

Experiences with “Sponge and Pump” Tree Covers

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Presentation outline

- Introduction to tree covers
- Case history
- Performance data
- Conclusions and path forward

Present status of tree covers in the U.S.

> 40 evapotranspiration landfill covers

20 tree landfill covers?

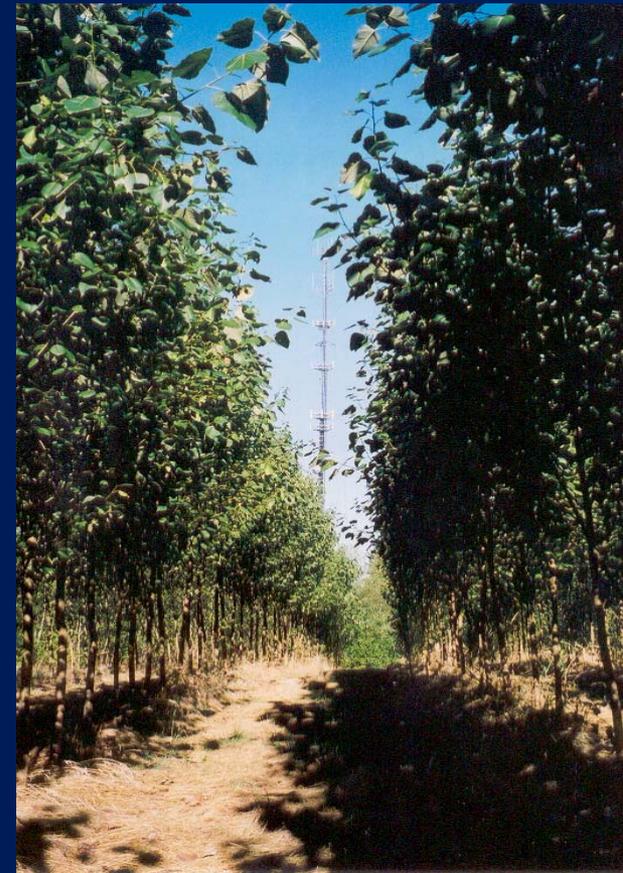
Our experience:

- 13 landfills (pre-Subtitle D, Subtitle D demonstrations, construction debris, Superfund)
- 11 non-landfill tree covers/caps



Benefits of tree covers

- Reduced construction and operation costs (30-50%)
- Can utilize temporary cover and waste materials to build the cover
- Lets the landfill “breathe” (reduce subsurface landfill gas movement offsite)
- Create wildlife habitat
- Beneficial end use/asset for community



Limitations of tree covers

Establishment period when “sponge and pump” not at full capacity

Landfill conditions can be tough on plants (i.e. gas, compaction, low nutrients)

Permit in jeopardy if trees die

Potential to leak more than prescriptive covers (regulatory barriers)



Case history:
Construction debris landfill (Oregon, 1990)



Shortly after planting 7,500 hybrid poplar whips (spring 1990)





...soldiers of sauron. Desped



G A N D A L F





DVD
TOWNS



Results since 1990

Received permit for tree cover over remainder of landfill (Oregon DEQ permit #24)

