



CATG-Alaska Village Initiatives

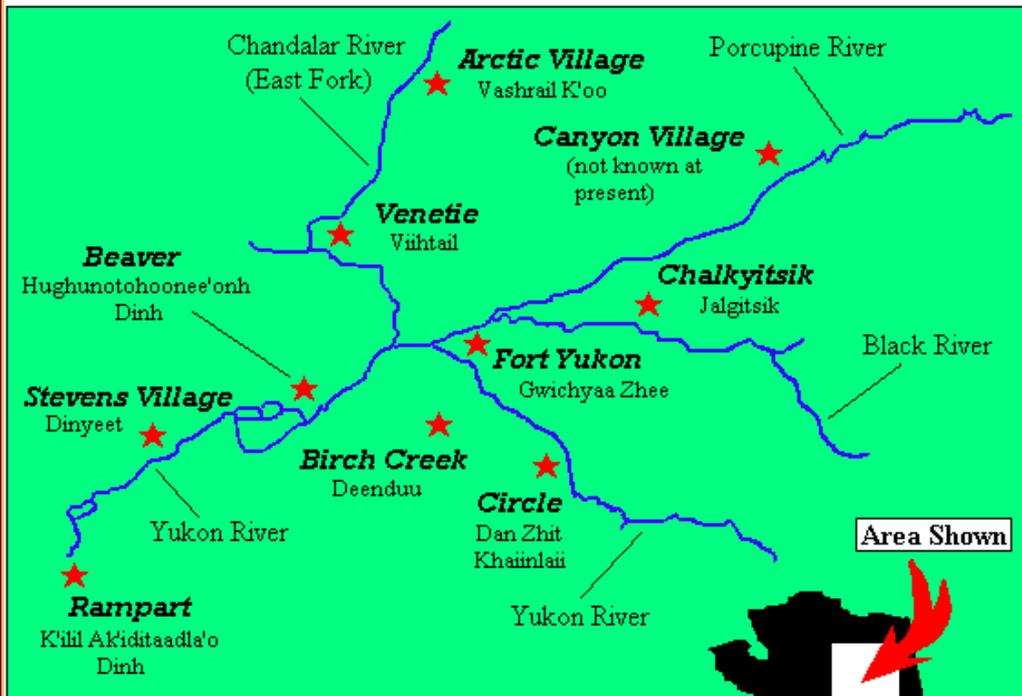
A Vision for an Integrated Biomass Energy Program for Rural Alaska

DOE NREL Tribal Energy Program

7 November 2007

Yukon Flats Region

YUKON FLATS REGION



Council of Athabascan Tribal Governments





Subsistence Lifestyle -- Salmon Fish Wheel





Mature Housing

New Housing – Fort Yukon





Downtown Fort Yukon – Spring Festival -20F

Rural AK Powered by Diesel Fuel Oil



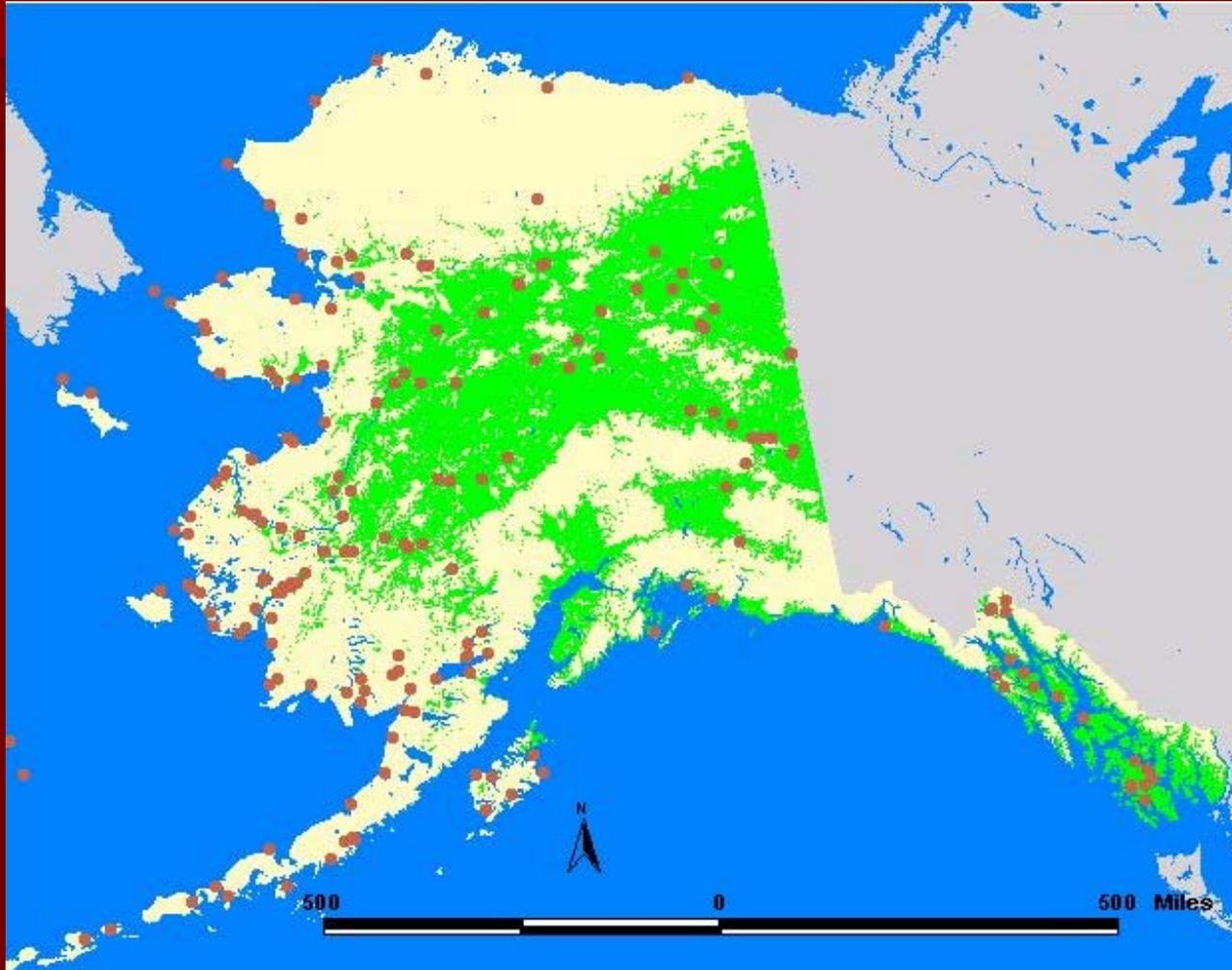
- Highest energy costs in nation \$.46/KW Ave.
- \$4.50 per gallon of heating fuel
- 800 gal. of fuel oil to heat one house 4K
- Heat School & Gym 30,000gals \$125K
- Run Generators = 197,000gals \$837K

