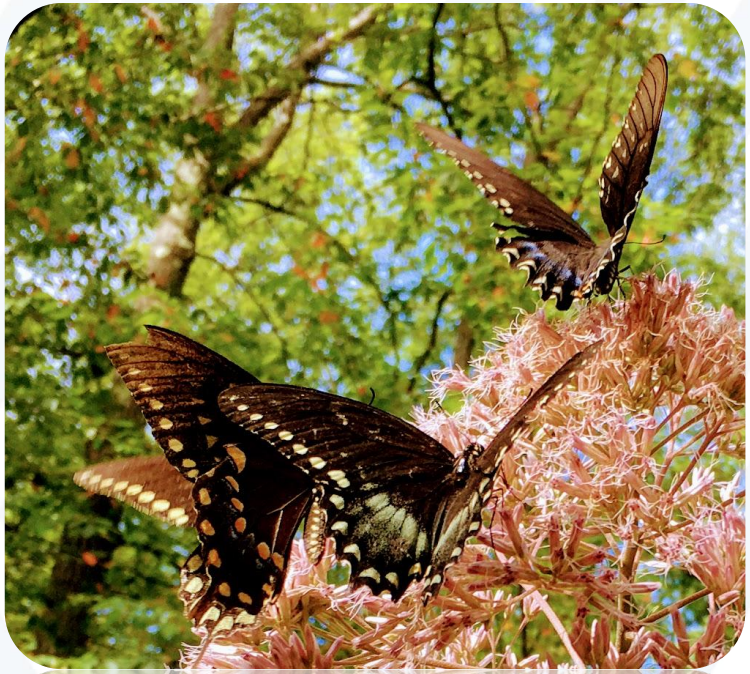
Riding on the back of pollinators



MASBio

USDA NIFA Funded Project No. 2020-68012-31881

West Virginia University

MASBio

USDA United States Department of Agriculture National Institute of Food and Agriculture

West Virginia University ESF INL Idaho National Laboratory Oak Ridge National Laboratory PennState

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Outline

1. One MASBio outreach effort for ecosystem services
2. Some ideas we want to convey to potential stakeholders about biochar
3. Pollinator projects to promote MASBio and biochar in the region

1. One MASBio outreach effort for ecosystem services

MASBio Consortium

Mid-**A**tlantic **S**ustainable **Bio**mass Consortium for Value-Added Products

- 6 Universities
- 2 DOE National Labs
- 12 Industry partners (and growing)
- USDA Forest Service RMRS and FPL

MASBIO OVERARCHING GOALS

To deliver a sustainable and economically feasible *biomass for value-added products system* in the Mid-Atlantic region

To promote the regional bio-economy

Bioeconomy = the portion of the economy made up of products, services, and processes stemming from living organisms (generally plants and microorganisms).

MASBio Objectives

Land reclamation and feedstocks

IDENTIFY AND DEMONSTRATE FEASIBLE AND COST EFFECTIVE APPROACHES TO SOIL AMENDMENT AND FEEDSTOCK PRODUCTION TO INCREASE THE BIOMASS YIELD;

Harvest logistics & Supply chain mgt

DEMONSTRATE EFFICIENT AND EFFECTIVE HARVEST AND LOGISTICS STRATEGIES FOR AN OPTIMIZED SUPPLY CHAIN OF INTEGRATED BIOMASS CROPS AND FOREST RESIDUES;

Value-added Bioproducts

DEVELOP AND OPTIMIZE BIOPRODUCT CONVERSION PROCESSES;

Sustainability & Human dimensions

EVALUATE THE SUSTAINABILITY AND HUMAN DIMENSIONS OF THE DEVELOPED SYSTEM;

Scale up analyses

CONDUCT SYSTEM AND SCALE UP ANALYSES USING ROBUST ARTIFICIAL INTELLIGENCE (AI) BASED DATA ANALYTICS;

