

Decisions

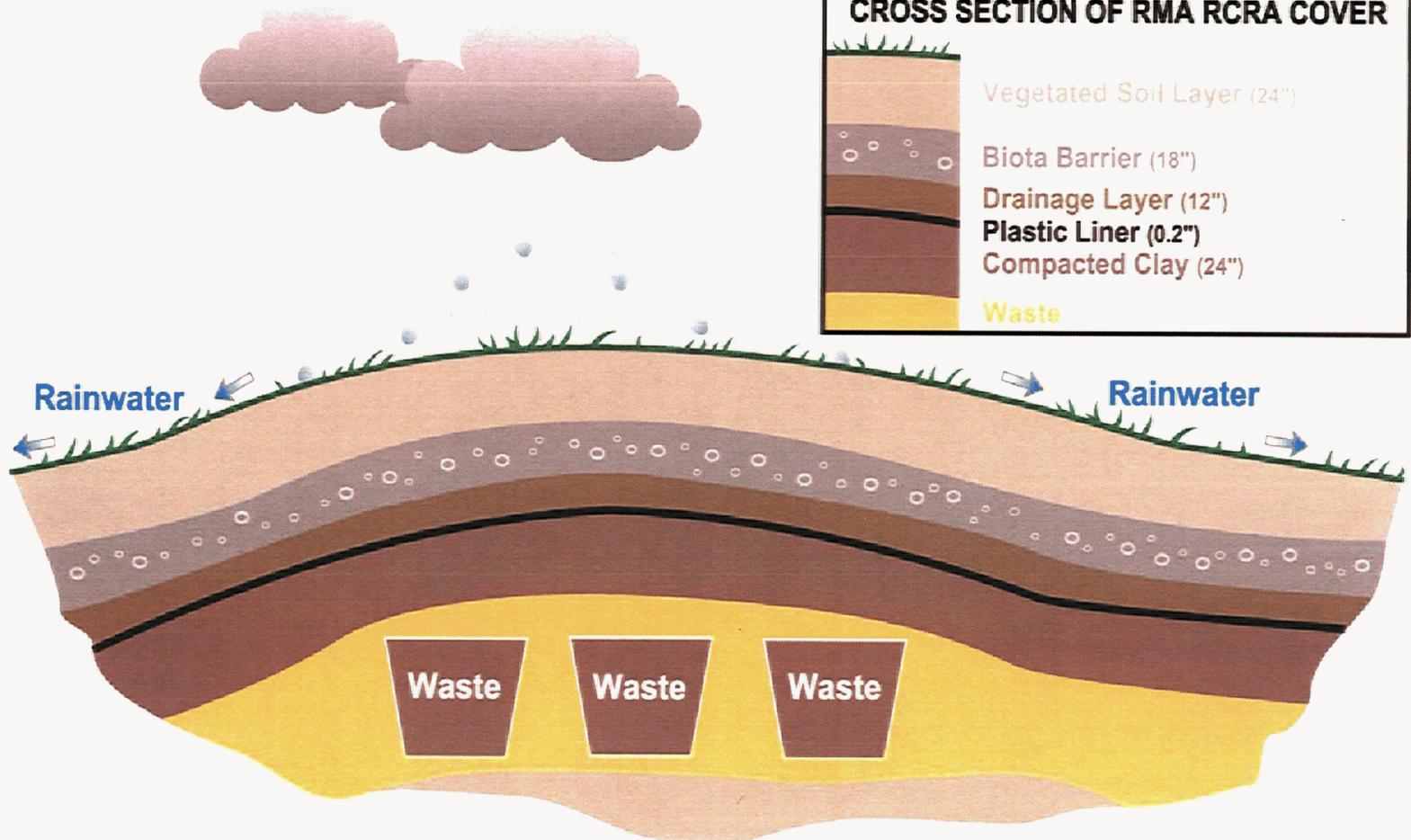
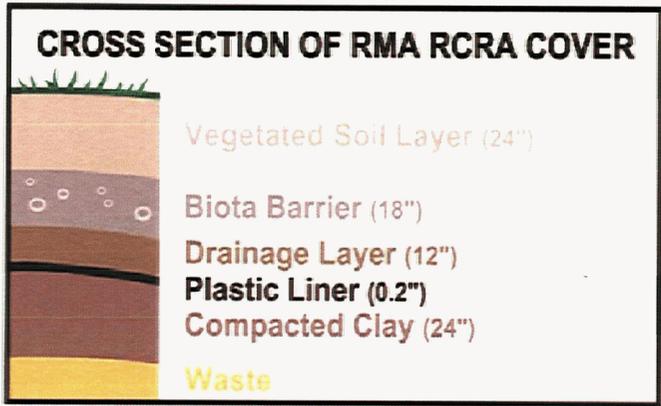
- ❖ How RCRA Equivalency would be determined
- ❖ How the comparative analysis would be conducted
- ❖ How the field demonstration would be designed, constructed, and monitored
- ❖ How the transition from demonstration to full-scale would be implemented

