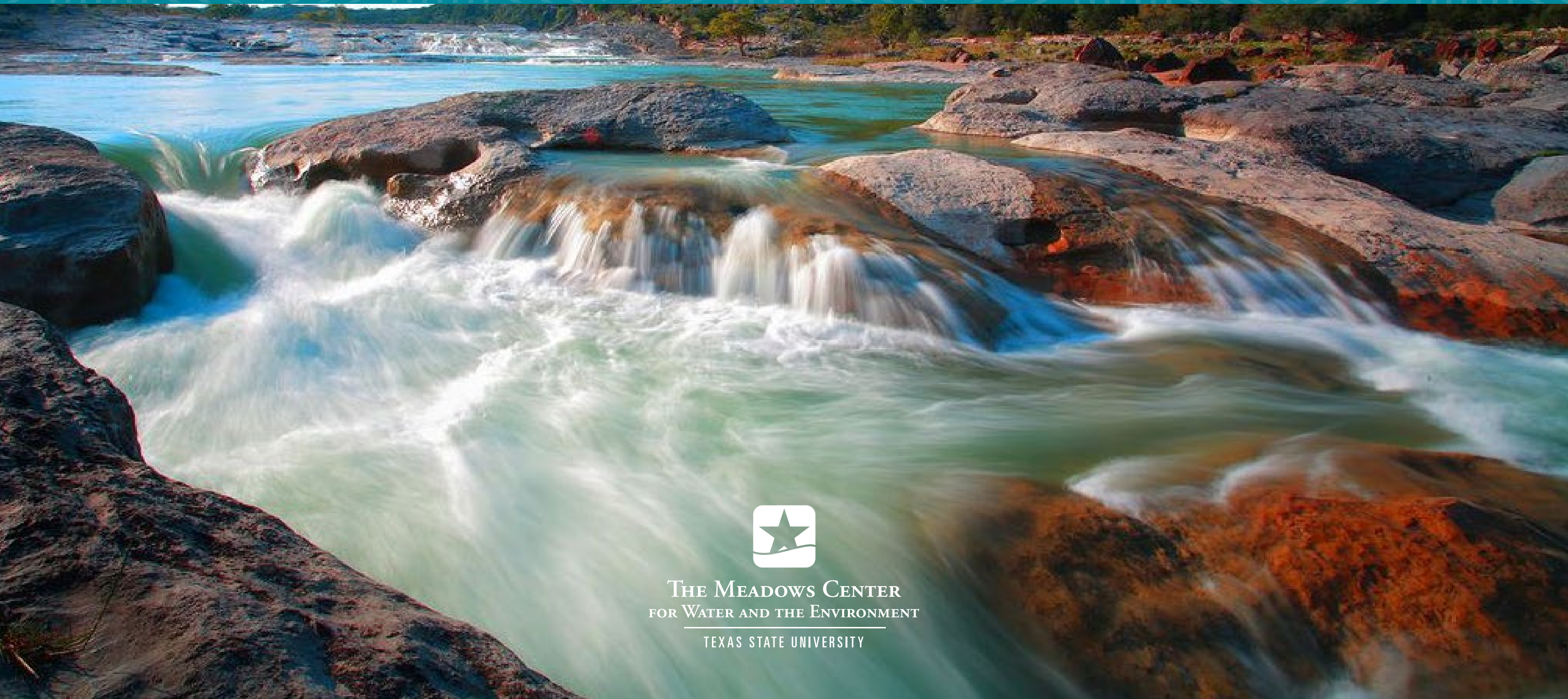


# PEDERNALES

## WATERSHED ATLAS



THE MEADOWS CENTER  
FOR WATER AND THE ENVIRONMENT  
TEXAS STATE UNIVERSITY

*This publication was made possible through the generous support of*  
**The Cynthia & George Mitchell Foundation**



# PEDERNALES

## WATERSHED ATLAS

*Authors* Douglas A. Wierman, P.G.; Jenna Walker, MAGEo; Meredith Miller, MS; and William Butler; MA

*Contributors* Anna Huff, BS; Jaime Moreno, BS; and Emily Warren, MPA, MSES

*Design* Dyhanara Rios, BS



THE MEADOWS CENTER  
FOR WATER AND THE ENVIRONMENT  

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TEXAS STATE UNIVERSITY

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# INTRODUCTION

The Pedernales River Atlas was prepared as a companion document to the How Much Water is in the Hill Country? Occurrence of Flowing Water and Water Quality during Base Flow Conditions in the Pedernales River Basin to graphically portray some of the key physical attributes of the basin at a scale such that the data may be useful to individual landowners. The results of the flowing water inventory, originally presented in How Much Water is in the Hill Country? Conservation Strategies, Management Approached and Action Plan – 2015, are presented to document the geologic origin of spring/base flow in tributaries and main channel of the Pedernales River.

The Pedernales River watershed is an ecologically and economically diverse region that spans 1,281 square miles that are primarily situated within the Texas counties of Gillespie and Blanco, with small portions being contained in Kimble, Kerr, Kendall, Hays, Travis, and Burnet counties. Human activity within the Pedernales River watershed is primarily rural and/or agricultural, as the largest population centers are the cities of Fredericksburg (pop. 10,829), the seat of Gillespie County, and Johnson City (pop. 1,785), the seat of Blanco County. Also contained within the watershed are the towns of Round Mountain in the northern end of the watershed on United States Highway (USH) 281 (pop. 181), Stonewall (pop. 469) and Hye (unincorporated) on USH 290 between Fredericksburg and Johnson City, the town of Harper (pop. 1,006) on USH 290 west of Fredericksburg, and the Austin exurb of Briarcliff (pop. 1,438) at the northeast end of the watershed.

The National Hydrography Dataset (NHD) splits the Pedernales Watershed into 27 “subwatersheds,” each with their own unique set of tributaries, surface geology, land cover, transportation hubs, and urban-rural dynamics. This Pedernales River Atlas documents the distinctive characteristics of each of these subwatersheds as well as the results of a watershed-wide Flowing Water Inventory that took place in August of 2015. Within that inventory there was a classification by flow of all stream corridors designated “flowlines” by the National Hydrography Dataset that were intersected by roads designated as public by the Texas Department of Transportation. Specifically, at each intersection of a flowline and a road, The Meadows Center staff observed whether flowing water, standing water, or no water was present at each site. On each subwatershed base map the results of that study are rendered with color coded dots to represent different results – red dots indicated dry flowlines, orange dots indicated standing water only, blue dots represented flowing water at

sites that were not chosen for further study, and green dots represented flowing water at sites that were chosen for further analysis of flow and water quality. The occurrence of flowing water is a surrogate for upstream spring or seep contribution to the tributary. Water quality sampling results are included in the How Much Water is in the Hill Country? Occurrence of Flowing Water and Water Quality during Base Flow Conditions in the Pedernales River Basin.

In addition to each base map displaying the roads, cities, flowlines and flowing water inventory results, separate maps of the land cover (courtesy of the National Land Cover Database or NLCD) and surface geology (courtesy of the Geological Atlas of Texas) were created for each of the 27 subwatersheds. The predominant land cover type within the Pedernales River watershed was shrubland or scrubland, which comprised 54.3% of the entire watershed, then Evergreen Forest cover (trees greater than 5 meters tall that primarily maintain their leaves all year and are greater than 20% of total vegetation cover), which constitutes 18.6% of all land cover, then Grassland/Herbaceous at 14%. Developed land cover within the watershed was sparse overall at only 3.7% of total land cover, although the overall area of developed land within the watershed did increase by 53% from 2001 to 2011. However, developed lands were primarily confined to the cities and small towns within this primarily rural watershed. Although Grassland/Herbaceous lands can be used for ranching purposes, only 3.1% of land within the watershed could be considered intensive agriculture, classified as Cultivated Crops (2.4%) or Hay/Pasture (0.7%). Many of these agricultural activities were confined to areas surrounding the Pedernales River where irrigation is possible, and are often located on surface rock deposits of Hensel Sand.

The surficial geology (relating to land surface) of the basin is dominated by lower Cretaceous carbonate strata. These predominately limestone and dolomites units include the Fort Terrett and Segovia members of the Plateau Edwards Formation and the upper and Lower members of the Glen Rose formation. The Hensel Sand, Cow Creek Formation, Hammett Shale and Sycamore Formation crop out locally but on consist of about 2.5% of the surficial geology. Undifferentiated Paleozoic and Precambrian strata comprise approximately 15% of the surficial geology, mainly on the north side of the river in eastern Gillespie and western Blanco Counties. Water quality tends to reflect the chemistry of the carbonate geology.



# BANTA BRANCH

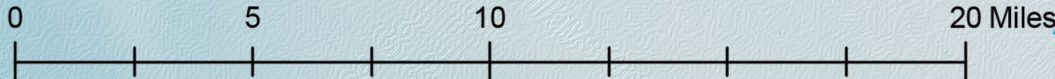


## Pedernales Subwatershed Locations

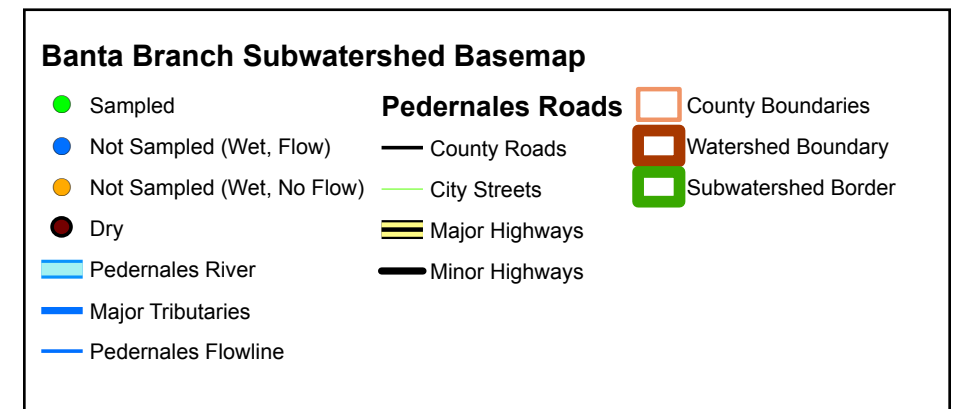
- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries



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**T**HE BANTA BRANCH SUBWATERSHED is located at the extreme northwest end of the Pedernales River watershed. The village of Harper encompasses the center-east portion and exists as a crossroads between USH 290, RM 783, and FM 2093. In addition to these major and minor thoroughfares, RM 385 and RM 479 also traverse portions of the western end of the subwatershed.

The functional headwaters of the river are located at the southeastern end of the subwatershed off of FM 2093 and near flowing water inventory site

618. Multiple sites surveyed along the main tributary of Banta Branch saw little evidence of constant flow, and multiple dry sites along the Pedernales on Highway 290 and RM 479 were observed. The lack of constant flow and presence of springs upstream of the headwaters suggests much of the Pedernales channel experiences ephemeral flow within the Banta Branch subwatershed until its spring-fed headwaters. Pecan Creek, another tributary within the subwatershed, was not accessible by road to The Meadows Center's staff members.

## ABOUT BANTA BRANCH SUBWATERSHED

*Size:* 48.77 square miles

*Counties:* Gillespie, Kimble

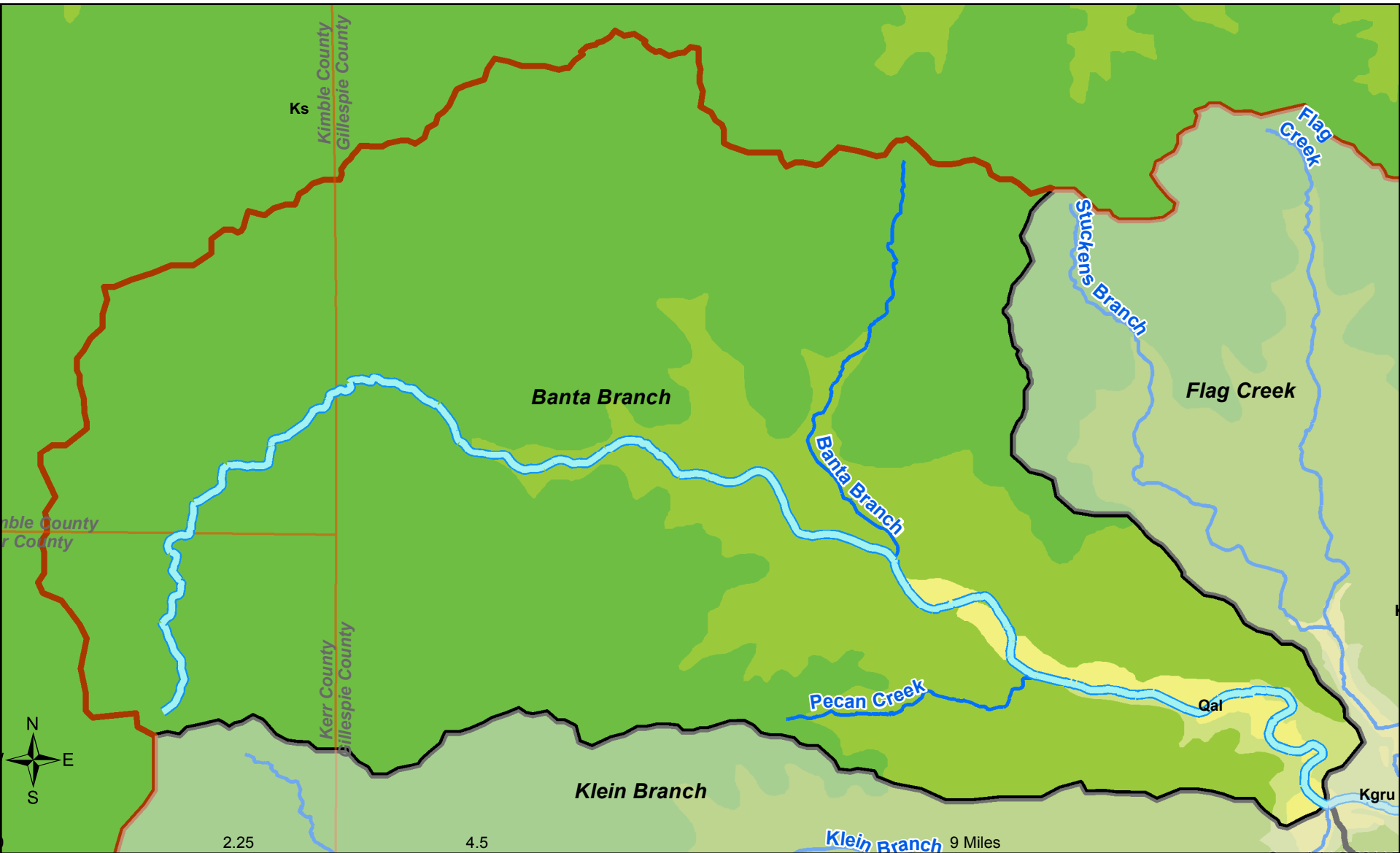
*Cities:* Harper (pop. 1,192)

*Tributaries:* Banta Branch, Pecan Creek, Klein Branch, Stuckens Branch and Flag Creek

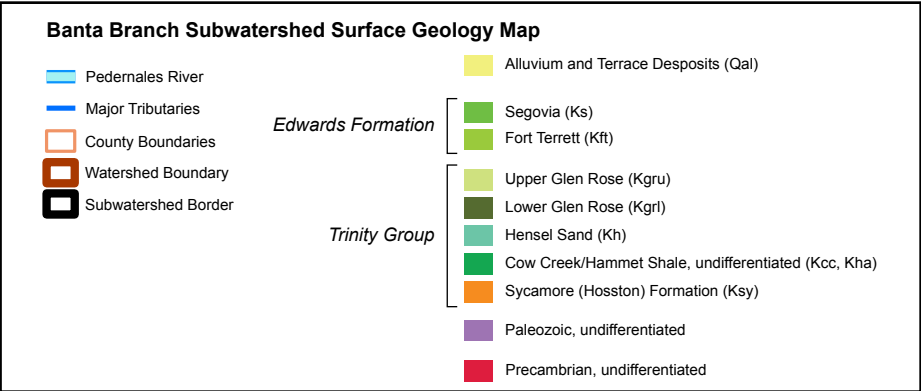
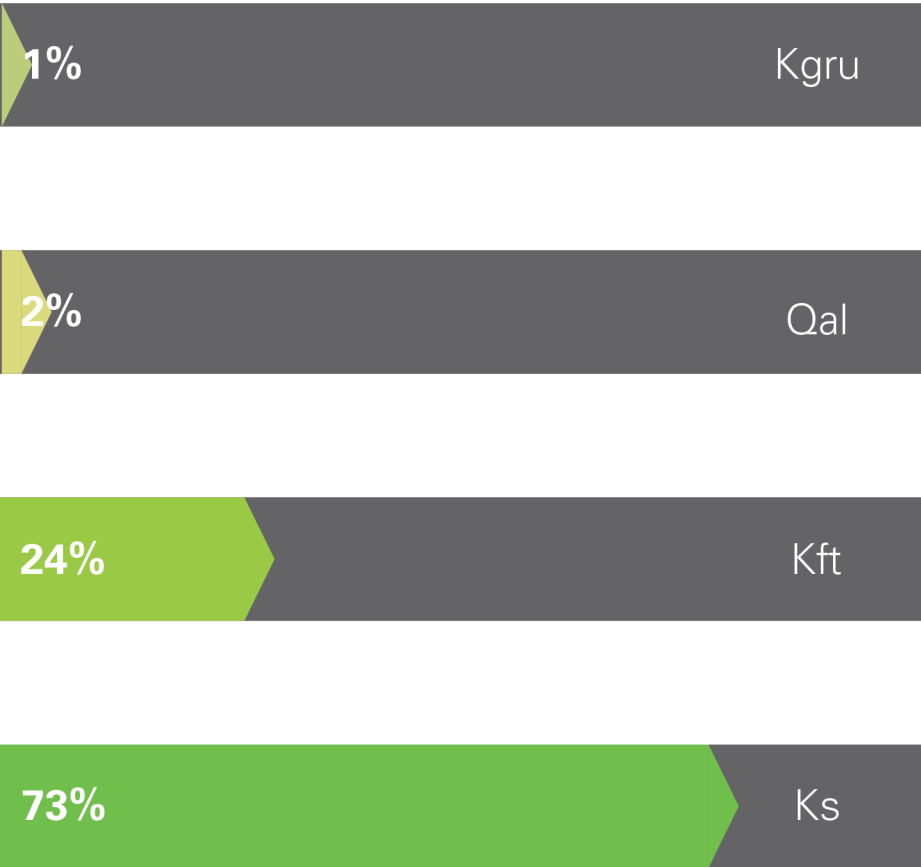


# Surface Geology

The predominant surface geology in Banta Branch consists of Edwards formation members, including the Segovia member in much of the western and central parts of the subwatershed and the Fort Terrett member in the southeast part of the subwatershed. A minimal amount of Upper Glen Rose member can be observed in the southeast portion of the subwatershed.

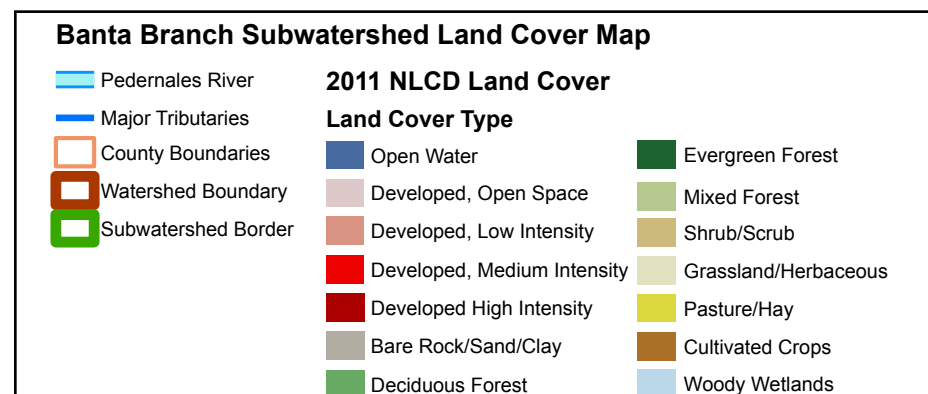
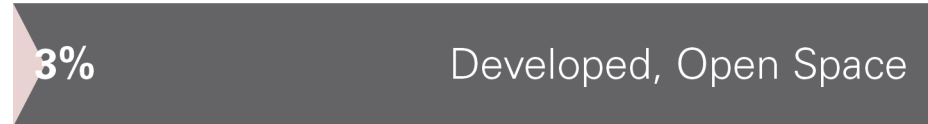


Banta Branch Geology Breakdown

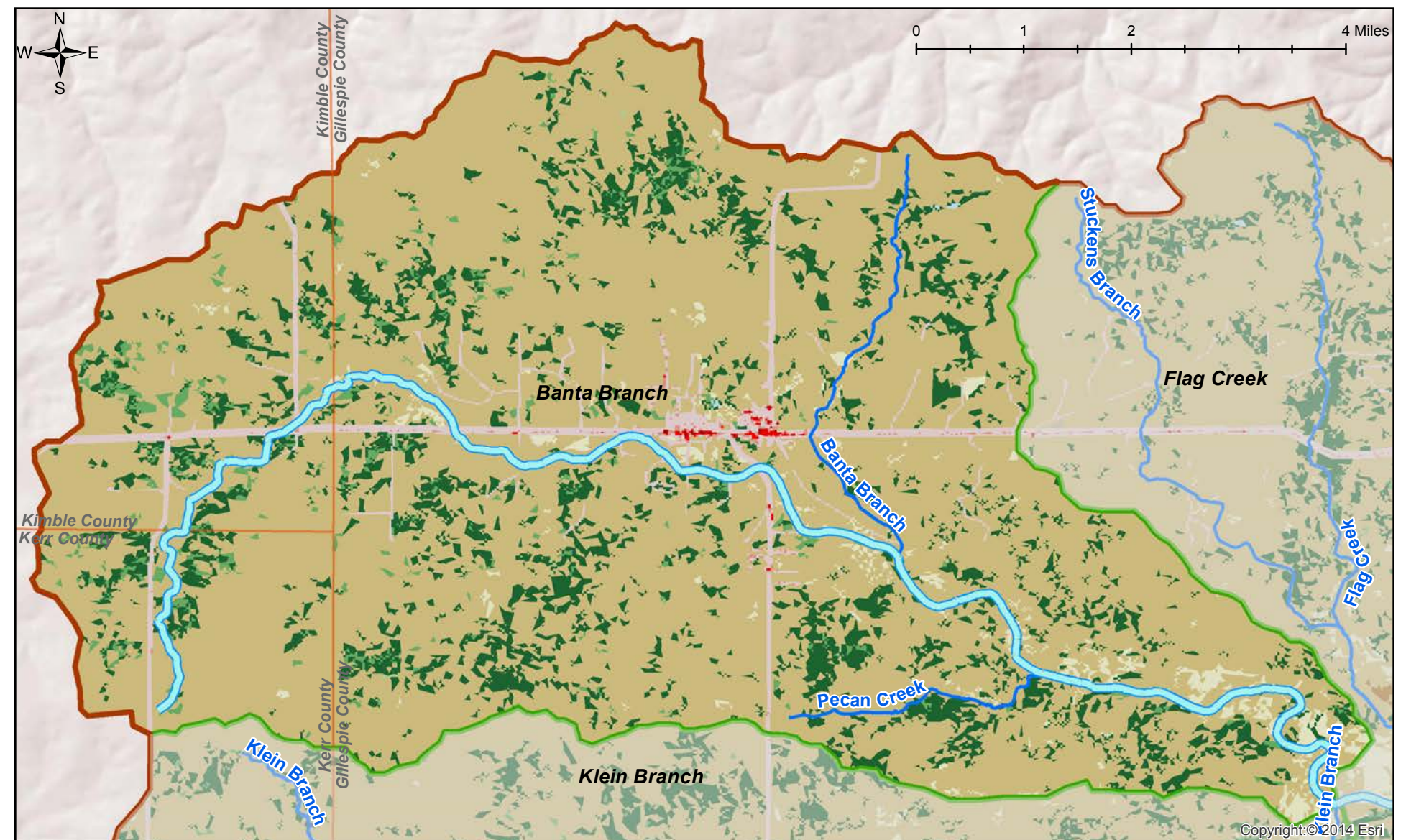


# Land Cover

## Banta Branch Land Cover



Outside of developed land within Harper and along the highways, human activity within the subwatershed appears to be minimal shrub/scrublands interspersed with stands of forest are by far the dominant land cover types. Agricultural activity within Banta Branch appears to be limited to small stands of grazing land around Harper and near the Pedernales River.





# BARONS CREEK

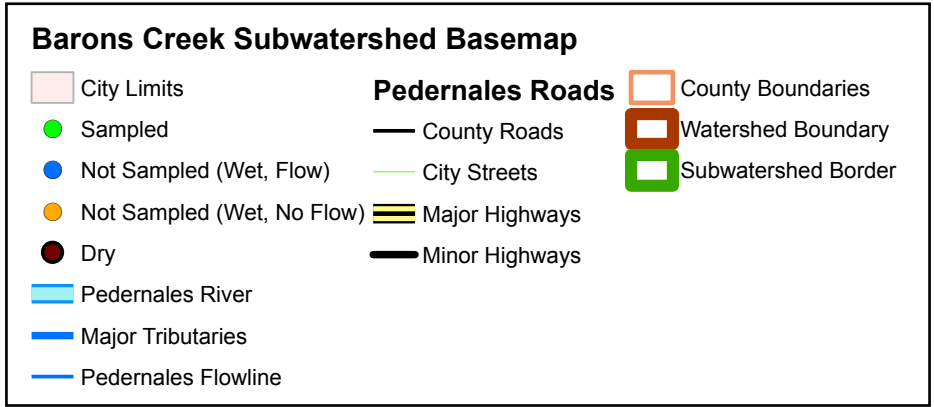


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Barons Creek Subwatershed, Site 884



**T**HE BARONS CREEK SUBWATERSHED CONTAINS MUCH OF THE CITY LIMITS OF the town of Fredericksburg. Fredericksburg serves as a transportation hub within the region, as United States Highway (USH) 290, USH 87, State Highway (SH) 16, Farm-to-Market (FM) 2093, and Ranch-to-Market (RM) 1631. The city also hosts a small airport on its southwestern outskirts. Barons Creek spans from its spring-fed location at the edge of the Pedernales watershed through ranchlands and small residences into downtown Fredericksburg, from where it then exits into lands with intensive

agricultural and urban development on the town’s outskirts, and eventually flows into the Pedernales. The Meadows Center’s staff observed flowing water along multiple points of Barons Creek, as well as a relatively stagnant flow within Town Creek in Fredericksburg.

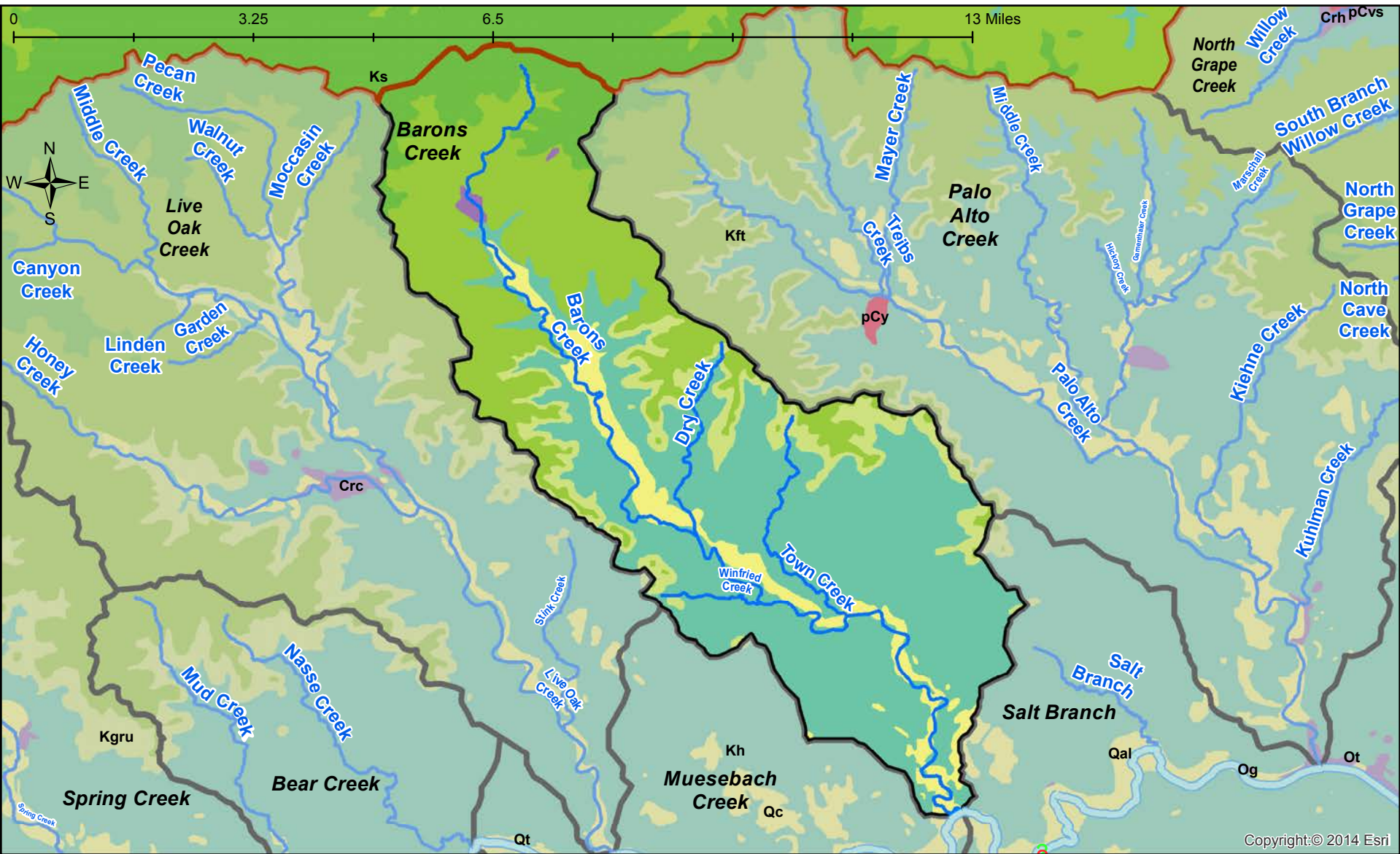
**ABOUT BARONS CREEK SUBWATERSHED**

*Size:* 32.35 square miles  
*Counties:* Gillespie  
*Cities:* Fredericksburg (pop. 10,530)  
*Tributaries:* Barons Creek (primary), Town Creek, Dry Creek

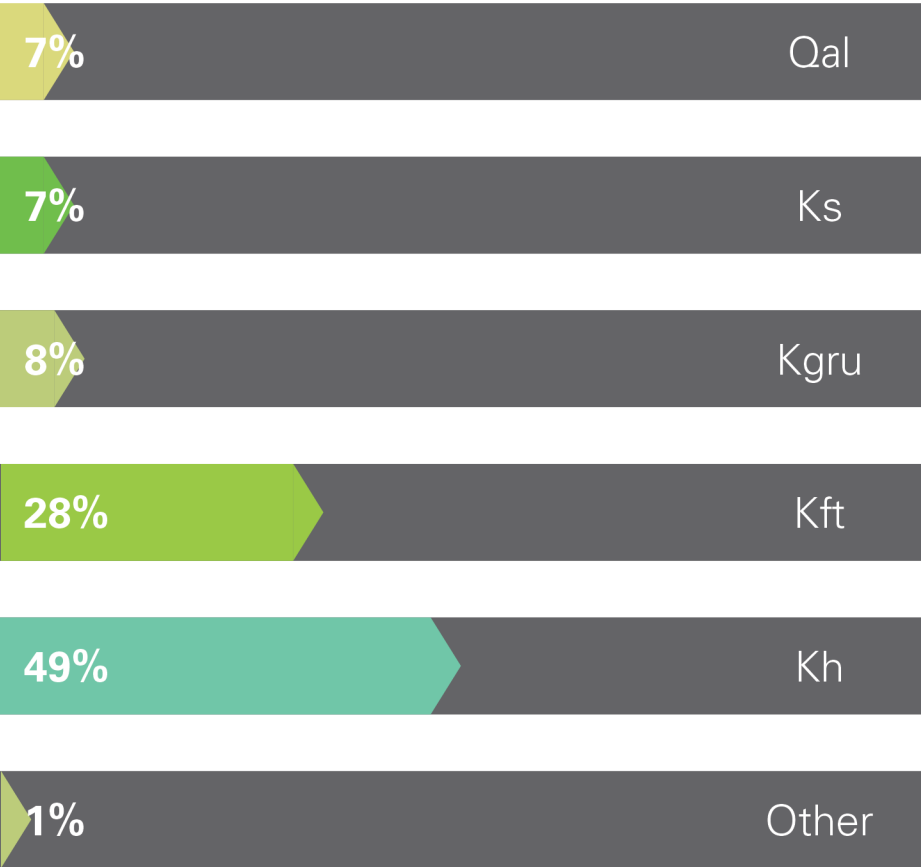


# Surface Geology

The surface geology of Barons Creek is an interesting transition from Edwards formation carbonates in the north-northwest end of the subwatershed to Hensell sand deposits and quarternary deposits along the creek’s riparian corridor. Much of the city of Fredericksburg, as well as the agricultural operations southeast of the city, are located on Hensell sand and quarternary deposits.