Tree height = 50-70 feet

Tree roots growing through entire 4-foot cover

Soil moisture data suggests superior water management to grass-only cover

> 30 poplar varieties planted over additional 15 acres



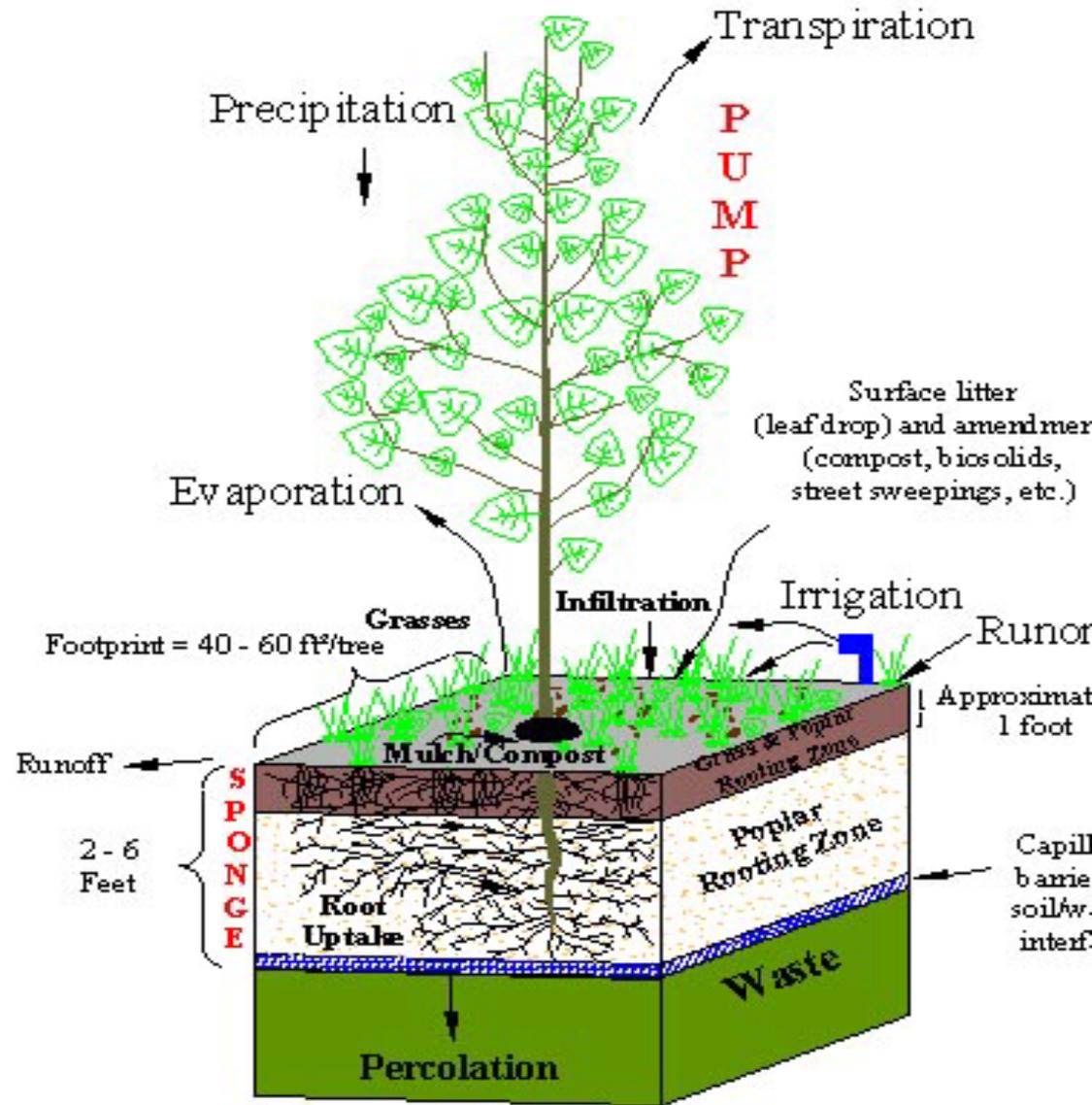
Lessons learned

- Involve the regulator early on
- Beware of compaction (preparatory rip)
- Plant trees at lower density
- Keep the sheep out



“Sponge & pump” mechanism

Tug of war between ET and available water holding capacity (AWHC)



$$\text{Percolation} = \text{Initial Moisture} + \text{Precipitation} + \text{Irrigation} + \text{Runoff} - \text{Final Moisture} - \text{Evaporation} - \text{Transpiration} - \text{Runoff}$$



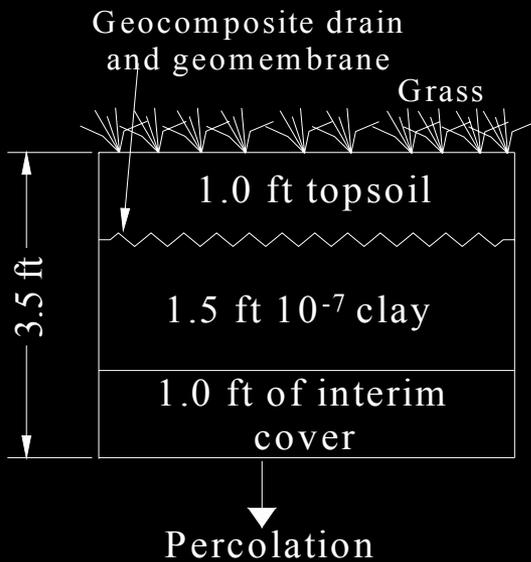
Why start with mainly pioneering trees?