RCRA Cover Requirements

- ❖ Minimization of percolation through unit
- ❖ Minimum maintenance
- ❖ Promote drainage, Minimize erosion
- ❖ Accommodate settling and subsidence
- ❖ Have a permeability less than or equal to bottom liner or natural subsoils



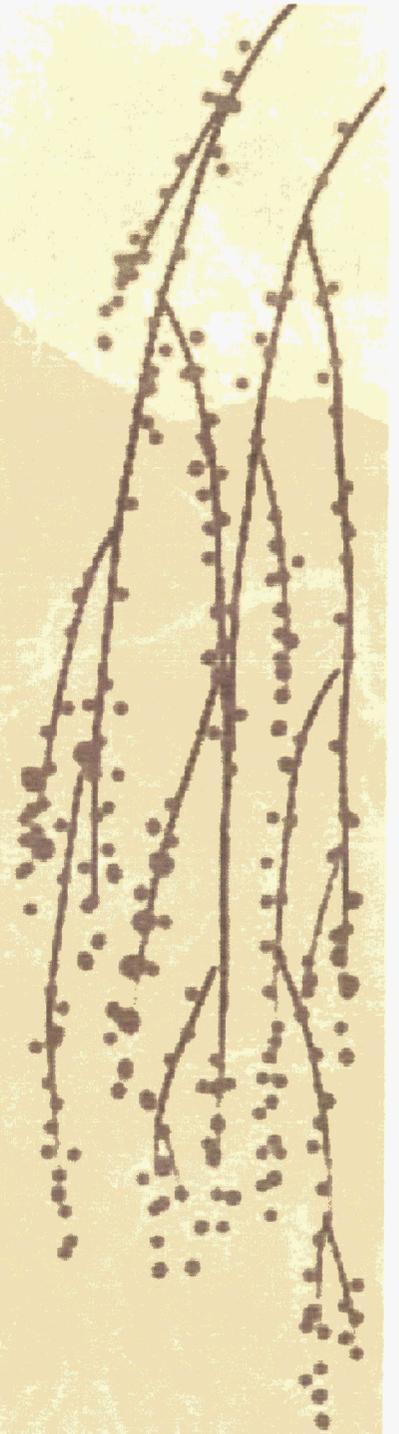
RCRA Cover Design



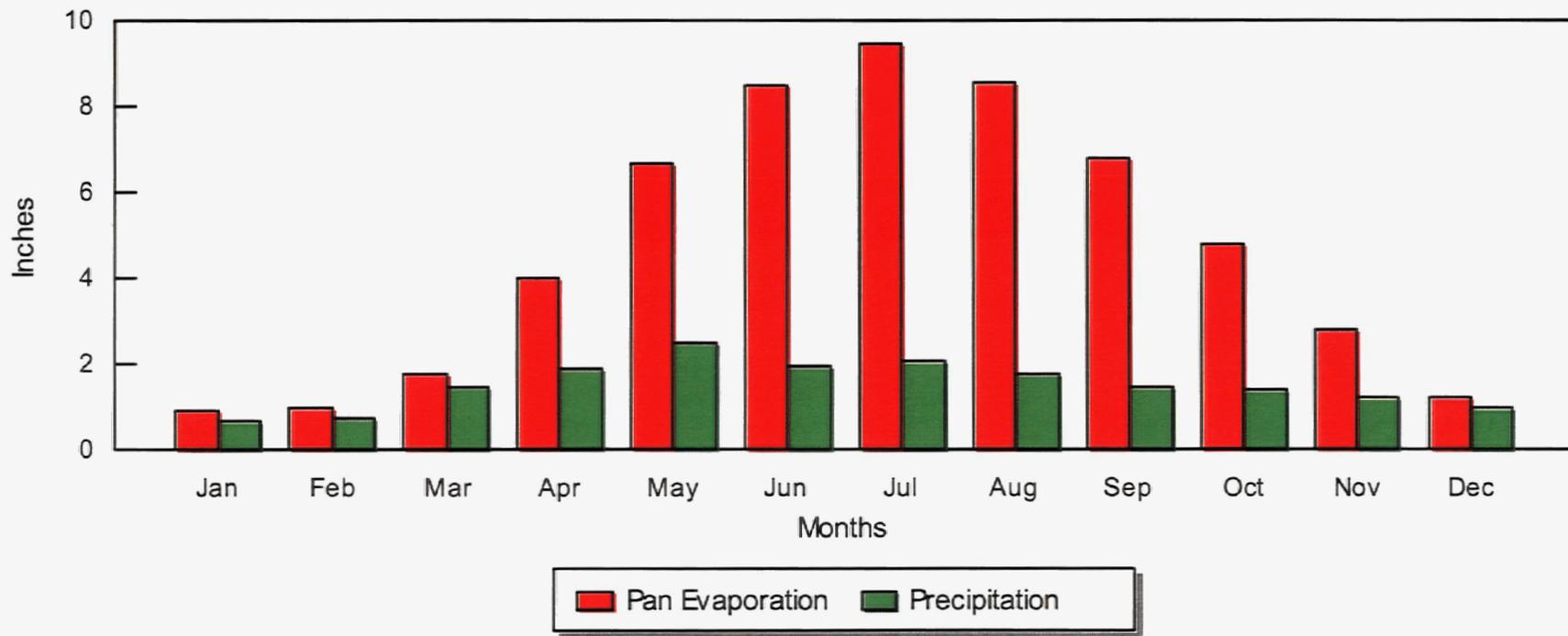
Design Basis

Why Would This Work?

- ❖ Semi-Arid Climate
- ❖ Availability of Suitable Soils
- ❖ Sustainable Vegetation

