



## **Texas Foundation for Identifying Species Habitats**

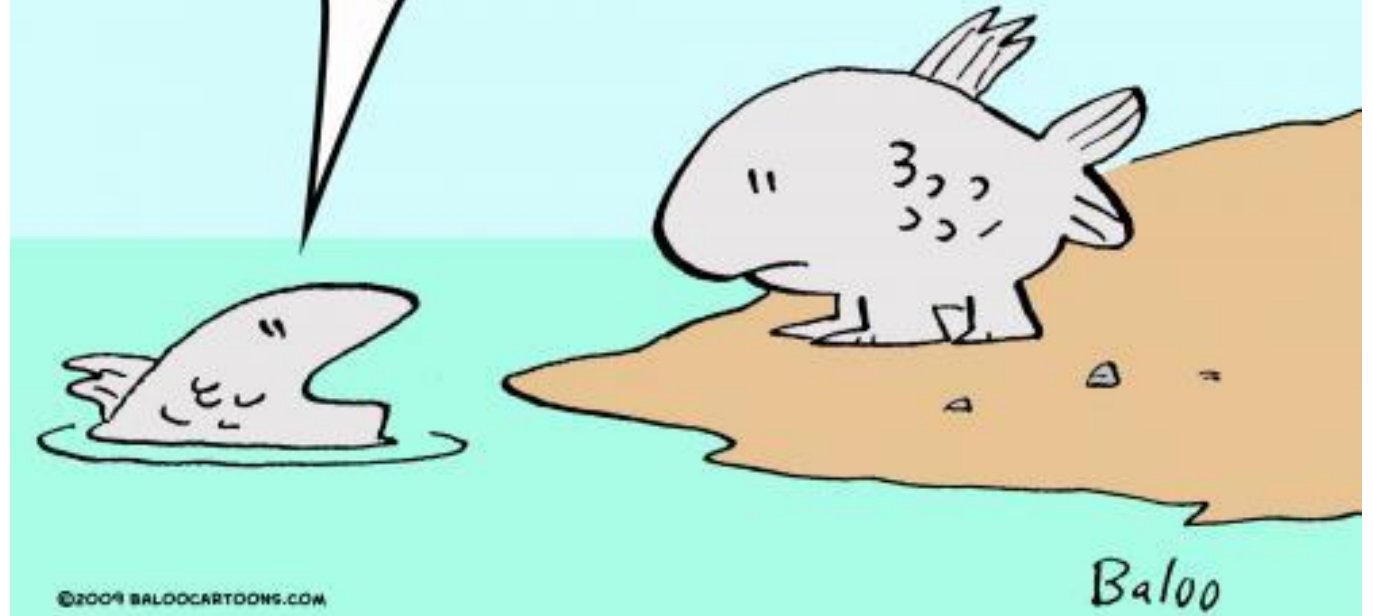
Sara Bell – GIS Analyst, Graphic Design Architect

Jennifer DeForke – GIS Analyst, Web Master

Jesus Avillaneda – Project Assistant Manager

Pete Castillo – Project Manager

**Now that's PROGRESS!!!!**



Jennifer  
DeForke

## Species Occurrence Probabilities for Fishes of Texas

Prepared by  
Tx FISH

# Data Collected

## Environmental Data from NHDPlus

Study Area for  
Texas Fish Species Occurrence Probabilities



### Hydrologic Regions

- States of Interest
- region 13
- region 12
- region 11

Map by TxFISH  
February 15, 2010

## Fish Occurrences from TNHC

### Pugnose Minnow



### Channel Catfish



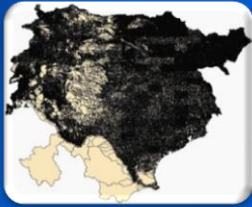
### Guadalupe Bass



Images from txstate.edu, usbr.gov



Review of Project Description



Work Completed



Work in Progress



Work to be Completed



Obstacles



# PROJECT DESCRIPTION

Sara  
Bell



# REVIEW OF PROPOSAL

- Collaborator



Image from [www.utexas.edu/tmm/tnhc/](http://www.utexas.edu/tmm/tnhc/)

Texas Natural History Collections





# PURPOSE

- Reformat large data collections
- Create a geodatabase of the newly formatted data
- Run a suitability model for 3 fishes



Image from [www.bio.txstate.edu](http://www.bio.txstate.edu)



Image from [www.bio.txstate.edu](http://www.bio.txstate.edu)



Image from [www.tpwd.state.tx.us](http://www.tpwd.state.tx.us)



# FINAL DELIVERABLES (REVIEW)

- 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).





# WORK COMPLETED/CURRENT WORK

Pete  
Castillo



# WORK COMPLETED

- Downloaded individual catchment shapefiles for the three different regions.
- Merged catchment shapefiles from National Hydrology Dataset (NHD) based on Com ID.
  - Region 11 Mississippi Region- 203,329 features
  - Region 12 Texas Gulf- 67,595 features
  - Region 13 Rio Grande-53,612 features
  - Total 324,916 features



- Gathered data from 4 databases from the National Hydrology Dataset website (NHD)
  - Catchment Attributes NLCD
  - Catchment Attributes Temperature Precipitation
  - Flowline Attributes Flow
  - Flowline Attributes Temperature Precipitation
- Joined of attribute fields to catchment files based on a Com ID field.
  - 31 fields of attributes
- Rasterized 31 fields of attributes.
- Made individual layers for raster files.
- Grouped individual rasters into categories.



# REGION 11

# REGION 12

Attributes of catchment

FID	Shape	COMID	GRID_CODE	GRID_COUNT	PROD_UNIT	AREASQKM
0	Polygon	916935	730359	1415	11d	1.273
1	Polygon	916411	730126	3481	11d	3.133
2	Polygon	916413	730127	3510	11d	3.159
3	Polygon	916427	730134	13699	11d	12.329
4	Polygon	916937	730360	611	11d	0.55
5	Polygon	916409	730125	7825	11d	7.042
6	Polygon	916425	730133	878	11d	0.79
7	Polygon	916419	730130	7540	11d	6.786
8	Polygon	916415	730128	2394	11d	2.155
9	Polygon	916421	730131	953	11d	0.858
10	Polygon	916433	730137	23159	11d	20.843
11	Polygon	916429	730135	2280	11d	2.052
12	Polygon	916997	730390	138	11d	0.124
13	Polygon	916995	730389	1130	11d	1.017
14	Polygon	916423	730132	5	11d	0.004
15	Polygon	916417	730129	3367	11d	3.03
16	Polygon	916437	730139	13303	11d	11.973
17	Polygon	916441	730141	6033	11d	5.43
18	Polygon	916431	730136	9972	11d	8.975
19	Polygon	916791	730291	8802	11d	7.922
20	Polygon	916447	730144	10188	11d	9.160

Record: 1 Show: All Selected Records (0 out of 201366 Selected)

