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Mobile Pyrolysis for Landscape-Scale Projects

Roger Smullen, CEO and Co-Founder
Earth Foundries, Inc.
Sustainable Forest Waste Disposal
February 13th, 2024



Earth Foundries, Inc.

- Goal: End California's Catastrophic Wildfires And Address Climate Change Through Sustainable Forest Waste Up-cycling That Will Lower The Cost And Carbon Footprint Of Landscape-scale Forest Health Projects
- Entity: Saratoga, California-based, Certified Woman-owned, Benefit "B" Corporation (B Labs Certification Underway)
- Funding: Bootstrapped, Grants, Revenue Generating
- Founders: Dede And Roger Smullen



Earth Foundries: What we do (now)



- Landscape Scale Forest Health Project Management
 - ICS (Incident Command structure)
 - Agency Liaison
 - Proposals/Contracts
 - GIS Mapping Services
 - Biochar Distribution
 - Carbon Credits (in process)
- Slash Attack™ : Growing Fleet of Carbonizers (CAL FIRE Grant)
- Biochar Grant Projects (USFS/CAL FIRE/Valley Water)

Mobile, Sustainable Forest Waste Disposal

Slash Attack™: Mobile Pyrolysis At Scale



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The Problem: So Much Forest Waste

- CA/USFS “Million Acre Strategy” → 5-15MBDT/Year Of Forest Waste
- CA Burned ~1M tons/year, 2018-2021
- CA Existing Burn Piles: ~1M Tons
- Challenges:
 - Trucking Long Distances → Not Economical
 - Pile Burns:
 - Fire Escape Hazards
 - Health Effects From Smoke Pollution
 - Poor Resource Utilization
 - Carbon Footprint



Data Source: “California Forest Biomass Pile Data Collection”, Joint Institute for Wood Products Innovation, 2023



One Solution: Make Biochar on Site At Scale with the Tigercat 6050



- Throughput: 10-15 green tons/hour
- Water usage: 2-4 gallons/minute
- Biochar Output:
 - Carbon Yield: ~10%
 - Carbon, Ash: 80-90%, 5-10%
 - H:C : 0.2
 - Surface Area: ~400m²/g
 - Moisture Content: 50-60%
- GHG/Emissions Reductions (Compared to Pile Burning)*
 - PM_{2.5}/10: 96% lower
 - CO/CO₂/CH₄: 96%/43%/54% lower

* (California Board of Forestry and Fire Projection/Ascent Environmental 2022)



Tigercat Setup

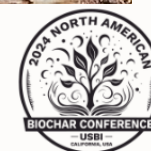
Item	Requirements
Permitting	CAL FIRE LE-5, Local Fire Department, City/County Use Permit, Air Quality Management Distric (AQMD)
Support Equipment	Loader with Grapple, Wood Sheer/Splitter (if larger pieces), Water Source/Tank, Biochar Supersacks or Bulk Container, Fork Lift
Safety Precautions	Bare Soil Perimeter, Water Buffalo, Fire Hose, Fire tools, Fire Watch
Material Handling	Diameter < 12-14 inches, else sheer (for faster processing) Length < 20 feet
Run time	~24/7 optimal, 2-3 hour warm up and cool down required



Anthony Chabot Park, SF Bay Area



Anderson, Shasta County



Biochar & Carbon Credits

- Testing:
 - IBI Category A, Soil Control Labs, Watsonville, CA
 - IBI Category B, Enthalpy Labs, Berkeley, CA
 - Radwag Moisture Analyzer
 - On-site scales
- Distribution:
 - Bulk
 - Bagged
- Carbon Credits (in Process)
 - Grain, Carbon Partner
 - Verra, Low Tech Pathway



Supersack Delivery to Ardenwood Farms, SF Bay Area



Bulk Delivery to Dry Creek Ranch, SF Bay Area



Pace and Scale to Meet the Moment

Item	Amount
Processing Rate Factors	Species, Size, Moisture Content
24-hour Throughput	240-360 tons
Yearly Throughput (100% Theoretical Maximum @300tons/day)	~100,000 tons (109ktons)
Throughput ½ year, 80% on-time	40,000 tons
Fleet of 10 Units	400,000 tons/year

Mobile, Sustainable Forest Waste Disposal at Scale Addresses California's Forest Waste Tsunami While Sequestering Carbon and Reducing Smoke Pollution



Biochar Market Development Projects

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Project Acknowledgments

- Thank you to our project funders:



US Forest Service
Wood Innovation
Grant



CAL FIRE Business
Development Grant



Valley Water
(Bioswale only)

Also, thanks to Raymond Baltar/Sonoma Biochar Initiative/Sonoma Ecology Center for Supporting these projects, and Falk Forestry and Pacific Biochar for providing biochar



Goal: Develop SF Bay Area Biochar Market

- **Why:**

- Creating A Market For Biochar Creates A Market For Forest Waste, Lowering The Cost And Carbon Footprint Of Forest Health Projects

- **How:**

- Demonstrate High-volume, Near-term Biochar Applications In Three Market Segments
- Develop Best Practice Guidelines
- Publicize Successes

- **More Info:**

<https://www.earthfoundriesinc.com/biochar-market-development/>



Compost:

- Speeds Process
- Reduces VOC's
- Improves Compost Quality



Stormwater Remediation:

- Increases Water Retention
- Filters Organics, Heavy Metals
- Promotes Plant Growth



Manure Management:

- Speed Process
- Reduces Methane, Ammonia & Odors
- Improves Amendment Properties

Project Status

Project	Status
Green waste/Biochar Co-Composting	Complete
Bioswale/Biochar	In planning phase
Dairy Manure/Biochar Co-Composting	Composting complete
Poultry Manure/Biochar Co-Composting	On Hold, Avian flu



Green Waste/Biochar Co-Composting

- Location: Napa Recycling, Napa California
- Composting Process: Upflow Covered Aerated Static Pile (CASP) Engineered Composting System (ECS)
- Project Design
 - Control: 100% compost (green waste, food scraps)
 - Sample: 90% compost, 10% biochar
- Principle Investigator: Rick Wilson



Green Waste/Biochar Co-Composting Results

- Reduced VOC Emissions **33%**
- Reduced Curing Time To Achieve Compost Maturity by **one week**
- Increased NPK value of Finished Compost (**11% vs control**)
- Reduced Salinity of Finished Compost (**50% reduction**)

Implications: Improved Facility Throughput & Better Final Product
Process More Material Without Adding CapEx



Thank you!/Questions?

Follow up/More info:

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