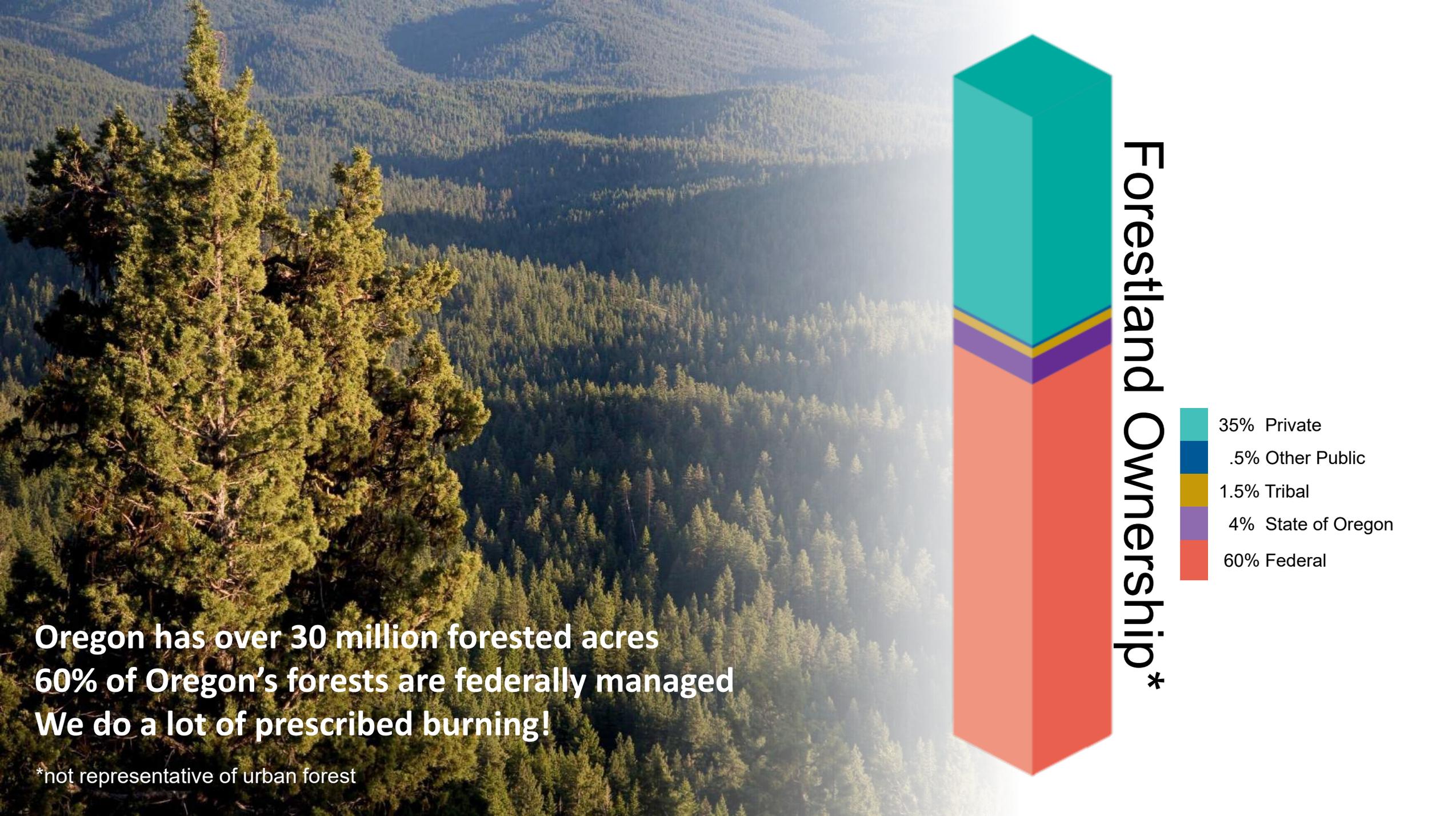


Air Curtain Incinerator Emissions Testing

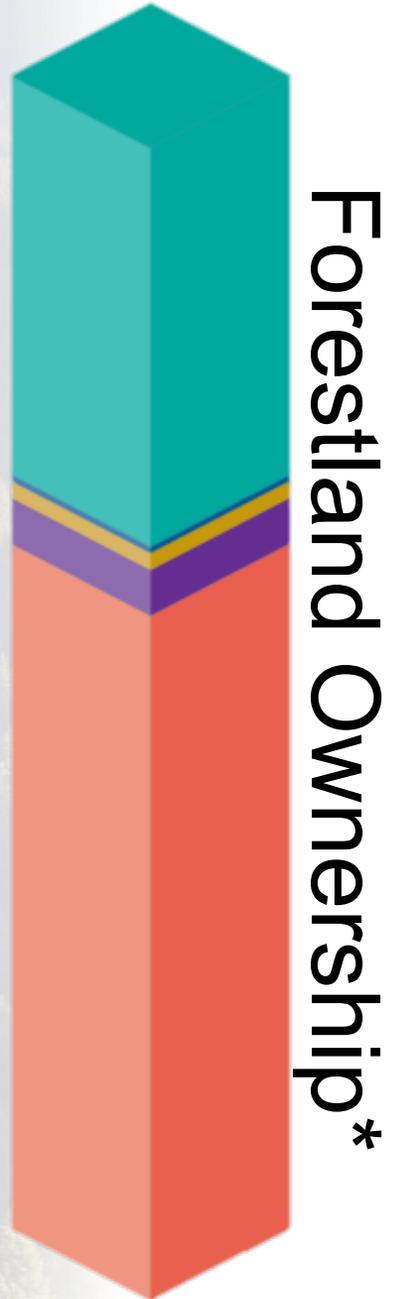
Margaret Miller, AQ Planner & Forester





