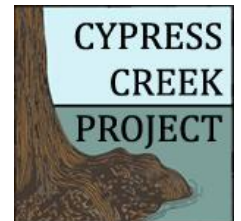


Cypress Creek Project

Building A Watershed Protection Plan

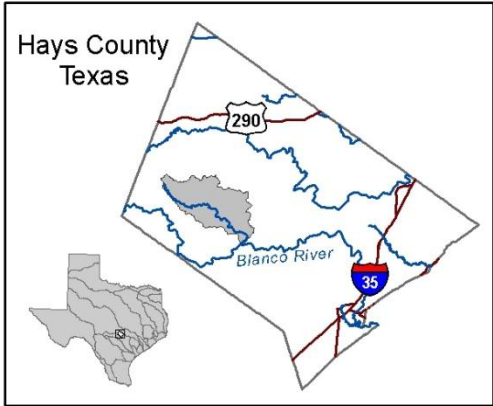
The preparation of this presentation is financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality



Cypress Creek Watershed

< to Blanco

^ to Dripping Springs



Dry Cypress Creek

MT SHARP RD

12

JACOBS WELL RD

Jacob's Well

WOODCREEK

W VALLEY SPRING RD

2325

WINTERS MILL PKWY

WIMBERLEY

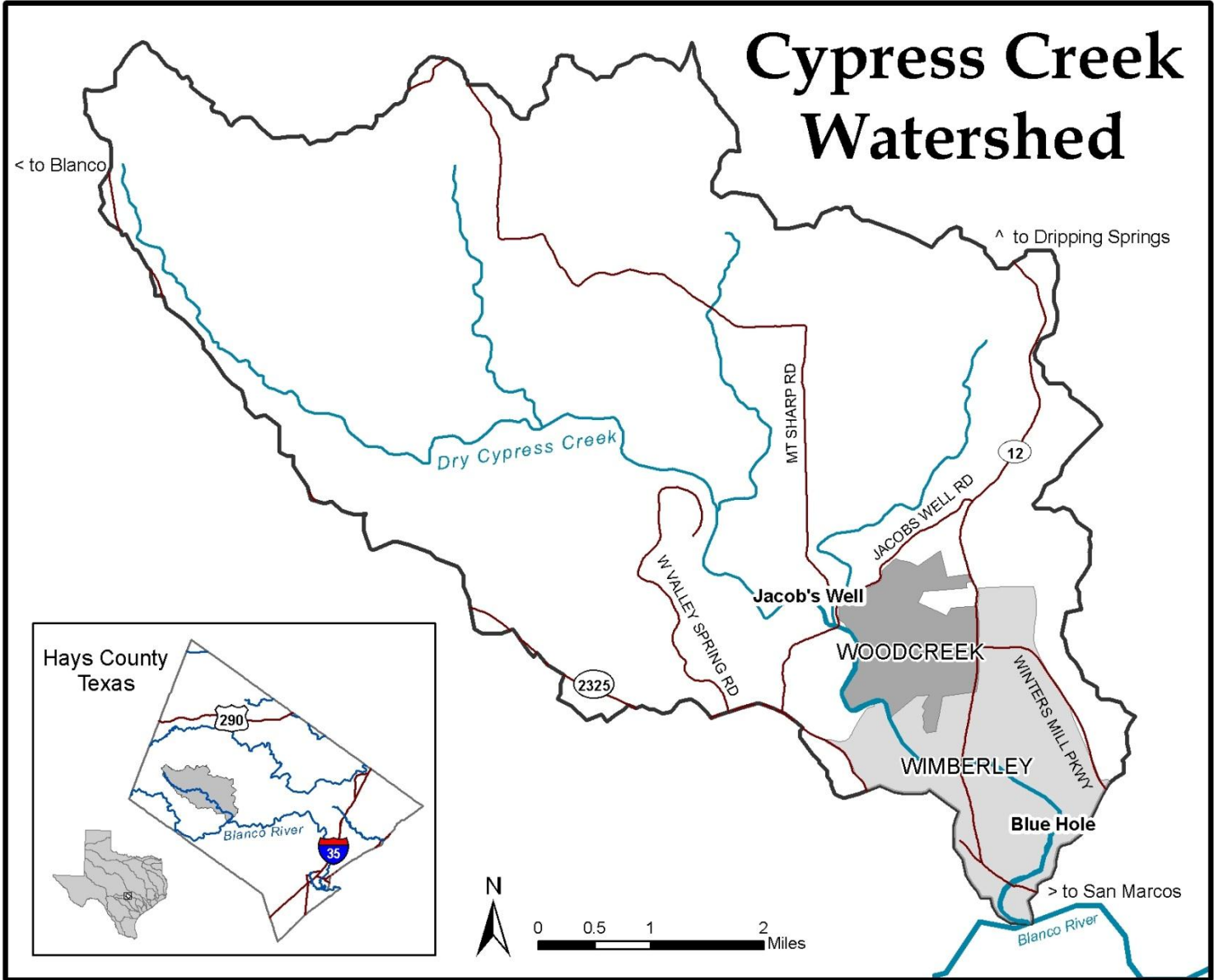
Blue Hole

> to San Marcos

Blanco River



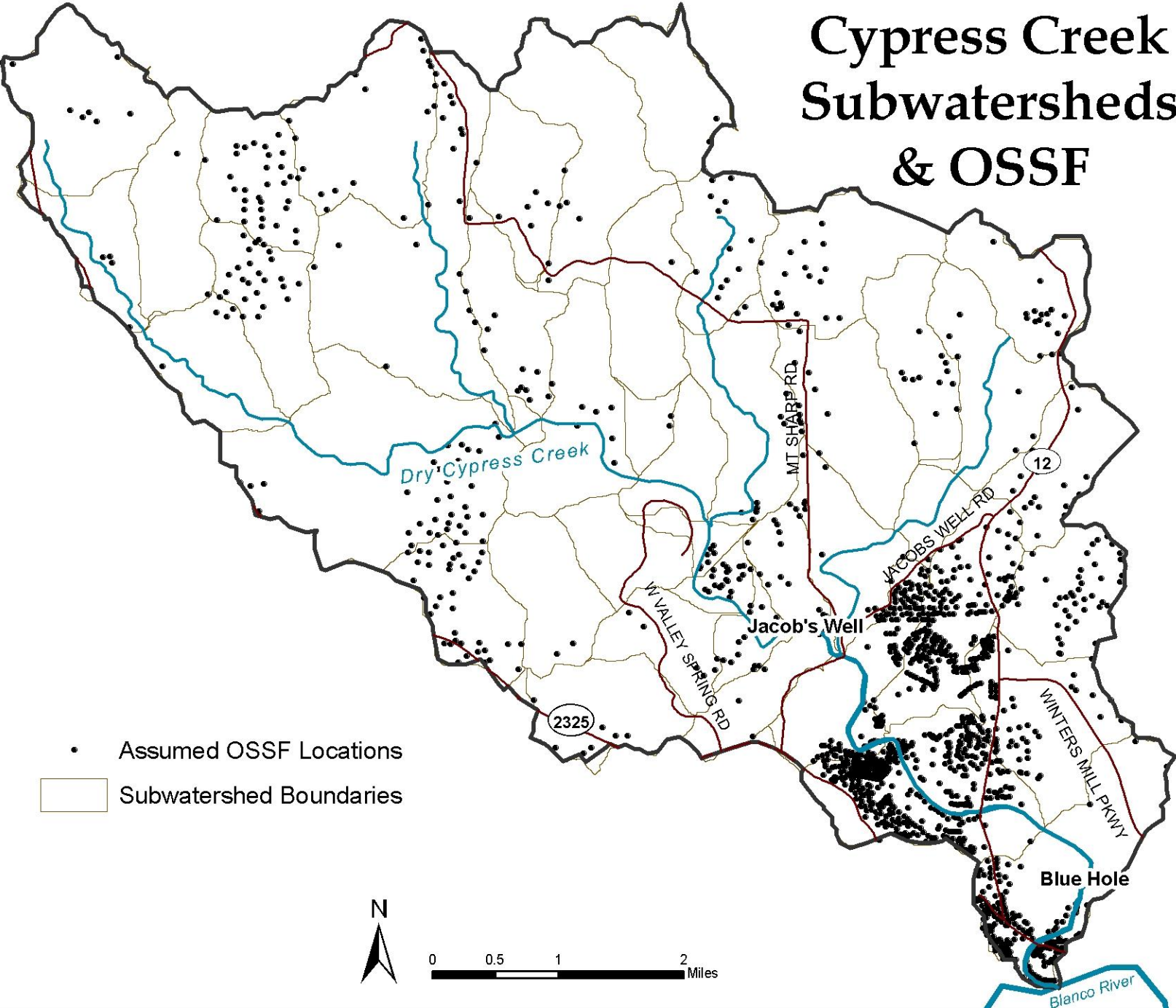
0 0.5 1 2 Miles







Cypress Creek Subwatersheds & OSSF



• Assumed OSSF Locations

□ Subwatershed Boundaries

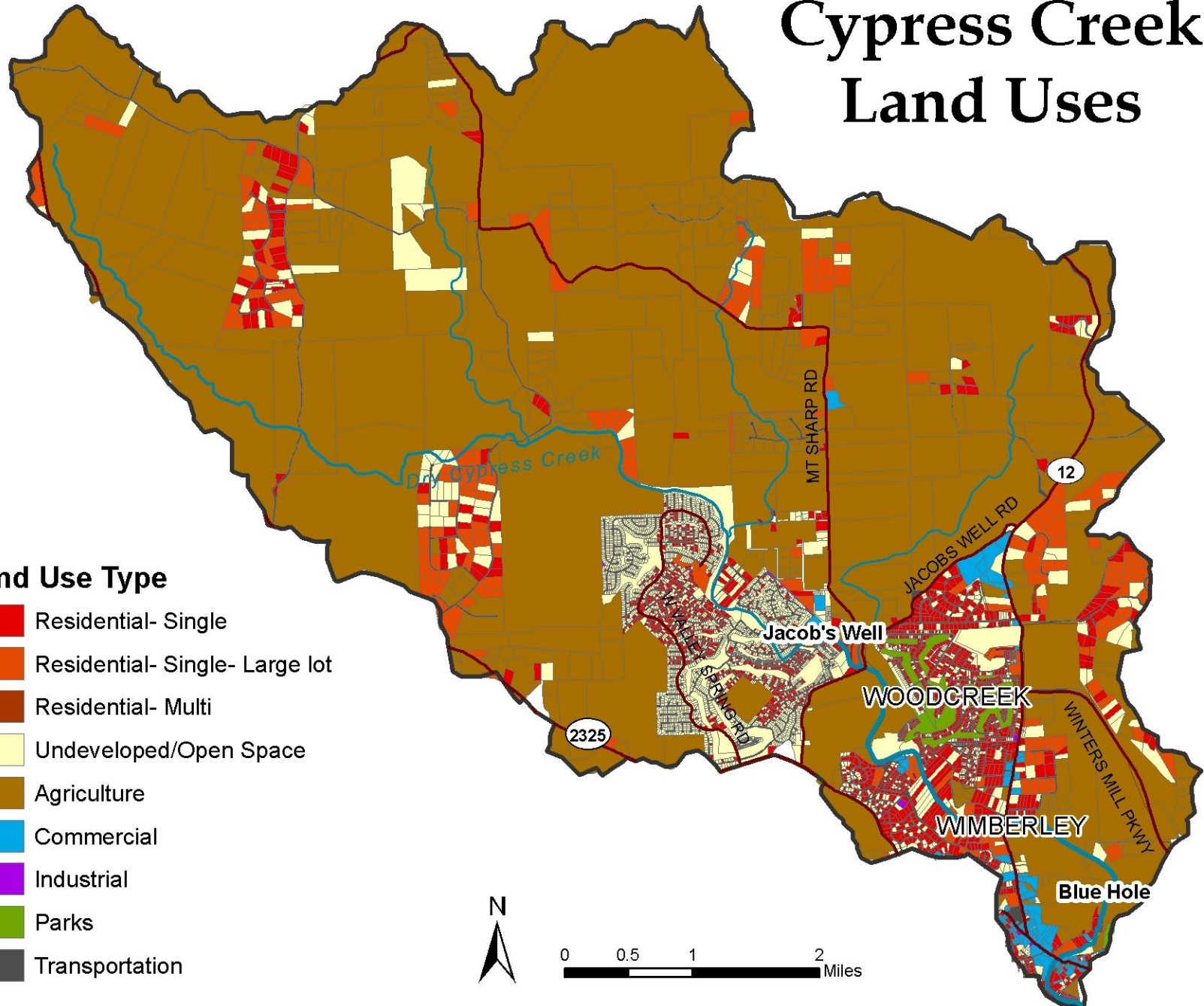


0 0.5 1 2 Miles

Cypress Creek Land Uses

Land Use Type

- Residential- Single
- Residential- Single- Large lot
- Residential- Multi
- Undeveloped/Open Space
- Agriculture
- Commercial
- Industrial
- Parks
- Transportation



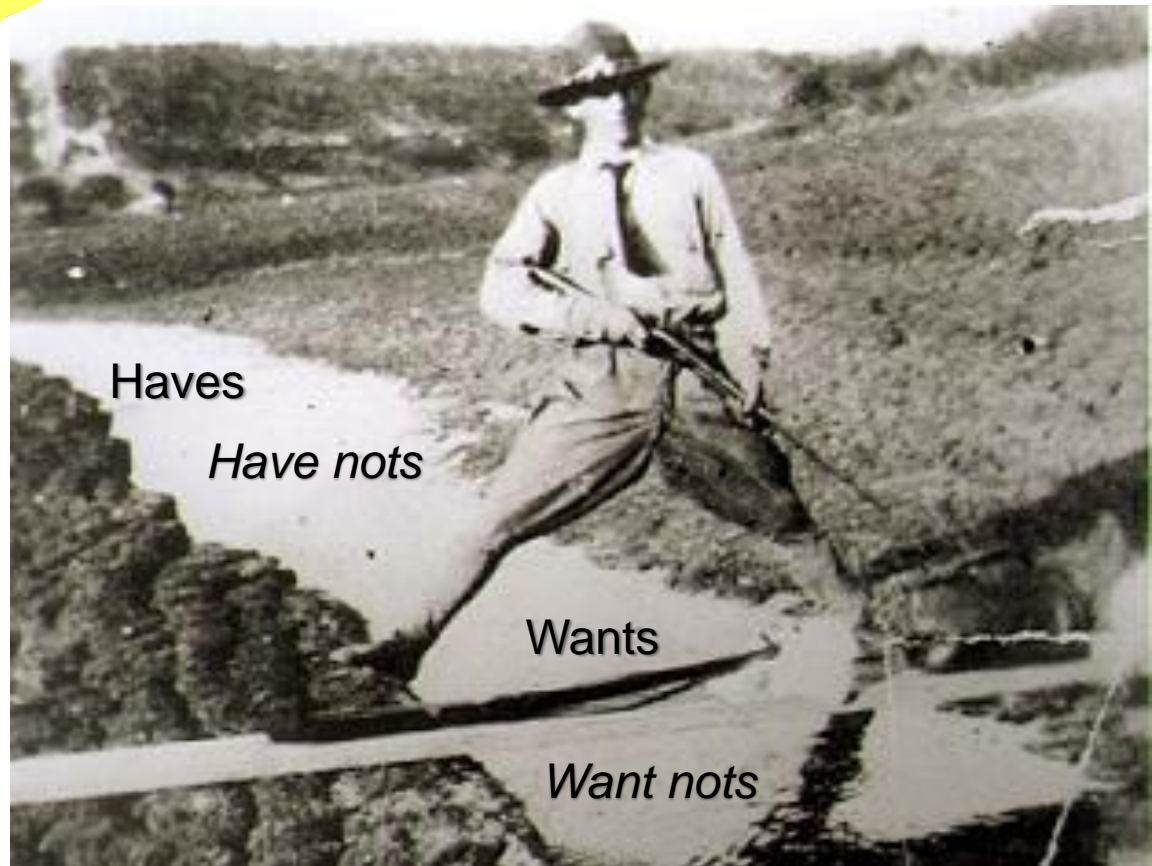