- Permit requires getting sponge and pump functional quickly
- Hardier trees more tolerant of environmental stresses (pH, low nutrients, weeds, low oxygen)
- Many climax species (oak, hickory) need shade to get established
- Transition to the climax forest

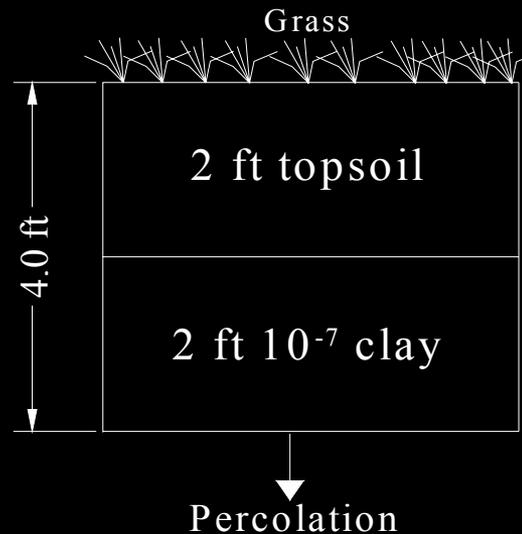


Performance data: ACAP study at Subtitle D landfill in Iowa

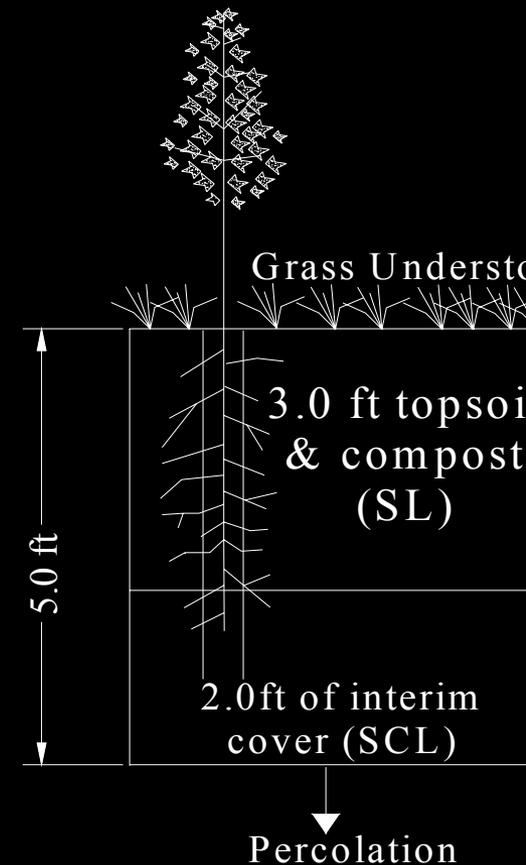
RCRA Subtitle D Cap



IDNR Cap



ECap™



Freeze-thaw climate, average annual precipitation = 34 inches





ACAP study results to date for Iowa landfill

percolation (leakage) rates and water management efficiencies between 7/1/01 – 10/18/01 and 5/4/02 - 10/21/02:

CRA cover =	0.3 inches	99%
DNR cover =	1.7 inches	96%
Cap™ cover =	3.0 inches	92%

months of data

precipitation = 39 inches



Tree cover being evaluated

7. 28. 2002

Performance data:
ACAP study at landfill in southern Georgia

Current situation:

Active Marine Corps base

20-acre former trench and fill disposal area

50 inches precipitation/year

Cost estimate for capping and 30 years of

O&M (Lunardini and Daniel, 2000):

