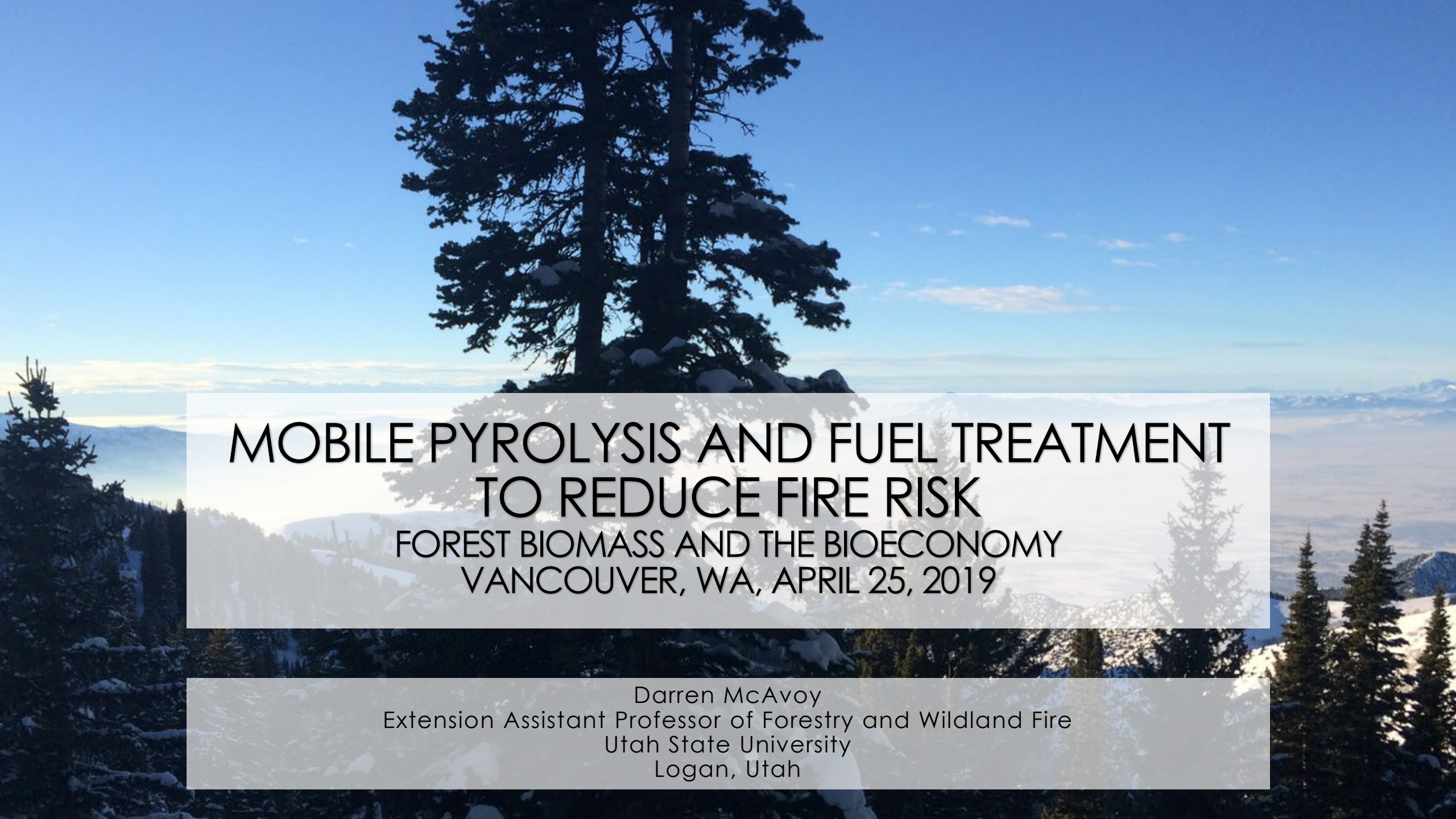


MOBILE PYROLYSIS AND FUEL TREATMENT TO REDUCE FIRE RISK

FOREST BIOMASS AND THE BIOECONOMY
VANCOUVER, WA, APRIL 25, 2019

Darren McAvoy
Extension Assistant Professor of Forestry and Wildland Fire
Utah State University
Logan, Utah

