

**Richland-Chambers Watershed Protection Planning
& Brush Management Workshop
Meeting**

**Thursday, March 7th, 2019
The Bennett Farm**

9:00 Registration w/ coffee & light breakfast snacks provided by TRWD

9:30 Richland-Chambers Watershed Protection Planning (WPP).

- TCEQ's 2016 Water Quality Report
- Report on Potential Bacteria Sources in the Watershed
- Bacteria-Related Management Measures and Assistance Needed

11:30 Lunch provided by TRWD

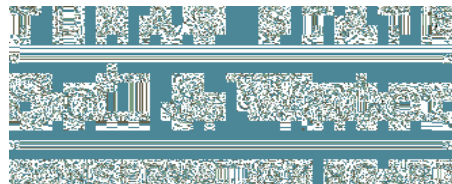
12:30 Ellis Soil and Water Conservation District: Chad Grantham

- Brush management with rangeland health in mind

1:30 A&M Forest Service: Lori Hazel, Water Resources Forester

- Brush management for water conservation
- Herbicide Application Methods and Water Quality

3:30 Adjourn



Richland-Chambers Watershed Partnership

STAKEHOLDER MEETING
MARCH 7, 2019

Richland-Chambers Watershed Protection Planning & Brush Management Workshop Meeting

**Thursday, March 7th, 2019
The Bennett Farm**

9:00 Registration w/ coffee & light breakfast snacks provided by TRWD

9:30 Richland-Chambers Watershed Protection Planning (WPP).

- *TCEQ's 2016 Water Quality Report*
- *Report on Potential Bacteria Sources in the Watershed*
- *Bacteria-Related Management Measures and Assistance Needed*

11:30 Lunch provided by TRWD

12:30 Ellis Soil and Water Conservation District: Chad Grantham

- *Brush management with rangeland health in mind*

1:30 A&M Forest Service: Lori Hazel, Water Resources Forester

- *Brush management for water conservation*
- *Herbicide Application Methods and Water Quality*

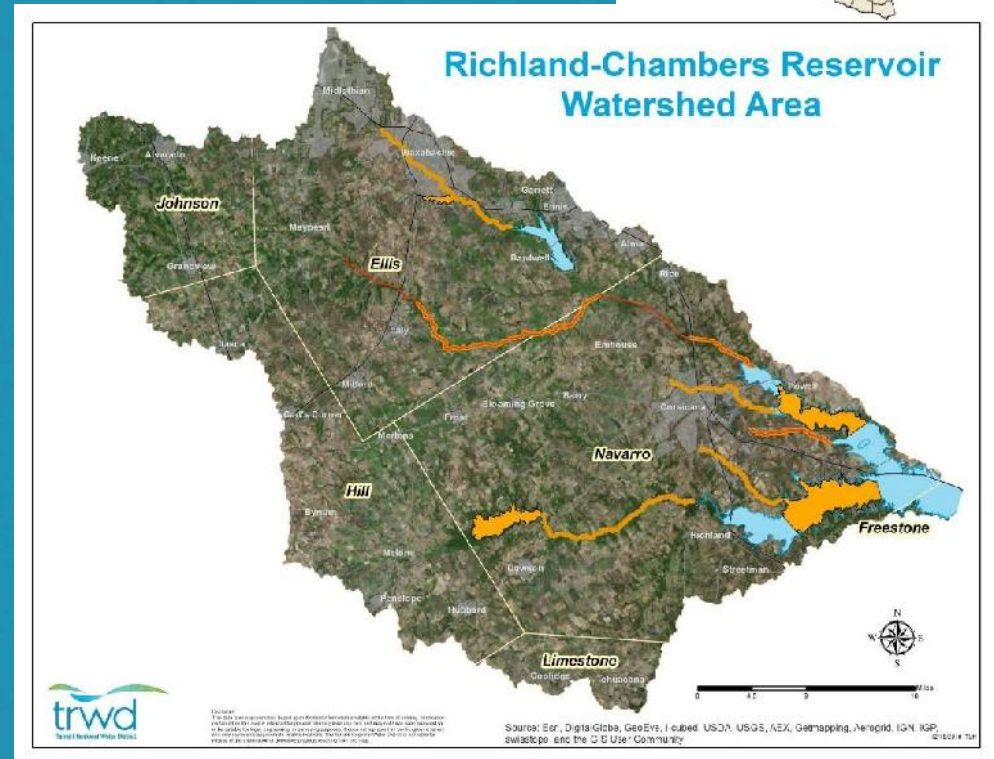
3:30 Adjourn

Introduction

“Successful development and implementation of the Richland-Chambers Watershed Protection Plan will depend on the involvement of the community.”

Why We're Here

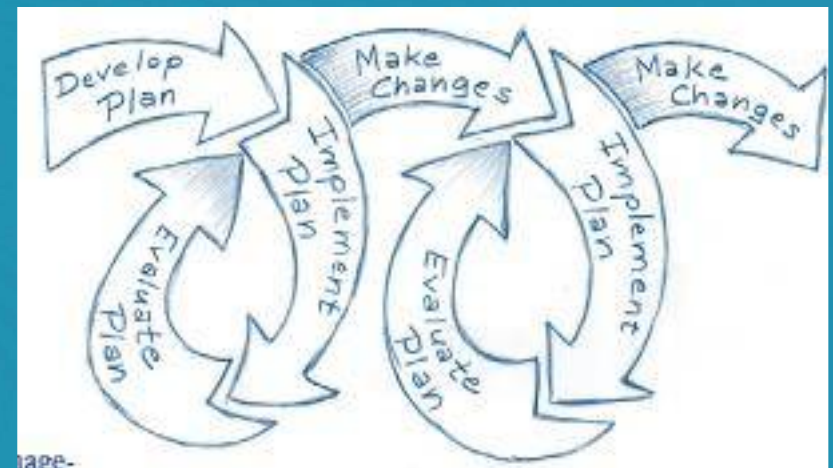
- TCEQ identified issues in streams & lakes
 - Nitrogen,
 - phosphorus,
 - dissolved oxygen
 - Chlorophyll- α



Watershed Protection Plans

Steps to Effective Watershed Management

1. Build partnerships
2. Characterize your watershed
3. Establish goals & identify solutions
4. Develop an implementation program
5. Implement your plan
6. Measure progress & make adjustments

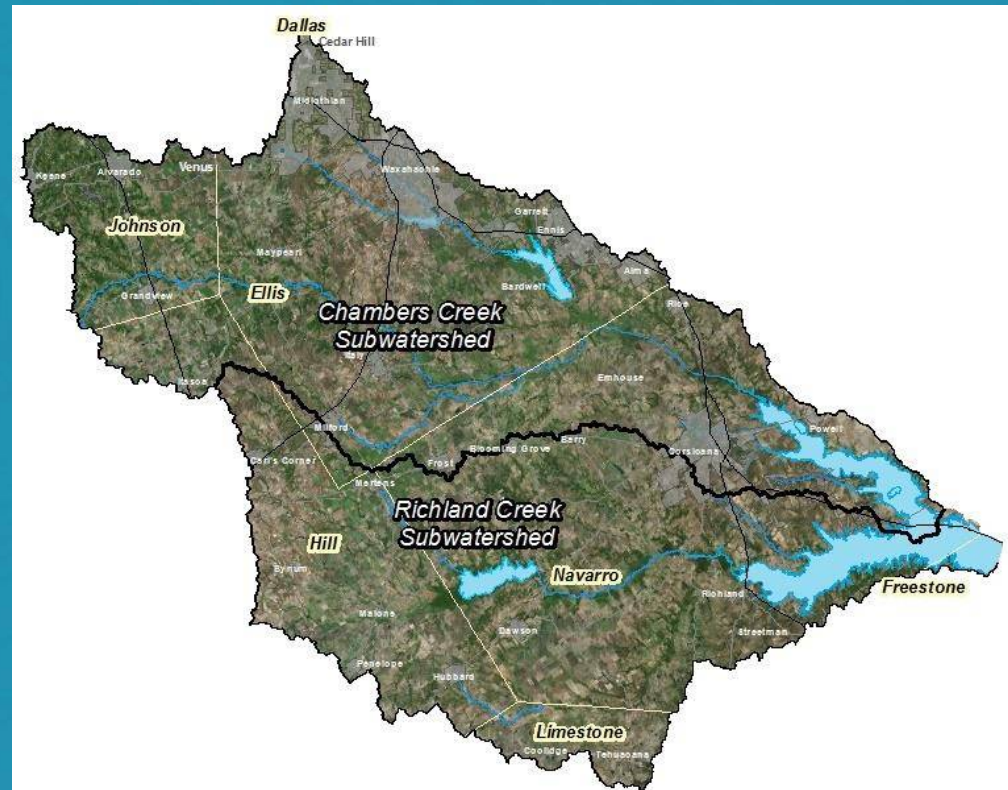


The outcomes of this process are documented or referenced in a watershed plan.

Watershed Protection Plans

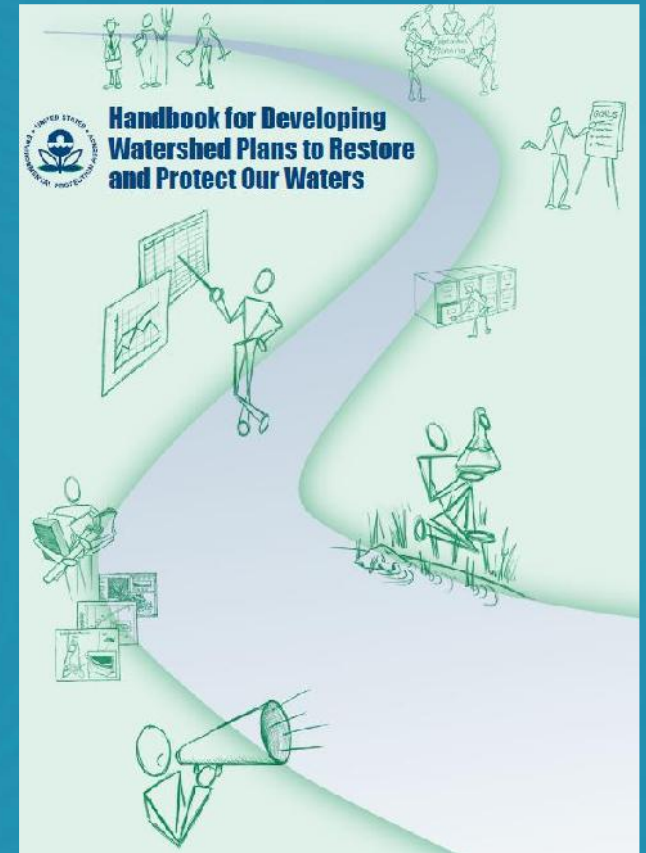
A strategy that provides assessment and management information for a defined watershed.

- EPA Framework
- Clean Water Act §319
- Stakeholder involvement
- Actions supported by sound science
- Technical expertise from diverse sources
- Diverse skills & knowledge
- Focus on water quality goals



Watershed Protection Plans

- A. Identify problem & sources
- B. Reductions needed to reach goals
- C. Identify measures needed to achieve reductions
- D. Assistance needed
- E. Education & outreach plan
- F. Schedule
- G. Milestones
- H. Criteria for measuring progress
- I. Monitoring Plan



Questions?



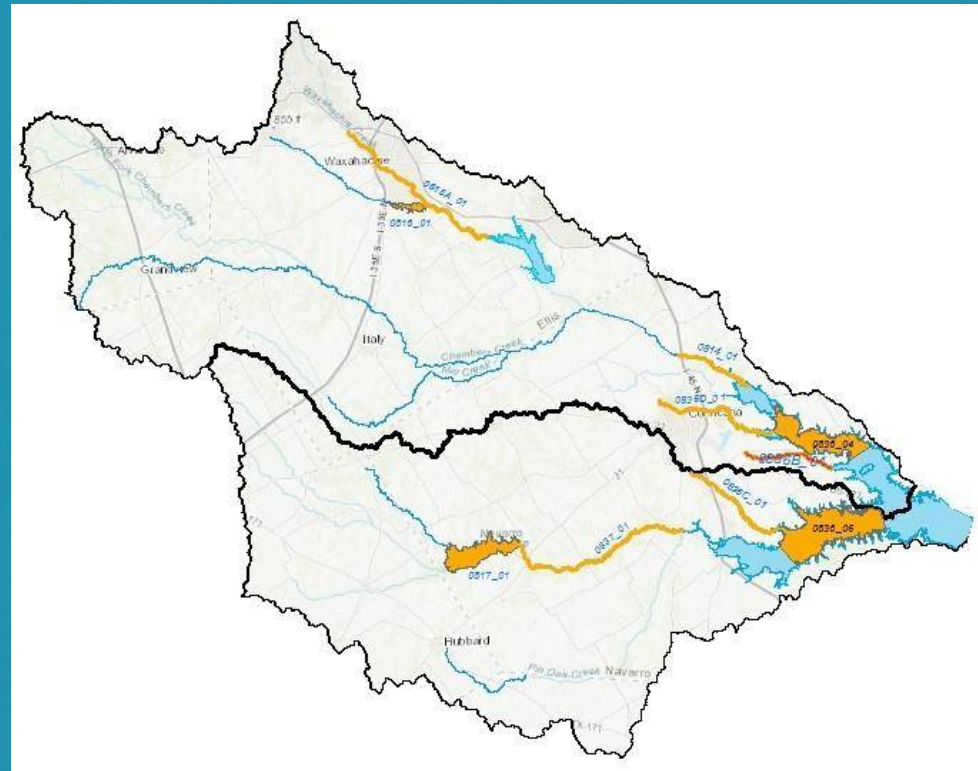
Status of the Richland- Chambers WPP

Richland-Chambers WPP

Element A: Watershed Characterization and Pollutant Sources

What are the Issues?

- Degraded quality of lakes and streams
Nitrogen, phosphorus, dissolved oxygen, chlorophyll- α
- Drinking water capacity
Sediment in lakes

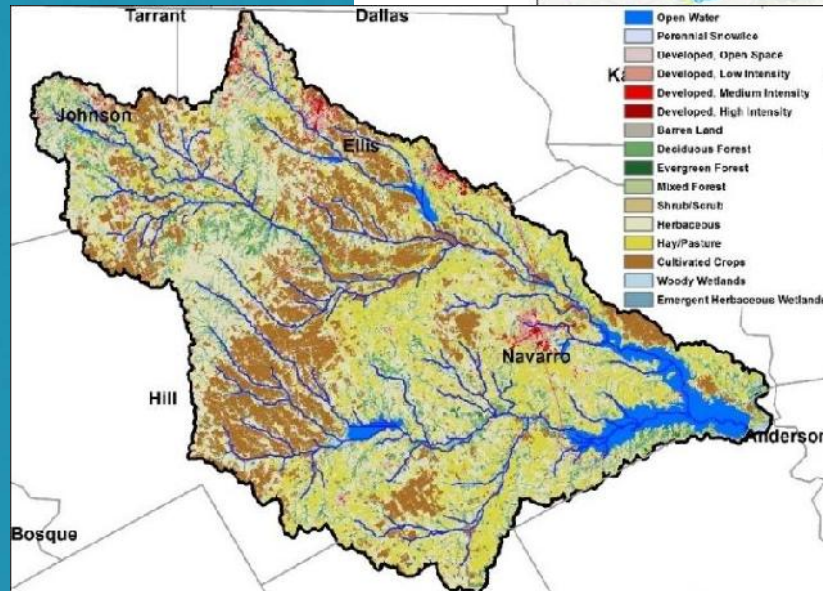
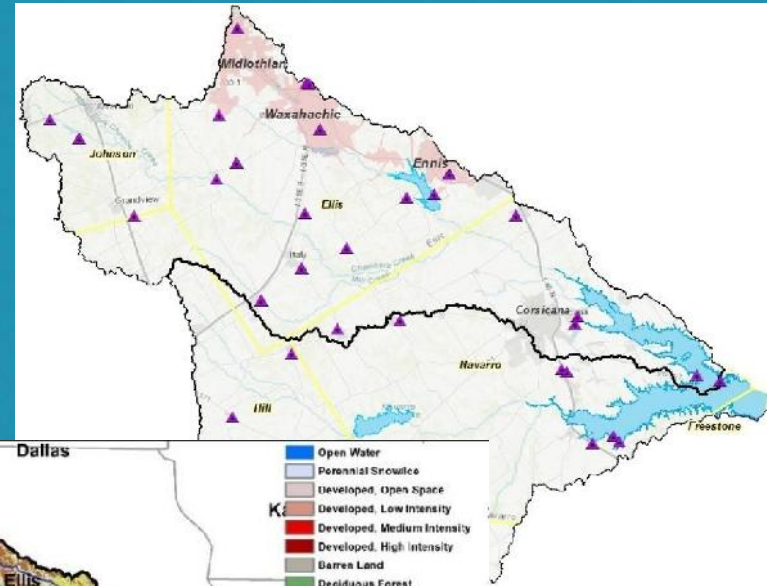


Richland-Chambers WPP

Element A: Watershed Characterization and Pollutant Sources

What are the Causes?

- Point Sources
WWTPs, sewer overflows
- Nonpoint Sources
Erosion and rainfall runoff from rural lands, agricultural operations, urban runoff, channel erosion



Richland-Chambers WPP

Element B: Goals and Pollutant Reductions

➤ **Goal Statement** (Restoration)

... streams and reservoirs in the Richland-Chambers reservoir meet appropriate water quality standards.

➤ **Goal Statement** (Protection)

... capacity of water supply reservoirs be protected by reducing erosion in the Richland-Chambers watershed.

Richland-Chambers WPP

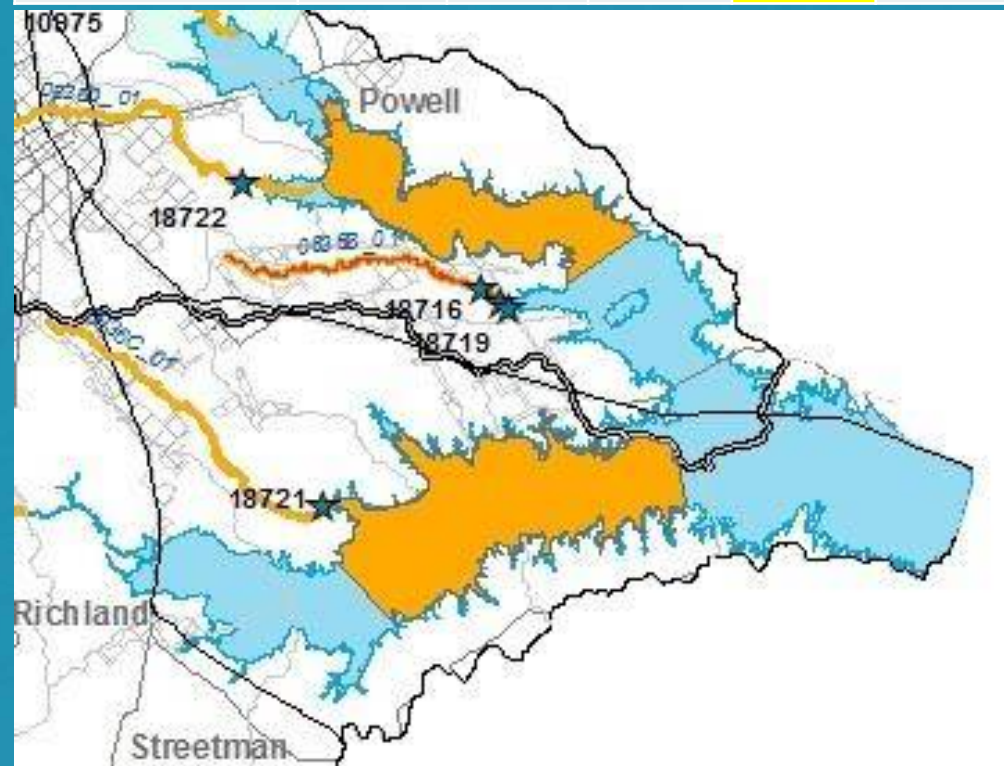
Element B: Goals and Pollutant Reductions

Richland-Chambers Lake

Total Phosphorus reduction

- 10% Chambers arm
- 40% Richland arm

Arm	10%	20%	30%	40%	50%
Chambers	24	22	19	16	12
Richland	34	32	27	24	21



Richland-Chambers WPP

Element B: Goals and Pollutant Reductions

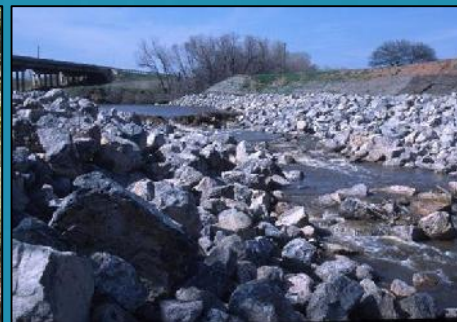
Other Waterbodies

- Richland and Chambers Creeks
 - Load Duration Curves to determine reductions
- Waxahachie Creek (inadequate data)
 - Trinity River Authority will resume sampling this site (site#?)
- Cedar Creek, Post Oak Creek, Grape Creek, DO (inadequate data)
 - Intensive studies will be initiated by Trinity River Authority to confirm concerns and impairments.

Richland-Chambers WPP

Element C: Management Measures

- Urban & Developed Areas
 - Nutrient management
 - Sediment trapping using green and conventional BMPs
- Agricultural & Rural Areas
 - State and Federal Conservation Plans and priority practices for farms and ranches
- Stream Channel Erosion
 - Stabilization and restoration projects in priority areas.
- Targeted in priority areas



Richland-Chambers WPP

Element C: Management Measures

Priority Ag & Rural Management Measures

Filter Strips

Terraces, contour farming

Residue management

Crop rotation

Prescribed grazing

Brush management

Nutrient Management

Cover crops

Critical area planting

Herbaceous weed control

Range planting

Riparian forest buffer

Upland wildlife habitat
management

Richland-Chambers WPP

Element D: Assistance Needed

Technical assistance from agencies, extension agents, private sector, landowners, and others for

- Planning, engineering, design, and education.



Financial assistance from agencies, nonprofit organizations, and corporations and industries to support planning and implementation of projects for

- natural resource conservation;
- wastewater and infrastructure design,
- construction, and management;
- riparian and channel management; and education.

Richland-Chambers WPP

Element E: Education & Outreach

- Stakeholder involvement and participation in plan
- Educational component associated with each management measure
- General natural resource & watershed/water quality awareness for the public

TOOLS

Demonstration sites

Meetings and workshops

Onsite technical assistance

Citizen monitoring programs

Training and certification programs

Social media

Richland-Chambers WPP

Element F: Schedule

Element G: Interim Milestones

- Implementation over 15 year timeframe
- Milestones planned & tracked in 3 year increments
- Annual report on implementation of management measures and other activities
- Review of WPP document every 5 years

Richland-Chambers WPP

Element H: Criteria for Load Reductions

- Assess progress toward water quality goals using TCEQ's biennial Integrated Report
- Concerns and Impairments











Draft 2016 Texas Integrated Report for the Clean Water Act Sections 305(b) and 303(d)

This report includes information about the quality of Texas' surface waters as reported in 2016

The Texas Integrated Report describes the status of the state's waters, as required by Sections 305(b) and 303(d) of the federal Clean Water Act. It summarizes the condition of the state's surface waters, including concerns for public health, fitness for use by aquatic species and other wildlife, and specific pollutants and their possible sources.

The Commission adopted the Draft 2016 Texas 303(d) List on October 17, 2018.

Draft 2016 Texas Integrated Report

- [Draft 2016 Texas 303\(d\) List](#) 
- [Draft 2016 New Listings](#) 
- [Draft 2016 De-listings](#) 
- [Draft 2016 Water Bodies with Concerns for Use Attainment and Screening Levels](#) 
- [Draft 2016 Texas Integrated Report - Supplemental Data for Reservoir Nutrient Assessment](#) 
- [Draft 2016 Water Body Assessments by Basin](#)
- [Draft 2016 Index of Water Quality Impairments \(Categories 4 and 5\)](#) 
- [Draft 2016 Potential Sources of Pollution for Impairments and Concerns](#) 
- [Draft 2016 Water Bodies Evaluated](#) 
- [Draft 2016 Trophic Classification of Texas Reservoirs](#) 
- [Draft 2016 Guidance for Assessing and Reporting Surface Water Quality in Texas](#) 

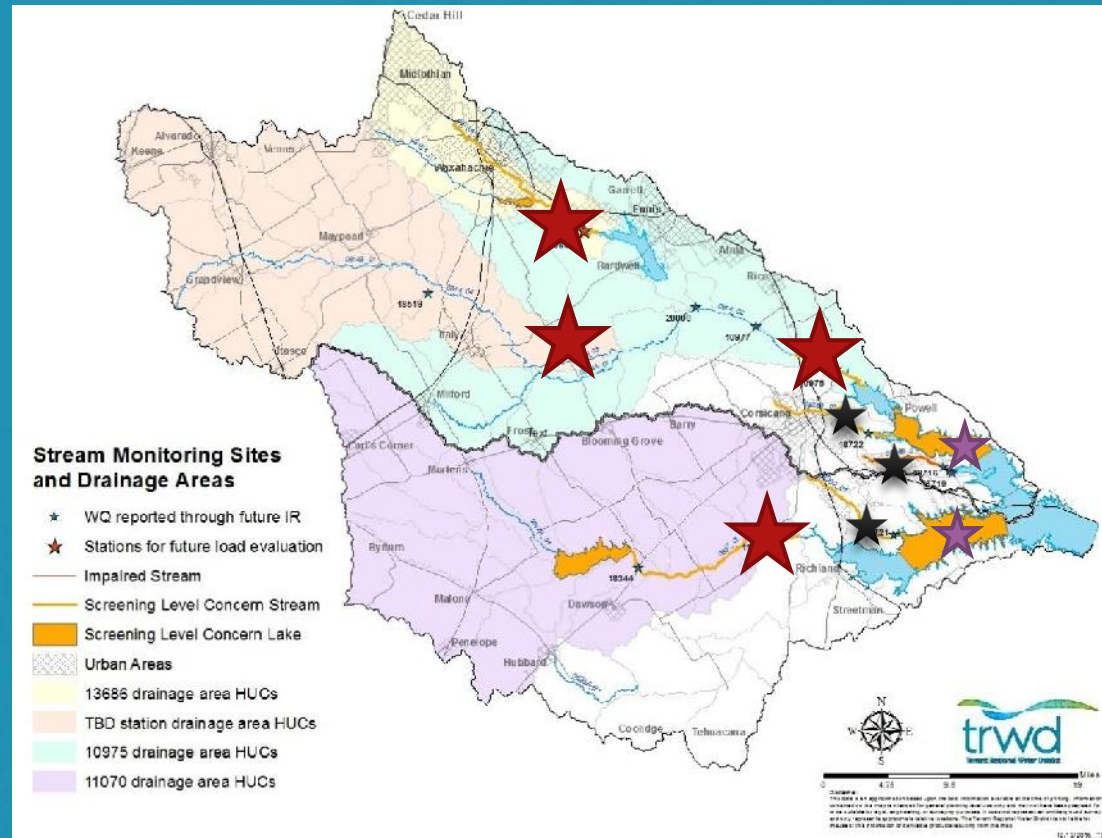
Richland-Chambers WPP

Element I: Monitoring

Measure progress in water quality improvements

- Waxahachie Creek
- Chambers Creek upper and lower
- Richland Creek
- Richland-Chambers Lake

Confirm status of Post Oak, Grape, & Cedar Creeks



Questions?



Update on TCEQ's 2016 Water Quality Report

Water Quality

TCEQ Water Quality Reports

*Period of Data Collected for
TCEQ Integrated Report Cycles*

Report	2005	'06	'07	'08	'09	'10	'11	'12	'13	'14	'16	'17	'18	'19
2014	Dec	>>	>>	>>	>>	>>	>>	Nov						
2016			Dec	>>	>>	>>	>>	>>	>>	Nov				
2018					Dec	>>	>>	>>	>>	>>	>>	Nov		

Water Quality

2014 Integrated Report: Dec 2005 – Nov 2012

Water Body	<u>N</u>	<u>P</u>	<u>DO</u>	<u>Chl-a</u>	<u>Chloride</u>
Chambers Creek Subwatershed					
Chambers Creek (lower)		C	C	C	Imp
Waxahachie Creek	C				
Lake Waxahachie				C	
Cedar Creek			Imp		
Post Oak Creek			C		
Richland Creek Subwatershed					
Richland Creek			C	C	
Navarro Mills Lake			C		
Grape Creek			C		
Richland-Chambers Lake				C	

TCEQ 305(b) Report;
 Imp = Impairment
 C = Concern

Water Quality

DRAFT 2016 Report: Dec 2007 – Nov 2014

Water Body (2016 report)	<u>N</u>	<u>P</u>	<u>DO</u>	<u>Chl-a</u>	<u>Algae</u>	<u>Sulfate</u>	<u>E. coli</u>
Chambers Creek Subwatershed							
Chambers Creek (lower)		C	C	C			C
Waxahachie Creek	C						
Lake Waxahachie				C			
Bardwell Reservoir					C	Imp	
Cedar Creek			Imp				
Post Oak Creek			C				C
Richland Creek Subwatershed							
Richland Creek			C	C			C
Navarro Mills Lake			C		C		
Grape Creek			C				
Richland-Chambers Lake				C	C		

Questions?