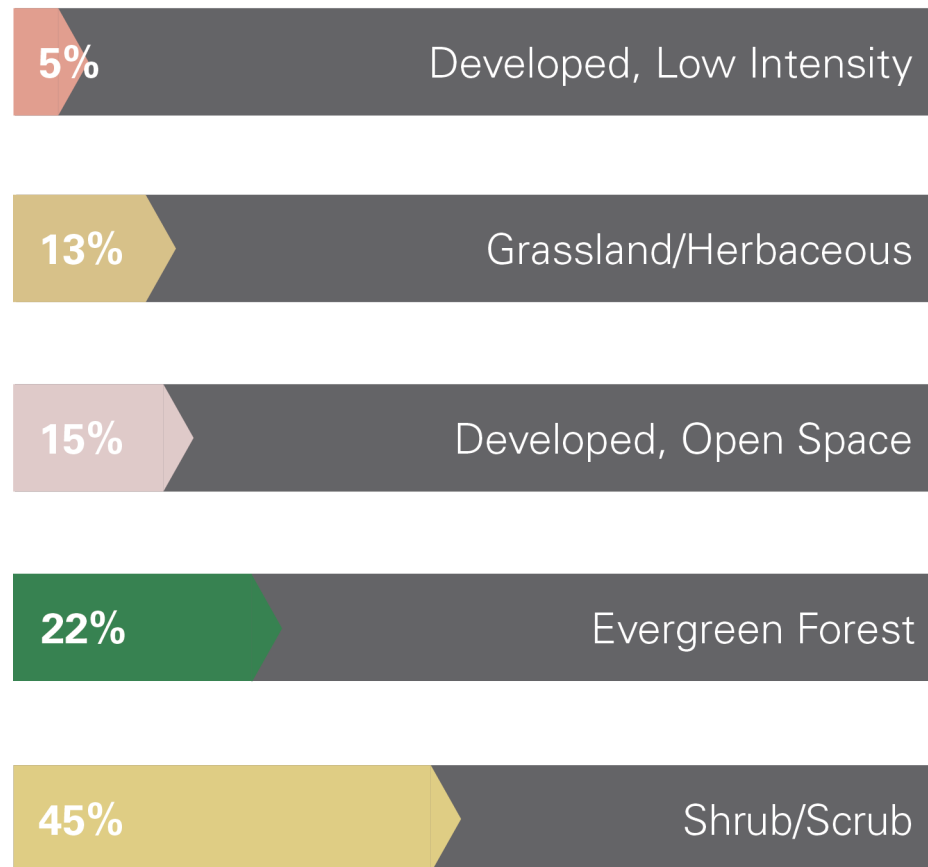
Barons Creek Geology Breakdown



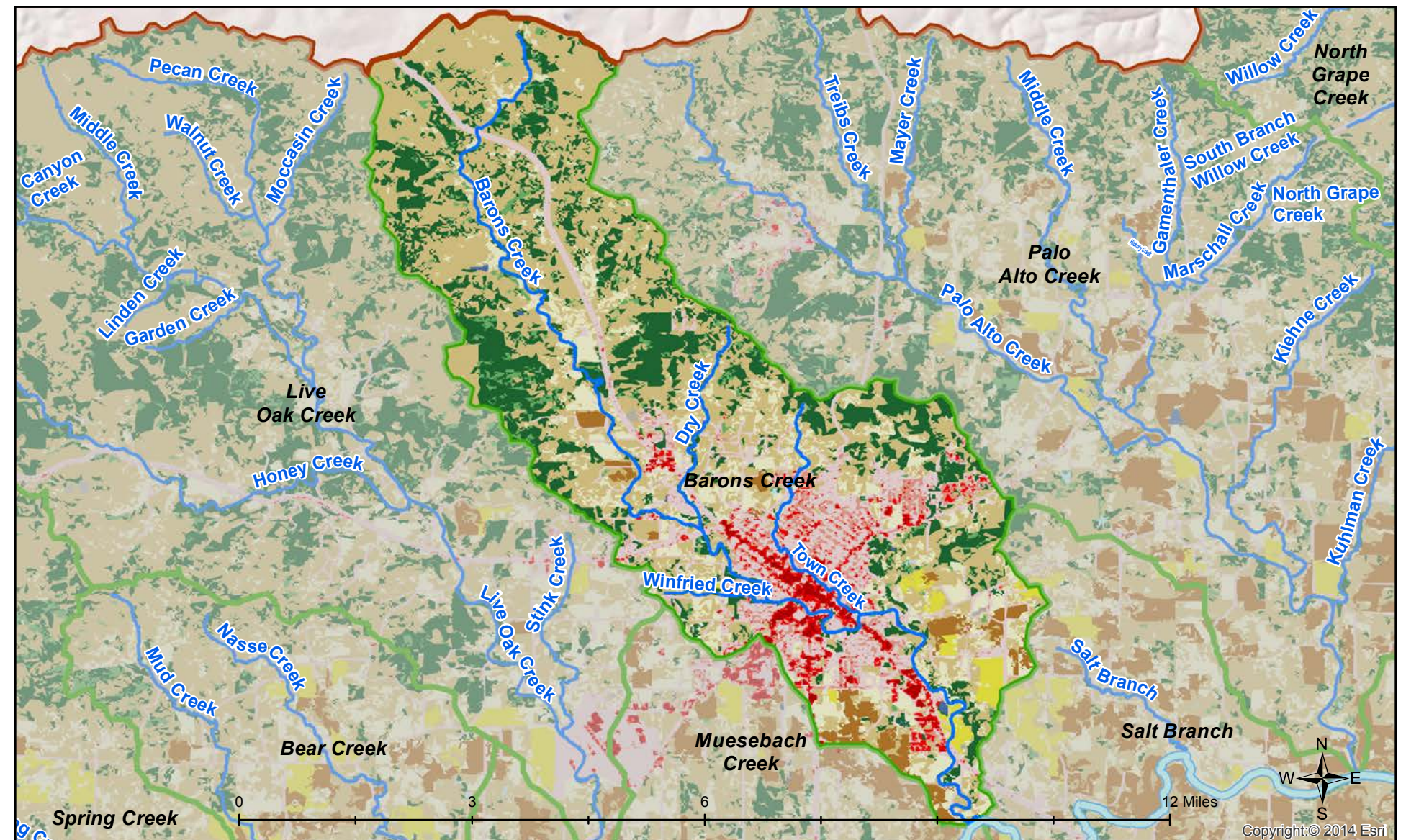
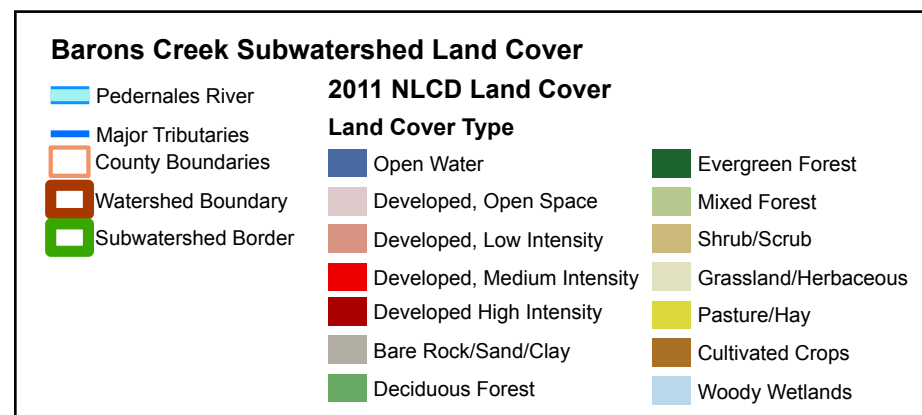


# Land Cover

## Barons Creek Land Cover



Land cover types vary widely within this subwatershed as shrub/scrublands (41%) and evergreen forests (19%) in the northern parts of the subwatershed transition into developed lands of varying impervious cover within the city, and finally to a mix of cultivated croplands and hay/pasturelands.





# BEAR CREEK

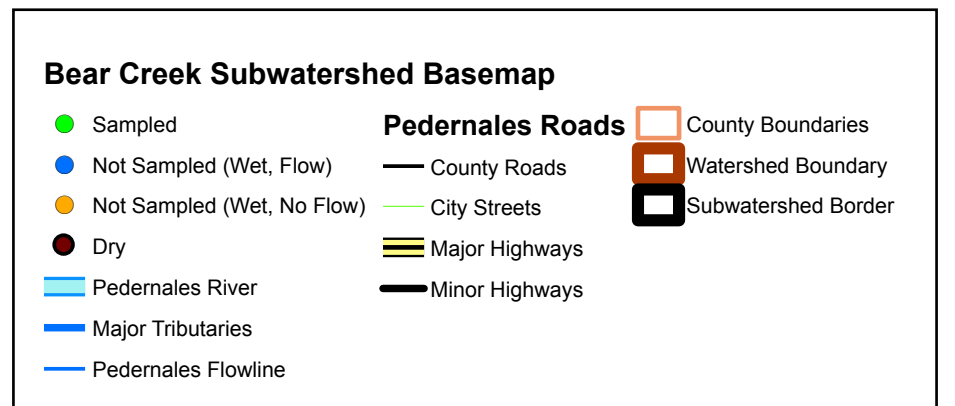


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Bear Creek Subwatershed at the Pedernales River, Site 884



**T**HE BEAR CREEK SUBWATERSHED is located in the southwest portion of the Pedernales River watershed, in close proximity to but not encompassing the city of Fredericksburg. Three major Fredericksburg arteries run through different areas of the subwatershed: SH 16 through its center-north portion, USH 87 through the southeast portion and FM 2093 north of the cropland and pasture concentrations.

During the project's sampling regime, only Bear Creek and Left Bear Creek had constant flows observed by The Meadows Center personnel. Mud Creek and Nasse Creek, which run within close proximity to and/or through the croplands and pastures north of SH16, were completely dry at multiple points upstream and downstream of their confluences with the Pedernales.

## ABOUT BEAR CREEK SUBWATERSHED

*Size:* 53.21 square miles

*Counties:* Kerr

*Cities:* N/A

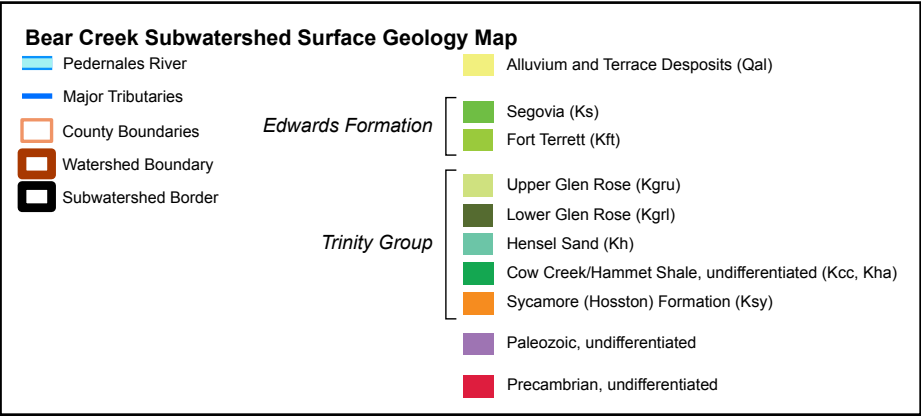
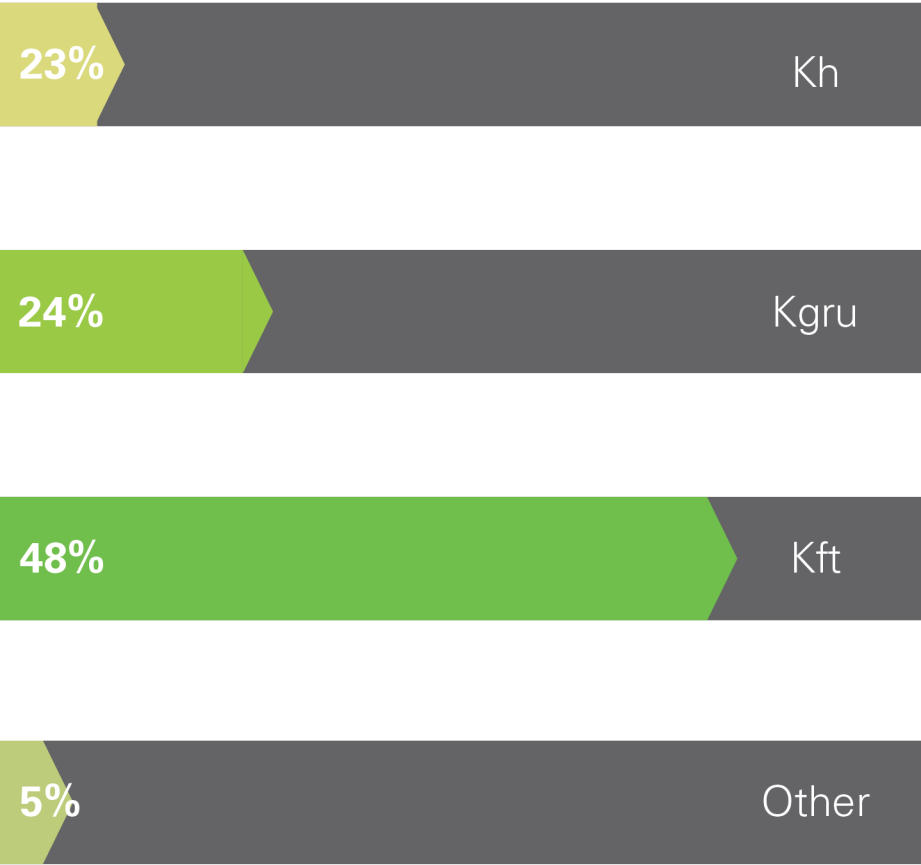
*Tributaries:* Bear Creek, Left Bear Creek, Mud Creek, Nasse Creek



# Surface Geology

The primary surface rock types in Bear Creek range from Edwards formations in the south and north to Cretaceous-era Hensell sand formations primarily directly north of the Pedernales River. Many of the agricultural activities within the Bear Creek subwatershed are located on top of the Hensell formations.

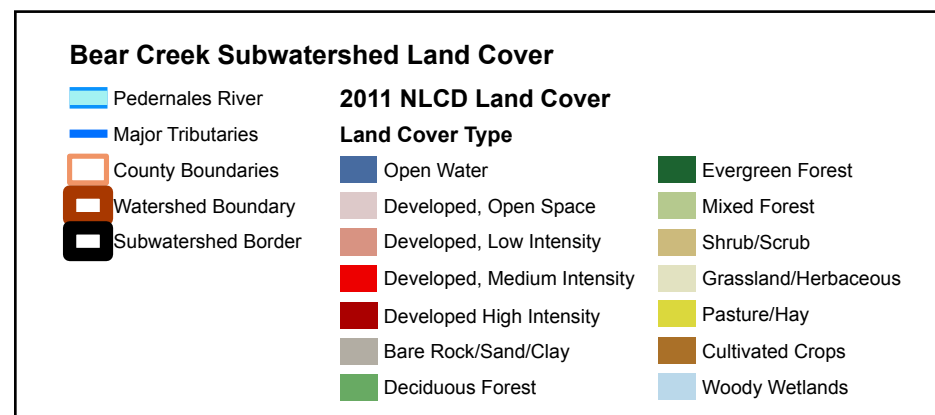
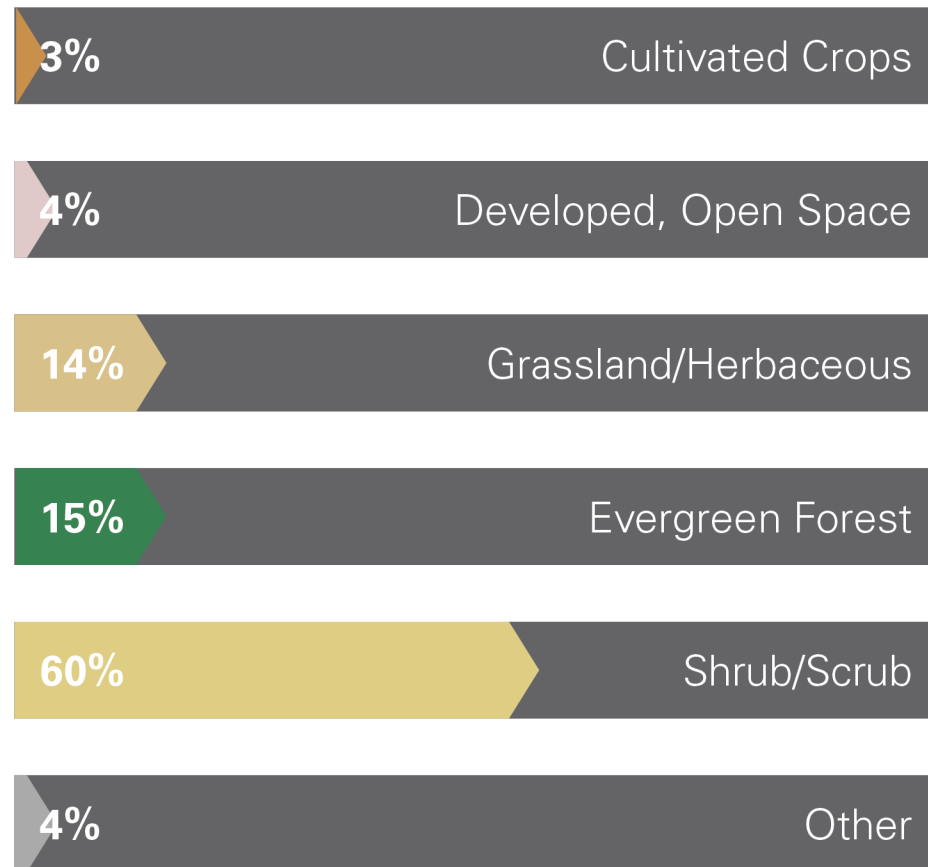
Bear Creek Geology Breakdown



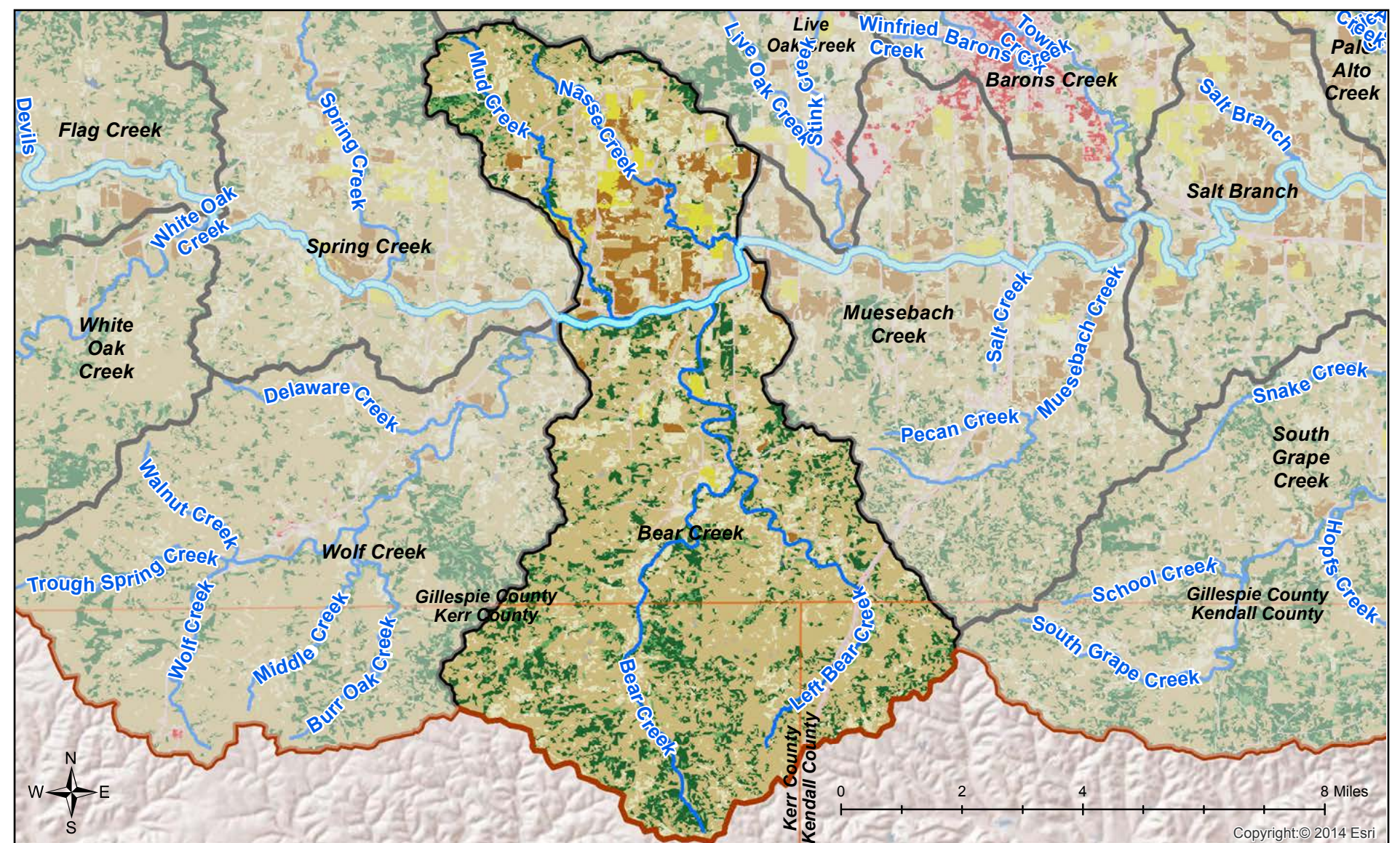


# Land Cover

## Bear Creek Land Cover

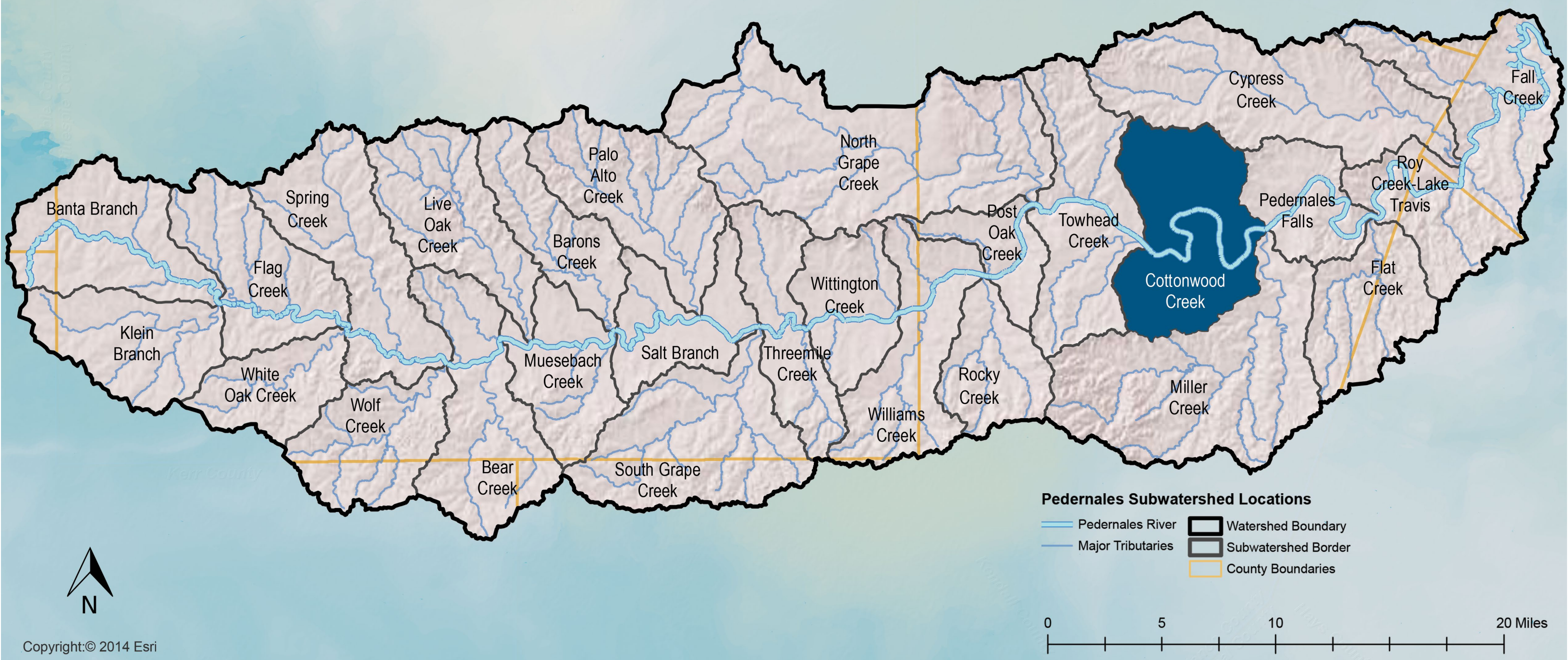


Land cover within the subwatershed ranges from forests and shrubland in its southern and extreme northern portions to cultivated croplands and pasturelands in the area just north of the Pedernales River and southwest of Fredericksburg.





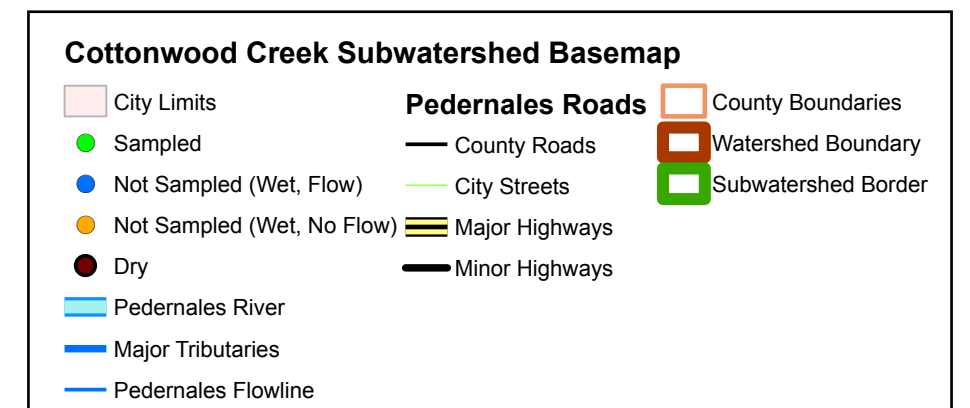
# COTTONWOOD CREEK







Cottonwood Creek Subwatershed at the Pedernales River, Site 837



**T**HE COTTONWOOD CREEK SUBWATERSHED is located in the east central portion of the Pedernales River watershed in Blanco County and contains 58.48 square miles. It also includes the town of Johnson City, the Pedernales River, and tributaries including Cottonwood Creek, Town Creek, Saber Spring Creek, Deer Creek, and Hardin Russell Creek. In addition to the urban development present in Johnson City, the subwatershed also contains two major highways in USH 281 and USH 290 as well as a minor highway in RM 2766, which heads due east from Johnson City.

Flowing water was observed by The Meadows Center staff along Cottonwood Creek, Town Creek, Deer Creek, Salter Spring Creek, the Pedernales River, and multiple flow lines near Deer Creek and Cottonwood Creek. However, Hardin Russell Creek along USH 281 was dry.

## ABOUT COTTONWOOD CREEK SUBWATERSHED

*Size:* 58.48 square miles

*Counties:* Blanco county

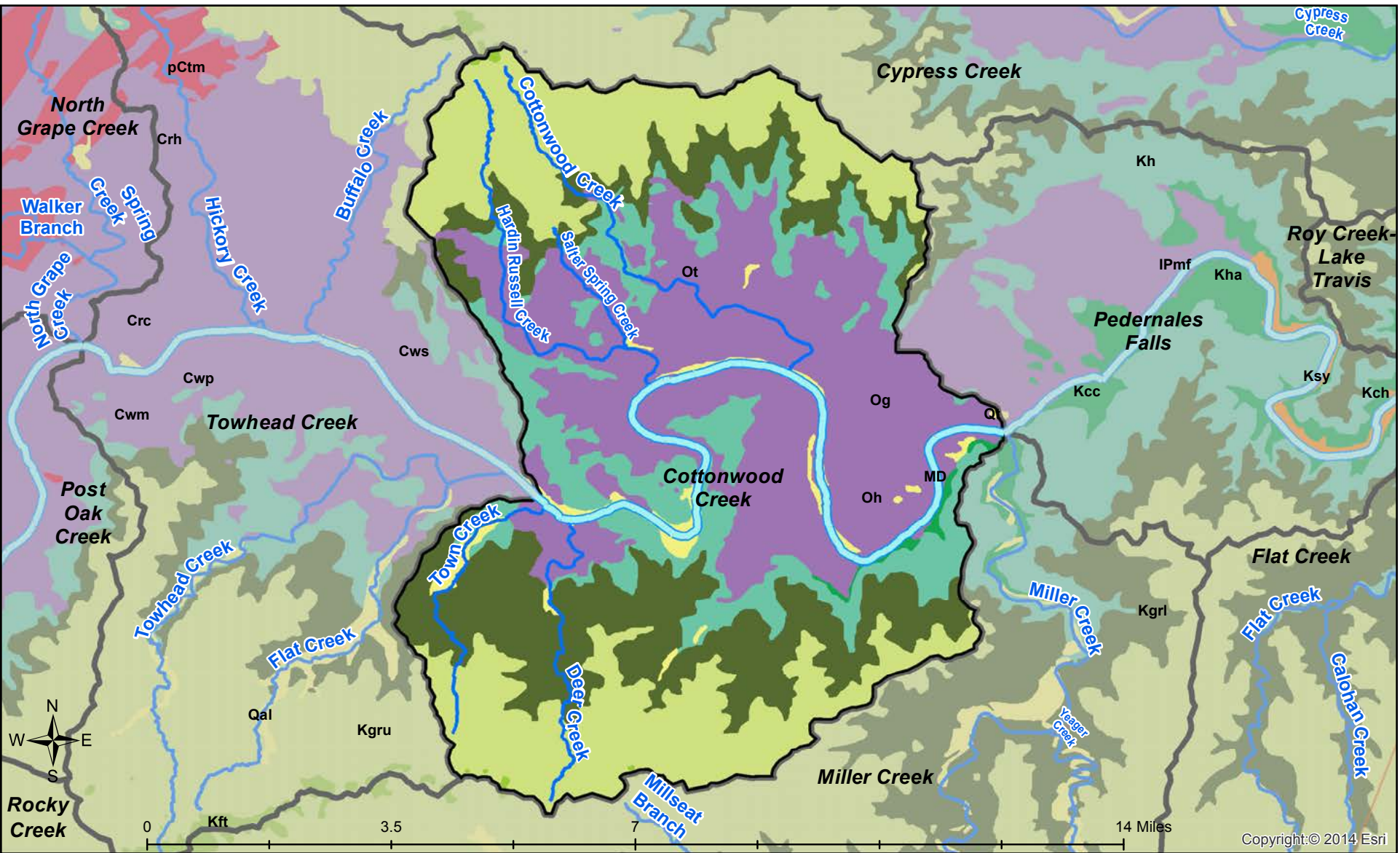
*Cities:* Johnson City (pop. 1,785)

*Tributaries:* Cottonwood Creek, Town Creek, Saber Spring Creek, Deer Creek, and Hardin Russell Creek

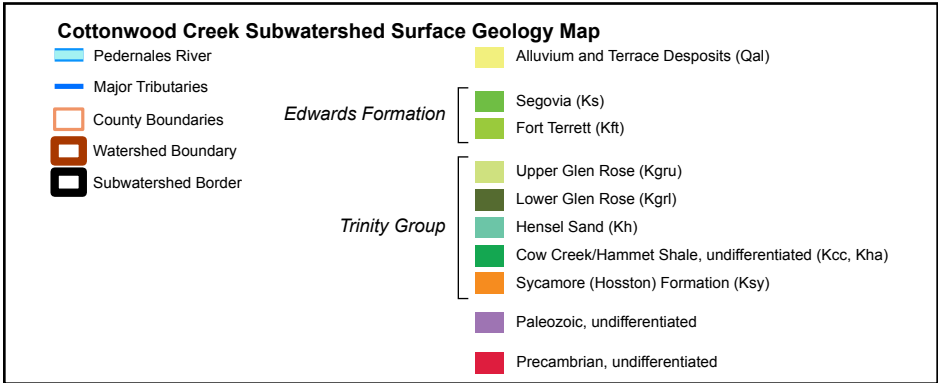
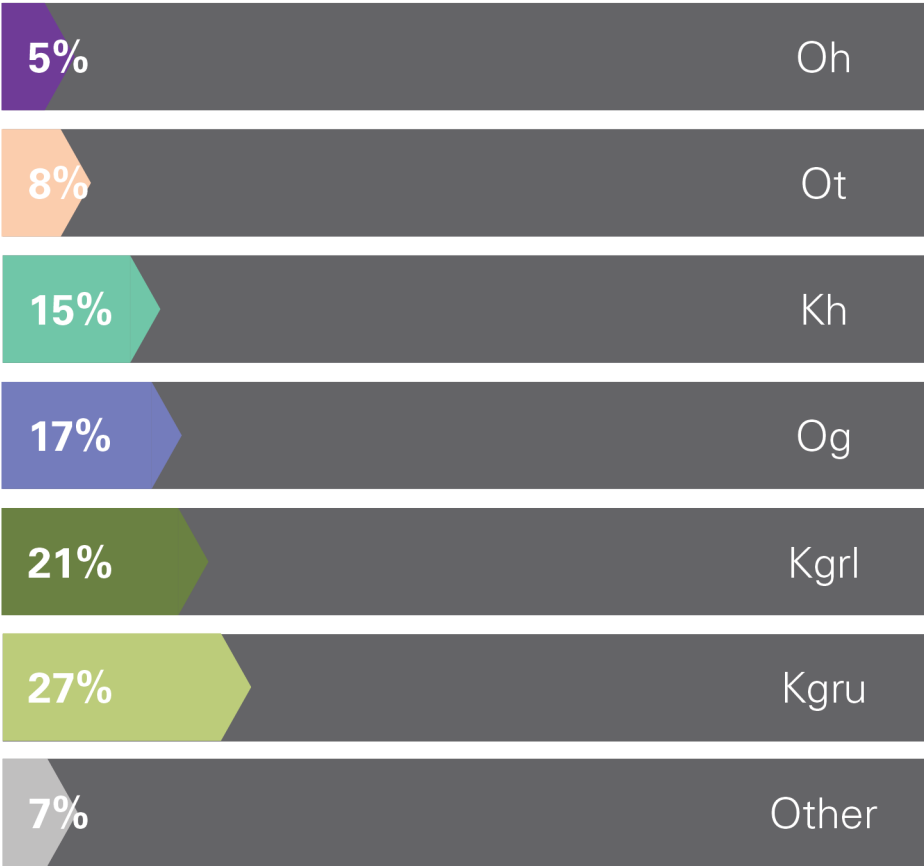


# Surface Geology

Surface rock members within the subwatershed include upper and lower Glen Rose units in the northern and southern areas transitioning to layers of Hensell sand members to pre-Cretaceous members closest to the Pedernales River.



