**Basin Conservation**

**BaCon makes everything better!**



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**The Environmental Health of the San Marcos Watershed**

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**The Environmental Health of the San Marcos Watershed**

**Introduction:**

**Summary:**

San Marcos, a living breathing city, encompassing the booming Texas State University, is ever growing. The population growth is contributed to by many factors including: urban sprawl coming from San Antonio and Austin, as well as the growing student population at the university. The outcome of this is increasing amount of new development in the city, increasing the percentage of impervious cover by constructing new buildings, roads, and parking areas. This has the ability to affect the delicate health of the aquatic systems within this area. In this research, our main concern is to preserve the health of the San Marcos River for native species and human uses. The necessity of our research stems from how the impervious cover increases runoff which prevents the trickle-down effect by rain water which replenishes the Edwards aquifer, and amplifies the amount of non-point source pollution entering the river and aquifer system. The health of the river depends on clear, clean water, and approximate temperature. The San Marcos River is home to endangered species including the blind salamander, Texas wild rice, and the fountain darter. Our group, Basin Conservation (BaCon), is working for the City of San Marcos to encourage the protection of the endangered species by predicting the effect of impervious cover on the water quality of the San Marcos River. Taking into account the newly created comprehensive plan by the City of San Marcos, we will develop a scenario concerning the effect impervious cover has on the water quality using a combination of GIS technology and another program known as BASINS. Through the use of these tools, our group will collaborate with the Meadows Center for Water and the Environment as the liaison for the City of San Marcos to provide information and knowledge to enable the intelligent design for the city’s future growth.

**Purpose:**

The city of San Marcos requires assistance in creating geospatial datasets for estimating the impact of the future land use and changes to land cover on the environmental health of the Upper San Marcos Watershed. These datasets, in addition to the powerful software available, will show the city how different amounts of impervious cover will affect the water quality of the river and watershed. This will in turn affect the living conditions of all the local species, but especially of the endangered species, some of which only exist in the San Marcos River. As a result, we will provide interactive maps to demonstrate the outcomes through our website as well as possible evaluations to the best management practices.

**Scope:**

The geographic extent is the Upper San Marcos River Watershed, which is the San Marcos River until its confluence with the Blanco River. This area is environmentally sensitive and many endangered species depend on the river for different needs. The western side of the city and its developmental planning are also taken into account up through the year 2035.

**Proposal:**

**Data:**

GIS Data:

-County boundaries (GLO)

-Digital Elevation Model (TNRIS)

-Streams (Meadows)

-Sources of pollution (obtained after analysis)

-Download with BASINS (EPA)

-Land Use Land Change

-Weather Stations locations and data

-Water Quality Stations locations and data

-USGS Stream Gauge Stations locations and data

Other:

-Weather (NOAA)

-Water Quality Guidelines (TCEQ)

-Map of the new comprehensive plan (COSM)

Abbreviations: Texas General Land Office (GLO), Texas Natural Resources Information System (TNRIS), Meadows Center for Water and the Environment (Meadows), National Oceanic and Atmospheric Administration (NOAA), Better Assessment Science Integrating point & Non-point Sources (BASINS), Environmental Protection Agency (EPA), U.S. Geological Survey(USGS), Texas Commission on Environmental Quality (TCEQ), City of San Marcos (COSM)

The software to complete this project includes ArcGIS 10 and BASINS. ArcGIS is a geographic information system (GIS) based program serving a variety of location-based questions. BASINS is a system created by the EPA for use in watershed and water-quality analysis.

**Analysis:**

After the required data is collected and thoroughly studied, BaCon will work toward applying the information to ensure water standards acceptable for the existence of the three chosen endangered species: Blind Salamander, Fountain Darter, and Texas Wild Rice. Water standards for clean, clear water potentially include, but are not limited to turbidity, pH levels, pollution runoff, and water levels. More research and comparison of commonalities between our three species will be done to determine which of the qualities of water are best for this project. The information for specific environmental requirements and the predicted amount of change deemed possible for 2035 in San Marcos for impervious cover will be cross-analyzed. In order to do this, we will use watershed modeling available from BASINS and tools provided by ArcGIS to create potential development scenarios based off the comprehensive plans recently announced by the city of San Marcos. We might have to digitize the plans provided by the City of San Marcos using ArcGIS as part of our project. Then, we will create build out scenarios. Our build out scenarios will be completely theoretical, only intended to allow us to compare the change in impervious cover. These theoretical build out scenarios and assessment of environmental impact will permit us to evaluate the best management practices when constructing on the Edwards Aquifer Recharge Zone. Collaborations with the Meadows Center will be necessary throughout the analysis process.