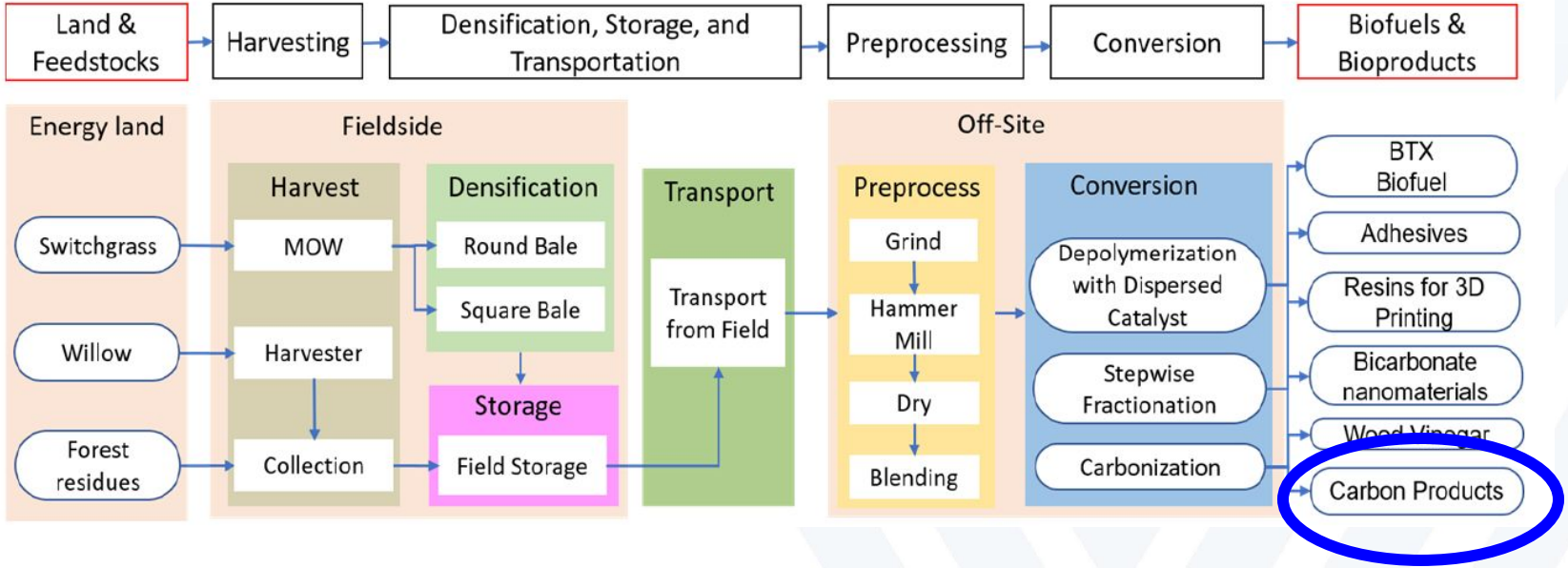
Education

ENGAGE THE NEXT GENERATION OF BIOPRODUCTS LEADERS THROUGH EDUCATION AND INTERNSHIP PROGRAMS;

Extension & Business Dev.

OUTREACH AND ENGAGE WITH ENTREPRENEURS, STAKEHOLDERS, AND BUSINESS DEVELOPERS TO PROMOTE BIOECONOMIC DEVELOPMENT THROUGH INTEGRATED OUTREACH PROGRAMS.

MASBio Supply Chain and Products



Why Biochar?

- Potential use as soil amendment
  + water retention
  + nutrient availability
  + soil microbiome
  + buffering capacity
- Potential use as a bio-filter
  -Excessive nutrients
  -Salts
  -Heavy metals
  +Buffering capacity
- Use for carbon sequestration
  +Market opportunities
  +ecosystem services

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WestVirginiaUniversity.

We are featuring biochar as a support/benefit to pollinators

(pollination ecosystem service; 88% of flowering plants, 35% of plant-based food supply)

2. Some ideas we want to convey to potential stakeholders about biochar

Plant blindness

Definition of “plant blindness” points to the inability of humans:

--to notice plants,

--recognize their importance in the biosphere,

--appreciate their aesthetic/unique features.

Adapted from:
Wandersee, J. H., & Schussler, E. E. (1999). Preventing plant blindness. *The American Biology Teacher*, *61*(2), 82-86.

Biochar is part of the plant story

Biochar

Porous, carbon-rich, stable material

1 gram = 2000 ft^2

Source:
https://char-grow.com/top-8-biochar-questions

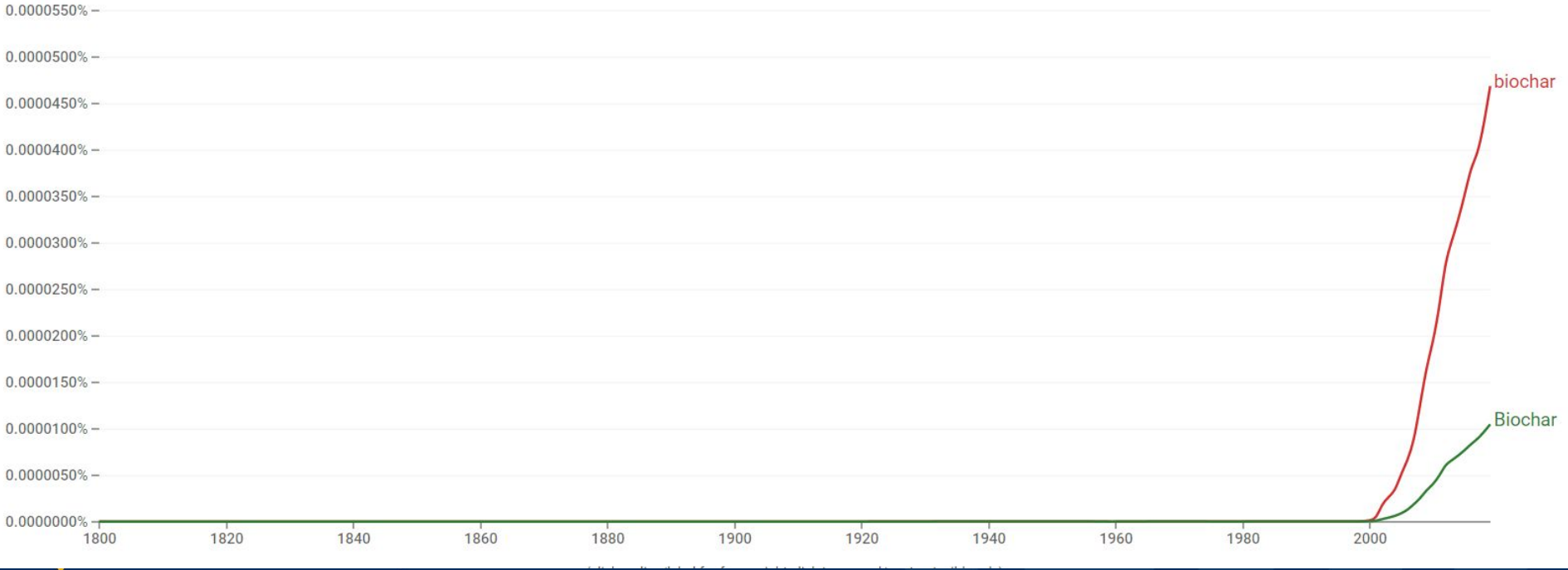
Idea: Biochar has been around a long time

