Biochar as a Tool in Oak-Prairie Habitat Restoration

in the Willamette Valley, OR

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USBI Biochar in the Woods Workshop, January 27, 2022

Oregon Watershed Councils

What We Do

- **Nonprofit** working to **improve habitat and water quality** for fish, wildlife, and people (for 25 years!)
- We provide opportunities for community members to **learn about local land and water issues**
- We gather **scientific data** that we share widely with the community and partners, and use to inform our work.
- We **implement restoration projects**, usually through grant funding and donations

LTWC Restoration Project Locations

ca 1850

2004

Oak-Prairie Habitats of the Willamette Valley

Oak woodland (brown), Prairie-Oak Savanna (tan), Riparian (green)

Threats to Oak and Prairie Habitats

- Indigenous displacement and European occupation→loss of culture, relationships, and biodiversity
- Conversion to timber, comm. agriculture, urban/residential growth
- Fire suppression→woody plant encroachment, ecol. degradation
- Invasive species
- <2% prairie and oak savanna; <10% oak woodland in the WV (<5% in Long Tom watershed)
- Prairie and oak savanna are now the rarest habitat types (mostly occur on private lands)
- Numerous species in decline, esp. grassland birds and plants

Above: Oregon Vesper Sparrow (Klamath Bird Observatory)
Below: Camas

Oak Habitat Biodiversity

62 mammals

80 birds

9 amphibians

15 reptiles

714 plants

1100+ arthropods

100+ vertebrates known to consume acorns

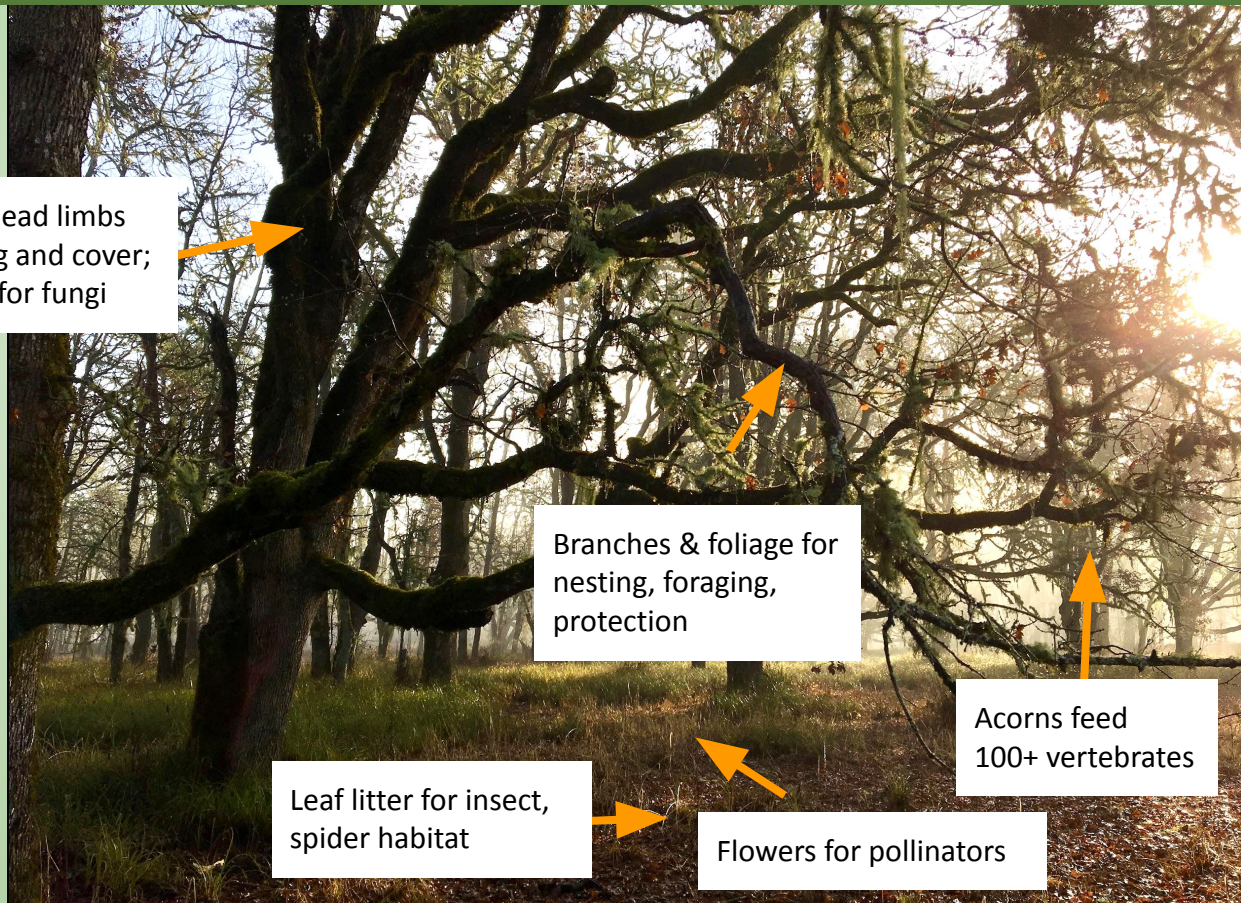

Image by Katie MacKendrick at Casares property near Eugene, OR

Evidence suggests biochar or black carbon is a long-time component of prairie soils (Hegarty et al. 2011) as a result of regular burning. Fire suppression has reduced its creation and incorporation into the soil.

Oak Woodland Restoration - Overview

- Thin stand density, remove encroaching trees from around old large oak trees
- **Slash treatment**
- Reduce understory shrubs
- Remove/reduce invasive species
- Seed disturbed areas with native forbs and grasses
- Long-term maintenance, regular disturbance

The Long Tom Watershed Council & Biochar

Nov. 2018 Biochar Demo with Kelpie Wilson

Organized by Katie MacKendrick (Ecologist, LTWC)

