

**THESIS TITLE:
REFORESTING FORT ORD**

**A Thesis Submitted to the Department of Landscape Architecture,
Harvard University Graduate School of Design**

by

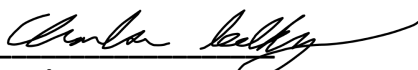
SLIDE KELLY

In Partial Fulfillment of the Requirements for the Degree of

MASTER IN LANDSCAPE ARCHITECTURE

May 2024

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Thesis Advisor



reforesting
fort ord

A DESIGN THESIS BY

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MASTER IN LANDSCAPE ARCHITECTURE
& MASTER IN DESIGN STUDIES, RISK &
RESILIENCE, CLASS OF 2024
HARVARD GRADUATE SCHOOL OF DESIGN



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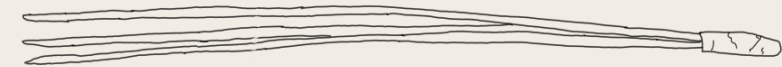
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AT HARVARD UNIVERSITY

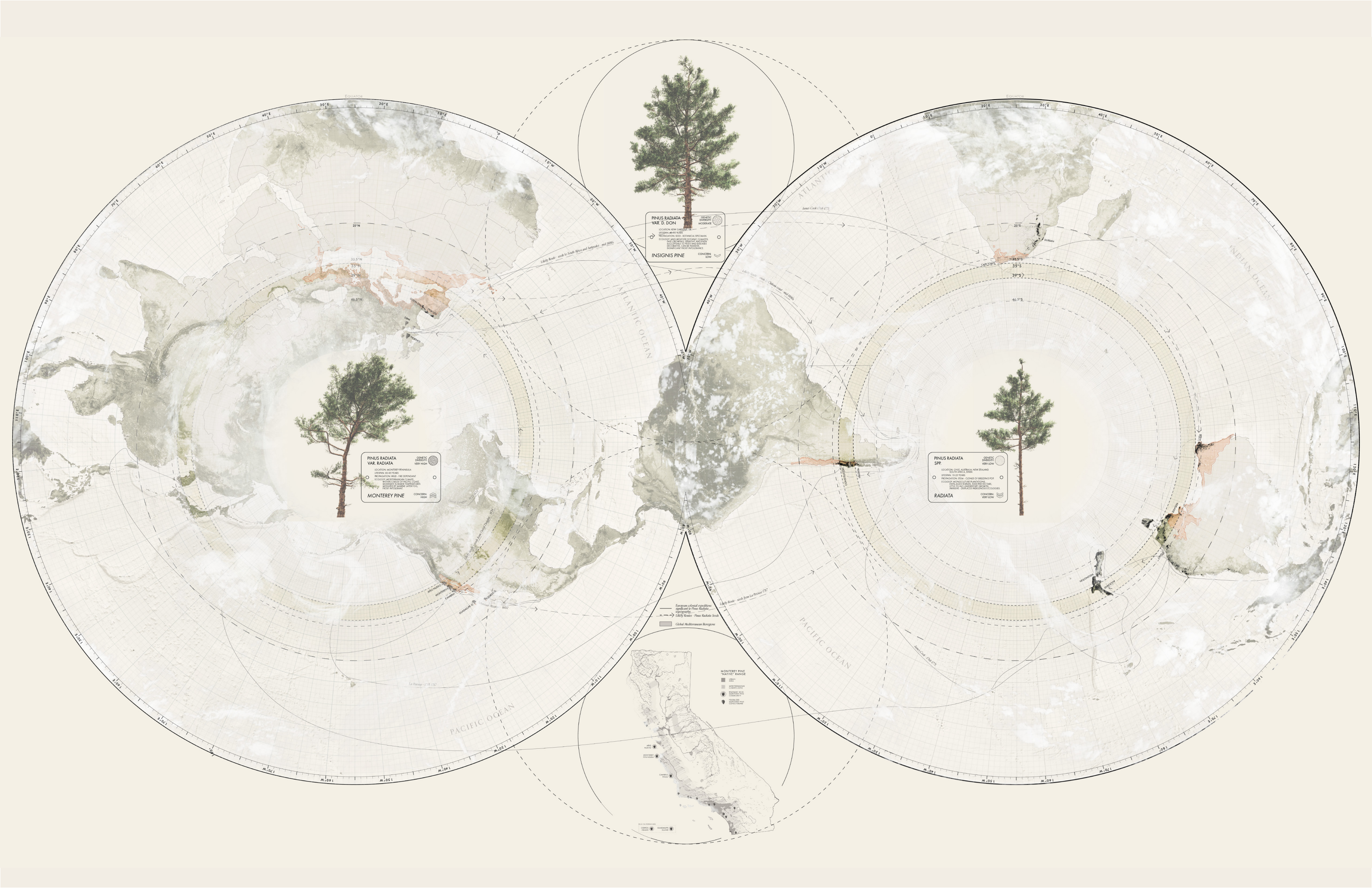
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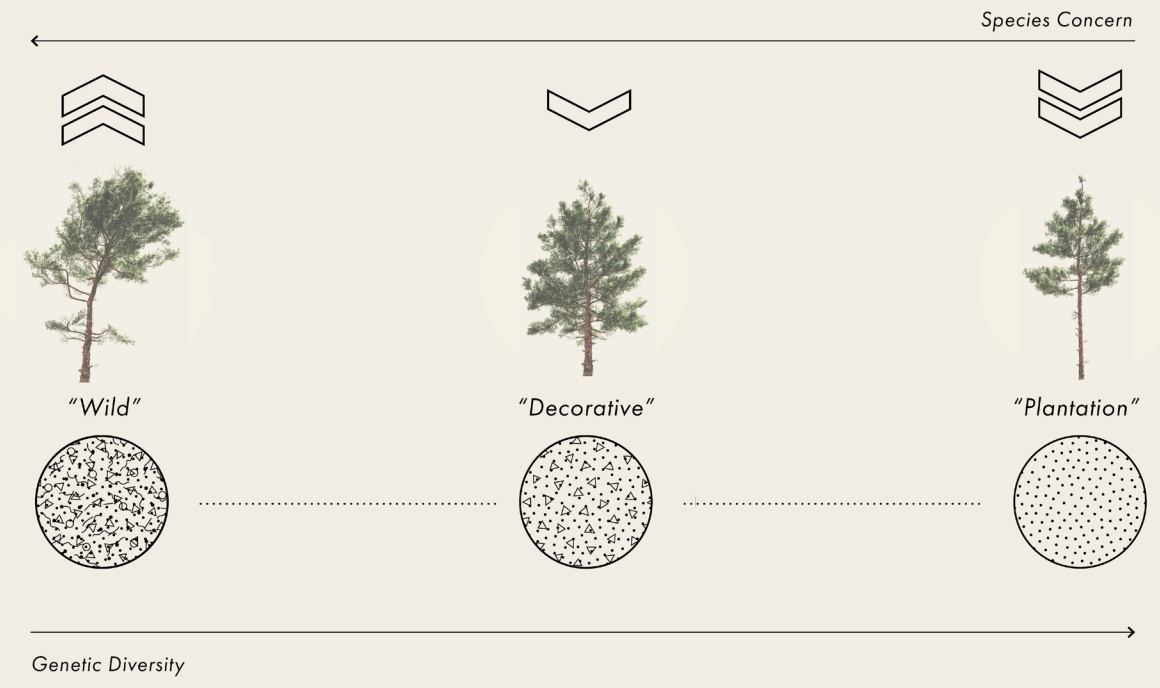
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This thesis examines the potential for the conservation of Monterey pine biodiversity through the active planting of an experimental forest in the Impact Area of Fort Ord: a former US military firing range soon to become part of a national monument. It confronts the delicate balance between passive ecosystem restoration and destructive total-remediation of compromised landscapes. Through choreographing munitions disposal with planting and tactical access to establish a human-assisted forest, the thesis challenges the colonial freeze-frame of what species can be "native" and where. In doing so, it provides a framework for re-connecting communities to locked-up public lands, and envisions how experimental forests, designed landscapes, and collaborative management can cultivate identity and social investment in a newly designated urban national monument. Here is a place once forbidden to people and to pines, where finally there is a possibility for more than preservation.



06	MONTEREY PINE
10	FORT ORD
18	REMEDICATION
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Monterey pine. When it was first encountered by Europeans on colonial expeditions, it grew in five distinct stands on the Pacific Coast of North America. Similar for their Mediterranean climate (an imported name) and cool summer fog, but diverse in every other way.

Cones from the stand on Monterey Bay (another imported name) were taken as specimens to Northern Europe in the 1830's where they were dubbed insignis pine, cataloged by the Linnean society under a different name, and grown as botanical experiments that mostly failed with damp, frost, and low northern light.

In short time, settlers carried cones on the Clipper routes to territories in the southern hemisphere. Plantation trials on stolen land exposed the species' latitudinal sweet spot – a mirror inverse of their northern range. *Pinus radiata* – as it is now mostly known – today is the most cultivated commercial timber species in the world, covering 9 million acres of land. 90% in the Southern Hemisphere, where it is has displaced indigenous ecologies and is a target of global forest carbon markets.

The biogeographical journey has morphed the species such that it no longer resembles itself, or is perhaps multiple different species. The plantations are the genetic equivalent of yellow corn – extremely low diversity, susceptible to threats, and incompatible with local ecologies. Decorative varieties that grow in the gardens of less ideal climates are charismatic but little better.

While the "wild" stands in the five remnant groves are of unknown genetic significance and considered "critically imperiled" due to the warming of their native range.

And what is considered the native range of Monterey Pine? The five populations that existed when Europeans first encountered the Pacific Coast. However, fossils have been found across Mediterranean California, indicating that the species has always occurred in small, disjunct communities that have regularly shifted in response to fluctuating climates.

Losing any of the remaining five groves would amount to a huge loss in biodiversity of the species, yet Monterey Pine, grown in backyards and on highway off-ramps, is considered invasive anywhere else on this map. Expanding conservation outside of simple preservation of these five groves could provide opportunities for adaptation through genetic recombination, divergence, and site selection. And challenge the colonial freeze-frame of what species can be "native" and where.

Trees, like humans, depend on migration to adapt. But, also like humans, there is little space available within the thin hem of the California coast. Land is intensively developed, intensively cultivated, or intensively preserved – pickled to protect the endemic biodiversity that changes every few miles, or locked away to protect human residents from the collateral of extractive or sacrificial uses.



Here was a place with suitable conditions for the trees, where they had finally arrived.

zach stgeorge - the tree thats rare, endangered, and common.

Standing at the edge of such a place, on the outside sidewalk of Gen. Jim Moore Blvd, 3 miles from the nearest "native" forest of the Monterey Peninsula, can be seen a cluster of pines behind a line of barbed-wire.



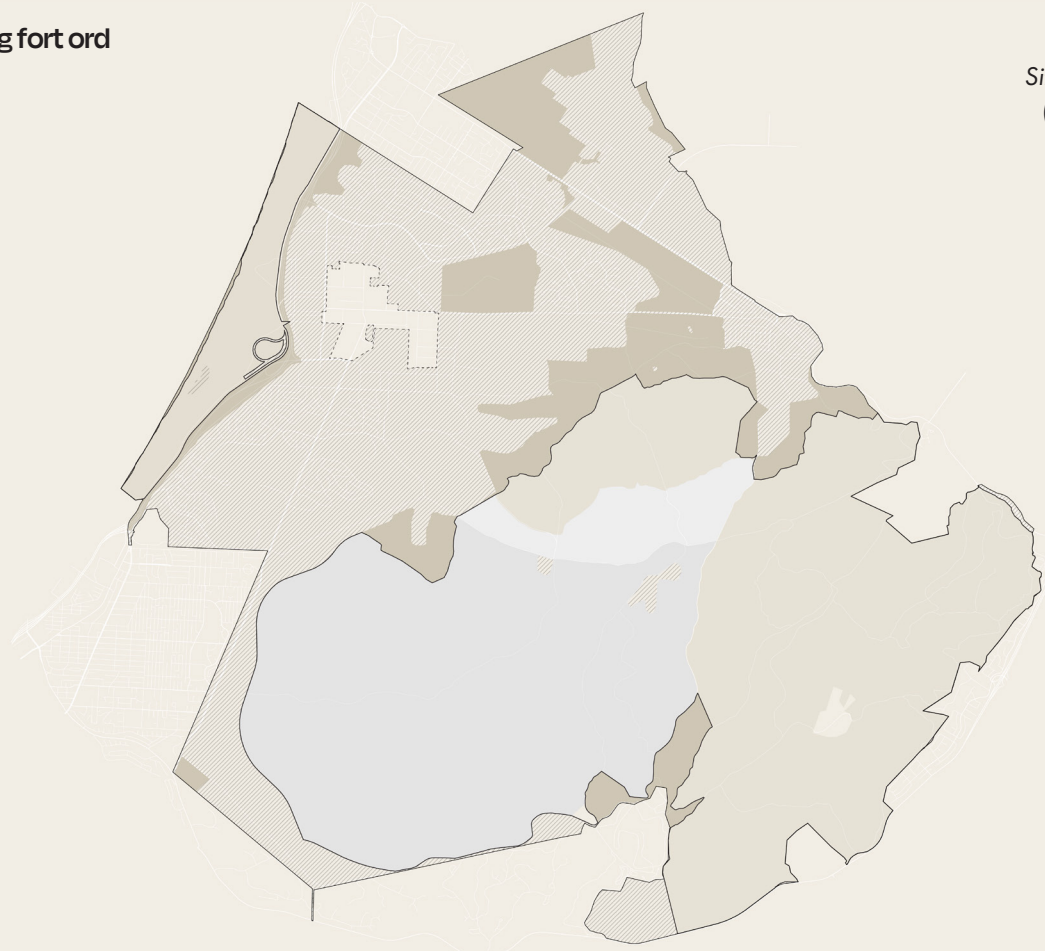
Archival postcards from Fort Ord, 1950s-1990s (various sources).



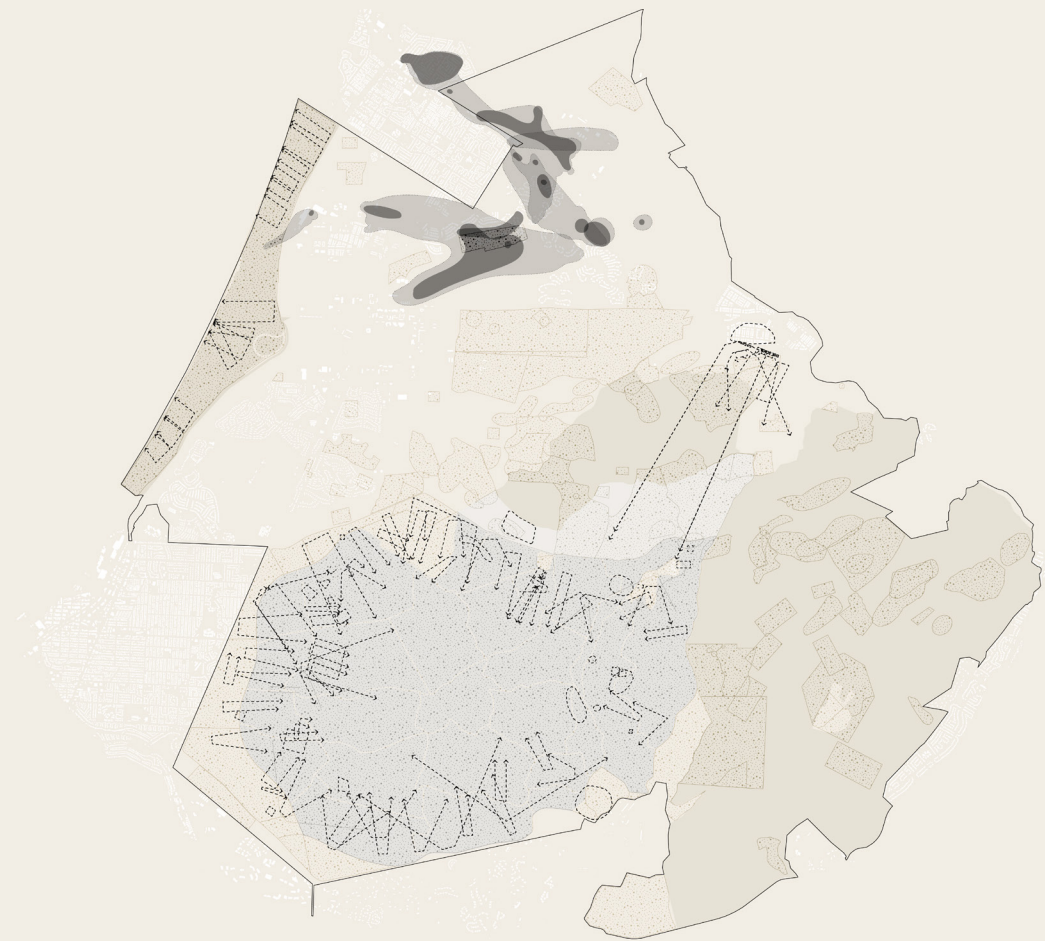
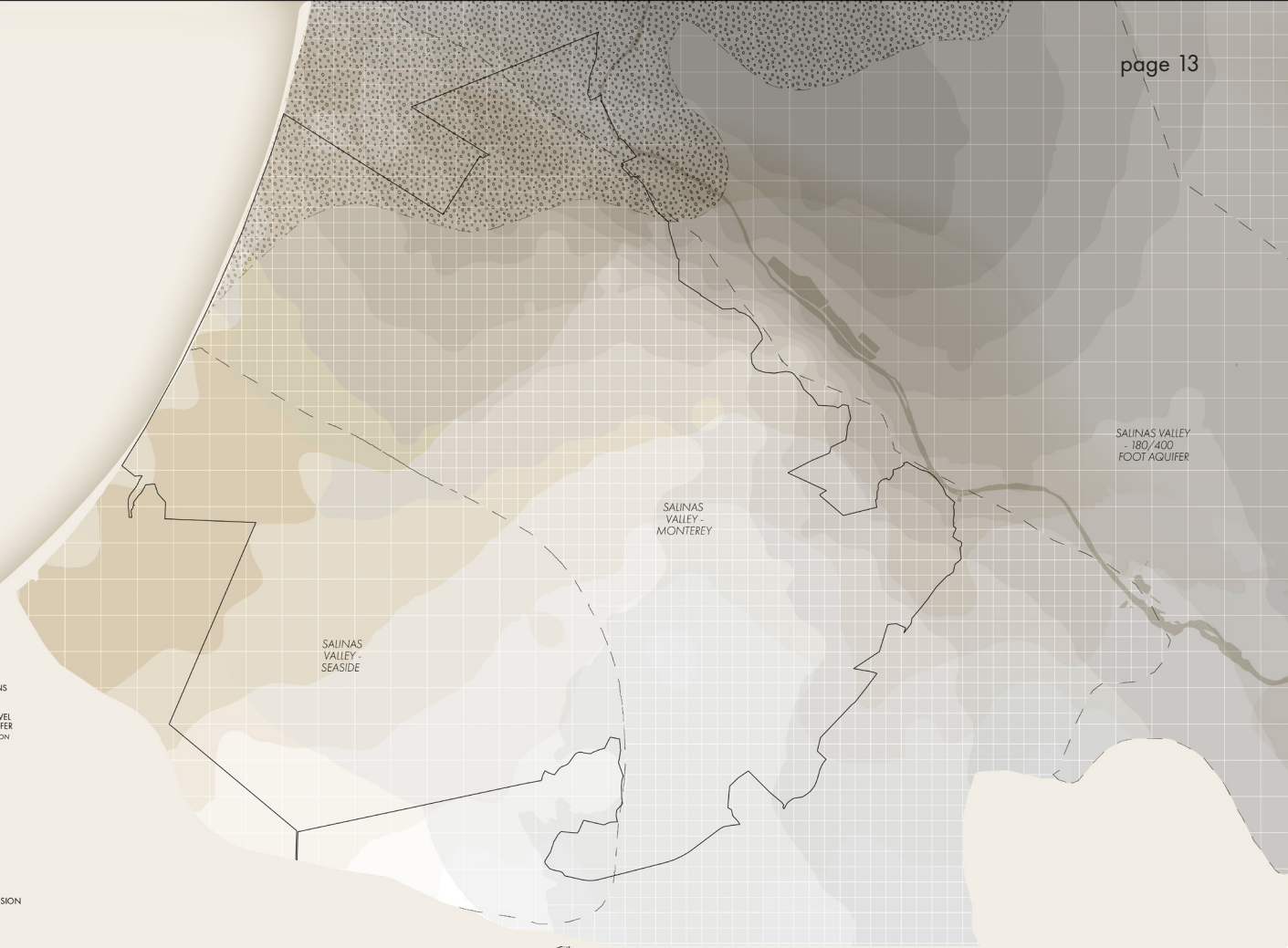
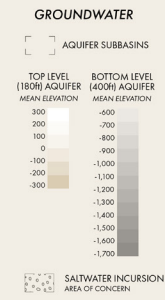
This is Fort Ord. Founded in 1917 on roughly 28,000 acres of land, it was an idyllic assignment for US Army-recruits until 1997, when it was decommissioned. The Fort Ord Reuse Authority managed its transition, enabling residential development and the founding of California State University-Monterey Bay with portions set aside for conservation and recreation. It is surrounded cities together totaling a quarter of a million people, with 86 miles of trail on the north and west sides already well loved by the community.