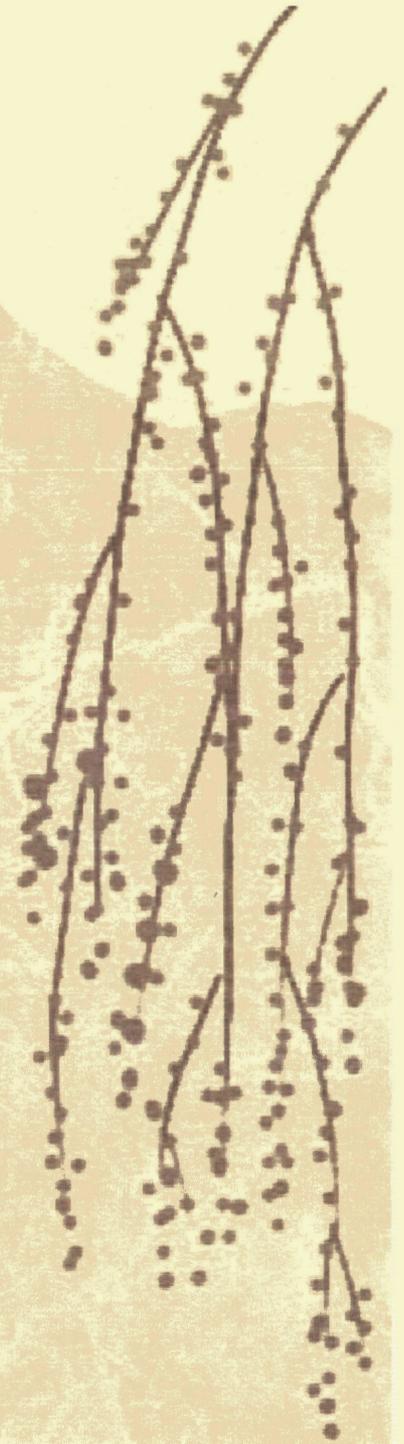


Rainfall and Pan Evaporation in the Denver Area: 1959 - 1994



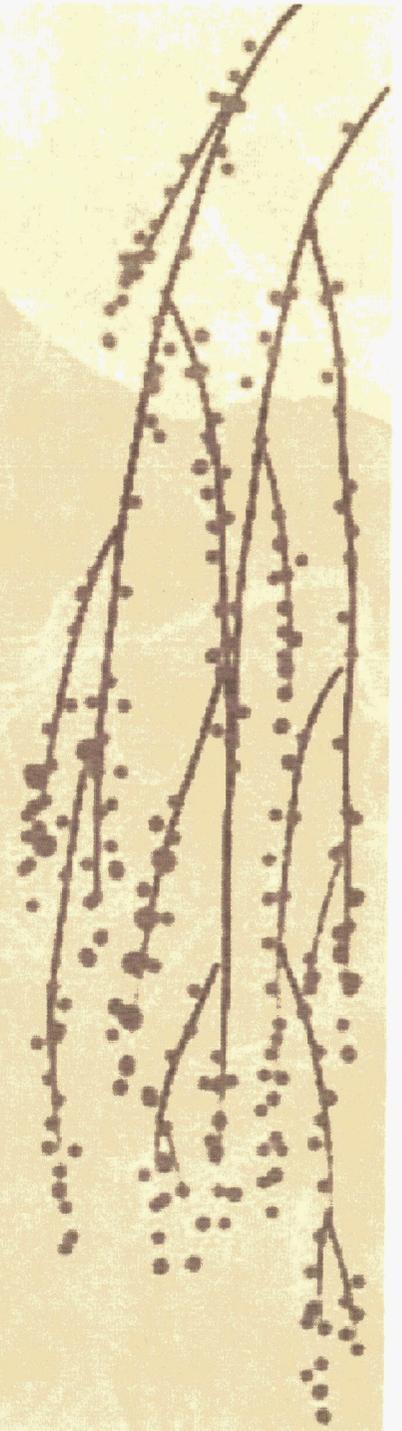
Evaluation of Soils

- ❖ Particle size gradation
- ❖ Saturated hydraulic conductivity
