

BACKGROUND

- Underserved communities can often be without power during some of the most pressing times of the year.
- This project is a part of the EPA's P3 initiative to create sustainable technology for the planet and humanity
- A large portion of tribal communities in the Pacific Northwest rely on wood stoves to provide heat in the winter.
- Wood stoves are inherently inefficient, as most heat is lost in the exhaust.
- The idea is to find a method that doesn't require power to improve the efficiency of wood stoves.

HOW DO WE MAKE A WOOD STOVE MORE EFFICIENT?



Our Team installed our retrofits here:

Replacing a portion of the stove's chimney

TEAM

- Paula Coto:** Researcher
- Christopher Mathis:** Builder/Designer
- William Statler:** Bookkeeper/Clerical Overseer
- Zachary McDonough:** Researcher
- Dr. Nordica MacCarty:** Faculty advisor/sponsor



HEATING HEROES!

Wood Stove Retrofits for improving heating in tribal and underserved communities.

Our team used these retrofits to increase the efficiency of the wood heaters:

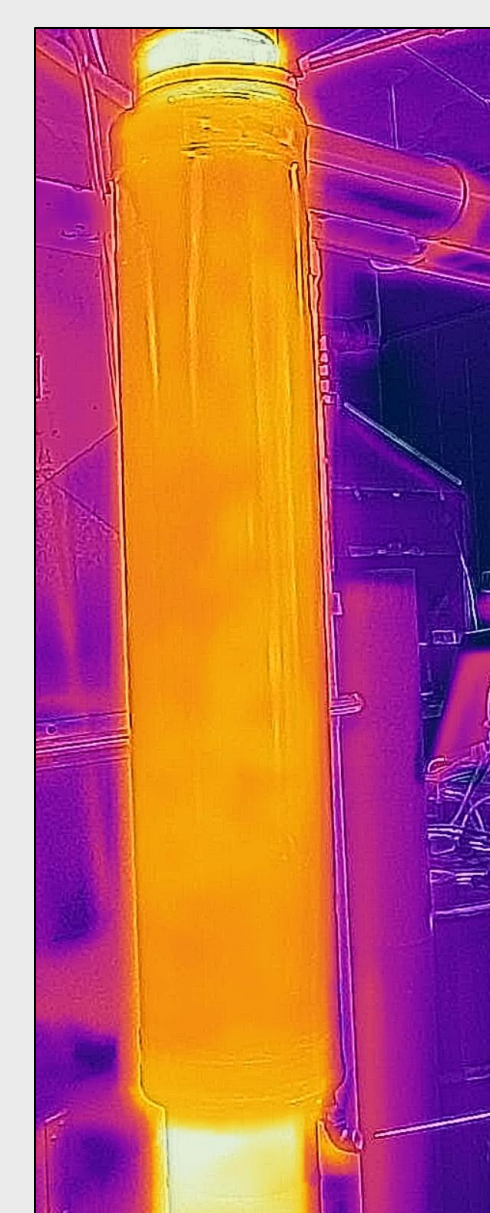
HEAT SPREADER

Runs exhaust gas through a series of smaller tubes to increase surface area while slowing flow.



