



BIOCHAR FOR SMALL WOODLAND OWNERS: GUIDELINES AND OPPORTUNITIES

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Outline

1. NRCS Biochar and Manure Conservation Innovation Grant
2. Forest Ecology and the Need for Biochar
3. Biochar Technology for In-Woods Production
4. NRCS Biochar Enhancement
5. Next Steps

Fifty-six percent of the 751 million **acres of forest land** in the **United States** is **privately owned**. Of this **private forest land**, 62 percent is owned by families and individuals in what we call “**family forests**.”

<https://www.nrs.fs.fed.us/pubs/inf/NRS-INF-06-08.pdf>

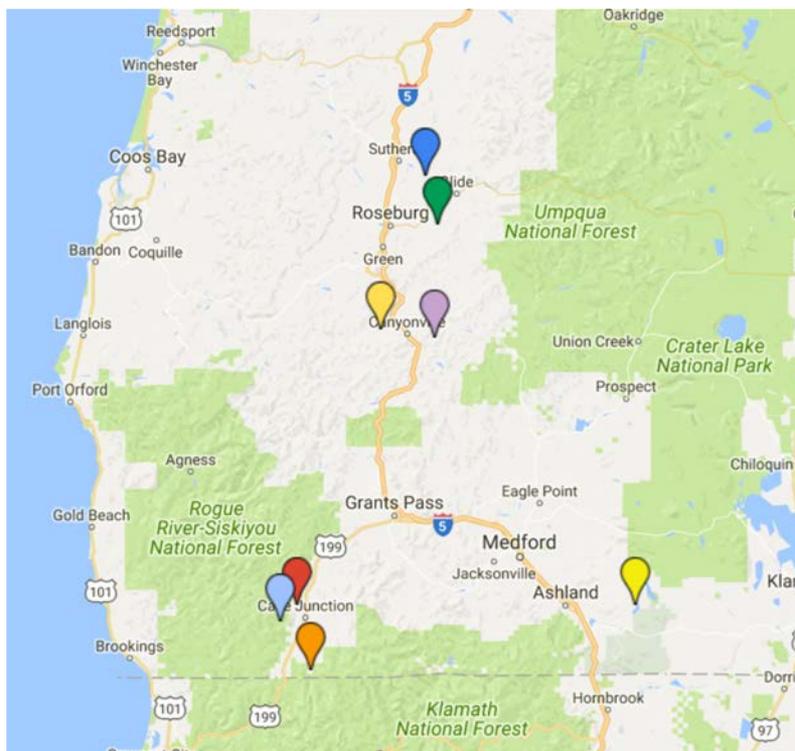


1. NRCS Biochar Farms & Manure

- Natural Resources Conservation Service (USDA) Conservation Innovation Grant
- Farmers in Oregon often have forest land and forestry residue that they burn for disposal
- Farmers with livestock have manure that can be a problem to handle
- Combine two waste streams to create value



Oregon Small Farms/Woodlands



| Farm Livestock and Acreage | | | | | | |
|----------------------------|------|---------------|------|--------|---------------|---------------|
| cows | pigs | sheep & goats | fowl | horses | pasture acres | woodlot acres |
| 250 | | | | | 200 | |
| 600 | | 325 | | | 1150 | 120 |
| | 12 | 37 | 100 | | 35 | 3 |
| | | 47 | | | 35 | 43 |
| | 60 | 60 | 200 | | 30 | 250 |
| | | | 18 | | 1 | |
| | | 17 | 73 | | 6 | 6 |
| | | 3 | 36 | 17 | | |
| 850 | 72 | 489 | 427 | 17 | 1457 | 422 |

Natural Resources Conservation Service (USDA)

Conservation Innovation Grant 2015-2018

Umpqua Biochar Education Team

Final Report (200+ pages!) UBETBiochar.blogspot.com



Willow Witt Ranch – Motivation



Two buckets of biochar sprinkled once a week in the goat barn keeps odors down.

No more ammonia smell!

- Better compost?
- Healthier animals?