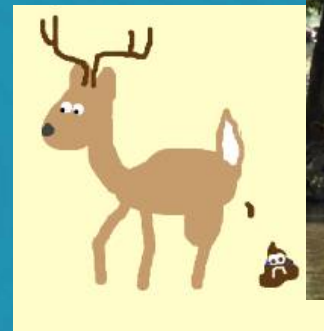


Potential Sources of Bacteria in Streams

Potential Sources of Bacteria

Element A: Pollutant Sources

- Wastewater Plants
- Septic Systems
- Pets - Dogs
- Livestock
Cattle, horses,
goats, sheep
- Wildlife - Deer
- Non-natives - Feral Hogs



Analysis of Potential Sources

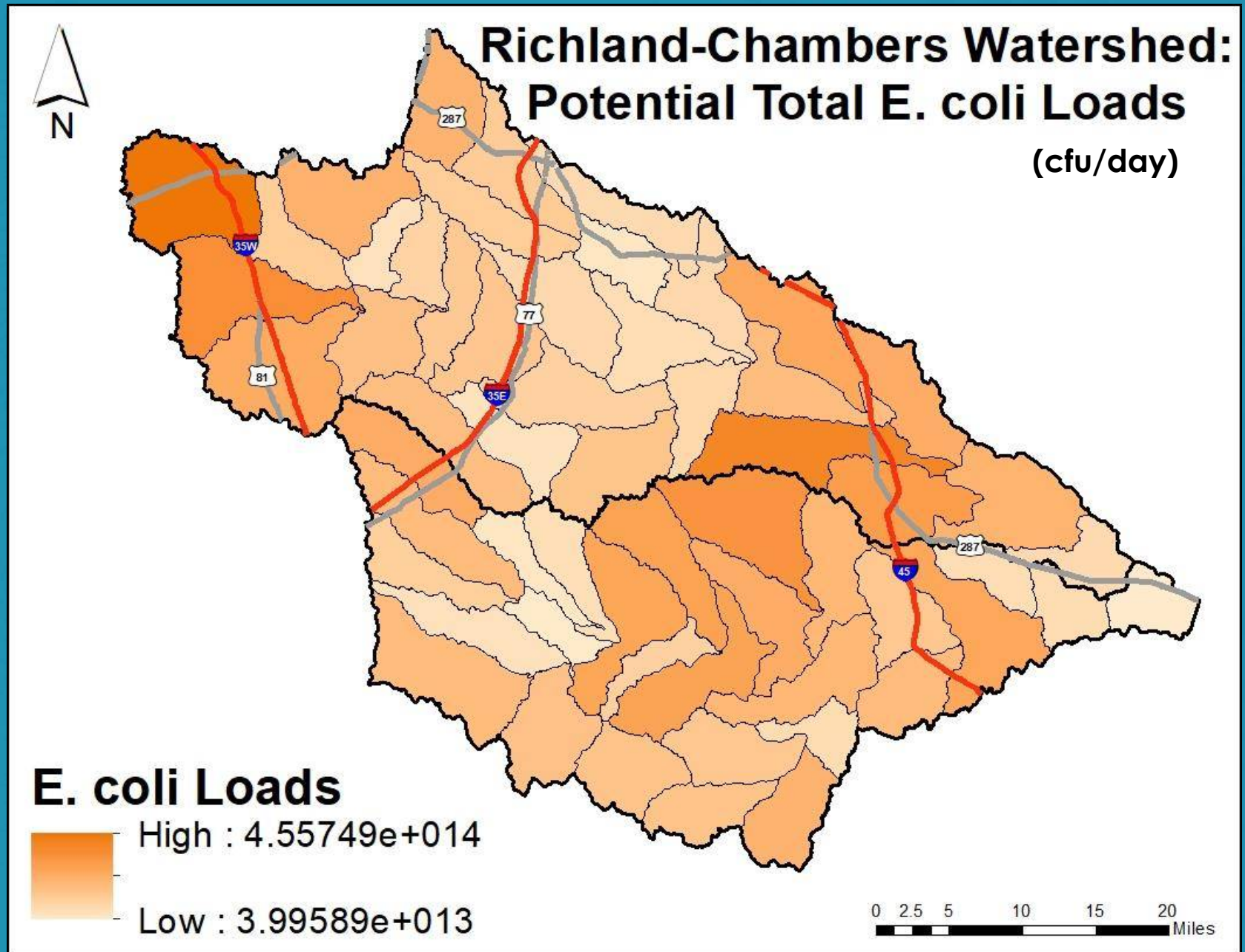
SELECT Model

- Combines population, natural resource and land use data into mapping software.
- Estimates total potential loads from identified sources.
- Provides maps of relative bacteria loads across the watershed.
- Used statewide in many watershed plans

Spatially
Explicit
Load
Enrichment
Calculation
Tool

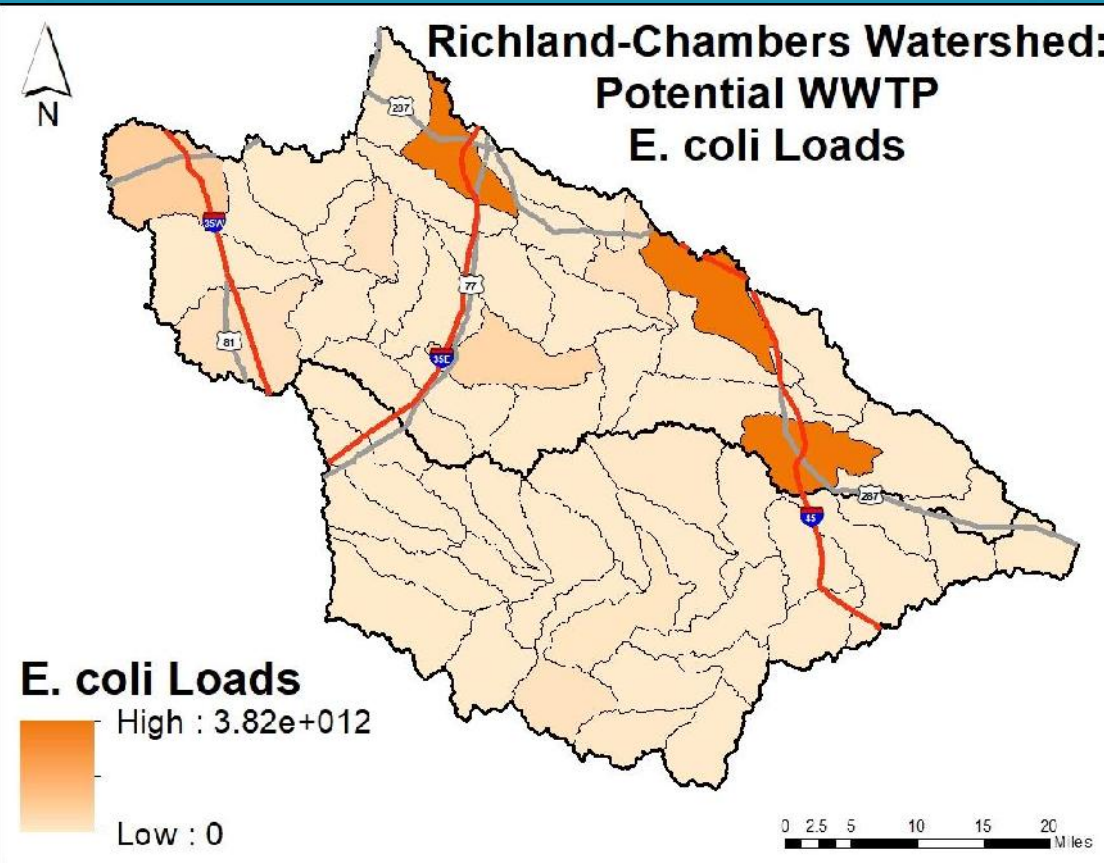
Does not provide exact loadings or locations

Analysis of Potential Sources



Analysis of Potential Sources

Wastewater Treatment Plants



	WWTPs
Chambers	20
Richland	12
Load Calculation:	
$\frac{126 \text{ cfu}}{100 \text{ mL}} * \frac{10^6 \text{ gal}}{\text{MGD}} * \frac{3758.2 \text{ mL}}{\text{gal}}$	

- TCEQ TPDES permit database
- TCEQ WQ Criteria
E. coli = 126 cfu/mL

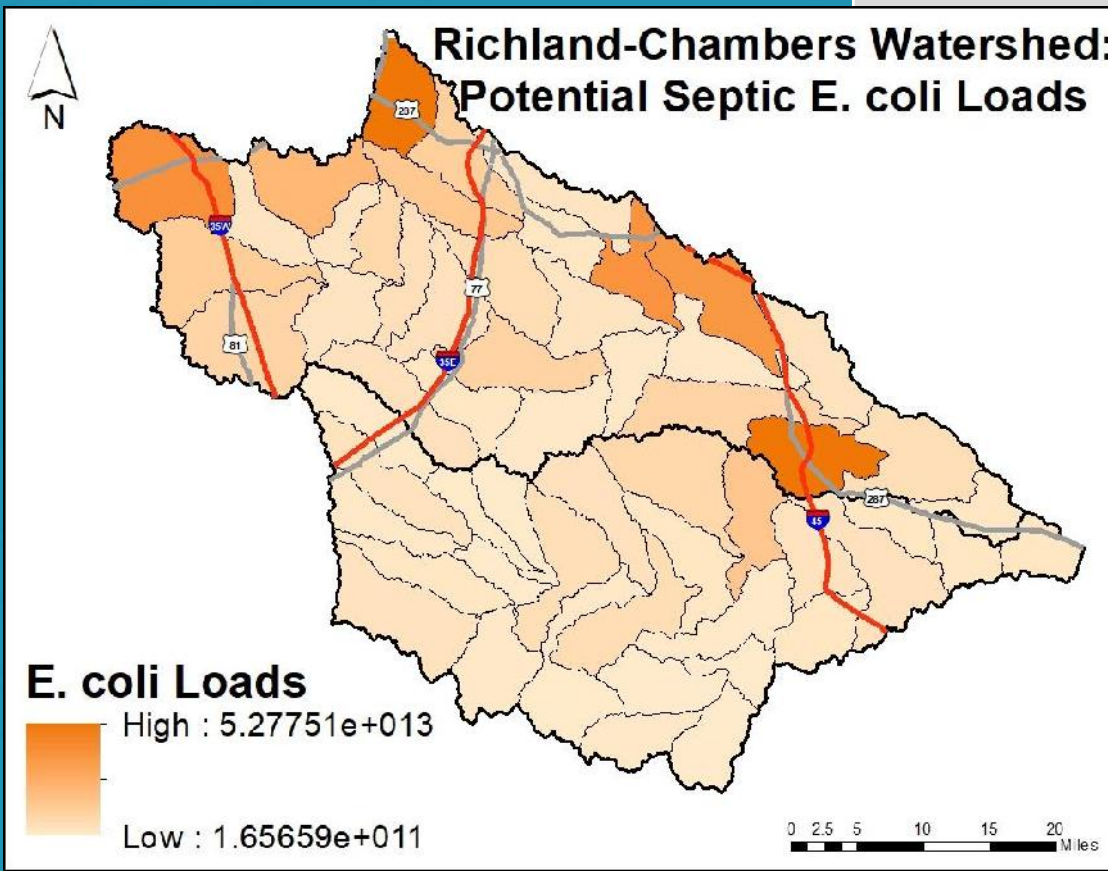
Analysis of Potential Sources

Septic Systems

	OSSFs
Chambers	36,071
Richland	8,670
E. coli cfu/day	10×10^6
Load Calculation:	

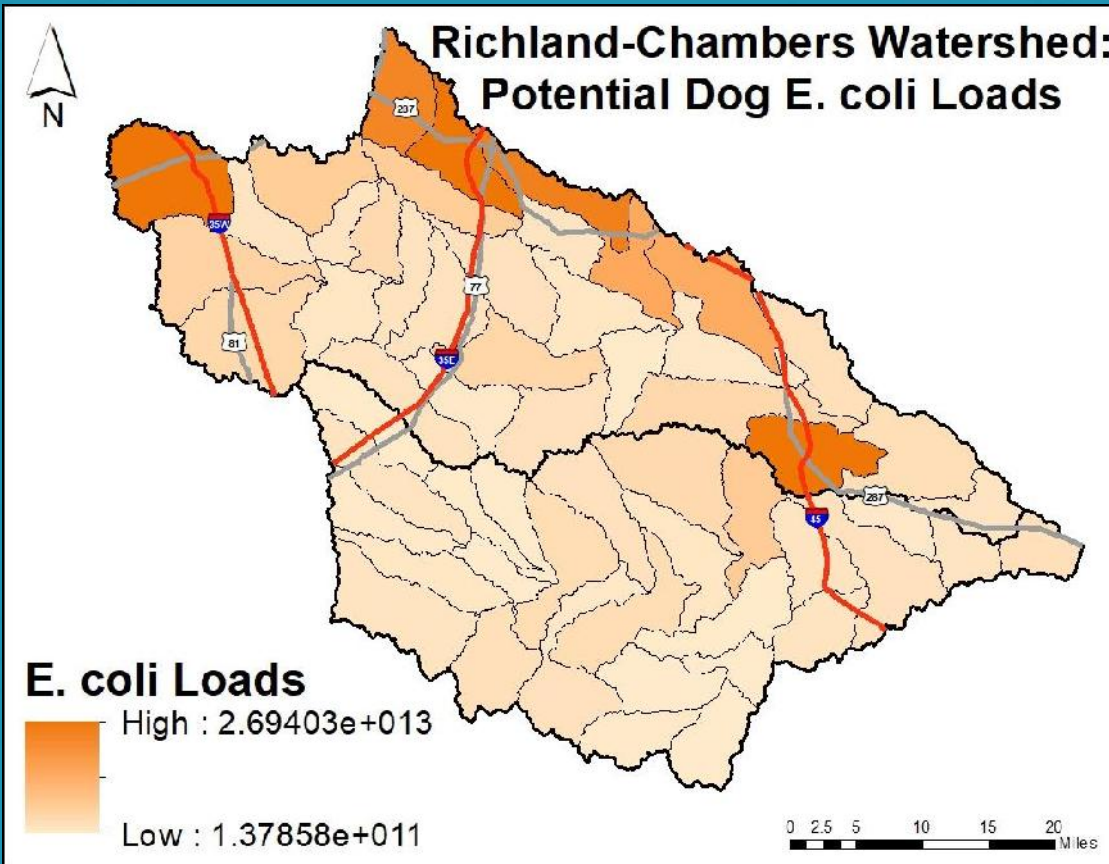
$$\frac{10 * 10^6 \text{ cfu}}{100 \text{ mL}} * \frac{60 \text{ gal}}{\text{person day}} * \frac{\text{Avg \#}}{\text{Household}} * \frac{3758.2 \text{ mL}}{\text{gal}}$$

- 2010 Census: # people/home
- Homes outside CCN excluded
- Discharge: 60 gal/day/home
- NRCS 2004: Failure rate by soil type



Analysis of Potential Sources

Pets - Dogs

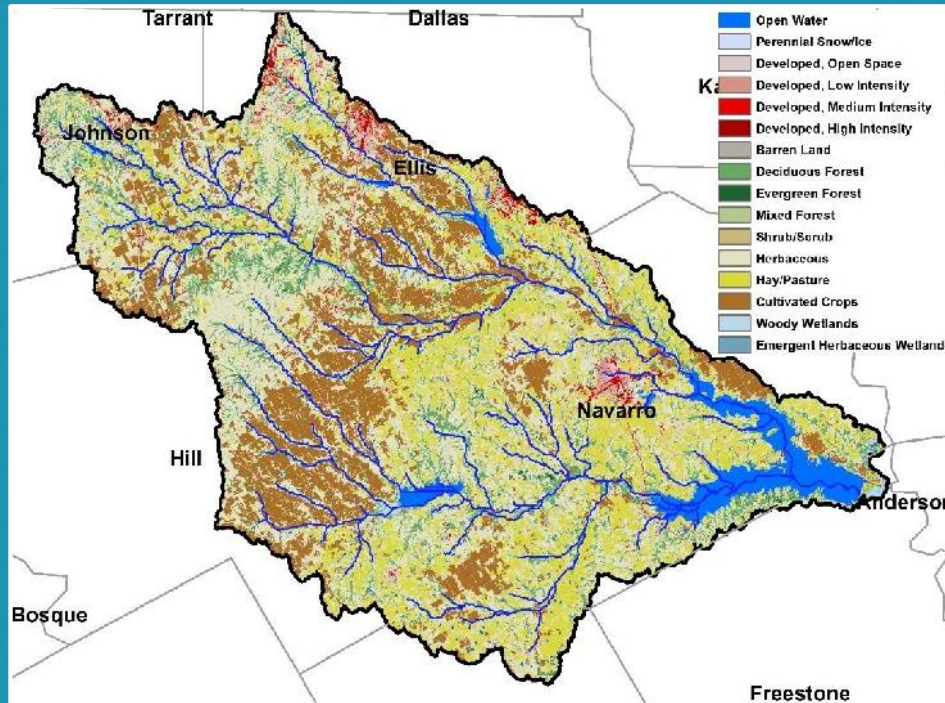


	Dogs
Chambers	49,494
Richland	9,380
E. coli cfu/day	5×10^9
Load Calculation:	
$\frac{1 \text{ dog}}{\text{Household}} * 5 * 10^9 \frac{\text{cfu}}{\text{day}}$	

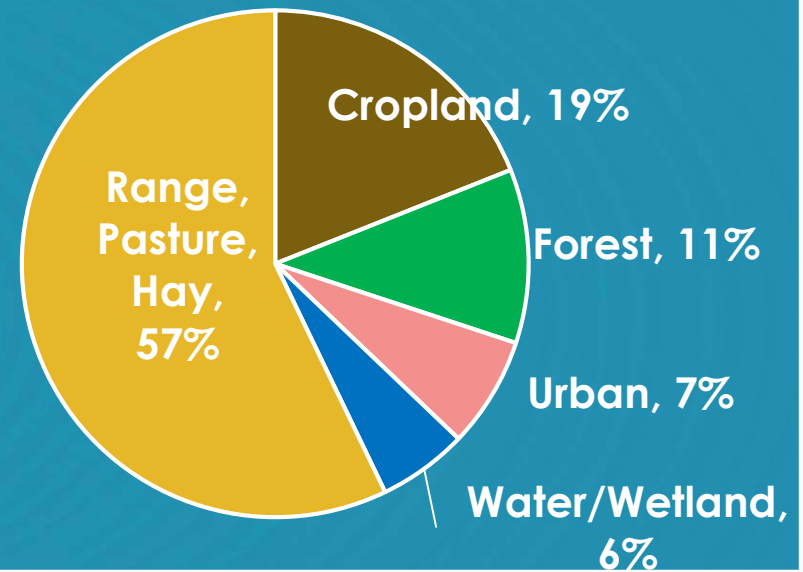
- AMVA 2002:
Average 1
dog/home

Analysis of Potential Sources

Land Uses and Coverage

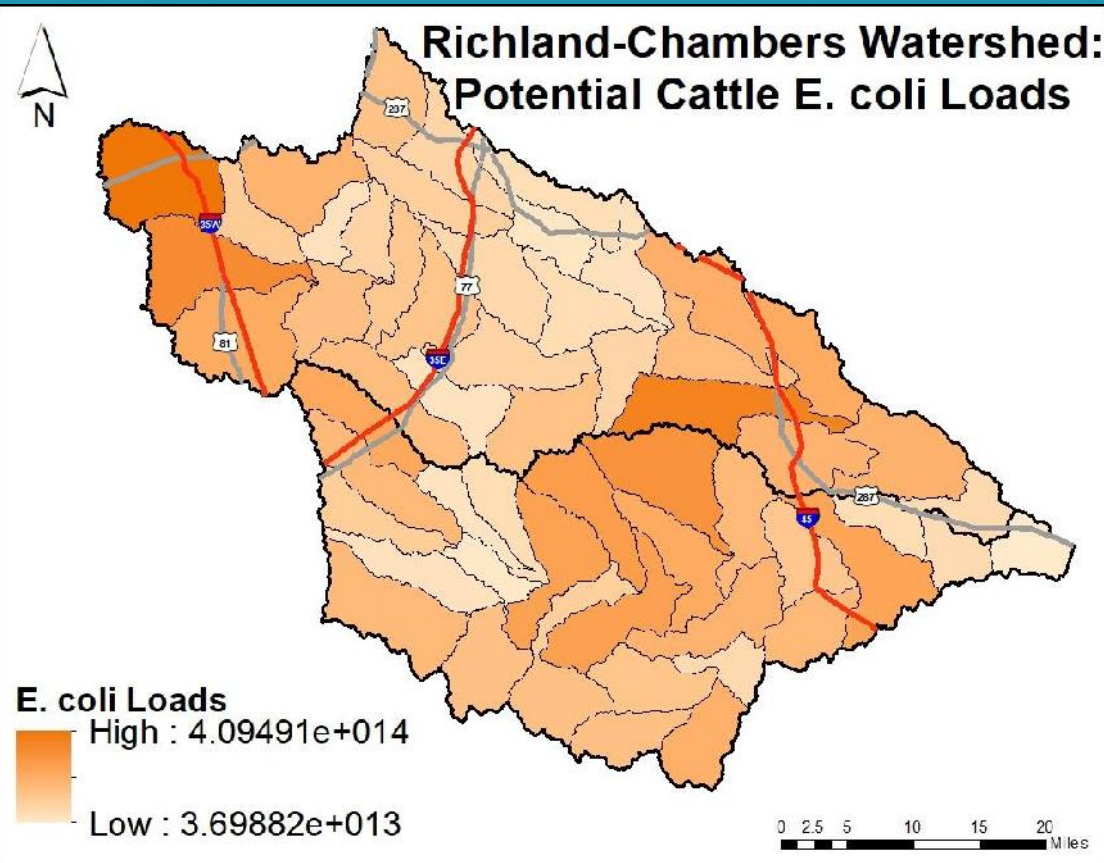


Land Use Percentages



Analysis of Potential Sources

Livestock - Cattle

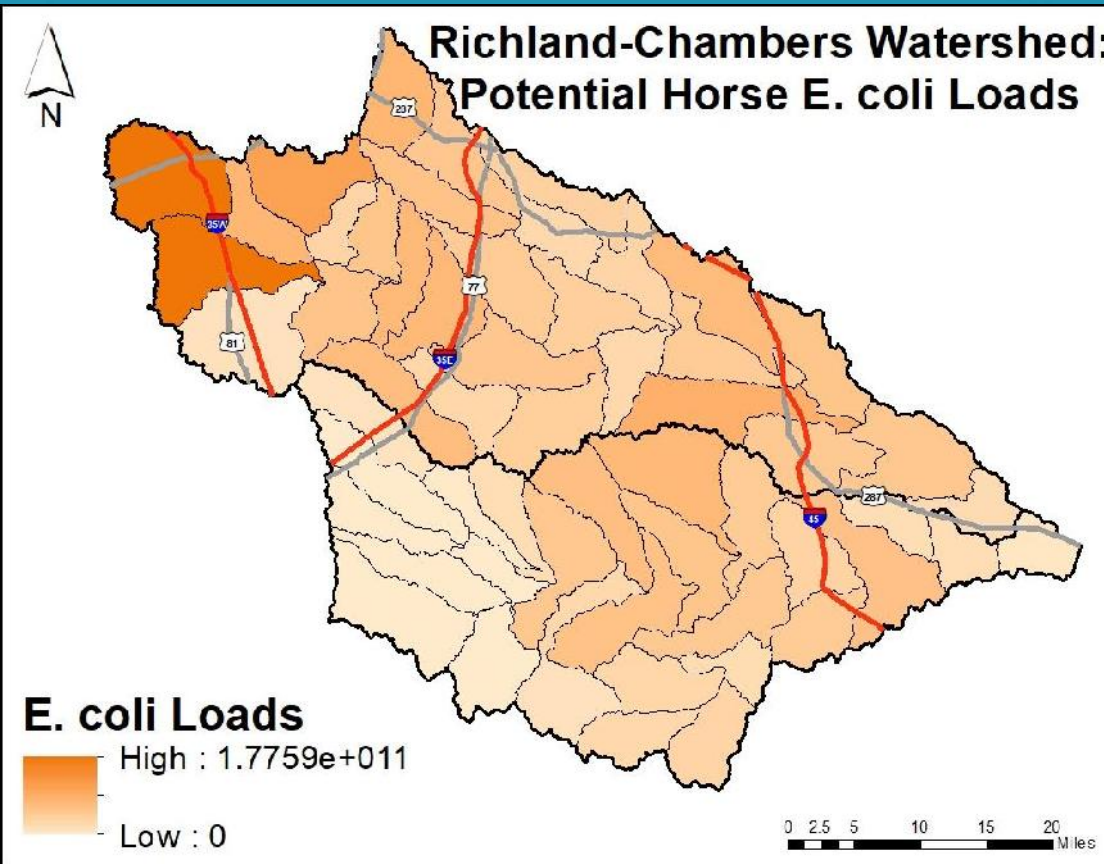


	Cattle
Chambers	70,892
Richland	67,377
E. coli cfu/day	10×10^{10} cfu/day

- USDA-NASS: Number of cattle in watershed
- USEPA 2001: daily E. coli production
- Applied to range, pasture, hay, brush, and forest land covers.

Analysis of Potential Sources

Livestock - Horses

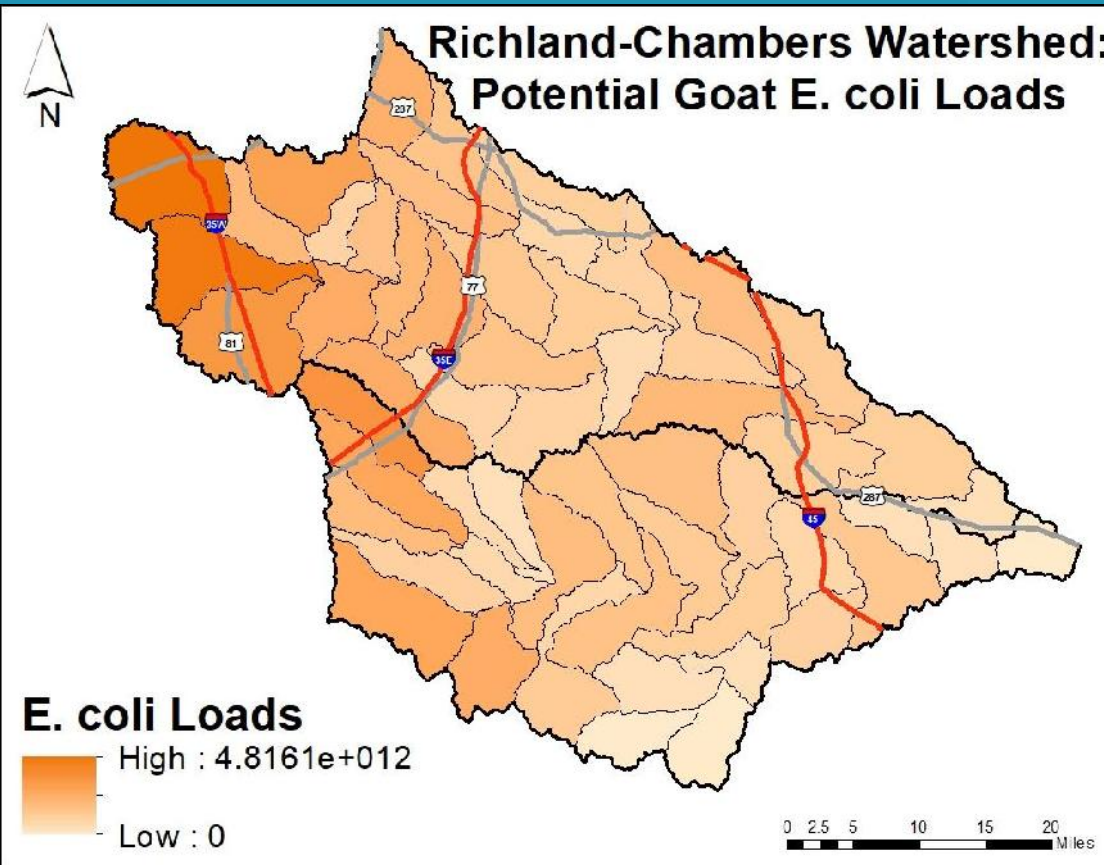


	Horses
Chambers	4,819
Richland	1,928
E. coli cfu/day	4.2×10^8 cfu/day

- USDA-NASS: Number of horses in watershed
- USEPA 2001: daily E. coli production
- Applied to range, pasture, hay, brush, and forest land covers.