Attributes of catchment

FID	Shape	COMID	GRID_CODE	GRID_COUNT	PROD_UNIT	AREASQKM
0	Polygon	2485082	2185274	62282	12b	56.054
1	Polygon	1366698	2183048	57261	12b	51.535
2	Polygon	1366698	2183051	11201	12b	10.081
3	Polygon	1366698	2183050	9106	12b	8.195
4	Polygon	1366699	2183053	16441	12b	14.797
5	Polygon	1366782	2183095	5869	12b	5.282
6	Polygon	1366698	2183052	15577	12b	14.019
7	Polygon	1366701	2183063	12533	12b	11.28
8	Polygon	1366701	2183065	11705	12b	10.535
9	Polygon	1366700	2183059	4885	12b	4.396
10	Polygon	1366703	2183075	26814	12b	24.133
11	Polygon	1366699	2183056	5981	12b	5.383
12	Polygon	1366697	2183047	1495	12b	1.345
13	Polygon	1366703	2183076	30541	12b	27.487
14	Polygon	1366900	2183096	104883	12b	94.395
15	Polygon	1366704	2183081	41178	12b	37.06
16	Polygon	1366702	2183072	126860	12b	114.174
17	Polygon	1366702	2183069	7301	12b	6.571
18	Polygon	1366781	2183089	20279	12b	18.251
19	Polygon	1366698	2183049	33	12b	0.03
20	Polygon	1366699	2183055	3520	12b	3.177

Record: 1 Show: All Selected Records (0 out of 67694 Selected)

Courtesy of: Jesus

Courtesy of: Sara



# REGION 13

Attributes of catchment

FID	Shape	COMID	GRID_CODE	GRID_COUNT	PROD_UNIT	AREASQKM
0	Polygon	1788662	2225510	7666	13b	6.899
1	Polygon	1788661	2225506	22	13b	0.02
2	Polygon	1788662	2225508	2918	13b	2.626
3	Polygon	1788662	2225511	2457	13b	2.211
4	Polygon	1788661	2225507	2415	13b	2.173
5	Polygon	1788662	2225509	3854	13b	3.469
6	Polygon	1788665	2225523	7382	13b	6.644
7	Polygon	1788663	2225515	7902	13b	7.112
8	Polygon	1788664	2225519	5593	13b	5.034
9	Polygon	1788663	2225513	2082	13b	1.874
10	Polygon	1788662	2225512	555	13b	0.499
11	Polygon	1788707	2225611	1353	13b	1.218
12	Polygon	1788708	2225612	3582	13b	3.224
13	Polygon	1788663	2225514	2107	13b	1.896
14	Polygon	1788664	2225518	2235	13b	2.011
15	Polygon	1788708	2225614	3933	13b	3.54
16	Polygon	1788663	2225516	1312	13b	1.181
17	Polygon	1788664	2225520	3994	13b	3.595
18	Polygon	1788665	2225524	2450	13b	2.205
19	Polygon	1788663	2225517	2514	13b	2.263
20	Polygon	1788665	2225527	4518	13b	4.266

Record: 1 Show: All Selected Records (0 out of 53611 Selected)



Courtesy of: Jennifer

# JOINING ATTRIBUTES TO CATCHMENT SHAPEFILE

Attributes of Catchment\_11\_Join

FID	Shape *	COMID	GRID_CODE	GRID_COUNT	PROD_UNIT	AREASQKM	OID_	COMID_1	GRID_COD_1	PRECIP	TEMP
0	Polygon	916935	730359	1415	11d	1.273	32588	916935	730359	825.91	0.3
1	Polygon	916411	730126	3481	11d	3.133	32366	916411	730126	737.9662	2.15326
2	Polygon	916413	730127	3510	11d	3.159	32367	916413	730127	774.8348	1.33687
3	Polygon	916427	730134	13699	11d	12.329	32374	916427	730134	767.041	0.14532
4	Polygon	916937	730360	611	11d	0.55	32589	916937	730360	678.51	-10.5
5	Polygon	916409	730125	7825	11d	7.042	32365	916409	730125	669.8304	-9.80505
6	Polygon	916425	730133	878	11d	0.79	32373	916425	730133	620.7045	4.05125
7	Polygon	916419	730130	7540	11d	6.786	32370	916419	730130	609.6359	4.21944
8	Polygon	916415	730128	2394	11d	2.155	32368	916415	730128	616.2807	4.08375
9	Polygon	916421	730131	953	11d	0.858	32371	916421	730131	612.7131	4.17838
10	Polygon	916433	730137	23159	11d	20.843	32377	916433	730137	733.1569	-14.6453
11	Polygon	916429	730135	2280	11d	2.052	32375	916429	730135	570.7496	4.47412
12	Polygon	916997	730390	138	11d	0.124	32619	916997	730390	791.3154	-2.13768
13	Polygon	916995	730389	1130	11d	1.017	32618	916995	730389	822.4384	-1.52106
14	Polygon	916423	730132	5	11d	0.004	32372	916423	730132	779.56	-2.6
15	Polygon	916417	730129	3367	11d	3.03	32369	916417	730129	662.4417	-8.05073
16	Polygon	916437	730139	13303	11d	11.973	32379	916437	730139	711.6989	-0.1238
17	Polygon	916441	730141	6033	11d	5.43	32381	916441	730141	576.9593	4.4966
18	Polygon	916431	730136	9972	11d	8.975	32376	916431	730136	646.1555	-10.5711

Record: 1 Show: All Selected Records (0 out of 201366 Selected) Options

CUMDRAINAG	MAFLOWU	MAFLOWV	MAVELU	MAVELV	INCRFLOWU	MAXELEVRAW	MINELEVRAW	MAXELEVSMO	MINELEVSMO	SLOPE	OID1	COMID_1_14	GRID_COD_4	AREAWTMAP	AREAWTMAT
1.2735	0.3104	-9999	0.68149	-9999	0.3104	3568.55	3558.89	3568.55	3558.89	0.01364	33034	916935	730359	825.91	0.3
4.4064	1.074	-9999	0.98429	-9999	0.7636	-9998	3217.72	3558.89	3217.72	0.09527	32812	916411	730126	763.38296	1.61765
3.159	0.76997	-9999	0.89498	-9999	0.76997	3376.73	3218.36	3376.73	3217.72	0.0632	32813	916413	730127	774.8348	1.33687
13.4748	3.28431	-9999	1.12088	-9999	3.00507	-9998	3146.7	3592.15	3146.7	0.06029	32820	916427	730134	771.45	-0.00241
0.5499	0.13403	-9999	0.28837	-9999	0.13402	3457.24	3457.24	3457.24	3457.24	0	33035	916937	730360	678.51	-10.5
7.5924	1.85055	-9999	1.03553	-9999	1.71652	-9998	3275.11	3457.24	3275.11	0.06873	32811	916409	730125	670.45904	-9.85538
8.3556	2.03657	-9999	1.01732	-9999	0.1926	-9998	3146.77	3217.72	3146.7	0.05102	32819	916425	730133	754.21927	1.74164
6.786	1.654	-9999	0.43871	-9999	1.654	-9999	3084.61	3084.61	3084.61	0	32816	916419	730130	609.6359	4.21944
2.1546	0.52516	-9999	0.83778	-9999	0.52516	3225.07	3090.28	3225.07	3090.28	0.05763	32814	916415	730128	616.2807	4.08375
26.8947	6.55525	-9999	0.98594	-9999	0.20905	-9998	3084.61	3090.28	3084.61	0.00709	32817	916421	730131	733.29056	1.34166
20.8431	5.08025	-9999	0.53535	-9999	5.08024	-9998	3191.41	3187.5	3187.5	0	32823	916433	730137	733.1569	-14.6453
23.8824	5.82104	-9999	1.10377	-9999	0.50014	-9998	3090.87	3146.7	3090.28	0.02307	32821	916429	730135	748.1772	0.9924
1.1457	0.27925	-9999	0.80983	-9999	0.03026	-9998	3592.15	3611.13	3592.15	0.10204	33065	916997	730390	818.89609	-1.59214
1.017	0.24788	-9999	0.31833	-9999	0.24788	3611.12	3611.12	3611.13	3611.13	0	33064	916995	730389	822.4384	-1.52106
1.0215	0.24898	-9999	0.31856	-9999	0.00109	-9998	3611.13	3611.13	3611.13	0	32818	916423	730132	822.24951	-1.52581
10.6227	2.58915	-9999	1.1192	-9999	0.7386	-9998	3187.5	3275.11	3187.5	0.08392	32815	916417	730129	668.17196	-9.34058
11.9727	2.9182	-9999	1.09907	-9999	2.9182	3525.53	3069.62	3525.53	3069.62	0.06027	32825	916437	730139	711.6989	-0.1238
39.1104	9.53267	-9999	1.16246	-9999	1.32343	-9999	3020.02	3084.61	3018.92	0.0177	32827	916441	730141	690.1319	2.27898
40.4406	9.85689	-9999	1.14061	-9999	2.18749	-9998	3153.59	3187.5	3153.59	0.01433	32822	916431	730136	696.77921	-12.34772



