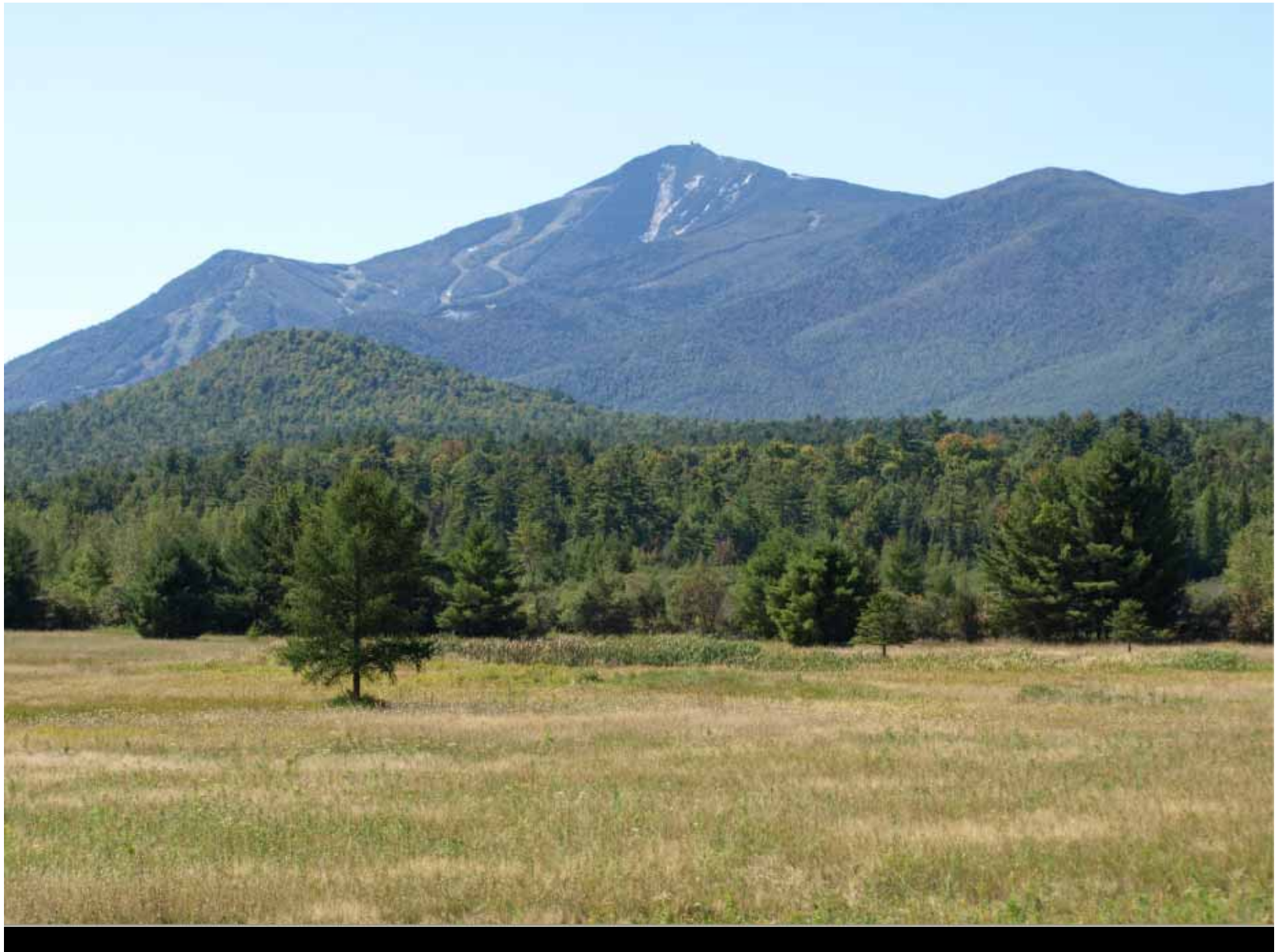
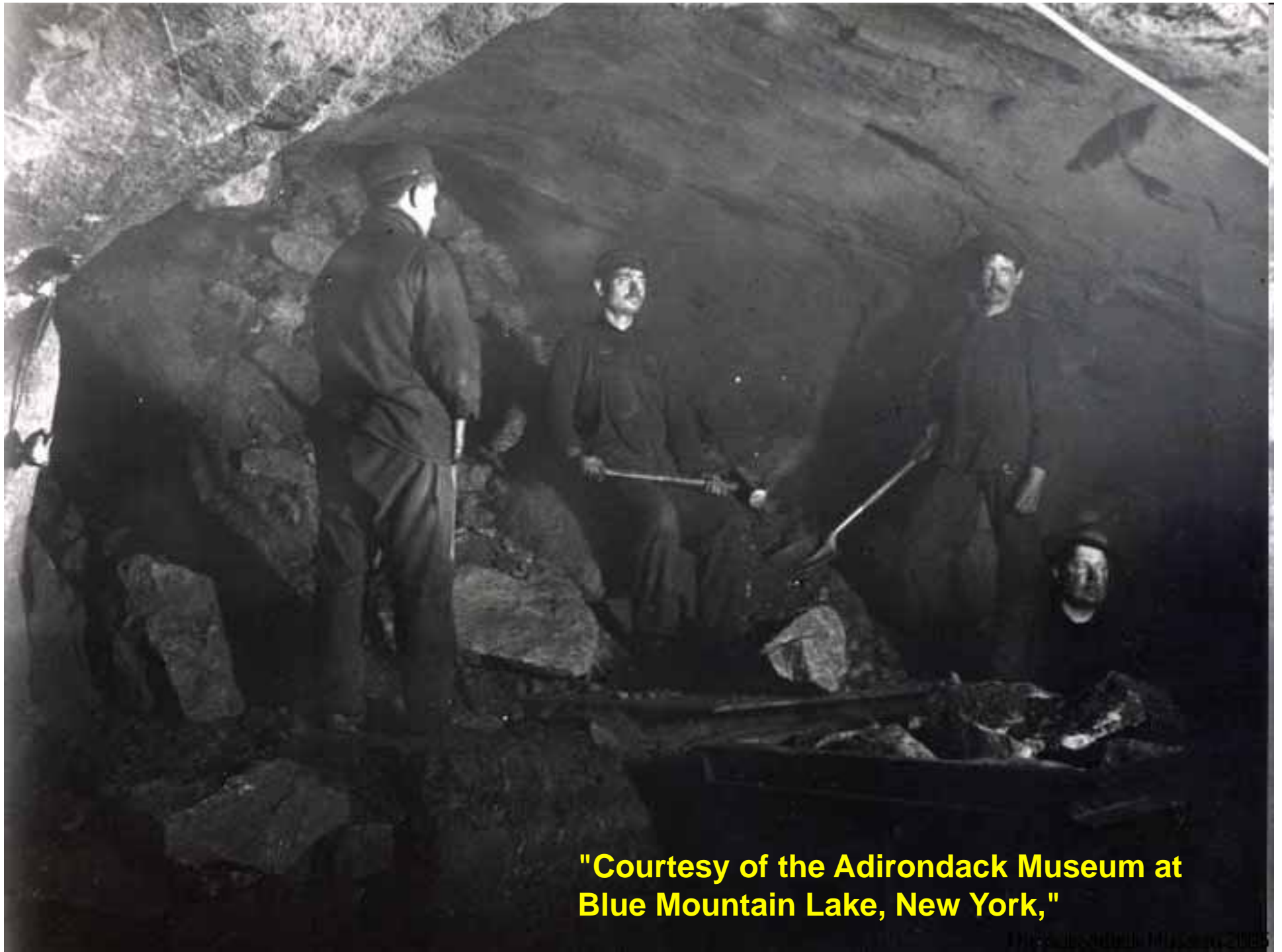