80 years of military use left Fort Ord a severely compromised site. Plumes of forever chemicals in the north impact the city of Marina's drinking water, and unexploded army munitions remain a hazard, particularly at the intersection of former test firing ranges.

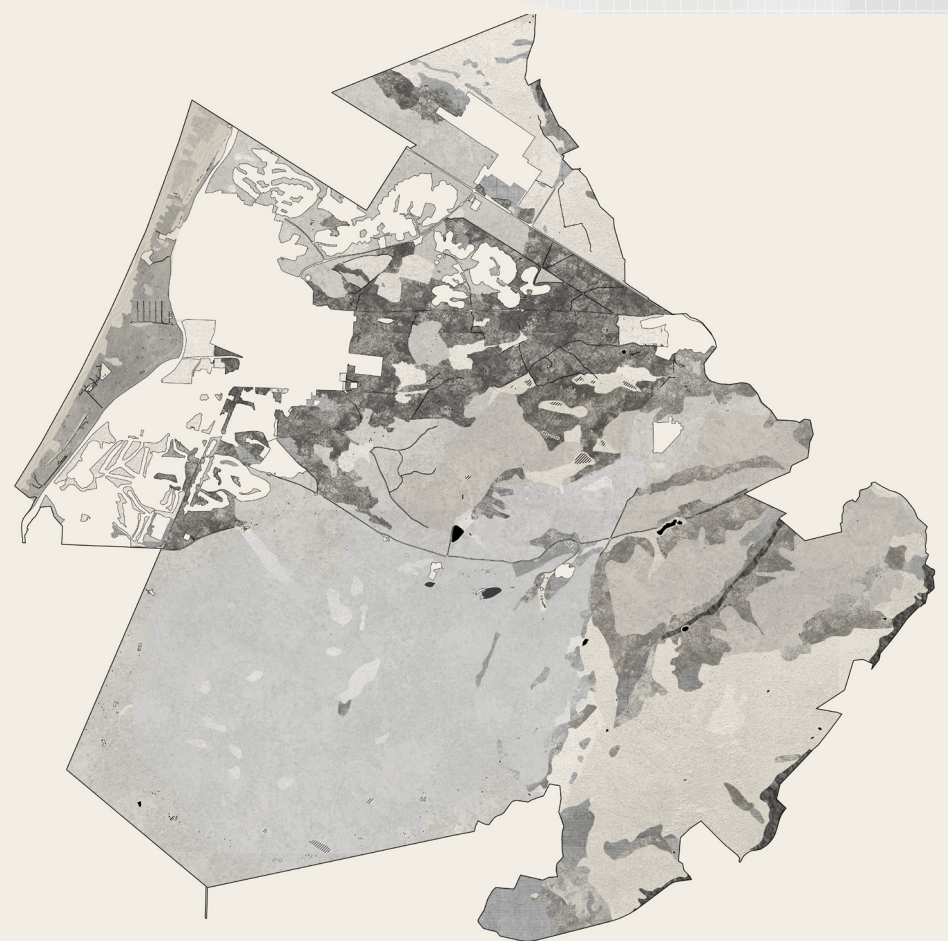
Site analysis maps, detailing (clockwise): Groundwater, Vegetation, Military Use Hazards, and Land Status.



- LAND STATUS**
- CONSERVATION LAND MONUMENT OR STATE PARK
 - OTHER HABITAT CONSERVATION
 - US ARMY MONUMENT LAND LIMITED PUBLIC ACCESS
 - US ARMY MONUMENT LAND IMPACT AREA - RESTRICTED ACCESS
 - PRIVATE DEVELOPMENT
 - UNIVERSITY - CSUMB



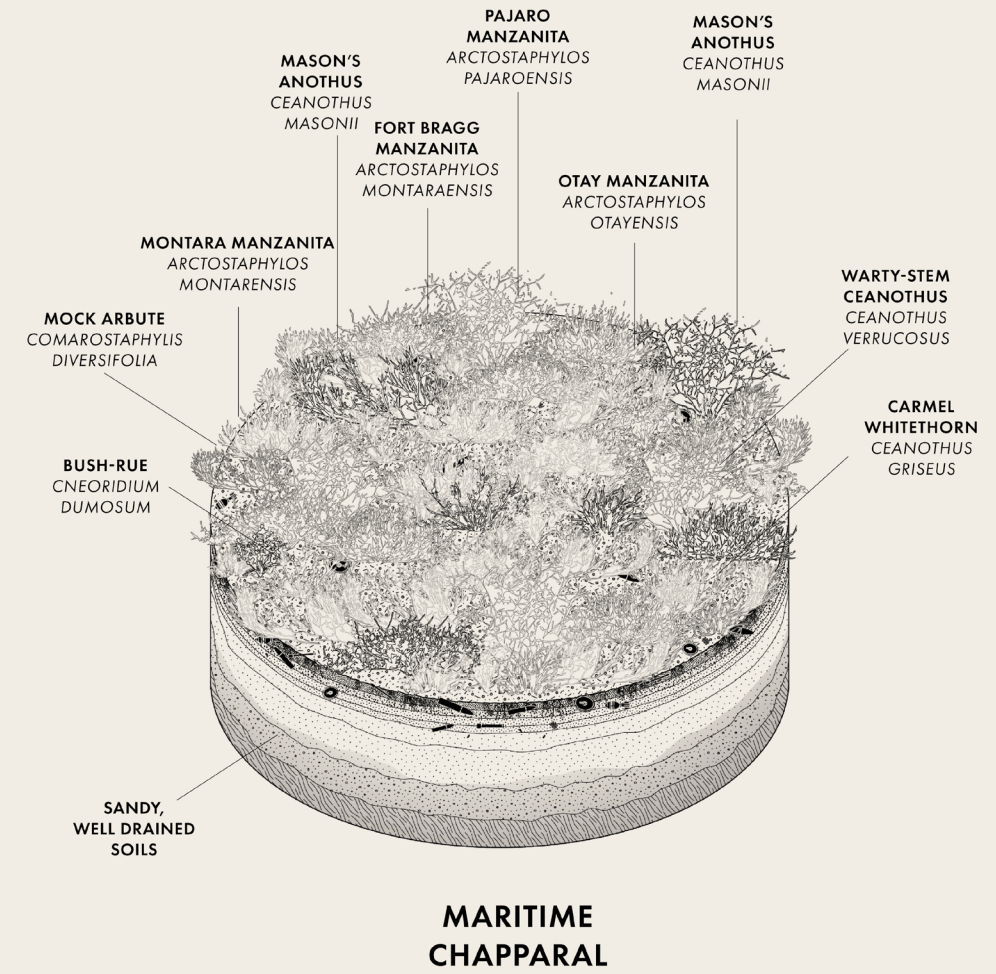
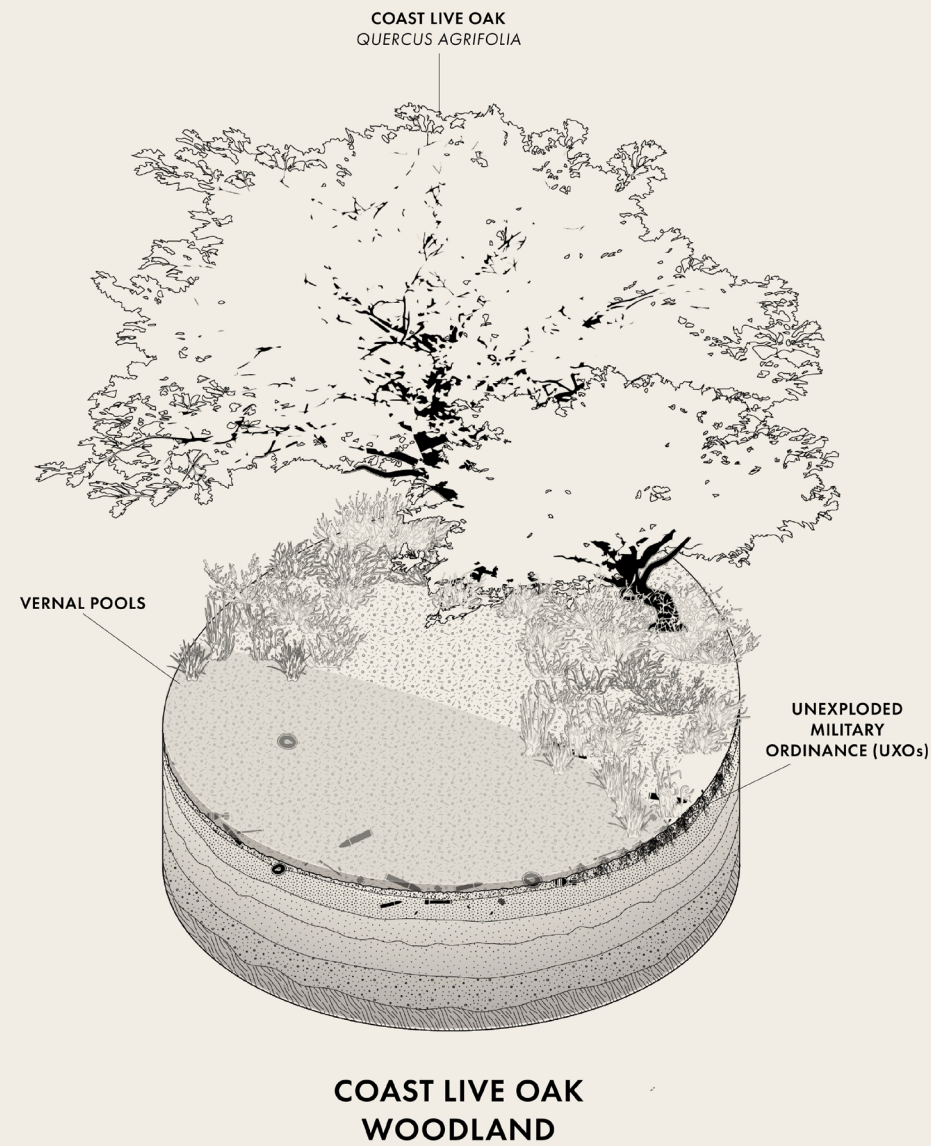
- MILITARY USE HAZARDS**
- GROUNDWATER CONTAMINATION
- CURRENT CHEMICAL PLUMES
 - HISTORIC PLUME EXTENTS
- UNEXPLODED ORDNANCE
- HAZARD AREAS
 - HISTORIC FIRING RANGES



- VEGETATION**
- MARITIME CHAPARRAL
 - COASTAL LIVE OAK WOODLAND (DENSE)
 - COASTAL LIVE OAK WOODLAND (OPEN/SPARSE OR SAVANNAH)
 - GRASSLAND
 - RIPIARIAN
 - DUNE ICE PLANTS
 - SAND
 - POND/WETLANDS
 - VERNAL POOLS
 - DEVELOPED



Images of ecosystem types taken onsite at Fort Ord during site visit.

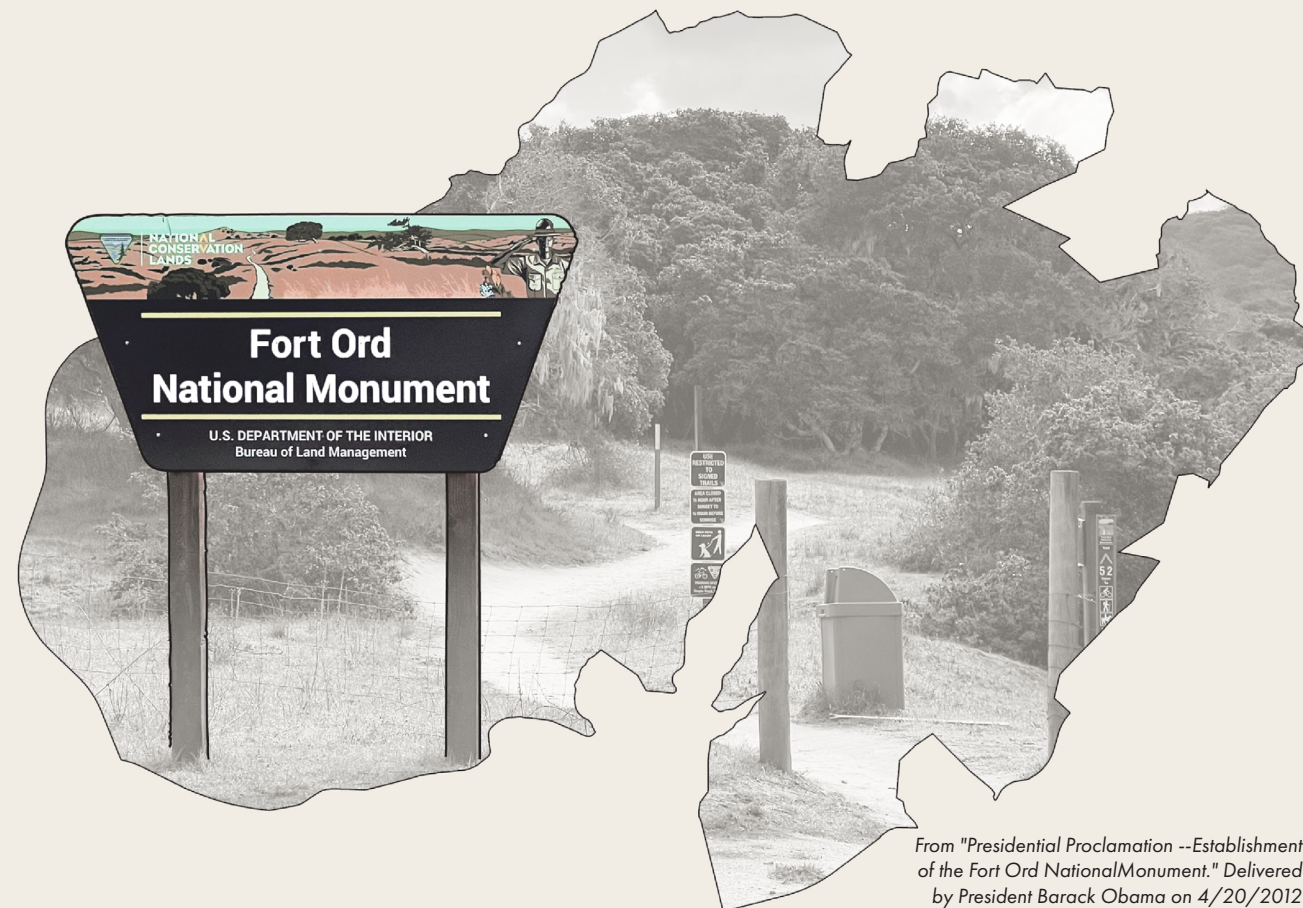


Yet, after thirty years of unuse, it has become a wild refuge, a contiguous habitat for birds, invertebrates, and mammals, primarily covered by coast live oak woodland and maritime chaparral.

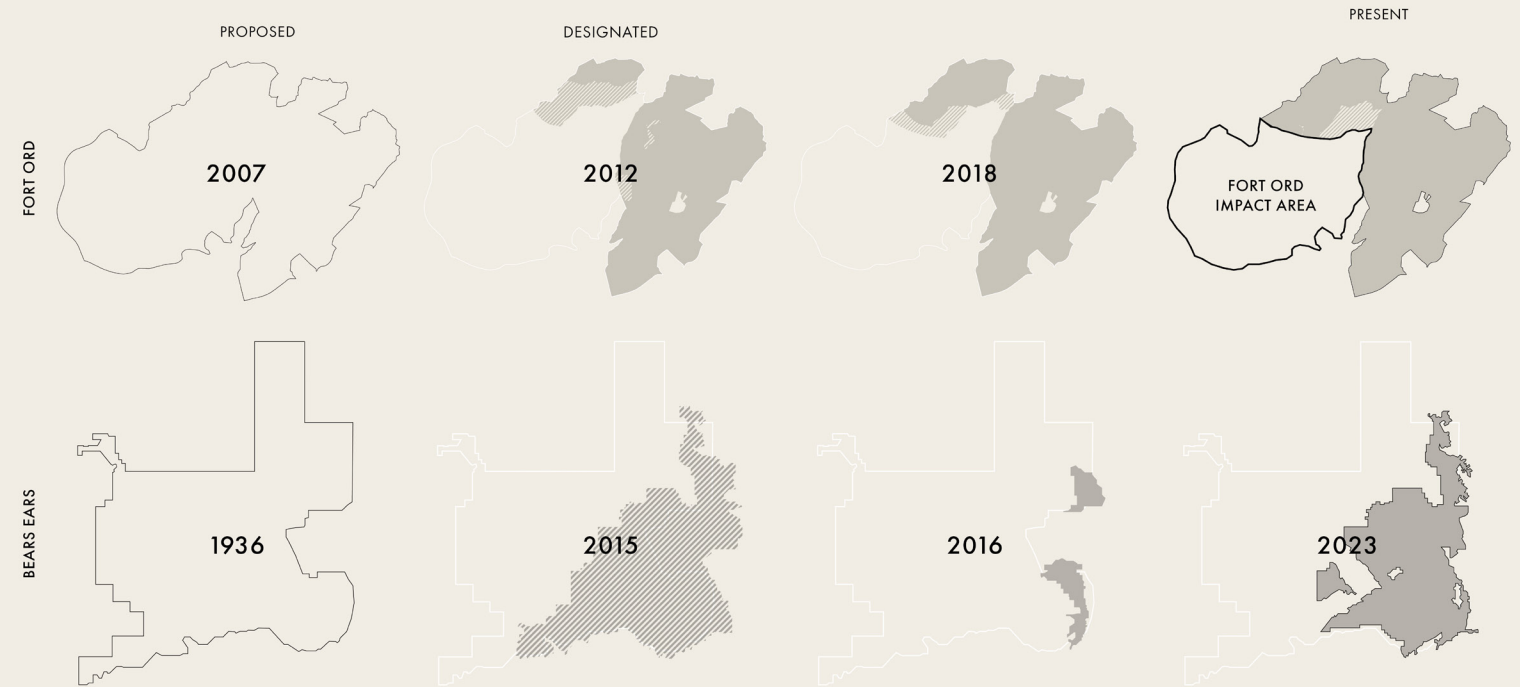
Maritime chaparral is a dense, highly diverse plant community of manzanita, laurel, and grasses - at least 20 of which are endangered and endemic to Fort Ord alone. It coexists oak woodland, and nearby Monterey pine forests.