Analysis of Potential Sources

Livestock - Goats

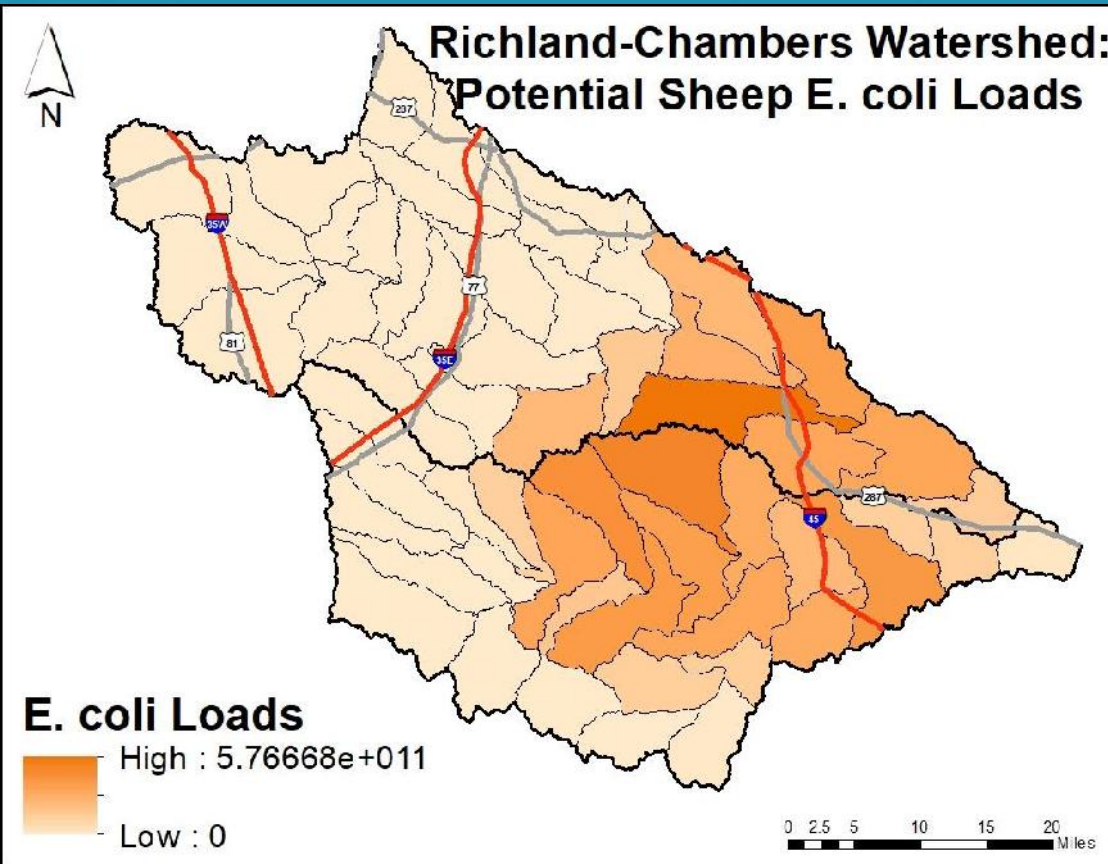


	Goats
Chambers	5,434
Richland	3,276
E. coli cfu/day	1.2×10^{10} cfu/day

- USDA-NASS: Number of goats in watershed
- USEPA 2001: daily E. coli production
- Applied to range, pasture, hay, brush, and forest land covers.

Analysis of Potential Sources

Livestock - Sheep

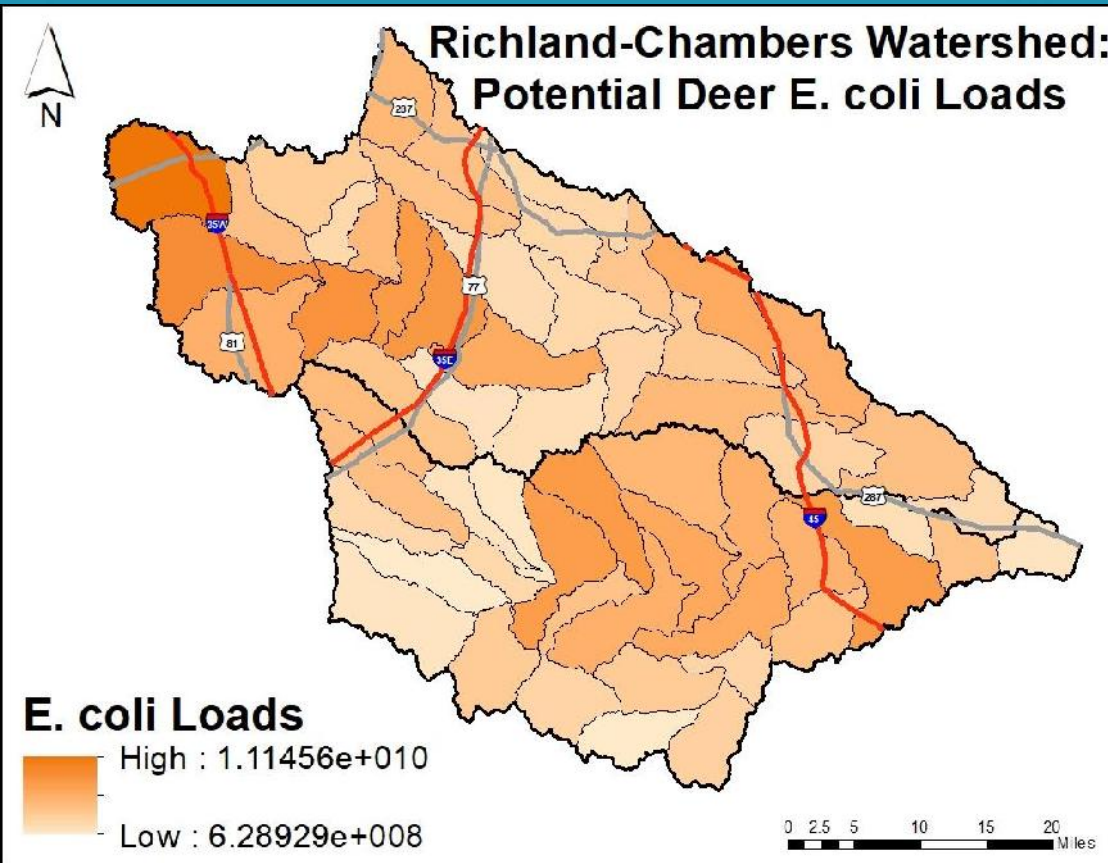


	Sheep
Chambers	355
Richland	587
E. coli cfu/day	1.2×10^{10} cfu/day

- USDA-NASS: Number of sheep in watershed
- USEPA 2001: daily E. coli production
- Applied to range, pasture, hay, brush, and forest land covers.

Analysis of Potential Sources

Wildlife - Deer

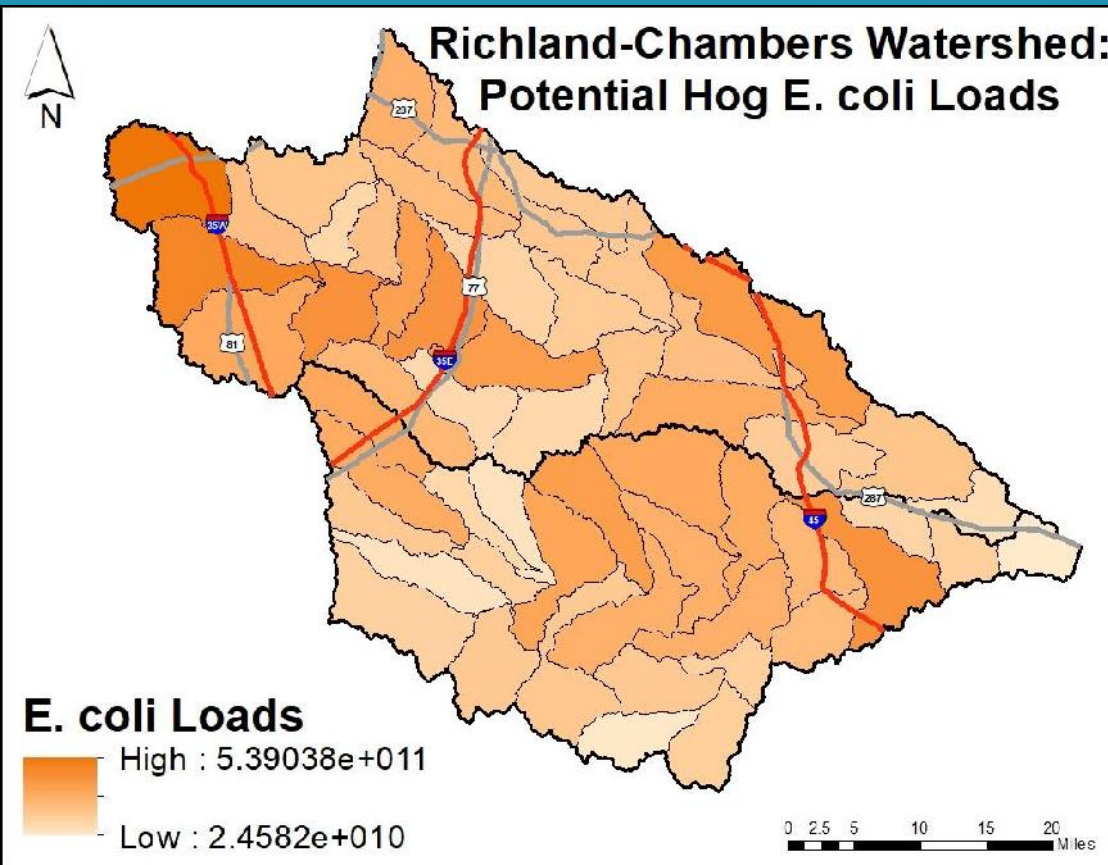


	Deer
Chambers	528
Richland	406
E. coli cfu/day	3.5×10^8 cfu/day

- TPWD/Lockwood 2005: Resource Management Unit density of 155 ac/deer
- USEPA 2001: daily E. coli production
- Applied to forested land.

Analysis of Potential Sources

Non-native Animals – Feral Hogs



	Feral Hogs
Chambers	9,920
Richland	7,344
E. coli cfu/day	1.1*10 ⁹ cfu/day

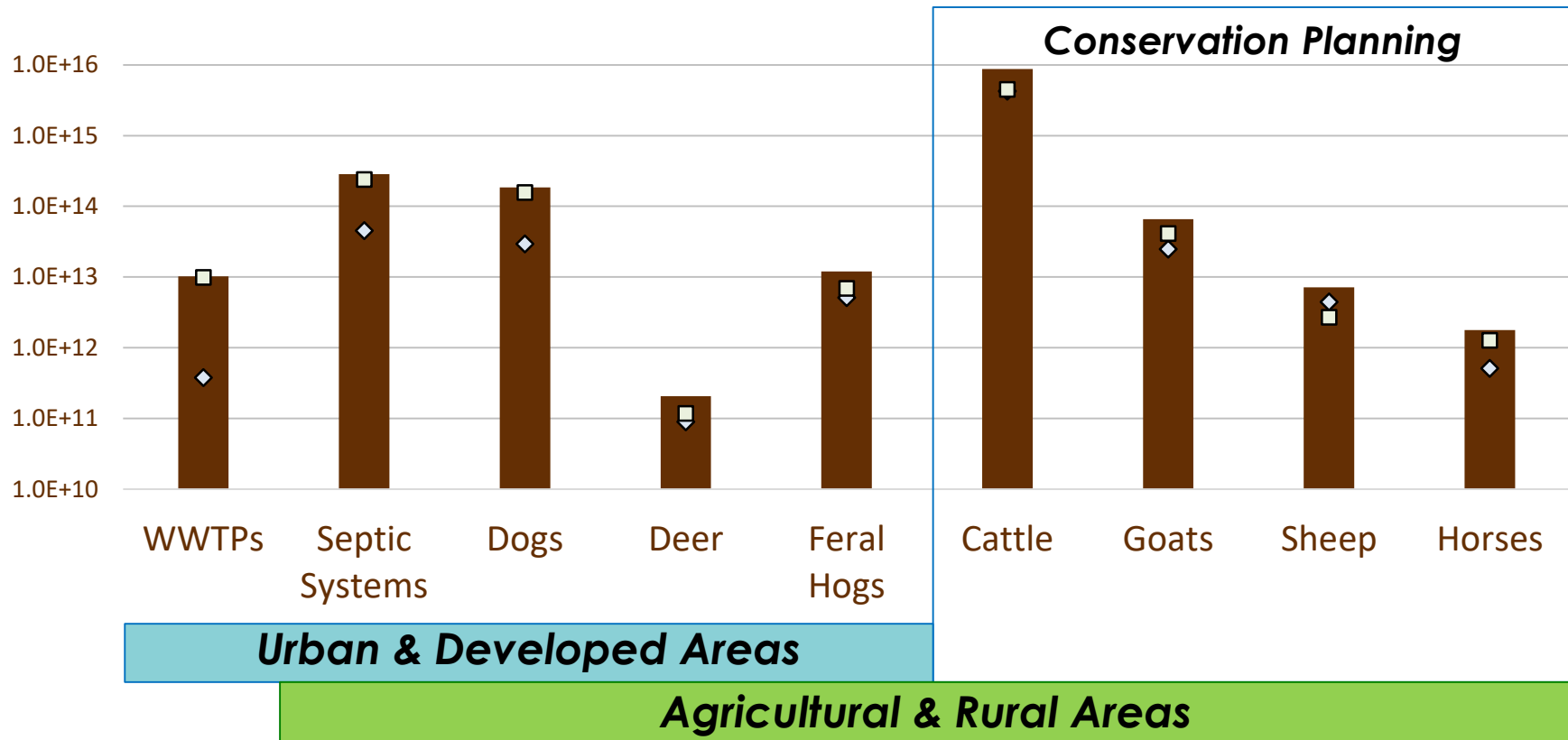
- Berg et al 2008: Density 20 ac/hog
- USEPA 2001: daily E. coli production
- Applied to forested land and wetlands in 100 meters of streams.

Relating Sources to Management

Total Potential Load from Identified Sources by Management Measure

■ RC Watershed Load ◇ Richland Subwatershed □ Chambers Subwatershed

Daily Potential E. coli Load (cfu/day)



Questions?



Management Measures to Address Bacteria

Measures that Address Bacteria

Urban Wastewater Management

Management Measures

- Good housekeeping
- Repair failing collection system infrastructure
- Sanitary Sewer Overflow Initiatives
- Controlling urban stormwater
- WWTP Improvements

Education & Outreach

- Municipal staff/WWTP operator education
- Public education on NPS, stormwater & “flushables”



Measures that Address Bacteria

****New**** Septic Systems

Management Measures

- Repair/replace failing OSSFs
- Permitting and inspections through OSSF delegated agency programs

Education & Outreach

- Homeowner education
 - classes, website, printed materials
- Inspector education



Measures that Address Bacteria Livestock

Management Measures

- NRCS Conservation Plans
- TSSWCB Water Quality Management Plans

Structural & Non-structural practices

Education & Outreach

- Producer education
- Lone Star Healthy Streams Workshops



Measures that Address Bacteria

****New**** Wildlife

- Possible management in overpopulated areas
- Work through regulatory agencies



Measures that Address Bacteria

****New**** Pets - Dogs

Management Measures

- Pet Waste Stations

Education & Outreach

- Pet owner education



Measures that Address Bacteria

****New**** Non-native Animals – Feral Hogs

Management Measures

- Animal removal through hunting or trapping
- Bounty programs
- Cooperative program for trapping equipment

Education & Outreach

- Feral Hog workshops



Path Forward

- Incorporate TCEQ 2016 Report into the WPP through maps, tables, and text
 - Pollutants added and removed
 - Investigate/confirm additions
 - Research potential sources of sulfate in Lake Bardwell
- Add bacteria-related sources, management measures, and education programs
- Add bacteria-related technical/financial assistance opportunities

Questions?



Richland-Chambers Watershed Protection Planning & Brush Management Workshop

Meeting

Thursday, March 7th, 2019

The Bennett Farm

9:00 Registration w/ coffee & light breakfast snacks provided by TRWD

9:30 Richland-Chambers Watershed Protection Planning (WPP).

- *TCEQ's 2016 Water Quality Report*
- *Report on Potential Bacteria Sources in the Watershed*
- *Bacteria-Related Management Measures and Assistance Needed*

11:30 Lunch provided by TRWD

12:30 Ellis Soil and Water Conservation District: Chad Grantham

- *Brush management with rangeland health in mind*

1:30 A&M Forest Service: Lori Hazel, Water Resources Forester

- *Brush management for water conservation*
- *Herbicide Application Methods and Water Quality*

3:30 Adjourn



Thank You!



United States Department of Agriculture



BRUSH MANAGEMENT IN THE BLACKLANDS

March 2019

Natural
Resources
Conservation
Service

nrcs.usda.gov/

WHAT IS BRUSH MANAGEMENT?



- The management or removal of woody plants including those that are invasive and noxious. Brush management should be designed to achieve the desired plant community consistent with the ecological site or desired state within the site description.

HOW IT HELPS THE LAND

- Managing brush can reduce the tree canopy and allow the recovery of native plants. This improves the grass cover and increases the forage for livestock, increases cover for wildlife and reduces erosion.



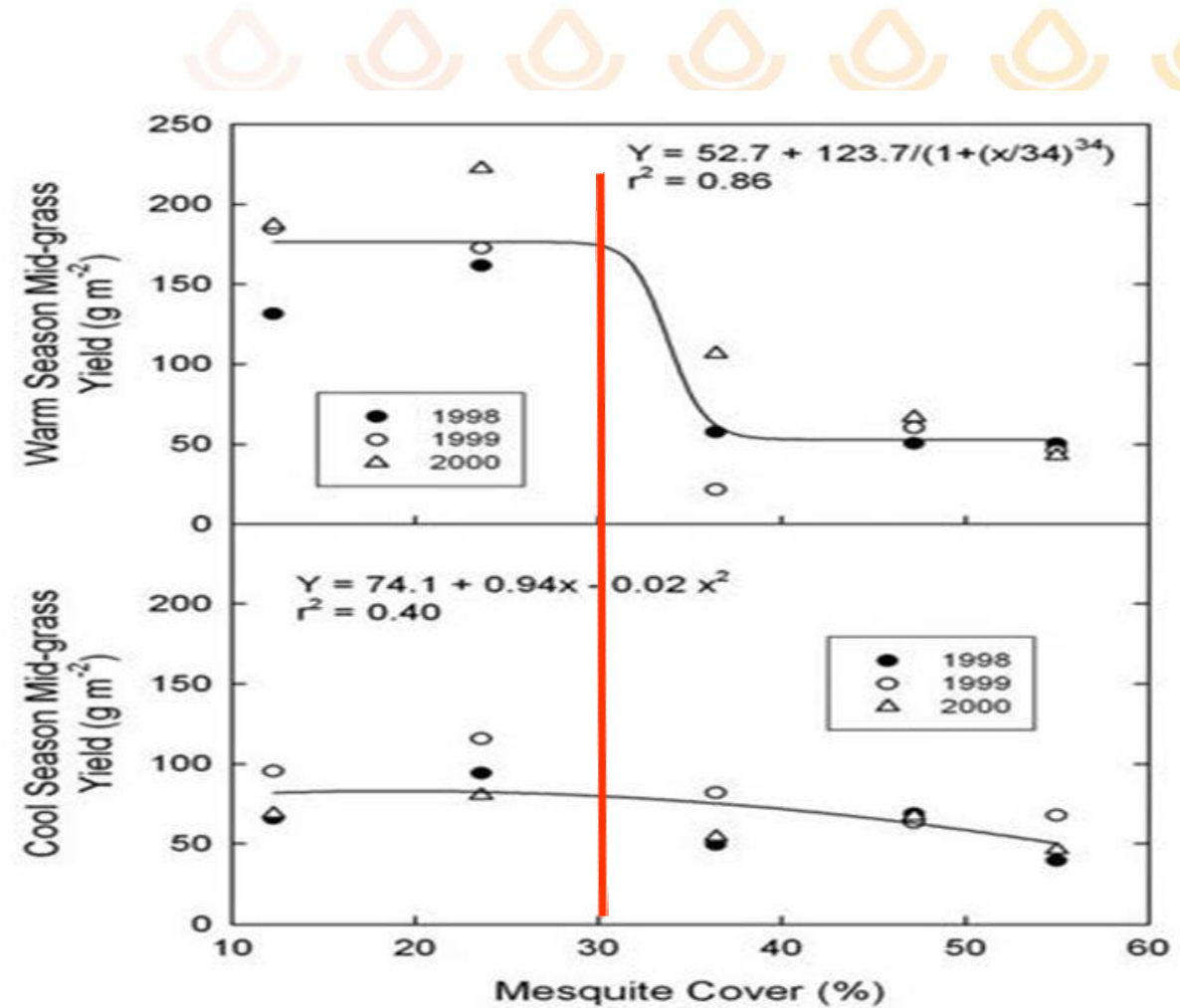
WHEN IS BRUSH A RESOURCE CONCERN?



- Excessive woody plant canopy cover may compete with herbaceous plants and increase erosion and sedimentation.
- A serious concern exists when brush densities exceed 10% canopy or are in excess of 50 plants per acre. Some introduced woody species may warrant treatment at any density or canopy if they are highly invasive.
- It should be understood that no single treatment is adequate to solve a brush problem but rather a systematic approach should be employed which may include a combination of treatments utilized over several years.



MANAGE TRANSPIRATION



Natural
Resources
Conservation
Service

nrcs.usda.gov/



BRUSH MANAGEMENT PLANNING CONSIDERATIONS

- Brush has long been considered one of the major management problems confronting managers of rangeland.
- No single method of brush management will provide 100% control with just one application.
- Follow-up treatment must be planned and implemented in a timely manner.



BRUSH MANAGEMENT & GRAZING MANAGEMENT



- The primary reason for implementing any type of brush management program is to increase total forage production in the grazing unit.

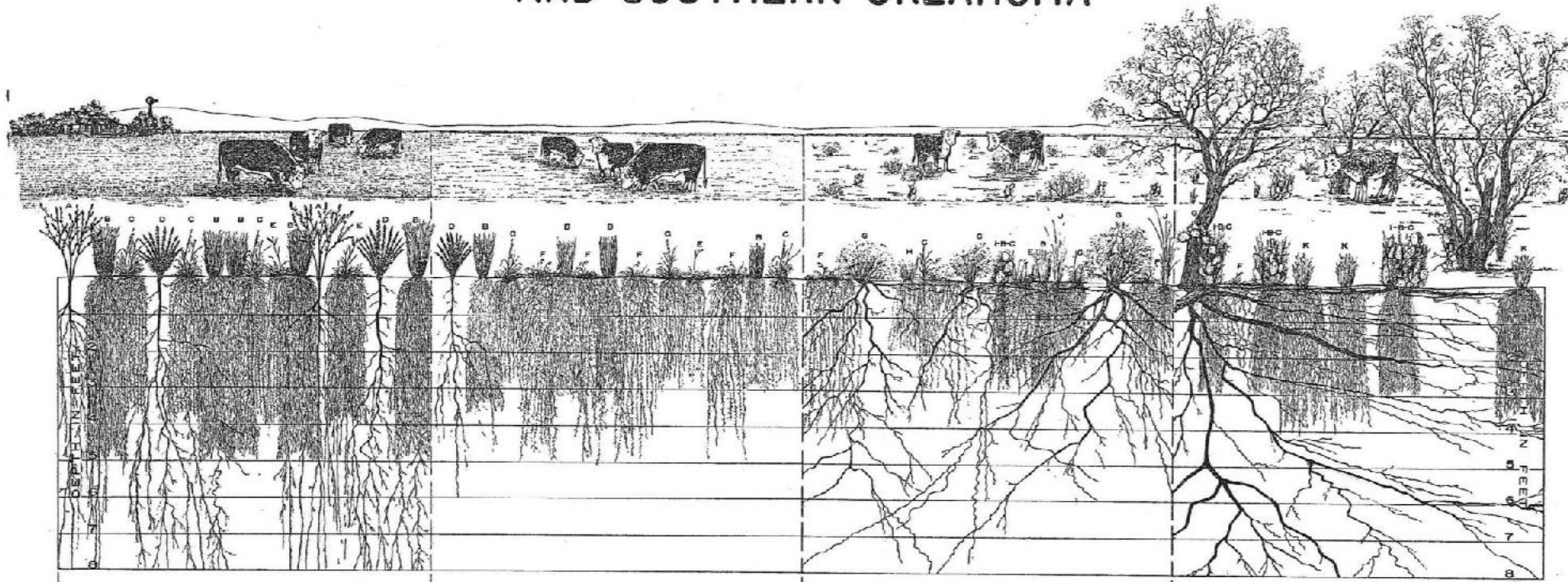


- If proper grazing management is not applied following brush control, then the desired increase in forage production will not be obtained.





FOUR RANGE CONDITION CLASSES IN CENTRAL TEXAS AND SOUTHERN OKLAHOMA



EXCELLENT CONDITION

Little bluestem, sideoats grama and forbs are most prominent plants. Roots penetrate deeply.

GOOD CONDITION

Buffalograss has invaded and is about as prominent as little bluestem and sideoats grama. Forbs are scarce, root systems are shorter.

FAIR CONDITION

Short grasses dominate; mesquite and other woody vegetation have invaded. Forbs have been killed and grass roots have shortened.

POOR CONDITION

Woody vegetation, threawn and inferior weedy vegetation have replaced the better forage plants.

A WILD-ALFALFA
B LITTLE BLUESTEM

C SIDEOATS GRAMA
D DOTTED GAYFEATHER

LEGEND
E HAIRY GRAMA
F BUFFALOGRASS
G MESQUITE

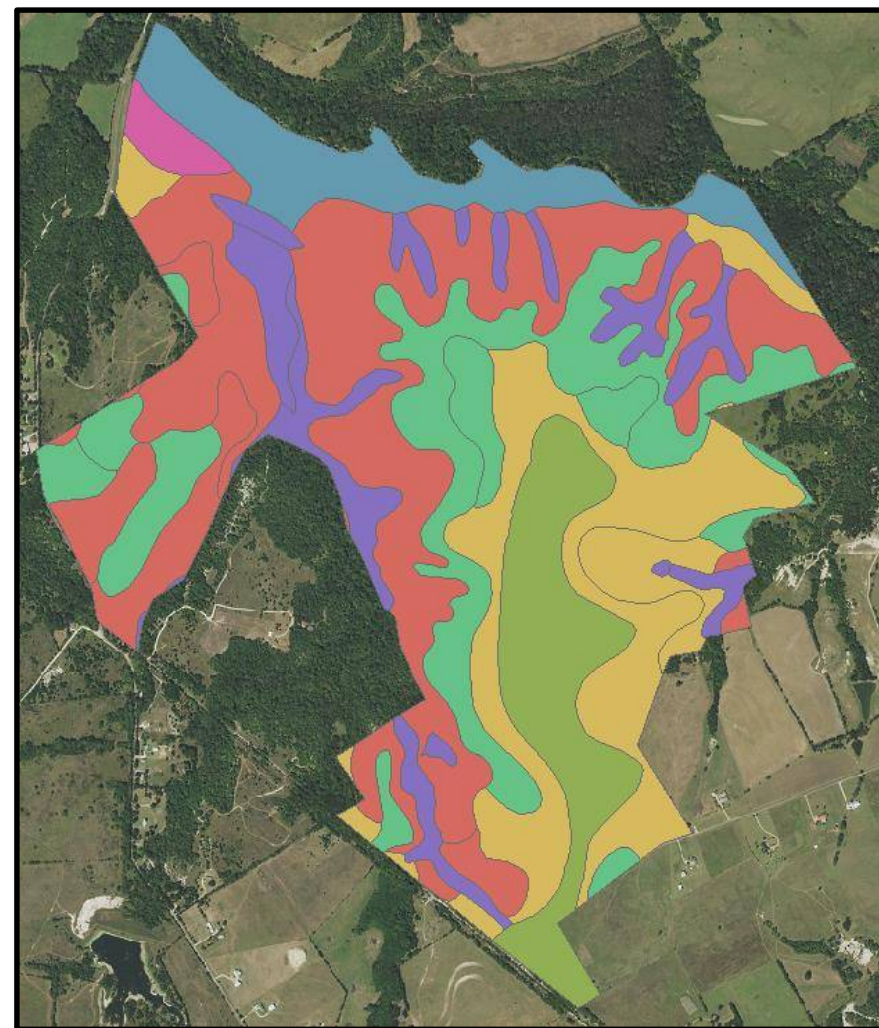
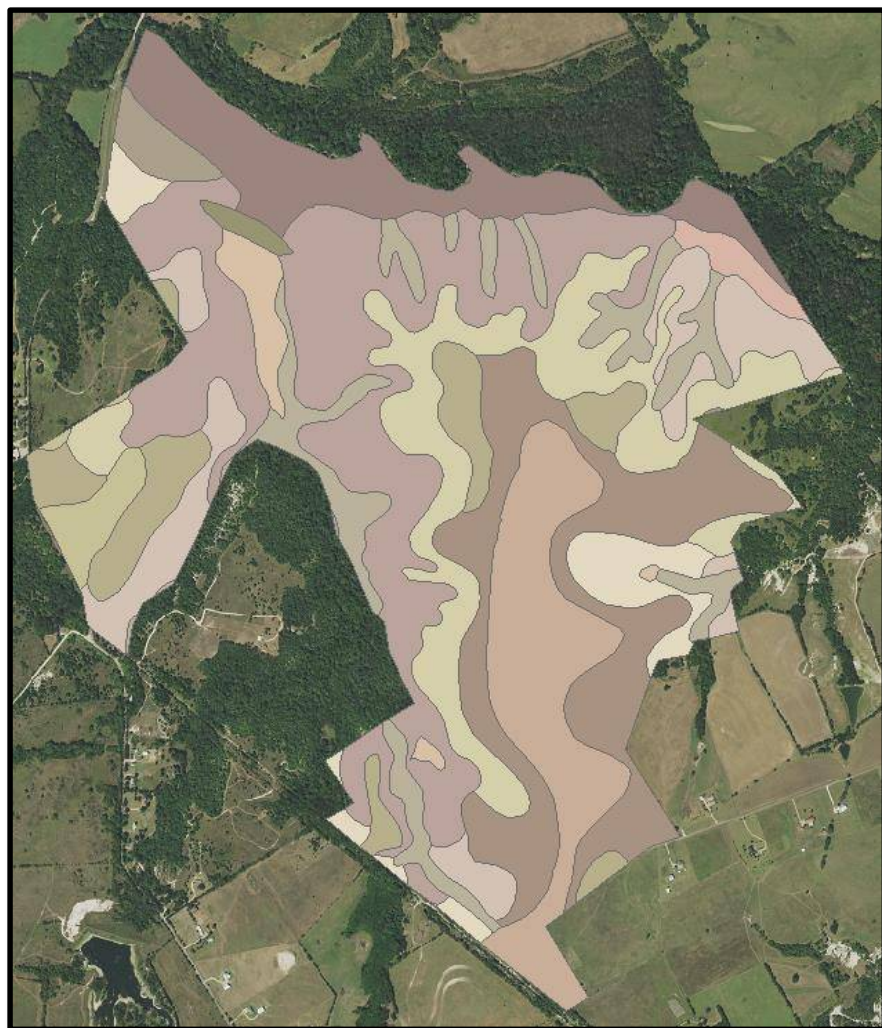
H SILVER BLUESTEM
I CACTUS