# Adirondack Mountains New York







**"Courtesy of the Adirondack Museum at Blue Mountain Lake, New York,"**



The Adirondack Museum 2005

**1850-1880, 7 million bushels of charcoal annually**

**7000 acres of forest cut per year**

**"Courtesy of the  
Adirondack Museum  
at Blue Mountain  
Lake, New York,"**



The Adirondack Museum 2005

**"Courtesy of the  
Adirondack Museum  
at Blue Mountain  
Lake, New York,"**

# TO THE MEN IN OUR EMPLOY

---

---

We are sorry to have to inform you that the prospects of the Iron Business are growing worse and worse, and the times look so bad that we are obliged to either close the mines or reduce wages. After much consideration we have decided not to close, but to reduce; and from and after DECEMBER 15th, the wages for a day of Ten Hours, will be as follows:

For Pit Foremen,	.	.	.	.	\$2,25
“ Miners,	.	.	.	.	1,75
“ Pit Men,	.	.	.	.	1,50
“ Bank Men,	.	.	.	.	1,35
“ Drill Boys,	.	.	.	.	1,00
“ Drill Sharpeners,	.	.	.	.	2,00
“ Machine Drill Men	.	.	.	.	1,75
“ Assistant Drill Men	.	.	.	.	1,50

**Witherbees, Sherman & Co.**  
**The Port Henry Iron Ore Co.**

Port Henry, N.Y. Nov. 30, 1874.

"Courtesy of the  
Adirondack Museum  
at Blue Mountain  
Lake, New York,"







# Natural vegetation



Development hindered by:

- 1) Acid soil
- 2) Excessive water drainage
- 3) Poor nutrient-holding capacity
- 4) Fragipan
- 5) Heat reflection
- 6) Exposure to wind

**Newton  
Falls Road**



**Artificial  
lake –  
former  
drainage  
into  
Chaumont  
Swamp**



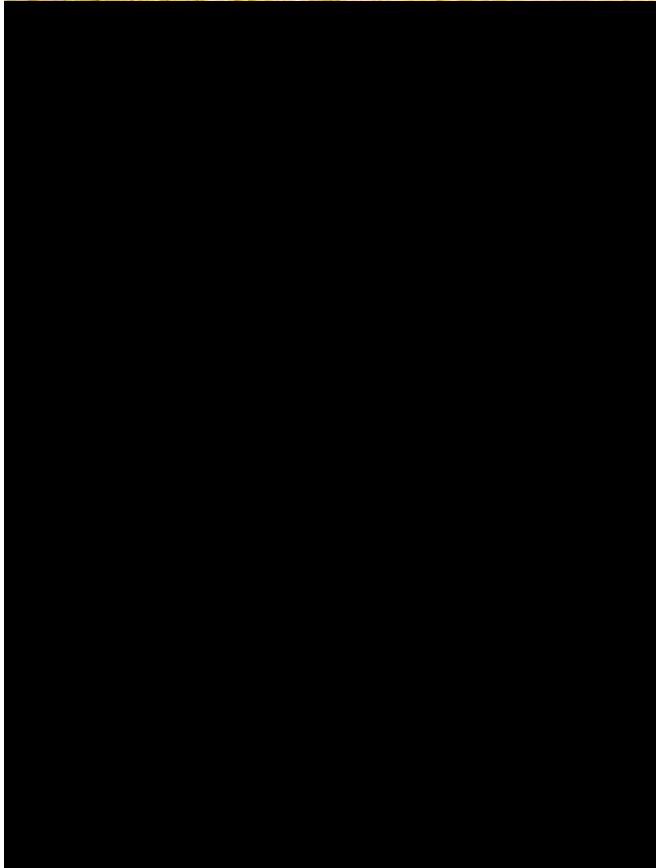
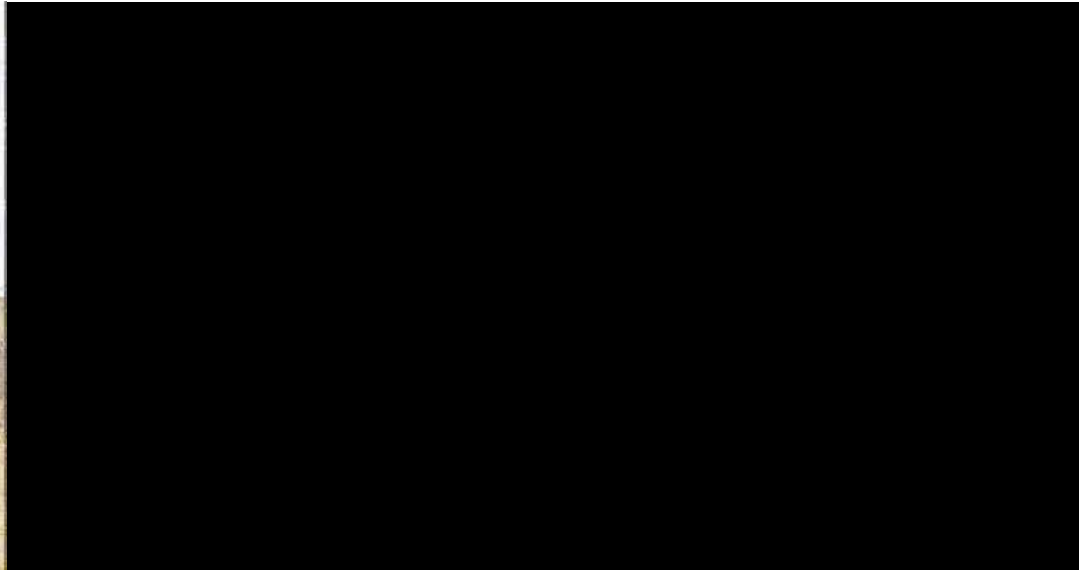


