CTUIR FWA Appendix A:

Project Carbon Inventory

CTUIR Nixyaawii, Don't Throw It Away! Project

Photo by Annie Warren, Northwest Public Broadcasting, (Feb 2026)

Nixyaawii, Don't Throw It Away! Project Introduction

Climate adaptation often begins with a small but meaningful change in behavior that, over time, can add up to have a big impact. Preventing food from being thrown away in landfills has the potential to reduce carbon emissions associated with transportation to landfilling locations and methane created from anaerobic decomposition of organics within landfills themselves. Measuring how much food waste is created from our Tribal entities and events is important for understanding the potential for our community to reduce our environmental foot print and recovery resources to be reinvested back into our community.

Methane and other combustible gases are potent greenhouse gas emissions and are an area of concern for many programs that aim to reduce atmospheric carbon. Preventing food and other organic materials from ending up in the anaerobic conditions of landfills can help prevent methane escape from undeveloped landfills and carbon dioxide release as flared gas in developed landfills. Transportation of organic materials from their point of collection to their point of disposal also contributes to carbon emissions from materials management sources, and reducing this distance can contribute to reducing carbon emissions. This project includes an exploration of carbon emissions implications associated with this pilot project.

Food Waste and Carbon

Carbon emissions associated with food waste come from three main sources:

1. Methane escape from undeveloped landfills
2. Carbon dioxide from flared methane in developed landfills
3. Vehicle emissions from transportation of landfill-bound materials

By keeping food and other organic material out of landfills, we can prevent methane creation, which will in turn prevent methane escape and carbon dioxide from flaring, as well as vehicle emissions from transportation. We can also increase our access to agricultural input materials like compost, that are known to improve soil health and reduce soil erosion into river basins.

Composting is the natural breakdown of organic materials such as food scraps, yard waste, crop residues, and manure by microorganisms and decomposing organisms into a rich, dark material called compost. Compost improves soil structure, increases soil organic matter, enhances water-holding capacity, supports beneficial soil biology, and reduces waste sent to landfills (U.S. Environmental Protection Agency [EPA], 2025; U.S. Composting Council [USCC], 2025).

Composting allows organic waste to be transformed into a valuable soil amendment while reducing the environmental impacts associated with landfill disposal. When organic materials are buried in landfills, they decompose under low-oxygen conditions and produce methane, a greenhouse gas significantly more potent than carbon dioxide over a 100-year period (EPA, 2025).

NDTIA!P Carbon Calculations

Our project's biggest carbon emissions reduction impact is preventing vehicle emission from food waste transportation. Table 1 is a diagram that outlines how this project calculates both the carbon emissions prevented and carbon emissions created by this project. This is a very small exploration of the carbon footprint of one project within CTUIR, as a very early exercise in calculating the Tribe's overall carbon footprint.

NIXYAAWII HOST SITES

FOOD WASTE CAPTURED

This is the total sum of food waste in all categories that was diverted by the project. If infrastructure and capacity is in place, the carbon emitted from this could be completely avoid. Represents the possible sum of carbon emissions reductions possible.

LIVESTOCK FEED

COMPOST OPTIONS

LANDFILL

These are the high quality fruits, vegetables, and grains like rice that are diverted for livestock animals like chickens and goats. It also includes meats diverted for pet dogs. Carbon emissions are calculated as the distance traveled to the drop off location. This carbon could be eliminated with pick up or EV options

These are fruits and vegetables that are lower quality but still good for aerobic, bokashi, and vermi composting. Carbon emissions reductions are calculated as the vehicle emissions from distance to landfill prevented. Additional benefits to soil health and food security have not been calculated but could be part of a large permanent operation.

This category represents food waste our project captured but was unable to process within our small operation. This includes oils, mixed or rancid food waste, and non-food waste contamination items like single use plastics. A large permanent operation is likely to be able to process these. Carbon emissions are calculated as vehicle distance to Columbia Ridge landfill.

Within this Carbon Inventory, carbon emissions are tracked as follows:

- Food Waste Captured
  This is the total sum of food waste in all categories that was diverted by the project. If infrastructure and capacity is in place, the carbon emitted from this could be completely avoid. Represents the possible sum of carbon emissions reductions possible.
- Livestock Feed
  These are the high quality fruits, vegetables, and grains like rice that are diverted for livestock animals like chickens and goats. It also includes meats diverted for pet dogs. Carbon emissions are calculated as the distance traveled to the drop off location. This carbon could be eliminated with pick up or EV options
- Compost Options
  These are fruits and vegetables that are lower quality but still good for aerobic, bokashi, and vermi composting. Carbon emissions reductions are calculated as the vehicle emissions from distance to landfill prevented. Additional benefits to soil health and food security have not been calculated but could be part of a large permanent operation.
- Landfill
  This category represents food waste our project captured but was unable to process within our small operation. This includes oils, mixed or rancid food waste, and non-food waste contamination items like single use plastics. A large permanent operation is likely to be able to process these. Carbon emissions are calculated as vehicle distance to Columbia Ridge landfill.

