Erosion Control Performance Studies on Ornamental Vegetation, Compost, and Jute Netting

CASQA 2008

Caltrans®

Outline

- Problem Statement
- Rainfall Simulation Experiment
- Overland Flow Experiment
- Conclusions

Problem Statement

- Grass species are effective for stormwater treatment on highway slopes and in biostrips.
- Ornamental plants have not been researched for erosion control effectiveness.
- Do ornamental species provide water quality treatment? Or are grasses the preferred species?
- Should ornamental species be replaced with grasses to provide stormwater treatment?

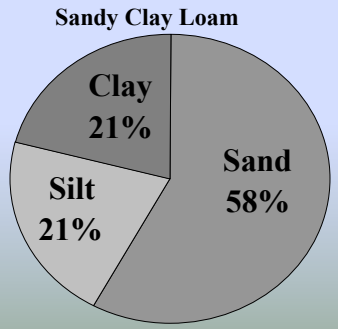
Two Studies

- Rainfall simulation (RS) on slopes to determine erosion control effectiveness of ornamental species and erosion control materials.
- Raindrop erosion

- Runoff simulation of overland flow (OF) through biostrips to determine effectiveness of ornamental vegetation and erosion control materials.
- Sheet erosion

RS Experimental Design

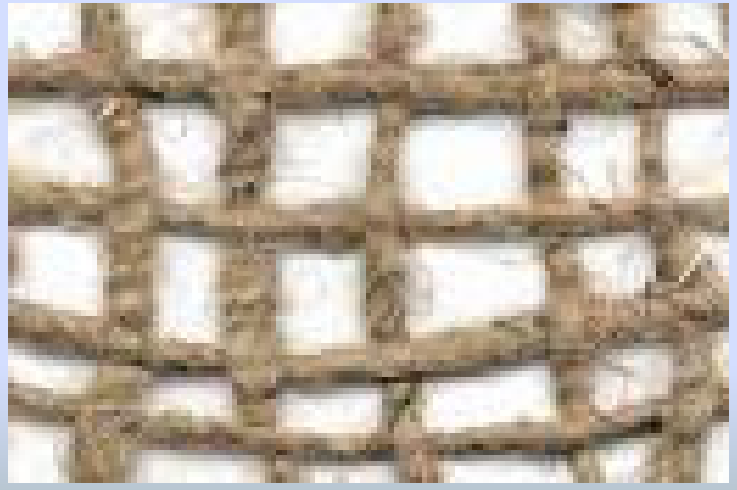
- Twenty Boxes
- 2:1 slope
- Sandy Clay Loam soil
- Treatments: Bare soil, compost, jute netting, or erosion control blankets (ECB)
- Ornamental vegetation commonly used by Caltrans



Erosion Control Materials

Bare Soil

- Jute and blankets are often used as temporary erosion control until vegetation establishes.
- Are erosion control materials effective in reduction of erosion on slopes?