- ❖ Moisture characteristic curves



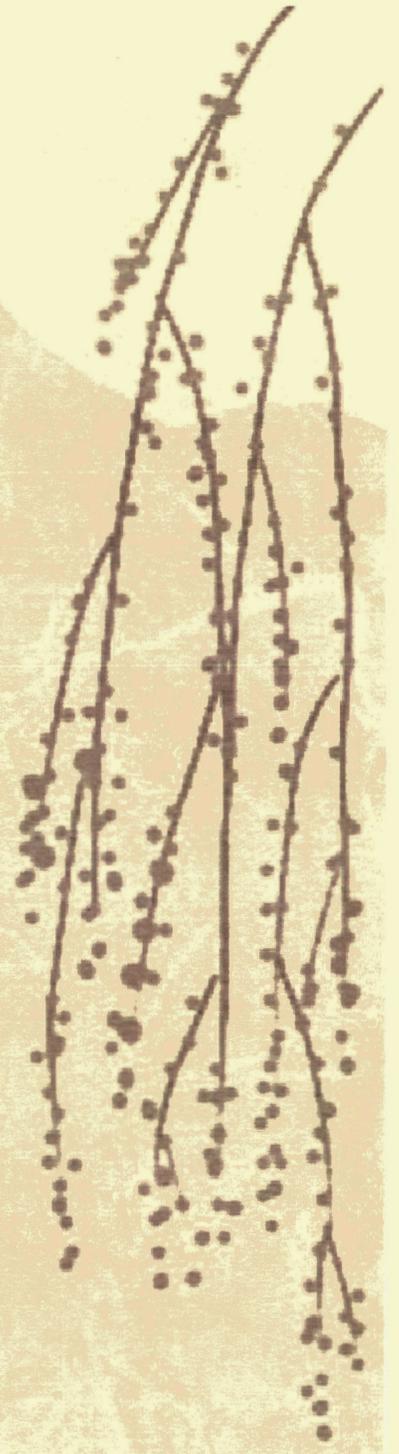
Sustainable Vegetation – Factors to Consider

- ❖ Height of mature vegetation
- ❖ Persistence
- ❖ Leaf-Area Index contribution
- ❖ Cool and Warm Season Grasses
- ❖ Seed Availability

