrebonne

¹⁶ Chamberlain, "Phytostabilization of Abandoned Diatomite Mine Sites in Terrebonne, OR Utilizing *Purshia Tridentata* and Soil Amendments."





Drum storage for the Deschutes Valley Sanitation cleanup (c. 1983 or 1984).



Visible dust cloud (c. 2008).



Material in one of the 700 drums found on site. (c. 1983-1985).



Drum inventory for cleanup (c.1983).



Former sludge pond (c.1983).



Collapsed portions of former mill structures (c.2000).



Drum removal and sludge pond cleanup (c.1983 -1985).



East Side parcel with some debris on surface (c.2014).



Former mill building (c.2000).

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department of environmental quality clean up

site narrative

Images sourced from Department of Environmental Quality (DEQ) and Oregon Public Health Division: Environmental Health Assessment Program (EHAP), 2008.



Former mill building (c.2008).



Dust storm during an extreme weather event (c.2008).



Soil impacted by barrel leakage(c.1983).



Former mill infrastructure (c.2000).



Pivot installation prior to watering and seeding (c.2012).



Former mill building looking south (c.2000).



Collapsed mill infrastructure and illegal dumping (c.2008).



Overpacked drum during the Deschutes Valley Sanitation cleanup (c.1983).

The afore-mentioned cleanup was conducted in 1980s. The Department of Environmental Quality (DEQ) began cleanup of the site in the 1980s. During the clean up all 797 number of barrels of toxic waste were moved, as well as removal of one of the four dug open pit lagoons. The DEQ cleanup removed a lot of the hazardous waste materials, sewage sludge, the mine building and associated structures that became a health hazard to the neighboring communities. There continues to be a health risk from the exposed patches of diatomite to the neighbors and community members. Exposure to silica dust and contaminated soils increases with extreme weather

due to climate change.¹⁷ Further investigation needs to be conducted to determine the validity of the exposure and take these concerns seriously. Due to the changed hydrology of the site from the spoils piles, in high rain weather episodes the site's existing surface material (a combination of wind thrown Central Oregon soils (sandy loam) and diatomite) will slough off and deposit diatomite sediment into the Deschutes River.

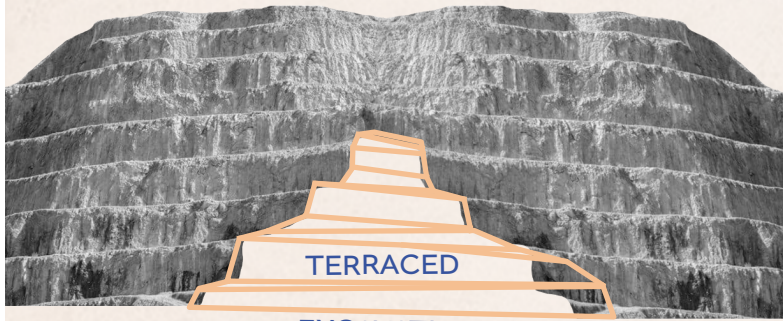
Strip mining is the process of scraping and harvesting the natural resource from the surface of the landscape and filtering the target resource from the topsoil. This process results in bi-products of

¹⁷ Center for Disease Control, "NIOSH hazard review: health effects of occupational exposure to respirable crystalline silica."

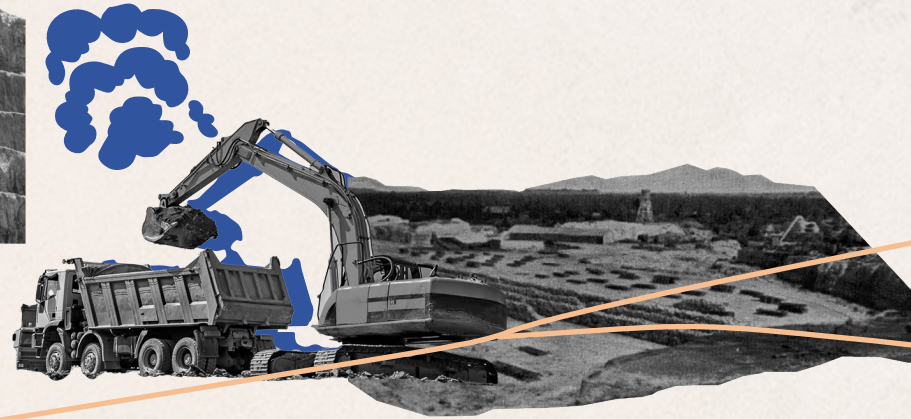
¹⁸ US Department of Health and Human Services, "Exposure Investigation Outdoor Air Exposures to Crystalline Silica Dust and Particulate Matter in Wedron, Illinois."

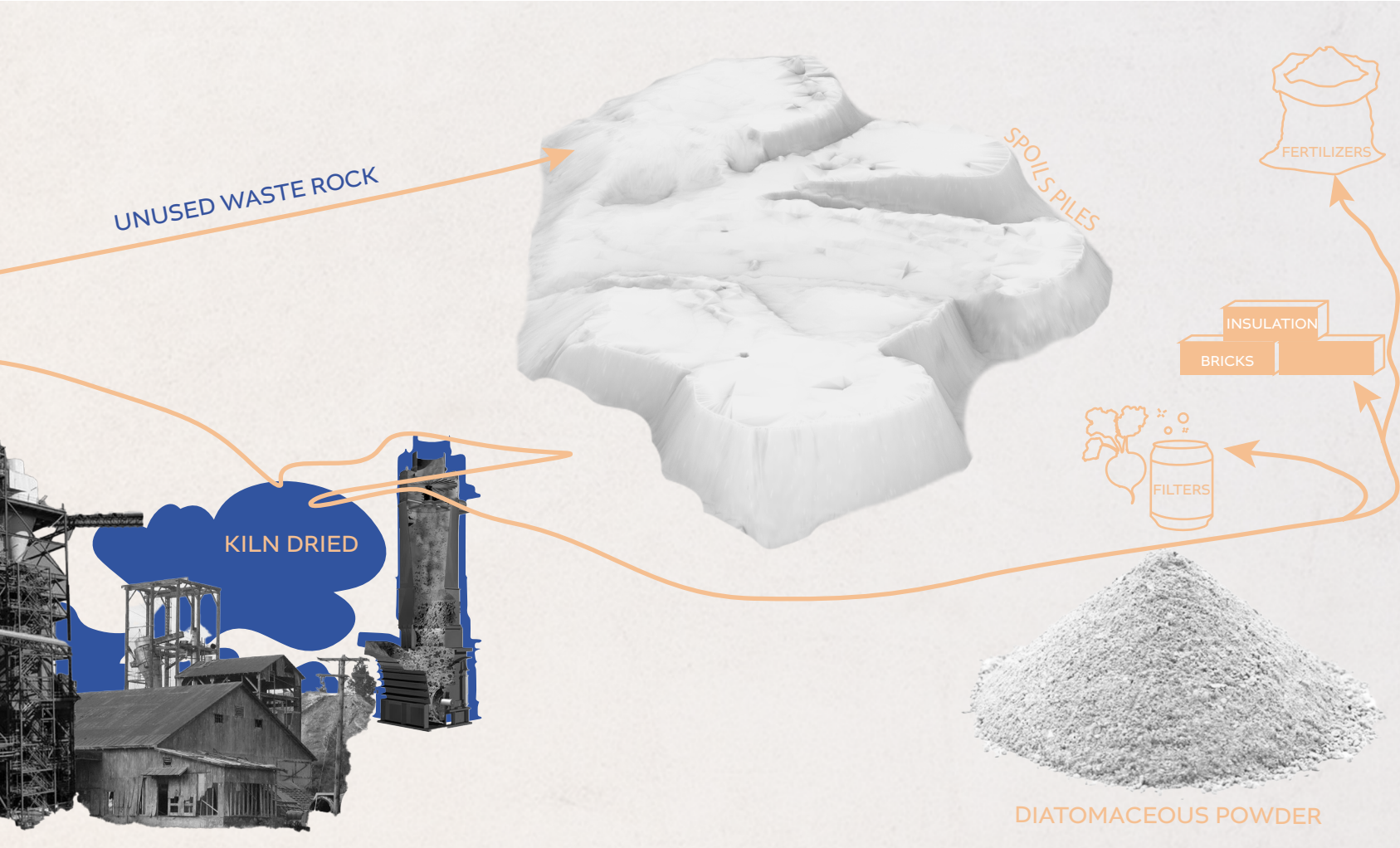
mine spoils and mine tailings. These spoils piles are unstable landforms and are subject to being colonized by invasive species or fragmented by heavy erosion. Excavation techniques allow the miner to segment out large chunks of the surface resource and processes the product and the bi-product from each other. It is a dance of active pits, future pits and spoils piles across the site, as an active pit was being dug the spoils were being discarded and shuffled along the perimeter of the future pit. These bi-product piles are called spoils piles, and are created by dropping the mixture of unused product and top soil into piles with a certain slope of repose. Once that pile becomes

too large for the machinery to pile, the next spoil pile was created. These are the remnants we see on the site today.



TERRACED
EXCAVATION





These spoils piles are culturally significant relics of the industrial period. They have dramatically altered the hydrology and topography of the landscape, and have effects on the natural environment surrounding the site. They also pose a serious health threat since inhalation of fine particle diatomite can lead to silicosis or lung cancer.¹⁹ The angle of repose is significant on the Lower Bridge Mine site, as the site is already precariously located on a bluff off of the Deschutes River. This escalates the hydrologic effects of the site significantly, as the magnitude of the piles create the runoff of foreign minerals, or chemicals became much more significant.

A series of site analysis studies using ArcGIS and Grasshopper to determine the ideal locations for design interventions. This diagram of the current topography shows high points in red occurring around the border of the tax lot, correlating to the deposit of bi-product as the material was mined and processed in the center. These high points are opportunities for challenging recreation alignments or scenic views.

The slope analysis diagram shows the angles of the site and the dramatic slopes of both the spoils piles and the Deschutes canyon walls. This analysis directly affects the experience of the proposed recreation program, as a trail alignment with a sustainable grade for multiple user groups will need to traverse the existing slopes.

A waterflow diagram was created to show where the significant runoff occurs into the Deschutes River. These areas will need to have a detention program in place to stop the non-point pollution. This diagram also shows opportunity to capture runoff on the site, before it ever reaches the river.

The aspect diagram gave insight into exposure and the solar conditions on site and ultimately helped determine the appropriate high desert plant communities.

The wind diagram helped give insight to the predominate winds going east to west over the Cascades for most of the year, with a southern wind occurring in the winter. This helped determine the position of certain land form interventions to retain some native windblown soils and seeds.

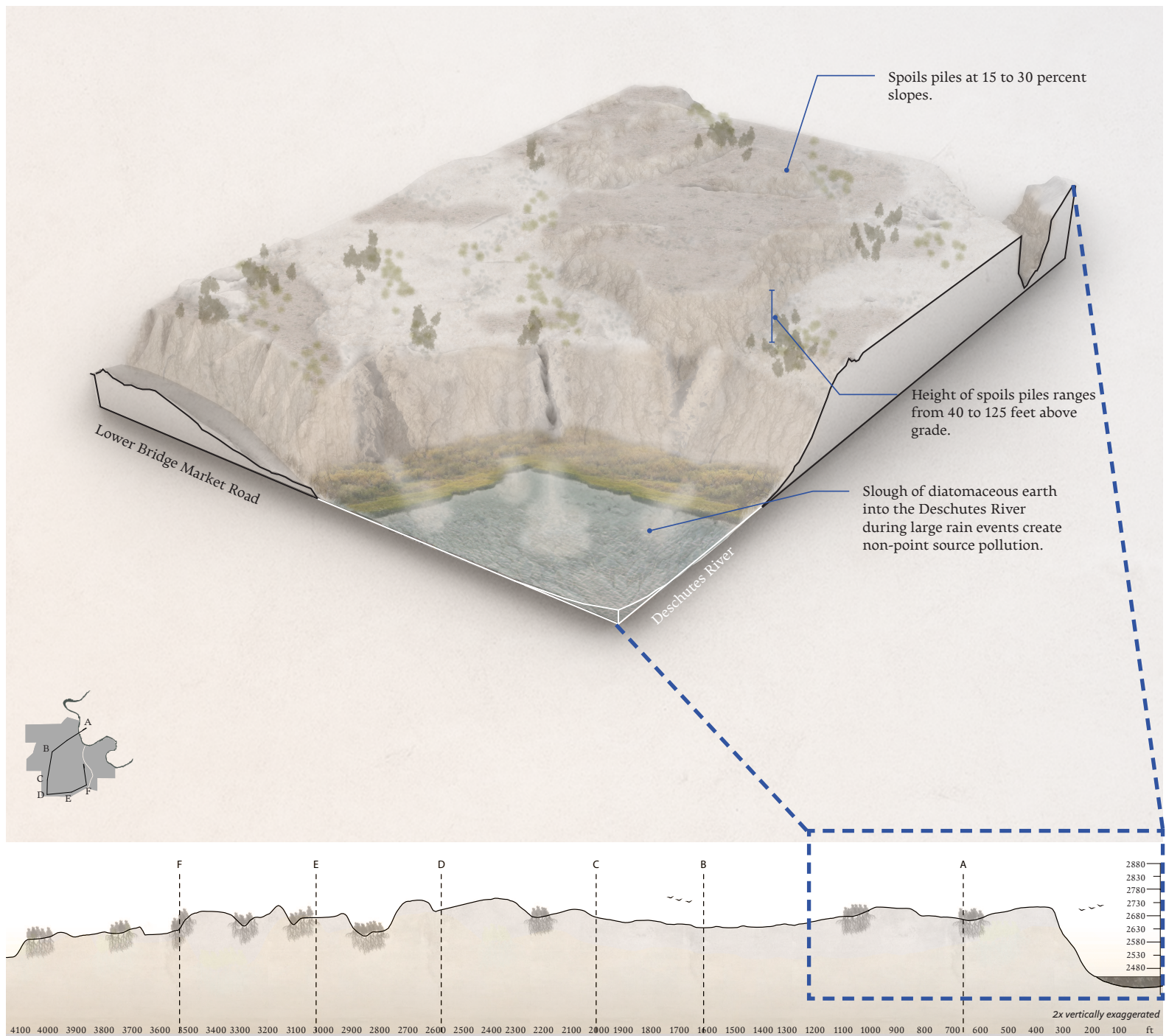
This viewshed map helped determine where opportunities for viewing platforms could be. For this diagram the ten potential viewpoints are overlaid into one map, in which we can see there are large expansive views of the Cascade mountains, the Deschutes River, the neighboring properties including a vineyard and the high desert landscape including Smith Rock.

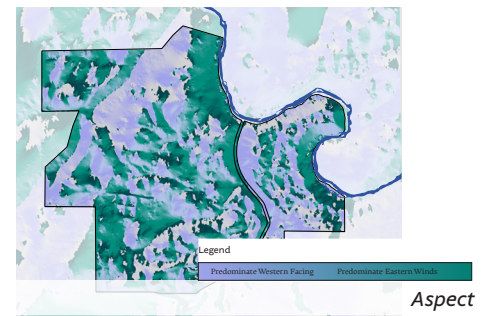
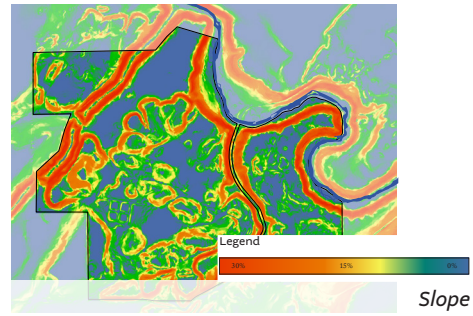
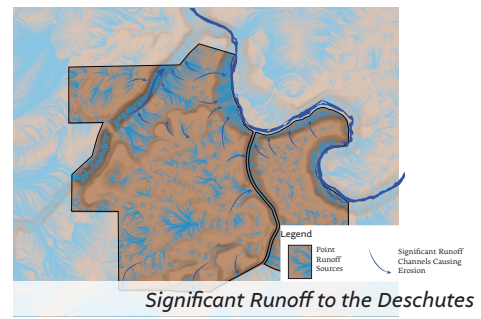
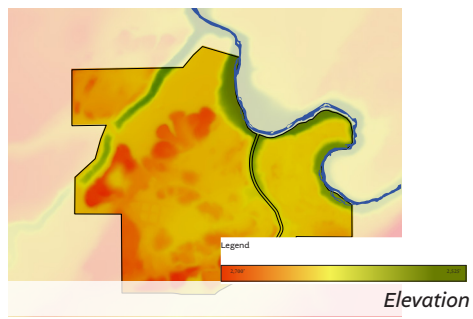
Finally, the precipitation diagram showed how much annual rain and snowfall the site receives and gave direction to the land form interventions.

