**Introduction**

**Summary**

Freeman Ranch is located on 2101 Freeman Ranch rd. off of Fulton Ranch rd. in Southeastern Hays County –2956N and 98W—midway between San Marcos and Wimberley, approx. 5mi (8km) west of TX State University. Its landscape coincides with that of the main central Texas, Edwards Aquifer Plateau area. Freeman Center is 4,200 acres of land in the Texas hill country that is owned by Texas State University, with the goals to provide effective stewardship of the center’s ecosystem and infrastructure. The main objectives of the Freeman Center are to protect its ecosystems, enable investigation, research and benefit the student body as a whole. In able to maintain the three-fold mission of research, education, and outreach, the Freeman Center has identified the need of a geodatabase. Dr. Huebner, director of Freeman Center, reached out to GeoTrek to put in place a geodatabase in order to meet the center’s mission and goals. The Freeman Center is in need of a geodatabase that will allow the center to quickly and accurately perform analysis, produce maps, and continually update data on the database as the Freeman Center evolves for additional educational purposes. The Freeman Center wants to use this database to facilitate future management staff and students the production of maps of physical and cultural features present on the property. They also wish to use it for worksite purposes and to produce brochures to distribute to future and present stake- holders and guests in general. In addition to the hard copy map atlas a digital format will be included, easily accessible through the Freeman Center’s website.

**Purpose**

The primary goal of this project will be to build a digital geodatabase that will enable future research and assist in the maintenance of the ranch. Secondary goals for this project include map generation for an atlas and an illustrated brochure, including a land-cover classification for *Acacia farnesiana*. GeoTrek will collect as much data as possible to build a comprehensive geodatabase for Freeman Center in accordance with specifications established by Dr. Huebner and Chris Thomas (general manager of the ranch). This database will be used to enhance the teaching, outreach, and research the ranch can provide for students and visitors. The map atlas and brochure will cover the physical and cultural features of the ranch. A bound volume of the atlas in digital form will be produced for the inclusion to the Freeman Center website (<http://www.txstate.edu/freemanranch/>) as well as a map brochure that will allow for easy navigation of the ranch to visitors, research partners, and stakeholders. The project will provide a geodatabase which will make information needed for spatial analysis readily available for future use and reference. This database will also help improve the efficiency of maintenance procedures.

**Scope**

The physical extent of our study area is 4200 acres of land owned by Texas State University known as The Freeman Center. Because of its size the Center might have more features than it is possible to map in the projected timeframe. This will encompass a substantial amount of field work like driving through caliche or two track roads in rough terrain.

The digital/technological scope of the project will include the development of a geodatabase that includes many physical and cultural features present on the ranch. Necessary skills will include GPS data collection, geodatabase design, digitizing, data management, cartographic modeling, and any additional expertise needed to achieve our goal.

 GeoTrek understands the importance of maintaining and performing analysis on a functioning ranch and research center. An operational Geodatabase will allow for analysis and upkeep of the many physical and cultural features this land has to offer. A current map atlas with accurate GPS data points will allow for easy navigation of the ranch to visitors, research partners, and stakeholders.

**Literature Review and Research**

Several articles and journals were referenced to better familiarize the team members with the type of work being done, the skills needed to accomplish project goals and the feasibility of our goals. The literature review revealed that ArcGIS and its components were regularly used by institutions to create geodatabases that helped in maintaining all the geospatial data –for physical and cultural attributes- available and ready to use for managing land use or establishing institutional controls. Some of the projects studied appeared to be much more complex than this project, but nonetheless, a well-organized geodatabase was always present and proved to be integral part of managing, analyzing and visualizing data.

As references, GeoTrek also looked to past GEO4427 projects that also included the design and implementation of a geodatabase. Another key element of our research and literature review included oral accounts from Dr.Huebner and Chris Thomas.