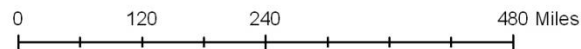
# REGION 11

## Region 11 with Attributes



 Region 11 with Attributes

Produced by: TX Fish  
April 23, 2010



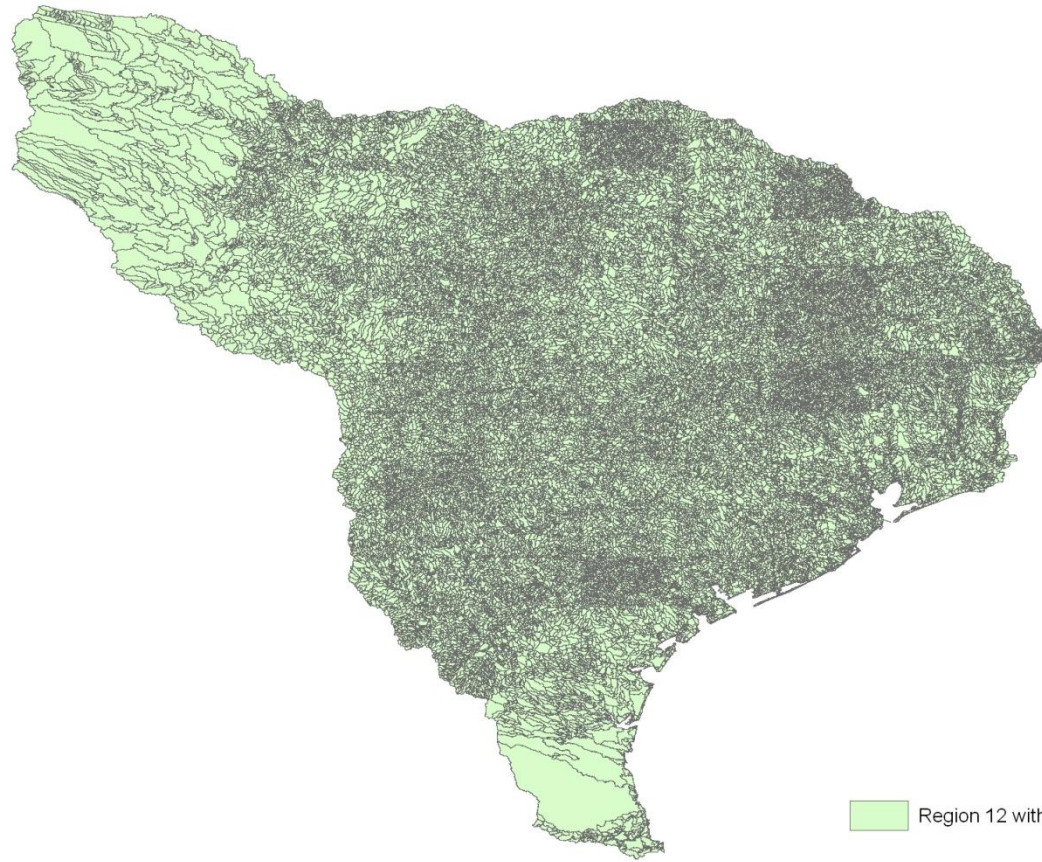
Prepared by: Jesus





# REGION 12

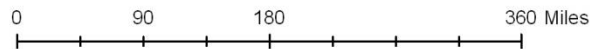
## Region 12 with Attributes



 Region 12 with Attributes



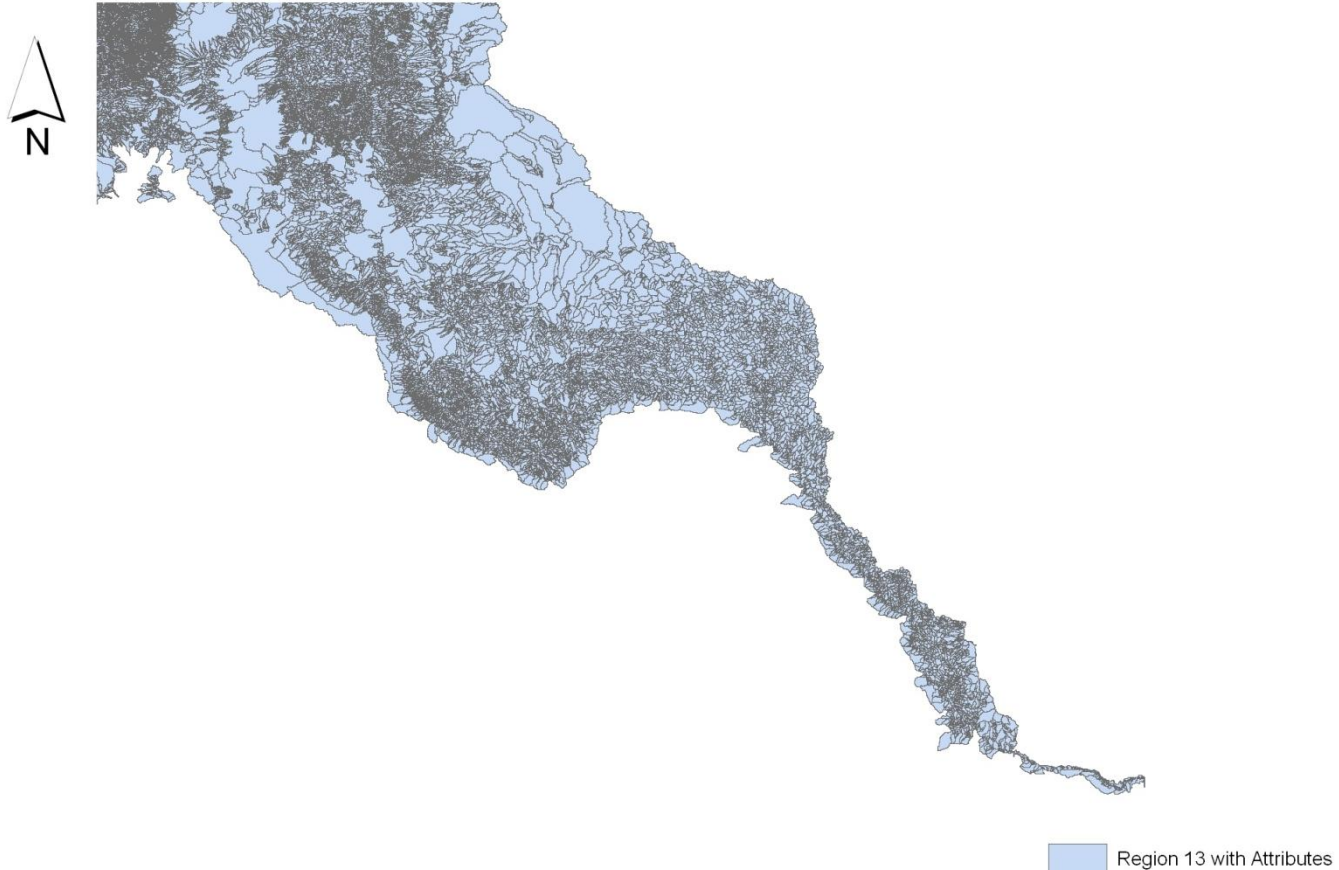
Produced by: Tx Fish  
April 23, 2010



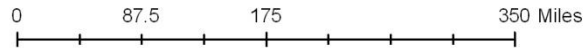
Prepared by: Sara

# REGION 13

## Region 13 with Attributes



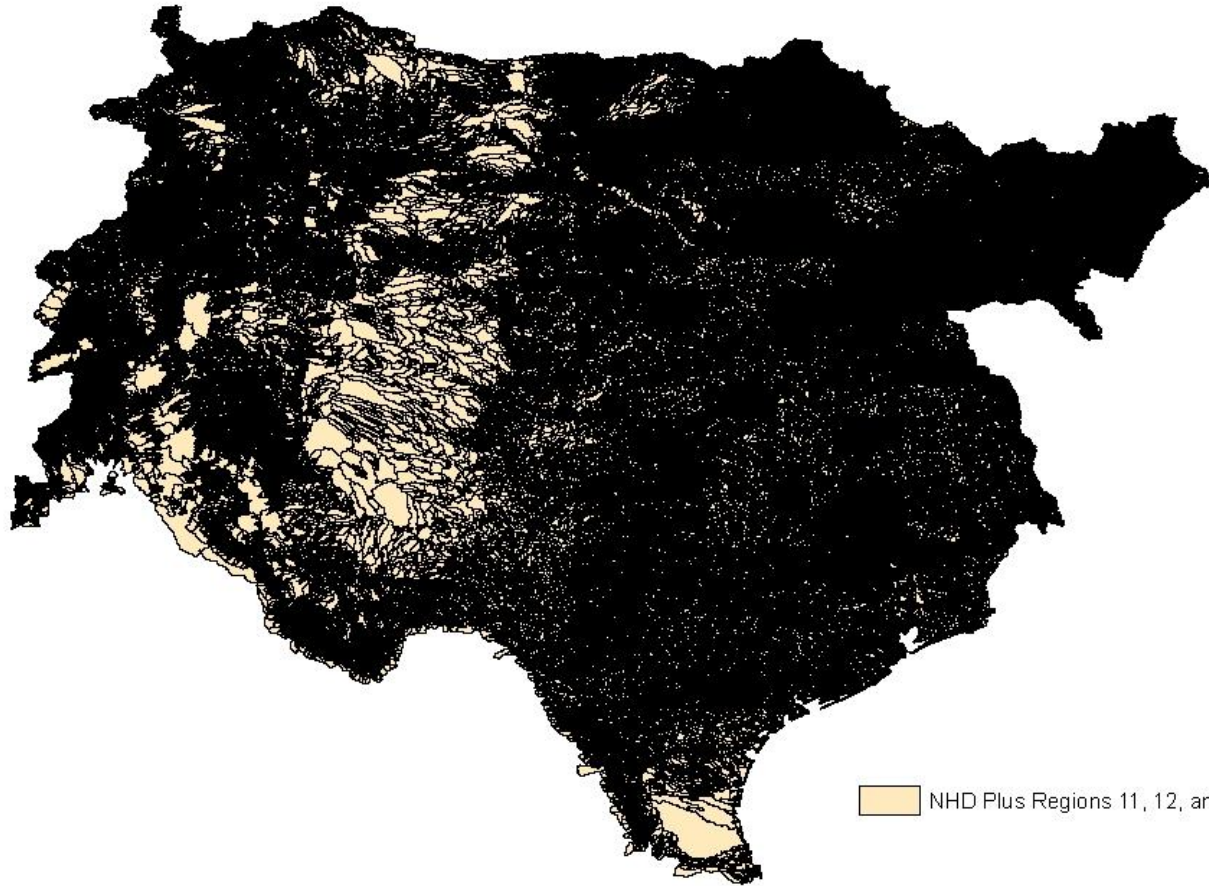
