

Analyzing the Economics of Tamarisk in the Pecos, Rio Grande, and Colorado River Watersheds

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Abstract—The potential economic effects of tamarisk (saltcedar), and the costs and benefits associated with controlling tamarisk infestations are being evaluated on the Pecos, Rio Grande, and Colorado River watersheds. Resource impacts analyzed include water, wildlife habitat, and fire risk. The extent of existing infestations will be quantified and projected over the next 30 years under the following four scenarios:

1. No action (status quo)
2. Containment
3. Maximum control in 20 years
4. Maximum control in 30 years

The economic costs and benefits associated with each alternative scenario will be estimated, and a sensitivity analysis will be conducted to determine which variables have the most impact on the results of the economic analysis.

Introduction

An economic analysis of Tamarisk (saltcedar) is being conducted to evaluate this invasive shrub in some areas of the Pecos, Rio Grande, and Colorado Rivers in the southwestern United States. Russian olive and Siberian elm infestations will be incorporated into the analysis to the extent feasible. The analysis consists of two case studies that address the extent of the existing infestations in the analysis areas; risk of spread to susceptible areas that are currently not infested; potential damage to various resources; and the costs and benefits associated with controlling tamarisk and restoring native vegetation. The case studies will provide a sample decision making format that can be used to evaluate future project proposals, set priorities for allocating Federal funds, and provide policy makers with accurate and credible information to help determine the most effective and efficient courses of action for dealing with tamarisk infestations.

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Methodology

Determining Current Conditions and Rate of Spread

The extent of the current infestations in the study areas is being determined and depicted on a map. Historical information is used to determine the average annual rate of spread during the past few decades. Projections of future acres affected over a 30 year period will be made based on historical growth rates.

Over the past decade, a number of independent mapping efforts have attempted to capture the distribution and abundance of tamarisk infestations in several areas of the western United States. However, many of these projects are spatially and temporally discrete, making it difficult to determine a broad, comprehensive picture of tamarisk spread over time. Some of the underlying difficulties stem from issues regarding mapping methodology, scaling, considerations of mixed stands, overstory/understory relationships, accessibility problems, and inclusion/exclusion of different functional mapping parameters (for example, upper watersheds). Merging these various mapping efforts should increase our ability to assess and track tamarisk infestations. Further, a subsequent comparative

effort should then foster a reasonable estimation of the rate of spread over time and space. However, issues regarding data quality and resolution, and therefore accuracy and precision, remain unclear.

Categorizing Levels of Infestation

Areas within the watersheds are placed into four broad categories: 1) not currently infested (in other words, no tamarisk, no Russian olive, and no Siberian elm), 2) lightly infested, 3) moderately infested, and 4) heavily infested. There are uncertainties regarding how much of an invasive species is in a given area in the base year, let alone future years. The four categories are perhaps better viewed as ranges. For example, 0 percent to 10 percent could be called uninfested (not currently infested in the case of the base year), 10 percent to 40 percent could be lightly infested; 40 percent to 80 percent moderately infested; and 80 percent to 100 percent heavily infested. Guidance on the appropriate percentages will be sought from ecologists and weed science experts.

Developing Alternatives

Four alternatives will be evaluated for the Pecos, Rio Grande, and Colorado River watersheds. These are not the only possible alternatives, but they represent a plausible range of actions, including variations in intensity and timing of control efforts:

Alternative 1

Maintain Status Quo—This serves as the “no action” alternative. Under this alternative, existing and planned private, local, tribal, state, and federal programs continue into the future, but no additional effort is made to control the spread of tamarisk or rehabilitate currently infested areas. The period examined is 30 years (2004 to 2034).

Alternative 2

Containment—The containment alternative is analogous to a strategy used to fight wildfires or control a disease epidemic. For example, by controlling the outer edges, the fire, the disease, or the invasive species infestation is contained, and prevented from spreading. Using 2004 as a base year, the containment alternative applies additional measures to ensure that areas that are not infested in 2004 remain that way throughout the 2004–2034 analysis period. The additional measures include a variety of tactics, including chemical, mechanical, and possibly biological control techniques, as well as maintenance, assessment, revegetation, and monitoring efforts.

