

# **Forest Management and Renewable Energy**



**Boulder County, Colorado**

# Overview

- Forest Management Leads to Biomass Energy
  - Mountain Pine Beetle
  - Wildland Fire
- Feasibility Study
- Biomass Central Heating Plant
- Current Status
- Lessons Learned



# Biomass Energy

Using wood chips from forestry thinning operations to provide thermal energy for central heating system



# Unhealthy Forest



# Mountain Pine Beetle Epidemic



# Mountain Pine Beetle Colorado

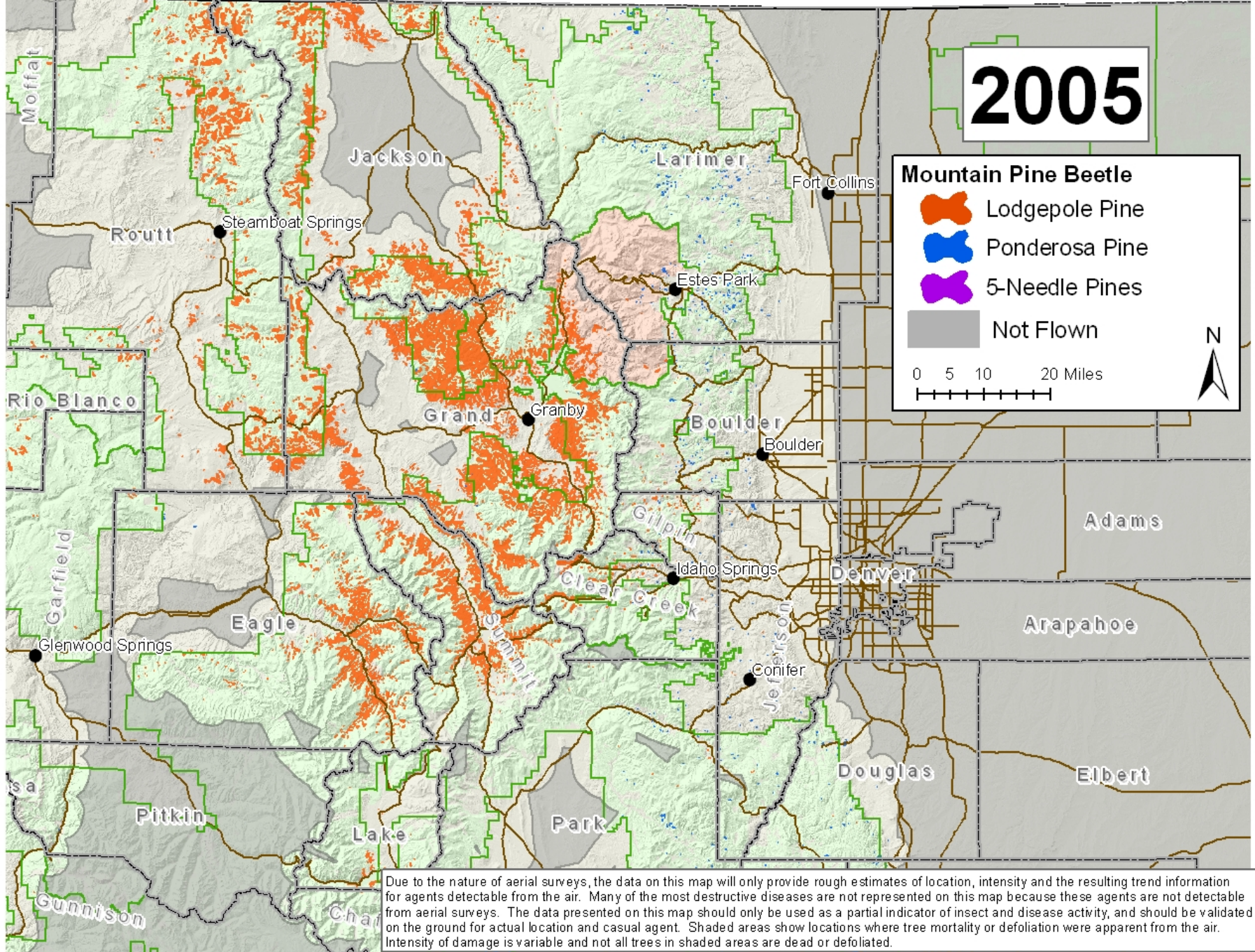
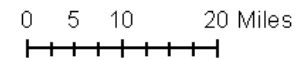