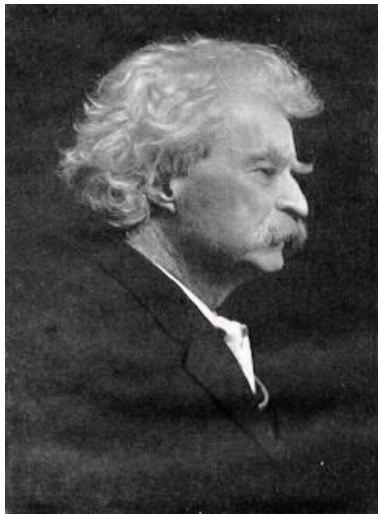
In

Texas...

and

Wimberley

**WHISKEY IS FOR
DRINKIN' &
WATER IS FOR
FIGHTIN'**



Haves

Have nots

Wants

Want nots



San Marcos River a long time ago

“Young Tex”



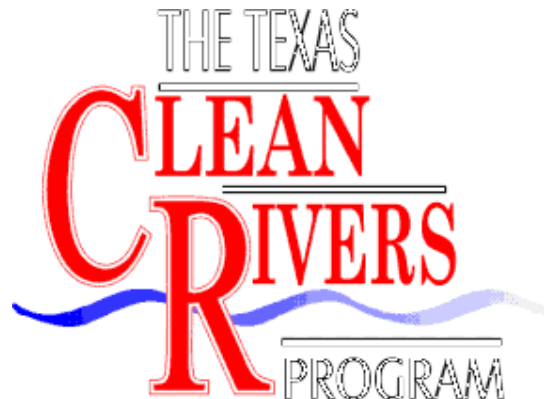
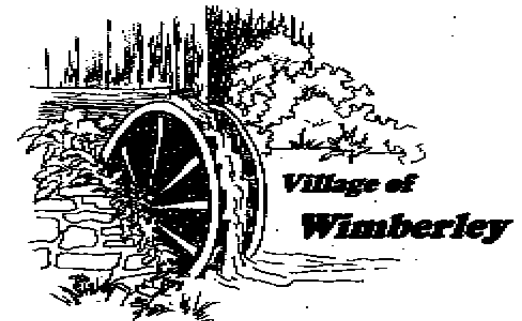
Blanco River 2005

“Ole Tex”





Project Partners







CYPRESS CREEK

**LET'S KEEP IT
CLEAN, CLEAR & FLOWING**

CYPRESS CREEK DECISION SUPPORT SYSTEM

Adrian L. Vogl

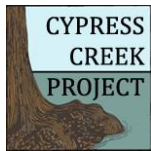
Watershed Science Lab

Texas State University-San Marcos

Decision Support for Cypress Ck

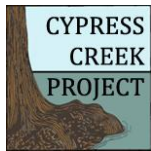
- Issues of Concern -

- Growth & development
 - Population 97,589 (2000) → 437,000 (2050)
- Water demand
 - Total water use ↑ 17% 1990-2004
 - Withdrawals from Trinity Aquifer projected to increase 151% in Hays County from 2000 to 2050
 - 125% increase projected in exempt wells (domestic, agriculture supply)
- Watershed-level impacts
 - Water quality, hydrology



