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Spatial Analysis of Stream Buffer Setbacks for the Texas Hill Country

Progress Report

Prepared by:

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1. Introduction

The Texas Hill Country Alliance (HCA), a non-profit group working to develop a strategic and responsible regional growth plan that reflects their expertise and ideas of land stewardship, has tasked PAKK with the creation and analysis of stream buffer setbacks for the Texas Hill Country. This document serves to function as an overview of the progression of the project. The following report contains a brief project description, a timetable, and details what work has been completed, is in progress, and what remains to be done, as well as a concluding summary.

2. Project Description

2.1. Purpose

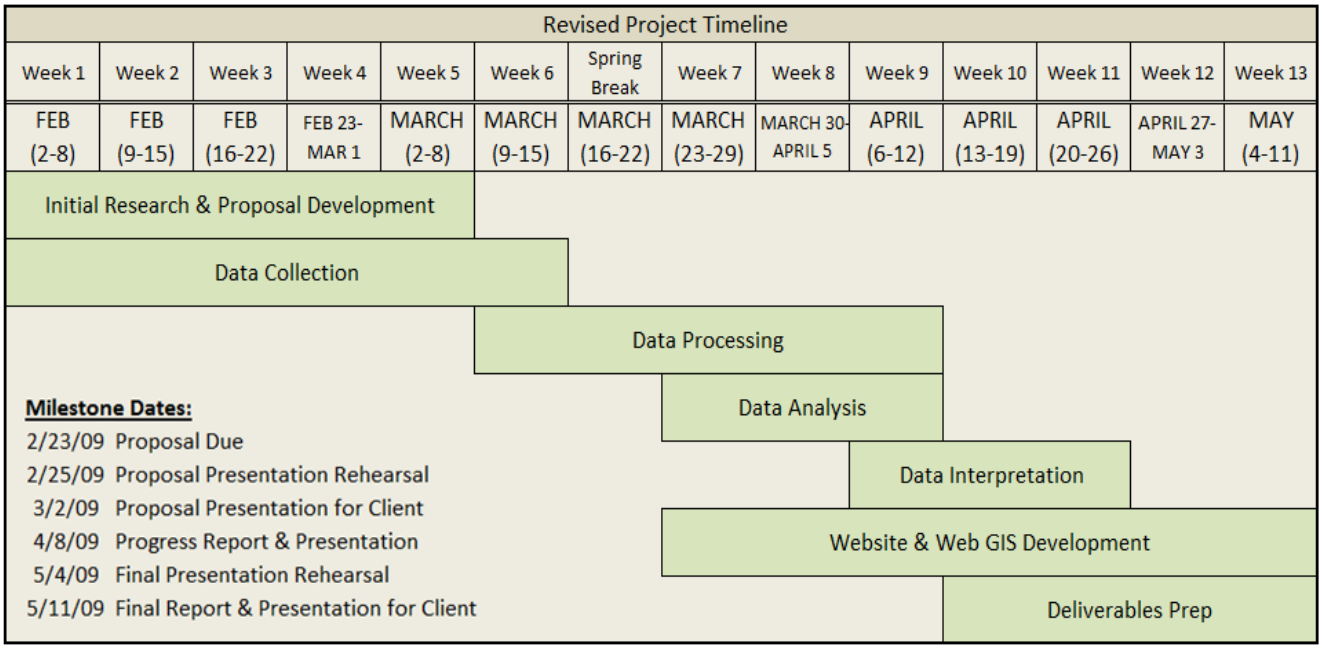
PAKK is applying geospatial technology and GIS tools for the creation of stream buffer setbacks based on guidelines expressed in the Regional Water Quality Protection Plan (RWQPP). The particular guideline PAKK is following states that a 300 ft. buffer on each side of the centerline of the stream (or 600 ft. wide) will be applied in relation to a contributing area of greater than 640 acres. The stream buffers created will be employed in calculating the amount of land area affected in relation to the size of county land area for 17 counties in central Texas. We will produce overview maps to illustrate these areas that are incongruous for well-planned sustainable development. PAKK will also be creating interactive web GIS maps for 6 counties which will include data layers that have been compiled.

2.2. Scope

The geographic scope in regard to the stream buffer analysis and land area calculations is a 17 county area of the central region of Texas called the Hill Country. The geographic scope in regard to the web GIS maps will be 6 of the 17 Hill Country counties including Hays, Comal, Blanco, Kendall, Bandera, & Medina.