- Native insect
- 3.3 Million acres in Colorado
- 140,000 acres in Boulder County
- USFS declared epidemic

# 2005

## Mountain Pine Beetle

-  Lodgepole Pine
-  Ponderosa Pine
-  5-Needle Pines
-  Not Flown



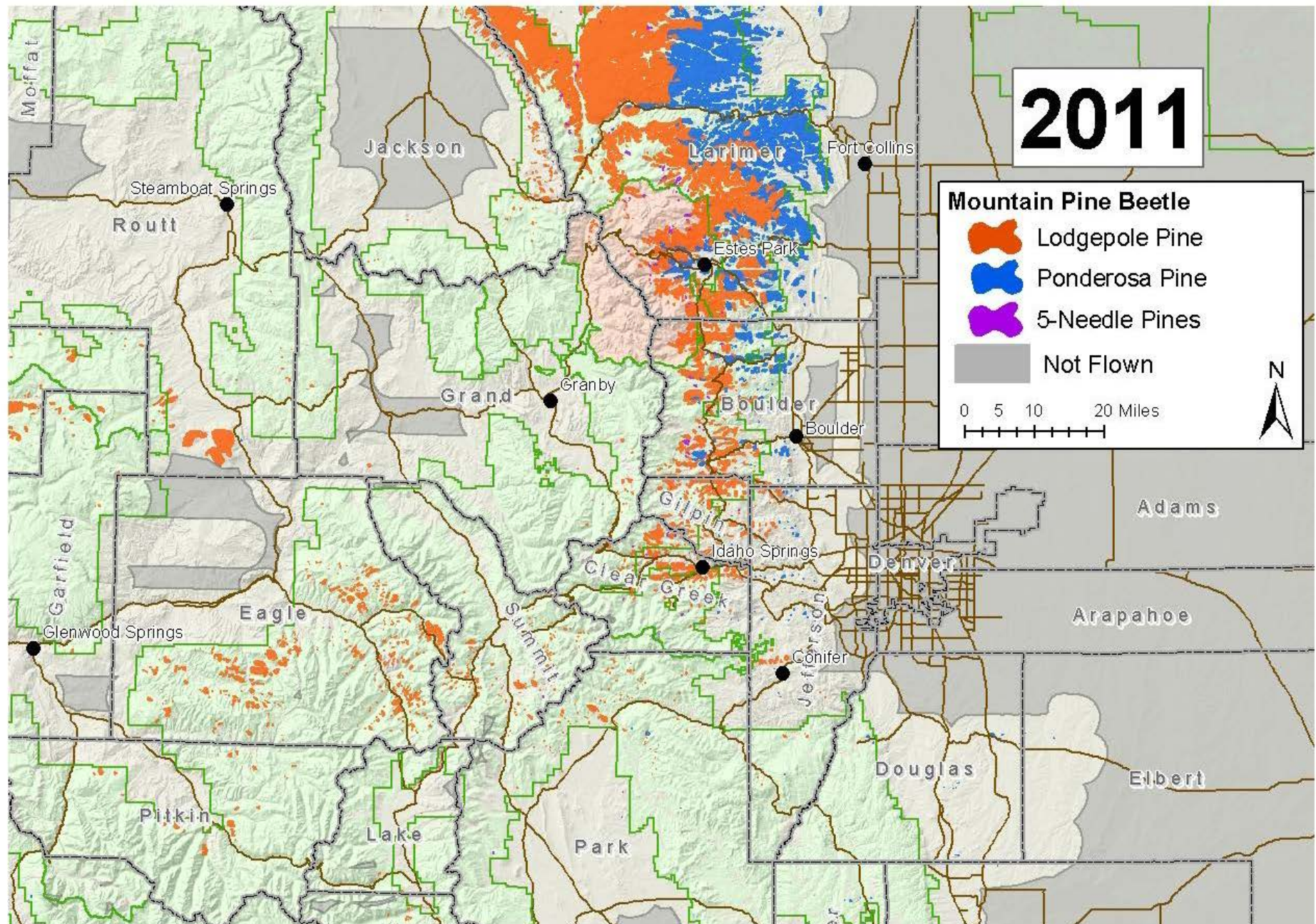
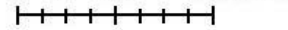
Due to the nature of aerial surveys, the data on this map will only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. Many of the most destructive diseases are not represented on this map because these agents are not detectable from aerial surveys. The data presented on this map should only be used as a partial indicator of insect and disease activity, and should be validated on the ground for actual location and casual agent. Shaded areas show locations where tree mortality or defoliation were apparent from the air. Intensity of damage is variable and not all trees in shaded areas are dead or defoliated.

