Biochar:

Black is the New Green

Dusty Moller

Biomass Utilization Specialist

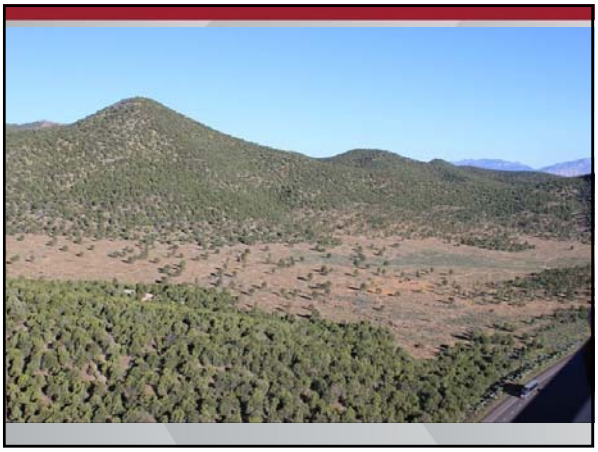
WSU Renewable Energy Program

WASHINGTON STATE UNIVERSITY ENERGY PROGRAM www.energy.wsu.edu

Critical Factors for the Successful and Sustainable Startup of a New Business

- Resource supply – what & how much is available?
- Products – what can you make from the resource?
- Markets – can you sell those products?
- Processing – what is the appropriate technology?
- Management – do you have what it takes?
- Financial – can you make money doing this?
- Environmental, health, safety – concerns?

From: Rusty Dramm, USFS Forest Products Laboratory, et. al.



The "Selling" of a New Industry

- Enabling technology
- Innovative business model
- Market adoption
- The Key? "Favorable Government Policy"

From: How to Jump-Start the Clean-Tech Economy; Mark W. Johnson, et. al.

Nevada Pinyon-Juniper Biochar Project

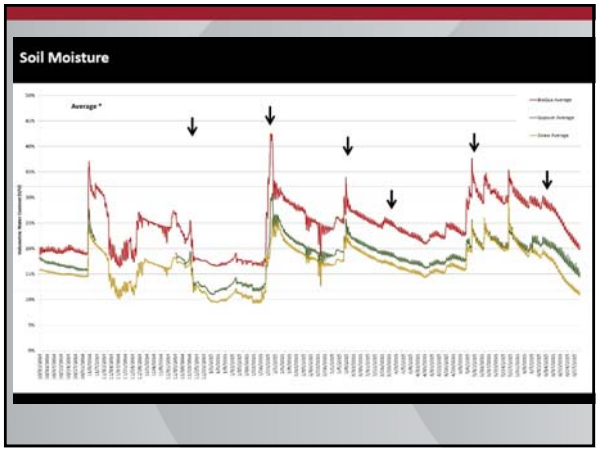
Jim Ippolito

USDA Agricultural Research Service
Northwest Irrigation and Soils Research Laboratory

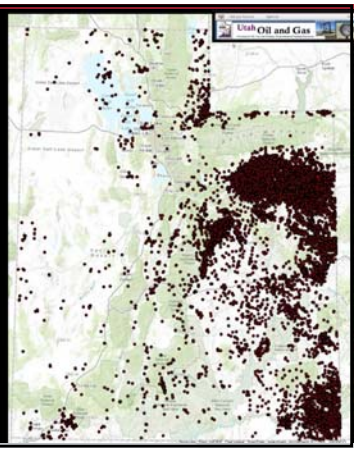
Biochar can play an important role in the rehabilitation of reserve pits and well site pads

