

Conserving Rural Landscapes: Green Infrastructure, Climate Resilience and Indigenous Knowledge

Green Infrastructure Webinar Series

October 17, 2024

Housekeeping

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- All participants are muted to minimize background noise.
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 - Contact us via the Q&A Box.







Your host



Clark Wilson
U.S. EPA
Green Infrastructure Team





Equity and Equitable Development

- "Equity" means recognizing that we do not all start from the same place and that actions must be taken to address the imbalances.
- "Equitable development" is "equity-in-action" in the built environment.
- Green infrastructure can help to reduce the disproportionate impacts of stormwater and flooding on overburdened communities provide additional benefits to communities.





Past and Upcoming Webinars with an Equity and Equitable Development Focus

Creating Age-Friendly Communities with Green Infrastructure: How Addressing Needs of Children and Older Adults Benefits All – April 2024

Planting for the Future: Native Plants, Green Jobs, and Equitable Climate Resilience – June 2024

Conserving Rural Landscapes: Green Infrastructure in the Rural and Tribal Context – Today!

Igniting Community Imagination: Advancing Green Infrastructure Implementation Through Arts and Culture – Winter 2024/25





Today's Panelists



Rachel Billiot
Environmental Educator and
Indigenous Storyteller



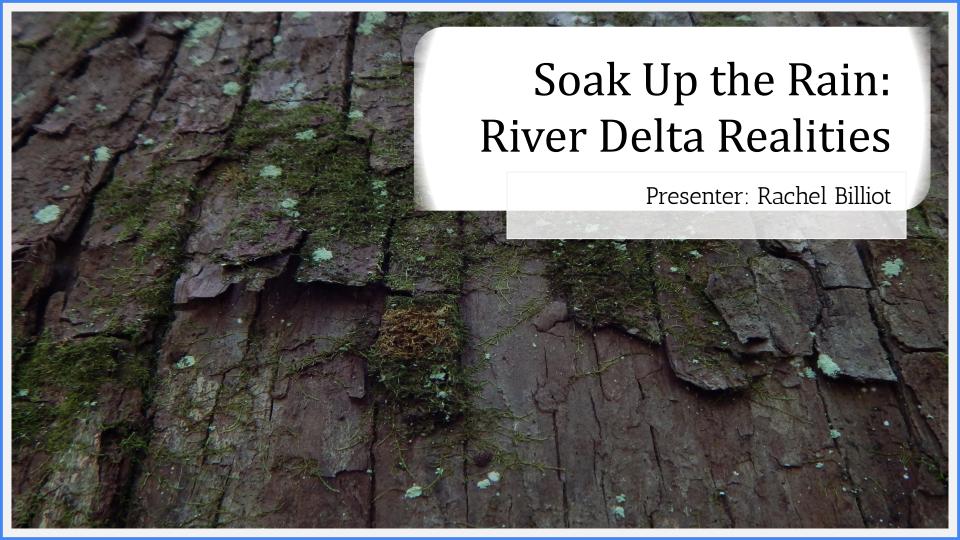
Pete Van Dyck
Owner,
Van Dyck Earthworks & Design LLC



Scott Cataffa
Partner and Co-founder,
Plural Studio



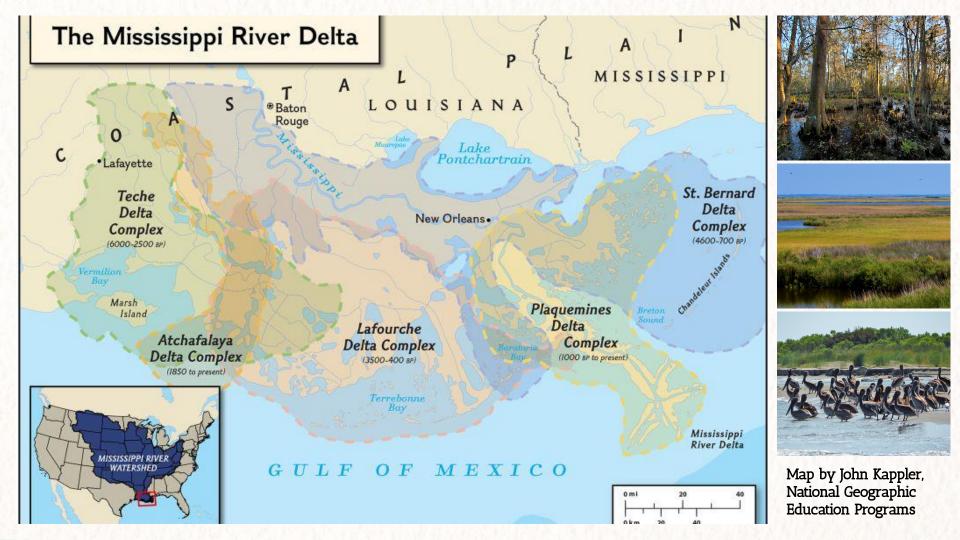


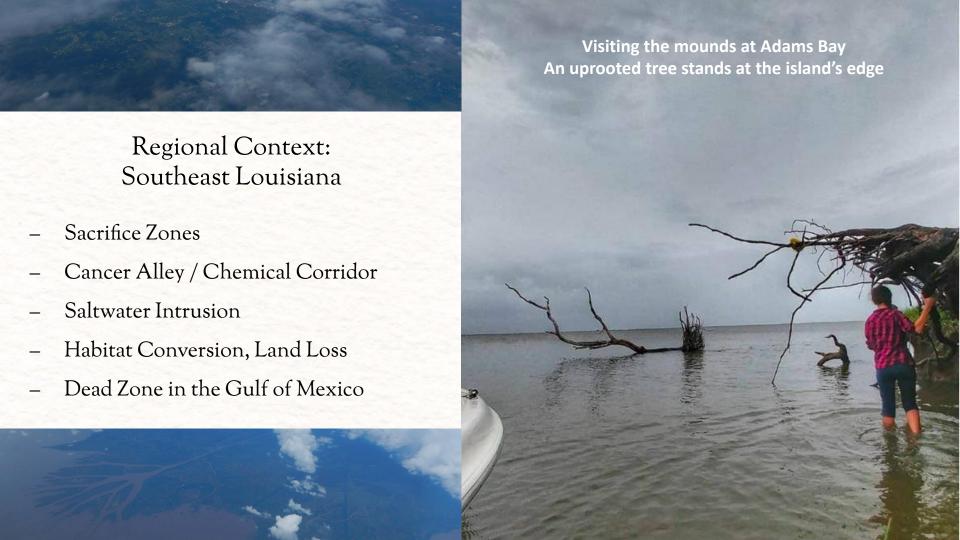




Background, Research, & Advocacy Work

- BIS Cultural & Environmental Studies
- UNO-CHART: Mixed Methods Research, TEK, Adaptation
- Haskell Environmental Research Studies Program
- Environmental Education & Cultural Storytelling
- Currently serving on NEYAC
- Record stories about the land from community members
- Focus on native biodiversity, conservation, wetlands protections, cultural connections, STEAM education





How did we get here? Cultural Views & Wetland (Mis)Management

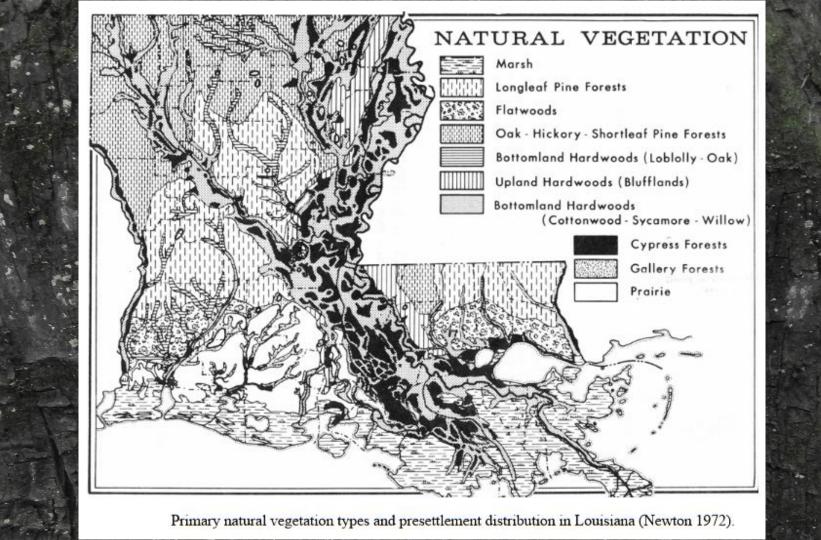


There is a Western focus on control & its basis in early European fear of the world around them; dismal view of wetlands

 cultural subconscious (language, folktales) villainizing animals and landscapes that weren't well understood, from wolves and snakes to bogs and swamps

- leads to disregard, endangerment, & mass death of these landscapes & creatures















Economies of Loss

- Levee systems built to prevent seasonal flooding (sediment starving)
 - Clear-cutting wetland forests & rivercane
 - for logging & farmland
- Swamp Lands Act
- Oil & gas industry, canal dredging
- What took 1000s of years to create was destroyed in only a few hundred.