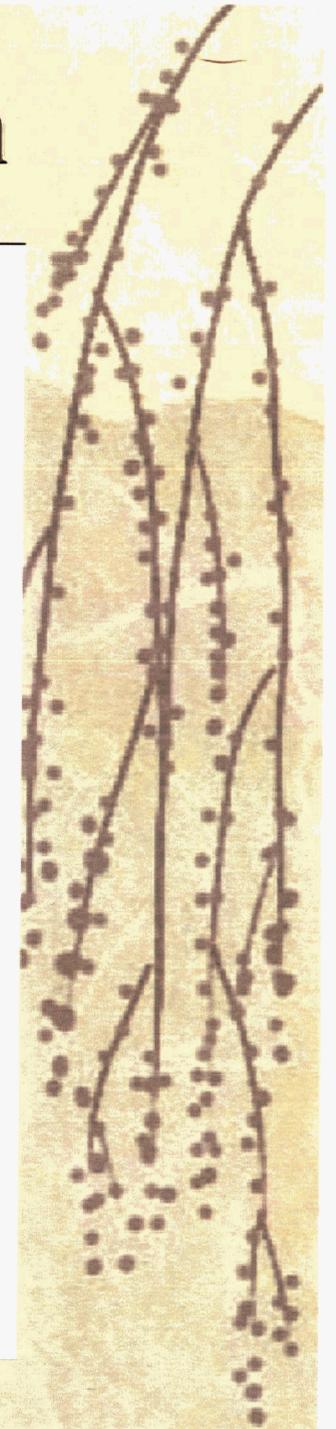
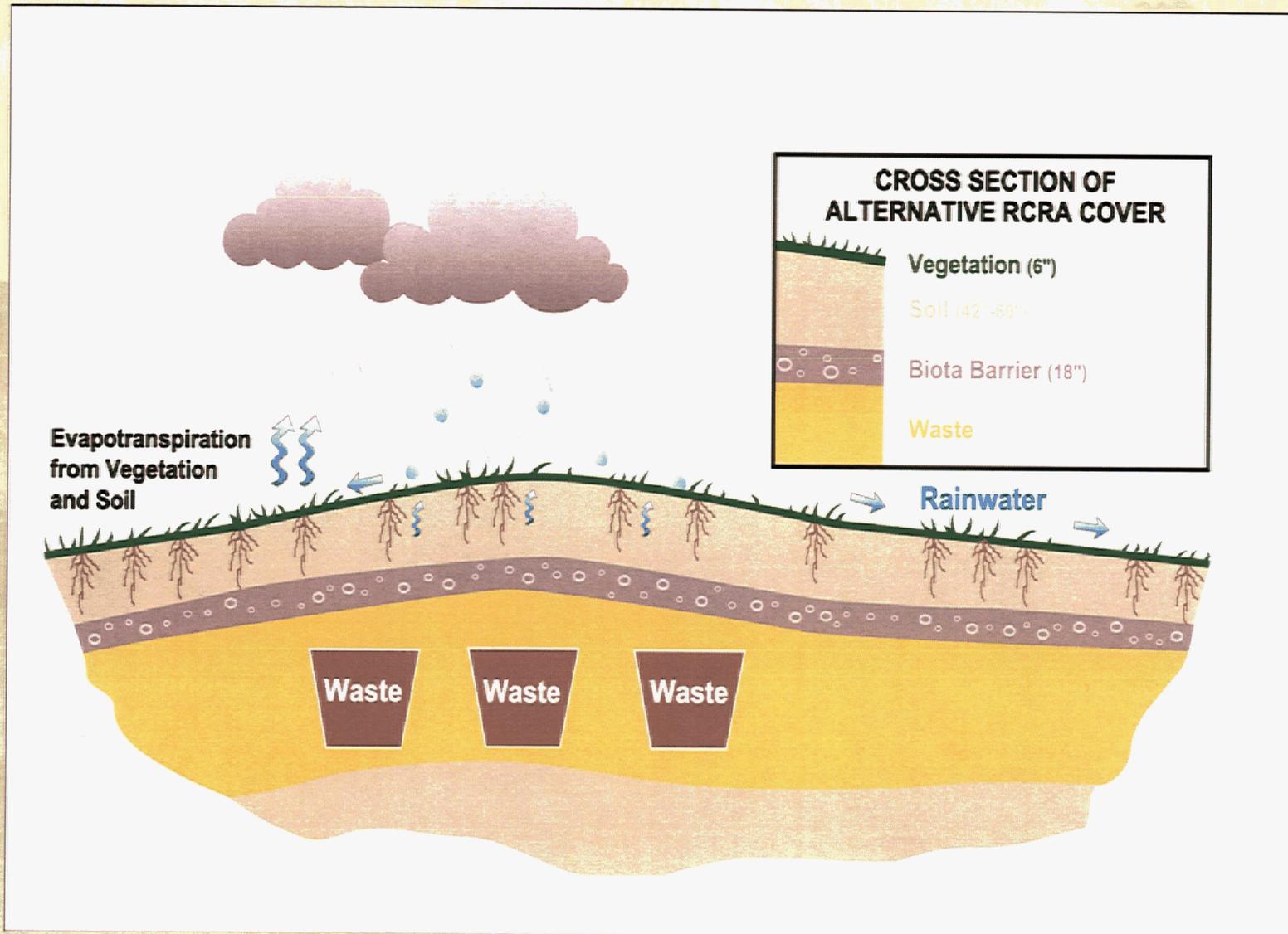