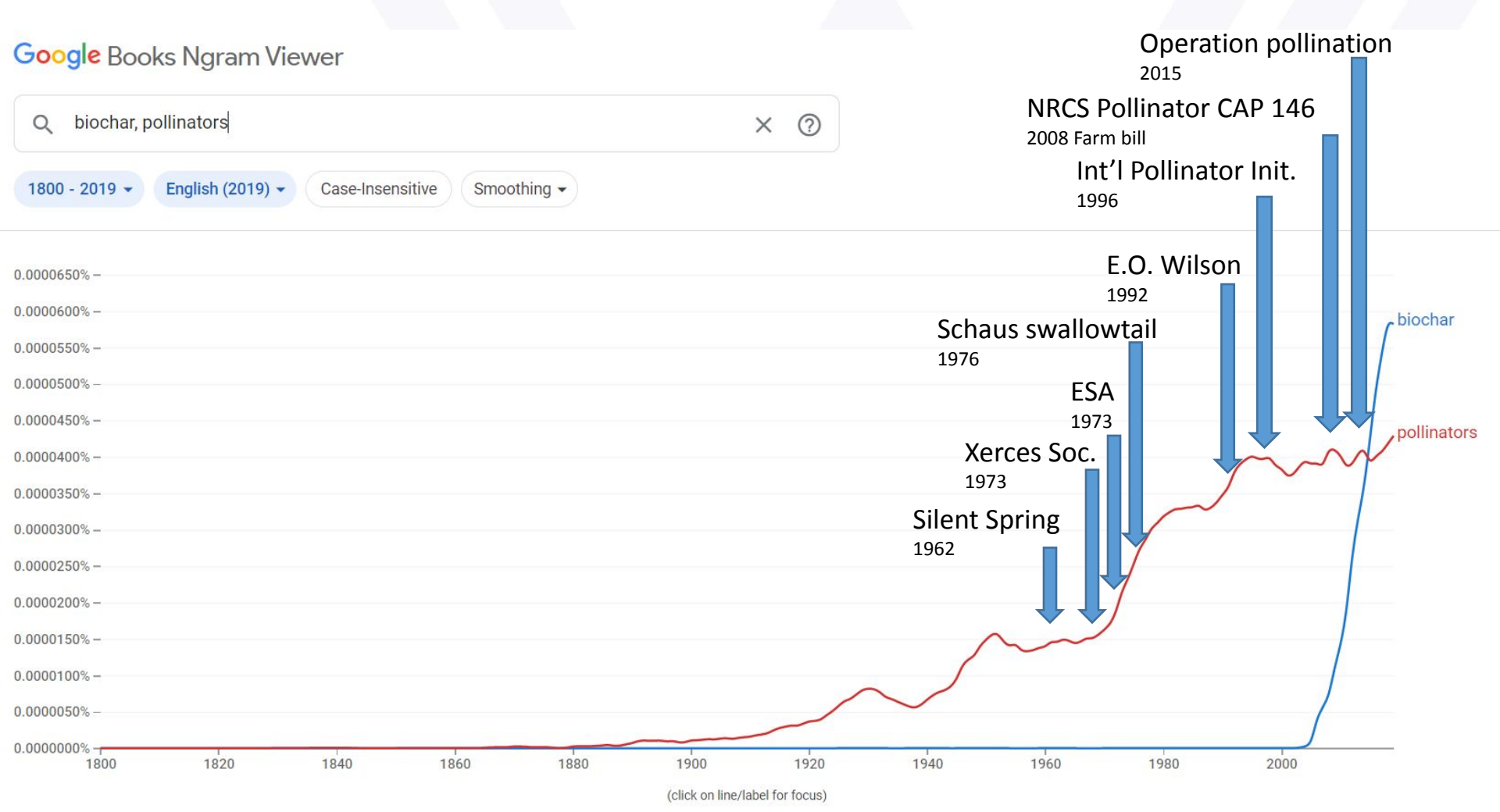
Photo source: https://www.allotment-garden.org/composts-fertilisers/biochar-terra-preta/