3. Timetable

After review of our team's progress in relation to the proposed timetable, some minor revisions were made. A timeline section was added for initial research and proposal development, which required an extensive amount of time, in turn extending our data collection and organization stage by one week. This resulted in our start date for data processing being delayed by one week. Most of the remaining timeline revisions resulted from the week off for the spring break holiday, and more time needed for data processing, reasons for which will be explained later in the report. The data analysis, data interpretation, website and web GIS development stages were all deferred by one week. Data processing and data analysis were completed this week (Week 9), with data interpretation beginning concurrently. We should be able to begin the preparation of deliverables in Week 10, which will continue through the end of the project along with website and web GIS related development activities. No additional time will be required in order to complete the overall project, which still has the original finish date of May 11, 2009.



4. Work Completed

Work to the point of this progress report includes completion of proposal activities; data collection and organization; data processing; and data analysis. PAKK created a GIS model to streamline and standardize output for analysis in relation to stream buffer creation and land area calculations (Fig. 1). Several test runs of the complex model (containing approximately 121 processes) were executed and the model was adjusted as needed to ensure the most accurate results possible. In conjunction with the model runs, test maps were produced, which provide a preliminary sample of how the cartographic output will be illustrated (Fig. 2).

In addition to the aforementioned tasks, we have outlined a general design format for our website, which is under construction at this time. Members of PAKK are taking part in a tutorial to become more informed in the creation and maintenance of metadata for GIS layers we created and/or modified. Preliminary development of the interactive web GIS component of the project is also underway.

4.1. Challenges

In the process of preparing the complete hydrography data layer for use in our GIS model, we encountered a few challenges that resulted in slight revisions of the timetable as noted above. The hydrography layer is not consistent in its portrayal of water features. The water features were digitized into multiple line segments to represent one feature. Consequently, no topology was defined in the hydrography data and no network connectivity between segments exists. That is, one stream could consist of multiple segments (e.g., West Bear Creek has eight segments), but when displayed in a GIS appear as a continuous line feature. Another related issue is that some hydrography features are illustrated as single lines (e.g., intermittent streams) but others are depicted with double lines (e.g., the Colorado River).

In order to address these concerns, PAKK created separate layers for each of the seven feature types in the original hydrography data layer. This enabled us to determine to what extent these issues existed within the data. The intermittent stream features consisted of only single line segments. This layer represents over 80% of all water feature types. The water bodies, stream bodies, dams, and intermittent lake feature types consist of mixed single and double line representations. Only a few major streams and one major river are represented with double lines. PAKK did attempt to locate different hydrography layers, but all those publicly available, as well as the one we possess, are based on Texas Department of Transportation maps where features have been digitized. Because we must complete this project within the current semester

timeframe, we do not have adequate manpower and time to completely resolve the issues or clean up the large amount of data contained in the complete hydrography layer.

Buffers were created for each of the separate layers. For features made up of single line segments, the line will function as the stream centerline and the 300 ft. buffer will be applied to each side for a total width of 600 ft. For the few features that are represented by double lines the 300 ft. buffer will be applied to each of the lines, resulting in a somewhat wider buffer. When the data layers are displayed at a county-wide scale, the inconsistencies are not conspicuous; however, the acreage calculations were slightly skewed toward a larger amount. It is our opinion that this skewed amount is negligible. The buffers were then merged back into one layer for calculations, which was one example of ways in which utilizing a model assisted us.

5. Work in Progress

Presently, PAKK has several activities simultaneously ongoing. First and foremost, we are currently working on data interpretation for the analysis results and related calculations performed in ArcGIS through utilization of our GIS model. As previously mentioned, PAKK members are in the process of completing a tutorial to become more knowledgeable in regard to creation and maintenance of metadata for GIS layers we have created and/or modified for this project. Manifold software is being employed in the ongoing development and creation of the interactive web GIS component of the project which will cover the counties of Hays, Comal, Blanco, Kendall, Bandera, & Medina. Construction of PAKK's website continues as planned, and we should be able to start posting project documents shortly.

6. Work Remaining

Data interpretation for the analysis results and related calculations will continue over the next couple of weeks as we simultaneously begin producing maps and tables for presentation of results; this includes the calculated amount of land acreage removed by buffered areas. Metadata needs to be written for layers we created and/or altered. Website construction and updating will continue throughout the remainder of the project. Besides the project documents and maps, interactive web GIS will be created for six counties including Hays, Comal, Blanco, Kendall, Bandera, and Medina. This web GIS functionality will enable users to more clearly see stream buffers, along with other data layers that may be of interest. Final deliverables will be prepared and presented on May 11, 2009.

7. Final Deliverables

The Hill Country Alliance will receive the following items:

- Detailed Final Report
- Static maps for the 17 Hill Country counties illustrating stream buffer setbacks
- Poster highlighting our analyses and results
- Access to the project website
- Web GIS for 6 Hill Country counties (Hays, Comal, Blanco, Kendall, Bandera, & Medina)
- CD containing all of our data, metadata, proposal, progress report, final report, digital image of poster, and any related PowerPoint presentations. This CD will include a readme file containing instructions for accessing data and other information.

