

BMP's for Irrigation Runoff

Principle Researchers:

Michael Cahn – UCCE Monterey, Allan Fulton – UCCE Tehama, Blaine Hanson – UCD, Rachael Long – UCCE Yolo, Don Weston – UCB.

Funding: California State Water Resources Control Board

Topics

- Why allow irrigation runoff?
- Our research with some BMP's for irrigation runoff

Why allow irrigation runoff?



What actually happens during a flood or furrow irrigation below ground?

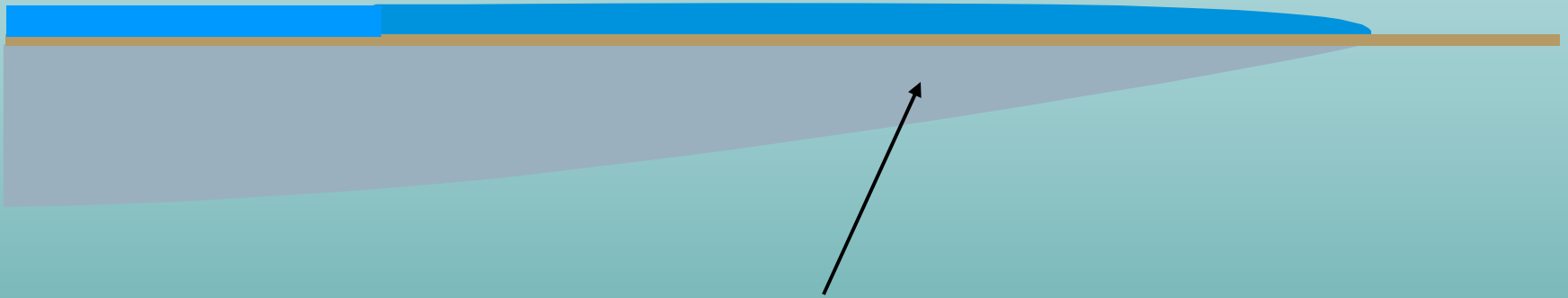


What actually happens during a flood or furrow irrigation below ground?



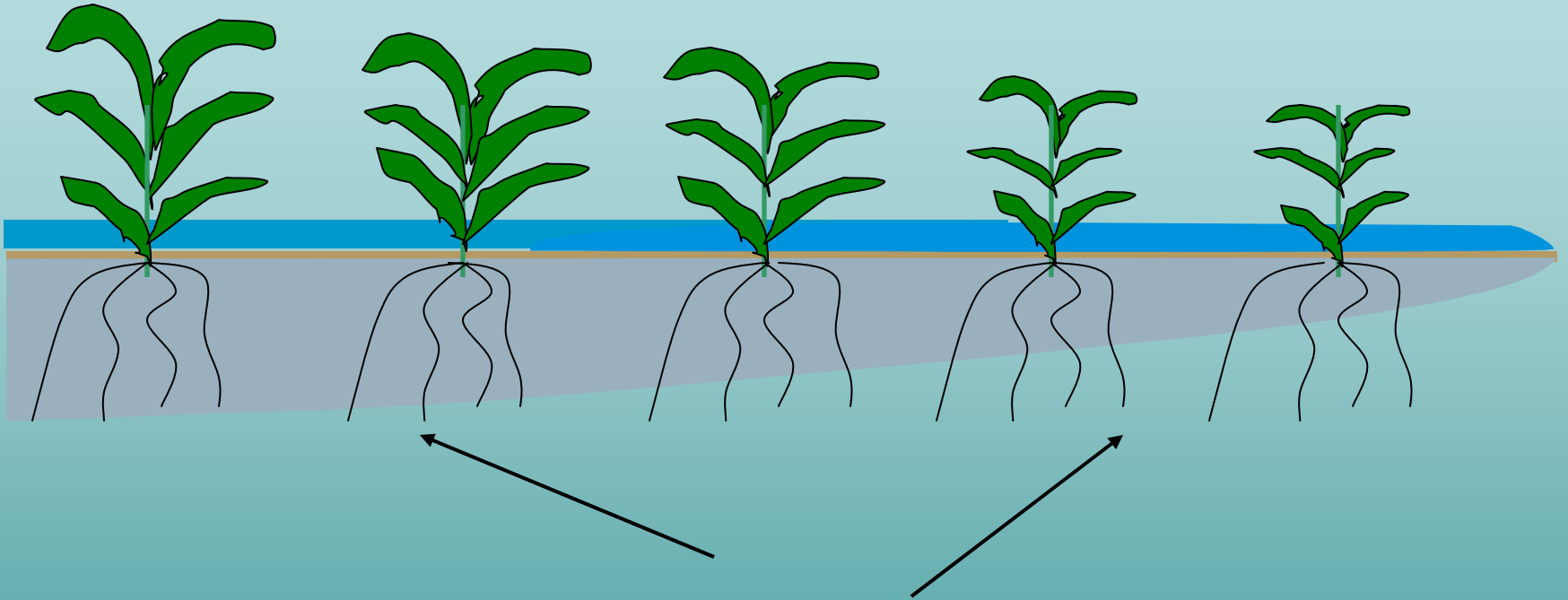
Water moves down
slope towards the end
of the field

What actually happens during a flood or furrow irrigation below ground?