Table 1: Carbon Emissions Associated with Food Waste Pathways

Food waste destination	Distance traveled	Vehicle Emissions Assoc.
Livestock Feed	12.9 km one way (25.8 km total) Local livestock	Medium gasoline vehicle **117 gCO2e per km**
Composting Options	0.5 km Longhouse, Culture Night, and Afterschool Program (1 km total) 1 km Seniors Center (2 km total)	Medium gasoline vehicle **117 gCO2e per km**

Landfill	129 km one way (258 km total) Columbia Ridge	Diesel Truck **192 gCO2e per km**

Organic waste includes food and yard waste both residential and commercial producers on the UIR. This waste is currently included in non-organic waste and disposed of in landfills, specifically a large regional landfill located in Arlington, Oregon. Thus this waste travels from the UIR to Arlington, a distance of 129 kilometers (one way), accounting for GHG emissions associated with transportation of this material. Once the organic material is disposed of in this landfill, additional GHG emissions are released from methane resulting from anaerobic decomposition in the landfill. Thus, preventing organic waste from being removed from the UIR as well as preventing uncontrolled anaerobic decomposition will result in GHG emissions reductions that are quantifiable, long lasting, and certain.

Typical landfill gas is made up of around 50% methane. Methane is a very strong greenhouse gas, more than 80 times as potent as carbon dioxide in the short-term.

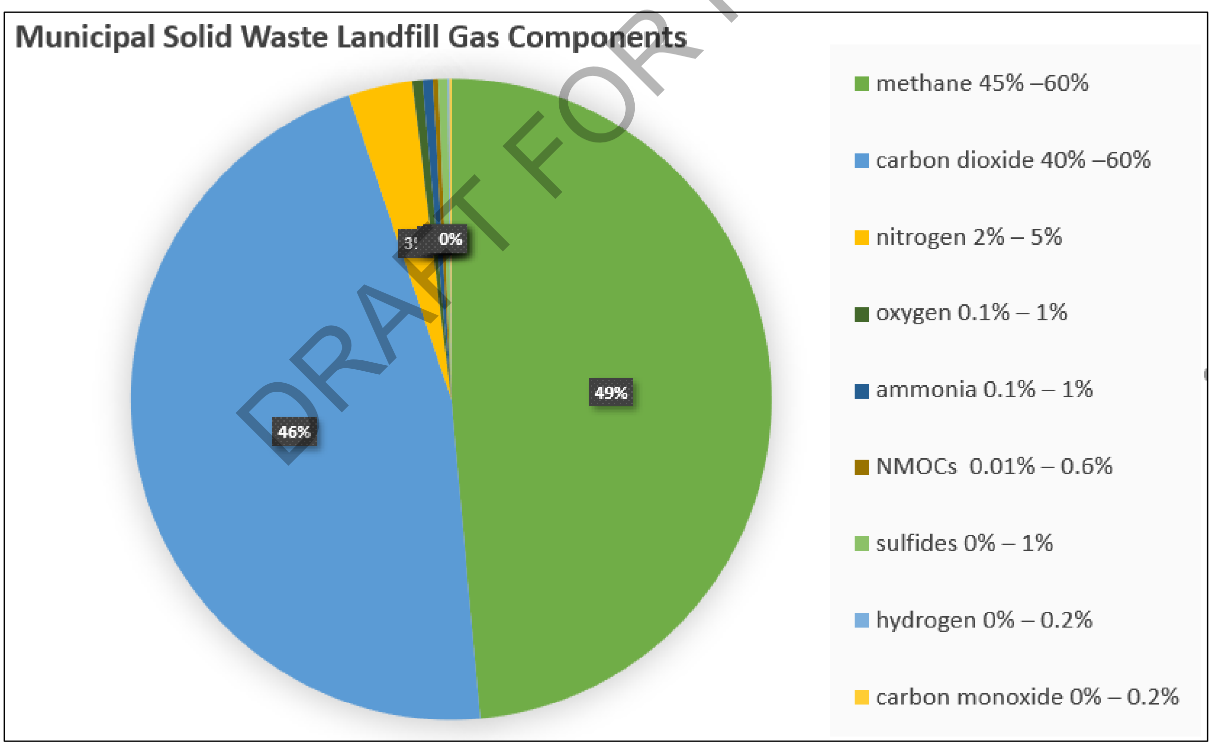

Figure 2: Greenhouse and Noxious gases produced by landfills in Oregon. Preventing food waste to landfills can also reduce the amount of noxious gases that are created. Figure by ODEQ, 2022.

