

A Baseline to Determine the Potential Distribution and Invasiveness of Buffel Grass in Arid Regions of Mexico: Distributed Databases of Specimens, Observations, and Digital Cartography

Laura Arriaga, Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, CONABIO México, D.F.

Alejandro E. Castellanos, DICTUS, Universidad de Sonora, Hermosillo, Sonora México

Diego Valdez, Depto. Agricultura y Ganadería, Universidad de Sonora, Hermosillo, Sonora México

ABSTRACT

The introduction of invasive species into the environment can represent a severe risk to biodiversity as well as to agriculture, forestry, and fisheries. Most of the invasive species that cause problems in México have been imported, although native plants can also become invasive species or weeds if they proliferate away from their natural habitats. Most of the plants that have been introduced to México are often free of the diseases and insects that would have controlled them in their native range of distribution. These weeds can then out-compete native plants for essential resources including space, light, water, and nutrients.

The buffel grass (*Cenchrus ciliaris*), a native species of southern Asia and east Africa, was introduced to México as an improved pasture. Buffel grass is considered to be an excellent fodder species and is widely used as a pasture plant. Since its introduction to Texas in the 1940's, buffel grass has become the most popular grass in the southern states of U.S.A. for its drought tolerance properties. Buffel grass is widely used around the world in areas with a warm and dry climate. However important ecological changes because of massive land use and cover changes, and the fact that buffel grass can invade native habitats, are major concerns particularly in the arid lands of Northern México. Buffel grass is known to occur over a wide range of environmental conditions. In Sonora, buffel grasslands now extend in about 1 million hectares and it has been found spreading into sites where soils are well drained, rainfalls are below 500 mm, and winter mean temperatures above 5°C. Buffel grass will not do well in poor soil drainage areas, high altitudes combined with temperatures below freezing and rainfalls above 700 mm.

During the last two years in CONABIO we have been implementing a new methodology to model the potential environments where invasive species can establish. This methodology is based in the label information included in the voucher specimens of biological collections and in reliable observations of the species. It uses a spatial analysis based in the geographical references of the localities where these specimens were collected or where the species was observed. The spatial analysis is done generating potential geographic distributions of the concerned species through spatial models. Ecological similarity areas (ESA) are obtained using models like Floramap (Jones & Gladkov, 1999) or using genetic algorithms like GARP (Genetic Algorithm Rule-Set Production; Stockwell & Nobel, 1991). These include diverse environmental variables to generate the ESA. The resulting maps are reviewed according to the species performance in different environmental conditions. ESA are validated or can be redesigned according to other digital covers, like thermal zones, land use and vegetation maps, etc. Here we represent a coarse grain approach to determine areas where buffel should not preferably be introduced to avoid the invasiveness of the species.