UTAH BIOMASS RESOURCES GROUP

UBRG

Founded 2010

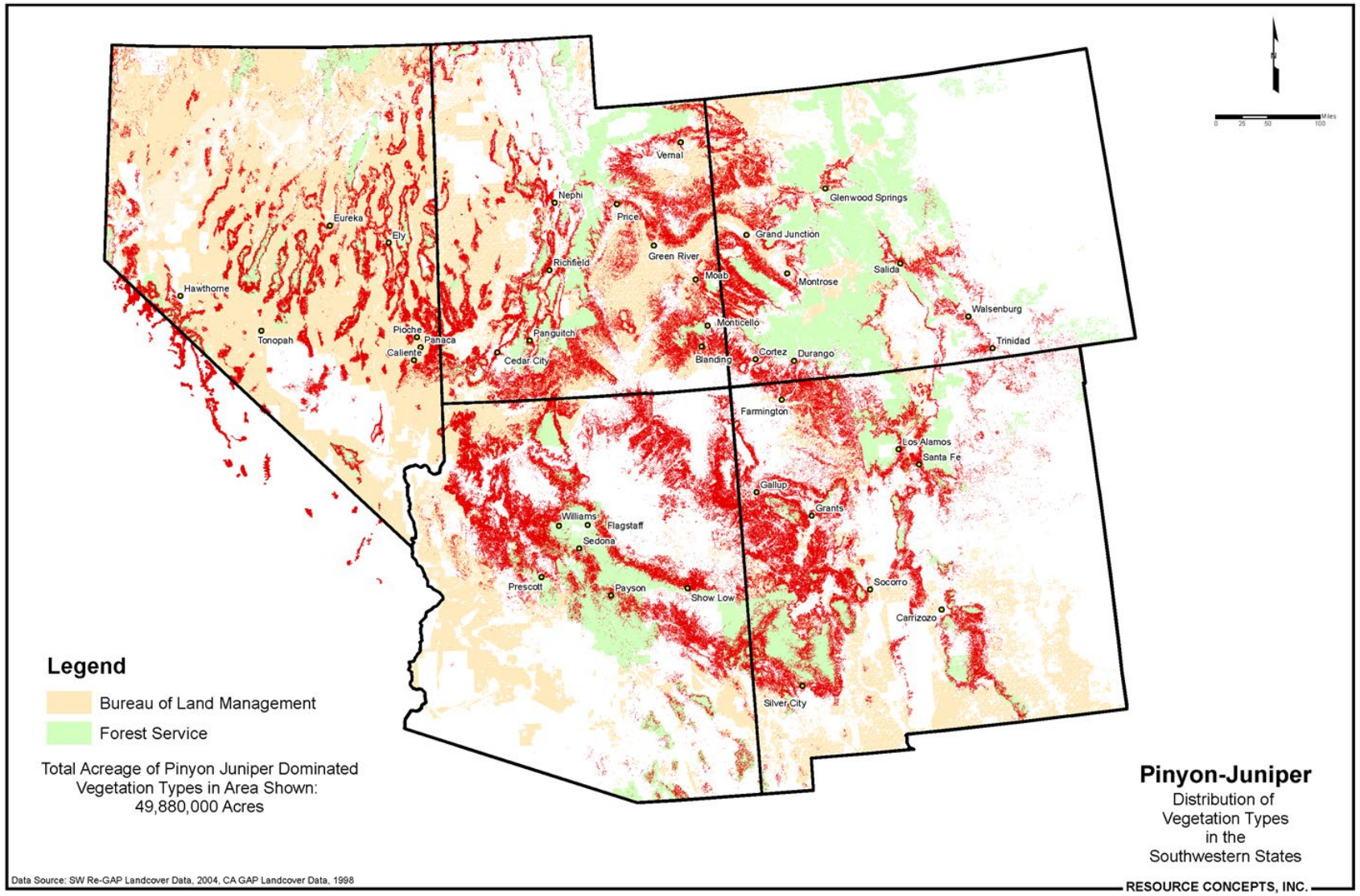
Partners

Pinyon juniper woodland

PJ

Expanding resource

Recognize persistent PJ



50 million acres

100 million acres west-wide

Beetle kill

Reduce hazardous Fuels

Improve firefighter safety

Alternative to traditional pile burning

Machine compacted piles can burn soil

Diffuse resource: six tons/acre

Wood is mostly air, water and carbon

Requires a mobile response

Researched using bio-balers, forwarder chippers, other approaches

Dragon Wagon Mobile Gasifier

Can power two homes

800 degrees Celsius

Standard propane generator fed by syngas

