

# Woody Biomass: Recovery and Transport

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# Why the interest in biomass?

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- US energy policy
- Healthy Forests
- Changing markets
- New opportunities

# Atlanta, ID

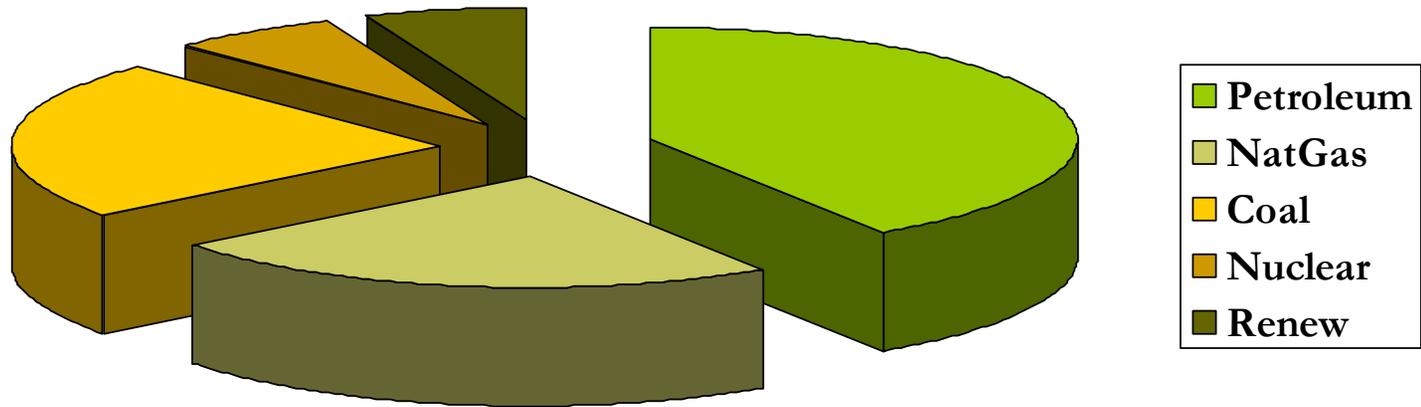
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# U.S. Energy

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- World's largest producer, consumer, importer of energy