Goal: Village Survival



Why Biomass as an Energy Source

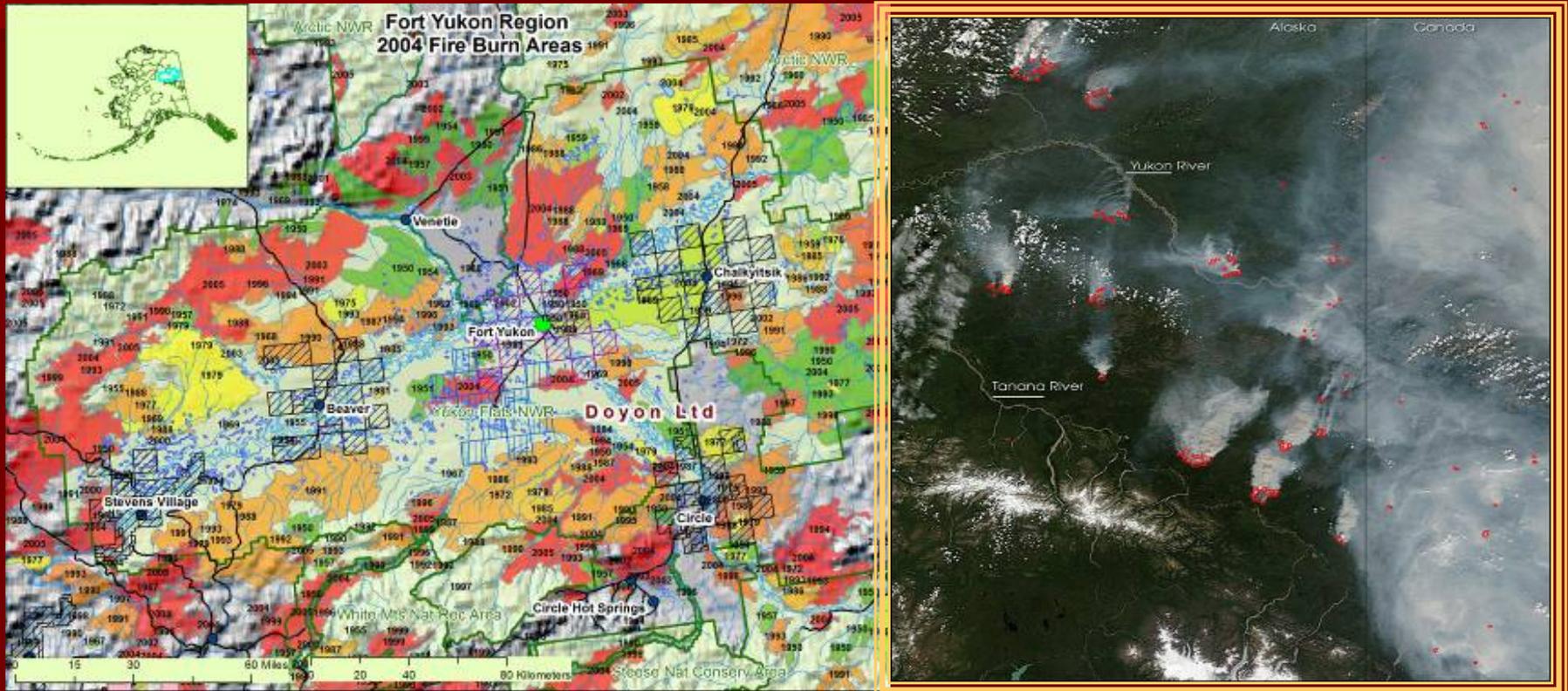
Alaska has 1/7 of US Forest Lands



Source: AK Energy Authority

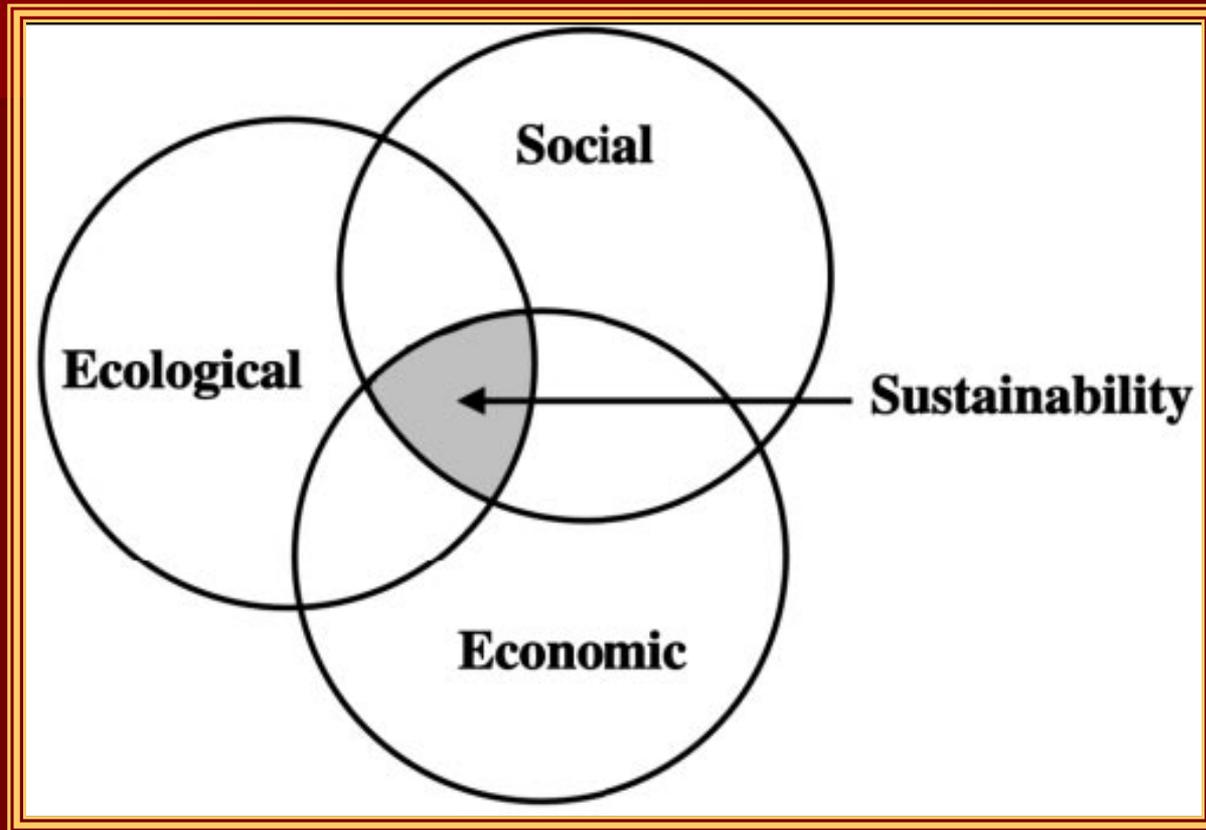
Fire Driven Ecosystem

12MM acres statewide in 2003-2004



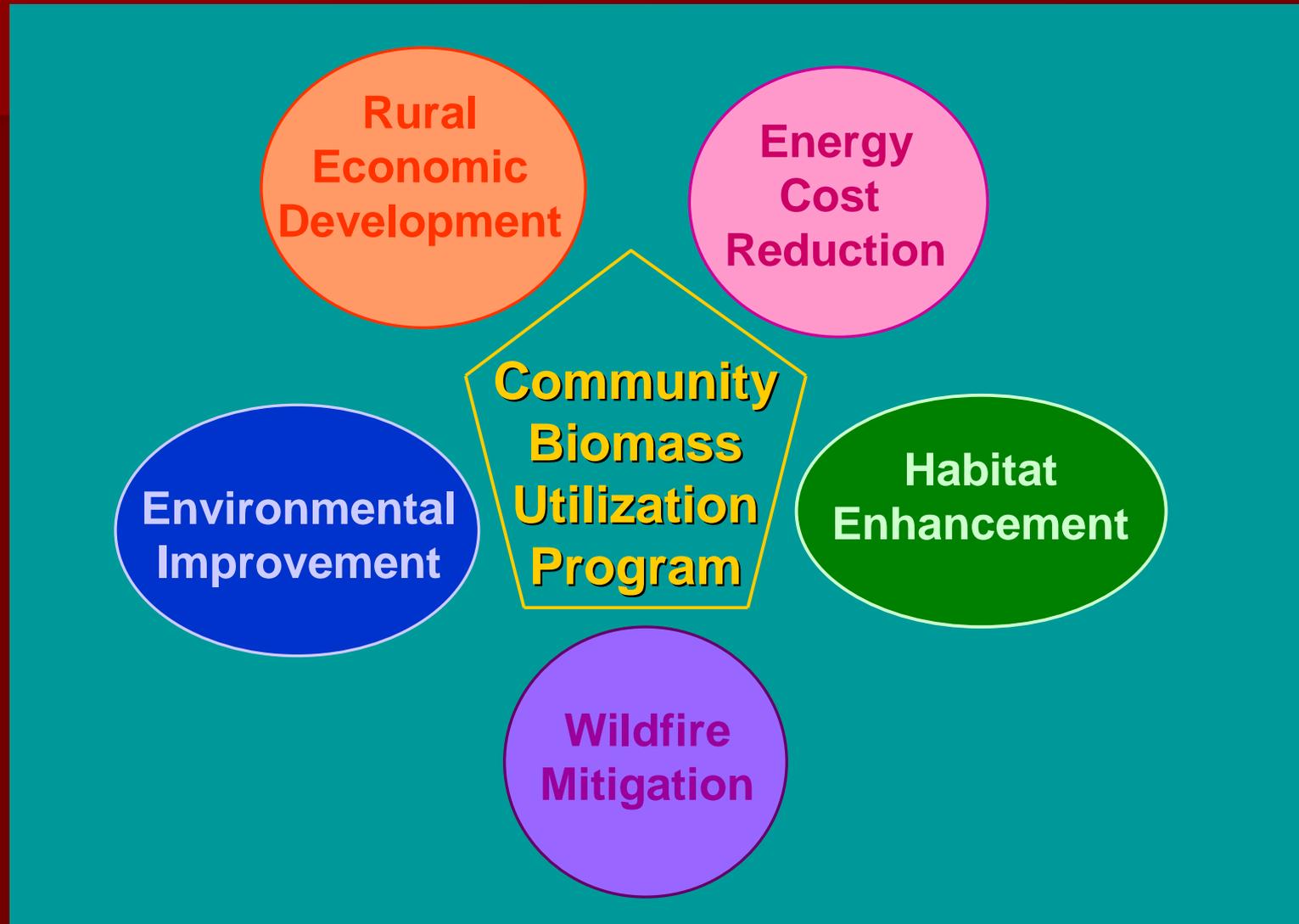
