



# OSM TECHNOLOGY TRANSFER

## APPLIED SCIENCE

### FINAL REPORT FACT SHEET

USDOJ Office of Surface Mining Reclamation and Enforcement

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## RESPONSE OF TRANSPLANTED ASPEN TO DRIP IRRIGATION ON RECLAIMED MINE LANDS

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### Project Description and Objectives:

Successful re-establishment of aspen on surface-mined lands in the western United States is problematic because the species normally regenerates vegetatively by sprouting from parent roots. This is not possible on reclaimed lands since topsoil containing rootstock is removed in the mining process. Soil moisture on reclaimed soils is often limiting for growth of small planted trees. Previous attempts to plant aspen seedlings on reclaimed surface mines have failed because transplanted root sprouts or seedlings do not have an extensive root system to access water and nutrients for rapid growth, and lack of soil moisture prevents the establishment of newly planted trees. The use of supplemental irrigation to help establish planted aspen was tested; and growth and survival of aspen stock on two soil types were compared. Soil and water conditions were monitored, and the effect of weed control on planting success was examined. Growth of trees transplanted from local sources was compared to potted nursery stock from unknown sources.

### Applicability to Mining and Reclamation:

This study confirmed that aspen trees can be established on reclaimed surface mine lands. The method utilized natural saplings transplanted from nearby local sources, and control of competing vegetation



ABOVE PHOTO: Growth of aspen on roto-cleared fresh-hauled topsoil (left) and dozer-cleared stored soil (right).



ABOVE PHOTO: Growth of aspen trees planted on reclaimed coal mine land, with competing vegetation (right) or removal of competing vegetation by hand-weeding (left).

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around individual trees by hand weeding. The study also indicated that best growth was on soils that were fresh-hauled compared to stored soils. Fresh-hauled top soils also provided aspen roots for natural sprouting. Best growth is obtained from trees transplanted from nearby local sources compared with potted nursery plants from unknown sources. Supplemental irrigation was of marginal usefulness in growth and survival of the aspen.

### Methodology:

The study was conducted at high elevation on relatively steep slopes of the Seneca Coal Mine of Hayden, Colorado. The area was surface mined for coal, overburden was replaced, and about three feet of topsoil was added. Natural aspen sprouts were transplanted from a nearby source or from potted nursery stock, with or without hand weeding, and with or without supplemental irrigation. The study was conducted on two soil types, one was fresh-hauled from a new mining site while the other was removed and stored for several months before placement at the experimental site. The experimental areas were fenced to prevent browsing by herbivore.

### Highlights:

**Irrigation:** Natural precipitation appeared to be sufficient to allow adequate growth and survival of the plants without supplemental irrigation. Initial water supply for irrigation was from a nearby pond that was found to be saline, suggesting that care should be taken to avoid saline water for irrigation of newly planted trees.

**Soil type:** Best growth and survival was on trees that were planted on fresh-hauled soils that had not been stored off-site. More natural sprouts were evident on the fresh-hauled soil.

**Weeding:** Removing competing vegetation around individual trees resulted in a dramatic increase in growth and survival of the trees. This was likely a result of removal of competition for soil moisture.

**Nursery stock source:** Best growth and survival was with small trees directly transplanted from local sources. Potted nursery stock trees survived well but growth was considerably less.

### Results/Findings:

The best combination of conditions for reproduction of aspen on reclaimed surface mined coal lands used transplanted saplings from local sources on fresh-hauled soil removed from aspen stands. Growth was significantly higher when competing vegetation was removed around individual trees. Irrigation with non-saline water may enhance growth and survival in years with drought conditions.



ABOVE PHOTO: Transplanted aspen saplings with hand-weeding (left) and without weeding (right), three years after planting.

### Website Information:

The final project report can be found at <http://www.techtransfer.osmre.gov/NTTMainSite/appliedscience/2006appscience/CompletedProjects/CSUandUSDATransplantedAspen2006.pdf>

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