J TEXAS WINTERGRASS
K THREEAWN

REVISED NOV. 16, 1968



IDENTIFY SOILS AND ECOLOGICAL SITES



Natural
Resources
Conservation
Service

nrcs.usda.gov/



CHOOSING YOUR BATTLES



Upland Site: Clay Loam



Draw: Loamy Bottomland

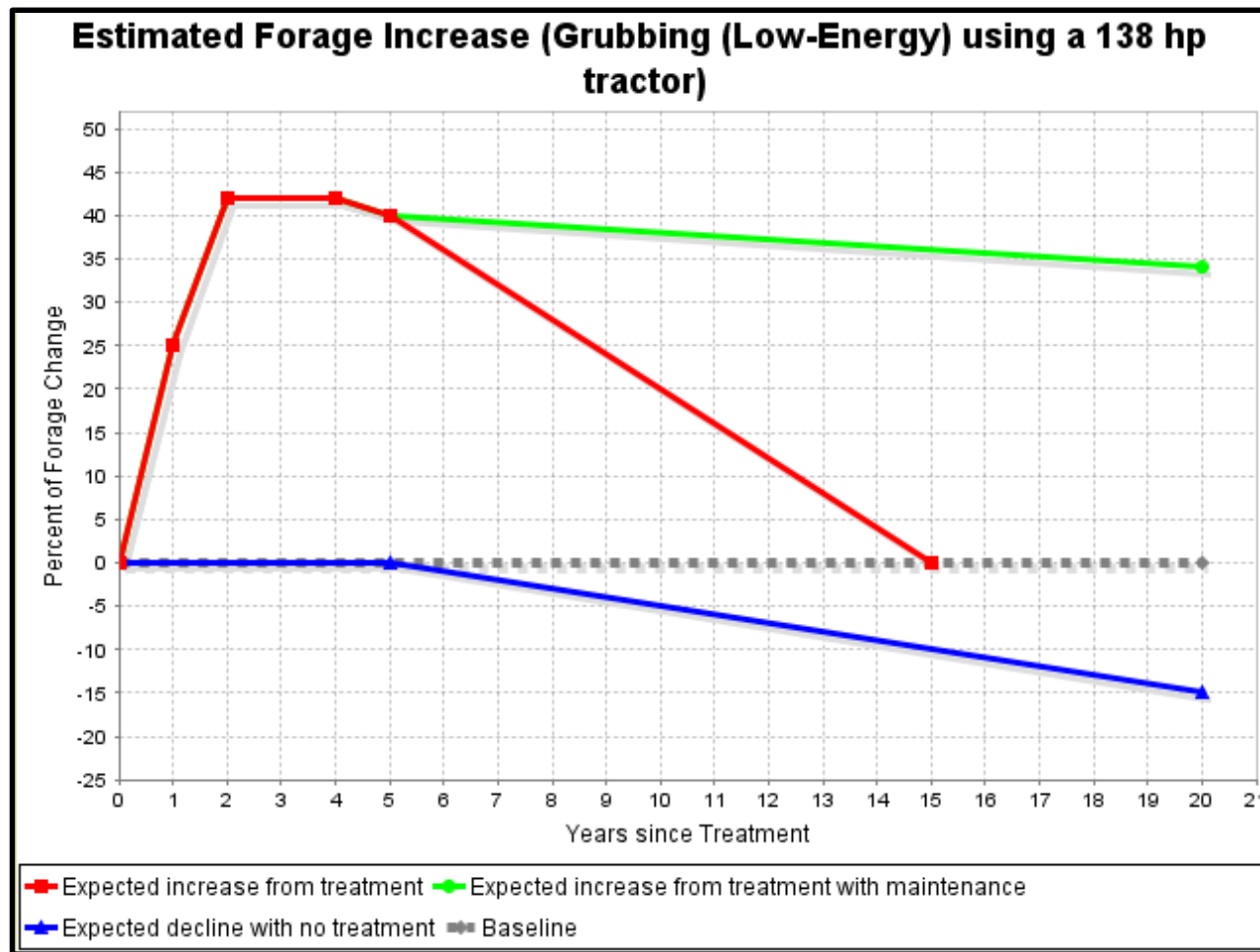


Know your site dynamics.

<https://edit.jornada.nmsu.edu>



TREATMENT LIFE



* www.pestman.tamu.edu

Natural
Resources
Conservation
Service

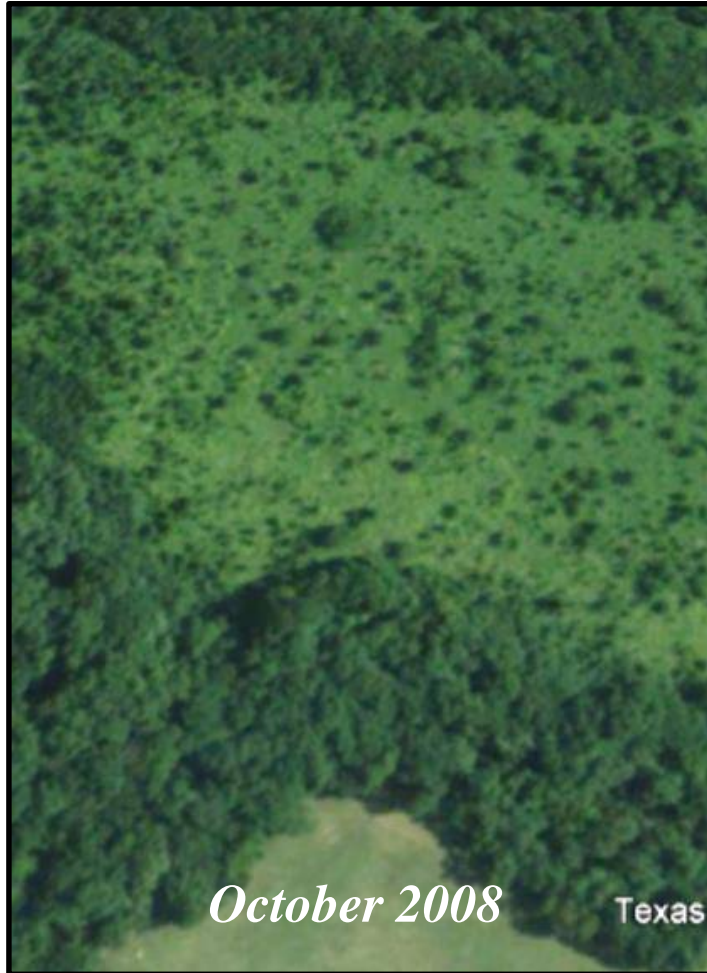
nrcs.usda.gov/



RESULTS OF NO BRUSH MANAGEMENT

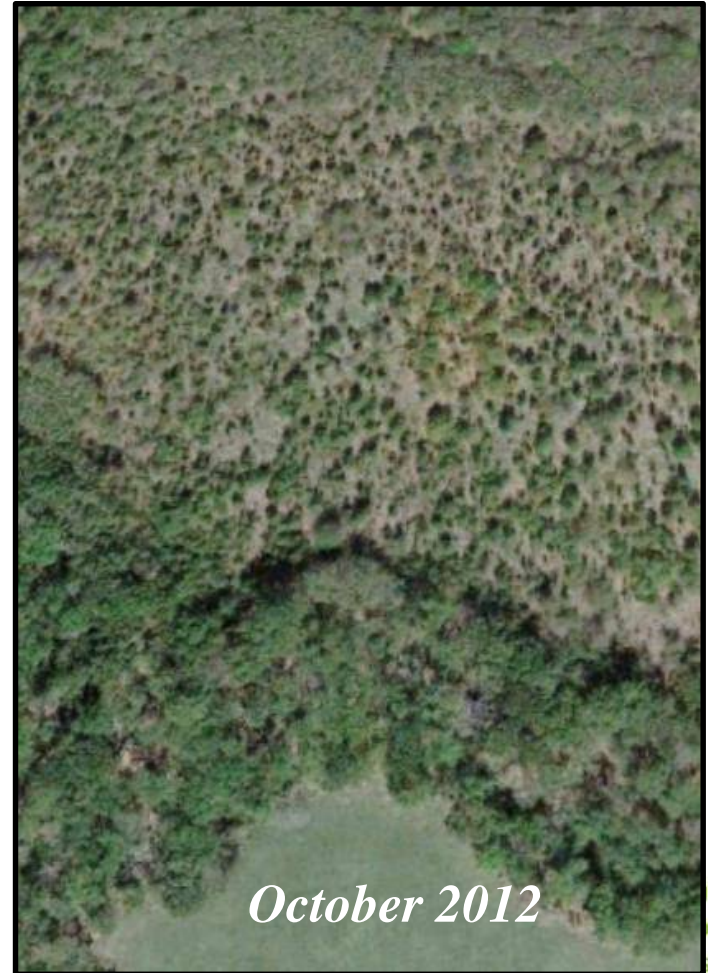


October 2005



October 2008

Texas



October 2012



IF I WOULD HAVE ONLY...



October 2005

Image USDA Farm S



September 2017



Natural
Resources
Conservation
Service

nrcs.usda.gov/

WILDLIFE CONSIDERATIONS

- Brush has some desirable attributes. It provides food and cover for many wildlife species, therefore...



...management objectives should accommodate the habitat needs of all wildlife.

- General rule is to leave 30-50% of the area in brush



BRUSH SCULPTING FOR WILDLIFE

- Selective removal of brush to increase/improve habitat
- Maintain brush density based on species of concern
- Large enough for concealment
- Curved features with mottes interspersed in openings
- Avoid riparian areas

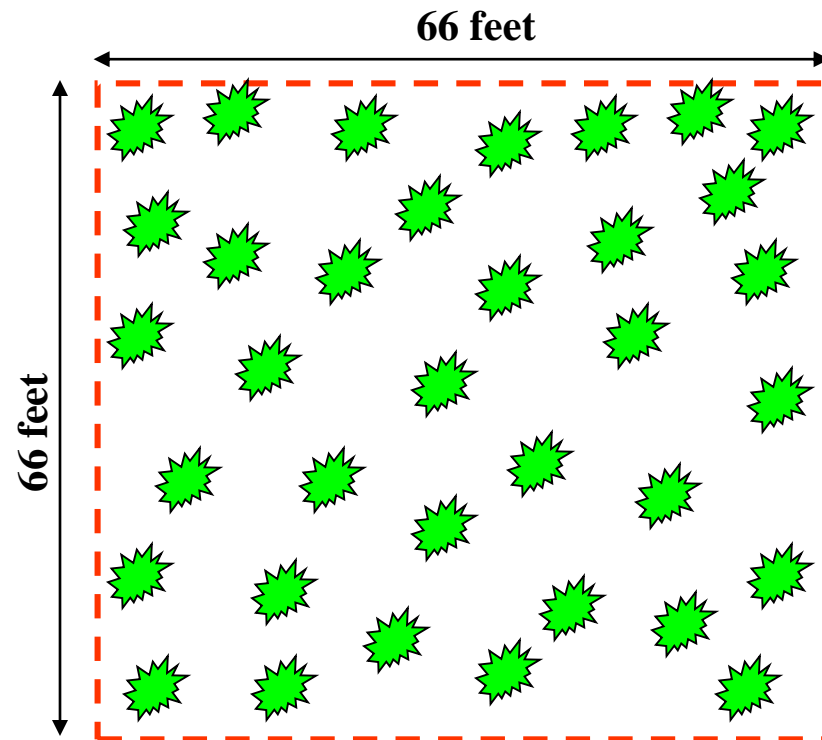


DETERMINING PLANT DENSITY

- Brush densities greater than 300 plants per acre should be controlled by means other than Individual Plant Treatment (IPT).
- The following example is a simple method for determining the number of target plants per acre :

1. Measure off a 66 ft. x 66 ft. plot that is representative of area. This area is 1/10th of an acre.
2. Count the number of target plants that are rooted within the plot.
3. In this example, there are 35 plants rooted within the plot:

$$(35 \text{ plants} \times 10 = 350 \text{ plants/acre})$$



*Therefore, IPT would not be feasible in this area (more than 300).

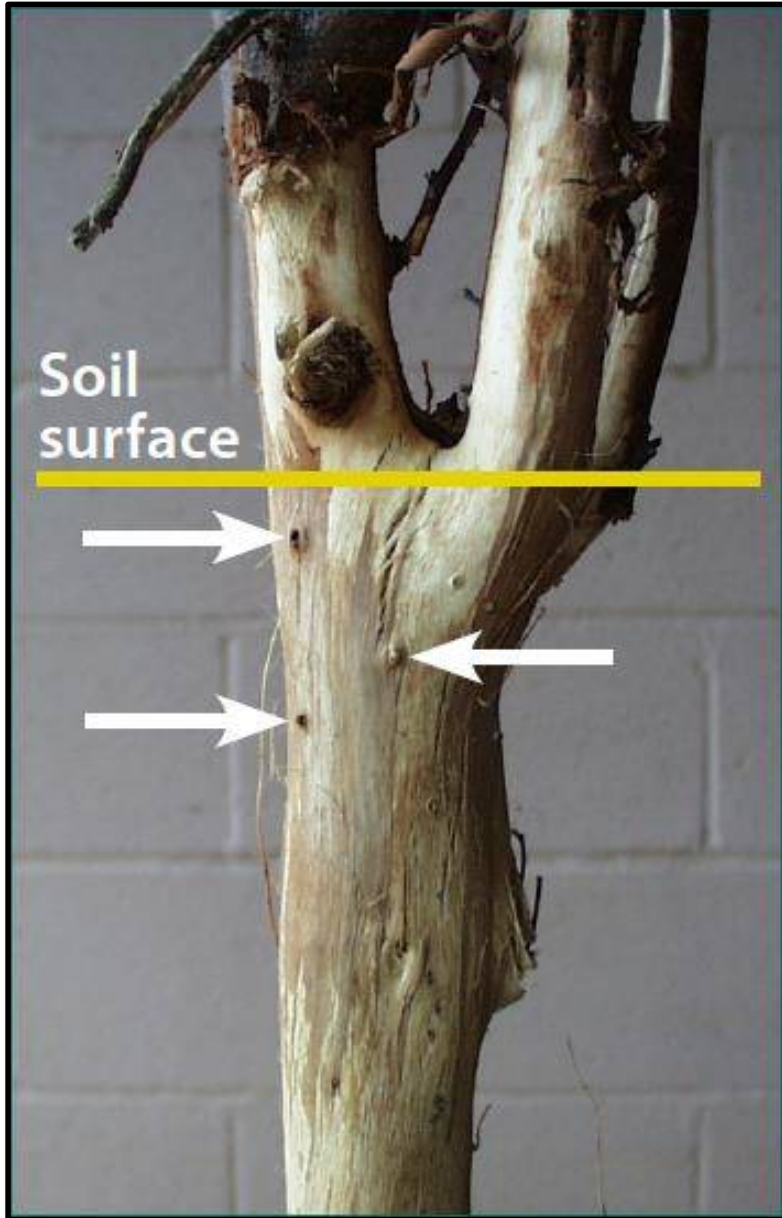


APICAL DOMINANCE

- Result is a multi-stemmed shrub
- Vertical movement of growth regulators/Auxin that suppress the basal bud growth
- Top removal removes suppression

Honey mesquite (*Prosopis glandulosa*)





Images courtesy of Texas A&M Agrilife



COMMON METHODS OF BRUSH MANAGEMENT



Mechanical

(grubbing, root plowing, etc.)



Chemical

(broadcast & individual plant treatment)



MECHANICAL GRUBBING



- Low-energy power grubbers may be used on thin stands of small mesquite and root diameter less than 4 inches.
- Mesquite and hardwood roots must be grubbed at least 14 inches or deeper to remove all of the basal and root buds.



- Power grubbing is most useful with scattered plants that are at least 3 feet tall.
- The efficiency of power grubbers decrease as soil clay content increases and water content decreases.



Image courtesy of H&W Attachments

EXCAVATOR GRUBBING



- Excavator grubbing is used to individually remove re-sprouting target species which is more selective than dozing.
- This method works best on smaller sized brush, however can remove larger brush but will take longer.



ROOT PLOWING



Image courtesy of HOLT CAT

- Root plowing is a nonselective treatment used to sever woody plants at a depth of 15 inches below the soil surface.
- Useful in moderate to dense stands of brush with a limited seed source from desirable forage plants.
- Although root plowing is a highly effective brush control method, it causes considerable soil disturbance and destroys most perennial grasses and forbs. Thus, seeding is often needed following treatment.
- This is very costly. Root plowing is best suited for deep soils where revegetation is feasible.



HYDRAULIC SHEARING

- Hydraulic shearing is used to selectively remove the target species at ground level.
- Generally, shearing should not be used on areas that are to be reseeded.



- If shearing “Re-sprouters” the stumps should be sprayed within 30 minutes, preferably immediately.



MULCHING

- Similar to shearing, mulching is used to selectively remove the target species at ground level.
- Mulching heads mounted onto skid steers with high flow hydraulics or on stand alone forestry mulching machines.



Natural
Resources
Conservation
Service

nrcs.usda.gov/



HAND CUTTING

- Hand cutting is also used to selectively remove the target species at ground level.
- Hand cutting should be used as a mechanical IPT method and considered when brush density is below 300 plants/acre.



- When cutting re-sprouting brush species, the stumps should be sprayed within 30 minutes, preferably immediately.



RAKING AND STACKING

- Raking and stacking is used to collect and pile debris left from mechanical treatments.
- Brush rakes should have open tines that gather debris without major accumulations of soil.



- Debris can be stacked in several piles or wind-rowed on the contour in steeper topography .
- Debris can be burned and smoothed out or it can be left as cover for small wildlife.



CHEMICAL BROADCAST TREATMENT

- Calculated on a per/acre basis
- Most cost-effective method for dense areas of brush or large acreages
- Often aurally applied by fixed wing aircraft or helicopter or with ground equipment with boom or boomless sprayers if brush is short enough
- Selective or non-selective herbicides can be used
- More economical than IPT when more than 300 plants/acre

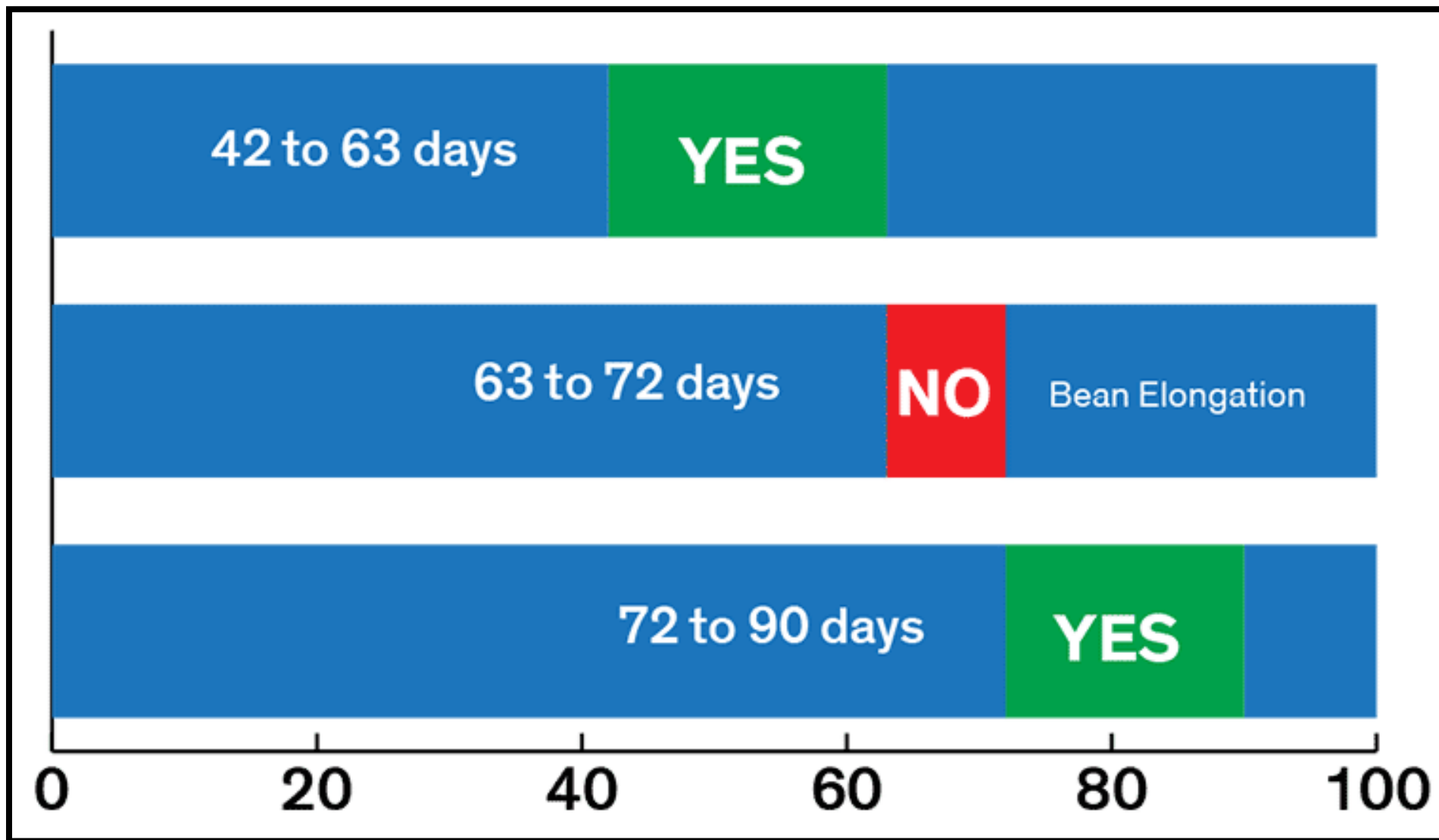


Natural
Resources
Conservation
Service

nrcs.usda.gov/



TEXTBOOK FOLIAR MESQUITE



INDIVIDUAL PLANT TREATMENT (IPT)

- Calculated as a % of herbicide in the mixture
- Consider when less than 300 plants/acre
- Usage of commercial dyes will limit double spraying brush



Natural
Resources
Conservation
Service

nrcs.usda.gov/



LEAF SPRAY METHOD (IPT)



- Application timing varies by brush species of concern
- Conejet 5500 X-6 or X-8 adjustable nozzle
- Spray leaf surfaces to the point of dripping
- Recommended on multiple stemmed plants less than 8 feet tall
- Cost and labor increases as brush density and size increase



STEM SPRAY METHOD (IPT)



- Applied any time during the year, best results occur during the spring-summer growing season
- Recommended over foliar/leaf spray on plants with 1-2 basal stems
- More effective on smooth-barked trees, rough barked trees may require higher percentage of chemical
- Use Conejet 5500 X-1 nozzle
- Spray completely around stem or trunk from the ground up to 12-18 inches, wetting almost to the point of runoff



CHEMICAL CONTROL EQUIPMENT

- Aftermarket Nozzles
- Conejet X-1 (Basal)
- Conejet X-8 (Foliar)



ATV/UTV UNITS



Natural
Resources
Conservation
Service

nrcs.usda.gov/



BACKPACK SPRAYERS



Natural
Resources
Conservation
Service

nrcs.usda.gov/

CUT STUMP METHOD (IPT)



- Nearly 100% effective
- Applied any time of the year, best results occur during the spring-summer growing season
- Cut at or near ground, avoid getting soil or debris on cut surface
- Spray entire surface, especially the cambium immediately after cutting
- Requires less chemical, more labor intensive



Image courtesy of Missouri Department of Conservation



HANDHELD SPRAYERS



Natural
Resources
Conservation
Service

nrcs.usda.gov/

SOIL APPLIED SPOT TREATMENT (IPT)



- Applied late winter to spring
- Pelleted or liquid form
- Less effective on heavy clay soils
- Do not apply within 3X the height or canopy width of desirable trees or in marshy or poorly drained sites
- Broad-spectrum, non-selective herbicide
- Apply suggested amount evenly spaced from trunk to dripline



SANDY SOIL



CLAY SOIL



Natural
Resources
Conservation
Service

nrcs.usda.gov/



SPOT GUNS



Natural
Resources
Conservation
Service

nrcs.usda.gov/

SURFACTANTS AND DYES



MEASUREMENT CONTAINERS



PREVENTION THROUGH INDIVIDUAL PLANT TREATMENT

TEXAS A&M
AGRILIFE
EXTENSION

ERM-1466
2/18

CHEMICAL WEED AND BRUSH CONTROL

— SUGGESTIONS FOR RANGELAND —



- Plant species list
- Treatment control ratings
- Chemical names
- Conversions
- Concentration tables
- Weed control
- Brush control





**ALWAYS FOLLOW LABEL
DIRECTIONS WHEN USING
HERBICIDES !**



UNDERSTANDING ERM-1466



TEXAS A&M
AGRILIFE
EXTENSION

ERM-1466
2/18

CHEMICAL WEED AND BRUSH CONTROL

— SUGGESTIONS FOR RANGELAND —



- Plant species list
- Treatment control ratings
- Chemical names
- Conversions
- Concentration tables
- Weed control
- Brush control

Natural
Resources
Conservation
Service

nrcs.usda.gov/



TREATMENT CONTROL RATINGS



Treatment control ratings

A control rating, based on the effectiveness of an herbicide treatment in controlling a target plant, has been assigned to each herbicide use suggestion. These ratings were determined from research and result demonstration data and from observations of commercial applications. The rating represents a degree of plant mortality of the target plant species when the treatment is applied properly under optimum conditions.

Table 1. Rating categories for herbicide treatments and degree of target plant mortality after treatment

Control rating	Percent of plants killed
Very high	76–100
High	56–75
Moderate	36–55
Low	0–35



HERBICIDE INFORMATION



Table 2. Common, chemical and product names of herbicides*

Herbicide common name	Chemical name	Product name	Active Ingredient or acid equivalent
aminocyclopyrachlor	6-amino-5-chloro-2-cyclopropyl-4-pyrimidinecarboxylic acid, potassium salt	Method 240 SL	2 lb/gal
aminopyralid	2-pyridine carboxylic acid, 4-amino-3, 6-dichloro-2-pyridine carboxylic acid, triisopropanolammonium salt	—	—
aminopyralid:2,4-D (1:8)	See aminopyralid and 2,4-D	GrazonNext HL	3.75 lb/gal
aminopyralid:clopyralid (1:4.6)	See aminopyralid and clopyralid	Sendero	2.8 lb/gal
aminopyralid:metsulfuron methyl (1:6.2)	See aminopyralid and metsulfuron	Chaparral	0.62 lb/lb
clopyralid	3,6-dichloro-2-pyridinecarboxylic acid	Pyramid R&P, Clopyralid 3	3 lb/gal
2,4-D	(2,4-dichlorophenoxy) acetic acid	Weedar 64, Broad Range 55, Hi-Dep,	amine salts, free acids, and esters



COMMON MEASUREMENT CONVERSIONS



Table 3. Common measurement conversions for use with herbicide applications

Liquid		Weight
1 gallon (gal) = 4 quarts (qt)	1 pt = 16 oz	1 pound (lb) = 16 oz
1 gal = 8 pints (pt)	1 pt = 473.12 ml	1 lb = 453.6 grams (g)
1 gal = 16 cups (c)	1 c = 8 oz	1 oz = 28.35 g
1 gal = 128 ounces (oz)	1 oz = 2 tablespoons (tbs)	1 kilogram (kg) = 2.2 lb
1 gal = 3784.96 milliliters (ml)	1 oz = 29.57 ml	
1 quart (qt) = 2 pt	1 tablespoon (tbs) = 3 teaspoons (tsp)	Area
1 qt = 4 c	1 tbs = 0.5 oz	1 acre = 43,560 square feet (sq ft)
1 qt = 32 oz	1 tbs = 14.79 ml	1 hectare (ha) = 2.471 acres
1 qt = 946.24 ml	1 teaspoon (tsp) = 4.98 ml	
1 pint (pt) = 2 c		



GUIDE FOR TOTAL VOLUME OF SPRAY MIX



Table 4. Guide to quantity of herbicide formulation for total volume of spray mix

Total spray volume desired	Herbicide concentration desired for individual plant and spot treatment											
	0.25%	0.5%	0.75%	1%*	1.5%	2%	3%	4%	5%	10%	15%	25%
	Quantity of herbicide formulation											
1 gal	0.32 oz	0.64 oz	1 oz	1.28 oz	2 oz	2.56 oz	4 oz	5.12 oz	6.4 oz	12.8 oz	19 oz	1 qt
3 gal*	1 oz	2 oz	3 oz	4 oz*	6 oz	8 oz	12 oz	15.5 oz	19 oz	38 oz	57 oz	96 oz
5 gal	1.67 oz	3.33 oz	5 oz	6.5 oz	10 oz	13 oz	19 oz	26 oz	32 oz	64 oz	96 oz	1.25 gal
10 gal	3.33 oz	6.5 oz	10 oz	13 oz	19 oz	26 oz	38 oz	51 oz	2 qt	1 gal	1.5 gal	2.5 gal
25 gal	8 oz	16 oz	24 oz	32 oz	48 oz	64 oz	96 oz	1 gal	1.25 gal	2.5 gal	3.75 gal	6.25 gal
50 gal	16 oz	32 oz	48 oz	64 oz	96 oz	1 gal	1.5 gal	2 gal	2.5 gal	5 gal	7.5 gal	12.5 gal
100 gal	32 oz	64 oz	96 oz	1 gal	1.5 gal	2 gal	3 gal	4 gal	5 gal	10 gal	15 gal	25 gal



EXAMPLE FOR MESQUITE...



