

# Role of Forests and Trees in Watershed Protection

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TEXAS A&M FOREST SERVICE



**TEXAS A&M**  
**FOREST SERVICE**

# Benefits Provided by Forests

- ▶ Wildlife Habitat
- ▶ Recreation
- ▶ Timber
- ▶ Clean Water



Forests provide the  
cleanest water of  
any land use

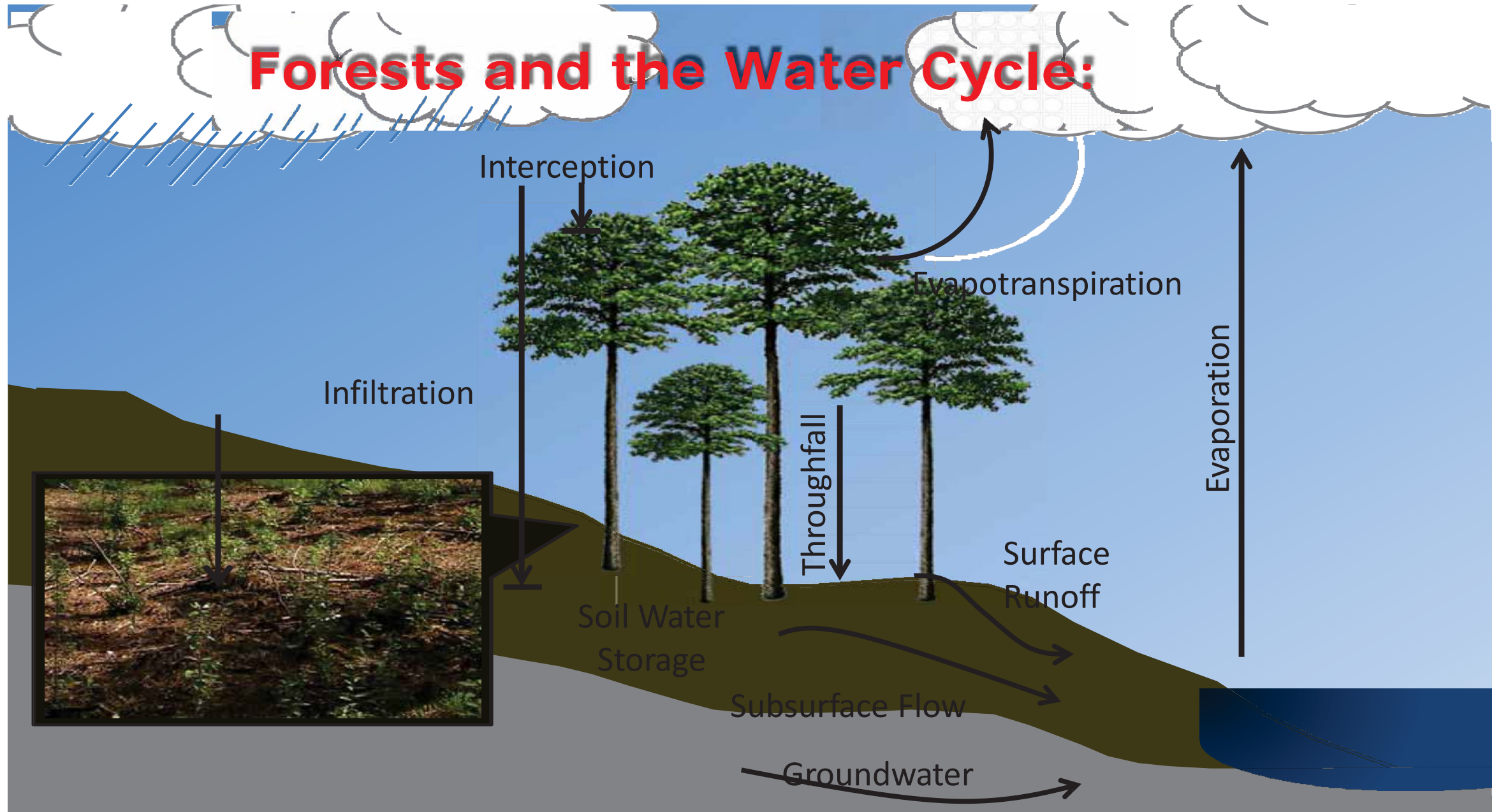


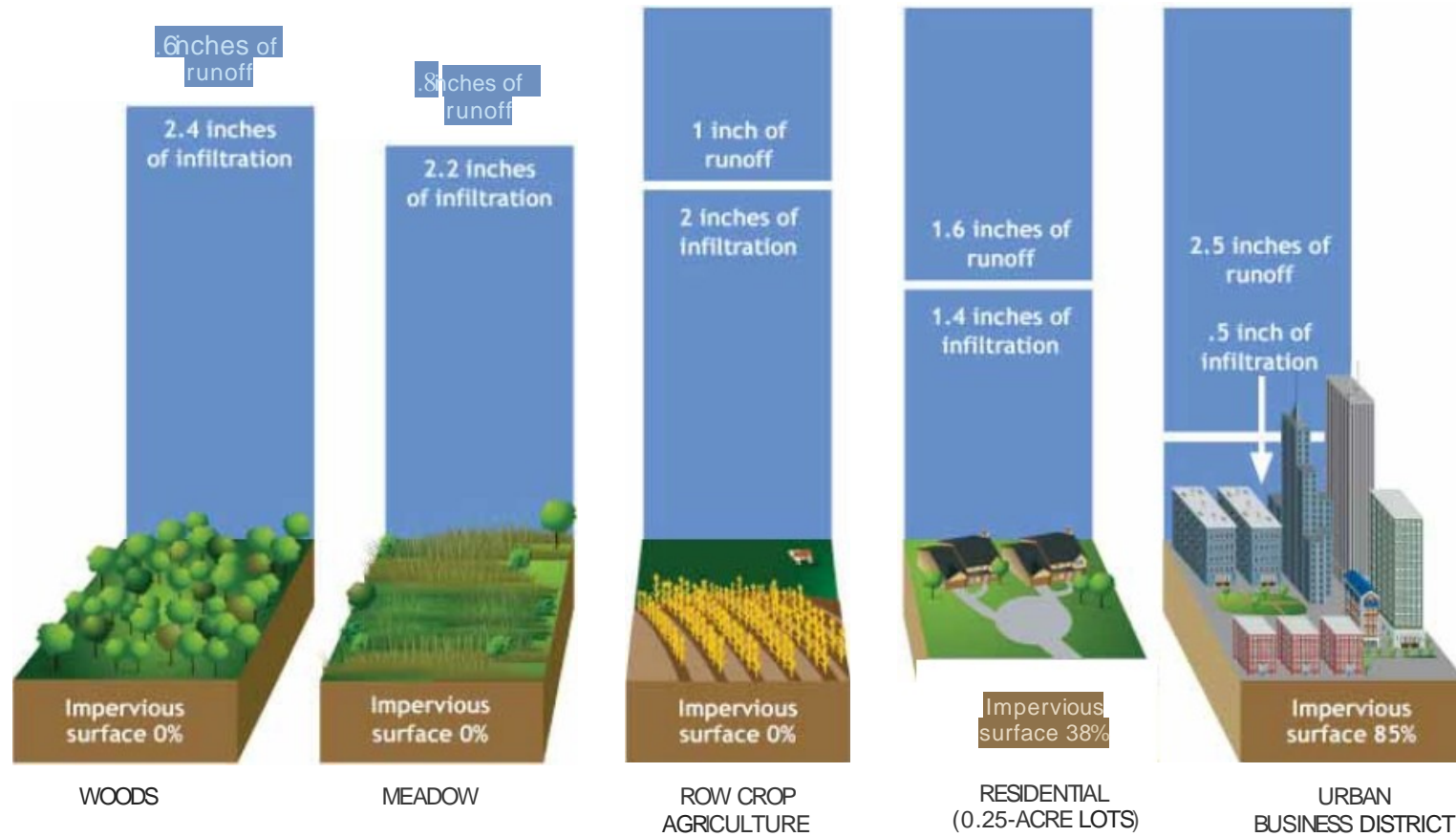


# Forests/Water Relationship

- ▶ Slowing Runoff
- ▶ Interception
- ▶ Enhancing infiltration
- ▶ Maintaining Temperature of Stream
- ▶ Preventing Floods
- ▶ Filtering Pollutants

# Forests and the Water Cycle:







# Increased Runoff:

- Increased frequency and severity of flooding
- Reduced ground water recharge
- Decreased base flow in streams
- Increased erosion
- Reduced natural filtration of the water
- Negative impact on stream health