Jute Netting

Compost

RS Vegetation Species

Carpobrotus edulis, Hottentot Fig

Hedera helix, English Ivy

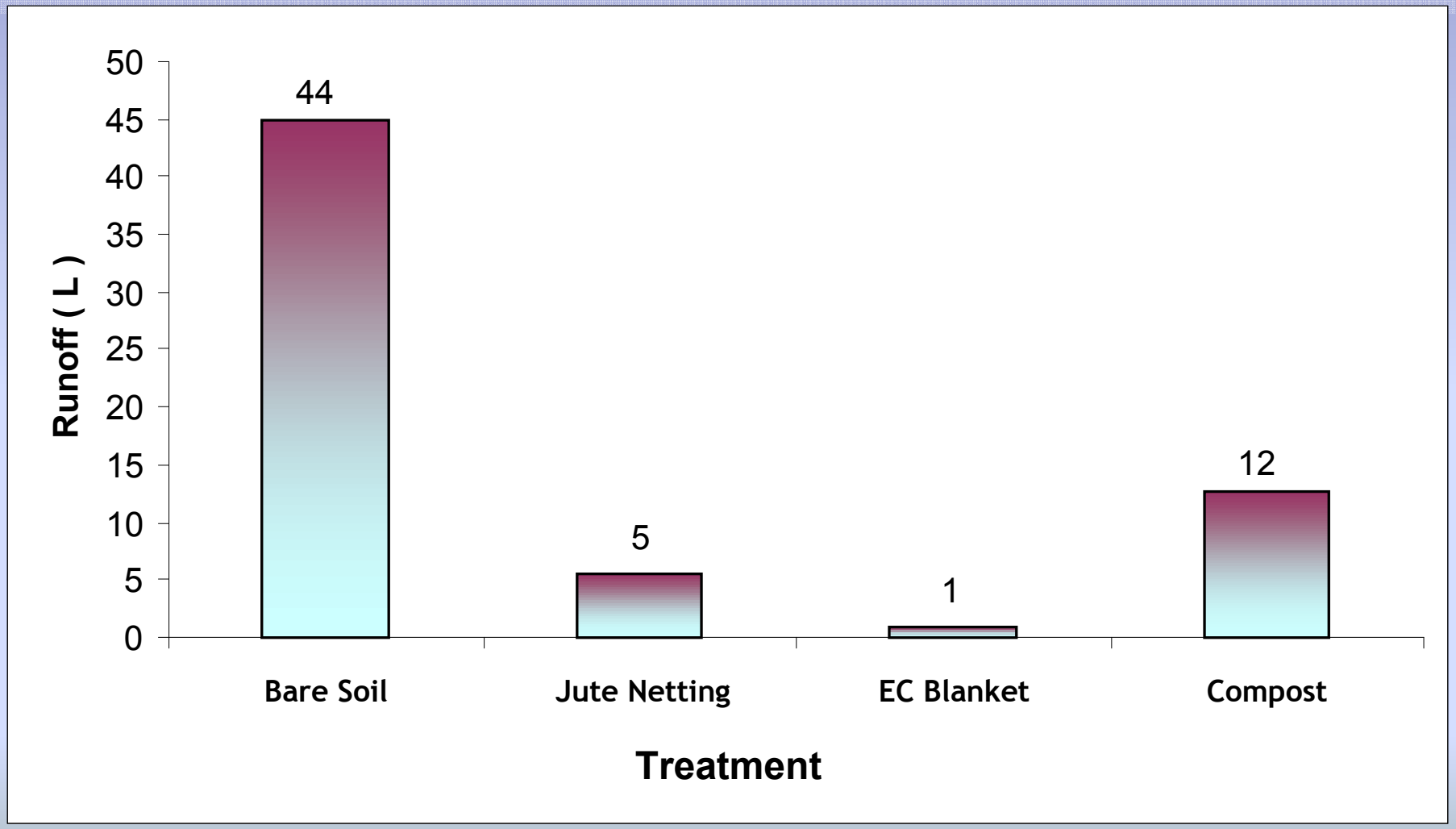
Rosmarinus officinalis, Rosemary

Myoporum parvifolium, Creeping Myoporum