Google Books Ngram Viewer

biochar

1800 - 2019 | English (2019) | Case-Insensitive | Smoothing of 7

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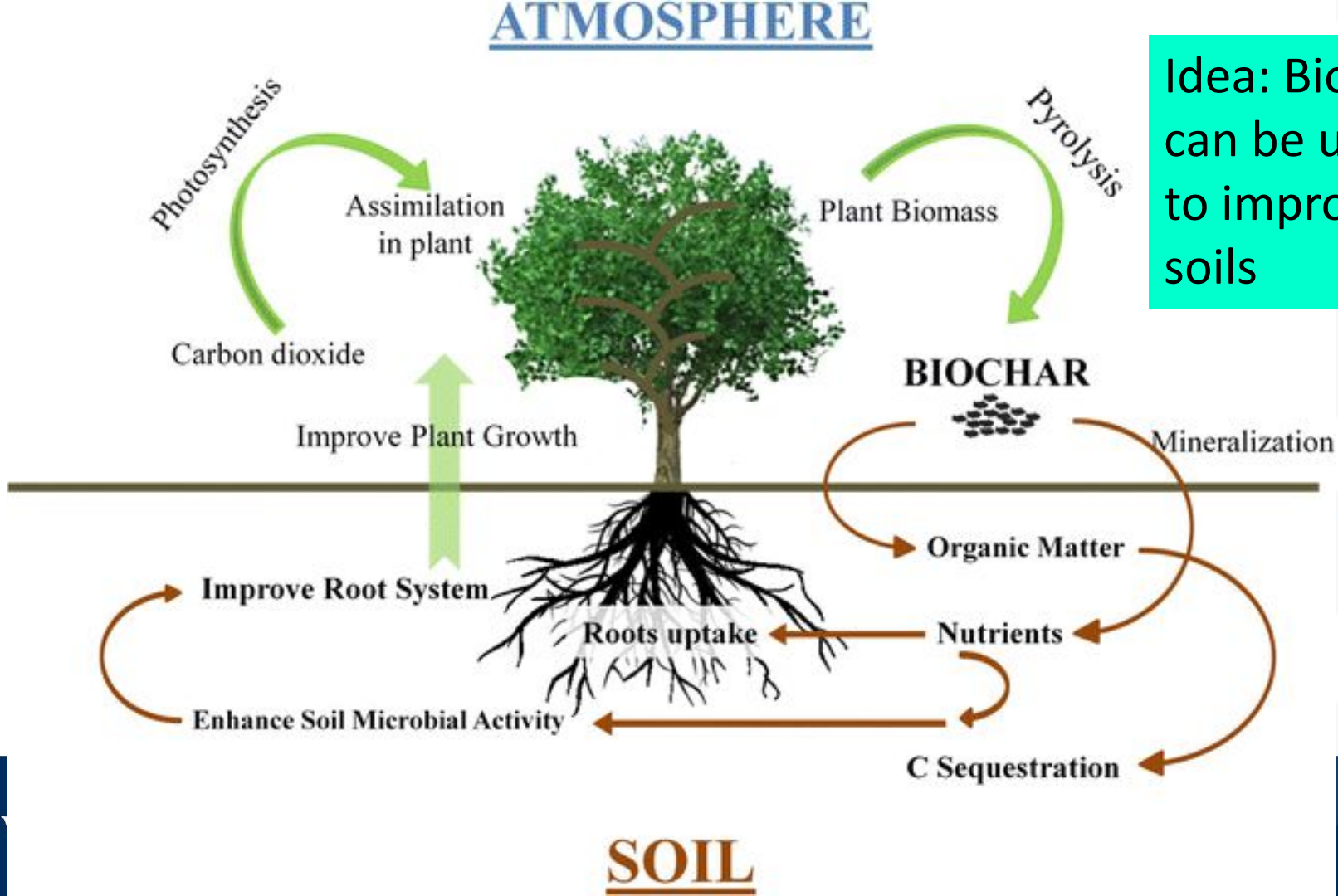