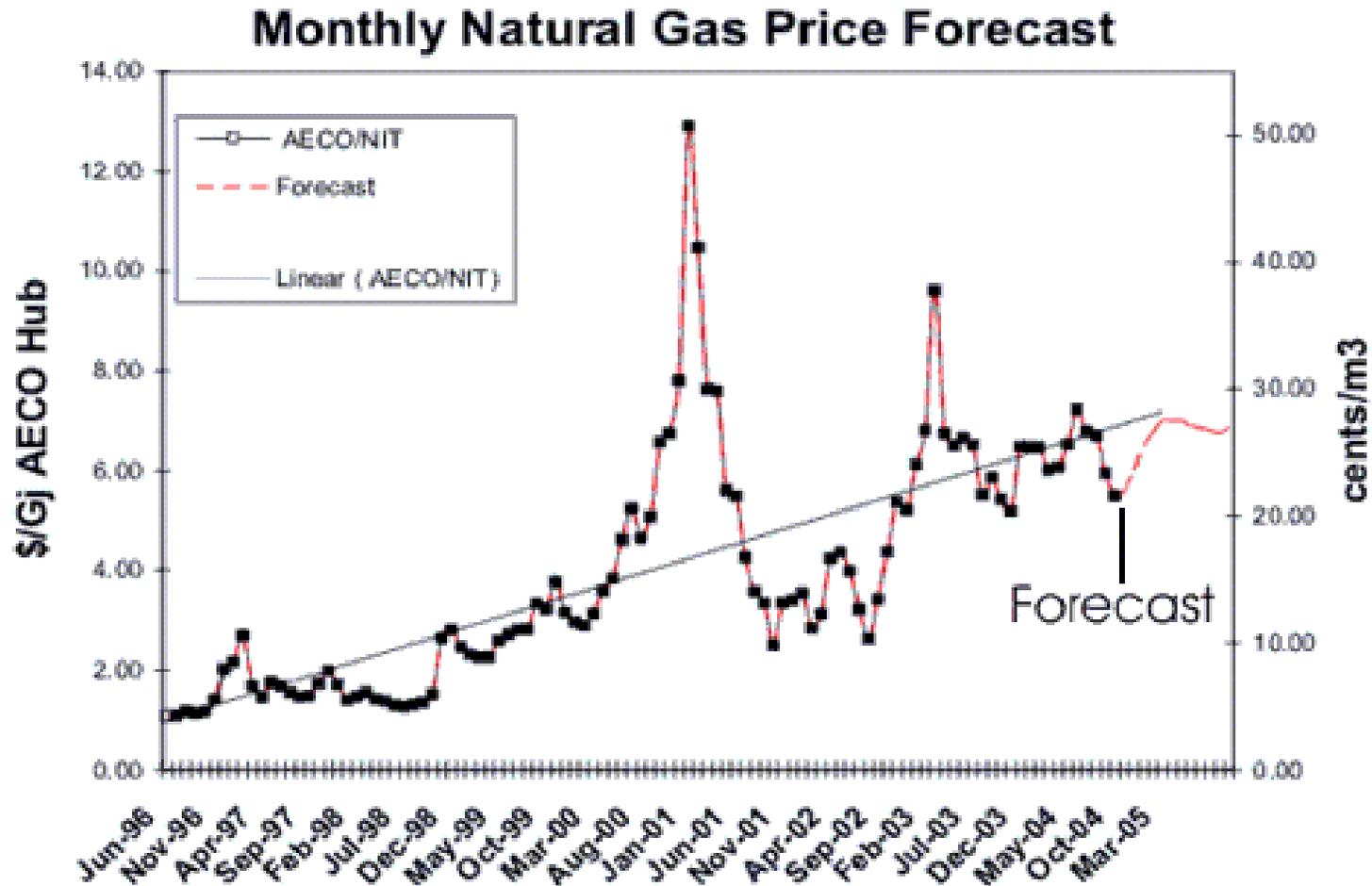
# Energy Issues

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- ❑ Security
- ❑ Economic impacts
- ❑ Environmental



# Looking to the future



# Energy Policy

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- ❑ Triple the use of bio-based products and bioenergy by 2010
- ❑ Biomass R&D Act 2000
- ❑ Energy Policy Act 2005?
- ❑ Billion-ton vision

“Biomass will supply 5% of the nation’s power, 20% of transportation fuels, and 25% of chemicals by 2030.”

# A Billion-Ton Feedstock

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- Forests currently about 70%
- 2.5 x increase to 368M bdt
- Most from:
  - Fuel treatments
  - Logging residues
  - Urban wood waste
- Ag shows 5 x increase
- Total about 1.3B bdt

# Future Woody Feedstocks

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- 52M tons fuelwood harvest
- 144M tons forest industry residues
- 47M tons urban woodwaste
- 64M tons logging residues
- 60M tons thinning/fuel treatments

# US Forest Service direction

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- 1.8 M acres of hazardous fuels treatment
- Utilization directive
- Quantities are huge

# Changing Markets

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- ❑ Decline of pulpwood markets
- ❑ New technology for biomass conversion
- ❑ The bio-refinery



# The Barriers

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- ❑ Conversion processes and efficiencies
- ❑ Feedstock recovery
- ❑ Transportation



# Whole tree harvesting

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Flagstaff, AZ

# Non-traditional recovery

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# New technology

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# New technology

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# Biomass harvesting

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# Small Scale

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# Forwarding Slash

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**Forwarding residues, Flagstaff, AZ**

# Leave it in the woods

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# Woody Biomass Recovery

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- Integrated harvesting is cheapest
  - Increased utilization
- Residue doesn't pay its way out of the woods
- SRWC are expensive fiber
- Value-driven process
- Conversion/densification as close to the stump as possible

# 2 acres of biomass



# At Roadside

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- Are there product sorting opportunities?
  - Slashers, strokeboom, processors, flail chippers
- Can processing equipment access the site?
- Is the volume sufficient to justify move-in?
- How far to markets?