# Polluted Runoff:

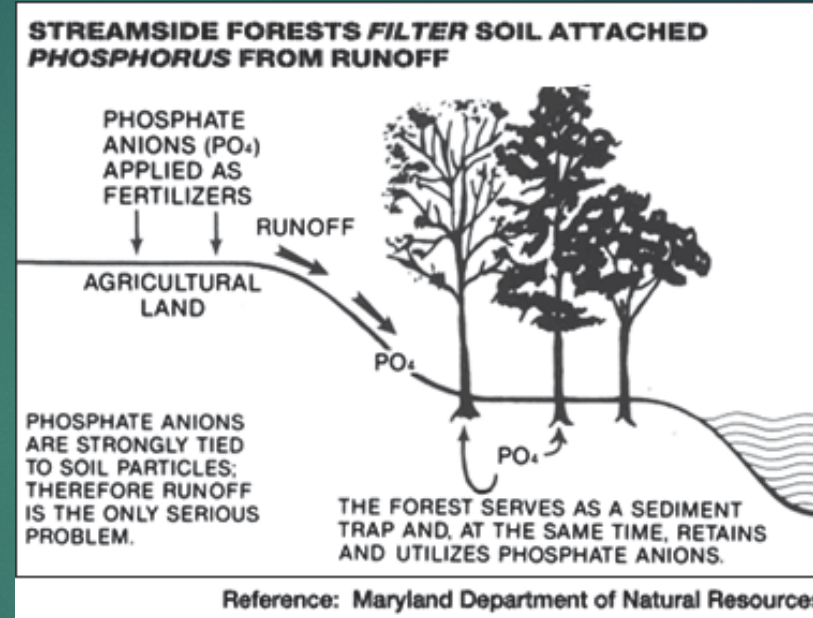
## ► “Nonpoint Source Pollution”

- Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas
- Oil, grease and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks
- Salt from irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes and faulty septic systems



# Forests Act as Pollutant Filters:

- Riparian vegetation **can remove metals, nutrients, and other chemicals from runoff** via plant uptake, and by facilitating bacterial transformation.



- Studies have shown that buffers along streams can **reduce Nitrogen and Phosphorous pollution by 80-90%**

## Effects on Water Temperature:

- Physiochemical effects
  - pH
  - Dissolved Oxygen
- Effects on aquatic life





# 2002 TPL and AWWA Study

- 27 water suppliers surveyed
  - For every 10%<sup>↑</sup> in forest cover, treatment costs<sup>↓</sup> 20%
  - 50–55% variation in treatment costs explained by % forest cover



# Watershed Protection

## BMPs

- Landowner level
  - Farm, Ranch, Forest
- Home owner level
  - Neighborhood, yard
- We can all make a difference!
  - Big and small efforts: All make up a piece of the pie

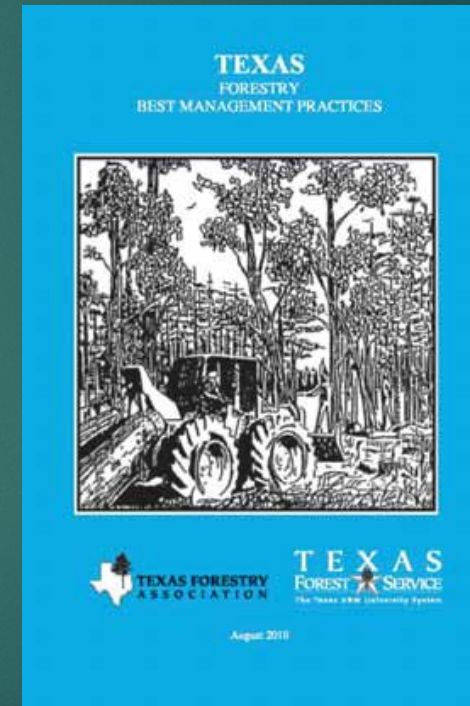




# Best Management Practices (BMPs)

Conservation practices implemented to protect water quality from nonpoint source (NPS) pollution

- Sediment
- Organic Material
- Silvicultural Chemicals
- Thermal Changes





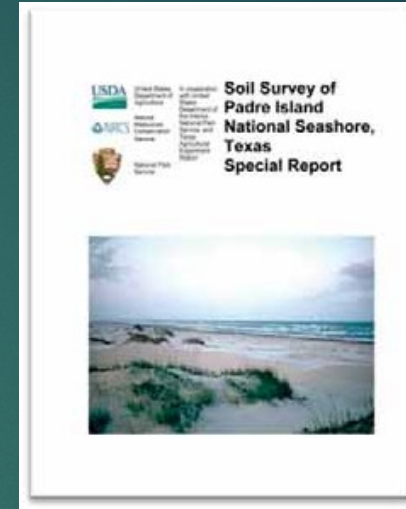
# Planning around Streams and Riparian Areas