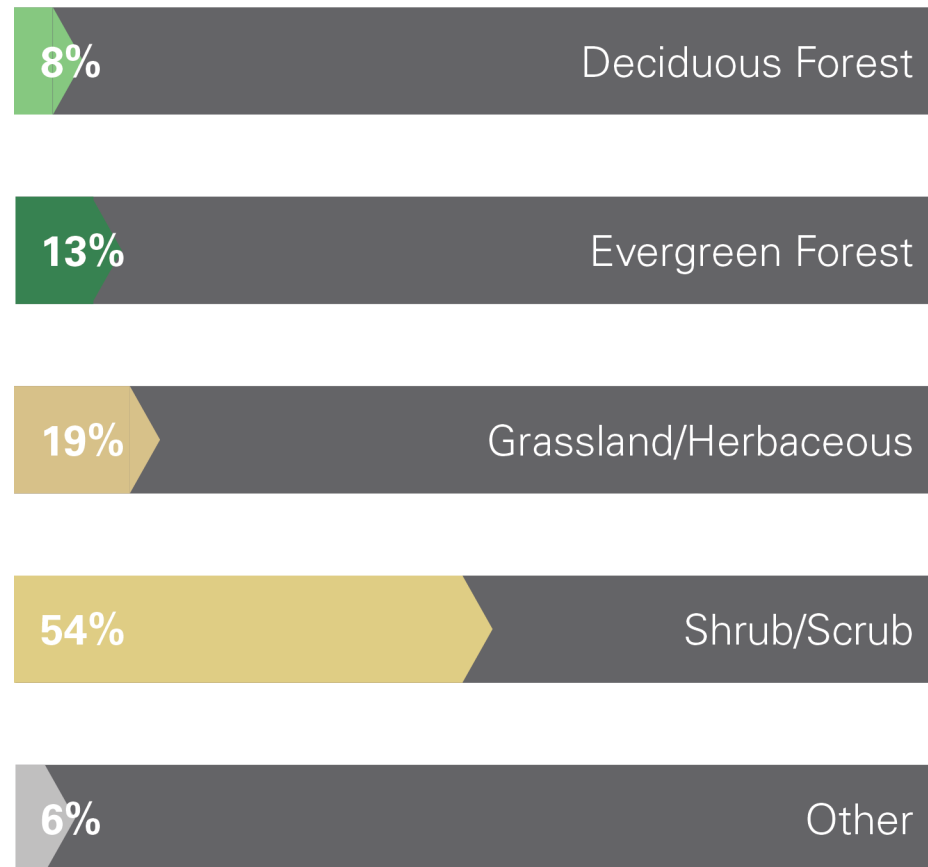
## Cottonwood Creek Geology Breakdown





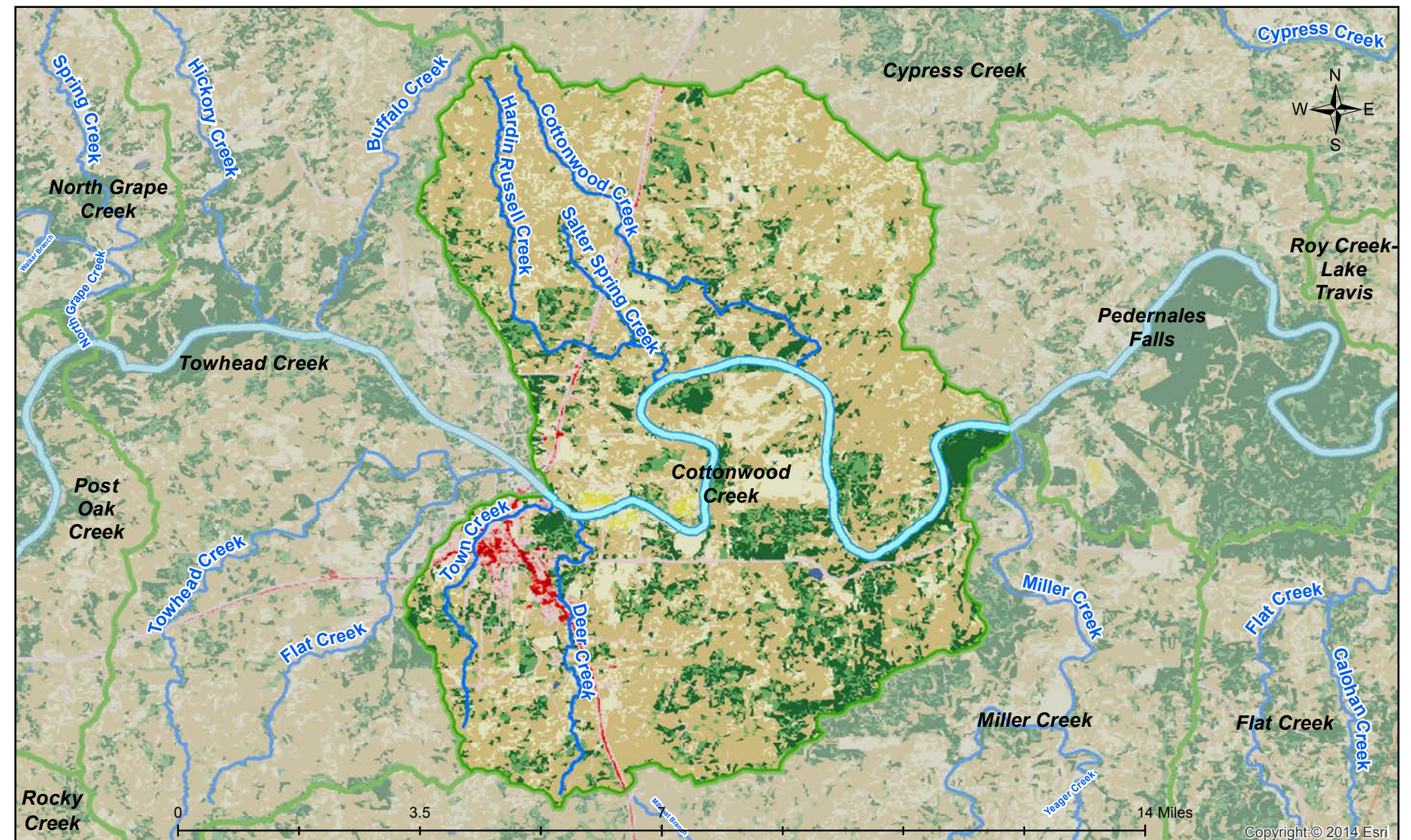
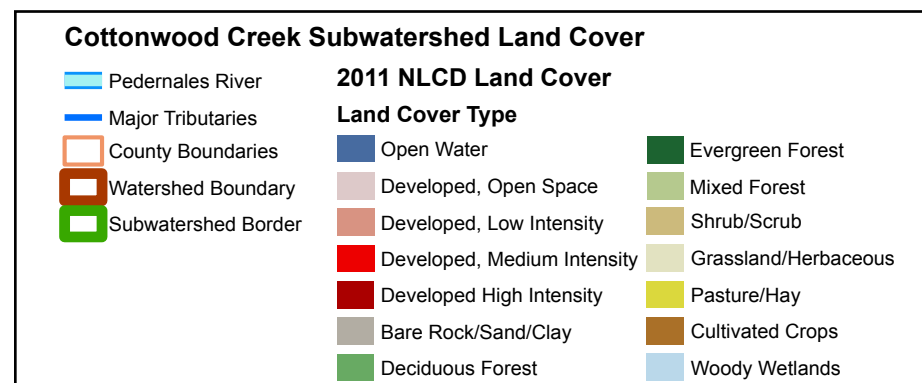
# Land Cover

## Cottonwood Creek Land Cover



Agricultural activities such as cultivated crops and hay/pasturelands are minimal in the area, but a considerable amount of grassland/herbaceous graze lands can be observed close to Johnson City, as well as, within close proximity of the Pedernales River. Herds of cattle were observed grazing in and around Cottonwood Creek along Cypress Mill road.

Despite all of the urban development within the subwatershed, shrub/scrublands accounted for a majority (54%) of the land cover, grassland/herbaceous being the second most common land cover type, followed by forest stands of varying types.



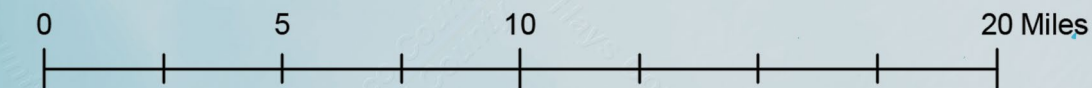


# CYPRESS CREEK



## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries

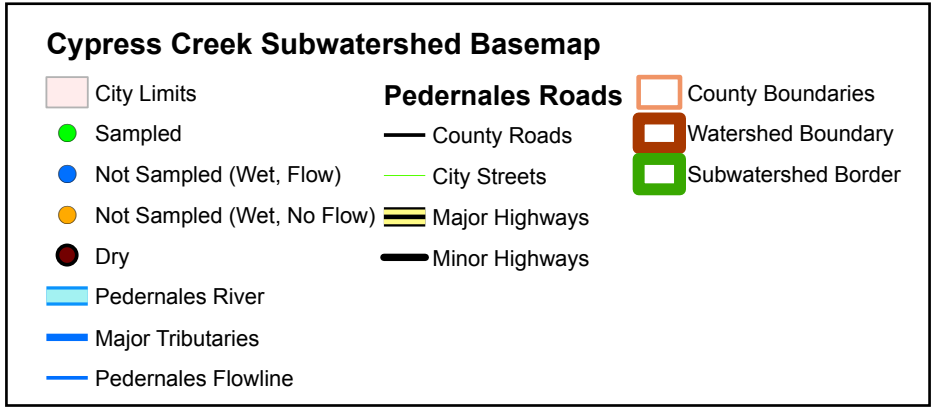


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Cypress Creek Subwatershed, Site 20



THE CYPRESS CREEK SUBWATERSHED in the northeast portion of the Pedernales River watershed in Blanco County and contains 81.60 square miles. USH 281 traverses the western portion of the watershed in a northeast-southwest orientation, and RM 962 traverses much of the watershed in a northwest-southeast orientation.

Flowing water was observed by The Meadows Center staff along Stribling Creek, Cypress Creek, Wallace Branch, and North Cypress Creek. Cleveland Branch was dry. Cypress Creek itself had ample flow and large stands of Cypress trees (*Taxodium distichum*) were observed along the river corridor.

**ABOUT CYPRESS CREEK SUBWATERSHED**

Size: 81.60 square miles

Counties: Blanco

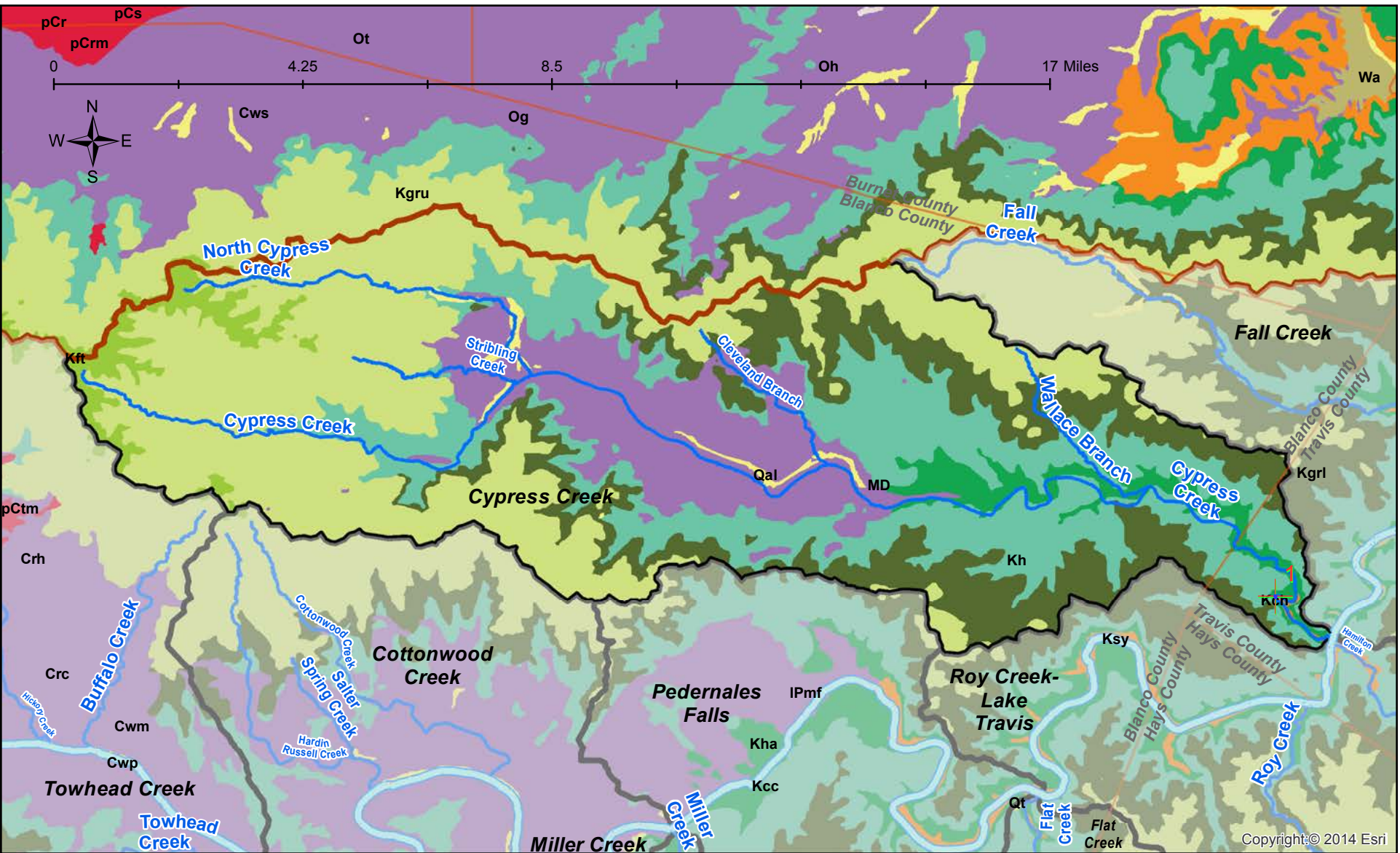
Cities: Round Mountain (pop. 181)

Tributaries: Cypress Creek, North Cypress Creek, Stribling Creek, Cleveland Branch, and Wallace Branch

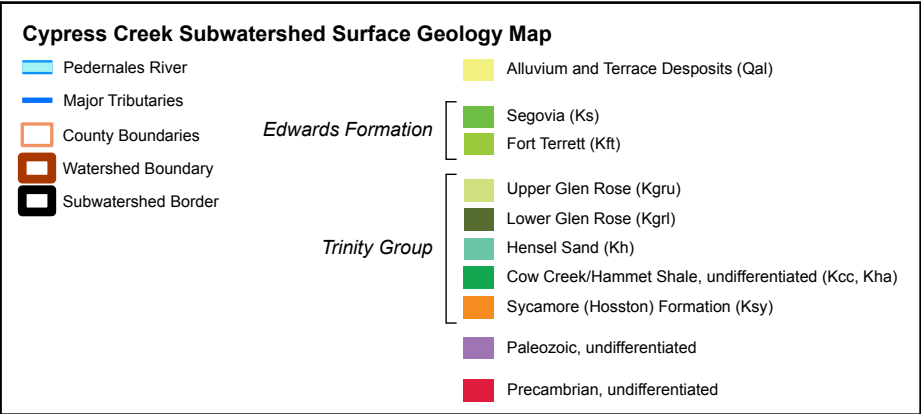


# Surface Geology

Surface rock units within the subwatershed include undifferentiated Paleozoics within the central portion of the subwatershed immediately abutting Cypress Creek, which then transitions to Cow Creek (Kcc) units immediately surrounding the creek further downstream. Hensel Sand (Kh) units can be found in the eastern portion of the subwatershed as well as immediately adjacent to the Paleozoic and Cow Creek units as one travels away from Cypress Creek. The Hensel units then transition to Lower and Upper Glen Rose units, especially in the central and eastern portions of the subwatershed. Small concentrations of Fort Terrett (Kft) and Sycamore (Hosston) units are found in the extreme western and southeastern portions of the subwatershed, respectively.



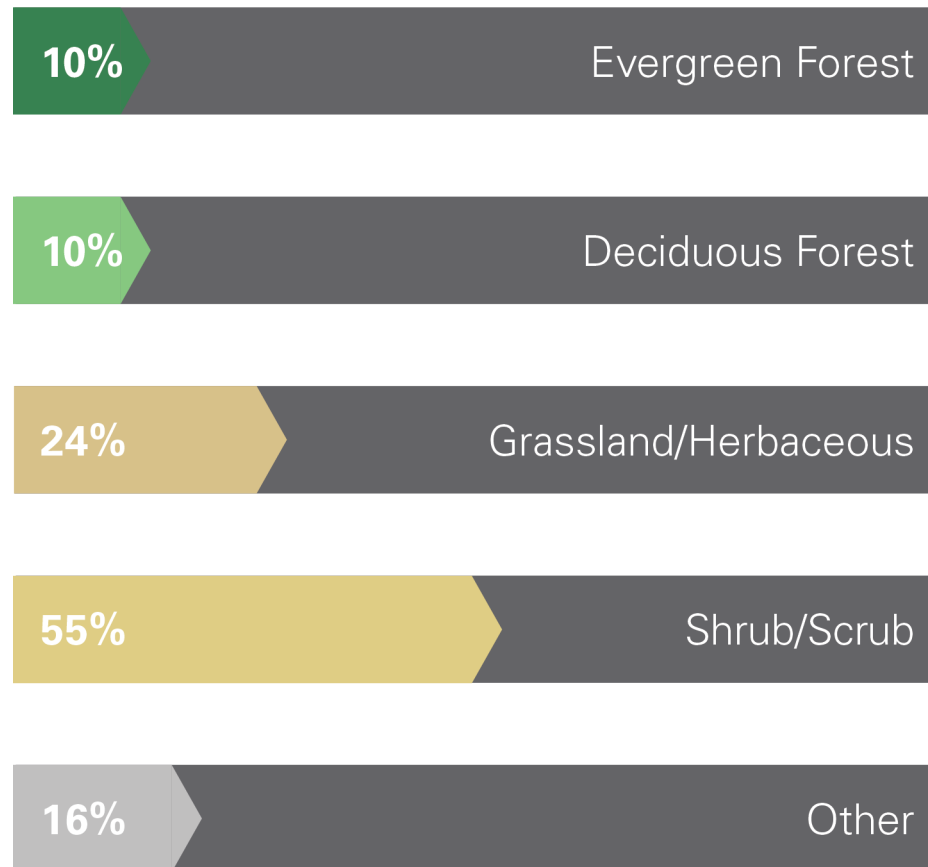
## Cypress Creek Geology Breakdown



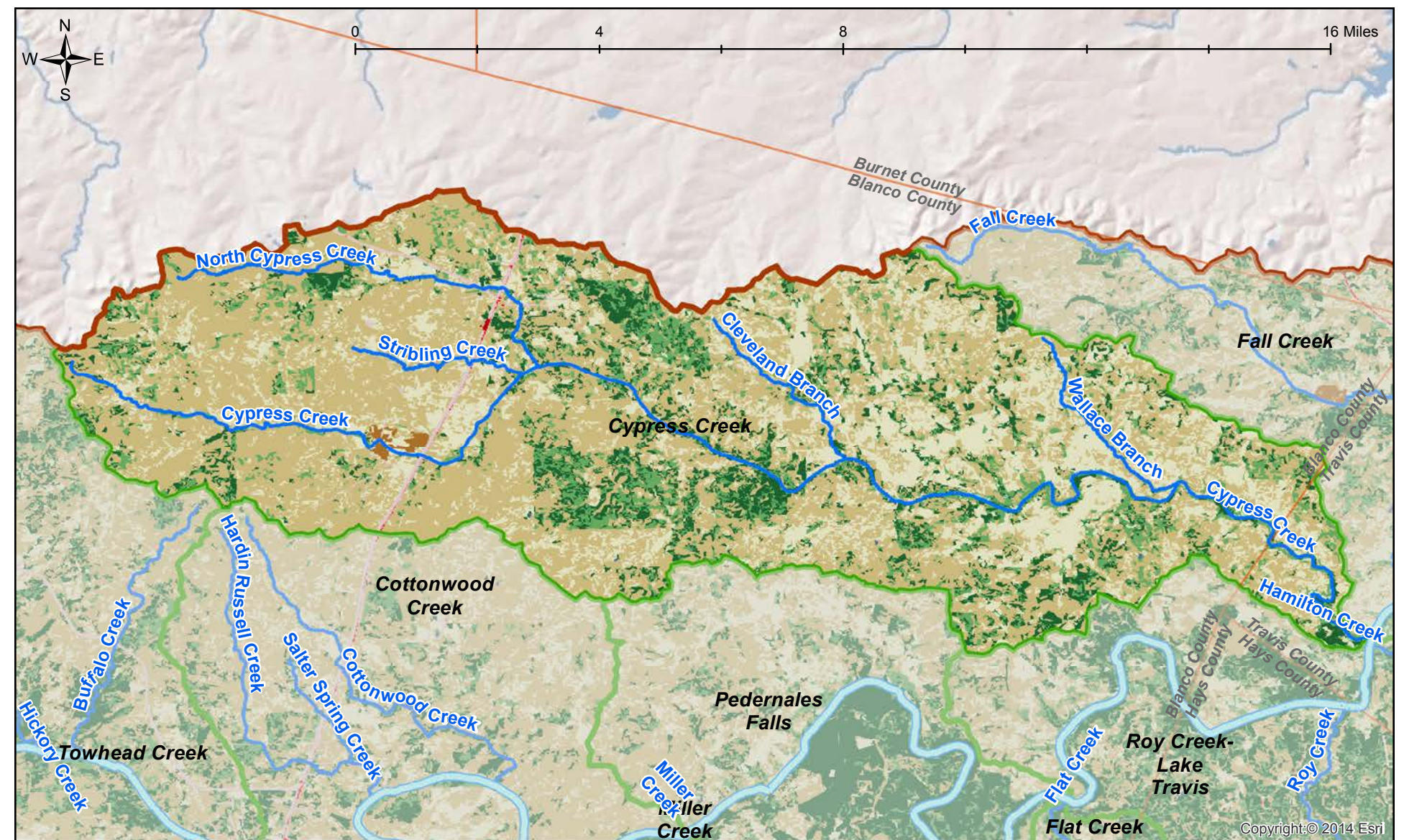
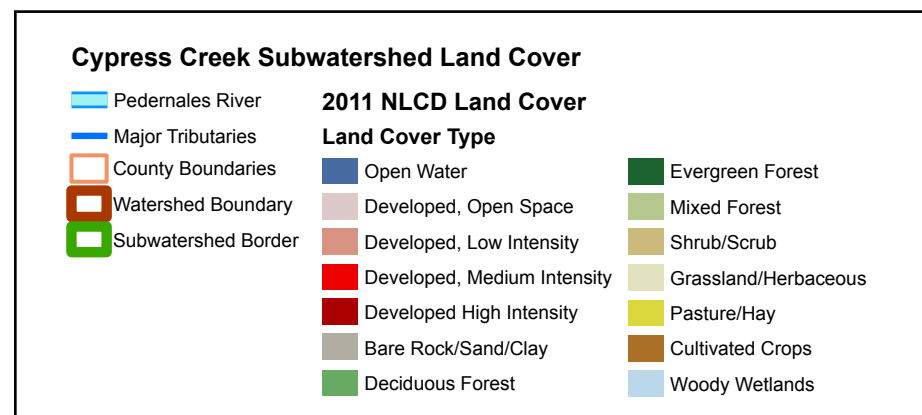


# Land Cover

## Cypress Creek Land Cover



Small portions of developed land cover are contained within the town of Round Mountain; otherwise the subwatershed is primarily dominated by scrublands, grasslands, and small concentrations of deciduous and evergreen forest in and around Cypress Creek. A minimal amount of cultivated agricultural land is located on the southwest edge of Round Mountain.





# FALL CREEK

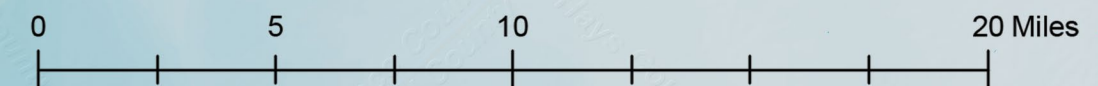


## Pedernales Subwatershed Locations

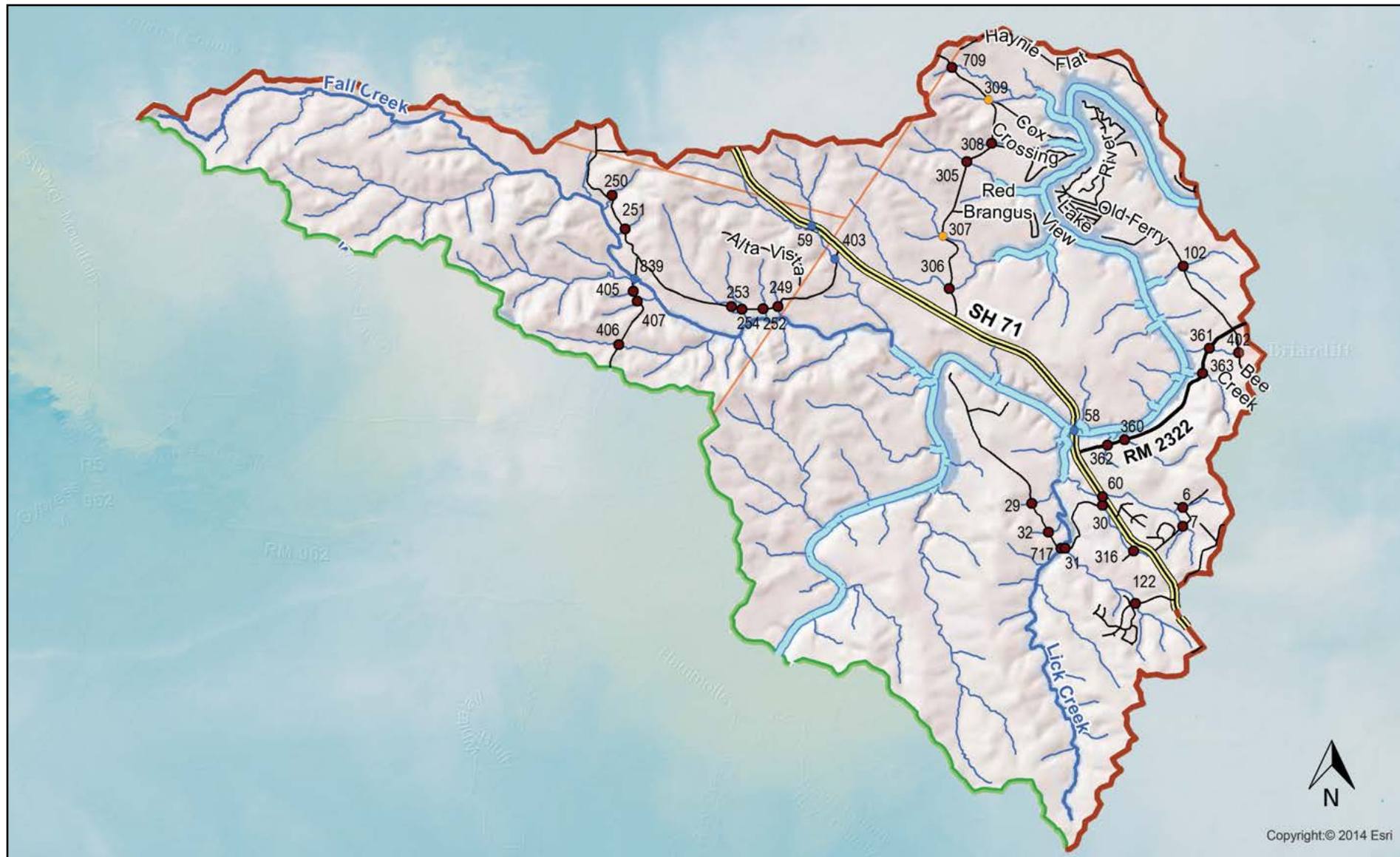
- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries



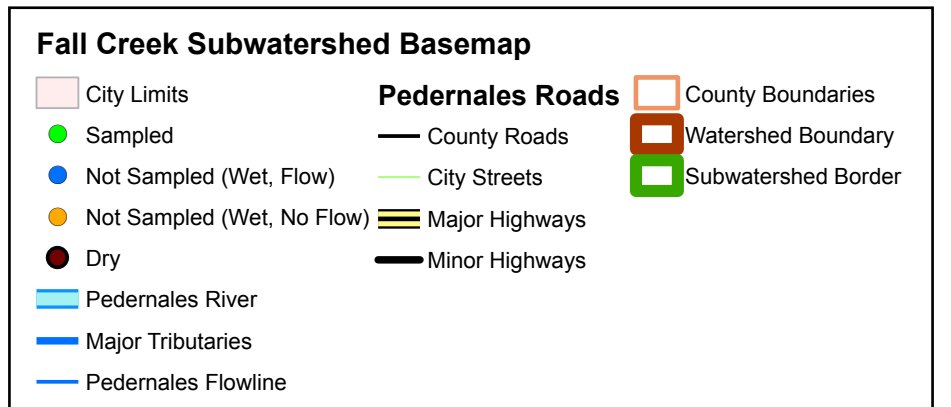
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Fall Creek Subwatershed, Site 58



**T**HE FALL CREEK SUBWATERSHED is located in the northeast portion of the Pedernales River watershed in Blanco County and contains 48.47 square miles. State Highway 71 traverses the central and eastern portion of the watershed in a northwest-southeast orientation, and RM 2322 spurs off from 71 to the northeast.

Flowing water was observed by The Meadows Center staff along Fall Creek and the Pedernales River, as well as a few flow lines with no confirmed name. However, only the site along Fall Creek was accessible by foot.

## ABOUT FALL CREEK SUBWATERSHED

*Size:* 48.47 square miles

*Counties:* Blanco County

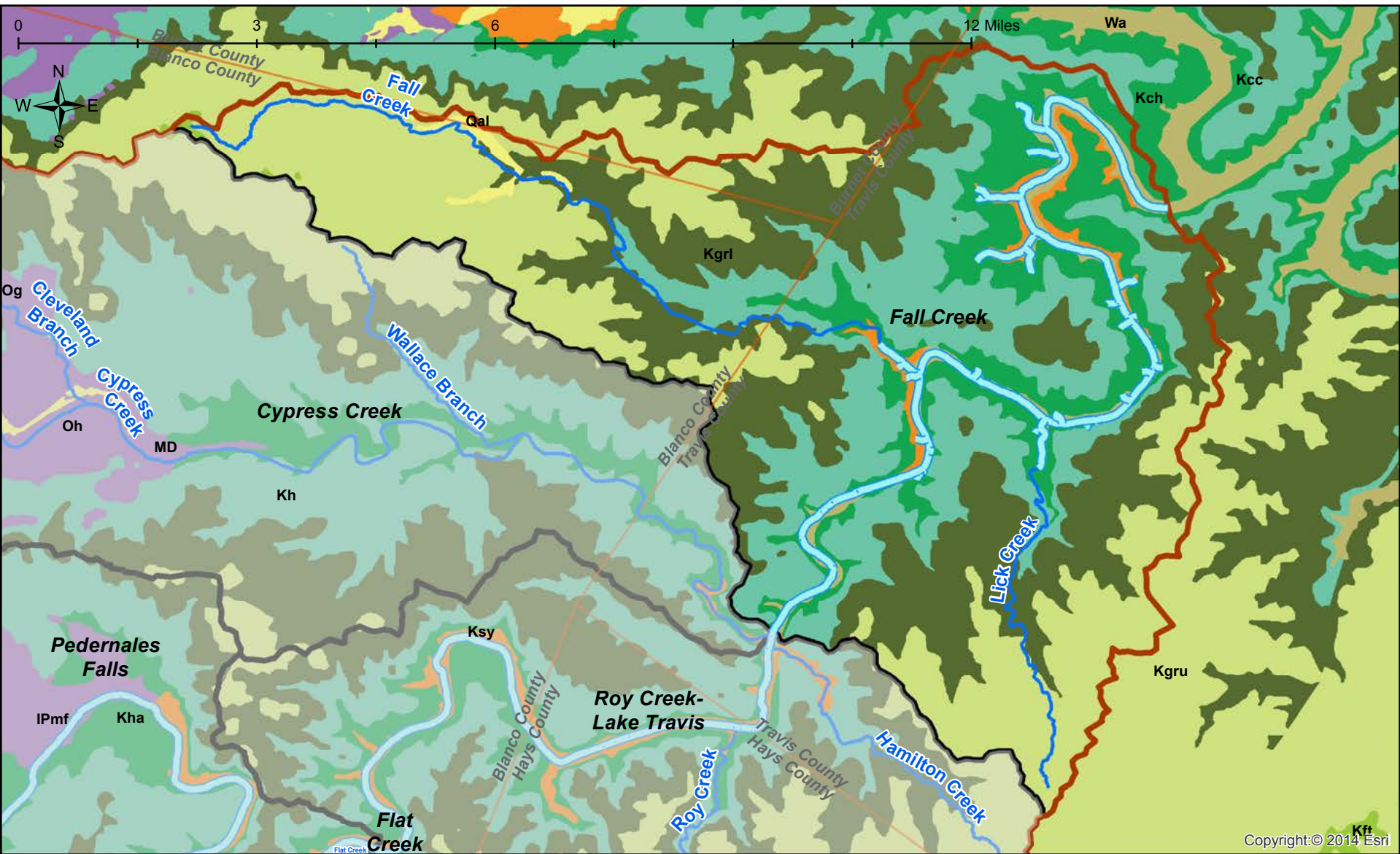
*Cities:* Village of Briarcliff (pop. 1,438)

*Tributaries:* Fall Creek and Lick Creek

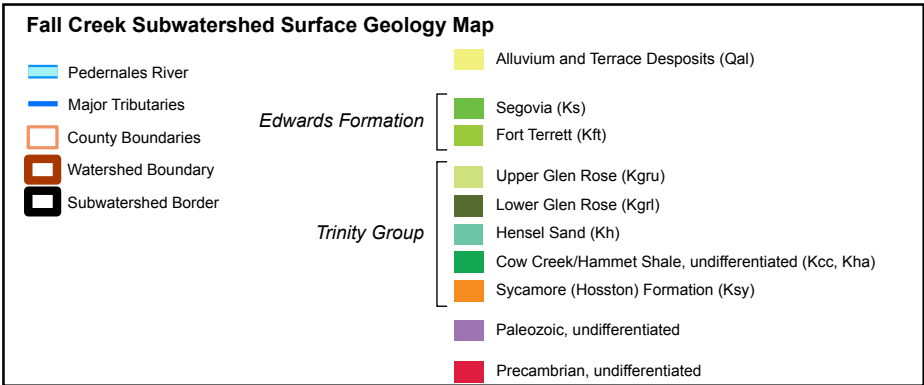
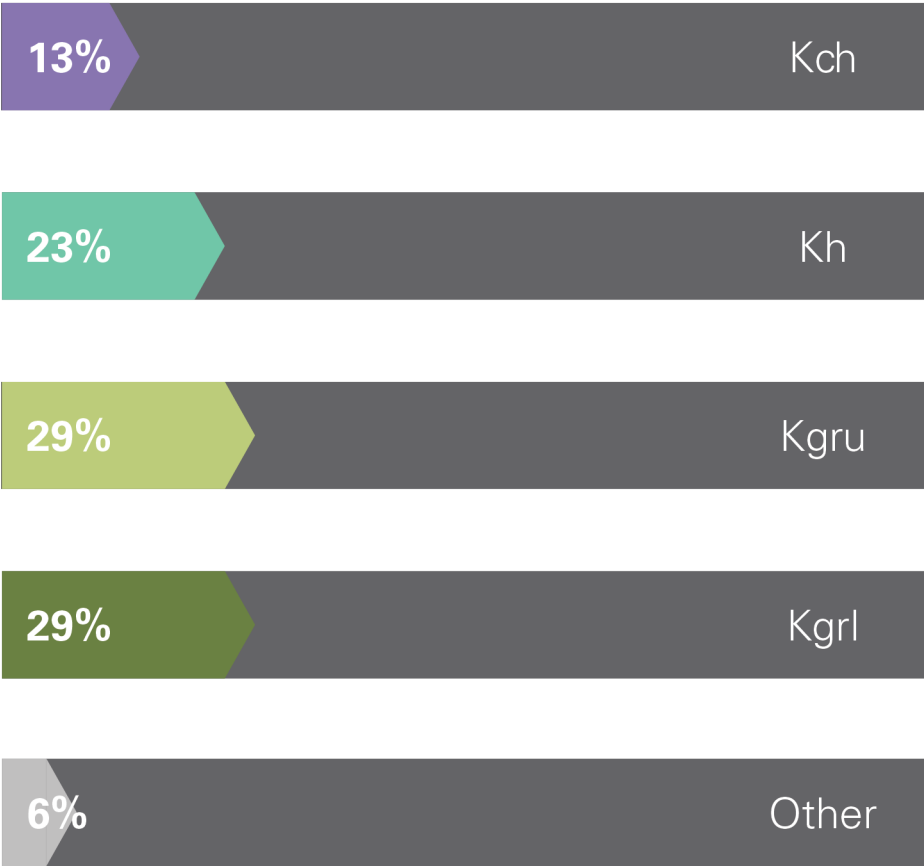


# Surface Geology

Surface rock units within the subwatershed include Tertiary and Sycamore formations immediately along the Pedernales River corridor, then Cow Creek (Kcc) units moving outward from the river, into Hensel Sand formations (Kh), and to Lower then Upper Glen Rose units.