# In-woods Merchandizing

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# Horizontal grinder

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# Tub grinder

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**Biomass One White City, OR**

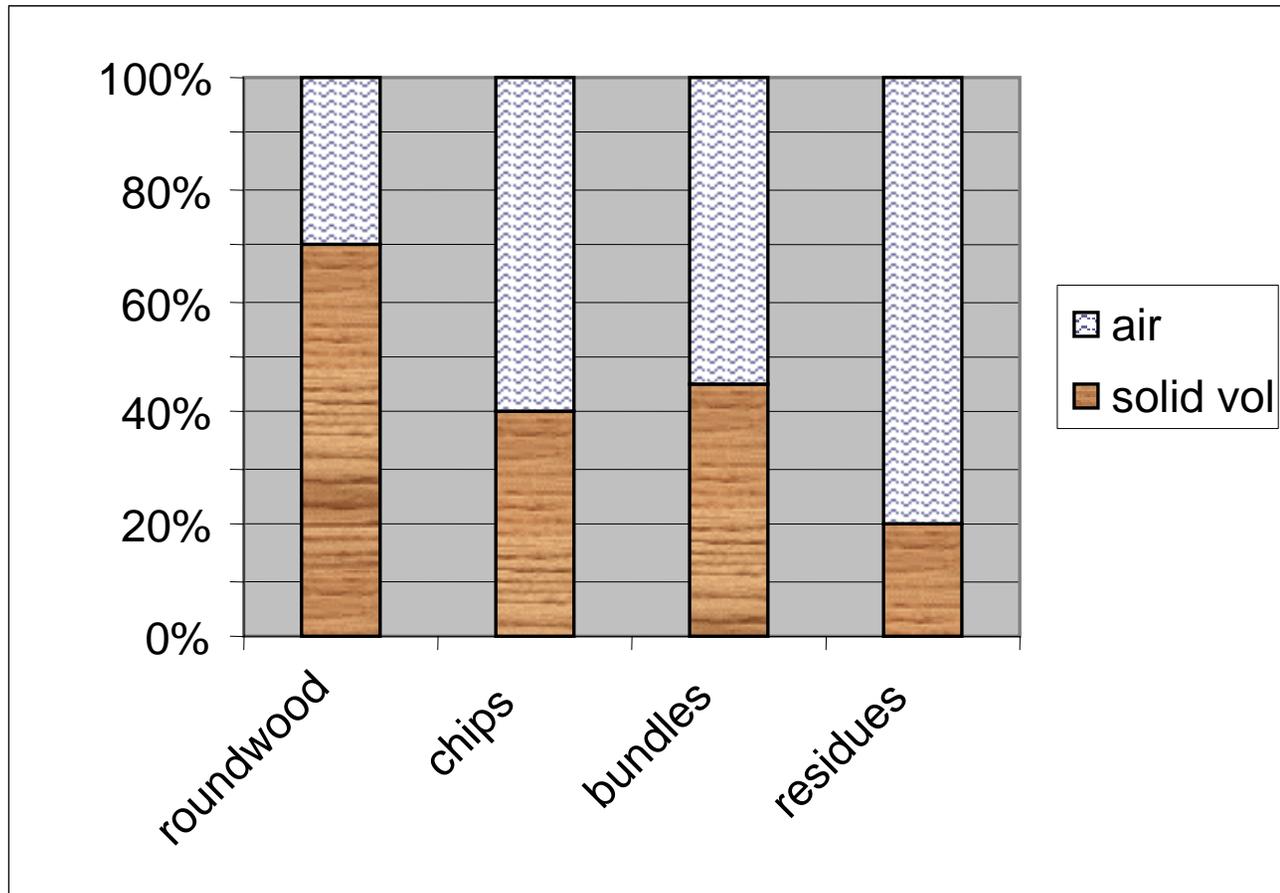
# Transport Density

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# Solid Volume Factors

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# Issues of scale







# Biomass transport

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# Maximize payload

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Alloy frames

Super singles

Lightweight bolsters

# What is a ton worth?

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- Assume trucking is paid 0.12/ton-mi
- Multiply by total haul miles/yr

$$\begin{aligned} & \$0.12/\text{ton-mi} * 40 \text{ mi/trip} * 2.5 \text{ trips/day} * 250 \text{ days} = \\ & \qquad \qquad \qquad \$3000/\text{yr} \end{aligned}$$

# The Problem: Residue Recovery

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- ❑ Logging residues, activity fuels
- ❑ Thinnings
- ❑ Inaccessible to roadside chipping