Produced by: Tx Fish  
April 23, 2010



Prepared by: Jennifer

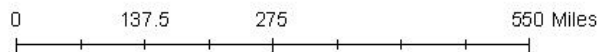
# MERGE CATCHMENT FILES

National Hydrology Dataset Plus Regions 11, 12, and 13



NHD Plus Regions 11, 12, and 13

Produced by: Tx Fish  
April 23, 2010



Prepared by: Pete

# AREAWTMAP

## Area Weighted Mean Annual Precipitation Map for Regions 11, 12, and 13



areawtmap

Value



0 135 270 540 Miles

Produced by: Tx Fish  
April 26, 2010

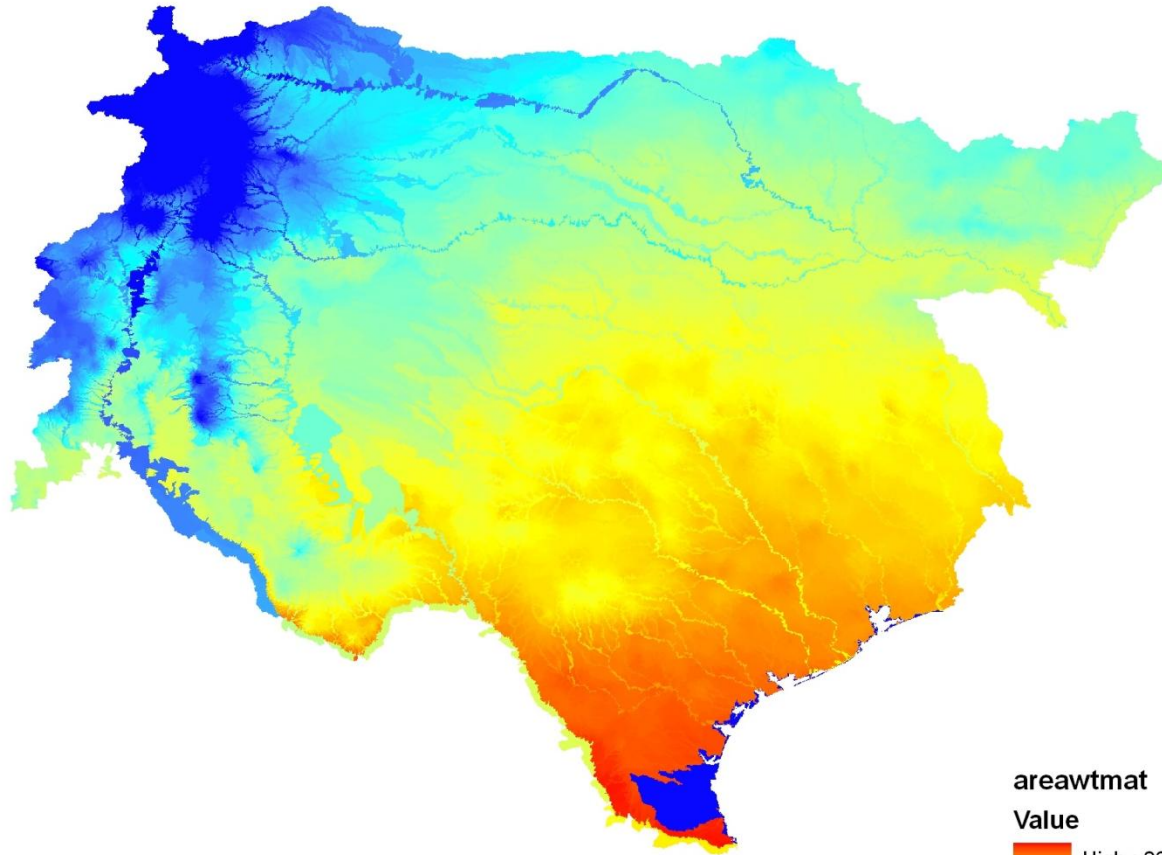


Raster files courtesy  
of: Jesus, Sara, Jennifer



