Community Based Wood Heat System for Fort Yukon

A Systems Integration

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Highest Energy Costs in Nation

Village Survival

Project Initiation Partners 2005

- **Council of Athabascan Tribal Government**
- **Alaska Village Initiatives**

- **Original Goal: Displace as much diesel fuel as possible through development of a sustainable community based program**

Highest energy costs in nation:
$6.00 per gallon of heating fuel
Heat School & Gym 30,000gals $180K
Run Generators = 200,000gals $1.4M

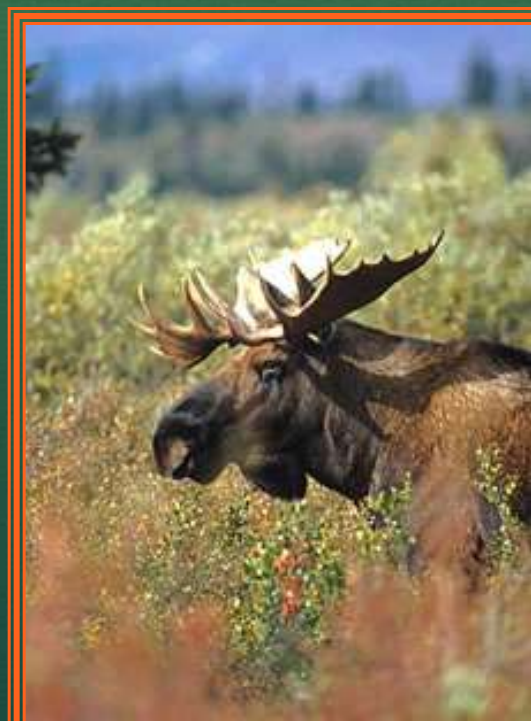
	$/MBTU
• $0.51 per kWh electricity	$149
• $6.75 per gallon gasoline	$52.70
• $7.00 per gallon heating fuel	$46.30
• $200 per ton wood	$17.33

Subsistence Life Styles

Subsistence Resources:

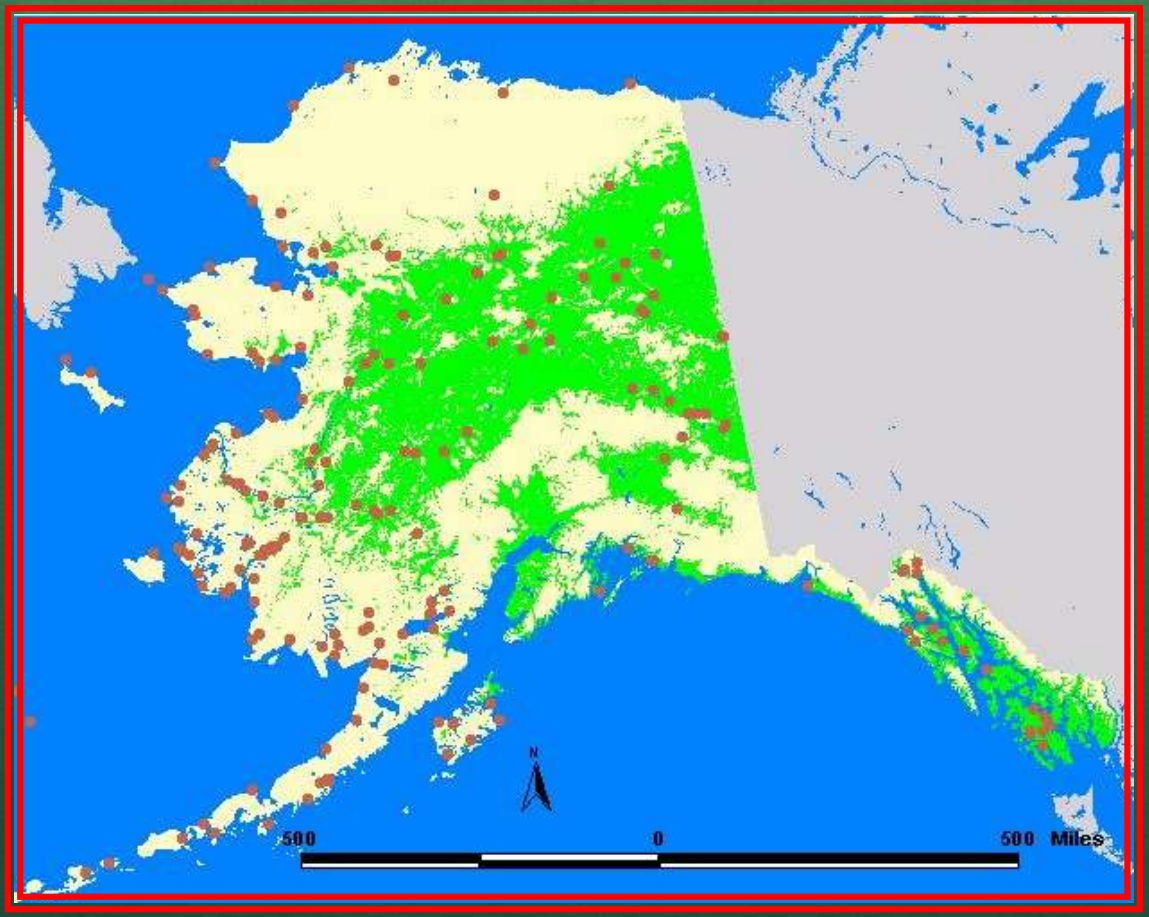
Wood, Wildlife, Fish,

Plant Products



Old & New Housing

Why Biomass as an Energy Source
