REVEGETATION
for
WILDLIFE ENHANCEMENT
along the
LOWER COLORADO RIVER

by
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Arizona State University - Center for Environmental Studies

1982

for the
Bureau of Reclamation
Lower Colorado Region
Office of Environment
Boulder City, Nevada

FINAL REPORT

REVEGETATION FOR WILDLIFE ENHANCEMENT ALONG THE LOWER COLORADO RIVER

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Tempe, Arizona 85287

December 1982

In fulfillment of

Bureau of Reclamation

Contract No. 7-07-30-V0009

7-2090 (4-81)
Bureau of Reclamation

TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO.	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.

4. TITLE AND SUBTITLE
Revegetation for Wildlife Enhancement along the Lower Colorado River

5. REPORT DATE
1982

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
Bertin W. Anderson & R. D. Ohmart

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Arizona State University
Center for Environmental Studies

10. WORK UNIT NO.

11. CONTRACT OR GRANT NO.
7-07-30-V0009

12. SPONSORING AGENCY NAME AND ADDRESS
Bureau of Reclamation
Dept of the Interior
P.O. Box 427
Boulder City, Nevada 89005

13. TYPE OF REPORT AND PERIOD COVERED
Final Report 1982

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The use of riparian vegetation by wildlife and the effects of rapidly disappearing habitat on various species. The report is the result of a two year study using soil and salinity data of dredge spoil and refuge sites. The report investigates the effect of deep tillage, irrigation on growth distributions, and components analysis.

Wildlife use and density are defined according to the study and a summary and synthesis is provided by the authors.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS--
Planting recommendations, analytical methods, intercorrelations, soils, wildlife densities

b. IDENTIFIERS--

c. COSATI Field/Group *COWRR:* *SRIM:*

18. DISTRIBUTION STATEMENT
Available from the National Technical Information Service, Operations Division, 5285 Port Royal Road, Springfield, Virginia 22161.

19. SECURITY CLASS (THIS REPORT)	21. NO. OF PAGES
UNCLASSIFIED	
20. SECURITY CLASS (THIS PAGE)	**22. PRICE**
UNCLASSIFIED	

PREFACE

More than two years after funding for this study started, we have analyzed some of the soil and salinity data from the refuge site (funds were never available for data collection or analysis). We have also collected growth and mortality data for two additional growing seasons from both sites. This additional work was made possible largely through the cooperative efforts of the University of California Agricultural Extension Division.

Although a thorough analysis of the additional data is months, or perhaps years away, we have progressed far enough to say unequivocally that had it been included, many of the conclusions in this report would have been substantially altered. This is true for two reasons. First, trees are long-lived, and a study encompassing only two growing seasons simply is not long enough to reach any definitive conclusions about growth and survival of trees beyond the two years. Second, the range of soil and salinity variables studied on the dredge spoil was too limited to make any statements regarding the growth of riparian species on other soil types. The refuge site greatly expanded the range of soil-salinity variables available.

Contractual requirements necessitated a document summarizing our findings. Anyone using these data as a guide to revegetating any area, including areas similar to the dredge-spoil site, and for making predictions about growth and mortality after 4-10 years should use cautious optimism. We caution that the reader view this report as preliminary until the site is at least 15 to 20 years old. We are concerned that some may rely too heavily on the preliminary data in this document and that failure in revegetating an area may result. The two years of data presented here from the dredge-spoil site are sound and the conclusions are correct. The problem is that two years simply is not a

CHAPTER 1

INTRODUCTION

Riparian vegetation is a rapidly disappearing habitat on the Colorado River and elsewhere on the continent. The importance of riparian vegetation to man and the extent of modification by man has been discussed by Ohmart et al. (1977) and Ohmart and Anderson (1982). The importance of riparian vegetation to wildlife has been stressed by Anderson and Ohmart (1982) and Ohmart and Anderson (1982).

In an effort to understand better how wildlife uses riparian vegetation, we first classified the vegetation in the lower Colorado River valley, from the Nevada-Arizona border southward to the border with Mexico (Anderson and Ohmart 1976). We then determined the wildlife densities and diversities associated with these vegetation types (Anderson and Ohmart 1981) in order to obtain the preliminary information needed before proceeding with revegetation efforts.

First, we found that most bird species avoided salt cedar; almost no bird species appeared to prefer salt cedar because most birds reached greater densities in other types of vegetation (Anderson et al. 1977, Cohan et al. 1978, Anderson and Ohmart 1981). We also quantified the fact that salt cedar was the numerically dominant species in the lower Colorado River valley (Anderson and Ohmart 1976). Cottonwood, willow, honey mesquite, and quail bush were all found to have significant value to wildlife. We then concluded that wildlife populations could be significantly enhanced by removing salt cedar and planting various species of native vegetation.