- Sacrifice Zone: a geographic area permanently changed by environmental damage, allowed to deteriorate for the benefit of industrialization & economic gain for extractive industries
- Sacrifice Zones exist across La, where oil wells, pipelines, canals, & other industries have left their marks:
 - Mining displacement & sinkholes
 - Dumping oilfield waste in the bayous
 - Dead Zone from agricultural waste, pesticides, fertilizers
 - Struggles with mass plant & animal death, habitat
 conversion, & health issues; ghost forests & skeleton trees
 - Turned the River Delta from a place once boasted for its pure water & beautiful landscapes into chemical corridors



PLANT REGIONS OF LOUISIANA

A plant region is a broad generalization of the primary habitat type in an area. Each plant region is divided into many types of plant communities. These communities are shaped by geographically distinct environmental conditions and natural histories, which dictate the types of plants and animals found in each community.



3. Shortleaf Pine-Oak-**Hickory Woodlands**

Prominent Physical Features: Occurs on dry hills and consists of mixed species stands with dry-sited hardwoods mixed with shortleaf pine. Canopy cover varies from open woodland with a grassy understory to more densely wooded stands. The community is maintained with beneficial forest fires every five to

Prominent Vegetation: Shortleaf pine, post oak, southern red oak, blacklack oak, hickories and blackgum.



4. Hardwood-Pine Flatwoods

Prominent Physical Features: Occupies older flat to gently undulating surfaces, slightly up gradient from bottomland hardwoods and is not directly influenced by flooding of nearby rivers and streams. Soils are typically poorly drained silt loams to clays, Several Inches of standing water in the winter can cause soils to be saturated into early spring.

Prominent Vegetation: Oaks, elms, maples, loblolly pine, spruce pine (southeastern LA only), sweet gum and sugarberry.



Coastal Marshes and Barrier Islands

Longleaf Pine Savannas and Woodlands Shortleaf Pine-Oak-Hickory Woodlands

Hardwood-Pine Flatwoods

Bluff Forests (Tunica Hills)

Bottomland Hardwood Forests and Swamps

Coastal Prairie Parish Boundary

Major Waterbodies



Prominent Physical Features: Found only in the northwestern Florida Parishes, primarily in Tunica Hills. Occurs on windblown silt deposits that eroded over thousands of years to form a highly-dissected landscape of narrow ridges, steep slopes, and deep ravines, which

creates a relatively cool, moist climate on the slopes and in the Prominent Vegetation:

Cherrybark oak, Shurnard oak, tulip poplar, southern magnolia, American beech, blue beech and hickories.



Woodlands Prominent Physical Features: Occurs on infertile soils of both poorly-drained flatwoods and dry hills. The combination of infertile soils and frequent lightningstrike fires, occurring every one to three years, historically maintained open stands of longleaf pine with diverse prairie-like

Prominent Vegetation: Longleaf pine with a rich herbaceous understory supporting little bluestern, slender bluestern, western bracken fern and many wildflowers.



1. Coastal Marshes and Barrier Islands

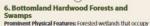
Prominent Physical Features: Includes freshwater, intermediate. brackish, and salt marshes, barrier islands, and fringing coastal forests. Due to a number of human activities, the Coastal Marshes and Barrier Islands plant region has suffered significant losses.

Prominent Vegetation: Grasses (cordgrasses and maidencane), sedges and rushes in the marshes. Forested coastal habitats support live oak, sugarberry, red bay, toothache tree and many other species.



Prominent Physical Features: Extension of Midwestern tall-grass prairie, with a subtropical influence. Once covered approximately 2.5 million acres in Louisiana. Modern agriculture has reduced Louisiana's coastal prairie to less than 1% of its former extent. Today, coastal prairie is limited to small remnants on grazing land, along railroads and a few small patches in urban areas. Fire, along with harsh soil conditions, restrict woody species to forests along streams dissecting the plant region.

Prominent Vegetation: A diverse mix of lush grasses (little bluestern, big bluestern, eastern gamma grass, switchgrass, and Indian grass), sedges, rushes, and many wildflowers.



broad floodplains and depressions bordering large river systems. The soil, hydrology and plant community vary based on river influence and landscape position. Floodplain soils are fertile and desired for agriculture, so most of the original forests have been converted to agriculture. Flood control efforts have also degraded the forests of this plant region.

Prominent Vegetation: Oaks, cottonwood, sycamores, elms, maples and ashes in bottomland hardwood forests. Bald cypress, water tupelo and swamp tupelo occur in the swamps.







Cultural Providers & Caretakers

- Live oak & bald cypress forest biodiversity fosters plants utilized in crafts, dyes, building, medicines, teas & food
- Last Defenders
 - Provide shelter & protection for communities & wildlife from heat & storm surge
 - Live oaks as "diagnostic" vegetation, mark archaeological sites in the wetlands
 - o Shell middens built as far back as 3000-3500 B.C.
- Living Legacies: seeds rooted to barren middens & built up communities that have thrived for centuries, a living legacy to the mound builders



Live oaks supporting resurrection fern, spanish moss, & dwarf palmetto



Indigenous Agriculture

- Centers Native Biodiversity
- Mound Gardens, Companion Planting,& Crop Rotations
- Agroforestry / Food Forests
- Ex: Hummingbird Springs Farm
 - Rematriating a 120-year old monoculture peanut farm to a traditional biodiverse food forest
 - Planting bald cypress alongside the food & medicinal plants
 - Reintroducing over 100 native species to the land











Maps & Farm Links

- Hummingbird Springs Farm: https://www.hummingbirdspringsfarm.org/
- Plant Regions of Louisiana Map:
 https://www.wlf.louisiana.gov/assets/Resources/Publications/Plants and Natural Communities/Native-Plant-Guide-Map.pdf
- Mississippi River Delta Formations Map:
 https://education.nationalgeographic.org/resource/miss-delta-formation/
- Cypress Logging (Image):
 https://scphistory.org/gmedia/20th century-page 0128 image 0001-jpg/
- Cypress Logs (Image): https://www.floridamemory.com/items/show/56656

Additional Resources

- Bethel, Matthew, Lynn Brien, Emily Danielson, Shirley Laska, John Troutman, William Boshart, Marco Giardino, and Maurice Phillips. 2011. "Blending Geospatial Technology and Traditional Ecological Knowledge to Enhance Restoration Decision-Support Processes in Coastal Louisiana." Journal of Coastal Research 27 (3): 555.
- Barras, J., S. Beville, D. Britsch, S. Hartley, S. Hawes, J. Johnston, P. Kemp, Q. Kinler, A. Martucci, J. Porthouse, D. Reed, K. Roy, S. Sapkota, and J. Suhayda. 2003. "Historic and Predicted Coastal Louisiana Land Changes: 1978-2050." U.S. Geological Survey Open File Report 03-334. U.S. Geological Survey. National Wetlands Research Center. Baton Rouge, LA. https://www.lacoast.gov/landloss/NewHistoricalland.pdf
- Bendick, Robert, Bryan DeAngelis, and Seth Blitch. 2018. "Oyster Restoration in the Gulf of Mexico." The Nature Conservancy, 28. https://www.nature.org/content/dam/tnc/nature/en/documents/OysterRestorationintheGulf.pdf
- O Brown, C., K. Andrews, J. Brenner, J.W Tunnell, C. Canfield, C. Dorsett, M. Driscoll, and E. Johnson, S. Kaderka. 2011. "Strategy for Restoring the Gulf of Mexico (A cooperative NGO report)." The Nature Conservancy Arlington, VA. https://www.fws.gov/doiddata/dwh-ar-documents/1187/DWH-AR0002936.pdf
- Oclten, Craig E. 2017. "Environmental Management in Coastal Louisiana: A Historical Review." Journal of Coastal Research 33 (3): 699–711.
- Davis, Donald W. 1973. "Louisiana Canals and Their Influence on Wetland Development." LSU Historical Dissertations and Theses, 234.

- O Day, John W., Louis D. Britsch, Suzanne R. Hawes, Gary P. Shaffer, Denise J. Reed, and Donald Cahoon. 2000. "Pattern and Process of Land Loss in the Mississippi Delta: A Spatial and Temporal Analysis of Wetland Habitat Change." Estuaries 23 (4): 425.
- O Day Jr., J. W., D. F. Boesch, E. J. Clairain, G. P. Kemp, S. B. Laska, W. J. Mitsch, K. Orth, et al. 2007. "Restoration of the Mississippi Delta: Lessons from Hurricanes Katrina and Rita." Science 315 (5819): 1679–84. https://doi.org/10.1126/science.1137030.
- O Dunn, Mary E. 1983. "Coquille Flora (Louisiana): An Ethnobotanical Reconstruction." Economic Botany 37 (3): 349–59.
- Giardino, Marco J. 2010. "NASA, Remote Sensing and Archaeology: An Example from Southeast Louisiana." https://ntrs.nasa.gov/search.jsp?R=20100005242
- Louisiana Department of Wildlife & Fisheries (LDWF). 2005. "Louisiana Comprehensive Wildlife Conservation Strategy." https://www.landcan.org/pdfs/la_wap_pdf.pdf
- Louisiana Department of Wildlife & Fisheries (LDWF). 2010. "Cypress Swamp & Cypress-Tupelo Swamp."
 https://www.wlf.louisiana.gov/assets/Resources/Publications/Natural Communities Fact Sheets/Cypress swamp
 Cypress-tupelo-swamp.pdf