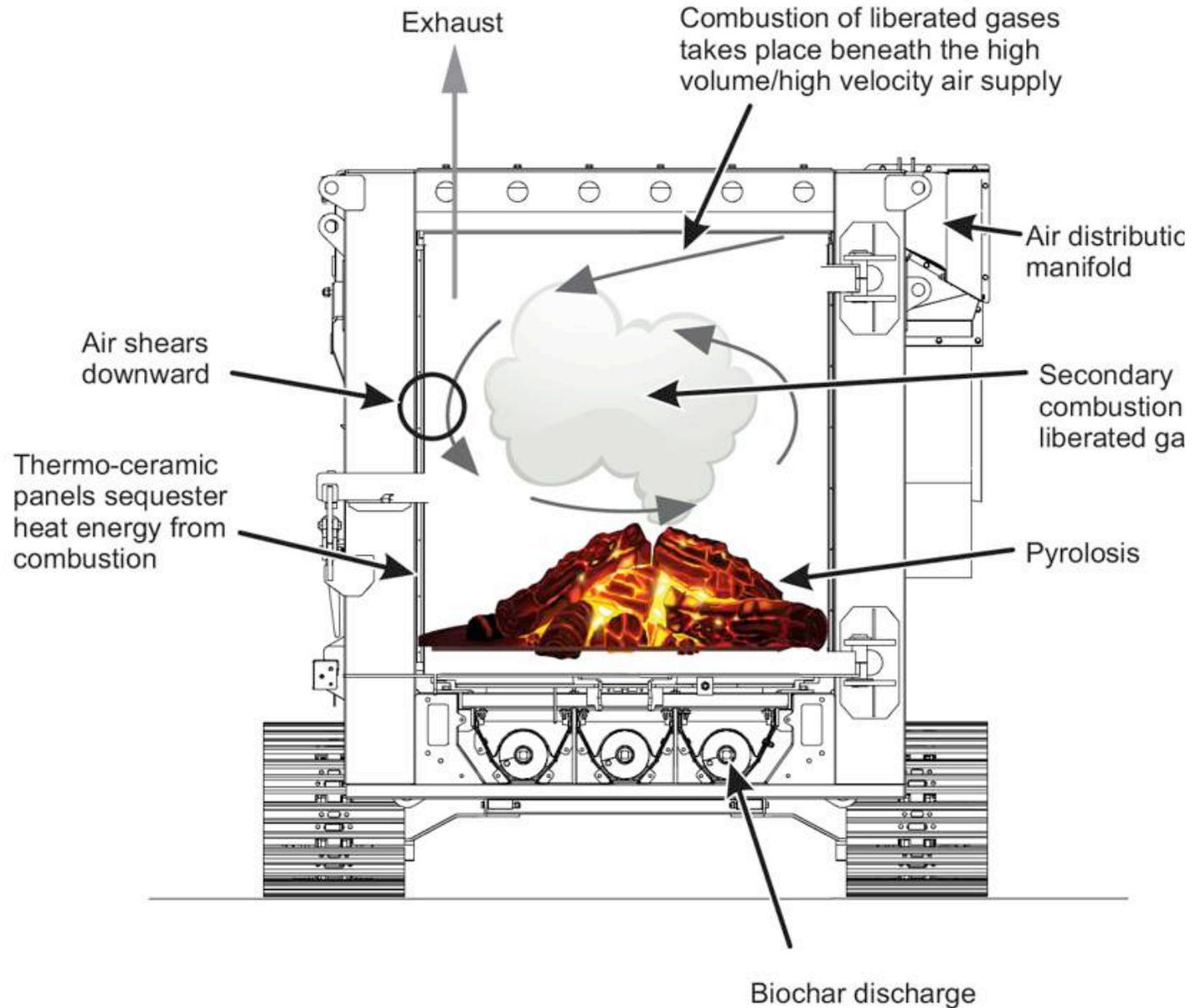
Oregon has over 30 million forested acres
60% of Oregon's forests are federally managed
We do a lot of prescribed burning!

