SANTA RITA EXPERIMENTAL RANGE
HISTORIC STUDY AREA
DATABASE SEARCH APPLICATION

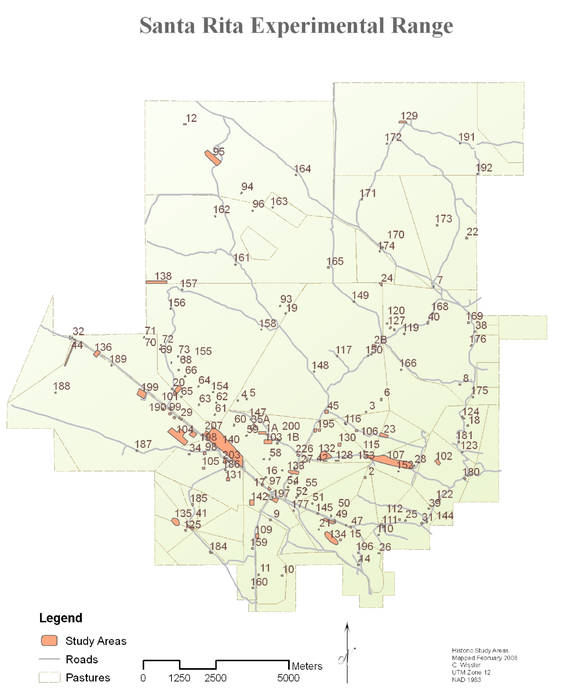


Figure 1. Map of historic study areas

INTRODUCTION

Established in 1903, the Santa Rita Experimental Range has been the site of numerous field studies. Many of these studies spanned several years and involved the use of specific locations on the range known as study areas (Figure 1). These study areas have generated a wealth of information in the form of research reports, study plans, photographs, and maps (Figure 2). Most of this information was developed and maintained in hardcopy format. Much of the information is unpublished and existed only as original documents.

Study area documents for research initiated on the SRER between 1915 and 1949 was automated by scanning and stored in digital file formats with funding from the USDA Forest Service. Some 300 study plans, reports, and maps were stored in the Adobe PDF format and some 440 photograhs were stored in the JFIF format with JPEG compression. These data files representover 2 gigabytes of content.

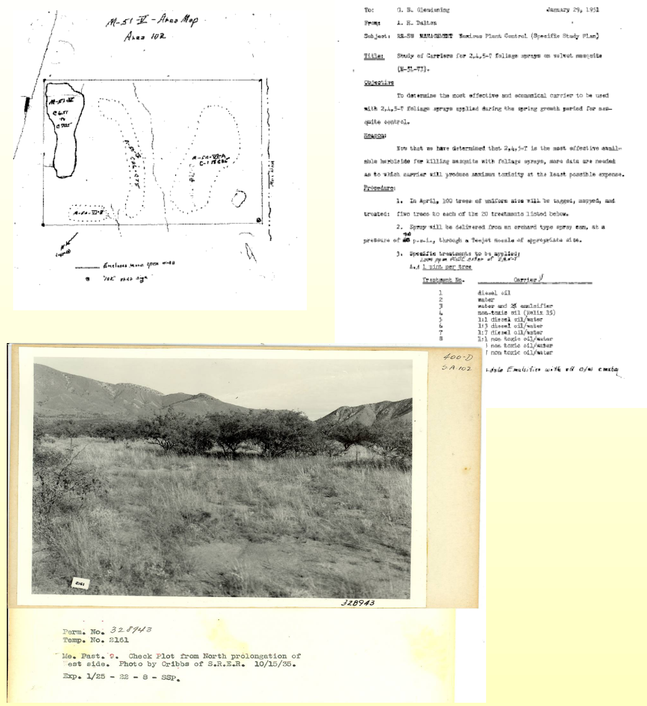


Figure 2. Sample of content types.

