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## **RIPARIAN STRUCTURES AND WATERSHED TREATMENTS IN THE SOUTHWEST: HISTORY, STATUS, AND MANAGEMENT IMPLICATIONS - A PRELIMINARY REPORT**

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### **INTRODUCTION**

Largely due to the arid and semi-arid climate of the Southwest, riparian areas and wetlands have always been limited. Even prior to settlement by European immigrants, less than 5 percent of the land could be so classified. Extensive changes in land use since the 1600s has reduced that figure even more. Recent estimates place the current extent of riparian areas and wetlands at less than 2 percent.

In an effort to halt destructive grazing, logging, mining, and similar practices common on western lands before the turn of the century, National Forests were designated to gain control of public lands. Since designation as National Forests, considerable activity has taken place to improve the condition of riparian areas and their contributing watersheds.

Literally millions of dollars have been spent over the decades to improve riparian and watershed conditions. Probably the most famous of these efforts was the Civilian Conservation Corps (CCC)

in the 1930s. Individual Forests and Ranger Districts have done improvement work on their lands for years, often with mixed results. Unfortunately, however, monitoring and evaluation of the effectiveness of these projects has been sporadic. While individual Forests and Districts have performed management reviews and inspections to assess some project work, no focused effort has been made to assess this work and learn from decades of effort.

### **HISTORICAL PERSPECTIVE**

Early Forest Service (FS) efforts until World War II mostly dealt with conservation work and gaining control over land uses such as timber harvest, livestock grazing, and wildfire damages that had previously proceeded unchecked.

Management emphasis following World War II focused more heavily on commodity production to meet the needs of a growing nation. Timber, livestock, and minerals production increased with relatively minimal emphasis given to non-commodity

outputs such as soil, water, and air resources. Riparian areas, which have always been a small percentage of the land base, were often overlooked or lumped with other resources, receiving little special management emphasis.

An awakening environmental awareness in the mid-1970s spawned legislation championing a broader mix of resource uses. The Multiple Use-Sustained Yield Act, Endangered Species Act, Wilderness Act, National Forest Management Act, and Clean Water Act are examples of this change in public emphasis.

National symposia in 1977, 1978, and 1985, highlighted riparian area values, recognized their disproportionate use relative to their size, and noted the loss of riparian acreage that had occurred over many decades. There was a growing realization of riparian areas as valuable resources in and of themselves. Additionally, two 1988 Government Accounting Office reports focused on problems with riparian areas in the West, especially related to livestock management. This provided even more incentive to speed rehabilitation of riparian areas and their contributing watersheds.

#### CURRENT STATUS

Increased awareness of the need to improve riparian area management has generated considerable efforts recently to inventory and evaluate these areas, improve fish habitats, develop riparian pastures, plant riparian species, control erosion, close roads, and many similar activities. Funding and targets for these efforts increased, but widespread success remained elusive. This generated a number of key questions: How do we spend the available dollars more efficiently? What works best and why? What doesn't and why not? Are there common principles that are positive and negative to this effort? How does the "system" or day-to-day, month-to-month, year-to-year operation of the FS enhance or hamper efforts to maintain and enhance riparian areas? What is the extent and success of technology transfer?

To evaluate and learn from past improvement projects, a study was developed that would accomplish four key objectives:

- Evaluate a wide variety of projects aimed at improving riparian area conditions
- Determine project success or failure
- Determine common mechanisms of success or failure

- Use the results to educate personnel involved with riparian improvements so they can repeat successes and avoid failures

Study funds were allocated to the Forest Service Southwestern Regional Office in Albuquerque, which in turn transferred funding and responsibilities to researchers with the Rocky Mountain Forest and Range Experiment Station (RMFRES) unit located in Tempe, Arizona. RMFRES, in consultation with the Southwestern Regional Office, chose to accomplish the study via a contract due to limited personnel and time within the RMFRES unit and a desire to get an outside opinion, thus enhancing the study's credibility.

#### STUDY SCOPE

The Southwestern Region of the USDA Forest Service encompasses over 22 million acres on 11 National Forests and 3 National Grasslands in Arizona, New Mexico, western Oklahoma and western Texas. Five National Forests are administered from New Mexico (Carson, Cibola, Gila, Lincoln, and Santa Fe) with the remaining units in Arizona (Apache-Sitgreaves, Coconino, Coronado, Kaibab, Prescott, and Tonto). The Cibola National Forest has administrative responsibility for the 3 National Grasslands. We designed the study to encompass projects in all National Forests as well as a wide variety of ecosystems, climates, soils, vegetation types, geologic types, and hydrologic responses. We needed to evaluate structural (fish habitat improvements, gully plugs, exclosures, etc.) and non-structural measures (management changes, prescribed fire, etc.), projects relating to a variety of land management activities (grazing, logging, recreation), and projects affecting both the riparian areas and their contributing watersheds.

The Watershed and Air Management (WSA) staff unit, Southwestern Regional Office, solicited proposals for possible project sites from all 11 National Forests in the region, using a series of criteria. The response from the Forests was very encouraging, with 116 potential projects identified across the region. Personnel from WSA and RMFRES reviewed the proposed sites and narrowed the scope to 25 representative sites that would meet the study criteria and time and funding constraints.

After reviewing proposals from several potential contractors, BioSystems, Inc. of Tiburon, Cali-

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ifornia, was chosen to perform the study. Their team of scientists and sub-contractors included the following individuals and skills:

- Bill Platts - Team Leader, Fishery/Range interactions
- Sherman Jensen - Soils, geology, geomorphology
- Gary Alborn - Biology, range management
- Toby Hanes - Hydrology, watershed improvements, stream geomorphology

The authors of this report were the Contracting Officer's Technical Representatives for the Forest Service.