- Compacted clay cover = \$10.5 million

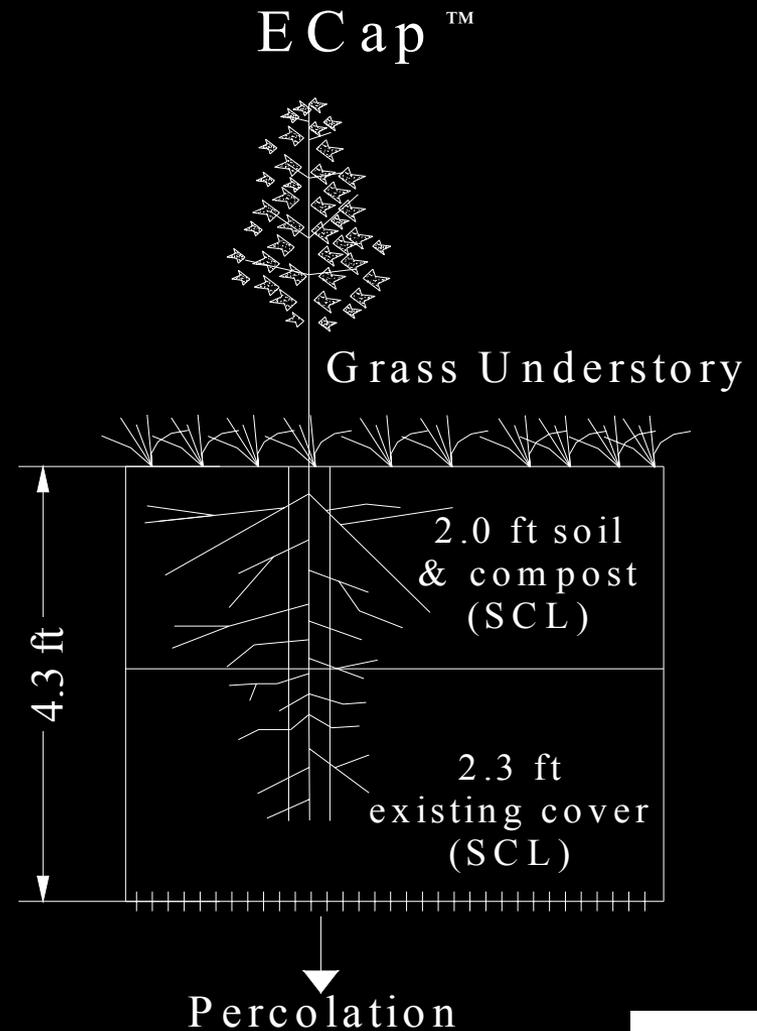
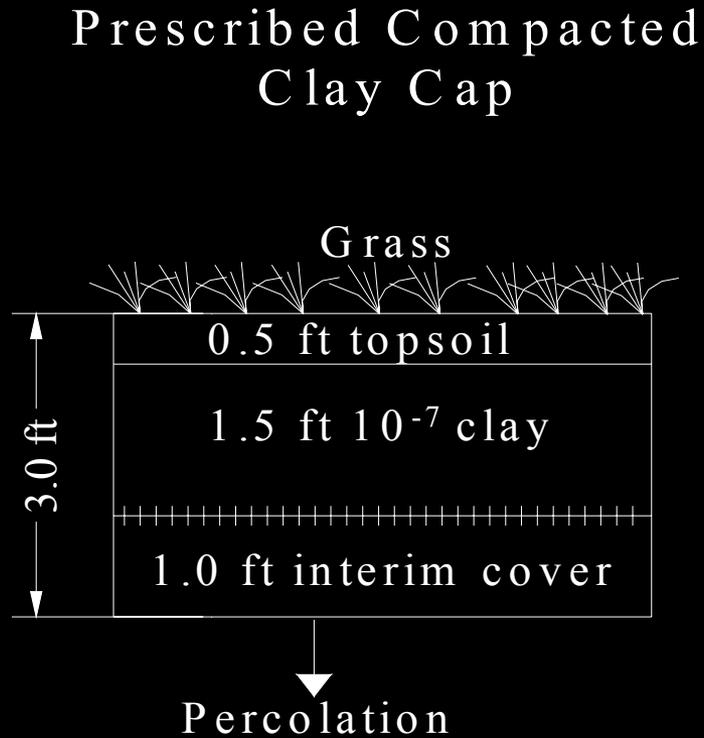
- Tree cover = \$5.4 million