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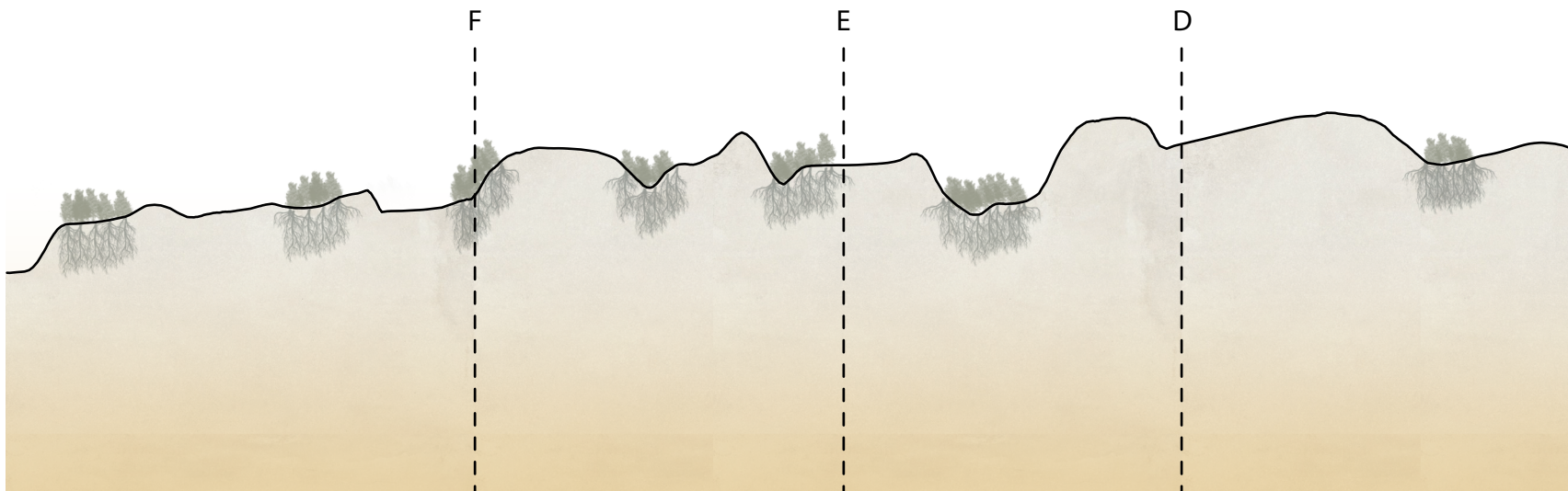
the spoils piles

¹⁹ Center for Disease Control, "NIOSH hazard review: health effects of occupational exposure to respirable crystalline silica."
Source: National Weather Service, 2024.
ESRI, 2024.
USGS, 2024.



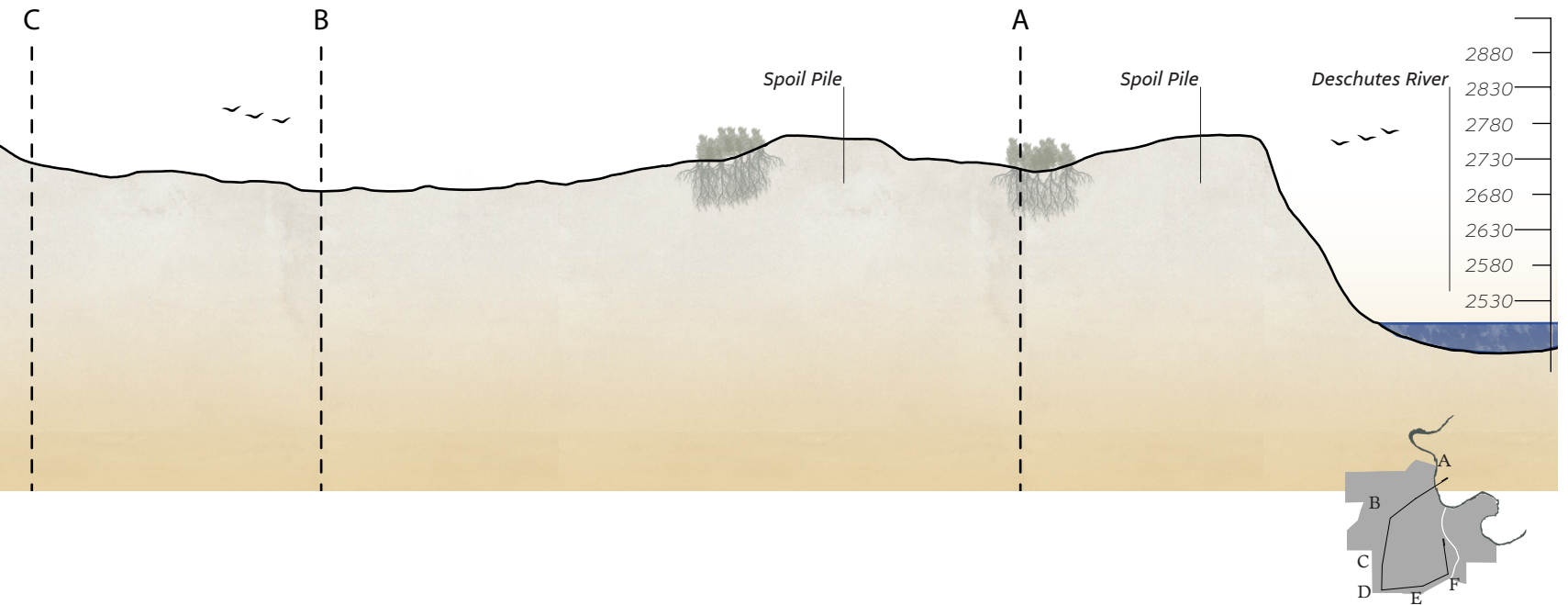
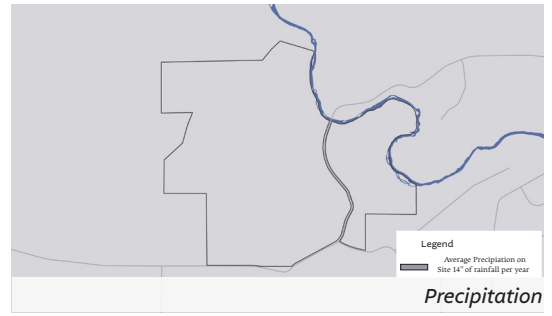
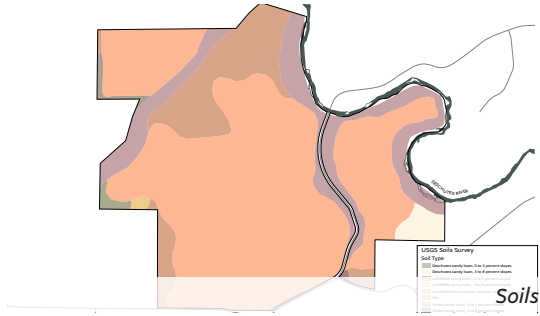
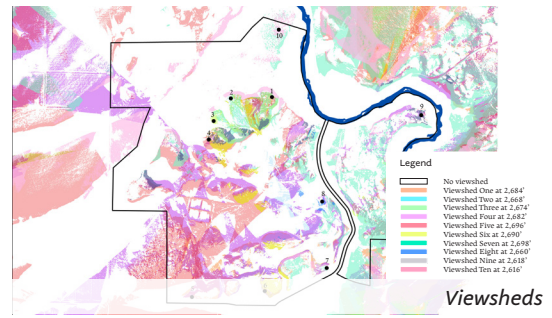
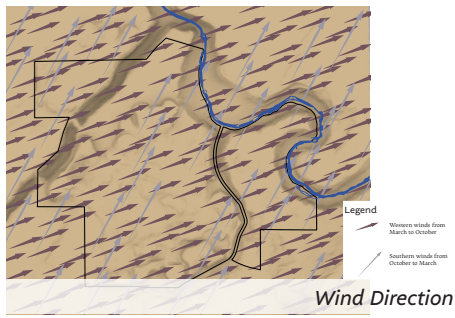


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site analysis

site narrative





The proposed redesign of the mine should target the diverse community that makes up the population of Central Oregon. The recreation program creates a level space for community members to begin accepting new ideas or seeing perspectives from a different point of view. This may sound optimistic or naive, but the special place that a trail systems creates is unlike many spaces and the combination of movement, nature and community affords opportunity to have conversation. This feeling when on a trail is an opportunity for placekeeping practices to facilitate and create community. The intended audience includes outdoor enthusiasts, equestrian riders, ranchers, wildlife, tribes, and local characters and families. But, brownfield remediation work takes a LONG time. Generations. Decades. It can get caught in a web of changing of land ownership, funding, regulations and policy changes. It is not an easy process and therefore using placemaking

practices in the form of local organizations who can become the champion of this place, local characters who are invested in seeing this project through, is recommended for the success of the project.²⁰

²⁰ *Outdoor Recreation Roundtable, "Rural Economic Development Toolkit."*

When engaging with rural communities in line with placemaking and placekeeping practices it is crucial that the community be involved in the design process from a very early stage.²¹ Often, these communities are rooted in deep traditional values and don't want to see change in their current way of life. Within the context of a brownfield site, the exposure to dust, runoff and contaminated soils is detrimental to the health and well-being of the community, and change is necessary. The UNICEF community guidelines states "When done effectively, Community Engagement can improve the quality and utilization of services by making decisions more accountable and transparent to the communities they concern, increasing the diversity and representation of communities in policy and practice design, and ensuring that communities have a voice in decisions

that directly affect their lives."²² This toolkit is a way to keep those voices within the design process so that the outcome does truly serve the direct community. This guide is meant to be an ever evolving, non-linear approach to engagement and design work. The major themes are to listen, to create shared authorship, and to allow for flexible timelines.

Currently, the voices that I have created are a generalization of the typical stereotypes of the Central Oregon community. The three characters are distinctly different in their use of public lands. One would think hunting, recreation, and conservation would not be able to coexist within the same site. This project strives to show that these groups are not as far left or right as they may appear to be, and one project can serve the greater collective of Central Oregon.

²¹ *Outdoor Recreation Roundtable, "Rural Economic Development Toolkit."*

²² *United Nations International Children's Emergency Fund (UNICEF), "Rural Community Engagement Guidelines."*

Nature United, "Indigenous Guardians Toolkit."

Resources



Rural Outdoor Recreation Development



Creative Placekeeping Citizens Artist Salon U.S. Department of Arts and Culture



APLU Rural Engagement for Resilient Communities



Indigenous Guardians Toolkit



Lower Bridge Mine

Stages of Engagement

listen to and research regional community

visit the site and surrounding recreation areas

iterations of design through shared authorship

determine areas of growth for public health benefits

identify and empower local champions

meaningful involvement during design implementation

identify the outdoor recreation character of the region

create strategic long-term master plan

monitor and adjust to allow for success of design interventions

establish a diverse pool of funding

equitable participatory community design charrettes

share the gained knowledge



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Sisters Local Character
“The site needs to benefit the local community and we need places we can gather as a collective to share ideas.”*

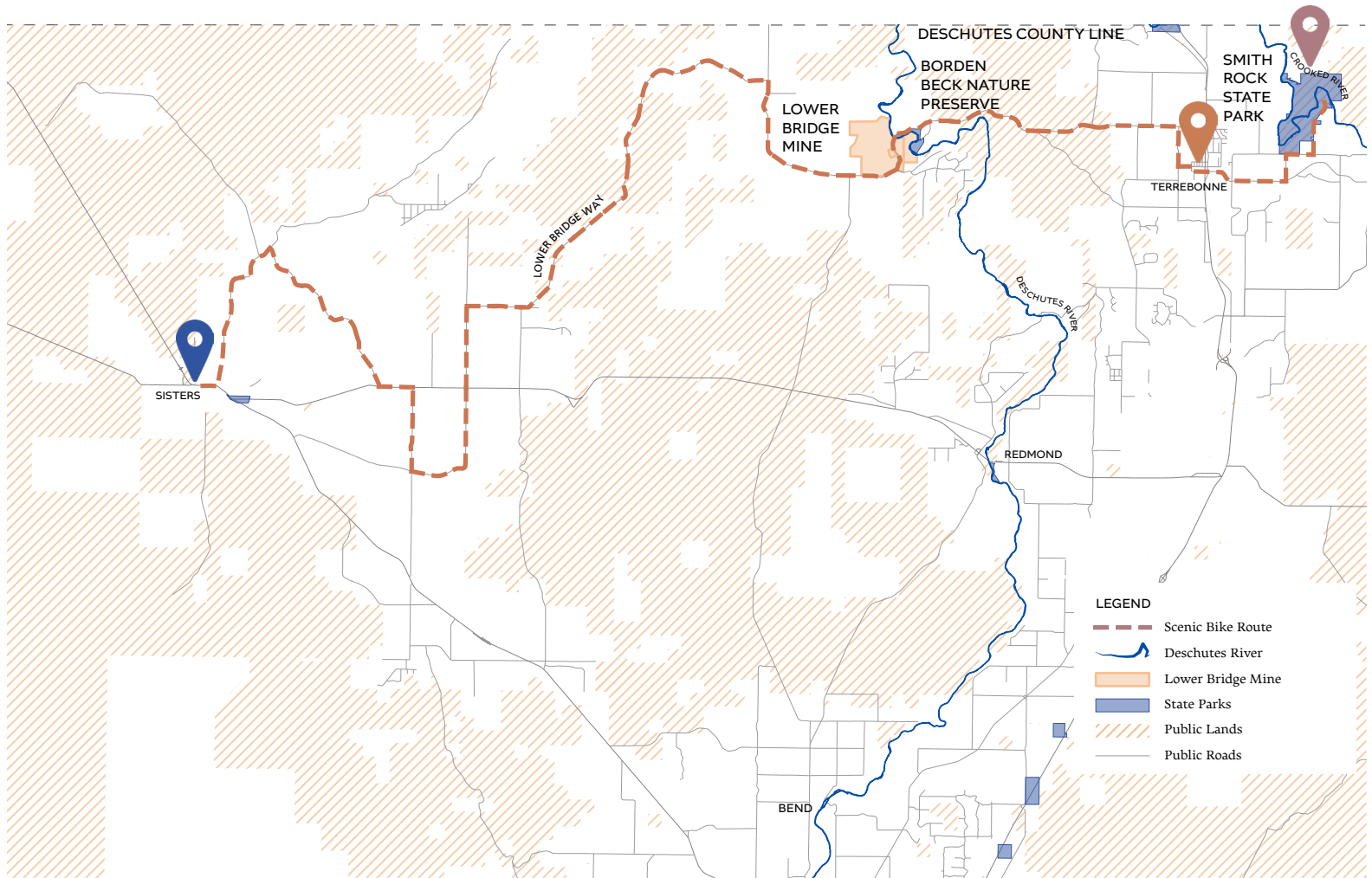


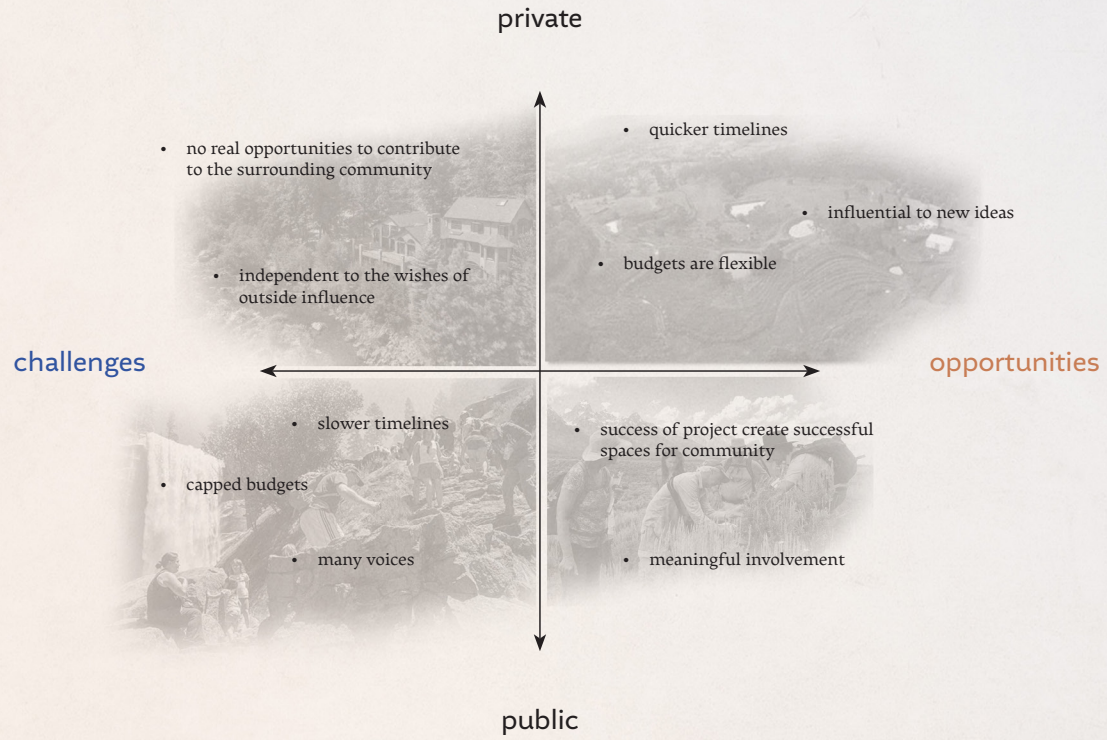
Rural Hunters
“Keep the rural character of the greater Terrebonne area. Let’s dedicate land for wildlife corridors!”*



Outdoor Enthusiast
“Would love to be able to recreate in a place with less traffic and competition to natural spaces.”*

community outreach





The nexus of this project lies within this spectrum of private versus public land ownership in rural spaces. In private settings, budgets are flexible as well as timelines, but they do not have to meet public opinion or provide opportunities for the greater good. Publicly accessible lands can have capped budgets and can have extremely long timelines due to bureaucratic hoops but can provide opportunity for public input.²³ Neither one is inherently preferred or undesirable for a brownfield site, but they dictate the timelines and outcomes of these projects.