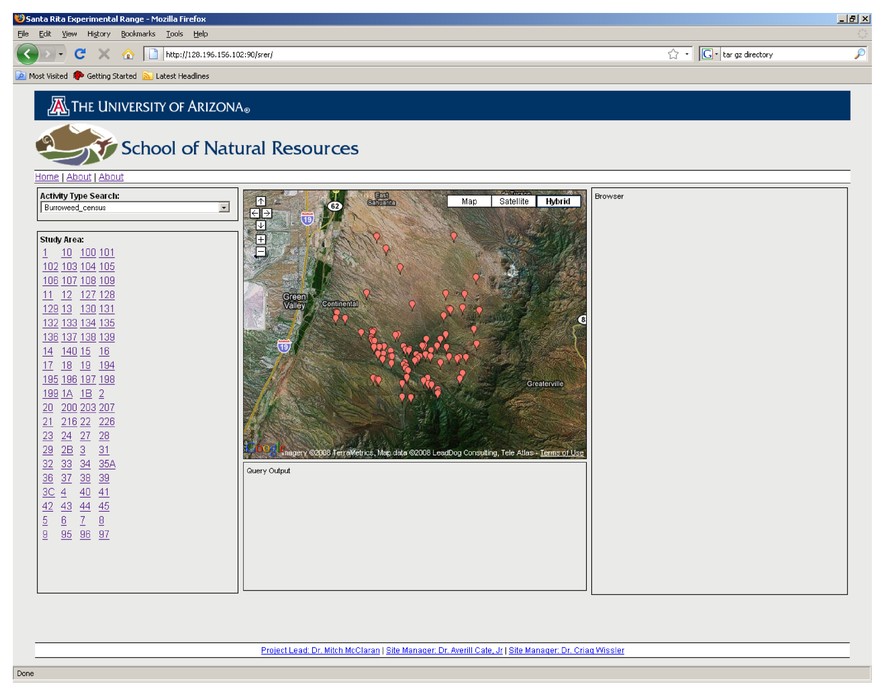
APPROACH

What is required to make these automated data useful to researchers is a method of searching the data files that is based on standard types of queries. To this end, a relational database model was suggested that would support queries of the historic data by location and by type of research activity. This model was to be implemented in format that would support queries in a client-server environment.

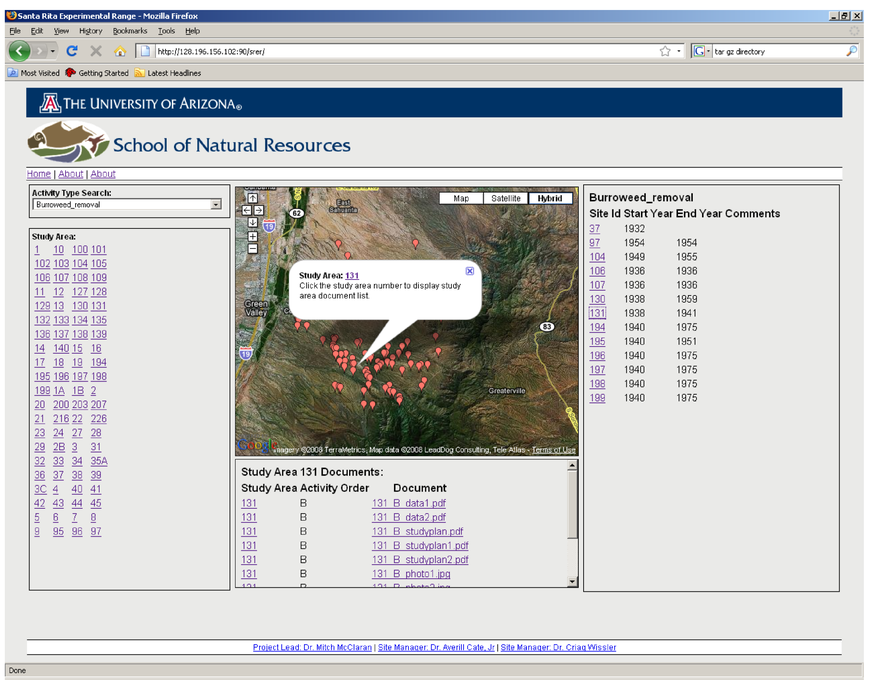
The first step in our approach was the development of a relational model that would support logical queries based on type of activity. Over 30 different research activities were identified for the logical search as shown in Figure 2. These activity types were developed from a domain of all types of research on the automated study area data. The structure of the resulting database is shown in Figure 3. A custom user interface was developed using Microsoft Access for the input of information about the activity types, locations, and dates of the studies.