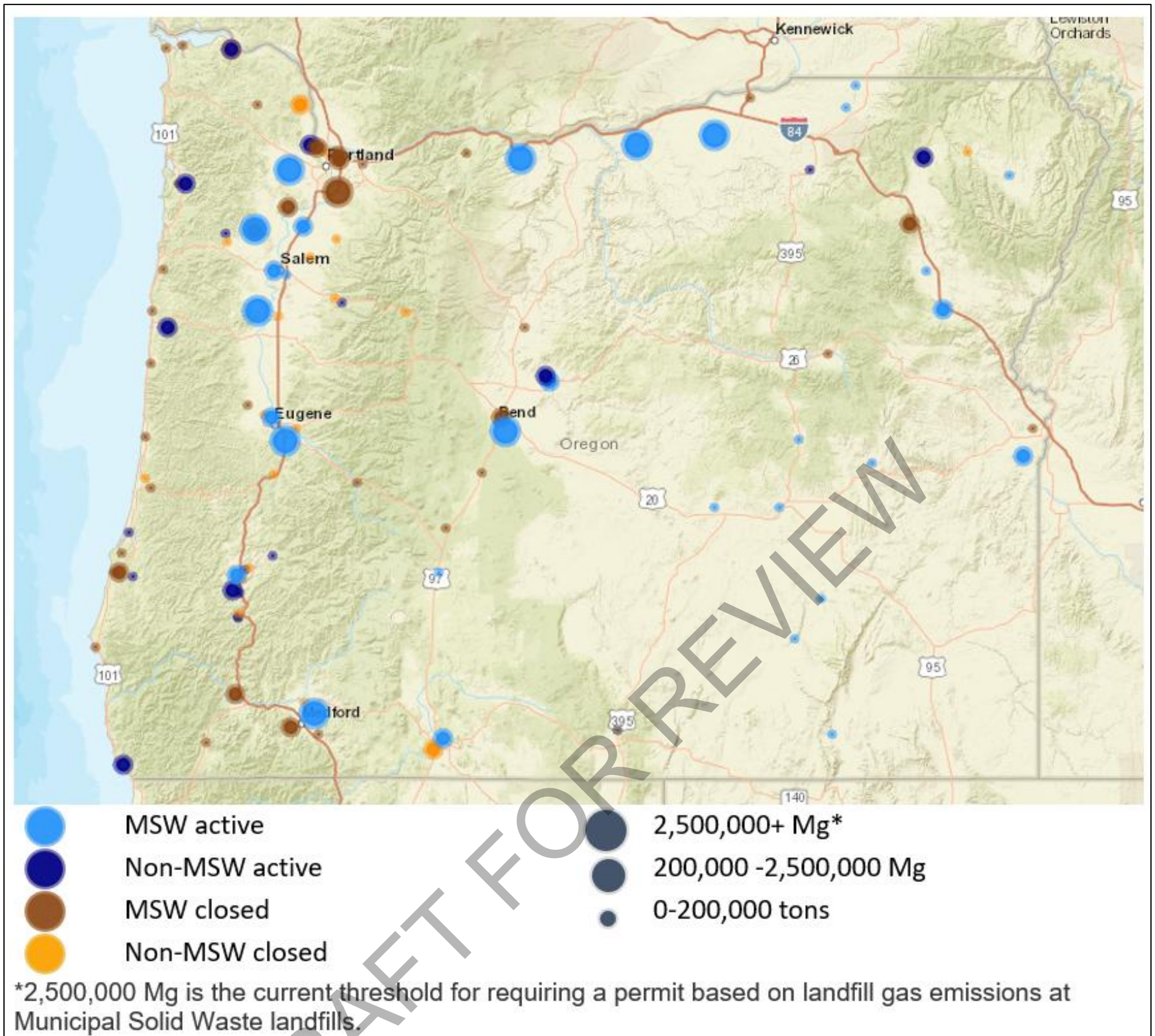

Figure 3: Landfill locations within Oregon. Of most importance to CTUIR are those located in the Ceded Lands and Zone 6 Tribal Fishing Area along the Mid-Columbia River. Figure by ODEQ, 2022.