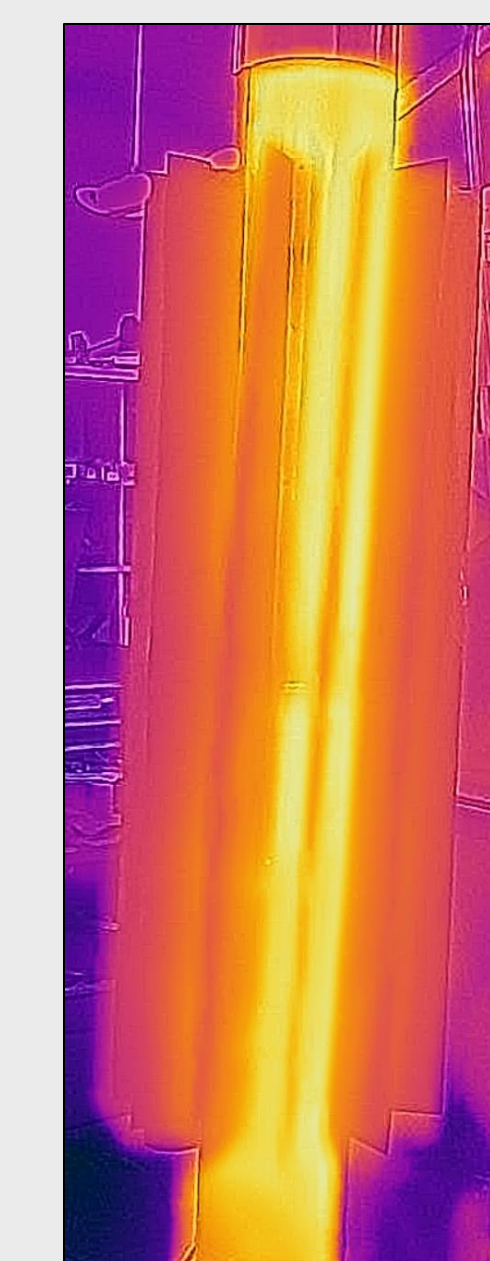
HEAT EXCHANGER

Uses secondary chamber to preheat the stove air, causing a more powerful and efficient burn.