Dragon Wagon powered Utah's first wood fired concert

Pyrolysis machine

Amaron Energy

Rotary kiln

Pyrolysis is separation by fire

Thermo-chemical de-composition

Limited oxygen

400-600 degrees Celsius

50%: Bio oil

Impacted by price of petroleum

Can make plastics, adhesives…

This epoxy novolac resin is plastic from wood

25%: Syngas

25%: Biochar

Converted pyrolysis machine to mobile platform

Demos

Winner: Mobile pyrolysis cook-off

2014: SUN Grant

Scale-up

20 tons/day

Super heated

Constant rotation

One degree tilt

Precise controls

Temperature

Residence time

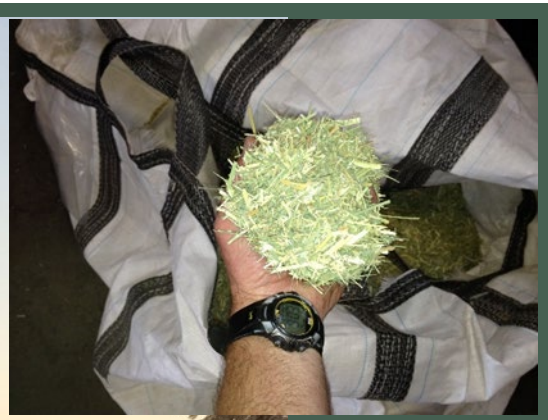
Demonstrated in Utah, Washington, Nevada, Colorado