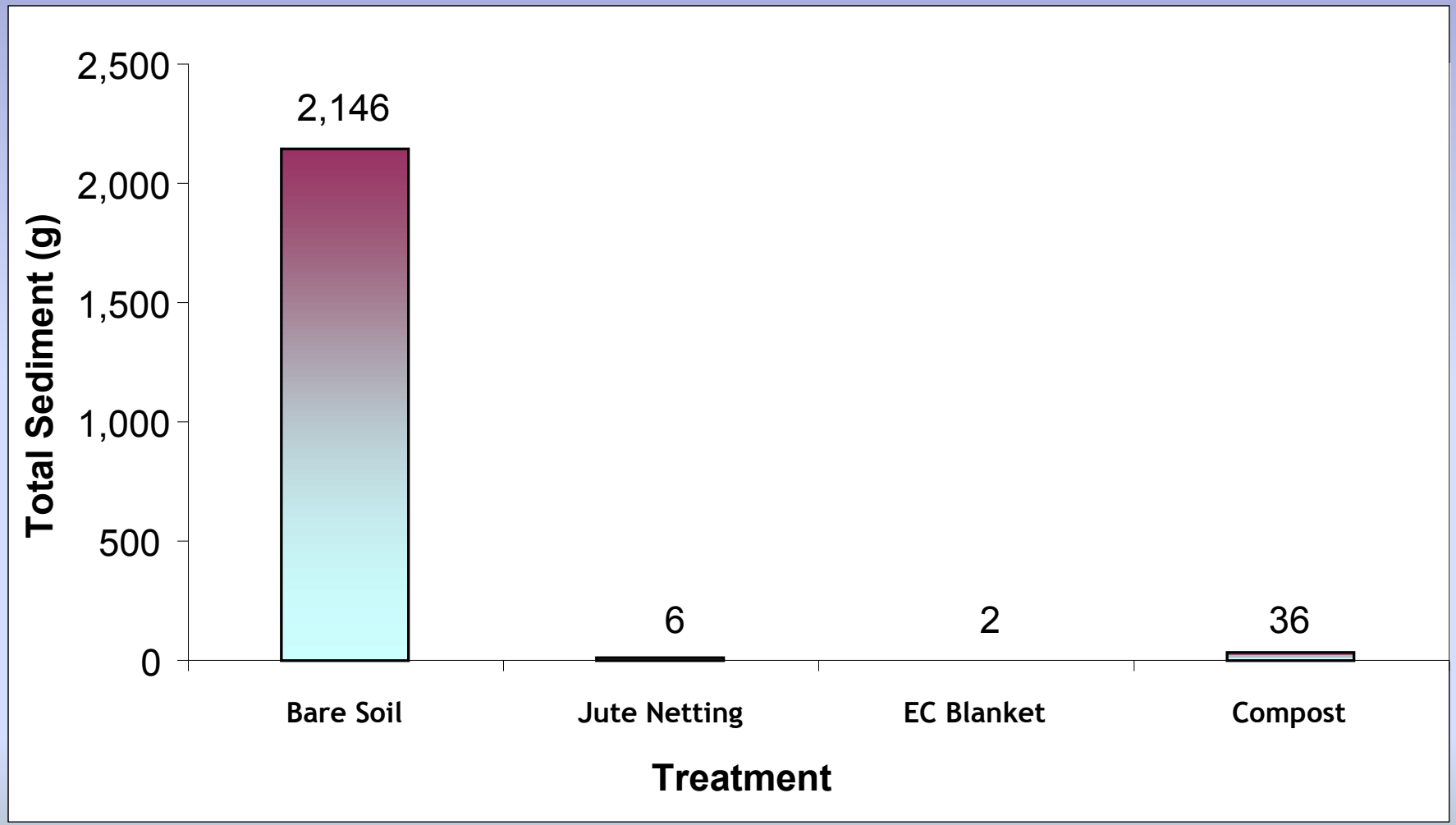
RS Key Findings

- Vegetation reduced runoff by more than 90% compared to bare soil.
- Vegetation reduced sediment by 99% compared to bare soil.