Fires 1950-2004

Community Based Sustainability



- Program will be economically, socially, and ecologically sustainable.

Integrated Biomass Program



Community Involvement

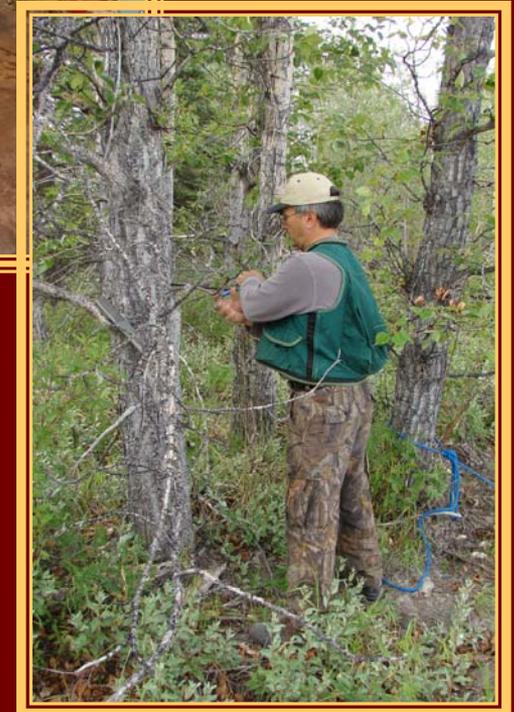
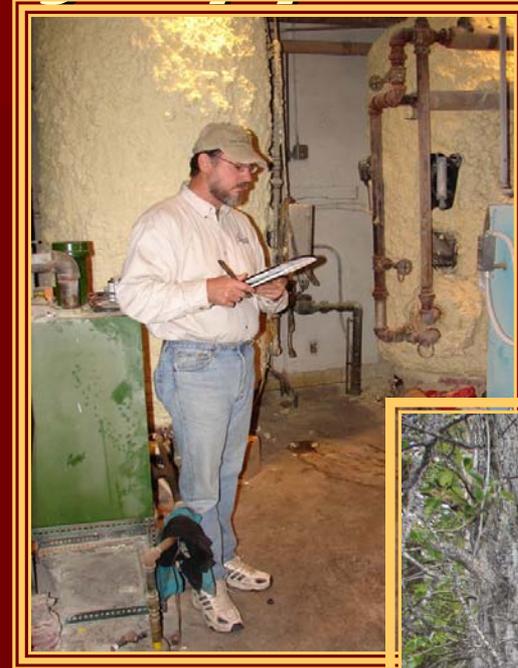
- Community must understand program and embrace it fully.
- Local communication is critical



Phase 1

Pre-feasibility Approach

1. Analysis of energy needs and opportunities for communities and regions
2. Analyze Forest Resource
3. Analyze Cost Benefits
4. Create an integrated systems approach