Preventing food waste and other organic materials from being disposed of in landfills not only reduces carbon emissions from these sources, but can improve air quality in the surrounding regions by reducing noxious gas emissions, especially to areas like Zone 6 where Tribal fishermen and other harvesters are frequently present without Personal Protective Equipment (PPE) like N95 masks.

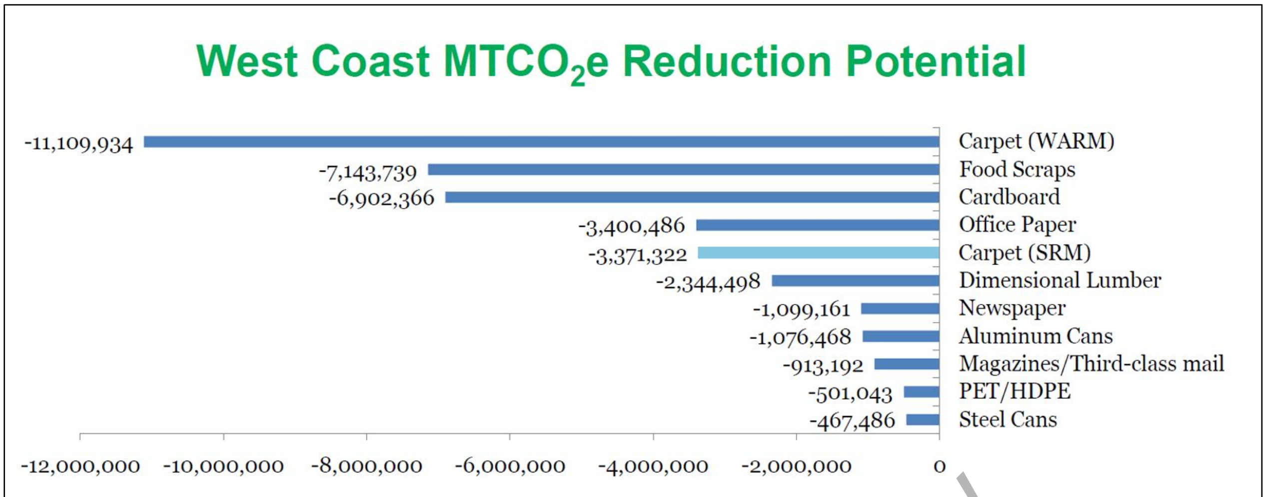

Figure 4: EPA Priority Materials GHG Reduction Potential chart (Davis, 2011). Improving materials management, especially with organics, can reduce carbon emissions. Graphic by EPA 2011.

Existing Data and Available Calculation Tools

Key Assumption: Food and yard waste data for the UIR specifically unfortunately does not exist currently. To calculate the contribution of UIR's organic waste GHG emissions, data from Umatilla County does exist and is recorded for 2022. The UIR population accounts for 3.6% of Umatilla County (US Census 2020), and thus our model utilizes 3.6% of Umatilla County's organic waste data to calculate these GHG emissions reductions. Estimates for current quantity of food and yard waste currently transported to landfills is calculated from Oregon Dept of Environmental Quality (ODEQ) Waste Impact Calculator (WIC) for Umatilla County, Oregon (open source at https://or-dept-environmental-quality.github.io/wic/)

Diesel trucks are estimated to emit 192 gCO2e per kilometer (International Energy Agency Mobility Model, May 2020, https://www.iea.org/reports/world-energy-outlook-2020). In the state of Oregon, approximately half the passenger vehicles on the road are small and medium vehicles, with an average carbon emission of 117 gCO2e per km, and half the vehicles are large vehicles, with an average carbon emission of 192 gCO2e per km.

This rough carbon calculation estimates carbon emissions prevented based on vehicle miles prevented to landfill sites.

Table 2 outlines the basic way carbon emissions prevented and emitted were calculated for project activities. Many of these emissions could have been prevented with use of an electric vehicle or other non-carbonized transportation, as was the original conception of the project. CTUIR internal and financial procedures prevented EV options from being utilized in the course of project activities, thereby reducing carbon emissions prevented, but these potential emissions reductions are logged as avoidable with better planning.