Decision Support for Cypress Ck - Objectives -

- Develop a Decision Support System (DSS) for watershed management of Cypress Creek
- Develop a watershed simulation model to simulate water quantity and quality in the Cypress Creek
- Develop scenarios (land use change, water demand, climate change) and analyze the impacts of these scenarios on water quantity and quality
- Solicit stakeholder input on DSS analytic capabilities, scenarios, outputs, and criteria for evaluation



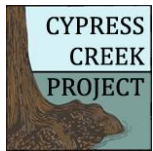
DSS/Technical Stakeholder Subcommittee

Purpose

- Conceptual framework and functionality of the Decision Support System (DSS)
- Input on social factors and biophysical system in DSS
- Identify priority issues, inputs and outputs
- Develop management objectives
- Identify appropriate indicators/ criteria

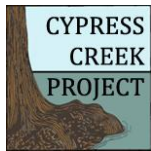
Representation

- Regulatory, municipal, conservation, landowner, scientific, and development interests



Stakeholder Goals for CCP DSS

- Evaluate location and density of development
 - Identify sensitive areas (high potential loading, high recharge potential)
- Evaluate structural BMPs
 - Retention ponds, location & size
 - Constructed wetlands/vegetative buffer strips
 - Rainwater harvesting
- Evaluate NPS load reductions per dollar spent
- Inform WPP Elements A through C



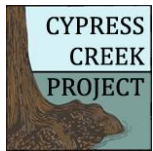
Parameters of Concern

Inputs:

- Impervious surface levels
- Landscaping practices
- Land uses
- Septic systems
- Treated effluent application
- Ranching practices
- Reduced spring flow

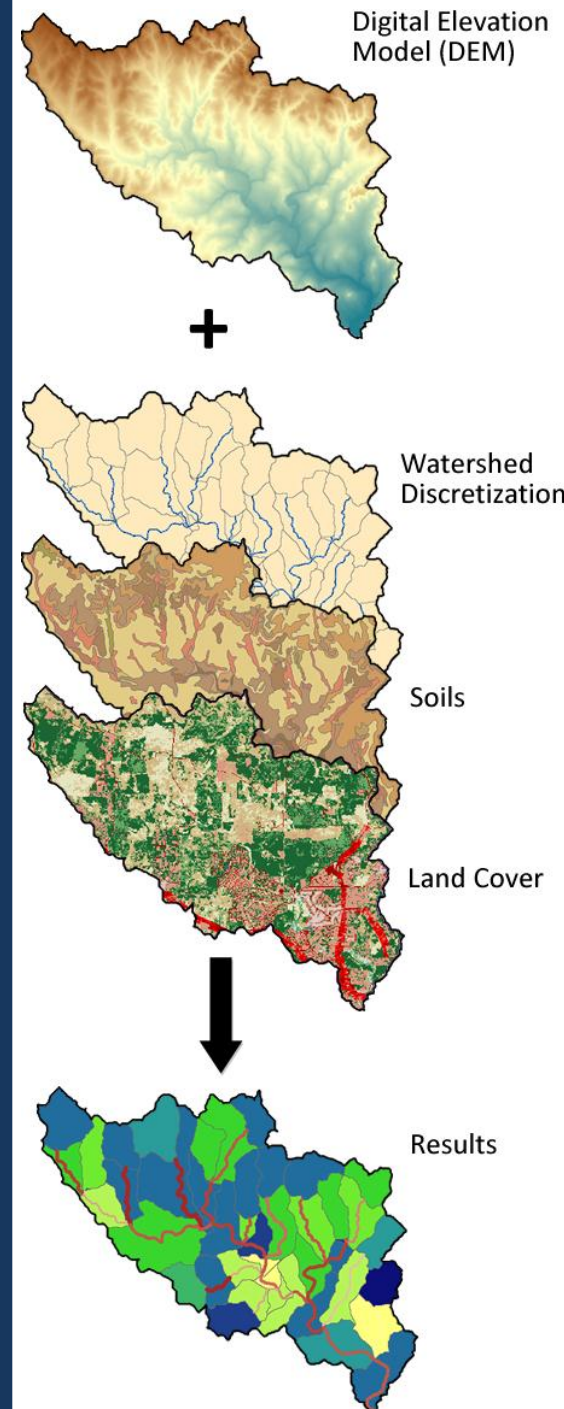
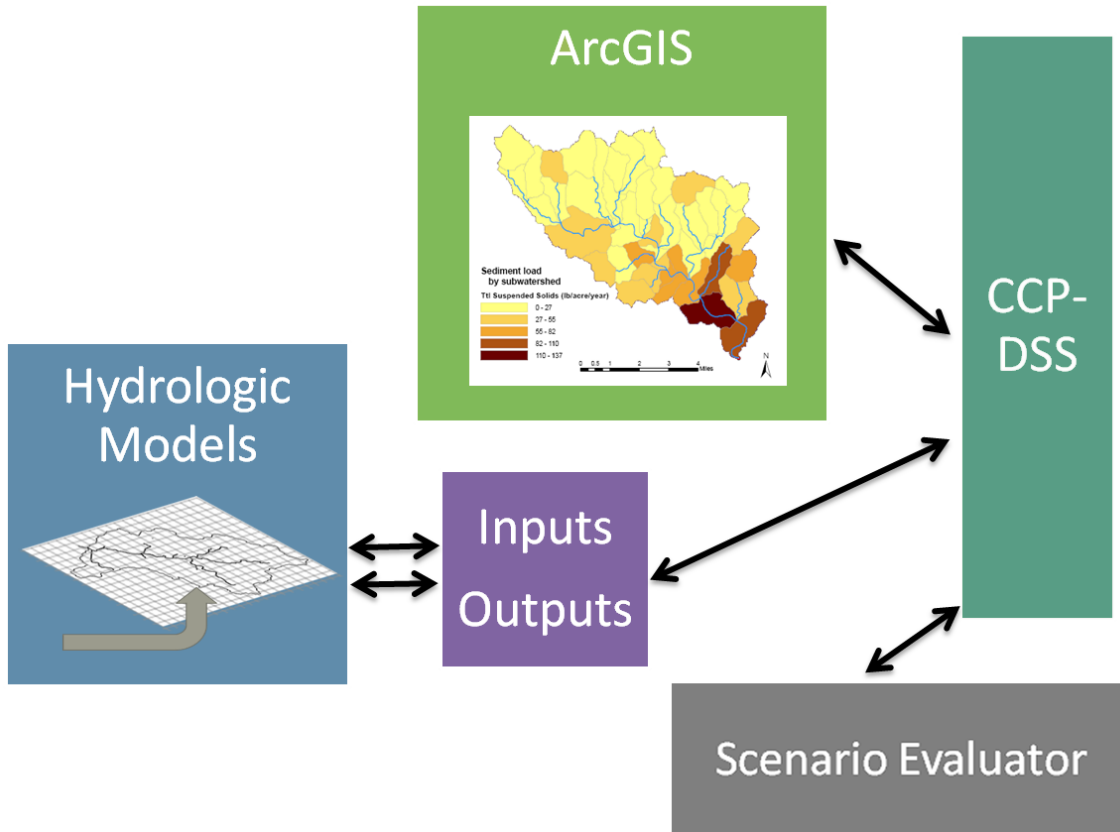
Outputs:

- Sediment
- Flow (surface and groundwater)
- Nutrients
- Bacteria
- DO



Cypress Creek Decision Support System (CCP-DSS)

- Components -



Scale: 1:91,886
60%
[Navigation icons]

Cypress Creek DSS (AGWA2) | Spatial Analyst | Layer: unrestrict7

Layers

- reservoirs
- cypressck
- CCOP_LCRA_stations_mer
- proposed_stations_2009_ut
- Streams
 - Sediment Concentration
 - 19.06 - -12.32
 - 12.32 - -5.69
 - 5.69 - -0.21
 - 0.21 - 6.16
 - 6.16 - 115.01
- Subwatersheds
 - N Surface Runoff (kg/h
 - 0.23 - 0.00
 - 0.00 - 5.00
 - 5.001 - 15.00
 - 15.01 - 25.00
 - 25.01 - 35.00
 - 35.01 - 45.00
 - 45.01 - 60.00
- gages_swat20perc4
- hays_roads_ProjectUTM

AGWA2 Results

Results Selection

Watershed: [Dropdown] [Info]

Simulation: [Dropdown] [Info] [Import]

Output: [Dropdown] [Update]

Difference | Time Series

Simulation 1: [Dropdown] [Info]

Simulation 2: [Dropdown] [Info]

Percent Change Absolute Change

Equation: [Text Box]

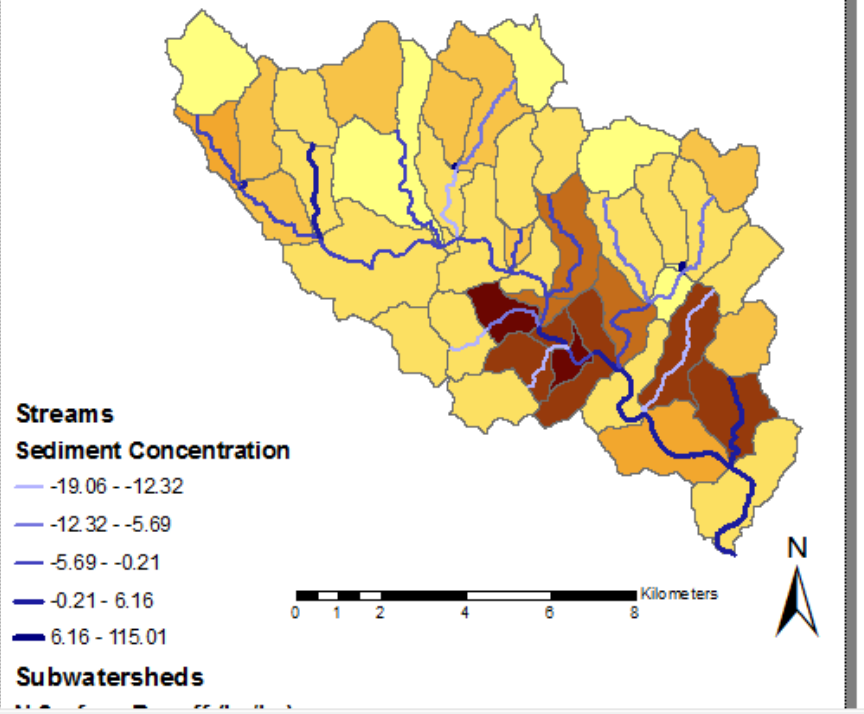
New Name: [Text Box] [Create]

