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Slotted drainage pipe for sub-irrigation

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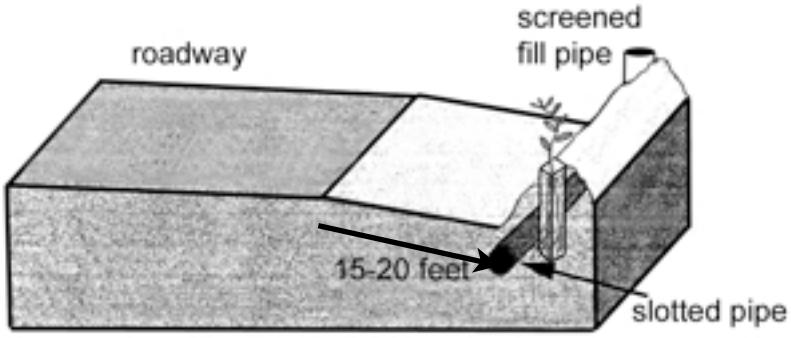
Use of sub-irrigation with a perforated pipe delivery system was tested in the upper Mojave Desert on a 0.5 mile long native plant windbreak. Topography on the site is flat with a gentle slope to the southeast. Soil on the site varies from a highly compacted sandy loam on the western end with large amounts of fine dust, the result of heavy vehicle traffic, to a coarse loose sand on the eastern end.



A motor grader was used to cut a trench for the perforated pipe and to erect a berm to discourage vehicle traffic from cutting through and damaging the plantings. This berm also catches and directs rainfall runoff from the street and the roadside to the plantings. The trench was cut to a depth between 12 and 16 inches and the berm raised to a height of 24 to 30 inches. The grading and plant positions are shown at left.

The perforated slotted pipe was set between 8 and 12 inches deep. Distance from the edge of the road was between 15 and 30 feet. After the trench was cut and the berm was erected, 3 inch diameter flexible ABS slotted drainage pipe was installed in 100 foot sections. The ends were bent upwards and staked in place with rebar to create watering standpipes. The perforated pipes were stabilized by shoveled soil to keep the pipe in position while it was buried by the motor grader. Plantings were made on the leeward side of the berm to benefit from roadside runoff and next to and over the slotted drainage pipe to minimize hand watering.

The windbreak was planted with six different native desert plant species primarily from plant bands: Honey Mesquite (*Prosopis glandulosa*), Screwbean Mesquite (*Prosopis pubescens*), Bladderpod

Staking fill pipes

Screened fill pipe

(*Isomeris arborea*), Desert Willow (*Chilopsis linearis*), Palo Verde (*Cercidium floridum*) and Cat Claw Acacia (*Acacia gregii*).
The seedlings were placed about 5 feet apart in a single row on the leeward side of the berm near the perforated pipe. Small watering basins were shaped by hand around each plant to facilitate initial hand watering. For the smaller plants, a two foot high Supertube™ treeshelter secured with rebar was used for protection. To increase visibility and discourage vehicle traffic from crossing over the berm, additional treeshelters were staked in placed alongside some of the larger plants.

Spot filling over pipe to stabilize pipe for grader cover

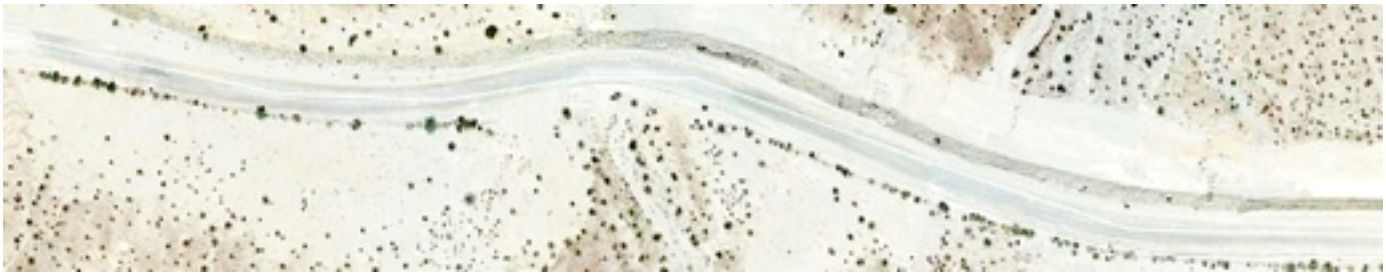
Initial watering was done by hand, but irrigation was then shifted to a water truck that would pump water into the vertical standpipes. This proved to be fast and efficient. The water delivery is estimate at about 100 gallons per 100 feet, applied once a month during the summer, starting in May.

Survival after one year is shown below.

Scientific Name	Number Planted	Alive	% Survival
*Prosopis glandulos*a	137	133	97
*Prosopis pubescen*s	78	75	96
Chilopsis linearis	85	81	95
Isomeris arborea	67	49	73
Parkinsonia floridum	128	87	68
Acacia gregii	13	2	15
Overall	508	427	84

Sub-irrigation with buried slotted drainage pipe was effective and economical. The fall planting minimized transplant shock and helped seedlings acclimatize to the site. Above average precipitation contributed to excellent survival as the ditches and berms provided rainwater harvesting. Survival was poorest for Acacia out-planted from tall pipe containers which were difficult to plant at this site with almost certain root damage.

Erosion of the berm led to burial of some seedlings in the eastern section of the windbreak after heavy rain storms. In March a motor grader was used to place a second berm along the eastern section of the existing windbreak to protect the seedlings from further flood damage. This effectively protected the seedlings through the vulnerable first year seedling stage. Once seedlings outgrow the treeshelters the shelters be removed and placed alongside the plant as a visual deterrent to traffic. Future maintenance should include grading to restore the berm where it has been buried with sediment or damaged by vehicle traffic.



Many trees are still alive after 17 years but have not grown very large

This is a very effective, relatively low cost method for establishing plants in remote areas without conventional irrigation. Planting in fall with initial hand watering into tree shelters and then sub-irrigation during the following summer is recommended. In many areas that may be sufficient for establishment. In very dry areas or where more growth is desired summer irrigation may be required for several years. More effective rainwater harvesting would also improve long term growth and survival.

Special thanks to my project manager Fred Edwards.

For more information on sub-irrigation with clay pipe and slotted pipe and other methods of super efficient irrigation look for my book ***Gardening with Less Water***, 2015. Storey Press.

Part 1: Super-Efficient Irrigation Systems
Chapter 1. Buried Clay Pots (Ollas)
Chapter 2. Porous Capsules
Chapter 3. Deep Pipes
Chapter 4. Wicks
Chapter 5. Porous Hose
Chapter 6. Buried Clay Pipe
Chapter 7. Tree Shelters
Part 2: Taking It to the Next Level
Chapter 8. Waterwise Gardening Tips
Chapter 9. Rainwater Harvesting
Chapter 10. Landscaping for Water Catchment
Chapter 11. Developing a Plan for Your Patio,
Garden, Home, or Farm
Our Water Future

And review other free resources at: GWLW http://works.bepress.com/david_a_bainbridge

Please tell your friends and colleagues!

For more on desert restoration see **A Guide for Desert and Dryland Restoration**, Island Press 2007.