Alaska has 1/7 of US Forest Lands



No Wind

Solar summer

Small Hydro

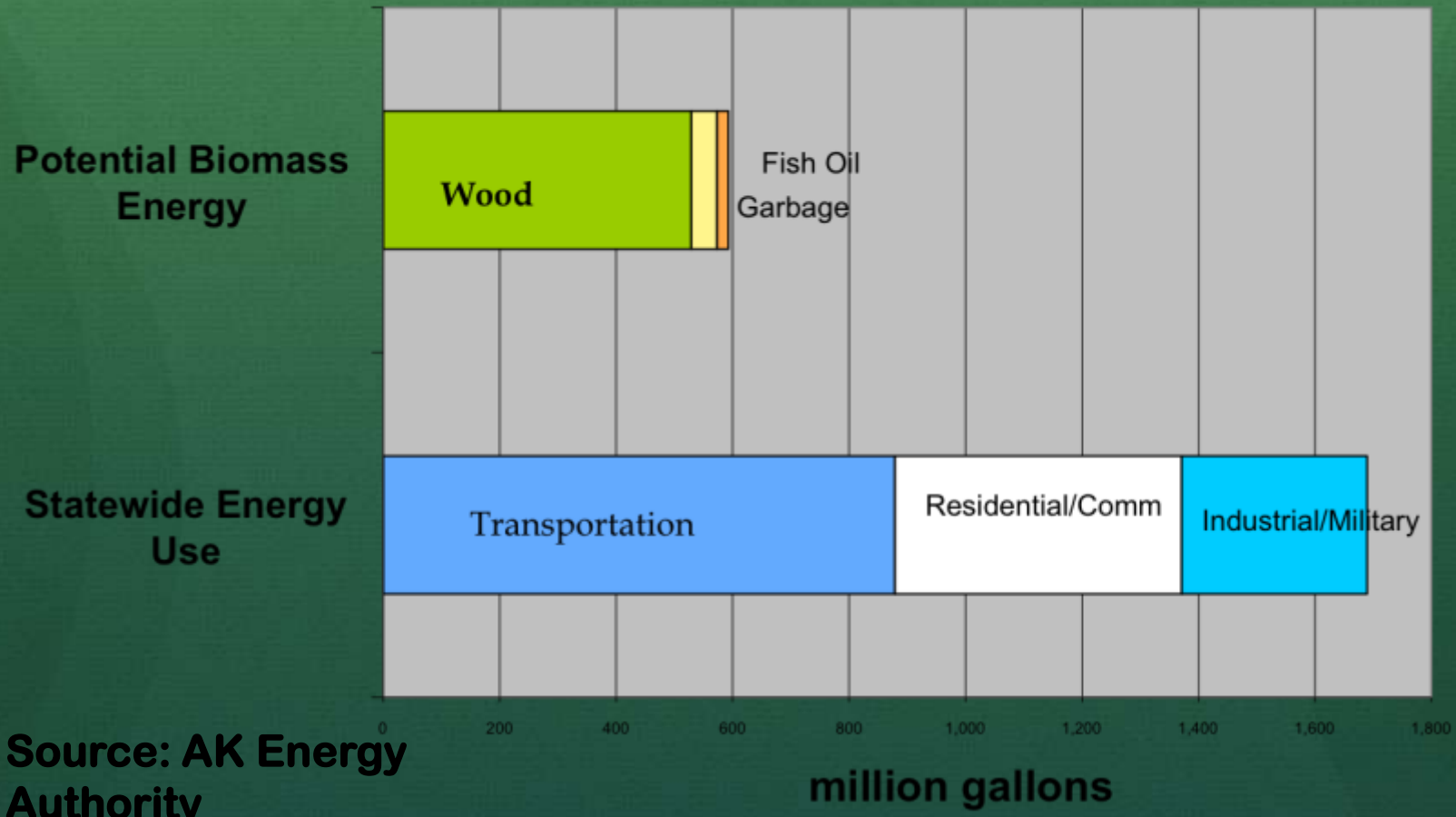
Objective:

Displace Diesel

Wood for Heat

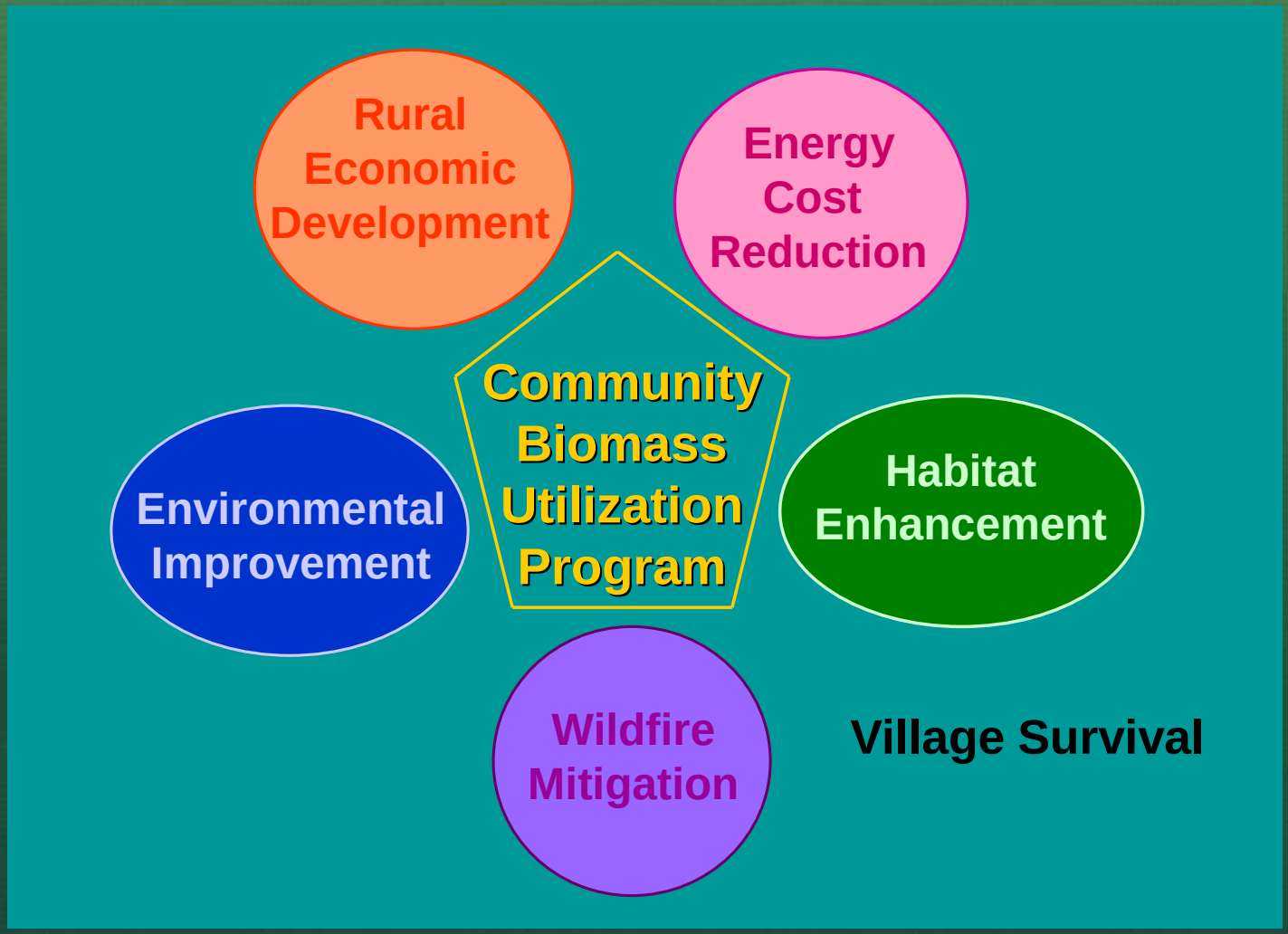
Source: AK Energy Authority

Potential Biomass Energy
vs
Actual Alaska Energy Use
(in diesel gallon equivalents)



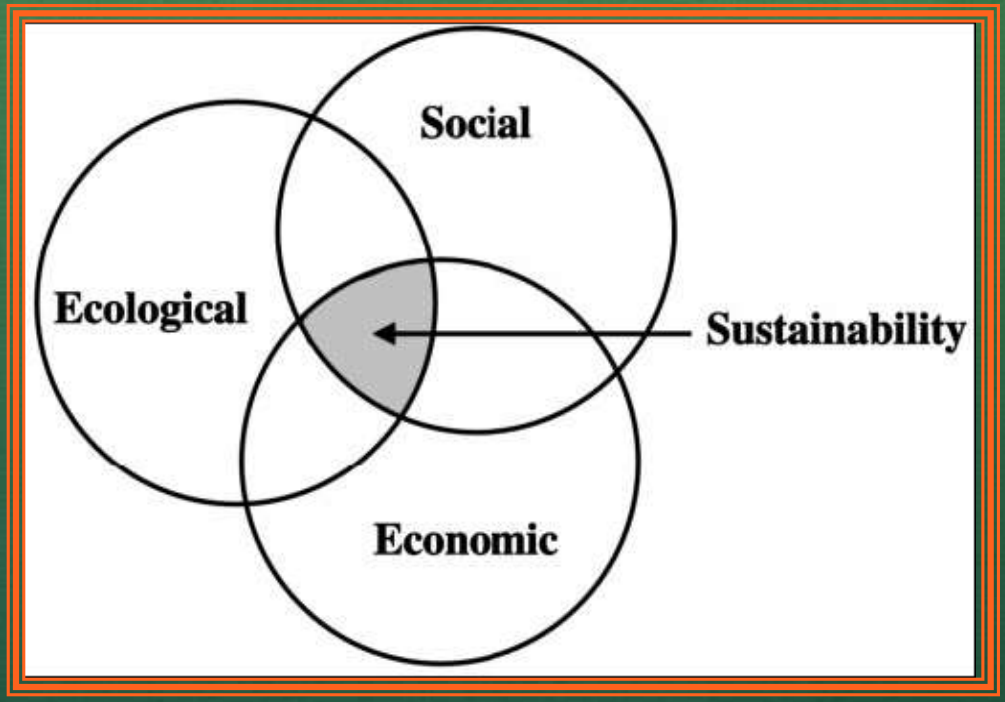
Source: AK Energy Authority

Community Wood Energy Program
More than an Energy Project



Community Based Sustainability

- **Program: economically socially/ culturally, ecologically sustainable.**
- **System sustainability**



Key Components of an Integrated Wood Energy Program

1. GIS based forest inventory and imagery
2. Sustainable 5-year harvest plan & support structure
3. Wood harvest, transportation and delivery equipment system functioning
4. District heat system design includes wood delivery and storage system functioning
5. Completing all environmental and permitting processes and compliance functioning
6. Timber Sales agreements – supply secured

Continued:

1. Energy sales agreement
2. Land Secured
3. Boiler operations functioning
4. Wood energy business model/plan functioning
5. Training and capacity building functioning
6. Technical support = training wheels funded
7. Hungry Boiler is Being Fed

For-Profit Wood Energy Business Model Fort Yukon

- Forest Management Service – CATG – TCC forestry
- For-Profit Wood Utility Company – Vertically Integrated
- Gwitchyaa Zhee Native Corporation
  - Wood Harvest
  - Village Wood Yard/Distribution
  - Wood Energy Utility = boiler operations
  - Wood diesel hybrid power plant - CHP – still looking for 100-400 Kwh technology