[View SWAT summary output file]

[Help] [Close]

Cypress Creek DSS (AGWA2) Menu

- Delineation Options
- Discretization Options
- Parameterization Options
- Precipitation Options
- Simulation Options
- View Results**
 - View KINEROS Results
 - View SWAT Results**
- Scenario Evaluation
- Other Options

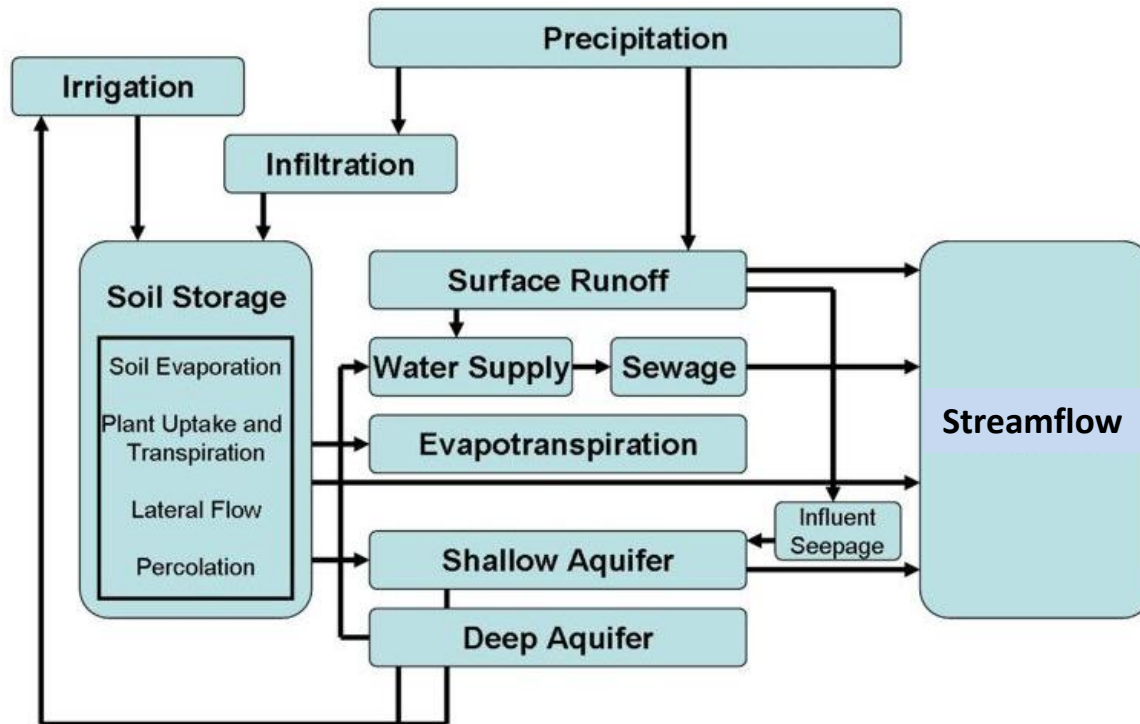


Toolbars: [Navigation], [Drawing], [Text], [Format], [Task: Create New Feature], [Target]

Modeling Approach

- Model Selection & Parameterization -

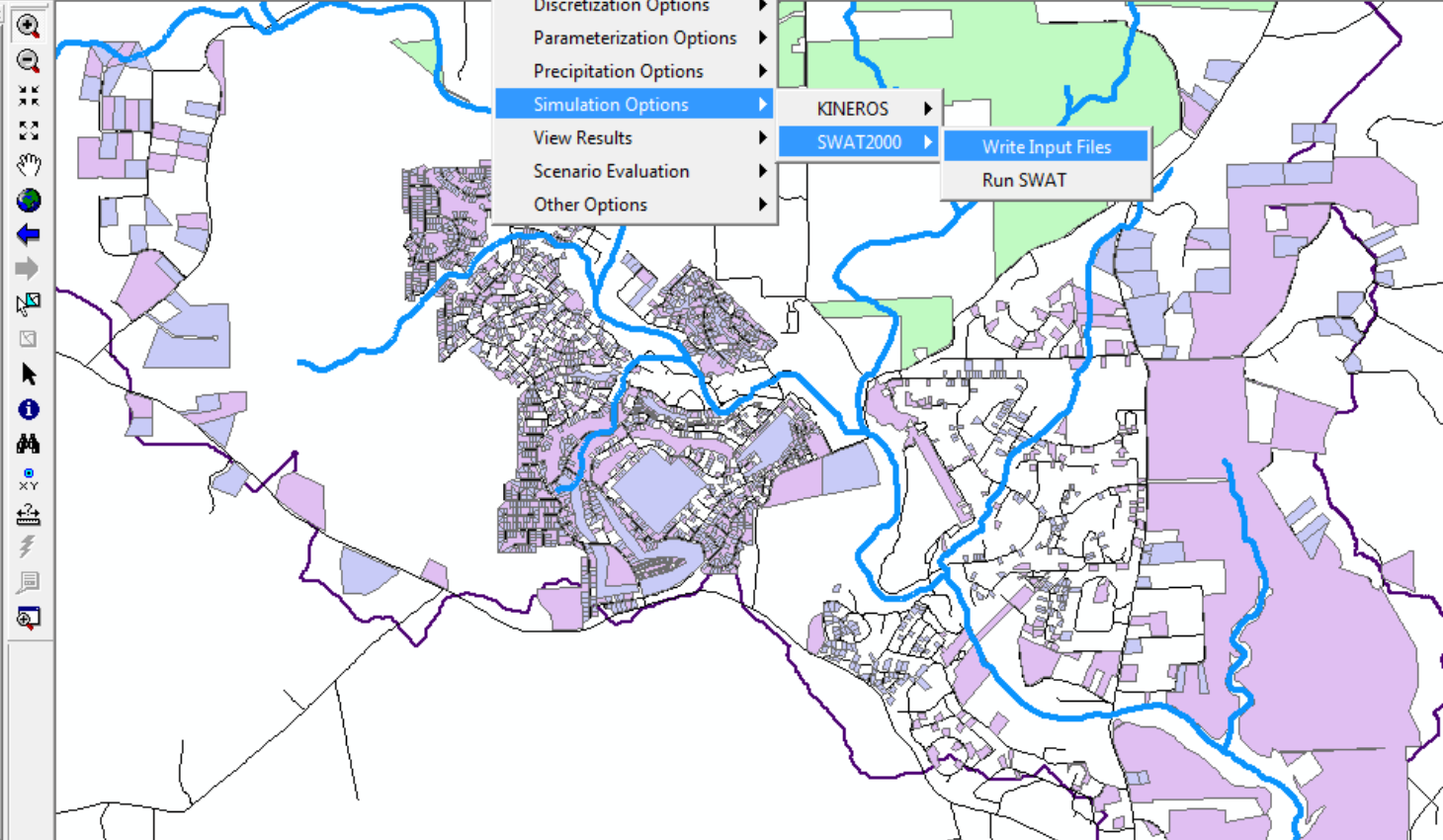
Models – KINEROS, SWAT



1:40,819 Spatial Analyst Layer: unrestrict7

- Delineation Options
- Discretization Options
- Parameterization Options
- Precipitation Options
- Simulation Options
 - KINEROS
 - SWAT2000
 - Write Input Files
 - Run SWAT
- View Results
- Scenario Evaluation
- Other Options

- proposed_stations_2009_utm_final
- streams_swat20perc4
- subwatersheds_swat20perc4
 - N Surface Runoff (kg/ha)
 - 0.0001000 - 0.00000000
 - 0.0001000 - 5.000
 - 5.001 - 15.00
 - 15.01 - 25.00
 - 25.01 - 35.00
 - 35.01 - 45.00
 - 45.01 - 60.00
- random_ag_dev
- limiteddev_lots
- DissolveEplusC_nofloodzone_edit
- gages_swat20perc4
- hays_roads_ProjectUTM
- cypress_outlet
- cypress
- unrestrict7



- Layers
- reser
- cypr
- CCO
- prop
- stream
- subv
- rand
- limiteddev_lots
- DissolveEplusC_nofloodzone_edit
- gages_swat20perc4

AGWA2 Results

Results Selection

Watershed: cypress\swat20perc4

Simulation: cal18tomid2abs

Output: [Empty]

Difference Type: [Empty]

Simulation 1: [Empty]

Simulation 2: [Empty]