Comparative Analysis

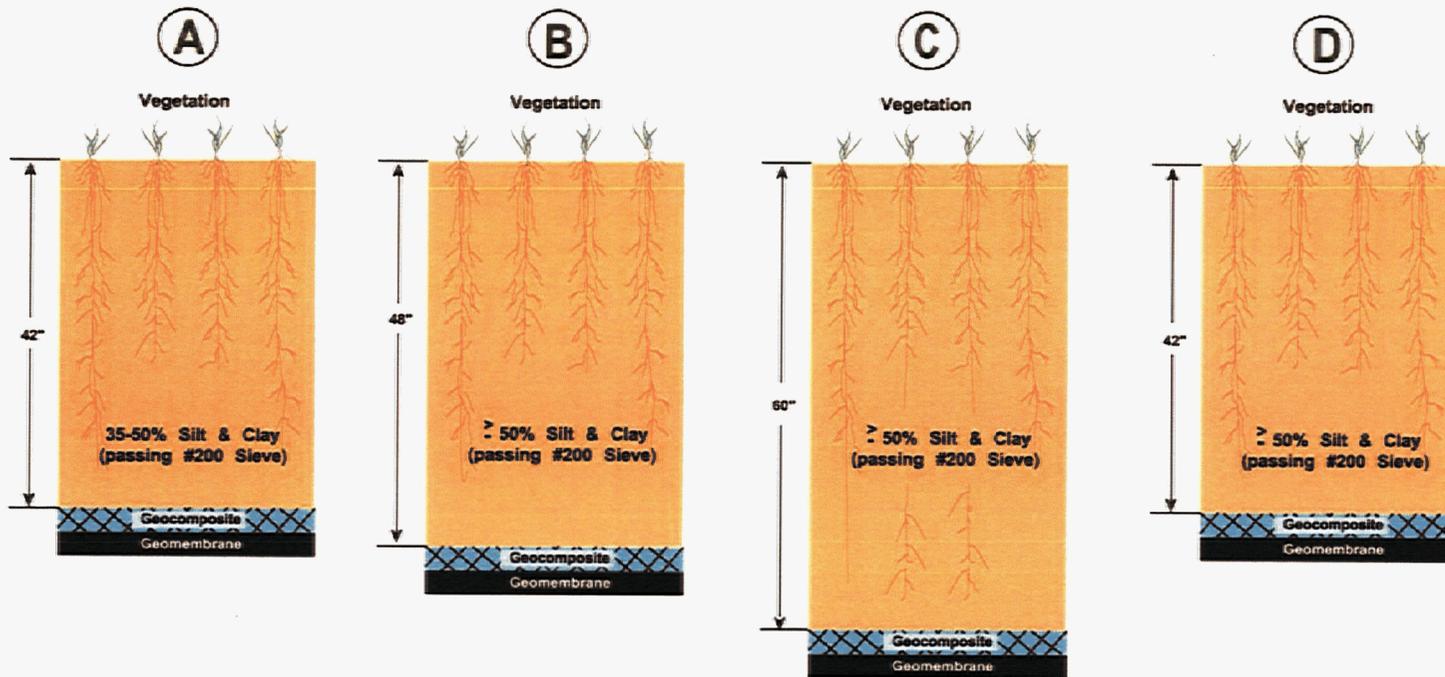
- ❖ Basis for Comparison
- ❖ Comparative Modeling
- ❖ Field Demonstration