# AREAWTMAT

## Area Weighted Mean Annual Temperature of Regions 11, 12, and 13



areawtm

Value

High : 231.538

Low : -28.7959

Produced by: Tx Fish  
April 26, 2010

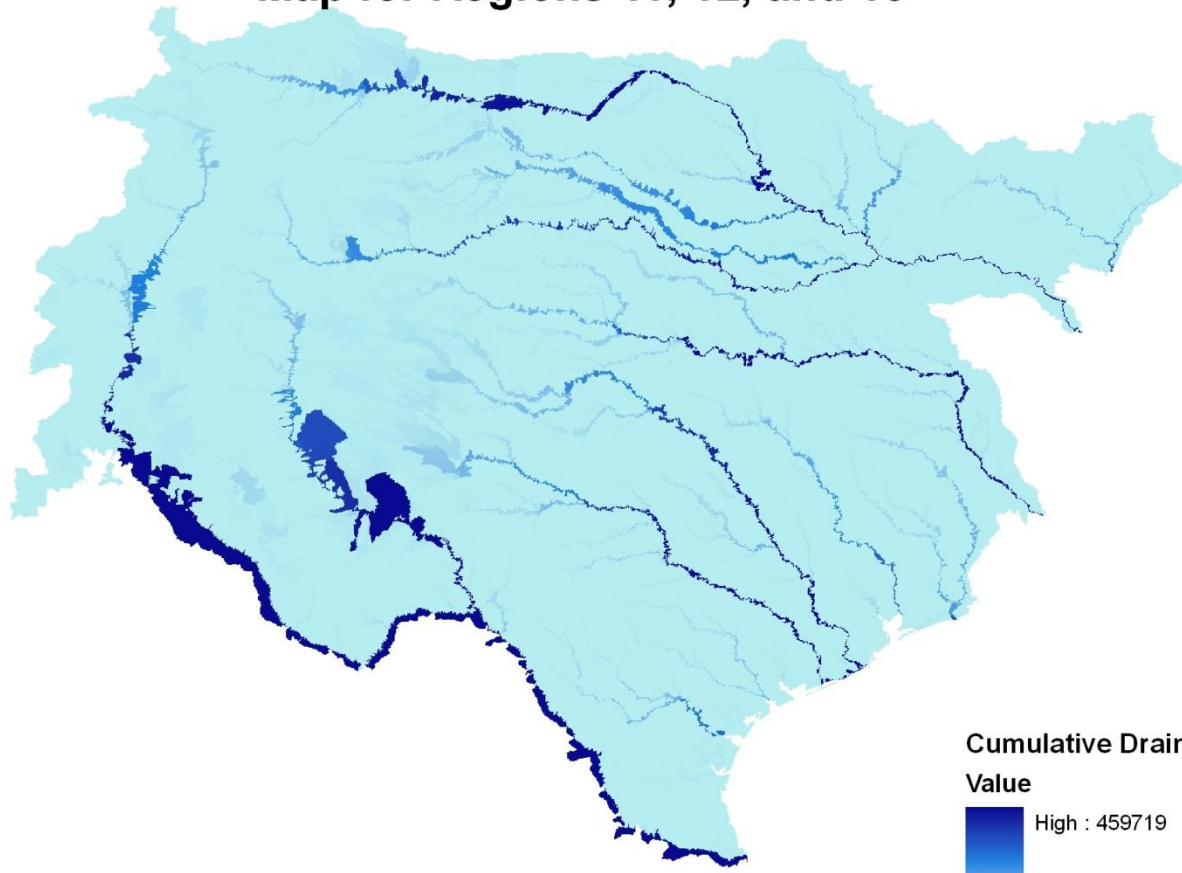
0 137.5 275 550 Miles



Raster files courtesy  
of: Jesus, Sara, Jennifer

# CUMDRAINAGE

## Cumulative Drainage at Bottom of Flowline Map for Regions 11, 12, and 13



Cumulative Drainage  
Value



0 135 270 540 Miles

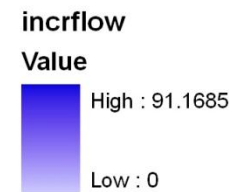
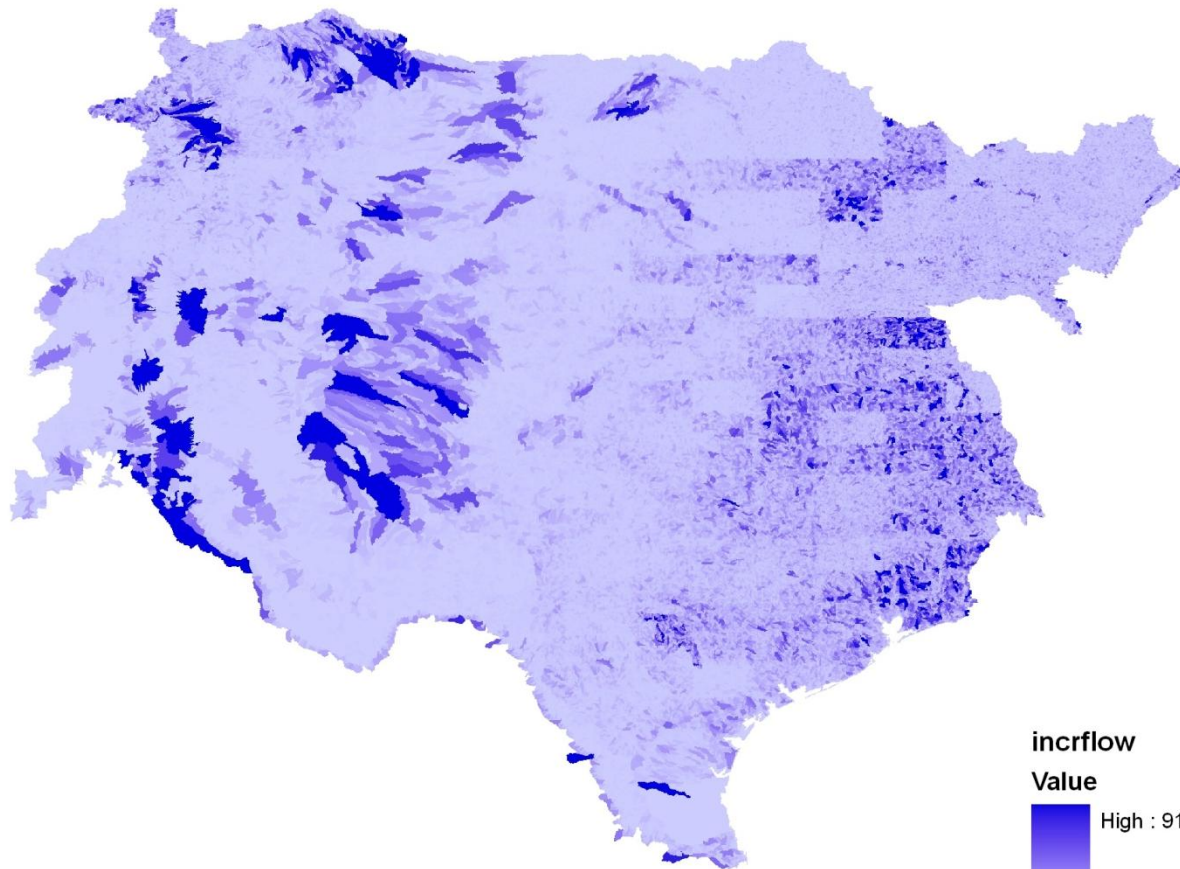
Produced by: Tx Fish  
April 26, 2010