“One of the few remaining expanses of large, contiguous open space in the increasingly developed Monterey Bay area, this area is a rolling landscape long treasured for recreation, scientific research, outdoor education, and historical significance.”

“WHEREAS it is in the public interest to reserve such lands as a national monument...”



From "Presidential Proclamation --Establishment of the Fort Ord National Monument." Delivered by President Barack Obama on 4/20/2012

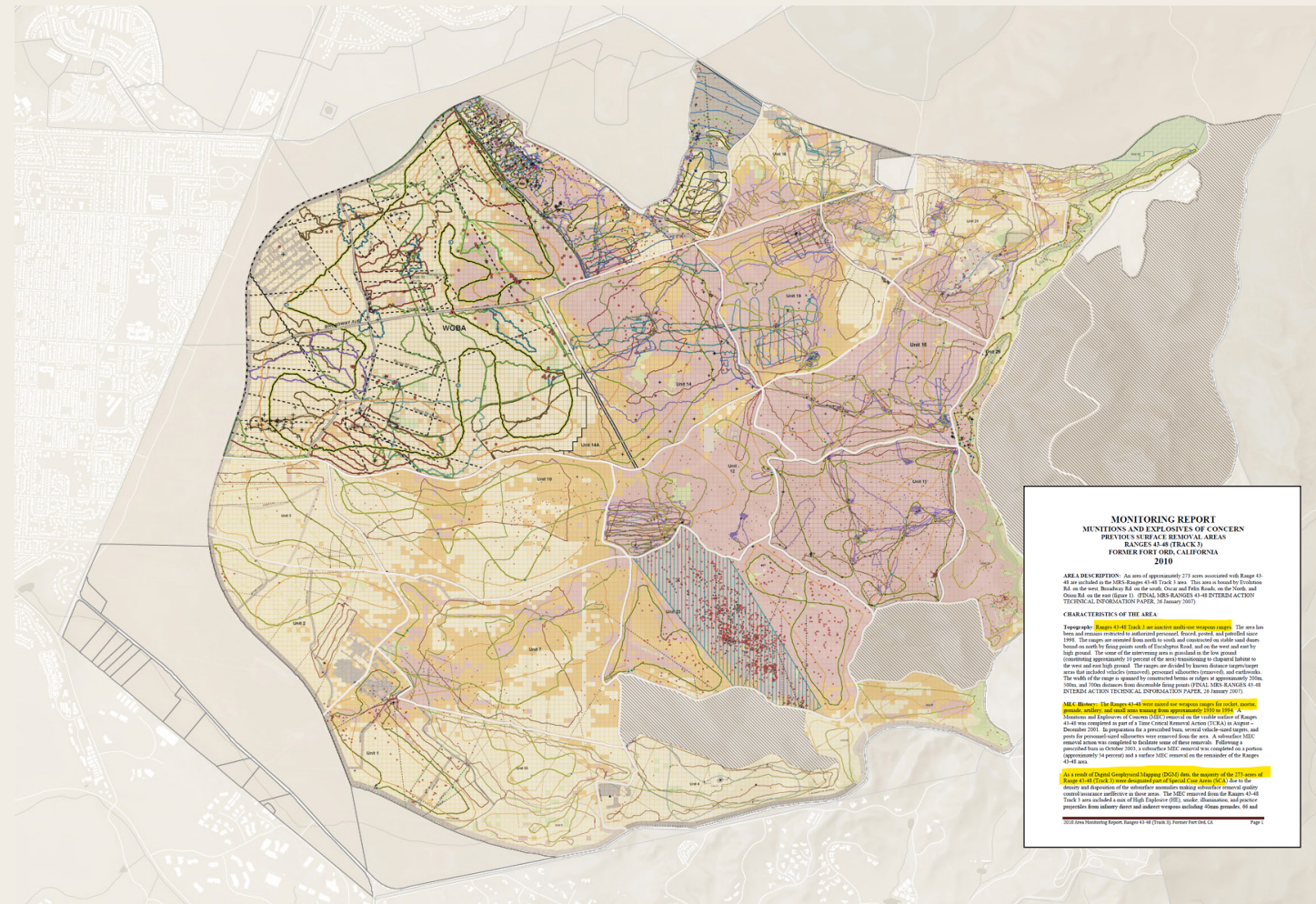


Based on data journalism "What Remains of Bears Ears" in the Washignton Post, 2019.

In 2012, 15,000 acres of Fort Ord were declared a BLM National Monument by President Obama using powers vested by the Antiquities Act.

You're probably familiar with the more famous hits of the Antiquities Act. It was the basis for the US National Parks beginning in 1906, which now totals over 85 million acres. The Bureau of Land Management's National Monument system is newer, a beginning in 1996 when President Clinton used them to underscore non-extractive priorities on BLM lands, now a constellation of 260 million acres – three times the National Parks system. It is also much more susceptible to the changing will of political agencies.

Bears Ears, another BLM monument, is an infamous example of this. Proposed to be three times the size it is today, it was shrunken to 85% of its current size in 2016 to allow for mining and oil extraction. Upon designation of Fort Ord, only 7,200 acres of the 15,000 total were made open to the public. Today, after 12 years, only 800 more acres have been opened. The remainder have been retained by the US Army, to be transferred over to the BLM and become part of the National Monument only after completion of munitions clean up within the so-called Impact Area.

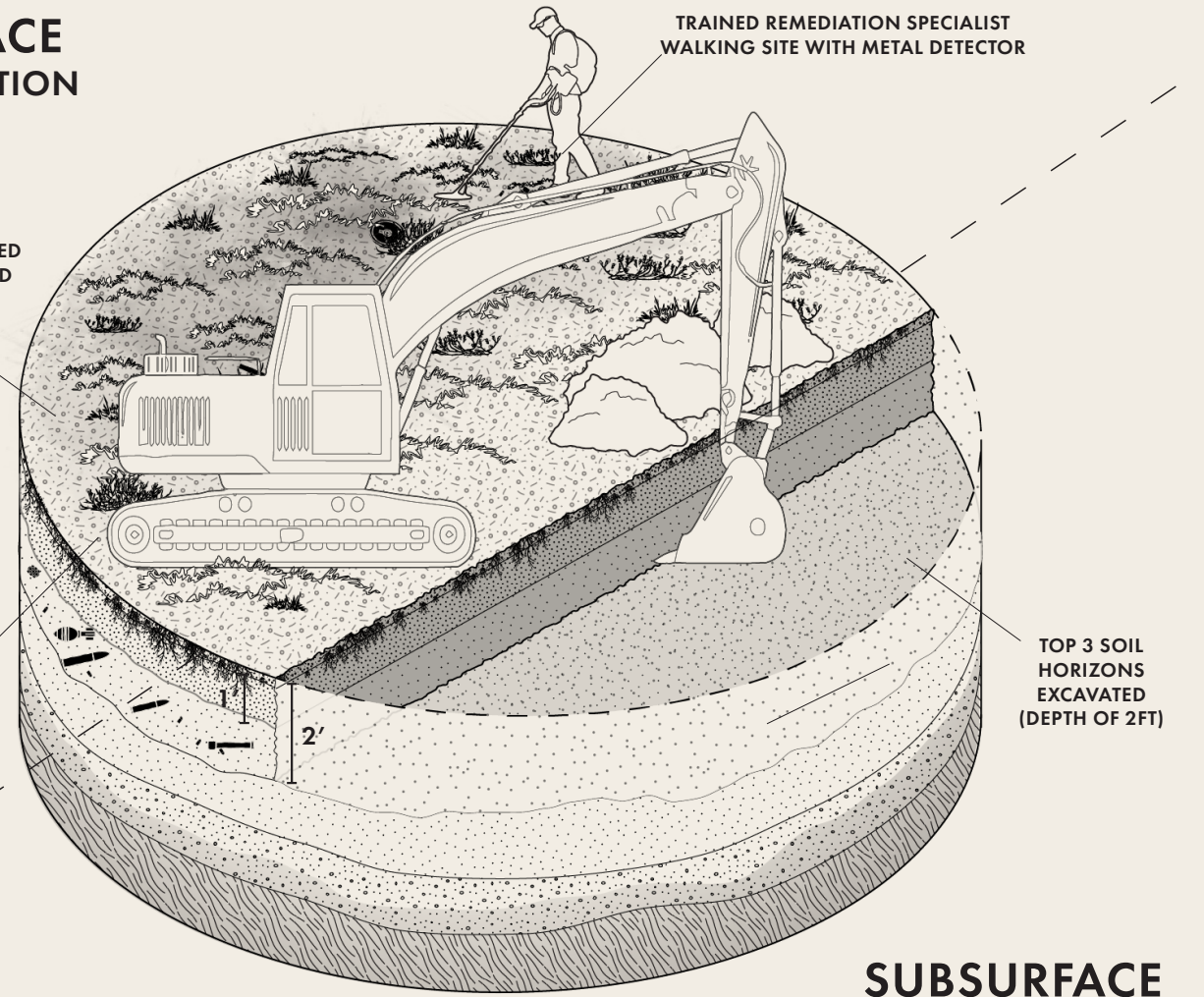


Mosaic DGM MEC report maps and distilled risk assessment classification from Fort Ord Track 3 remediation documents.

SURFACE REMEDIATION

GROUND COVER REDUCED THROUGH CONTROLLED BURNING

EXCAVATORS BROUGHT IN POST-SURFACE REMEDIATION FOR SOIL REMOVAL



SUBSURFACE REMEDIATION

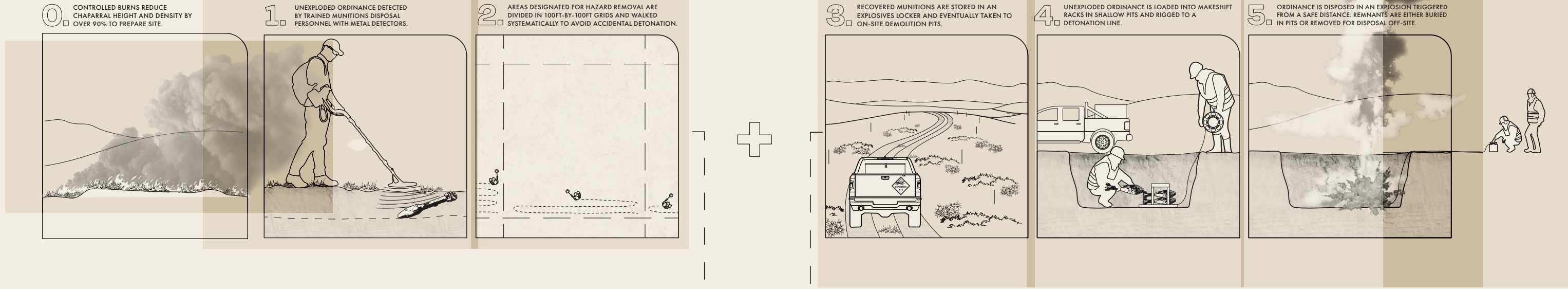
The impact area is 6,800 acres that, since deactivation of the base, have been divided into smaller edge parcels given to adjacent cities to develop mixed use housing, and a larger central parcel currently undergoing Army led remediation.

mapping techniques. Within this mess of detail, are key layers through which to understand the actions currently being taken that will dictate any possible future for the Impact Area.

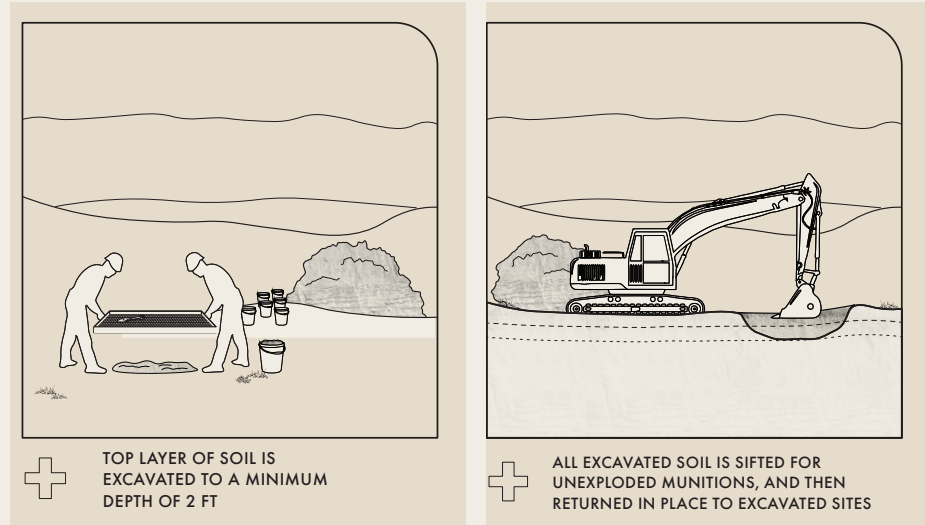
A mosaic of 22 monitoring maps from publicly accessible Munitions and Explosives of Concern reports spanning a 15 year period reveals significant detail to the dynamics of ongoing remediation. It includes site walk paths, recovered surface munitions and remaining subsurface munition densities taken using digital geophysical

The DGM MEC maps segment the Impact Area into 3 levels of risk— low, with 0-450 subsurface munitions per acre, medium, with 450-900, and high-risk with more than 900 detected per acre. The areas in white and the edge parcels have been remediated to clear all munitions, while the remainder of the dotted area has only been cleared of surface munitions.

SURFACE REMEDIATION



SUBSURFACE REMEDIATION



The difference between the surface and subsurface remediation approaches is hugely important in terms of landscape operations.

All remediation begins with controlled burning to reduce chaparral height and density by 90%. Then unexploded ordnance is detected by trained munitions disposal personnel with metal detectors, walking areas divided into 100-by-100ft grids to avoid accidental detonation. Recovered munitions are stored in explosive lockers on-site, and eventually taken to on-site demolition pits, where they are loaded into racks and detonated from a safe distance.

Site remediators deem surface remediation reduces risk from the highest level to a medium level for users with a very light surface impact, such as hikers or habitat monitors, but remains at the highest risk level for any other activity, including any digging, planting, or emergency fire fighting.

Subsurface remediation requires all the actions of surface remediation with a few additional, intrusive steps. After site walks to clear munitions, excavators are brought

in to dig the top layer of soil to a depth of 2ft, and all excavated soil is sifted and the returned in place.

Both techniques together result in risk reduction from highest to lowest levels for any surface use that within the top 2ft of soil, including hiking, biking, foraging, fire fighting, cultural burning, planting, weeding, etc. with risks remaining highest only for intrusion below 2ft.

POST REMEDIATION RISK ASSESSMENT

FROM USACE FORT ORD IMPACT AREA REMEDIAL INVESTIGATION

BEFORE SURFACE REMEDIATION

GRADE: **E** [Progress bar: 100% filled] **HIGHEST RISK**
TO: **ALL USERS**

AFTER SURFACE REMEDIATION

GRADE: **C** [Progress bar: 33% filled] **MEDIUM RISK**
TO: **HIKERS, HABITAT MONITORS**

GRADE: **E** [Progress bar: 100% filled] **HIGHEST RISK**
TO: **ANY ACTIVITY BREAKING GROUND SURFACE, INCLUDING:**

- EMERGENCY WILDLAND FIRE FIGHTING
- PLANTING, WEED CONTROL, OR PLACING STAKES
- CONSTRUCTION OR DIGGING OF ANY KIND

AFTER SURFACE & SUBSURFACE REMEDIATION

GRADE: **A** [Progress bar: 16% filled] **LOWEST RISK**

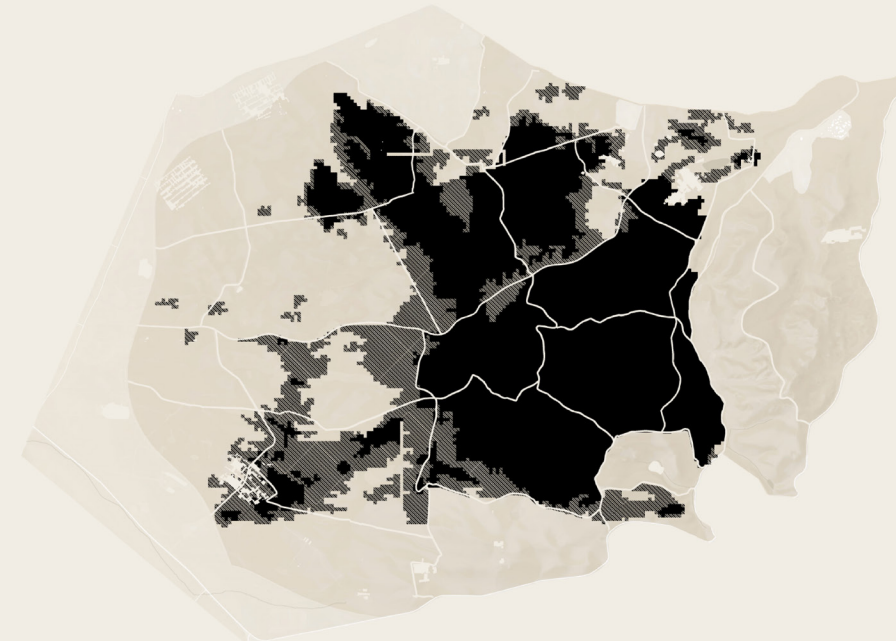
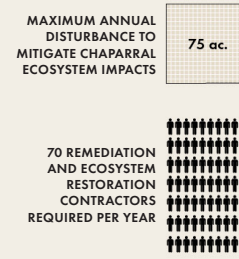
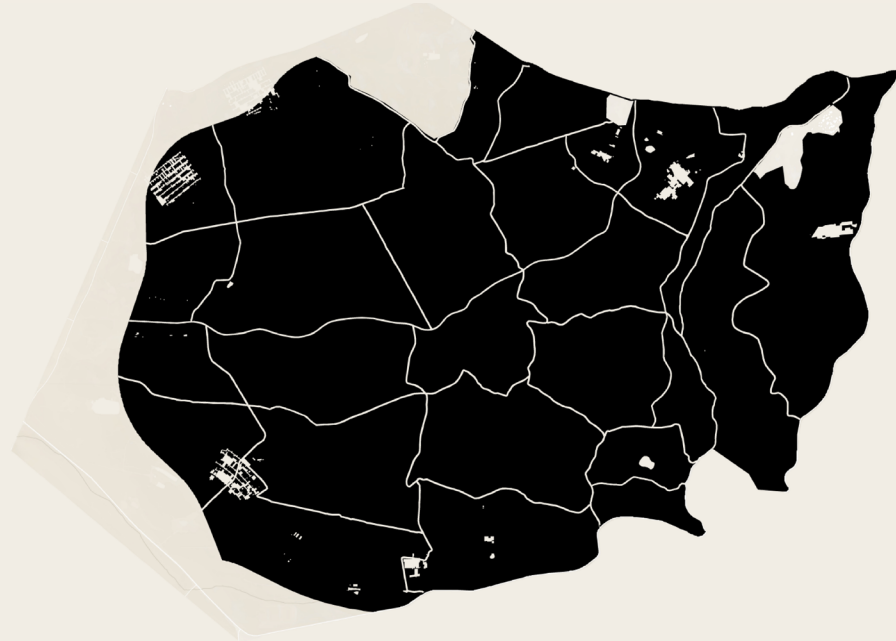
FOR: **ANY SURFACE USE INTRUDING UP TO 2FT, INCLUDING:**

- EMERGENCY WILDLAND FIRE FIGHTING
- PLANTING, WEED CONTROL, OR PLACING STAKES
- HIKING, BIKING, HORSEBACK RIDING, FORAGING, EXPLORING

GRADE: **E** [Progress bar: 100% filled] **HIGHEST RISK**

FOR: **ANYONE DIGGING BELOW 2FT POST REMEDIATION, INCLUDING:**

- DEEP-INTRUDING PLANTING AND HEAVY CONSTRUCTION



(left) A discretisation of munitions risk depending on scenarios of risk acceptability. (above) Time and labor it would take to intensively remediate areas of >900/ac munitions density, accounting for mitigation of chaparral habitat destruction.