It is important to point out that at this time, the site is privately owned and when I visited the site the owner expressed a passive approach to landscape

remediation. As you can see here, the site has made some recovery in the decades since the DEQ conducted its clean up. These ideas around furthering restoration efforts were discussed but at the time were moved on from and the site visit ended with just ideas. This has always been a debatable point for me with this project, because as a landscape architect I am biased to wanting to see the site transform from a hindrance to the community to becoming an asset. And the realities of working in this space can be daunting. The site needs a master plan to help guide the restoration.

²³U.S. Department of Arts and Culture, "Creative Placekeeping Citizen Artist Salon"



Barren landscape from exposed diatomaceous earth.



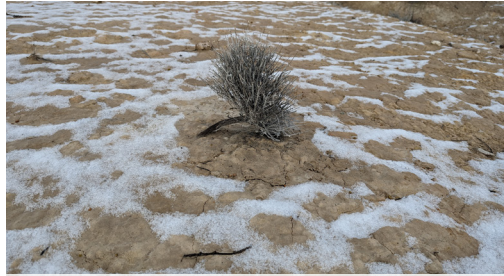
Diatomaceous earth on site.



Volunteer vegetation takes hold.



Secondary erosion gullies form from primary gully creating complex channels.

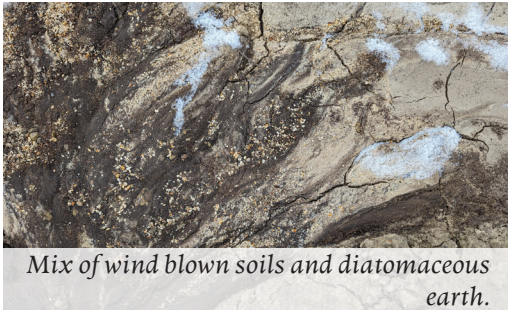


Volunteer sagebrush on landscape.



Erosion gully starts to form.

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Mix of wind blown soils and diatomaceous earth.



Barren landscape with a few volunteer native species.



View from neighboring road.

site conditions



Edge of Deschutes canyon walls.



Spoils pile with a few established volunteers.



Edge of a gully that has attracted high desert volunteer species.



Edge of property boundary with Smith Rock in the viewshed.



Rugged terrain with exposed diatomaceous earth.



New gullies beginning to form.



Volunteer rabbitbrush plant.

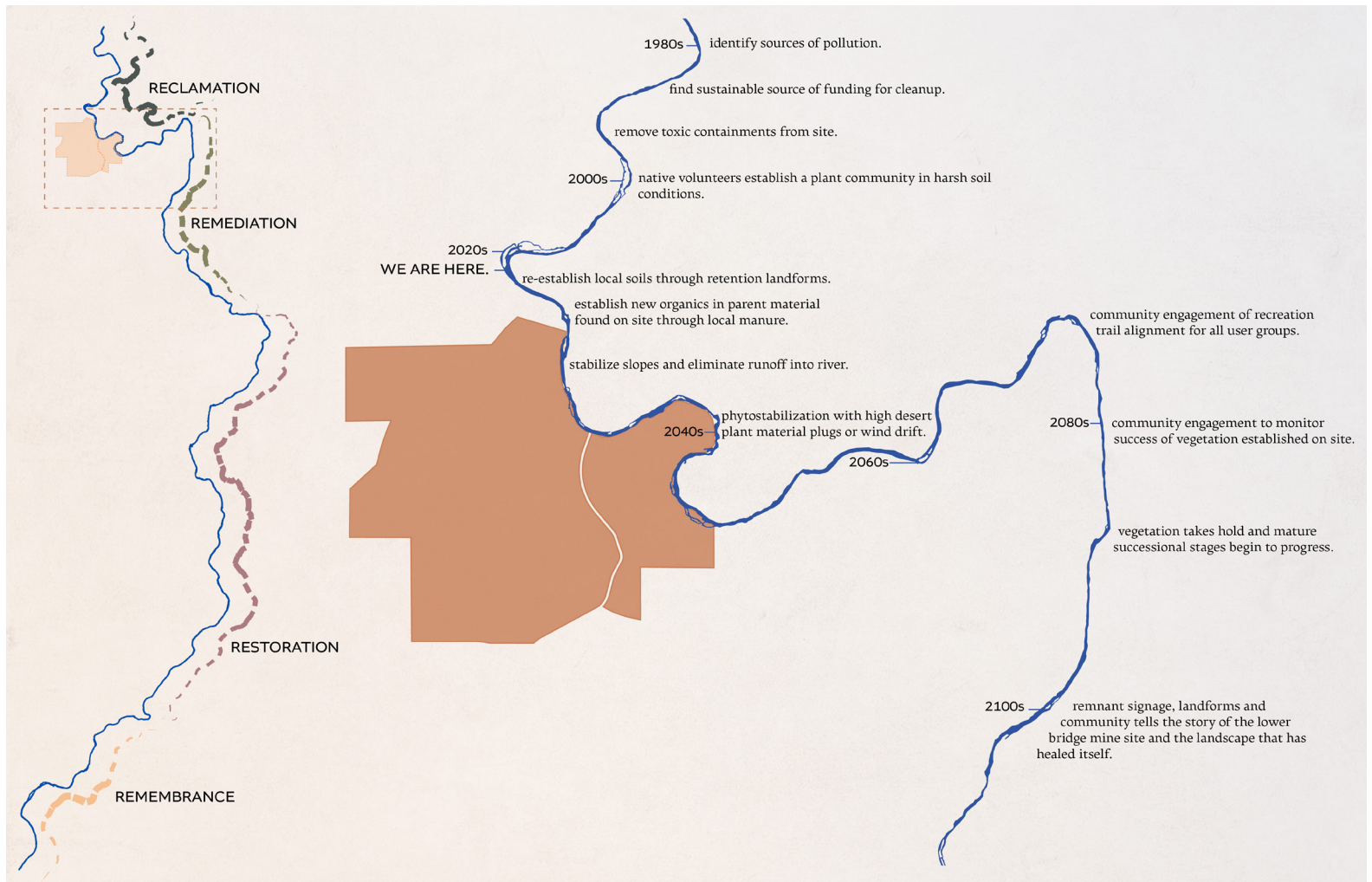


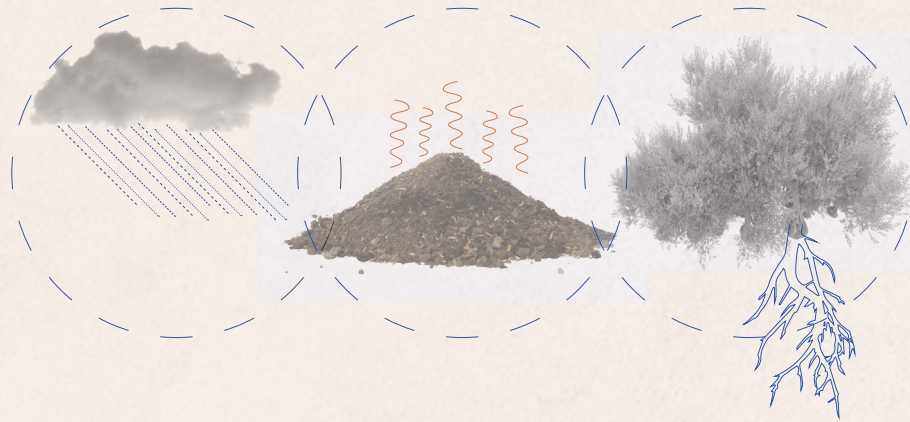
New gullies beginning to form.



Low point on site shows abundance of wind blown soils.

Finally, this timeline illustrates the larger context of the design intent. The reclamation of the site has been conducted, as defined by DEQ, as sufficient clean-up and removal of the industrial processes and contaminants for the surrounding community. Remediation is the next step, which is the process of stabilizing any adverse effects the mining process may have had on the site through soil stabilization or phytoremediation. Restoration is the process of creating successional families within the plant community on site and creating natural system cycles on site. Finally, remembrance of the process that have happened here, even if the site is beautifully restored to a high desert ecosystem, is critical.





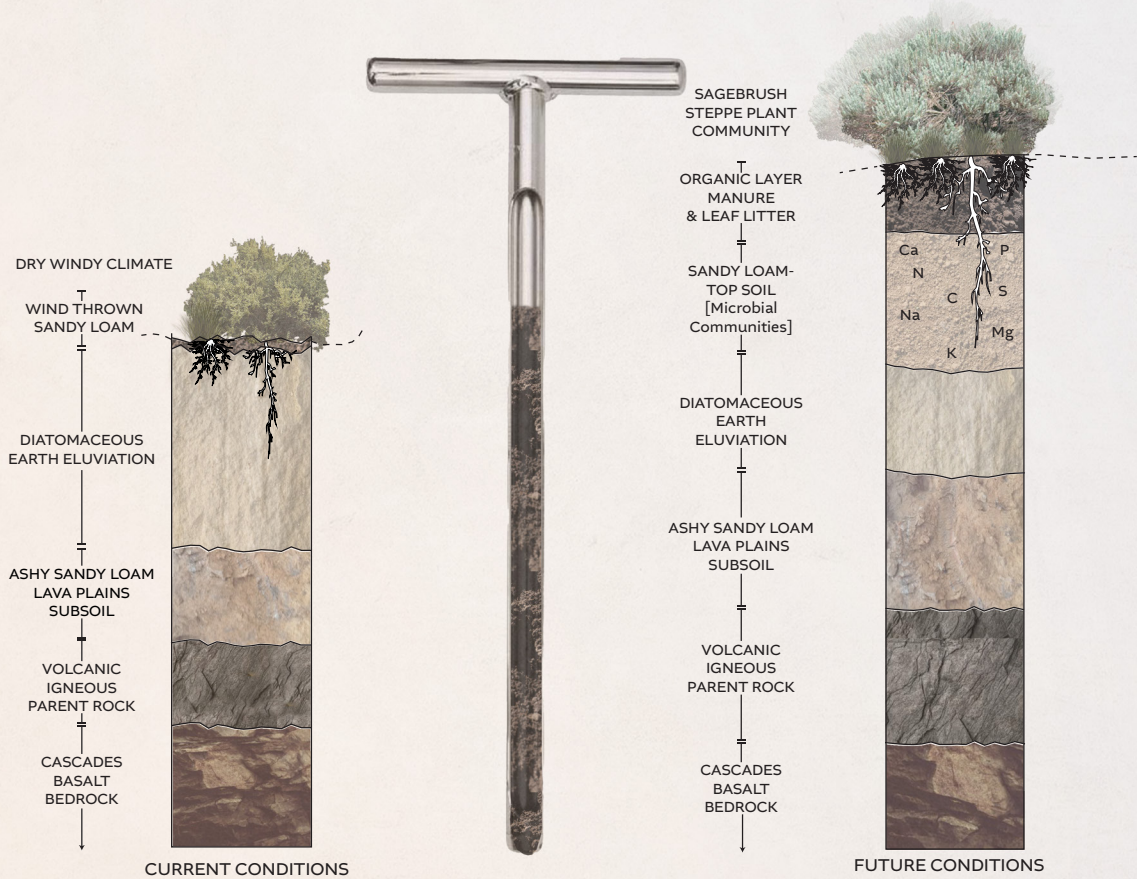
I. context

II. site narrative

III. remediation and restoration

an exploration in the ways in which
through small interventions we can
detain moisture and building soils on site
to provide a habitable top surface for high
desert plant communities.

IV. remembrance



Through a 2008 thesis research project's soil analysis, we know the site's soil conditions consisted of mostly exposed diatomaceous earth, but some sections had begun to capture sandy loam native soils through predominant winds across the landscape.²⁴

Remediation by retention is the first step in the life cycle of the site. Creating shallow spots to capture and cultivate a rich topsoil layer that will support thriving plant community is a proven way to gain such desired results. To minimize the occurrence of silica dust storms, and for the cultural rehabilitation of the spoils piles, regrading of the site is not advised. Instead, berms, on contour channels or low dry stone masonry retaining walls will be employed across the site. Obtaining "good soil" on the site will be challenging, and to avoid a costly dumping of topsoil across the entire 570+ acres can be avoided if an alternative approach including

the landforms is deployed. The diagram shows the predicted current soils on site. The site would have to be tested and sampled further to confirm these conditions. Throughout the site there is some exposed diatomaceous earth, but some sections have begun to capture sandy loam native soils through predominant winds across the landscape. Ideal soil conditions would begin with a diverse native plant community, along with an organic layer of soil curated from manure and leaf litter. Then the predominate soil type in Central Oregon, a sandy loam, on top of the eluvial layer of diatomaceous earth, a subsoil of ashy sandy loam from the various volcanic activities of the area, finally the parent rock of volcanic igneous rock and the cascade basaltic layer.

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²⁴ Chamerlain, "Phytostabilization of Abandoned Diatomite Mine Sites in Terrebone, OR Utilizing *Purshia Tridentata* and Soil Amendments."

By deploying these landscape interventions of a crescent shaped berm, a on-contour swale and small dry-stone masonry retaining walls, the landscape becomes a sponge for water and soils to collect and to encourage plant life.

These top two soil layers will be encouraged and inhabited by the three landscape interventions. Curated by farmer and engineer P.A. Yeomans, the keyline design typology takes the existing landscape and cultivates it to become more inhabitable for plants and animals.²⁵ This technique has been adopted by many in the effort to stop creeping desertification, which is the spread of a arid landscape in which self-sustaining life is not possible. Many also adopt this landforms strategy in farming techniques where water is scarce, or soils are poor. These techniques are not original, they have been used since time immemorial by Indigenous communities in western arid climates and re-introduced as vital techniques in permaculture practices. Traditional ecological knowledge within these landforms is within the scope of placekeeping practices and further collaboration with tribes would bring a deeper cultural understanding of the importance of those landforms. This technique also emphasizes

the creation of a top layer of soil environment that rapidly accelerates soil biological activity, thus vastly increasing the total organic matter content within the soil.

The dry stone masonry retaining walls were specifically used by Indigenous communities in the southwest to disperse the natural water sources. Rock dams in the Turkey Pen Watershed, of the Chiricahua Mountains in Southwest Arizona, provided a 30-year case study to consider a Traditional Ecological Knowledge approach to dryland watersheds.²⁶ The USGS study reintroduced the low impact structure to the tributaries of the watershed and resulted in a dispersal and spread of the ephemeral streams. In this design proposal, the dry stone masonry walls will ideally be collecting soils and sediment in critical steep areas (of 15 percent slope or more) and be slowing down the impact of erosion. The sediments and organic matter coming through the gullies will build up sediments and organic debris behind the structure to form thick, rich soils that sequester carbon. These detention structures will create soil-water sponges, and in turn create deeper root structures in the proposed plant palette.²⁷

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landscape interventions

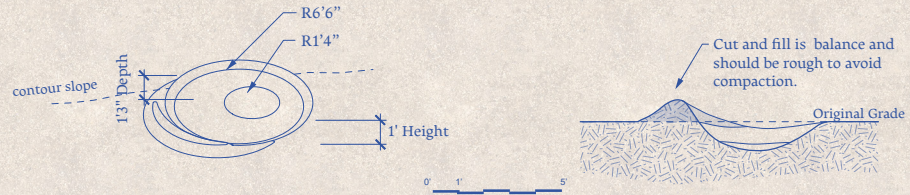
²⁵Yeomans and Yeomans, "Water for Every Farm."

²⁶Norman, "Model Impacts of Check Dam Analysis."

²⁷Gooden and Pritzlaff, "Dryland Watershed Restoration With Rock Detention Structures."