*not representative of urban forest



- 35% Private
- .5% Other Public
- 1.5% Tribal
- 4% State of Oregon
- 60% Federal

ACI System



- 
- Carbon-rich, highly stable soil amendment resulting from pyrolysis
 - Up to 30% sequestration
 - Increases water holding capacity
 - Captures metals and excess nutrients



Air Curtain Incinerators in Oregon



Two major manufactures
(AirBurners and Tigercat)

Five ACIs currently operating in
Oregon

Using surrogate emissions factors
DEQ has created a ACDP and TV
General Permit (Oregon's first TV
GP)

Surrogate emission factors were
established from wood fire boilers
and pile burning

Tigercat
Tough • Reliable • Productive


AirBurners

ACI Emissions Testing Background

- CAO modelers could not find ACI emissions factors for HAPs
- ACI emissions testing was identified as a top priority of the Biomass Utilization Working Group (BUWG)
- The ACI emissions test is funded in-part by SB-762 (2021) and funding received from ODF via the U.S. Forest Services EAB response funding

Request for Information & Montrose Contract



State of Oregon Department of Environmental Quality

Request for Information: Air Curtain Incinerator Emissions Testing Feb. 28, 2022

The Oregon Department of Environmental Quality (DEQ) is seeking information from interested parties for services related to air curtain incinerator (ACI) emissions testing. The goals of this Request for Information (RFI) on ACI emissions testing are to (1) identify existing testing methods, (2) determine all associated costs for testing (a non-binding price estimate), and (3) a timeline for completion.

This RFI may or may not result in a Request for Proposal (RFP). Responses provided to this RFI will be used for general information purposes and will not be considered binding on any party. Responses provided to this RFI will not have any impact on any future RFP selection. DEQ is currently working to secure financial assistance for ACI emissions testing and is planning to release an RFP if funding is secured.

Air Curtain Incinerators and DEQ Air Permits

ACIs are devices that burn wood waste like trees and brush. ACIs have an insulated box to burn the wood waste and a fan powered by a diesel engine that blows a curtain of air over the box. Oregon uses ACIs for both wildfire cleanup and fire prevention efforts. ACIs are an alternative to traditional open burning and they likely produce less harmful smoke and particulate matter.

Compared to traditional outdoor burning of wood waste, air curtain incinerators emit lower levels of air pollutants including fine particulate matter (PM_{2.5}) and nitrogen oxide (NO_x). ACIs produce toxic air pollutants from burning the wood waste and emissions from the diesel engine that powers the fan. All emissions from the ACI are assessed as part of a DEQ air permit.