Raster files courtesy  
of: Jesus, Sara, Jennifer

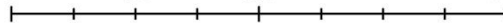


# INCRFLOW

## Mean Annual Flow Map for Regions 11, 12, and 13



0 135 270 540 Miles



Produced by: TX Fish  
April 26, 2010

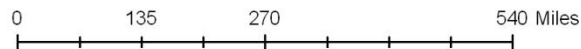


Raster files courtesy  
of: Jesus, Sara, Jennifer



# MAFLOWU

## Mean Annual Flow Map for Regions 11, 12, and 13



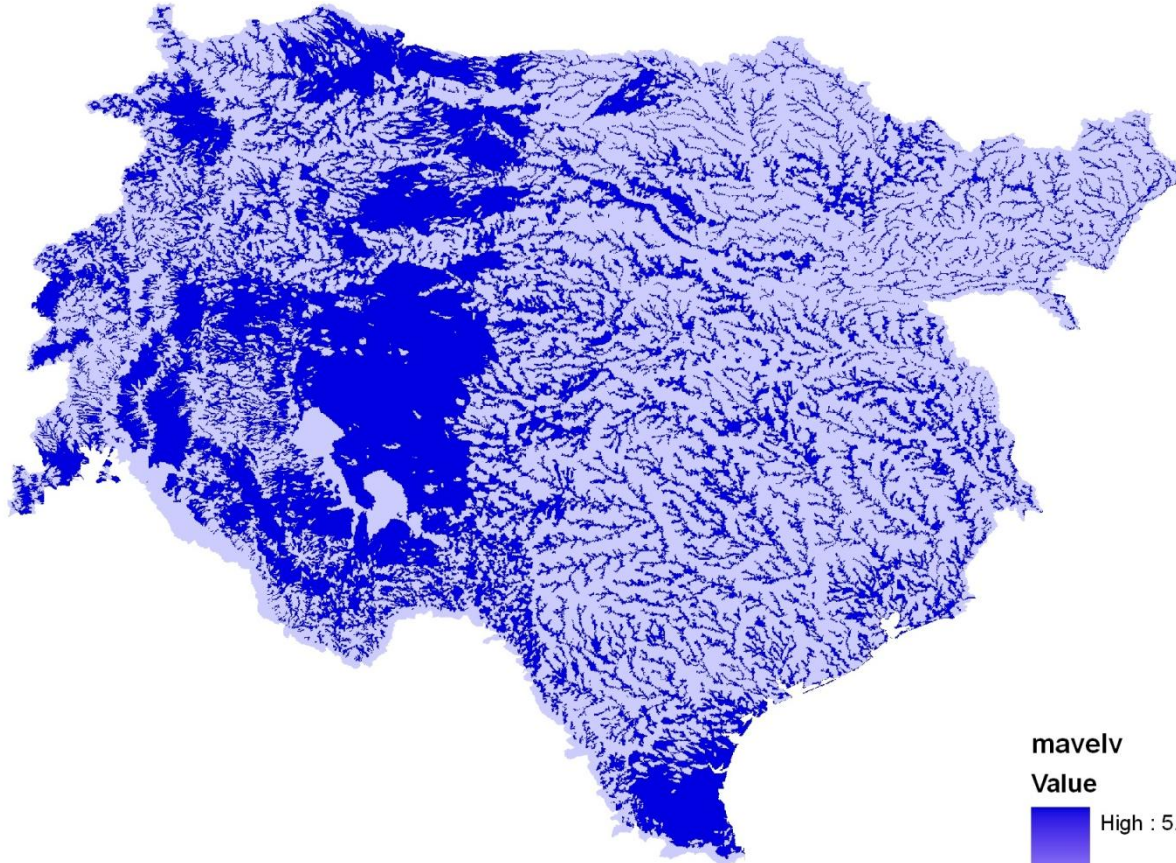
Produced by: Tx Fish  
April 26, 2010



Raster files courtesy  
of: Jesus, Sara, Jennifer

# MAVELV

## Mean Annual Velocity Map for Regions 11, 12, and 13



mavelv  
Value



0 135 270 540 Miles

Produced by: Tx Fish  
April 26, 2010

Raster files courtesy  
of: Jesus, Sara, Jennifer



# MAFLOWV

## Mean Annual Flow Velocity Map for Regions 11, 12, and 13



maflowv

Value



0 135 270 540 Miles

Produced by: TX Fish  
April 26, 2010

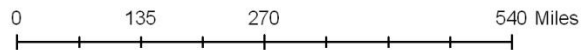


Raster files courtesy  
of: Jesus, Sara, Jennifer



# PRECIPITATION

## Mean Annual Precipitation for Regions 11, 12, and 13



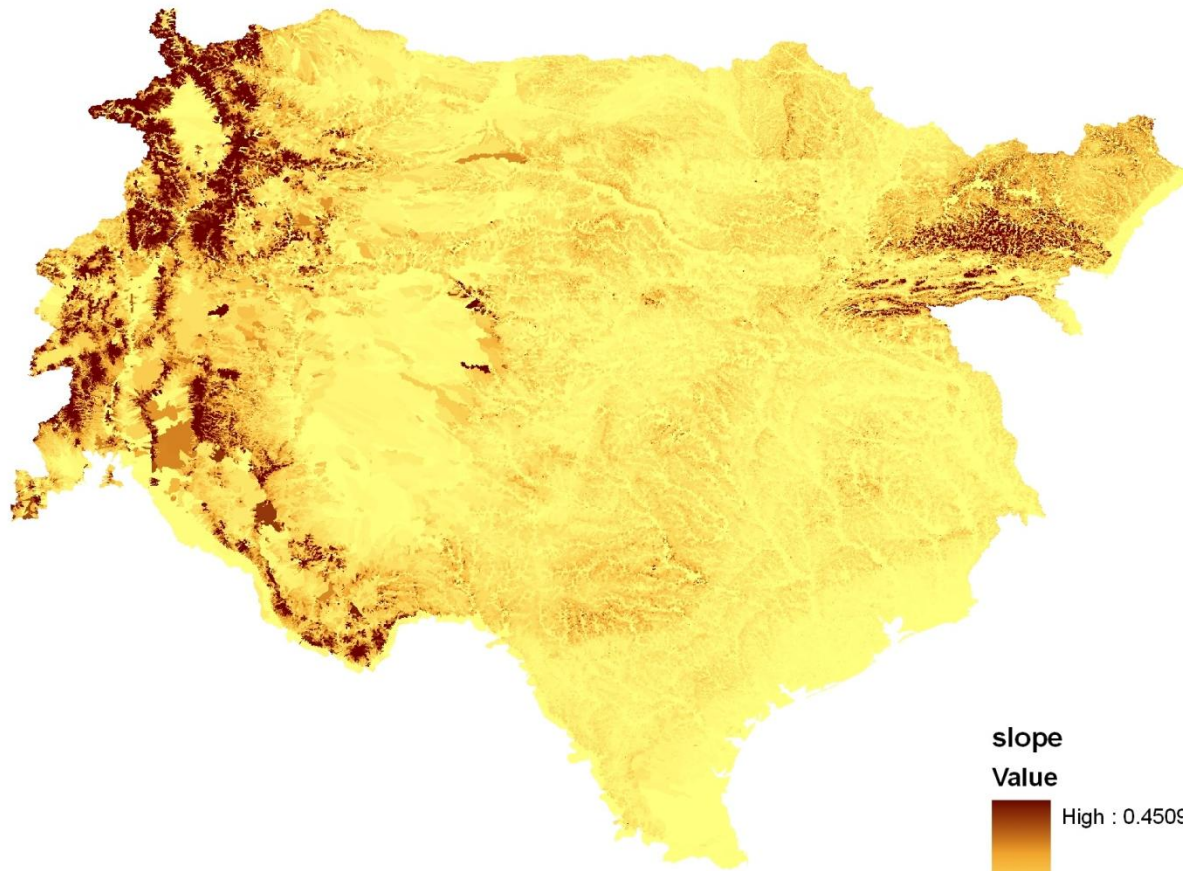
Produced by: TX Fish  
April 26, 2010

Raster files courtesy  
of: Jesus, Sara, Jennifer



# SLOPE

## Slope of Flowline for Regions 11, 12, and 13



slope  
Value



0 135 270 540 Miles

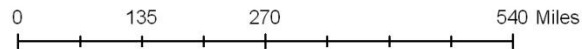
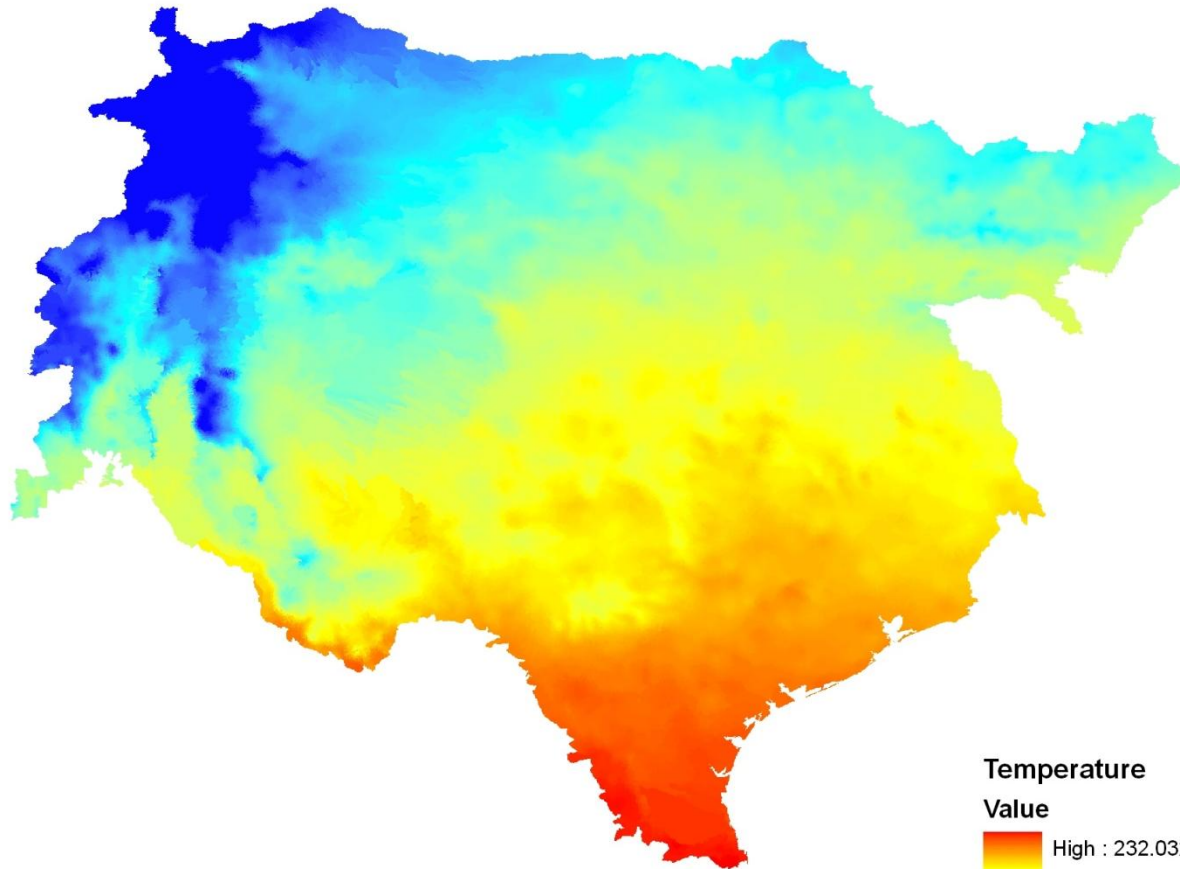
Produced by: TX Fish  
April 26, 2010

Raster files courtesy  
of: Jesus, Sara, Jennifer

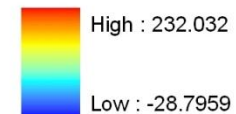