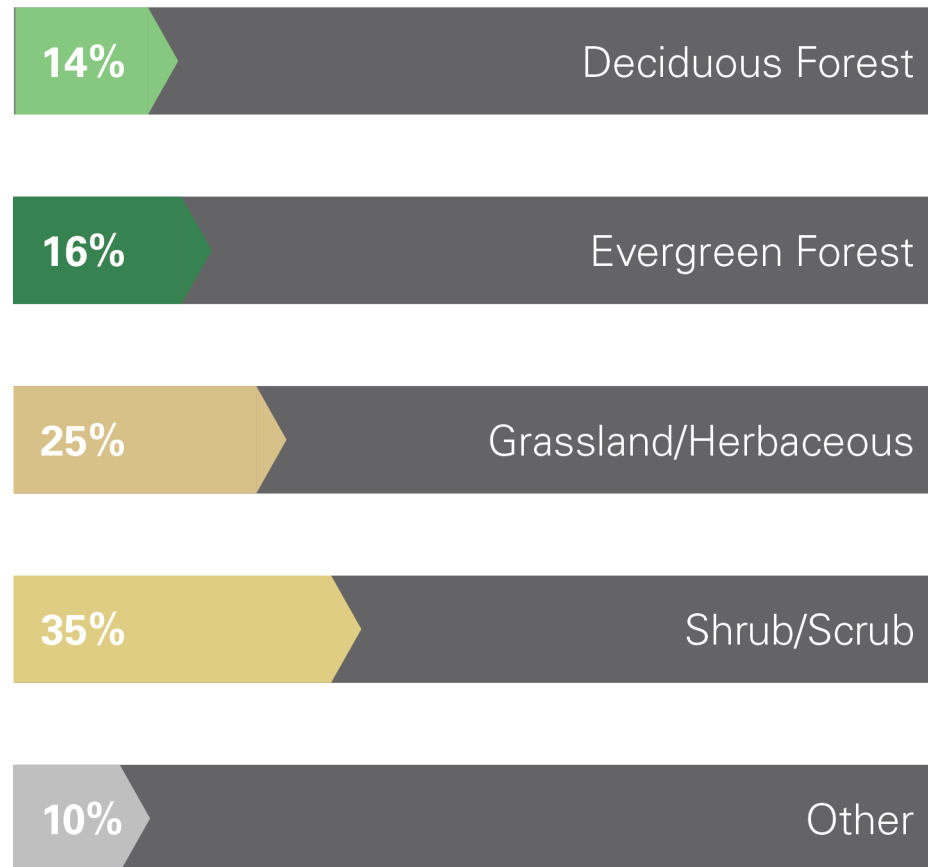
## Fall Creek Geology Breakdown



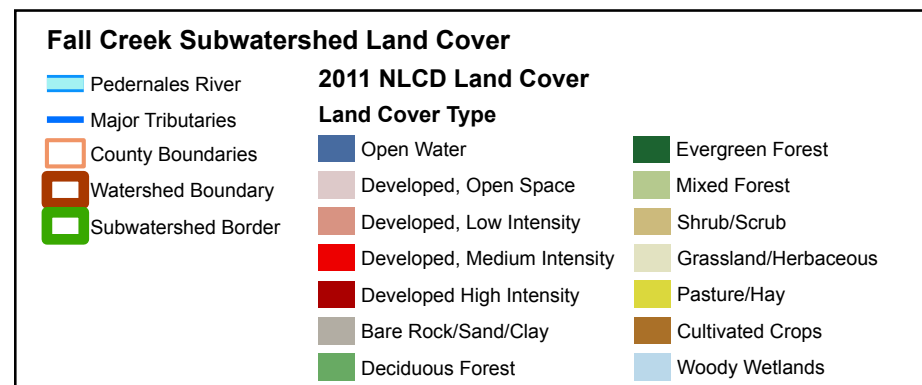


# Land Cover

## Fall Creek Land Cover

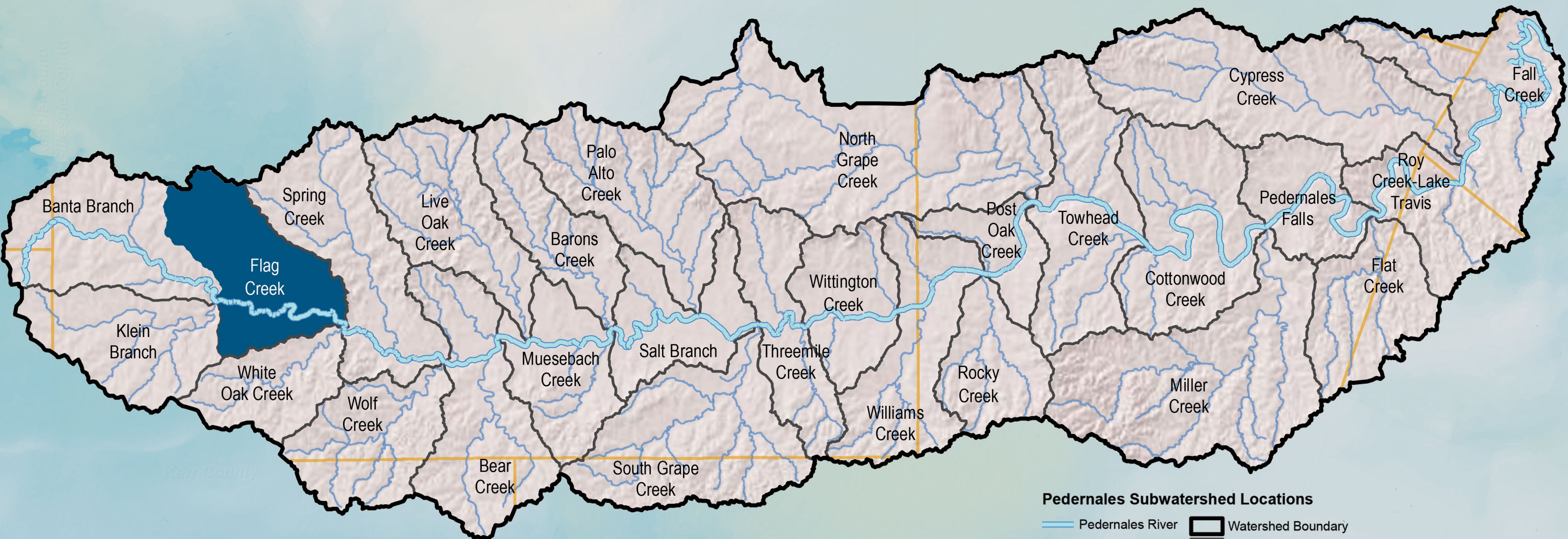


Small portions of developed land cover are contained within the town of Briarcliff; otherwise the subwatershed is primarily dominated by scrublands, grasslands, and small concentrations of deciduous and evergreen forest in and around the Pedernales River. Agricultural activity within the subwatershed is minimal as Briarcliff is primarily a residential exurb of Austin.





# FLAG CREEK

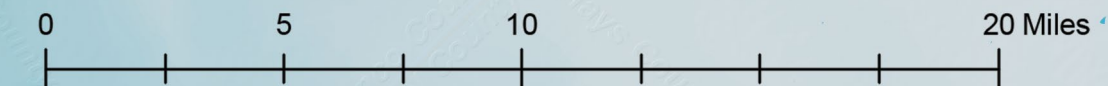


## Pedernales Subwatershed Locations

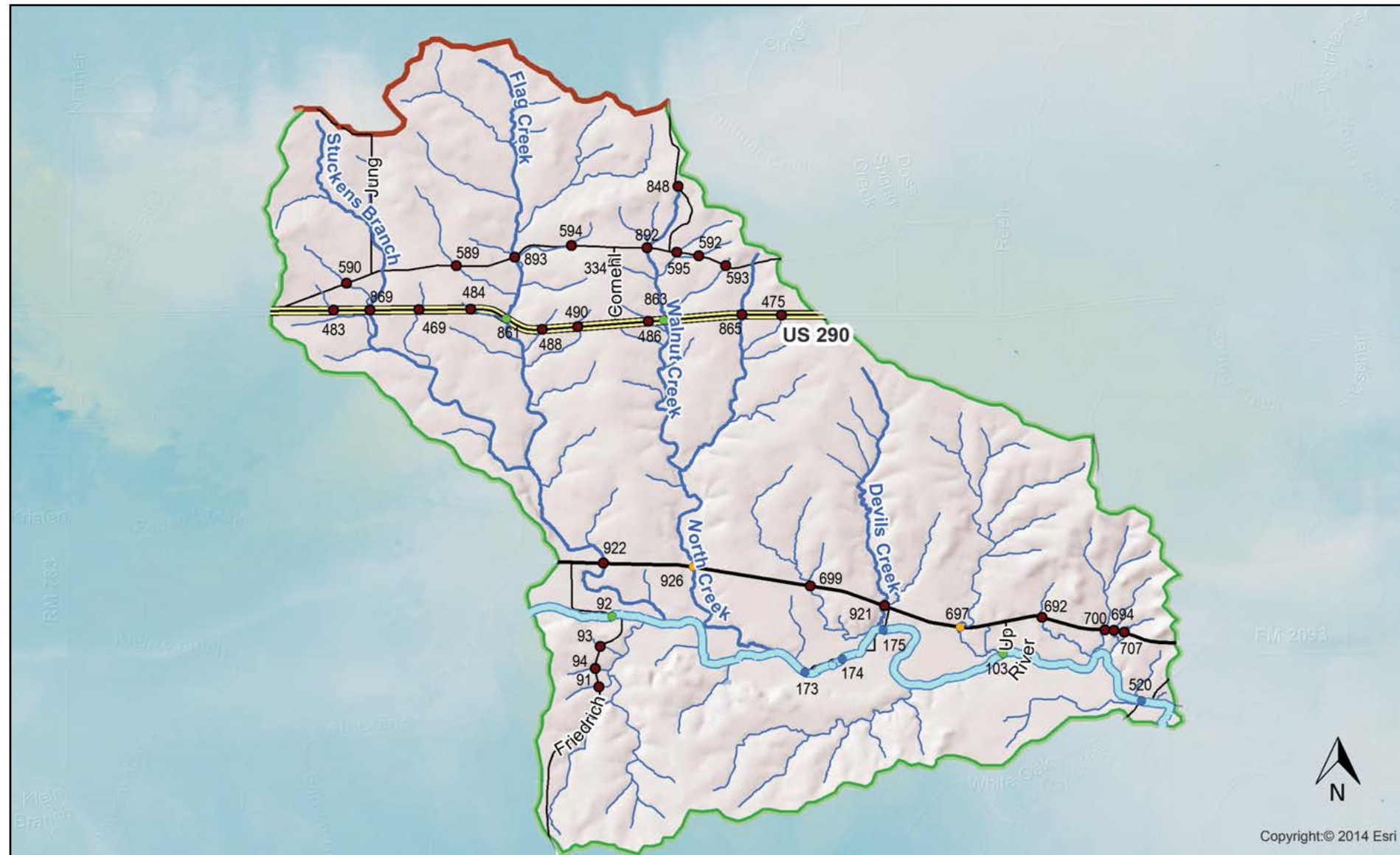
- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries



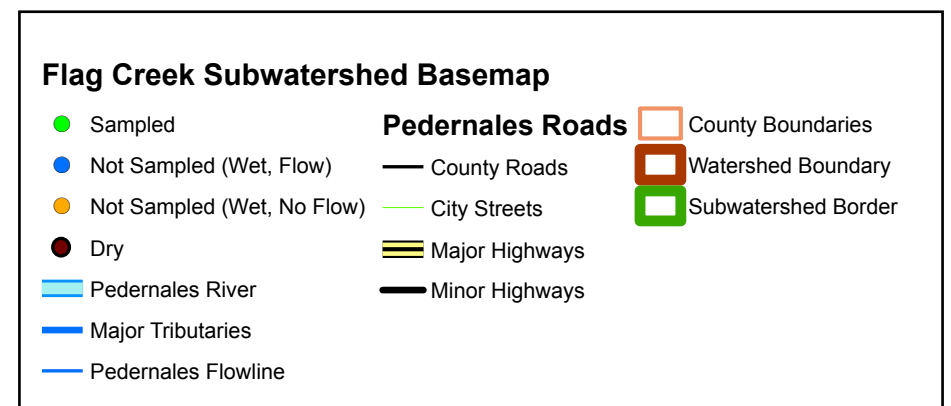
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Flag Creek Subwatershed, Site 861



**T**HE FLAG CREEK SUBWATERSHED is located at the northwest portion of the Pedernales River watershed in between Harper and Fredericksburg.

Flowing water was observed on upstream portions of Flag Creek and North Creek, but further downstream they were dry or had standing water only, respectively. There were five crossings at the Pedernales River from the western to eastern edges of the subwatershed, and flowing water was observed at each site.

## ABOUT FLAG CREEK SUBWATERSHED

**Size:** 44.64 square miles

**Counties:** Gillespie County

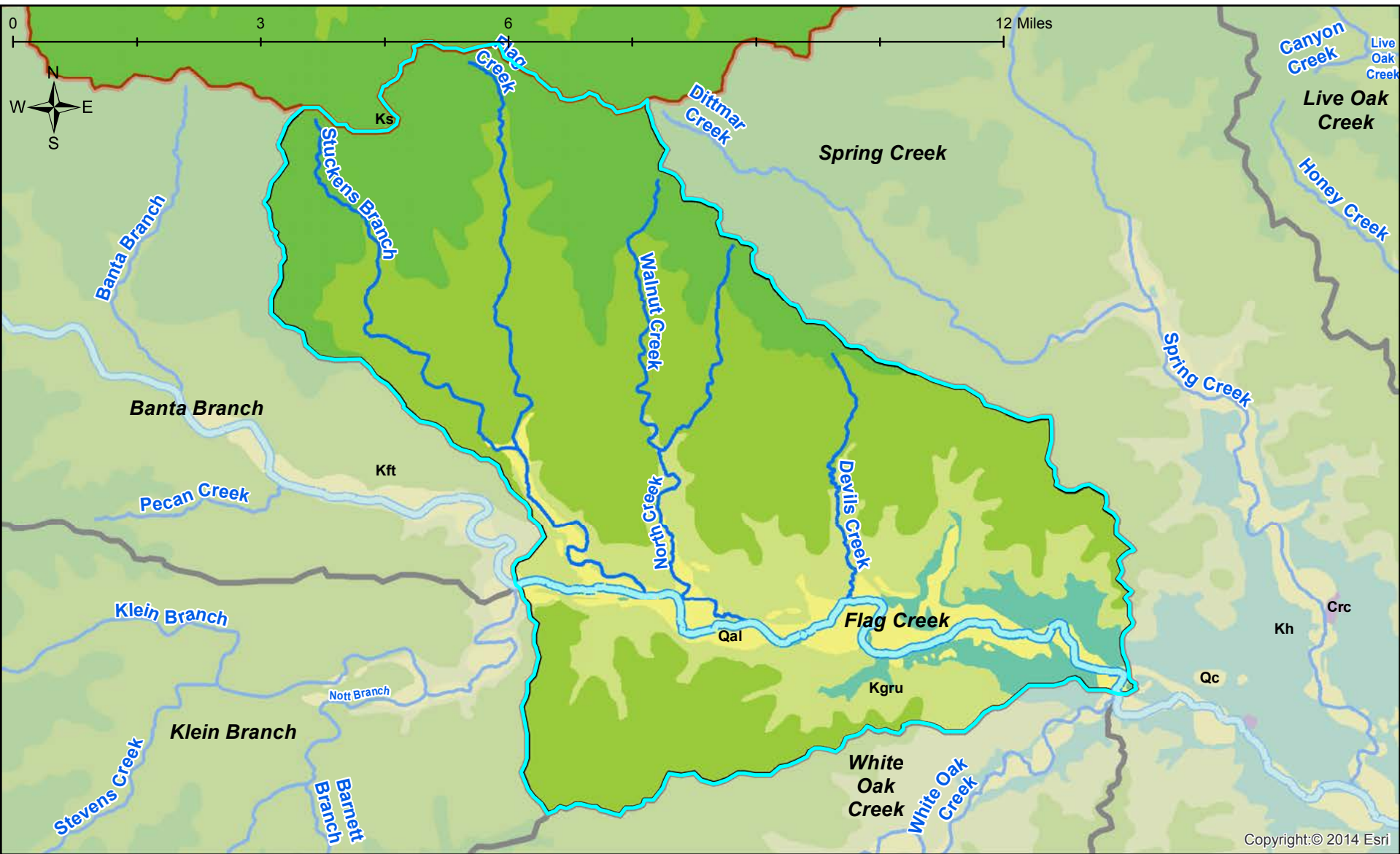
**Cities:** N/A

**Tributaries:** Flag Creek, Stuckens Branch, Devils Creek, and North Creek

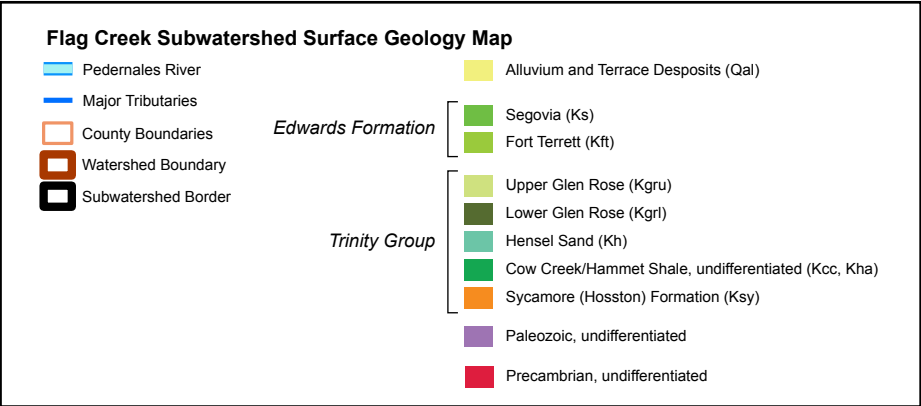


# Surface Geology

Surface rock members within the subwatershed include Edwards formation members in its northern portion, which transitions to Upper Glen Rose and Hensell Sand members along the Pedernales River, then back to Edwards heading south of the river.



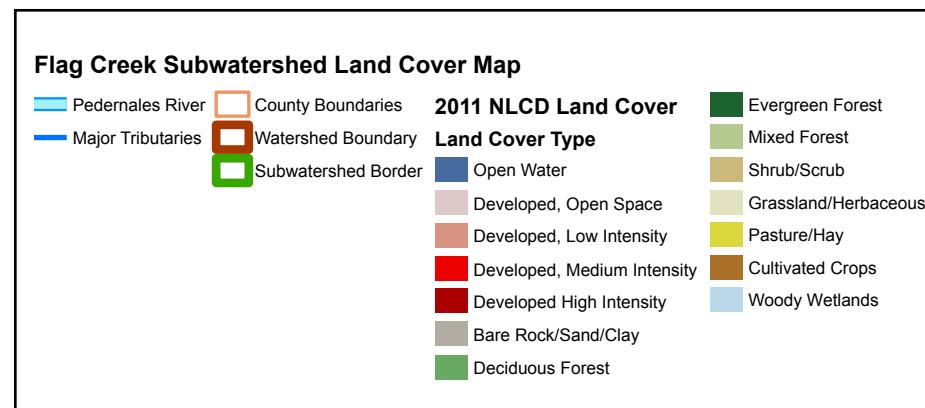
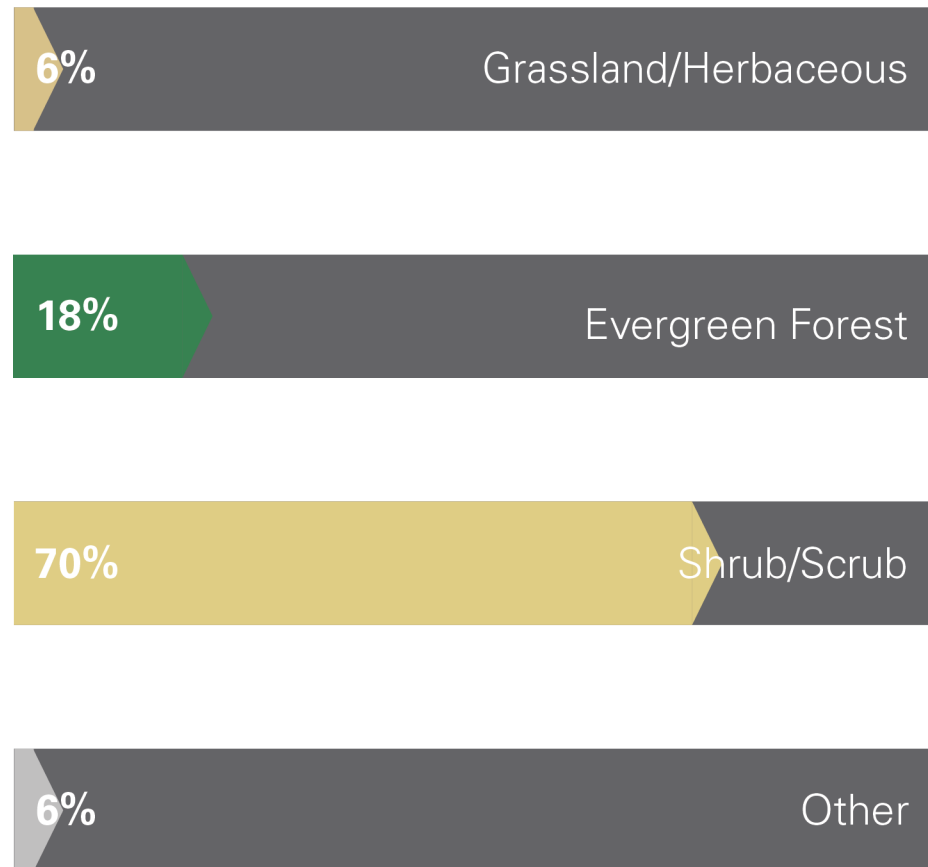
## Flag Creek Geology Breakdown



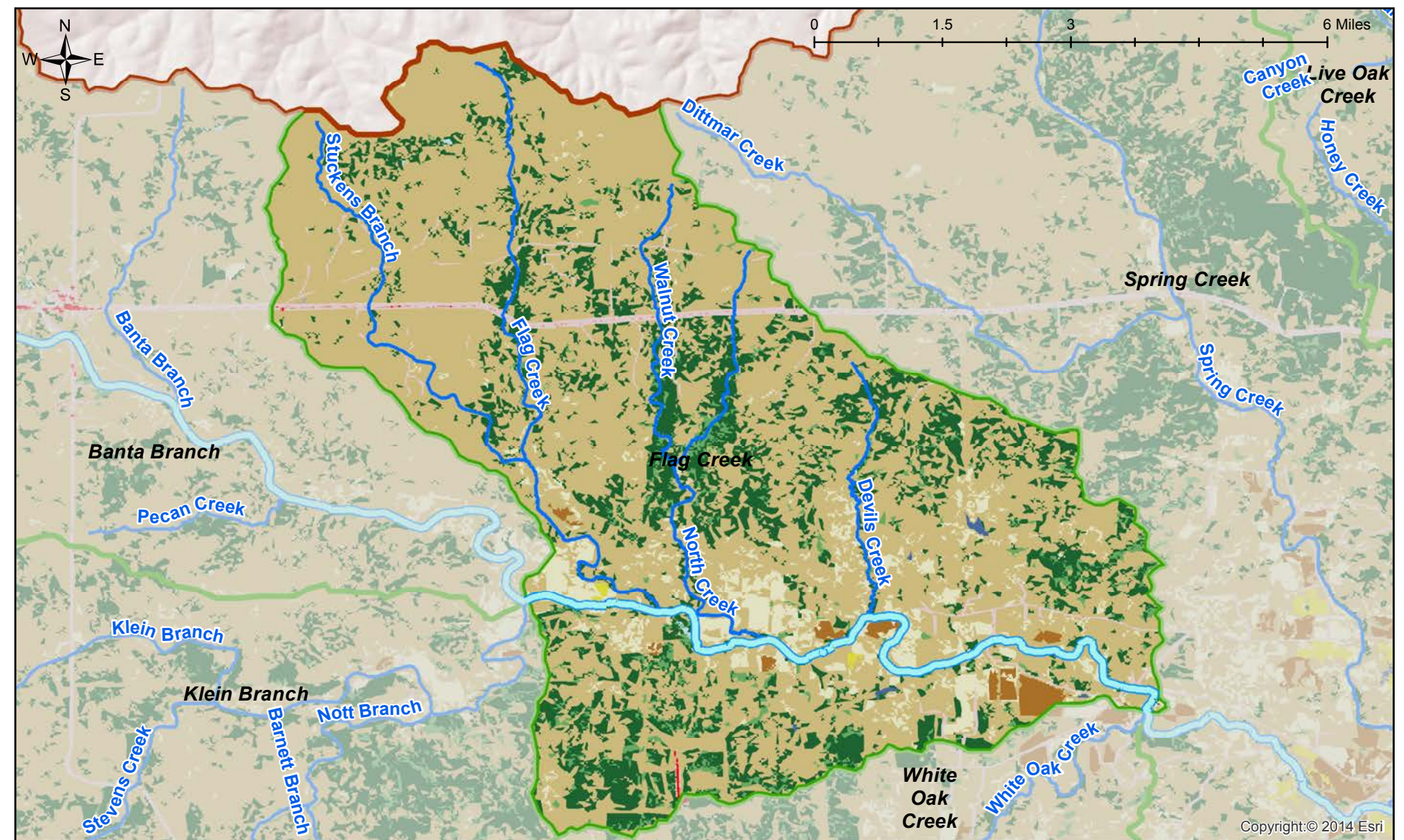


# Land Cover

## Flag Creek Land Cover

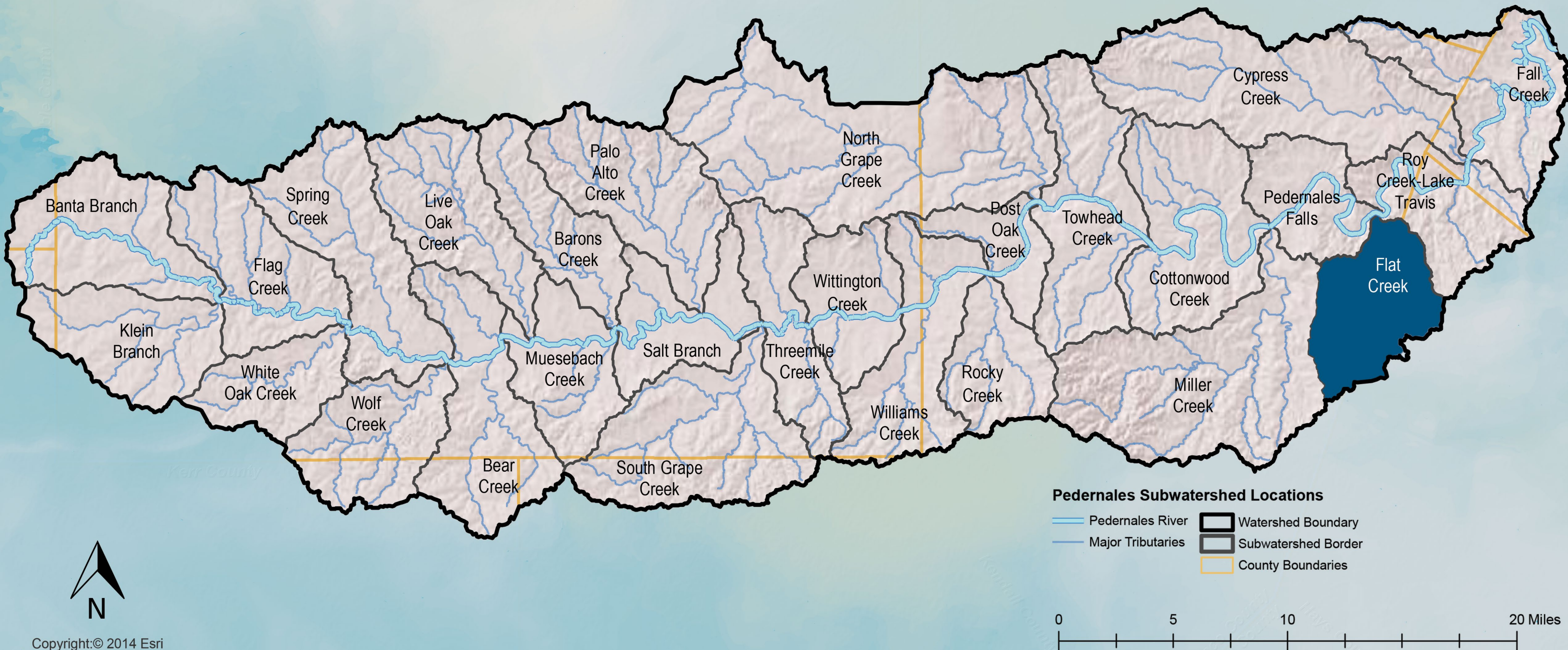


The Pedernales River flows through the most southern areas of the subwatershed. Urban development is minimal in most of the subwatershed, with USH 290 and FM 2093 crossing the subwatershed in an east-west direction. Some agricultural activity is present along the Pedernales River corridor, with significant amounts of pastureland present along with occasional developments of cultivated crops.

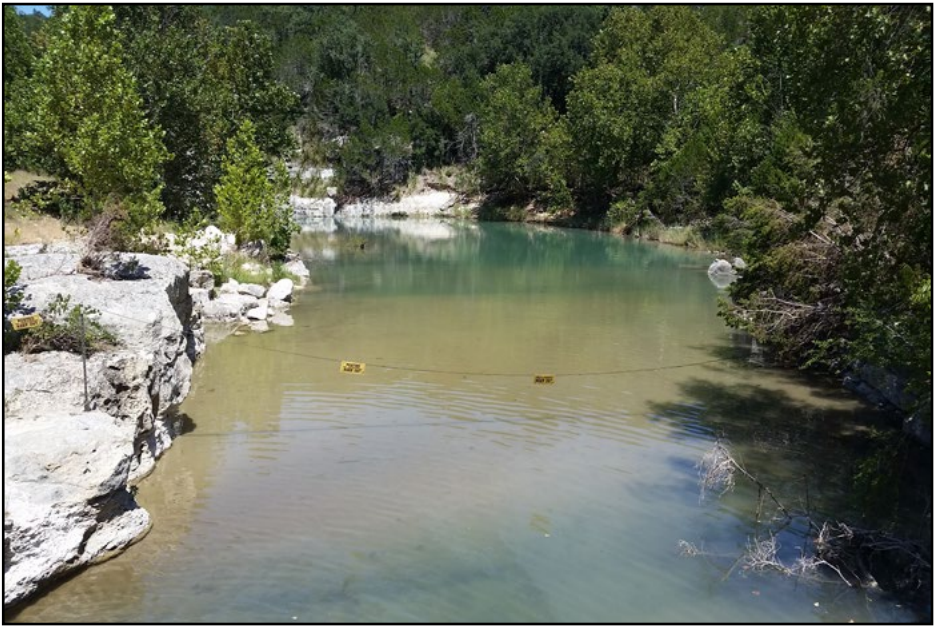




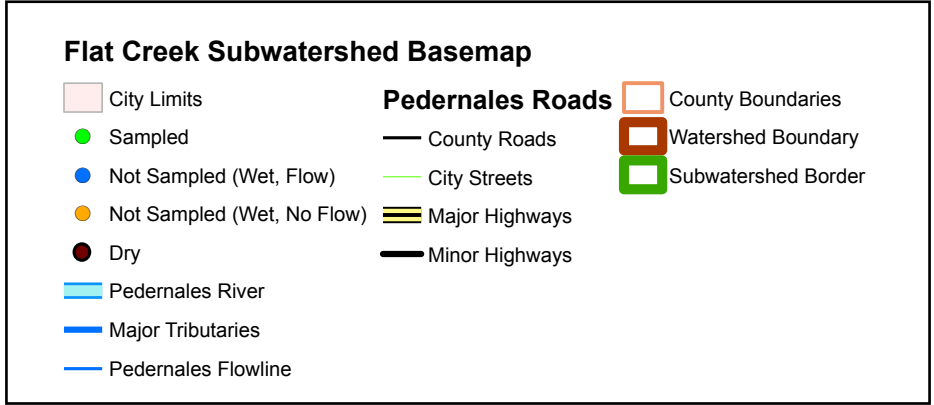
# FLAT CREEK







Flat Creek Subwatershed, Site 887



**T**HE FLAT CREEK SUBWATERSHED is located in the east-southeast portion of the Pedernales River watershed and contains a small portion of USH 290 to its extreme south as well as the beginning of RM 3232, which runs along the western edge of the subwatershed.

Flowing water was observed by The Meadows Center staff along Flat Creek at site 887 and far upstream on Sycamore Creek at site 66. However, Sycamore Creek lost flow further downstream, as only stagnant water was observed at site 770. Calohan Creek was not accessible by public roads.