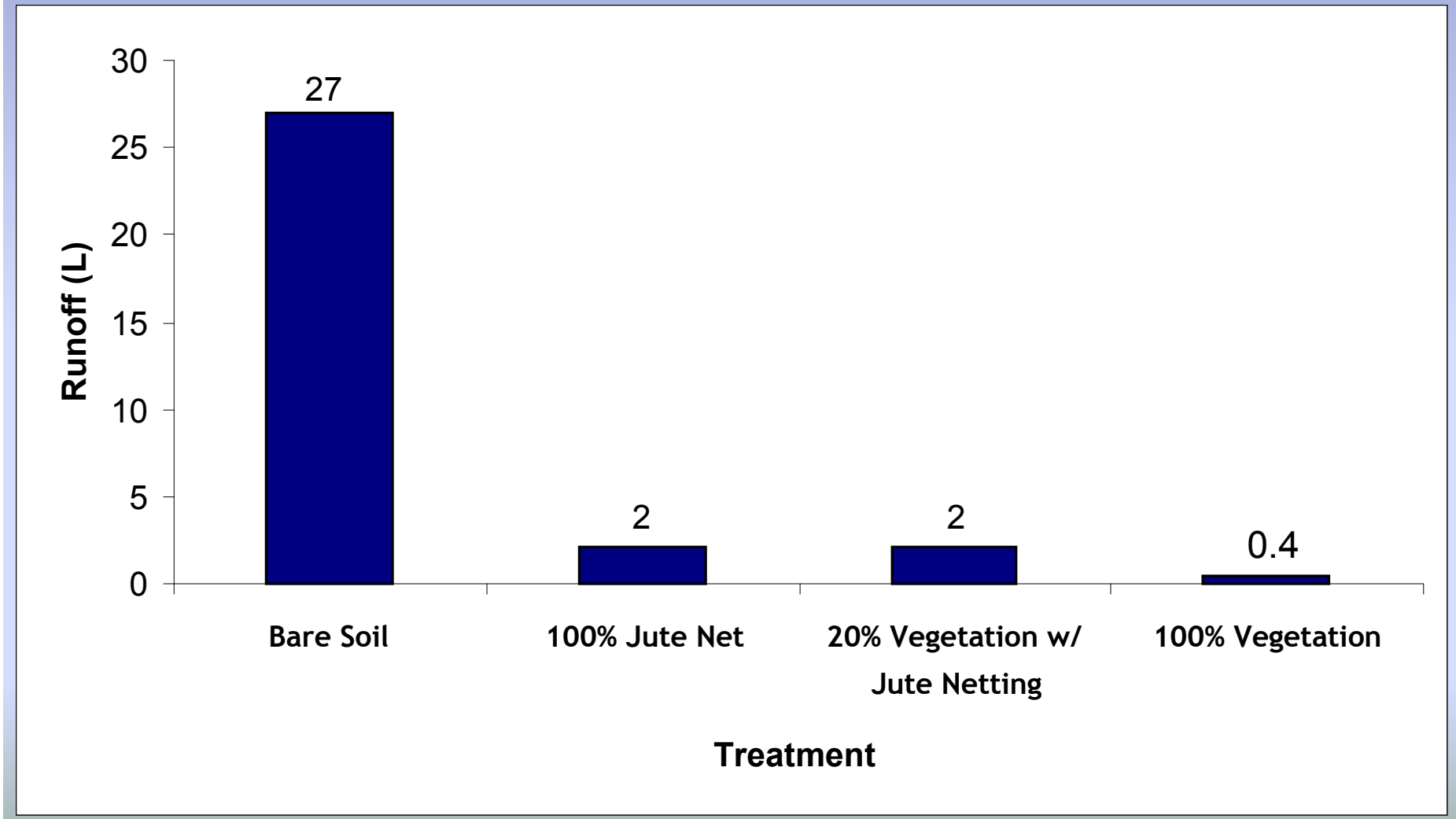
Effect of Erosion Control Treatments on Runoff