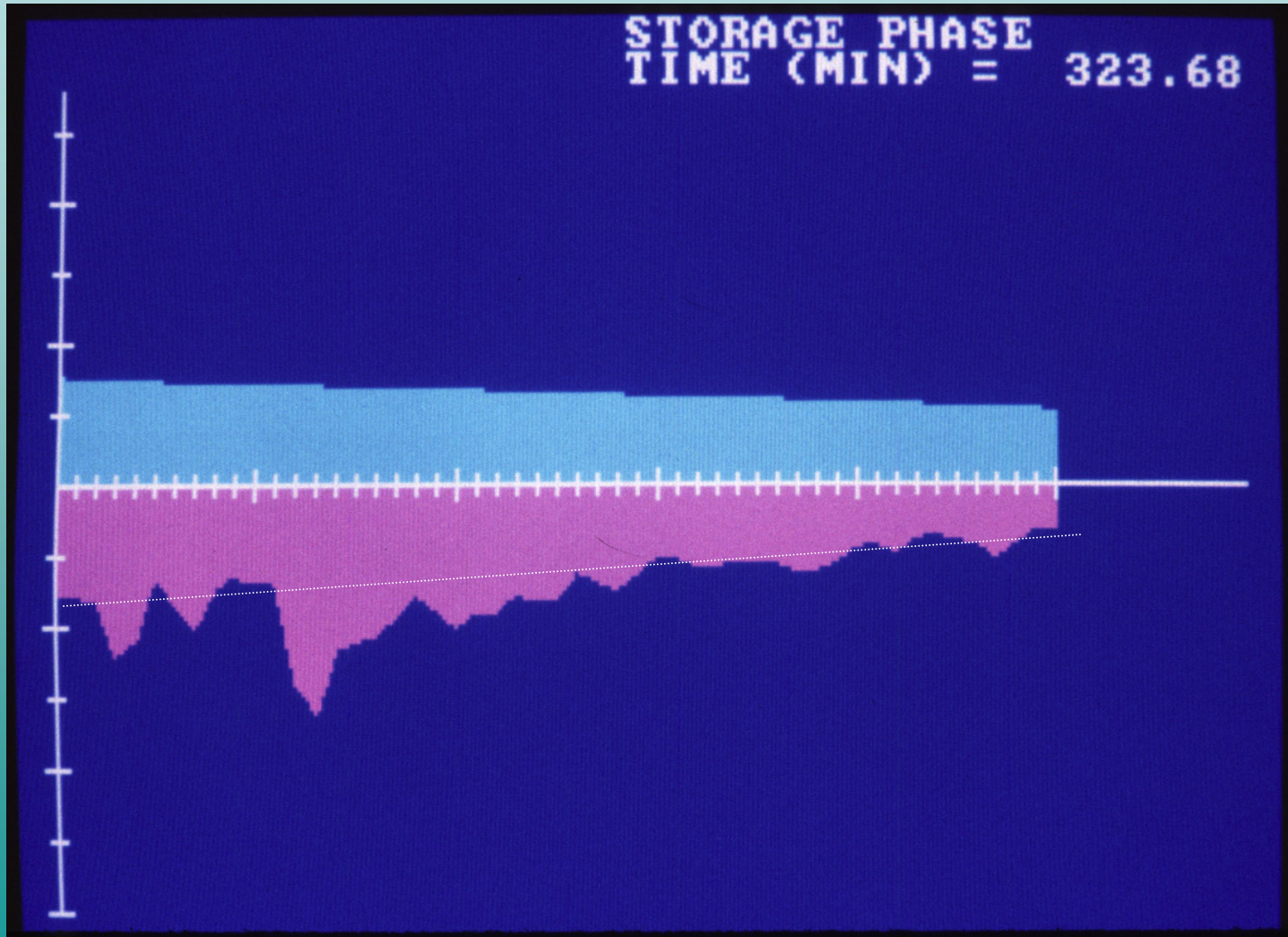
Water moves down
slope towards the end
of the field

What actually happens during a flood or furrow irrigation below ground?



