



Texas Foundation for Identifying Species Habitats

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Species Occurrence Probabilities for Fishes of Texas

Prepared by Tx FISH
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Project Summary

Texas Natural History Collections (TNHC), a part of the Texas Natural Science Center (TNSC), began gathering its first collection privately in 1946 and by 1959 was incorporated into The University of Texas at Austin. TNHC has collections in Ichthyology, Herpetology, Invertebrate Zoology, Entomology, and Ornithology/Mammalogy. The Ichthyology Collection currently has 900,000 specimens of approximately 1634 species, most of which are from the freshwaters of Texas. TNHC is working with Texas Parks and Wildlife on the Fishes of Texas Project. This project is highlighting the freshwater fish populations in Texas in an attempt to combine all scientific information about these species together into one, easily accessible dataset. Texas Foundation for Identifying Species Habitats (Tx FISH) is working with TNHC to create a geodatabase containing environmental data for locations of freshwater fish in Texas. We will also take the gathered information to create specific attribute layers for the study area that can be easily used by the Fishes of Texas Project.

Purpose

The overall goal of the Fishes of Texas Project is to take all of the information already gathered for over two years and put it into a program called MAXENT in order to predict species distribution, analyze how habitat affects the distribution, and to be able to predict distribution shifts due to environmental factors, among other analyses. Since MAXENT only runs on raster files, it is vital that all gathered data be put in this form. Tx FISH will gather the environmental data for the study area and turn them into raster files. Tx FISH will then take the raster files and create a geodatabase which, along with the occurrence records provided by TNHC through Ben Labay, will be used to make a suitability model to present to TNHC. By placing all data in one convenient place and turning all needed layers into raster files, Tx FISH will greatly help the Fishes of Texas project run the analysis desired in a more efficient manner.

Scope

The scope of this project will consist of three hydrologic regions encompassing all of Texas and parts of Oklahoma, New Mexico, Colorado, Kansas, Missouri, Louisiana, and Arkansas (see Figure 1). The project will take 10 weeks to complete, with the final deliverables available by May 10, 2010.



Data Requisites and Sources

The data for this project will be obtained from two sources: Horizon Systems Corporation’s National Hydrography Dataset Plus website (NHDPlus) and from University of Texas at Austin’s Texas Natural Science Center researcher Ben Labay.

Data are available for download from the NHDPlus website by hydrologic regions. Horizon Systems Corporation defines NHDPlus as “an integrated suite of application-ready geospatial datasets that incorporate many of the best features of the National Hydrography Dataset (NHD), the National Elevation Dataset (NED), the National Land Cover Dataset (NLCD), and the Watershed Boundary Dataset (WBD)” (NHD Plus, n.d, para. 1). The United States is divided into 21 regions and our study area consists of regions 11, 12, and 13. Region 11 is a part of the Mississippi hydrologic region, region 12 is the complete Texas gulf region, and region 13 is the complete Rio Grande region(see Figure 1).

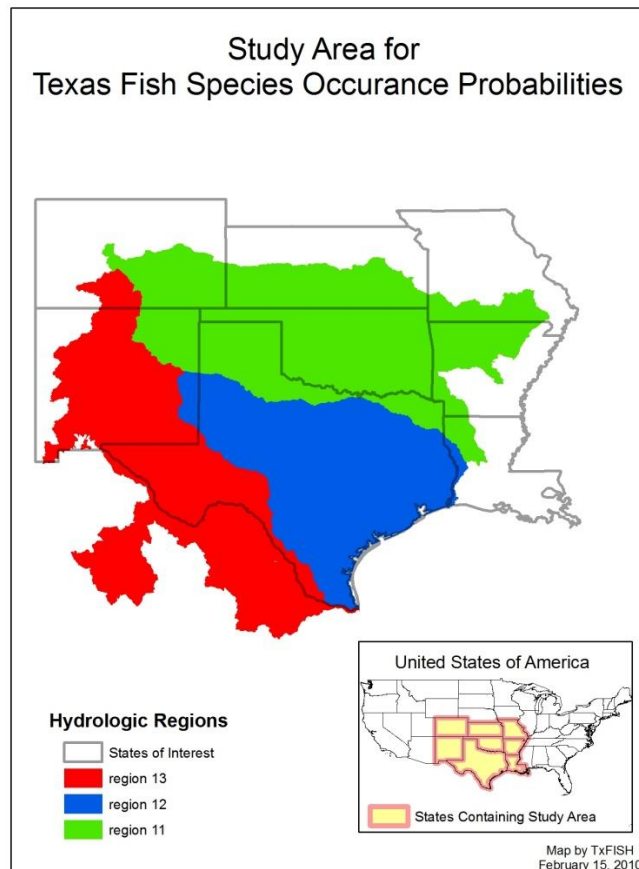


Figure 1 Map of Study Area



NHDPlus data consists of the following environmental data components (NHD Plus, n.d., para 2):