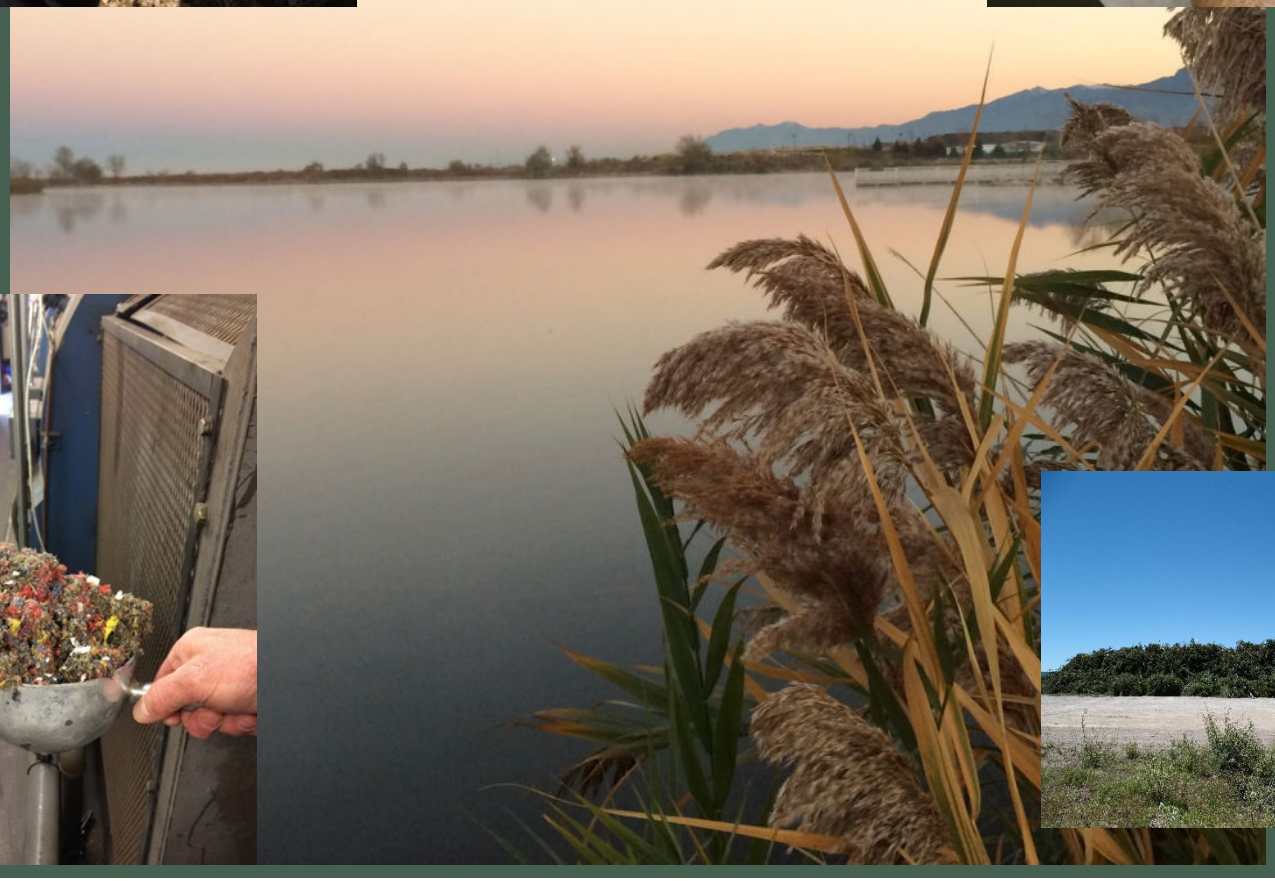
Remote locations

Chipping and grinding can cost more than pryolysis

Scale up to 48” diameter reactor to be economical

Oils from a wide variety of feedstocks





Pyrolyzed 25 different feedstocks

Bio-oil production

Challenges

Related to price of petroleum

Biochar

Charcoal for agriculture

Mostly carbon

Can be made from any organic material

Balancing mechanism

Carbon sequestration

Torrified Wood

Lower temperatures

Densification

Coal replacement

300 degrees Celcius

Hunter Powerplant

Replace 10% of coal with torrified wood

100 truckloads of wood