# **Benefits of paper mill Sludge**

- **High pH neutralizes acid soil**
- **Sludge increases water-holding capacity**
- **Sludge increases nutrient-holding capacity**
- **Application via trenches breaks fragipan**
- **Resulting vegetation reduces heat reflection**
- **Resulting vegetation reduces wind exposure**

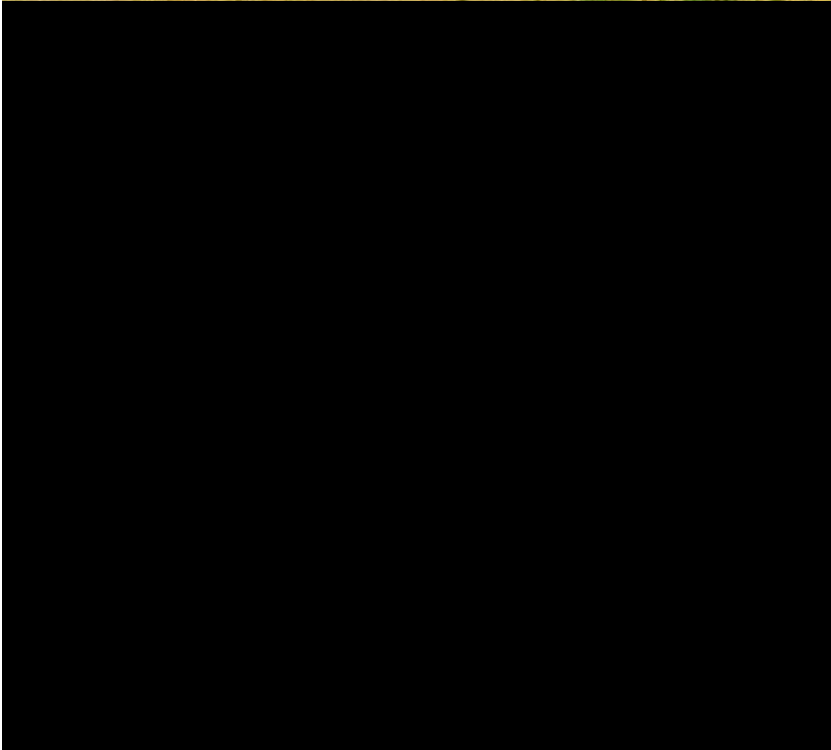
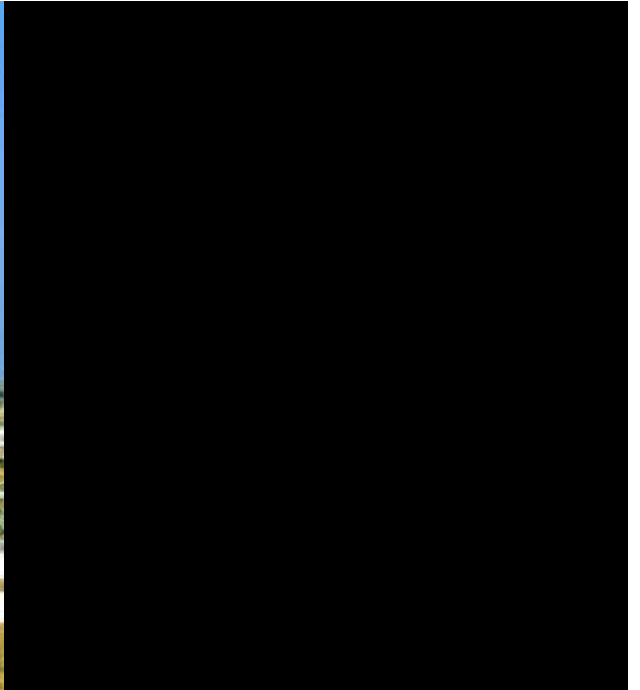
# Hypothesis

- **Incorporating paper mill sludge into the iron mine tailings increases the productive capacity of the site and allows the development of a more natural ecosystem**