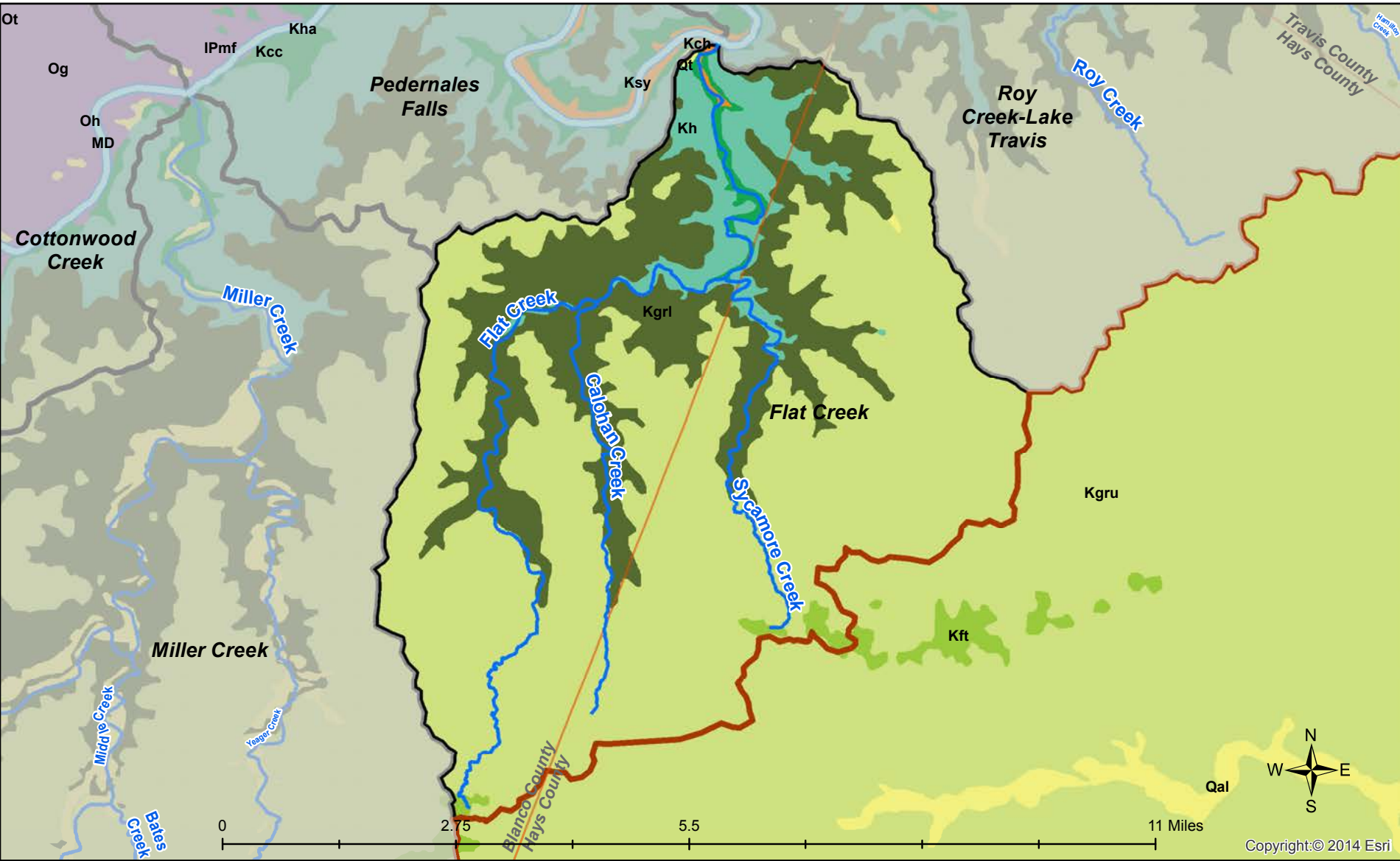
**ABOUT FLAT CREEK SUBWATERSHED**

*Size:* 37.11 square miles  
*Counties:* Hays County and Blanco County  
*Cities:* N/A  
*Tributaries:* Flat Creek, Calohan Creek, and Sycamore Creek

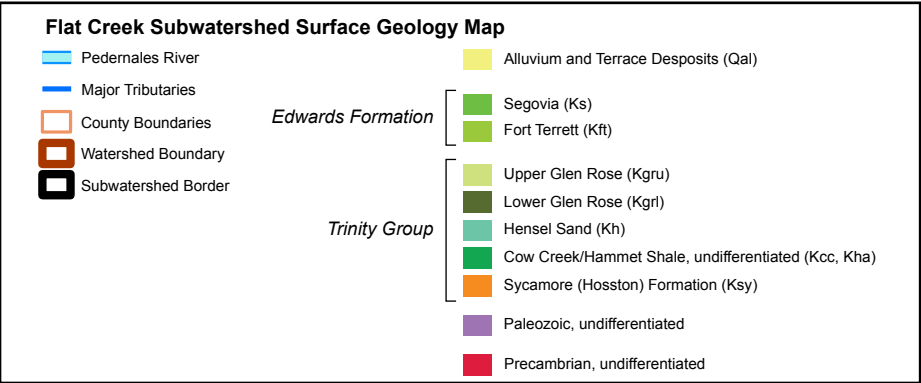
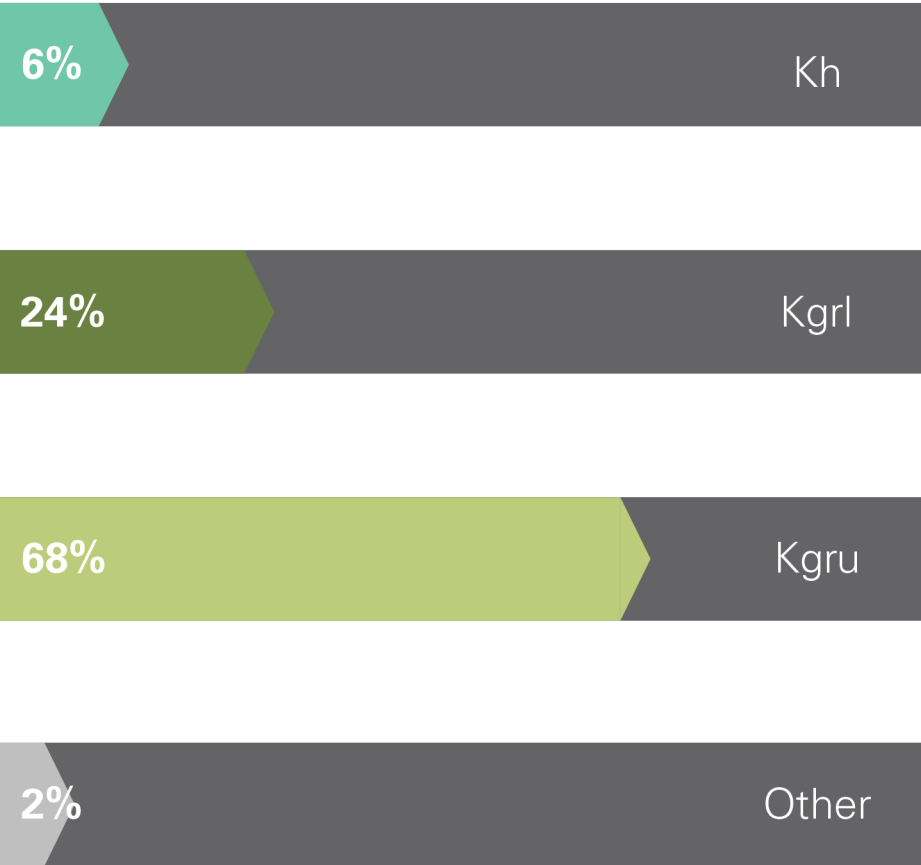


# Surface Geology

Surface rock units within the subwatershed mostly include Cow Creek units (Kcc) running immediately along the creek corridors, then transitioning outward into Hensel Sand units (Ks), then lower to upper Glen Rose formations.



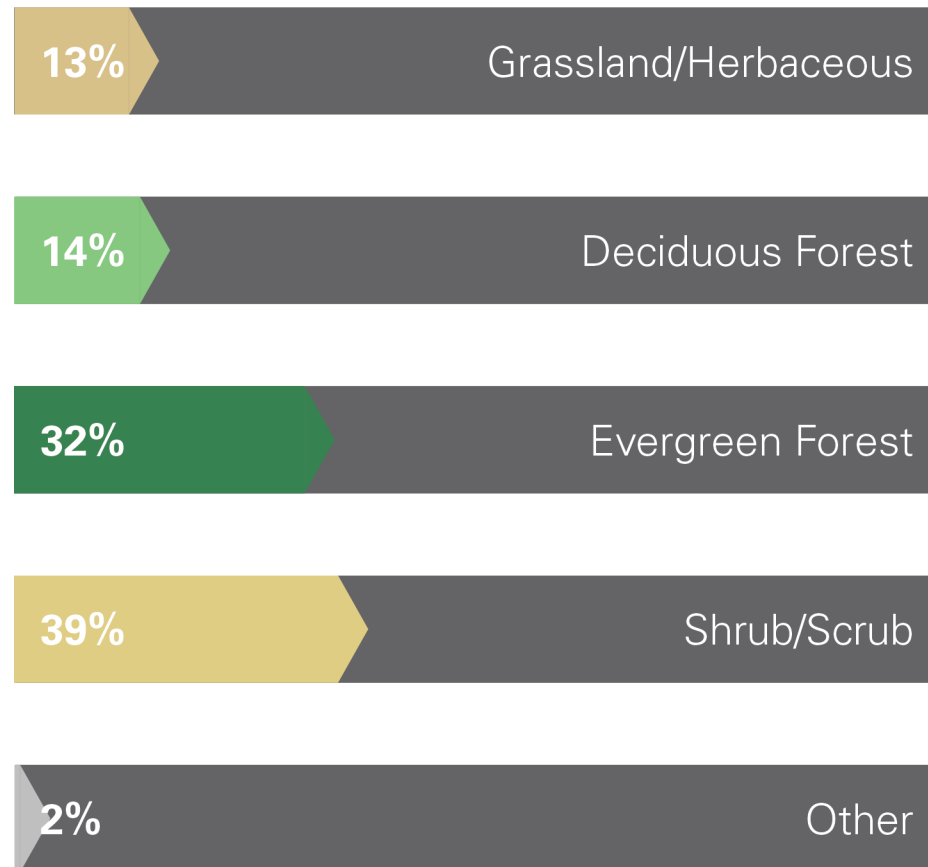
Flat Creek Geology Breakdown



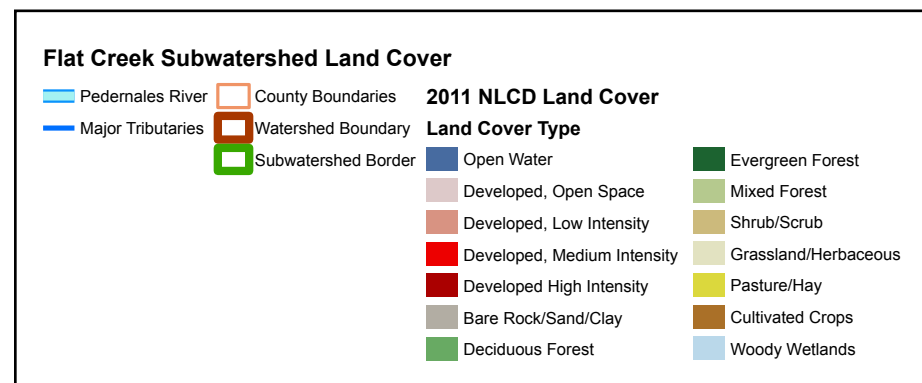


# Land Cover

## Flat Creek Land Cover



The subwatershed is primarily dominated by scrublands, grasslands, and concentrations of deciduous and evergreen forests along the creek corridors. Agricultural activity and land development within the Flat Creek subwatershed is nonexistent.





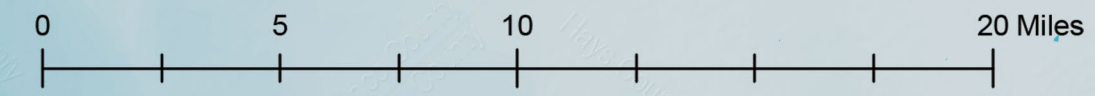
# KLEIN CREEK



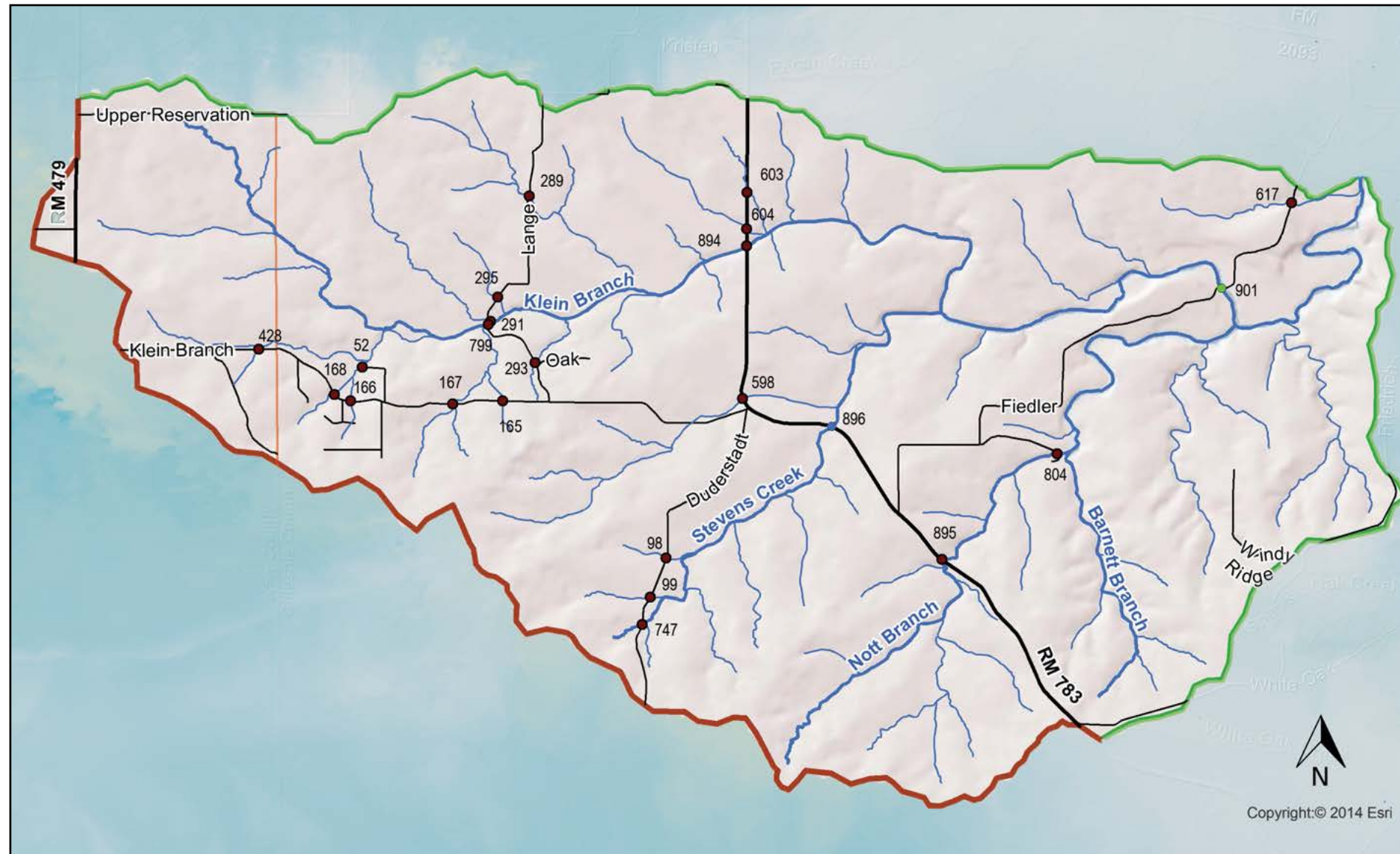
## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries

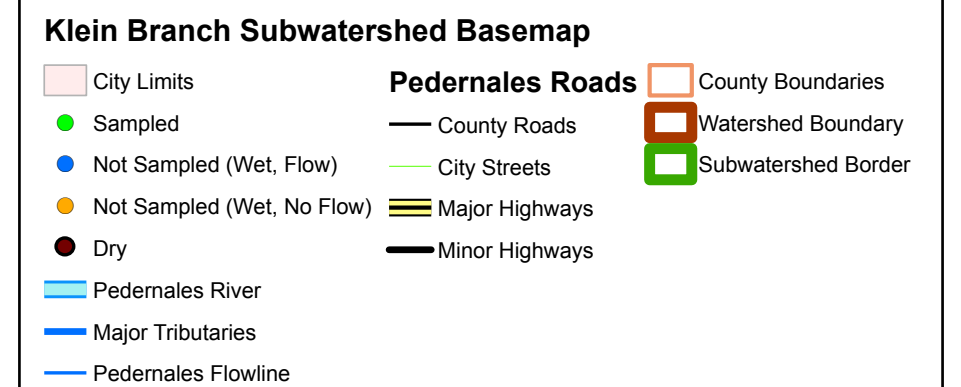
N  
Copyright:© 2014 Esri







Klein Branch Subwatershed, Site 901



**T**HE BANTA BRANCH SUBWATERSHED at the extreme western end of the Pedernales River watershed. Although four main tributaries within the subwatershed exist, flowing water was only found at Stevens Creek and Klein Branch a couple of miles downstream from the Stevens Creek/Klein Branch confluence. Barnett Branch was not publicly accessible to The Meadows Center staff.

Although multiple small county roads exist within the Klein Branch subwatershed, highways are minimal. RM 783 runs through the central and southeastern areas of the subwatershed, and crosses three of the main tributaries. However, most of the agricultural activities within the area are situated along the rural county roads.

## ABOUT KLEIN BRANCH SUBWATERSHED

**Size:** 41.35 square miles

**Counties:** Kerr County and Gillespie County

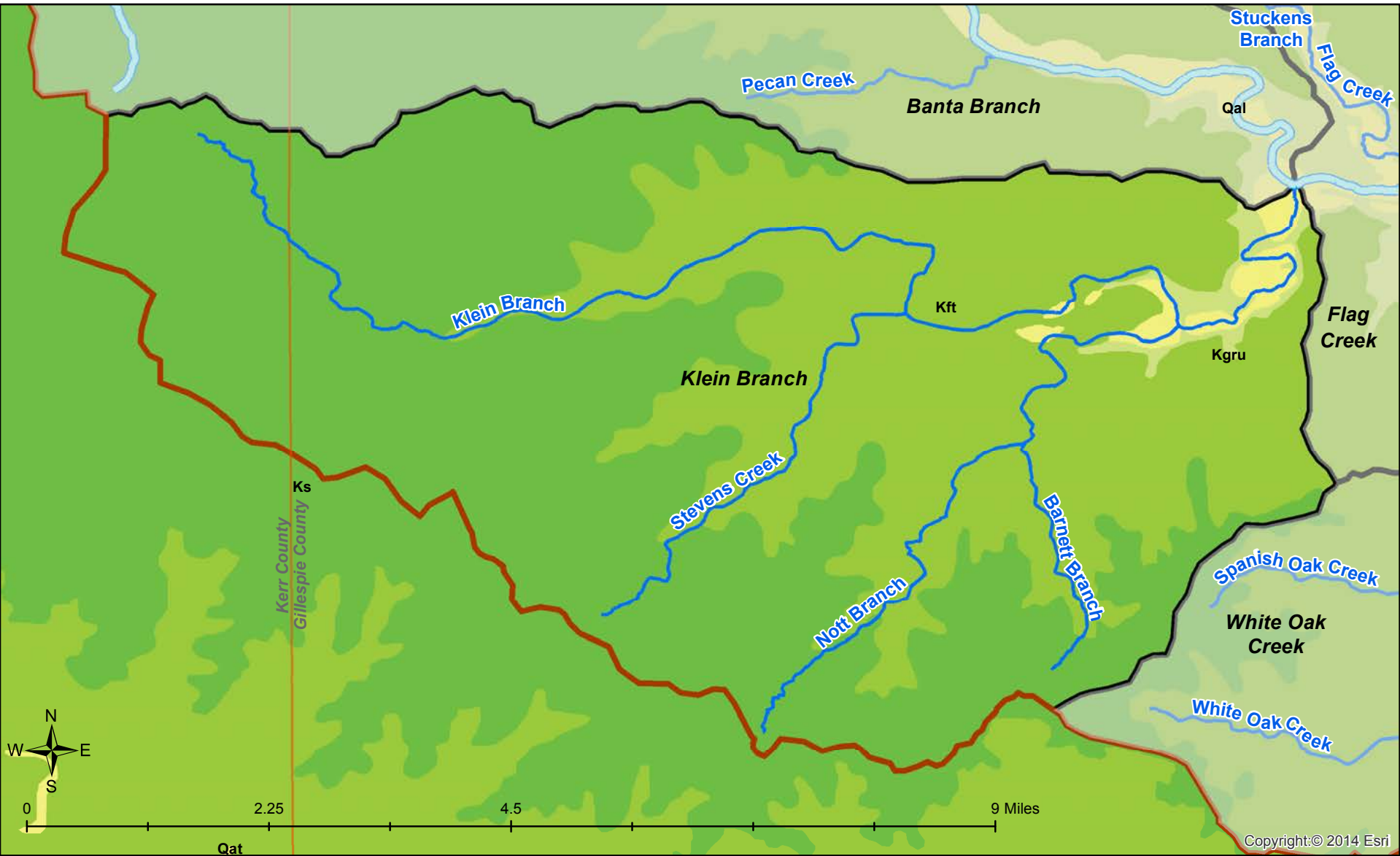
**Cities:** N/A

**Tributaries:** Klein Branch, Stevens Creek, Nott Branch, and Barnett Branch

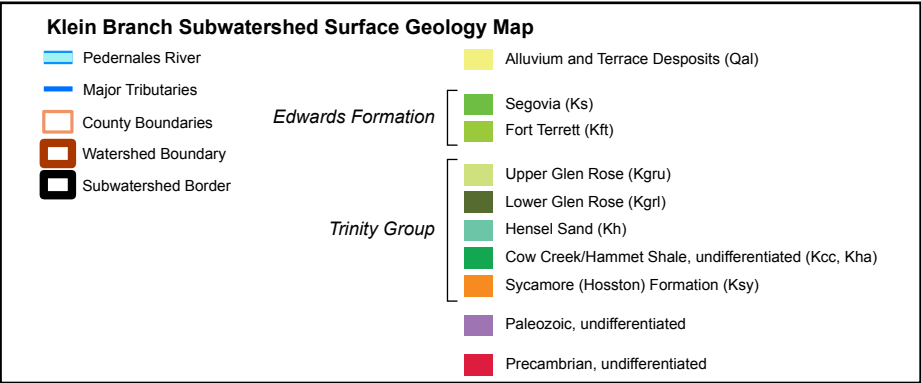


# Surface Geology

Minimal amounts of the Upper Glen Rose member can be observed along the Klein Branch corridor near and after its confluence with Nott Branch. Much of the grassland/herbaceous land cover within this area takes place on top of the Upper Glen Rose member or quaternary sediment deposits along the creeks.



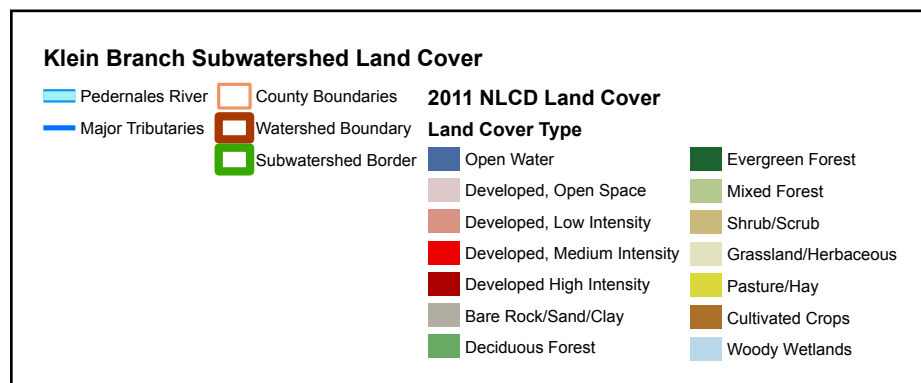
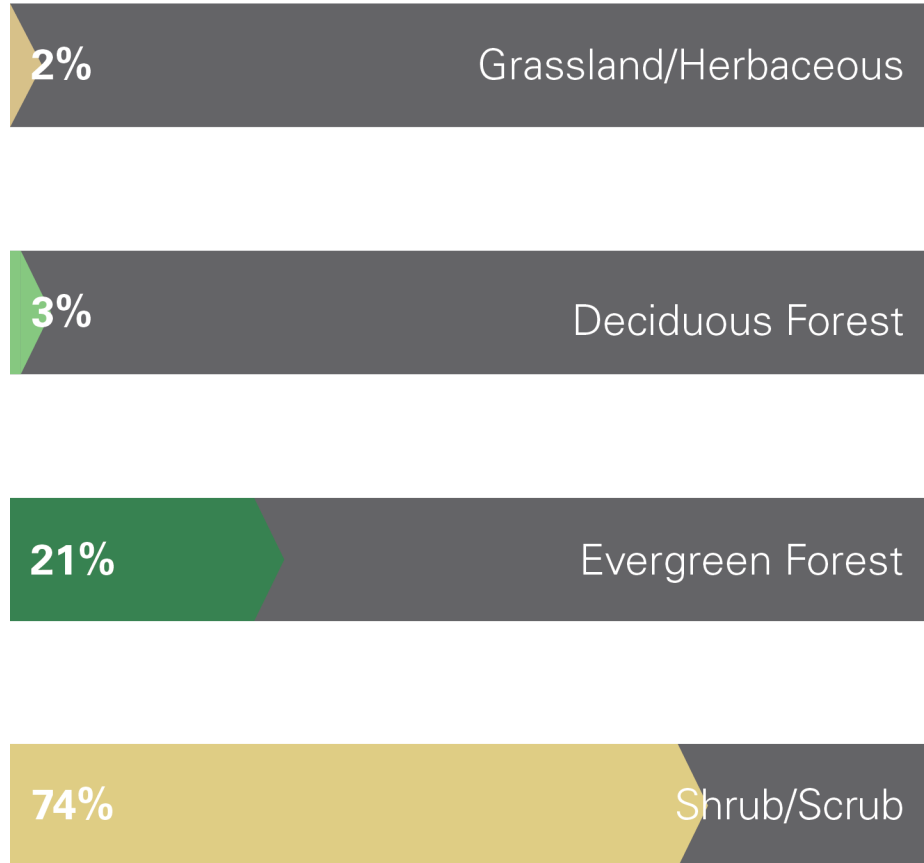
## Klein Branch Geology Breakdown



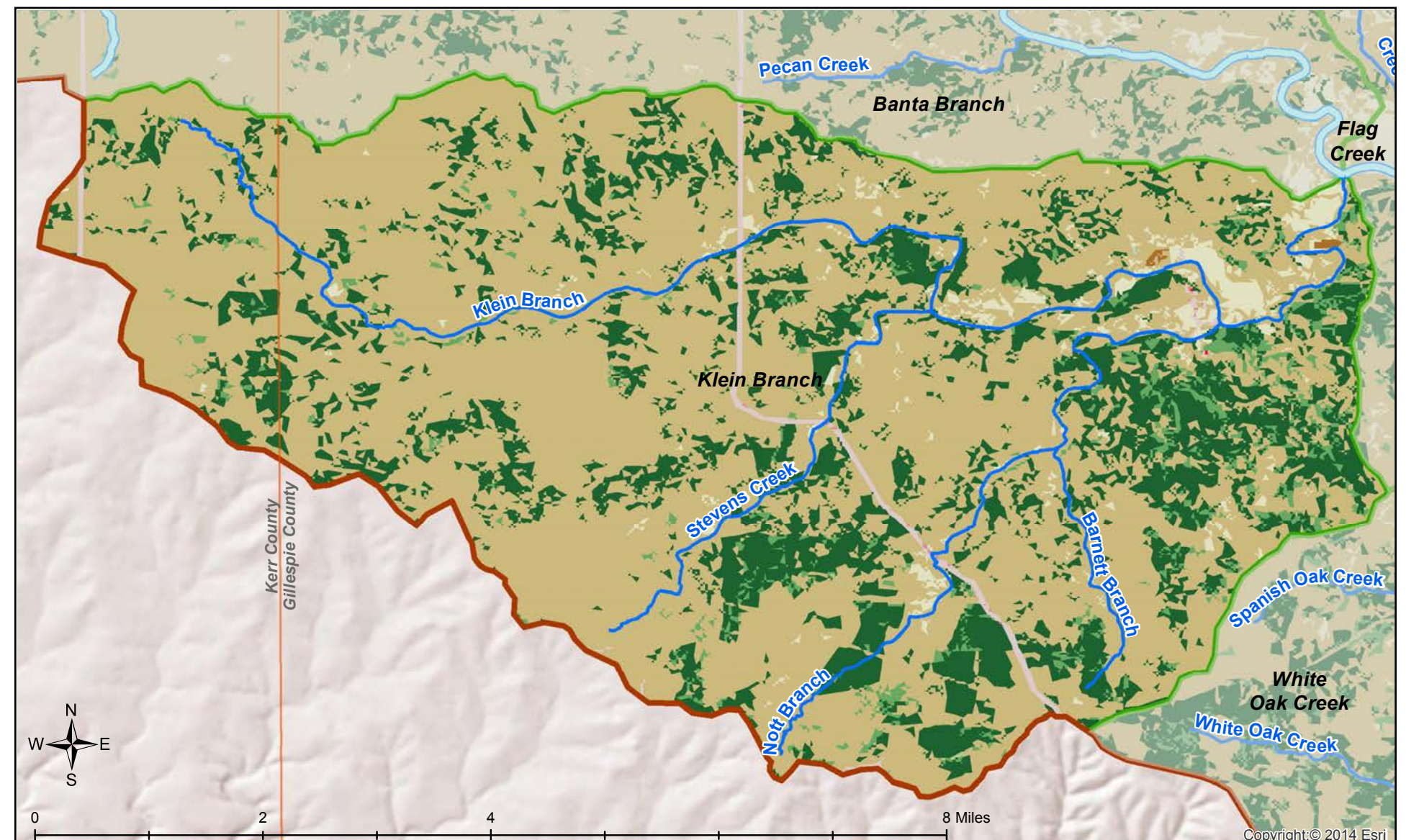


# Land Cover

## Klein Branch Land Cover

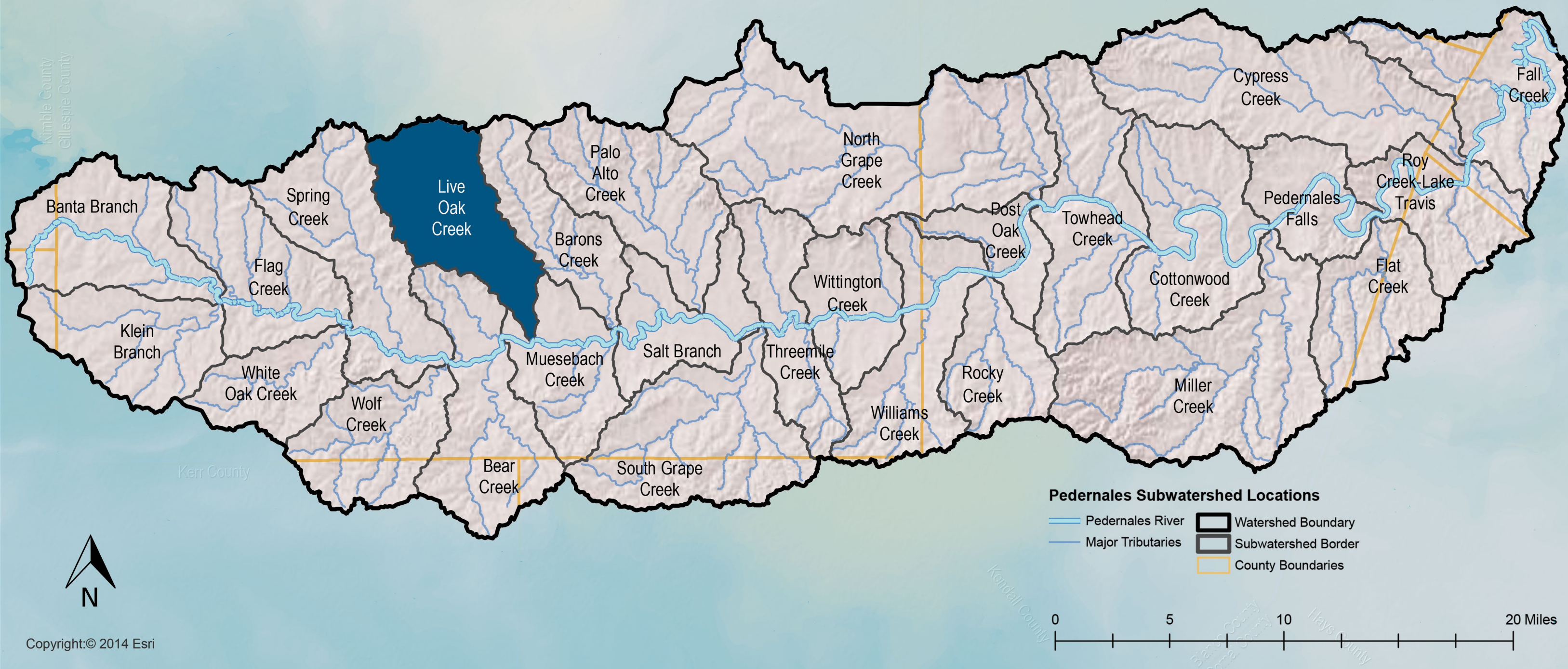


The predominant land cover within Klein Branch is rural, with little evidence of human settlement aside from some grazing lands close to the Klein Branch/Pedernales River confluence at the extreme northeast end of the watershed. Shrub/scrublands are the predominant land cover type in this subwatershed, with stands of evergreen and deciduous forest as the next most common types. The predominant surface geology within the watershed is from the Edwards formation, with the Segovia member being the most common in the southwest end of the watershed to the Fort Terrett member in its central and eastern areas.





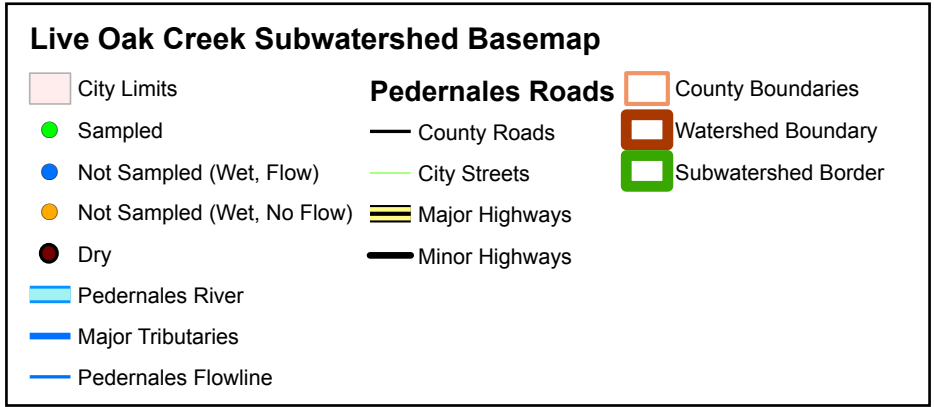
# LIVE OAK CREEK







Live Oak Creek Subwatershed, Site 73



**T**HE LIVE OAK CREEK SUBWATERSHED is located in the northern portion of the Pedernales River watershed in Gillespie County. Transportation arteries within the subwatershed include a small portion of USH 290 in its central and southern areas as well as a portion of FM 2093 in its extreme southern end.

Flowing water was observed by The Meadows Center staff along Pecan Creek at Site 72, Honey Creek at sites 725 and 866, and Live Oak Creek at sites 737, 741, 737, 867, 825, and 320. Moccasin Creek had only stagnant water, and Canyon and Stink Creeks were dry. Linden and Garden Creeks were not accessible by public road.