Help for Acid Pasture Soils

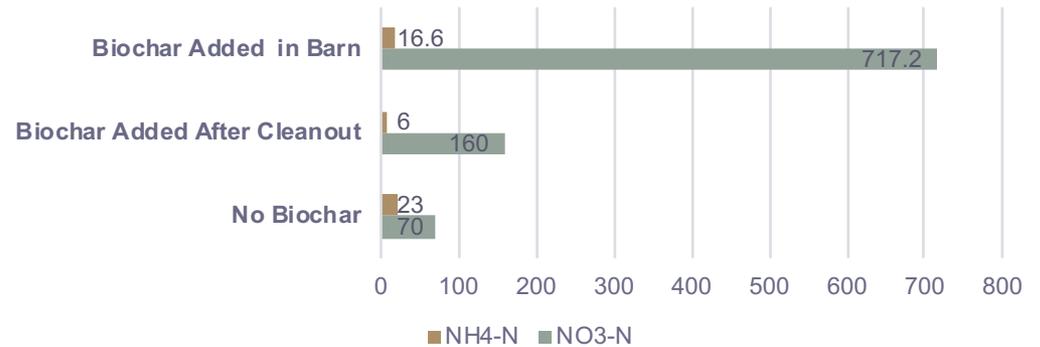
- Biochar in winter feed bards
- Biochar-manure spread on pasture



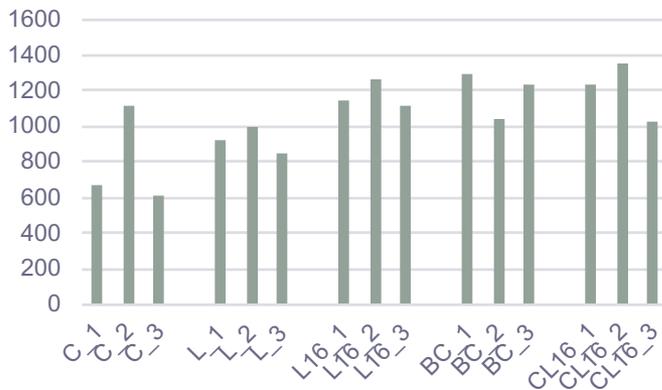
Experimental Results



Nitrogen Content of Manure with Biochar (ppm)



Treatment harvest weight (grams)



Note: Charcoal label is Biochar. Biochar label is Biochar Compost

2. Forest Ecology

Dense young forests need thinning, both for forest health and fuels reduction



The image is a composite. The left side shows a forest with a large plume of white smoke rising from a slash pile in the distance. The right side is a semi-transparent overlay of a similar forest scene. The text is centered over the bottom half of the image.

**Smoke fills the air from hundreds
of burning slash piles**







Burn pile scars are long-lasting



Pile burning can create grass and forb-filled openings that often remain treeless for decades, as can be seen in this aerial photo of a 40-year-old regenerating lodgepole pine stand in Grand County, Colorado. (Photo by C. Rhoades)



Fire adapted forest soils need char

- Activities that exclude fire ... eliminate the contribution of this stable, yet biochemically important form of C to the soil ecosystem.
- The long-term implications of such activities could result in shifts in ecosystem processes that cannot currently be easily predicted.
- *DeLuca, T. H., & Aplet, G. H. (2008). Charcoal and carbon storage in forest soils of the Rocky Mountain West. Frontiers in Ecology and the Environment, 6(1), 18–24. <http://doi.org/10.1890/070070>*



Conventional Burn vs. Biochar Burn



- Conventional Burn: Flame under cold biomass makes smoke
- Biochar Burn: Light on top – heat transfers to pile by radiation
- Flame on top burns smoke