# Monitoring well

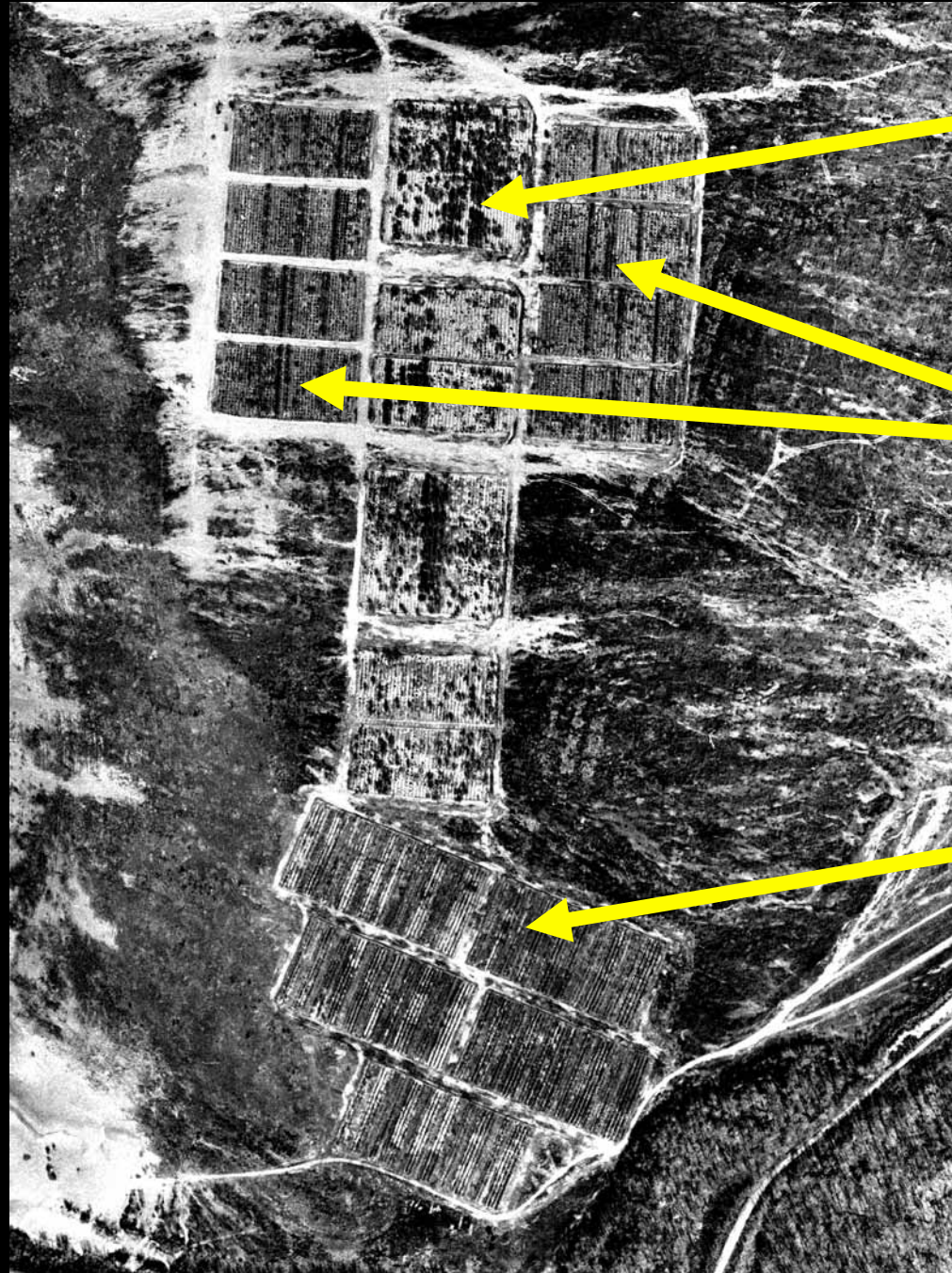












1995/96 Plantings

1997 Plantings

1999 Plantings

# Older projects

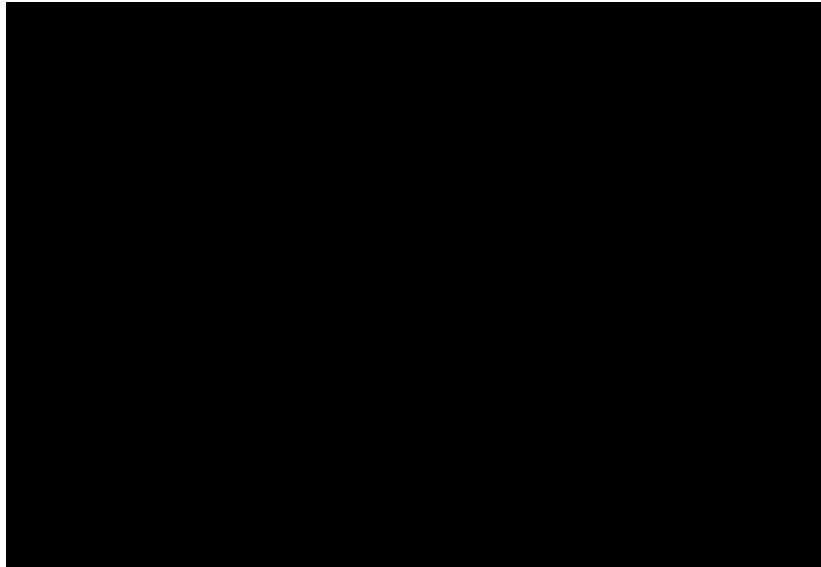


# 10-year-old red pine

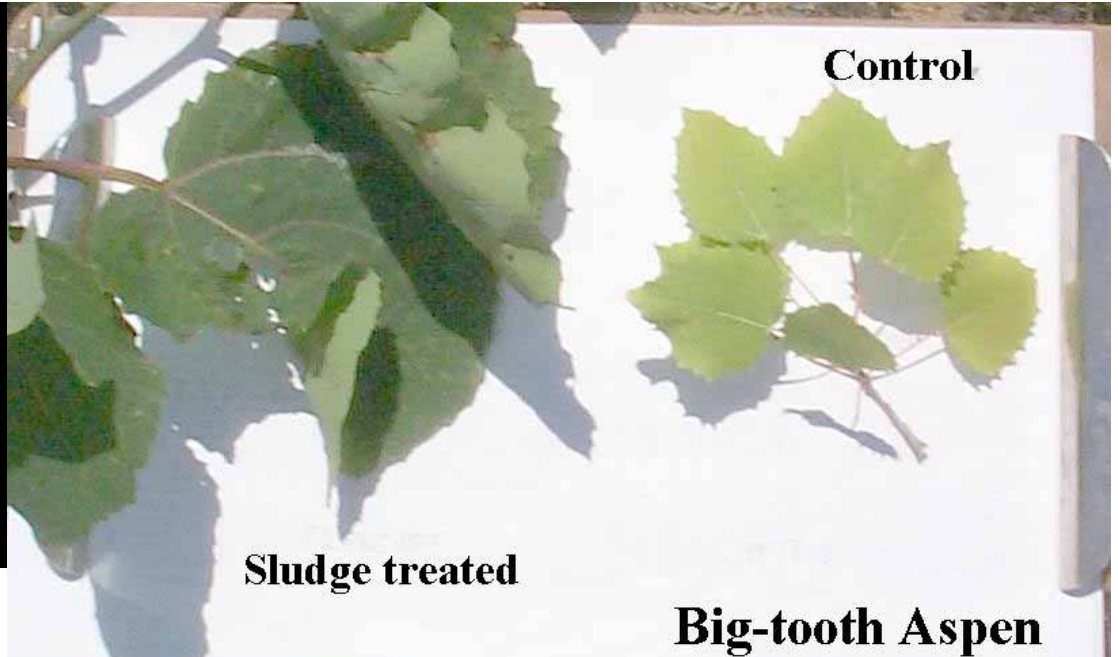


# 10-year-old white pine





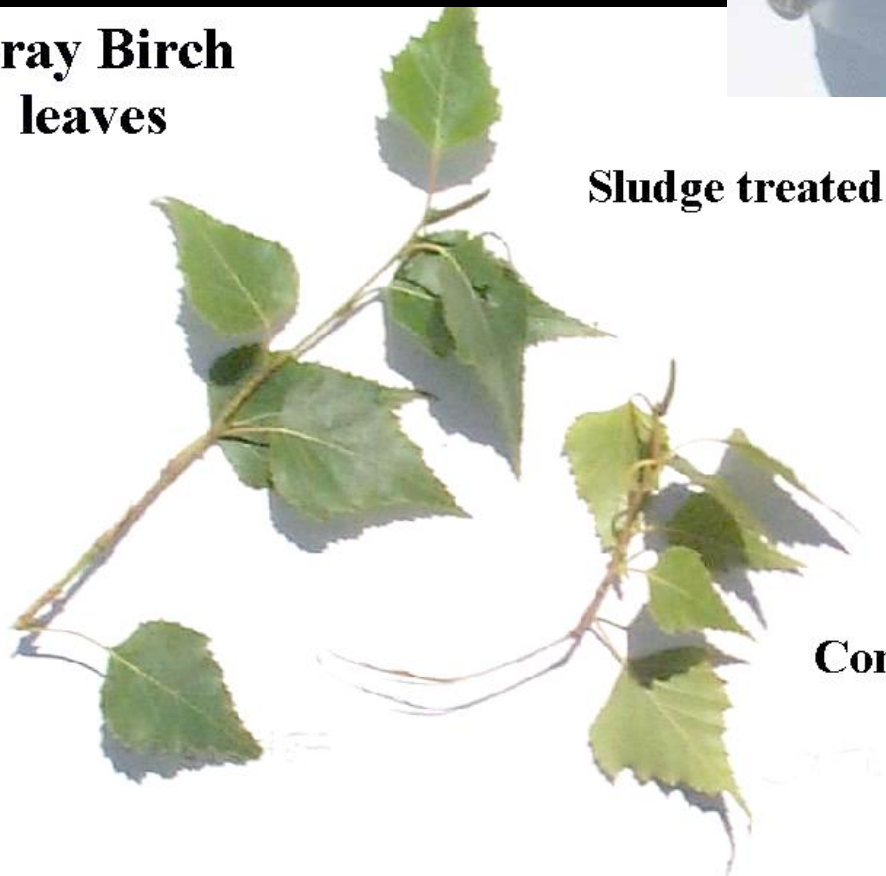
**Gray Birch  
leaves**