- Louisiana Department of Wildlife & Fisheries (LDWF). N.d. "Guide to the Plants of Louisiana." U.S. Geological Survey (USGS). https://warcapps.usgs.gov/PlantID/
- Louisiana Natural Heritage Program (LNHP). 2009. "The Natural Communities of Louisiana." Louisiana
 Department of Wildlife & Fisheries. Baton Rouge, Louisiana. https://www.landcan.org/pdfs/LA NAT COM.pdf
- Mancil, Ervin. 1972. "An Historical Geography of Industrial Cypress Lumbering in Louisiana. (Volumes I and II)."
 LSU Historical Dissertations and Theses. 2296. https://digitalcommons.lsu.edu/gradschool_disstheses/2296
- Mitsch, William J, Bernal, Blanca, Nahlik, Amanda M, Mander, Ülo, Zhang, Li, Anderson, Christopher J, Jørgensen,
 Sven E, and Brix, Hans. "Wetlands, Carbon, and Climate Change." *Landscape Ecology* 28.4 (2012): 583-97. Web.
- o Moerman, Daniel E. 1998. Native American Ethnobotany. Portland, Oregon: Timber Press.
- Penfound, William T., and Julian A. Howard. 1940. "A Phytosociological Study of an Evergreen Oak Forest in the Vicinity of New Orleans, Louisiana." American Midland Naturalist 23 (1): 165.
- Salinas, L.M., R.D. DeLaune, and W.H. Patrick, Jr. 1986. "Changes occurring along a rapidly submerging coastal area: Louisiana, USA." Journal of Coastal Research 2(3): 269-284. Fort Lauderdale, ISSN 0749-0208
- White, David A, and Stephanie A Skojac. 2002. "Remnant Bottomland Forests near the Terminus of the Mississippi River in Southeastern Louisiana." Castanea 67: 12.

Additional Resources

- Hummingbird Springs Farm (Angie Comeaux) https://www.hummingbirdspringsfarm.org/
- Alliance of Native Seedkeepers https://www.allianceofnativeseedkeepers.com/
- Creator's Garden (Joseph Pitawanakwat) https://www.creatorsgardenmarket.ca/
- Robin Wall Kimmerer (Author: Braiding the Sweet Grass, Gathering Moss Books) https://www.esf.edu/faculty/kimmerer/
- Indigenous Environmental Network https://www.ienearth.org/
- Indigenous Climate Action (Just Transition Guide) https://www.indigenousclimateaction.com/programs/just-transition
- IAC Regenerative Ag Practices— https://www.indianag.org/understanding-regenerative-agriculture
- Vanishing Voices: The Extinction of the World's Languages (book that connects cultural losses and environmental issues worldwide)

Additional Resources continued

Organizations committed to health southeastern ecosystems & green infrastructure principles:

- Atchafalaya Basinkeeper -- https://www.basinkeeper.org/
- Healthy Gulf -- https://healthygulf.org/
- Restore the Mississippi River Delta -- https://mississippiriverdelta.org/

Storytellers

- Michaela Goade (Alaska Native Artist, Author) (Recommended: Salmon Boy, How Devil's Club Came to Be, Berry Song) -- https://www.michaelagoade.com/
- S.D. Nelson (Standing Rock Sioux, Artist, Author) (Recommended: Buffalo Bird Girl) -- https://sdnelson.net/
- Chikasha Stories Volume One: Shared Spirit -- https://chickasawpress.com/Books/Chikasha-Stories-Volume-One-Shared-Spirit.aspx
- Gather (Film) -- https://gather.film/stories/
- Abuela Grillo (Animated Short about Water & Rain) https://www.youtube.com/watch?v=AXz4XPuB_BM&t=645s
- Restore the Mississippi River Delta -- https://mississippiriverdelta.org/

RURAL LANDSCAPE GREEN INFRASTRUCTURE PRINCIPLES

- Bare Soil is Public Enemy #1
- Topsoil is created when plant roots come into contact with photosynthesizing plants.
- Plants moderate extreme climate conditions.
- It's our job to steward the land and create the conditions necessary for photosynthesis to occur.
- There is no recipe. Only a recipe for disaster. Discernment of context is everything. CONTEXT
- Keep soil protected in anticipation for extreme weather events.

TOPSOIL CREATED VIA PHOTOSYNTHESIS



MULCHING



THINGS ON CONTOUR (ROCKS)



THINGS ON CONTOUR (LOGS)



UPLAND ROCK DAMS



UPLAND ROCK DAMS — QUIVERA COALITION



ROCK DAMS (AKA ONE ROCK DAM)



ROCK DAMS (AKA ONE ROCK DAM)



SOIL AND WATER CONSERVATION TERRACE



SOIL AND WATER CONSERVATION TERRACE



SOIL AND WATER CONSERVATION TERRACE



SOIL AND WATER CONSERVATION TERRACE(CULVERT CATCHER)



COMBO LOG BERM, TERRACE, COVER CROP



UPLAND PONDS



NO TILL SEED DRILL



KEYLINE PLOW

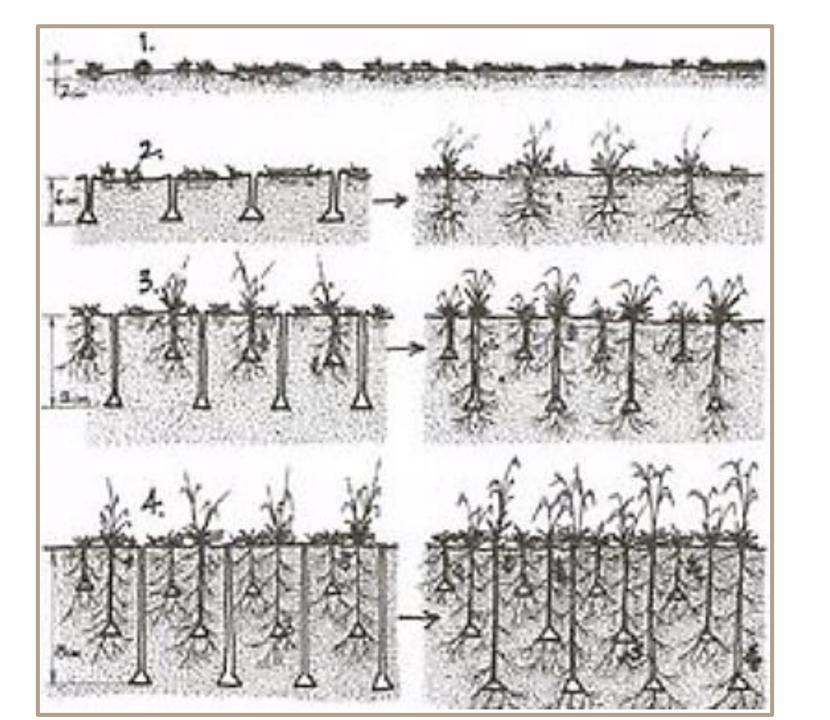


KEYLINE PATTERN FOR SOIL/WATER CONSERVATION



KEYLINE PATTERN FOR SOIL/WATER CONSERVATION (IN FIELD)