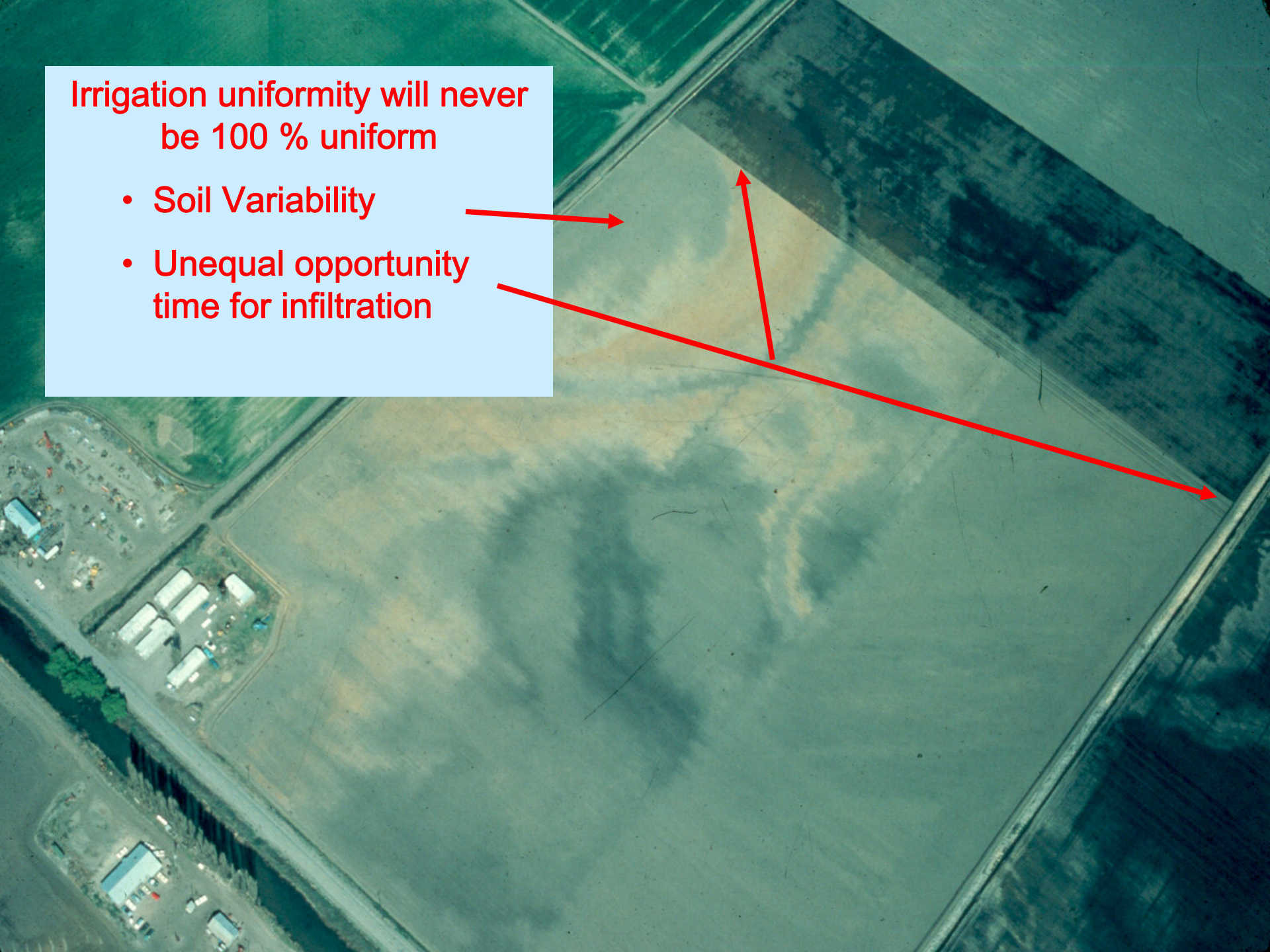
Do all locations in the field have the same opportunity to receive water and how will it affect the crop?

A Common Pattern of Infiltrated Water for Furrow and Basin Flood Irrigation



Irrigation uniformity will never
be 100 % uniform

- Soil Variability
- Unequal opportunity
time for infiltration



Irrigation runoff results from:

- Efforts to irrigate uniformly and adequately
- Using higher furrow and basin flows designed to manage variable soils and difference in opportunity time for infiltration
- Furrow and basin irrigation system designs and management strategies intended to reduce deep percolation and address groundwater quality and drainage concerns

Our Research with some BMP's for Irrigation Runoff

- Polyacrylamide (PAM)
- Vegetated tailwater ditches
- Sediment traps
- Pesticide degradation
enzymes