Oregon's Cleaner Air Oregon Program requires facilities to evaluate the health risk from toxic air pollutants. First, facilities estimate the types and amounts of toxic air pollutants emitted. Next, facilities determine the risk from those toxic air pollutants to adults and children living, working, or going to school nearby. DEQ uses dispersion modeling to estimate how much of a given pollutant a person nearby may breathe based on distance, time and amount.

DEQ compares the dispersion modeling estimates of risk with Oregon's established health standards. If the facility's risk is higher, DEQ requires the facility to lower their emissions.

Emissions Data Considerations

There is insufficient data available on emissions from ACIs. For permitting air toxics emissions through Cleaner Air Oregon, DEQ is currently using a combination of conservative emission factors from open pile burn testing and emission factors from woodfire boilers. DEQ would like emissions testing to be performed on ACIs to improve our understanding of ACI emissions and use more accurate emission factors in health assessments.

DEQ is interested in the following three scenarios, with our main priority being scenario one (1).

1. Metals (including at least manganese, lead, cadmium, and arsenic), polycyclic aromatic hydrocarbons (PAHs), PM_{2.5}, and NO_x
2. Dioxins and Furans, Trichloroethene, Vinyl acetate, Acrolein, Benzene, Formaldehyde, and the other criteria pollutants
3. Repeat of scenario 1 (and possibly scenario 2) at variable operating conditions such as different wood type, wet vs. dry, and wood seasonality

DEQ asks that you please provide testing methods and associated costs for each testing scenario.

After soliciting a request for information and reviewing the information received

DEQ decided to work with Montrose Environmental Services

Montrose is an international environmental solutions company known for comprehensive air measurement and laboratory services

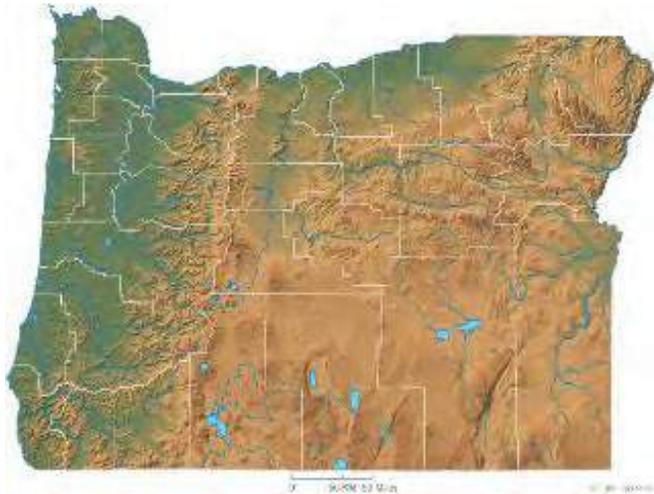


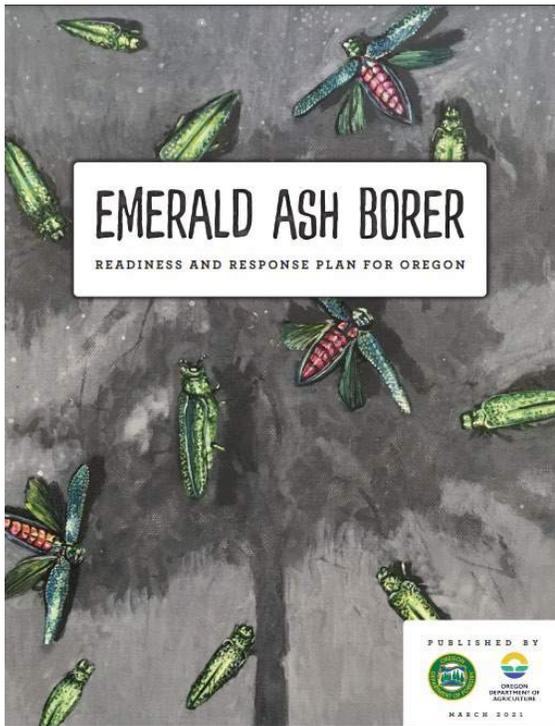


Cross Agency Collaboration!