**Implications:**

This project will provide the Meadows Center and the City of San Marcos the necessary data to determine the effects of growth in San Marcos within environmentally sensitive areas of the Upper San Marcos River Watershed. This growth will be analyzed based on increasing percentages of impervious cover caused by development and by studying land cover data. Using the EPA’s analysis system known as BASINS and pairing it with the TCEQ’s environmental guidelines, we will be able to show the effects an increased amount of impervious cover has on water quality and on endangered species. Results from this project will show the need for careful development and the impacts that population growth in San Marcos can have on the aquatic environment.

**Budget:**

|  |  |  |  |
| --- | --- | --- | --- |
| Job Title | Hourly Pay | Timetable | Total |
| Data Acquisition | $10.00 | (10 hours/week \* 2 weeks \* 3 consultants + 5 hours/week \* 2 week \* 1 consultant) | $700.00 |
| Data Analysis | $25.00 | (10 hours/week \* 4 weeks \* 3 consultants + 5 hours/week \* 4 weeks \* 1 consultant) | $3,500.00 |
| Manager | $55.00 | 5 hours/week \* 10 weeks | $2,750.00 |
| Webmaster | $35.00 | 10 hours/week \* 2.5 weeks | $875.00 |
| Web Design/Presentation | $15.00 | (10 hours/week \* 2.5 weeks \* 2 consultants + 5 hours/week \* 2.5 weeks \* 1 consultant) | $938.00 |
| BASINS Training | $9.00 | (10 hours/week \* 1 week \* 3 consultants + 5 hours/week \* 1 week \* 1 consultant) | $315.00 |
|  |  | Labor Subtotal | $9,078 |

|  |  |  |  |
| --- | --- | --- | --- |
| Supplies | Costs |  |  |
| Arc GIS License | $5,210.00 |  |  |
| Depreciation | $560.00 | (8,000 [value of computers]/36[life of computers] \* 2.5 [months using computers]) = $560.00 |  |
| Basic Supplies | $500.00 |  |  |
| Maintenance | $700.00 | Supplies Subtotal | $6,970.00 |
|  |  | **Grand Total** | **$16,048.00** |

**Timeline:**

October 3-12, Data Acquisition

October 15 - 19, BASINS training

October 15 - November 16, Data Analysis

November 19 - 30, Web design and preparing the final presentation

December 3-7, Final editing

 

**Final Deliverables:**

• Detailed Final Report

• Professional Poster for Display of Project

• Professional PowerPoint Presentation

• Useable Data: Metadata, BASINS output, any external resources (Refer to Data Section)

• All of the above will be included on a CD, as well as:

* Instruction manual
* Readme file for the CD

• Website with Interactive capabilities Section)

• Hard copies of any maps deemed necessary

**Conclusion:**

By the end of this project, BaCon will have researched, acquired, and used all data, information, or technology deemed necessary to successfully assist the City of San Marcos with predicting the effect of impervious cover from increased land use and development on the Upper San Marcos Watershed. The extent of any potential harm to the water quality will be determined and the potential issues facing the endangered species in connection to altering their natural environment will be assessed. Using the internet to create an interactive map, this research will assist the City of San Marcos in its future endeavors to balance the growth of the City with environmental standards as it pertains to the San Marcos River and its dependents. The future build-out scenario created will be based on projected population increases for 2035 and highlight any environmentally sensitive areas which need to be included in the land use decision making process. By using the research BaCon provides, the City of San Marcos will be able to use the information for important decisions that affect the citizens of San Marcos and its prized water resource.

**Participation:**

Ekaterina Troudonochina

Cover, Table of Contents, Purpose, Scope, Timeline, References, Editing

Julian Montejano

Analysis, Budget

Mark Hiler

Scope Map, Implications, Data, Budget

Veronica Gentile

Summary, Deliverables, Conclusion, Analysis

**References:**

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