The next step was to learn how to grow native species of vegetation. We knew virtually nothing about the autecological requirements or the economic feasibility of revegetation efforts. We did not know if salt cedar could be

permanently eliminated from an area nor did we know anything about its rate of reinvasion. We did know that burning does not kill salt cedar, but that fire is an important factor associated with its dispersal and persistence. Removing salt cedar with a bulldozer resulted in little if any mortality.

Thus one set of primary objectives of the revegetation study included determination of (1) how to permanently eliminate salt cedar from an area, (2) environmental conditions required for maximum growth rates and survival of native vegetation, and (3) costs associated with revegetation efforts. Another major objective was to (4) monitor the wildlife that used the revegetated plots in order to assess the potential for enhancement of wildlife use of an area. The revegetation studies also permitted (5) an evaluation of predictions generated by our studies of riparian vegetation concerning the value of various species of plants and vegetation structures to wildlife. By determining growth rates of the vegetation we would (6) be able to predict the time necessary for revegetated areas to attain maximum value to wildlife.

Our work was initiated in 1977 on a 30-ha (75-a) dredge-spoil area which was almost devoid of vegetation. It was desirable to establish vegetation on such an area if possible, yet a lack of success would result in no damage to wildlife. A second site, including 20 ha (50 a), was located on the Cibola National Wildlife Refuge. This site was vegetated with salt cedar and scattered patches of rather scrubby Goodding willow and arrowweed prior to clearing.

The first three chapters of this report deal with an analysis of the use of the revegetated areas by wildlife. The lead chapter in the series provides a detailed account of use of the revegetated areas by birds. The following two chapters, concerning use of the revegetated areas by reptiles and rodents, respectively, are quite superficial, but they provide the reader with a general idea of how the revegetated areas were used by these groups.

Chapters 5 and 6 have two partially related objectives. In Chapter 5 we present the costs associated with developing each site for one year. The economic aspects of each site were combined and the probable costs are presented for a site carefully selected so that growth will be maximized, but costs minimized. Since drip irrigation is important in revegetation efforts, Chapter 6 presents a detailed description and discussion of the advantages and disadvantages of each irrigation system.

Chapter 7 presents a detailed analysis of the soil profiles on the dredge-spoil site. This chapter is a preface to Chapters 8, 9, 10, and 11 on growth and survival of cottonwood, willow, honey mesquite, and palo verde trees, respectively. Since not all tree species were studied across all combinations of environmental variables, generalizations about conditions leading to maximum growth rates cannot be made for any single species. In Chapter 12 we attempt a synthesis of the results from the four tree species in order to arrive at some generalizations. In that chapter we make limited conclusions about how to grow native species of riparian trees in the lower Colorado River valley. The final chapter provides a series of generalizations about how and where to plant trees and shrubs and how to irrigate them, keep costs minimal, and still attract large densities of wildlife. Of course, trees must grow and wildlife must be attracted as quickly as possible.

In retrospect it seems quite remarkable that we attained any success at all, in view of our initial naiveté and of the nightmarish deluge of problems that we encountered. Whatever success was attained can be attributed in part to luck and in part to the stubborn, pugnacious determination of John Disano and his wife, Louise. He was also knowledgeable and resourceful and pushed on with little consideration for himself. His philosophical belief in the value of what we were doing was a very important ingredient. This was John Disano's project as much as anyone's.

The following individuals helped write various chapters: Don Brooks, Chapter 10; Julie K. Meents, Chapters 3 and 4; John Disano, Chapter 5. We are grateful to Jeannie Anderson, Susan M. Cook, Jane R. Durham, Julie K. Meents, and Cindy D. Zisner for editorial assistance. We thank Marcelett Ector and Cindy D. Zisner for typing the numerous drafts of each chapter. We thank Dr. Jake Rice for advice concerning statistical procedures and Kurt Webb for programming the computer. Don Brooks labored extensively in getting the data on the computer; we are grateful for his efforts. Melodie Carr, Elaine Hassinger, Judy Huff, Stephanie Lewis, James Moore, and Rodney H. Ohmart prepared the illustrations.

We are particularly grateful to the U.S. Fish and Wildlife Service for allowing us to hire workers for the project through their Young Adult Conservation Corps Program (YACC). Without that help the project could not have been carried out. Don Barry, director of the YACC camp, Sulphur, Oklahoma, was particularly cooperative and his patience with us is appreciated. Les Ede and Jule Meyer, University of California Agricultural Extension Service, Riverside, California, gave freely of their counsel on numerous questions we had about how to grow trees. They also carried out two extensive soil analyses for us, at no charge, and offered advice pertinent to our experimental work.

Wesley Martin, Refuge Manager at Cibola National Wildlife Refuge, cooperated extensively with our efforts. His assistance is much appreciated.

We thank Ronald Swan for the help he gave us, especially for doing the slip plowing at no charge. Sam Martinez kindly lent us a root ripper. Without this piece of equipment we might never have gotten the salt cedar removed from the refuge site.

We thank the U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service for funding the project. Their faith in us and encouragement are deeply appreciated.