**ABOUT LIVE OAK CREEK SUBWATERSHED**

*Size:* 45.57 square miles

*Counties:* Gillespie County

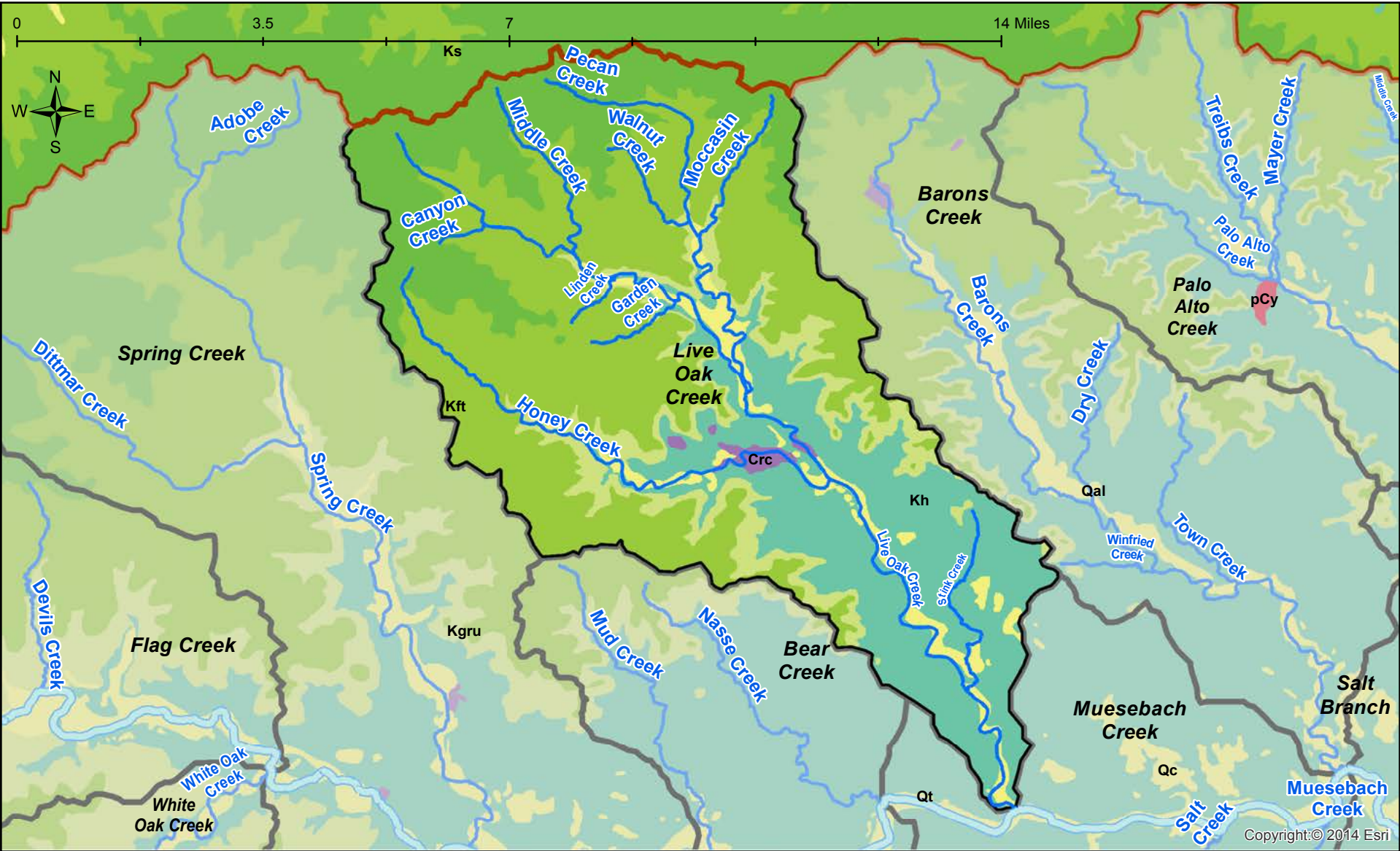
*Cities:* Fredericksburg (pop. 10,530)

*Tributaries:* Live Oak Creek, Stink Creek, Honey Creek, Garden Creek, Linden Creek, Canyon Creek, Pecan Creek, and Moccasin Creek

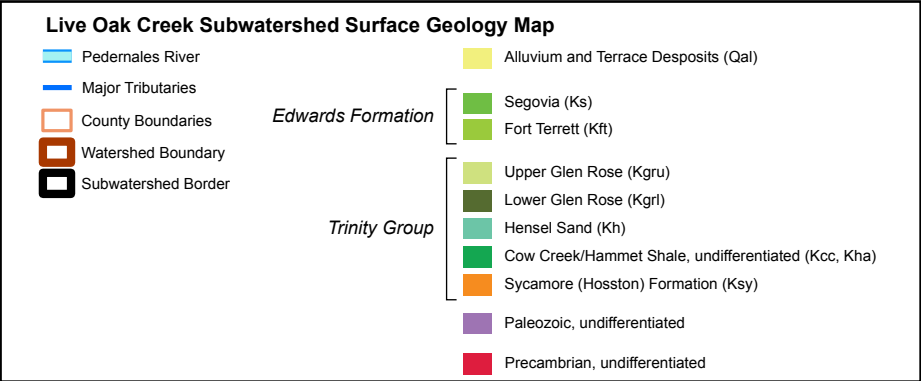


# Surface Geology

Hensel Sand (Ks) can be found along much of the Live Oak Creek corridor starting in the center of the subwatershed downward to its southeastern edge. As one moves outward from the creek corridors, the surface rock units transition into Fort Terrett units (Kft) and then into Segovia units (Ks) in the subwatershed’s extreme northern edge. A small amount of Paleozoic formations are found along Honey Creek in the center of the subwatershed.



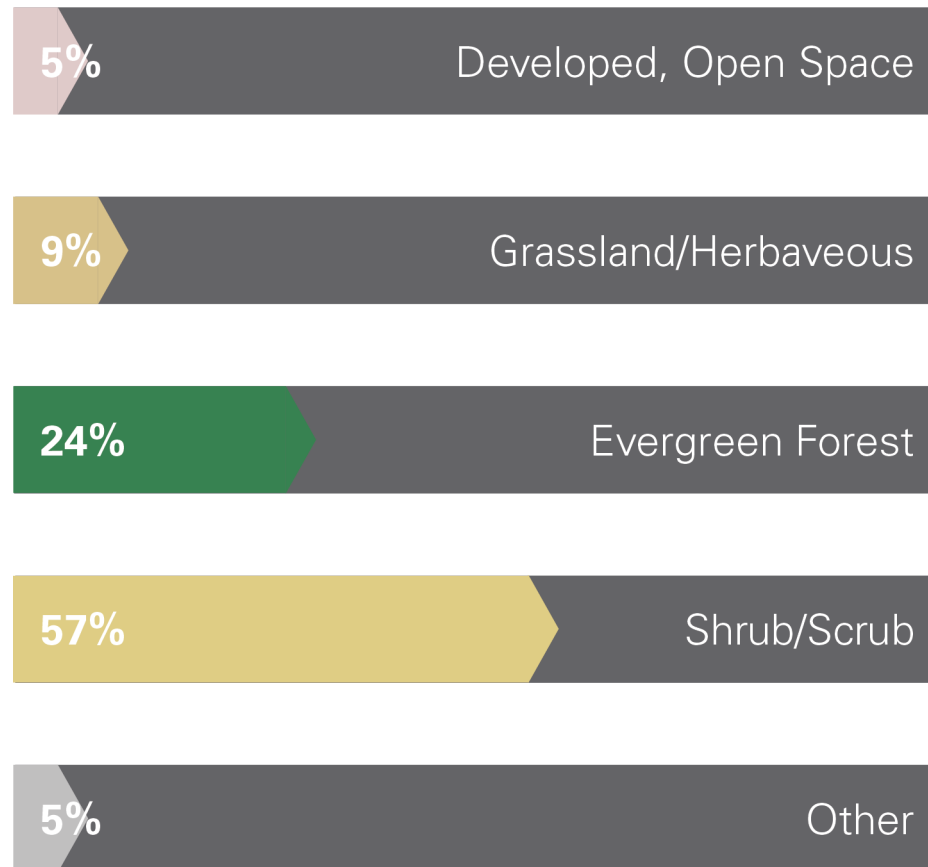
Live Oak Creek Geology Breakdown



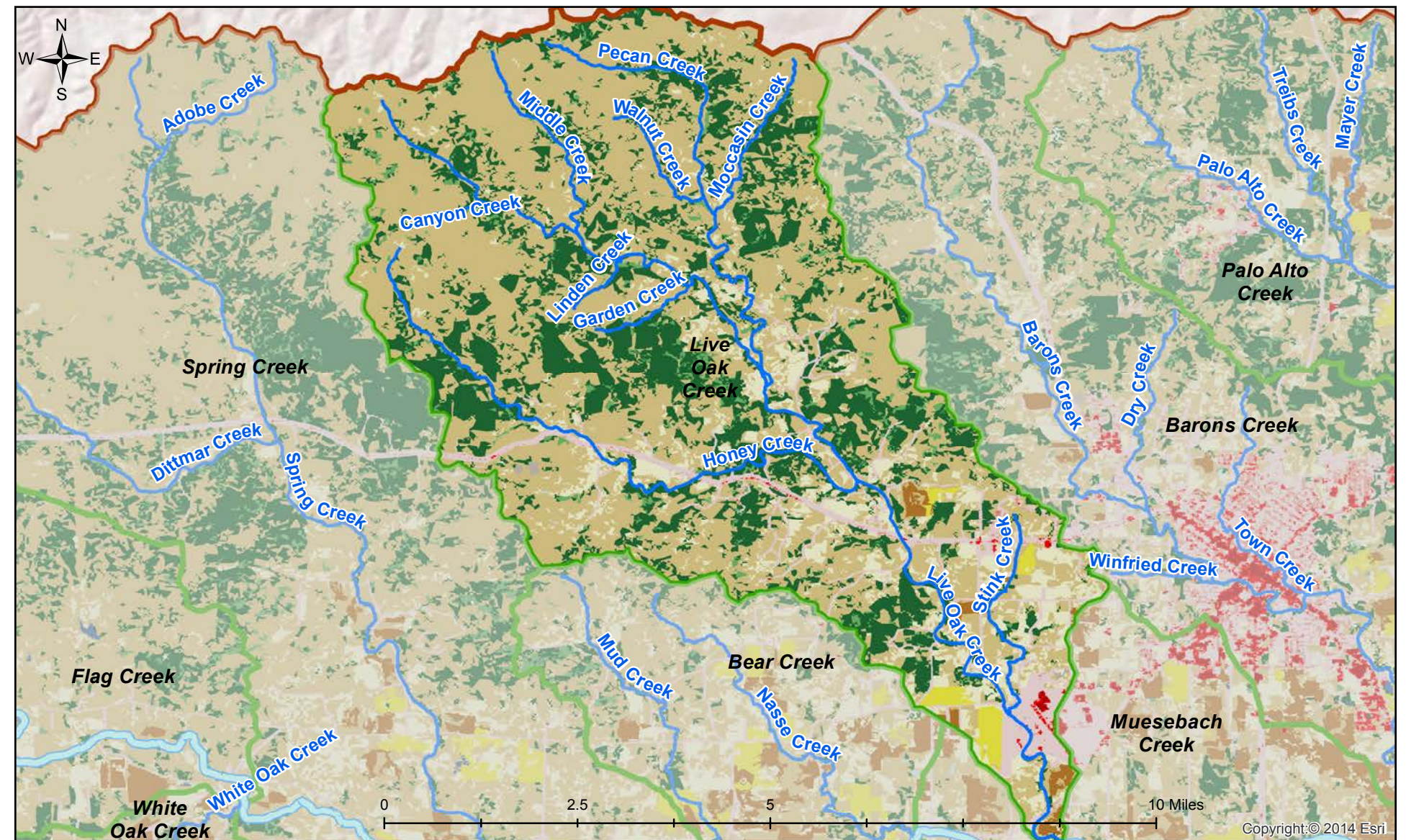
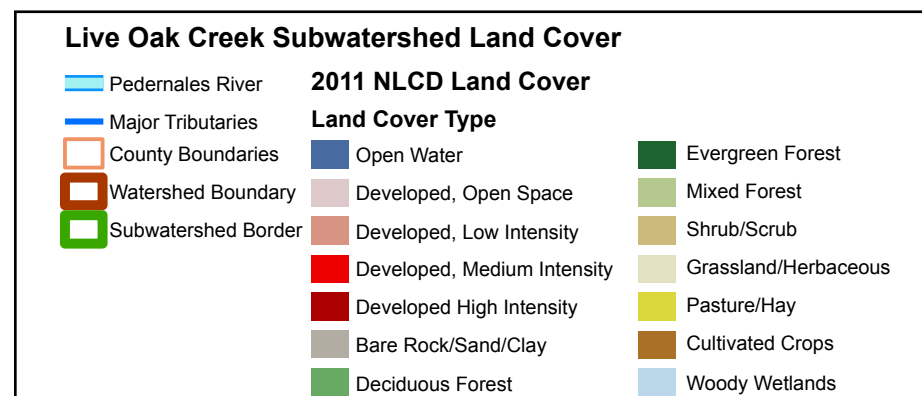


# Land Cover

## Live Oak Creek Land Cover

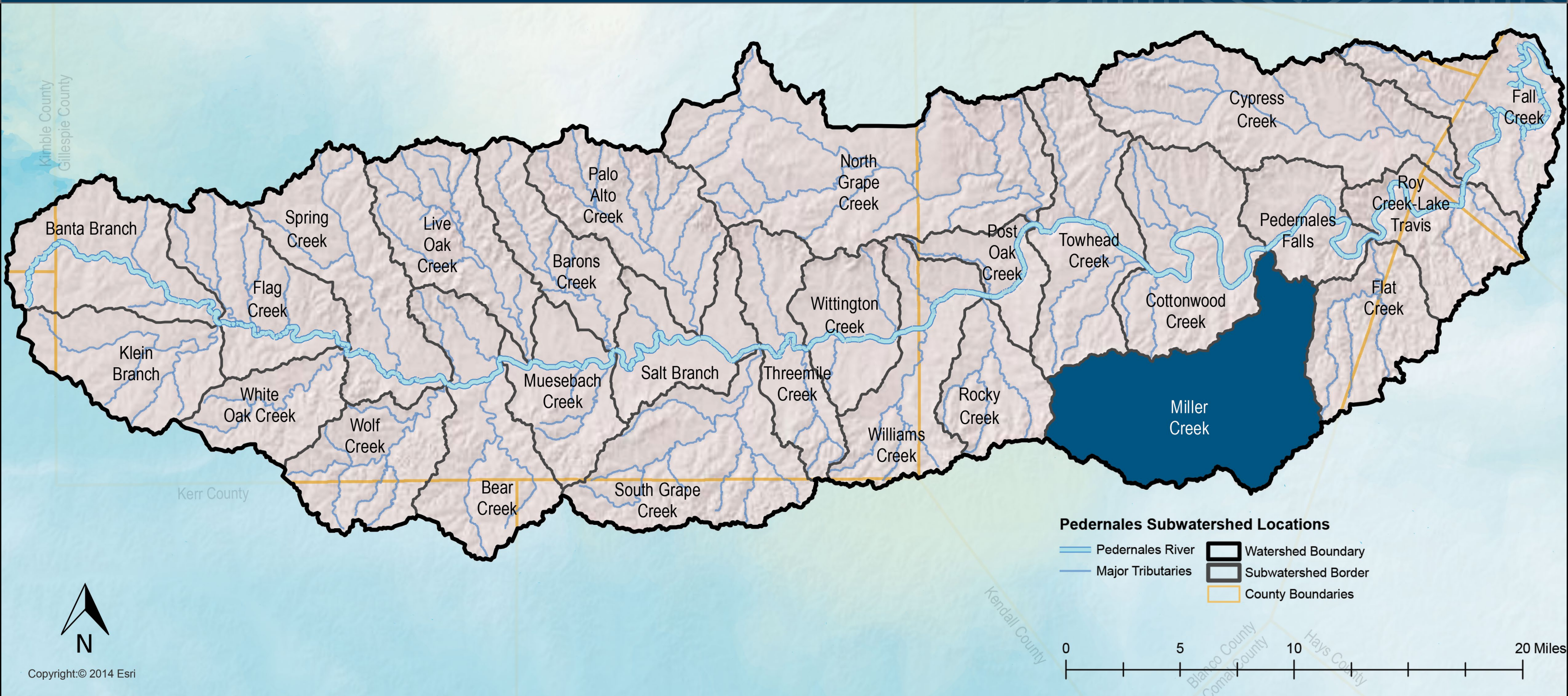


The subwatershed is primarily dominated by scrublands, grasslands, and concentrations of deciduous and evergreen forests along the creek corridors. Agricultural activity and land development within the Flat Creek subwatershed occurs primarily in the southeastern edge of the watershed within or near Fredericksburg city limits.





# MILLER CREEK

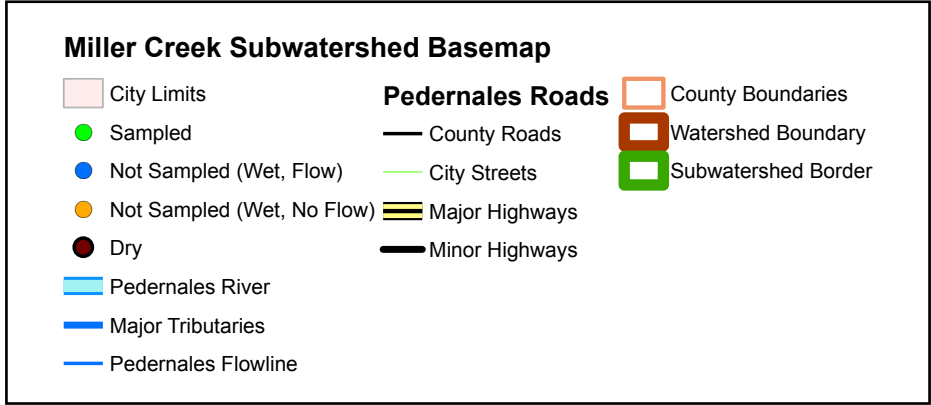


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Miller Creek Subwatershed, Site 851



**T**HE MILLER CREEK SUBWATERSHED is located in the southern portion of the Pedernales River watershed in Blanco County, within close proximity of Johnson City. Transportation arteries within the subwatershed include the important junction between USH 290 and USH 281, as well as a small portion of RM 2766 passing through its extreme northeast edge.

Flowing water was observed by The Meadows Center staff along Miller Creek at sites 135, 851, and 903, Middle Creek at site 818, McCall Creek at Site 772, Turkey Creek at site 223, and Yeager Creek at Site 847. Bates Creek was dry at its one public access point, and McCall Creek was dry further upstream at USH 281. Millseat Branch was not accessible by public road.

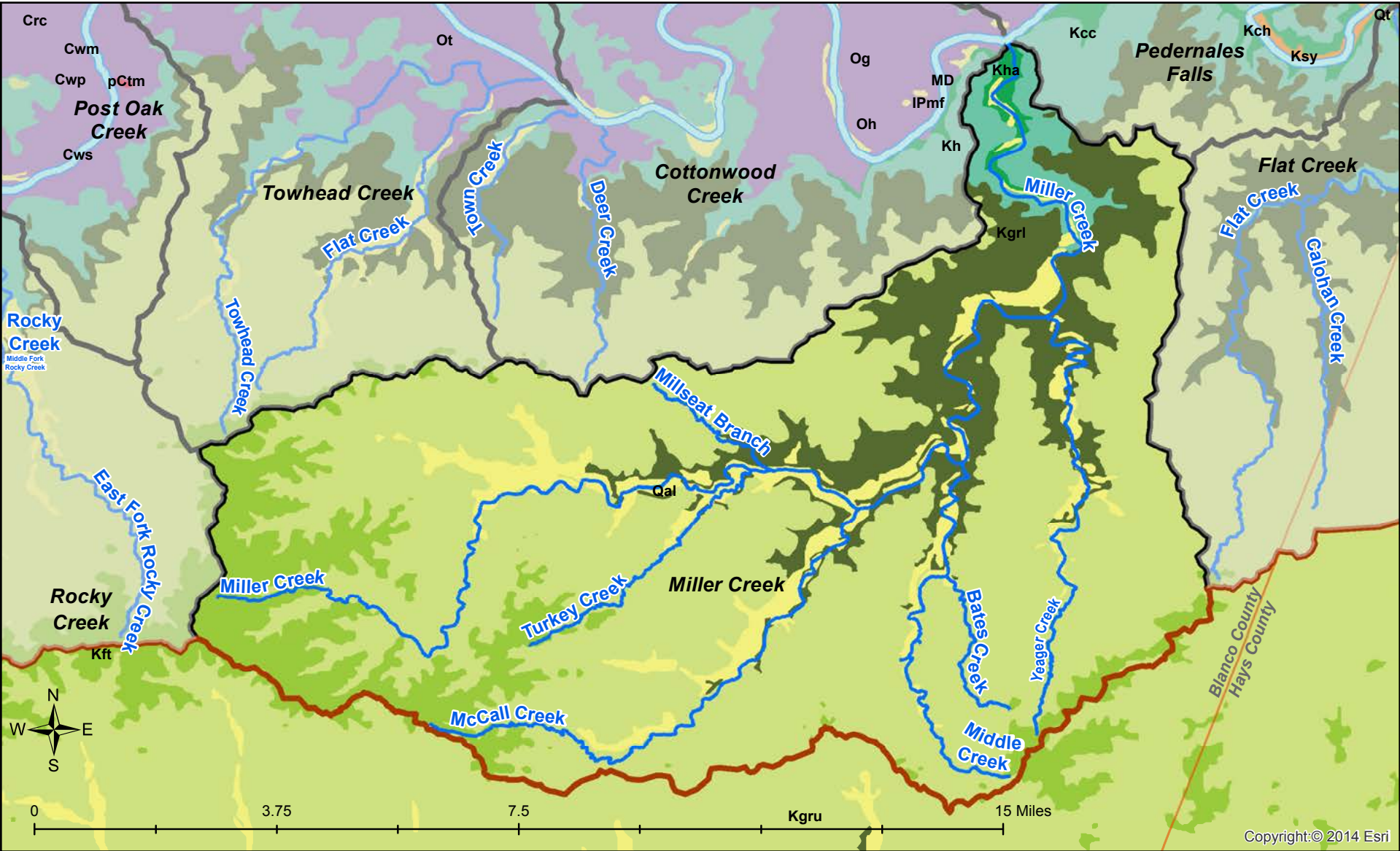
**ABOUT MILLER CREEK SUBWATERSHED**

*Size:* 88.45 square miles  
*Counties:* Blanco County  
*Cities:* N/A  
*Tributaries:* Miller Creek, Turkey Creek, McCall Creek, Bates Creek, Middle Creek, Yeager Creek, and Millseat Branch

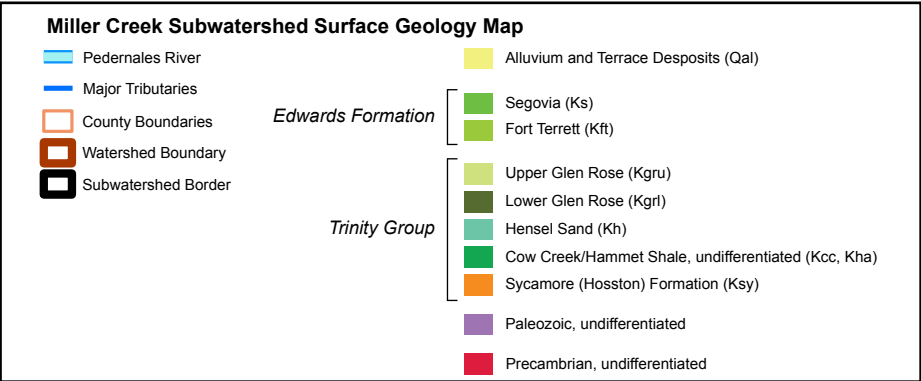


# Surface Geology

As you move away from the Pedernales up Miller Creek, the predominant surface rock type transitions from small deposits of Cow Creek (Kcc) units to Hensel Sand (Ks) then lower to upper Glen Rose moving into the outward tributaries. A small amount of Fort Terrett (Kft) rock units may be found at the extreme southwest and southeast edges of the subwatershed.



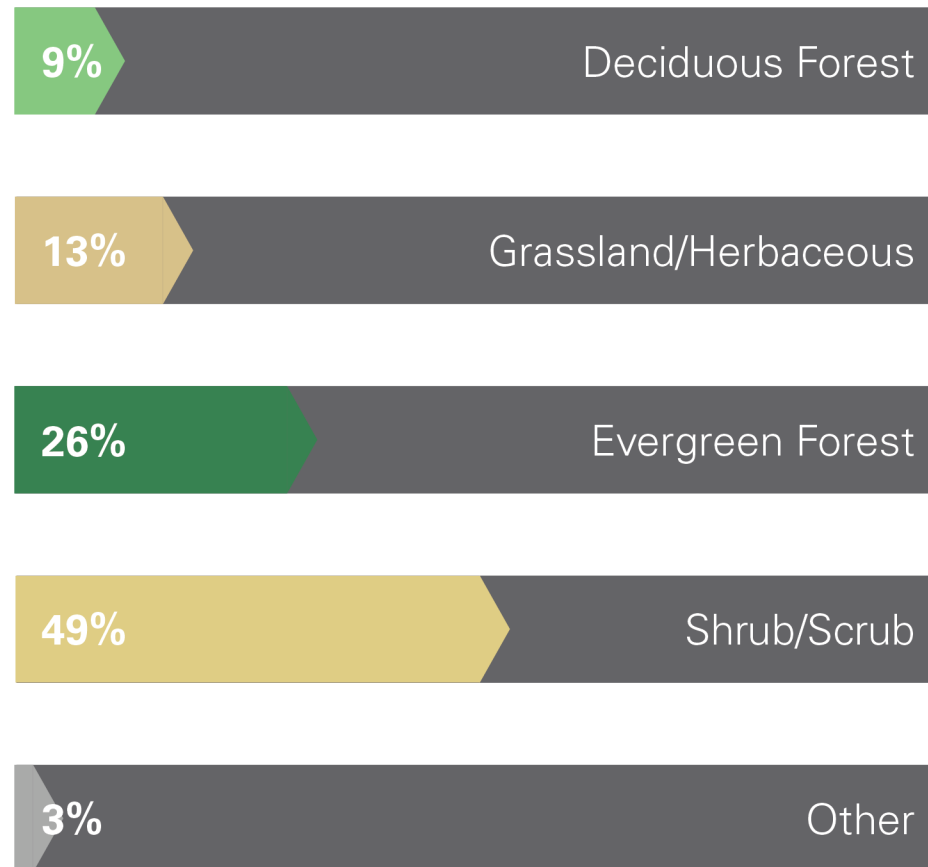
## Miller Creek Geology Breakdown



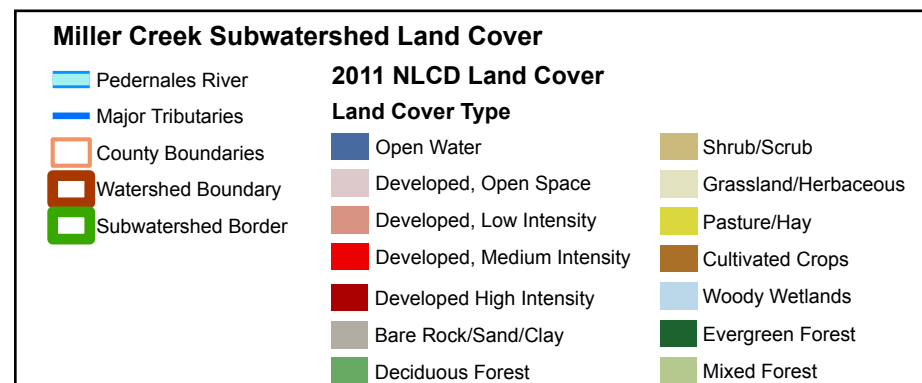


# Land Cover

## Miller Creek Land Cover

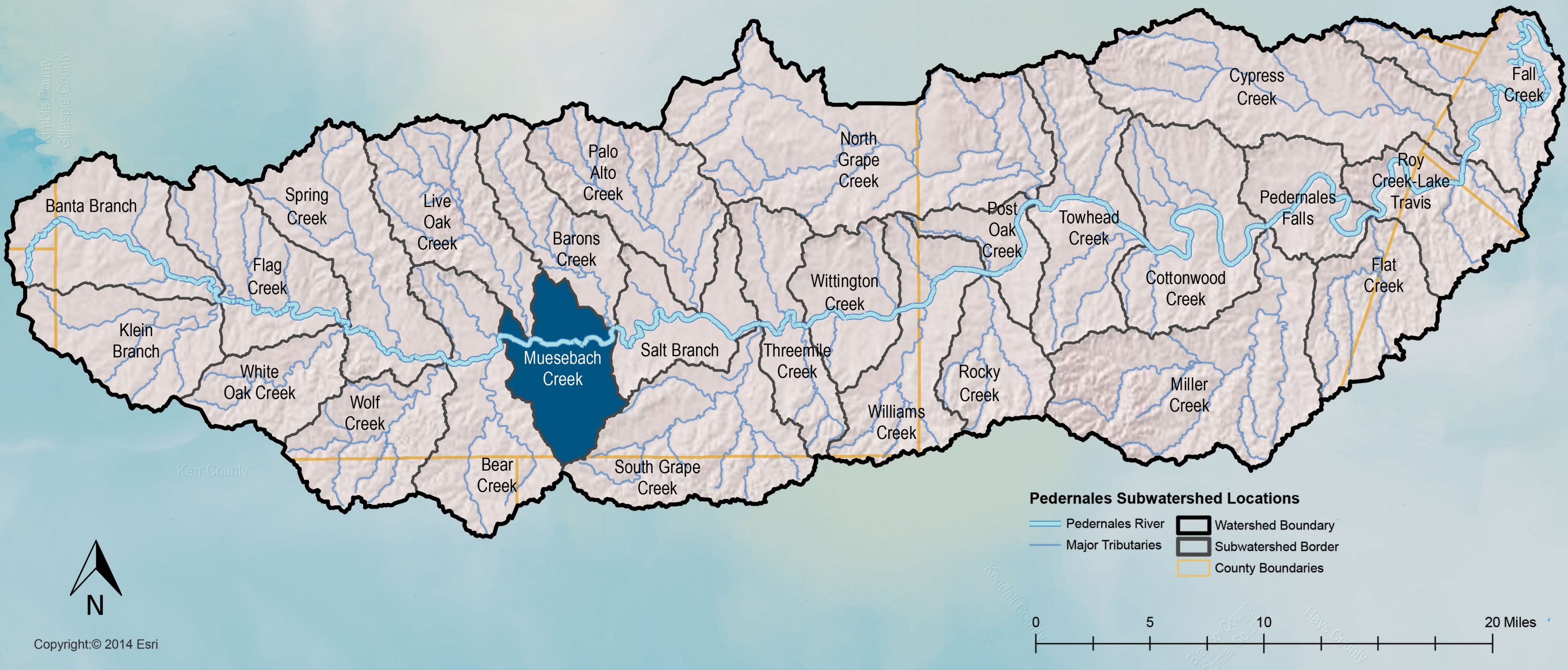


The subwatershed is primarily dominated by scrublands, grasslands, and concentrations of deciduous and evergreen forests along the creek corridors. Agricultural activity within the Miller Creek subwatershed is almost nonexistent and land development is limited to roads.





# MUESEBACH CREEK

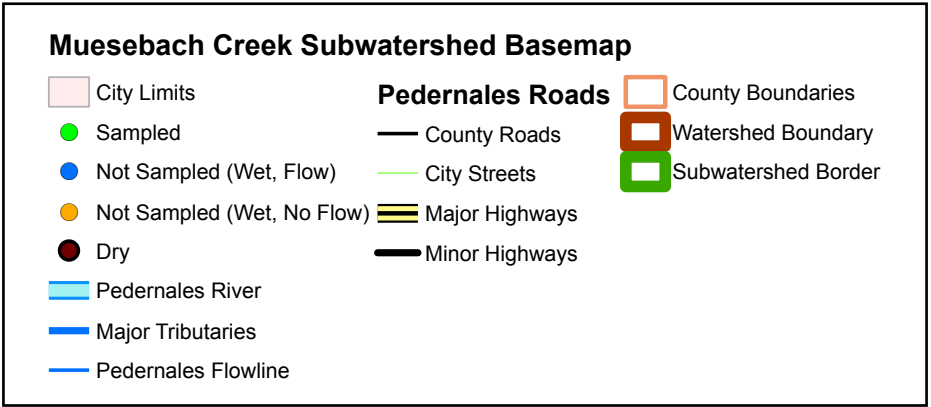


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Muesebach Creek Subwatershed at the Pedernales River, Site 43



THE MUESEBACH CREEK SUBWATERSHED is located in the western portion of the Pedernales River watershed in Gillespie County. Transportation arteries within the subwatershed include USH 84 and SH 16. Muesebach Creek is the primary tributary to the Pedernales within this watershed, but Pecan Creek and Salt Creek are also minor contributors. The Pedernales River itself flows through the north central portion of the subwatershed.

Flowing water was observed by The Meadows Center staff along the Pedernales River at sites 95, 43, 113, and 587, Muesebach Creek at sites 762 and 789, and Pecan Creek at site 744. Salt Creek was dry at its public access point.

ABOUT MUESEBACH CREEK SUBWATERSHED

Size: 34.32 square miles

Counties: Gillespie County

Cities: Fredericksburg (pop. 10,530)

Tributaries: Muesebach Creek, Pecan Creek, and Salt Creek

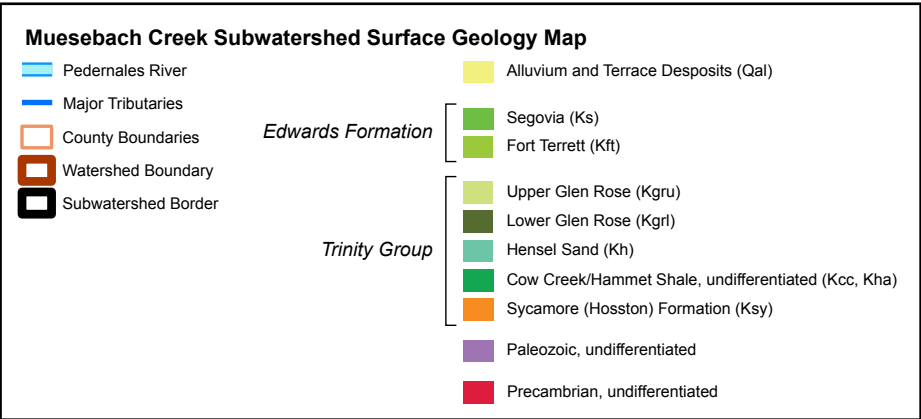
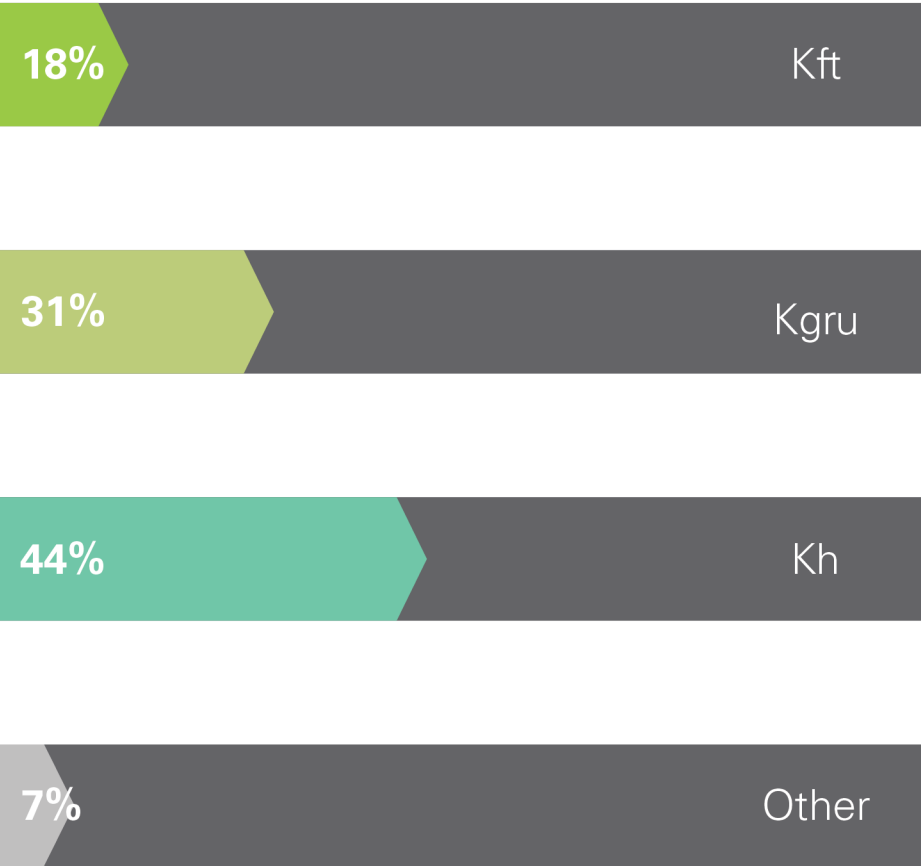


# Surface Geology

Hensel Sand (Ks) deposits are predominant in the northern part of the watershed immediately surrounding the Pedernales, and as one moves south the predominant rock units transition from Upper Glen Rose (Kg<sub>ru</sub>) to Fort Terrett (K<sub>ft</sub>). There are small deposits of Segovia units at the subwatershed's extreme southern edge.