- 1:100K National Hydrography Dataset (NHD)
- A set of value added attributes to enhance stream network navigation, analysis and display
- An elevation-based catchment for each flowline in the stream network
- Catchment characteristics
- Headwater node areas
- Cumulative drainage area characteristics
- Flow direction, flow accumulation and elevation grids
- Flowline min/max elevations and slopes
- Flow volume & velocity estimates for each flowline in the stream network

Tx FISH will use Microsoft Office Excel to compile and organize data from multiple databases obtained from NHDPlus. The data will then be imported into ArcMap 9.3 (ESRI software) to be spatially organized in preparation for the creation of a geodatabase.

Once the geodatabase is created, Tx FISH will then obtain specific data pertaining to Texas fishes from Ben Labay in order to conduct analysis using occurrence records of species with environmental data to produce a model predicting occurrence probability or habitat suitability (see Figure 2).

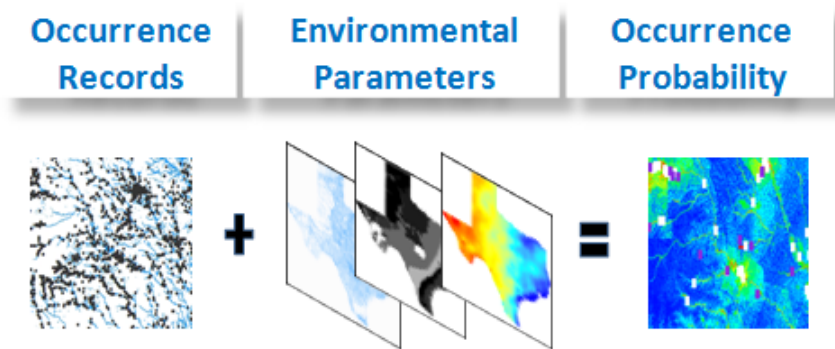


Figure 2

Occurrence model



Methodology

The three main regions of data Tx FISH collects will have to be merged into one database.

- Join the attributes based on the common identifying key
- Import merged database into ArcMap
- Create separate layers for each attribute from merged database

Raster files will be created for each attribute of interest.

- All data must be imported into ArcMap to create rasters
- The rasters will be created using Spatial Analyst's Features to Raster tool
- Rasters will have to be reclassified to a range of values easier to work with

Set up a geodatabase.

- Import all environmental layers into geodatabase

Create Suitability model or Species Occurrence Predictability Model for the identified species.

- Create model using data from geodatabase and data from TNHC in ArcGIS and compare results to model created by Ben Labay using MAXENT

Implications

The completion of our database will help produce maps that will identify habitat suitability for different species of fish. With the occurrence records from TNHC and the environmental data compiled by Tx FISH, the analyst will be able to create occurrence probability models using MAXENT. The information provided will allow hydrologists and ichthyologists interested in continuing their studies of endangered fish species to better predict locations of species and preserve them.



Budget

Product/Service	Cost	Amount	Total
Analysis			
Two GIS analysts	\$20/hr	10hr/wk x 10wks	\$4,000
Management			
Assistant Manager duties	\$27/hr	3hr/wk x 10wks	\$810
Asst. Mgr as GIS analyst	\$20/hr	7hr/wk x 10wks	\$1,400
Project Manager duties	\$30/hr	5hr/wk x 10wks	\$1,500
Project Mgr as GIS analyst	\$20/hr	5hr/wk x 10wks	\$1,000
Equipment			
Computer Rental	\$150/computer/wk	4 comp x 10 wks	\$6,000
Computer Supplies	\$150/yearly	4 computers	\$600
Roll of paper for poster	\$160	-	\$160
Outsourced Services			
Web Master	\$35/hr	10hr/wk x 3 wks	\$1,050
Poster printing	\$40	6 copies	\$240
Computer Maintenance	\$200/computer/yrarly	4 computers	\$800
Data			
ArcInfo Software	\$25,000/computer/12 mo	2.5 mo	\$5,208
TOTAL COST			\$22,768

Tx FISH has an overall budget of \$22,768.00 which will help fund the project so that the required analysis and final results that need to be attained are met within a reasonable deadline. We will be utilizing two GIS analysts who will work a combined 200 hours on this project. The project manager and assistant manager will spend 50% and 30% of their time, respectively, on management tasks and the remainder of their time on GIS analysis.