Idea: Biochar can be used to improve soils

Carbon pools

Trees, shrubs, and grasses

All live roots

Idea: Biochar can be used to sequester carbon

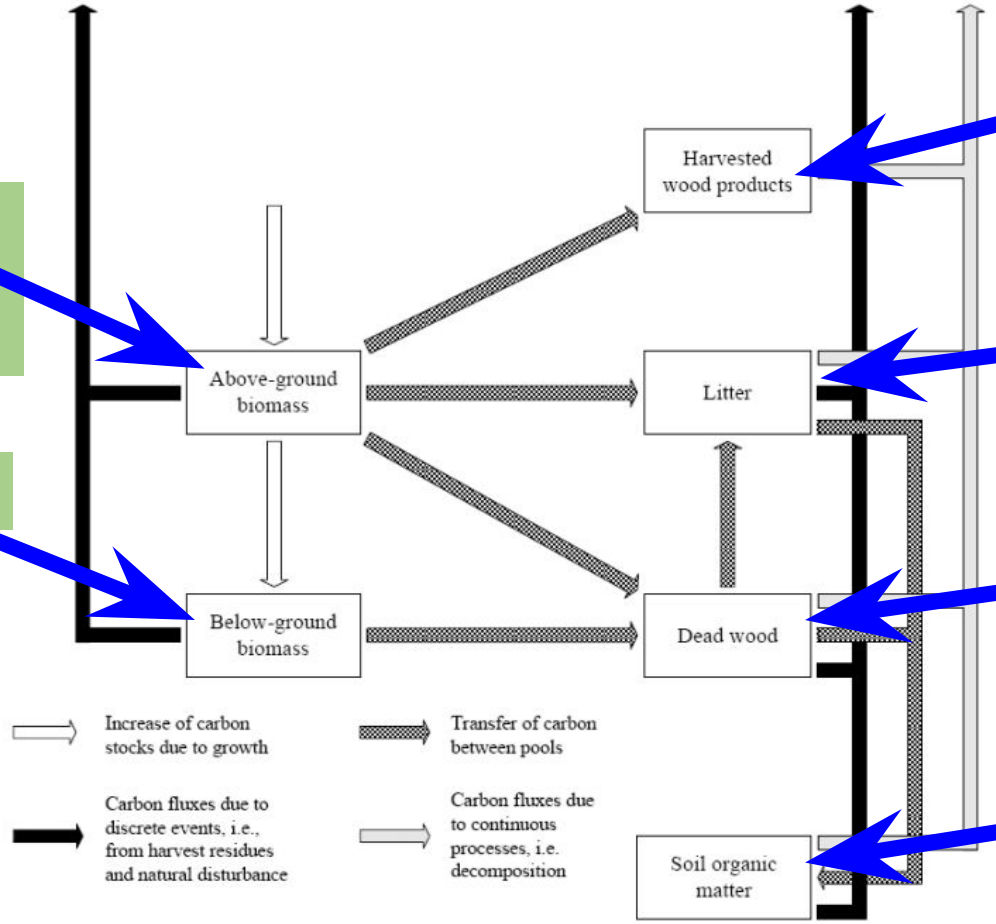

Figure 2. Generalised flow of carbon between pools

(source IPCC, 2006)

Logs that are converted into other uses

Dead leaves, twigs, fruits that have fallen

Dead trees and shrubs

Dead plants and animals, soil microbes, exudates & biochar

3. Pollinator projects to promote MASBio and biochar in the region

Pollinator Plantings
(and other efforts)

- Soil amendment for pollinator plantings
  - Focus on ecosystem services component of biochar
  - Partnering with variety of groups to promote pollinator mixes & biochar amendments

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Facts About Biochar

Dave McGill, *WVU Extension Service Specialist – Forest Resources*
Erin Shaw, *WVU Forestry Graduate Research Assistant*

This fact sheet explains what biochar is, describes how it is produced, and highlights its many applications.

What is Biochar?

Biochar – like charcoal – is a porous, carbon-rich solid. Charcoal and biochar are both made from biomass (that is, organic matter from plants), but the two products differ in end-use. Charcoal is typically used for fuel, while biochar is designed for soil enrichment, stormwater treatment and control, and carbon sequestration. Besides being incredibly porous, biochar's surface area is 800 to 1,400 square meters per gram. In other words, a teaspoon of biochar has as much surface area as two basketball courts. This high porosity and surface area help biochar readily absorb nutrients and water and serve as a micro-ecosystem to healthy soil organisms.

Biochar is a porous, carbon-rich solid designed for soil enrichment, stormwater treatment and control, and carbon sequestration. (Photo credit: Erin Shaw)

How Biochar Is Made

Biochar is produced by pyrolysis. Pyrolysis involves heating an organic substance at extremely high temperatures in the absence of oxygen. Because oxygen is removed from the heating process, the organic material does not burn completely, but decomposes into gases, oils and solids.

To make biochar, biomass – the "feedstock" for biochar creation – is typically obtained from agricultural and forestry waste products. This biomass is chipped and dried, then placed into kilns and "baked" at temperatures ranging from 400 to 550 C. The end-product is a substance consisting of 70% to 80% carbon, though this varies depending on the type of biomass and methods of production used.

When done properly, biochar production is a carbon neutral – and at times, carbon negative – process, meaning no excess carbon enters the atmosphere in this process. Biochar production can also provide the added benefit of removing woody, potentially flammable residue from forests. This can help reduce fire severity and makes uses of non-merchantable wood damaged by insects or disease.

– continued –

Uses of Biochar

Biochar is primarily used as a soil amendment. Biochar can be spread across or mixed into soils to improve agricultural production, increase forage on grazing sites, assist with mine land restoration or promote growth in plant nurseries.

Biochar tilled into ground to enhance water holding capacity.

Benefits of biochar as a soil amendment:

- Sequesters carbon.
- Promotes retention of essential soil nutrients, such as nitrogen and potassium.
- Increases the variety and quantity of soil microorganisms.
- Improves soil's water holding capacity, which can in turn improve drought resiliency, extend the growing season, promote plant survival, reduce run-off/erosion and improve water filtration.
- Impacts mineral soil within one to five years and can remain in soil for extremely long periods of time (biochar's persistence in soil ranges from 1,000 to 10,000 years, with an average of 5,000 years).