Aerial Photos



Topographic Maps



USDA Soil Surveys



Field Reconnaissance



Landowner Maps

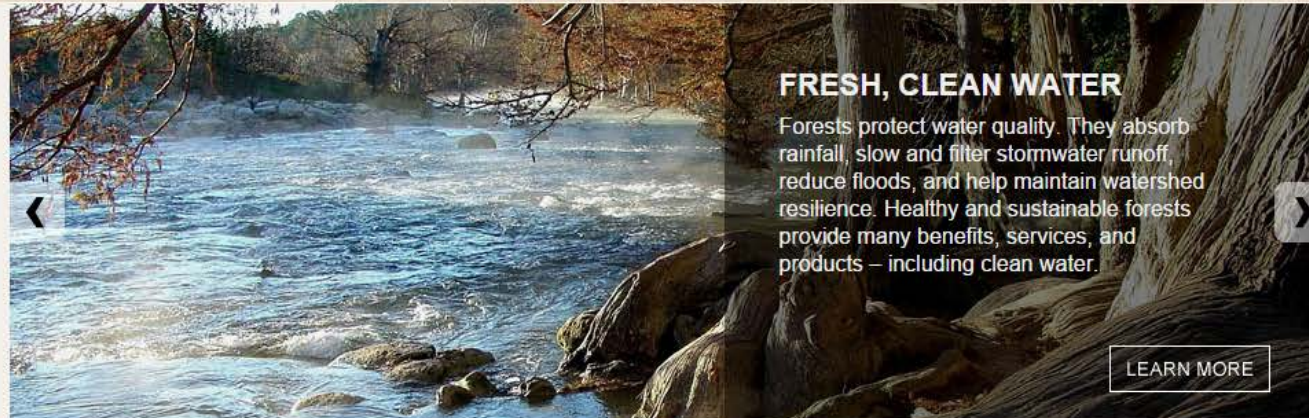


Weather Reports





[www.texasforestinfo.com](http://www.texasforestinfo.com)



**Discover & Explore** an array of maps depicting forest conditions

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

## Applications

Timber Supply Analysis <i>i</i>	Forest Distribution <i>i</i>	Forest Ecosystem Values <i>i</i>
Economic Impact <i>i</i>	Map My Property <i>i</i>	Urban Tree Canopy <i>i</i>
Forest Products Directory <i>i</i>	Timber Decision Simulator <i>i</i>	Tree Trails <i>i</i>
Forest Action Plan <i>i</i>	Plan My Land Operation <i>i</i>	Mobile Apps <i>i</i>

## About this Portal

Through Texas Forest Info, Texas A&M Forest Service provides landowners, managers, government officials, local community groups, and the public state-of-the-art access to information about trees and forest lands across the state.