One day test

Bioeconomic Development: Creating a Market for Biochar

Biochar application trials

Mine land restoration

NPK reduced

BLM supported research

Biochar application results

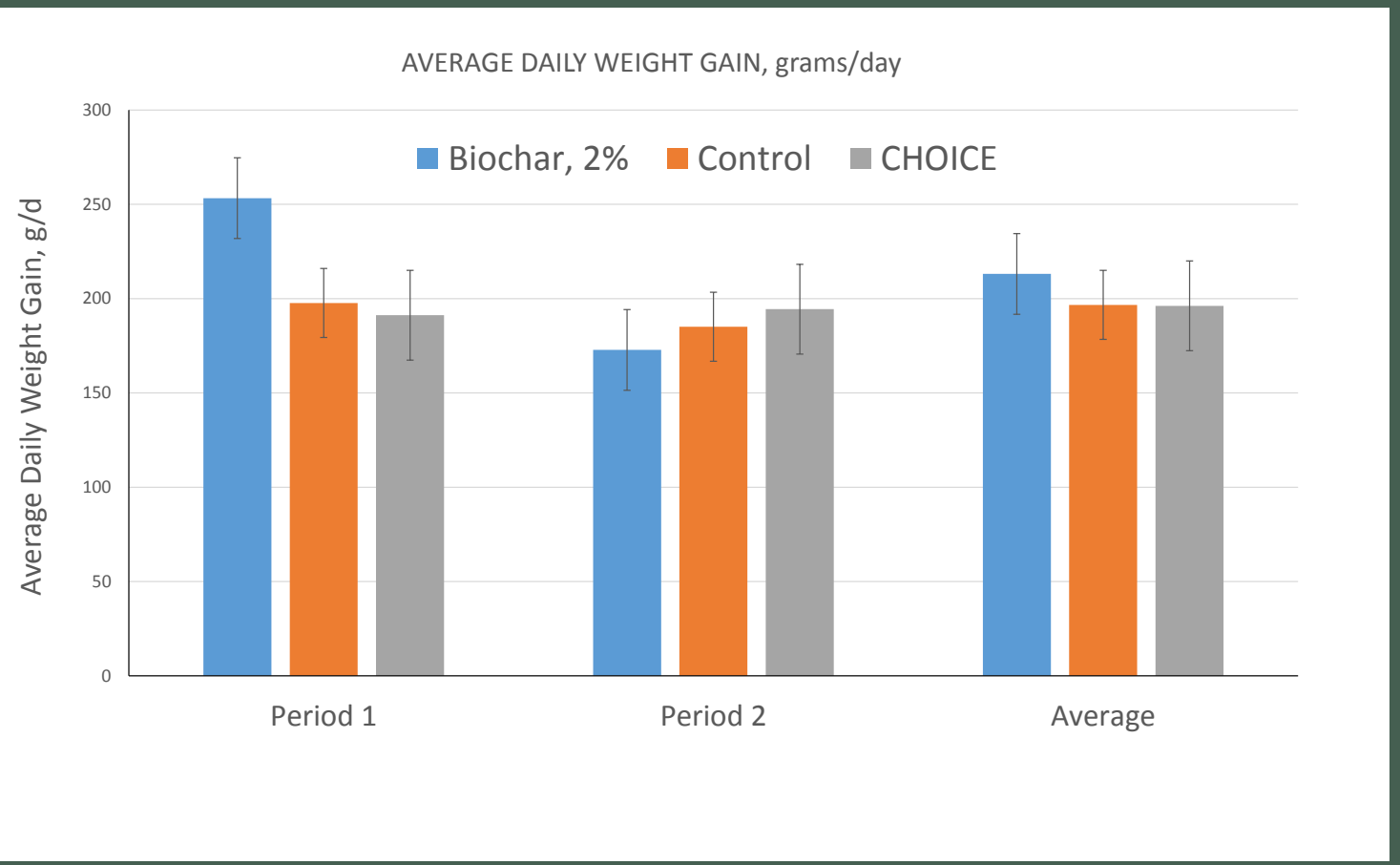
Application methods

Vegetable farm applications

Western Sustainable Agriculture Research and Education (WSARE) Grant

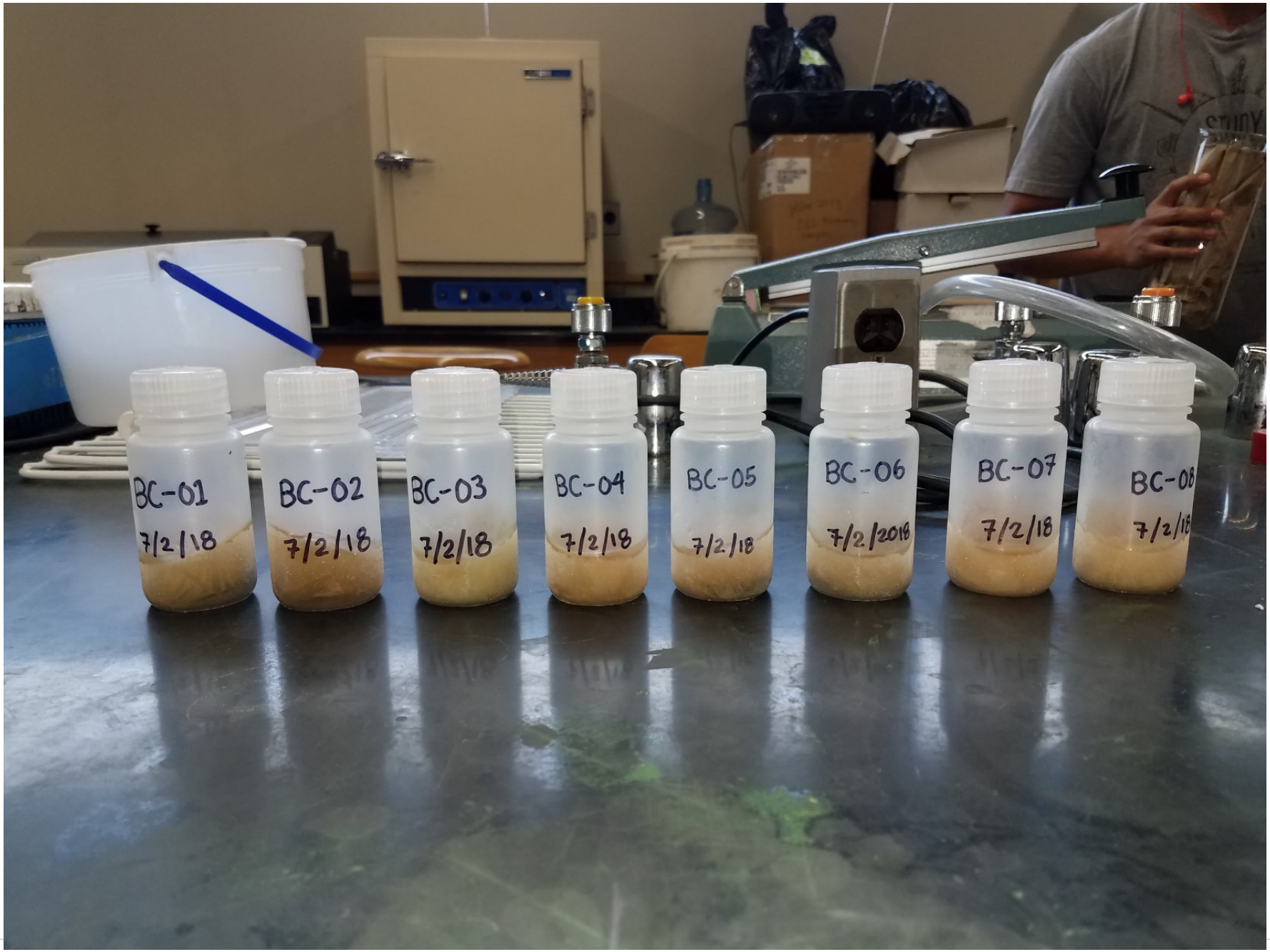
Use of biochar by sheep: impacts on nutrition and diet selection

Utah Agriculture Experiment Station funded research



Significant increase in weight gain by lambs choosing biochar in their diet

Sampling rumen



Analyzing rumen samples

Research project: using biochar to reduce water usage on Utah alfalfa

USU Extension Water Initiative Grant

Threadcycle

Making biochar from fabric waste from New York City

Simple kilns

Kelpie kilns

Seven simple kiln demos in Utah to date

Big box burning project

USU Extension Grant

Increasing variety of biochar related products

Increasing awareness of biochar, methods to make it, and related products

228 attendees to date

State and Park City doing their own workshops now

We will still burn piles, but perhaps less of them

Contact info:

darren.mcavoy@usu.edu