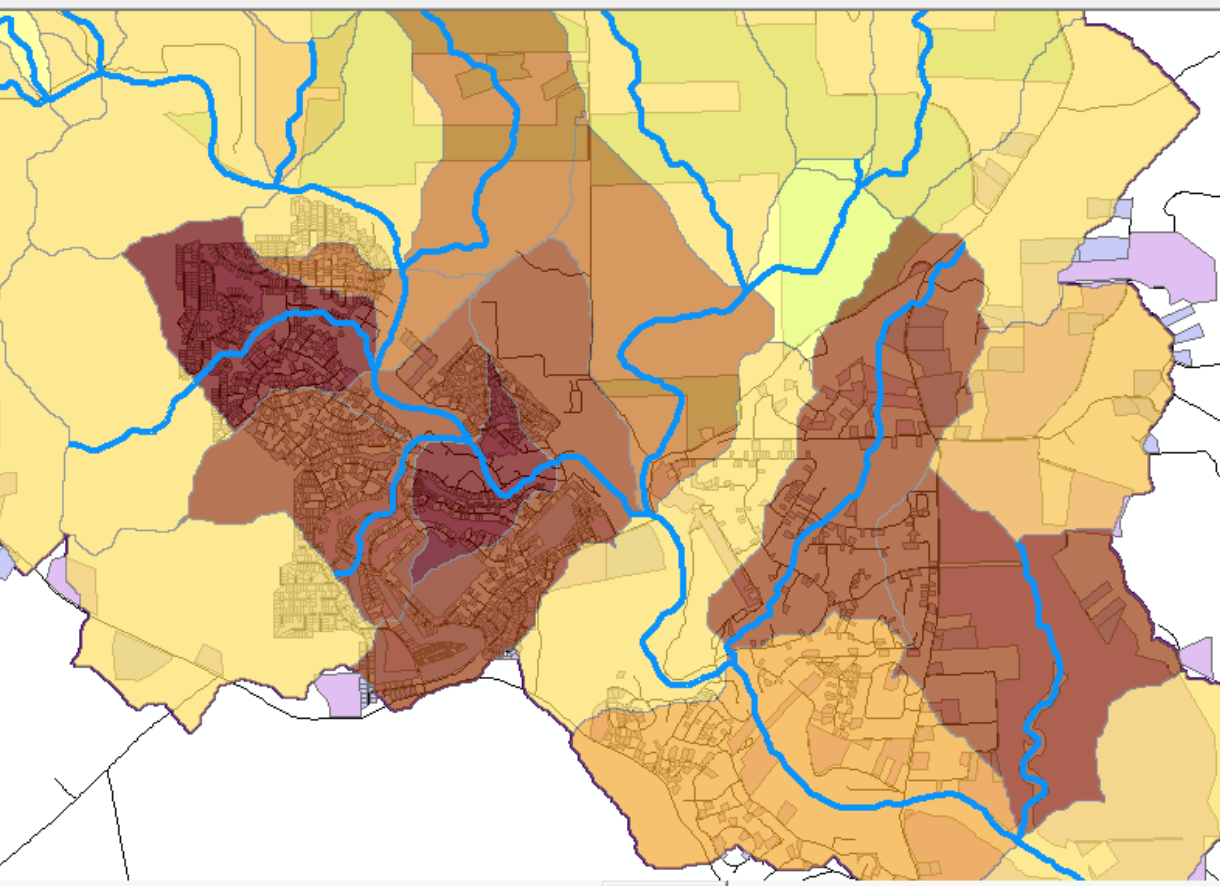
Percent Change Absolute Change

Equation: [Empty]

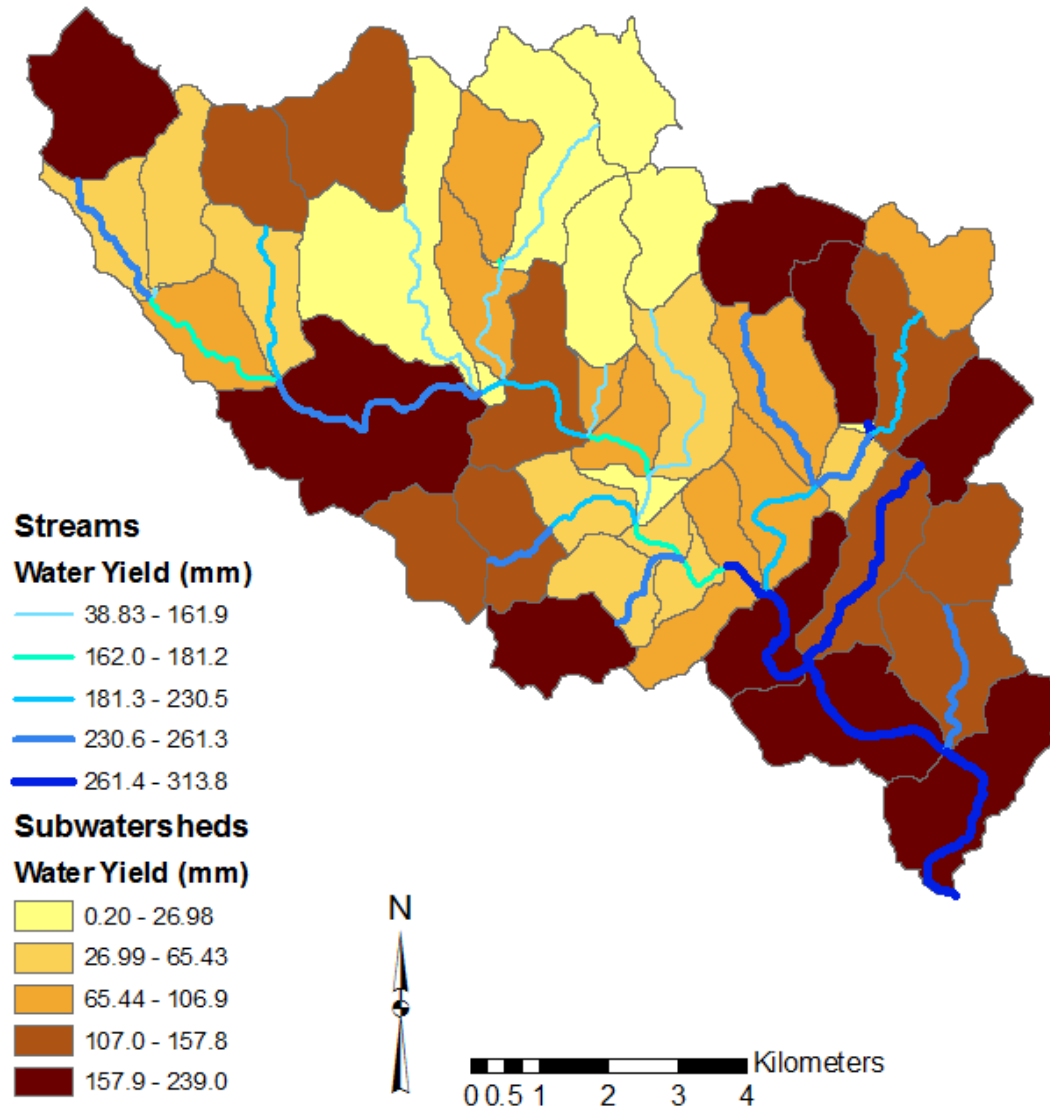
New Name: [Empty]