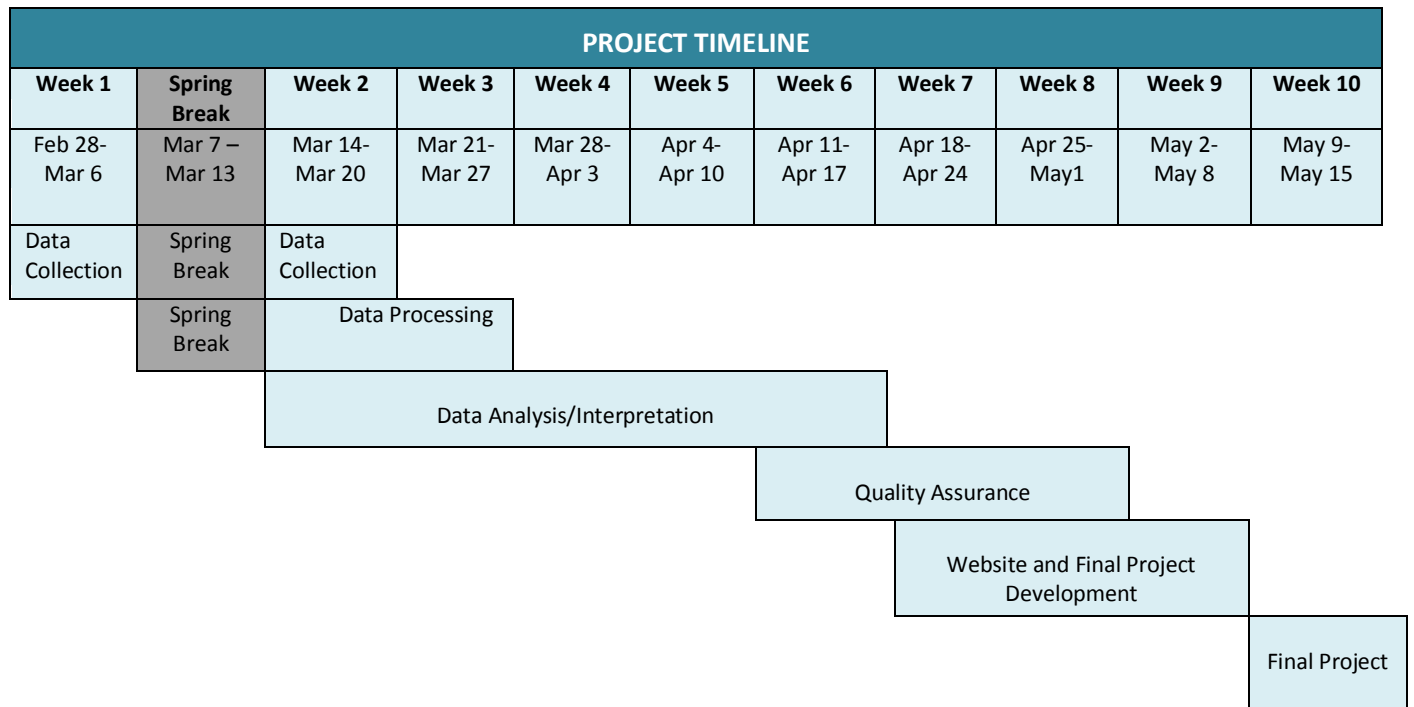
Additionally Tx Fish will need equipment to help in this project for TNSC. We will need office supplies for the computers which will be rented from Texas State Geography Department on a weekly basis along with the department printer to produce the necessary posters for the client, Geography Department, and Tx FISH staff.

Outsource services that are required for the project include a web master that will be in charge of providing a functional website that will allow the client to view his proposal and have access to the information, as well as computer maintenance for the time allotted to the project.