Field Research Layout



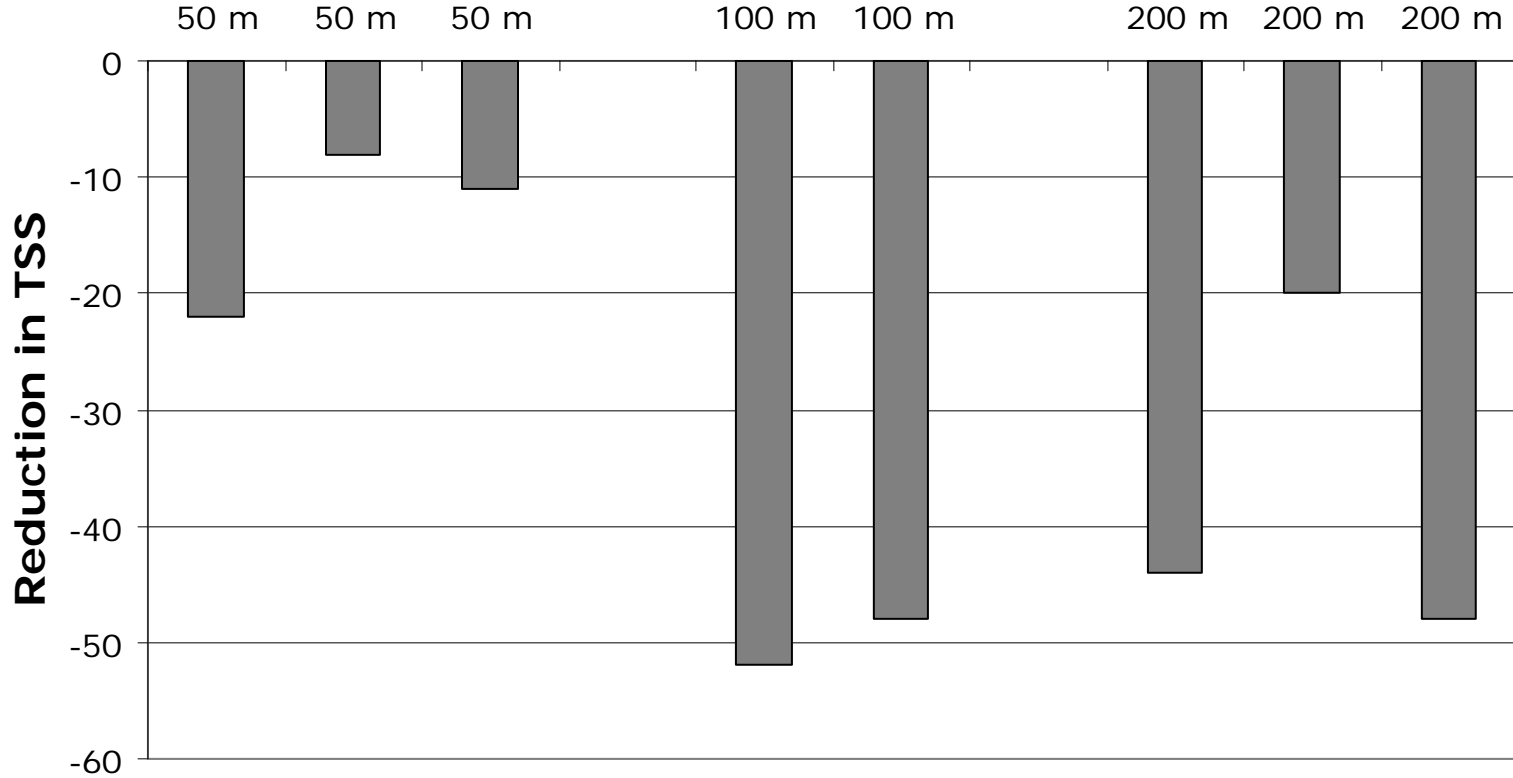
Matrix of BMP's Evaluated at Chico in 2007 (Year 2)

Date	Plot 1	Plot 2	Plot 3	Plot 4
6/5/07	Large sediment trap w/o PAM	Large sediment trap w/o PAM	PAM tablets, one tablet/furrow bottom	PAM E300 injected into water source for entire irrigation
6/15/07	Vegetated ditch	Earthen ditch	PAM tablets, one tablet suspended per furrow	PAM E300 injected into water source during advance phase
6/26/07	Vegetated ditch	Earthen ditch	Small sediment trap with PAM injected into runoff	PAM E300 injected into water source for entire irrigation
7/6/07	Vegetated ditch	Earthen ditch	PAM tablets, two tablets placed in 10 ft long stretch of uncultivated furrow	PAM E300 injected into water source for entire irrigation
7/17/07	Large sediment trap w/o PAM	Large sediment trap w/ PAM in runoff	PAM tablets suspended in mainline, two tablets/furrow	Plot not cultivated, no PAM injection, assess residual effect of PAM

Total Suspended Sediments off of field without any mitigation with BMP's



Percent Increase of Total Suspended Sediments with distance down an unvegetated tailwater ditch