View SWAT summary output file

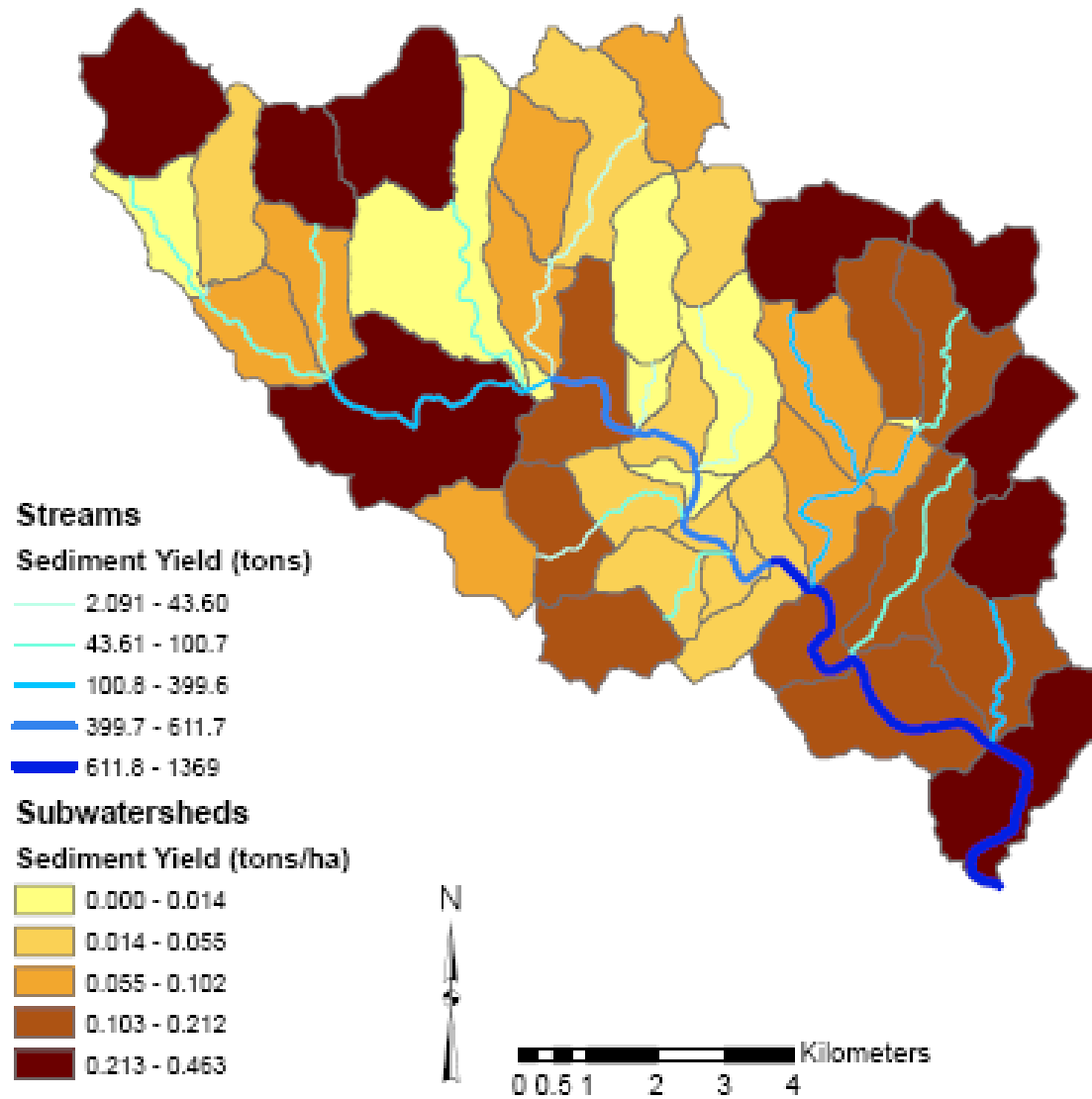
Help Close



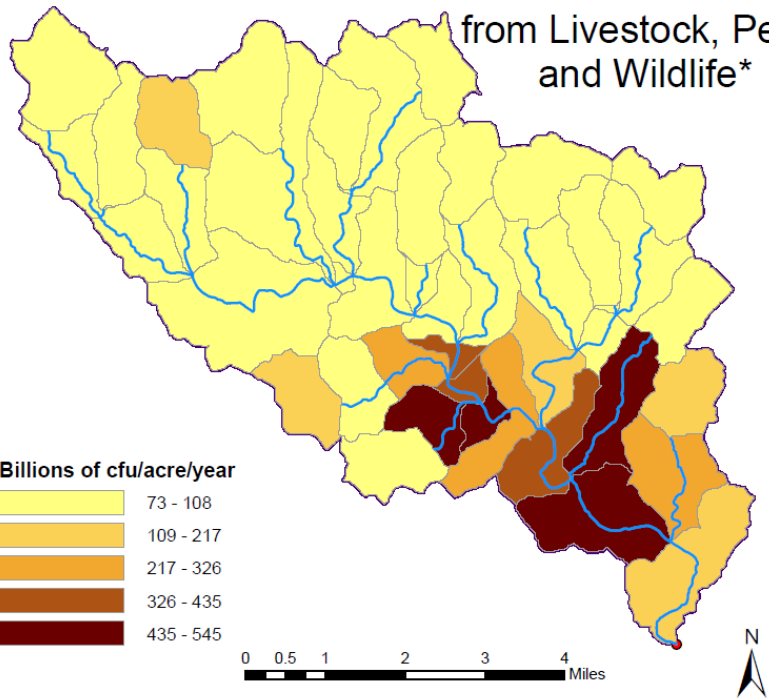
Model Results - Annual Water Yield



Model Results - Sediment Yield

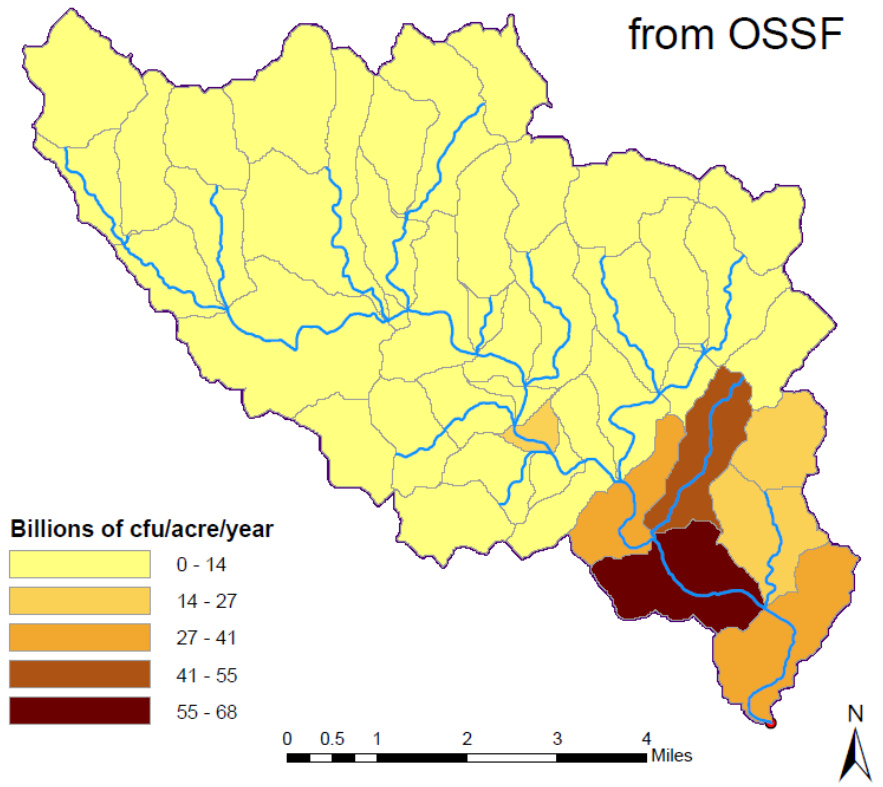


Potential *E. coli* load from Livestock, Pets, and Wildlife*



* Sources include: cows, goats, horses, pets, deer, and feral hogs.

Potential *E. coli* load from OSSF

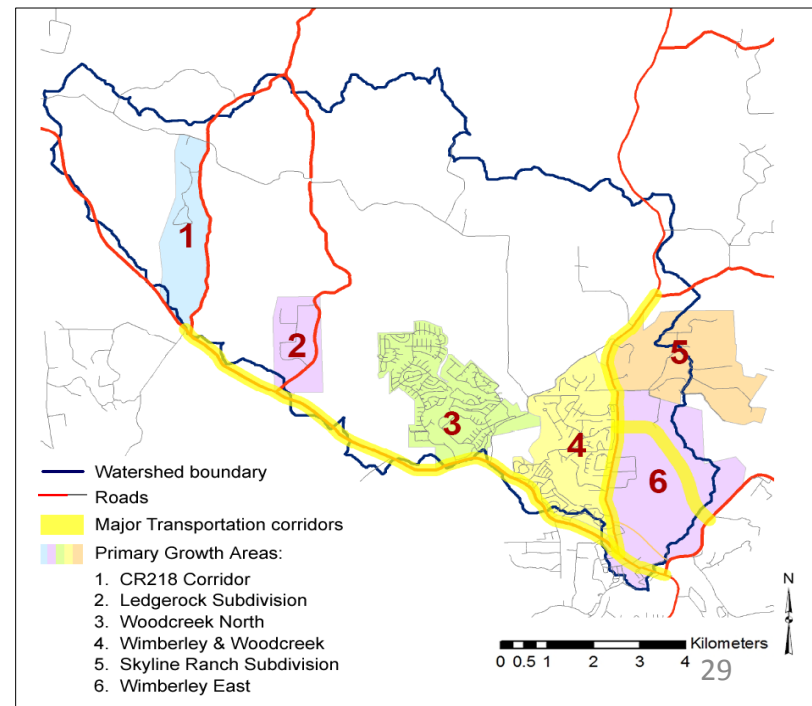


Alternative Futures for the Wimberley Valley

Alternative Futures

- Conceptual -

1. Email questionnaire
“Best” and “Worst” case scenarios for 25 years
2. Develop alternative future maps & conceptual scenarios
3. Stakeholder review
4. Develop GIS rasters



Alternative Futures

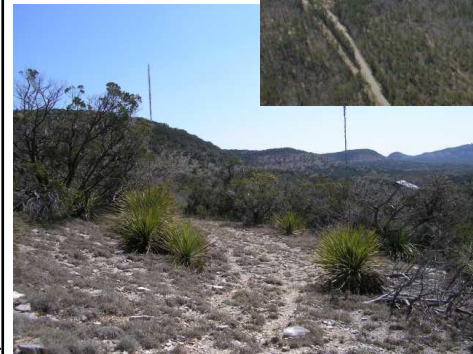
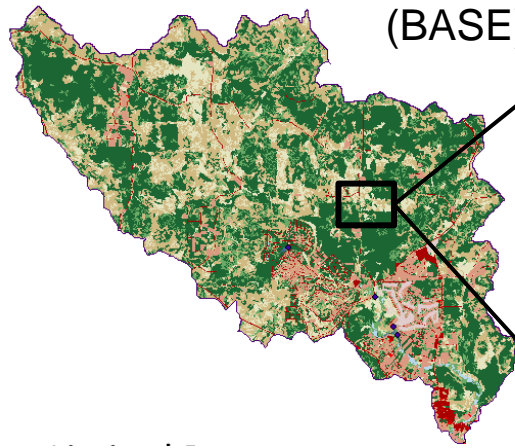
- Maps -

Land Cover Class

- Open Water
- Developed - Open Space
- Developed - Low Intensity
- Developed - Medium Intensity
- Developed - High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Scrub/Shrub
- Grasslands/Herbaceous
- Woody Wetlands