The risk reduction achieved by both surface and subsurface remediation is undeniably a preferred state for this land to be left in after over 100 years of military occupation. It is a labor intensive process, but the remediation crews are composed of readily available, trained, and well-paid military contractors. And it is within reason to argue that - despite cost and labor - the US Army should be on the hook for cleaning up this and other lands they have sacrificed to operations of war.

If surface remediation alone is considered enough for access to areas with low densities of munitions, a condition emerges with access decreasing along the three tiers of risk handed down by the contractors' maps.

The reason remediators are not pursuing subsurface approaches for the entire site is that the removal and sifting of 2ft of soil degrades endangered maritime chaparral ecosystems to the point of lobotomization, and severely impacts seed banks' ability to recover from disturbance.

Really, however, these tiers are a discretization of a gradient, and the cutoffs are arbitrary - over 900 could be 901, or it could be 9001. Data on the actual gradient likely exists, but has been obscured to the public in the production of MEC remediation reports.

The status-quo options, then, for what this landscape becomes when is joined with the National Monument depend on what is deemed as acceptable levels of risk.

In any case, what we're likely to get with present remediation is this: off-limits habitat preserves, maybe with travel within fuel breaks, but it would be highly likely that the entire Impact Area will remain closed. Any possibility for a different future for this land starts with a different remediation decision.

If nothing but the lowest possible risk to people is acceptable, we get a binary where travel is restricted to already remediated fuel breaks and select nodes.

Based on the limited information available, performing subsurface remediation on the 900 and above density area would significantly reduce the overall quantity of buried munitions on this site. It would also leave a large portion of the maritime chaparral ecosystem on site intact, balancing conservation goals with wider remediation.

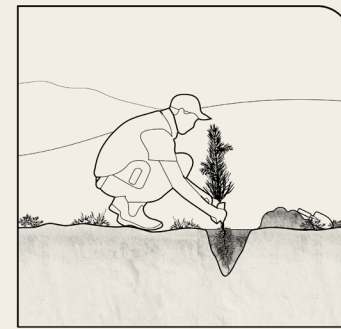




Spatial framework map including 4 major framework elements.

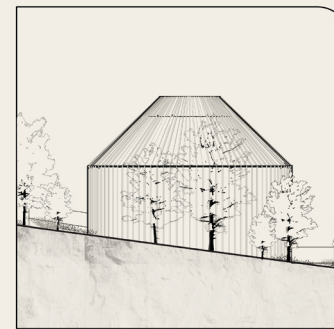
Choosing to intensively remediate this land offers the opportunity to consider a future other than passive restoration and preservation. It allows us to consider how plants and people long restricted from this place could be allowed to arrive, in the planting of an ex-situ conservation forest of Monterey Pine, a network of stations to care for the forest and investigate its adaptation, a vision for compelling ways of getting across this landscape when restricted to fuel breaks, and a re-imagined edge between city, national monument, and forest.

PLANTING



MORE-THAN-NATIVE RESTORATION

FIELD STATIONS



CROSS-SITE CARE AND INQUIRY

TRAVEL



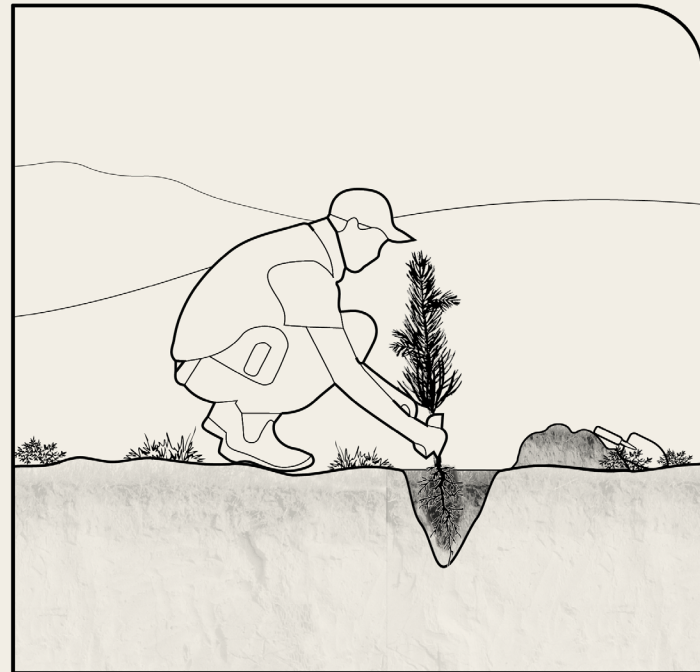
COMPELLING FUEL BREAKS WITHIN PARTIALLY OFF-LIMITS LAND

SEASIDE PORTAL



POROUS ACCESS TO AN URBAN NATIONAL MONUMENT

PLANTING



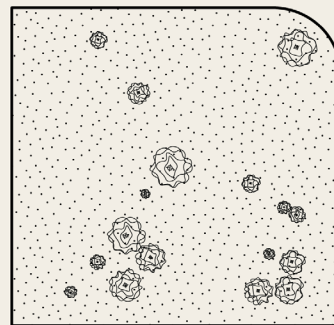
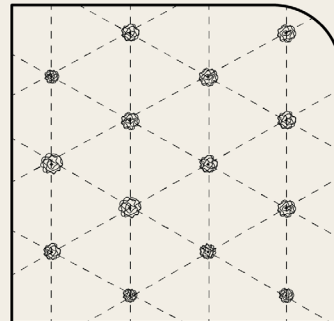
MORE-THAN-NATIVE RESTORATION

Considering this alternative future starts with understanding where the trees might reasonably grow.

Monterey pines thrive in well-drained soils of slight to moderate slopes between 4% and 15%. They can handle a range of topographic conditions, but do best on protected slopes on neither ridgelines or in depressions, which at Fort Ord are dominated by ecologically-vibrant vernal pools.

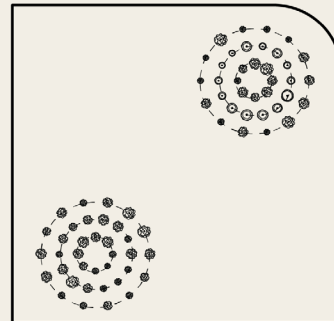
Using a slope and topographic analysis, the 100x100ft munitions monitoring grids within the expanded high-risk

INTENSIVE EXPERIMENTAL PLOTS



PASSIVE SEED BANK STIMULATION

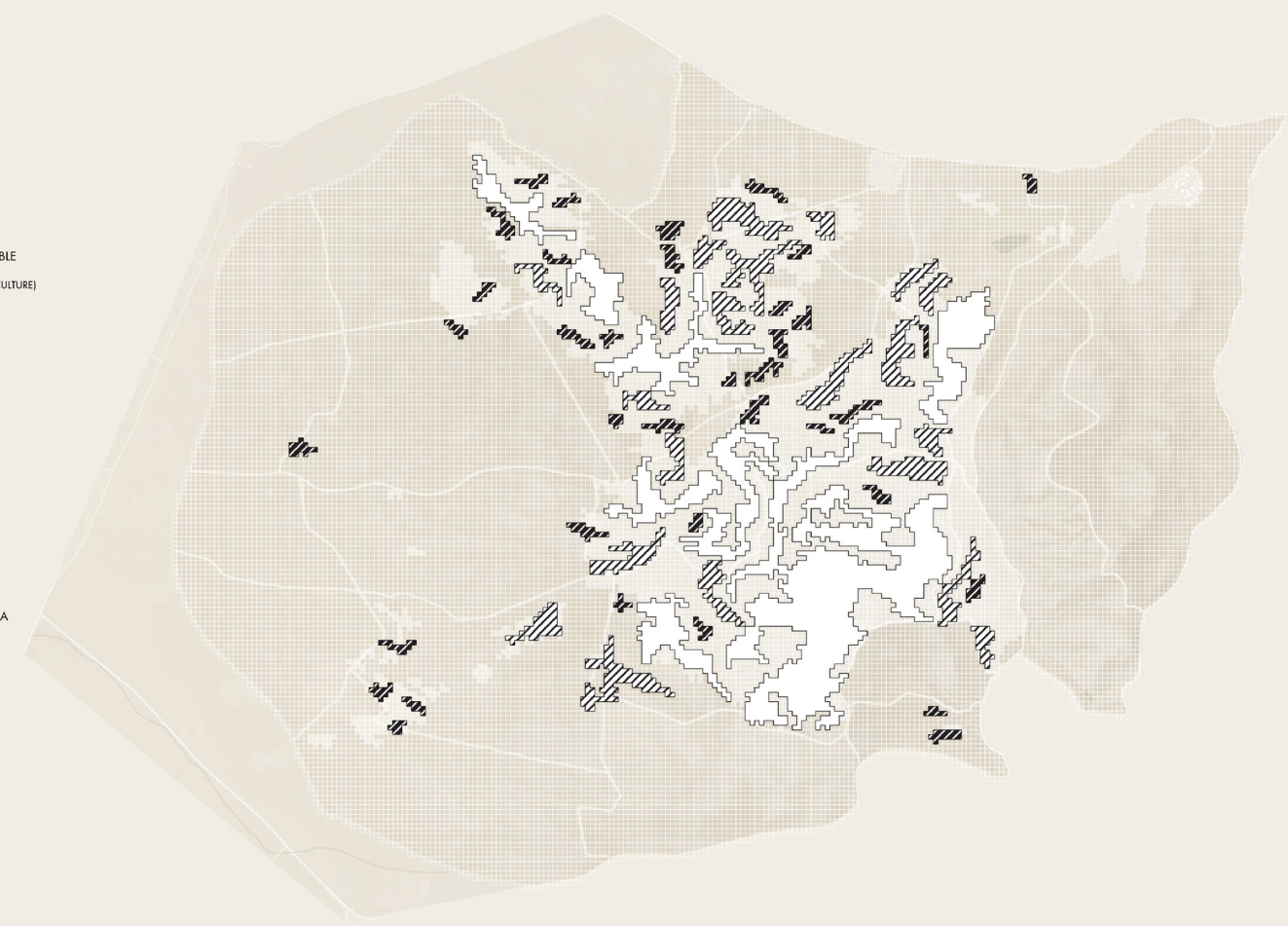
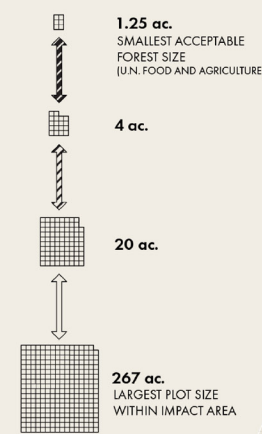
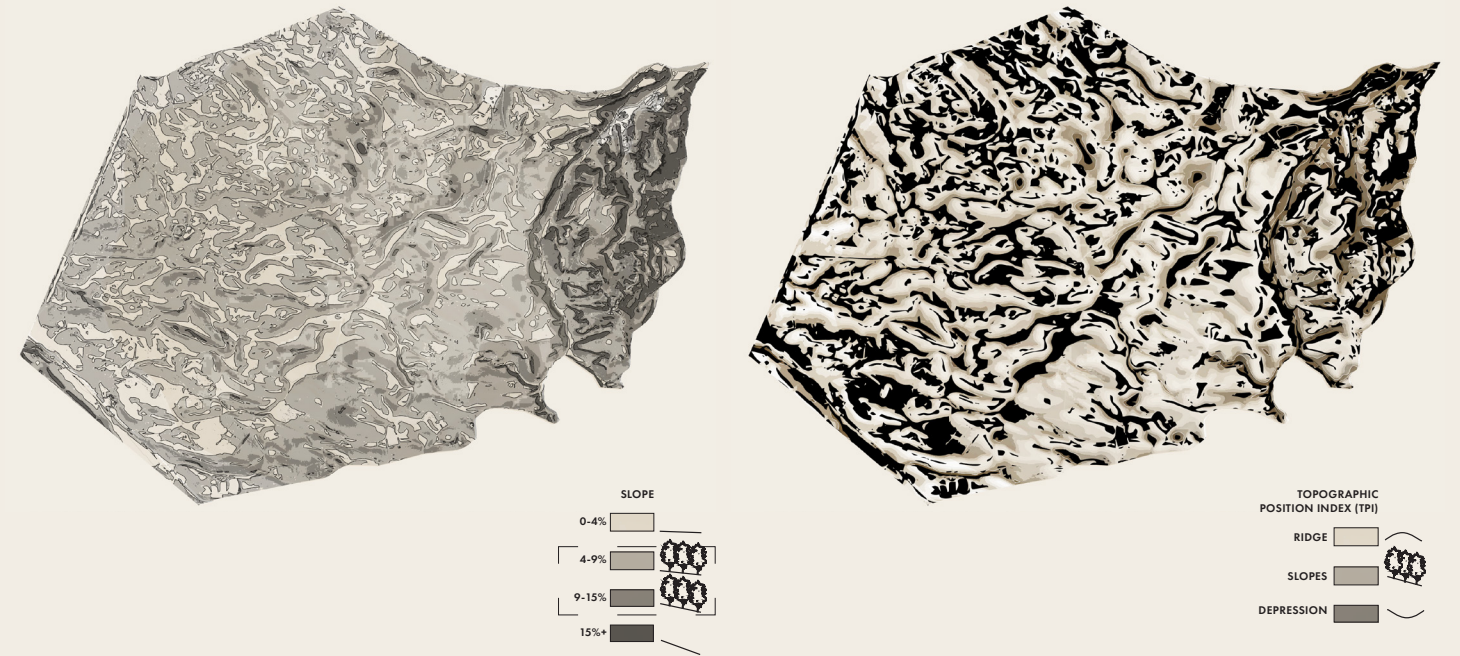
EXTENSIVE CLUSTER NULEATION

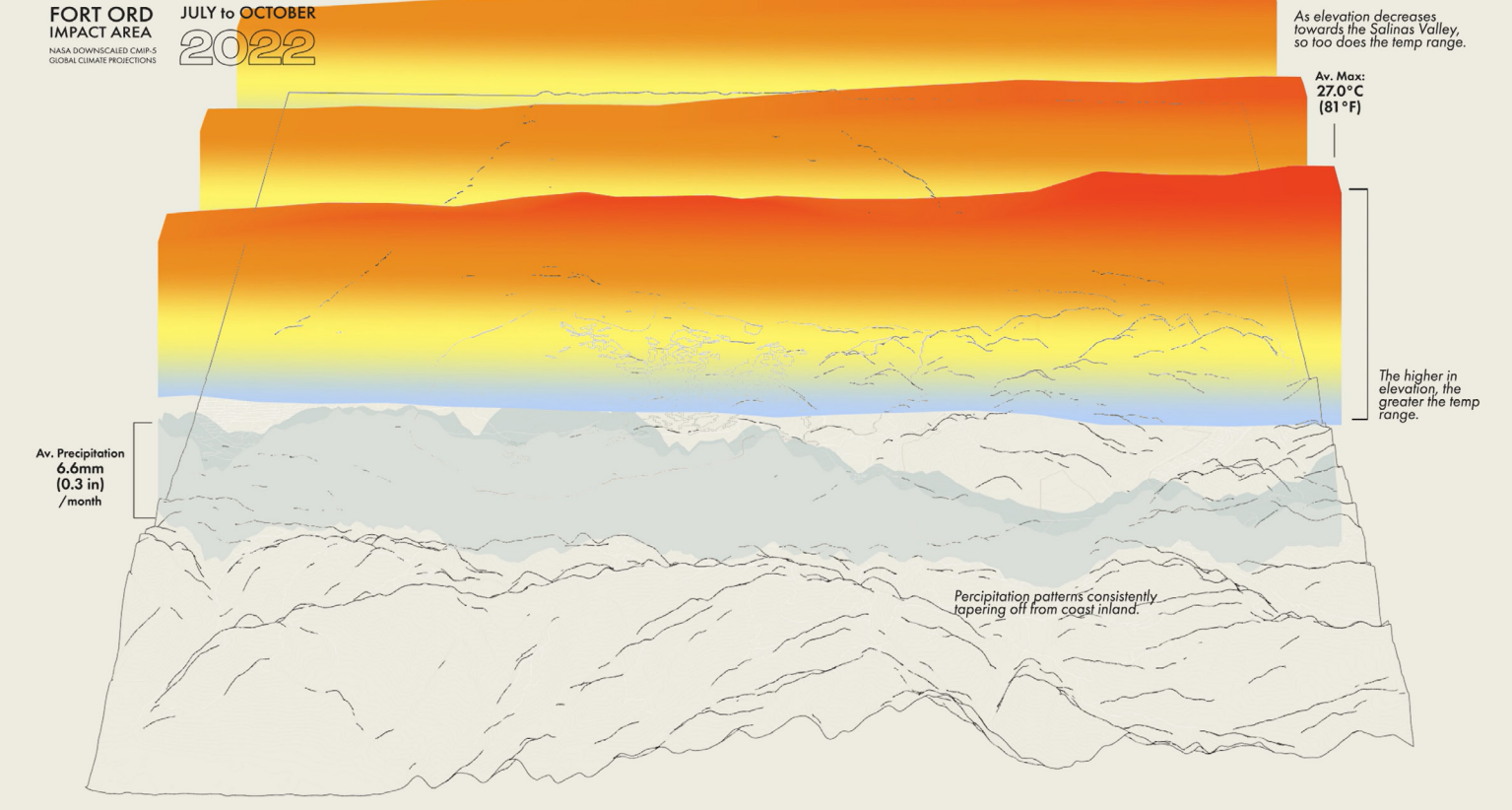
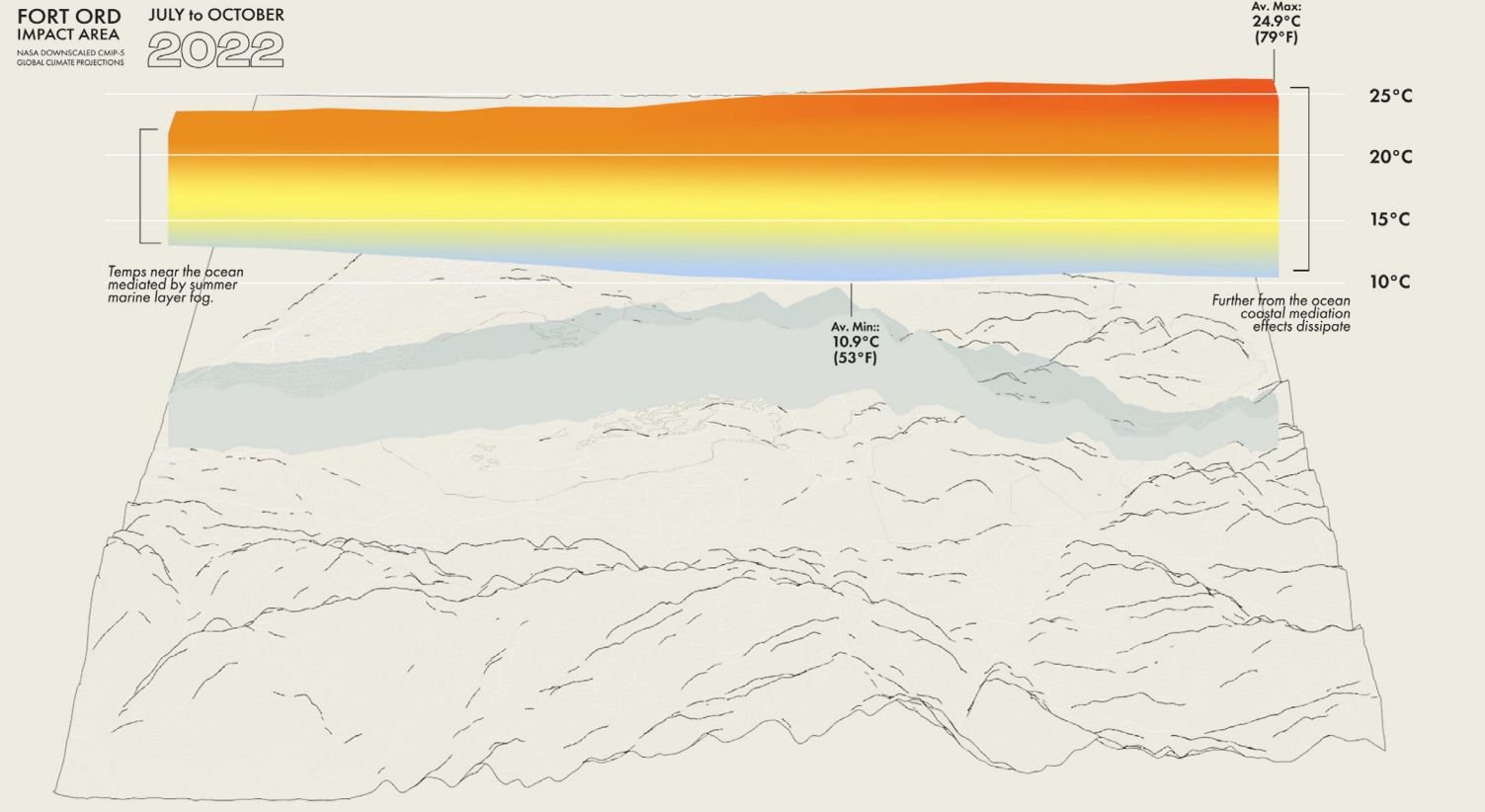