Mouse Coordinates: Lat/Long is: 31.735215 / -94.341785

Hybrid Streets Topo Aerial

ESRI Aerial

Find Location of Property

Define Boundaries

Soils and Vegetation

☒ Soils

☐ Vegetation Type

☐ Visible


☒ Identify

0% 50% 100%

Layer Transparency

Clip

Clear Clipped Layer

 Soils Report

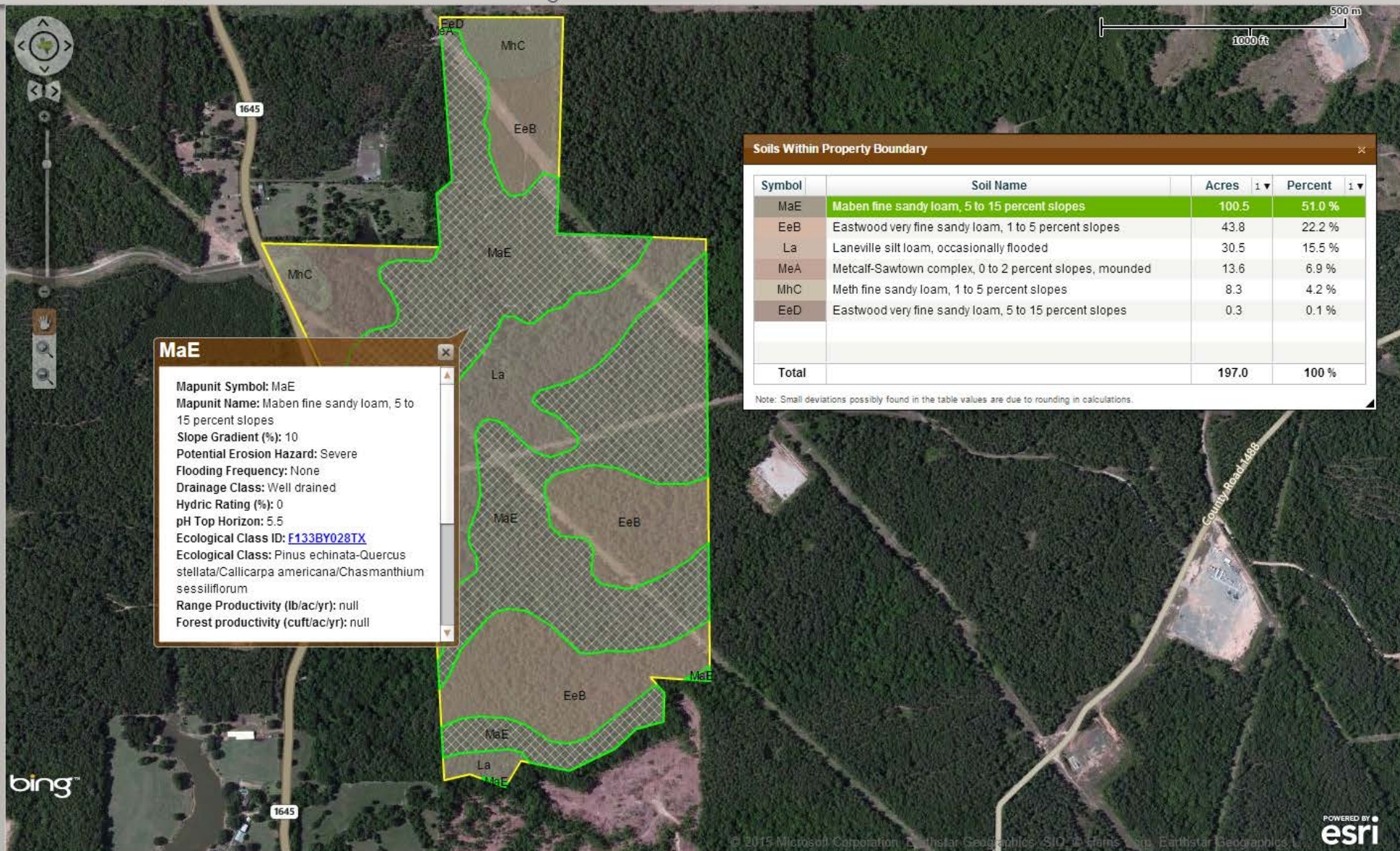
Measure

Add Labels

Add Linear Features

Add Points of Interest

Print or Export Map to PDF



#### Soils Within Property Boundary

Symbol	Soil Name	Acres	Percent
MaE	Maben fine sandy loam, 5 to 15 percent slopes	100.5	51.0 %
EeB	Eastwood very fine sandy loam, 1 to 5 percent slopes	43.8	22.2 %
La	Laneville silt loam, occasionally flooded	30.5	15.5 %
MeA	Metcalf-Sawtown complex, 0 to 2 percent slopes, mounded	13.6	6.9 %
MhC	Meth fine sandy loam, 1 to 5 percent slopes	8.3	4.2 %
EeD	Eastwood very fine sandy loam, 5 to 15 percent slopes	0.3	0.1 %
Total		197.0	100 %

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

#### MaE

Mapunit Symbol: MaE

Mapunit Name: Maben fine sandy loam, 5 to 15 percent slopes

Slope Gradient (%): 10

Potential Erosion Hazard: Severe

Flooding Frequency: None

Drainage Class: Well drained

Hydric Rating (%): 0

pH Top Horizon: 5.5

Ecological Class ID: [F133BY028TX](#)

Ecological Class: Pinus echinata-Quercus stellata/Callicarpa americana/Chasmanthium sessiliflorum