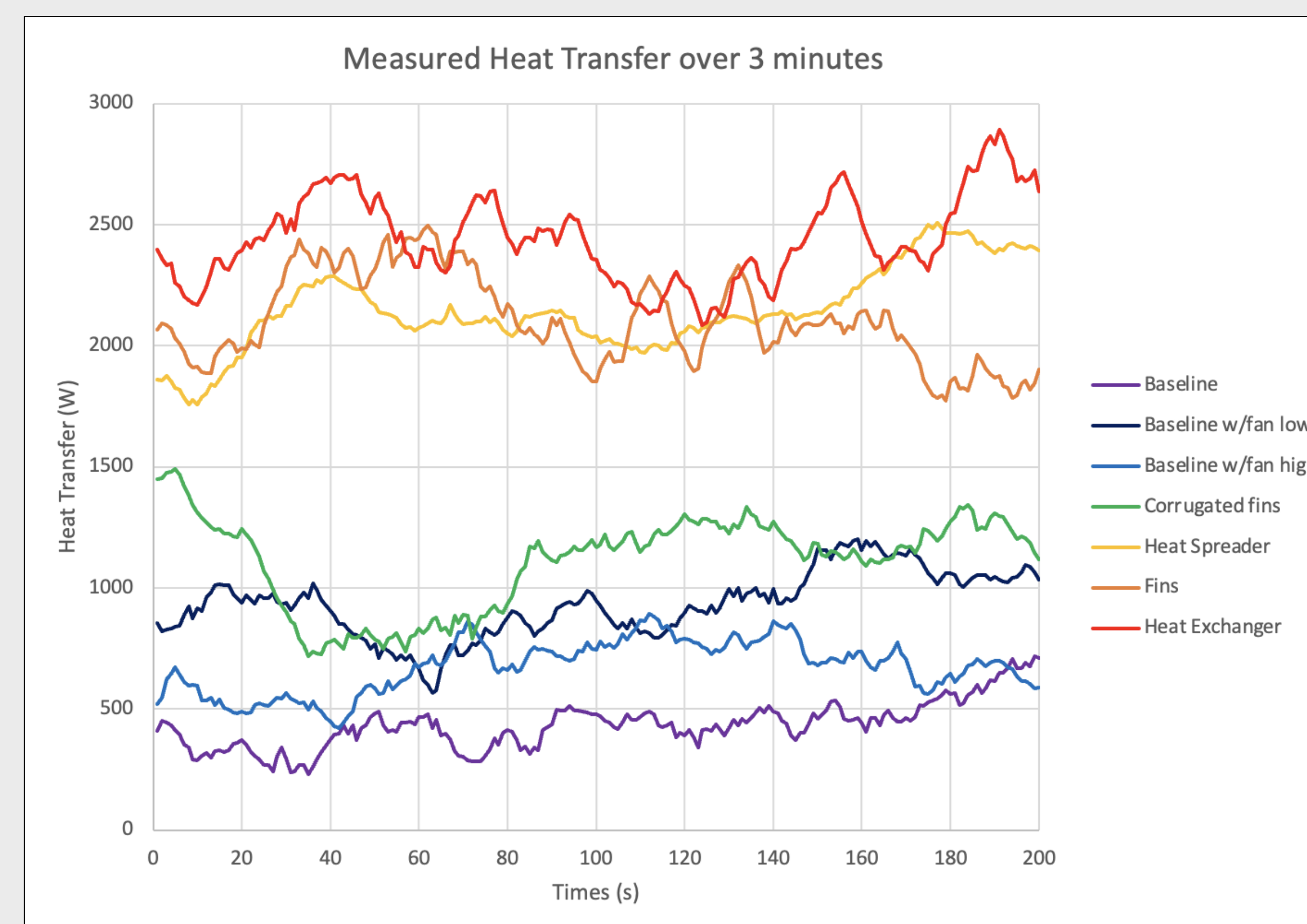
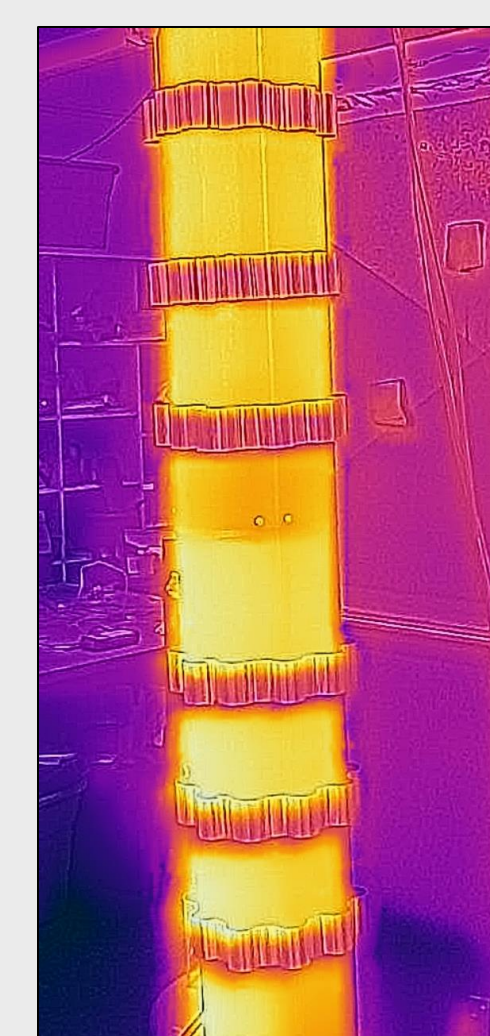
OUTSIDE FINS

Increased surface area causes more efficient heat transfer at very low installation cost.



ATTACHABLE FINS

Corrugated fins are added via a "strap-on" design. Extremely low cost, not as effective as proper fins.



Heat Output	Plain Chimney	Plain Chimney with Fan (Slow)	Plain Chimney with Fan (Fast)	Heat Spreader	Heat Exchanger	Outside Fins	Attachable Fins
Calculated	796.6 W	857.7 W	1313 W	1444 W	1946 W	1914 W	1812 W
Experimental	433 W	932 W	600 W	2147 W	2441 W	2103 W	1105 W

DESIGN PROCESS

Research feasible ideas requires evaluating overall goals:

- Affordability
- Increased Effectiveness
- Low Installation Costs
- Mass Producibility

ROUGH PROTOTYPING

Construct low cost, simple models out of cardboard to evaluate size and complexity



REFINED PROTOTYPING

Construct more refined models to evaluate final assembly difficulties



Special Thanks to Aprovecho Research Center in Cottage Grove