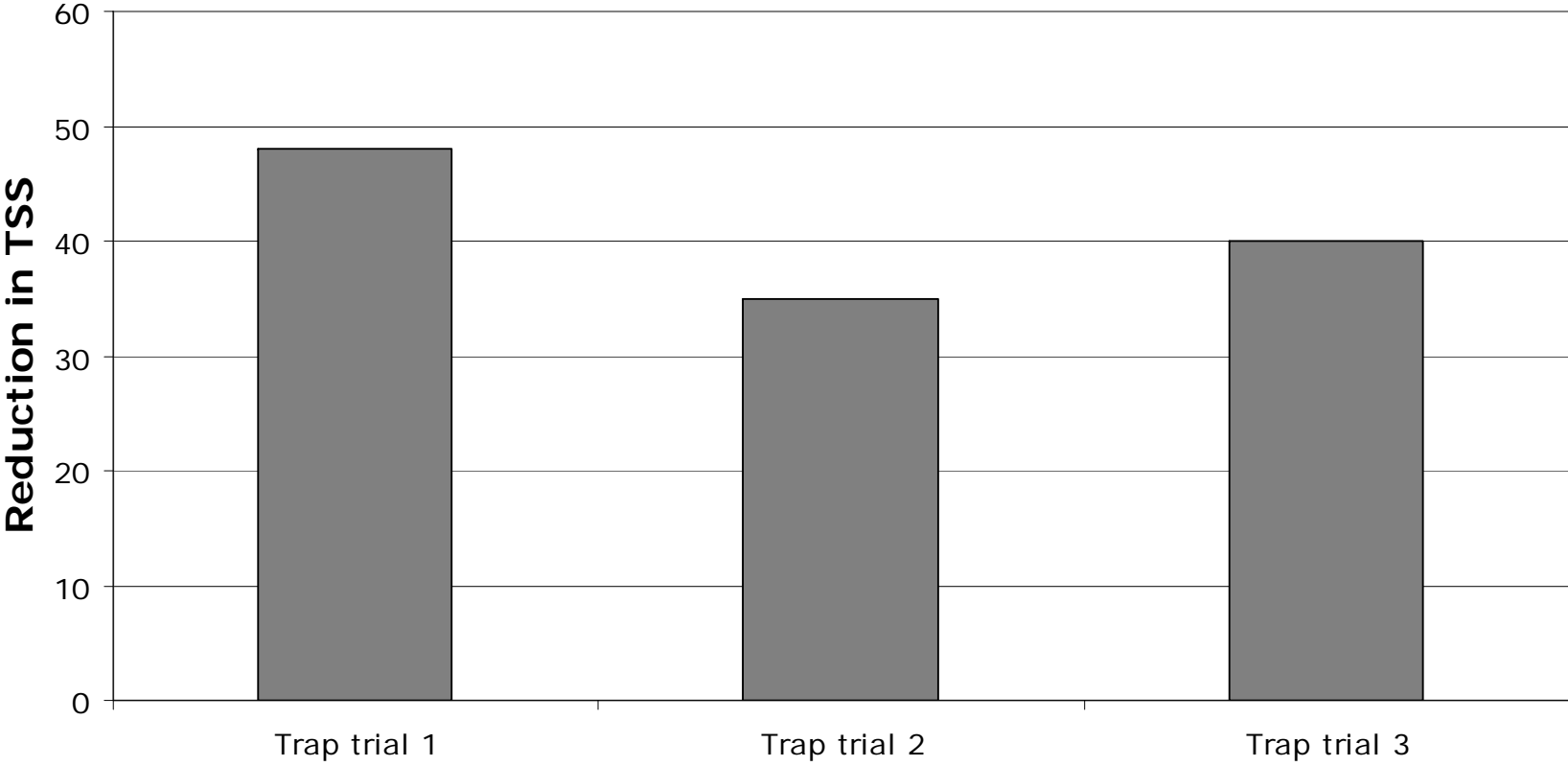
Example of the turbidity in runoff with distance down an unvegetated ditch. (0, 50, 100, and 200 meters).



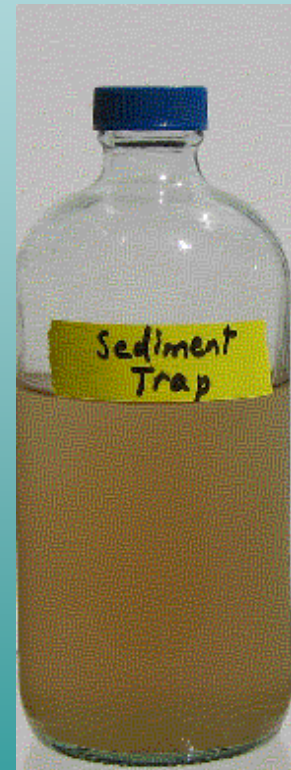
Sediment Trap in Operation



Percent reduction in Total Suspended Sediments (TSS) with a sediment trap



Comparison of the turbidity in runoff entering sediment trap and turbidity of runoff exiting trap.



Vegetated Tailwater Ditch (700 ft long)