Emerald ash borer was detected in Oregon.

- Invasive species
- Reported on June 30, 2022
- Joseph Gale Elementary School in Forest Grove, OR
- First discovery on West Coast





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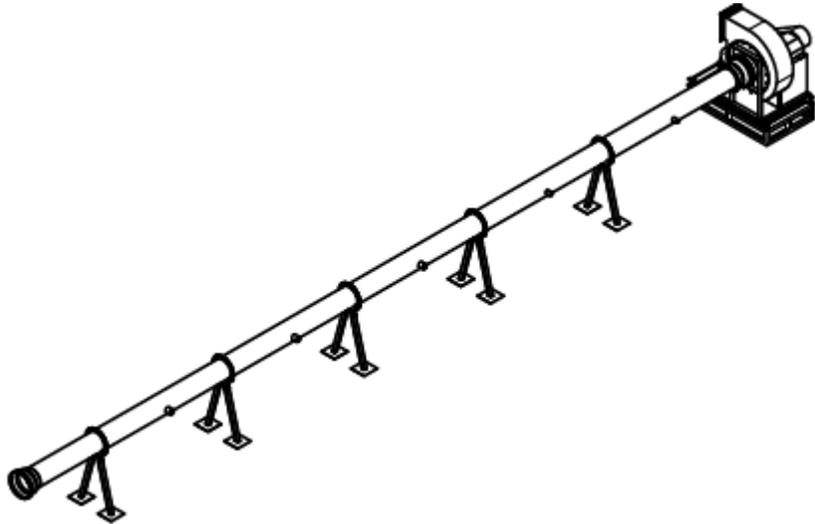
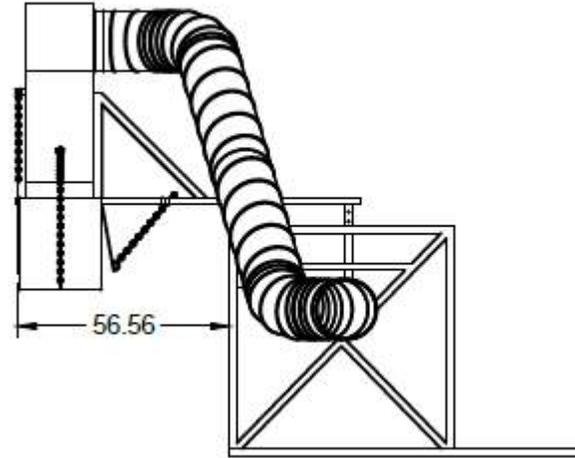
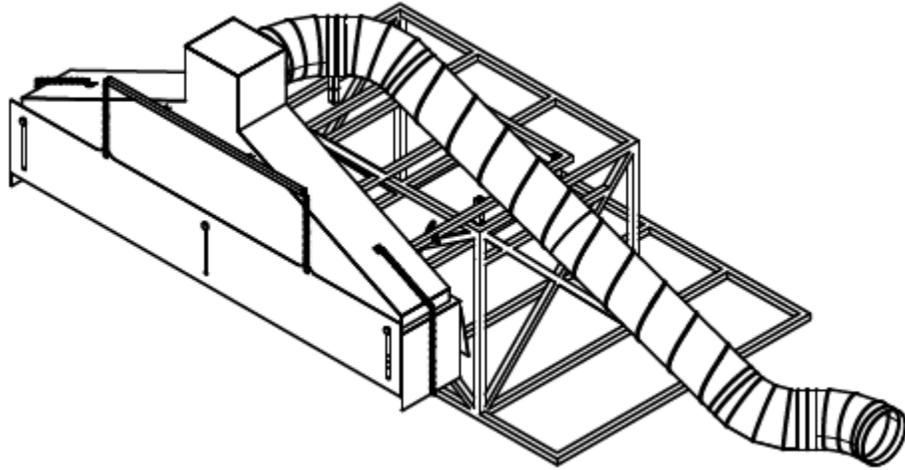


Task Force Subcommittees

1. Survey & Monitoring
2. Wood Waste & Wood Utilization
3. Training & Technical Assistance
4. Integrated Pest Management
5. Research
6. Communication
7. Funding