**Proposal**

**Methodology**

In order to achieve our goals, GeoTrek will:

* Schedule meetings with the ranch director, Dr. Huebner, to prioritize which physical and cultural features will be maintained in the database and which will be displayed in the atlas.
* Design a conceptual model based around the features wanted for the geodatabase.
* Collect data by using GPS units, digitizing data, and using current Google KMZ or KML files and ESRI geodatabase files that will be necessary to achieve GeoTrek’s goal.
* GeoTrek will build a geodatabase and atlas of maps depicting the physical and cultural features of Freeman Center, including a change-detection map of *Acacia farnesiana*.
* GeoTrek will compile our final deliverables and present the client with an atlas and a brochure displaying the Freeman Center’s cultural and physical properties. We will implement a GIS schema that can be used to store and visualize data.

The creation of the geodatabase is our primary project. This requires careful consideration of the needs of Freeman Ranch, because a well-constructed geodatabase is a powerful tool that makes map creation, data manipulation and data analysis much more efficient. The first step in creating a geodatabase is a conceptual model. This is a physical document to show how our database will be laid out. Our database will be categorized in to two broad domains, physical and cultural. Next we will populate the domains with feature datasets and applicable tables. We will have to carefully design the database schema to insure we have a robust product for the customer. We will research whether creating our own data model or utilizing a data template from ESRI is the best option. Most of the process can be done using ArcCatalog.

The field data collection will be done using Trimble GeoExplorer 2005XT along with Pathfinder. The data gathered will then be transferred to ArcCatalog and, if needed, converted to a format compatible with the FreemanRanch.gdb.

After the creation of the geodatabase in ArcCatalog, we will add data that supports cartographic modeling. This data can be broadly categorized into two groups: physical and cultural. GeoTrek will produce an elevation map for freeman ranch. Our remote-sensing specialist will also provide a supervised classification and change detection map for the spread of *Acacia farnesiana* on the property using training data gathered with the Trimble GPS unit. Further manipulation of remotely imagery will generate additional data for inclusion in the geodatabase.

**Data**

GeoTrek will gather data from available public sources such as the city of San Marcos, Texas Parks and Wildlife Department (TPWD), Texas Natural Resources Information System (TNRIS) and Capital Area Council of Governments (CAPCOG). Some examples of this available data are plat maps or utility right of ways. Some public data will be processed by us to match the needs of Freeman Center. Other data will be manually created by our teams in the field using a Trimble unit. Some examples of this data will be the exact location of cow drinkers and water wells as well as the location of *Acacia farnesiana* for use as training data in a landcover classification. We intend to use NAD 83 with all of our data wherever possible to limit the amount of datum shift for future researchers using this geodatabase. Additionally, our field teams will ground-truth major landmarks on the ranch to ensure the absolute accuracy of our data. The ESRI ArcGIS software suite and ERDAS Imagine will be used to manipulate the data for needs of the project.

Data will include remotely sensed imagery, topographic maps, GPS data collected, KMZ and/or KML files, soil classification files, land use and property files.

**Implications**

Once the geodatabase proves to be functional it can be used for the creation of maps needed to give directions and instruction to maintenance personnel. It can be used to perform cartographic modeling and spatial analysis that can aid in the decision making process during the planning of future projects. It will immediately become an asset for students performing GIS and RS research. Our product will provide a solid foundation for the continued efforts in improving the stewardship of Freeman Center alike.