Reclamation Process

- Empty and backfill reserve pit



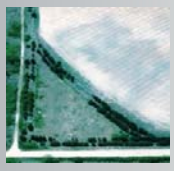
Name	Wells
KERR-MCGEE OIL & GAS ONSHORE, L.P.	4932
NEWFIELD PRODUCTION COMPANY	4512
EOG RESOURCES, INC.	1945
QEP ENERGY COMPANY	1541
LINN OPERATING, INC.	1518
XTO ENERGY INC	1174
RESOLUTE NATURAL RESOURCES	819
CRESCENT POINT ENERGY U.S. CORP	744
CONOCOPHILLIPS COMPANY	726
BILL BARRETT CORP	712
ENDURING RESOURCES, LLC	633
EP ENERGY E&P COMPANY, L.P.	609
PETROGLYPH OPERATING CO	568
ENERVEST OPERATING, LLC	525
GASCO PRODUCTION COMPANY	302
ULTRA RESOURCES INC	235
QUESTAR EXPLORATION & PRODUCTION CO	220
ANADARKO E&P ONSHORE, LLC	206
CHEVRON USA INC	194
FINLEY RESOURCES, INC.	194
WESGRA CORPORATION	188
CITATION OIL & GAS CORP	186
GULF OIL CORPORATION	166
QEP UINTA BASIN, INC.	165
AMOCO PRODUCTION COMPANY	156
WEXPRO COMPANY	139
RUNNING FOXES PETROLEUM, INC.	132
LONE MTN PRODUCTION CO	131
SHENANDOAH ENERGY INC	127
SHELL OIL COMPANY	124
FOREST OIL CORPORATION	121
HARKEN SOUTHWEST CORP	121
ROSEWOOD RESOURCES INC	121
COASTAL OIL & GAS CORP	116
LOMAX EXPLORATION COMPANY	114
SUPERIOR OIL COMPANY	111
TEXACO INC	111



Eastern Nevada Landscape Coalition (NV) $75,964

Nevada Biochar Field Demonstration Trials: Treatment within Agricultural Pivots and Rehabilitation of Pivot Corners

Expansion and encroachment of pinyon-juniper woodlands into sagebrush steppe ecosystems can have negative impacts, including loss of wildlife habitat, increased erosion, and loss of herbaceous species. Field demonstration activities carried out through this project will assess the impact of applying biochar in production agriculture and rangeland restoration settings near pinyon-juniper encroachment areas. Turning woody biomass into biochar, and then returning biochar to the soil may be an effective method for maintaining or improving soil moisture and vegetative productivity, improve sage grouse habitat, and return soil carbon to historic levels. This technique is expected to reduce the overall cost of invasive pinyon-juniper treatment (by creating a value for invasive species woody biomass), helping stimulate the local economy.



Evaluating the Utility of Pinyon and Juniper Derived Biochar: Utube Video (Approximately 60 minutes)

https://www.youtube.com/watch?feature=player_embedded&v=4KgrYx4oqfc

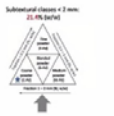
Rural v. Urban Biomass---Guess Who Wins?

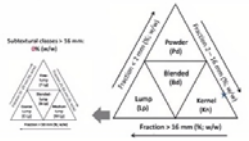
- In 2012, the timber harvest from National Forests was 2.64 billion board feet. That converts to 6.2 million cubic meters (m^3). At 896 kg/m^3, that volume of timber would weigh about 6.1 million tons.
- The population of the US was 282.1 million in 2012; today, that number is 313 million—an increase of about 11%.
- Using the same ratio of tons of biomass per capita as in 2000, the estimated amount of urban biomass in 2012 would be about **16.1 million tons.**

Biochar Decision System

Carbon storage classes	1	sBC_{+100} = 240 g kg^{-1}
Fertiliser classes	2	P_{Bt} Mg_{Bt}
Liming classes	3	$Liming_{eq}$ 15.1 %
Particle size classes	Kn	Kernel particle size
Suitability for soilless agriculture		Not tested

Example: Biochar from biosolids mixed with eucalyptus wood produced at 550°C



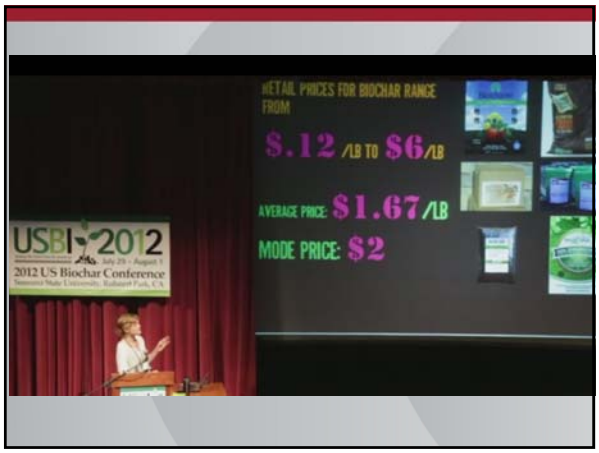


FERTILISER GRADE

Total N = 1.66%	Avail. N/total N = 4.6%
Total P_2O_5 = 11.60%	Avail. P/total P = 36.4%
Total K_2O = 0.84%	Avail. K/total K = 53.6%
Total S = 0.21%	Avail. S/total S = 34.9%
Total MgO = 0.52%	Avail. Mg/total Mg = 79.3 %
Total CaO = 3.22%	Avail. Ca/total Ca = 84.5 %