**Sludge treated**

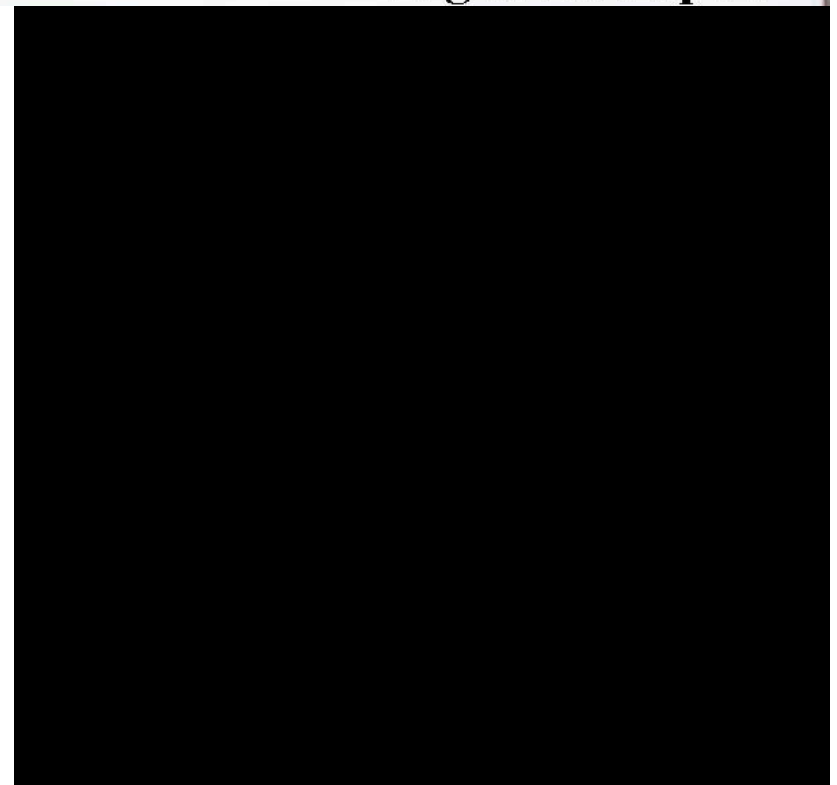
**Control**

**Big-tooth Aspen**



**Sludge treated**

**Control**





**Twig from  
sludge-treated  
area**

**Twig from  
control area**

**Quaking  
Aspen  
Twigs**



## **Advancements in the 1999 Trial:**

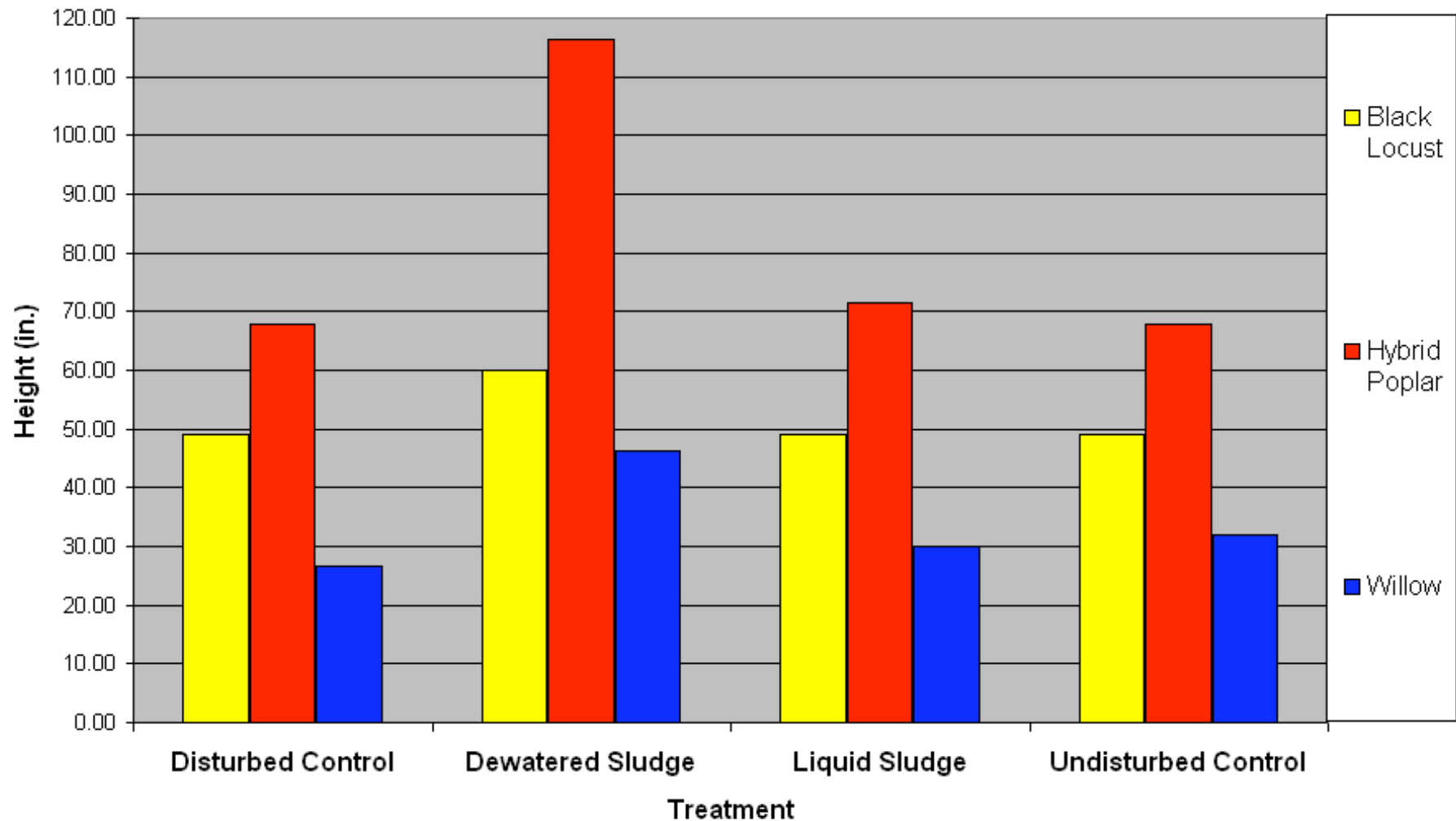
- Incorporated dewatered sludge in addition to regular (liquid) sludge