Table 2: Generalized Carbon Emissions Calculated for Project Activities

Food Waste Destination	Frequency and Schedule	Emissions Associated
Livestock Feed FW to Livestock was conducted roughly twice per week during the course of FW diversion	Twice per week = 96 trips per year - 25% of this was picked up = 24 trips per year FW pick up was not included in Carbon Emissions due to existing travel outside project scope - 75% delivered by project team = 72 trips per year FW Drop off to local sites was calculated due to the dedicate trips vehicles made to the site	Medium gasoline vehicle traveling 25.8 km (round trip) - 72 trips per year Calculation: 25.8 km * 72 trips per year * 117 gCO2e per km = **217, 334 gCO2e per year** Over 2 years of the project's food waste diversion, this is an estimated: **434,678 gCO2 emitted for project total**
Composting Options FW was picked up from host sites roughly 0.5 to 1 km from its processing site at the project shed	Twice per week collection from three sources at 0.5 km; 3 kms traveled per week from three host sites - Pick up was estimated as 75% without vehicle and 25% with vehicle One host site was 1 km distance (2 km) total (Seniors Center); 100% of these pick up trips were with a Medium gasoline vehicle twice per week * Note: it was the original intent of the project to use an EV bicycle to perform this collection, thereby preventing these emissions from being created	Pick up estimated as 75% without vehicle and 25% with vehicle = 0.5 km * 2 times per week * 3 host sites = 3 km per week Over 48 weeks in a year, 144 km traveled total. 25% of these were with a Medium gasoline vehicle, meaning 36 kms per year vehicle travel 36 km per year * 117 gCO2e per km = **4,212 gCO2e per year** Over 2 years, estimated: **8,424 gCO2 emitted for project total** Seniors Center pick up is 100% with vehicle

		= 2 km * 48 weeks * 117 gCO2e per km = **11, 232 gCO2 e per year** Over 2 years, estimated = **22,464 gCO2 emitted**
Landfill CTUIR collected municipal solid waste is sent to Columbia Ridge Landfill in Arlington, OR = 129 km one way (258 km)	Food waste that could not be reclaimed with composting methods was returned to the municipal solid waste stream to be sent to Columbia Ridge Landfill. Waste pick up is once per week using a heavy industrial truck, with 192 gCO2e per km	Once per week pick up * 48 weeks per year * 258 km * 192 gCO2e per km **= 2,377,728 gCO2e per year** Over 2 project years, **= 4,755,456 gCO2 emitted**
Emissions Prevented	Carbon emissions saved by preventing food waste from traveling to Columbia Ridge Carbon emissions from livestock and compost travel is subtracted from landfill travel as carbon emissions prevented This methodology is a rough estimate designed to spark exploration about carbon emissions reductions possible through organics recovery These calculations are tentative and can be further refined by carbon market pricing schemes in development	Livestock 25.8 km * 119 gCO2e = 3,070 gCO2 per trip Compost 2 km * 119 gCO2e = 238 gCO2e per trip Landfill 258 km * 192 gCO2e = 49, 536 gCO2 e per trip Rough Savings 3,070 + 238 gCO2 e = 3,308 gCO2 e per trip
Emissions Prevention Possible	4,212 gCO2e per year from three Nixyaawii Host Sites 11, 232 gCO2 e per year from one Nixyaawii Host Site 217, 334 gCO2e per year from vehicle travel to livestock feed location With an electric or non-carbonized vehicle to perform these transportations, carbon that could potentially be saved by project = **232,778 gCO2 emissions per year**	

	For an additional potential carbon reduction o**f 465,556 gCO2 emissions over the course of the project.**

These are rough calculations to begin the conversation of organics recovery carbon emission reductions potential for CTUIR. It should be noted that due to environmental “sacrifice zone” practices, landfills are disproportionately located in closer proximity to rural and socially disadvantaged communities. Because the Columbia Ridge Landfill is located closer to CTUIR than it is to other large waste generating communities like Portland OR and Seattle WA, both of which send municipal solid waste to Columbia Ridge, CTUIR’s potential GHG reductions are smaller than they would be for these cities. This is a shortcoming of the GHG calculations for organics recovery; improved methods would account for the siting of landfills near disadvantaged communities.

References

IEA (2020), World Energy Outlook 2020, IEA, Paris https://www.iea.org/reports/world-energy-outlook-2020, Licence: CC BY 4.0

Oregon Department of Environmental Quality: Landfill Methane Emissions Reduction. Department of Environmental Quality : Landfill Methane Emissions Reduction : Action on Climate Change : State of Oregon

EPA Reducing Greenhouse Gas Emissions through Recycling and Composting. Davis, 2011. Reducing Greenhouse Gas Emissions through Recycling and Composting | US EPA ARCHIVE DOCUMENT

Livestock: 434,678 gCO2 emitted for project total

Composts: 8,424 gCO2 emitted for project total

Landfill: 4,755,456 gCO2 emitted

Prevented = Landfill – Livestock & Compost = 4,312,354 gCO2 emissions prevented over 2 years