OPERATION

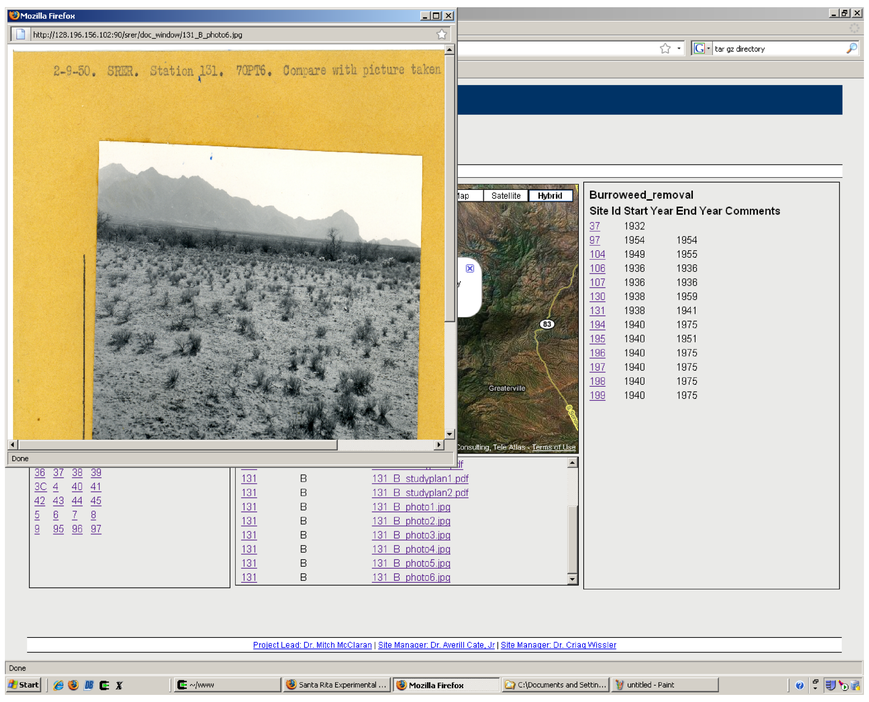
The Study Area Database Search website is designed to facilitate user interaction with a supporting database containing information related to historic activities on the range. The web application provides tools that let users complete text or attribute based queries as well as map based queries. The images below provide examples of typical user interaction with the application.



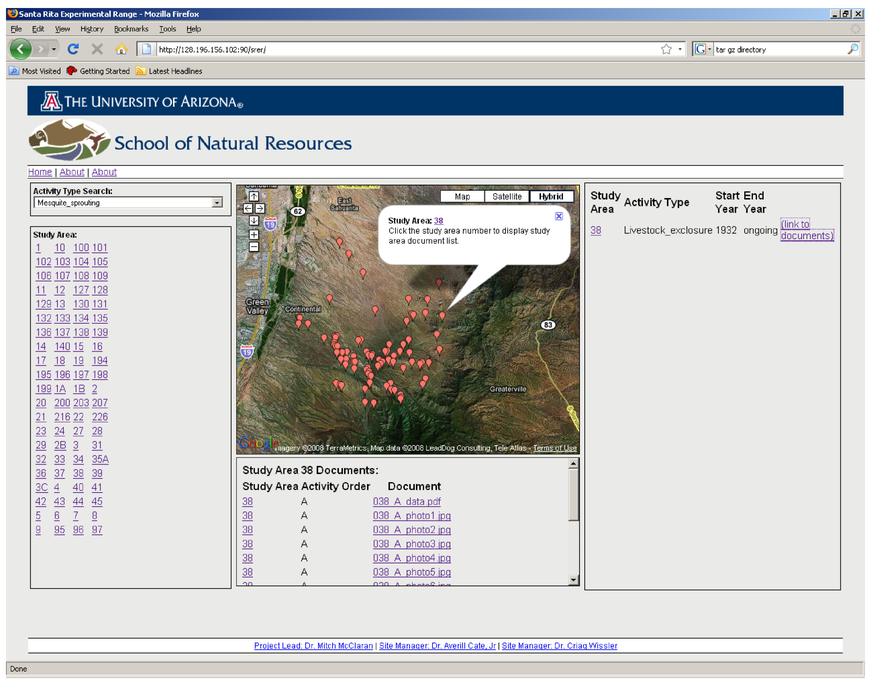
The landing page image shows the main page for the application. When first accessing the website the user is presented with this interface showing query tools on the left side of the interface, mapping and output regions in the center of the application and further data browsing region on the right part of the application. The query region allows the user to query studyareas by activity type or by a study area. The map portion of the interface allows the user to click on a location identified by one of the red- balloon icons. Clicking the balloon presents a study area link which lists documents for the site in the query output window.