Percent reductions in Total Suspended Solids (TSS) with vegetated ditch

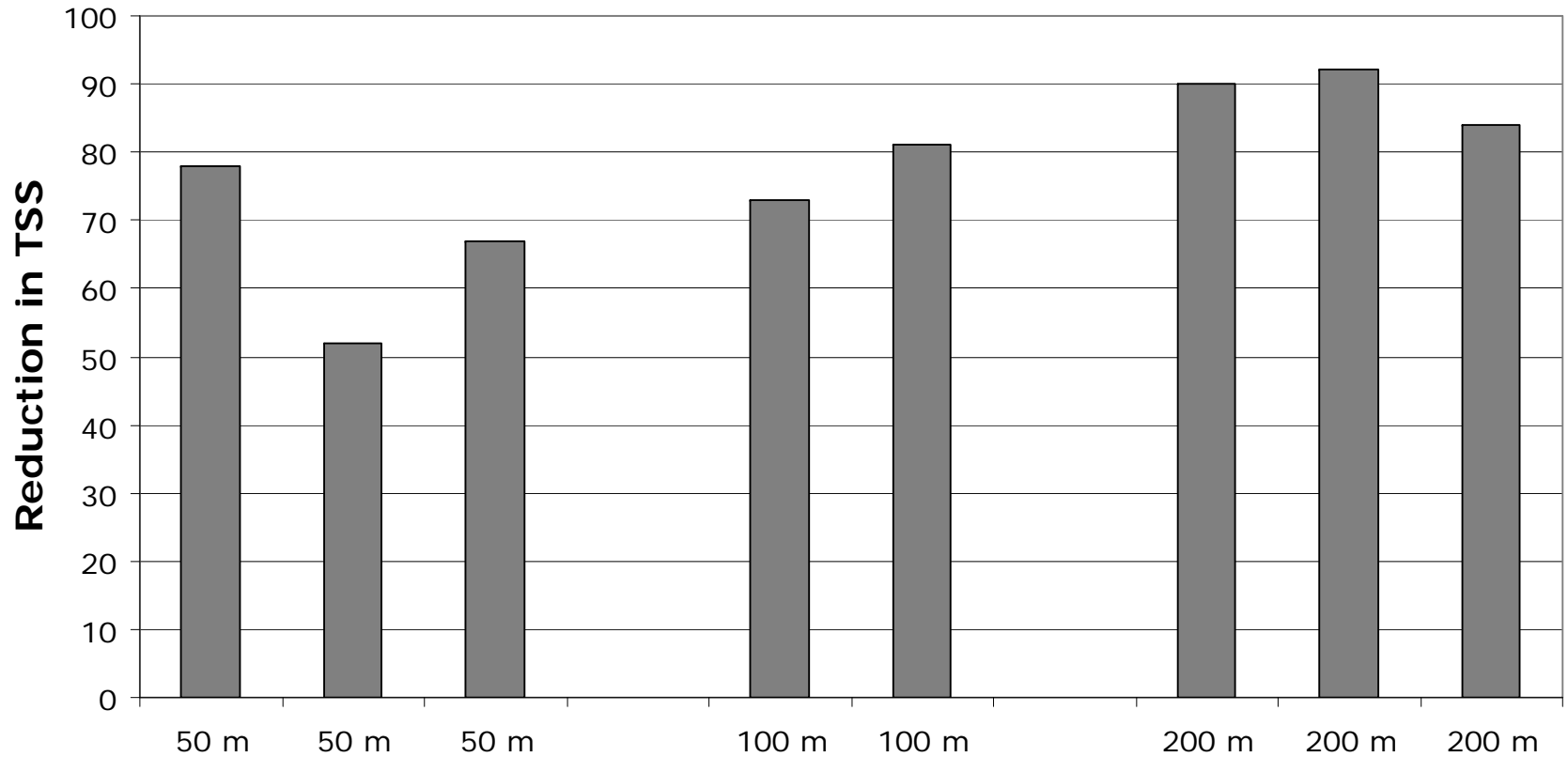


Illustration of the filtering effect of the vegetated ditch on turbidity.