Tx FISH will need data services that involve renting ArcInfo Software from Texas State Geography Department. Additionally, upon renting the software from the Geography Department we will then purchase 4 licenses for the computers that will allow us to perform analysis for the client and to deliver the final results to the client at the end of the semester.



Timetable



Project Milestones

- 1/27/10- Request for proposal identified
- 2/24/10- Proposal Review and Client Presentation
- 3/31/10 Progress Report and Client Presentation
- 5/10/10 Final Client Project Presentation



Qualifications

Pete M. Castillo, Project Manager

- Background in GIS and Cartography
- Projects include:
 - *Burglary Analysis: The percentage of burglaries that occur in San Marcos along the I-35 corridor*, Fall 2008
 - *Population density map of student population attending Texas State in surrounding 5 counties*, Spring 2009
 - *Walking Trails at Texas State University*, Spring 2009
 - *Student Population density analysis of where students live in San Marcos for tram service*, Spring 2009
 - *Hispanic Study: Identifying high percentage of Hispanics in Texas counties based on TAKS scores and percentage of Hispanics in the school district*, Fall 2009

Jesus Avillaneda, Project Assistant Manager

- Background in GIS, Remote Sensing, and Cartography
- Projects include:
 - *Analysis on the distribution of Burger King, and McDonalds restaurants*, Spring 2008
 - *Crime Analysis within the Houston City Limits*, Spring 2009

Sara Bell, Graphic Design Architect/GIS Analyst

- Background in GIS, Remote Sensing, and Technical Writing
- Projects include:
 - *Endangered Species: The San Marcos Gambusia*, Spring 2009

Jennifer DeForke, Web Master/GIS Analyst

- Background in GIS, Remote Sensing, Cartography, and Technical Writing
 - Projects include:
 - *Austin Bites: Dog Bite Occurrences in the City*, Fall 2008
 - *Possible Location of Plesiosaur Fossil Sites in Dinosaur Provincial Park*, Fall 2009
 - *Eat Up Cats: Dining Options on Texas State University Campus*, Fall 2009
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Final Deliverables

Tx FISH will provide a progress report presentation and a final presentation along with the following deliverables by May 10, 2010.

- Detailed final report with maps
- Website of completed project
- Professional poster
- (2) CDs that contain
 - All data
 - Metadata
 - Reports
 - Poster
 - Presentation
 - Readme file (how to use CD).

Conclusion

This proposal, Species Occurrence Probabilities for Fishes of Texas, contains information necessary to provide THNC with the basis of the proposed actions of Tx FISH. Tx FISH will collect environmental data from NHDPlus website for the study area and convert it to raster format. The raster data will then be compiled into a geodatabase available to researchers through THNC who can easily access data needed to perform analysis and understand the affect that hydrology has on different freshwater fish species. Additionally, Tx FISH will provide a suitability model that will help forecast the impact of hydrologic attributes. Information as to the nature, scope, and methodology necessary to undertake the proposed project has been provided. The proposal's budget and timeline have also been included to present to the client a reasonable plan of services provided over a certain time period.



References

NHD Plus - NHDPlus Data. (n.d.). *Horizon Systems Corporation*. Retrieved February 19, 2010, from <http://www.horizon-systems.com/NHDPlus/data.php>

NHD Plus - NHDPlus Home. (n.d.)a. *Horizon Systems Corporation*. Retrieved February 19, 2010, from <http://www.horizon-systems.com/NHDPlus/>

Simley, J. D., & Jr., W. J. (n.d.)b. USGS Fact Sheet 2009-3054: The National Map-Hydrography. *USGS Publications Warehouse*. Retrieved February 19, 2010, from <http://pubs.usgs.gov/fs/2009/3054/>

Texas Natural Science Center: Texas Natural History Collections- TNHC Home Page. (n.d.). *The University of Texas at Austin - Web Central*. Retrieved February 19, 2010, from <http://www.utexas.edu/tmm/tnhc/>



Participation of Tx FISH Team Members

Project Proposal Assignments:

Pete Castillo – Budget, Timeline, Final Deliverables, Conclusion

Jesus Avillaneda – Methodology, Implications, Liaison with Client

Sara Bell – Logo, Introduction (Summary, Purpose, Scope), Compiling PowerPoint Presentation

Jennifer DeForke – Data Requisites and Sources, Conclusion, Proposal Layout and Printing Final Proposal