DIVERSITY OF SPECIES EXPANDING COMPOSITION

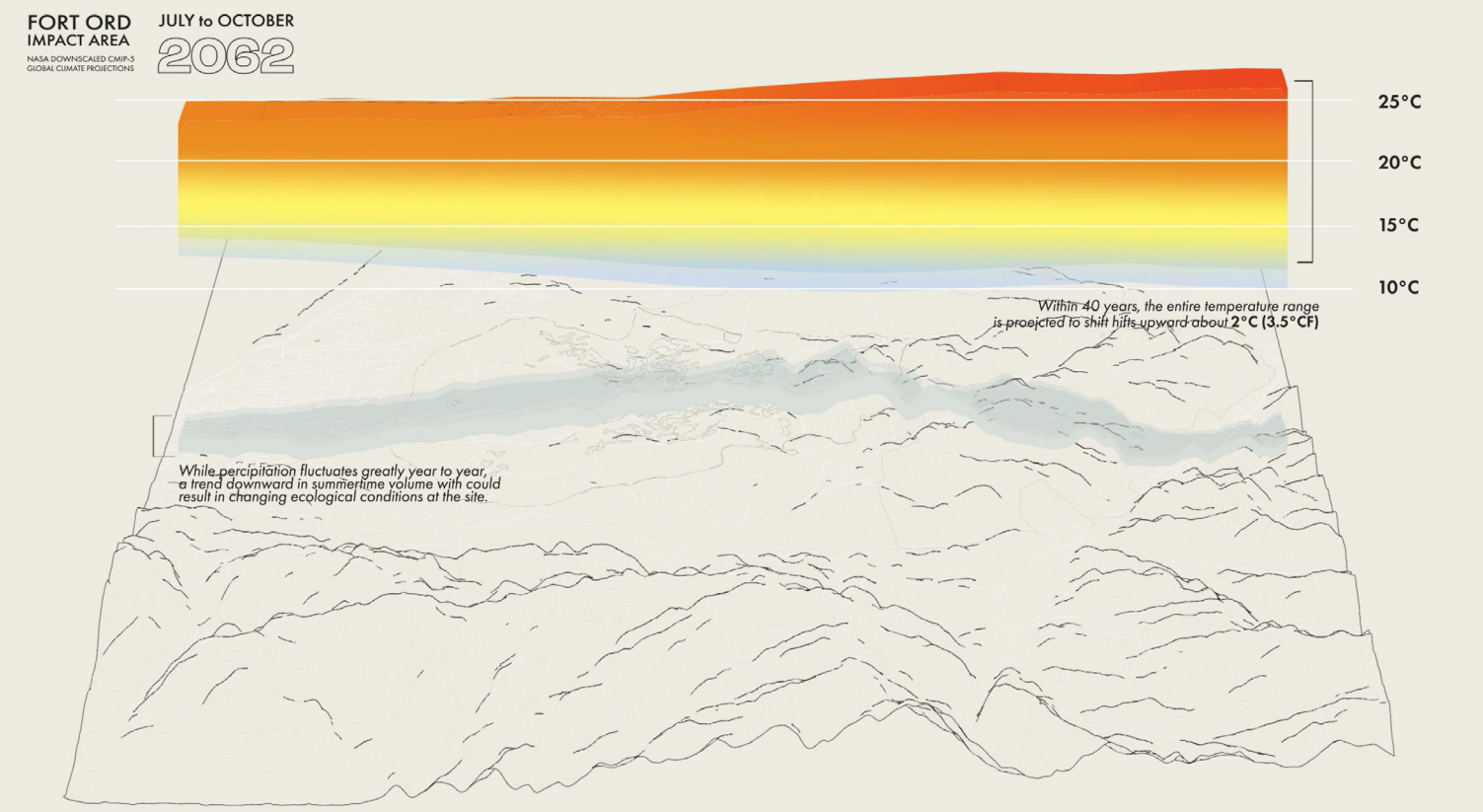
remediation area were filtered for cells with more than 90% inclusion in both desired landscape conditions. Then, these cells were combined to identify potential forest plots of minimum 1.25ac, the smallest area qualifying as a contiguous forest according to U.N. Food and Agriculture

Once identified, these forest plots could be broken down into three different size groups - small, between 1.25 and 4 acres, medium, between 4 and 20 acres, and large, greater than 20 acres. The largest contiguous plot is 267 acres.





Stills from the animation Fort Ord Impact Area Climate Conditions 2012-2062, using custom visualization components to model NASA CMIP-5 downscaled climate projection Google Earth Engine data.

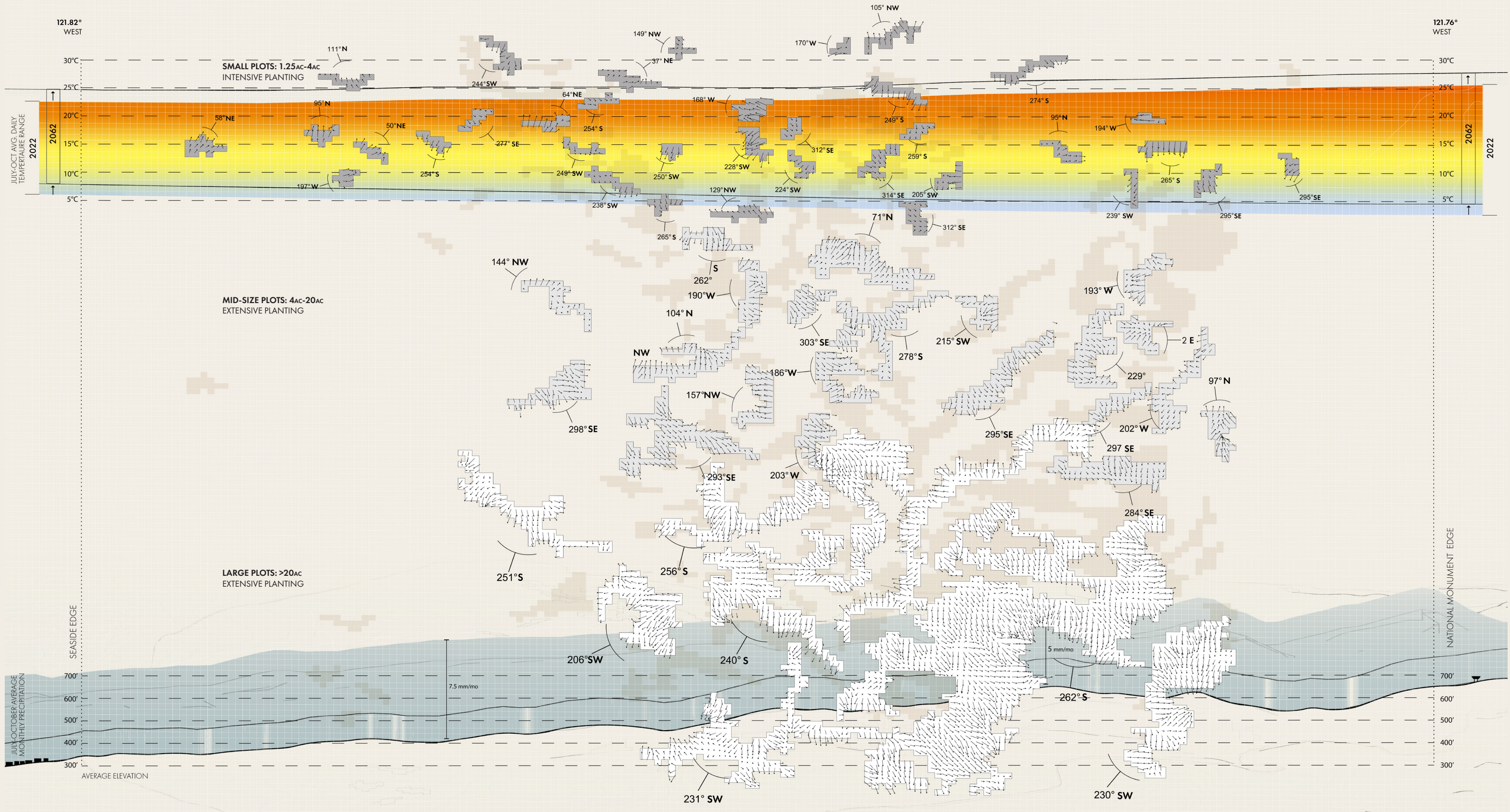


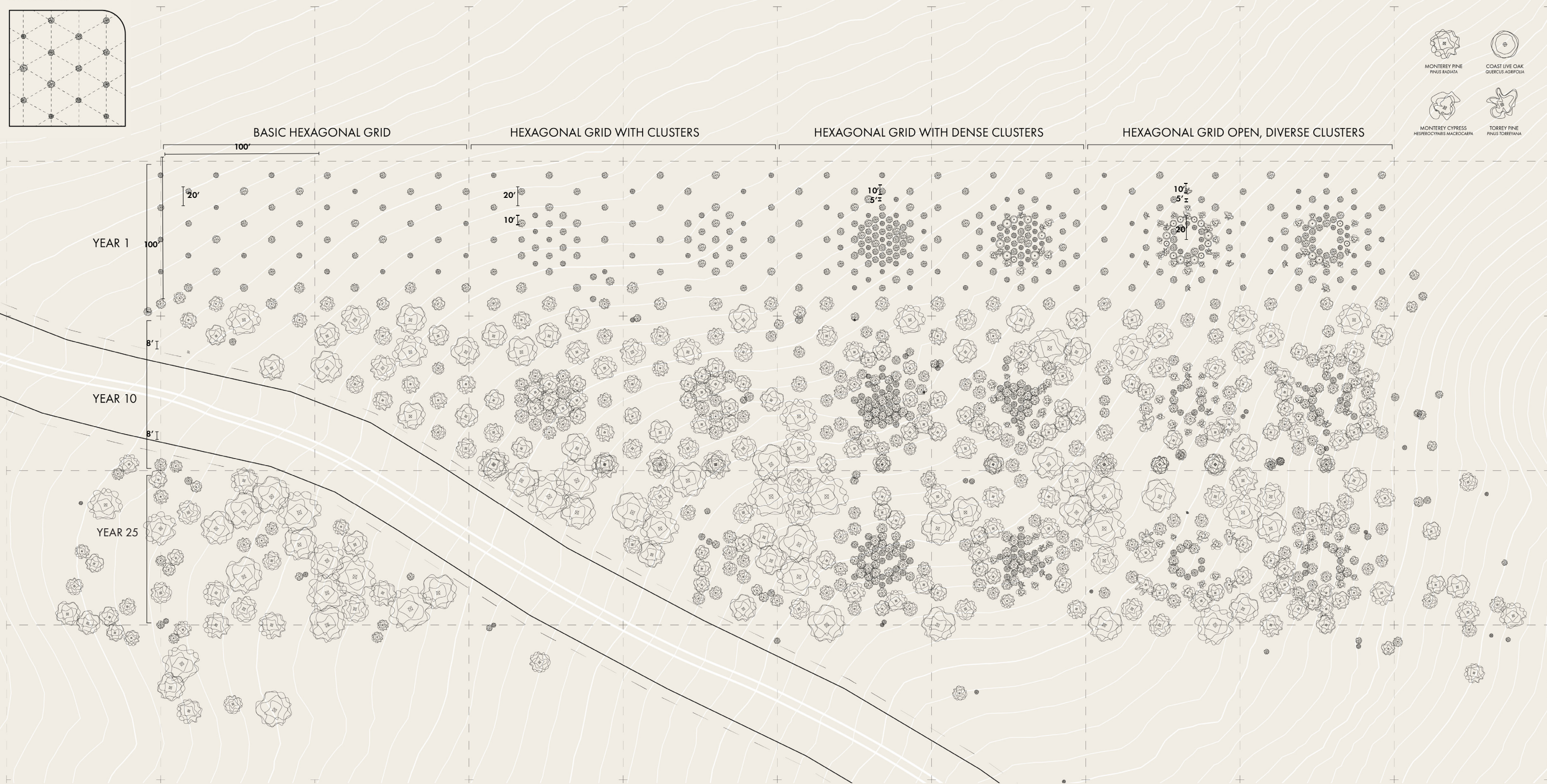
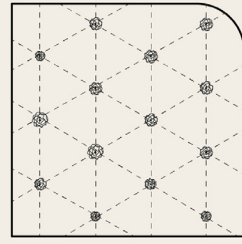
The distribution of these plots would expose pines to a gradient of climate conditions that provide different scenarios for adaptation. Characteristic of coastal California, the temperature range is reduced towards the ocean and exaggerates inland, while summer precipitation falls of slightly on the eastern slope of Fort Ord outside of marine layer fog. Conditions changes depending on proximity to the coast range mountains with places higher in elevation experiencing hotter and lower temperatures.

But how will this change? Based on CMIP-5 climate comparison models, we see starting from 2012 that temperatures vary summer to summer, but the range slowly creeps upward into projected climate years. By 2062, the entire temperature range is anticipated to shift upwards by 2° C.

This gradient across site and anticipated change create conditions for forest plots with different climate profiles, slope and aspect, which are useful for understanding how climate and other conditions will impact these trees elsewhere. The small plots are well distributed across this range, while medium and larger plots are clustered in the eastern half of the site.

Based on these three plot sizes and their distribution, strategies for bringing Monterey pines to the site can be broken down into intensive, extensive, and passive planting approaches.





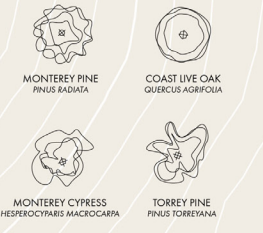
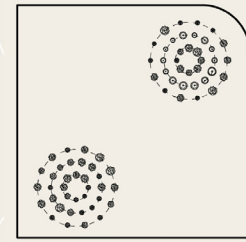
For the intensive approach, the smallest plots, are organized with a highly structured, monitored form. This is an approach used by foresters for understanding how a reintroduced species might fare in various portions of the site.

Hexagonal grids are good for slopes of different directions, and could take on many formal permutations depending on desired outcome.

Though the plantings start very structured, death of original trees and spontaneous growth within and near the plot allow the form to develop into forest of different character.

In a typical example of this, dense Monterey pine plots stimulate rapid upward growth, over 60' in 15 years, and maritime chaparral slowly reseeds in the understory.

EXTENSIVE
CLUSTER NUCLEATION



BASIC CLUSTER

DENSE MULTISPECIES CLUSTER

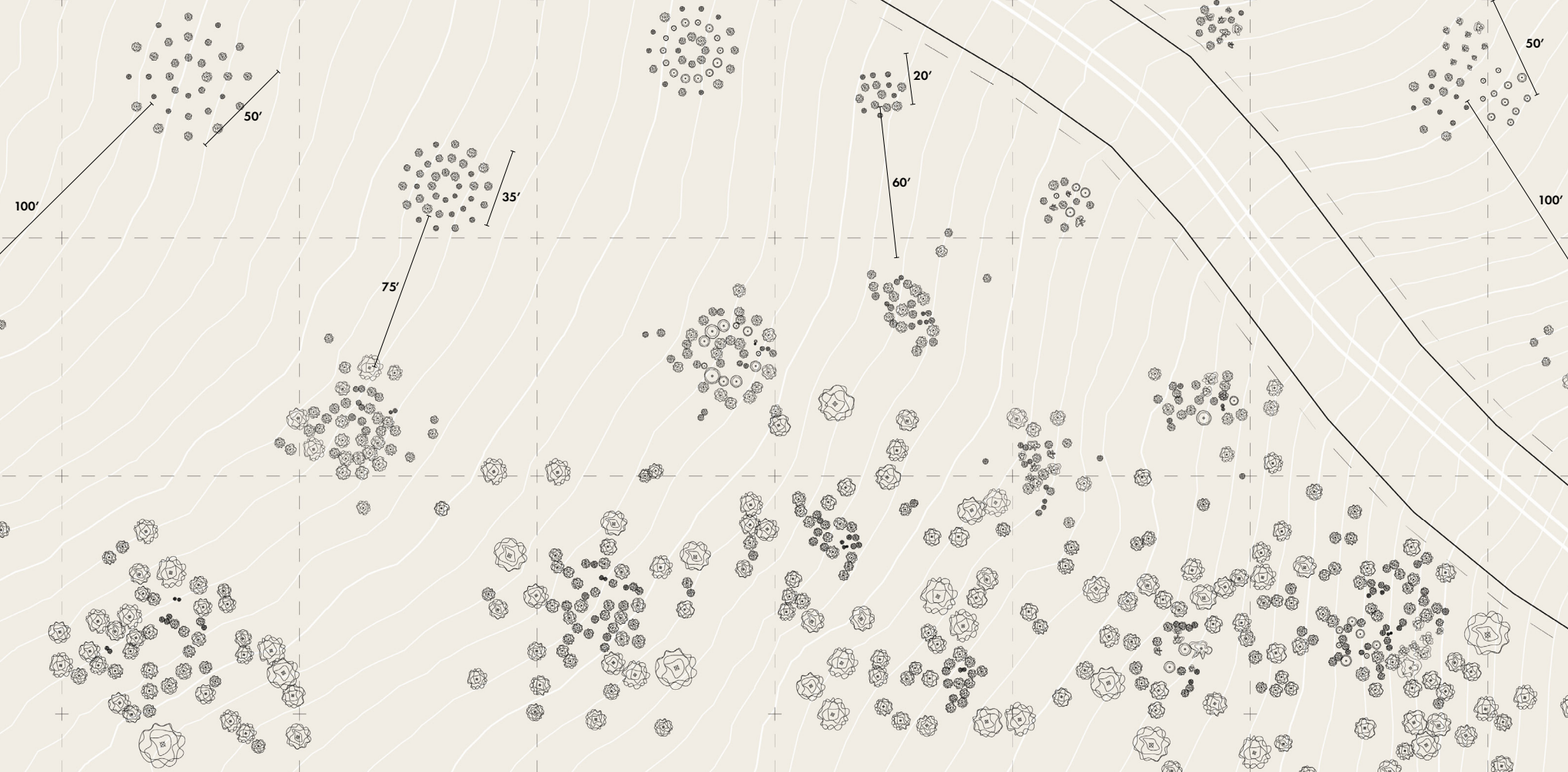
SMALL RANDOM CLUSTER

POLY-NUCLEIC CLUSTERS

YEAR 1

YEAR 10

YEAR 25

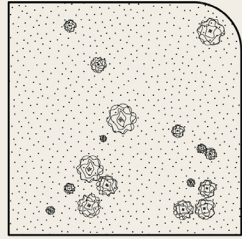


The mid-sized plots can be approached with an extensive technique known as clustered nucleation – which stimulate growth in large landscapes through the development of small forest clusters.