Brush controlled	Herbicide (common and chemical names, Table 2)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Mesquite (basal stem diameter ≤1.5 in.)	triclopyr ester	—	VH 15% in diesel fuel oil or basal bark oil	Apply to lower 12–18 in. of trunk to wet the trunk; do not spray to point of runoff. Apply completely around the trunk.	Anytime—optimum time is during growing season when plants have mature leaves	This is a Brush Busters® low volume basal application method. Use a 5500X1 adjustable cone nozzle. Use only on plants with smooth bark and a trunk diameter <4 in.
Mesquite (basal stem diameter >1.5 in.)	triclopyr ester	—	VH 25% in diesel fuel oil or basal bark oil			
Mesquite (basal stem diameter ≤1.5 in.)	triclopyr ester	—	VH 15% in diesel fuel oil 10% d,l limonene (a penetrant) may be added to the mixture—see remarks		Anytime—optimum is in the growing season when the leaves are mature	This is commonly called the streamline basal application method. Use a straight stream nozzle. Use only on plants with smooth bark and a trunk diameter <4 in. Add a penetrant to the mixture to improve coverage around the trunk. Trade names for d,l limonene are Quick Step II, Cide-Kick, Cide-Kick II and AD 100. Other penetrants may be effective but have not been tested on rangelands in Texas.
Mesquite (basal stem diameter >1.5 in.)	triclopyr ester	—	VH 25% in diesel fuel oil 10% d,l limonene (a penetrant) may be added to the mixture—see remarks			



EXAMPLE FOR ELMS, HACKBERRY, ETC.

Brush controlled	Herbicide (common and chemical names, Table 2)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Baccharis (dryland willow, Roosevelt willow, seep willow or willow baccharis) (continued from previous page)	hexazinone liquid	—	VH** 2 ml/3 ft height or canopy diameter, whichever is greater	—	Late winter–summer	Apply undiluted hexazinone liquid, picloram or hexazinone pellets between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply hexazinone liquid and picloram. If plant size requires more than a single 2 ml or 4 ml application of hexazinone liquid or picloram, or more than 1 hexazinone pellet, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on
	hexazinone pellet		VH** 1 pellet/3 ft height or canopy diameter, whichever is greater			
Baccharis (dryland willow, Roosevelt willow, seep willow or willow baccharis), blackbrush, bois d'arc, catclaw acacia, catclaw mimosa, Chinese tallowtree, elm, greenbriar, hackberry, pricklyash (Hercules club), Texas persimmon (see remarks), winged elm, yaupon	triclopyr ester	—	VH 25% in diesel fuel oil	Apply to lower 12–18 in. of trunk to wet the trunk; do not spray to point of runoff. Apply completely around the trunk.	Anytime—optimum time is during growing season when plants have mature leaves	This is a Brush Busters® low volume basal application method. A 5500-X1 adjustable cone nozzle is preferred. Use only on plants with smooth bark and a trunk diameter less than 4 in. For Texas persimmon, apply in spring after leaves mature but before June 15.
	triclopyr ester	—	VH 25% in diesel fuel oil 10% d,l-limonene (a penetrant) may be added to the mixture—see remarks	Apply to the trunk in a 3- to 4-in.-wide band near ground level or at line dividing smooth bark from corky bark. Apply completely around the trunk.	Anytime—optimum time is during growing season when plants have mature leaves	This is commonly called the streamline basal application method. Use a straight stream nozzle. Use only on plants with smooth bark and trunk diameter less than 4 in. Addition of a penetrant to the mixtures aids with coverage around the trunk and increases the control for most species. Trade names for d,l limonene are Quick Step II, AD 100, Cide-Kick II and Cide-Kick. Other penetrants may be effective but have not been tested on rangeland in Texas. For Texas persimmon, apply in spring after leaves mature but before June 15.



COMMON HERBICIDE REFERENCE (ESC-046)



Quick Reference for Common Rangeland and Pasture Herbicides

Joshua McGinty, Vanessa Corriher-Olson, Megan Clayton, and Robert Lyons*

TEXAS A&M
AGRILIFE
EXTENSION

ESC-046
11/16

Active Ingredient(s)	Trade Name(s)	Grazing Restrictions	Hay Harvest Restrictions	Rainfast Interval	Pesticide Applicator License Required?
2,4-D + aminopyralid	GrazonNext HL	none ¹	7 days ^{2,3,4}	2 hours	yes
2,4-D + aminopyralid	PasturAll HL	none ¹	7 days ^{2,3,4}	2 to 4 hours ⁵	yes
2,4-D + dicamba	Weedmaster, Range Star, Outlaw, Latigo	none, except for lactating animals (7 days)	7 days	4 hours	yes
2,4-D + picloram	Graslan L, Grazon P+D, Gunslinger	none, except for lactating dairy animals (7 days)	30 days	2 to 4 hours ⁵	yes
2,4-D + triclopyr	Crossbow, Everett	none, except for lactating dairy animals (next growing season)	none, unless feeding to lactating dairy animals (14 days)	6 hours ⁵	yes



Natural
Resources
Conservation
Service

nrcs.usda.gov/

KNOW YOUR PLANTS



-You cannot manage a plant that you cannot identify



Natural
Resources
Conservation
Service

nrcs.usda.gov/

USDA-NRCS PLANTS DATABASE

(<https://plants.usda.gov/>)



The screenshot shows the website's layout with a top navigation bar, a search sidebar, a main content area with sections for 'Plant of the Week', 'Spotlights', and 'I Want To...', and a right sidebar with 'I Want To...' and 'I Want Help' sections.



PLANTS OF TEXAS RANGELANDS

(<http://rangeplants.tamu.edu>)



Department of
ECOSYSTEM SCIENCE AND MANAGEMENT

Plants of Texas Rangelands

Virtual Herbarium

[Home](#)
[Virtual Herbarium](#)
[Publications](#)

Successful rangeland management plans begin with proper plant identification.

This website provides a description, identifying characteristics, the geographic distribution and a habitat description of species found on Texas rangelands, along with photographs of the plant and its distinguishing features. Information on the most common toxic plants in the state, including signs of poisoning and controlling those plants are also included.

[Help Me Identify My Plant](#)

[Common Name Index](#)

[Scientific Name Index](#)

[Map of Regions](#)

[Plants In Our Books](#)

Chinese Tallow Tree
Sapium sebiferum (L.) Roxb.



Natural Resources Conservation Service

nrcs.usda.gov/

LADYBIRD JOHNSON WILDFLOWER CENTER

(<https://www.wildflower.org>)



TEXAS
The Lone Star State

Lady Bird Johnson
Wildflower
center

Join Volunteer Host an Event Contact Us **DONATE**

VISIT NATIVE PLANTS EVENTS LEARN OUR WORK MAGAZINE ABOUT

FORT LANDIA
YOUR SECRET HIDEOUT AWAITS

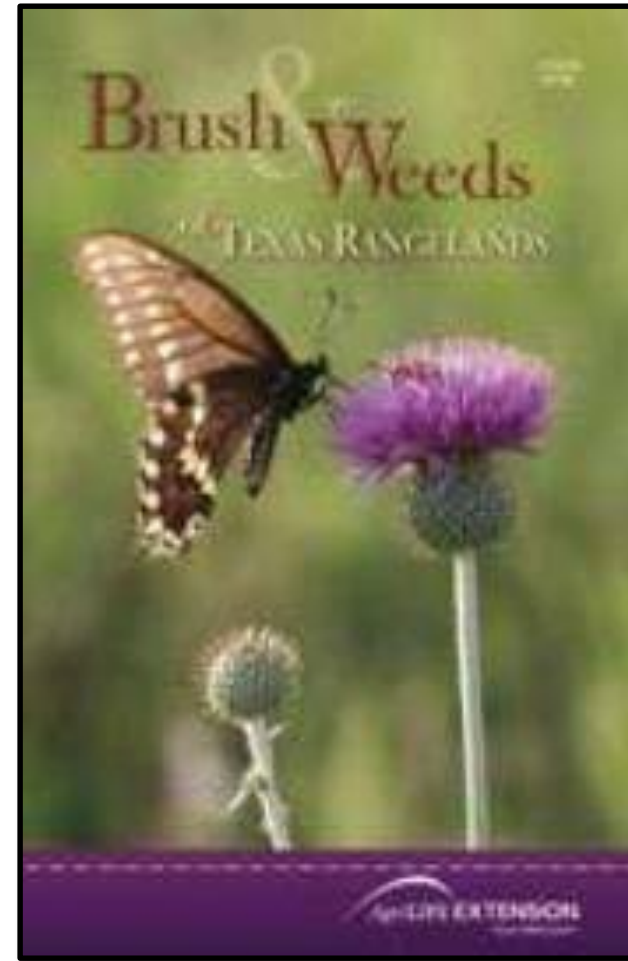
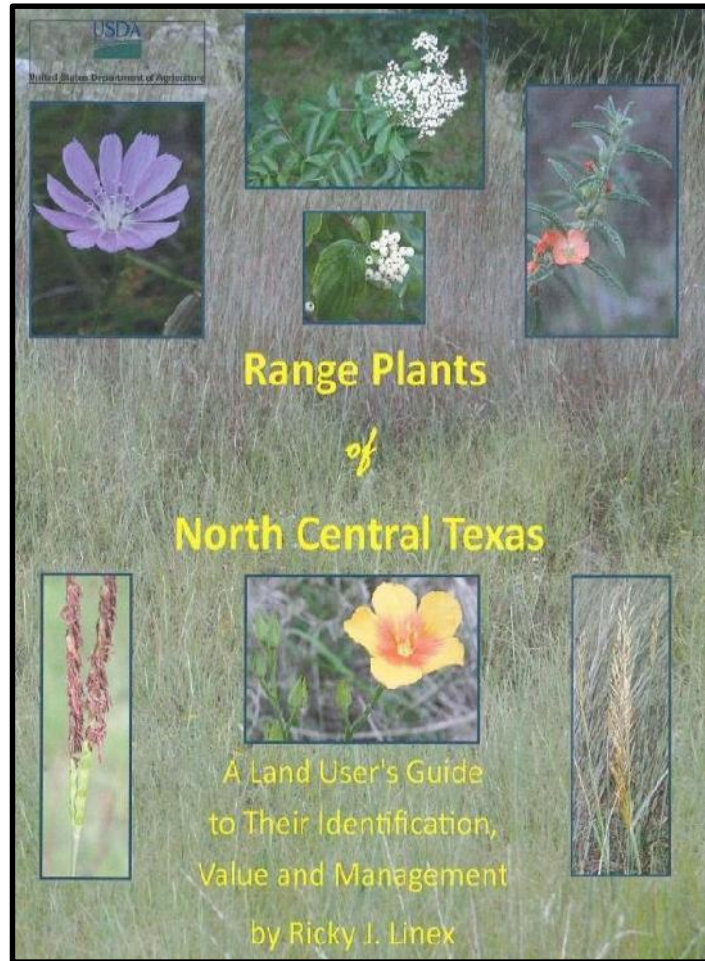
Explore Today



Natural
Resources
Conservation
Service

nrcs.usda.gov/

PLANT FIELD GUIDES



Natural
Resources
Conservation
Service

nrcs.usda.gov/



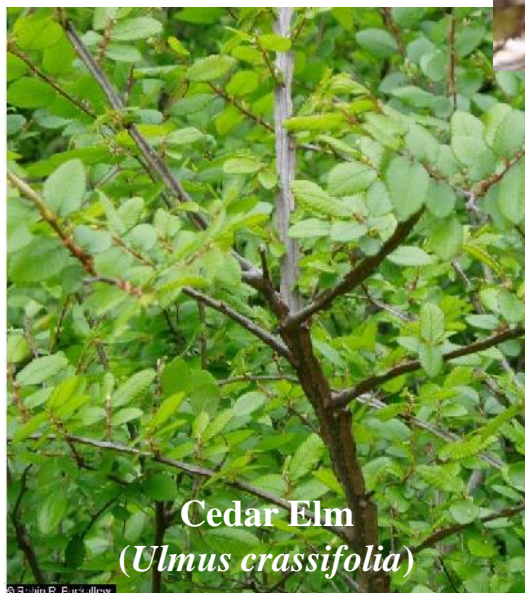
OTHER GOOD BROWSE



Western Soapberry
(*Sapindus saponaria*)



Hackberry
(*Celtis laevigata*)



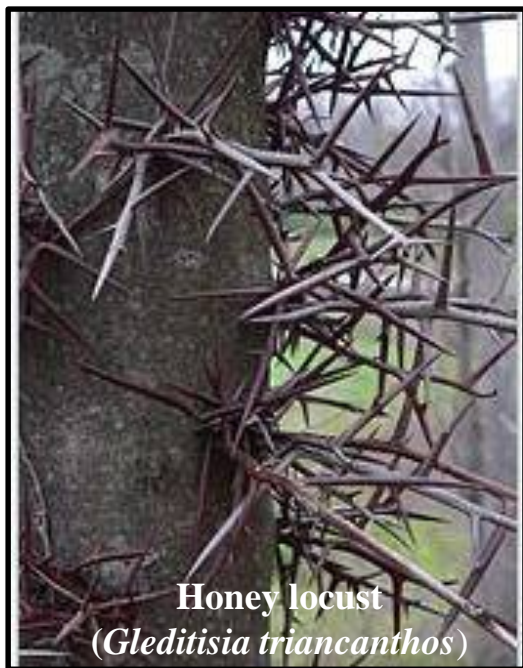
Cedar Elm
(*Ulmus crassifolia*)



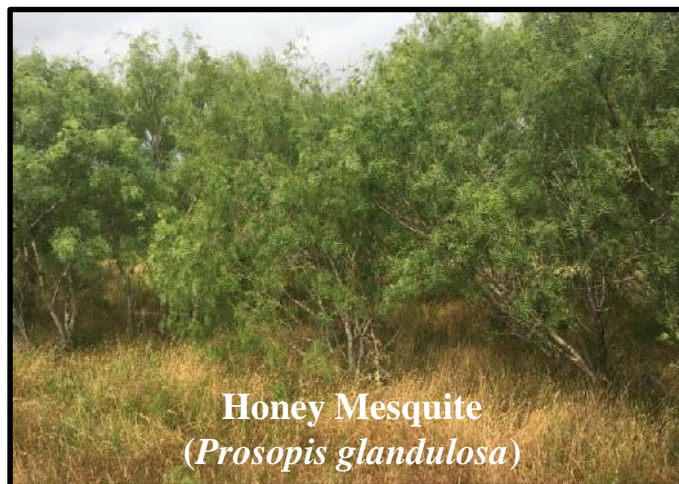
Gum Bumelia
(*Sideroxylon lanuginosum*)



THE BAD



Honey locust
(*Gleditsia triacanthos*)



Honey Mesquite
(*Prosopis glandulosa*)



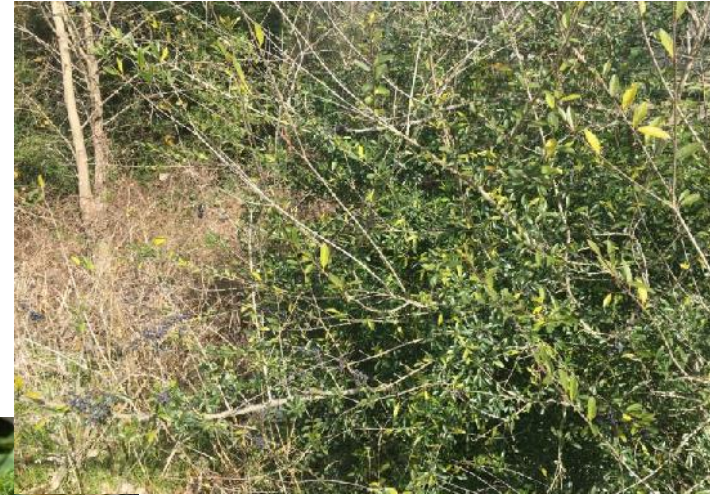
Bois d'arc
(*Maclura pomifera*)



Eastern Redcedar
(*Juniperus virginiana*)



THE UGLY



CHINESE TALLOW TREE (*Triadica sebifera*)



Photographer: Chris Evans
Source: The University of Georgia, Bugwood.org



James Henson. Provided by USDA NRCS National Plant Data Center (NPDC).

Natural
Resources
Conservation
Service

nrcs.usda.gov/



CHINABERRY TREE (*Melia azedarach*)



Photo Credit: Mike Farley



AgriLIFE EXTENSION

Texas A&M System



Natural
Resources
Conservation
Service

nrcs.usda.gov/

CHINESE PRIVET (*Ligustrum sinense*)



Natural
Resources
Conservation
Service

nrcs.usda.gov/



MAINTENANCE AFTER TREATMENT

- Following initial application, some regrowth or re-sprouting of brush should be expected. Spot treatment of individual plants or areas needing retreatment should be completed while woody vegetation is small and most vulnerable.
- Additional treatments will be needed to achieve effective control of pervasive plant species through reapplication.



Image courtesy of Corteva Agriscience



MANAGEMENT



- Disturbed areas will need to be revegetated if existing seed sources will not provide adequate cover from natural reseeding.
- A grazing management plan is recommended to insure establishment and maintenance of the desired plant community. Recovery may require deferment for one or two consecutive growing seasons following treatment.
- A minimum of 90 days deferment during the growing season is recommended.



IMPROPER GRAZING POST-TREATMENT



Natural
Resources
Conservation
Service

nrcs.usda.gov/

PROPER GRAZING POST-TREATMENT



Natural
Resources
Conservation
Service

nrcs.usda.gov/

REFERENCES/QUESTIONS?



- USDA-Natural Resources Conservation Service, Field Office Technical Guide, Section IV
- Texas A&M AgriLife Extension, Brush Management Methods, Publication B-5004
- Texas A&M AgriLife Extension, Brush Busters Publications
- Center for Natural Resource Information Technology (CNRIT), PestMan
- Chemical Weed and Brush Control Suggestions for Rangeland, ERM-1466
- Chemical Company Representatives

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident. Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English. To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. USDA is an equal opportunity provider, employer, and lender

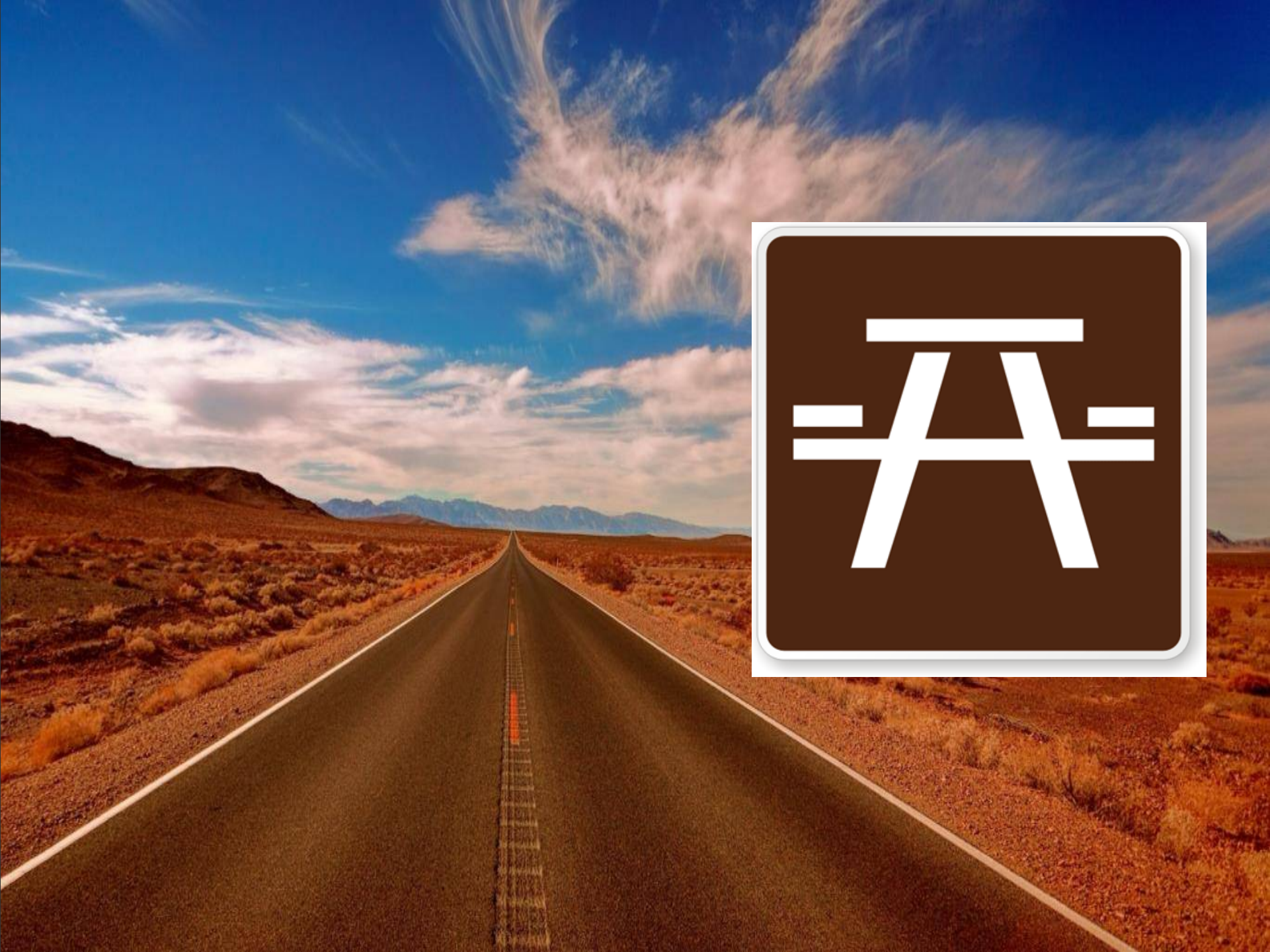


Best Management Practices for Water Quality



Brush Management Workshop
March 7, 2019

Lori Hazel
Forester, Water Resources



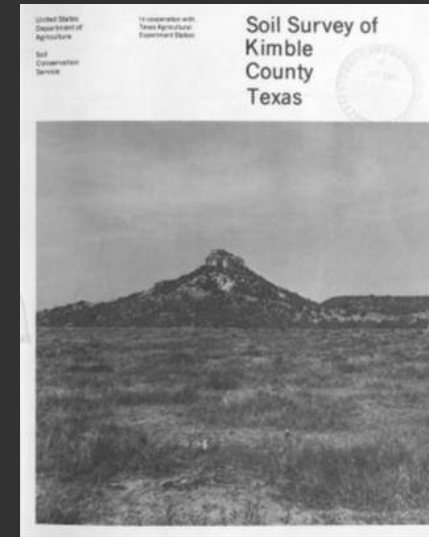
Planning and Layout



Aerial Photos



Topographic Maps



NRCS Soil Surveys



Field Reconnaissance



Landowner Maps



Weather Reports

Environmental Considerations

- Planning and Layout
- Timing / Scheduling Operations
- Conducting Operations
- Site Closeout

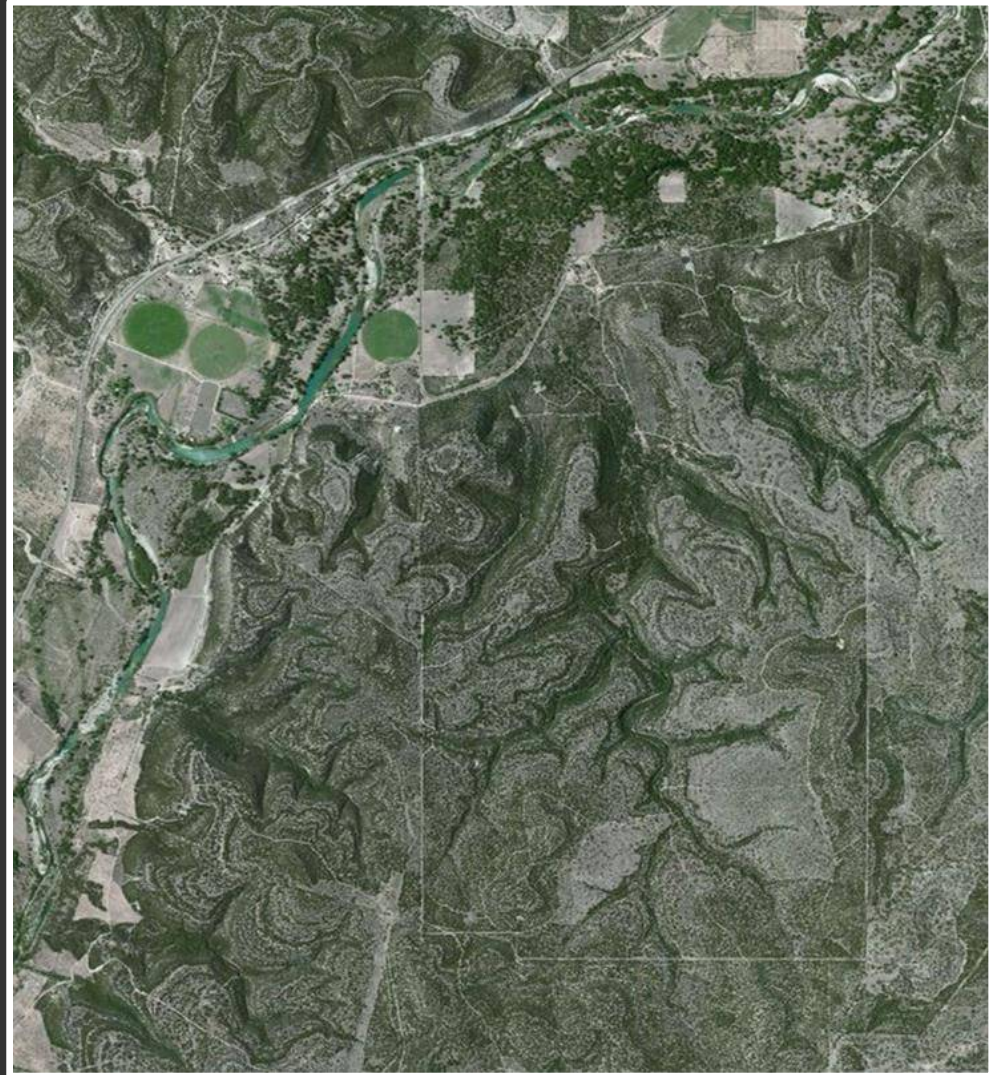
Aerial Photos

Aerial photos can be a very helpful tool in the planning and layout of your operation. They can help you identify:

- Streams
- Existing roads
- Utility R-O-Ws
- Property boundaries
- Structures
- Vegetative cover types

There are several places to obtain current aerial photos including:

- Farm Services Agency
- Texas A&M Forest Service
- Google Earth
- Google Maps



Topographic Maps

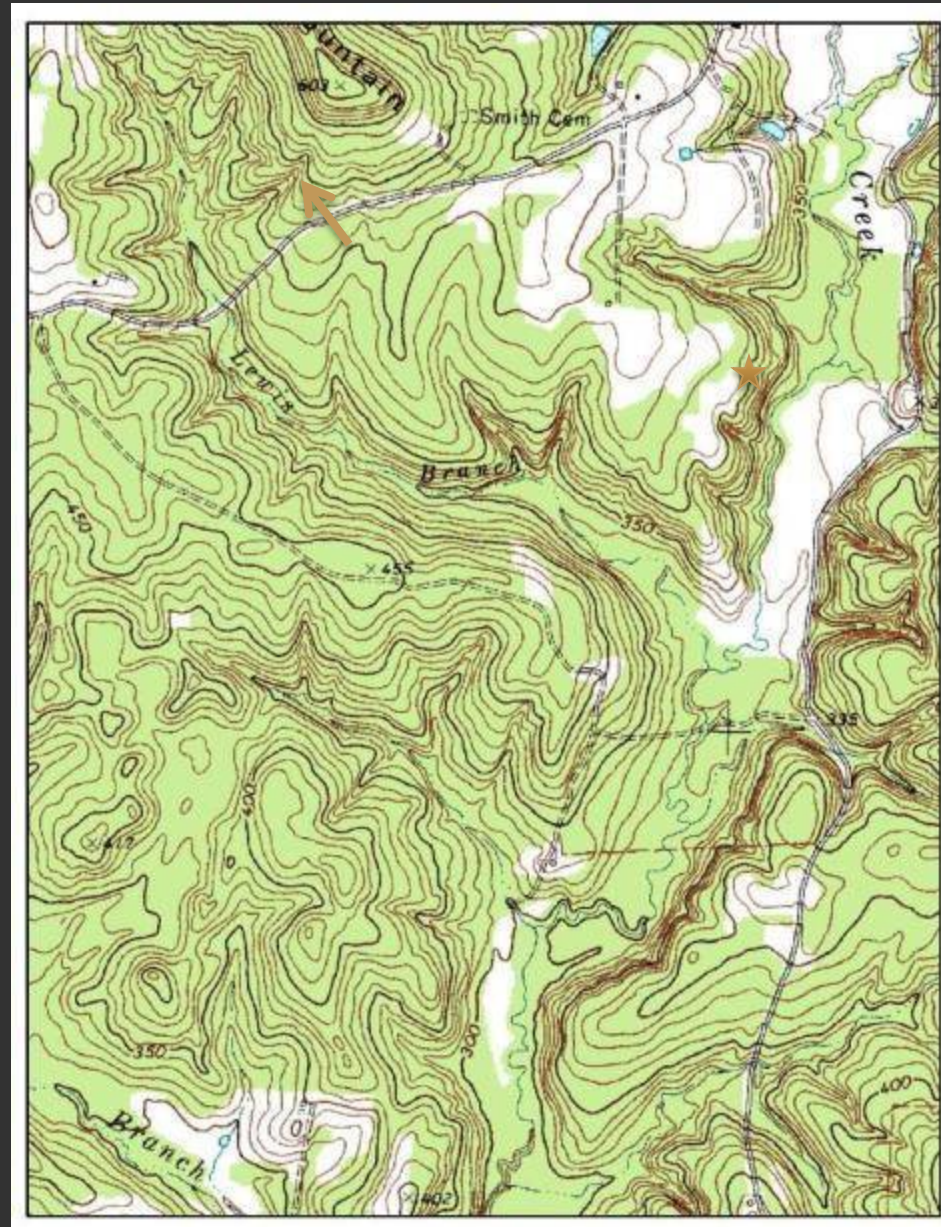
Topographic maps display 3D topography on a 2D map.

