

Representative Community Emissions Inventory

Prepared by

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Purpose

- WRAP Emissions Forum is responsible for compiling emission inventories for use in meeting regional haze requirements
- The goal of this project is to improve emission estimates for rural areas of the west
- The first phase is focused on emissions in rural Alaska
- Emissions in Anchorage, Fairbanks and Juneau are very well documented
- Little is known about emissions from communities in the rest of the State, including
 - 45 mid-sized (population of 2,000 – 59,332) and
 - 329 small (population of <2,000)

Purpose (con't)

- Objective is to develop estimates for “representative communities” that can be extrapolated to other similar sized communities

Approach

- Review demographic data and define common regions within the state
- Set criteria for selecting representative communities
 - location
 - population
 - willingness to participate
 - proximity to Class I areas impacted by regional haze
 - representativeness of other villages within the region
- Work with Alaska Native Coalition on Employment and Training (ANCET) members to identify target communities
- Recruit local ANCET staff to participate
- Send letter to tribal council explaining purpose of the study

Approach (con't)

- Establish contracts with ANCET members to cover survey expenses
- Design surveys, circulate for comment
- Conduct residential surveys (home interviews)
- Conduct non-residential surveys
- Build data base with survey results
- Compute community specific emission estimates
- Prepare and present report of results to tribal councils
- Extrapolate results to rest of communities
- Document results

Selected Regions and Initial Target Communities

Region	Community	Population
Aleutians/ Bristol Bay Region	Sand Point	947
	Iliamna	92
	Nondalton	217
North Slope	Barrow	4,417
	Wainwright	558
	Atkasuk	228
Rural Interior	Stevens Village	86
	Fort Yukon	574
	Arctic Village	166
	McGrath	415
	Galena	763
	Huslia	291

Selected Regions and Initial Target Communities (con't)

Region	Community	Population
South Central/Interior Roads Region	Ninilchik	777
	Anchor Point	1,826
	Healy	1,022
	Cantwell	226
	Tanacross	144
	Eagle Village	59
Southeast Region	Sitka	8,891
	Ketchikan	8,002
	Petersburg	3,016
	Angoon	505
	Hoonah	851

Selected Regions and Initial Target Communities (con't)

Region	Community	Population
West Coast Region	Unalakleet	741
	Noatak	469
	Kotzebue	3,706
	Bethel	5,899
	Nome	3,448

Revised List of Communities to be Surveyed

Region	ANCET Member	Villages
Aleutians/Bristol Bay Region	APIA	Sand Point
	BBNA	Dillingham
West Coast and North Slope	Kawerak	Barrow
		Atqasuk
		Elim
		Buckland
	AVCP	Bethel
Rural Interior	TCC	Arctic Village
		Northway Village
		Minto
		Huslia

Revised List of Communities to be Surveyed (con't)

Region	ANCET Member	Villages
Southcentral/Interior Roads Region	CIRI	?
Southeast Region	CCTHITA	?
	Alaska DEC	Sitka

Village Recruitment Status

Organization	Contact	Village/Contact	Status
APIA	Connie Fredenberg	Sand Point (no local contact)	Completed summer and winter residential survey
BBNA	Cathy Reamey	Dillingham (no local contact)	Completed summer and winter residential survey
Kawerak	Jerry Trainor	Barrow (no local contact)	No agreement to participate
		Atqasuk (no local contact)	No interest, Atqasuk was replaced with Stebbins, see below

Village Recruitment Status (con't)

Organization	Contact	Village/Contact	Status
Kawerak (con't)	Jerry Trainor (con't)	Elim (no local contact)	No interest, Elim was replaced with Gambell, see below
		Buckland (Natalie Hadley)	Copies of surveys and contract recently mailed
	Erin Lilley	Stebbins	No interest to date
		Gambel	No interest to date
		Nome	No interest to date from local youth organization

