G. Public Comment

capital and operating costs and generate annual net non-tax revenues of $20M-$40M for SOIRL Programs. We could also produce super sacks for commercial landscapers. The numbers will start out smaller, but could be larger if distribution was extended beyond the IRL watershed (think taking market share from biosolids products like Milorganite).

The owner of a popular nursery said that if Sally Sclaera of the IFAS Brevard County Extension gave a dewatered muck-biochar soil amendment a favorable review in the Sunday paper, they would have a hundred customers asking for it Monday morning. Sally has responded to the idea enthusiastically calling it "fantastic". I brought some bags of biochar for you to play with.

There are a variety of other powerful soil amending additives from local sources that could be incorporated into a dewatered muck-biochar product, including seaweed & worm casting extracts and beneficial microbes. The dewatered muck is likely to serve as a good base for the fertilizer-soil amendment. It contains 7% organic carbon – after all it is dead algae not toxic waste – and minerals (2% sulfur, 11% calcium, 2% magnesium). It has less than 1% nitrogen and 0.1% phosphorus and would likely need supplemental nitrogen to serve as a fertilizer. The only heavy metals analyzed include arsenic, chromium, and copper but these are present at very low concentrations consistent with background soil levels and government exposure standards, and well below fertilizer guidelines.

We suggest convening a group of experts and stakeholders to reach a consensus on the appropriate product formulation; and additional testing of dewatered muck from various dredge dewatering sites to better characterize the variability of muck quality and assist with the product formulation effort. The result will be a Brevard-based industry, creating jobs and reducing taxes. This is an aspirational and entrepreneurial vision. It would take a lot of work to do to make this happen, but we're going to do a lot of work anyway, we might as well make it productive for the Lagoon.

We recommend the following path forward to limit initial investment while gaining confidence in the feasibility of the circularity of IRL muck:

- Additional testing and inventory of dewatered muck from various dredge dewatering sites & management areas,
- Nutrient loading and leaching performance testing,
- Product formulation consensus-building;
- Sales & Marketing ground game (big box & other retail, nurseries & distributors);
- Limited blending, mixing, pelletizing, confirmation testing;
- Bag design and limited production and distribution (by the truckload).

Caution: *Charge* your biochar sample by soaking it with nutrient-rich water before use.

Good morning. I am Bob Pickert, a long-time Brevard resident, IRL supporter, and EHS manager for Wakefield Biochar. I would like to propose a circular approach to managing dredged Lagoon muck that would be good for the lagoon, the watershed, and Brevard's economy. In a word – biochar. Amending dewatered muck with biochar would:

- Transform the muck into a slow-release fertilizer and soil amendment,
- Replace or supplement the SOIRL Tax with a non-tax revenue from sales within (and beyond) the watershed,
- Distribute a high-quality and permanent source of carbon to landscaped soils that would reduce the flux of nutrients and other contaminants to the lagoon, and
- Provide a way for Brevard residents and businesses to contribute directly to the restoration of the Lagoon.

The irony is that to get the muck out - and stay the muck away – we need to ***embrace*** and enhance the muck.

First, let me talk about biochar. Biochar is a powerful plant-based soil amendment produced by woody biomass in a high-temperature, low oxygen environment through a process known as pyrolysis. This locks carbon into a lightweight and stable form with incredible surface area – think activated carbon – that remains stable in soils for hundreds of years. Biochar has impressive soil health benefits:

- *Absorbs* and retains water making landscaped soils more drought-resilient;
- *Adsorbs* nutrients - including nitrogen and phosphorus - making them more bio-available to plants, and less leachable to surface and groundwater;
- Adsorbs and retains metals (such as arsenic and chromium) and organic contaminants including the many emerging ubiquitous contaminants like PFAS;
- Provides the ideal habitat for beneficial microbes critical to soil health - increasing nutrient utilization, decreasing nutrient demand, and increasing microbial metabolism of a growing list of toxic chemicals; and
- Increases soil cationic exchange capacity making plants more salt-tolerant.

There are more benefits, including the fact that biochar is carbon negative, often providing sellable carbon credits in voluntary carbon markets. I have distributed a biochar flyer from IFAS explaining some of the benefits of biochar. Pelletized biochar is also a highly effective media for stormwater treatment in low-impact designs.

To get a feel for how this could finance the SOIRL Programs - The sale of 2 million, 1 cubic foot bags for $45 each – the equivalent of 4 bags for every home and business in Brevard, Volusia, Indian River, and Martin Counties - would generate nearly $100 million of annual gross sales. Assuming 40% goes to retailers, the remaining 60% ($60M) would cover

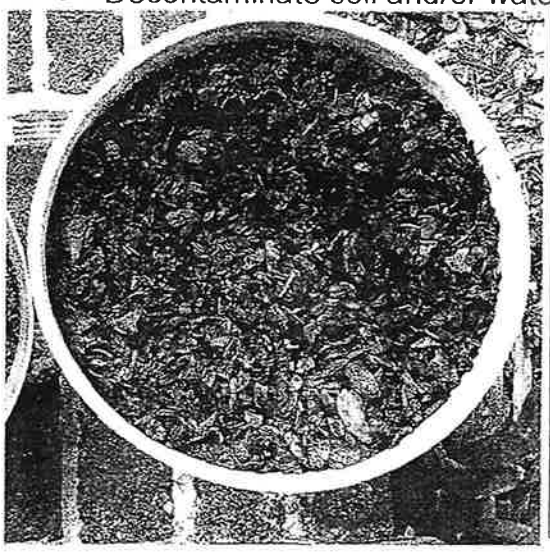
useful in foliar and other sprays (think liquid seaweed), where mineral ions and nutrients are packaged in ultra-light carbons. Such nutrients are more easily and efficiently assimilated through leaf pores. Inside a plant, the carbons strengthen plant structure and energy.