*Idaho City RD, Boise Nat'l Forest*

# Project Partners

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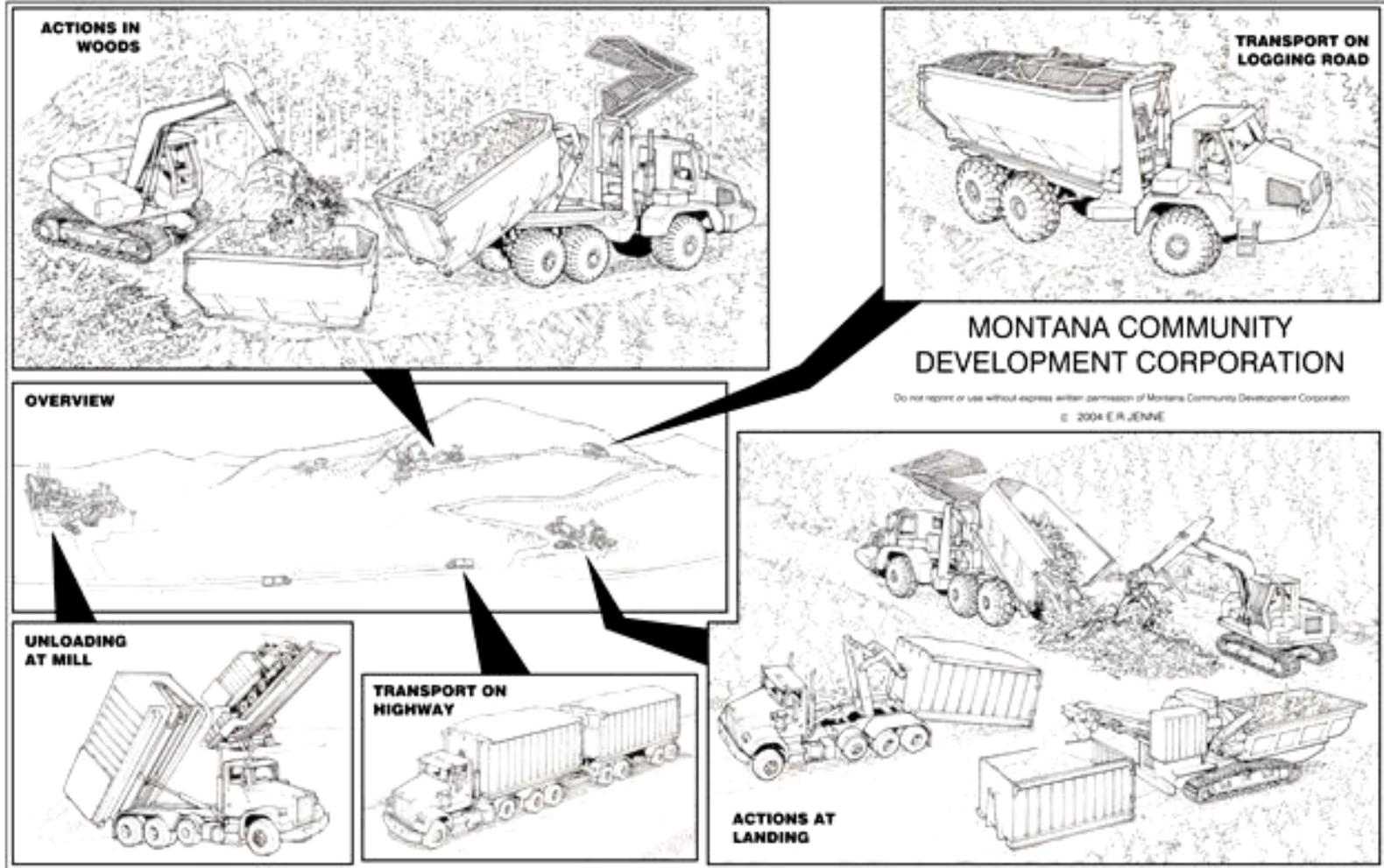
- ❑ Montana Community Development Corp
- ❑ Johnson Brothers Contracting
- ❑ Cheff Logging
- ❑ Missoula Cartage
- ❑ Smurfit-Stone
- ❑ Missoula Technology Development Center
- ❑ State & Private Forestry, Region 1

# Existing Applications

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# Two-stage Transport Concept



# DCT Bin Truck

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# Dry Creek: RO w/chips to mill

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# Dry Creek



# Dry Creek

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# Hog fuel to Smurfit-Stone

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# Cowboy Gulch

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# Cowboy Gulch: RO w/Slash

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# Cowboy Gulch

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# Cowboy Gulch

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# Off-highway Dumper

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# Grinding at Stimson millyard