Alternative RCRA Cover Design

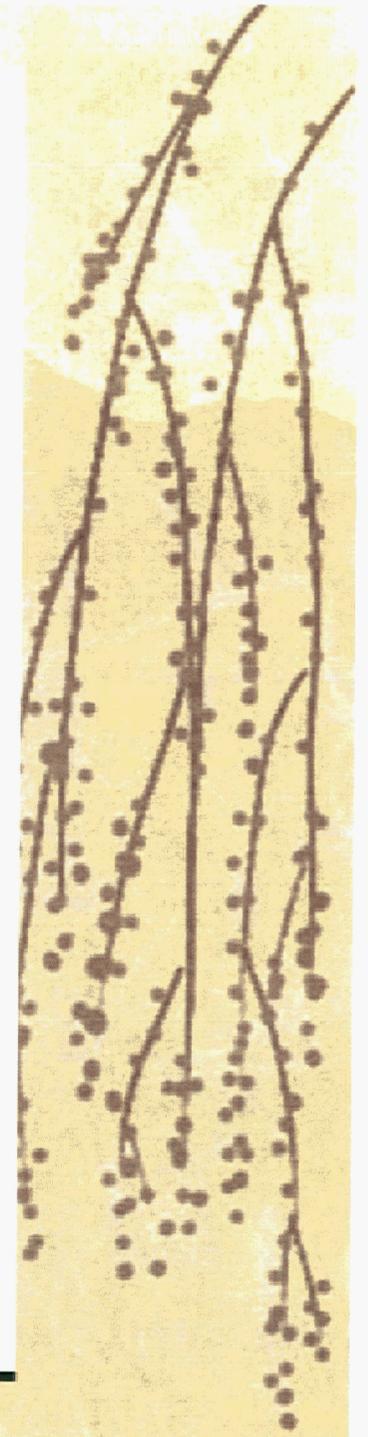
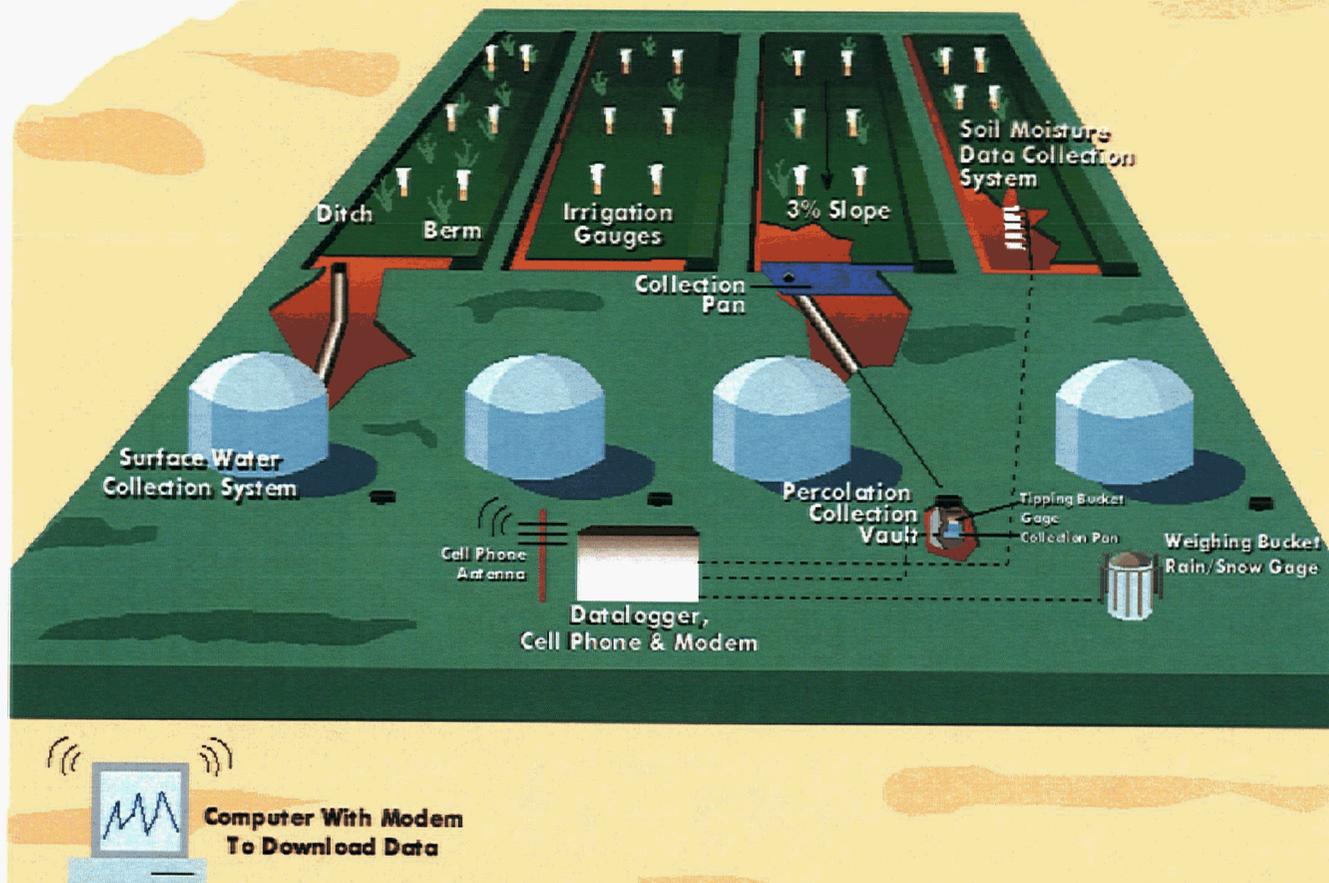