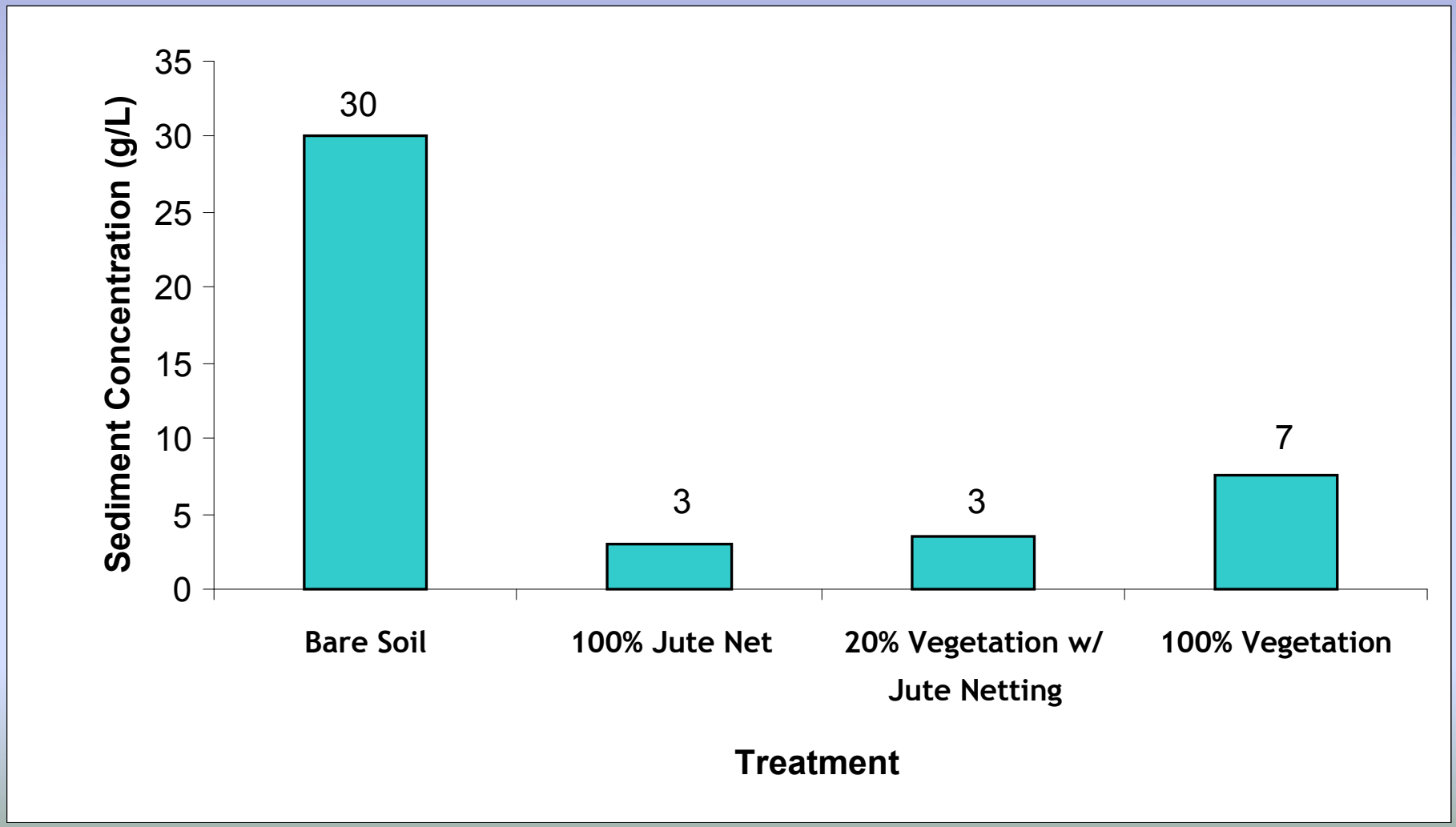
Effect of Erosion Control Treatments on Sediment Concentration