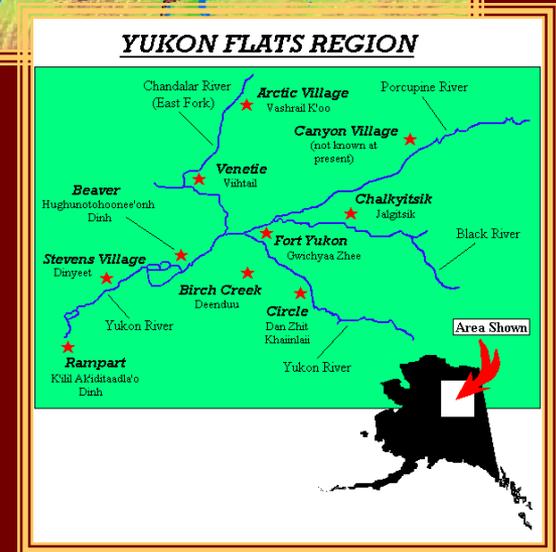
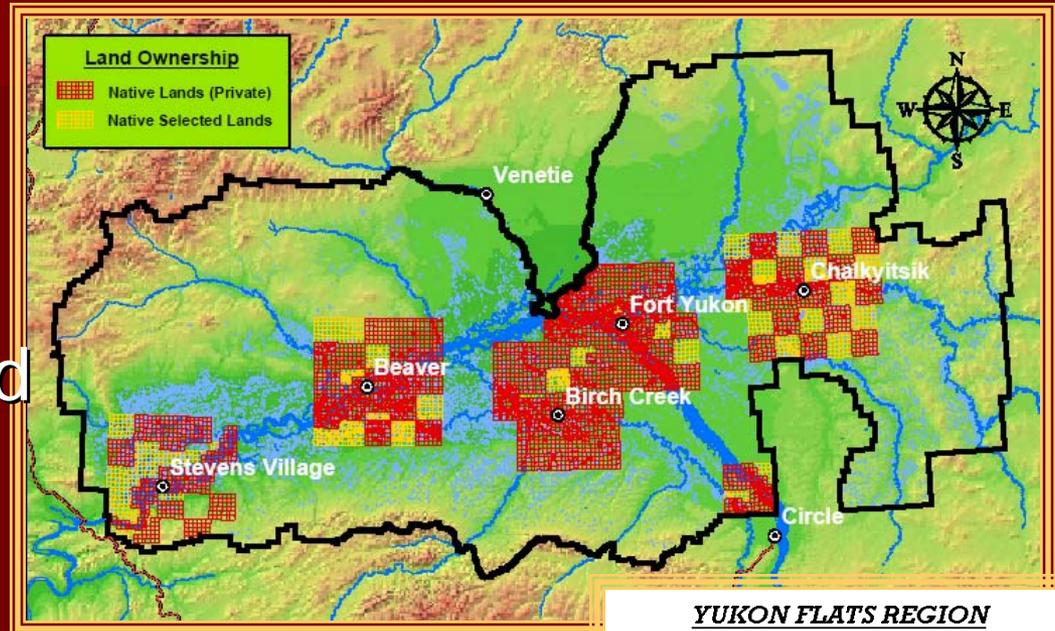


For-Profit Wood Energy Business Model Fort Yukon

- Forest Management Program – CATG
- Three For-Profit Companies –
 - Gwitchyaa Zhee Native Corporation
 - Regional Wood Harvest Company
 - Village Wood Yard/Distribution Company
 - Wood Energy Utility – Diesel Biomass Hybrid Power Plant

Regional Supply Plan

- Harvest from private native lands
- Both summer and winter harvest is possible
- Silvicultural practices are known for interior AK



Wood Harvest Company

- Harvests wood from GZ lands summer and winter – start with recent fires
- Delivers to Village Wood Yard
- Paid upon delivery of wood by weight and dryness formula
- Requires harvest equipment with capacity for 10,000 tons production per year

Village Wood Yard/Distribution Company

- 2-3 acre wood yard - capacity to deliver split fire wood, boiler round wood, wood chips for electrical power boilers;
- Small sawmill for production of dimension lumber for village use;
- Develops supply contracts with end users;
- Or owns heat boilers and sells BTUs of heat and is responsible for feeding boiler