They can help you identify:

- Elevations (slopes, ridges)
- Existing roads
- New road locations
- Stream types
- Sensitive areas to avoid
- Vegetation

Topographic maps can be obtained from:

- USGS
- Texas A&M Forest Service
- Google Maps
- Sporting goods stores



Calculating Slope

- Clinometer
- Topographic Map
 - Measure line distance (run)
 - Count contour intervals (rise)
 - Slope = $(\text{Rise} / \text{Run}) * 100$

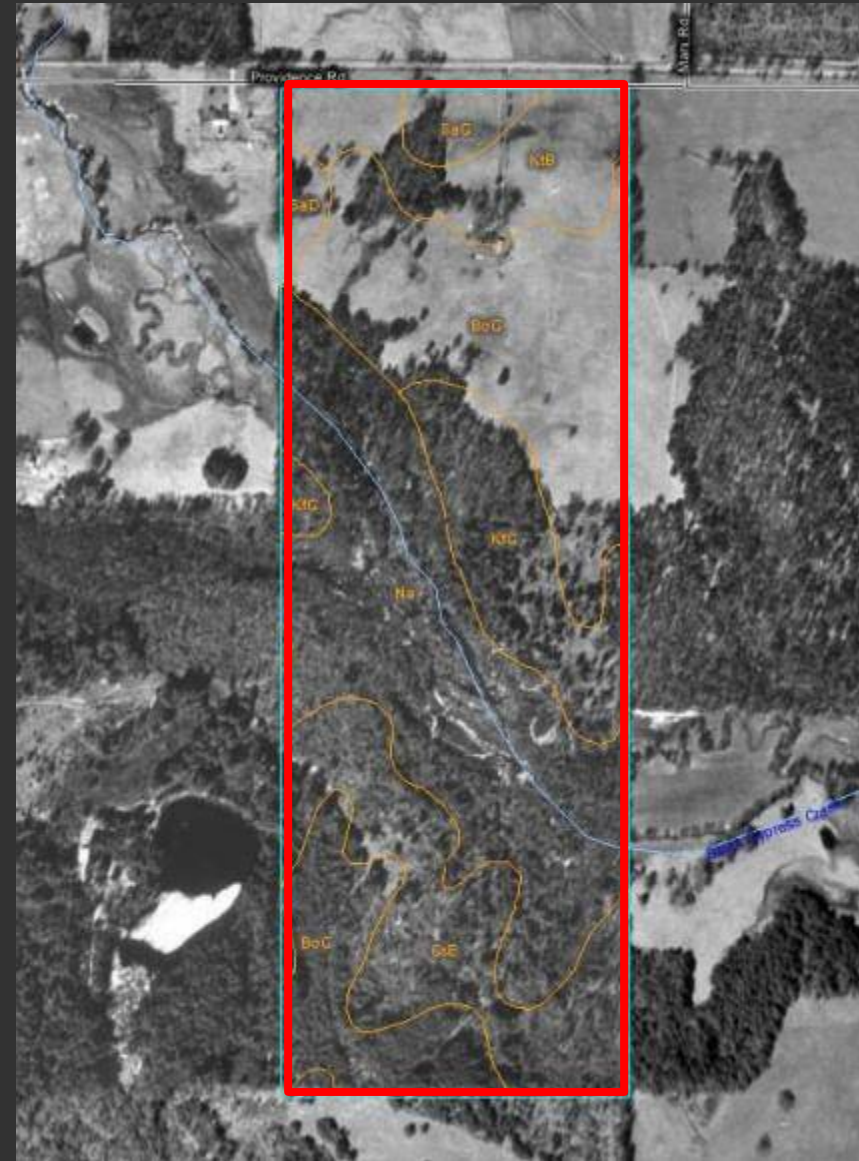
NRCS Soil Surveys

Soil surveys display areas with similar soil types delineated on an aerial photograph. Properties for each soil type are provided. Soil surveys can help determine:

- Erosion hazard
- Road suitability
- Equipment operability
- Rutting potential

Soil Surveys can be obtained from:

- NRCS
- [Web Soil Survey](#)



Soil Type

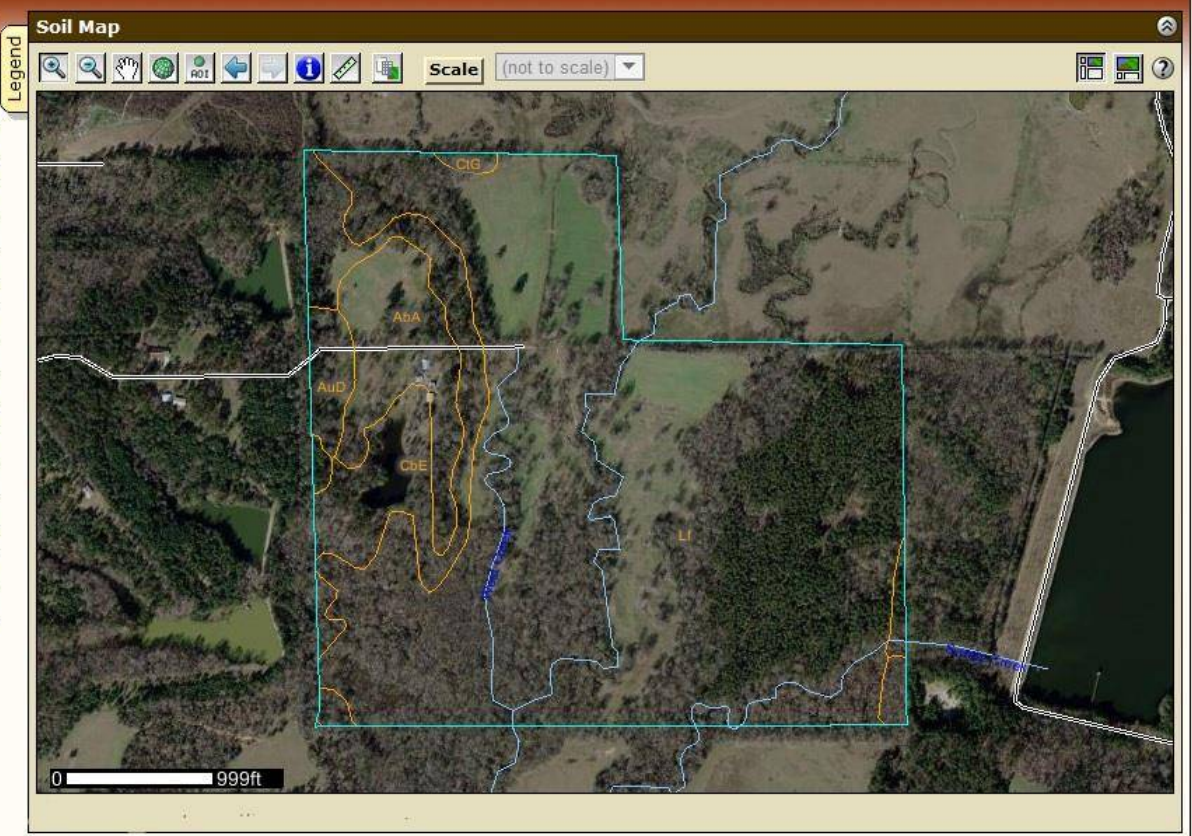
- Sand
 - Coarse particles, Best drainage, High erosion potential, good operability when wet
- Silt
 - Medium drainage
- Clay
 - Fine particles, Poor drainage, Low erosion potential, poor operability when wet



Area of Interest (AOI) | Soil Map | **Soil Data Explorer** | Shopping Cart (Free) | View Soil Information By Use: All Uses | Printable Version | Add to Shopping Cart

Intro to Soils | Suitabilities and Limitations for Use | Soil Properties and Qualities | Ecological Site Assessment | **Soil Reports**

- Search**
- Soil Reports**
- Open All | Close All
- AOI Inventory
 - Building Site Development
 - Construction Materials
 - Disaster Recovery Planning
 - Land Classifications
 - Land Management
 - Recreational Development
 - Sanitary Facilities
 - Soil Chemical Properties
 - Soil Erosion
 - Soil Physical Properties
 - Soil Qualities and Features
 - Vegetative Productivity
 - Waste Management
 - Water Features
 - Water Management



Link opens in new window



Discover & Explore an array of maps depicting forest conditions

Query & Download data and reports on a variety of forest interests

Applications

Timber Supply Analysis



Forest Distribution



Forest Ecosystem Values



Economic Impact



Map My Property



Urban Tree Canopy



Forest Products Directory



Timber Decision Simulator



Tree Trails



Forest Drought



Plan My Land Operation



My City's Trees



Forest Action Plan



Mobile Apps



Story Maps Gallery



Plan My Land Management Operation



- Find Location of Project Area
- Define Boundaries
- Sensitive Areas
- Soils
- Operational Considerations
- Culvert Size & Elevation Profile
- Measure
- Add Labels
- Add Linear Features
- Add Points of Interest
- Export Map to PDF



Find Location of Project Area

Plan My Land Operation v.2.1 TexasForestInfo.com About Contact Help TFS Home

Mouse Coordinates: Lat/Long is: 32.231449 / -98.886542

Hybrid Streets Topo Hydro Aerial

Find Location of Project Area

Type Address

Found: 13220 NW County Road 4020, Blooming Grove, Texas, 76626

OR

Type Latitude and Longitude

-
-
-
-
-
-
-
-
-
-

Define Boundaries

Mouse Coordinates: Lat/Long is: 32.077244 / -98.738720

Hybrid Streets Topo Hydro Aerial



Find Location of Project Area

Define Boundaries

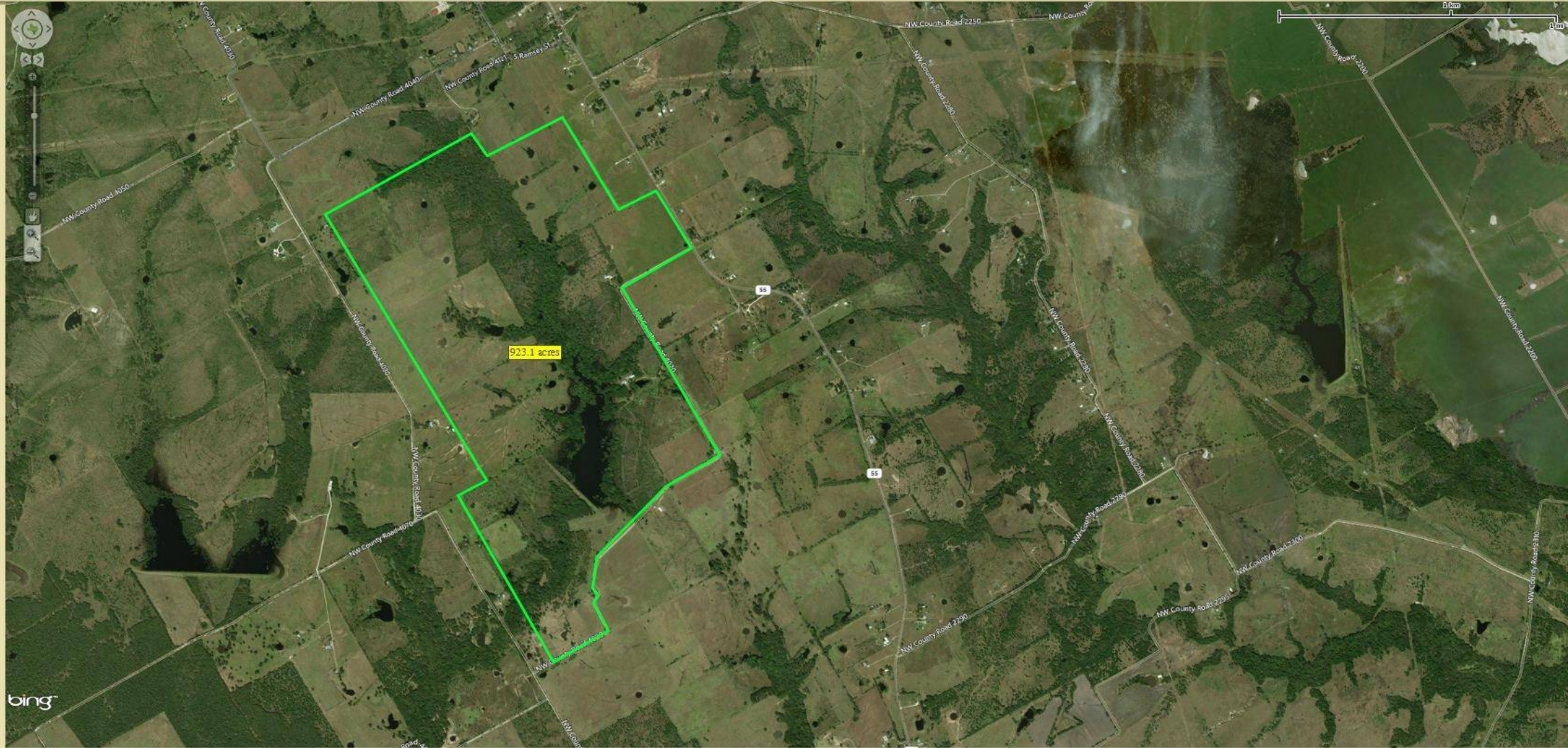
Boundary Outline

Color

Style

Width

Transparency



923.1 acres

Mouse Coordinates: Lat/Long

Find Location of Project Area

Define Boundaries

Sensitive Areas

Layer Transparency

0% 50% 100%

Streams

+ Stream Buffers (SMZ)

+ Severe Slopes (>8%)

- Wet Areas

35 feet Buffer

Clear layer

Report

Soils

Operational Considerations

Culvert Size & Elevation P

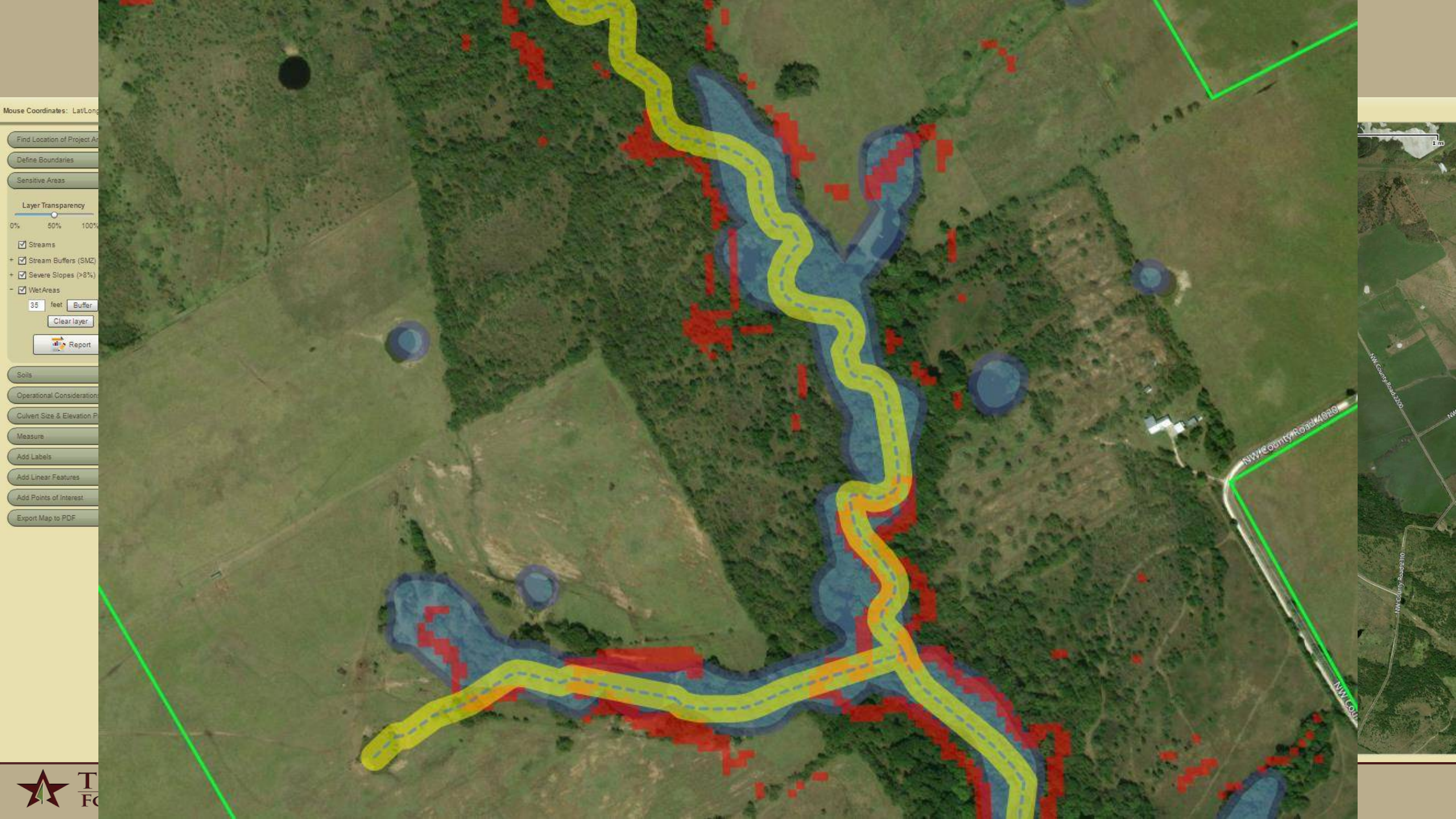
Measure

Add Labels

Add Linear Features

Add Points of Interest

Export Map to PDF



Plan My Land Operation

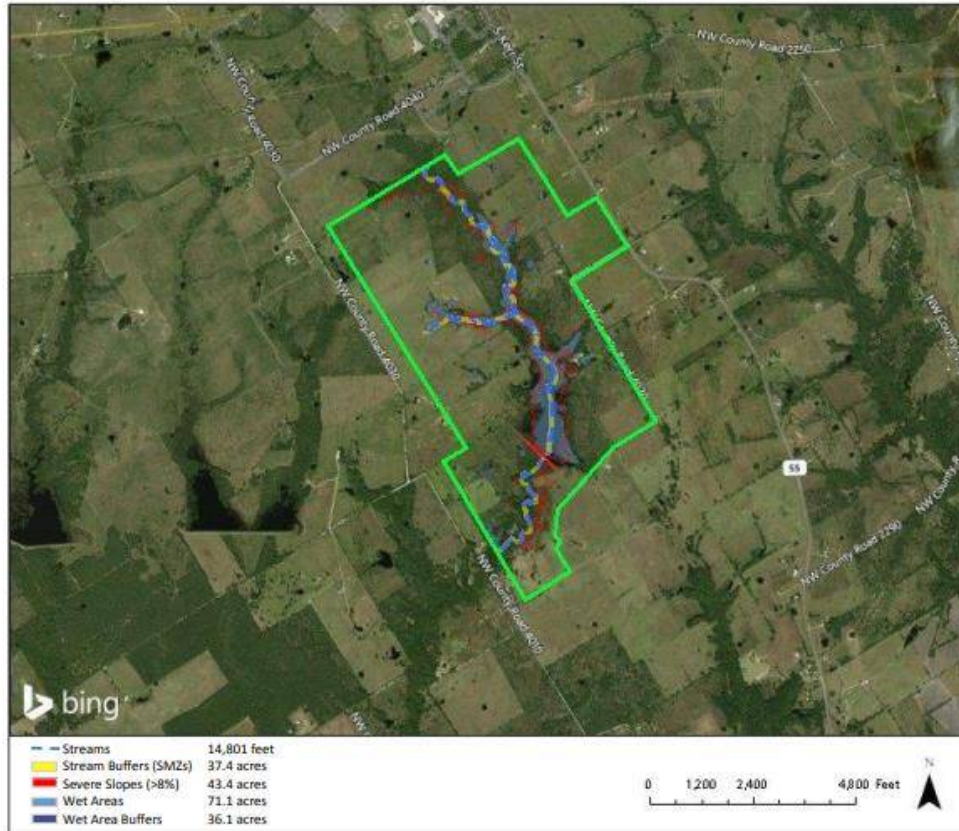
Sensitive Area Report



BGDemo

This report was produced using the *Plan My Land Operation* application that is accessed from the Texas Forest Information Portal found at TexasForestInfo.com. This application provides foresters and other natural resource professionals a way to explore an area and develop a plan for conducting a forest operation. Although it is primarily targeted to planning harvest operations in the traditional commercial timber-growing region of East Texas, operators may find it useful for planning other types of activities anywhere in state.

This report shows where sensitive areas occur within the project area. These areas are places where the land operator (e.g. logger) should avoid as much as possible when operating on the tract. They include streams as defined by the National Hydrography Dataset; stream buffers (user-defined width or default value of 50 feet); severe slopes (defined as those greater than 8%); wet areas as defined by the National Land Cover dataset 2011 wetland classes 90 and 95; and any wet area buffers as defined by the user.



Soils

Mouse Coordinates: Lat/Long is: 32.079098 / -98.738774

Hybrid Streets Topo Hydro Aerial

Find Location of Project Area

Define Boundaries

Sensitive Areas

Soils

Visible

Identify

0% 50% 100%

Layer Transparency

Clip

Clear Clipped Layer

Report

Operational Considerations

Culvert Size & Elevation Profile

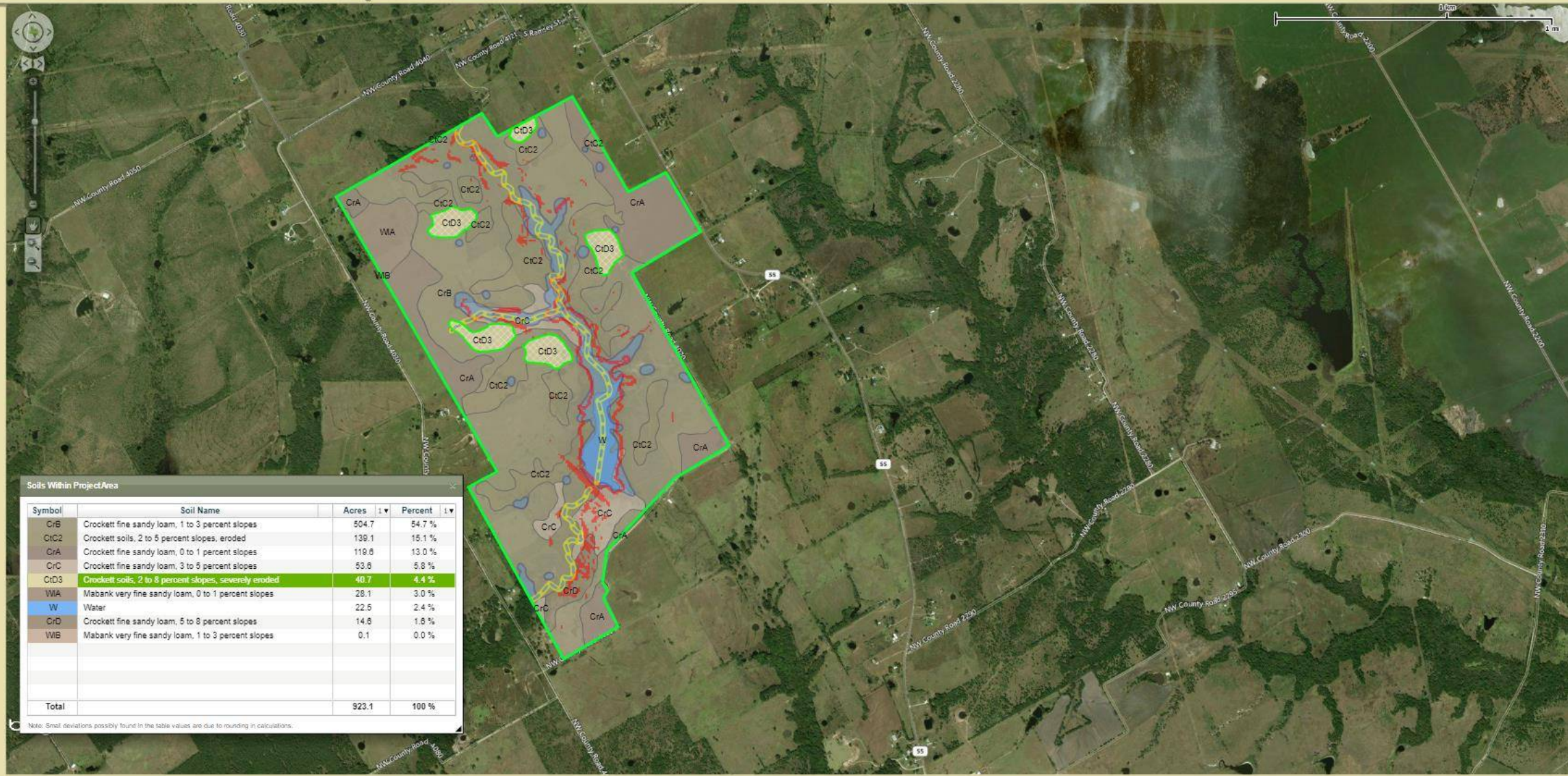
Measure

Add Labels

Add Linear Features

Add Points of Interest

Export Map to PDF



Soils Within Project Area

Symbol	Soil Name	Acres	Percent
CrB	Crockett fine sandy loam, 1 to 3 percent slopes	504.7	54.7 %
CrC2	Crockett soils, 2 to 5 percent slopes, eroded	139.1	15.1 %
CrA	Crockett fine sandy loam, 0 to 1 percent slopes	119.6	13.0 %
CrC	Crockett fine sandy loam, 3 to 5 percent slopes	53.6	5.8 %
CrD3	Crockett soils, 2 to 8 percent slopes, severely eroded	40.7	4.4 %
WIA	Mabank very fine sandy loam, 0 to 1 percent slopes	28.1	3.0 %
W	Water	22.5	2.4 %
CrD	Crockett fine sandy loam, 5 to 8 percent slopes	14.6	1.6 %
WB	Mabank very fine sandy loam, 1 to 3 percent slopes	0.1	0.0 %
Total		923.1	100 %

Note: Small deviations possibly found in the table values are due to rounding in calculations.

Plan My Land Operation

Project Area and Soils Report



BGDemo

This report was produced using the *Plan My Land Operation* application that is accessed from the Texas Forest Information Portal found at TexasForestInfo.com. This application provides foresters and other natural resource professionals a way to explore an area and develop a plan for conducting a forest operation. Although it is primarily targeted to planning harvest operations in the traditional commercial timber-growing region of East Texas, operators may find it useful for planning other types of activities anywhere in state.

This report includes a general project area summary that lists key site and soil attributes affecting operations and more detailed information on the various soils that can be found on the project area. Below is a map of the project area boundary. A soils map is also provided in the soils section. Additional maps can be produced by using the print functionality of the application. Also included are links to several informative publications (BMP Manual, brochures, and BMP fact sheets) that can be used to guide the planning process.



