Supplementary Material for HOCHMAIR, HARTWIG H., FRANCESCO TONINI AND RUDOLF H. SCHEFFRAHN−**The Role of Geographic Information Systems for Analyzing Infestations and Spread of Invasive Termites (Isoptera: Rhinotermitidae and Termitidae) in Urban South Florida.** Florida Entomologist 96(3) (September 2013) at http://purl.fcla.edu/fcla/entomologist/browse

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ABSTRACT

The ability to manage geospatial data has made Geographic Information Systems (GIS) an important tool for a wide range of applications over the past decades, including management of natural resources, analysis of wildlife movement, ecological niche modeling, or land records management. This paper illustrates, using invasive termite species as examples, how GIS can assist in identifying their potential sources of infestations and model their spread in urban South Florida. The first case study shows that the Formosan subterranean termite, *Coptotermes formosanus* Shiraki, and the Asian subterranean termite, *Coptotermes gestroi* (Wasmann) (Isoptera: Rhinotermitidae), were introduced into and dispersed across South Florida by sailboats and yachts. The second case study shows an agent-based model to simulate the natural spread of *Nasutitermes corniger* (Motschulsky) (Isoptera: Termitidae) in Dania Beach, Florida. This paper provides an overview of basic functionalities in GIS and demonstrates how they can be customized for advanced modeling and simulation.

Key Words: Spatial analysis, GIS functionality, modeling, South Florida, exotic termites

RESUMEN

La capacidad de manejar datos geoespaciales ha hecho de los Sistemas de Información Geográfica (SIG) una herramienta importante para una amplia gama de aplicaciones en las últimas décadas, incluyendo el manejo de los recursos naturales, análisis de movimiento de la fauna, modelos de nichos ecológicos, o manejo de los registros de terrenos. Se ilustra, utilizando especies invasoras de termitas como ejemplos, cómo el SIG puede ayudar a identificar las posibles fuentes de infestación y modelar su diseminación en las zonas urbanas del sur de la Florida. El primer caso de estudio muestra que la termita subterránea de Formosa, *Coptotermes formosanus* Shiraki y la termita subterránea asiática, *Coptotermes gestroi* (Wasmann) (Isoptera: Rhinotermitidae), fueron introducidas y dispersadas en todo el sur de la Florida por medio de los barcos veleros y yates. El segundo caso de estudio muestra un modelo basado en agentes para simular la diseminación natural de *Nasutitermes corniger* (Motschulsky) (Isoptera: Termitidae) en Dania Beach, Florida. Este documento provee una visión global de las funciones básicas de SIG y demuestra la forma como puede ser adaptado para producir modelos azanzados y simulaciónes.

Palabras Clave: análisis espacial, funcionalidad GIS, modelos, sur de la Florida, termitas exóticas