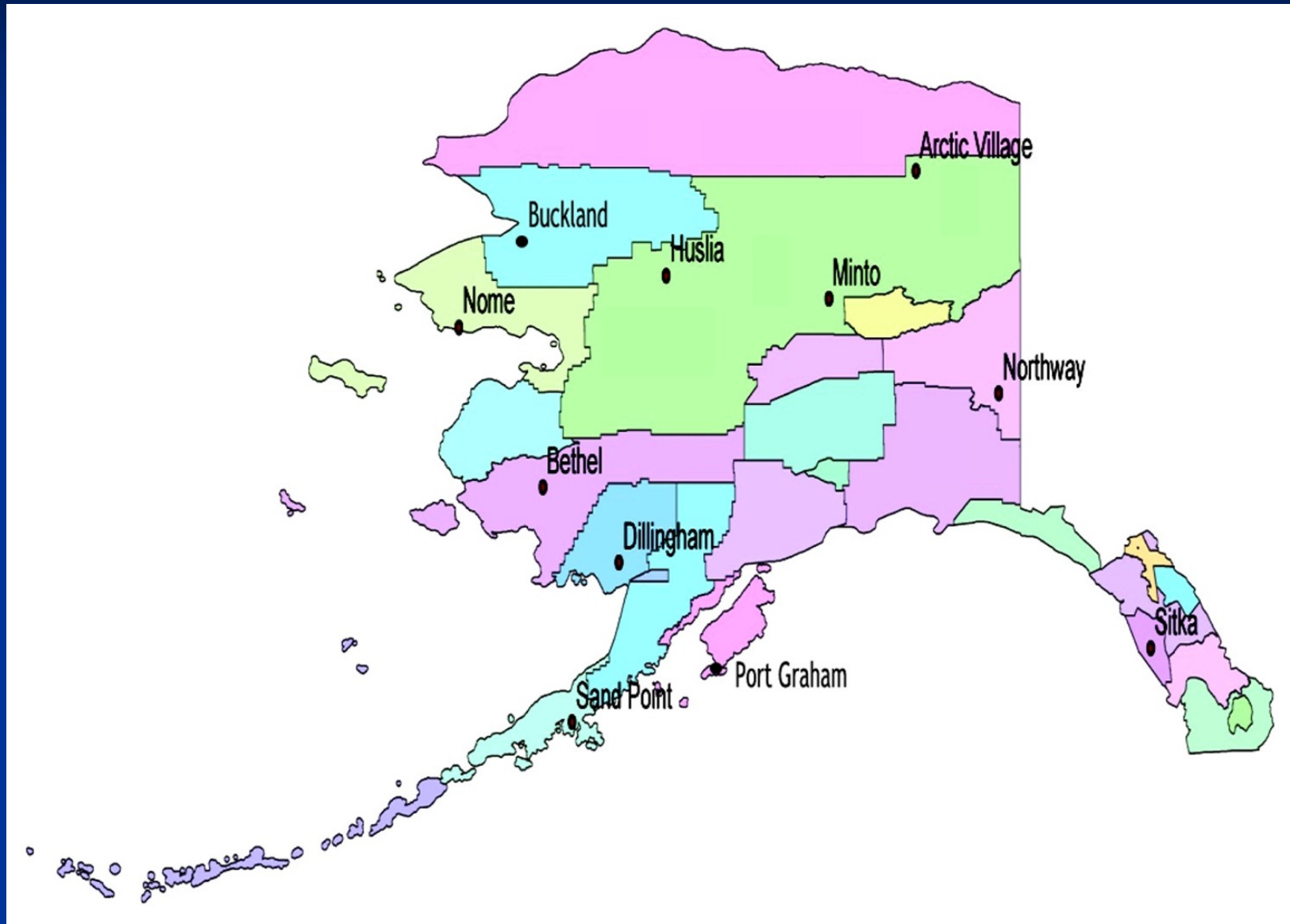
Village Recruitment Status (con't)

Organization	Contact	Village/Contact	Status
TCC	Adam Demientieff, Kimberly Carlo, Rachael Graybeal	Arctic Village (Nina John)	Completed summer and winter residential survey
		Northway Village (Glenn Marunde)	Completed summer and winter residential survey
		Minto (Jordan Baker)	Completed summer and winter residential survey
		Huslia (Shelia Esmailka)	Completed summer and winter residential survey

Village Recruitment Status (con't)

Organization	Contact	Village/Contact	Status
WRAP	Jerry Pardilla	Port Graham (Violet Yeaton)	Completed winter residential survey
SEARHC	Shawn Sorenson	Hydaburg (no contact)	No interest
AVCP	Rosalie Kalistook	Bethel (Danny Twitchell)	Status unclear
Alaska DEC	Alice Edwards	Sitka	Staff collected data from available sources

Survey Communities



Survey Approach

- Work with ANCET member to identify someone living in each community to conduct the survey
 - approach varied by community, ANCET not always involved
 - frequently involved ANCET staff located in the village working with village youth to collect the data
- Negotiate contracts with ANCET members to
 - recruit staff
 - establish contacts with village councils
 - cover expense of collecting data
 - transmit results to Sierra
 - travel to villages to present results
- Send out post cards to announce the survey to homes