# 2011

## Mountain Pine Beetle

-  Lodgepole Pine
-  Ponderosa Pine
-  5-Needle Pines
-  Not Flown

0 5 10 20 Miles



Due to the nature of aerial surveys, the data on this map will only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. Many of the most destructive diseases are not represented on this map because these agents are not detectable from aerial surveys. The data presented on this map should only be used as a partial indicator of insect and disease activity, and should be validated on the ground for actual location and casual agent. Shaded areas show locations where tree mortality or defoliation were apparent from the air. Intensity of damage is variable and not all trees in shaded areas are dead or defoliated.





# Wildland Fire



# Forest Management

- Manage ~ **30,000** acres of forested land
- Thin ~ **100-200** acres/year
- **25** years to thin **5000** ac





● 1600 slash piles/year

# Chipping on Site







Healthy Forest

# Benefits of Biomass Energy

- Renewable resource
  - Energy conservation in BC Comprehensive Plan
- Uses forest treatment residue
- Reduce soil impacts of chips



- **Innovation in Colorado**

# Feasibility Study

- Heating System Size
- Annual Wood Consumption
- Emissions from Wood Combustion
- Economic Analysis





# Heating System Size

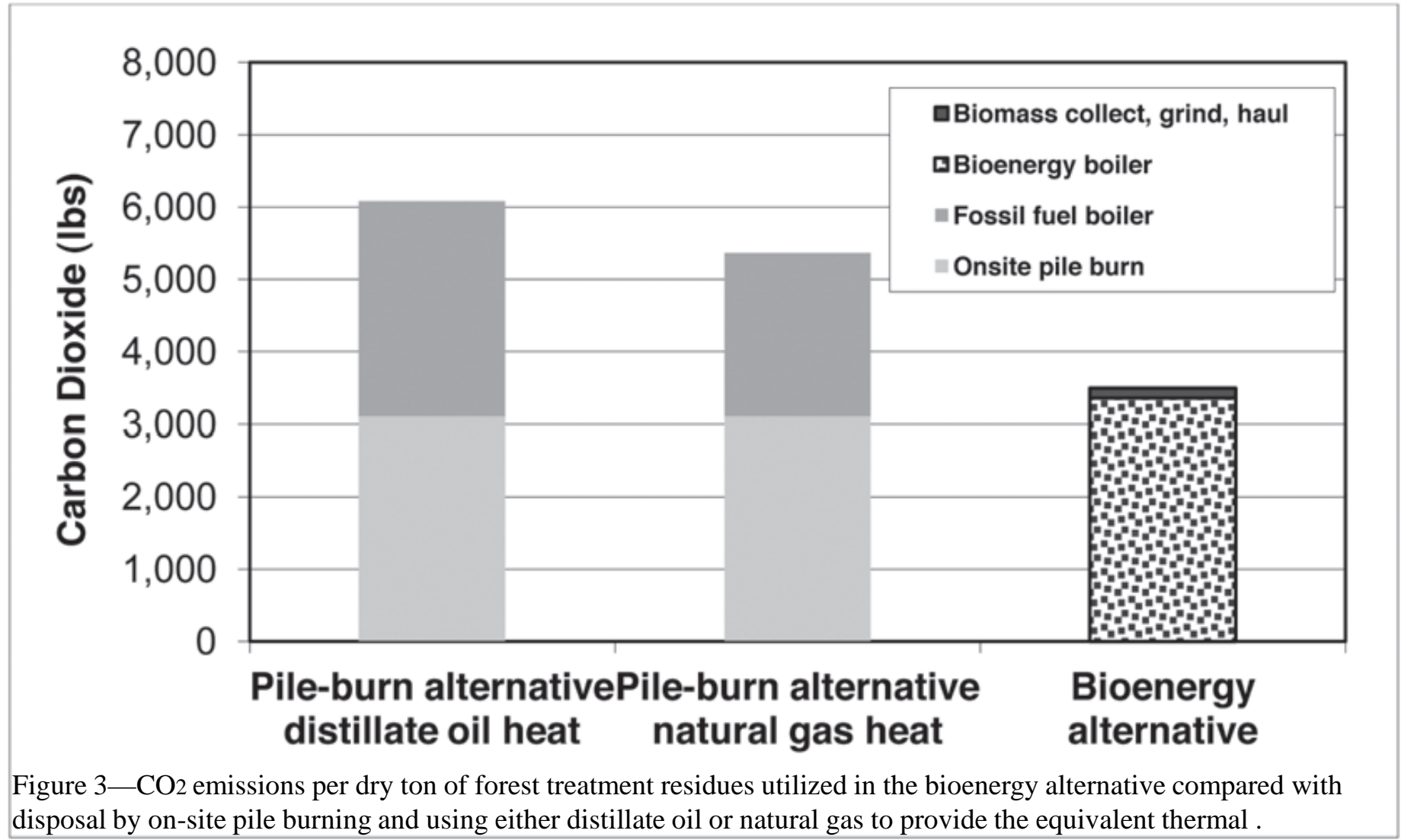
- 5 Buildings: **95,000** sq ft
- Peak output demand estimated at **100** bhp
- Energy use: **6,700** million Btu/yr