Flame-cap kilns ("Oregon kiln" design)

"Conservation" burn piles

Oak Woodland & Biochar - Motivation

- Improve oak habitat restoration practices
- Reduce carbon emissions, smoke emissions, soil sterilization
- Replenish soil conditions

Make and apply biochar on oak restoration sites from on-site materials

Study to understand impacts of biochar on native plant communities and soil

Oak Woodland & Biochar - Study Design

20' A (Control) 20'	B	C	D

5 Plots on 2 private properties
Within 55 acres previously thinned oak woodland
Remnant prairie plants in grazed understory

Treatments:

A. Control - no action taken
B. **Biochar** (60 gal biochar per subplot)
C. **Woodchips** (60 gal woodchips per subplot)
D. **Biochar + Woodchips** (30 gal each per subplot)

Oak Woodland & Biochar - Study Design

0-2"

2-6"

Vegetation Survey (Releve Plots)

- Species Richness
- % Cover Native, Introduced species
- Year 0 and 5

Soil Samples

- Every year
  - pH
  - Nutrients
  - Organic Matter content
- Year 0 and 5
  - Active carbon respiration
  - Wet Aggregate stability
  - Cation exchange capacity
  - Water holding capacity

Oak Woodland & Biochar - Plot Implementation

Conservation Burn Footprint - Seeding

- Yarrow
- Self Heal
- California Oatgrass
- Blue Wild Rye
- Clarkia
- Oregon Sunshine
- Tarweed
- More...

Aaron Liston, Oregon flora

Lessons So Far

- Biochar takes a lot of time and effort to make!
- Biochar is a fun and engaging education / community engagement tool
- We need more time, and more studies, to find out how biochar impacts native plant communities
- Need regionally specific best practices (soil, precip, airshed…)
- **Biochar cannot replace burning as a management practice in WV uplands but may help restore conditions to make burning more feasible and effective**
- Biochar is one tool in the toolkit

Image: Camas emerging through biochar pile (by Dan Casares)

Restoring the People to the Place

What's Next?

- Study biochar for stormwater filtration in urban areas
- Continue oak woodland study sites
- Biochar and grazing?
- Biochar and invasive species?
- Biochar and prescribed burning?
- Biochar in prairies and wetlands?

Seeking research collaborators!

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