

# **SAN CARLOS APACHE RESERVATION HIGH SCHOOL GIS PROJECT— NATURAL RESOURCES**

**Sabrina Tuttle and Meckenzie Helmandollar-Powell**

## *Abstract*

*Sabrina Tuttle and Meckenzie Helmandollar-Powell instructed 7 students and one teacher during 18 GIS/GPS classes using ArcGIS 9.1 Desktop Series, and Garmin V and Extrex GPS technology. The classes included a 7-hour course on GIS in natural resources, and a 5-hour field trip mapping data collection sites and “youth favorite places.” The classes also included using the internet to search for existing maps, importing coordinate data, and spatial imagery, constructing new maps; writing essays for the community atlas, composing a presentation poster, presentation practice, and a class/community service presentation. The class produced the following GIS maps: Tonto National Forest Desert Fires of 2005 (from imported data). The class collected the following data with handheld GPS units: Fuel Model Sites 1, 2 and 3; Fuel Model Sites 1a, 2a, and 3a; San Carlos “My Favorite Places,” and scavenger hunt locations on campus. Collected coordinate data was used to produce four GIS maps. The class downloaded other maps to further describe the community and natural resources of the area. The presentation will highlight the challenges of completing the entire project and the knowledge gained by students and instructors.*

Our 4-H Community Atlas project developed out of a 22-hour course for Mr. Robin Smith’s Biotechnology Class at San Carlos High School. It was posted on the ESRI Community Atlas Site on May 26, 2006. Sabrina Tuttle and Meckenzie Helmandollar-Powell instructed 18 GPS/GIS classes using ArcGIS 9.1 Desktop Series, and Garmin V and Extrex GPS technology. The classes included a 7-hour course on GIS in natural resources, and a 5-hour field trip mapping fuel model data collection sites and “youth favorite places.” It also included practice searching for maps, importing maps, and constructing maps; writing essays for the community atlas, composing a presentation poster, practice presenting and a class/community service presentation. Meckenzie Helmandollar-Powell developed 5 GIS and GPS lab manuals targeting beginner GIS users by using simple logic steps and many visual cues. The manuals include:

- Becoming Familiar with ArcGIS 9.1
- Creating Maps using Existing Data
- Collecting Field Data with a GPS Receiver (Garmin V and Garmin Extrex)
- Importing Field Collected Data into ArcMap
- Mapping Fuel Model Sites

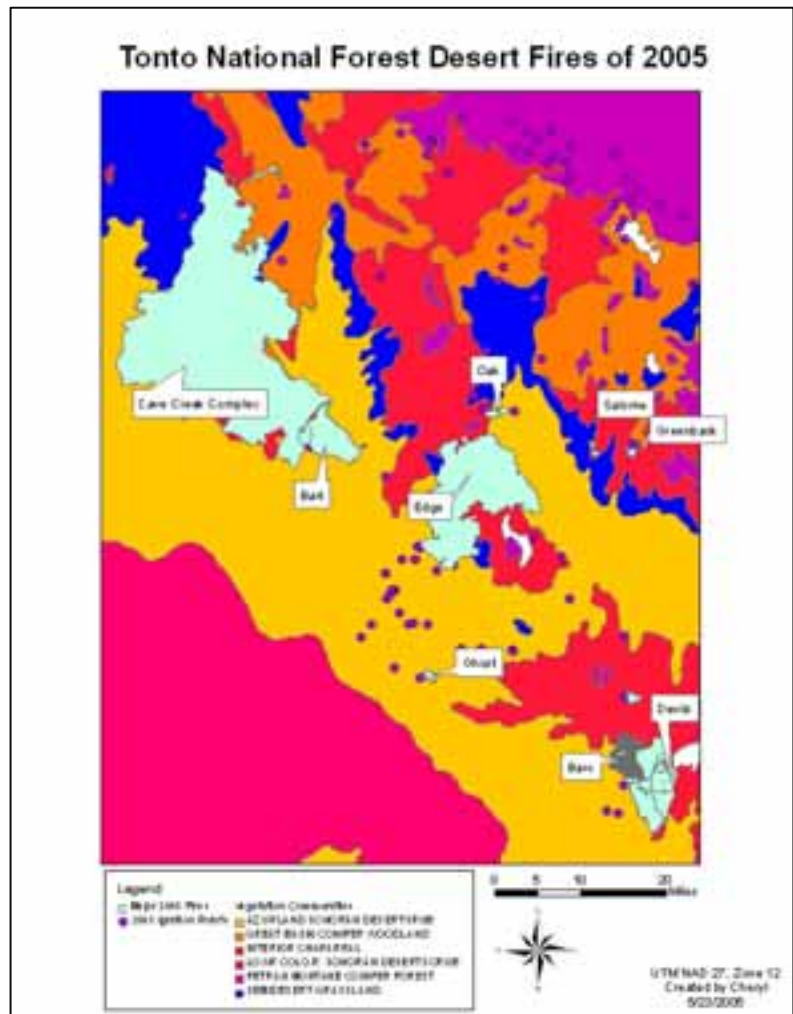
The class produced the following GIS maps that incorporated collected coordinate data (and existing data in some cases), spatial imagery, and hot-links to field photos:

- Tonto National Forest Desert Fires of 2005 (from imported data)
- San Carlos High School Campus Scavenger Hunt
- Fuel Model Sites 1, 2, and 3
- Fuel Model Sites 1a, 2a, and 3a
- San Carlos High School “My Favorite Places”

The class conducted an internet to find maps that further described the community and natural resources of the area. The following maps were downloaded as stand-alone documents and as background GIS imagery:

- Location of San Carlos Reservation in eastern Arizona
- Historical map of Arizona
- Upper Gila and Salt River Watershed
- Tonto National Forest
- University of Arizona Extension Office location at San Carlos topographical map with inserted photo

Here are some examples of the maps that the class constructed, along with field trip photos:



Fuel Model Data Collection in the Pinal Mountain area near San Carlos, AZ 2005



Legend

★ Fuel Model Data Collection Sites

Data Projection: UTM NAD83, Zone 12  
Map Created by: Francesco Rossi  
March 5, 2005

Our Favorite Places on the San Carlos Reservation



Our Favorite Places

- ★ Round Butte
- ★ San Carlos Lake
- ★ The Mesa
- ★ Total Service Building

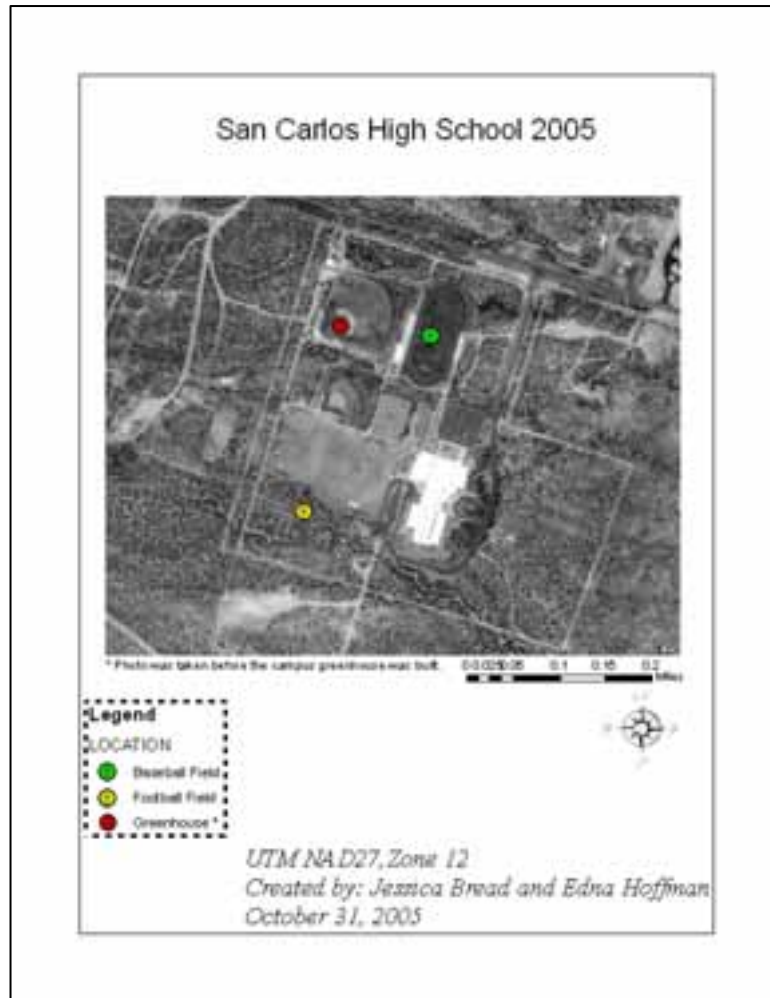
Map Projection: UTM NAD83, Zone 12  
Map Created by: Francesco Rossi  
May 5, 2005