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# Tarkio: Stroke to bin to millyard

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# Loading

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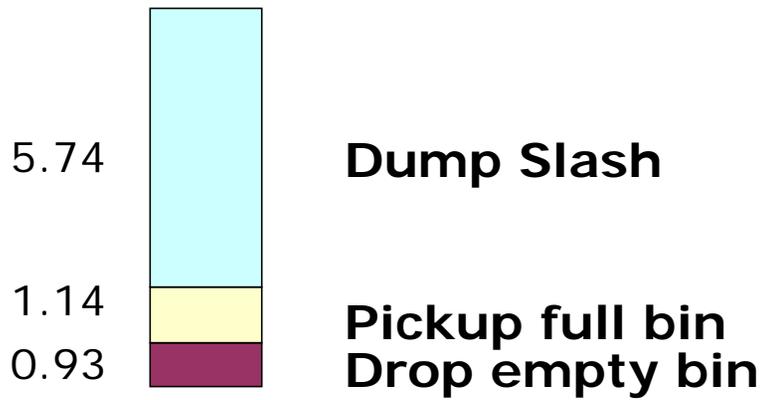
- ❑ BE cable loader: 33 minutes (10.5 bdt/hr)
- ❑ Strokeboom: 12 minutes (28 bdt/hr)
- ❑ Knuckleboom: un-measured



# Results

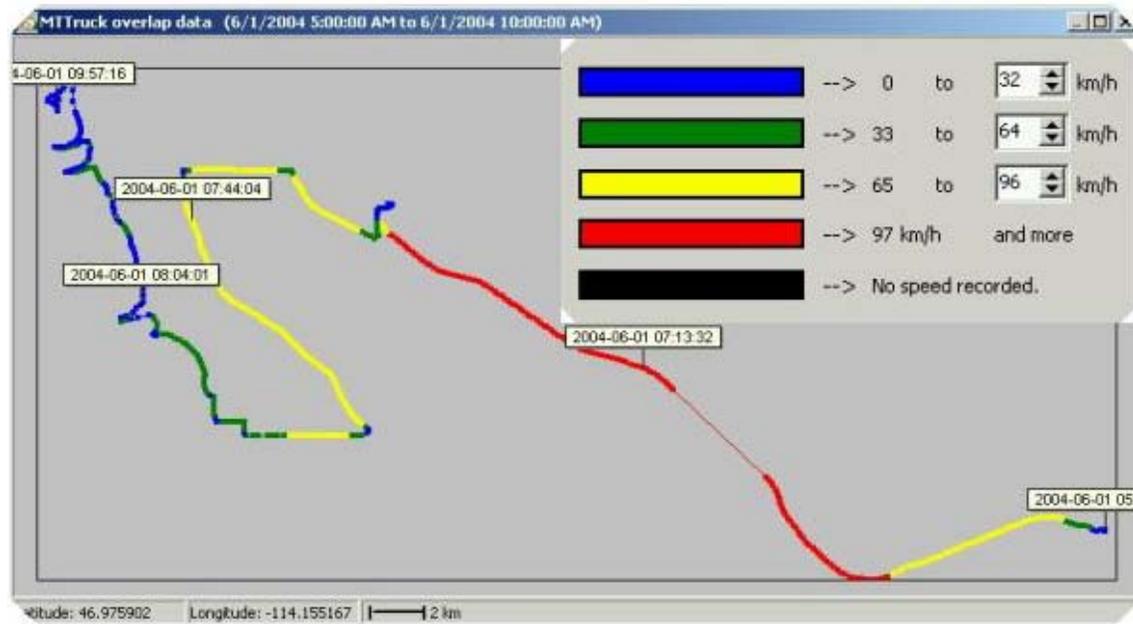
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- Residue payload 9.5 gt (6 bdt)
- Hog fuel 12 gt (7.5 bdt)
- Cat 769 dumper 4 bdt



# Truck Speeds

- ❑ 60 mph interstate
- ❑ 50 mph 2-lane paved
- ❑ 30 mph gravel
- ❑ 10.5 mph forest road



# Conclusions

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- Two-stage transport has an application
  - Low-volume biomass sources
  - Inaccessible sites
  - Complement to logging operations
- Applications must be carefully considered
  - Alternative biomass procurement
  - Cost of removal for fuel reduction
  - Tradeoff in access construction