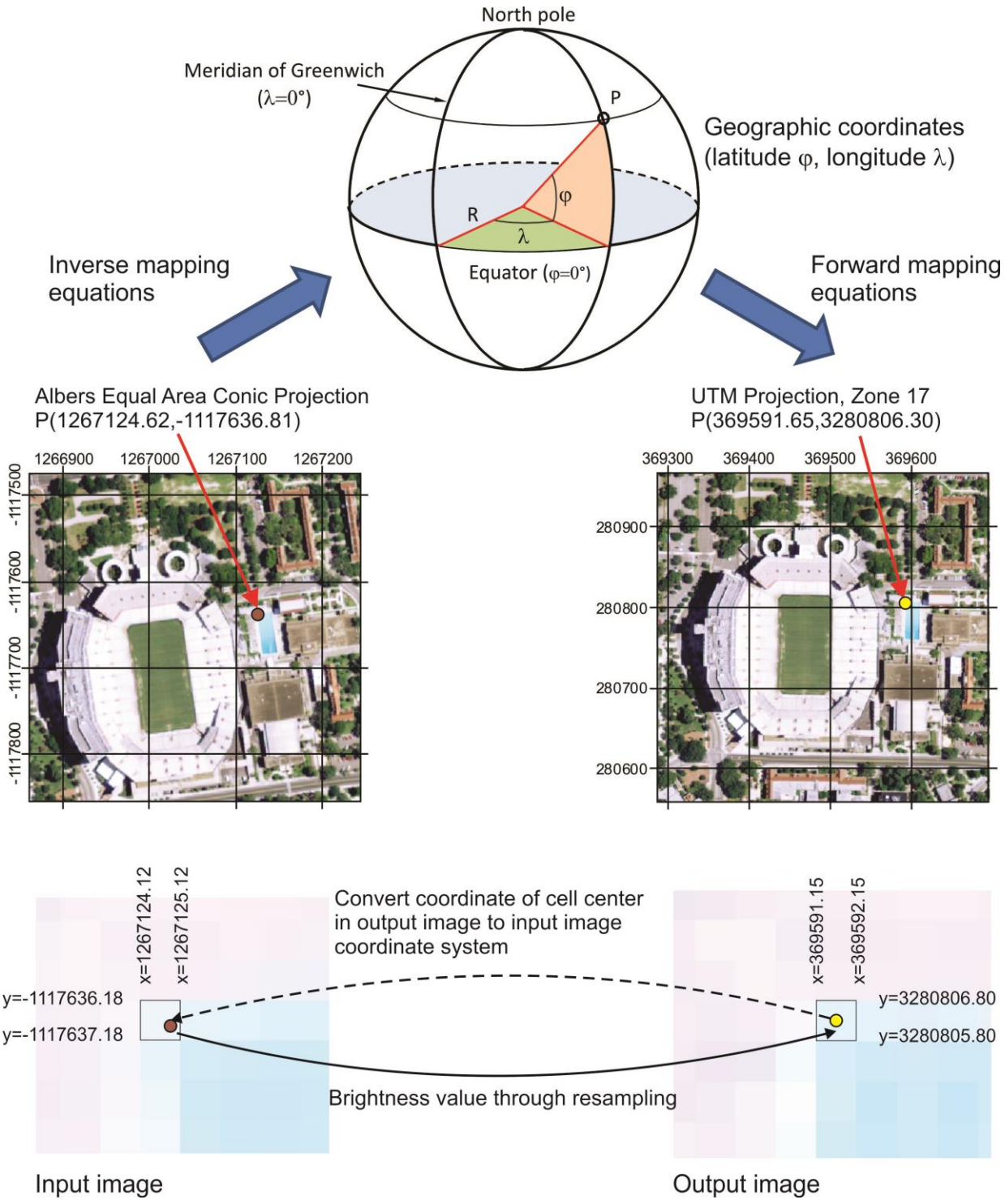

Fig. 1. Re-projection of a 1-m resolution aerial image between Albers Equal Area Conic projection and UTM projection (Zone 17) using geographic coordinates as an intermediate step. Resampling is used to fill pixel values in the output image through pixel values derived from the input image.