Soils Source: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture, Soil Survey Geographic (SSURGO) Database. Available online at <https://sdmdataaccess.sc.egov.usda.gov>. Accessed 12/16/2014



Plan My Land Operation

Project Area Summary

Project Area						
Project Name	Acres	County				
BGDemo	923.1	Navarro				
8-digit HUC Watershed	Latitude	Longitude				
12030108 Richland	32.065038	-96.710657				
TFS Contacts						
District	District Forester	District Forester Phone				
Palestine	Buster Robinson	903-729-7738				
Water Resources Forester	Water Resources Forester Phone					
Todd Thomas	936-639-8182					
Streams ¹ (feet)						
Perennial	Intermittent/Ephemeral					
0	11,157					
Sensitive Soils (acres)						
Drainage Class	-----					
<i>Excessively drained</i>	<i>Somewhat excessively drained</i>	<i>Well drained</i>	<i>Moderately well drained</i>	<i>Somewhat poorly drained</i>	<i>Poorly drained</i>	<i>Very poorly drained</i>
0.0	0.0	0.0	900.5	0.0	0.0	0.0
Wet Areas ²	Slope -----			-----		
71.1	<i>Severe (>8%)</i>			<i>Average</i>	<i>Maximum</i>	<i>Minimum</i>
	43.6			4.9%	26.6%	1.8%
Suitability for Roads and Log Landings	-----					
<i>Well Suited</i>	<i>Moderately suited</i>	<i>Poorly suited</i>	<i>Construction Limitations for Haul Roads and Log Landings</i>			
0.0	900.5	0.0	<i>Slight</i>	<i>Moderate</i>	<i>Severe</i>	
			0.0	900.5	0.0	
Erosion Hazard: Off-Road/Off-Trail	-----					
<i>Slight</i>	<i>Moderate</i>	<i>Severe</i>	<i>Very Severe</i>	<i>Erosion Hazard: Road/Trail</i>		
900.5	0.0	0.0	0.0	<i>Slight</i>	<i>Moderate</i>	<i>Severe</i>
				652.5	248.0	0.0
Harvest Equipment Operability	-----					
<i>Well suited</i>	<i>Moderately suited</i>	<i>Poorly suited</i>	<i>Soil Rutting Hazard</i>			
0.0	900.5	0.0	<i>Slight</i>	<i>Moderate</i>	<i>Severe</i>	
			0.0	0.0	900.5	

¹ Source: National Hydrography Dataset

² Source: National Wetlands Inventory

Soils



EAT DIRT!

It's important to get enough minerals in your diet.

Operational Considerations

Mouse Coordinates: Lat/Long is: 32.078077 / -98.647399

Hybrid Streets Topo Hydro Aerial

- Find Location of Project Area
- Define Boundaries
- Sensitive Areas
- Soils
- Operational Considerations

Layer Transparency ?

0% 50% 100%

- Drainage Class
- Suitability for Roads and Log Landings
- Construction Limitations for Haul Roads and Log Landings
- Erosion Hazard: Off-Road/Off-Trail
- Erosion Hazard: Road/Trail
- Harvest Equipment: Operability
- Soil Ruting Hazard

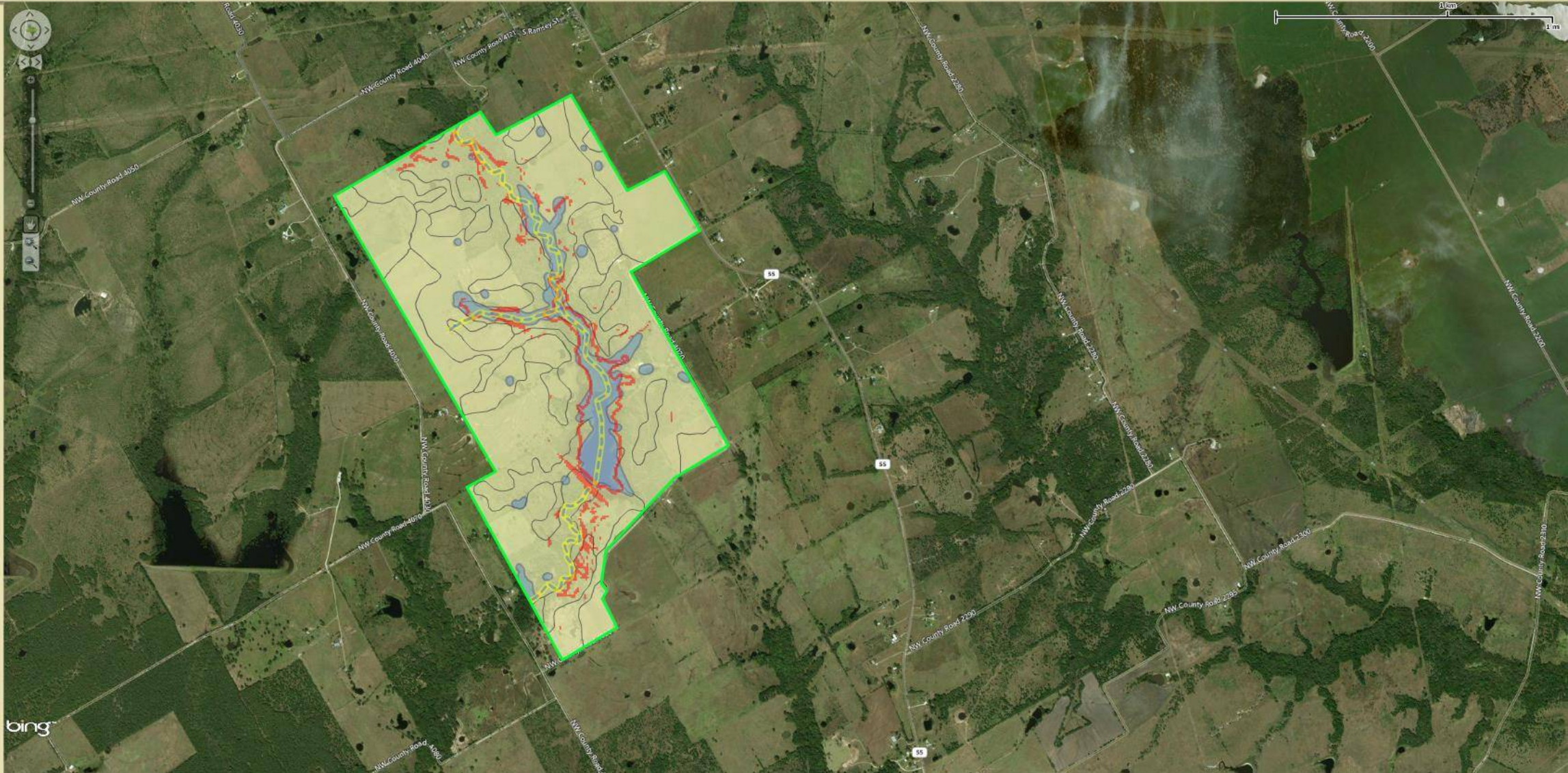
Legend

- Poorly suited
- Moderately suited
- Well suited
- Not rated

Clear layer

Report

- Culvert Size & Elevation Profile
- Measure
- Add Labels
- Add Linear Features
- Add Points of Interest
- Export Map to PDF



Operational Considerations

Mouse Coordinates: Lat/Long is: 32.081038 / -96.649744

Hybrid Streets Topo Hydro Aerial

- Find Location of Project Area
- Define Boundaries
- Sensitive Areas
- Soils
- Operational Considerations

Layer Transparency

- Drainage Class
- Suitability for Roads and Log Landings
- Construction Limitations for Haul Roads and Log Landings
- Erosion Hazard: Off-Road/Off-Trail
- Erosion Hazard: Road/Trail
- Harvest Equipment Operability
- Soil Rutting Hazard

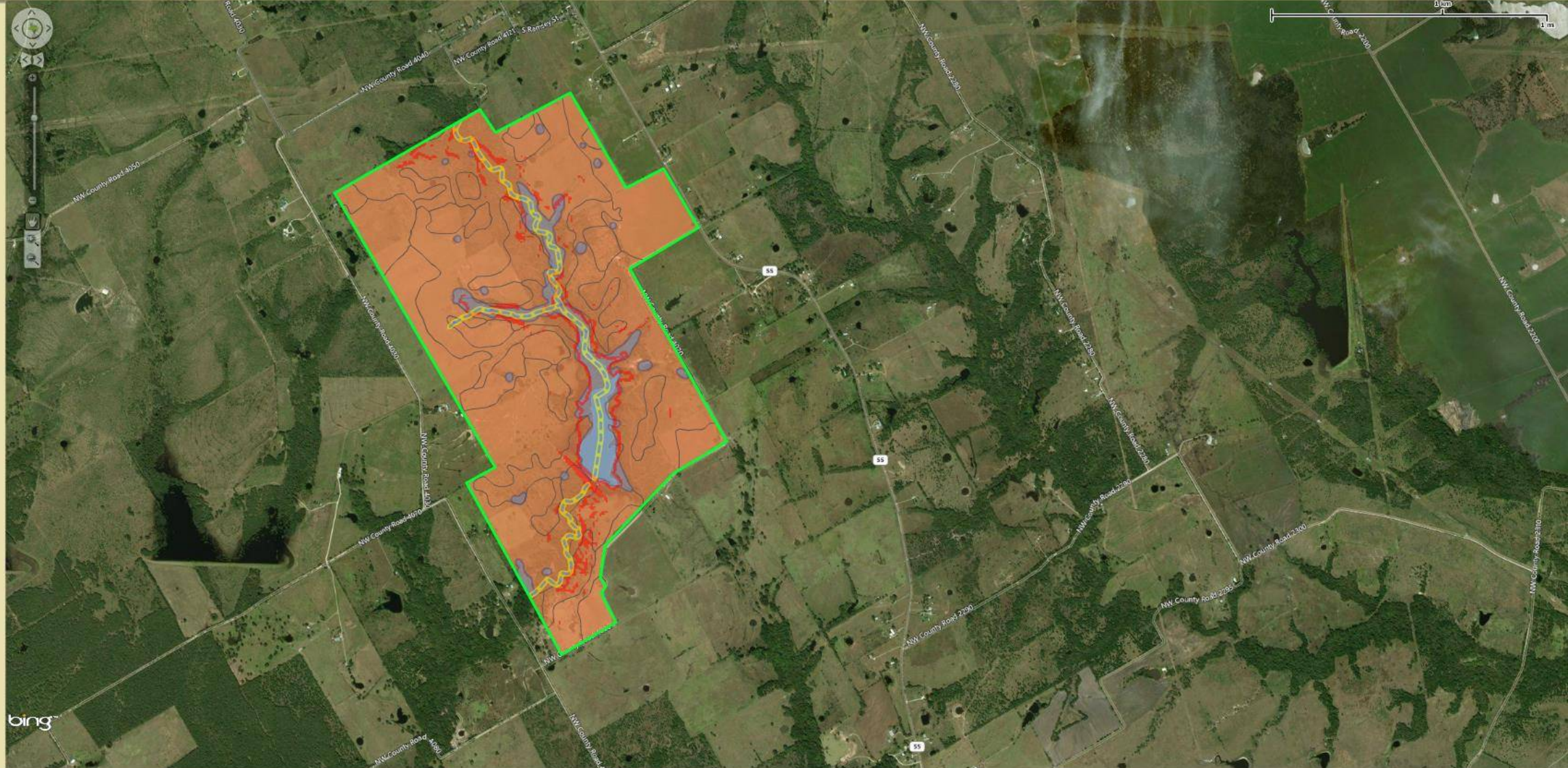
Legend

- Severe
- Moderate
- Slight
- Not rated

Clear layer

Report

- Culvert Size & Elevation Profile
- Measure
- Add Labels
- Add Linear Features
- Add Points of Interest
- Export Map to PDF



Plan My Land Operation

Operational Considerations Report

Erosion Hazard: Road/Trail



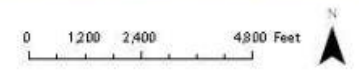
BGDEMO

This report was produced using the *Plan My Land Operation* application that is accessed from the Texas Forest Information Portal found at TexasForestInfo.com. This application provides foresters and other natural resource professionals a way to explore an area and develop a plan for conducting a forest operation. Although it is primarily targeted to planning harvest operations in the traditional commercial timber-growing region of East Texas, operators may find it useful for planning other types of activities anywhere in state.

This report shows how the various soils are classified within the project area in regards to Erosion Hazard (Road, Trail) as provided in the NRCS's Soil Web Survey. The ratings in this interpretation indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments.



Severe	0.0 acres
Moderate	248.0 acres
Slight	652.5 acres
Not rated	22.5 acres



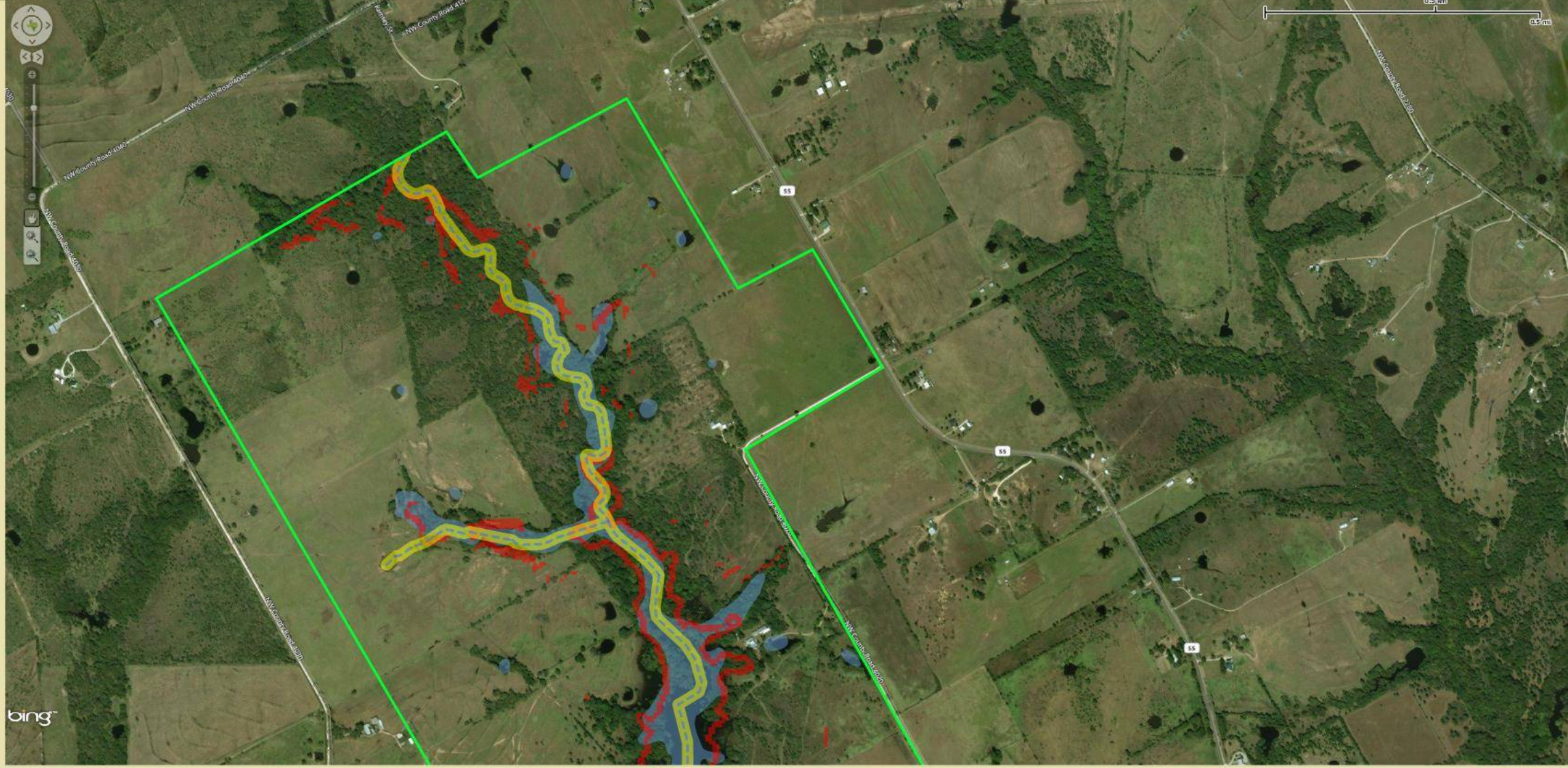
Culvert Size

Mouse Coordinates: Lat/Long is: 32.082339 / -96.678624

Hybrid Streets Topo Hydro Aerial

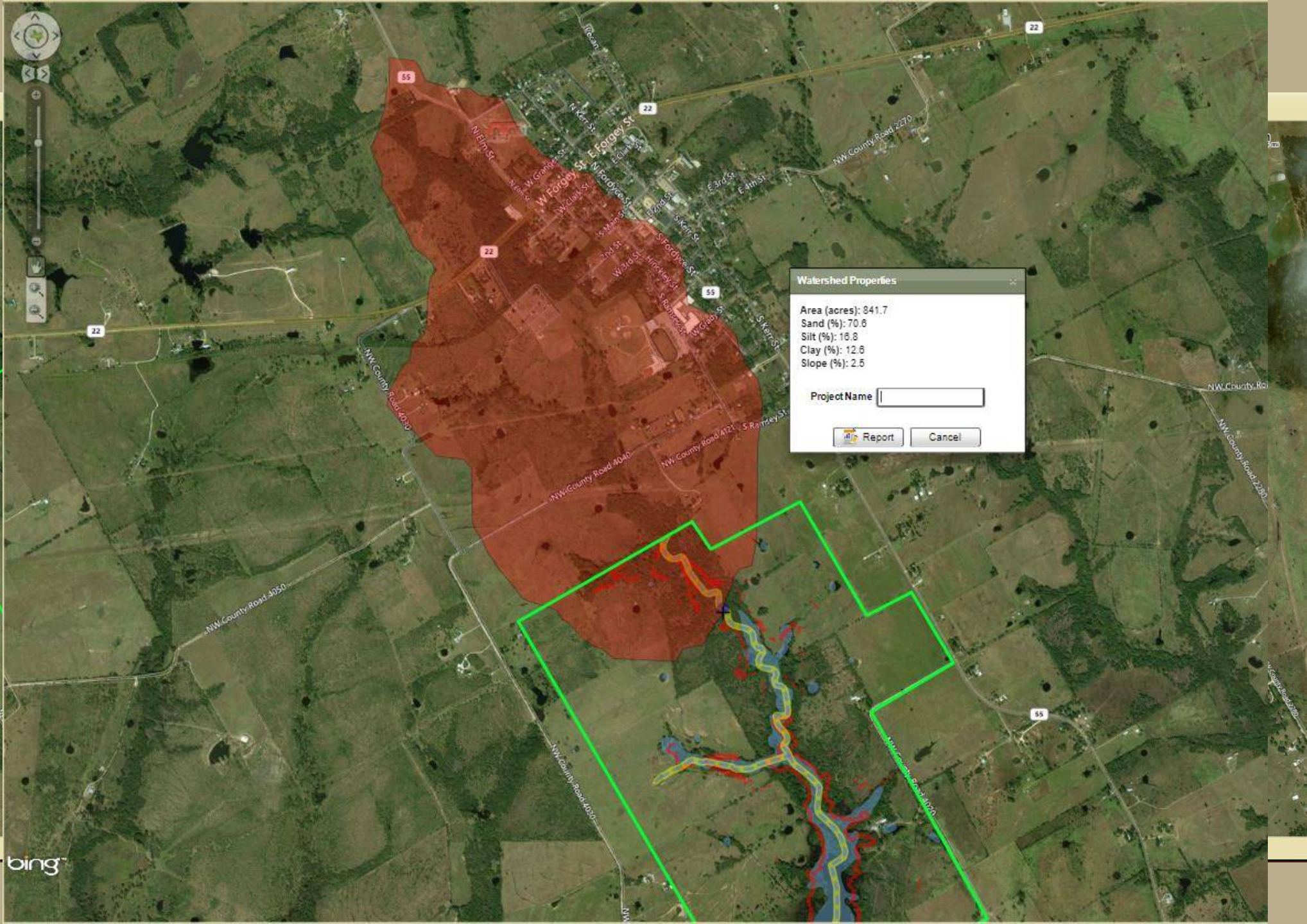
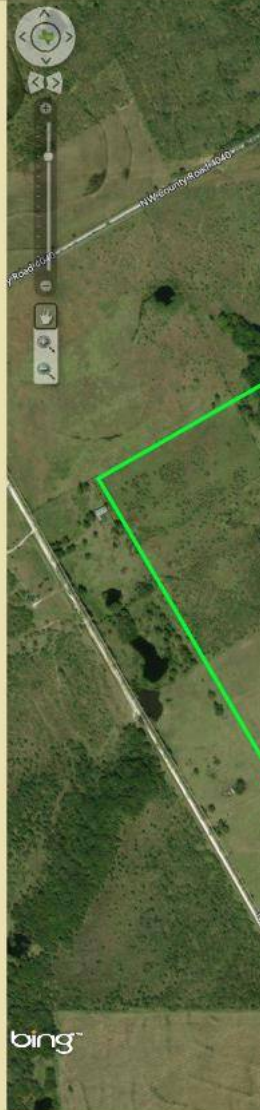


- Find Location of Project Area
- Define Boundaries
- Sensitive Areas
- Soils
- Operational Considerations
- Culvert Size & Elevation Profile
- Culvert Size
- Elev Profile
- Clear layer
- Measure
- Add Labels
- Add Linear Features
- Add Points of Interest
- Export Map to PDF



Mouse Coordinates: Lat/Long is: 32.072274 / -98.876151

- Find Location of Project Area
- Define Boundaries
- Sensitive Areas
- Soils
- Operational Considerations
- Culvert Size & Elevation Profile
- Culvert Size
- Elev Profile
- Clear layer
- Measure
- Add Labels
- Add Linear Features
- Add Points of Interest
- Export Map to PDF



Watershed Properties

Area (acres): 841.7
Sand (%): 70.6
Silt (%): 18.8
Clay (%): 12.6
Slope (%): 2.5

Project Name

Plan My Land Operation

Watershed Size/Culvert Size Report



BGDemo

This report was produced using the *Plan Land My Operation* application that is accessed from the Texas Forest Information Portal found at TexasForestInfo.com. It calculates size of watershed that drains to a user-defined point along a stream and recommends the minimum size culvert to use at that point. In determining the recommended culvert size, the application uses (1) acres drained, (2) soil texture, and (3) slope as provided in the culvert sizing chart found in the [Texas Forestry Best Management Practices Handbook](#).

Results of this analysis are:

Latitude: 32.070892
 Longitude: -96.708862
 Acres Drained: 65.0
 Mean Slope (%): 1.7
 Soil Texture: Sandy Loam
 Sand (%): 70.9
 Silt (%): 16.6
 Clay (%): 12.5

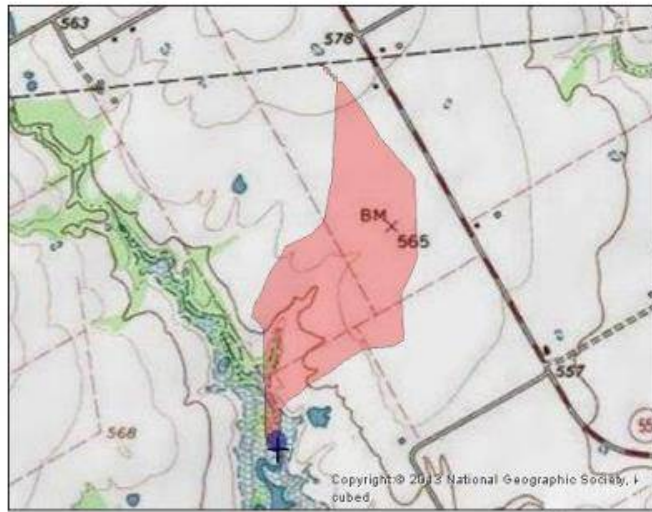
Recommended Minimum Culvert Diameter:

18 inches

Legend:

- User input point
- ✚ Pour point
- Watershed

Note: Pour point is a point within 30 meters of the user-defined point that drains the most area of the watershed.



Culvert Sizing Chart

Acres Drained	Light Soils (Sands)			Medium Soils (Loams)			Heavy Soils (Clays)		
	Flat <5%	Moderate 5-15%	Steep >15%	Flat <5%	Moderate 5-15%	Steep >15%	Flat <5%	Moderate 5-15%	Steep >15%
Minimum Culvert Diameter in Inches									
5	18	18	18	18	18	24	24	24	24
10	18	18	18	24	24	30	30	30	36
20	18	18	18	24	30	36	36	36	42
30	18	18	18	30	30	36	36	42	48
40	18	18	18	30	36	42	42	48	
50	18	18	18	30	36	48	48	48	
75	18	24	24	36	42				
100	24	24	24	36	48				
150	24	24	24	42					
200	24	30	30	48					
250	30	30	30						
300	30	36	36						
350	30	36	42						
400	36	36	42						

Plan My Land Operation

Watershed Size/Culvert Size Report



BGDemo

This report was produced using the *Plan Land My Operation* application that is accessed from the Texas Forest Information Portal found at TexasForestInfo.com. It calculates size of watershed that drains to a user-defined point along a stream and recommends the minimum size culvert to use at that point. In determining the recommended culvert size, the application uses (1) acres drained, (2) soil texture, and (3) slope as provided in the culvert sizing chart found in the [Texas Forestry Best Management Practices Handbook](#).

Results of this analysis are:

Latitude: 32.075091
 Longitude: -96.712196
 Acres Drained: 841.7
 Mean Slope (%): 2.5
 Soil Texture: Sandy Loam
 Sand (%): 70.6
 Silt (%): 16.8
 Clay (%): 12.6

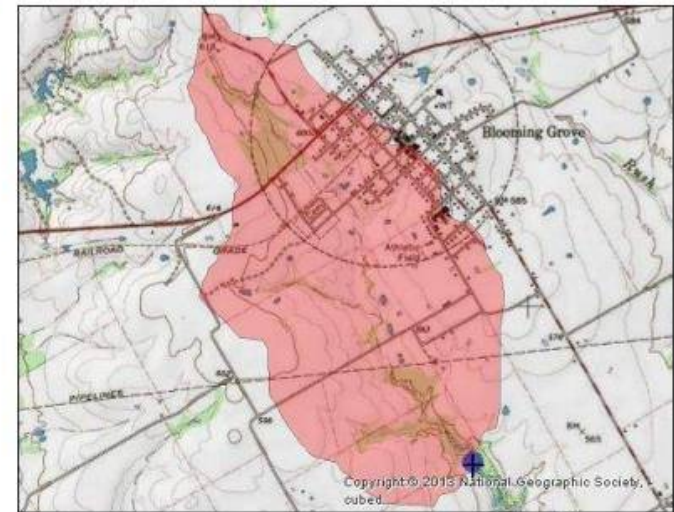
Recommended Minimum Culvert Diameter:

Off Chart

Legend:

- User input point
- ✚ Pour point
- Watershed

Note: Pour point is a point within 30 meters of the user-defined point that drains the most area of the watershed.