Over time, with spontaneous growth creeps out from dense central clusters. It is less immediately full after 25

years, but provides island habitat benefits and reduce the planting burden involved compared to intensive plots.

It, like other techniques, can incorporate species other than Monterey pine, the formal arrangements of which can yield finding for how these species relate to one another.



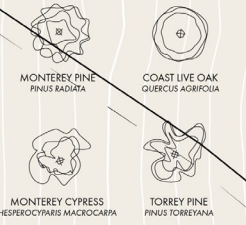
PASSIVE SEED BANK STIMULATION

LOW-DENSITY MONTEREY PINE SEED MIX

LOW-DENSITY 70% MONTEREY PINE/30% OAK

MID-DENSITY MONTEREY PINE/OAK/CYPRESS

HIGH DENSITY MULTI-SPECIES MIX



YEAR 1

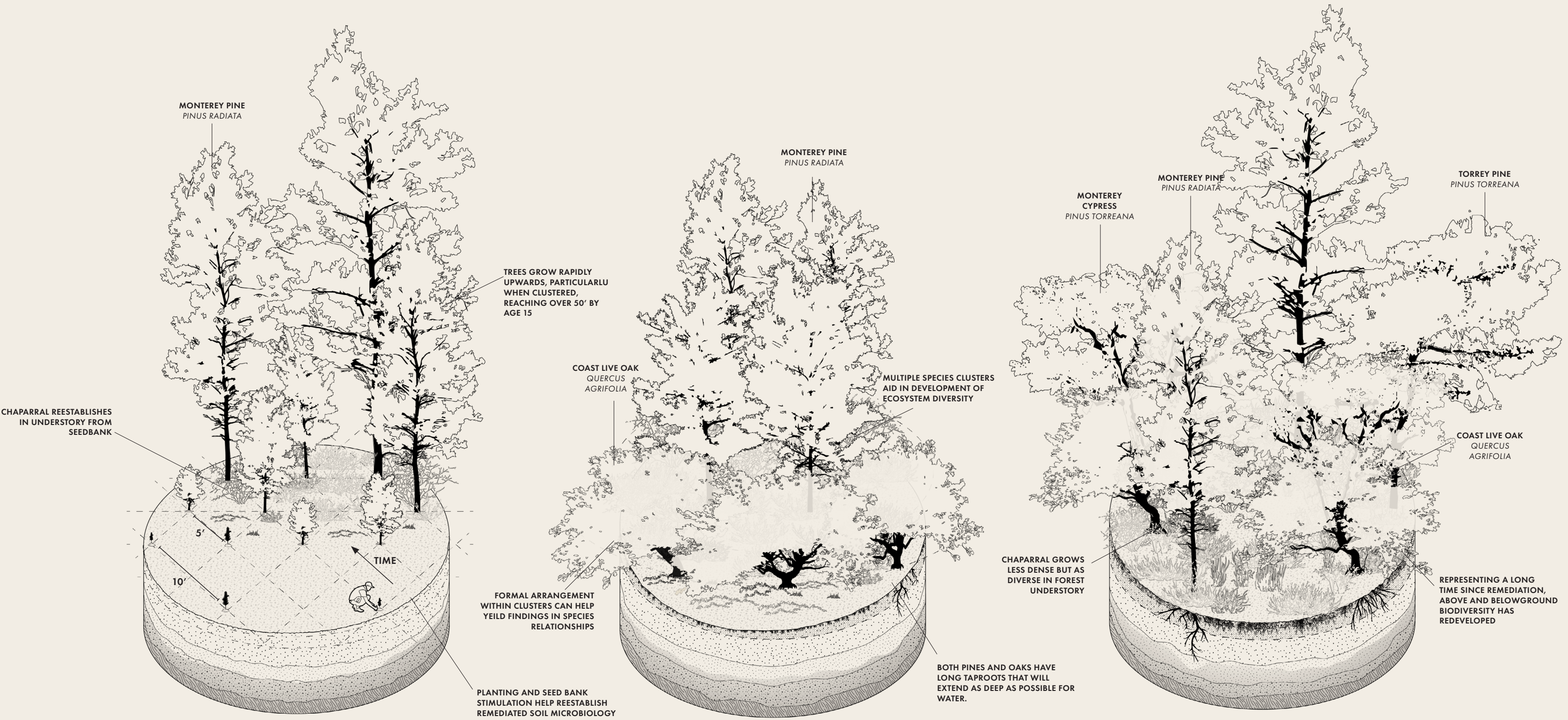
YEAR 10

YEAR 25

Finally, the largest plots can be approached by a passive technique, stimulating seed banks with fire-treated Monterey pine, chaparral, or other associate species' seeds during the last steps of the remediation process.

All species in the Fort Ord area reproduce via fire, so after a prescribed burn, different ecological mixes might emerge depending on seed bank.

Here showing a passive restoration forest after a longer period of time, including many other associate species other than pine and chaparral – such as oak, Monterey cypress, and Torrey Pine, another “non-native” whose native range is under threat and yet could thrive at Fort Ord.



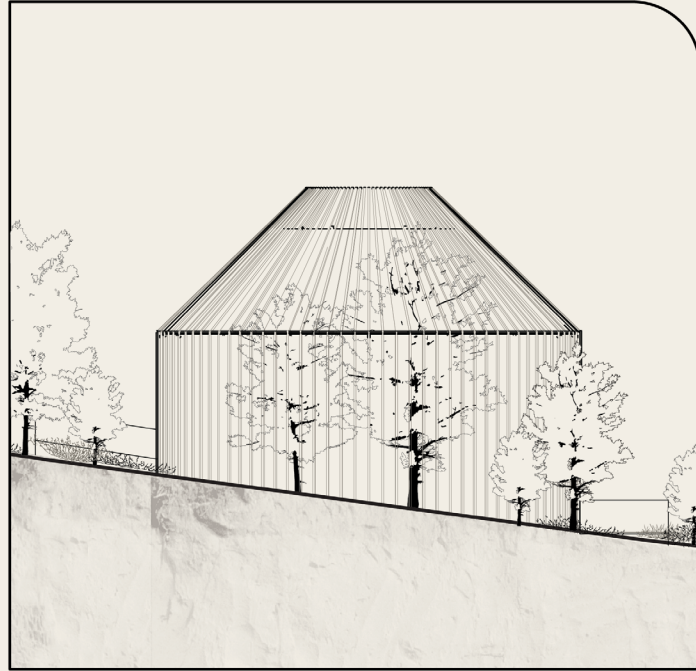
**INTENSIVE
EXPERIMENTAL PLOT**

**EXTENSIVE
CLUSTER NUCLEATION**

**PASSIVE
SEED BANK STIMULATION**

These three approaches together set a framework for how certain places can become a human assisted home for Monterey Pine and associate species, while the other non forest plot the remediated area can be restored with maritime chaparral.

FIELD STATIONS



CROSS-SITE CARE AND INQUIRY

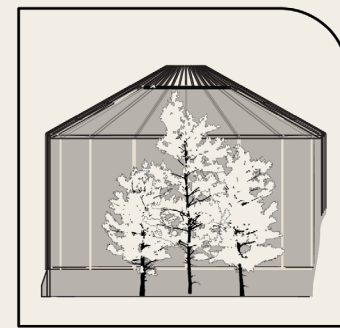
Within these plots, sites can be established for dedicated support and care for more-than-native-restoration including ex-situ Monterey Pine conservation forests.

It is a common practice within scientific forestry to construct enclosures in the forest to test species response to things like humidity and precipitation, carbon dioxide levels, heat, and genetic interactions.

There is often a reason for these structures to be closed, but enclosure can occur on a gradient, from elevated walkways above the surface, to structures clad in paneling to control for light and visibility.

However, Monterey pines are tall, fast-growing species, so care warrants structures that allow trees to outgrow them through a controlled aperture of light.

APERTURES LIGHT AND GROWTH

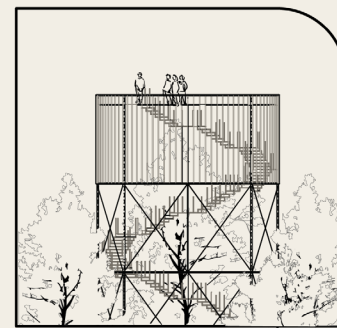


CLIMATE CONTROL TESTING ADAPTATION

This typical concept for a field station structure for forest plots can be made with materials that allow for fire both outside and within, a flexible roof with different angles of aperture, and varying sizes and layouts to allow for those who are supporting the forest to care for and conduct research on ex-situ adaptation.

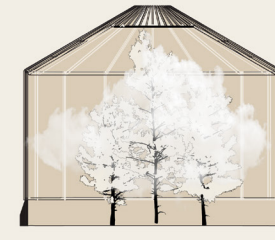
But, they can also be social structures, providing break stops or restrooms for visitors traversing the national monument. And an inclusion of canopy observation towers – a forest structure used at the Harvard experimental forest to track how trees absorb CO₂, can double as places for visitors to get above the trees and look out across Monterey Bay.

ENCLOSURE INCREMENTAL SPACE

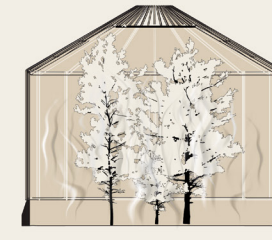


OBSERVATION SOCIAL INFRASTRUCTURE

PERMUTATIONS FOR CLIMATE & ADAPTATION



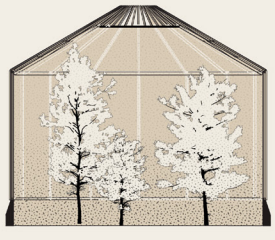
HUMIDITY AND PRECIPITATION



CARBON DIOXIDE LEVELS



HEAT AND DRYNESS

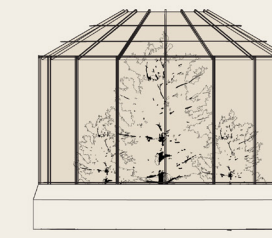


GENETIC DIVERGENCE &
RECOMBINATION

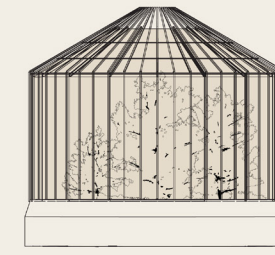
PERMUTATIONS FOR VARYING ENCLOSURE



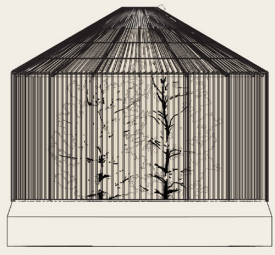
FULLY OPEN ELEVATED
WALKWAY



ENCLOSED GREENHOUSE

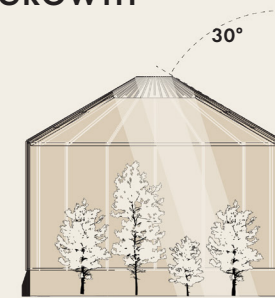


GREENHOUSE WITH LIGHT
CONTROL PANELING

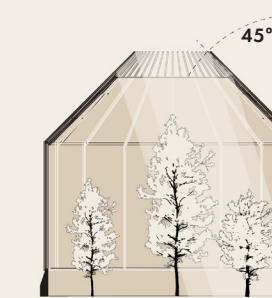


DENSE LIGHT CONTROL
PANELING

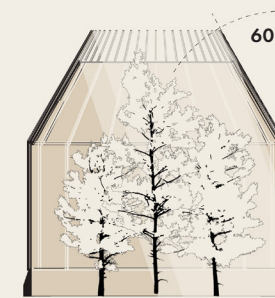
PERMUTATIONS FOR LIGHT & GROWTH



LOW LIGHT & YOUNG
GROWTH



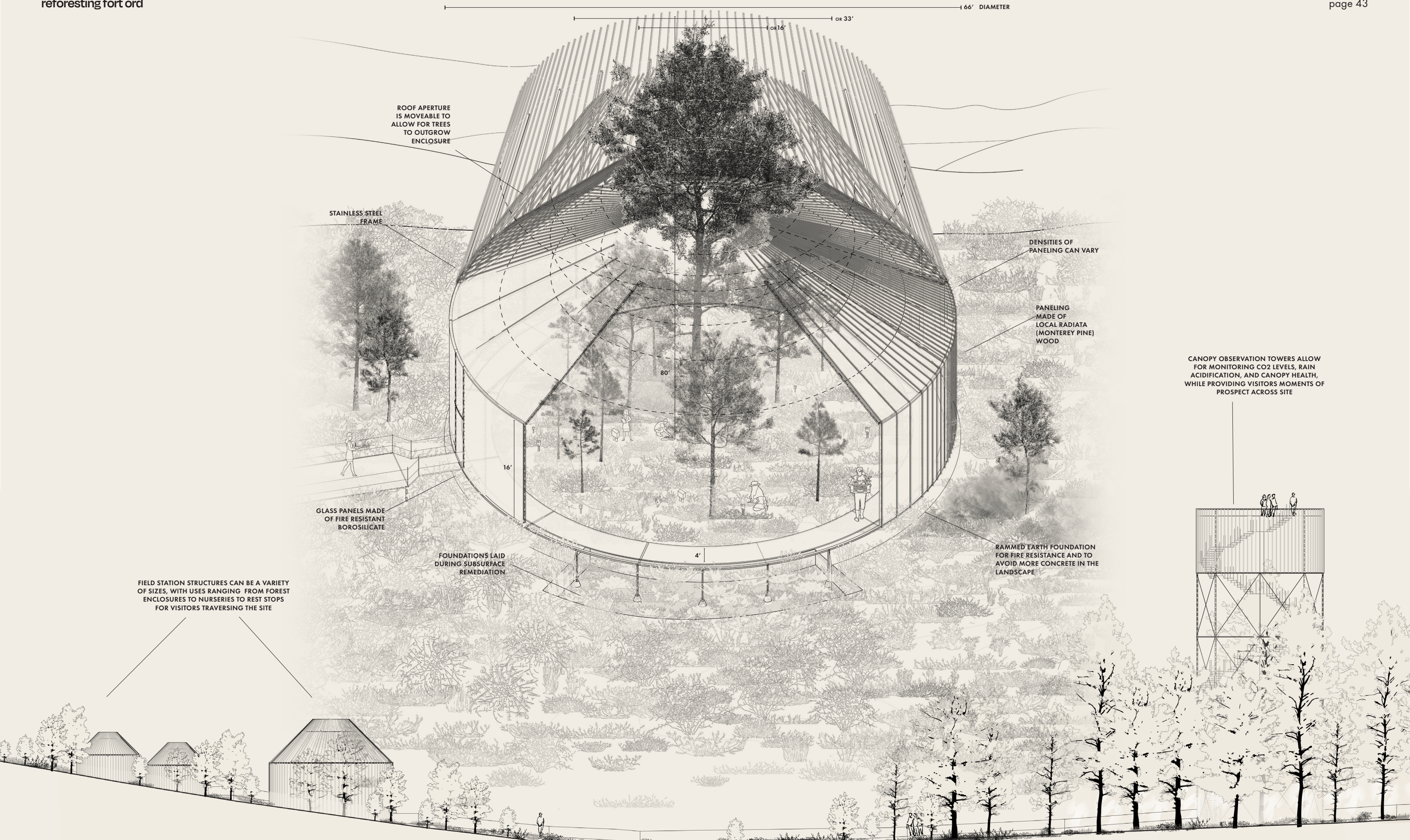
INCREASED LIGHT



INCREASED LIGHT & OPEN
TOP



FULLY OPEN APERTURE AND
OLDER GROWTH



66' DIAMETER
 or 16'
 or 33'

ROOF APERTURE IS MOVEABLE TO ALLOW FOR TREES TO OUTGROW ENCLOSURE

STAINLESS STEEL FRAME

DENSITIES OF PANELING CAN VARY

PANELING MADE OF LOCAL RADIATA (MONTEREY PINE) WOOD

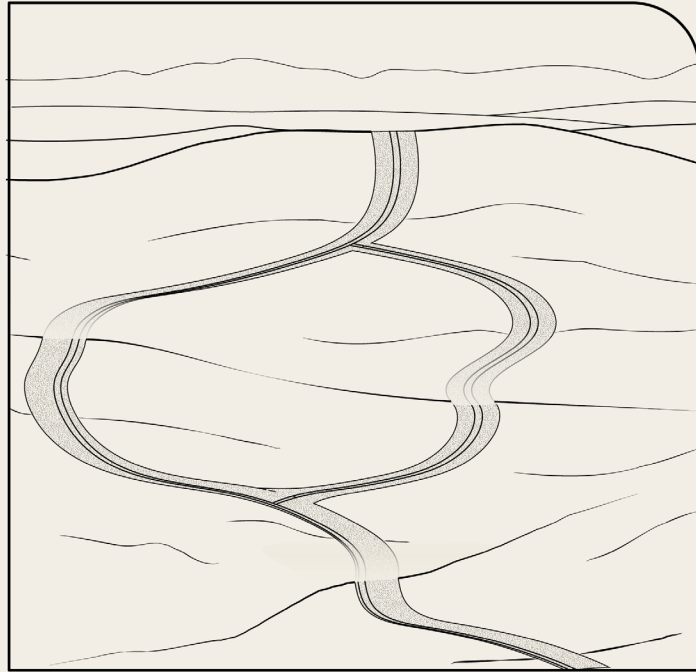
CANOPY OBSERVATION TOWERS ALLOW FOR MONITORING CO2 LEVELS, RAIN ACIDIFICATION, AND CANOPY HEALTH, WHILE PROVIDING VISITORS MOMENTS OF PROSPECT ACROSS SITE

GLASS PANELS MADE OF FIRE RESISTANT BOROSILICATE

FOUNDATIONS LAID DURING SUBSURFACE REMEDIATION

RAMMED EARTH FOUNDATION FOR FIRE RESISTANCE AND TO AVOID MORE CONCRETE IN THE LANDSCAPE

FIELD STATION STRUCTURES CAN BE A VARIETY OF SIZES, WITH USES RANGING FROM FOREST ENCLOSURES TO NURSERIES TO REST STOPS FOR VISITORS TRAVERSING THE SITE



COMPELLING FUEL BREAKS WITHIN PARTIALLY OFF-LIMITS LAND

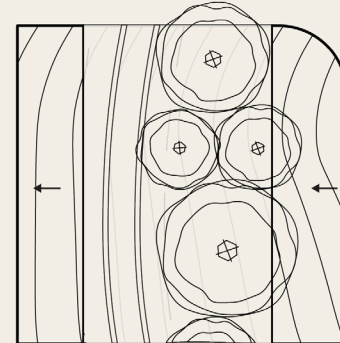
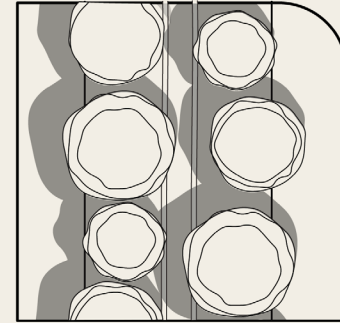
Next is the issue of how people get to the field stations and across Fort Ord. The existing fuel break network is, in truth, already well laid out for functional wildland fire resilience, with burn units of 200-400 acres.