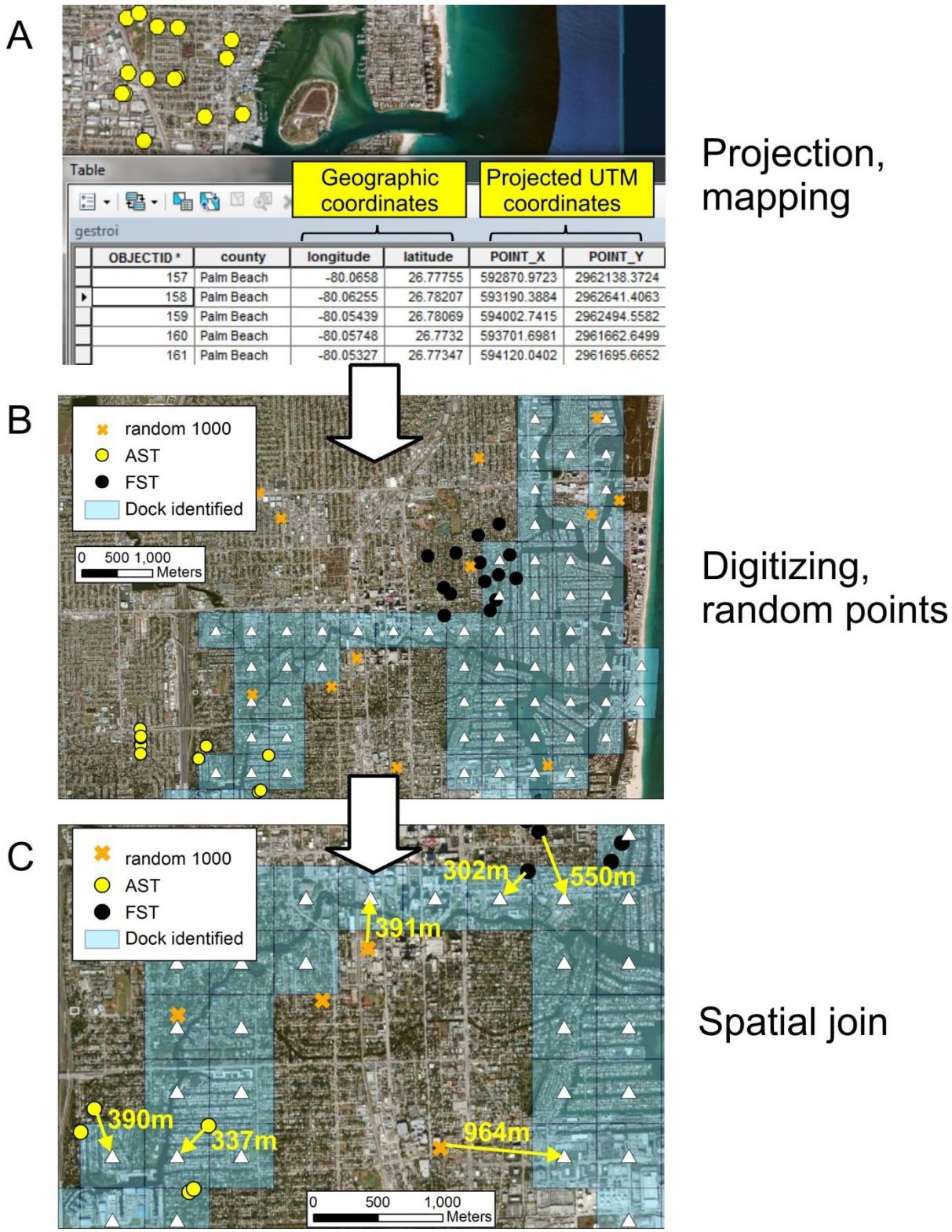

Fig. 2. GIS operations involved in distance analysis of termite collection sites and random points to nearest dockage: A) Point coordinate conversion from geographic to UTM coordinates; B) Digitize dock locations and generate random point pattern in urban areas; C) Determine distance to nearest dockage through Spatial Join function, as illustrated for selected termite and random points.