Survey Approach (con't)

- Send letter to tribal councils describing purpose of the study
- Review purpose of study and content of surveys with local staff and youth prior to the start of the survey
- Respond to questions as they occur

Residential Surveys

- Minimum target of 30 responses per community
- Survey designed for in-home interview
- Information collected on both activity (e.g., hours, miles, etc.) and fuel use (e.g., cords, gallons, etc.)
- Goal is to be able to report both emissions and fuel use statistics back to the community
- Fuel categories include
 - wood (cords)
 - fuel oil (gallons)
 - propane (gallons)
 - other (please specify)

Local Residential Survey Experience

- ANCET member recruitment
- In village coordination
- Village Youth

Nonresidential Surveys

- Covers all facilities not addressed in residential surveys
- Facilities include
 - airports
 - schools
 - fuel suppliers
 - marinas and ports
 - utilities (electricity generation, water treatment, etc.)
 - landfills
 - hospitals and clinics
 - municipal offices
- Information collected on both activity (e.g., hours, miles, etc.) and fuel use (e.g., gallons, etc.)
- Surveys provided to all communities
- Limited response to date

Completed Residential Surveys

	Number of Surveys	
Community	Summer	Winter
Arctic Village	29	25+
Dillingham	35	29
Huslia	26	30
Minto	27	29
Northway Village	30	30
Port Graham	TBD	32
Sand Point	18	18

Average Household Fuel Use (Total/Week)

Community	Season	Fuel Type		
		Wood (cords)	Fuel Oil (gallons)	Propane (gallons)
Arctic Village	Summer	2.8	2.2	0.8
	Winter	n/a	n/a	n/a
Dillingham	Summer	0.3	2.6	15.0
	Winter	0.3	25.7	0.1
Huslia	Summer	0.0	5.6	0.0
	Winter	0.2	18.0	0.0
Minto	Summer	0.1	11.0	0.2
	Winter	0.4	28.4	1.3
Northway Village	Summer	0.6	16.1	57.4
	Winter	0.3	67.7	8.5
Port Graham	Summer	n/a	n/a	n/a
	Winter	0.2	16.9	0.01
Sand Point	Summer	0.0	22.4	0.0
	Winter	0.0	65.6	0.0

Average Household On-Road Vehicle Travel (Miles/ Week)

Community	Season	Vehicle Type		
		Car	Pickup/SUV	Motorcycle
Arctic Village	Summer	107.1	31.0	22.9
	Winter	n/a	n/a	n/a
Dillingham	Summer	104.5	58.7	0.0
	Winter	27.8	56.6	3.3
Huslia	Summer	0.0	16.7	0.0
	Winter	0.0	0.0	5.1
Minto	Summer	64.6	95.1	0.0
	Winter	50.1	62.1	4.3
Northway Village	Summer	109.3	76.0	2.2
	Winter	106.3	161.8	8.9
Port Graham	Summer	n/a	n/a	n/a
	Winter	16.2	6.0	1.8
Sand Point	Summer	49.4	58.2	0.4
	Winter	11.0	36.9	0.4

Average Household Off-Road Vehicle Use (Hours/ Week)

Community	Season	Vehicle Type							
		Outboard		Inboard		4-Wheeler		Snow Machine	
		2-Stroke	4-Stroke	Gasoline	Diesel	2-Stroke	4-Stroke	2-Stroke	4-Stroke
Arctic Village	Summer	0.1	0.0	0.0	0.0	8.3	10.0	---	---
	Winter	---	---	---	---	n/a	n/a	n/a	n/a
Dillingham	Summer	4.6	0.03	0.0	2.8	2.1	0.0	---	---
	Winter	---	---	---	---	0.0	0.0	4.3	0.0
Huslia	Summer	0.0	2.6	0.0	0.0	0.3	10.0	---	---
	Winter	---	---	---	---	0.0	0.0	0.0	0.0
Minto	Summer	1.5	0.5	0.4	0.0	0.0	0.0	---	---
	Winter	---	---	---	---	0.0	0.02	2.7	0.0
Northway Village	Summer	1.3	0.0	0.0	0.0	1.7	3.3	---	---
	Winter	---	---	---	---	1.0	0.5	3.8	0.0
Port Graham	Summer	n/a	n/a	n/a	n/a	n/a	n/a	---	---
	Winter	---	---	---	---	1.2	2.9	0.001	0.0
Sand Point	Summer	0.4	0.0	0.6	0.0	0.2	1.5	---	---
	Winter	---	---	---	---	0.03	1.4	0.0	0.0