RFP – Design, Fabrication & Transportation Services



**ADVENTURE METAL
MACHINE WORKS**

Testing Logistics and Details

Air Curtain Incinerator Testing Calendar

March 2023						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

April 2023						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

May 2023						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	Jun 1	Jun 2	Jun 3

ACI Testing Dates:

Monday, May 1 – Tuesday, May 2, 2023 – Onsite Assembly and Pre-Testing
Monday, May 22 – Friday, May 26, 2023 – ACI Test Burn and Disassembly
Tuesday, May 30 – Friday, June 2 – Weather Contingency Test Burn

March and April logistics are still being flushed out including scheduling for the following activities:

- Prewrite to improve site access and pad at Clean Water Services
- Felling of Ash at CWS
- Bucking and piling of wood at CWS

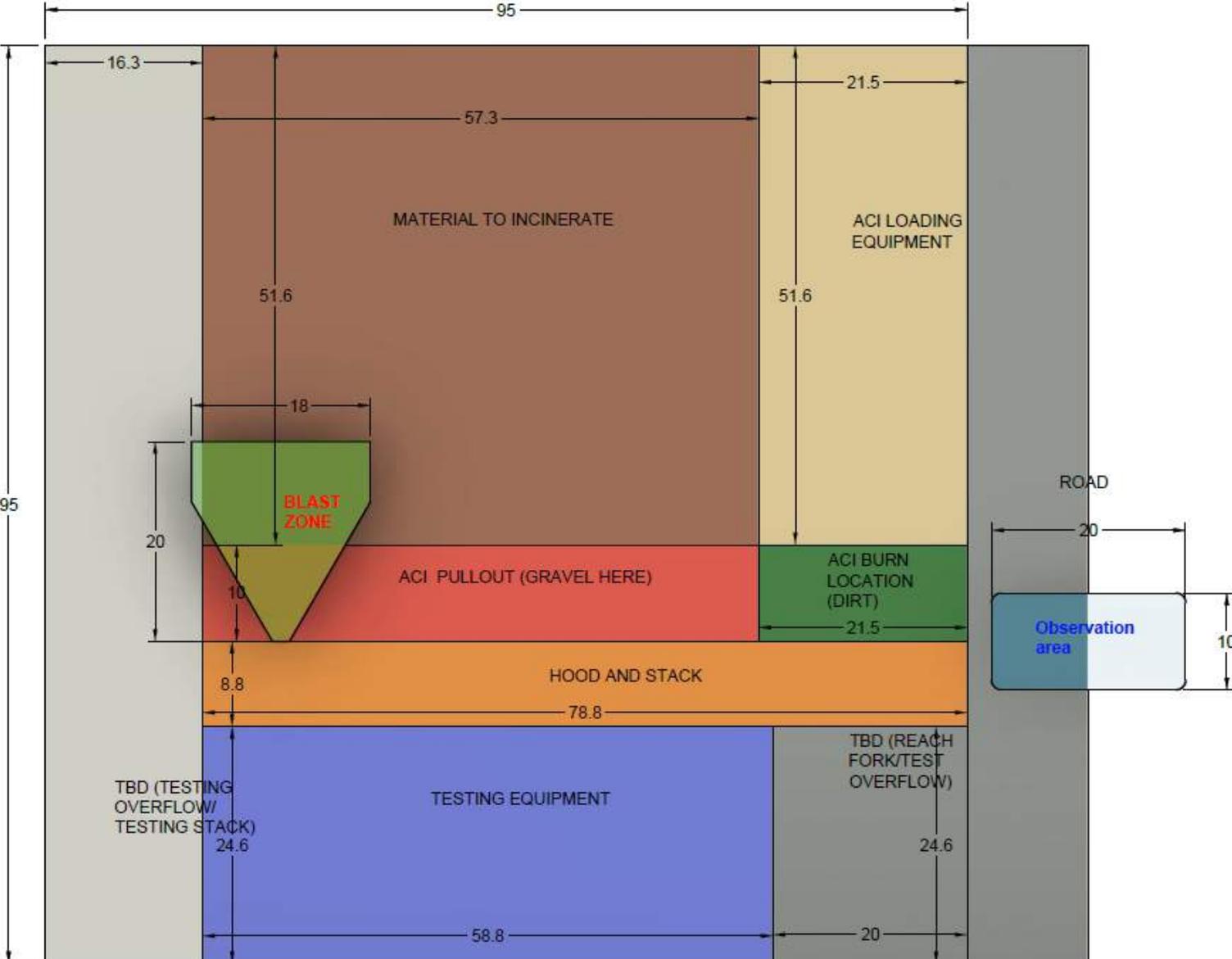
Clean Water  Services



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A lot of effort went into site selection and layout.



May 1st = Set Up

May 2nd = Pre-Testing

What we learned: the unit gets very hot!



Table 1-1
Summary of Test Program and Proposed Schedule – ACI Preliminary Test

Proposed Test Dates	Activity/Parameters	Test Methods	No. of Runs	Duration (Minutes)	Reporting Units
5/2/2023	Traverse Points	EPA M1	N/A	N/A	N/A
5/2/2023	Stack Gas Velocity	EPA M2 ¹	N/A	N/A	ft/s
5/2/2023	H ₂ O	EPA M4	2-3	60	% volume
5/2/2023	PM	ODEQ M5	2-3	60	lb/MMBtu
5/2/2023	O ₂ , CO ₂ , SO ₂ , NO _x , CO, VOC, NMVOC, CH ₄	EPA M3A, 6C, 7E, 10, and 25A	2-3	60	ppm, ppmvd lb/MMBtu
5/2/2023	Mass emission rate	EPA M19	N/A	N/A	lb/MMBtu