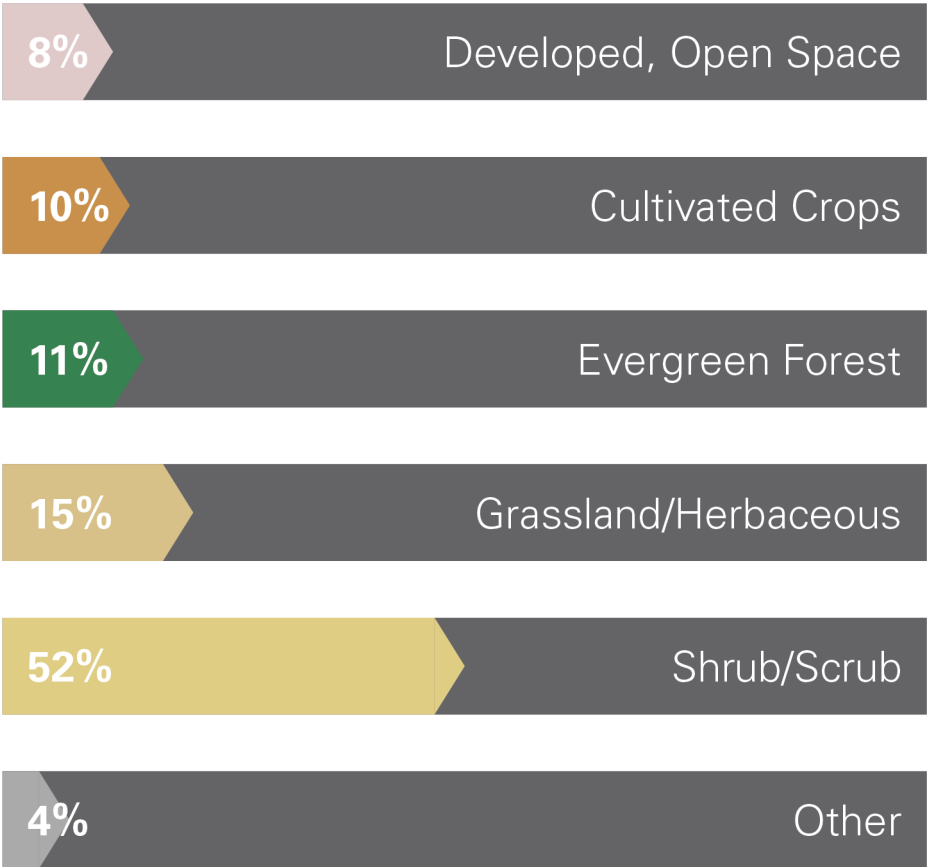


## Muesebach Creek Geology Breakdown

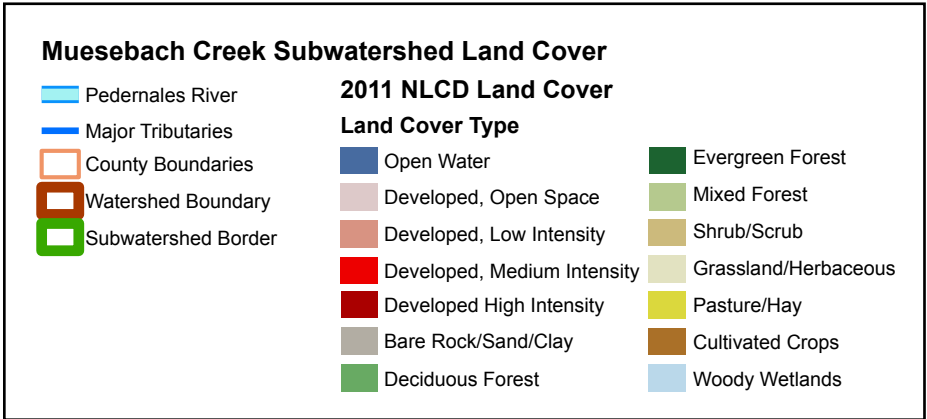




Muesebach Creek Land Cover

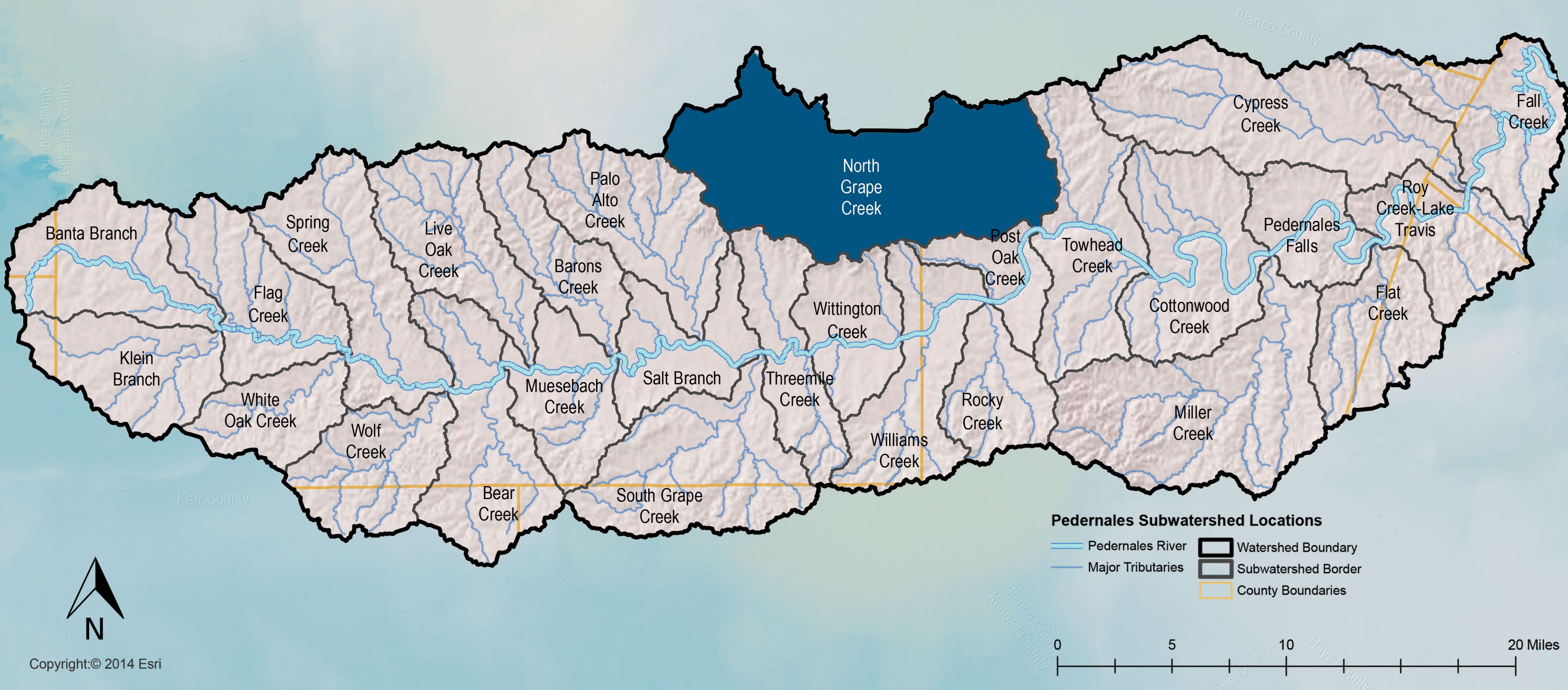


Although shrublands and grasslands are the predominant land cover types within this subwatershed, significant amounts of agricultural activity take place along the Pedernales and towards Fredericksburg city limits. Cultivated crops comprise 10% of the land cover within the Muesebach Creek subwatershed, and Open Space development comprises 8% of the total land cover.





# NORTH GRAPE CREEK

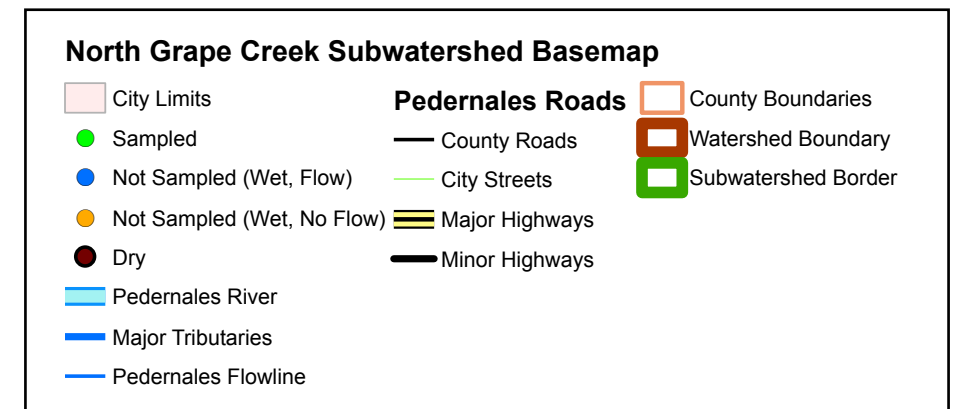


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North Grape Creek Subwatershed, Site 898



**T**HE NORTH GRAPE CREEK SUBWATERSHED is a large subwatershed located in the northern portion of the Pedernales River watershed. Transportation arteries within the subwatershed include RM 1320 to the southeast, RM 1323 to the north and east, and RM 1631 to the west and south.

Flowing water was observed by The Meadows Center staff along North Grape Creek at the downstream site 898, but the water was only flowing in stagnant pools further upstream until site 841, which is located before the confluence with North Cave Creek. Willow Creek had flowing water at site 829, but only had stagnant water further upstream. Dry Hollow Creek had stagnant water at multiple sites. All other tributaries were either dry or inaccessible.

## ABOUT NORTH GRAPE CREEK SUBWATERSHED

*Size:* 116 square miles

*Counties:* Gillespie County and Blanco County

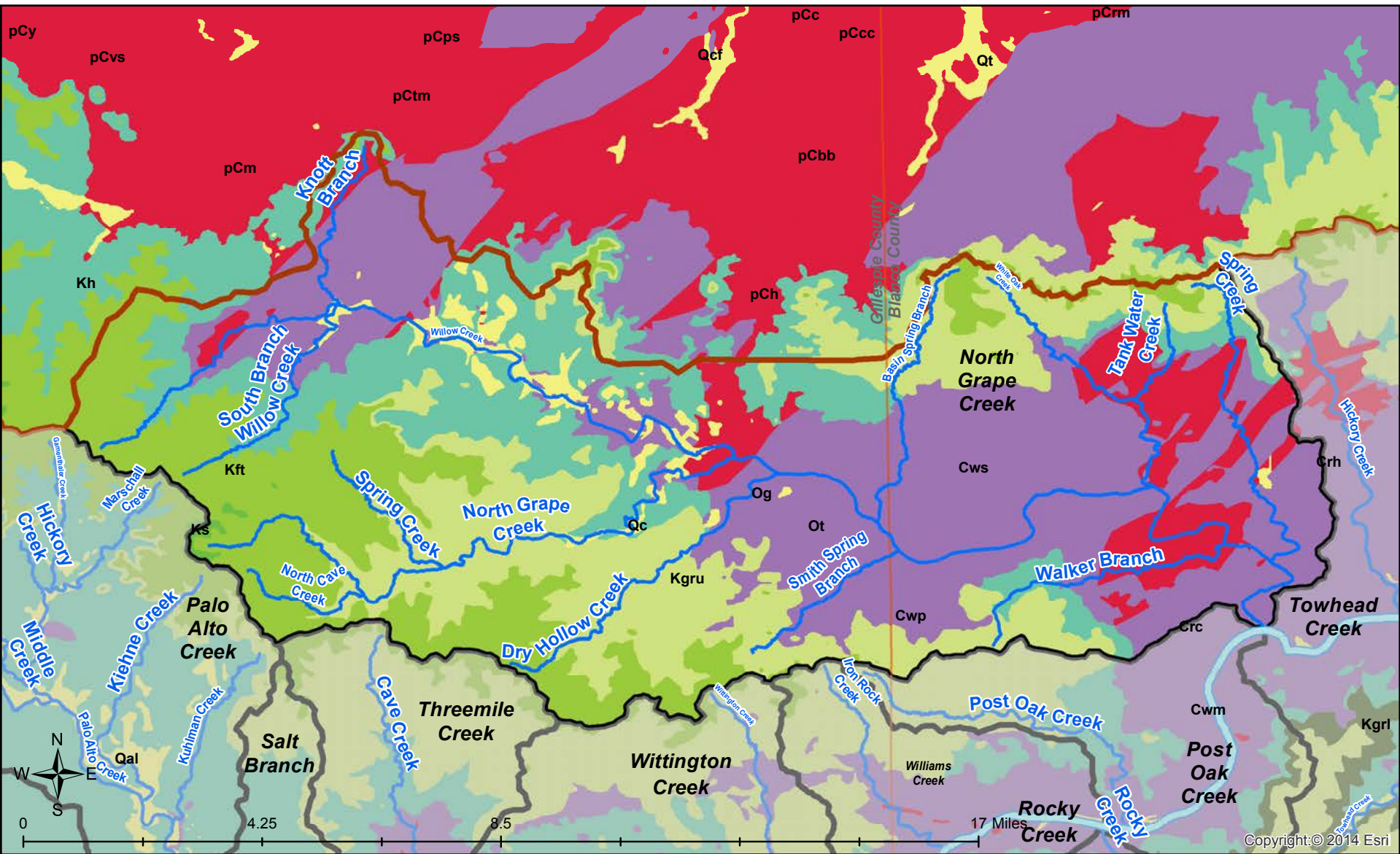
*Cities:* N/A

*Tributaries:* Knott Branch, Willow Creek, Spring Creek, North Cave Creek, Dry Hollow Creek, Smith Spring Branch, Walker Branch, Tank Water Creek, and White Oak Creek

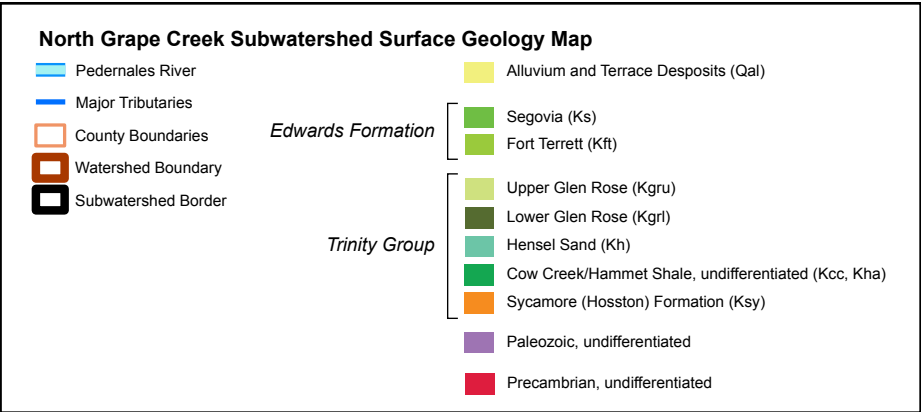
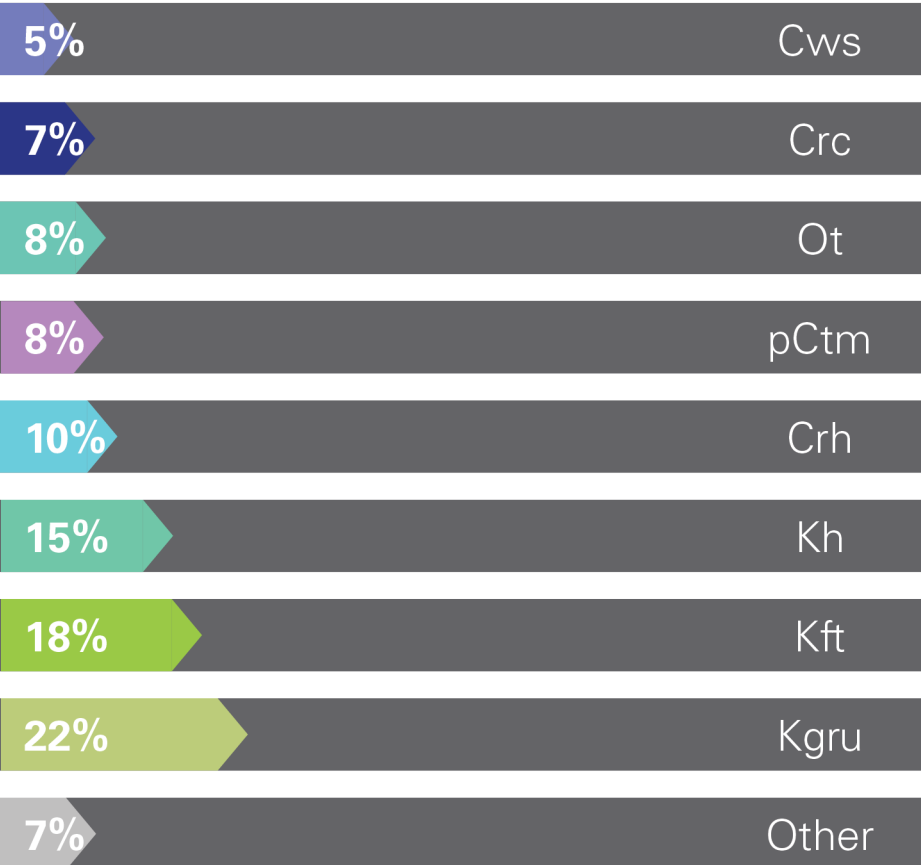


# Surface Geology

Hensel Sand (Ks) deposits are predominant in the northern part of the watershed immediately surrounding the Pedernales, and as one moves south the predominant rock units transition from Upper Glen Rose (Kgru) to Fort Terrett (Kft). There are small deposits of Segovia units at the subwatershed’s extreme southern edge.



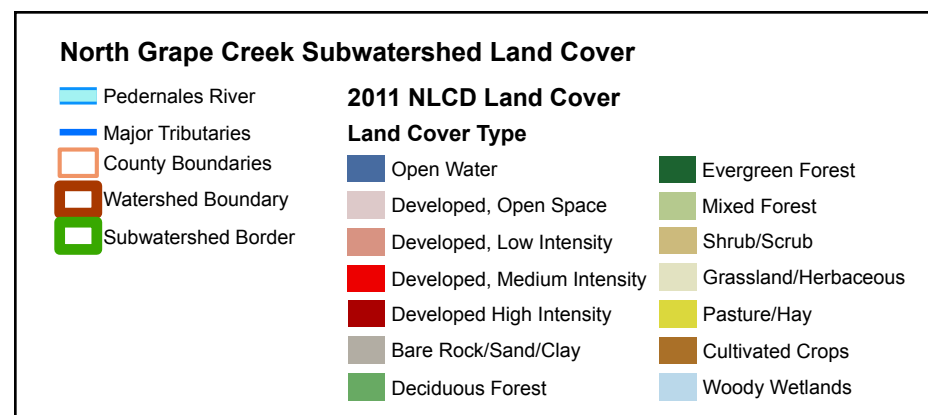
## North Grape Creek Geology Breakdown





# Land Cover

## North Grape Creek Land Cover



Shrublands and grasslands are the predominant land cover types within this subwatershed, although minimal amounts of agricultural activity including cultivated crops and pasture/hay occur in the central and northwestern portions of the subwatershed. A large stand of evergreen forest is located between White Oak and North Grape Creeks.





# PALO ALTO CREEK

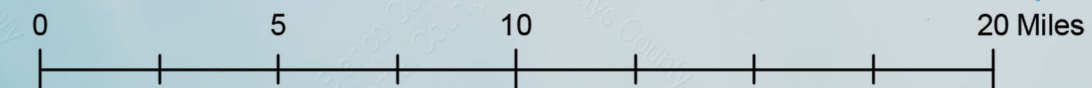


## Pedernales Subwatershed Locations

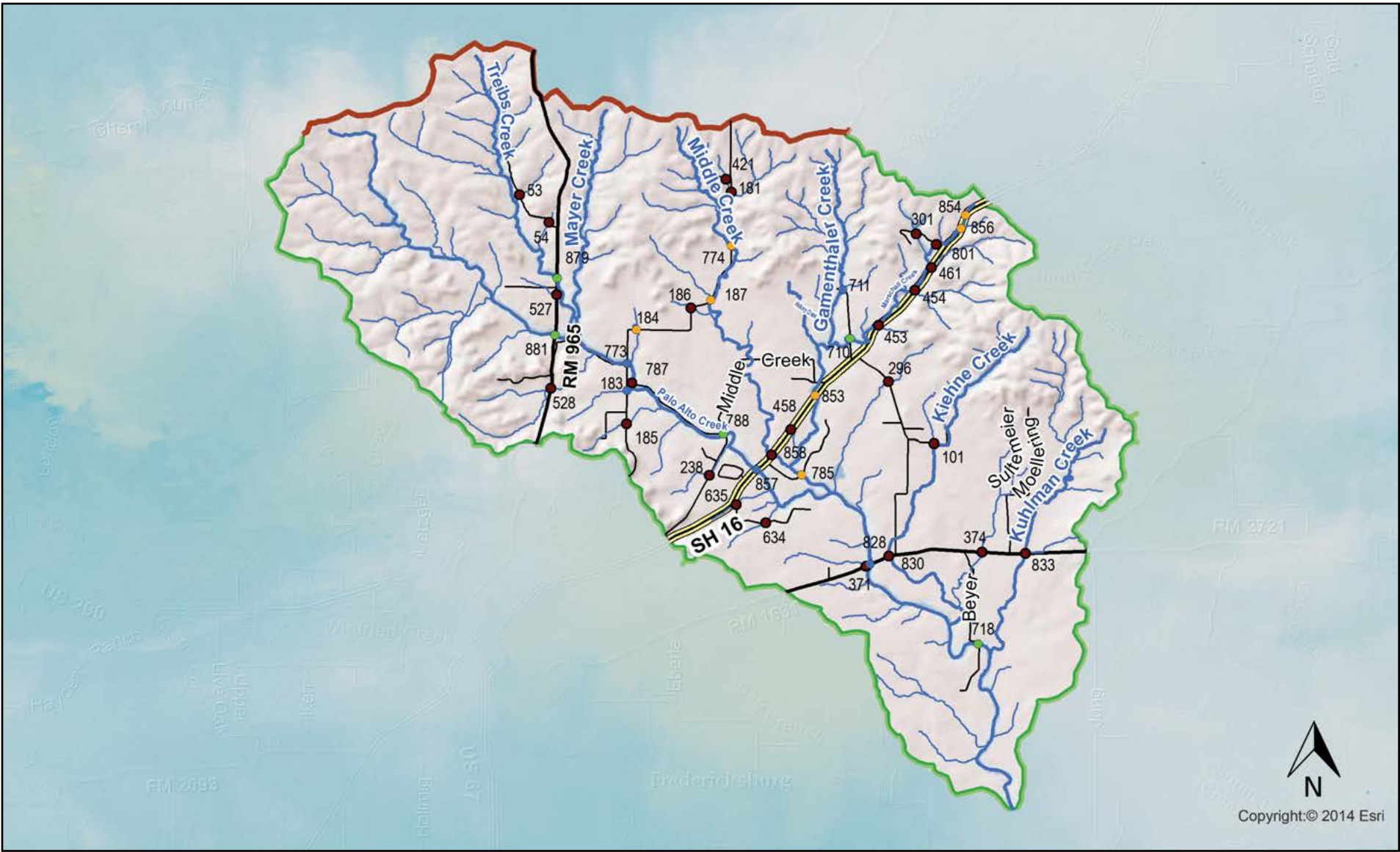
- Pedernales River
- Watershed Boundary
- Major Tributaries
- Subwatershed Border
- County Boundaries



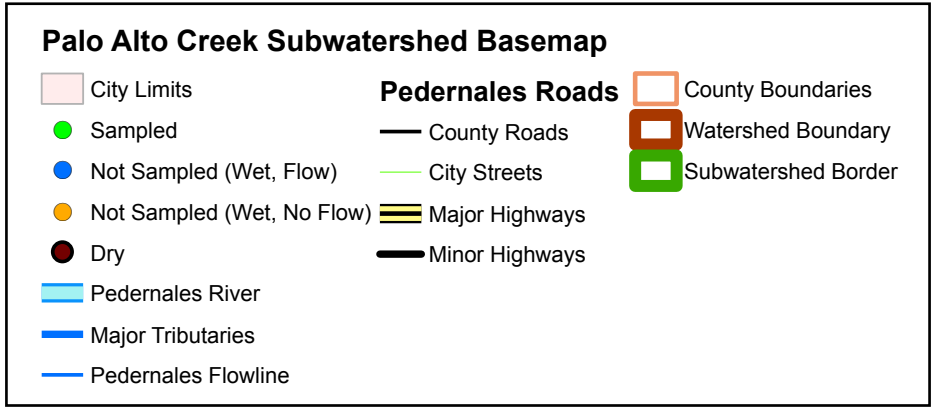
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Palo Alto Creek Subwatershed, Site 710



**T**HE PALO ALTO CREEK SUBWATERSHED is located in the northern portion of the Pedernales River watershed in Gillespie County, just barely northeast of the outskirts of the city of Fredericksburg. Transportation arteries within the subwatershed include SH16 traversing its east central section, RM 965 in the west, and RM 1631 in the southeast.

Flowing water was observed by The Meadows Center staff along Palo Alto Creek at sites 881, 788, 858, 828, and 718. Treibs Creek, as well as at Marshall Creek (#710), Gamenthaler Creek (#711), and Treibs Creek (#879). Middle Creek only had stagnant water, and Marshall Creek’s water was stagnant further upstream towards its headwaters. All other creeks were dry or inaccessible.

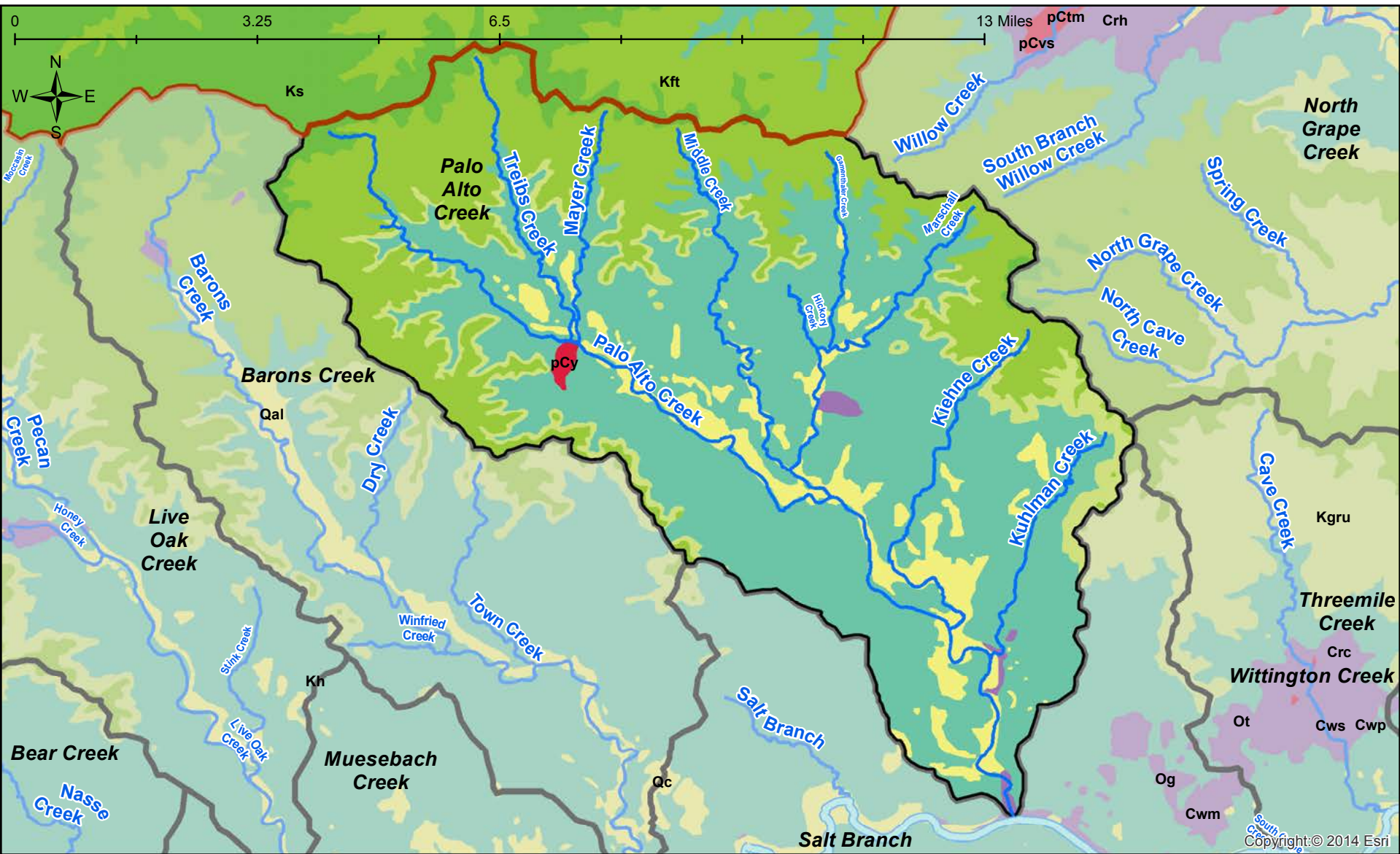
ABOUT PALO ALTO CREEK SUBWATERSHED

**Size:** 51.29 square miles  
**Counties:** Kimble County, Gillespie County, Kerr County  
**Cities:** Northeast of Fredericksburg  
**Tributaries:** Treibs Creek, Mayer Creek, Middle Creek, Marshall Creek, Hickory Creek, Gamenthaler Creek, Kihne Creek, and Kuhlman Creek

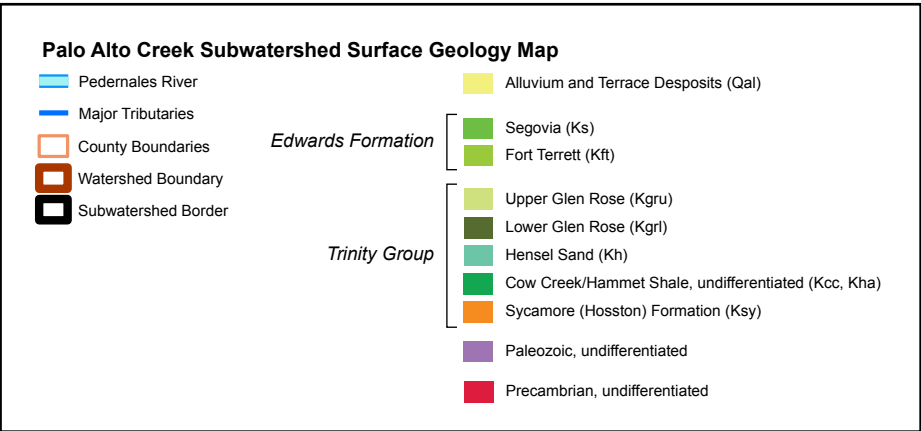
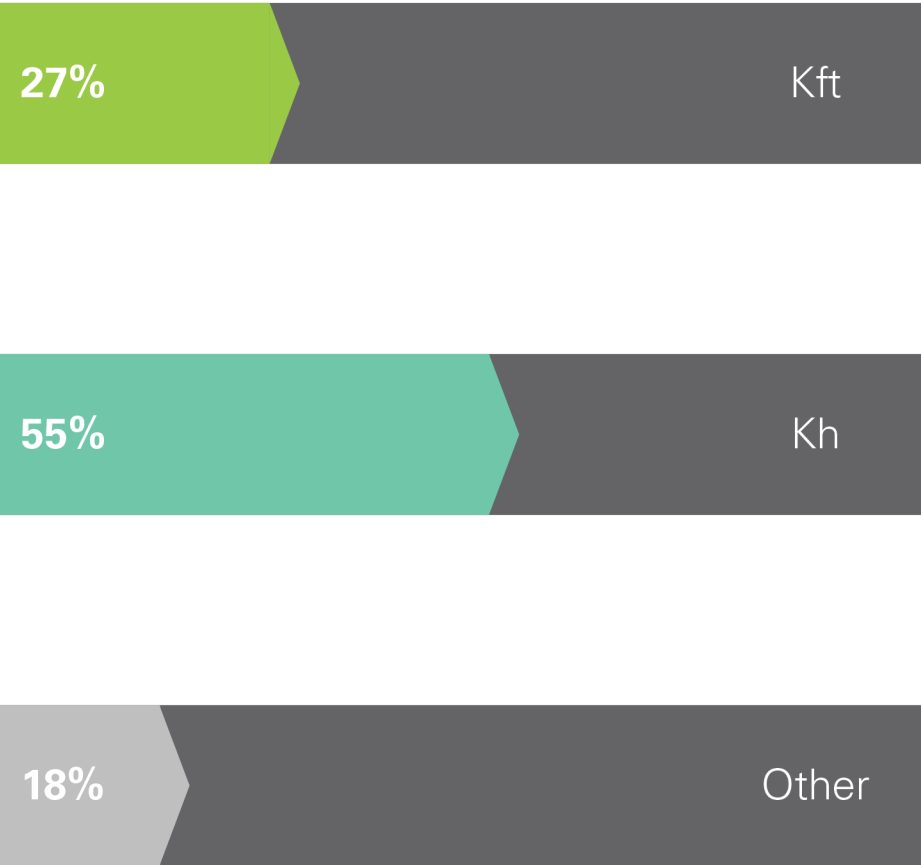


# Surface Geology

Hensel Sand (Ks) deposits are predominant in much of the subwatershed, especially in and around the tributary corridors. Moving outward from the Hensel deposits, one can find a thin layer of Upper Glen Rose (Kg<sub>ru</sub>) deposits which immediately transitions to Fort Terrett (K<sub>ft</sub>) units. A small amount of Segovia (K<sub>s</sub>) deposits is present in the subwatershed's extreme northern edge, and a small deposit of Precambrian units can be found at the confluences of Palo Alto, Mayer, and Treibs Creeks.