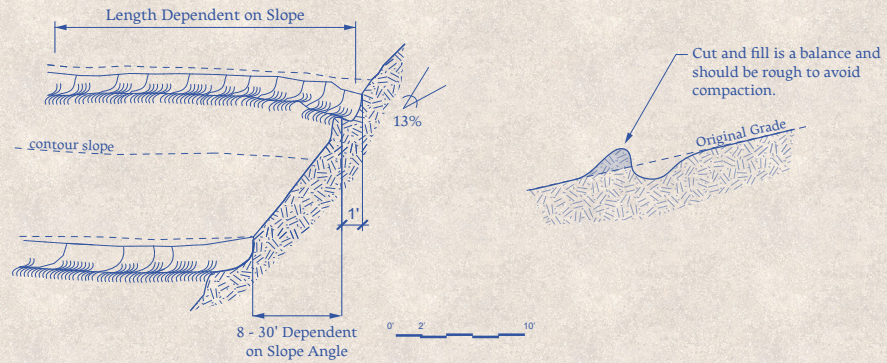
Carved Crescent Berms

Cut and Fill Shaped Basins
0.5% - 5% Slope



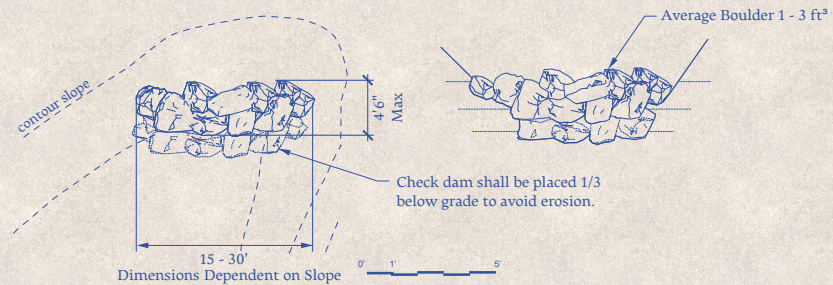
Branches of Ephemeral Swales

On-Contour Swales
5% - 15% Slope



Storage through Trinchera Terraces

Dry Stone Masonry Detention Basins
15% & Above Slope

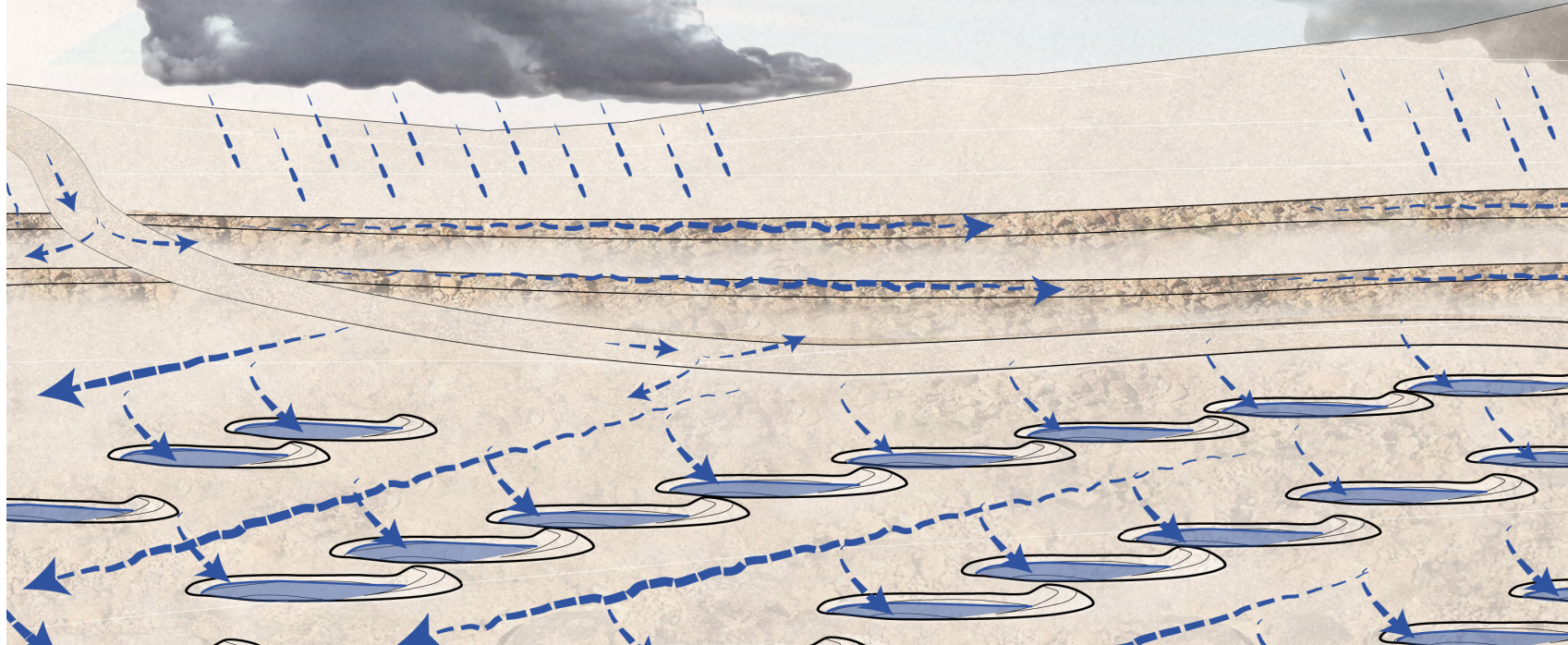




Lower Bridge Mill

14" Average Rainfall

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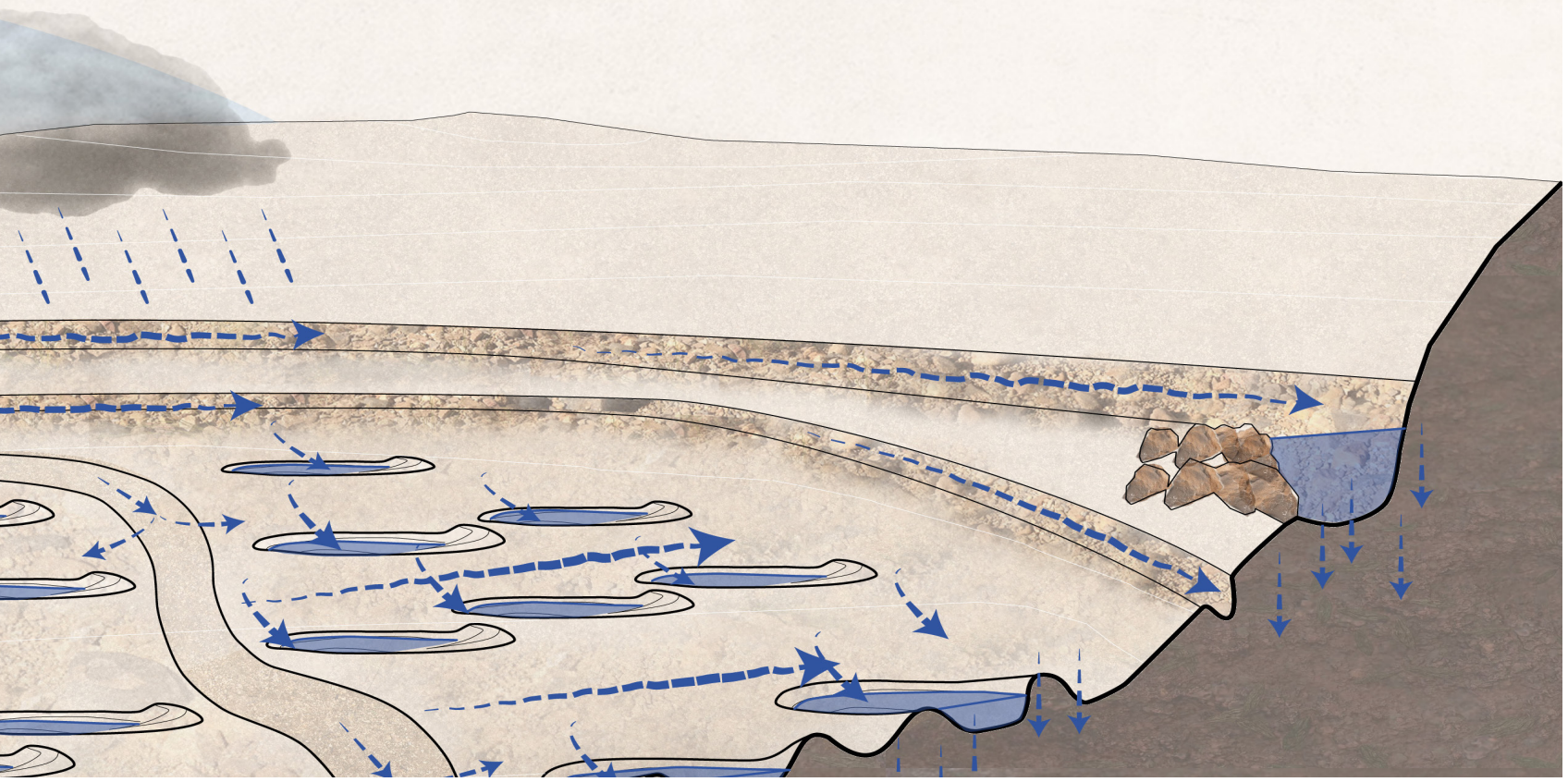
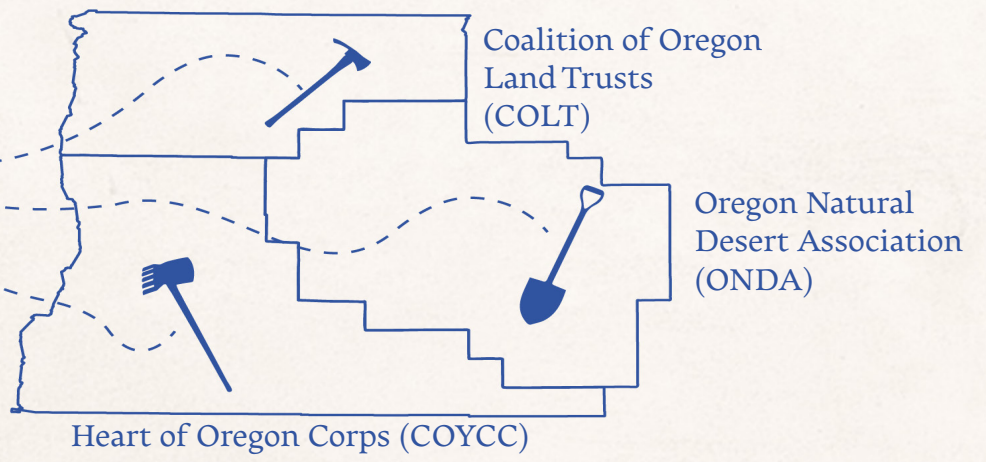


runoff + landscape interventions

All three landscape interventions, crescent berms, on-contour swales, and small dry stone masonry retaining walls work to capture moisture on site.



ne



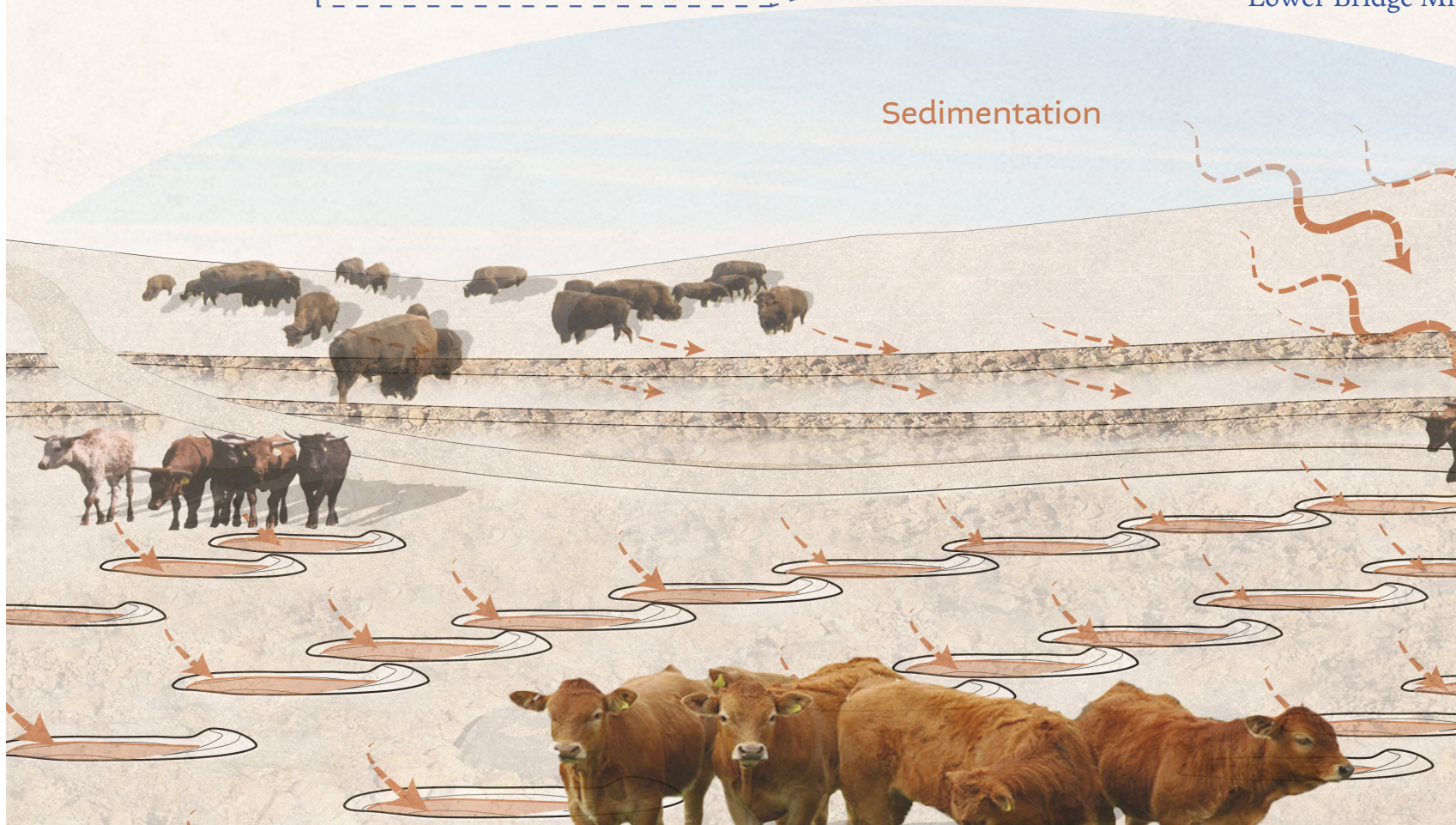
Fertilization and
Seed Sowing



Lower Bridge Mi

Sedimentation

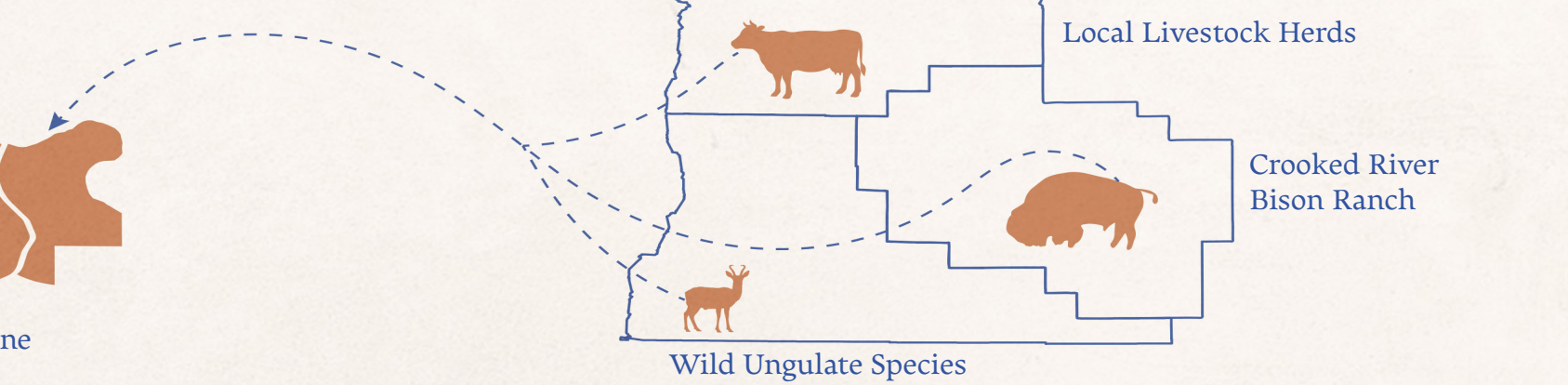
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soils + landscape interventions

remediation and restoration

All three landscape interventions, crescent berms, on-contour swales, and small dry stone masonry retaining walls work to capture soils on site.