Quench with water to save char



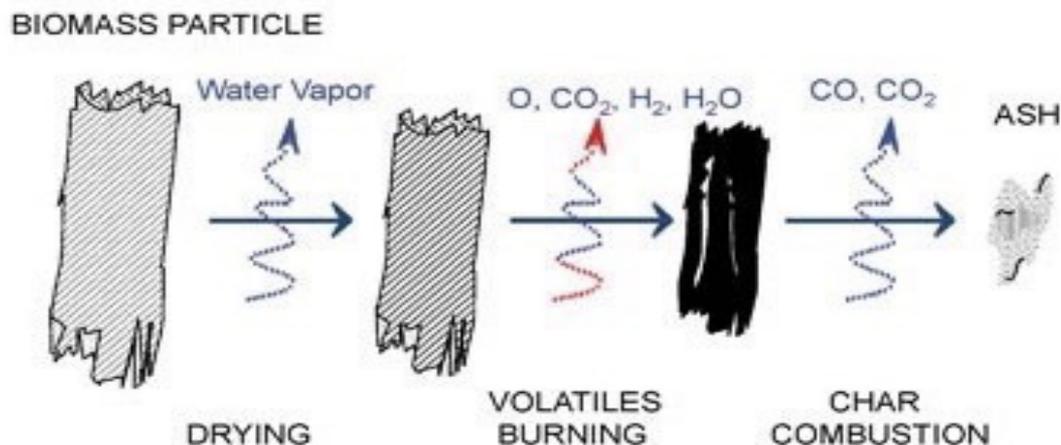


3. Technology for In-Woods Production



The Flame Cap Kiln – Bonfire Biochar

Technology: Flame Carbonization



- Biomass burns in 3 stages
- To make char, stop the process before it goes to ash
- Just another form of gasification
- **For more info see my ANZBI webinar, Biochar in the Woods – Ecology, Technology and Logistics @ wilsonbiochar.com**



Complete Biochar Forestry System



Pioneering a complete biochar production system
UBETbiochar.blogspot.com

Design Parameters - the Oregon Kiln

- Sized for feedstock
 - Logs 4 to 5 feet long
 - Up to 6" diameter
- Portable but Durable
 - Less than 200 lbs
 - 14 gauge steel
- Ergonomic for loading
 - Only 2 feet high
- Capacity
 - Makes > 1 cubic yard of biochar in about 4 hours
- Economical
 - Pyramid shape cheaper to fabricate than cone
 - \$800 for Kiln – 5' top base, 4' bottom base, 2' high sides



Umpqua Community College Welders



Drew Biochar Project – Umpqua Biochar Education Team



- 17 acres of thinning
- Removal of small pine and fir trees
- Umpqua National Forest



More info at: UBETbiochar.blogspot.com



Three days, 25 people, 150 cy of forest slash, 28 cy of biochar



NRCS-CIG Deliverables: Practice Guidelines

Free Download: Complete Practice Guidelines and Open Source Kiln Drawings
Wilsonbiochar.com
UBETbiochar.blogspot.com

Smoke into Biochar

Safe Burn Practices for Recovering Biochar for Use in Soil and Compost

Biochar

Have you heard about the benefits of Biochar? Biochar is charcoal that you can add to soil or compost. It helps retain moisture and nutrients and it promotes beneficial microbes in soil. Biochar can be expensive to buy, but if you have burn piles, you can make your own biochar and have a cleaner, safer fire as well.

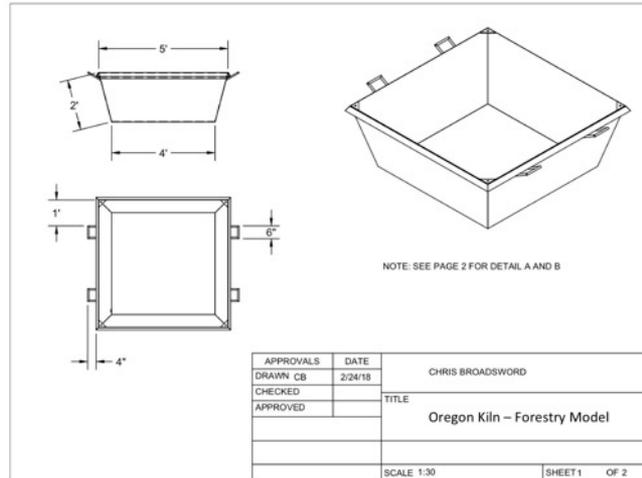
There are five requirements you need to follow if you want to make biochar in your burn pile. These principles will also ensure that your fire is as smoke-free as possible:

1. Use only dry wood
2. Burn small brush separately from thicker logs (greater than 4" in diameter)
3. Make small piles that are loose with good airflow and no dirt. A good pile size is four to six feet in diameter and four to six feet tall
4. Light the piles on the top
5. Have a water hose nearby so you can quench the fire and save the charcoal

YOU CAN KEEP SMOKE OUT OF THE ATMOSPHERE
THE CARBON THAT WOULD HAVE GONE UP IN SMOKE STAYS IN THE BIOCHAR!



Small brush burns quickly when dry. You need to consolidate it as it burns down and put it out with water before it burns to ash. Three brush piles this size made one cubic yard of biochar. Biochar sells for between \$200 - \$400 a cubic yard.