Installed March 2000



Former disposal area

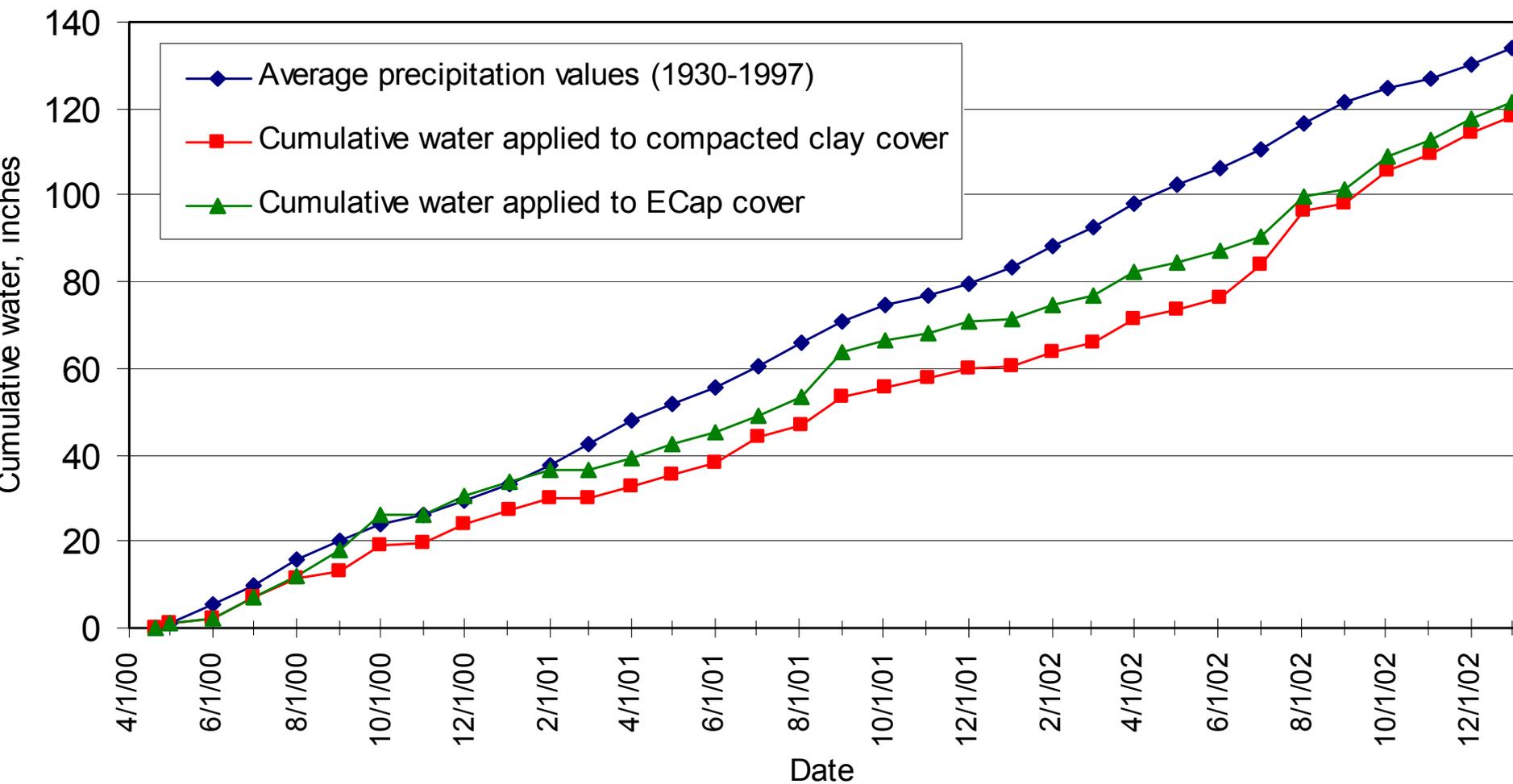
ACAP study at military base in southern Georgia