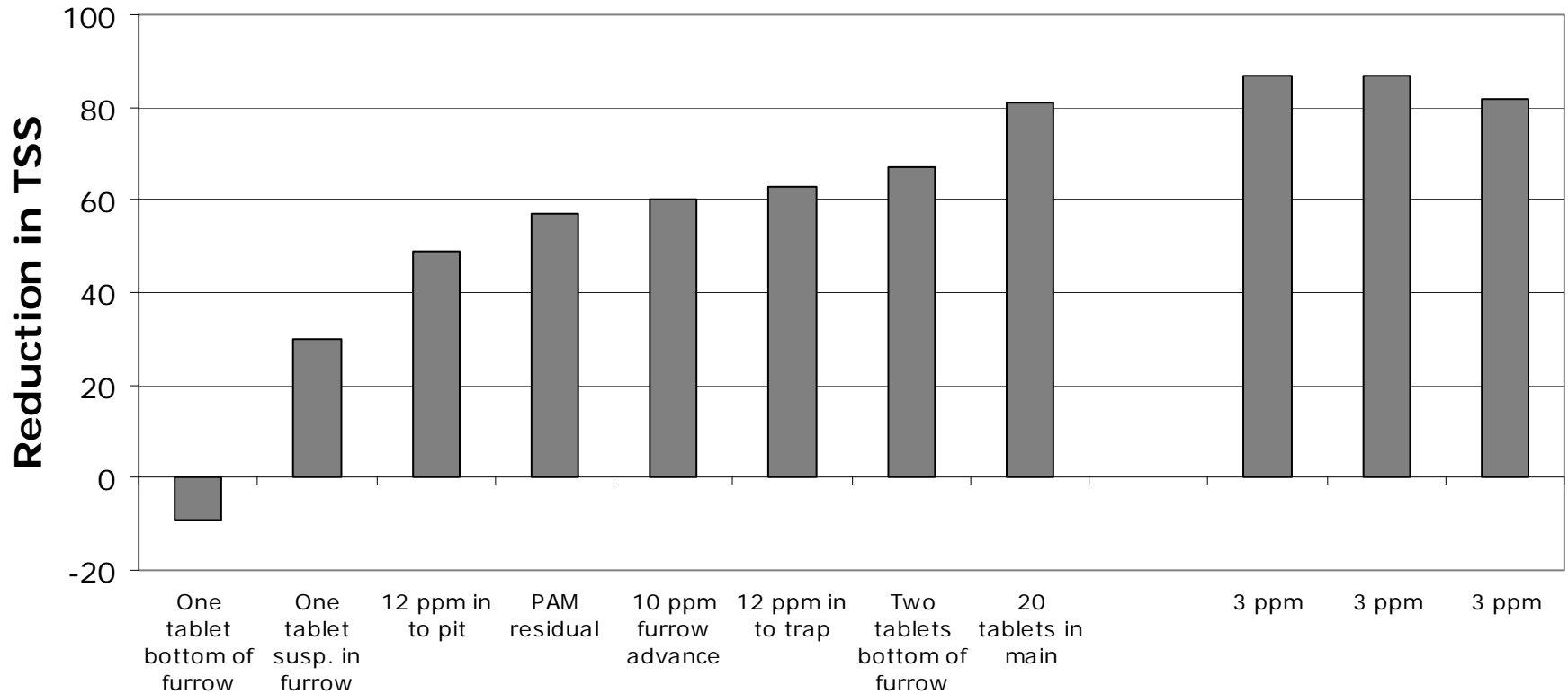


Features of PAM Used for Erosion Control

- Anionic polymer
- Large, linear molecule
- High molecular weight
- High charge density
- Soil flocculent
- Various formulations
- Environmentally safe?



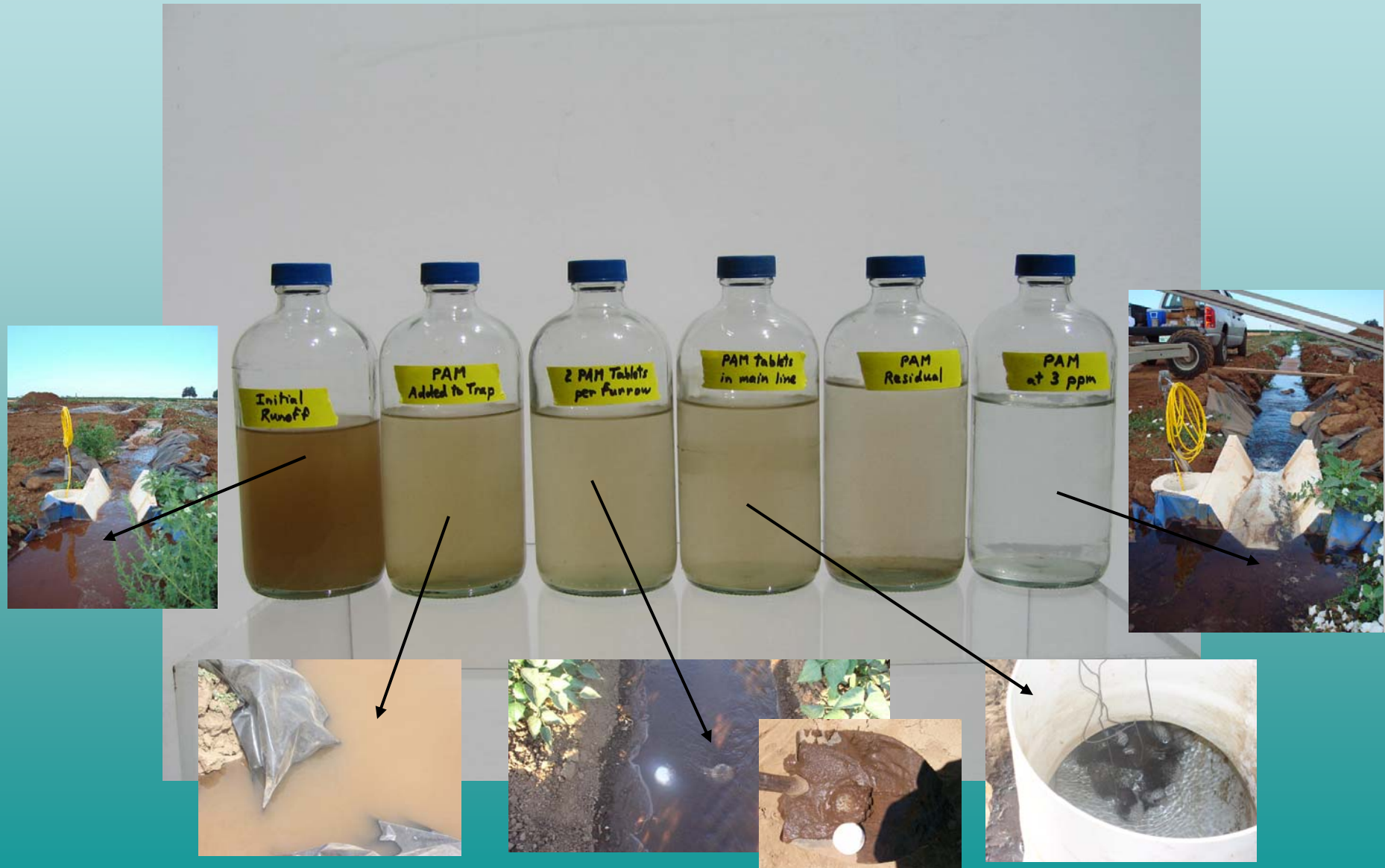
Percent reduction in Total Suspended Sediments with different PAM application strategies