Effect of Different Treatments on Total Runoff

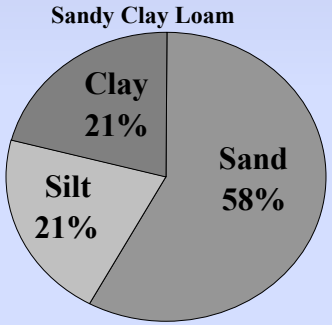


Effect of Different Treatments on Sediment Concentration



Experimental Design: OF1 & OF2

- 3:1 Slope
- Sandy Clay Loam
- 15 gal/hr
- Even distribution of drops onto pre-wetted felt
- Dry soil
- Duration of test varied between OF1 and OF2
  - OF1: 1 hour
  - OF2: 2 hours

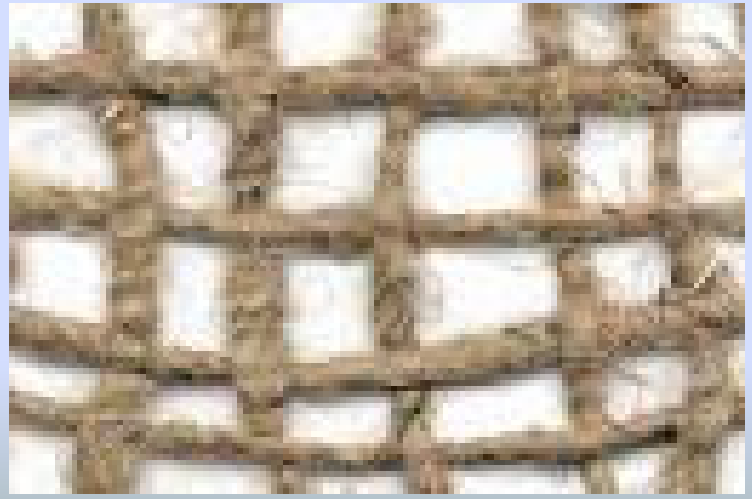


Runoff on Bare Soil after 12 Minutes

Erosion Control Materials

Bare Soil

Compost



Jute Netting

OF Vegetation

Carpobrotus edulis, Hottentot Fig

Hedera helix, English Ivy

Rosmarinus officinalis, Rosemary

Myoporum parvifolium, Creeping Myoporum

Lonicera Japonica, Japanese Honeysuckle

Vinca Major, Periwinkle

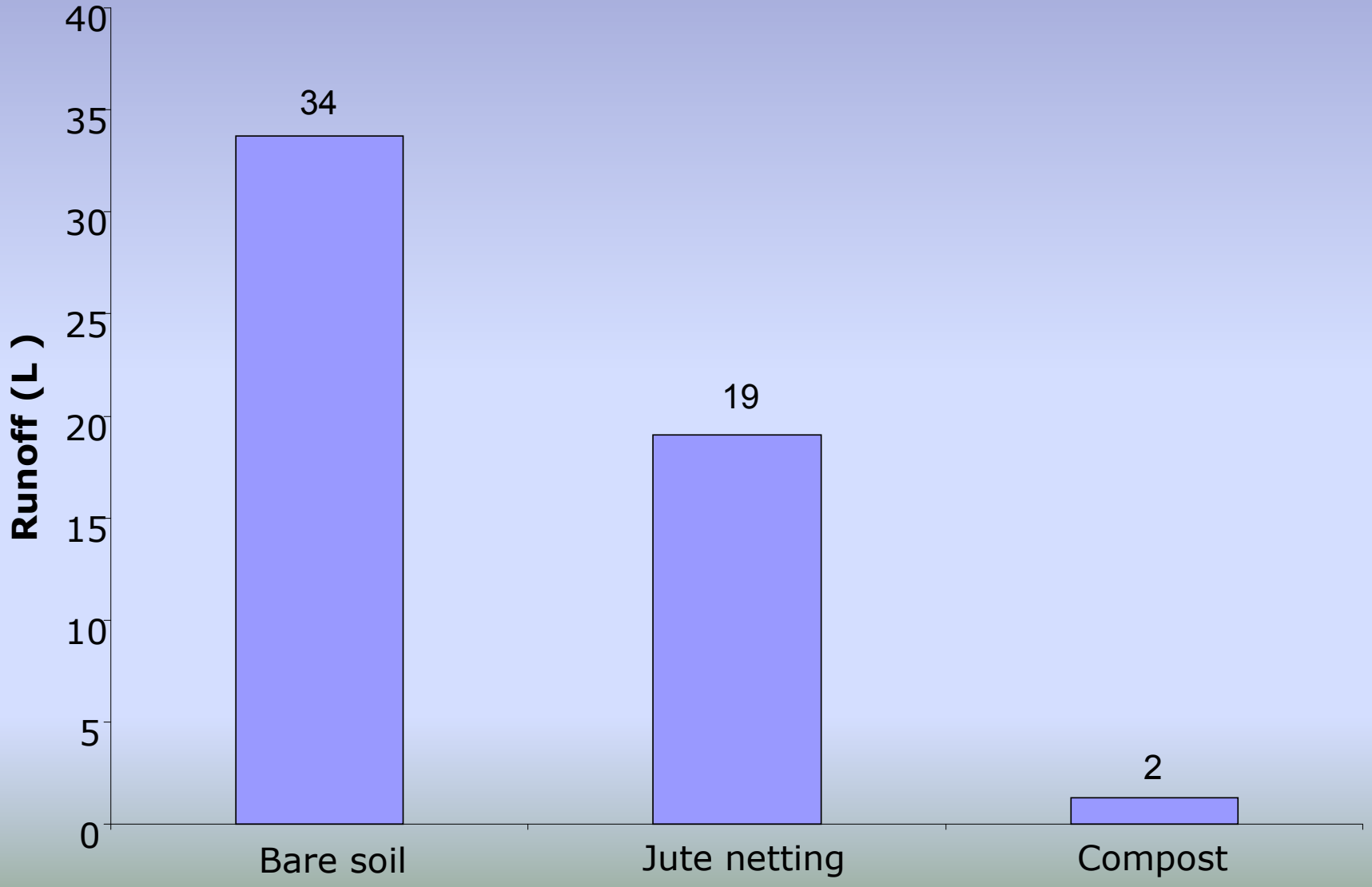
Lantana Montevidensis, Trailing Lantana

Carpobrotus Edulis, Sea Fig

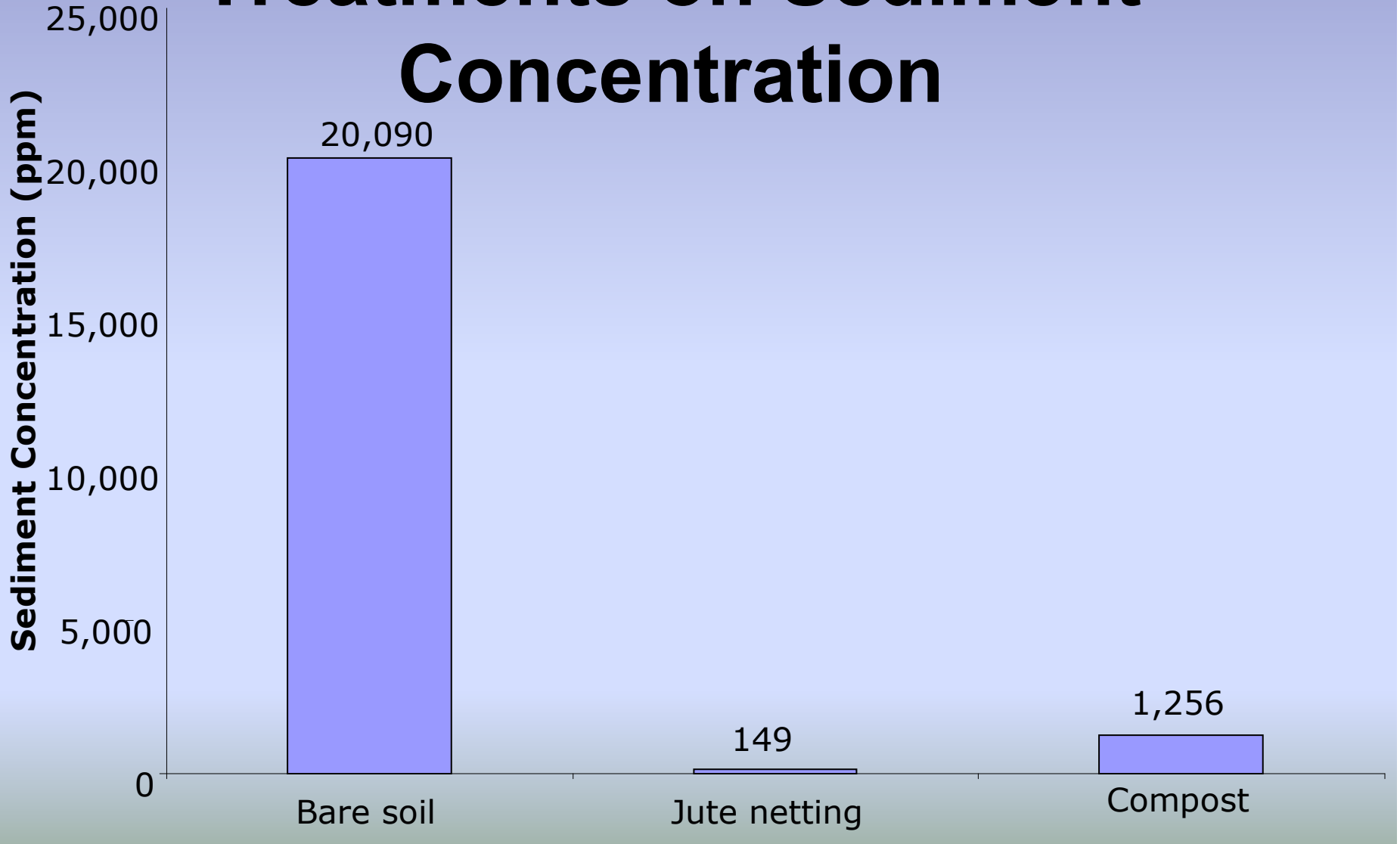
OF Key Findings

- High infiltration and evapotranspiration provided no runoff in vegetation treatments.

Effect of Erosion Control Treatments on Runoff



Effect of Erosion Control Treatments on Sediment Concentration



RS Conclusion

- Ornamental vegetation at 100% cover provided 98% infiltration on slopes.
- No statistical difference could be made between ornamental species.
- Erosion control blanket and jute reduced sediment concentration and runoff.
- Ornamental vegetation at 100% cover provided the best stormwater treatment on slopes.

OF Conclusion

- Biostrips with 100% vegetation cover provided 100% infiltration of stormwater.
- Compost decreased the most runoff as compared to other treatments.
- Jute netting decreased sediment concentration the most.
- Ornamental biostrips performed effective stormwater treatment in both reduction of sediment and runoff.

Summary

- Ornamental vegetation provided effective stormwater treatment both on slopes and in biostrips at 100% vegetation cover.
- With effective cover this suggests that ornamental species are as effective as grasses in stormwater treatment on slopes and in biostrips.


QUESTIONS?