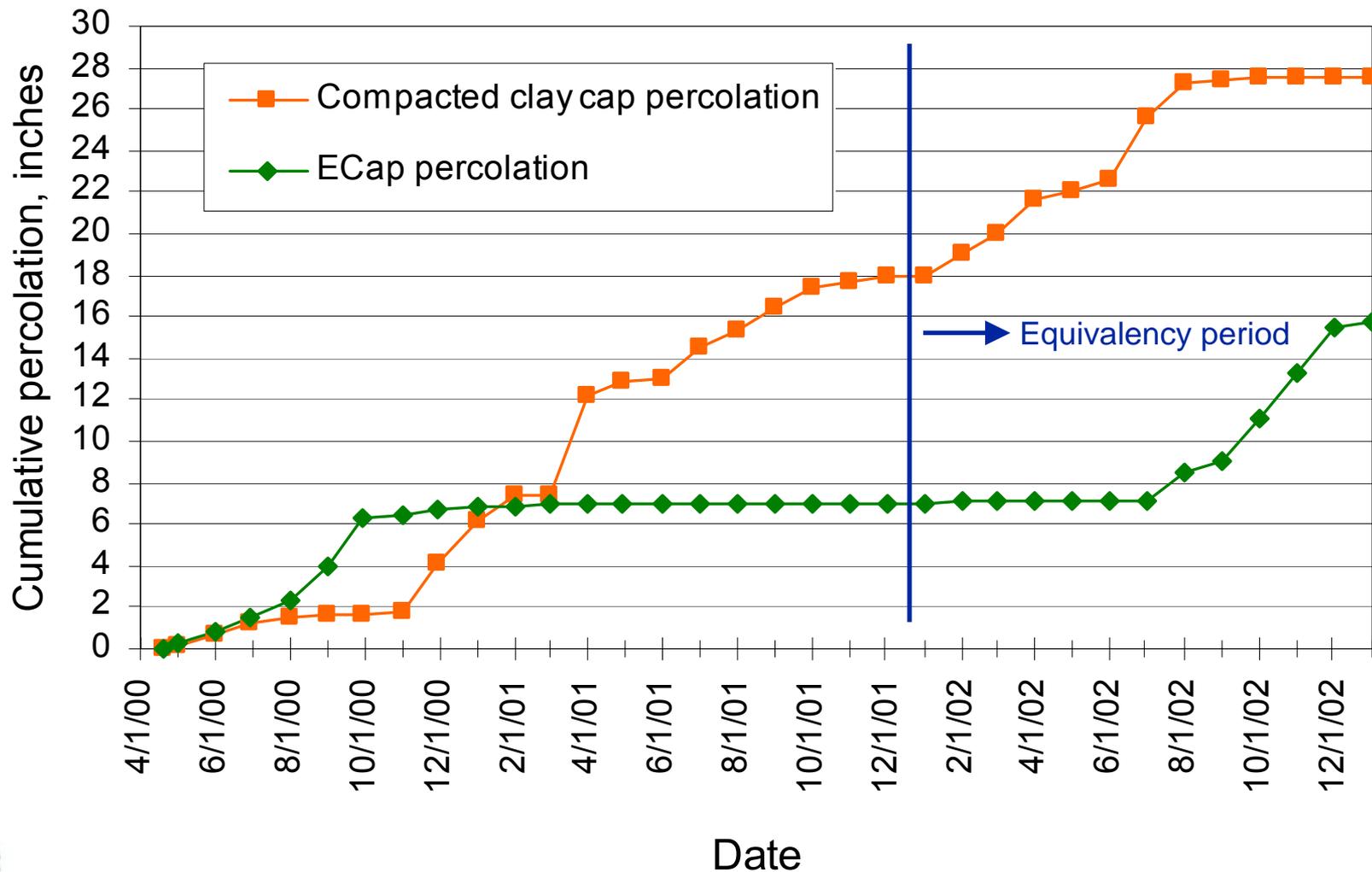
Test cells in August 2002 (2.5 years after installation)