Illustrated Guide to Using the Oregon Kiln



4. NRCS CSP Biochar Activity



United States Department of Agriculture

CONSERVATION ENHANCEMENT ACTIVITY
E384135Z

CONSERVATION
STEWARDSHIP
PROGRAM

Biochar production from woody residue

Conservation Practice 384: Woody Residue Treatment

APPLICABLE LAND USE: Forest, Associated Ag Land

RESOURCE CONCERN ADDRESSED: Degraded Plant Condition

ENHANCEMENT LIFE SPAN: 10 years

Enhancement Description

Uses woody debris remaining after fuel reduction harvests or wildfires to create biochar. Biochar stores carbon and is a useful soil amendment that improves Soil Organic Matter (SOM) and water-holding capacity.



Criteria

- States will apply general criteria from the NRCS National Conservation Practice Standard Woody Residue Treatment (Code 384) as listed below, and additional criteria as required by the NRCS State Office.
- The enhancement will be applied to sites where woody debris presents a fire risk or interferes with land management objectives or planned activities (e.g., impedes regeneration, limits access, interferes with livestock movement, etc.).
- Woody debris that does not have a commercial use is suitable for biochar creation.
- Where this enhancement can be coordinated with a fuel reduction treatment, woody debris should be separated by size classes if possible.
- Biochar will be created on site in kilns designed for the purpose.
- Kiln operators shall be properly trained in procedures for creating biochar, and shall adhere to state safety precautions at all times. A plan for quenching biochar will be in

Lems Ridge, California



Baskin Lems Ridge Property

Stewardship Plan

Date: 7/5/2018

Customer(s): JAMES R BASKIN
 District: DEL NORTE RESOURCE CONSERVATION DISTRICT
 County and State: DEL NORTE, CA

Field Office: DEL NORTE LPO
 Agency: USDA-NRCS
 Assisted By: NATHAN BIRD
 Legal Description: Farm 149 Tract 1325
 SE 1/4 Sec 24-015N-02E



Prepared with assistance from USDA-Natural Resources Conservation Service

Legend

Practices (polygons)

Practice name

-  Herbaceous Weed Treatment
-  Biochar production from woody residue
-  CStwP_8191041820P
-  PLSS_BLM_2016_US_Townships
-  PLSS_BLM_2016_US_Sections



Yew Creek Land Alliance, Oregon



5. Next Steps

- Thanks to climate change, forest fires are burning longer and stronger across the western United States
- Cost of fighting U.S. wildfires topped **\$2 billion** in 2017
- Property loss was more than **\$65 billion** in 2017 in California alone.
- **NRCS Biochar Enhancement is very welcome. But will it last?**
- **Will the public step up and support programs to regenerate healthy forests, with biochar as a key component?**



Where Does Value Truly Lie?



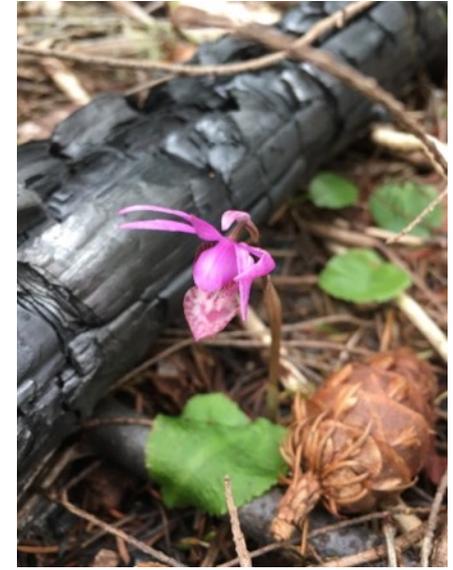
- The Santa Rosa fires of 2017 were so hot that aluminum car wheels melted.
- What good is a car and fossil fuels to run it, if fires destroy property?
- Of all the things we can spend money on, are soil carbon and healthy ecosystems that provide food, water and climate stability a priority?



More and More Landowners Say: Biochar – Just Do It!



Remember, 35% of US forestlands are owned by families.



Thank You!

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Wilson Biochar Associates specializes in biochar technology and market development. We provide strategic advice and services to businesses and organizations.

- Technology Assessment
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More info at: WilsonBiochar.com