Range Productivity (lb/ac/yr): null

Forest productivity (cuft/ac/yr): null

bing



Find Location of Project Area

Define Boundaries

Boundary Outline

Color 

Style solid

Width 

Transparency 

 Draw

 Load

 Save

☒ mmp ☐ shp

☐ kml ☐ gpx

Clear Boundaries

Clear Acres Labels

Sensitive Areas

Soils

Operational Considerations

Culvert Size & Elevation Profile

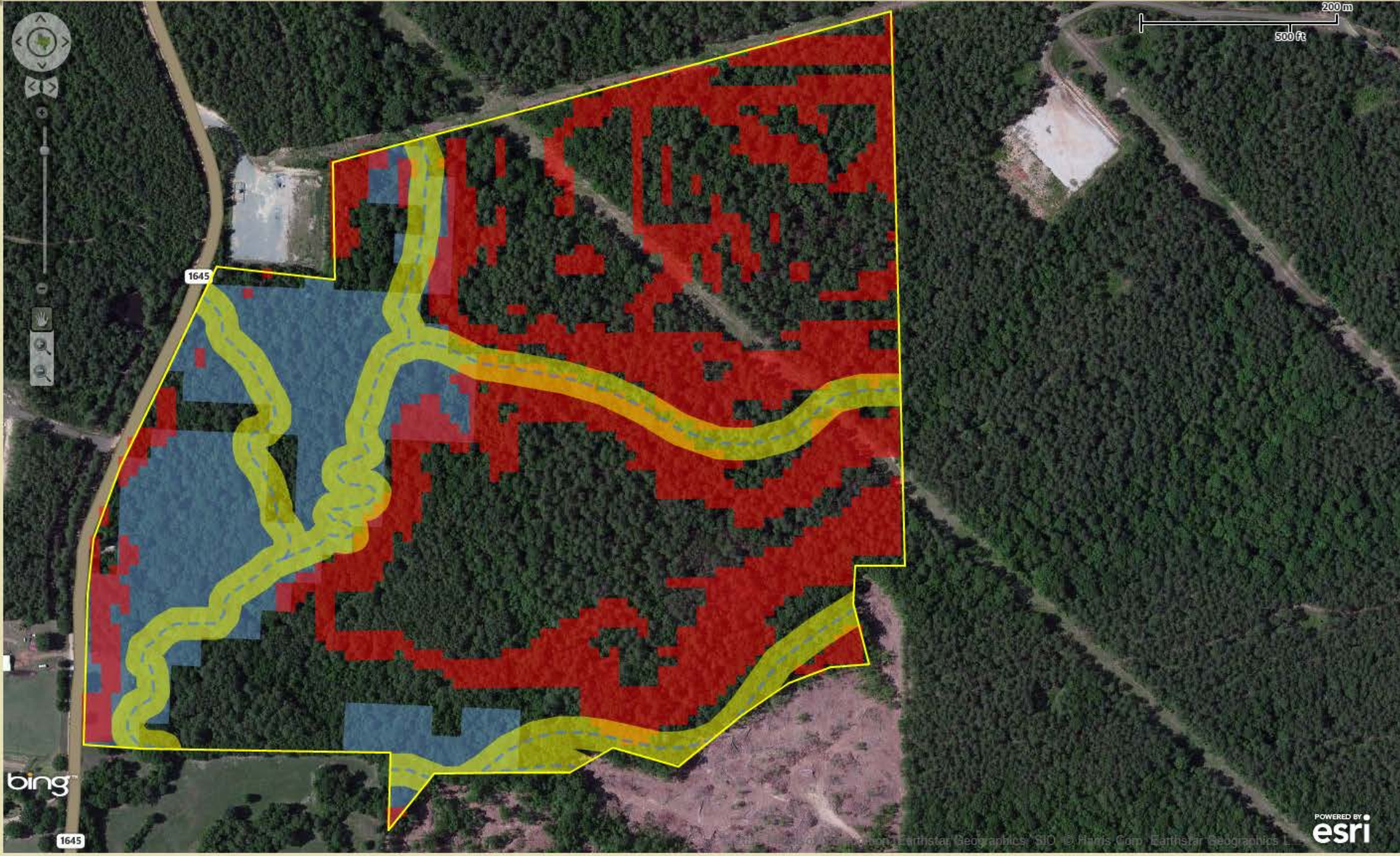
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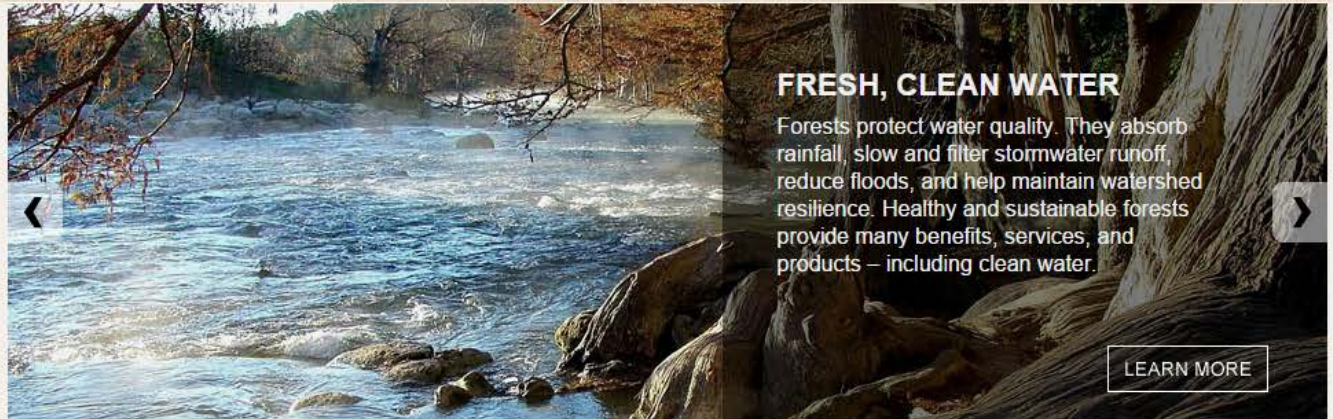
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### Applications