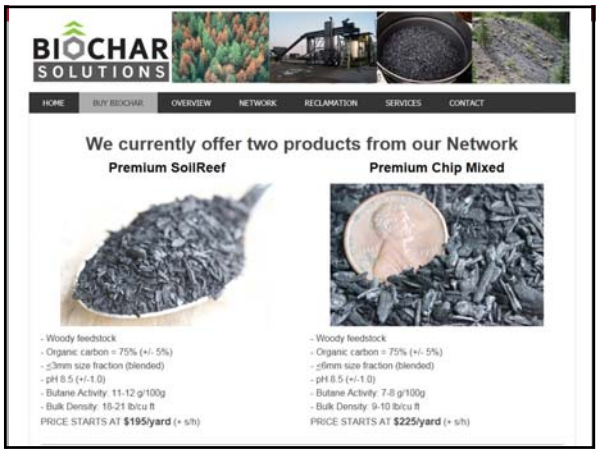
Cornell University

Camps et al., 2015, *Earthscan*


RETAIL PRICES FOR BIOCHAR RANGE FROM
$.12 /LB TO $6/LB
AVERAGE PRICE: $1.67/LB
MODE PRICE: $2
USBI 2012
2012 US Biochar Conference

BIOCHAR SUPREME
"When quality matters."
Biochar
Growing Products
Environmental Products
Projects, Events & Testimonials
Contact
Environmental Benefits
Black Owl Biochar™
Growing Products:
BIOCHAR
Mellow Mix
Blossom Mix
PREMIUM BIOCHAR
INFUSION
RICH BRIX MIX
MELLOW MIX
BUXOM BLOSSOM

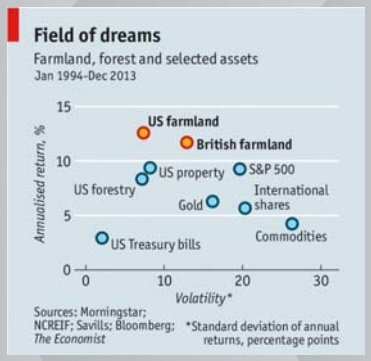
BLACK OWL
Premium Organic
BIOCHAR
Rich Brix Mix
RICH BRIX MIX
Title:
1.25 Quarts
Available Spring/Summer, 2014. Email us to pre-order at:
Info@BiocharSupreme.com
1.25 Quart Bag(s) $16
1 Cubic Foot Bag(s) $48
1 Cubic Yard Tote(s) * Email For Bulk Quantities
For the gardener interested in health, BOB's Rich Brix Mix with Black Owl Biochar's Premium, Organic product at its base, is a full compliment of biochar, combined with minerals, biotic ingredients, organic nutrients for substantial soil benefits.
Soils are:
• Enriched
• Remineralized
• Restored Eco-communities



Cost Calculation Regarding Using a 3MW CHP System to Produce Biochar

Annual woody biomass required in "Base Case"	25,000 Green Tons
Ash Residue Yielded	800 Dry Tons
Biochar Yielded Via Combustion Process Modifications	2,000 Dry Tons
Additional residue generated	1,200 Dry Tons
Additional woody biomass required to meet 3MW annual Commitment vis-à-vis California SB 1122 Program	4,800 Green Tons
Annual Cost of Additional woody biomass @ $50/Dry Ton	$120,000
Pounds of Biochar in 2,000 Tons of Biochar	4,000,000
Raw Material Cost/Pound	**$.03**

Source: Calculations derived from communication with Bill Carlson, Carlson Small Power Consultants, Redding, CA



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Dusty Moller
Biomass Utilization Specialist
WSU Renewable Energy Program
mollerd@energy.wsu.edu
(509) 443-4355

WASHINGTON STATE UNIVERSITY
ENERGY PROGRAM
www.energy.wsu.edu