In collaboration with the Mid-Atlantic States Sustainable Biomass (MASBio) Project

MASBio

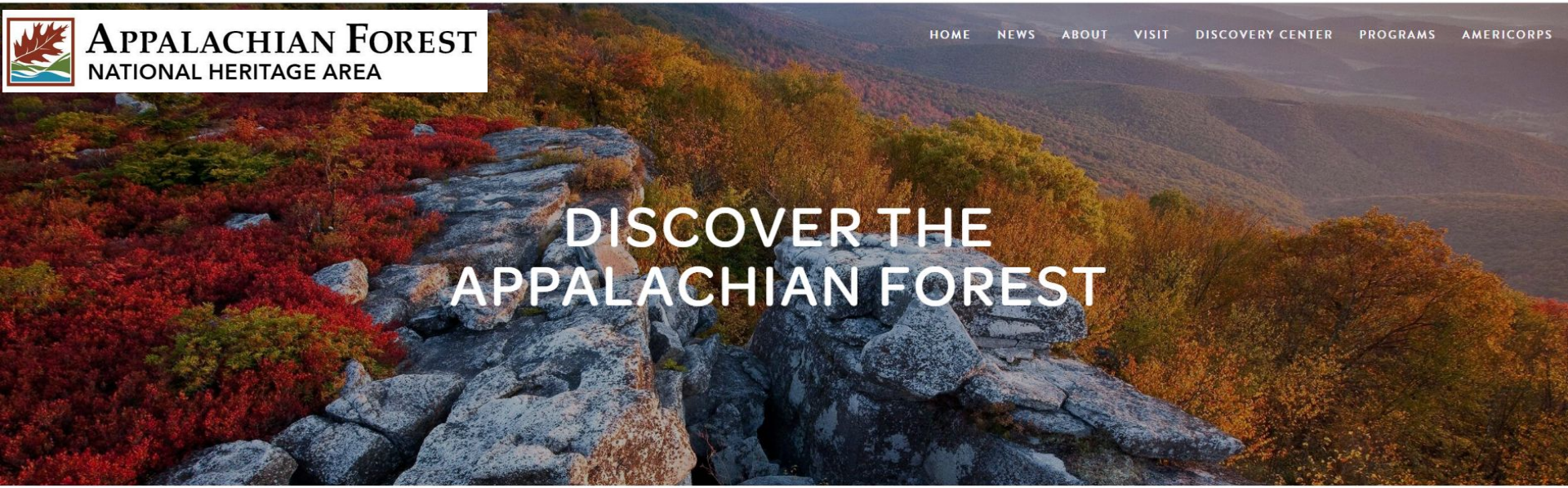
For more information

For more information contact Dave McGill, *WVU Extension Service Specialist – Forest Resources*, *dmcgill@mail.wvu.edu*; 304-293-5930
extension.wvu.edu
Date created: May 2021

appalachianforestnha.org

APPALACHIAN FOREST
NATIONAL HERITAGE AREA

HOME NEWS ABOUT VISIT DISCOVERY CENTER PROGRAMS AMERICORPS



Highlands Creative Economy Tourism Summit

SPONSORED BY APPALACHIAN FOREST NATIONAL HERITAGE AREA AND EASTERN WV COMMUNITY AND TECHNICAL COLLEGE

August 25, 2022 at Canaan Valley Resort, 9:30am~5pm

Two Tracks including sessions on Tourism and Marketing, and Tourism Product Development

Check back here for more information

Planning
Creative Economy
Pollinator Initiative
Monongahela Outdoor Volunteers
Volunteer
Membership
Donate

In August, AFNHA hosted eight speakers for the 2021 Pollinator Conservation Conference! It featured presentations from professionals throughout the region, and the presentation recordings can be found here on our YouTube channel if you missed it.

POLLINATOR CONSERVATION CONFERENCE 2021

Below you will find resources on how to support pollinators, either by creating your own pollinator habitat, adding to the knowledge base for pollinators in the Appalachian forest region, or by spreading awareness in your community! We also encourage you to sign our pollinator pledge, a

Dayla Woller
AFNHA/MASBio Americorps


Discover
Nature Day
at the Seneca Rocks Discovery Center
Saturday June 5th, 2021
from 10am-3pm
Live animals, naturalists, activities, giveaways, and more!
Contact Cassidy.Attanasio@usda.gov or call (304)-567-2827 for more information
Can't make it? Scan for virtual activities!
SCAN ME
AmeriCorps
USDA
Potomac Highlands CWPMA

Pollinator plot – Seneca Rocks, WV

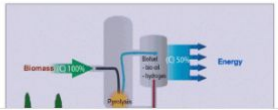
2021 Conference

Coordinated by Dayla Woller
AFNHA/MASBio Americorps

August 23, 2021

BIOCHAR: WHAT IS IT AND HOW CAN IT SAVE YOU MONEY, WATER AND TIME?

Biochar is a charcoal created when biomass, such as wood, crop residue and manure, is put into a high heat environment without oxygen. When this process, called pyrolysis, is conducted in a contained environment,



GLENDALE POLLINATOR GARDEN

Providing nectar resources and habitat for native pollinators

Why is it important to support pollinators?

Pollinators across the world, including native West Virginia pollinators, have all experienced population declines due to increases in pesticide use, increases in non-native invasive plants and a decline in habitat. Bees, butterflies, moths, beetles and flies are the main pollinators in West Virginia and provide essential ecosystem services and are responsible for producing, on average, one in every four bites of food that we eat. One way to support these pollinators is by planting a native pollinator garden!

Clouded sulfur butterfly (*Colias philodice*)

Pearl crescent butterfly (*Phyciodes tharos*)

What is biochar and why is it here?