Planting and
Monitoring



Lower Bridge Mi

Phytoremediation

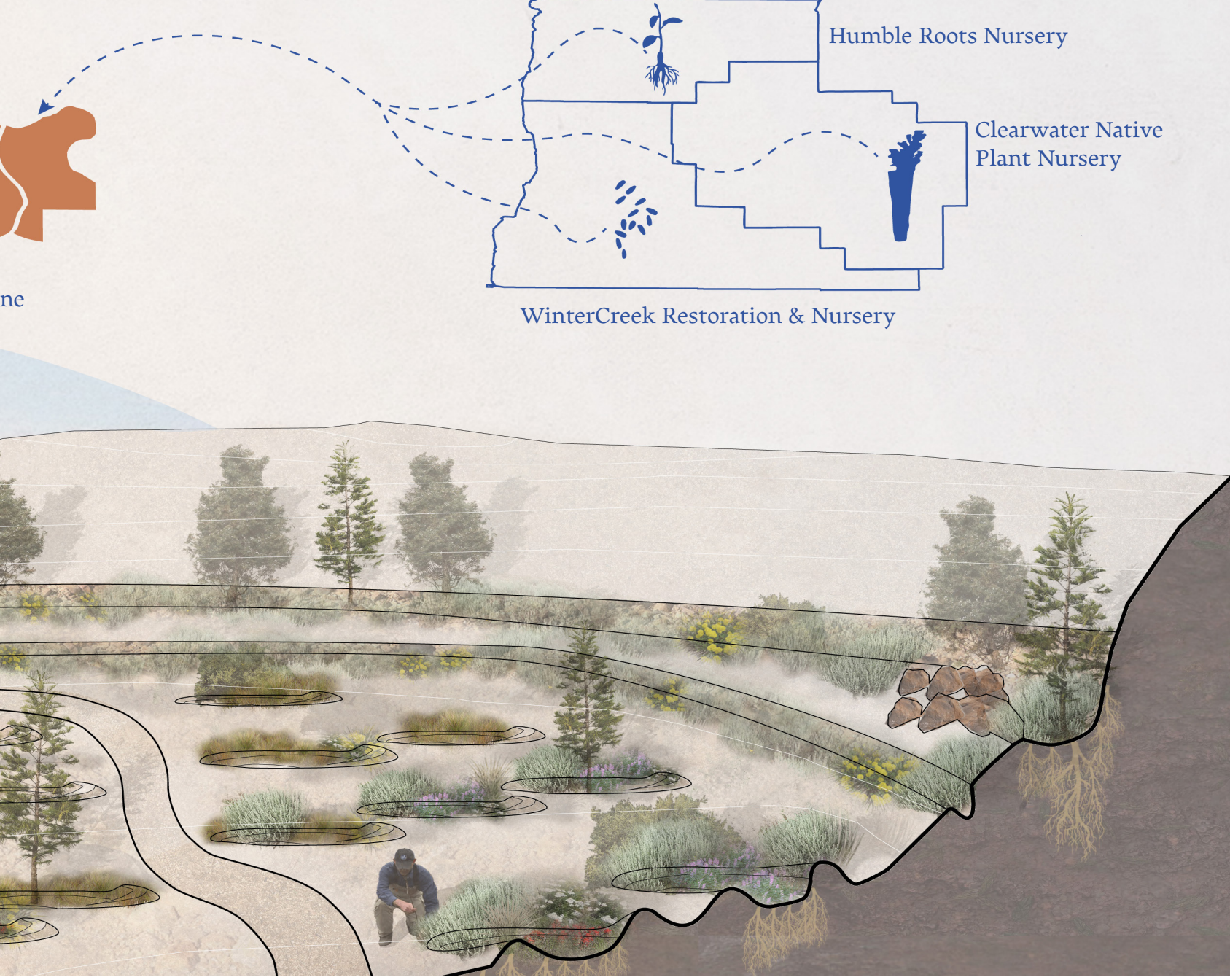
80



vegetation + landscape interventions

remediation and restoration

All three landscape interventions, crescent berms, on-contour swales, and small dry stone masonry retaining walls working to create habitable spaces for a high desert plant community.



The first phase of the remediation is to carve the landscape interventions. These interventions sculpt the landscape into a sponge-like form for water retention. With less than 14 inches of rainfall a year, these crescent shaped berms and divets are imperative for lengthening the amount of time moisture gets into the ground and reduces the impact of runoff. Incorporating local organizations like the Heart of Oregon Corps could be a way to engage with placemaking practices while also being an affordable way to conduct field work.²⁸

The second phase of remediation is the establishment of soil. Through the landscape

interventions the collection areas will begin to build up sediment or wind thrown soils. The introduction of a herd of bison or cattle, or the visit of a native pronghorn or elk would introduce manure and new organic matter to create a rich composition within the topsoil. If herd animals were used, this would bring local farmers to participate in a placemaking approaches to the project, like, for example, the Crooked River Bison Ranch located outside of Prineville, who use rotational grazing methods with their herd of bison.²⁹

These landscape interventions will encourage a high desert plant palette to establish. Mixtures of

²⁸ Heart of Oregon Corps.

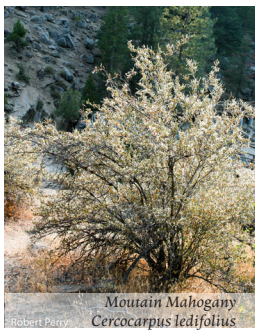
²⁹ Crooked River Bison Ranch.

³⁰ WinterCreek Restoration and Nursery.

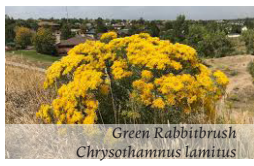
shrubs, grasses and forbs should be spread across the low points of the interventions, so overtime the species can create a strong biomass and contribute to the top layer of organic material. Spreading seeds and planting plugs can create an established diverse plant community more quickly and is an opportunity for placemaking practices and community engagement. Local nurseries including WinterCreek source most of their native seeds from the surrounding public lands or grow their woody specie plugs from cuttings.³⁰



Ponderosa Pine *Pinus ponderosa*



Mountain Mahogany
Cercocarpus ledifolius



Green Rabbitbrush
Chrysothamnus lamius



Bitterbrush *Purshia tridentata*



Serviceberry
Almelandier alnifolia



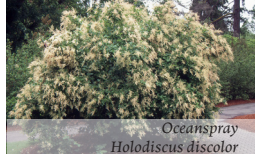
Bluebunch Wheatgrass
Pseudoroegneria spicata



Sagebrush *Artemisia tridentata*



Wax Current *Ribes cereum*



Oceanspray
Holodiscus discolor



Squirrel Tail *Elymus elymoides*



Juniper *Juniperus occidentalis*



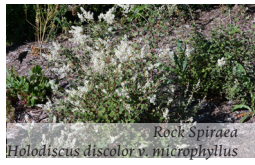
Cottonwood *Populus trichocarpa*



Saltbush *Atriplex nummularia*



Gray Rabbitbrush
Ericameria nauseosa



Rock Spiraea
Holodiscus discolor v. microphyllus



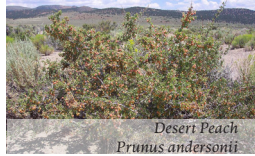
Steppe Bluegrass *Poa secunda*



Hopsage *Grayia spinosa*



Winterfat *Eurotia lanata*



Desert Peach
Prunus andersonii



Idaho Fescue *Festuca idahoensis*



Alder *Alnus spp.*



Quaking Aspen
Populus tremuloides



Mexican Cliffrose
Purshia mexicana v. stansburiana



Purple Sage *Salvia dorrii*



Silver Buffaloberry
Sheperdia argentea



Great Basin Rye *Leymus cinereus*



Mugwort *Artemisia frigida*



Apache Plume
Fallugia paradoxa



Desert Sweet
Chamaebatiaria millefolium



Prairie Junegrass
Koeleria macrantha

trees

shrubs

grasses

high desert plant species

Source:
Taylor, "Sagebrush Country: A Wildflower Sanctuary".
USDA Plants Database, 2024.
CalScape, 2024.
OregonFlora, 2024.
North Carolina Extension Gardener Plant Toolbox, 2024.
iNaturalist, 2024.



forbs

The proposed plant palette is a climate adaptive selection of high desert species that can withstand the extreme fluctuations of the high desert. The percentage of trees and shrubs will be dramatically less than the proposed percentage of grasses and forbs. This is to continue to establish those nutrient rich cryptobiotic soils to be able to support species like trees. Mixtures of grasses and forbs should be spread across the low points of the interventions, so overtime the species can create a strong biomass and contribute to the top layer of organic material. The trees should be planted in contour strip forests to directly connect with the on-contour swale

designs and more densely planted in the areas of concentration above the dry stone masonry walls.³¹

A modular approach is taken to direct the plant palette, with different options for the many aspects that occur on site. The important concept to note is that there are certain species within the high desert palette that can tolerate more water in the winter months while still being fairly drought tolerant in the summer time. The generalists and drought tolerant species are hearty plants and should be planted abundantly throughout the landscape interventions. While most of these species can be planted together depending on the aspect and conditions of the site,

³¹Yeomans and Yeomans, "Water for Every Farm."

it is important to group species that have been documented growing together as this suggests a symbiotic system occurring by passing nutrients. The sagebrush community is incredibly diverse plant palette with a rich seed bank of forbs that occur in ideal conditions for short bursts throughout the summer months. All of these species are often wind pollinated or sometimes by native pollinators like bees, beetles, butterflies and moths.

Drought Tolerant High Desert

| | |
|-------------------------------|--|
| Juniper | <i>Juniperus occidentalis</i> |
| Mountain Mahogany..... | <i>Cercocarpus ledifolius</i> |
| Bitterbrush..... | <i>Purshia tridentata</i> |
| Sagebrush | <i>Artemisia tridentata</i> spp. <i>tridentata</i> |
| Saltbrush..... | <i>Atriplex nummularia</i> |
| Grey & Green Rabbitbrush..... | <i>Ericameria nauseosa</i> |
| Purple Sage..... | <i>Salvia dorrii</i> |
| Steppe Bluegrass..... | <i>Poa secunda</i> |
| Idaho Fescue..... | <i>Festuca idahoensis</i> |
| Yarrow..... | <i>Achillea millefolium</i> |
| Buckwheat Species..... | <i>Eriogonum</i> spp. |

Generalist High Desert

| | |
|---------------------------|--|
| Ponderosa Pine..... | <i>Pinus ponderosa</i> |
| Lodgepole Pine..... | <i>Pinus contorta</i> v. <i>contorta</i> |
| Wax Current..... | <i>Ribes cereum</i> |
| Oceanspray..... | <i>Holodiscus discolor</i> |
| Serviceberry..... | <i>Amelanchier alnifolia</i> |
| Silverbuffalo Berry..... | <i>Shepherdia argentea</i> |
| Desert Sweet..... | <i>Chamaebatiaria millefolium</i> |
| Squirrel Tail..... | <i>Elymus elymoides</i> |
| Bluebunch Wheatgrass..... | <i>Pseudoroegneria spicata</i> |
| Oregon Sunshine | <i>Eriophyllum lanatum</i> |
| Penstemon Species | <i>Penstemon</i> spp. |
| Lupine Species..... | <i>Lupine</i> spp. |
| Death Camas | <i>Zigadenus venenosus</i> |

Low Drought Tolerant High Desert Species

| | |
|-------------------------|-----------------------------------|
| Aspen..... | <i>Populus tremuloides</i> |
| Alder..... | <i>Alnus</i> spp. |
| Cottonwood | <i>Populus californica</i> |
| Red-Twig Dogwood | <i>Cornus sericea</i> |
| Geyer's Willow | <i>Salix geyeriana</i> |
| Mock Orange..... | <i>Philadelphus lewisii</i> |
| Desert Peach..... | <i>Prunus andersonii</i> |
| Klamath Plum..... | <i>Prunus subcordata</i> |
| Golden Currant | <i>Ribes aureum</i> |
| Great Basin Rye | <i>Leymus cincereus</i> |
| Prairie Junegrass | <i>Koeleria macrantha</i> |
| Western Columbine | <i>Aquilegia formosa</i> |
| Bleeding Heart | <i>Dicentra formosa</i> |
| Blue-eyed Grass..... | <i>Sisyrinchium angustifolium</i> |
| Goldenrod | <i>Solidago canadensis</i> |

Trees 13% coverage total

Juniper
Mountain Mahogany
Ponderosa Pine
Lodgepole Pine
Aspen
Alder
Cottonwood

Shrubs 38% coverage total

Bitterbrush
Sagebrush
Saltbrush
Grey & Green Rabbitbrush
Purple Sage
Wax Current
Oceanspray
Serviceberry
Silverbuffalo Berry
Red-Twig Dogwood
Geyer's Willow
Mock Orange
Desert Peach
Klamath Plum
Golden Currant
Desert Sweet

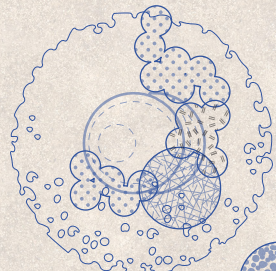
Grasses & Forbs 33% coverage total

Steppe Bluegrass
Idaho Fescue
Yarrow
Buckwheat Species
Squirrel Tail
Bluebunch Wheatgrass
Oregon Sunshine
Penstemon Species
Lupine Species
Death Camas
Great Basin Rye
Prairie Junegrass
Western Columbine
Bleeding Heart
Blue-eyed Grass
Goldenrod

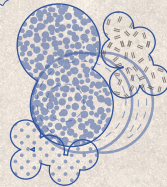
88

Legend

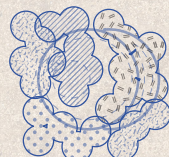
- Trees
- Climax Shrubs
- Seral Shrubs
- Seral Bunchgrasses
- Seral Forbs
- Pioneer Bunch Grasses
- Pioneer Forbs



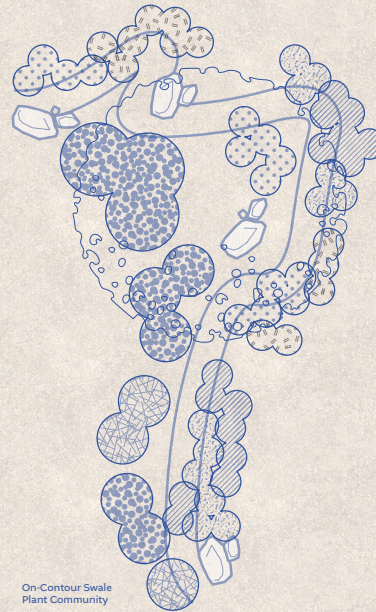
Berm Option One:
Trees, Shrubs, Grasses & Forbs



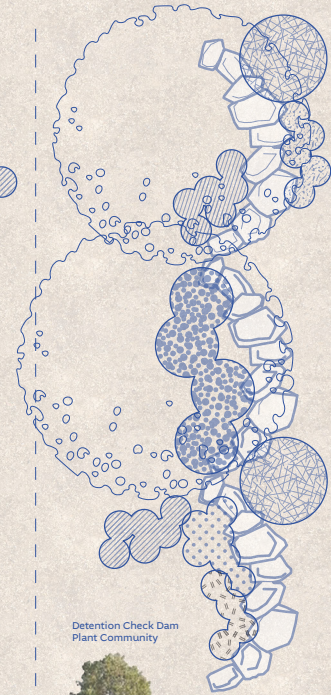
Berm Option Two:
Shrubs, Grasses & Forbs



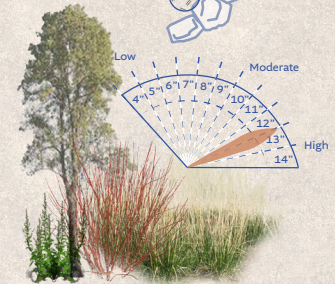
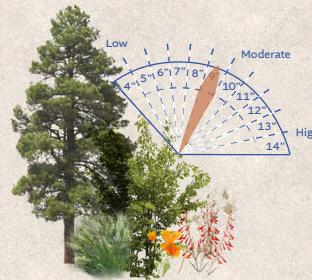
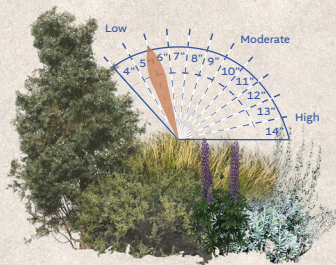
Berm Option Three:
Grasses & Forbs



On-Contour Swale
Plant Community









Detention Check Dam
Plant Community



The proposed site is over 570 acres of restored high desert habitat. The recreation space addresses key community members represented in the Central Oregon region. Multiple entrances lead you to small parking lots, creating a intentional limited number of spaces and availability on the western half of the site. There are comfort stations and pavilions to support the visitors. Three miles of trails disperse from the parking lot in all directions, often taking visitors on a variety of levels of difficulty, from flat terrain to steep inclines. Mixed use is encouraged on the trails, to overlap different user groups and monitoring of the rehabilitation of the site. These trails lead visitors to community gathering spaces, a river access path, and a camp ground.