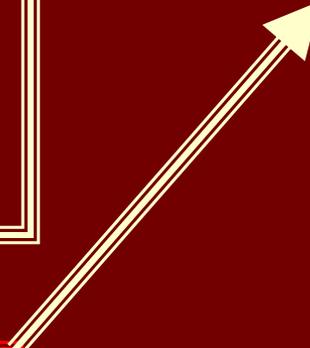
Forest land management plan



Contractual agreements with timber owners



Harvest Company contractual agreement with distribution companies



Village Wood Distribution Company



Contractual agreements with wood consumers



Wood consumed for energy for heat and power generation

Heat Production Household to Large Buildings



200 KWH ORC Unit Combined Heat and Power

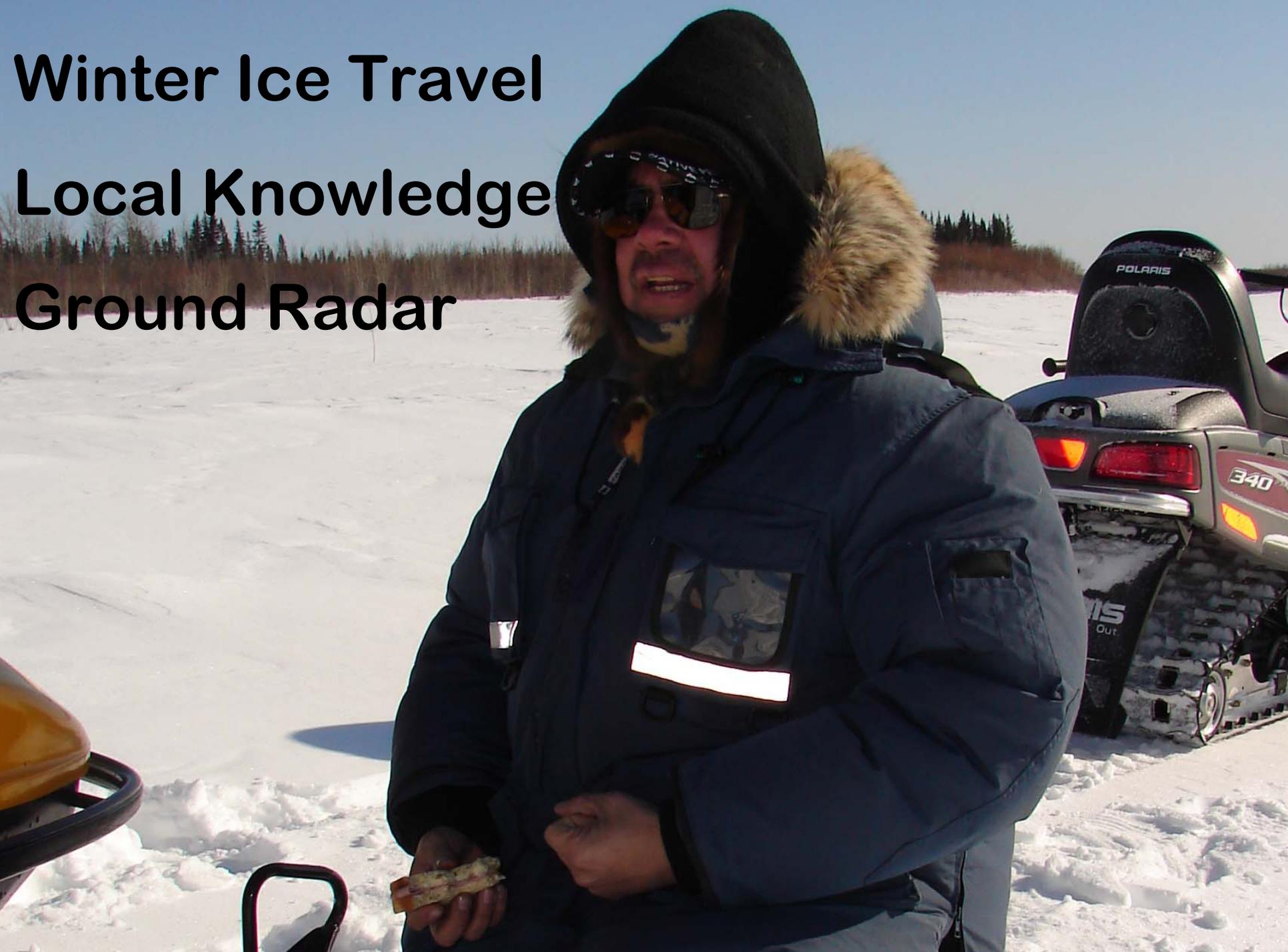


Summer River Travel

- The most efficient and reliable river transportation system will be a critical component to the overall success of the harvest operations