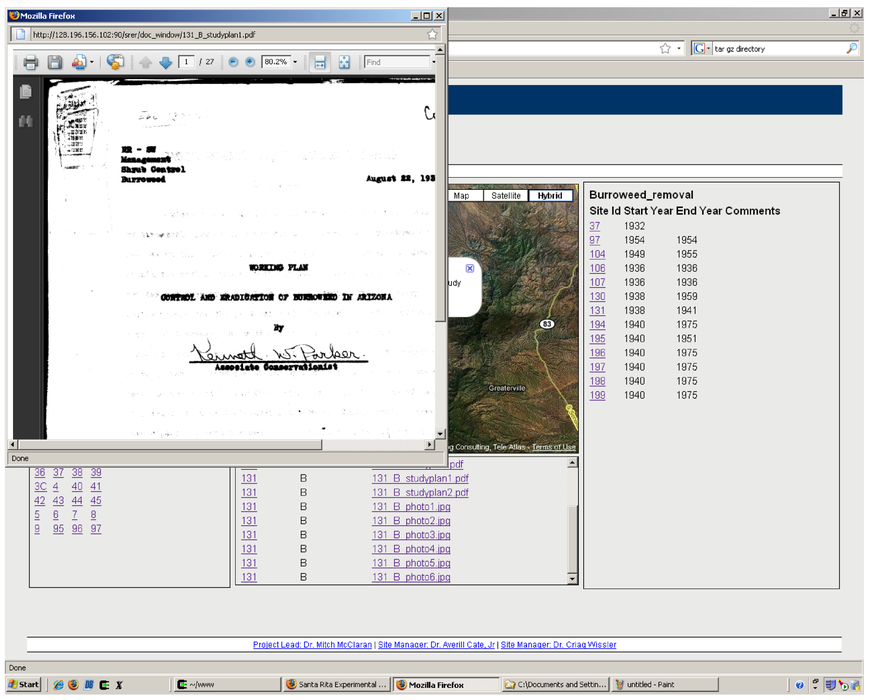
The activity type query image presents the results of a user selecting an activity type. Here the user has queried for Burroweed Removal. The resulting study areas that have had Burroweed Removal are listed in the browser window to the right of the map. Here the user has selected study area 131. The map component of the application identifies the location of study area 131 and displays a list of documents. Future improvements may have the listed documents be filtered based on the user-selected activity type.



The results of an activity type query for Burroweed Removal. The user has selected study area 131 and selected one of study area 131's images to view.



The study area query result image shows the results generated by the user selecting a study area link in the lower- right query window. The map display updates showing the study area's location. The browser output window updates as well and lists the study areas activities with a link that when activated will list the documents associated with the study area in the query output window located below the map. The user can select a document for further review.



The user has the same activity type query, but displaying a pdf document associated with the study area instead.

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This application was developed using the Python programming language (www.python.org), the Django (www.djangoproject.com) web application framework, Google Maps (maps.google.com), the Google Maps Javascript Application Programming Interface (code.google.com/apis/maps), and the Apache web server (apache.org). These programming tools and web server technologies were integrated with each other and connected to the underlying Santa Rita Experimental Range database. The Python programming language served as the core programming language used to interact with the database and develop the application. The DJango framework is based on the Python programming language and servers as a tool and quasi-programming environment that provides functionality that facilitates programming interactions between the supporting database and the user interface. Finally, GIS functionality was added to the application by embedding a Google Map in the interface. The map enhances the application by facilitating some of the study area queries and providing spatial relevance to the application and the study area.