- |   |   |   |
|---|---|---|
| <a href="#">Timber Supply Analysis</a> ⓘ    | <a href="#">Forest Distribution</a> ⓘ       | <a href="#">Forest Ecosystem Values</a> ⓘ |
| <a href="#">Economic Impact</a> ⓘ           | <a href="#">Map My Property</a> ⓘ           | <a href="#">Urban Tree Canopy</a> ⓘ       |
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# Three Classes of Streams

1. Perennial
2. Intermittent
3. Ephemeral





Perennial or  
Intermittent Stream



Streamside  
Management Zone  
(SMZ)

This 3D diagram illustrates a Streamside Management Zone (SMZ) as a buffer area adjacent to a stream. The stream is shown as a grey channel at the bottom. The land is depicted with a yellow, textured surface. A dashed white line outlines the SMZ boundary, which follows the stream's course. A solid white line indicates a specific boundary within the SMZ. A brown box with a white border contains the text 'Streamside Management Zone (SMZ)'. At the bottom, two horizontal dimension lines with vertical end caps indicate buffer widths: '50 feet' for the inner buffer and '100 feet' for the outer buffer. The background is a solid dark blue, and a red rectangular block is visible in the top right corner.

50  
feet


100 feet



Surface runoff  
containing non-point  
source pollution








50 square feet of basal area per acre evenly distributed

This 3D visualization illustrates a forest stand with a total basal area of 50 square feet per acre. The ground is represented by a yellow, low-poly mesh surface. Numerous tall, green coniferous trees are scattered across the terrain. A white dashed line outlines a specific area on the ground, and a white line points from the text box to this area, indicating the distribution of basal area.






A 3D perspective diagram of a landscape cross-section. The terrain is represented by a yellow, low-poly surface. A stream flows from the top center towards the bottom right. The stream banks are marked with dashed white lines. Several trees are scattered across the landscape: some have green foliage and dark brown trunks, while others have bright purple foliage and purple trunks. A cluster of purple trees is prominent in the center-right. A brown rectangular box with a white border is positioned on the left side of the stream bank. A white line points from this box to a specific tree on the stream bank. In the top right corner, there is a solid red vertical rectangle. The background is a solid dark teal color.