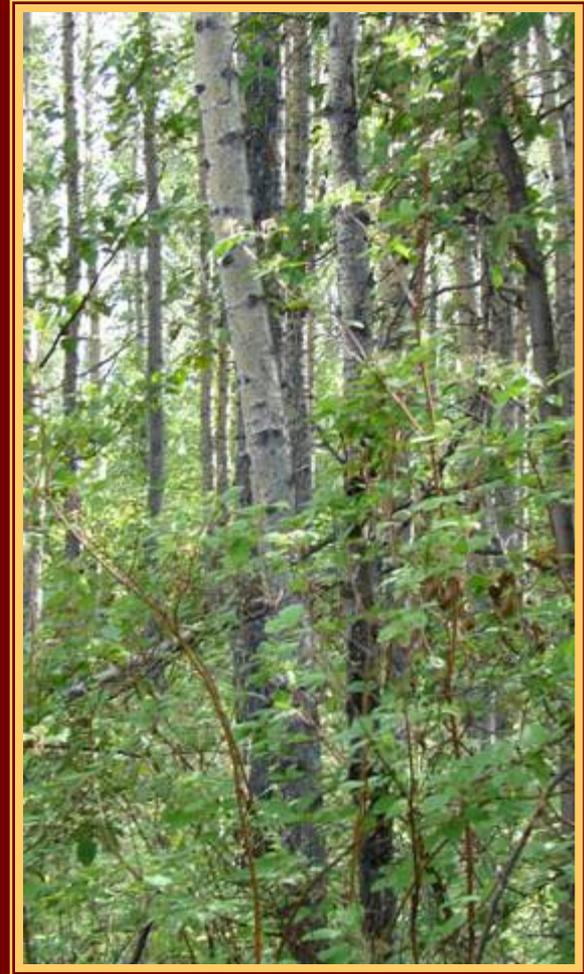


Winter Ice Travel
Local Knowledge
Ground Radar



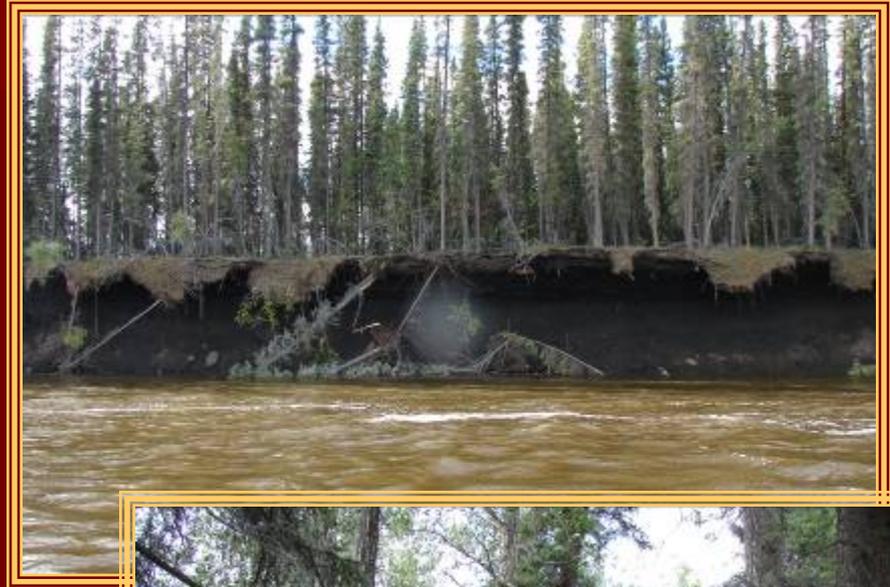
Fort Yukon Annual Consumption

- First estimate that the Fort Yukon will require more than 10,000 tons of wood annually to fuel their heat and electrical power consumption



Acreeage Harvested

- 10,000 tons / year
- 18 tons/acre
- 60 year biomass rotation
- 555 acres / year
- 33,300 acres / rotation
- GZ 214,000 acres



Wildlife and Land Management

- Integration of wildlife population and habitat management to improve subsistence resources.
- Increase from 1-7 moose/ sq mi



Harvest System Development

- A complete harvest system capable of producing 10,000 or more tons of woody biomass annually will cost approximately \$800,000



Ground Harvest Systems

- Small scale harvest systems with proven reliability will be employed



Harvest Production Model

Biomass Acreage Requirements

Tons/Acre	Tons Required Annually	Acres Required Annually	Rotation Age Assumption	Total Sustained Acres Required
18	3700	206	60	12,333

Biomass Harvest Assumptions

Annual Harvest-Acres	Pieces Per Acre	Acres/Day Harvested	Pieces/Day Harvested	Tons/Day Harvested	Total Harvesting Days/Year	Cords/Day Harvested
206	500	2.1	1,050	38	98	31