## Annual Wood Consumption

- **650** tons of green wood per year to fuel boiler

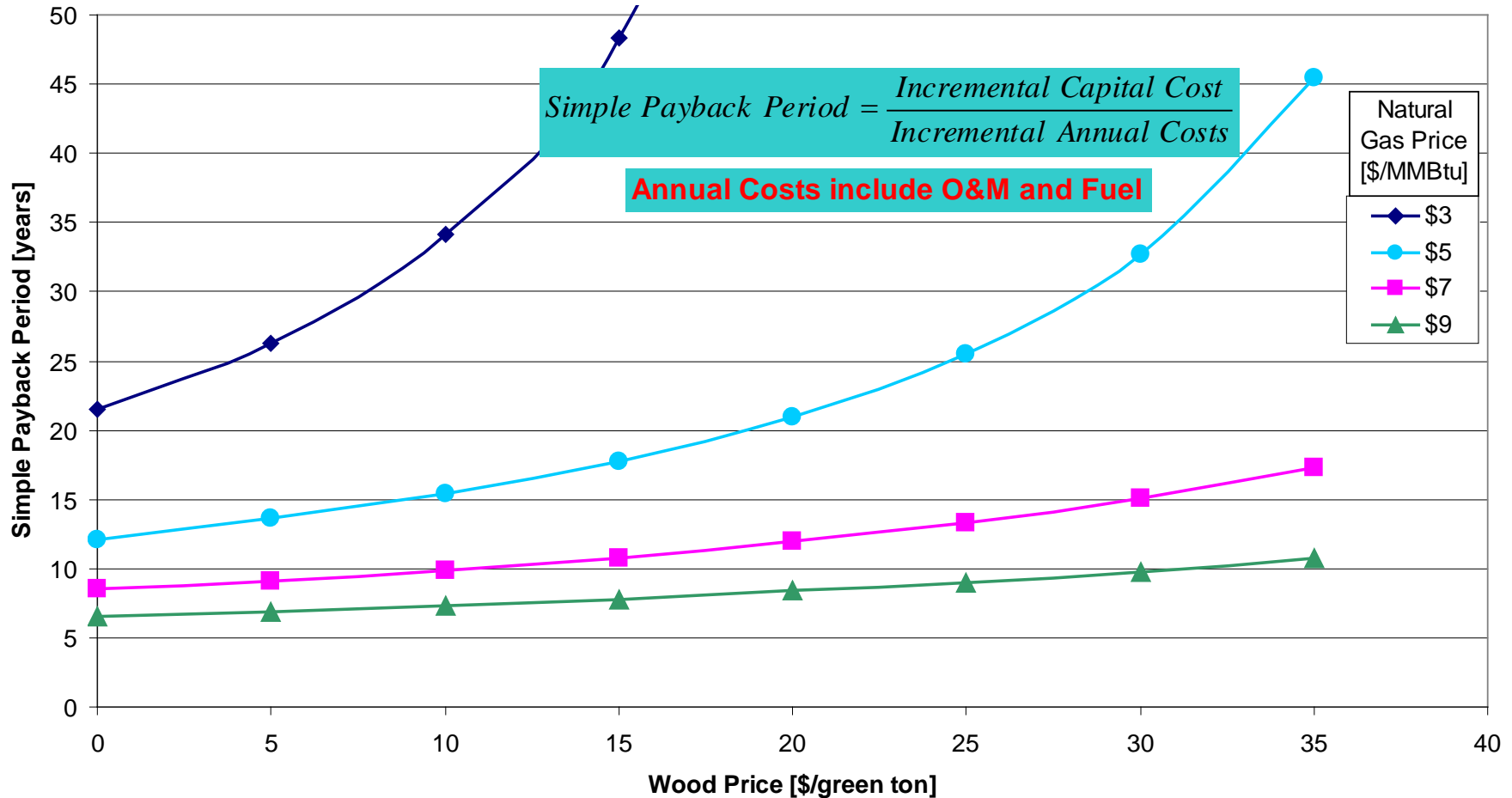
Thinning 65 acres per year yields enough material

# Comparing Open Burning to Biomass Boiler Output Emissions: CO<sub>2</sub>



# Economic Analysis Chart

Simple Payback Period  
vs. Wood and Natural Gas Prices



# Feasibility Conclusions

- Proven technology
- Natural resources available on county land
- Meets air quality standards
- Will pay for itself over time



# BOCO Biomass Heating Plant



The background of the slide is a dense field of light-colored wood chips, likely from a sawmill, scattered across the entire frame. The chips vary in size and orientation, creating a textured, natural-looking surface.

# **Biomass Processing &** **Transport**

**..... or how do we get it from  
there to here?**



# Forest Operations

# Chip Delivery





# Fuel Bin and Auger System



# Boiler and Fuel Box



# What about the smoke and ash?



# Current Status

- Operation began December **2005**
- Fuel handling and transport costs \$24/ton  
(25 miles)
- Installed second system 2010
- Saving **\$30,000/year** per system



# Lessons Learned



- Get everyone on board
- Consistent chip quality – no rocks, moisture content
- It takes time – fine tuning
- We set the stage for others in Colorado



Integrated Natural Resource Management