**Timetable**

The time-table for this project is 10 weeks in length:

* Weeks 1–2: ascertaining the client's specific wants and needs, identifying the cost of required services, gathering GPS datum in the field, creating schema for geodatabase, and any additional research found necessary for planning the project.
* Weeks 2–6: data acquisition and manipulation, geodatabase population,
* Weeks 7-8: map generation and atlas design, supervised land-cover classification using GPS training data.
* Week 9: Finish atlas, prepare final product and presentation
* Week 10: Present final deliverables

**GEOTREK Timeline for the Freeman Center project**

|  |  |  |  |
| --- | --- | --- | --- |
| Task | Month | Week | Important dates |
|  |  |  |  |
| Assessing client’swants and needs/research and training | September(starting on the 11th) | 0 | 9/41st client visitReview of RFP |
|  |  |  |  |
| Data acquisition/Manipulation, Geodatabase designAnd population | September&October | 1-3 | 9/30Proposal to clients(2nd visit) |
|  |  |  |  |
| Map generation/Atlas design/SupervisedLand-cover classification | October | 4-6 | 10/28(3rd client visit) |
|  |  |  |  |
| Website development/Prepare final product /Finish atlas and brochure | November | 6-9 |  |
|  |  |  |  |
| Final Presentation/  | December | 10 | 12/9 |
| Turn in final deliverables |  |  | Project presentation |
|  |  |  | (4th client visit) |
|  |  |  |  |

*Important:* Timetable reflects projected ideal timetable. In the event difficulties might arise some changes may occur.

**Final Deliverables**

By the end of the project we expect to have readily available the following items:

* Detailed Final Report accompanied with a PowerPoint presentation.
* CD/DVD copies of Map Atlas along with printed copy.
* Brochures with pertinent maps and information.
* Professional poster for display in the Geography Department.
* Webpage to be embedded into Freeman Center’s website.
* Drive containing the geodatabase with instructions and metadata.

**Conclusion**

The project will deliver the Freeman Center a geodatabase which will catalogue and make readily available information needed for spatial analysis and reference in future projects. This database will also help improve the efficiency of maintenance procedures on the ranch. The database will include both physical and cultural features classified into point, line, and polygon elements that will be further categorized into subtypes representing the different spatial and descriptive attributes. These elements will be used to create appropriate maps for the atlas and brochure portions of the project. A webpage format of the brochure will also be included in the final deliveries along with a final poster and CD available to the Geography Department of Texas State University. Geotrek understands the importance of accurate and organized datum; our product will provide a solid basis for the continued efforts of researchers and employees of the Freeman Center alike.

**Participation**

* **Alfredo Perez Jurado: Project Manager, Graphic Designer**
	+ Cover Page, Title Page, Table of contents, Final Deliverables, Implications
* **Peter Vogt: GIS Analyst, Graphic Designer**
	+ Data, Methodology, Implications
* **Hunter Krenek: GIS Analyst, Remote Sensing Analyst**
	+ Budget, Timeline, Timetable
* **Thomas Dowling: Assistant Project Manager**
	+ Summary, Purpose, Scope, Conclusion, References

All though specific tasks have been assigned to the different team members, the cooperation and input of all were invested in each section of the proposal.

References

Daum, Mary L.1, daum@bnl.gov, and William R.2, dorsch@bnl.gov Dorsch. 2007. "Managing Land Use and Institutional Controls with GIS." *Journal Of Map & Geography Libraries* 4, no. 1: 163-173. *Library & Information Science Source*, EBSCO*host* (accessed September 13, 2013).

Superchi, L., M. Floris, M. Ghirotti, R. Genevois, M. Jaboyedoff, and D. Stead. 2010. "Technical Note: Implementation of a geodatabase of published and unpublished data on the catastrophic Vaiont landslide." *Natural Hazards & Earth System Sciences* 10, no. 4: 865-873. *Environment Complete*, EBSCO*host* (accessed September 13, 2013).

Carrillo, J., S.Christensen, B.Dillshaw, K. McGauhey, S.Ortega. 2011 *Construction of Database for the New Braunfels Public Works Department.* San Marcos, TX: Texas State University

Henderson, R., D. Sablatura, V.Suarez, M. Montelongo. 2012 *Construction and Creation of a Geodatabaase on the Colorado River Refuge Owned and Managed by Pines and Prairies Land Trust in Bastrop, TX.* San Marcos, TX: Texas State University