Biomass Harvest Costs Work-up

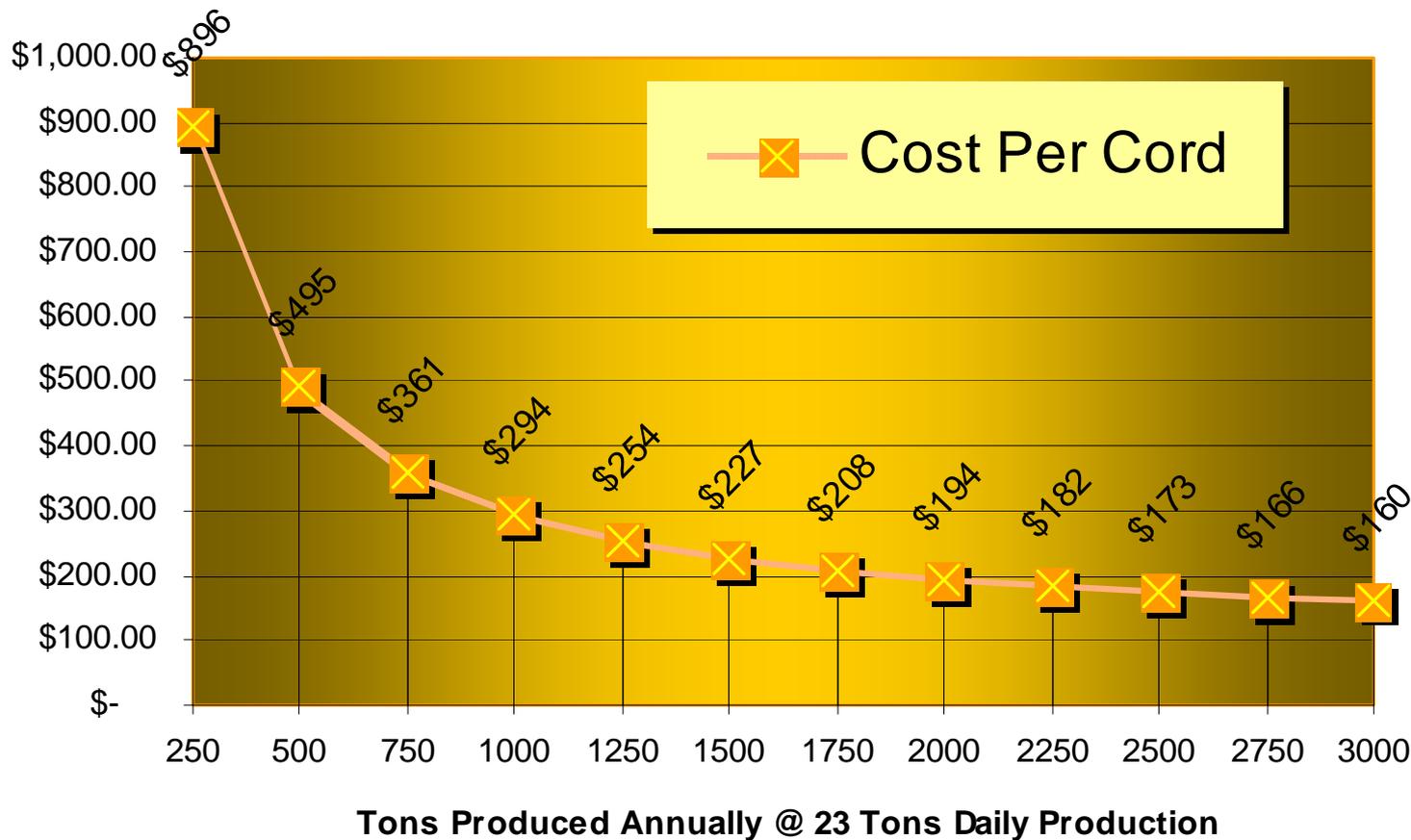
Annual Equipment Payments	Annual Maintenance/Repair Costs	Annual Fuel Consumption (Gallons)	Fuel \$/Gallon	Annual Fuel Cost	Annual Insurance Cost	Total Annual Equipment Costs
\$ 97,000	\$ 6,500	900	\$ 3.50	\$ 3,150	\$ 25,500.00	\$ 133,053.50

Man-hrs Per Day	\$/Man-hr (All Inclusive)	Labor Cost Per Day	Labor Cost Per Acre	Labor Cost Per Ton	Machine Cost Per Ton	Logging Cost Per Ton
40	25	1000	\$ 476.19	26	\$ 35.96	\$ 62.42

Economies of Scale

Annual Production Influence on Cost

Cordwood Production Costs Economies of Scale



Fort Yukon Heat Analysis

100 gals fuel oil = 1 ton of wood in BTUs

Fort Yukon Village Heating Analysis

Village Wood Heating based on Houses, District Heat, Major Buildings	Equipment and Installation Costs	Annual Fuel Oil Consumption(gal)	Fuel Cost \$/Gallon	Annual Fuel Cost	Annual Cord Wood Use Equivalent @70% Displacement	Cord Wood Cost Delivered and Boiler Fed	Total Annual Wood Costs	Total Annual Savings	Annual Savings as % Capital Cost
School & Gym	\$80,000	30000	\$4.10	\$123,000	214.29	\$250	\$53,571	\$82,529	41%
Vocational School	\$80,000	16000	\$4.10	\$65,600	114.29	\$250	\$28,571	\$17,849	22%
4 District Systems	\$320,000.00	38400	\$4.10	\$157,440	274.29	\$250	\$68,571	\$41,637	13%
100 Houses	\$120,000.00	80000	\$4.10	\$328,000	571.43	\$250	\$142,857	\$86,743	72%
Total	\$600,000	164400	\$4.10	\$674,040	1174.29		\$293,571	\$178,257	30%

At \$4.10/gal & \$250/ton of delivered wood and 70% displacement of diesel an \$80K boiler will pay back in 3 years via fuel oil cost savings.

Wood Energy = Greatest Opportunity for Local Economic Develop and Energy Self-Sufficiency



Summer 2005 Porcupine Burn 79,762-acre

Woody Biomass Advantages

- Stabilizes village energy costs and may reduce
- Energy import substitution
- Local employment
- Self-sufficiency = culturally sound
- Village sustainability

Funding Partners to Date

- USDA NRCS
- USDA Rural Development
- Alaska Division of Forestry – DNR
- CATG
- State and Private Forestry – USFS
- DOE Tribal Energy Program
Nat'l Renewable Energy Lab

Key Components of Biomass Energy Program

- Forest Management Program
- Regional Harvest Company
- Village Wood Distribution Company
- Village Wood Heat Installations
- CHP Diesel Wood Hybrid Power Plant