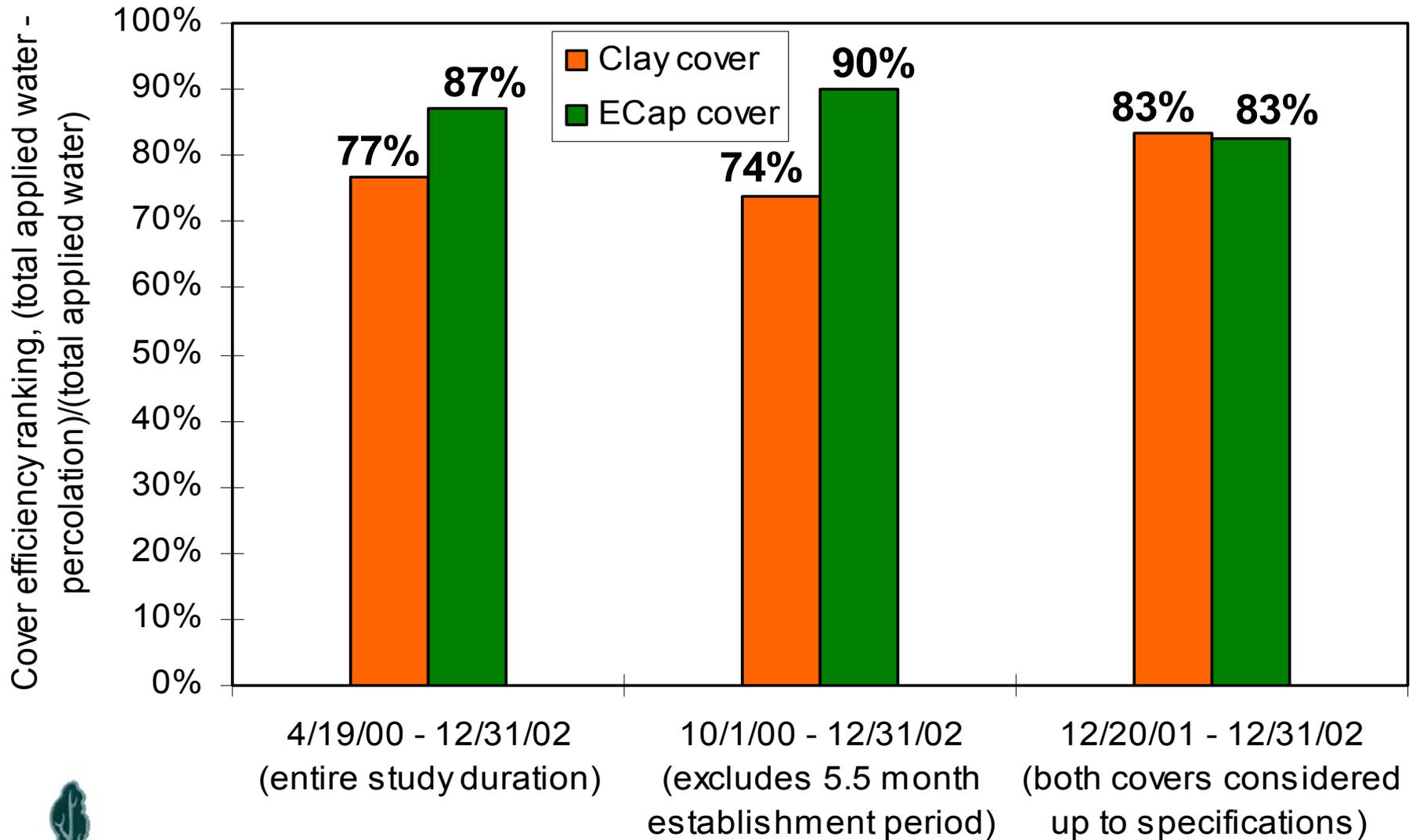
Total applied water to ACAP test cells in Albany, Georgia



Cumulative percolation for ACAP test cells in Albany, Georgia



Cover efficiency for ACAP test cells in Albany, Georgia



Conclusions and Path Forward

- “We” (owners, regulators, and consultants) have learned a lot about sponge and pump tree covers since 1990
- “We” realize that it is not landscaping
- Compared to 1990, more owners, regulators, and communities are open-minded to forested landfill covers
- Performance data is still coming
- US EPA regulatory changes (RD&D or other) are likely needed to take the next step