Average Household Motorized Equipment Use (Hours/ Week)

Community	Season	Equipment Type					
		Chain Saw	Snow Blower	Brush /Weed Trimmer	Generator	Water Pump	Other
Arctic Village	Summer	25.4	---	0.1	0.0	0.0	0.0
	Winter	n/a	n/a	---	n/a	---	n/a
Dillingham	Summer	2.1	---	0.9	2.2	0.0	0.2
	Winter	2.8	0.0	---	0.8	---	0.0
Huslia	Summer	3.2	---	3.8	2.2	0.0	0.0
	Winter	3.1	0.0	---	0.0	---	0.0
Minto	Summer	3.8	---	3.0	0.0	0.2	0.0
	Winter	5.6	0.0	---	0.0	---	0.0
Northway Village	Summer	2.7	---	0.6	0.1	0.4	0.0
	Winter	1.3	0.0	---	0.3	---	0.1
Port Graham	Summer	n/a	---	n/a	n/a	n/a	n/a
	Winter	0.5	0.0	---	0.0	---	0.1
Sand Point	Summer	0.02	---	0.9	0.2	0.0	0.1
	Winter	0.0	0.0	---	0.0	---	0.0

Average Household Outdoor Burning (Hours/ Week)

Community	Season	Open Burning	Burn Barrel	Cook/Camp Fires	Smokehouse	Other
Arctic Village	Summer	10.0	22.8	8.7	12.1	0.0
	Winter	n/a	n/a	n/a	n/a	n/a
Dillingham	Summer	0.1	1.0	0.5	38.0	0.0
	Winter	0.1	6.2	0.0	0.0	0.4
Huslia	Summer	0.0	2.4	0.2	4.3	0.0
	Winter	0.2	2.2	0.0	0.0	0.0
Minto	Summer	2.4	0.7	15.7	27.2	0.0
	Winter	0.3	0.7	0.0	0.0	0.0
Northway Village	Summer	0.6	0.4	15.0	14.4	0.0
	Winter	0.0	0.4	0.0	0.0	0.4
Port Graham	Summer	n/a	n/a	n/a	n/a	n/a
	Winter	0.0	0.1	0.0	0.0	5.3
Sand Point	Summer	0.0	0.2	0.4	0.0	0.0
	Winter	0.0	0.2	0.0	0.0	0.0

Arctic Village

Average Household Seasonal Emissions (Pounds/Day)

Category	Summer				Winter			
	HC	CO	NOx	PM	HC	CO	NOx	PM
Wood Combustion	111.0	63.0	1.3	11.6	n/a	n/a	n/a	n/a
Fuel Oil Combustion	0.001	0.002	0.006	0.000	n/a	n/a	n/a	n/a
Propane Combustion	0.000	0.000	0.002	0.000	n/a	n/a	n/a	n/a
On-Road Transportation	0.1	0.9	0.1	0.001	n/a	n/a	n/a	n/a
Off-Road Transportation	0.2	0.7	0.01	0.01	n/a	n/a	n/a	n/a
Motorized Equipment	0.8	3.0	0.01	0.1	n/a	n/a	n/a	n/a
Refuse Burning	10.1	19.9	1.4	3.7	n/a	n/a	n/a	n/a

Dillingham

Average Household Seasonal Emissions (Pounds/Day)

Category	Summer				Winter			
	HC	CO	NOx	PM	HC	CO	NOx	PM
Wood Combustion	12.1	6.9	0.1	1.3	12.1	6.9	0.1	1.3
Fuel Oil Combustion	0.001	0.002	0.01	0.000	0.01	0.02	0.1	0.001
Propane Combustion	0.001	0.004	0.03	0.001	0.000	0.000	0.000	0.000
On-Road Transportation	0.1	1.1	0.1	0.001	0.1	0.6	0.03	0.001
Off-Road Transportation	0.6	3.4	0.6	0.1	2.5	6.7	0.02	0.1
Motorized Equipment	0.1	1.1	0.03	0.01	0.1	0.6	0.01	0.01
Refuse Burning	0.3	0.6	0.04	0.1	1.9	3.8	0.3	0.7

Huslia

Average Household Seasonal Emissions (Pounds/Day)