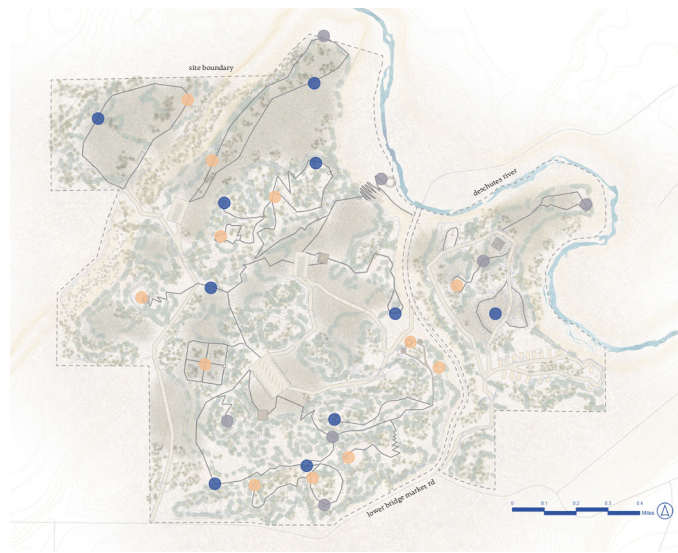
90

Legend

-  Trail Mixed Used Program:
Mountain Biking, Horse Back Riding, Hiking, Aquatic Access
- A Campsite
 - B Comfort Station
 - C Overlook
 - D Amphitheater
 - E Parking Lots
- Vegetation Coverage - 84%
-  13% Trees
 -  33% Shrubs
 -  38% Grasses & Forbs
-  Contours 5 ft Intervals
-  Site Boundary 570 acres






master plan





Legend

Circulation




-  Roads
-  Mixed Use Trails
-  Easy
-  Intermediate
-  Challenging
(Equestrian, Mountain Biking, Hiking, Aquatic Access)

 Contours 5 ft Intervals

 Site Boundary 570 acres

Legend

Culturally Significant Signage Moments

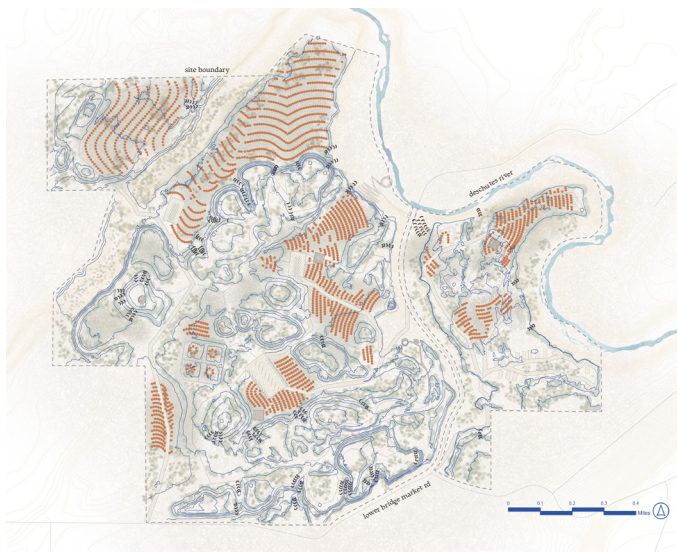
-  Industrial Remnants
-  Indigenous Memory
-  Homesteader Impressions

 Contours 5 ft Intervals

 Site Boundary 570 acres






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site plans

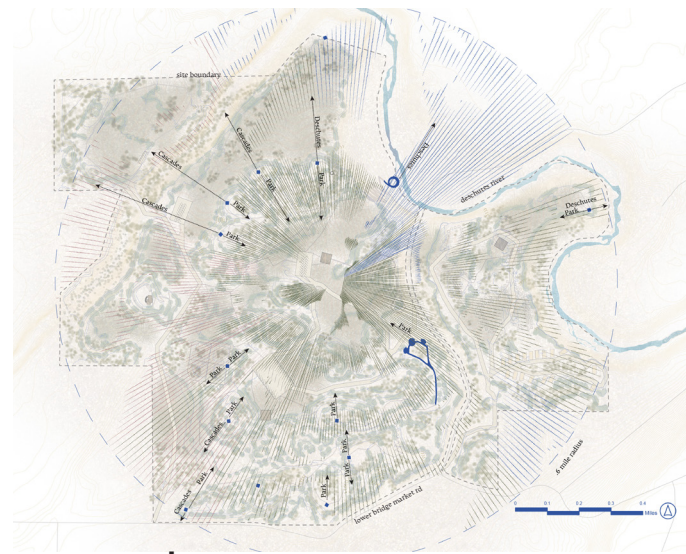


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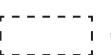
Landscape Interventions

-  589 Check Dams
-  200, 660 ft of Swales
-  11,949 Crescent Berms
-  Contours 5 ft Intervals
-  Site Boundary 570 acres

¹¹Parks, "California State Parks." California Trails Parks and Recreation Guide.

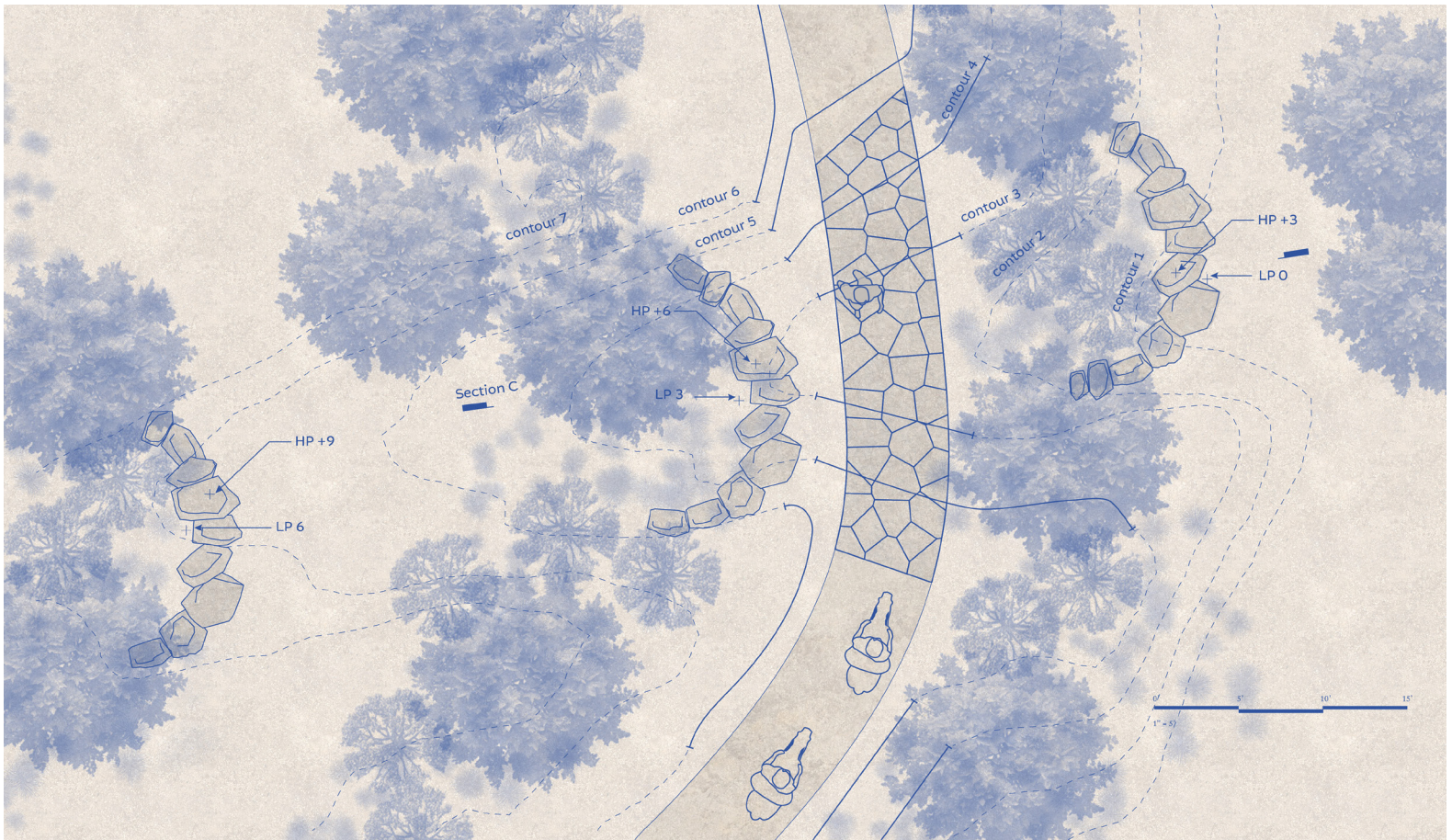


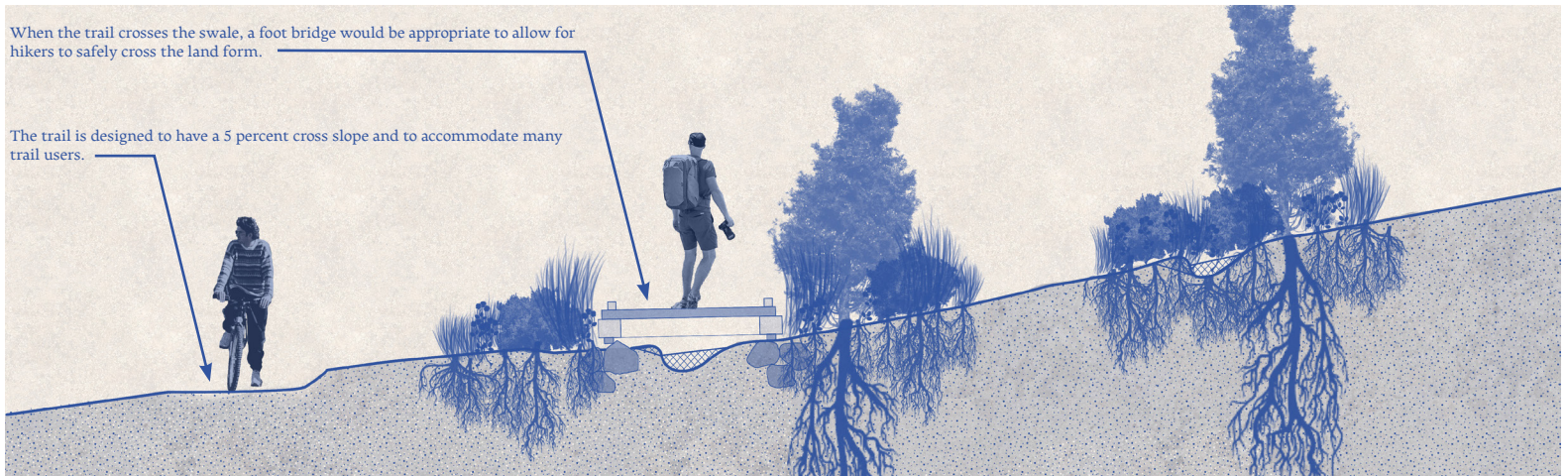
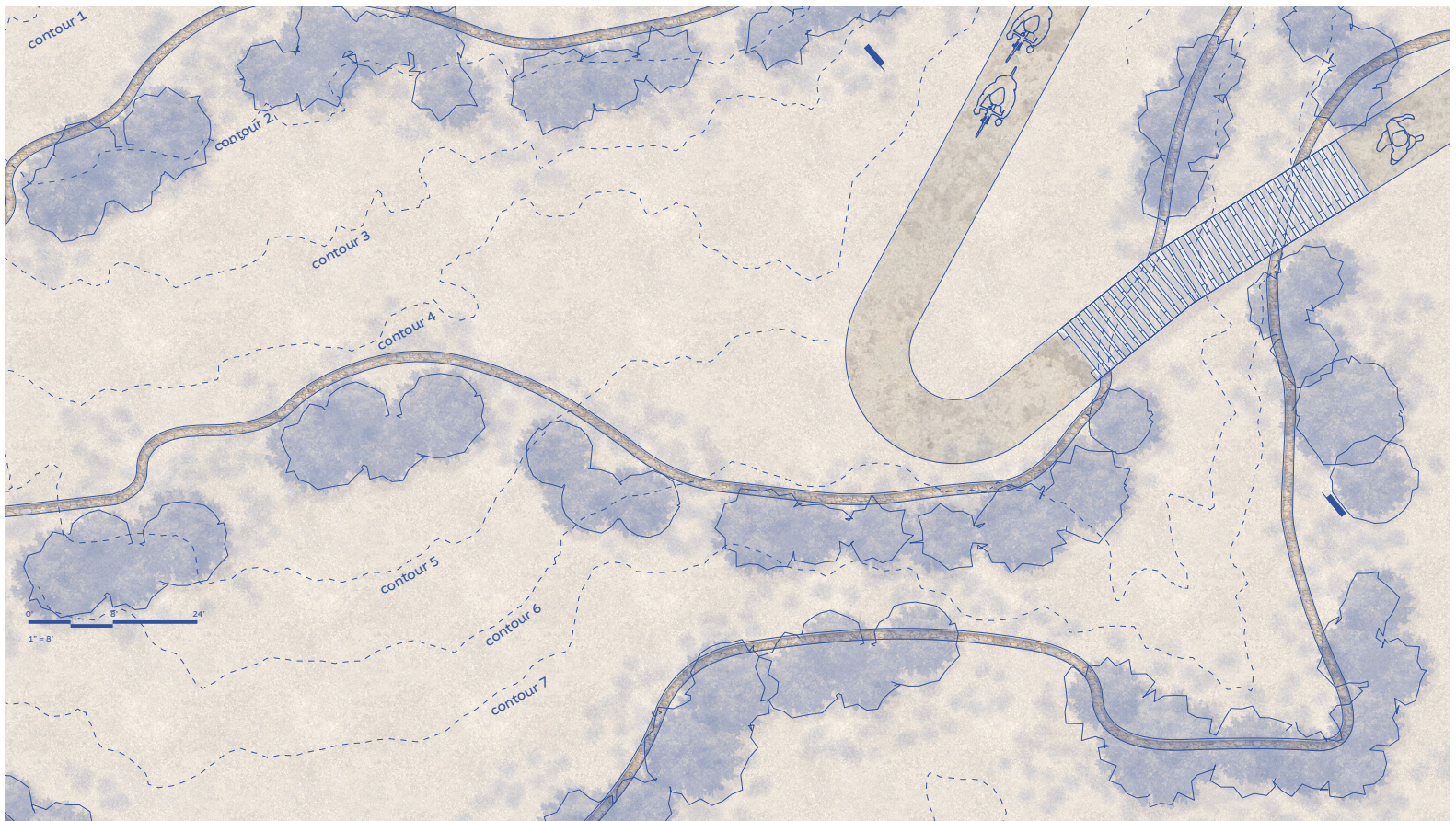
Legend

-  Viewshed
- Predominate view:
-  Cascade Mountain Range
-  Deschutes River
-  Lower Bridge Mine Park
-  Contours 5 ft Intervals
-  Site Boundary 570 acres

¹¹Parks, "California State Parks." California Trails Parks and Recreation Guide.

The trail alignment is specifically designed to integrate the visitor with the three landscape intervention types. When the trail cuts over 15% cross slope, where one of the dry stone masonry retaining walls is placed, the trail will have to be built up with an armored drain pan. These structures are common in trail design and are created to allow runoff to pass over top of the structure without eroding the trail surface. They are also built without modern building materials like concrete or metal, and build their strength by a minimum 1 ft³ boulders held together with crush rock and gravity.³³





When the trail crosses over the on-contour swales, a bridge or puncheon will need to be built to allow for all visitors to cross the drainage comfortably. These structures will be built on a 5 to 15 percent back slope. Vegetation is encouraged to grow around the landscape interventions in linear forests as an establishment technique.³⁴

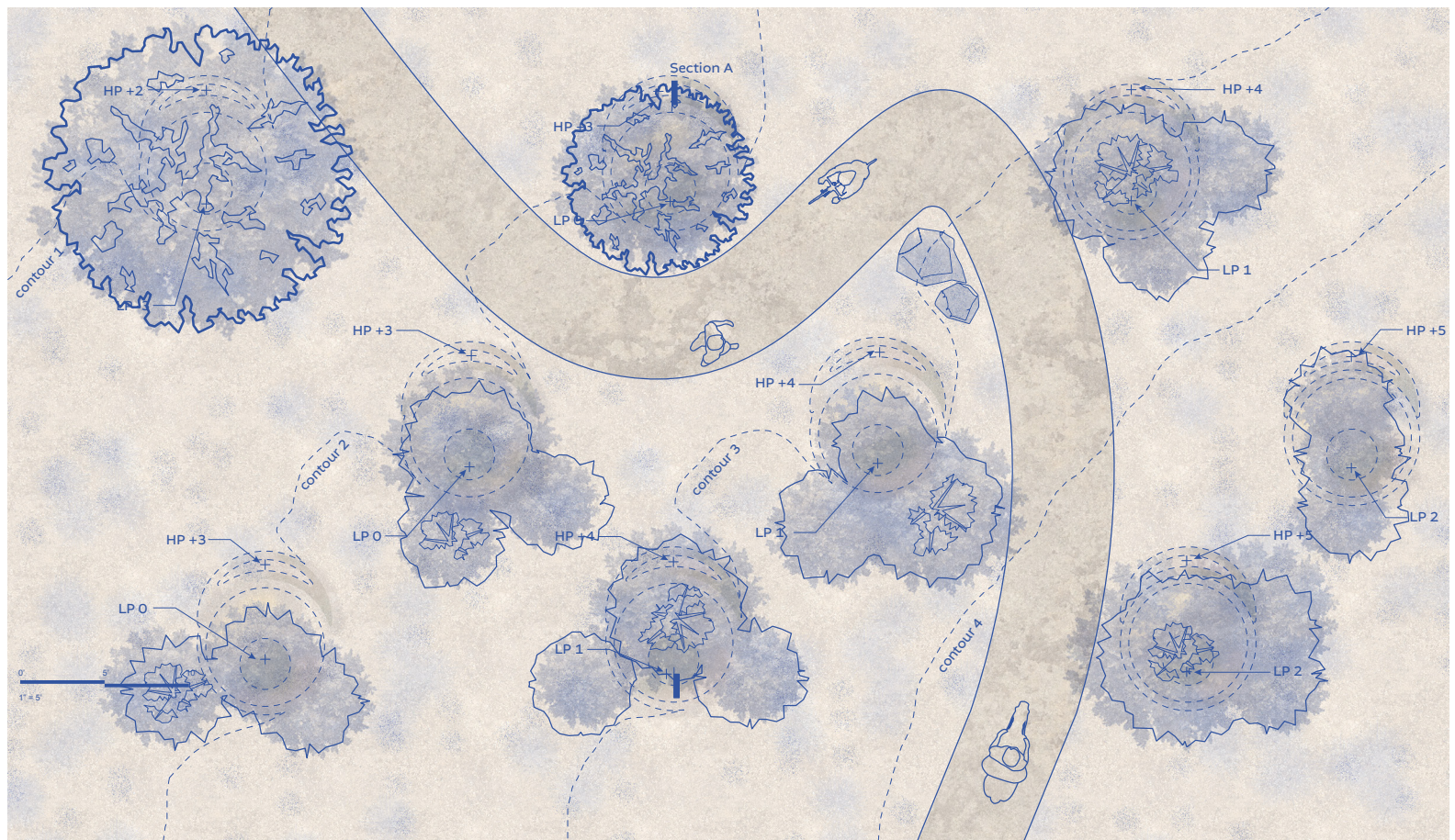
A water bar or step down drain pan may also be considered if the slope is not too steep or the section of trail is already designated as a challenging or hard level of trail.³⁵

³⁴ *Yeomans and Yeomans, Water for Every Farm.*

³⁵ *Parks, "California State Parks." California Trails Parks and Recreation Guide.*

Finally, when coming across crescent berms on the lowest sloping points of the site, between 0 and 5 percent slope, switch backs or curving trail alignments should be considered to encourage hikers to not cut across the landscape. Placing the trail alignment around anchor points like a crescent berm, boulder or tree is a great way to keep the intended trail alignment. Ideally, the visitor will move through the landscape on the intended paths close to the landscape interventions so that regular monitoring of the interventions occur. These interventions will fade over time as vegetation takes hold and sediment build up. They are intended to blend into the landscape over time.