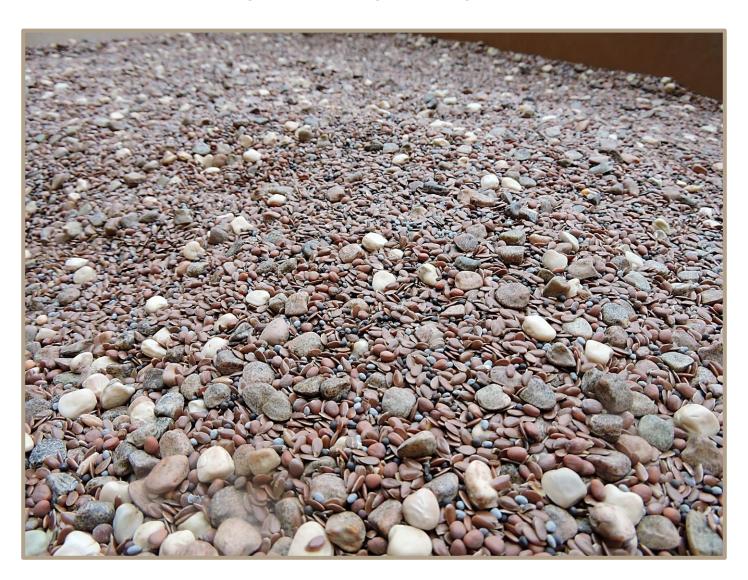




COVER CROPS



COVER CROPS

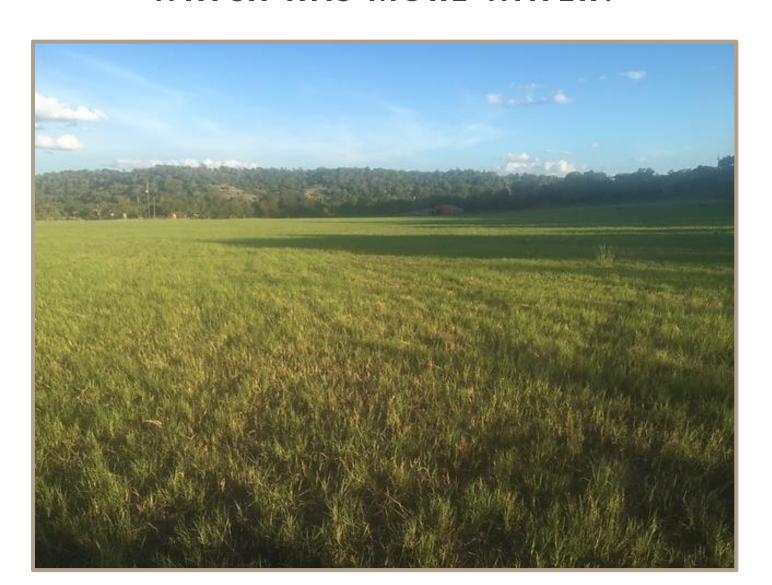


NATIVE SEED

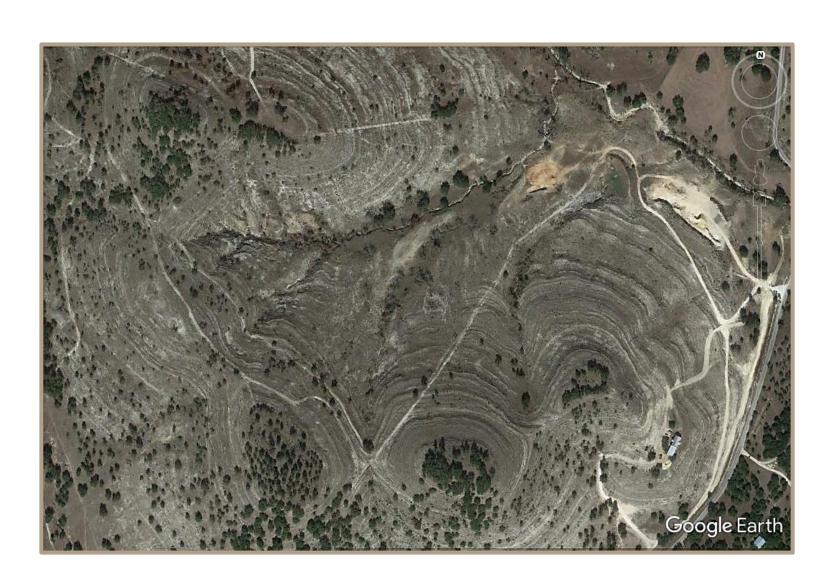


GRAZING MANAGEMENT

- Adapted Genetics
- Non-selective grazing
- Managing for soil Fertility
- Proper Protein Supplementation
- Ultra high density with frequent moves
- High level of management
- Jaime Elizondo
- droughtprooftx.com/business/regenerative-grazing-jaime-braun/
- Real Wealth Ranching by Jaime Elizondo (rwranching.com)









THANK YOU!

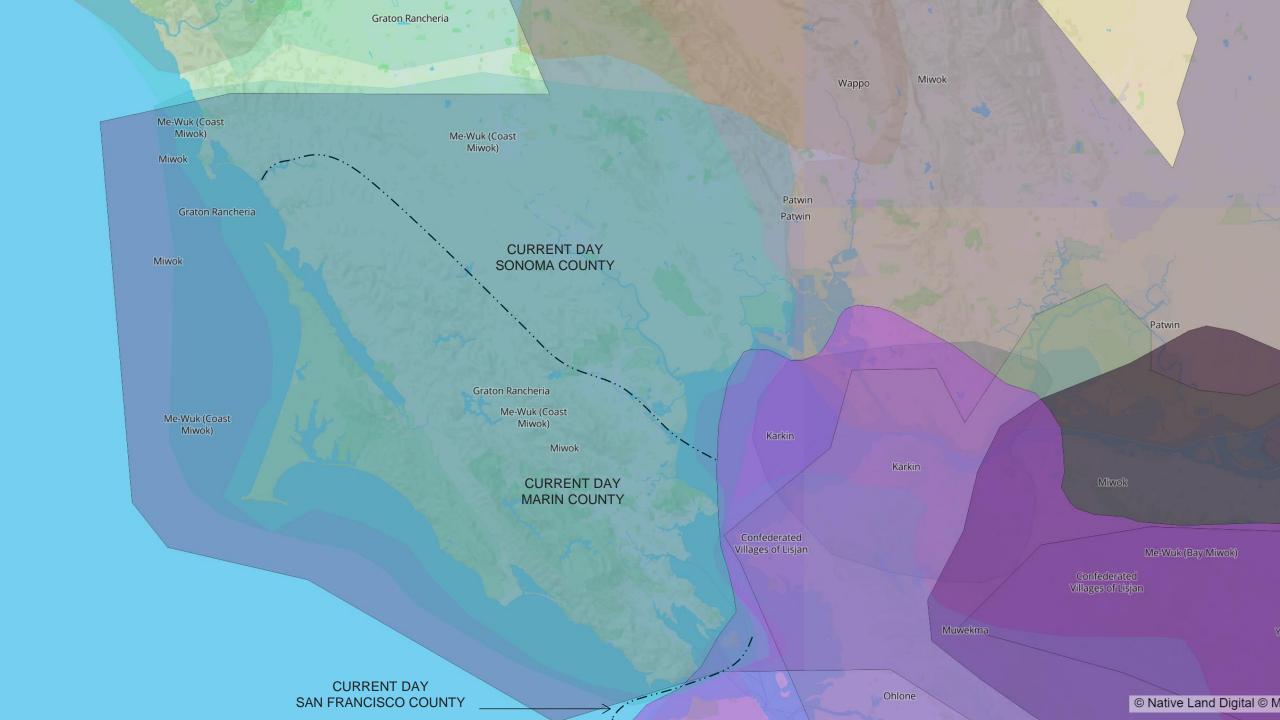
Joseph "Pete" Van Dyck (405) 606-5626 vandyck.designs@gmail.com

DroughtProofTX.com

Roots of Resilience:

Leveraging Nature-Based Design for Sustainable Agriculture and Place-Making

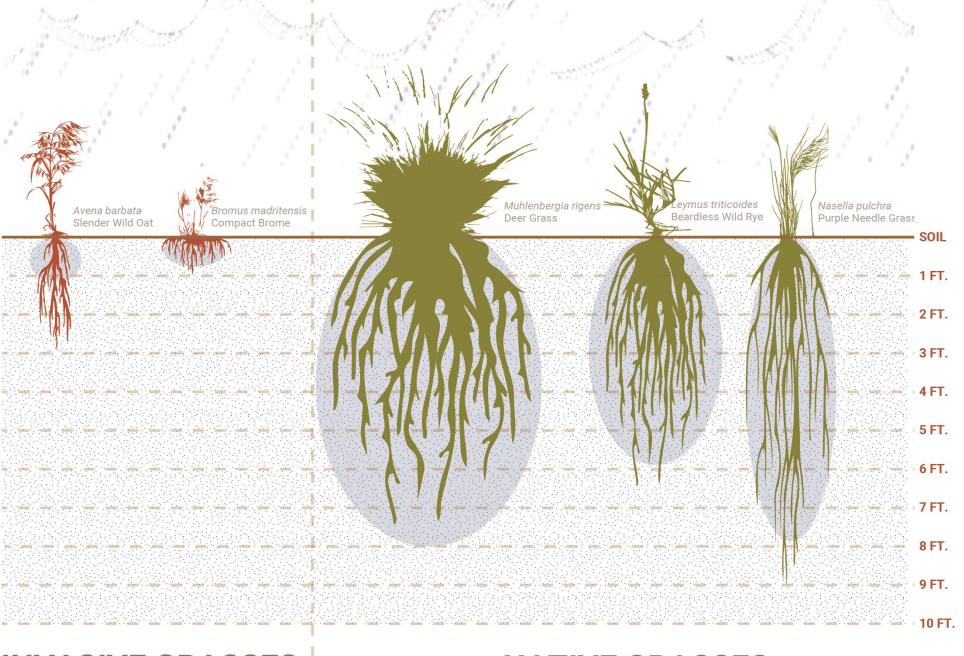






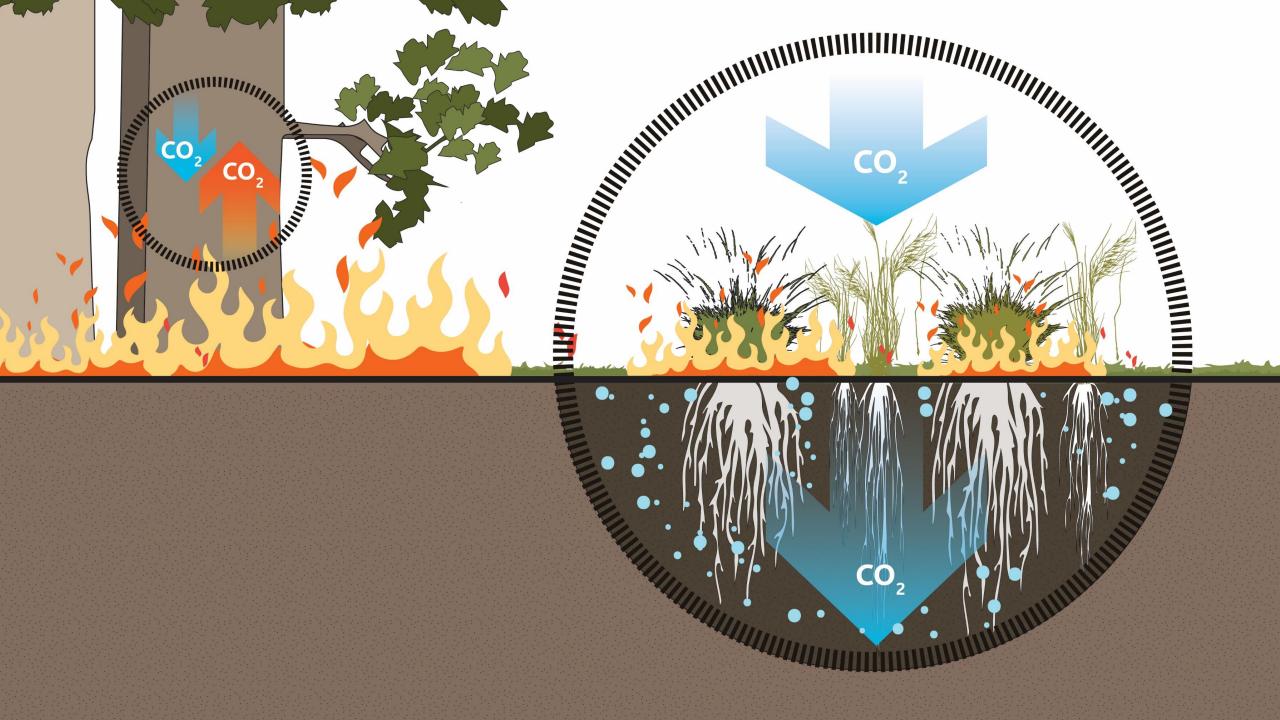


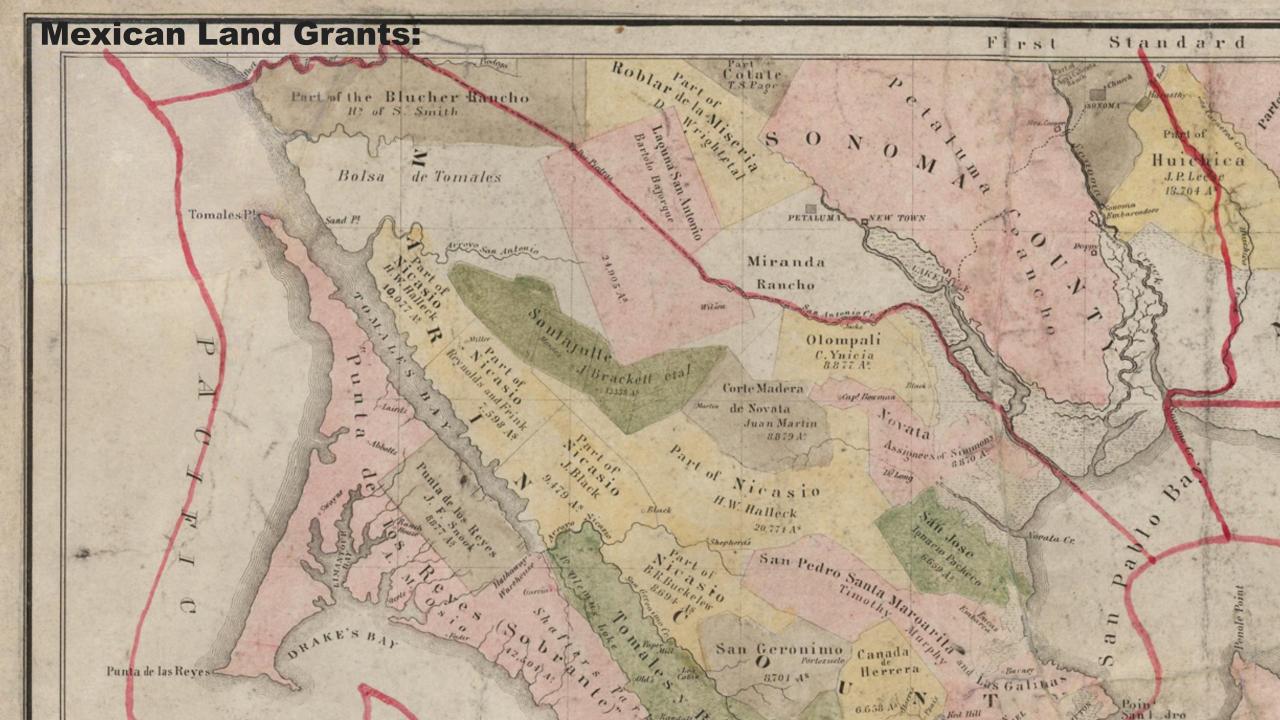




INVASIVE GRASSES

NATIVE GRASSES









Site Chapters GRASSLAND & GRAZING (2)**ENTRY RAIN** COURTYARD GARDEN **GRASSLAND** RAIN & GRAZING CATCHMENT FARM GARDEN

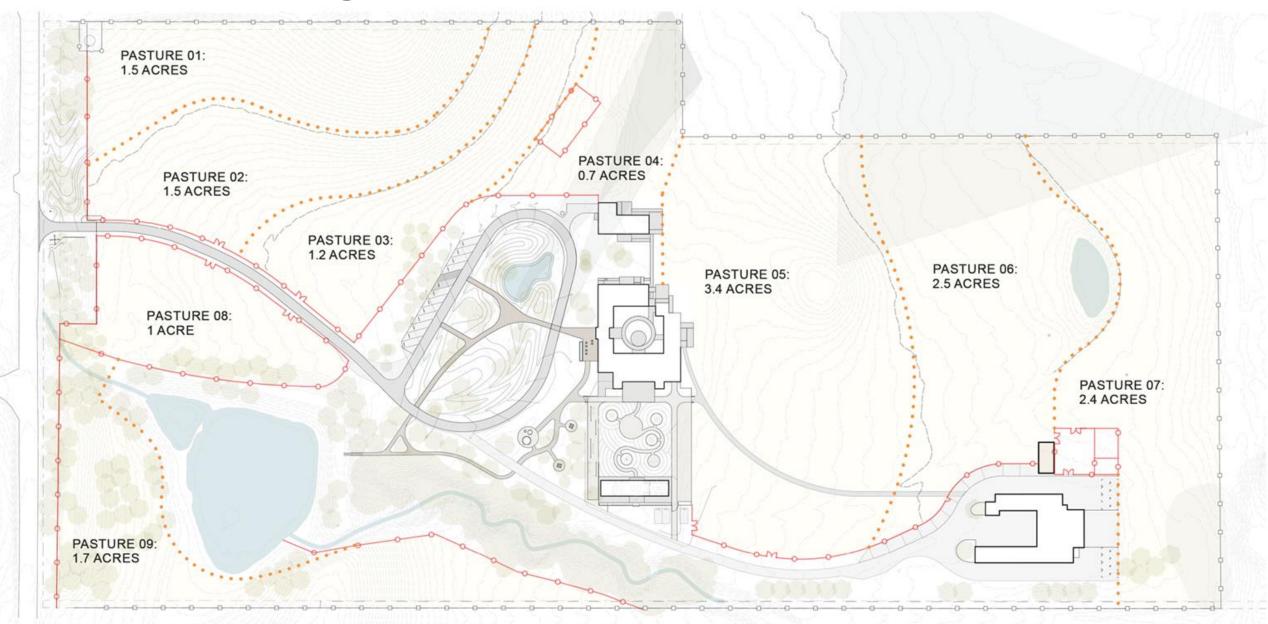


1.) Grassland Restoration & Grazing:

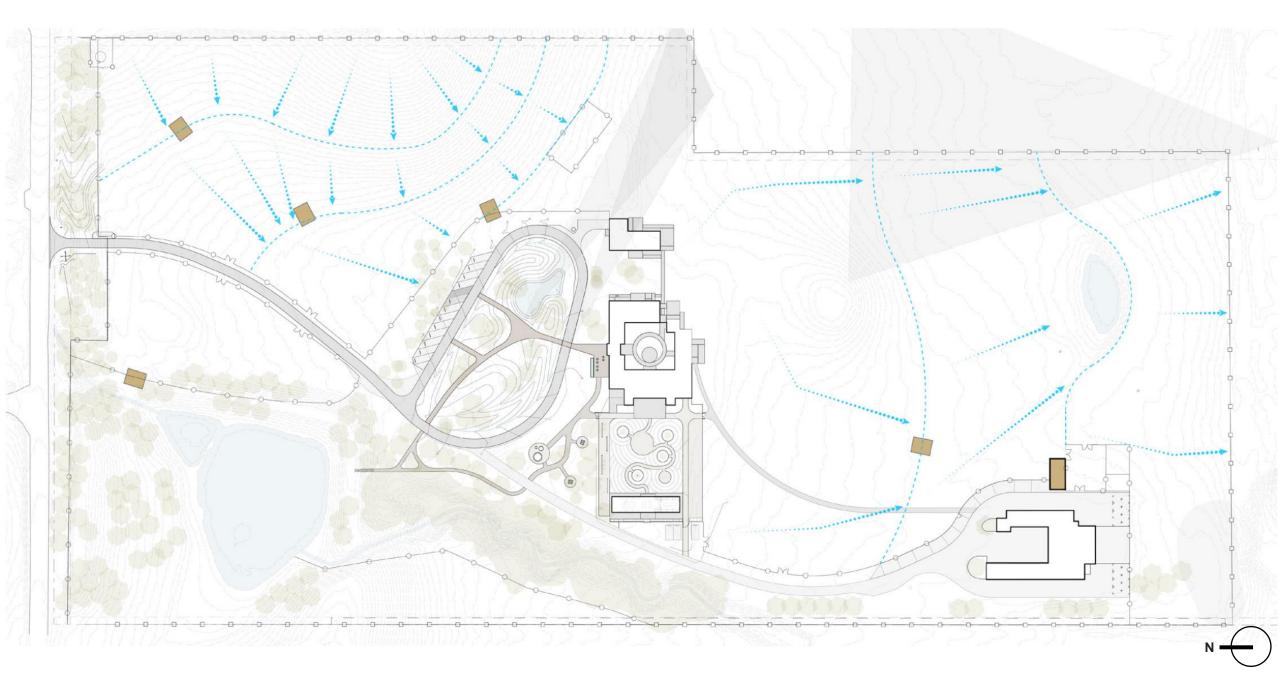




Rotational Grazing:



Rainwater Runoff Collection:

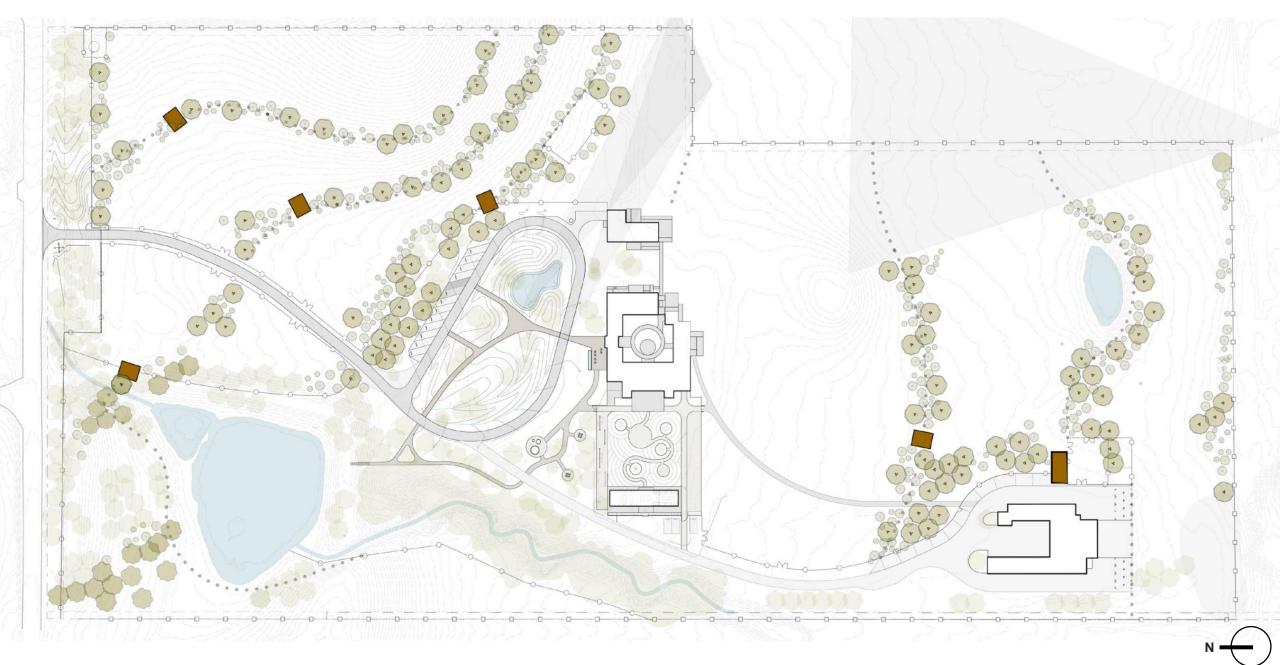


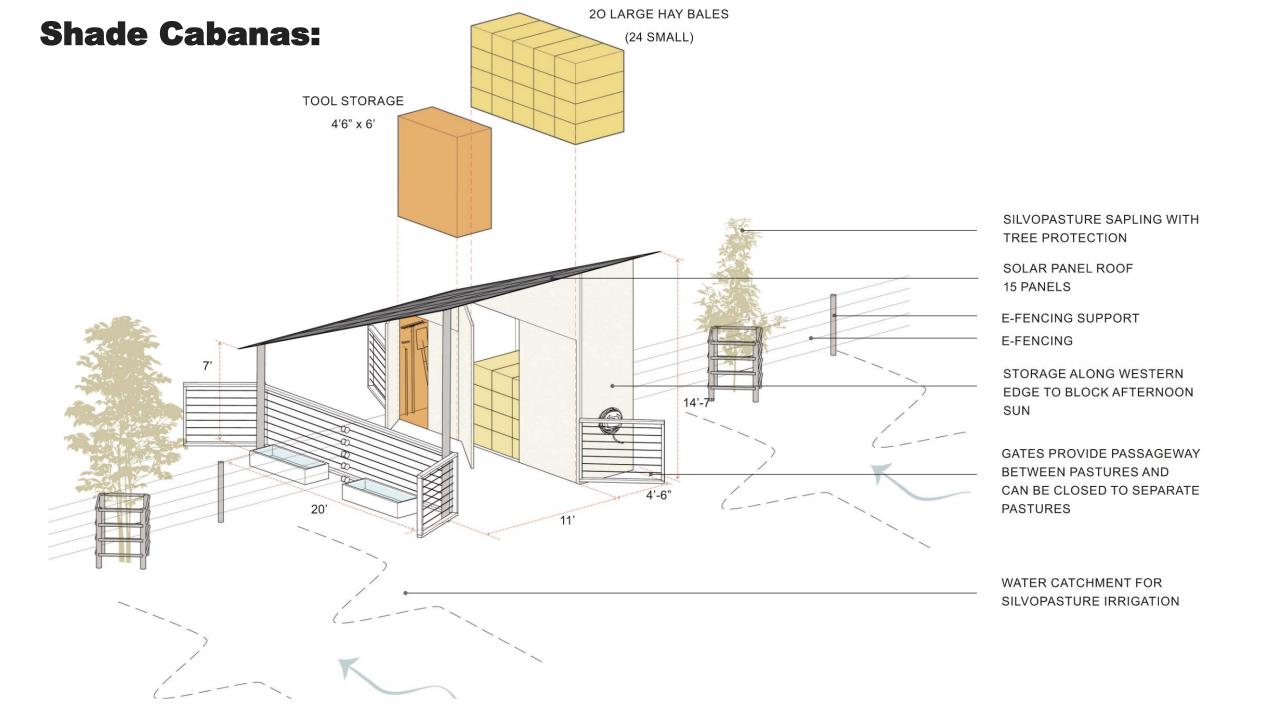
Grassland Restoration & Silvopasture:





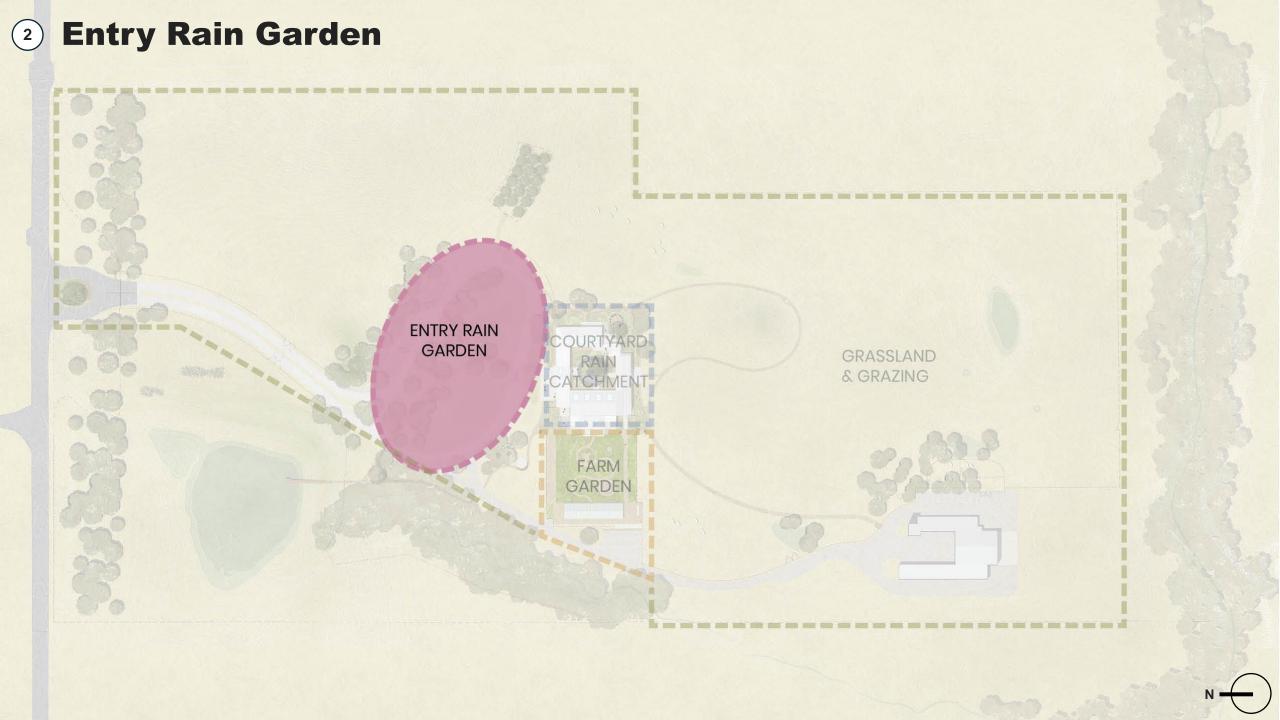
Shade Cabanas & Infrastructure:















Topography & Hydrology:





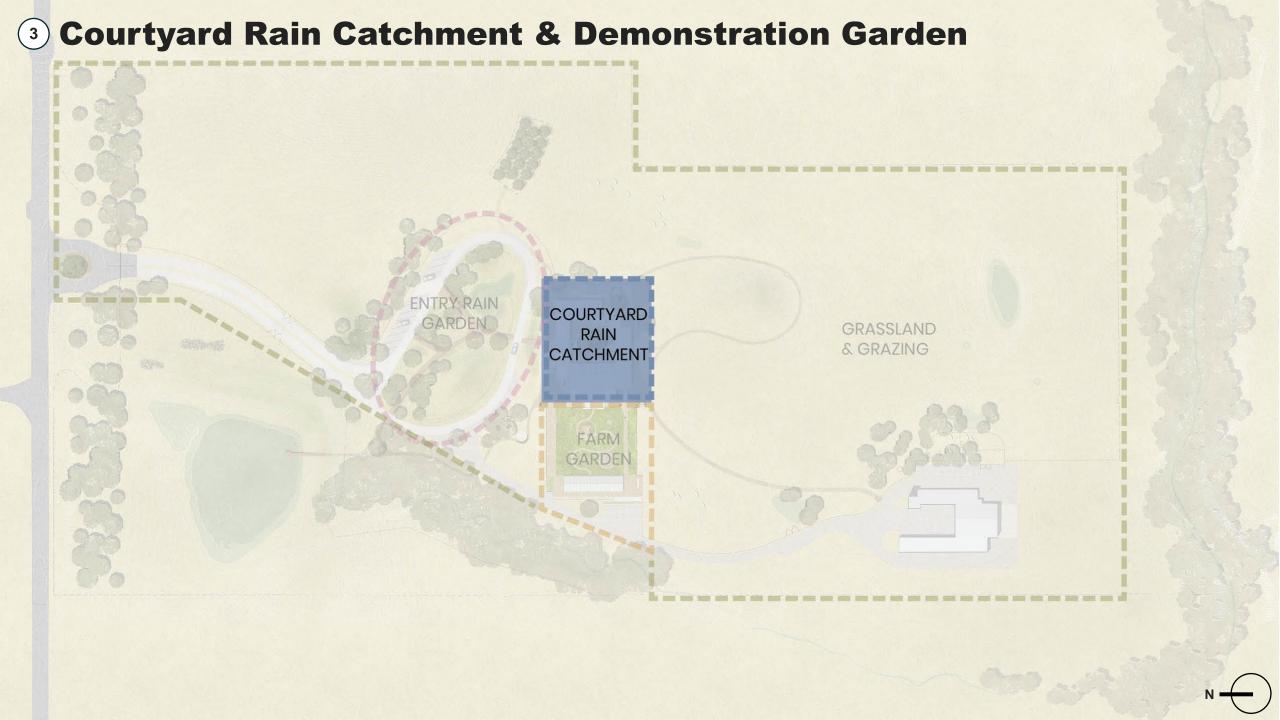




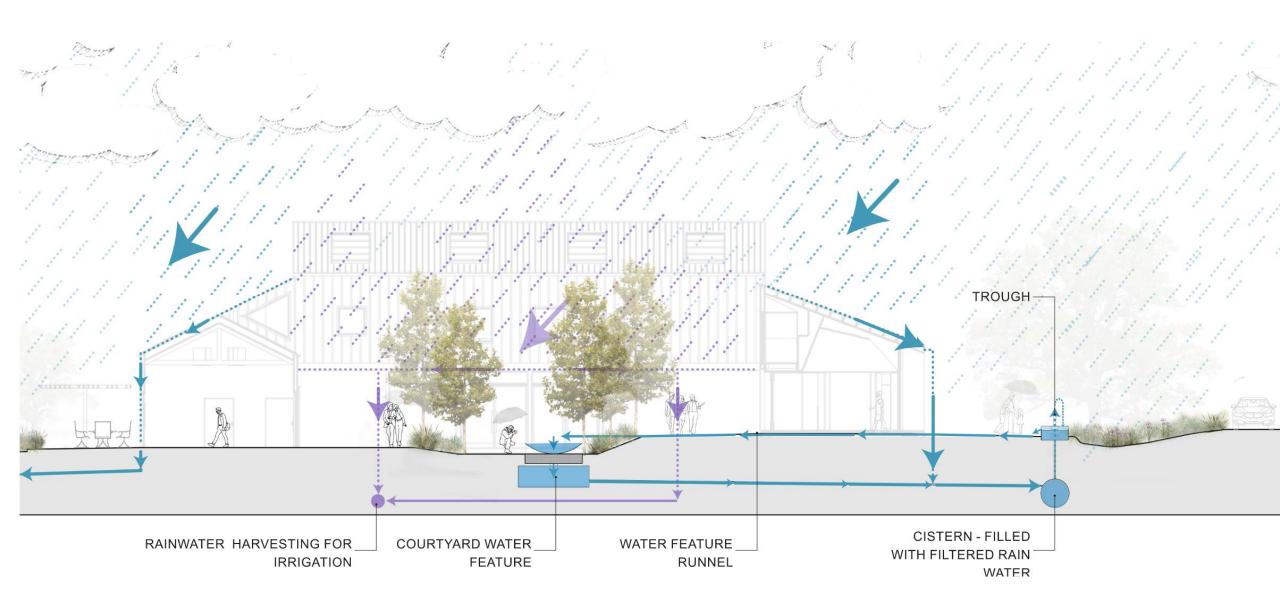


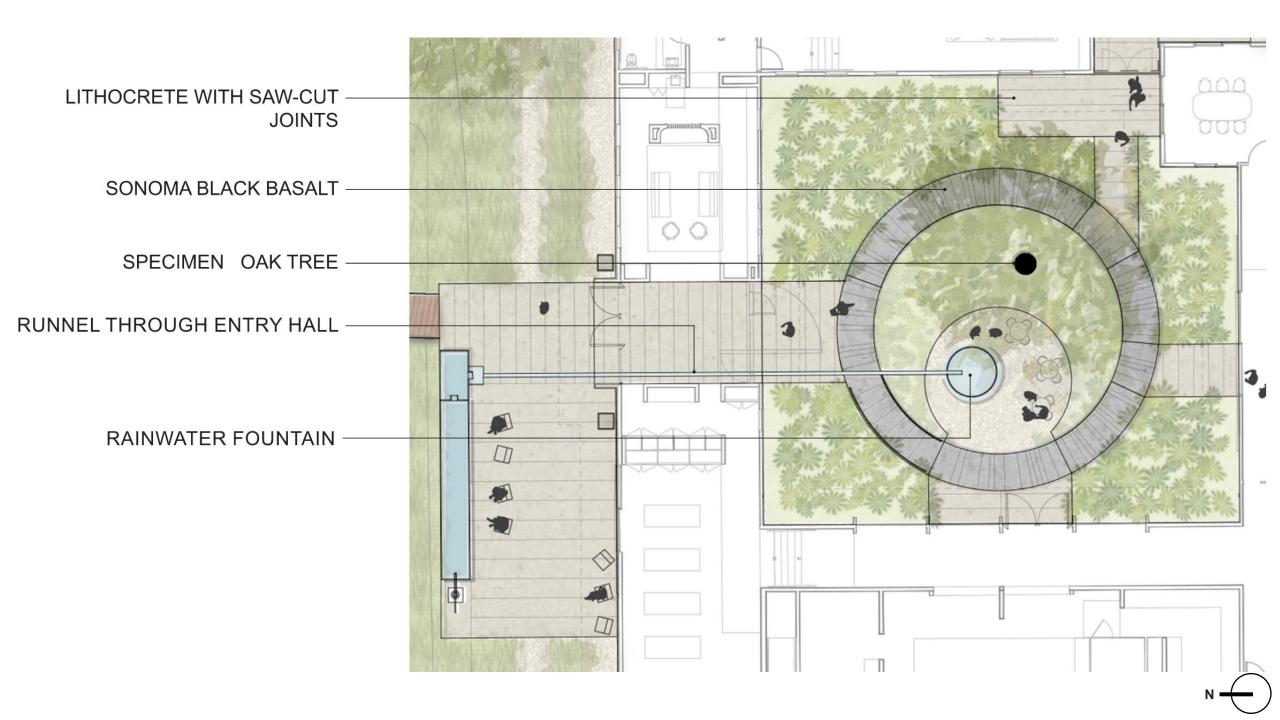






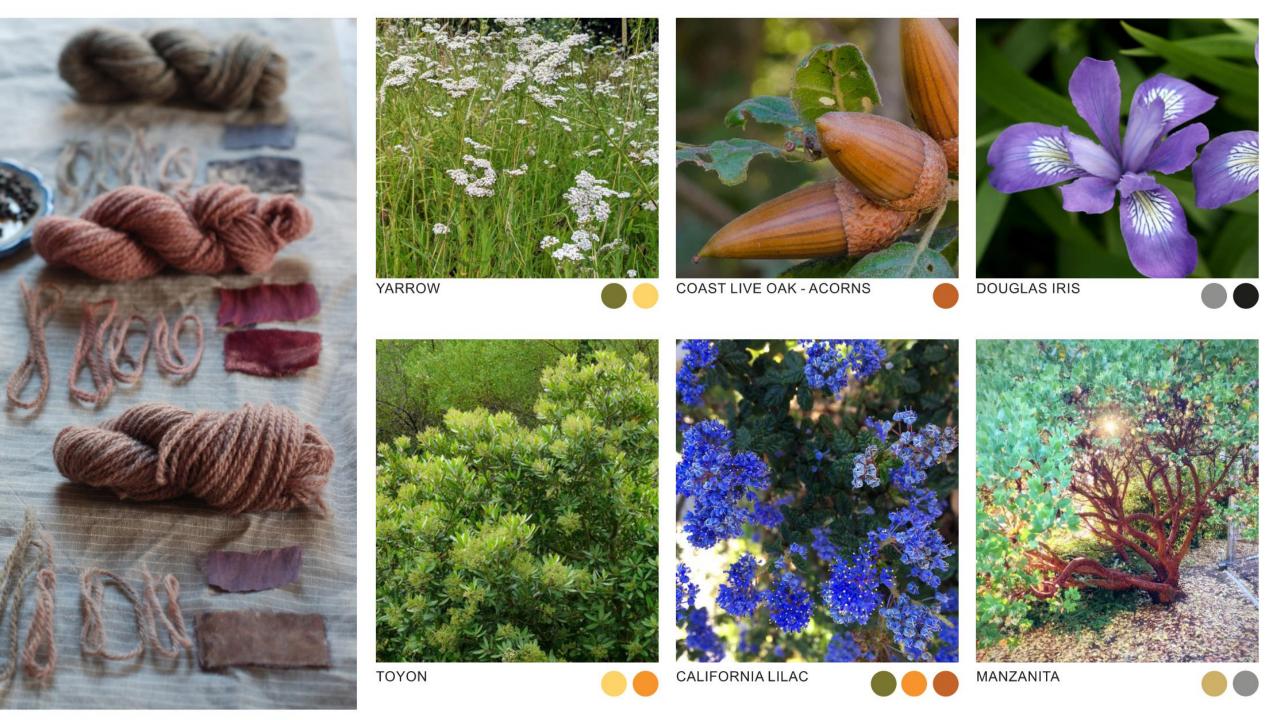
Rainwater Harvesting:





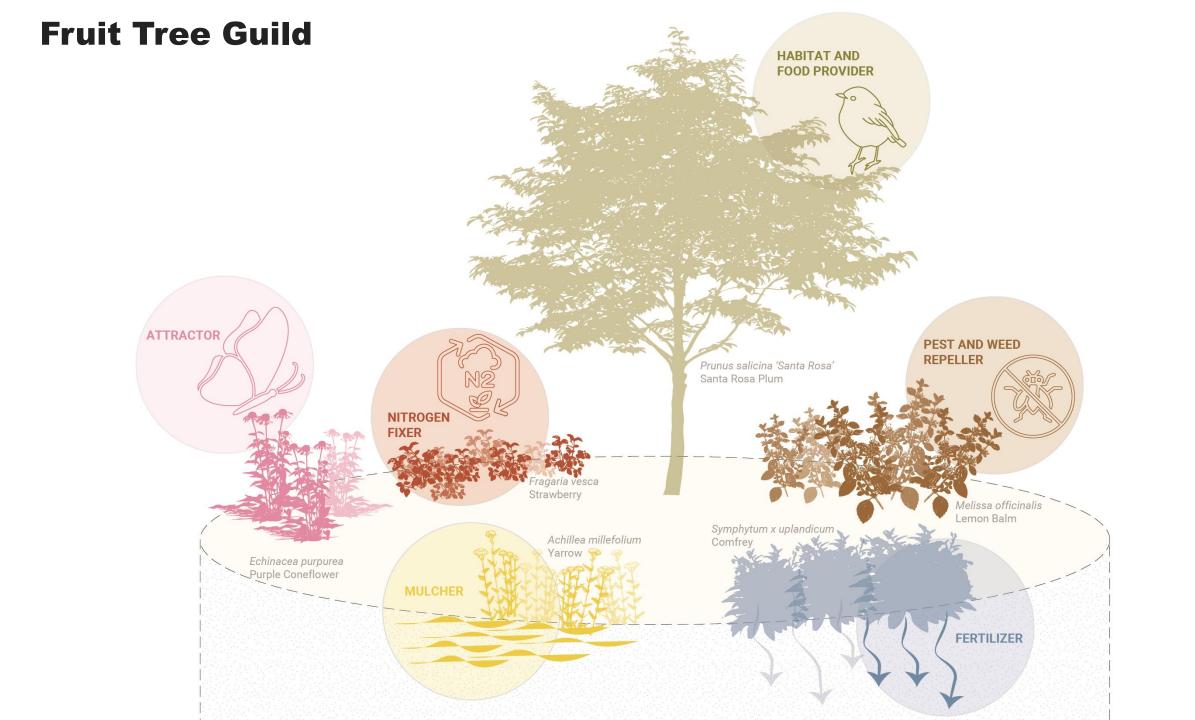


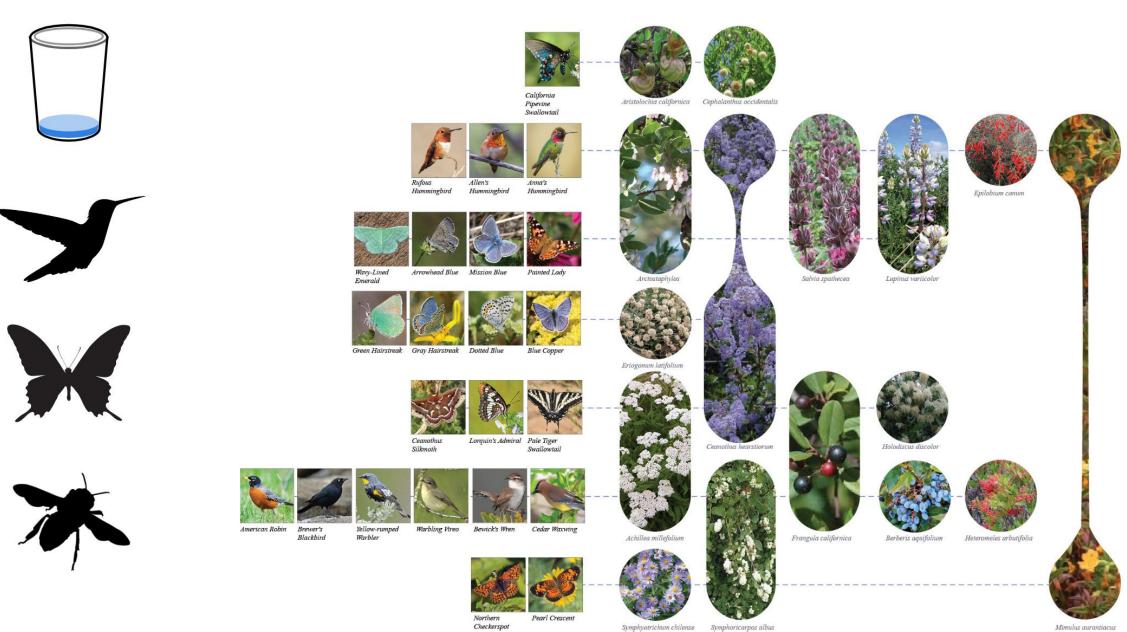




















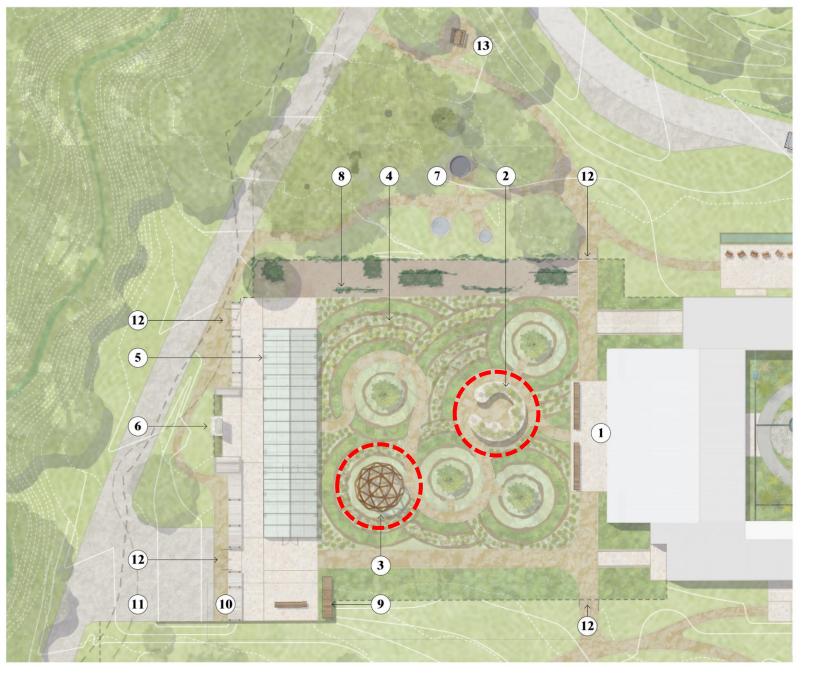


AUTUMN



WINTER





- 1 MTB WEST PATIO
- (2) "KEY-HOLE" DEMONSTRATION GARDEN
- (3) GEODESIC DOME
- (4) "TREE GUILD" DEMONSTRATION GARDEN
- (5) GREEN HOUSE & FARM PAVILION
- 6 HEARTH & PIZZA OVEN
- 7 WATER TOWER
- 8 GRAPE VINE TRELLIS
- 9 COMPOST BIN EXHIBIT
- $\widehat{\mathbf{10}}$ SOLAR BATTERY STORAGE EXHIBIT
- STAFF & MAINTENANCE PARKING W/ CHARGING STATIONS
- (12) ACCESS GATES
- (13) PICNIC GROVE





Hügelkultur Keyhole Garden