How is biochar "charged" before using it?

- If you are composting or vermicomposting, add 10-30% biochar to your compost/vermicomposting material.
- Spread biochar, an inch thick or less, into the animal's (chickens, rabbits, etc.) bedding. This can also help to reduce odors. Anecdotal evidence suggests it can also reduce illness among the animals. When the bedding is spent, it can also be added to the compost pile so the biochar will essentially be 'double-charged.'
- The first step in charging biochar is to soak it in a large bucket of water because fresh char isn't just dry, it's hydrophobic and will resist water penetration.
- Fill the bucket of biochar with enough rainwater (if using tap water, let the water sit for a day for the chlorine gas to escape) to cover all the biochar.
- Next, some nutrients such as fish hydrolysate or bat guano and liquid seaweed, as well as SEA-90 or Azomite, are added to the bucket for trace elements.
- Also, add **microorganisms** to the mix. Liquid products are available locally or online that contain a large variety of different microbes (i.e., Bushdoctor's Microbe Brew or Kangaroots, Plant Success Great White mycorrhizae, etc.) that include bacteria, saprophytic fungi, plus endo and ectomycorrhizae. **Worm casting** will also add microbes, including protozoa, so add that too.
- Other products that can be added include **sugar**, **oatmeal**, and **clay kitty litter**.
- After charging the biochar, save the solution and spray it on the foliage of plants, lawn, etc., or pour it on the soil around plants.

Uses for "charged" biochar:

- After rinsing the dusty biochar in water, spray the dark water with liquid seaweed on the foliage of vegetable plants, fruit trees/shrubs, ornamental plants, or lawns.
- Add some biochar to the bottom of the planting hole when planting.
- Apply it as a top-dressing, ¼ - ½" thick, to the lawn or landscape.
- Decontaminate soil and/or water.



Large pieces of charcoal are broken up and, once charged, can be added to the planting hole when planting a new plant. This typically needs to be done just one time if soil nurturing practices are adopted.

Additional Reading

An introduction to Biochars and Their Uses in Agriculture http://edis.ifas.ufl.edu/ss585

Biochar Effects on Weed Management http://edis.ifas.ufl.edu/ag390

Videos

Watch online now - Biochar Documentary - https://grow.foodrevolution.org/

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Biochar in the Garden: It's all about the Carbon!

What is it? It was originally discovered in the Amazon, called terra preta or dark earth, where plant debris was smothered and slowly burned, with just the carbon matrix remaining. When it was discovered, the organic matter layer was six feet deep. The term biochar is used for a charcoal product that is specifically produced for gardening or agricultural purposes. The biochar acts like a sponge and becomes colonized by various organisms, which produce carbon-based molecules that become stuck to the charcoal. Over time, this adds up to an increase in the soil's carbon content. For more information, check out this website, Amazon's Dark Earth: https://eos.org/features/the-nutrient-rich-legacy-in-the-amazons-dark-earths.

Why is it so good?
It is a gardener's friend because it helps create organic matter in the soil, which is a food source for soil microbes, and helps to supply plants with a variety of nutrients. Wood is burned, and when the flames begin to die down, the fire is put out. The remaining product, called biochar, is essentially a solid form of carbon that can be added to the soil as an amendment. Biochar is very porous, so it has spaces to store nutrients, harbor soil organisms, and stabilize the humus. The carbon from the dead plants, which is normally lost to the atmosphere as carbon dioxide, is sequestered by the biologically active biochar in the soil.

Where can I buy it and/or how do I make it?

- Biochar **products are available** (i.e., Earthshine Biochar, Vermont Organics biochar, Humichar, etc.) If the biochar you purchase isn't already "charged," you must do that before adding it to the soil.
- You can also **purchase lump charcoal** (i.e., Red Oak, Cowboy, Myron Mixon, etc.) and crush it into smaller pieces before charging it.
- You can **make your own** by burning wood, bamboo, etc., and drowning out the fire once the flames begin to die down.
- To crush it, put it in a bag and use a hammer or drop a sledgehammer on it repeatedly until the pieces are approximately 1" or less, optimizing its effects on soil structure, ion adsorption, and microbial colonization. A one-inch chunk has a surface area of roughly six square inches that can become a microbial metropolis where millions of microbes can reside. Biochar, the size of a rice grain kernel, is large enough to house thousands of microbes.
- Biochar dust will disappear quickly into the soil, distributing into the soil more widely and mixing more thoroughly with the soil particles and organisms. Dust, the smallest particle, smaller than most soil particles, can insert itself between soil particles. Thus, clay is less sticky, and sand will become more cohesive. The dust is also small and light enough to suspend in water. These extremely small carbon molecules can be harvested by rinsing fresh, dusty char with water. They disappear into the water, making it slightly dark. **These microparticles are**