Test Cover Cross Sections



Test Cover Cross Sections

RCRA- Equivalent Cover Demonstration Project Monitoring Instrumentation





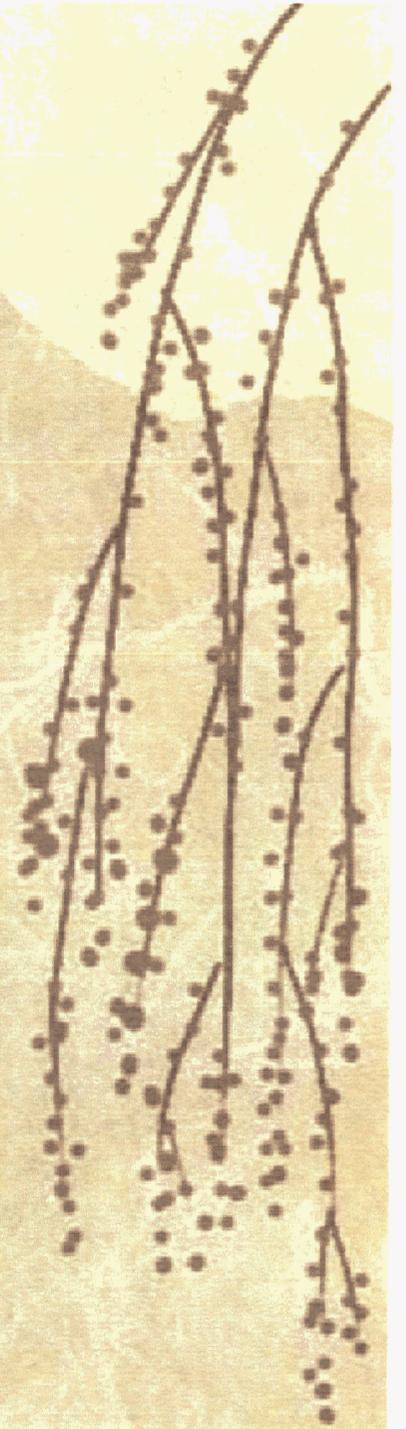
Sprinkler System in Operation

First Blades of Grass





Test Cover at End of Test Year



Percolation Results

Rocky Mountain Arsenal RCRA-Equivalent Cover Demonstration Project

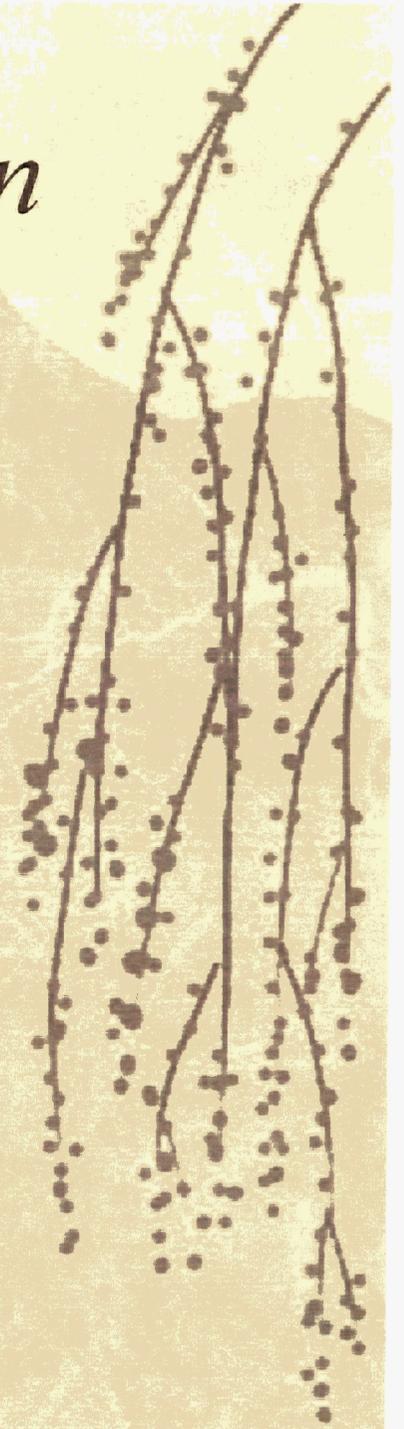
RESULTS FROM TEST YEAR PERIOD (September 1, 2000 through August 31, 2001)

Test Cover ID	Cover Thickness (inches)	Soil Type	Natural Precipitation (inches)	Precipitation Plus Irrigation (inches)	Surface Runoff (inches)	Deep Percolation* (gal.)
A	42	Coarse Grain	15.56	21.44	0.27	0
B	48	Fine Grain	15.56	21.58	0.33	0.07
C	60	Fine Grain	15.56	21.42	0.34	0
D	42	Fine Grain	15.56	21.55	0.37	2.87

*Pass/Fail criterion was approximately 48 gallons.

Full Scale Implementation

- ❖ Soil Specifications
- ❖ Borrow Soil Characterization
- ❖ Placement Densities
- ❖ Quality Assurance/Quality Control
- ❖ Swale Design
- ❖ Percolation Monitoring
- ❖ Vegetation Monitoring
- ❖ Settlement and Erosion Monitoring



Summary

- ❖ Properly constructed evapotranspirative covers perform as well as prescriptive RCRA-C covers
- ❖ Cost savings
- ❖ Naturally sustainable