# TEMPERATURE

## Mean Annual Temperature for Regions 11, 12, and 13



Temperature  
Value



Raster files courtesy  
of: Jesus, Sara, Jennifer



# NLCD CATEGORIES

**Original categories**                      **Reclassified categories**

<b>Developed, Open Space</b>	<b>Urban</b>
<b>Developed, Low Intensity</b>	
<b>Developed, Medium Intensity</b>	
<b>High Intensity, Residential</b>	
<b>Deciduous Forest</b>	<b>Forest</b>
<b>Evergreen Forest</b>	
<b>Mixed Forest</b>	
<b>Shrub/Scrub</b>	
<b>Grasslands/Herbaceous</b>	<b>Grassland</b>
<b>Pasture/Hay</b>	
<b>Cultivated Crops</b>	<b>Agriculture</b>
<b>Woody Wetlands</b>	<b>Wetland</b>
<b>Emergent Herbaceous Wetlands</b>	



Courtesy of: Ben Labay



# ATTRIBUTE DEFINITIONS

## CatchmentAttributesTempPrecip (dBase file)

**Description:** NHDPlus attributes derived for each flowline catchment.

**Note:** Precipitation and temperature values are the average values over the catchment from the PRISM 1961-90, 2.5-minute (approximately 4 km) resolution data by Daly and Taylor (1998). If a catchment extends into Canada or Mexico, the value will be the average over only the U.S. portion of the catchment. TEMP values are not provided for Hydrologic Region 20 (Hawaii) because TEMP is not needed for the regression-based flow estimates in that region (refer to Step 6 in Appendix A).

**Note:** In Hydrologic Region 21 (Puerto Rico and the Virgin Islands) Temp values are not provided and Precip values are provided for Puerto Rico only.