### STUDY METHODS

The study had three distinct phases:

- Pre-field
  - Pre-site visitation forms/questionnaire sent to Ranger District offices
  - Data gathering from Ranger Districts
- Field site visits
  - 13 sites in Arizona in June 1990
  - 12 sites in New Mexico in September 1990
  - Site measurements and evaluations
  - Photography - 35mm and video
  - Interview/discussion with field personnel from Forest and District
- Post-field and follow-up
  - Data analysis, interviews, etc.
  - Conclusions and recommendations
  - Report preparation and publication

### PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Based upon site visits and data gathering efforts, the contractor developed the following conclusions and recommendations to improve riparian project success in the Southwestern Region.

- **Grazing Conflicts**

Conclusion:

Proper livestock management is essential to implementation of successful riparian treatments. Inappropriate livestock management poses the single most serious obstacle to riparian project success.

Recommendations:

- Develop riparian-compatible grazing strategies
- Develop riparian-specific utilization standards
- Fund structural treatments only where grazing management is compatible with riparian goals
- Establish standards for riparian pasture and enclosure fences
- Increase the size of projects and enclosures

- **Watershed Management Objectives Coordination**

Conclusion:

Riparian treatments and watershed management must share similar goals for riparian treatments to succeed. Many projects appeared to lack these shared goals.

Recommendations:

- Implement only projects that integrate watershed condition and riparian health
- Assess watershed management activities with respect to effects on riparian area conditions
- Use upland vegetation conversions to aid riparian areas only after intensive interdisciplinary planning

- **Monitoring and Evaluation Lacking**

Conclusion:

Few projects included monitoring and evaluation as part of the overall project design and implementation.

Recommendations:

- Develop and implement monitoring plan as integral part of project action plan
- Establish evaluation criteria to measure success in monitoring plan
- State project objectives carefully to drive inventories and monitoring
- Link monitoring to maintenance and adjust maintenance to reflect monitoring findings

● **Coordinating Partnerships**

Conclusion:

Public and special interest group partnerships are increasing and provide valuable expertise and labor. Short-term efforts to take advantage of this interest sometimes conflicted with long-term rehabilitation strategies.

Recommendations:

- Maintain control of partnership projects, not letting projects control FS
- Insist on quality construction and maintenance from all partners

● **Reliance on Instream Structures**

Conclusion:

In many cases the region relies on instream structural measures to restore riparian areas when the root cause of poor riparian health is unsatisfactory watershed condition. Efforts to restore the riparian area without addressing the overall watershed will likely have limited success.

Recommendations:

- Consider benefits of non-structural measures as the first alternative
- Use formal engineering designs for more projects
- Use bioengineering designs where possible
- Use projects compatible with stream dynamics and watershed response
- Use risk analysis in project design

● **Funding Imbalance Discourages Planning, Monitoring, and Maintenance**

Conclusion:

Funding for project implementation appears acceptable in most cases. Funding for project planning, monitoring, and maintenance, however, is under funded and under emphasized. This trend hampers long-term project success and seems to emphasize quantity rather than quality in project work.

Recommendations:

- Properly fund all phases of a treatment including analysis, planning, implementation, monitoring, and maintenance

- Perform cost/benefit analyses on all projects and related land management activities

- Approve only projects with monitoring and maintenance plan and budget

- Develop procedures to budget all phases of projects

● **Site Potential Assessment Needs**

Conclusion:

Project implementation is seldom preceded with an inventory adequate to assess existing site condition or potential. This limited knowledge often leads to selection of inappropriate treatments, thus minimizing the likelihood of project success.

Recommendations:

- Conduct baseline inventories to assess current and potential assessment needs
- Gather baseline data using methods compatible with future monitoring methods
- Design projects specific to site needs. Avoid cookbook approaches where possible.

● **Interdisciplinary Approach Necessary**

Conclusion:

A true interdisciplinary approach on projects was found infrequently, thus limiting success.

Recommendations:

- Institute Integrated Resource Management (IRM) on all projects
- Use true interdisciplinary approach in all projects
- Increase hydrological input to most projects

● **Alternative Analysis Needed**

Conclusion:

Few projects include alternative analysis to determine the range of project alternatives and define consequences of actions.

Recommendations:

- Use Integrated Resource Management (IRM) process to develop full range of alternatives

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- Address and treat underlying problems in the analysis, not just ways to treat symptoms

● **Maintenance Lacking**

**Conclusion:**

Lack of project maintenance was evident in many projects and contributed significantly to project failure.

**Recommendations:**

- Include maintenance plan and funding with overall project plan
- Fund only projects that include maintenance in the project plan
- Provide targets and rewards for project maintenance just as is done for new projects
- Develop means to include maintenance funds at all levels of budget process
- Insure links between monitoring and maintenance. Allow alteration of maintenance based on monitoring results

● **Commitment at All Levels**

**Conclusion:**

Successful project implementation seemed directly dependent upon the personal commitment of individuals on site rather than upon a commitment by the organization as a whole. Projects were, therefore, related to individual rather than organizational enthusiasm.

**Recommendations:**

- Develop means to increase commitment at all levels in organization
- Increase training and awareness of watershed and riparian functions and values throughout the organization

**SUMMARY**

The draft contract report containing the above recommendations and conclusions is undergoing final review by the Forest Service. The final report will be issued early in 1992. The Southwestern Regional Office and RMFRES will use this information to begin implementing changes aimed at increasing the success of riparian improvement

projects on all southwestern National Forests. These efforts will include the publication of a General Technical Report from RMFRES, training for professional and technical personnel involved with riparian improvement projects, and development of handbooks, visual aids, and related materials to promote techniques with high success probabilities.

**RECOMMENDED READING**

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