Minimize harvesting  
trees on the stream  
bank





Conduct machine  
planting and site  
preparation activities on  
the contour

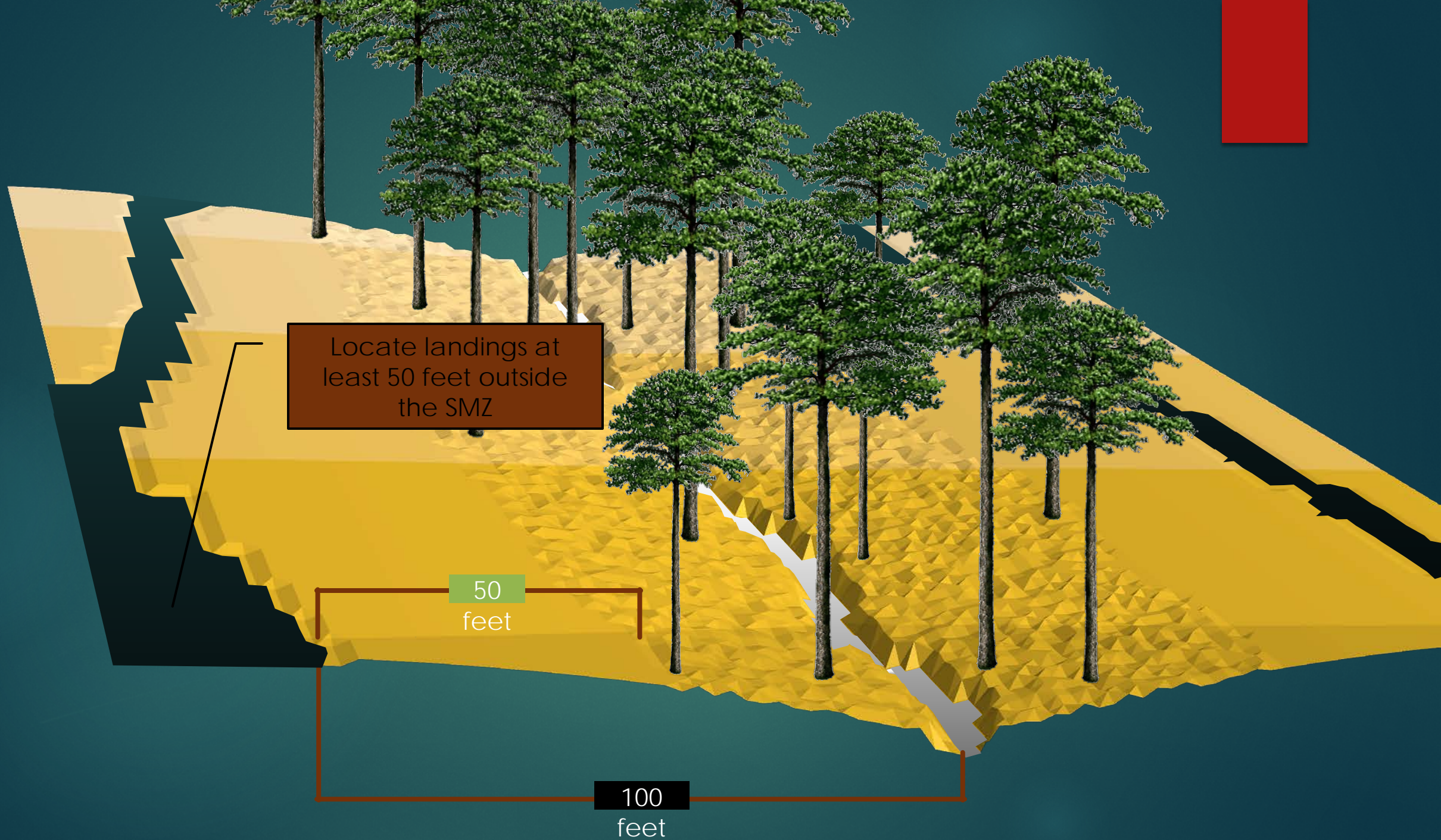
This 3D visualization illustrates a hillside with a yellow, low-poly textured surface. A series of horizontal contour lines are visible across the slope. Several green pine trees are planted along these contours. A brown rectangular text box with a black border is positioned in the upper-middle section of the hill, containing the text 'Conduct machine planting and site preparation activities on the contour'. A thin black line points from the left side of the text box to the contour line it describes. The background is a solid dark teal color, and a solid red rectangle is located in the top right corner.





Locate roads outside  
of the SMZ






Locate landings at  
least 50 feet outside  
the SMZ

50  
feet

100  
feet




A 3D perspective diagram of a landscape. The ground is a yellow, low-poly surface. A dark blue stream flows from the left towards the right. Several green, coniferous trees are scattered across the landscape. Two brown rectangular boxes with black text are overlaid on the image. The top box has a line pointing to a small structure on the stream. The bottom box has a line pointing to the stream's path. A solid red rectangle is in the top right corner.

Locate water control  
structures outside the SMZ

Ensure that structures  
discharge outside the  
SMZ



A 3D perspective view of a landscape model. The terrain is represented by a yellow, low-poly surface. A dark blue stream channel flows from the background towards the foreground. Several green, coniferous trees are scattered across the landscape. A brown rectangular box with a black border is positioned on the left side of the image, containing the text "Avoid felling trees across the stream channel". A thin black line extends from the bottom right corner of this box, pointing towards the stream channel. In the top right corner, there is a solid red vertical rectangle.

Avoid felling trees across  
the stream channel







# SMZ on Ephemeral





# Don't operate in saturated soils!









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