

Colorado Tamarisk Mapping & Inventory Project Objectives, Protocols, and Guidelines

Purpose: The purpose of this study was to establish and implement an inventory protocol that provides a clear understanding of the extent of the tamarisk problem but is also economical to perform. Quantifying and characterizing the tamarisk infestations on each major river system provides a wealth of information for many diverse users. The data produced provides planning level information that can support policy; and state, federal, and local decision-making concerning tamarisk control and riparian restoration efforts. Land managers, however, must take into consideration the site specific conditions of each land parcel and the desires/preferences of the landowner to select the appropriate tamarisk control and revegetation approach to implement.

Goal: The goal of these mapping and inventory protocols was to identify 85 to 90 percent of the tamarisk infestations in Colorado. This goal is achieved through the efficient inventory approach described below. The remaining 10 to 15 percent of infestations are scattered among minor tributaries and headwaters which can cost more to find than to control. These small scattered infestations are best identified as a component of larger-scale control projects.

Inventory Approach: To provide a thorough understanding of tamarisk infestations, a comprehensive data set was collected. This data provides essential information for developing effective cost estimates for control and revegetation, and to better understand impacts such as water losses and wildlife habitat effects. Tamarisk infestations were mapped by the Tamarisk Coalition on the Arkansas, Colorado, Purgatoire, White, Gunnison, Uncompahgre, Dolores, San Juan, Republican, and South Platte watersheds including major tributaries of each. The Yampa River watershed was mapped under an agreement with the National Park Service at Dinosaur National Monument. The North Platte and Rio Grande watersheds have minimum infestations that were assessed based on local weed managers' input but were not directly surveyed. The mapping and inventory process had five basic components.

- 1) High resolution aerial and satellite photos that are ortho-rectified (usually at 2 meter resolution or better) were acquired from available sources at no cost. These include photography from Mesa County GIS, U.S. Department of Agriculture – Farm Service Agency, and TerraServer. Utilization of National Agricultural Imagery Program (NAIP-2005) aerial photographs were, in most cases, the most current, consistent source of imagery for mapping purposes (available at <http://datagateway.nrcs.usda.gov/NextPage.asp>).
- 2) A basic understanding of infestation locations was gleaned from county weed managers, the state weed coordinator, state agriculture specialists, the water conservancy district staff, federal weed managers, university researchers, private land owners, and/or others. Photo interpretation of high-resolution aerial photography proved to be valuable in determining the potential infestation extent where prior knowledge was not available.

- 3) A consultation with the US Geological Survey (USGS) and National Institute of Invasive Species Science was performed for technical assistance and data standardization to ensure database compatibility with the national database system (www.niss.org)
- 4) On-the-ground surveys were then performed by a two-person crew to verify the following attributes of the tamarisk infestation:
 - ✓ GPS coordinates of tamarisk stand (Universal Transverse Mercator-UTM)
 - ✓ Percent cover (canopy)
 - ✓ Average height (added at the request of USGS partway through the field work on the Arkansas River)
 - ✓ Percent riparian area: defined as the portion of area currently occupied by tamarisk found in the floodplain corridor where native phreatophytes such as cottonwoods and willows could exist in the future.
 - ✓ Percent upland area: defined as the remaining land within the floodplain where dryland plant species would be more prevalent after tamarisk control is achieved is classified as upland.
 - ✓ Maturity (mature or immature)
 - ✓ Accessibility (good or poor for mechanized removal)
 - ✓ Presence other significant species (Russian olive, willow, cottonwood).
Note that for some rivers such as the White, South Platte, Republican, and Purgatoire that Russian olive was the dominant invasive species and additional mapping was performed to inventory these infestations.

These attributes were initially recorded on a Personal Data Assistant (PDA) system with standardized data collection software (EcoNab) integrated with a GPS unit. As the mapping work progressed, a rugged quality field laptop computer with ArcView 9 and preloaded NAIP imagery was used to allow for on-site data entry. Digital photos representing each data point were also taken to visually display the infestations. Additionally, a field notebook documenting other significant observations (i.e. access issues, land use, etc.) was recorded at every data point.

- 5) The field imagery data was transferred into shapefiles using ArcGIS software and attached to the tabular data listed above. These shapefiles were subsequently utilized to calculate the total areas of infestation in any specific region.

Deliverables:

- 1) Shape files characterizing each infestation with an attribute table including the following fields: acreage, percent cover, average height, percent riparian, maturity, accessibility, and other significant species presence. These shapefiles have added value in that they can be overlaid with other GIS referenced information; e.g., county property boundaries and ownership maps.

- 2) Digital photo album of the infested areas corresponding to each data point.
- 3) Auxiliary notebook describing significant observations.
- 4) PDFs of river segments showing shapefiles overlaid onto aerial photos and Excel spreadsheet tables are provided as user-friendly formats to present usable information for people without GIS expertise.
- 5) Excel spreadsheets provide individual details for each shapefile as well as watershed summaries. The summaries contain infestation acreage, percent cover, estimates of existing and future water losses, and estimates of total restoration costs including planning, control, revegetation, monitoring, and maintenance. These cost estimates are based on algorithms developed in *Options for Non-Native Phreatophyte Control* (March 2006, Tamarisk Coalition). The cost equations incorporate best management practices coupled with an Integrated Pest Management approach based on three variables – percent tamarisk cover, accessibility, and average width of infestation.

System Requirements:

System requirements to use the inventory and mapping data require the following computer and software capability.

- 1) The minimum requirement for viewing the shapefiles is a free program called ArcExplorer, available at <http://www.esri.com/software/arcexplorer/>.
- 2) Computer specs: Access the ESRI site at www.esri.com for specific system requirements.
- 3) Microsoft Word and Excel software are used for viewing reports and spreadsheets. Adobe Reader is required for PDFs of river segments showing shapefiles overlaid onto aerial photos.
- 4) Digital photos: Any software capable of viewing JPEGs is sufficient.