Culvert Sizing Chart

Acres Drained	Light Soils (Sands)			Medium Soils (Loams)			Heavy Soils (Clays)		
	Flat <5%	Moderate 5-15%	Steep >15%	Flat <5%	Moderate 5-15%	Steep >15%	Flat <5%	Moderate 5-15%	Steep >15%
Minimum Culvert Diameter in Inches									
5	18	18	18	18	18	24	24	24	24
10	18	18	18	24	24	30	30	30	36
20	18	18	18	24	30	36	36	36	42
30	18	18	18	30	30	36	36	42	48
40	18	18	18	30	36	42	42	48	
50	18	18	18	30	36	48	48	48	
75	18	24	24	36	42				
100	24	24	24	36	48				
150	24	24	24	42					
200	24	30	30	48					
250	30	30	30						
300	30	36	36						
350	30	36	42						
400	36	36	42						

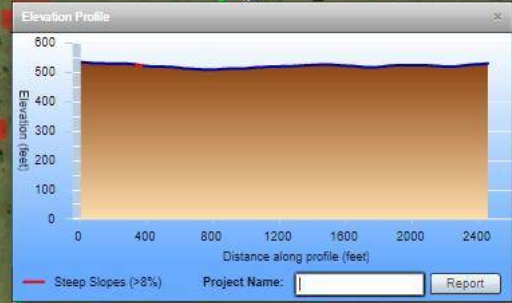
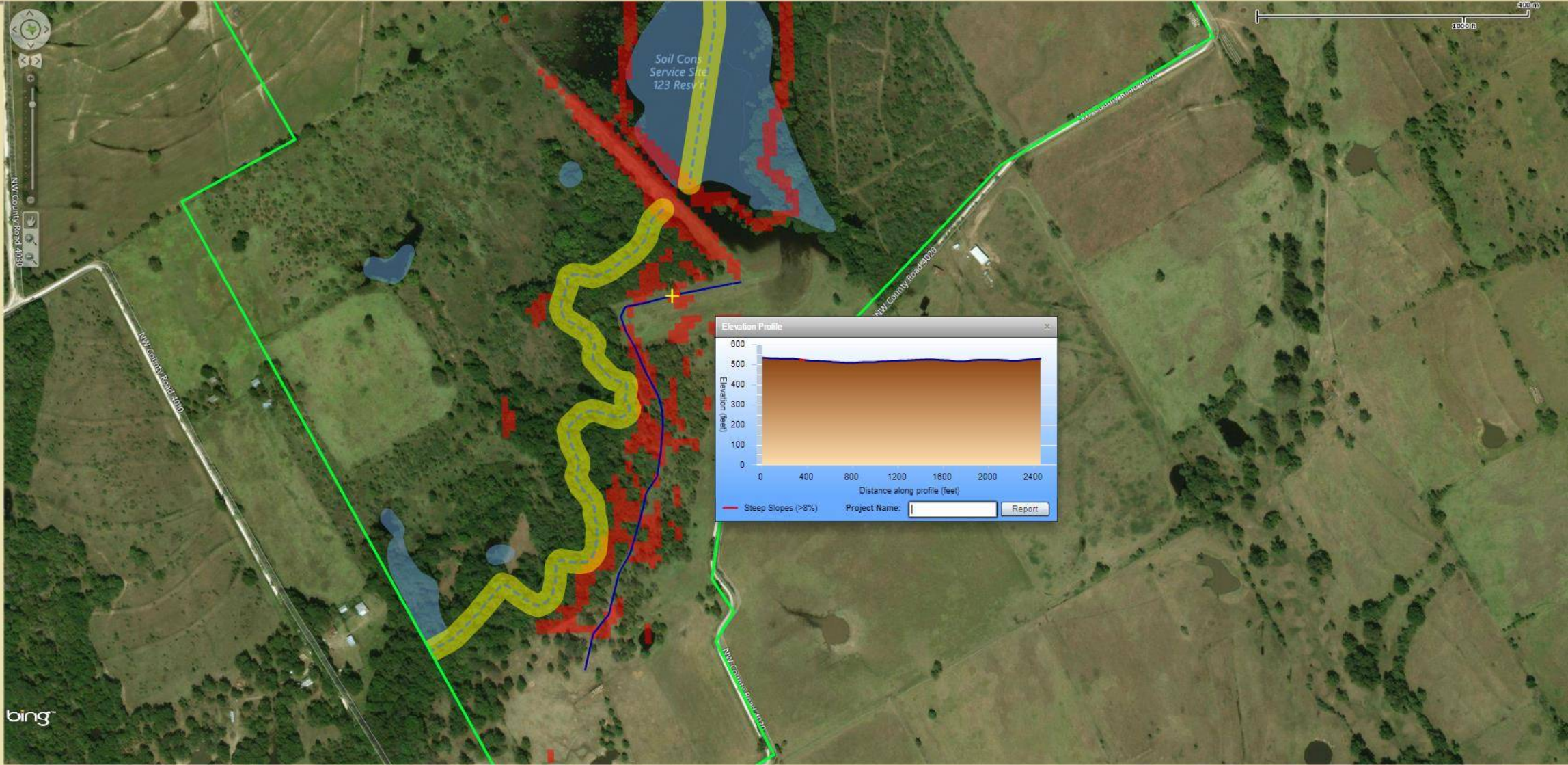
Elevation Profile

Mouse Coordinates: Lat/Long is: 32.055888 / -98.892945

Hybrid Streets Topo Hydro Aerial



- Find Location of Project Area
 - Define Boundaries
 - Sensitive Areas
 - Soils
 - Operational Considerations
 - Culvert Size & Elevation Profile
- Culvert Size ?
- Elev Profile
- Base Sea Level
- Clear layer
- Measure
- Add Labels
- Add Linear Features
- Add Points of Interest
- Export Map to PDF



Plan My Land Operation



Elevation Profile Report

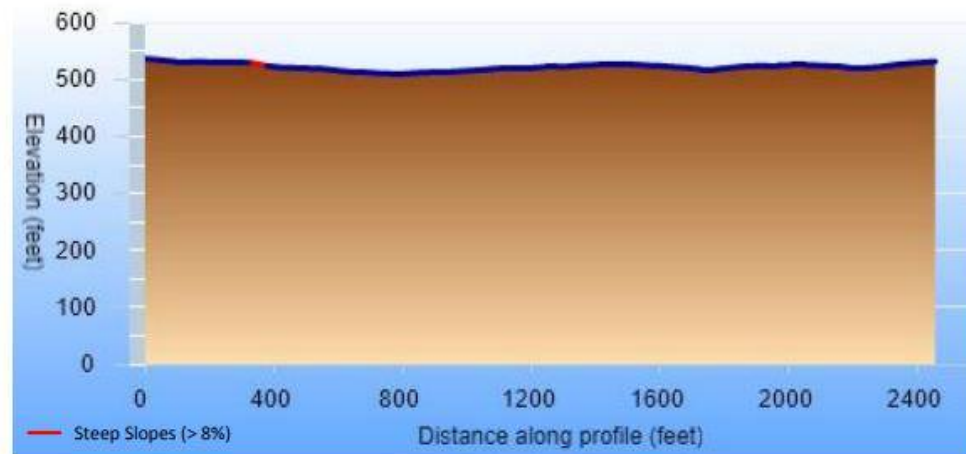
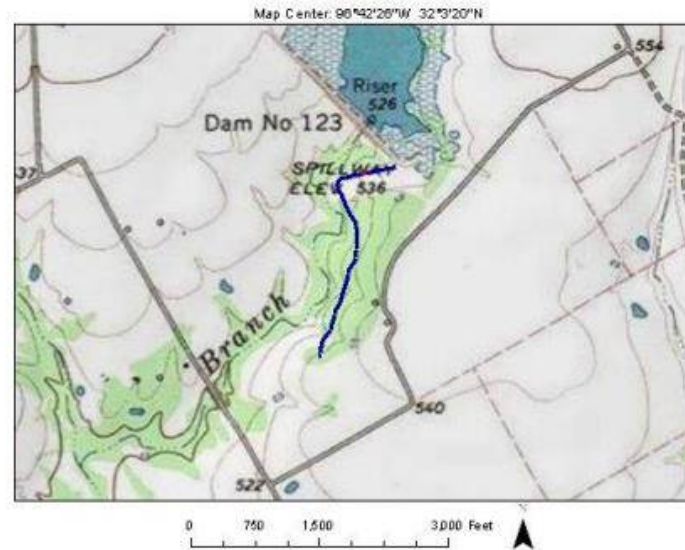
BGDemo

This report was produced using the *Plan My Land Operation* application that is accessed from the Texas Forest Information Portal found at TexasForestInfo.com. It displays the elevation profile, slope, and distance of a user-defined linear feature. This information can be useful in installing appropriate erosion control structures where necessary.

Results of this analysis are:

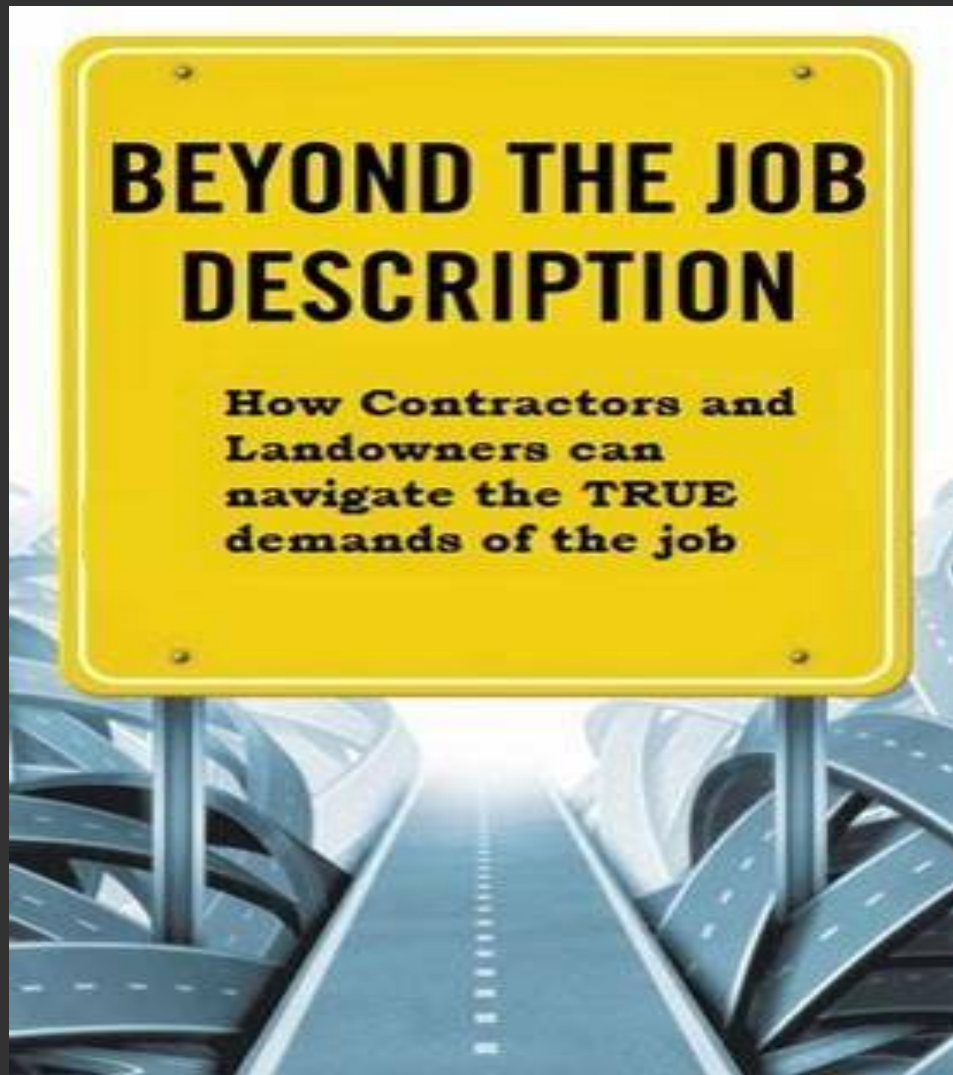
Total Distance: 2,456 ft
Maximum Slope: 10.5%
Minimum Slope: 0.0%
Mean Slope: 3.1%
Steep Slopes (> 8%): 44.0 ft

Elevation Range: 27 ft
Minimum Elevation: 510 ft
Maximum Elevation: 536 ft
Total Elevation Gain: 36 ft
Total Elevation Lost: 42 ft



BEYOND THE JOB DESCRIPTION

**How Contractors and
Landowners can
navigate the TRUE
demands of the job**



Timing / Scheduling Operations

- Weather Patterns
- Seasonal Conditions
- Wildlife / Natural Resource Concerns

Site Reconnaissance

Of course, nothing better prepares you in your planning stage than actually visiting the site.

Here are a few things to look for when visiting the tract:

1. Condition of existing roads
2. Presence of water features
3. Property boundaries
4. Stream crossing locations
5. Topography
6. Soil type



This “Legacy” road may have looked fine from an aerial photo, but shows severe erosion issues upon the site visit.





Wildlife / Natural Resource Concerns

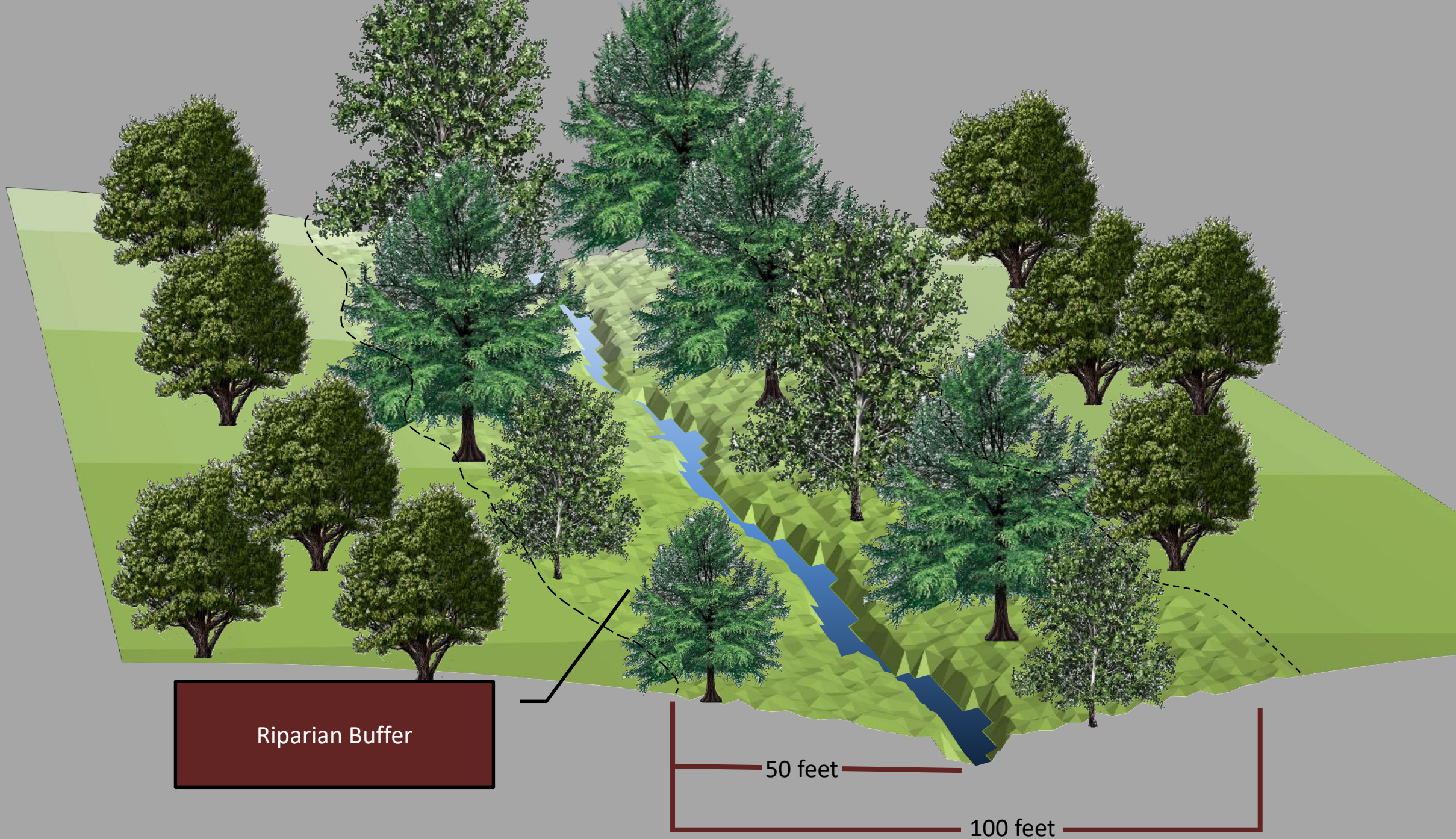
- Endangered Species
 - Breeding / nesting season
- Oak Wilt
 - Extra care Feb 1 – Jun 30
- Invasive species

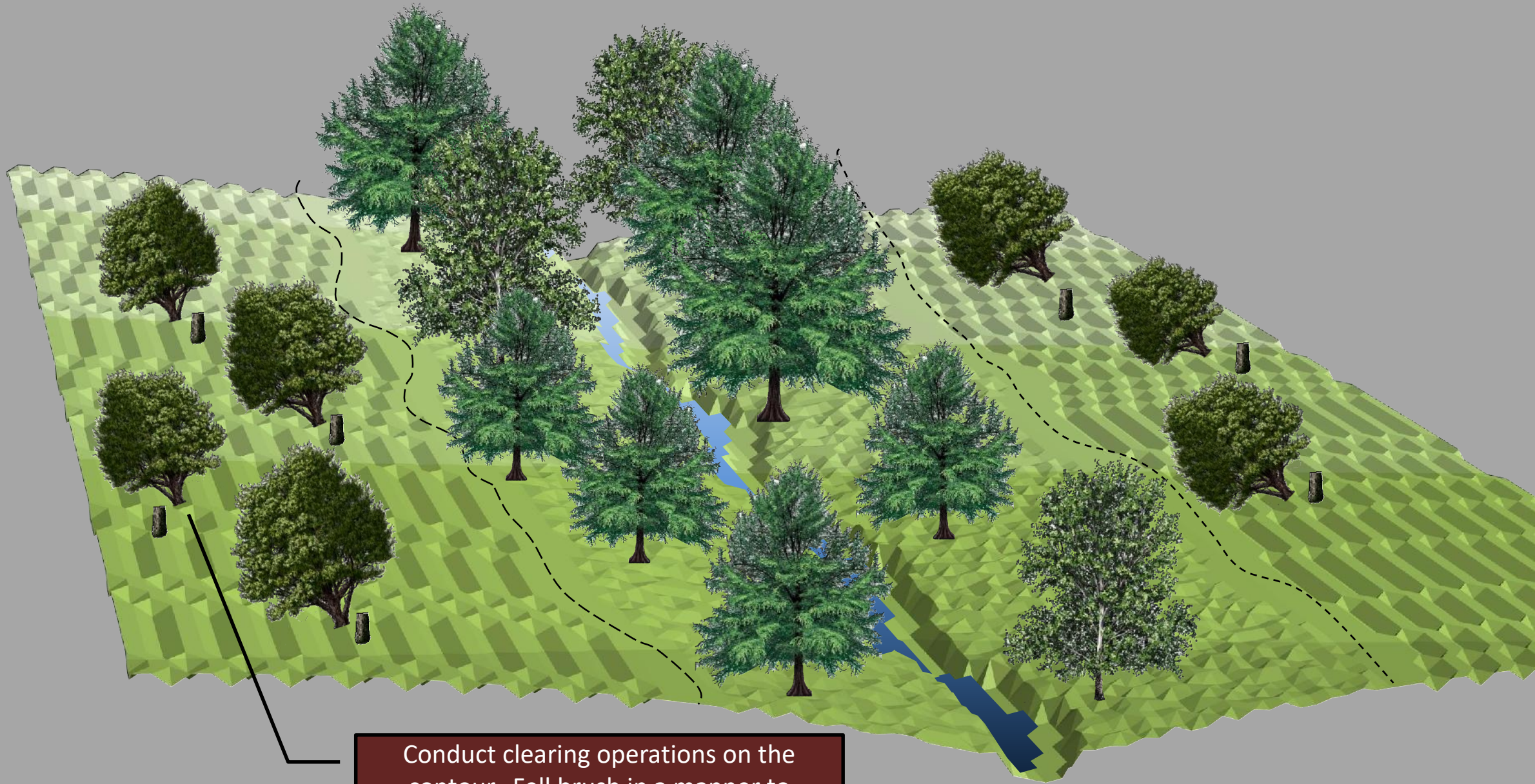


Conducting Operations

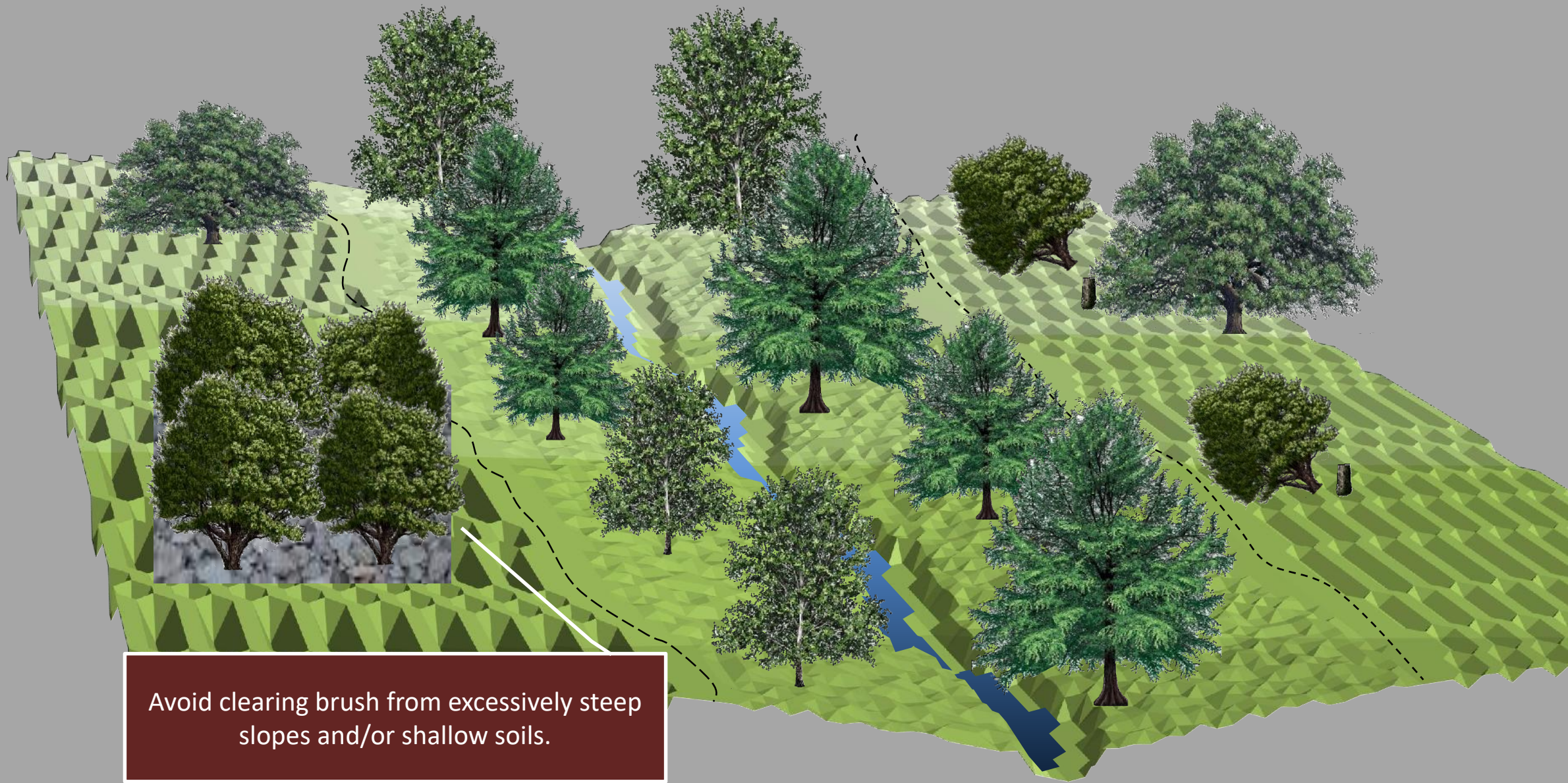
- Respect sensitive areas
- Protect water features
- Minimize site disturbance
- Follow the contour







Conduct clearing operations on the contour. Fell brush in a manner to prevent erosion. Avoid excessive soil disturbance. Maintain buffers.



Avoid clearing brush from excessively steep slopes and/or shallow soils.



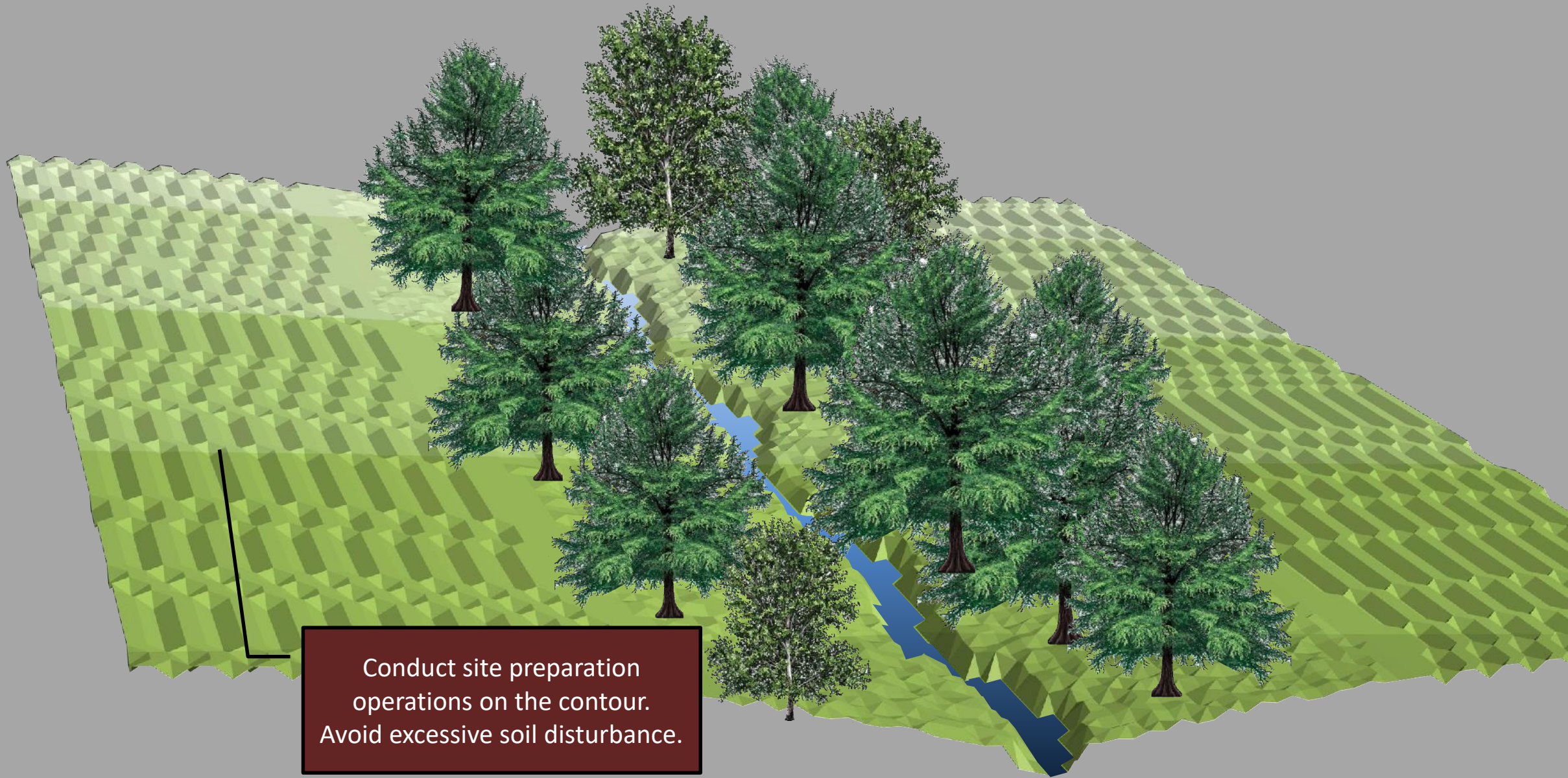
Take special care to avoid chemicals entering streams



Don't push brush or other debris
into streams



Minimize impacts to riparian areas when prescribed burning



Conduct site preparation operations on the contour. Avoid excessive soil disturbance.

Sensitive Areas

- Streams / Riparian Areas
- Wetlands
- Aquifer Recharge Areas
- Steep Slopes
- Unstable Soils

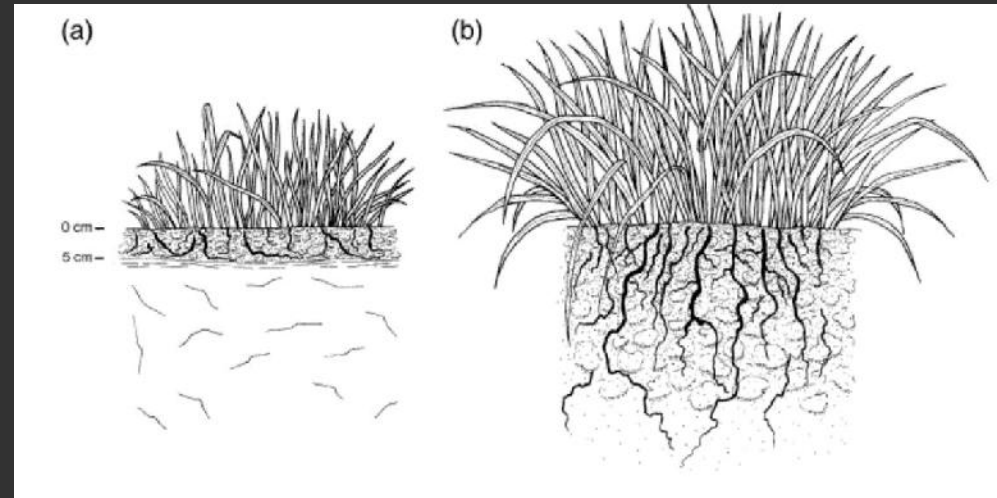
Protect Water Features

- Leave buffers where possible
- Minimize disturbance within these zones
- Install water control structures at edge of buffer
- Prevent roads, firelines from dumping into streams
- Don't push debris into stream
- Avoid or minimize stream crossings

Minimize Site Disturbance

➤ Excessive soil disturbance

➤ Soil compaction



➤ Damage to residual trees

Don't Operate in Saturated Soils



Stream Crossings

- Avoid crossing streams when possible – go around
- If crossing is necessary, minimize the number and size of crossings
- Pick a small, straight section with low banks to cross
- Avoid filling a stream with too much dirt

Know Where the Stream Crossings are Located



Site Closeout

- Fix potential erosion problems
- Restore stream crossings
- Clean up trash

Fix Potential Erosion Problems

- Focus on problem areas
 - Slope, Soil Type, and Run (distance) can be indicators
- Install erosion control structures
 - Waterbars, wing ditches, etc.
 - Space properly
 - Technical specifications found in TFS BMP manual / NRCS FOTG
- Be careful where you discharge runoff



Restore Stream Crossings

- Remove temporary crossings
- Stabilize approaches to stream

Clean up Trash







Lori Hazel

Texas A&M Forest Service

101 S. Main St

Temple, TX 76501

Phone: (254) 742-9874

Email: lhazel@tfs.tamu.edu