Current Conditions

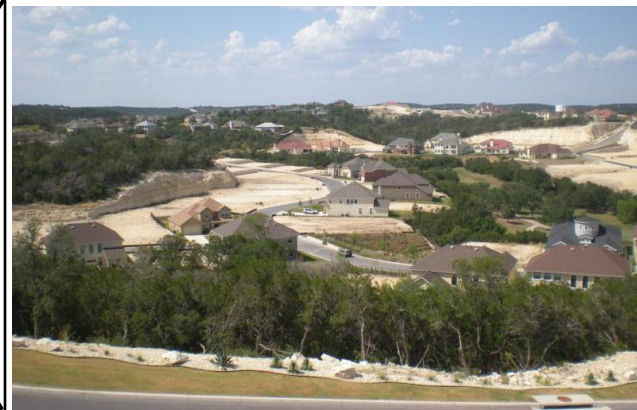
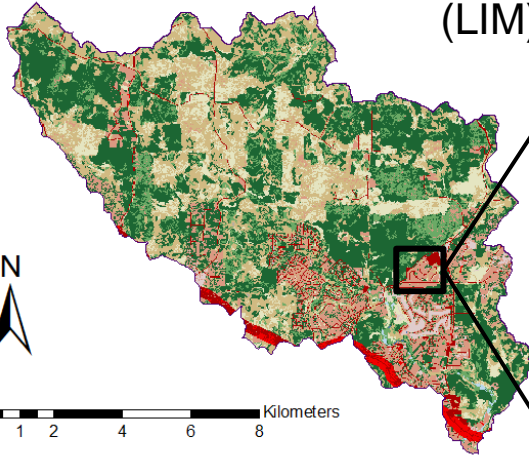
(BASE)



None to low
development

Limited Development

(LIM)



Medium
residential

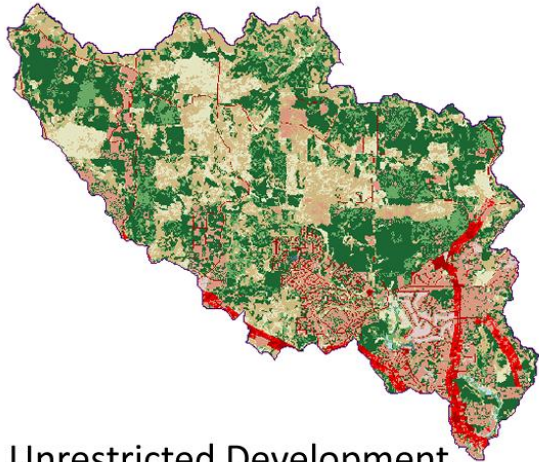


0 1 2 4 6 8 Kilometers

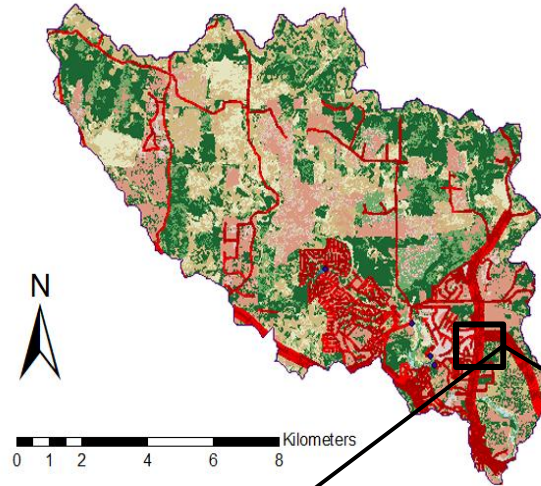
Alternative Futures

- Maps -

Moderate Development (MOD)

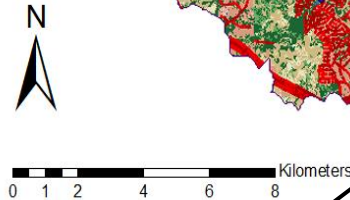


Full Development (40 yrs)

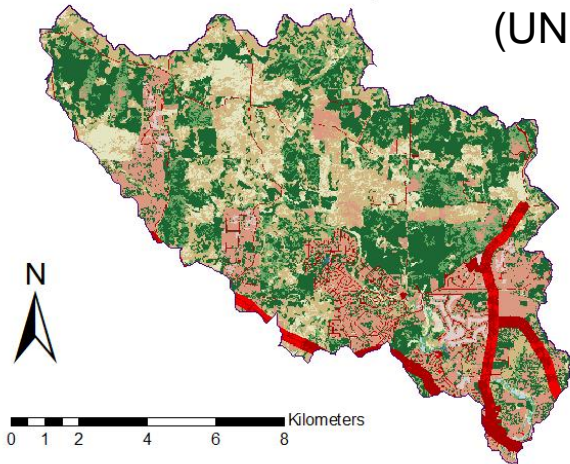


Land Cover Class

- Open Water
- Developed - Open Space
- Developed - Low Intensity
- Developed - Medium Intensity
- Developed - High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Scrub/Shrub
- Grasslands/Herbaceous
- Woody Wetlands



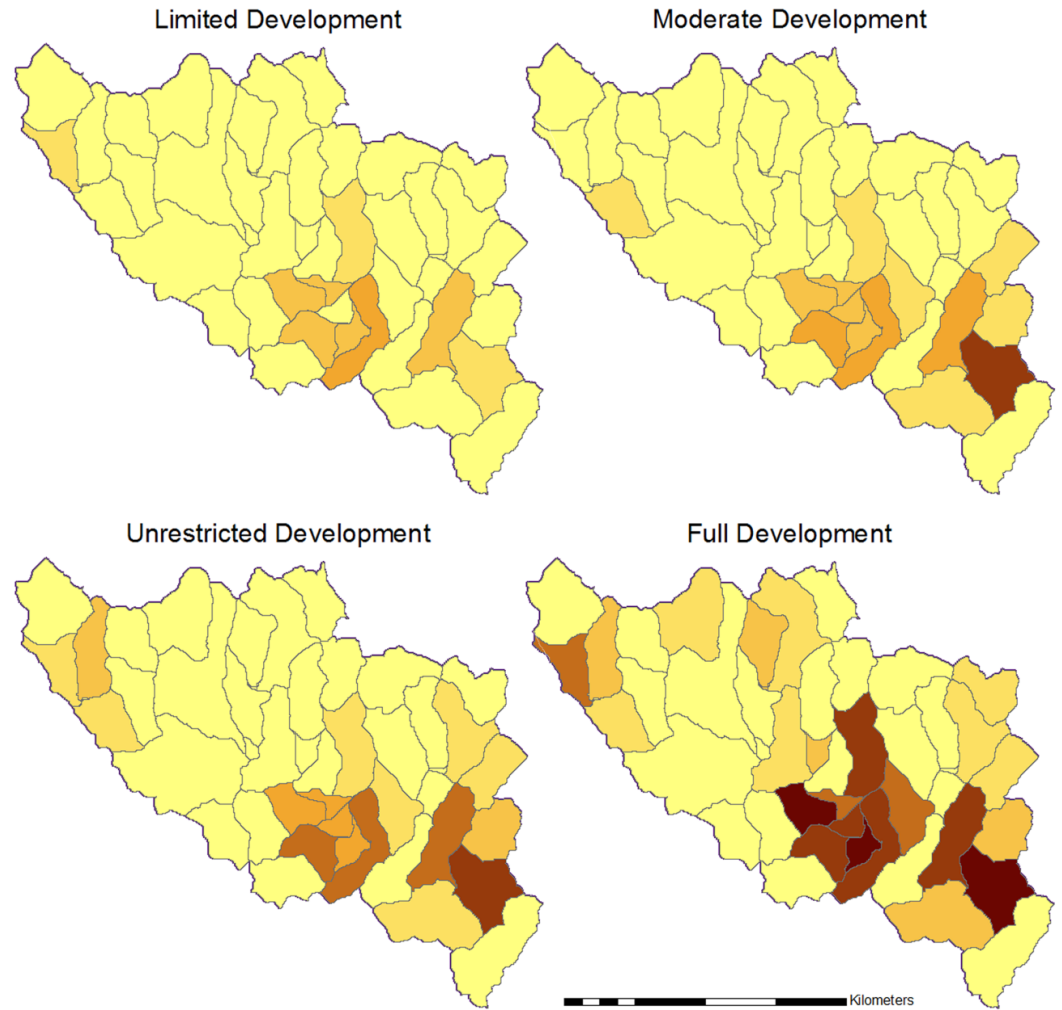
Unrestricted Development (UNRST)