Biochar is a charcoal produced when biomass (such as wood or crop residue) is burned in a contained environment at a high heat without oxygen. This process, called pyrolysis, results in a product with a very high porosity and surface area, which enables it to act like a sponge. It has been mixed into the soil here, and can assist with nutrient and water retention because of this! Biochar also can last for thousands of years, which means that, as an added benefit, it is a form of carbon sequestration.

Project Sponsors

Appalachian Forest National Heritage Area

WestVirginiaUniversity. EXTENSION SERVICE

MASBio

Why plant a variety of flowering species?

Over millions of years, pollinators and plants have coevolved to depend on each other for food and reproduction. In exchange for food (in the form of nectar or pollen), pollinators transfer pollen between the flowers they visit, assisting with reproduction. Below are a few of the species planted in the Glendale Pollinator Garden!

Buttonbush (*Cephalanthus occidentalis*)

Swamp milkweed (*Asclepias incarnata*)

Common boneset (*Eupatorium perfoliatum*)

Stiff goldenrod (*Oligoneuron rigidum*)

Every pollinator is adapted to different flowering plants, which means that each pollinator will have a different characteristics that they seek out in a flower. This is why it's important to have a variety of plant species - to ensure all species have a source of food! Additionally, pollinators need a food supply throughout the entire spring and summer, so a successful pollinator garden will include flowering plant species that bloom at different times during the season.

Scan here for citizen science projects that you can contribute to to support pollinators!

SCAN ME

How can you support pollinators?

- Use native plant species in your garden!
- Provide nesting habitat for native bees by leaving patches of bare soil in full sun.
- Plant a variety of species with different bloom times, flower colors and flower shapes.
- Use resources such as Bumble Bee Watch or e-Butterfly to document pollinators you see!

Summer 2021

Jackson's Mill

- Pollinator plots (25ft X 70ft)
- Two site types
- Varying levels of biochar (0T/ac, ≈4T/ac, and ≈ 8T/ac)


Lower slope
Sheldon
Upper slope

Little Indian Creek WMA

- Collaboration
  - First Energy
  - WV DNR
  - WVU Extension/DFNR
  - MASBio


llinator Habitat
Project Area
WILDLIFE
WEST VIRGINIA
DIVISION OF NATURAL RESOURCES
West Virginia University.
DIVISION OF FORESTRY AND NATURAL RESOURCES
EXTENSION