Category	Summer				Winter			
	HC	CO	NOx	PM	HC	CO	NOx	PM
Wood Combustion	1.4	0.8	0.02	0.1	9.8	5.5	0.1	1.0
Fuel Oil Combustion	0.002	0.004	0.01	0.000	0.01	0.01	0.05	0.001
Propane Combustion	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
On-Road Transportation	0.01	0.1	0.01	0.000	0.003	0.02	0.002	0.000
Off-Road Transportation	0.05	1.2	0.4	0.004	0.000	0.000	0.000	0.000
Motorized Equipment	0.2	1.8	0.04	0.02	0.1	0.4	0.002	0.01
Refuse Burning	0.7	1.5	0.1	0.3	0.7	1.5	0.1	0.3

Minto

Average Household Seasonal Emissions (Pounds/Day)

Category	Summer				Winter			
	HC	CO	NOx	PM	HC	CO	NOx	PM
Wood Combustion	4.2	2.4	0.05	0.4	16.8	9.6	0.2	1.8
Fuel Oil Combustion	0.004	0.01	0.03	0.001	0.01	0.02	0.1	0.002
Propane Combustion	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
On-Road Transportation	0.1	1.1	0.1	0.001	0.1	0.8	0.04	0.001
Off-Road Transportation	0.2	1.6	0.1	0.03	1.6	4.2	0.01	0.04
Motorized Equipment	0.2	1.1	0.01	0.02	0.2	0.7	0.003	0.02
Refuse Burning	1.0	1.9	0.1	0.4	0.3	0.6	0.04	0.1

Northway Village

Average Household Seasonal Emissions (Pounds/Day)

Category	Summer				Winter			
	HC	CO	NOx	PM	HC	CO	NOx	PM
Wood Combustion	23.0	13.1	0.3	2.4	11.8	6.7	0.1	1.2
Fuel Oil Combustion	0.01	0.01	0.04	0.001	0.02	0.05	0.2	0.004
Propane Combustion	0.004	0.02	0.1	0.003	0.001	0.002	0.02	0.000
On-Road Transportation	0.1	1.2	0.1	0.002	0.2	1.9	0.1	0.002
Off-Road Transportation	0.2	1.1	0.02	0.03	2.2	5.8	0.02	0.1
Motorized Equipment	0.1	0.6	0.01	0.01	0.04	0.3	0.005	0.004
Refuse Burning	0.3	0.6	0.04	0.1	0.1	0.3	0.02	0.1

Port Graham

Average Household Seasonal Emissions (Pounds/Day)

Category	Summer				Winter			
	HC	CO	NOx	PM	HC	CO	NOx	PM
Wood Combustion	n/a	n/a	n/a	n/a	8.0	4.6	0.1	0.8
Fuel Oil Combustion	n/a	n/a	n/a	n/a	0.01	0.01	0.04	0.001
Propane Combustion	n/a	n/a	n/a	n/a	0.000	0.000	0.000	0.000
On-Road Transportation	n/a	n/a	n/a	n/a	0.02	0.1	0.01	0.000
Off-Road Transportation	n/a	n/a	n/a	n/a	0.03	0.1	0.001	0.001
Motorized Equipment	n/a	n/a	n/a	n/a	0.02	0.1	0.001	0.001
Refuse Burning	n/a	n/a	n/a	n/a	0.03	0.05	0.004	0.01

Sand Point

Average Household Seasonal Emissions (Pounds/Day)

Category	Summer				Winter			
	HC	CO	NOx	PM	HC	CO	NOx	PM
Wood Combustion	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel Oil Combustion	0.01	0.02	0.06	0.001	0.02	0.05	0.2	0.004
Propane Combustion	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
On-Road Transportation	0.1	0.7	0.04	0.001	0.04	0.4	0.02	0.000
Off-Road Transportation	0.1	0.9	0.1	0.01	0.004	0.1	0.001	0.000
Motorized Equipment	0.02	0.3	0.005	0.001	0.000	0.000	0.000	0.000
Refuse Burning	0.1	0.1	0.01	0.03	0.1	0.1	0.01	0.03

Residential Survey Issues

- Unclear whether reported wood use includes camp and outdoor use
- Unclear how much wood is used in a typical campfire, smoke house, cooking activity and steam bath
- Several respondents used unit measures that could have different interpretations
 - fuel oil, gasoline barrel/drum (42 gallons?)
 - propane canister/tank/bottle (_ gallons?)
- Blank responses were interpreted to mean no fuel use or activity
- Are there any obvious errors in the fuel use or activity data that has been presented?

Next Steps

- Still working to recruit
 - Barrow
 - Bethel
 - Gambell
 - Stebbins
- Need results from nonresidential surveys
- Will prepare community-specific fuel use and emission estimates
- Jerry Pardilla will present results to each participating community
- Community-specific results will be extrapolated to other similar communities based on population
- Emission summaries will be prepared by Borough