The section perspective shows all of the elements of the design proposal working together. The trail leads the visitor over the spoils piles at a steep but sustainable grade of 10% slope. The visitor passes through remembrance signage that prompts the visitor to stop and think about how this landscape was formed and the dedication it took to bring the native landscape back.



100



Interpretive Moments at Viewpoints.

Linear Forests Along On-Contour Swales.

Native vegetation roots can go 20 to 30 feet deep to help stable spoils piles slopes.

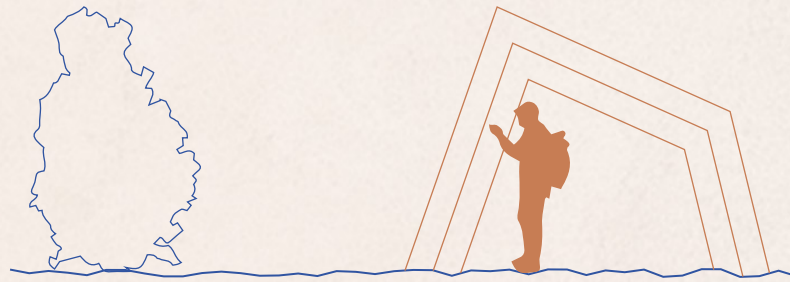
activation through recreation



Dock Along
River Allows for
Contemporary
Cultural Practices.

Trail system designed for all user groups.





I. context

II. site narrative

III. remediation and restoration

IV. remembrance

how the elements of the past
will become relics in the landscape
and influence the experience of the
Lower Bridge Mine Park.

In this chapter we discuss remembrance of the past. This site will be restored to a high desert ecosystem with vibrant plant community, suppressing any exposure to the toxic silica dust. Eventually, visitors coming to the site will be able to walk through fields of sagebrush without noticing the white diatomaceous earth below their feet. Nevertheless, it is important to remember the site as it was, in an effort to not repeat its harmful practices. If previously mined site can be reclaimed, remediated, and restored without a trace of past degradation, visitors may fail to value the natural resources they are experiencing or appreciate the magnitude of

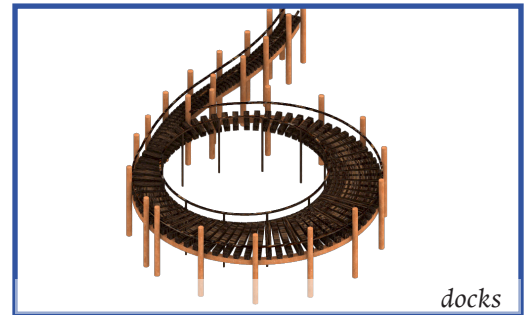
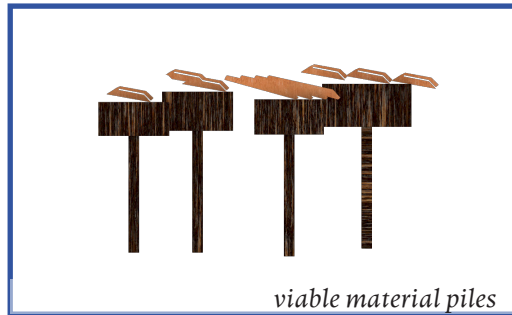
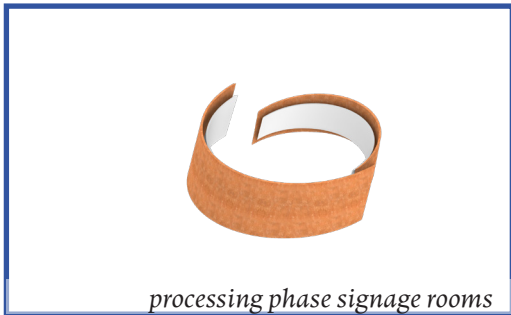
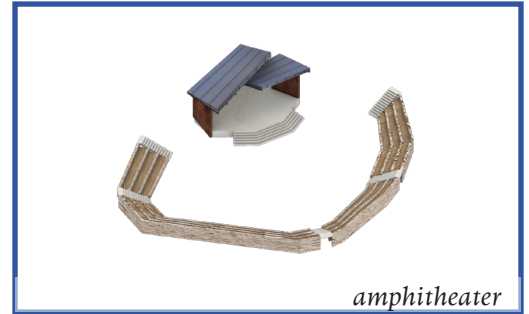
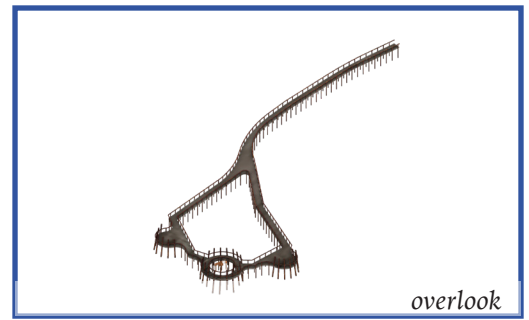
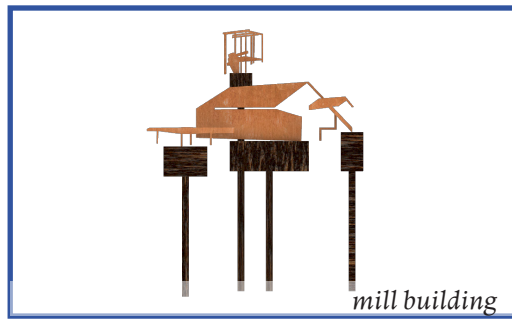
devastation caused by strip mining. Nature is the true precious resource, not the diatomaceous earth and the reality to these projects is that it could be decades or longer of careful monitoring efforts before true restoration to a high ecological level is restored. The time, effort, resources and energy to get to back to a sustainable habitable space is enormous, so why strip mine the site in the first place? This project attempts to address the ramifications of strip mining, but does acknowledge that in practice, the products of diatomaceous earth are not inherently bad, and we as a society benefit from those products regularly.

Fragile ecosystems like the high desert need to be

protected and cherished for their inherent ability to provide recreation opportunities and essential community spaces. A part of restoring spaces like this includes remembering the fragility of those ecosystems and the harm that has been inflicted on them through poor management.

As a reflection of a community that truly values access to nature and the benefits it provides as well as a rich history and pride in the labor force of the landscape, it is imperative that we remember the history that happened here. Signage and interpretive sculptures will become beacons of remembrance across the landscape. They invite the

visitor to reflect, stop or react to a piece of the site's history. Placekeeping practices are more than just a framework for design intent, they are practices in which community is a part of the whole lifespan of the project. These signage pieces will be that physical representation in the landscape. In placemaking, spaces should be redefined as opportunities for the future community. The community gathering spaces, including the trail system, seating areas, and overlooks are ways in which placemaking practices can occur not in a physical form but in the relationships that are built on site.



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landscape rooms

imprint forms

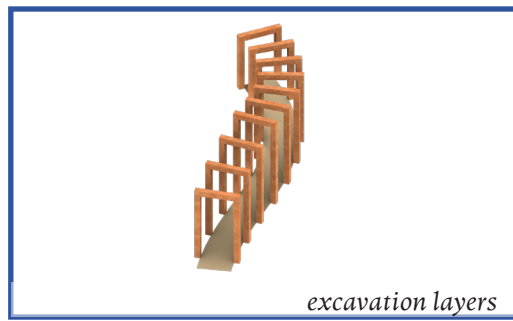
public gathering spaces

structure study

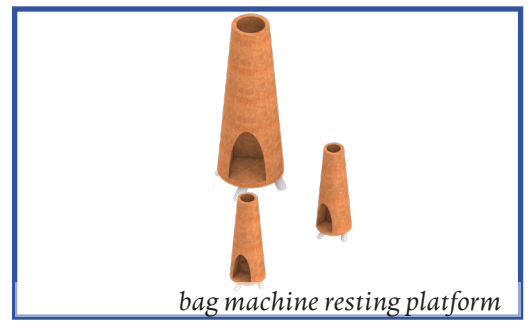
These are six different forms remembrance will take. Landscape rooms, public gathering spaces, motion inhibiting structures, public gathering spaces, wayfinding, structural relics and viewing platforms will all take shape on the landscape. They serve to provide an thumbprint of the history of the site for the visitor as they travel through the site.



linear landscape cut



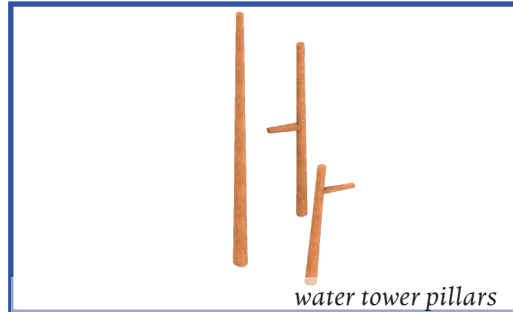
excavation layers



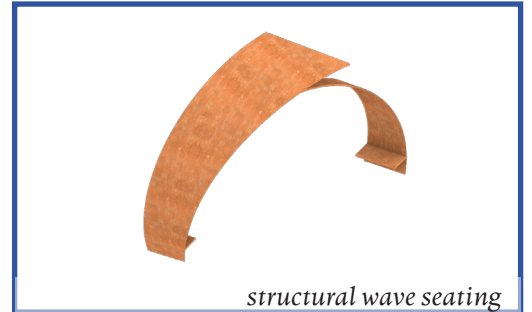
bag machine resting platform



you are here site sections



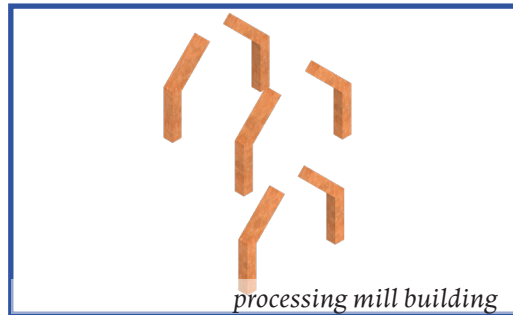
water tower pillars



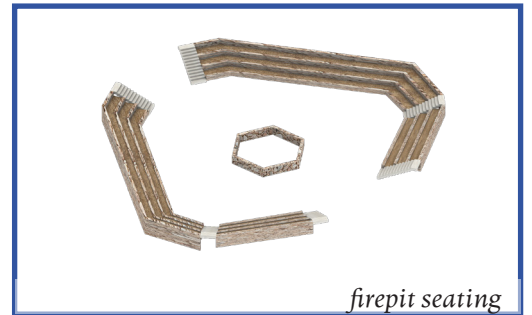
structural wave seating



topographic section posts



processing mill building



firepit seating

wayfinding

structural relics

rest areas

The Tribes of Central Oregon

“The Paiutes lived in southeastern Oregon and spoke a Shoshonean dialect. Their high-plains existence required that they migrate further and more frequently for game, and fish was not an important part of their diet. Although Paiute territories historically included a large area from southeastern Oregon into Nevada, Idaho, and western Utah, the Paiute bands which eventually settled at Warm Springs lived in the area of Lake, Harney, and Malheur counties in Oregon.”

“Traditional ways of life changed greatly after the Wasco and Warm Springs tribes relocated onto the Warm Springs Reservation. They quickly found that their former economic system was no longer workable. In addition, federal policies to assimilate the Indian people forced them to abandon many of their customary ways in favor of modern schools, sawmills, and other infrastructure foreign to the tribes.”

Indigenous Juniper Wood → Industrial Corten Steel

Process the Commodity | Extract the Material | Remove the Overburden

The materials in these structures will be indicators of the era they reference. Cor-ten steel frames on the left reference the industrial era's stages of quarrying of diatomaceous earth. Each pillar will have a moment etched into the material describing the mining process. Wooden posts on the right show the reference to Native Americans who would have placed rocks along a tepee base to hold down the edges of their tents while on their season rounds across the high desert. The suggested text here are direct quotes from Indigenous websites or authors, and the final language should be approved by the tribes.

Campsites will have platforms or huts for campers to sleep halfway through a scenic bikepacking trip from Sisters to Smith Rock or to visit the park from out of town. These forms reference the air filtration machines used in the mine to protect workers. Wayfinding signage on the right is brought to the landscape through mixed materials of wood and steel to orient the visitor and to show the trail alignment. These forms are impressions of the topography of the spoils piles and the trail alignment is cut through the forms to give the viewer a sense of direction.

Welcome to the Campsite.



For years industrial practices were conducted on this site, and engineered forms like air filtration machines were to protect workers who were processing the naturally occurring diatomaceous earth. Now these forms are replicated into sleeping platforms as a part of a campsite to help protect campers from the elements of the high desert.



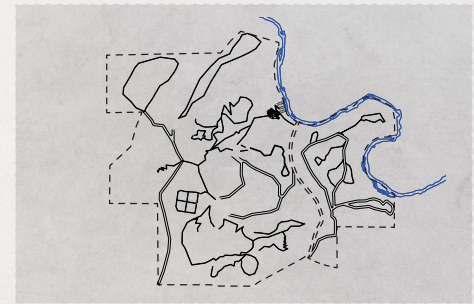
Indigenous



Industrial

Juniper Wood

Corten Steel

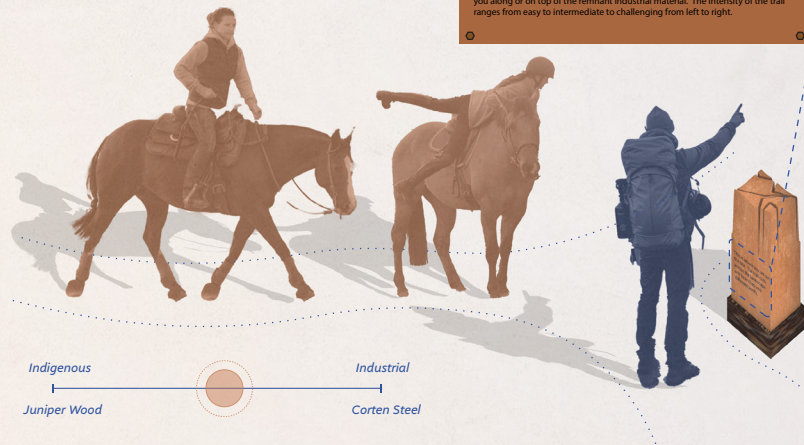


You are Here.



All three trail alignments bring you to a destination with a scenic view of the Deschutes River.

The alignment of the trail circumnavigates the base of the spoil pile and guides you along or on top of the remnant industrial material. The intensity of the trail ranges from easy to intermediate to challenging from left to right.