- Incorporated disturbed and undisturbed controls
- Incorporated fifteen species-density treatments
- Used only aggressively-growing hardwood species

# 2001 Data – Two growing seasons



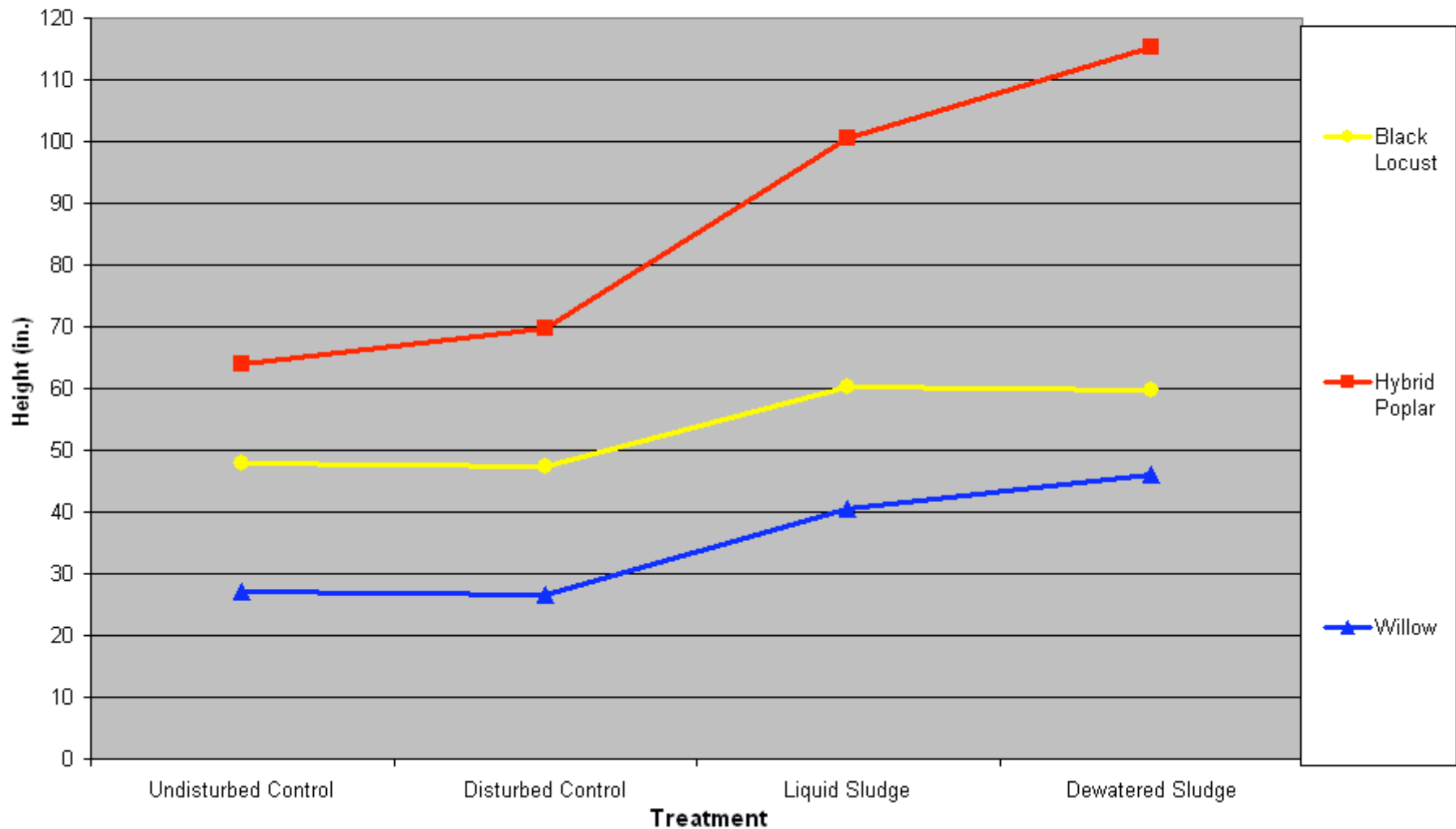
# 2001 Data – Two growing seasons

Average Height of Three Species, by Treatment at the Mine Tailings Project as measured July, 2001