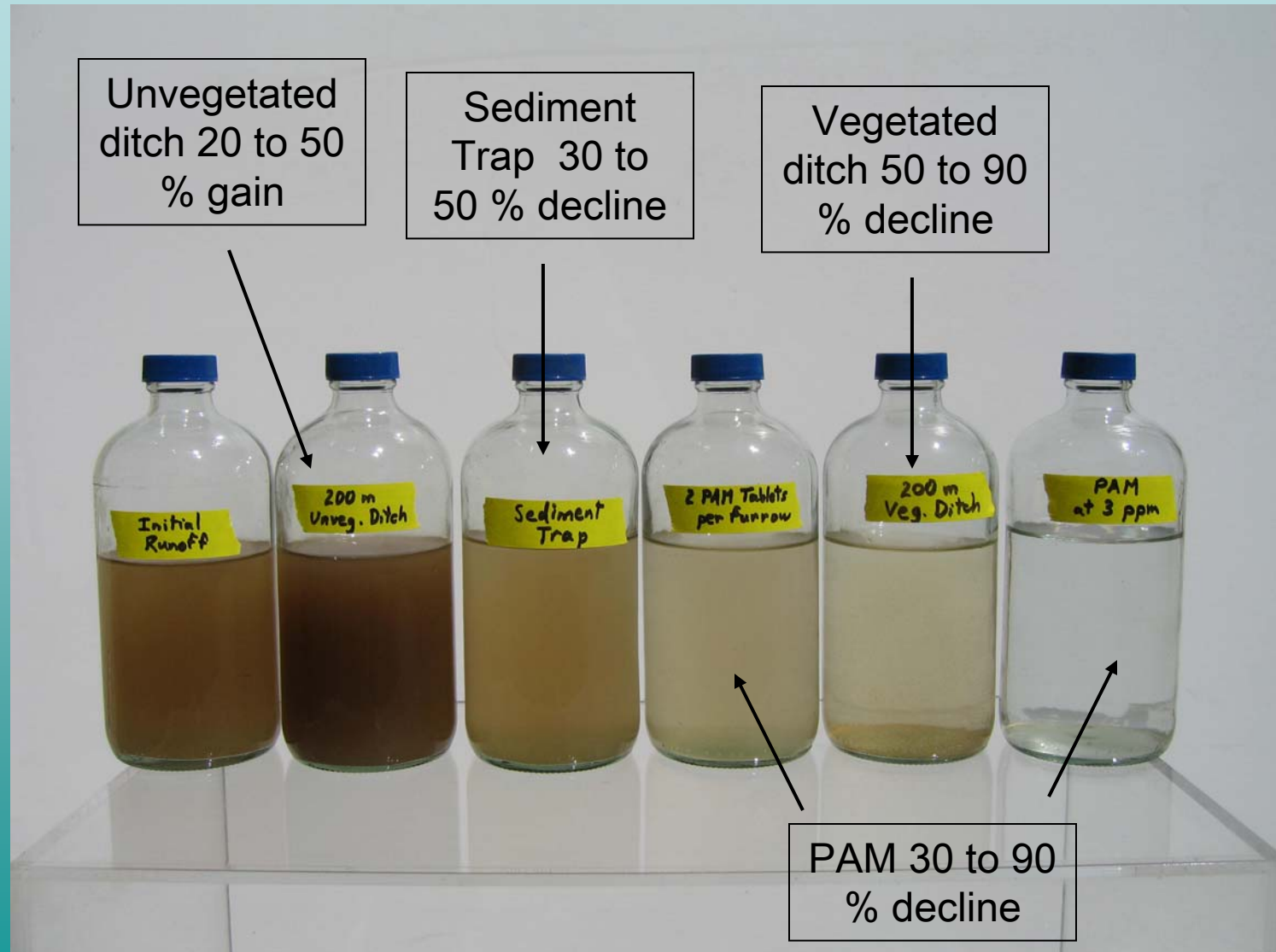
Furrow erosion with and without PAM



Illustration of different PAM formulations and strategies on turbidity of irrigation runoff.



Summary of Effect of BMP's on TSS, 2007 (Year 2)



BMP effects on Pyrethroid Toxicity, 2006 (Year 1), All Three Farm Sites

Management Option	Reduction in Pyrethroid Discharge (%)	Survival <i>H. azteca</i> in bed sediments (%)
Earthen Ditch	Range 10 - 61 Avg 25	Range 0 -28 Avg 9
Sediment Trap	Range [37] – 28 Avg 1.3	Range 0 – 58 Avg 18
Vegetated Ditch	Range 17 – 88 Avg 56	Range 0 – 94 Avg 56
PAM	Range 78 – 100 Avg 91	Range 0 Avg 0

Thank you!