8. Conclusion

PAKK's progression with the stream buffer analysis and mapping project is occurring in a steady, timely manner. In processing the data, we faced some challenges in relation to the hydrography data, but worked through those issues, which slightly delayed the start of subsequent project phases. However, we are currently on target and do not foresee any other major problems arising, especially since the data analysis stage is now completed. The remaining stages will focus on cartographic output through the creation of maps (both static and Web GIS), website related material, and finalizing deliverables for the expected completion date of May 11, 2009.

9. Figures

Figure 1. GIS model created by PAKK for stream buffer setback analysis and land area calculations.

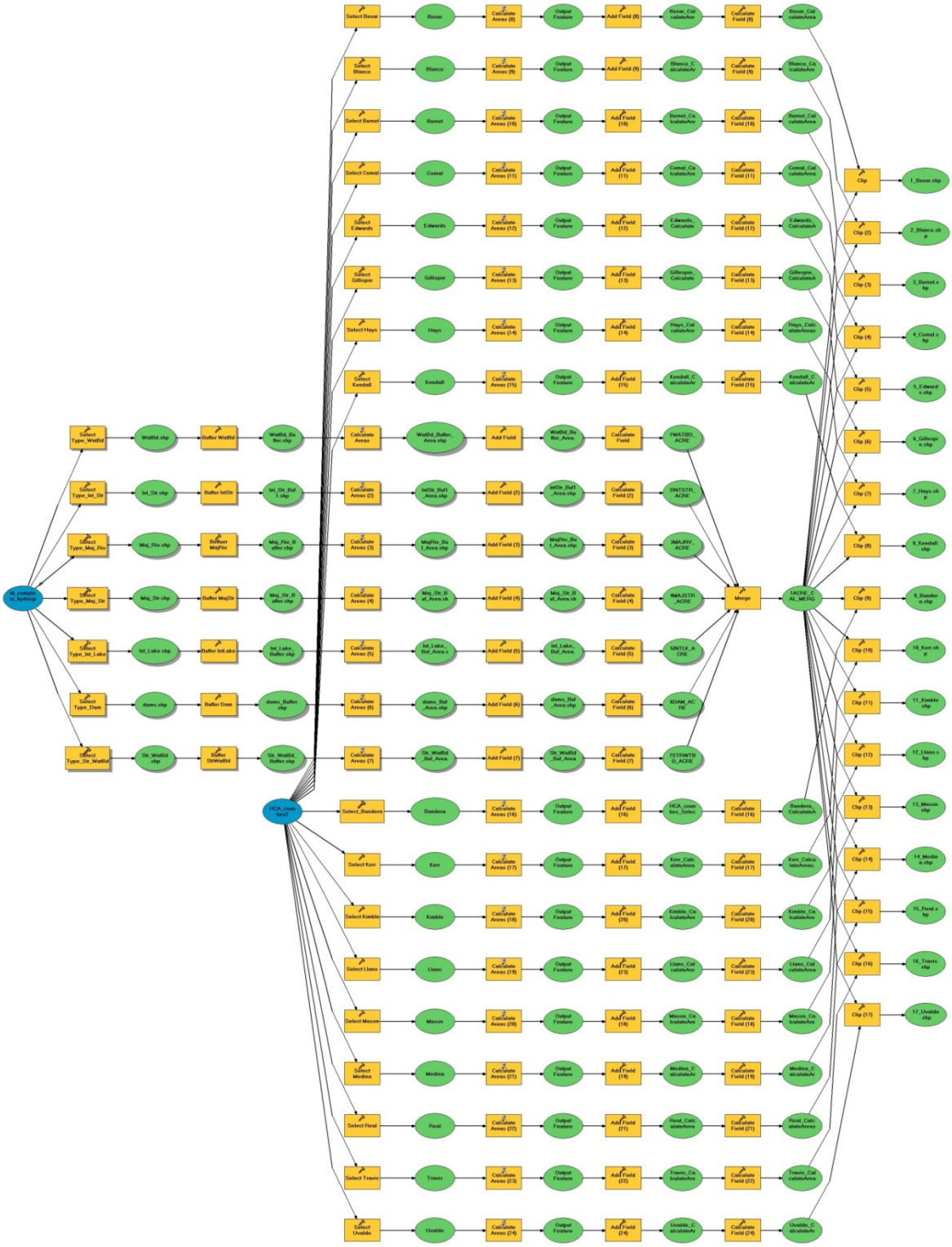
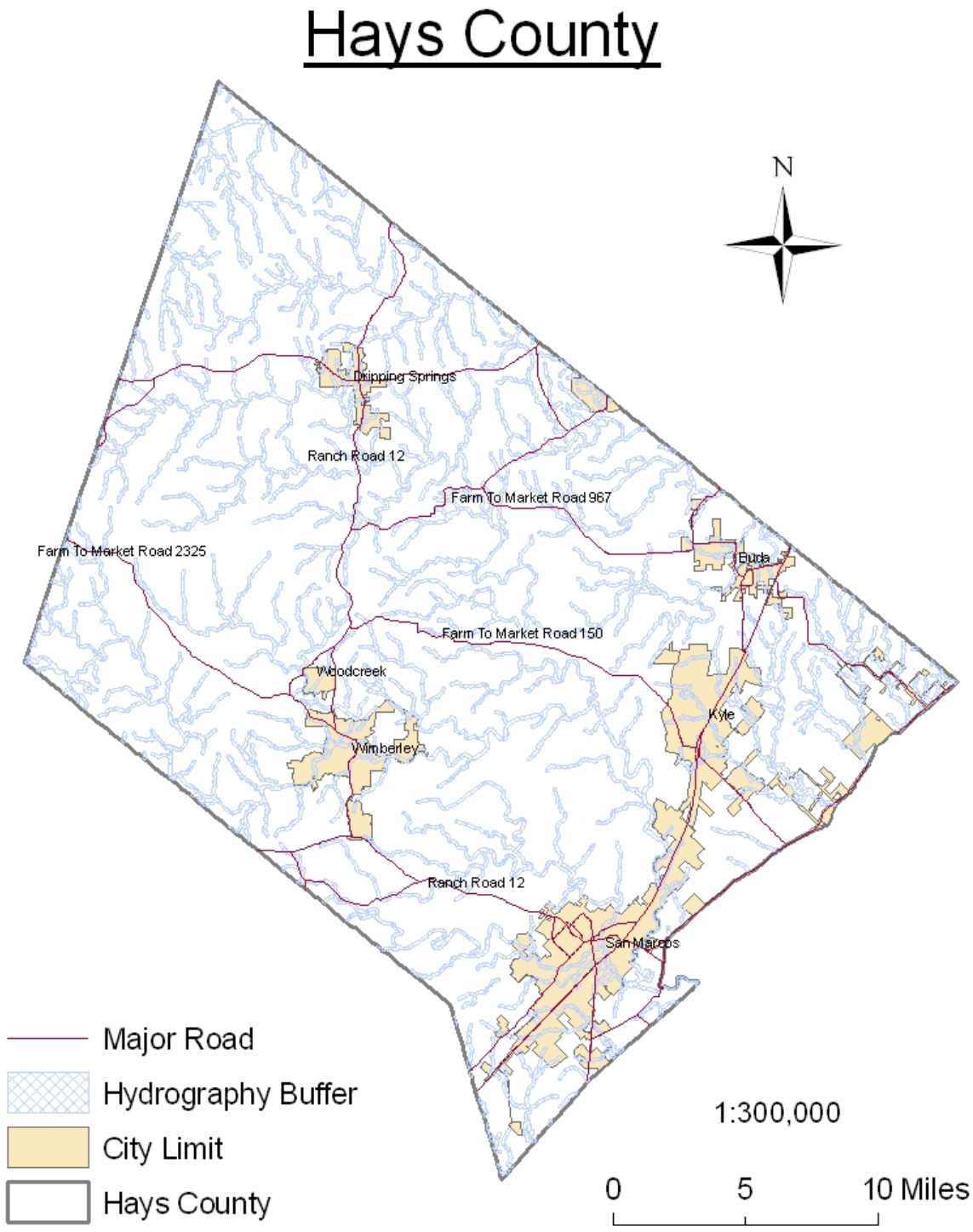


Figure 2. Preliminary map illustrating stream buffer setbacks for Hays County, TX.



10. Participation

This section details participation in the project up to the time of the progress report.

Ms. Katherine Grobe – Project Manager

- Project Proposal
- Proposal Power Point
- Proposal Presentation
- Project Website Design
- Progress Report
- Progress Report Power Point
- Progress Report Presentation

Ms. Phillicia Phillips – Assistant PM / GIS Analyst

- Project Proposal
- Proposal Power Point
- Proposal Presentation
- Data Organization
- Development of GIS Model
- Preliminary Map Testing
- GIS Data Analysis
- Progress Report Presentation

Mr. Amon Clack – GIS / Web GIS Analyst

- Project Proposal
- Proposal Presentation
- Web GIS (Manifold) Preliminary Maps
- Progress Report Presentation

Mr. Kyle Furtwangler – Webmaster / Analyst

- Project Proposal
- Proposal Presentation
- Project Website Design & Development
- Progress Report Presentation