# 2001 Data – Two growing seasons

Height by Species and Treatment  
of Three Species Planted at the Mine Tailings Project



# What does it look like today?



# Liquid sludge trenches



# Dewatered sludge trench



# Disturbed control row





# Disturbed Control

Locusts  
and  
poplars



# Willows Undisturbed Control between two Dewatered Sludge rows



# Undisturbed Control hybrid poplars and locust



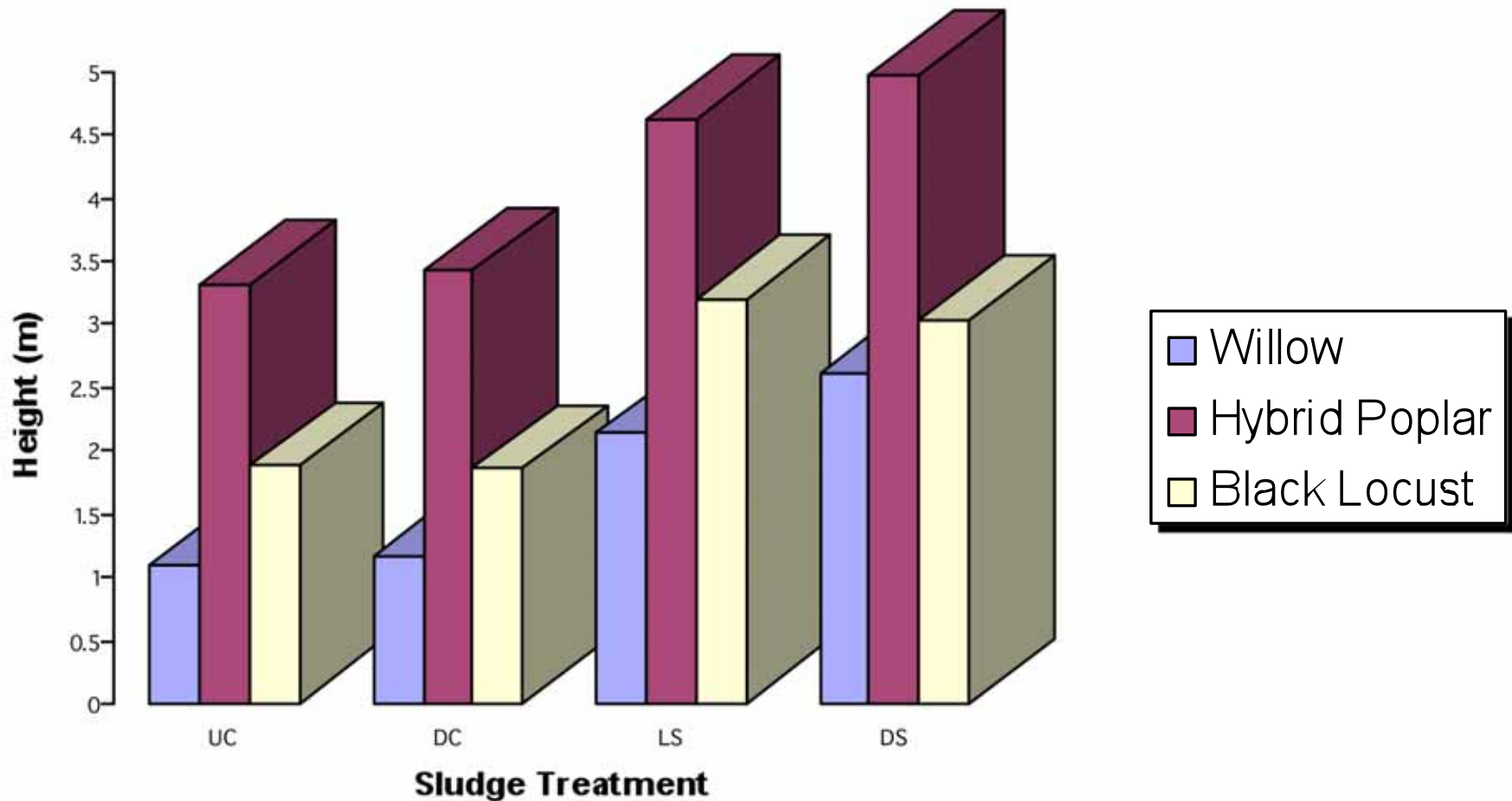