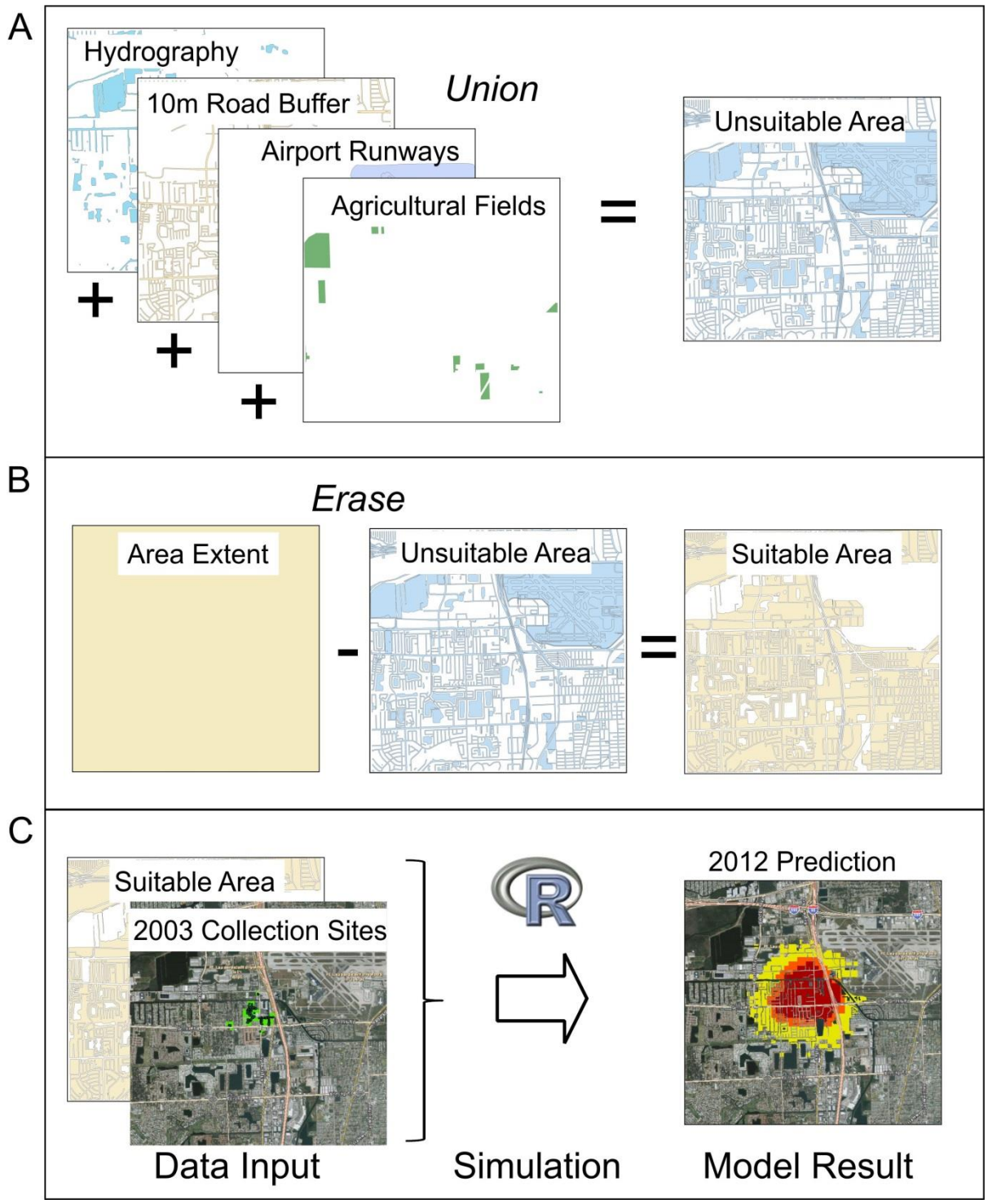

Fig. 3. Spatial analysis functions supporting termite spread model: A) Union overlay to determine unsuitable area; B) Erase operation to identify suitable area; C) Suitable area coverage together with 2003 termite collection sites used as input for spread model in R, with mapped model result to the right.

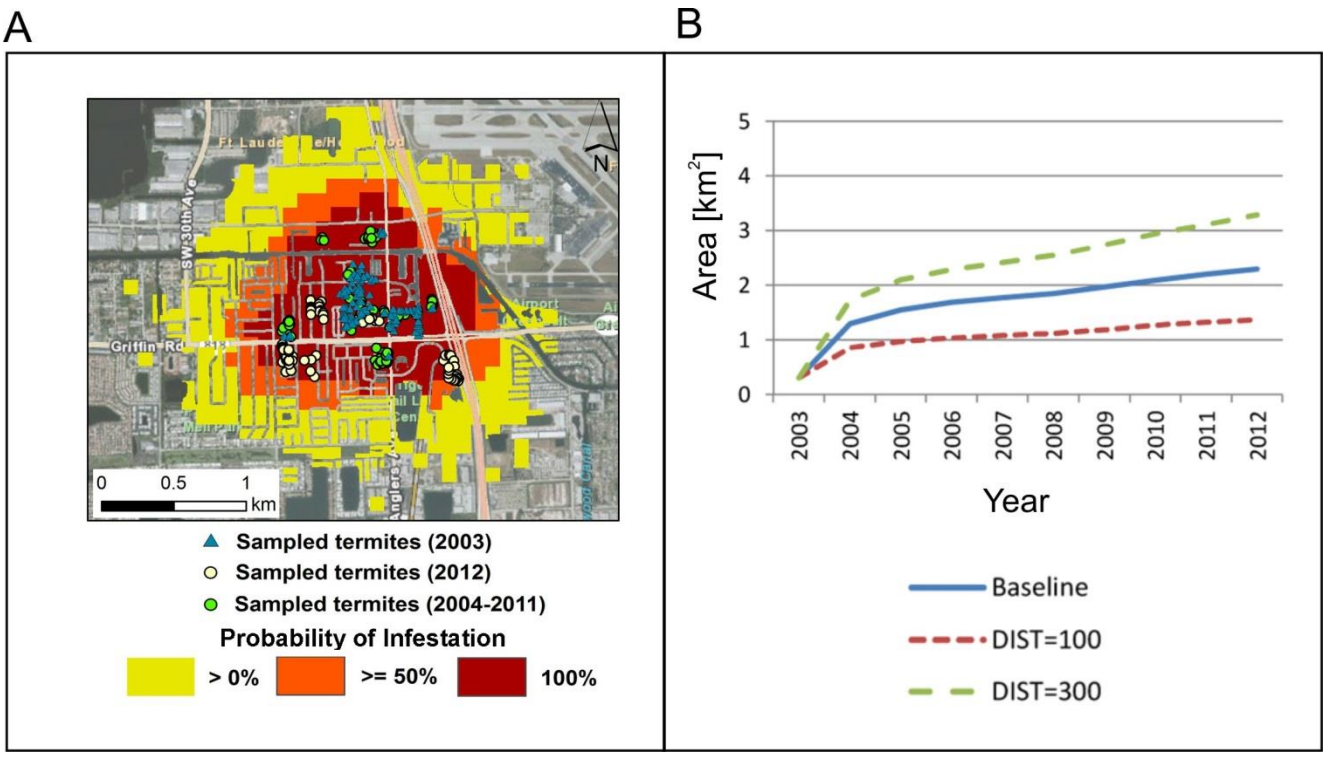

Fig. 4. A) Model evaluation comparing predicted infested areas for 2012 with 2012 sampled termite locations; B) Model sensitivity to the mean flight distance parameter in meters (Tonini et al. 2013).