- FirstEnergy and Mon Power personnel work together to install deer fencing

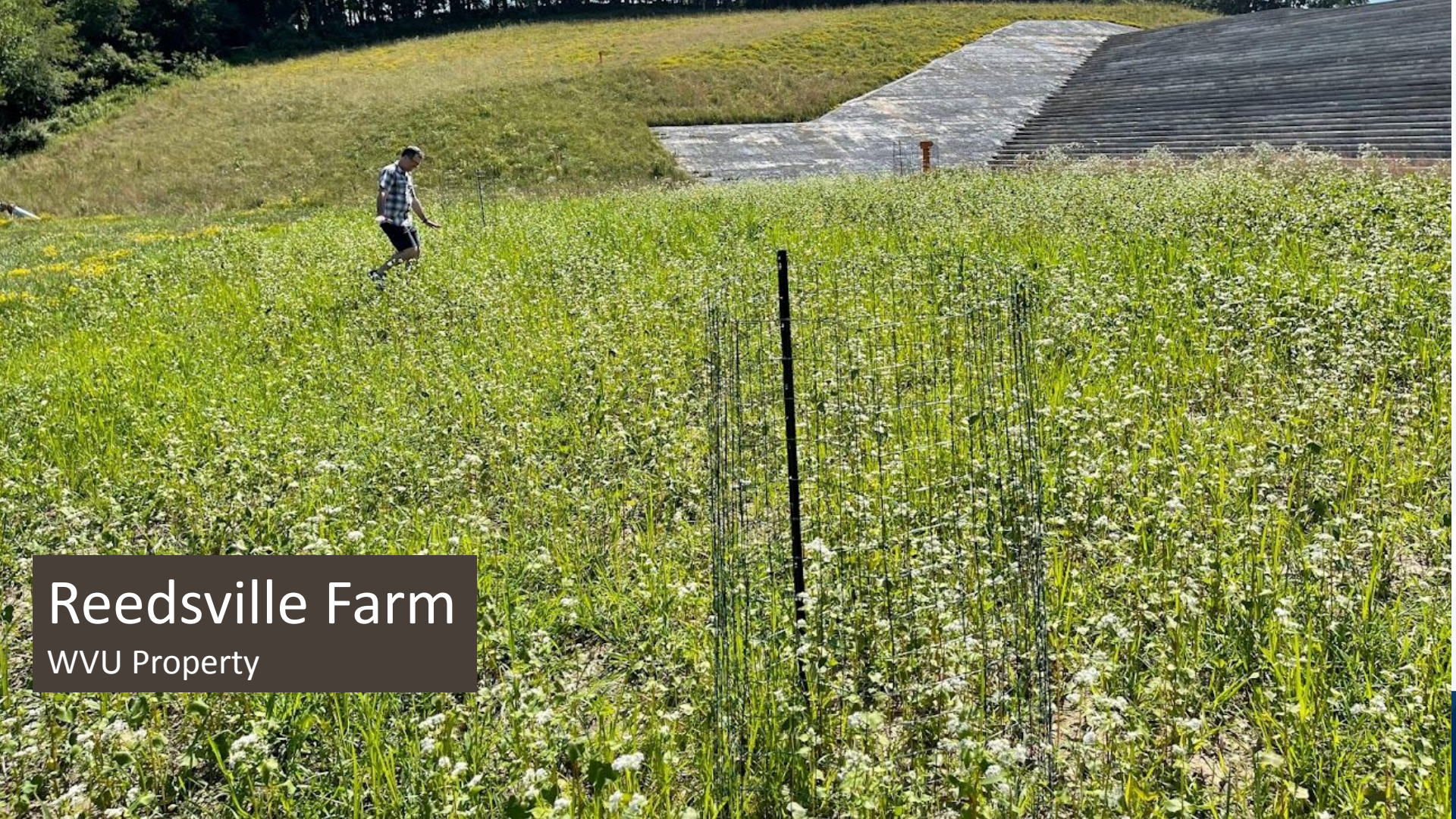
Photo: S. Owen 08/09/22

Photo: S. Owen 08/09/22

Date	Location	Event
3/29/2021	Seneca Rocks	Biochar application
4/7/2021	Seiber	Herbicide
4/20/2021	Jacksons Mill	Herbicide obs
5/14/2021	Seiber	Herbicide results
5/20/2021	Little Indian Creek WMA	First exploratory meeting
5/21/2021	Seiber	Seeding
5/21/2021	Jacksons Mill	Herbicide obs
5/22/2021	Jacksons Mill	Biochar application/cultivation
6/25/2021	Glendale Garden	Hericide results
6/25/2021	Jacksons Mill	Additional biochar application in new plot/cultivation
7/2/2021	Jacksons Mill	Herb obs
7/7/2021	Jacksons Mill	Herb app
7/9/2021	Seiber	Plant observation
8/3/2021	Little Indian Creek WMA	Second planning discussion
8/15/2021	Richwood County School	Finished planting
8/21/2021	Jacksons Mill	Herbicide application
8/25/2021	Little Indian Creek WMA	Mowing results
8/25/2021	Seiber	Site visit with Sheldon
9/20/2021	Glendale Garden	Photo with flowers from Phyllis
9/7/2021	Jacksons Mill	Site visit
9/17/2021	Little Indian Creek WMA	Spray operation
10/7/2021	Little Indian Creek WMA	Herbicide obs
12/10/2021	Jacksons Mill	Plant observation
12/10/2021	Little Indian Creek WMA	Herbicide obs
2/10/2022	Little Indian Creek WMA	Plot layout
3/14/2022	Little Indian Creek WMA	Fecon mower treatment
4/2/2022	Little Indian Creek WMA	Biochar application
4/8/2022	Little Indian Creek WMA	Biochar obs
4/13/2022	Little Indian Creek WMA	Meeting with Logan manager and Todd
4/20/2022	Easter WV Tech College	Planting project
4/20/2022	Jacksons Mill	Herbicide application
5/13/2022	Little Indian Creek WMA	Cultivation
5/25/2022	Reedsville Farm	Cultivation and biochar application
5/25/2022	Little Indian Creek WMA	Seeding
5/26/2022	Jacksons Mill	Seeding
6/1/2022	Reedsville Farm	Seeding
6/6/2022	Little Indian Creek WMA	Plant observation
6/21/2022	Reedsville Farm	Plant observation
6/23/2022	Reedsville Farm	Plant observation
6/30/2022	Little Indian Creek WMA	Plant observation
7/11/2022	Little Indian Creek WMA	Deer exclosures
7/11/2022	Reedsville Farm	Deer exclosures
7/25/2022	Jacksons Mill	Deer exclosures
8/8/2022	Little Indian Creek WMA	Exclosure obs

EASTERN
West Virginia Community & Technical College

Maya Paul
MASBio Coordinator



Reedsville Farm

WVU Property

Mike & Susan Seiber

Private landowners


PANTHER
CREEK
ELEMENTARY
SCHOOL

Carnegie Science Center

Pittsburgh, Pennsyvania

How do we 10x demand for biochar?

How do we 10x demand for biochar?

#	Statement	Points	Rank:
1	Create biochar demo projects that show the techno-economic benefits and publicize.	30	1
2	Incentivize private landowners and industry to use biochar.	28	2
4	Increase public knowledge of biochar.	22	3
3	Further develop carbon credit system in the Unites States	15	4
8	Invest in technology to drive down cost	14	5
10	Leverage soil partnerships/ initiatives	12	6
9	Establish a database of biochar sources volumes prices and standards	11	7
5	Expand Applications and develop use cases (eg. Concrete drywall asphalt)	6	8
6	Encourage public use to achieve municipal agency net zero goal	5	9
7	Establish requires quality standards	3	10

Next steps

- Continue to develop and monitor sites
- Host field workshops for professionals and landowners
- Further develop project goals with FirstEnergy on ROW site

Questions?

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304-293-5930

MASBIO Contact Information:

Jingxin Wang

jxwang@wvu.edu