5/2/2023	Fuel Sample for Btu/lb & F-Factor	Ultimate & Proximate Analysis	TBD	N/A	Btu/lb





Updated testing design with a water feature to cool the exhaust before it hit the blower.



Table 1-2 Summary of Test Program and Proposed Schedule – ACI Source Test

Proposed Test Dates	Activity/Parameters	Test Methods	No. of Runs	Duration (Minutes)	Reporting Units
5/23-25/2023	Traverse Points	EPA M1	N/A	N/A	N/A
5/23-25/2023	Stack Gas Velocity	EPA M2	N/A	N/A	ft/s
5/23-25/2023	Mass emission rate	EPA M19	N/A	N/A	lb/MMBtu
5/23-25/2023	H ₂ O	EPA M4	6	180	% volume
5/23-25/2023	PM	ODEQ M5	3	180	lb/MMBtu
5/23-25/2023	O ₂ , CO ₂ , SO ₂ , NO _x , CO, VOC, NMVOC, CH ₄	EPA M3A, 6C, 7E, 10, and 25A	3	180	ppm, ppmvd lb/MMBtu
5/23-25/2023	PCDD, PCDF	EPA M23	3	180	pg/m ³ , ug, lb/MMBtu
5/23-25/2023	Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Hq, Ni, P, Se, Ag, Tl, Zn	EPA M29	3	180	ug, mg/dscm, lb/MMBtu
5/23-25/2023	PAH Suite	EPA SW-846 M0010	3	180	ug, ug/mL, lb/MMBtu
5/23-25/2023	Trichloroethene, vinyl acetate	EPA TO-15	3	180	ppb, ppbvd lb/MMBtu
5/23-25/2023	Selected HAPs (Acrolein, benzene, formaldehyde)	NCASI M 99.02	3	180	ppb, ppbvd, lb/MMBtu
5/23-25/2023	Fuel Sample for Btu/lb & F-Factor	Ultimate & Proximate Analysis	TBD	N/A	Btu/lb
5/23-25/2023	Biochar H, N, C, moisture	ASTM D5373, D3173-03, and	1/day	N/A	Wt %



Testing Protocols

May 22 = Set Up

May 23 = Testing Day 1

May 24 = Testing Day 2

May 25 = Testing Day 3**

May 26 = Tear Down

** Media and Testing Demo for VIP



[Wood incinerator potential key to slowing spread of emerald ash borer](#)





DEERE

436









We took representative fuels samples



We took representative byproduct samples



We are still waiting on results.
Questions?