*SC High students learning how to "track-back" to known locations using GPS receivers*



*Apache Crown Dancer in front of SC High School*



For our community service project, the class presented a poster that included the essays, maps, and photos to representatives of University of Arizona Cooperative Extension Firewise program from Globe, AZ and also to one of Mr. Smith's other agriculture classes. The purpose of this presentation was to showcase the work of the students, to promote GIS projects to other students, and to demonstrate the work that the students performed on fuel model sites to members of the Firewise program. The Firewise program aims to educate land and homeowners about how to prevent wildfires by correct landscaping and home construction. The Firewise program is especially pertinent to residents of the semi-arid climate of Arizona, where wildfire is often a danger.

The fuel model data collection sites that the students mapped are related to Meckenzie Helmandollar-Powell's Master Degree study, which analyzes the fire history and potential fire occurrence on the Pinal mountain range, east of the San Carlos reservation. The type of understory fuel model is related to the area's propensity to spread wildfire. The field trip activity compared existing ground fuels to an existing fuel model from a previous research study. Our class noted

that some of the data collection sites had changed fuel model classes from the prior study, potentially due to drought or grazing impacts.

Several challenges confronted our class and the instructors during implementation of the project. The first difficulty was downloading the GIS software on the high school computers. Some computers and/or their operating systems were rather capricious and not compatible with the program, so the instructors spent approximately 10 hours to download ArcGIS software onto 13 computers. The second challenge was figuring out how to design lab manuals that the youth could easily understand—our first tries at using the manuals at times were difficult, because the manuals were not graphic enough or were missing communication links as the students went from one step to another. We also had trouble getting some of the data to download when constructing maps, as some participants had not keyed data correctly into their GPS receivers in the field, or did not key the correct coordinates into their spreadsheet software in the lab. Meckenzie also had to help Sabrina and Mr. Smith develop competency in using the software. It was a challenge to try to finish each exercise within the 45 minute class period, and we often had to extend our work to a subsequent day to finish. Although students worked at different rates, this was not too problematic; the short class period was more of a problem.

Introducing GIS to the youth seemed to give them added confidence in developing a new skill; it also allowed them to do computer and field work that they normally would not have experienced during regular class time. The students showed the most satisfaction at sharing their favorite places that they had mapped on the reservation to the instructors and their teachers. Students never looked bored while working on their GIS project. For the majority of the classes, the students remained on task, listened well to instructions, and seemed genuinely interested in learning about GIS. The class worked on skills other than GIS mapping, such as designing a poster and presenting it to another group—most of the students had little experience with public speaking, but performed well after practicing their speeches. They learned how to research maps on the Internet and compose essays explaining the content of each map. One student was particularly good at problem solving, and actually figured out how to move forward with constructing a particular map when the secondary instructor became stalled while teaching the class due to a misunderstanding of the directions on the lab sheet. Although the students did not become experts at any of these tasks, they did learn the basics of GIS mapping and will hopefully be open to studying more technological subjects, including mapping, in the future. The instructors also emphasized job opportunities in GIS, including the higher salaries available in this field, and hopefully the project has sparked interest in the students to look further into a career in GIS.

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