However, they are logistical elements of landscape infrastructure not designed with people in mind. As it will take many years to complete additional remediation and some portions of the site may stay off limits to people, developing a compelling multi-user travel experience within existing fuel breaks is key to connecting visitors to landscapes within.

A typical fuel break at Fort Ord is designed for two trucks to pass each other, maintained as a 50 foot wide strip of gravel and maybe short grasses. However, all that is really needed for these fuel breaks to serve their fire and maintenance purposes is a single axle width double track and a clear strip for two vehicles to pass each other in absolute emergencies.

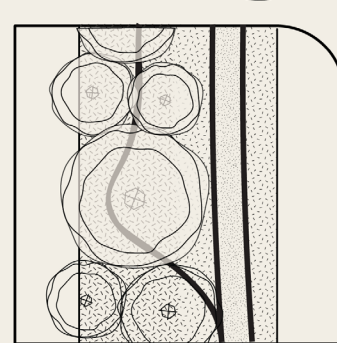
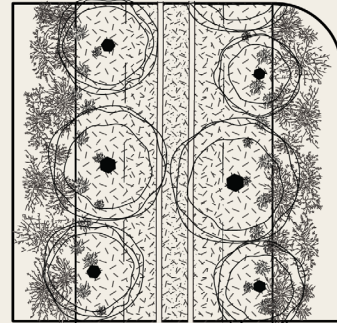
The remaining space becomes ground to intervene in the fuel break experience. Coast live oak - found across Fort Ord - are incredibly fire tolerant species, and have been found to help buffer fire from spreading. Supporting the

SHADE COOLING BREAKS



TERRAIN RESPONSIVE BANKING CORRIDOR

PLANTED BREAKS VEGETATED BUFFERS



PATH DIVERSITY BANKING CORRIDOR

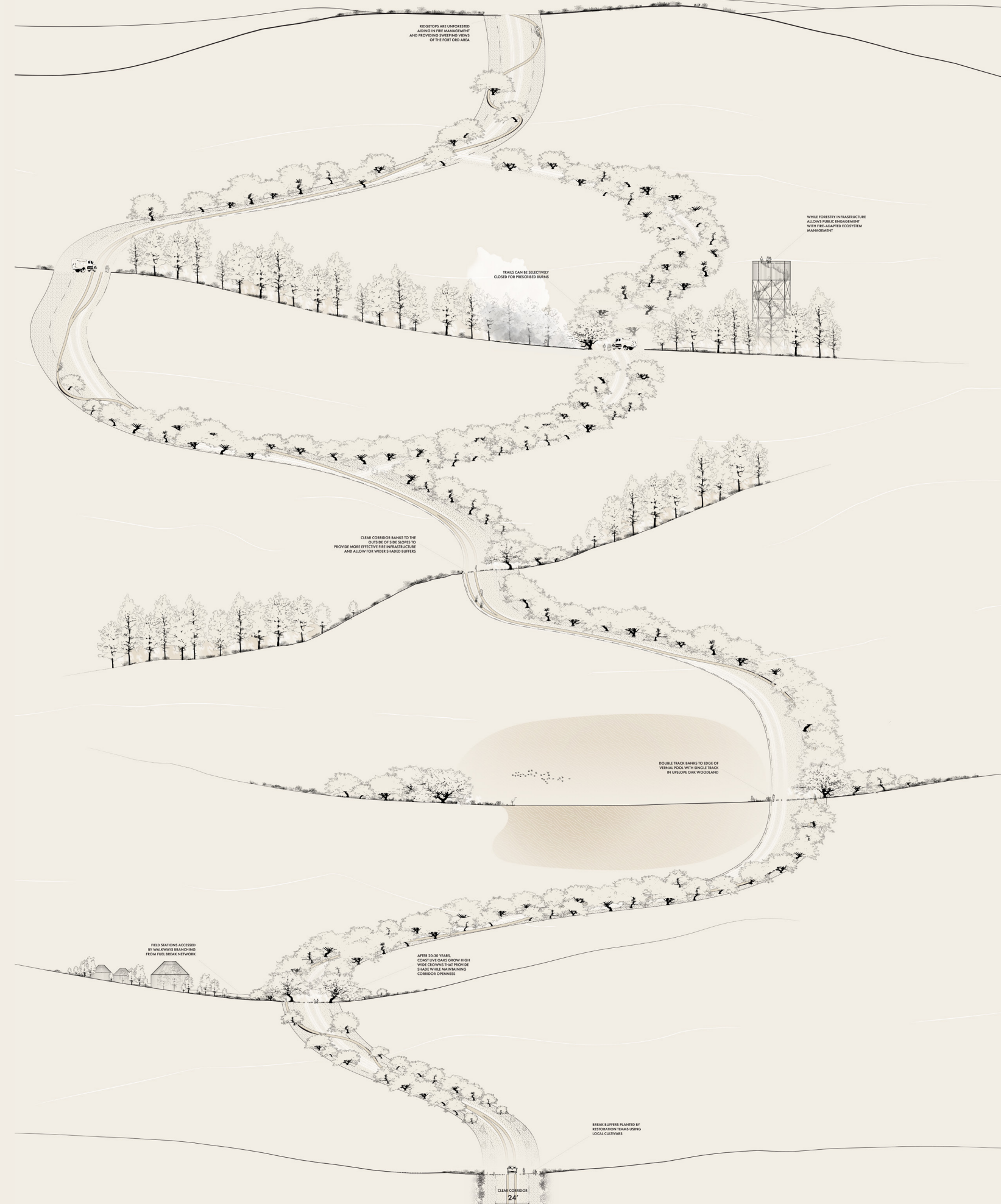
concept of a shaded fuel break, they can be planted within the buffers on either side of a 24" clear corridor.

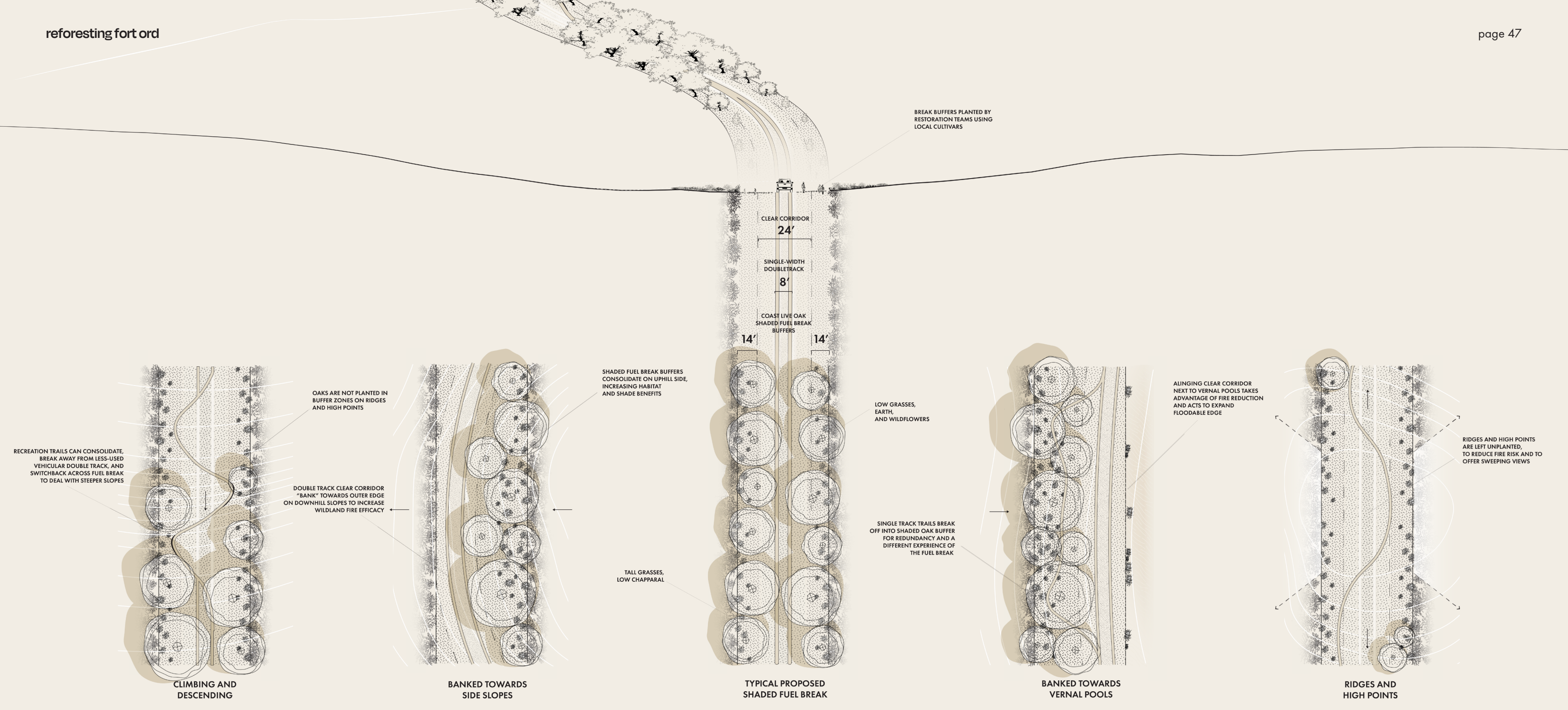
Both this clear corridor and the shaded break buffers can be planted and maintained with low grasses and wildflowers.

With this language, what happens within the breaks can bank to respond to topography, for instance shifting to the outer edges of slopes to help catch fires moving uphill, or next to vernal pools, in both cases consolidating the contiguous area of the shaded buffer zone.

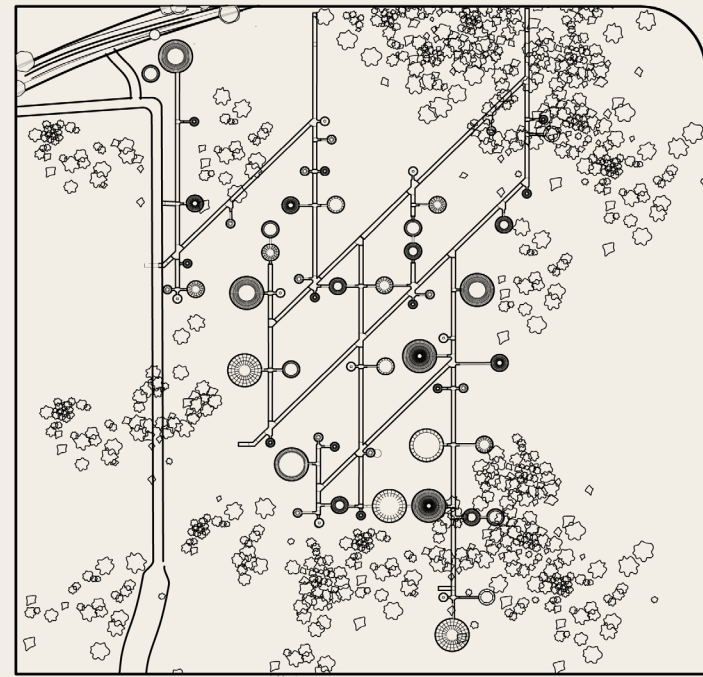
It can also deviate from the double track as the only way in which to experience the landscape – shifting to switchbacks to help visitors climb or descend slopes, or diverting from double tracks to wind through shaded oak groves. Towards the tops of ridges, oak plantings taper off to aid in fire response and provide sweeping vistas of the Fort Ord area.

Altogether, a refined fuel break travel strategy provides a shifting, rolling, banking travel experience within breaks, meeting field stations that branch of from fuel break network, diverting around closures and allowing for different areas of the site to be accessed when others are closed, for a range of visitors and experiences.





SEASIDE PORTAL

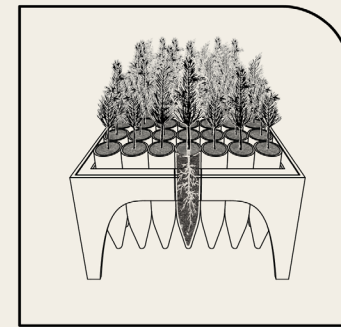
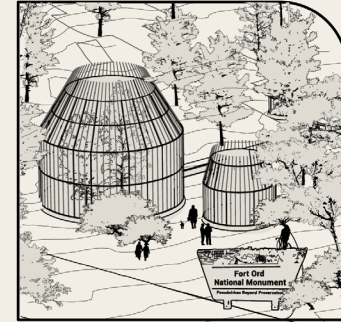


POROUS ACCESS TO AN URBAN NATIONAL MONUMENT

Finally, with the goal of all previous strategies being to allow people into and across the Fort Ord Impact Area, the framework for expanded remediation and a conservation forest converge to a national monument portal at urban edge of the city of Seaside.

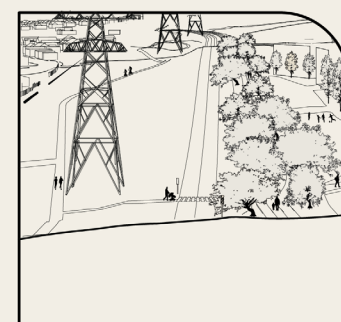
The edge between the City of Seaside and the Fort Ord Impact Area is currently dominated by a utility corridor, the four-lane General Jim Moore Boulevard, and a barbed wire fence at the edge of the site. Seaside has plans underway to develop a mixed-use residential development within the edge parcel between the road and the impact area, to increase much needed housing for the dense Monterey Bay area.

MONUMENT ARRIVAL PORTAL VILLAGE



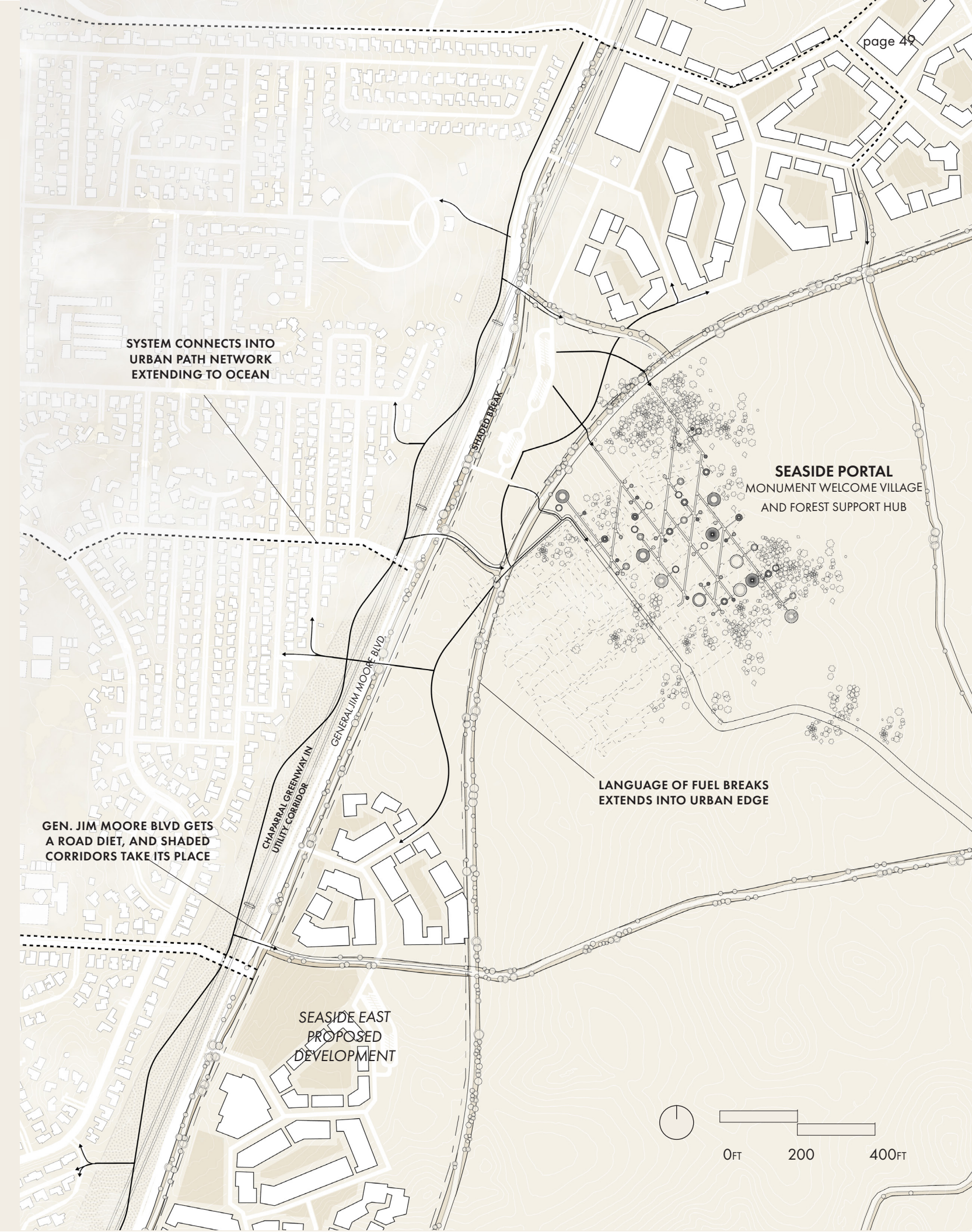
SUPPORT & CULTIVATION FOREST MAINTENANCE

CORRIDOR DUPLICATION DISTINCT TRAVEL TYPES



INTEGRATING CIRCULATION URBAN TO MONUMENT

The transformation of Fort Ord can be extended through this new development to bring the National Monument to the edge of Seaside. A shaded break takes the place of half of the existing boulevard, connecting seamlessly to the monument system, while connecting paths are duplicated within the transmission corridor creating a chaparral greenbelt. Reduced boulevard size and speeds and increased opportunities to cross create an edge much safer for monument neighbors. And to the northeast where the Seaside East parcel is the thinnest between city and monument, a village of field station structures forms a welcome center and operations hub for Fort Ord national monument.