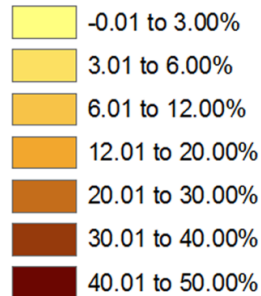
High intensity

Scenario Results

Surface Runoff

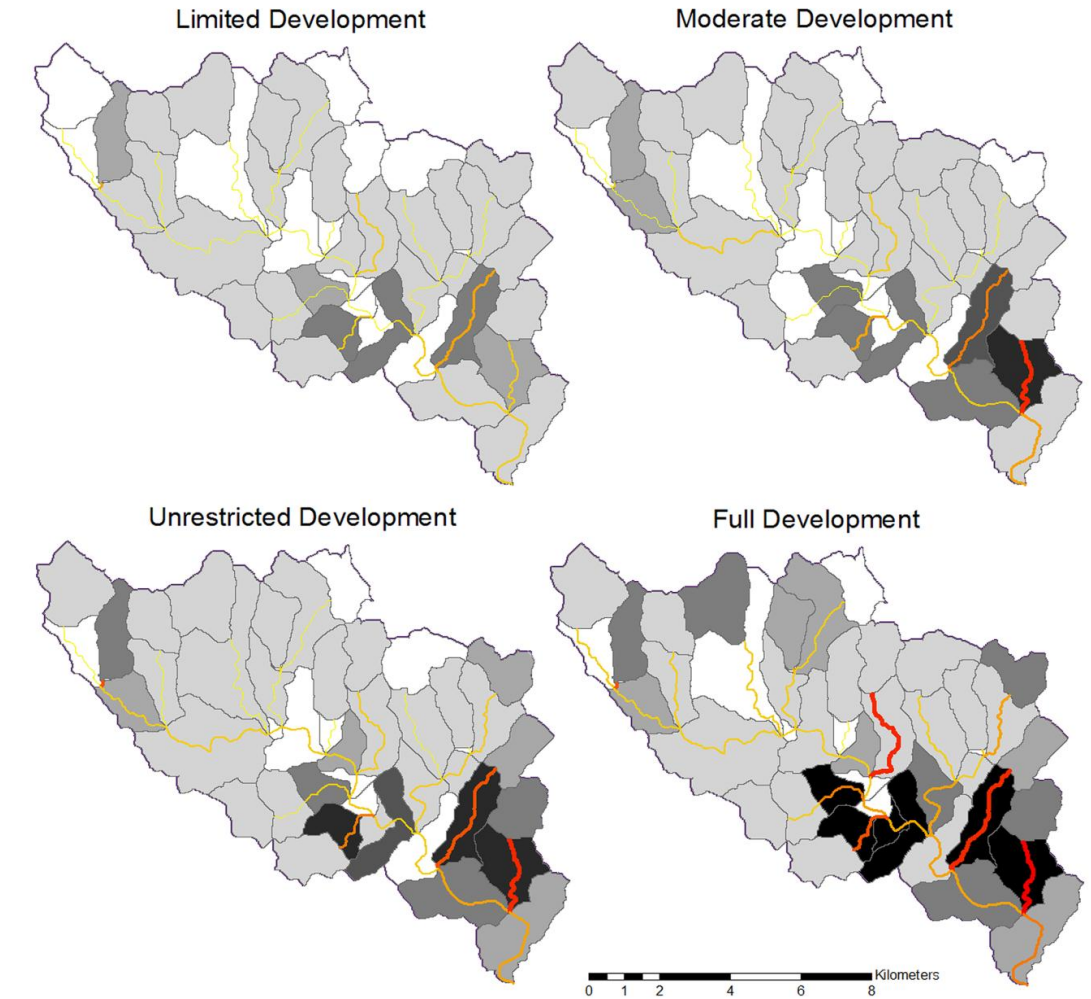


% Change in Surface Runoff (mm)



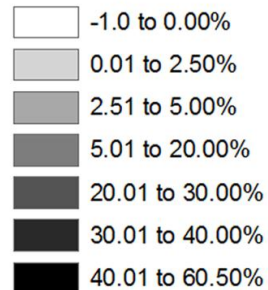
Scenario Results

Sediment Yield



Subbasins

% Change in Sediment Yield (tons/ha)



Channels

% Change in Sediment Yield (tons)



Scenario Evaluation Tool

The screenshot displays the Scenario Evaluation Tool interface. At the top, the title bar reads "Facilitator: test_run" and the menu bar includes "File", "Window", "View", "Run", and "Help". A "MAPPER" icon is visible on the left, and a "Help" icon is on the right. A table lists four scenarios with their corresponding model outputs. Two green arrows point from the text "SCENARIOS" to the scenario names and from "MODEL OUTPUTS" to the numerical values in the table. Below the table, two pop-up windows are shown: "Base Criteria" and "Ranking". A green arrow points from the text "CRITERIA" to the list of criteria in the "Base Criteria" window. The "Ranking" window shows a list of criteria with checkboxes, indicating their selection for ranking.

Scenario	Percent impervious cover	Annual Sediment yield	Relative change in flood peak	Mean Flow at JW spring
Full build-out	0.5	2,000	5	3.5
conservation plan	0.08	500	1	50
Build out at 1/2 full	0.25	1,000	3	10
Build out at 1/2 full plus Imp c	0.1	750	1.8	15

Base Criteria

List of Base Criteria

Add Edit Move Up Move Down Delete

- Percent impervious cover
- Annual Sediment yield
- Relative change in flood peak
- Mean Flow at JW spring

Ranking

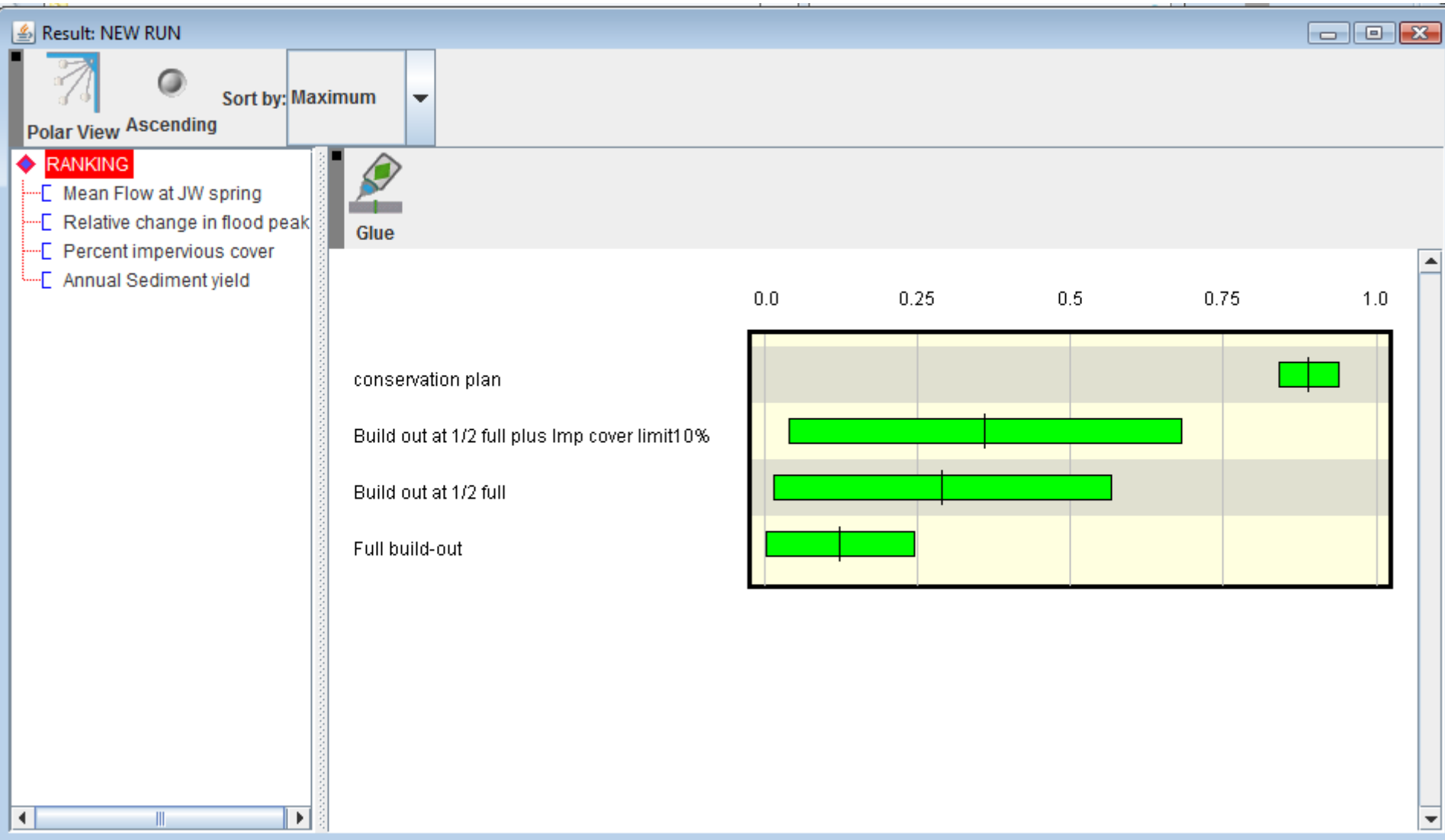
Add Composite Edit Composite Add Base Delete

RANKING

- Mean Flow at JW spring
- Relative change in flood peak
- Percent impervious cover
- Annual Sediment yield

Decision Support System

Facilitator – Options Ranking



Benefits of Participation

- Increased trust in simulation models and their utility for planning
- Trust in the motives of other participants
- Priorities and barriers for water resource management
 - Priorities, consensus ↓
Shift from general to specific
 - Barriers, consensus ↑
Lack of education, legal-political issues
- Effective and appropriate management approaches
 - Consensus ↑ or ↓

Challenges and Opportunities

Challenges

- Hard to interact with “silent majority”
- Multiple jurisdictions with rotating elected officials
- Weak watershed regulations
- Population projections
- No regional water/WWTP services
- Good water quality with some degrading trends
- Lack of awareness
- Sole reliance on aquifer for drinking water
- Sensitive karst system susceptible to NPS
- Underperforming GCD
- “Young” growing cities

Challenges and Opportunities

Opportunities

- People observe changes in creek health
- Direct connection to drinking water
- Sophisticated stakeholders
- Politically oriented advocacy groups
- ~ 10 % impervious cover
- Connection to economy
- People really care about Cypress Creek
- RSI viewed as neutral
- DSS viewed as an important resource
- Stakeholders are willing to work!
- Some local supplemental funds are available

Key Membership for Phase 2

WHO:

County Commissioner, Wimberley Mayor, Woodcreek Mayor, WVWA Executive Director, HTGCD president, Friends of Blue Hole president, Woodcreek North POA president, Wimberley Springs Partners, Aqua Texas, Wimberley Water Supply Company, Cypress Creek Project Chair; Chamber of Commerce (or their appointed delegates)

Stakeholder Roles

TASKS:

Attend quarterly meetings; provide input on subject matter related to developing the watershed protection plan; selected/available individuals will attend planning meetings with staff and represent CCP; selected/available individuals will communicate with officials regarding WPP development and implementation; ensure diverse representation, fairness; maintain open communications with project staff; and advocate for local ownership and implementation of the DSS and WPP. Committee members will be asked to review documents prior to meetings and provide perspective and input. Members will vote and determine final WPP components.

The Role of Regulation ?



CYPRESS CREEK
LET'S KEEP IT
CLEAN, CLEAR & FLOWING

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