Field Name	Description
ComID	Common identifier of an NHD Flowline
Grid_code	Value field from Catchment Grid
Precip	Mean annual precipitation in mm
Temp	Mean annual temperature in degrees centigrade * 10



**FlowlineAttributesFlow for All Hydrologic Regions Except 21 (dBase file)**

**Description:** NHDPlus attributes derived for NHD Flowlines.

<b>Field Name</b>	<b>Description</b>
ComID	Common identifier of an NHD Flowline
Grid_code	Value field from Catchment Grid
CumDrainag	Cumulative drainage area in square kilometers(sq km) at bottom of flowline
MAFlowU	Mean Annual Flow in cubic feet per second (cfs) at bottom of flowline as computed by Unit Runoff Method
MAFlowV	Mean Annual Flow (cfs) at bottom of flowline as computed by Vogel Method. In Hydrologic Region 20 (Hawaii), this value is the median annual flow (cfs) as computed using the method of Fontaine, et. al. (1992).
MAVelU	Mean Annual Velocity (fps) at bottom of flowline as computed by Jobson Method (1996) using the flow in MAFlowU.
MAVelV	Mean Annual Velocity (fps) at bottom of flowline as computed by Jobson Method (1996) using the flow in MAFlowV.
IncrFlowU	Incremental Flow (cfs) for Flowline as computed by the Unit Runoff Method
MaxElevRaw	Maximum elevation (unsmoothed) in meters
MinElevRaw	Minimum elevation (unsmoothed) in meters
MaxElevSmo	Maximum elevation (smoothed) in meters
MinElevSmo	Minimum elevation (smoothed) in meters
Slope	Slope of flowline (m/m)



### **FlowlineAttributesFlow For Region 21(dBase file)**

**Description:** NHDPlus attributes derived for NHD Flowlines.

<b>Field Name</b>	<b>Description</b>
ComID	Common identifier of an NHD Flowline
Grid_code	Value field from Catchment Grid
CumDrainag	Cumulative drainage area in square kilometers(sq km) at bottom of flowline
MAFlowU	Mean Annual Flow in cubic feet per second (cfs) at bottom of flowline as computed by Unit Runoff Method
MAVelU	Mean Annual Velocity (fps) at bottom of flowline as computed by Jobson Method (1996) using the flow in MAFlowU.
IncrFlowU	Incremental Flow (cfs) for Flowline as computed by the Unit Runoff Method
MaxElevRaw	Maximum elevation (unsmoothed) in meters
MinElevRaw	Minimum elevation (unsmoothed) in meters
MaxElevSmo	Maximum elevation (smoothed) in meters
MinElevSmo	Minimum elevation (smoothed) in meters
Slope	Slope of flowline (m/m)

<b>Field Name</b>	<b>Description</b>
ComID	Common identifier of an NHD Flowline
Grid_Code	Value field from Catchment Grid
AreaWtMAP	Area Weighted Mean Annual Precipitation at bottom of flowline in mm
AreaWtMAT	Area Weighted Mean Annual Temperature at bottom of flowline in degree C * 10



**Description:** National Land Cover Dataset 1992 (NLCD) attributes derived for each flowline catchment.

**Note:** The NLCD was available only for the conterminous United States. Percentages of the NLCD categories pertain only to the portion of a catchment within the United States but are computed as a percentage of the total area. Thus, any non-zero percentages in fields PCT\_CN or PCT\_MX must be added to the percentages in the NLCD categories to account for the entire catchment area.

Field Name	Description
ComID	Common identifier of an NHD Flowline
Grid_code	Value field from Catchment Grid
NLCD_11	% of catchment area classified as Open Water in NLCD
NLCD_12	% of catchment area classified as Perennial Ice/Snow in NLCD
NLCD_21	% of catchment area classified as Low Intensity Residential in NLCD
NLCD_22	% of catchment area classified as High Intensity Residential in NLCD
NLCD_23	% of catchment area classified as Commercial/Industrial/Transportation in NLCD
NLCD_31	% of catchment area classified as Bare Rock/Sand/Clay in NLCD
NLCD_32	% of catchment area classified as Quarries/Strip Mines/Gravel Pits in NLCD
NLCD_33	% of catchment area classified as Transitional in NLCD
NLCD_41	% of catchment area classified as Deciduous Forest in NLCD
NLCD_42	% of catchment area classified as Evergreen Forest in NLCD
NLCD_43	% of catchment area classified as Mixed Forest in NLCD
NLCD_51	% of catchment area classified as Shrubland in NLCD
NLCD_61	% of catchment area classified as Orchards/Vineyards/Other in NLCD
NLCD_71	% of catchment area classified as Grasslands/Herbaceous in



Field Name	Description
	NLCD
NLCD_81	% of catchment area classified as Pasture/Hay in NLCD
NLCD_82	% of catchment area classified as Row Crops in NLCD
NLCD_83	% of catchment area classified as Small Grains in NLCD
NLCD_84	% of catchment area classified as Fallow in NLCD
NLCD_85	% of catchment area classified as Urban/Recreational Grasses in NLCD
NLCD_91	% of catchment area classified as Woody Wetlands in NLCD
NLCD_92	% of catchment area classified as Emergent Herbaceous Wetlands in NLCD
PCT_CN	% of catchment area in Canada and not classified in NLCD
PCT_MX	% of catchment area in Mexico and not classified in NLCD
SUM_PCT	Sum of the % catchment areas



# CURRENT WORK

- Establish Geodatabase for raster files
- Give raster files individual layer symbolization
- Metadata





# FUTURE WORK

Jesus  
Avillaneda



# CREATE A SUITABILITY MODEL

- Take point locations provided by Ben Labay for 3 fishes
  - Pugnose minnow, Channel Catfish, Guadalupe Bass
- Run model with ArcGIS
- Compare model with MAXENT model



Image from [www.bio.txstate.edu](http://www.bio.txstate.edu)

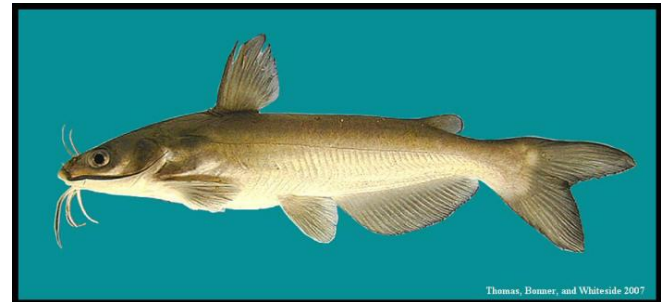


Image from [www.bio.txstate.edu](http://www.bio.txstate.edu)



Image from [www.tpwd.state.tx.us](http://www.tpwd.state.tx.us)



# CREATE A WEBSITE

## ○ Basic website that will include:

- Finished maps
- Copies of proposal, progress report, final report
- Copies of presentation slideshow
- Links to where data was gathered
- Contact information for group
- Etc...



Image from [webbuildinginfo.com](http://webbuildinginfo.com)



# CONSTRUCT A README FILE

- Simple text file that will include:
  - Instructions on how to use the data
  - Instructions on how to use/read the maps
  - Overall information on how the disk can be used, as well as how to use the programs



# OBSTACLES



IMAGE FROM [WWW.SEMANTICSINCORPORATED.COM](http://WWW.SEMANTICSINCORPORATED.COM)





# OVERALL ASSESSMENT



# Questions?