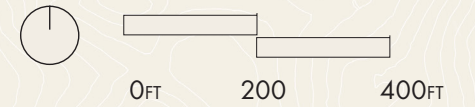
SYSTEM CONNECTS INTO URBAN PATH NETWORK EXTENDING TO OCEAN

SEASIDE PORTAL MONUMENT WELCOME VILLAGE AND FOREST SUPPORT HUB

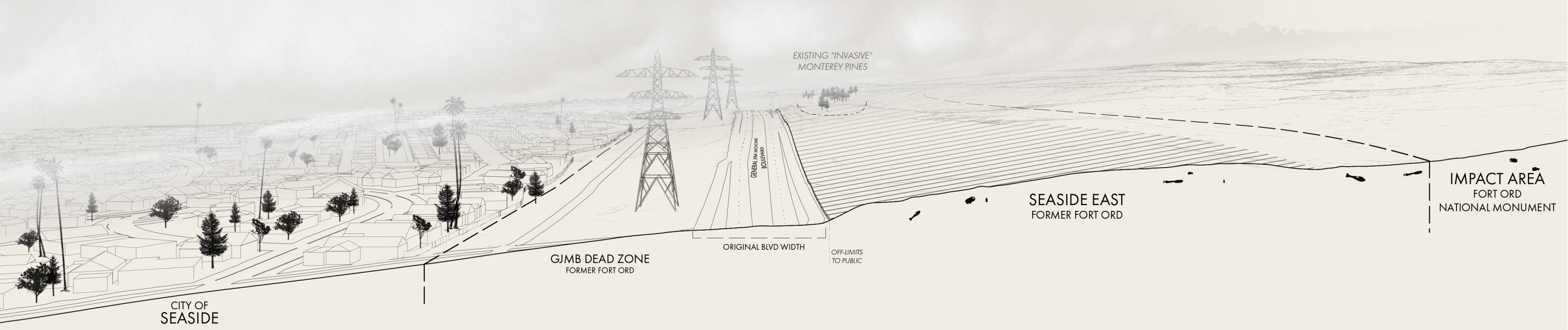
LANGUAGE OF FUEL BREAKS EXTENDS INTO URBAN EDGE

GEN. JIM MOORE BLVD GETS A ROAD DIET, AND SHADED CORRIDORS TAKE ITS PLACE

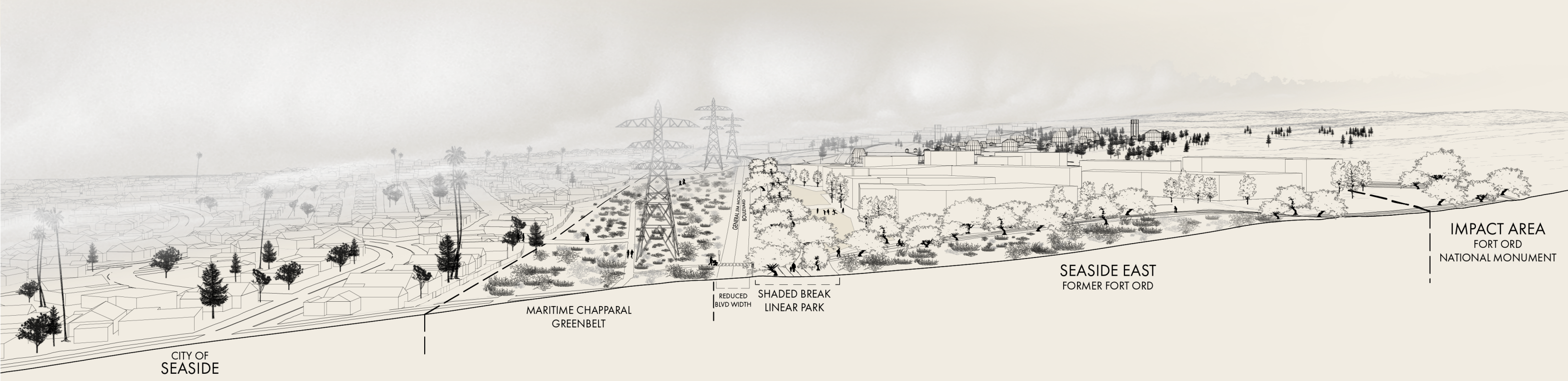
SEASIDE EAST PROPOSED DEVELOPMENT



SEASIDE EDGE - BEFORE











SEASIDE EDGE - AFTER

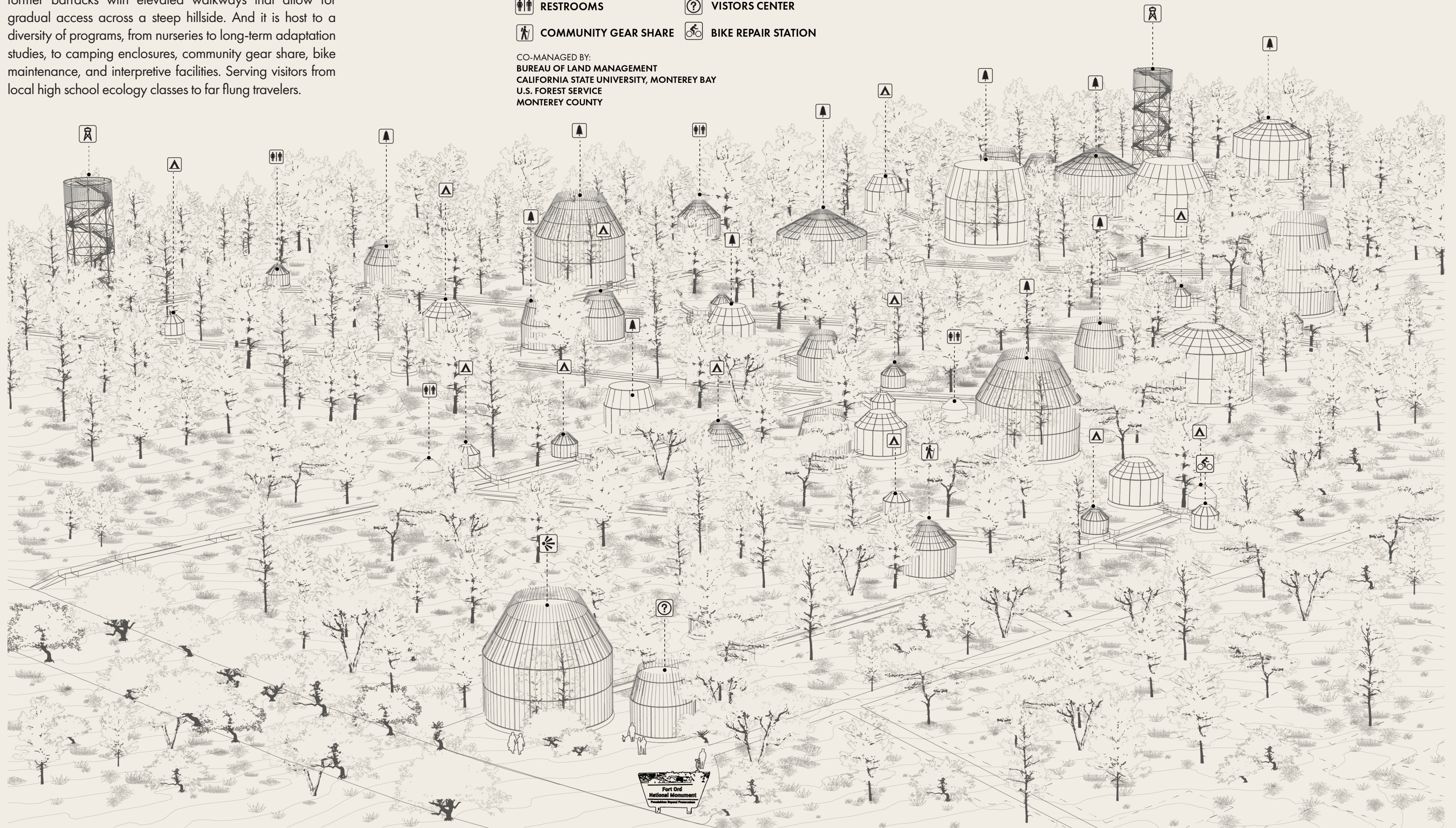


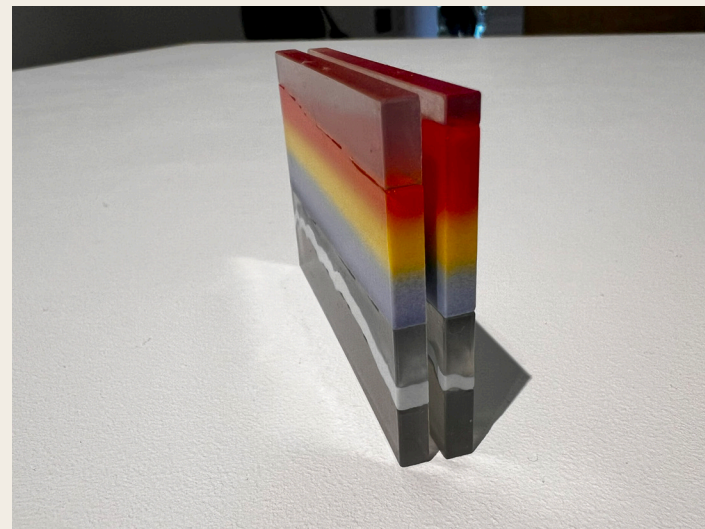
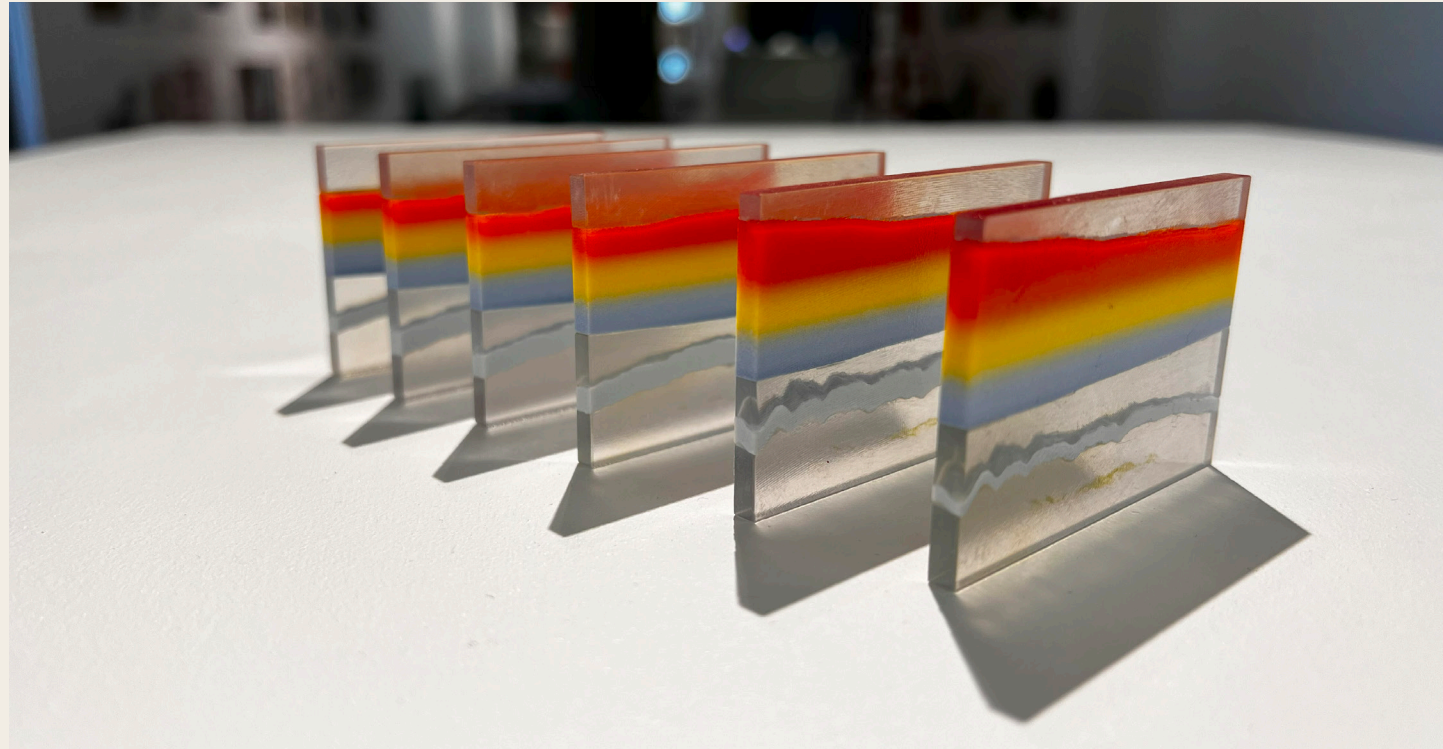
reforesting fort ord

This welcome center is the Seaside Portal, bringing experimental forestry together with the social needs of arrival to a national monument. It is built on remediated former barracks with elevated walkways that allow for gradual access across a steep hillside. And it is host to a diversity of programs, from nurseries to long-term adaptation studies, to camping enclosures, community gear share, bike maintenance, and interpretive facilities. Serving visitors from local high school ecology classes to far flung travelers.

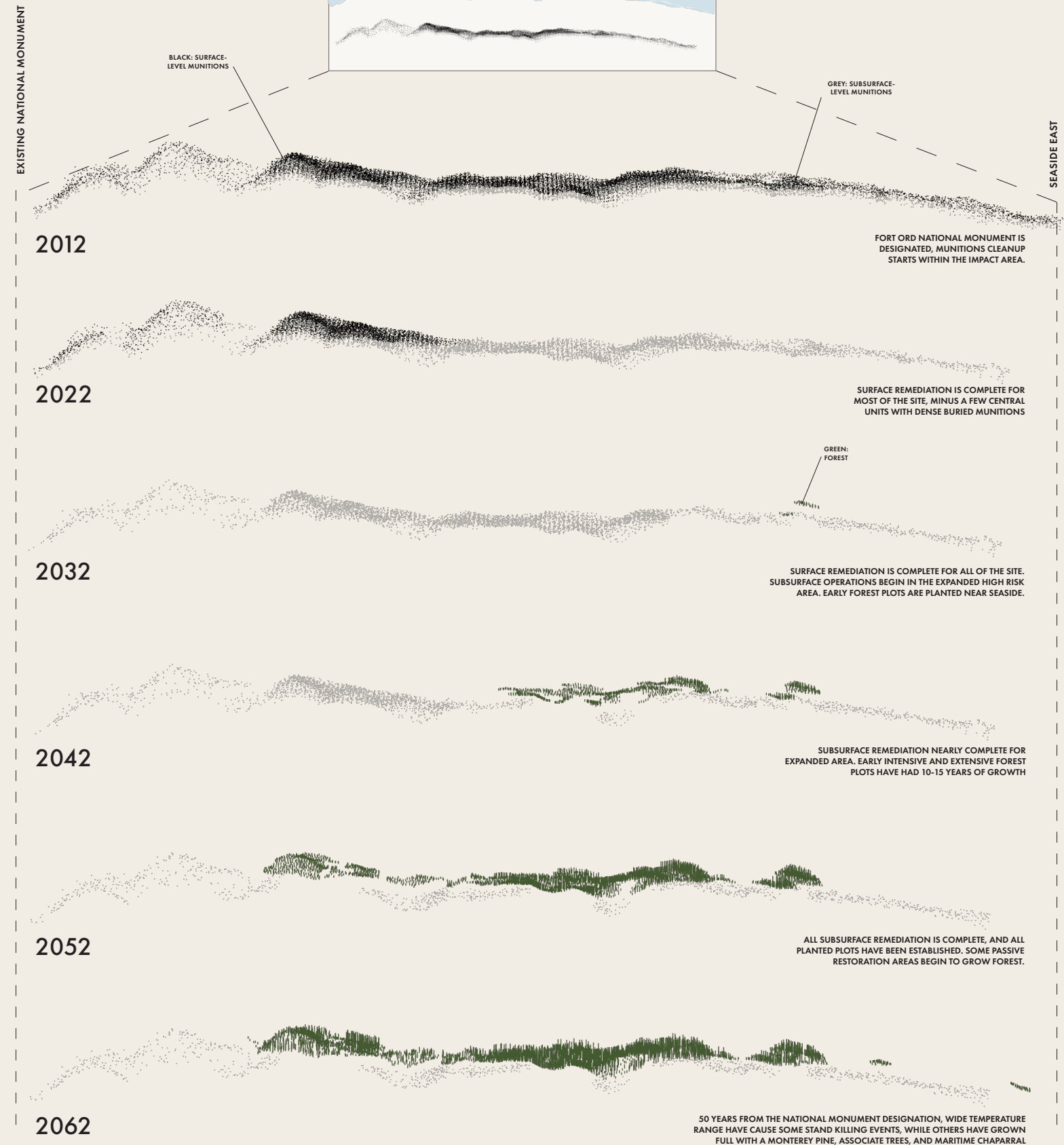
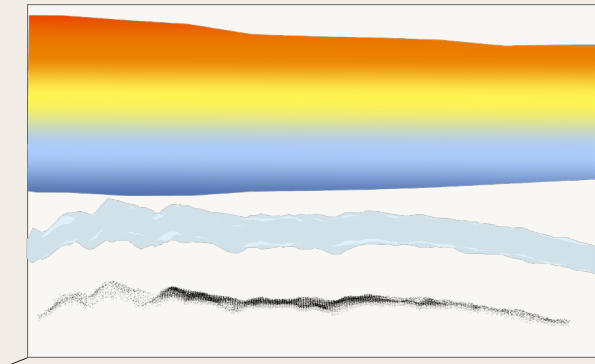
-  FOREST STRUCTURES
-  INTERPRETIVE ENCLOSURE
-  CAMPER STRUCTURES
-  OBSERVATION TOWER
-  RESTROOMS
-  VISITORS CENTER
-  COMMUNITY GEAR SHARE
-  BIKE REPAIR STATION

CO-MANAGED BY:
BUREAU OF LAND MANAGEMENT
CALIFORNIA STATE UNIVERSITY, MONTEREY BAY
U.S. FOREST SERVICE
MONTEREY COUNTY





(left) images of multi-material 3D printed "transparencies" representing changes to temperature, precipitation, and the field condition between buried munitions and planted pines at Fort Ord. (below) excerpts of field condition models for six years between 2012-2062.



The redefined edge and Seaside Portal are significant not only in connecting a city to the monument in its backyard, but in cementing the importance for US public lands - especially at urban edges - to be public, and the identity of an urban national monument within the Bureau of Land Management system.

This will take time. Despite these strategies, the land will remain in a constant state of risk mitigation and not-quite-full remediation.

From its designation in 2012, when very little if any munitions had been cleaned up, until the near-present 10 years later most of the site has been remediated at the surface-level.

In the imagined future of expanded remediation, by 2032 all of the site would be remediated to surface level and some areas to the west would've received subsurface remediation and been planted with Monterey pine. By 2042, both the subsurface remediation and planting is much more extensive, and by 2052 the 25-year work plan for remediation would've completed, with forests in a range of maturity from full near the western edge to newly planted in the east.

The climate conditions for these imagined ecologies are less sure into the 2050s and 2060s. By 2062, large stand-killing heat events might've occurred, while others have simply been thinned and grown spacious and diverse.



While dependent on the progression of both a larger scale remediation and the growth of a more-than-native-ecological restoration, this project sets forward a framework for how both people and pines inhabit a place that has been deemed off-limits and made unsuitable through sacrificial military exploitation. Unlocking access from the ocean to the Salinas Valley, and maintaining space for rare endemic ecologies of concern, yet not putting preservation of some locals at the expense of many others.

This framework, however, has the potential to do more than provide for public access to Fort Ord National Monument and the potential for an expanded view of conservation and ecosystem restoration. By remediating more extensively, and planting a landscape that requires a longer term engagement with forest health and adaptation, the project to reforest Fort Ord has the potential to achieve a form of "fixity" that provides resistance against these

federal lands being handed back over to the US Military, in the way that Bears Ears was made and extractive landscape under unfavorable political regimes.

Longitudinal studies involving ex-situ conservation forests of Monterey pine necessitate landscapes that are maintained with a deeper human engagement over a longer period of time. But this deeper engagement also

promises to foster greater public investment in an open Fort Ord Impact area, where sometimes-off-limits lands are mediated through a system of travel, rest, care, and possibility for many ecologies and communities, an urban national monument through a porous threshold at the edge of Seaside.



We can picture standing again on General Jim Moore Boulevard and imagine a portal to a national monument in the once-non-native pines. Within the portal there are foresters, visitors, Seaside residents, maybe joggers preparing for the 13-mile run between Seaside and Salinas. We venture out into the monument. The coast range pops into view as we make our way onto fuel breaks shaded by coast live oaks and surrounded by chaparral. In the distance pine-clad field stations peek out of sparse forest. As we continue the forest gets denser, breaking into clearings, light dappled oak woodland and vernal pools.

Traveling across sides and up and down ridges until finally, at the crest of a hill, an observation tower can be seen peaking out of dense forest, the Salinas valley in the distance. A runner is passing a mountain biking family on double track trail. The runner came from foggy Monterey, the bikers from the sunny eastern edge. The pines are from stock up the coast in Ano Nuevo. All have arrived here, to Fort Ord, where, after a bit more remediation, there are possibilities beyond preservation.

(left) Stills and renderings from a view animation across Fort Ord, from the eastern edge at Seaside Portal to a view of the salinas valley, observation towers, and ex-situ conservation forests of Monterey pine.





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