

**AN EVALUATION OF RIPARIAN REVEGETATION EFFORTS IN ARIZONA**

by

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**ABSTRACT**

Twenty-five riparian revegetation projects and two alternative mitigations were evaluated in Arizona. Sites were visited and agency personnel were interviewed to detail riparian revegetation methodologies and categorize revegetation projects based on how well they achieved their objectives.

Riparian revegetation is limited in its ability to improve degraded riparian ecosystems and is most effective when the causes of site degradation are addressed.

Of the selected successful revegetation projects, 73% incorporated other forms of mitigation (e.g., improved land management strategies, bank stabilization structures, irrigation) that either indirectly or directly addressed the causes of site degradation.

Over 33% of the successful revegetation projects experienced prolific natural regeneration, demonstrating the potential for natural regenerative processes to accomplish revegetation objectives. Of the unsuccessful revegetation projects, 85% did not achieve objectives due to low water availability or flooding.

The appropriateness of using riparian revegetation should be determined on a site by site basis using two check-lists developed from the results of this study. The first check-list describes the potential effectiveness of artificial revegetation, the second check-list describes the potential that prolific natural regeneration will occur.

## DISCUSSION

### Identifying the Causes of Site Degradation

Analysis of successful and unsuccessful projects indicates that addressing the causes of site degradation prior to planting is extremely important in achieving project objectives. Identifying the causes of site deterioration and designing methods of treatment should, therefore, be the first priority of any mitigation plan.

Generally, natural regeneration will occur when three environmental characteristics are provided concurrently: a seed source (or parent vegetation that can sprout), sufficient and timely water availability for seed germination and subsequent establishment, and stable substrate devoid of direct competition (Barbour et al. 1987). Prior to mitigation, all 27 sites were characterized by reduced densities and diversities of riparian vegetation, possibly indicating that one or more of the key ingredients necessary for natural regeneration were either absent or being obstructed.

Interrupting natural river flow, a drop in the water table, intense competition from animals and plants, and unstable substrate were all cited as probable causes of site deterioration among the successful projects (Table 5). All of these factors have acted to reduce the potential for natural propagation of riparian species. If artificial revegetation is used without addressing the causes of site degradation, it seems likely that whatever is preventing or slowing the establishment of riparian vegetation naturally will also prevent the establishment of riparian vegetation artificially.

Table 5. Successful projects categorized according to percent survival of artificially-planted vegetation for 19 riparian sites in Arizona.

Site	Probable Cause of Deterioration	Type of Secondary Mitigation Performed	Water Availability	Obligate Riparian Vegetation Prior to Mitigation
< 20% Survival				
1. Canyon Creek (Site #3)	1) Overgrazing by livestock 2) Unstable stream bank 3) Wide shallow stream channel	1) Fence construction, 2) Bank stabilizing structures; 3) Placement of boulders and large tree trunks in the channel	High	Scattered old growth along stream channel.
2. Gentry Creek (Site #4)	Overgrazing by livestock	Fence construction for livestock management	High	Scattered old growth along stream channel.
3. Barro Creek (Site #12)	1) Over-grazing by livestock; 2) Low water table	1) Implementation of improved livestock management system; 2) Irrigation	Low (in plantation)	High diversity of riparian species remained.
4. Bartlett (Site #15)	Loss of natural river flow regimes due to dam construction.	none	Medium	Old growth riparian trees scattered along river channel.
5. Needle Rock (Site #16)	Loss of natural river flow regimes due to dam construction.	none	Medium	Old growth riparian trees scattered along river channel.
Prolific Natural Comeback				
6. Coleman Lake (Site #2)	Overgrazing by livestock	1) Dynamite, 2) Fence construction for livestock management	Very High	No obligate riparian trees, with a much reduced understorey.
7. Tubac (Site #5)	Flood plain instability enhanced by major flood event	Use of stream bank stabilizing structure	Medium	Obligate riparian trees upstream.
8. Nogales Wash (Site #7)	Flood plain instability enhanced by major flood event	none	High	Obligate riparian trees upstream.
9. Sheephead Spring (Site #9)	1) Overgrazing by livestock 2) Lack of fine sediment in the stream channel	1) Fence construction for livestock management 2) Construction of check dams	High	Diverse riparian vegetation growth at spring source.

Table 5 (continued).

Site	Cause(s) of Degradation	Other Mitigation	Water Availability <sup>1</sup>	Riparian Vegetation Prior to Mitigation
Prolific Natural Comeback (continued)				
10. Aravaipa Canyon (Site #19)	100 to 1000 year flood event	none	High	Scattered old growth along main channel and side canyons.
11. Hessayampa Preserve (Site #22)	Overgrazing by livestock and overuse by recreationists	Fence construction around the perimeter of the site	High	Scattered old growth on site and upstream.
> 20% Survival				
12. N. Tubac (Site #6)	Flood plain instability enhanced by major flood event	Use of stream bank stabilizing structure	Medium	Obligate riparian trees upstream.
13. Francis Creek (Site #11)	Overgrazing by livestock	Improved livestock management system	Medium	Scattered old growth
14. McEuen Seep (Site #17)	Overgrazing by livestock	Fence construction for livestock management	Medium	No obligate riparian trees
15. Clay Mines Spring (Site #18)	Year-round livestock grazing and road construction	none	Medium	None

Table 5 (continued).

Site	Cause(s) of Degradation	Other Mitigation	Water Availability	Riparian Vegetation Prior to Mitigation
> 20% Survival (continued)				
16. Seven Mile Wash (Site #20)	1) Stability of Stream-bank; 2) Water availability	Bank stabilizing structures	Medium	No obligate riparian trees, some <u>Baccharis glutinosa</u>
17. Goose Flats (Site #23)	Low water availability due to consistently low water table	1) Irrigation 2) Holes augered prior to planting	Low	No obligate riparian trees
18. 83 <sup>rd</sup> Avenue (Site #24)	Low Water Availability	1) Major land manipulation prior to and following planting; 2) Irrigation with water truck.	High	None
19. Sugar Dike (Site #26)	Vegetative Competition	1) Initial clearing of vegetation; 2) Holes augered prior to planting	Medium	None

1 Site water availability is as defined below:

Very High - Year-round water table fluctuations rarely drop 0.5 m below the soil surface;

Medium - Year-round water table fluctuations rarely drop 2.0 m below the soil surface;

High - Year-round water table fluctuations rarely drop 1.0 m below the soil surface;

Low - Year-round water table fluctuations rarely drop 3.0 m below the soil surface;

Very Low - Year-round water table fluctuations frequently drop 3.0 m or more below the soil surface.