A strict definition of containment would have areas with no invasive species remain that way throughout the 2004–2034 period. However, under Alternative 2, some

ramp-up period or lag structure in applying the measures and getting the results is assumed.

Alternative 3

Maximum Control in 30 Years—As in Alternative 2, Alternative 3 requires that the areas within the watersheds with no invasive species in 2004 remain that way throughout the 2004–2034 period. In addition, under Alternative 3, further actions will be taken to provide a continuous rate of progress toward reducing the intensity of infestations and restoring native vegetation to the maximum feasible extent by 2034. This continuous rate of progress is measured in part by determining the number of acres shifting from the high infestation category to moderate, to low, and to the uninfested category.

Alternative 4

Maximum Control in 20 Years—Alternative 4 represents the most aggressive approach to controlling tamarisk. This alternative is similar to alternative three, except that the maximum feasible level of control is achieved by 2024 and maintained through 2034.

Categorizing Vegetation Types

The impacts of tamarisk infestations differ by location. In riparian zones, tamarisk replaces native cottonwood and willow trees. In the semi-arid upland terrace area adjacent to the riparian zone, tamarisk replaces native grasses, sedges, and woody shrubs.

The amount of water consumed by tamarisk compared to the amount consumed by native vegetation will differ greatly in the two areas. Thus, currently-infested, as well as projected acres will be divided into these two categories for this analysis.

A third category representing areas of sensitive or special status will also be identified to represent areas of special concern for a number of reasons. These areas are tracts along rivers having unique or important attributes that would require or compel local managers or private landowners to protect, maintain, or improve their condition. Examples include: (1) habitat for threatened, endangered, and sensitive species; (2) dense stands of tamarisk and riparian sites with heavy fuel accumulations that increase the risk of wildfire; (3) historical cottonwood gallery forests; (4) areas of religious and cultural significance; and (5) areas where perennial water could be restored. Due to their importance, such sites often receive priority for management with limited funds. A very small percentage of the total acres analyzed will fall into this category.

These categories will be further divided into three “difficulty of access” classifications that will help determine type and cost of potential control techniques.

The selection of the most efficient tamarisk control technique is highly influenced by the difficulty of access to each site. For areas that are relatively level with adjacent roads, heavy equipment can be used; whereas, in canyons, access is limited to foot, horseback, or river travel. The control costs per acre are significantly different for these two situations. Thus, a good understanding of the accessibility throughout the Colorado, Pecos, and Rio Grande watersheds is essential to accurately estimate tamarisk control costs. The three “difficulty of access” classifications are:

- *Highly difficult to access*—This classification is associated with those areas that can only be accessed by foot, horse, or boat. Examples include steep embankments, canyons, and roadless areas.
- *Moderately difficult to access*—This classification covers those areas that have a mix of level terrain where heavy equipment could be used, and steep embankments that would require hand labor to control tamarisk. Typical of this classification are river channels where the side slopes adjacent to the river are too steep for equipment use, but have broad flood plains that have good access potential.
- *Low difficulty of access*—An area that is easily accessible is defined as one that is relatively level, near an existing road, and where heavy equipment can be used throughout.

Identifying Resource Impacts

The following three resource impacts will be assessed for each alternative:

1. Water
2. Fire
3. Wildlife Habitat (including endangered species)

These resource impacts will be quantified in physical and monetary terms to the extent possible, given the availability of data and the ability of scientists to provide expert judgments.

Identifying Costs

All costs associated with control and restoration of infested areas will be compiled for each alternative. Cost components include direct control costs, as well as costs related to research, maintenance, assessment, revegetation, and monitoring. Also, costs associated with biomass utilization will be estimated to the extent feasible.

Identifying Benefits

Benefits of containing or controlling tamarisk infestations are based on changes in resource impacts related to water, fire, and wildlife habitat (including endangered species). For example, the benefits of Alternative 2 (Containment) would be the increased water yield, reduced fire risk, and reduced impact on wildlife habitat that result from moving from conditions under Alternative 1 to conditions under Alternative 2. Likewise, the benefits of Alternative 3 result from moving from conditions under Alternative 2 to Alternative 3. Also, benefits associated with biomass utilization will be estimated when appropriate.

Results

We expect to have preliminary results of the analysis completed by April, 2005.