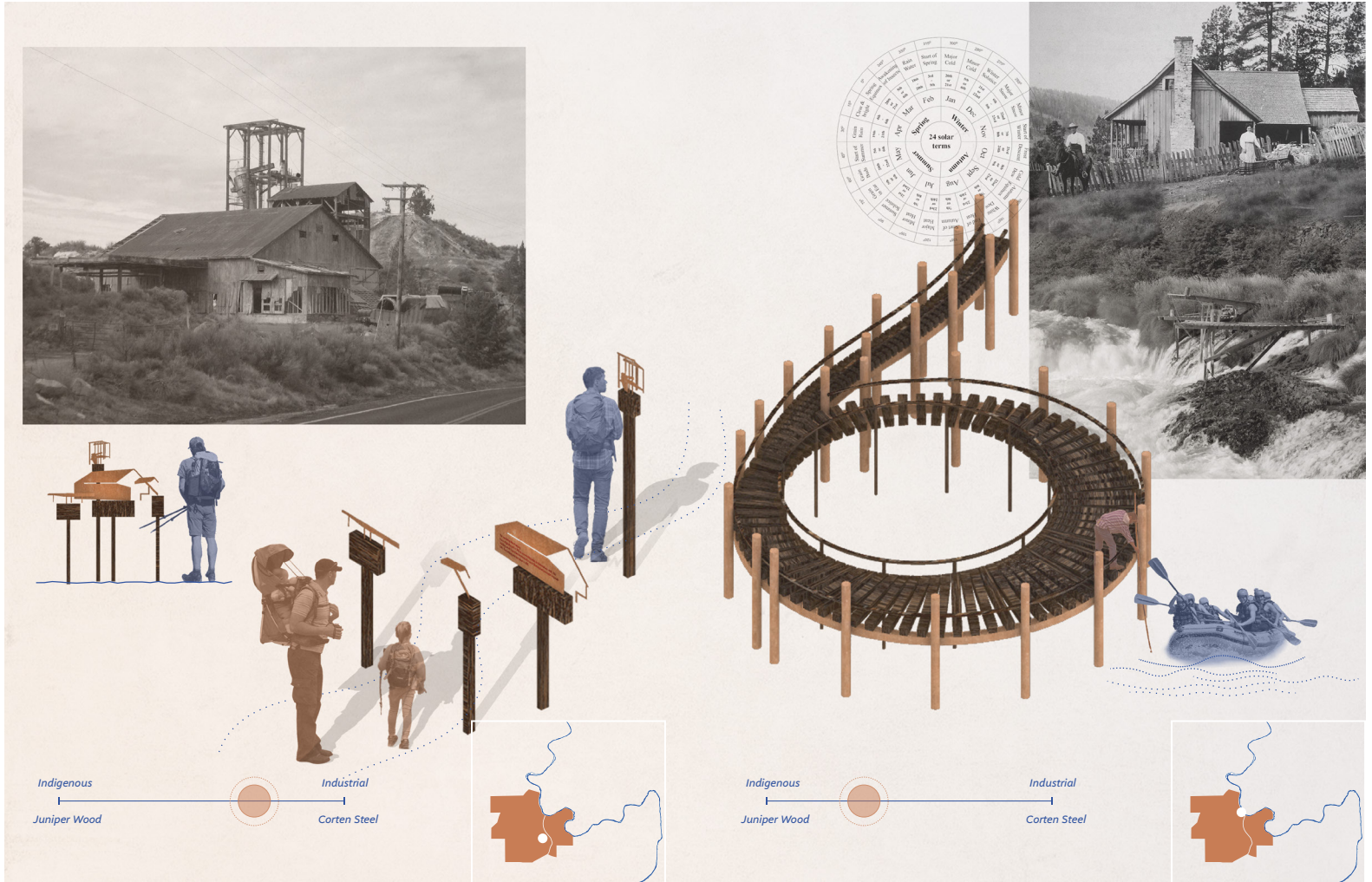
Indigenous



Industrial

Juniper Wood

Corten Steel



wayfinding through forgotten forms + a season's cycle

These two forms are placed at specific locations on site as they are dependent on landscape features or culturally significant forms that would have had a location on the site.

Impression signage shows the outline of the old mill through optical illusion placement. These signs are a mix of cut cor-ten steel sheets and wooden posts, indicating the significance of the building through the industrial and contemporary era. Viewers would have to stand along the path to see the true alignment of the mill building.

A fishing platform made from mixed materials of wood and steel reference the cycles of the agricultural calendar during the homesteading era. This structure also promotes the Indigenous practice of dip netting in the Deschutes River. Recreationists will take advantage of this platform to access the river with boats, rafts or kayaks.

Community gathering spaces within the eastern parcel camping area encourage conversation and provide a central location for placekeeping practices to develop. The crescent berms create patches of a second successional stage of sagebrush communities to flourish. The trail winds through the fields of sage filled berms to encourage monitoring practices. Wooden posts delineate a transitional space into a loop trail, giving the user a moment of cultural reflection and a reprieve from communal gathering for reflection.





As a reflection of a community that truly values access to nature and the benefits it provides as well as a rich history and pride in the labor force of the landscape, it is imperative that we remember the history that happened here. Signage and interpretive sculptures will become beacons of remembrance across the landscape. They invite the visitor to reflect, stop or react to a piece of the site's history. Placekeeping practices are more than just a framework for design intent. It is a practice in which community is a part of the whole lifespan of the project. These signage pieces will be that physical representation in the landscape. In placemaking, spaces should be redefined as opportunities for the

future of a community. The community gathering spaces, including the trail system, seating areas, and overlooks are ways in which placemaking practices can occur not in a physical form but in the relationships that are built on the site.

The overlook crosses the on-contour swale and provides the viewer with a scenic view of the entry to the park with a sign that shows the previous footprint of the mill building. The overlook circles around the previous place of the water tower re-imagined as corten steel posts to provide the viewer with context.

opportunities for viewshed reflection

Finally, retention basins are placed within the ravines as the trail switch backs along the spoils piles. Wayfinding signage and remembrance structures create a sense of place for the rider. The trail is an advanced alignment for a mountain biker to have fun as they navigate the steep slopes or for a hiker to take on the challenge of the spoils pile. A landscape room is situated at the top of the spoil pile, providing the viewer with a moment of historical reflection and a transition before the intended viewpoint.

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trails carving through moments of the landscape

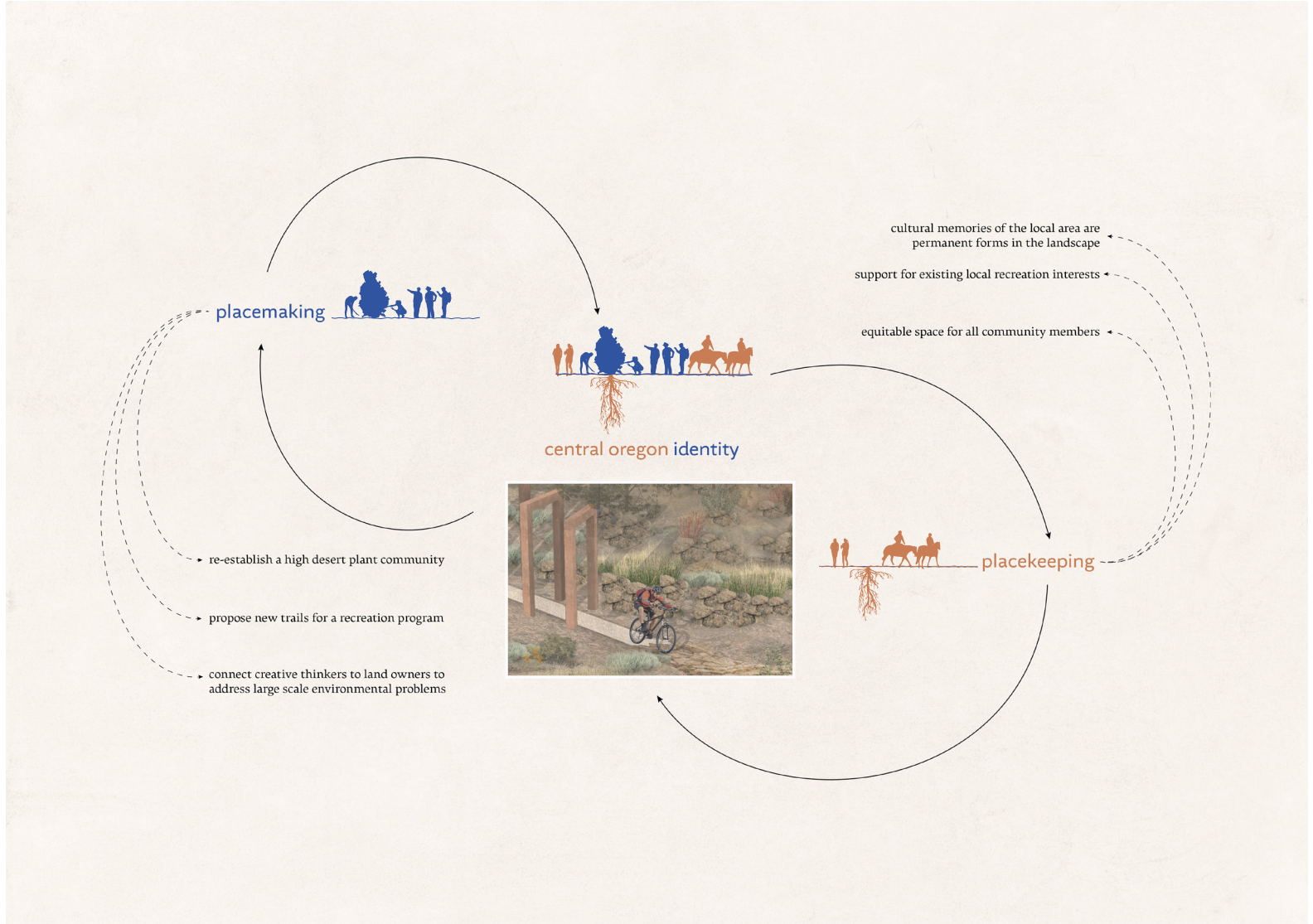
remembrance

The trail switch backs up a steep section of trail to a viewpoint. The landscape interventions are retaining soils and moisture to sustain a thriving high desert plant community. A wayfinding sign is an icon to navigate the trail system.



By using placekeeping guidelines to design a space with the participation and acknowledgement of contemporary values of the Central Oregon community, the cultural context of the site will be remembered. Placemaking practices allow the re-establishment of the high desert plant community and a new recreation program. This project is a practice in blending the methodology of placemaking and placekeeping within an adaptive reuse project. These practices are crucial because each site is unique, the context is important, and there is no one size fits all for mined landscapes. There are thousands of sites scattered amongst rural communities that should be reclaimed and could be revitalized and restored to support a recreation program. Central Oregon is a growing vibrant community that prioritizes its opportunities to recreate and enjoy nature. This

proposal encompasses the need to remediate mine sites while exploring the possibilities of what those clean ups could become.



Adaptive Reuse:

within the field of design, it is the term that is used when an existing structure is taken and adapted for a new purpose. Within the landscape, an ever-evolving moving target, within seasonality, vegetation growth and regression, adaptive reuse is seen when existing forms, structures, activities or cultural practices are conducted within the same space.

Reclamation:

the period of time in which adverse environmental effects of surface mining are minimized and mined lands are returned to an acceptable state

Remediation:

the removal, reduction or naturalization of substances, wastes or hazardous material from a site to prevent or minimize any adverse effects on the environment now or into the future. These interventions may look like soil stabilization, revegetation, and/or decontamination.

Remembrance:

after the remediation of a brownfield site it is important to remember the history of the site, and the destruction an industrial process can do to the landscape. In this project the signage will be the reminder for future communities.

Restoration:

restoration is the process of ecological re-establishment of a location returning to a naturalistic habitat

Diatomite/Diatomaceous Earth:

Diatomite is a siliceous sedimentary rock composed mainly of the fossilized skeletal remains of diatoms, which are single-celled organisms related to algae.

Spoils:

excavated material from the mining process that consists of topsoil or non-pure material (unusable in the mining practice or maybe not worth the effort to clean) that are temporarily stored in piles during the excavation process. Modern mining practices do not leave the spoils piles and regrade the site to

Placekeeping:

the active care and maintenance of a place and its social fabric by the people who live and work there. It is not just preserve [spaces] but keeping the cultural memories associated with a locale alive, while supporting the ability of local people to maintain their way of life as they chose.

Placemaking:

a process of community development that leverages outside public, private and nonprofit funding to strategically shape and change the physical and social

character of a neighborhood using arts and cultural activities

Brownfield:

a site that has been detrimentally altered by industrial practices. Specifically in this project the process of strip mining and toxic waste storage are the two big factors impacting the site

High Desert:

the high desert is a landscape that is above 3,000 feet in elevation but receives less than 10 inches of average rainfall. The high desert is unlike many other deserts in that it can receive snow in the winter and spring.

Pluvial Lake:

a basin that fills up with rain water, and stays there due to low temperature and lack of evaporation or transpiration

Cryptobiotic soil:

incredibly important for the high desert to retain its “health”, these are living soils, kind of the way the semi-arid climate’s top soils are held together without blowing away, often described as a top layer of crust it is crucially important for retaining soil moisture, nutrients and carbon sequestration

Dirt:

dirt is material made from clay, sand and silt and does not contain live organic matter

Rural character:

the feeling of an expansive space predominately natural or the large land areas absent of built structures including residential housing, industrial buildings or commercial spaces

Private Land:

private land refers to land that is owned by an individual or a private entity, as opposed to being owned by the government or being part of the public domain. Private land in a rural setting may include farmland, ranches, forested areas, and other types of rural properties that are used for a variety of purposes, such as agriculture, livestock raising, recreation, or simply as a private residence

Public Land:

public land refers to land that is owned by the government or other public entities and is typically open for use by the general public. Examples include national parks and forests, wildlife refuges, or public roads and highways.

Cox, Thomas R. *The Other Oregon: People, Environment, and History East of the Cascades*. Corvallis, OR: Oregon State University Press, 2019.

Deschutes County. “Terrebonne Community Plan Comprehensive Plan Update,” 2030 2010.

Gooden, Jennifer, and Richard Pritzlaff. “Dryland Watershed Restoration With Rock Detention Structures: A Nature-Based Solution to Mitigate Drought, Erosion, Flooding, and Atmospheric Carbon.” *Frontiers in Environmental Science* 9 (November 4, 2021): 679189. <https://doi.org/10.3389/fenvs.2021.679189>.

James G. Wright. *Risks and Rewards of Brownfield Redevelopment*. Lincoln Institute of Land Policy, 1997.

Kathryn Anne Toepel, William F. Willingham, and Rick Minor. *Cultural Resource Overview of BLM Lands in North-Central Oregon: Archeology, Ethnography, History*. University of Oregon Anthropological Papers, n.d.

Moore, Bernard. *Nonmetallic Mineral Resources of Eastern Oregon*, 1937.

Native Land Digital Canadian Non-Profit. “Native Land Digital.” *Native-Land.ca*. Accessed April 25, 2024. <https://native-land.ca/>.

Norman, Laura M., and Rewati Niraula. “Model Analysis of Check Dam Impacts on Long-Term Sediment and Water Budgets in Southeast Arizona, USA.” *Ecohydrology & Hydrobiology* 16, no. 3 (August 2016): 125–37. <https://doi.org/10.1016/j.ecohyd.2015.12.001>.

“Oregon Health Authority : Lower Bridge Mine : Environmental Health Assessment : State of Oregon.” Accessed December 5, 2023. <https://www.oregon.gov/oha/ph/healthyenvironments/trackingassessment/environmentalhealthassessment/pages/lbmsite.aspx>.

Parks, California State. “California State Parks.” *CA State Parks*. Accessed May 5, 2024. <https://www.parks.ca.gov/>.

references

- “Pleistocene Pluvial Lakes.” Accessed April 19, 2024. <https://www.oregonencyclopedia.org/articles/pleistocene-pluvial-lakes/>.
- Ramsey, Jarold. *New Era: Reflections on the Human and Natural History of Central Oregon*. 1st ed. Corvallis: Oregon State University Press, 2003.
- Ronald J. Taylor. *Sagebrush Country: A Wildflower Sanctuary*. Mountain Press Publishing Company, 1992.
- Sam Chamberlain. “Phytostabilization of Abandoned Diatomite Mine Sites in Terrebone, OR Utilizing *Purshia Tridentata* and Soil Amendments.” Reed College, 2008.
- “Smith Rock State Park.” Accessed December 5, 2023. https://www.oregonencyclopedia.org/articles/smith_rock_state_park/.
- “Surface Mining Control and Reclamation Act - Energy and Minerals Management (U.S. National Park Service).” Accessed December 5, 2023. <https://www.nps.gov/subjects/energyminerals/smcra.htm>.
- Wewa, Wilson. *Legends of the Northern Paiute: As Told by Wilson Wewa*. Corvallis: Oregon State University Press, 2017.
- Yeomans, Ken B., and P. A. Yeomans. *Water for Every Farm: Yeomans Keyline Plan*. Southport, Qld: Keyline Designs, 2002.

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data sources

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| Deschutes County Data Portal | USGS Geological Survey |
| Deschutes County Dial | USGS Soils Survey |
| ESRI ArcGIS Hub | United States Census Bureau |
| Oregon Geohub | |
| Mapbox Movement Data | |
| Native Land Digital Platform | |