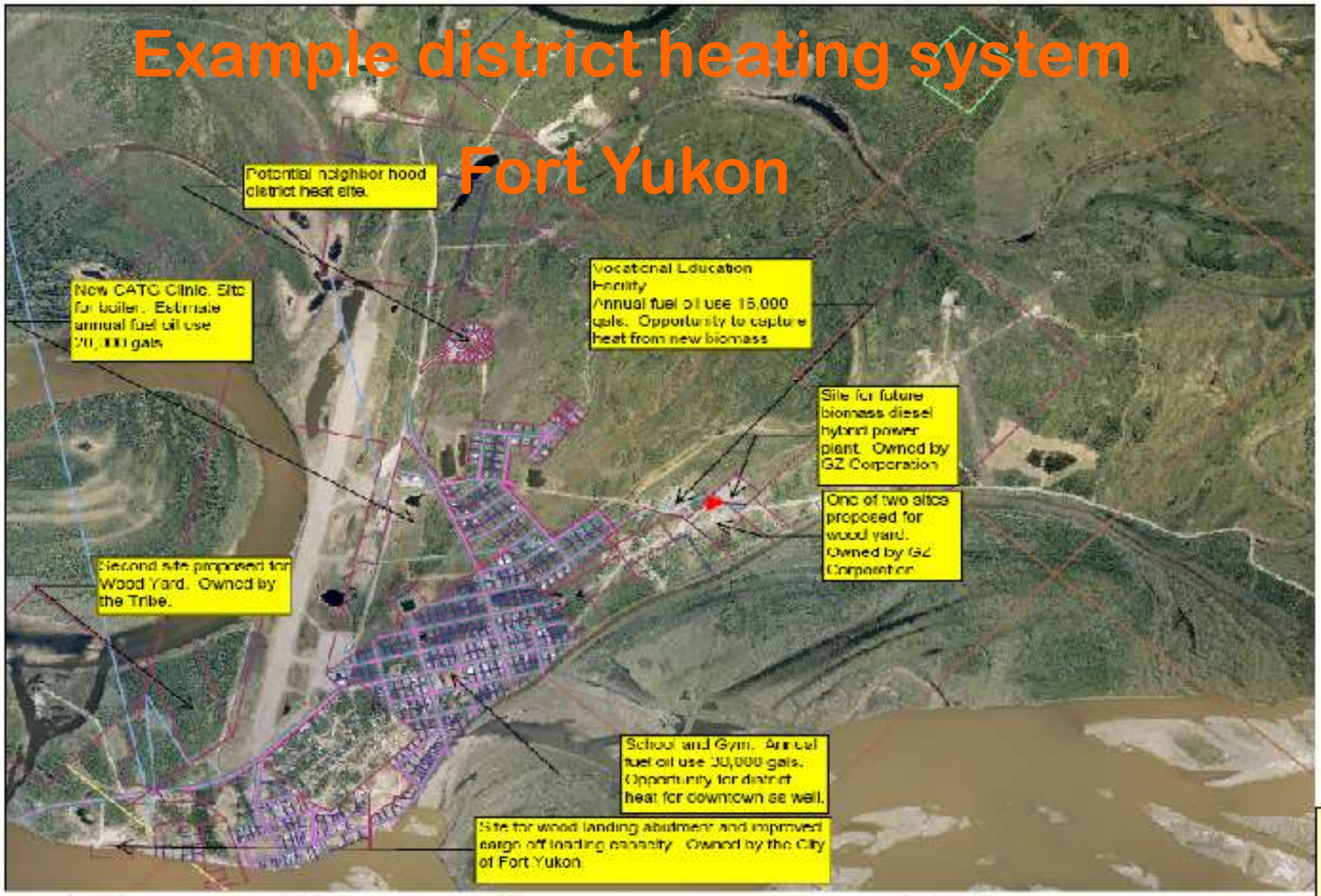
Heating Systems
Stick Fired

150,000 gal. displacement = 35 burns / day in 18 boilers

Heat Systems
Chip Boilers

Example district heating system

Fort Yukon



Boiler System

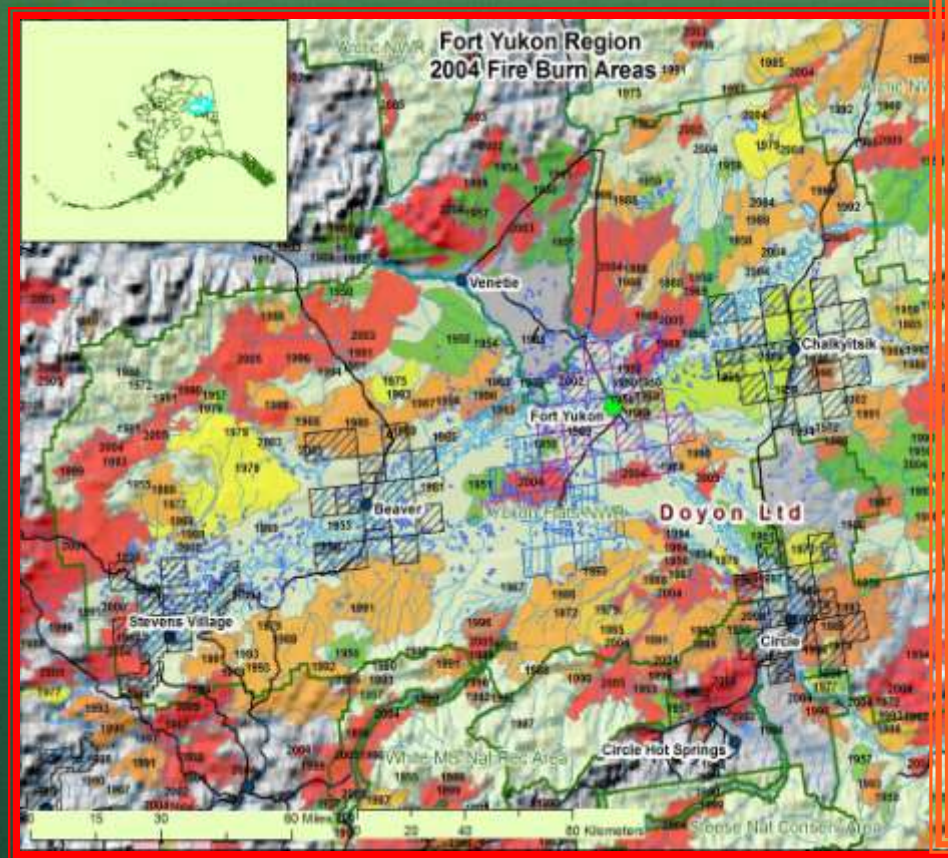
- **Chip Fired 1600-2000 tons per year @ $175/ton**
- **Displace 150,000 Gallons per year in 15 buildings**
- **Project cost $3.0 million**
- **14 year payback @ $4/gallon**
- **6.5 year payback @ $6/gallon**

Displacement of Fuel Oil, Local Economic Develop, Energy Self-Sufficiency & Sustainability