# Liquid sludge – poplars



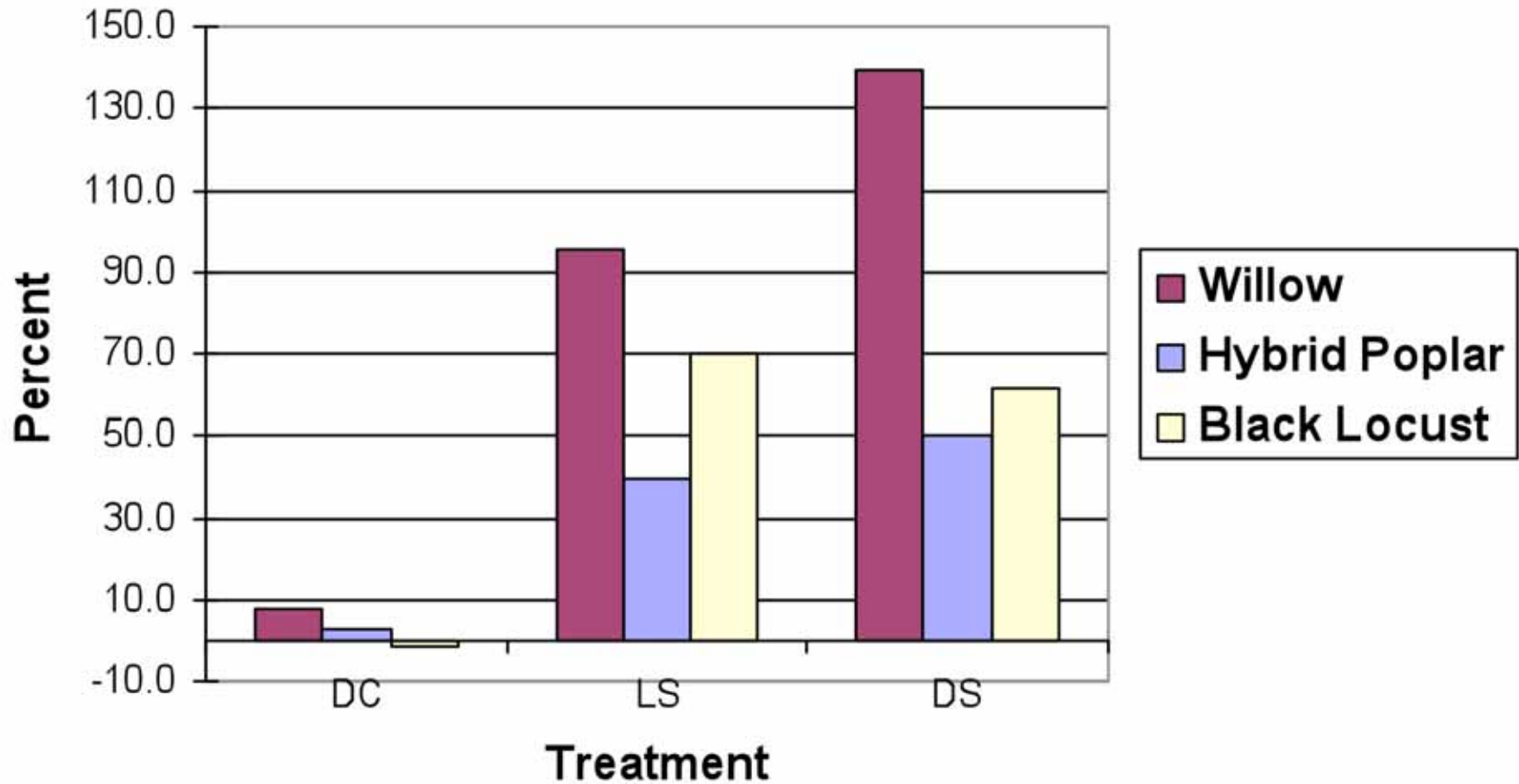
# Black locust with willow understory



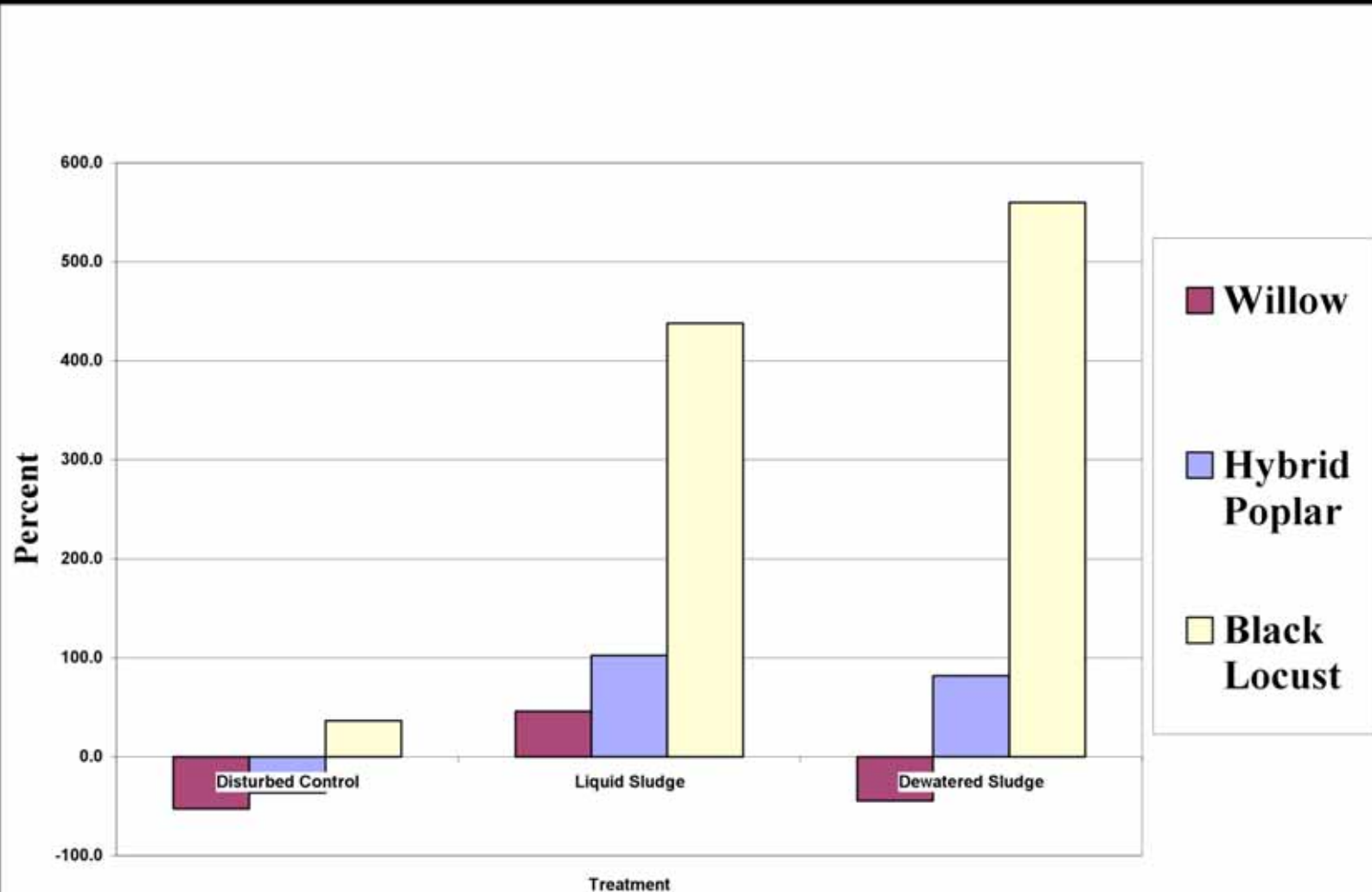
# 1999 Mine Tailings Project Seven-year Growth Results



# Percent Change in Average Heights from Undisturbed Control



# Percent Change in Average Root Mass from Undisturbed Control







**Does a developing forested ecosystem, on a former waste dump, constitute a “beneficial use” of entrenching paper mill sludge?**