Summer 2005 Porcupine Burn 79,762-acre

Fire Driven Ecosystem

12MM acres statewide in 2004-2005



Fires 1950-2004

Fires in 2004

Typical Example of Seral Stages of Black Spruce Forest in Interior Alaska

3 Years Old | 15 Years Old | 43 Years Old | 81 Years Old

Fort Yukon Biomass Resource Assessment

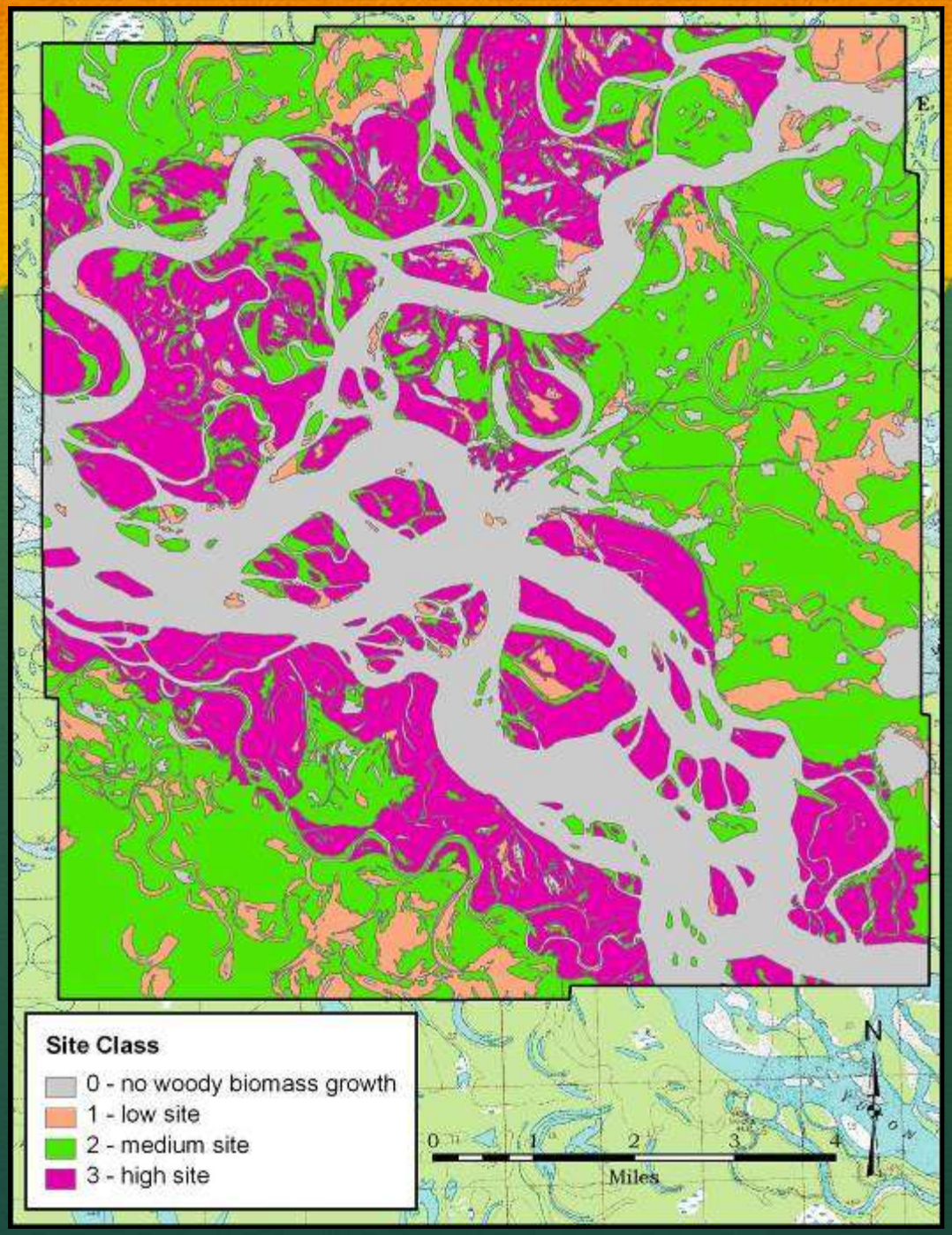
GIS layers:

Cover Types

Fort Yukon Biomass Resource Assessment

GIS layers:

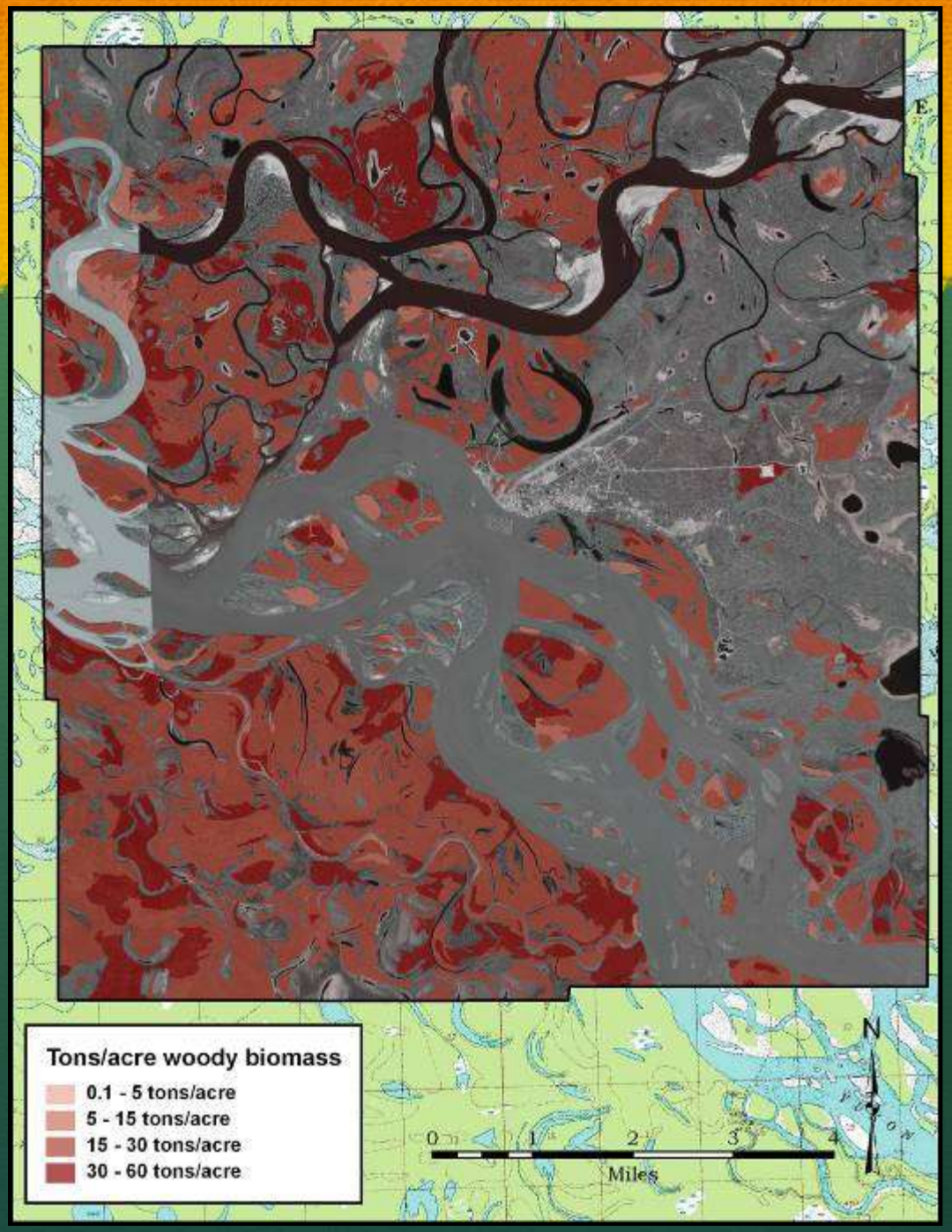
Site Class



Fort Yukon Biomass Resource Assessment

Results:

Woody biomass tons/acre



Results

Biomass Stocking and AAC by Cover Type Class

Cover Type Class	Acres	Standing Green Tons	Green Tons AAC
Black spruce	395	860	56
Cottonwood poletimber	2,296	29,238	562
Cottonwood sawtimber	227	3,895	78
Hardwood poletimber	211	4,063	55
Mixed poletimber	3,773	105,010	1,631
Mixed sawtimber	281	7,516	150
Reproduction	8,155	0	1,223
White spruce poletimber	7,853	229,971	4,134
White spruce sawtimber	2,639	82,404	1,627
Totals:	25,829	462,958	9,517

Acreage Harvested for Heating

- 2,000 tons / year heat
- 25 tons/acre
- 40 year rotation
- 80 acres / year
- 3200 acres / rotation
- Moose habitat for 20 years
- Historical wildfire events have burned 80,000 acres in one month

Proposed Rural Wood Fuel Supply System

- Capital costs for system capable of producing 7,000 TPY: $600,000

Key Obstacles to Overcome

- Development of program understanding/support:
  - Community
  - Funding agencies
  - Political support
- Local Capacity to own and operate the full business model
- Creating the correct incentives/model in each village
- Scaling the hardware & systems to meet local conditions
- Keeping the training wheels on long enough = funding

Accomplished to Date Fort Yukon

- **Community Support**
- **Forest Stewardship Completed**
- **Transportation and equipment study completed**
- **GIS based inventory completed**
- **35% boiler modeling completed with powerhouse**
- **EA in progress**
- **Conceptual Design Study to link Powerhouse in progress**

Next Steps

- Just hired a project liaison – Randy Engler
- Build confidence of funders
- 5 year wood harvest plan in progress
- Business plan in progress
- 65% design in progress
- Start construction of boiler
- Start wood harvesting

Lessons Learned

- **Perseverance – Thanks Lizana**
- **Keep a Champion from the Village out front –**
  Thanks Randy
- **Integration – Integration- Integration**

Funding Partners

- USDA NRCS
- DOE Tribal Energy Program
- Denali Commission
- Alaska Energy Authority
- Division of Forestry – DNR
- USDA Rural Development
- State and Private Forestry – USFS