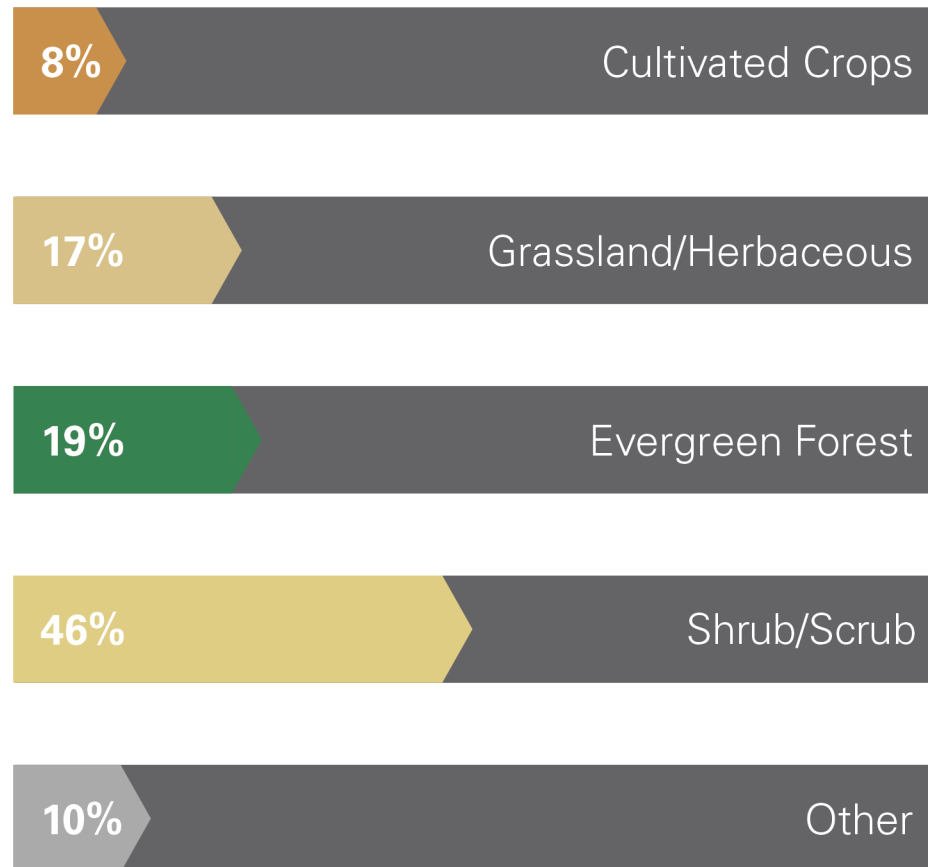
## Palo Alto Creek Geology Breakdown



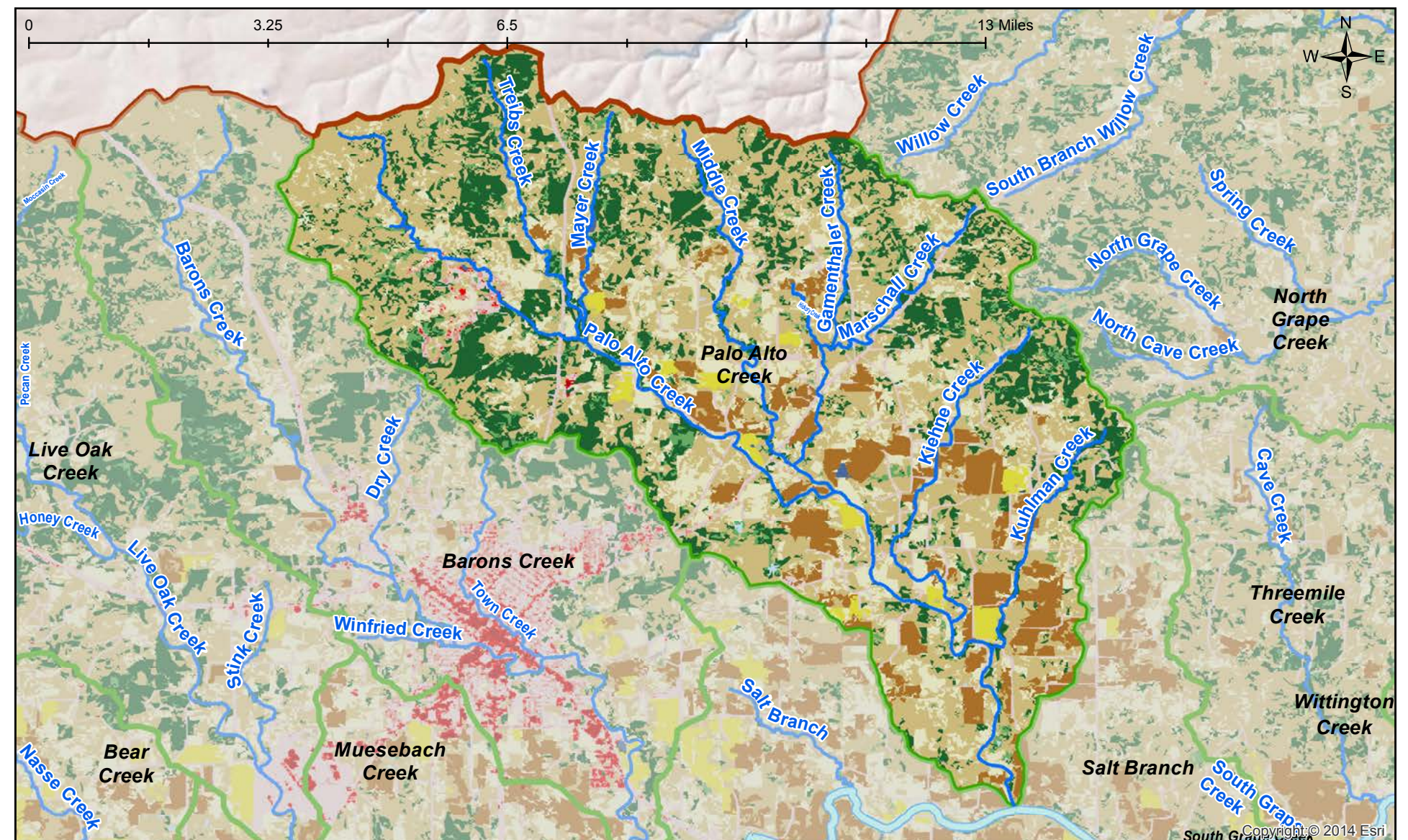
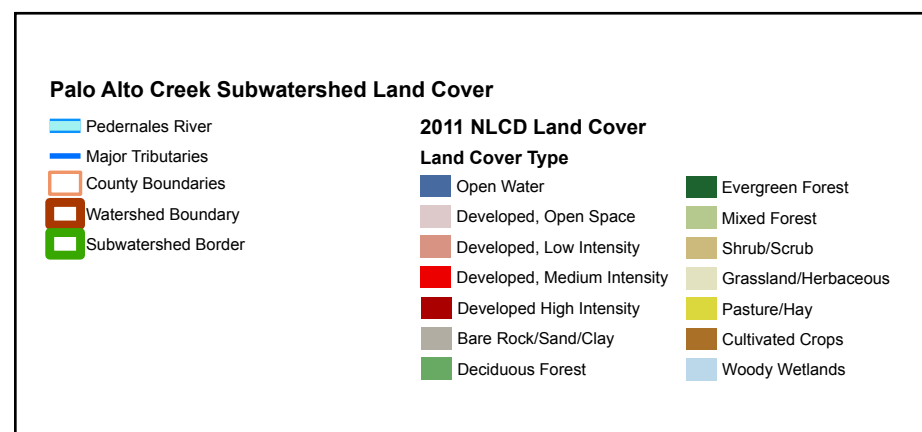


# Land Cover

## Palo Alto Creek Land Cover



Although open space development within this subwatershed is minimal, cultivated croplands comprise eight percent of the land cover here, as well as additional pasture and hay lands immediately adjacent to them. Shrublands, grassland, and evergreen forests are the predominant land cover types here.



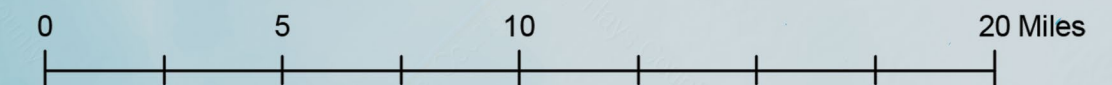


# PEDERNALES FALLS

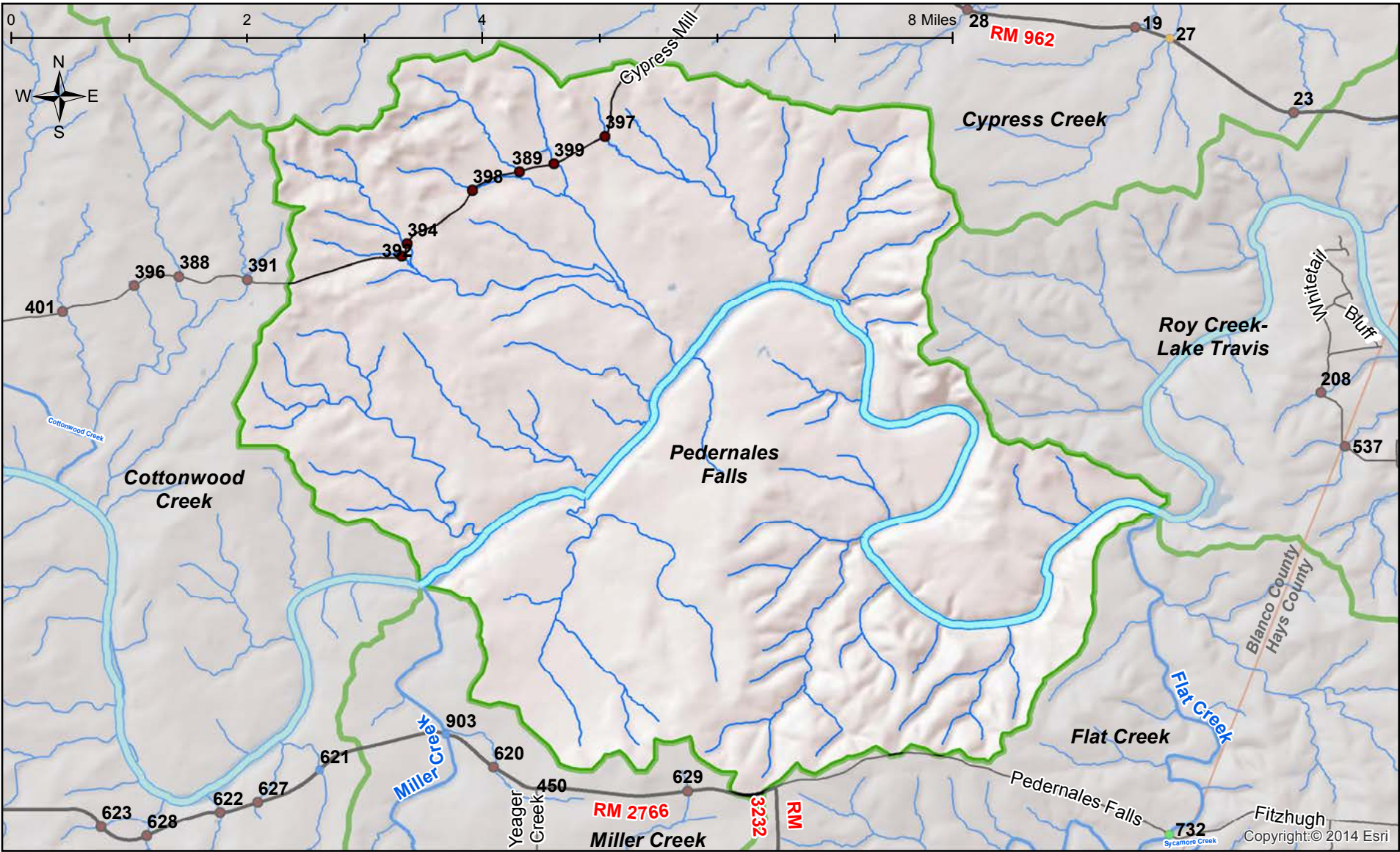


## Pedernales Subwatershed Locations

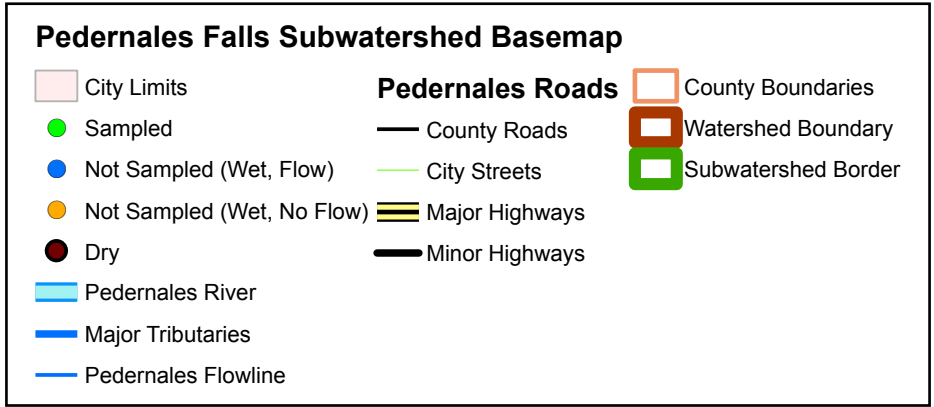
- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries







Pedernales Falls State Park. Photo by Jim Nix.



THE PEDERNALES FALLS SUBWATERSHED is located in the eastern portion of the Pedernales River watershed in Blanco County and contains Pedernales Falls State Park within 28.20 total square miles. The only main county road is Cypress Mill, as most of the roads within the subwatershed are owned by Texas Parks and Wildlife. No major tributaries are located within this subwatershed, although the Pedernales winds its way through the middle of it.

Flowing water was not observed by The Meadows Center staff along the flowlines on Cypress Mill Road during the Flowing Water Inventory. However, water was observed within the Pedernales River in the second phase of the sampling project.

**ABOUT PEDERNALES FALLS SUBWATERSHED**

Size: 28.20 square miles

Counties: Blanco

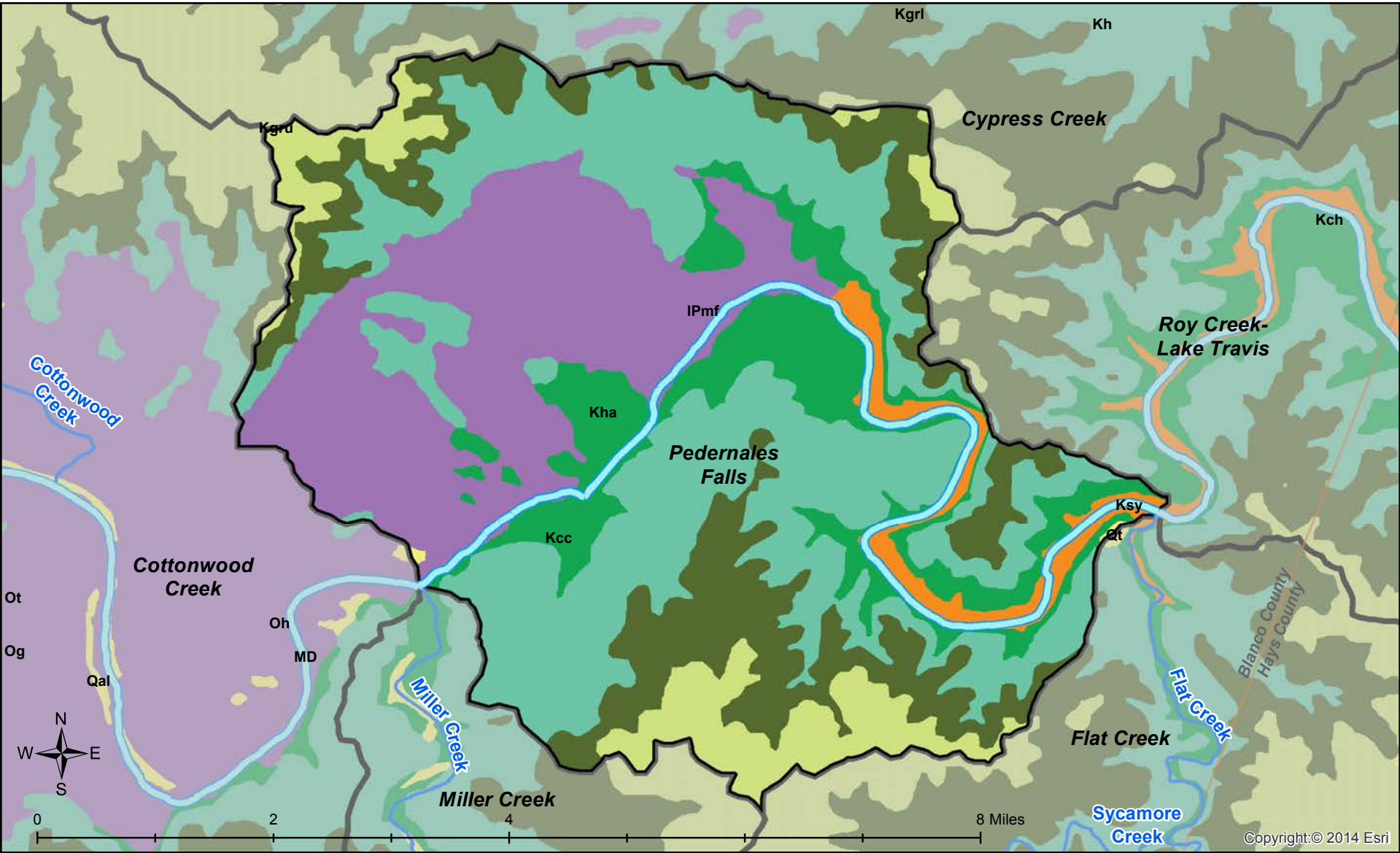
Cities: N/A

Tributaries: N/A

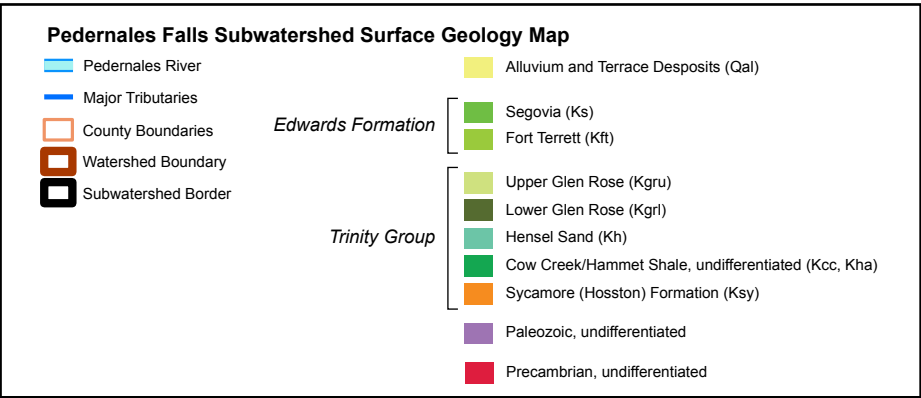
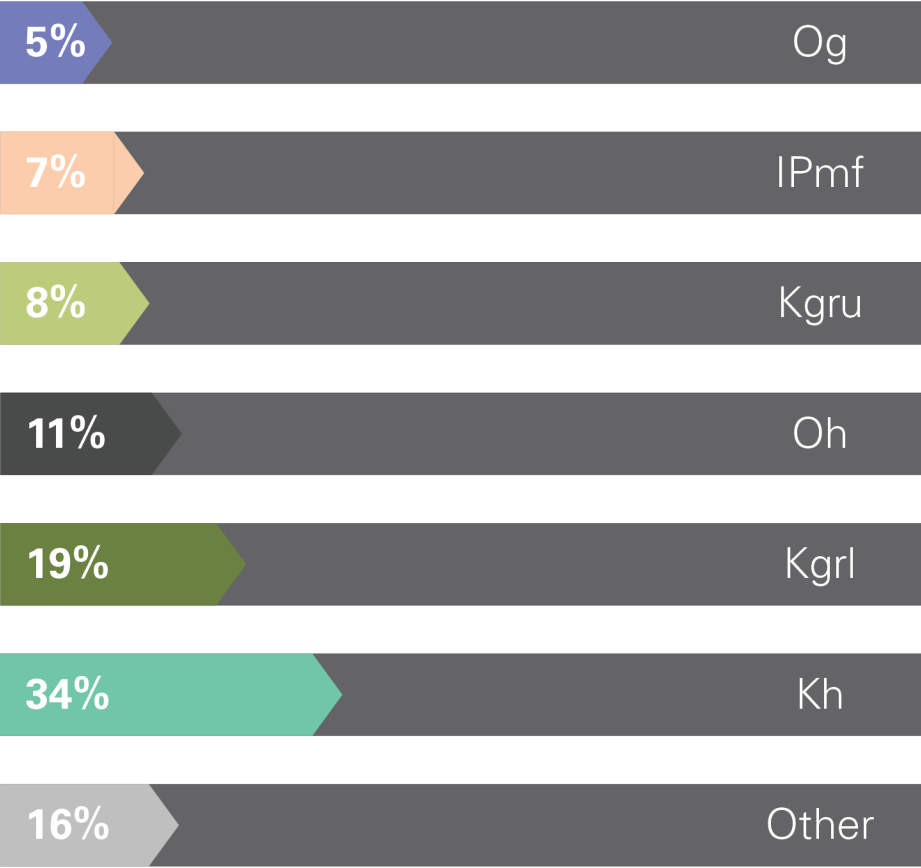


# Surface Geology

Paleozoic and Edwards formation rock units are common along the Pedernales within this subwatershed, especially within the central and western areas. Sycamore (Hosston) formations can be found within the river’s vicinity in the eastern portion of the subwatershed. Hensel Sand (Kh) formations are located outward from Paleozoic/Edwards/Sycamore formations, which then transitions into Lower (Kgrl) then Upper Glen Rose (Kgru) formations.



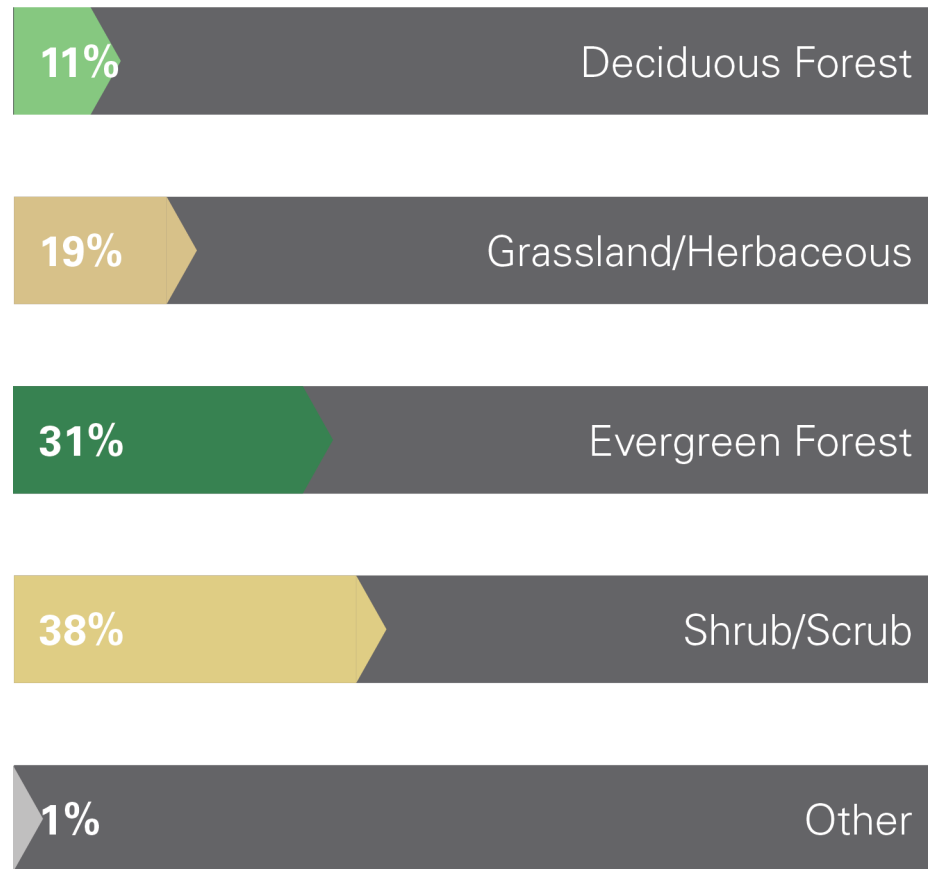
## Pedernales Falls Geology Breakdown



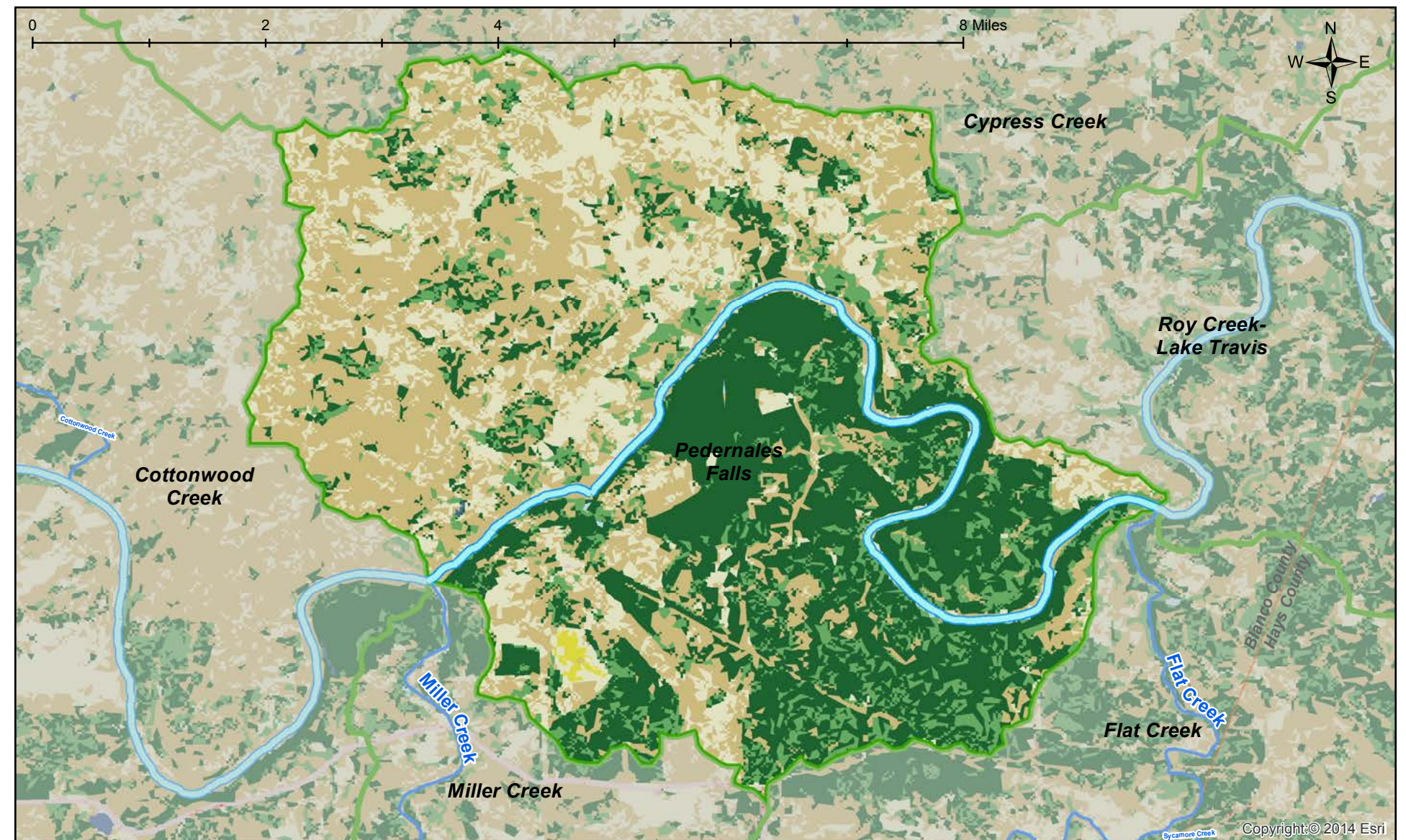
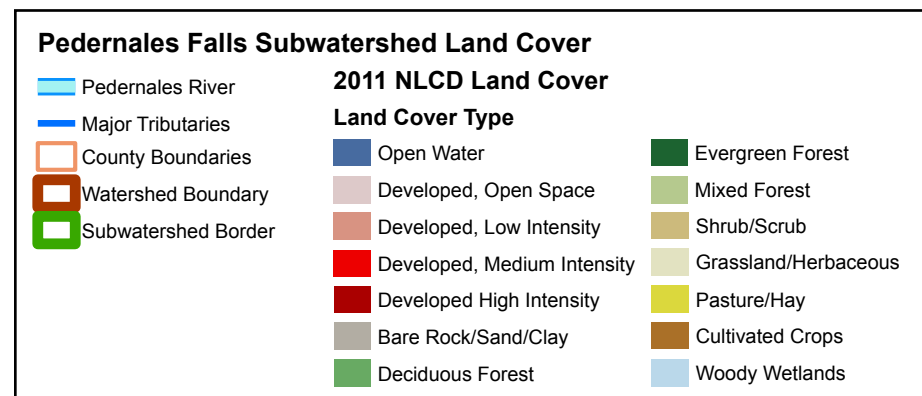


# Land Cover

## Pedernales Falls Land Cover



Forest cover is the predominant land cover type within the Pedernales Falls subwatershed at 42% when combining evergreen (31%) and deciduous (11%) forest cover. Scrublands are the next most dominant land type at 38% and then grasslands at 19%. Very minimal agricultural activity is found within this subwatershed, and any development is limited to roads or park structures.





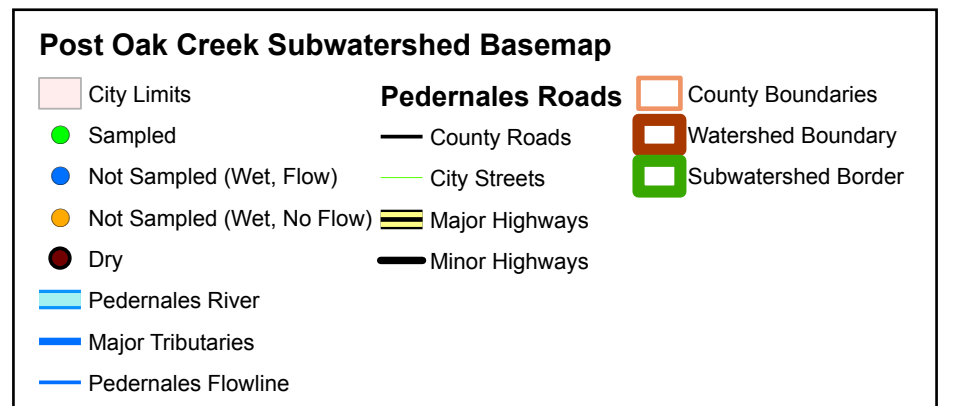
# POST OAK CREEK







Post Oak Creek Subwatershed, Site 608



**T**HE POST OAK CREEK SUBWATERSHED is the smallest subwatershed within the Pedernales River basin, containing only 18.90 square miles. The subwatershed is located mostly in Blanco County just west of Johnson City, with a small portion of its northwestern edge located in Gillespie County. Transportation arteries within the subwatershed include a small portion of USH 290 in the south, and the meeting of Ranch-to-Market roads 1320 and 2721 in its center. Only Post Oak Creek is considered a major tributary within this subwatershed to the Pedernales, which winds from its center to its extreme northeast edge.

No flowing water was observed by The Meadows Center staff within this tiny subwatershed, although access to the Pedernales River was not possible. Post Oak Creek was dry at both sites visited by staff members.

## ABOUT POST OAK CREEK SUBWATERSHED

*Size:* 18.90 square miles

*Counties:* Gillespie, Blanco

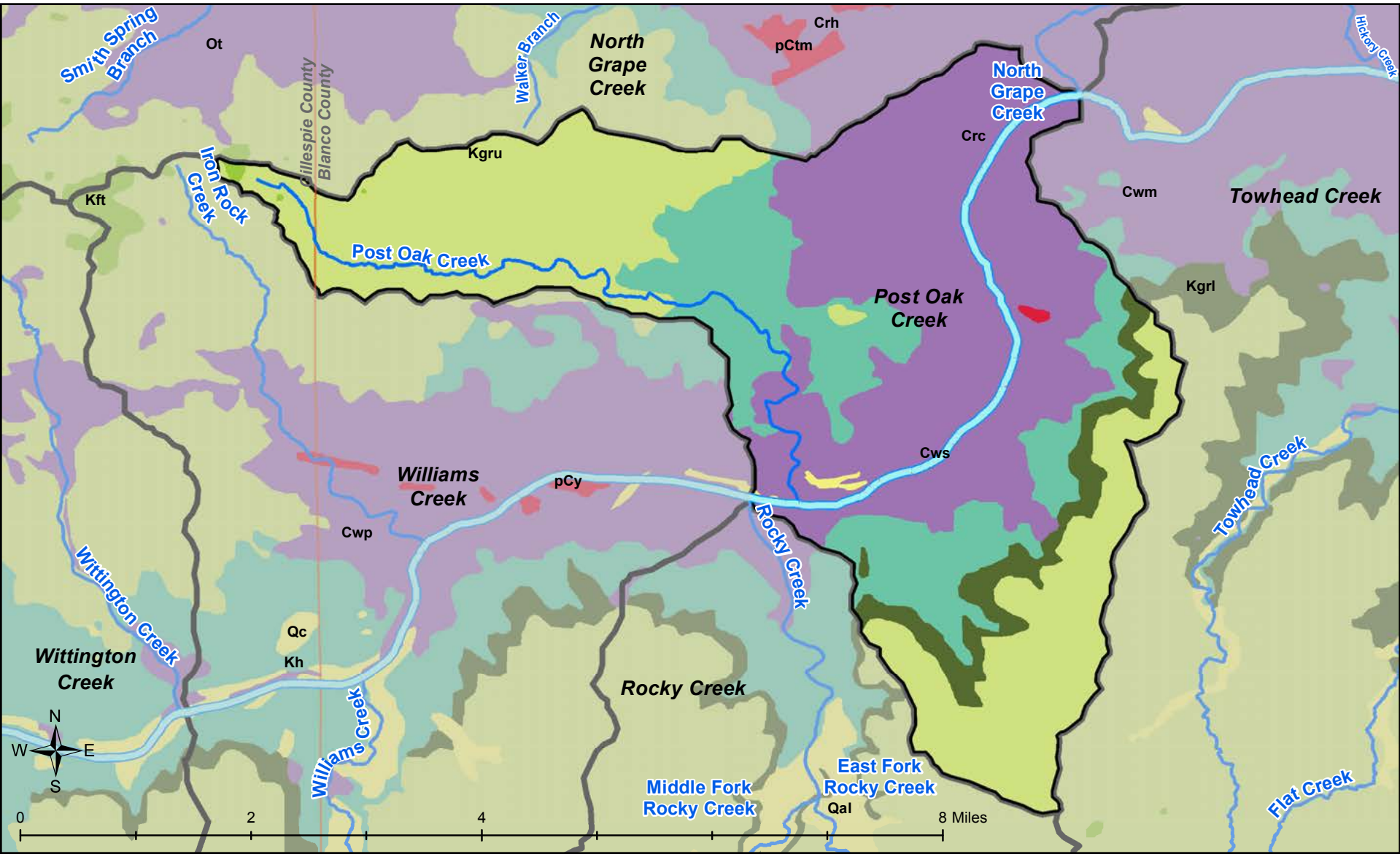
*Cities:* N/A

*Tributaries:* Post Oak Creek

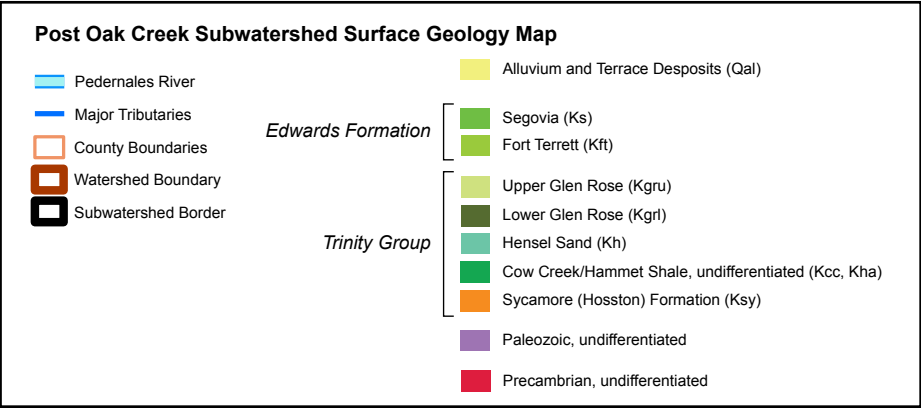


# Surface Geology

Surface rock deposits within this subwatershed follow a predictable pattern; Paleozoic rock formations (with small patches of alluvium and Precambrian deposits) close to the Pedernales transition to Hensel Sand (Kh) as one moves away from the river. In the southern portion of the subwatershed, Hensel Sand deposits then transitions into small deposits of Lower Glen Rose units (Kgrl) and then Upper Glen Rose units (Kgru). In the northern and western areas, Hensel Sand deposits transition immediately into Upper Glen Rose units as one moves away from the Pedernales.



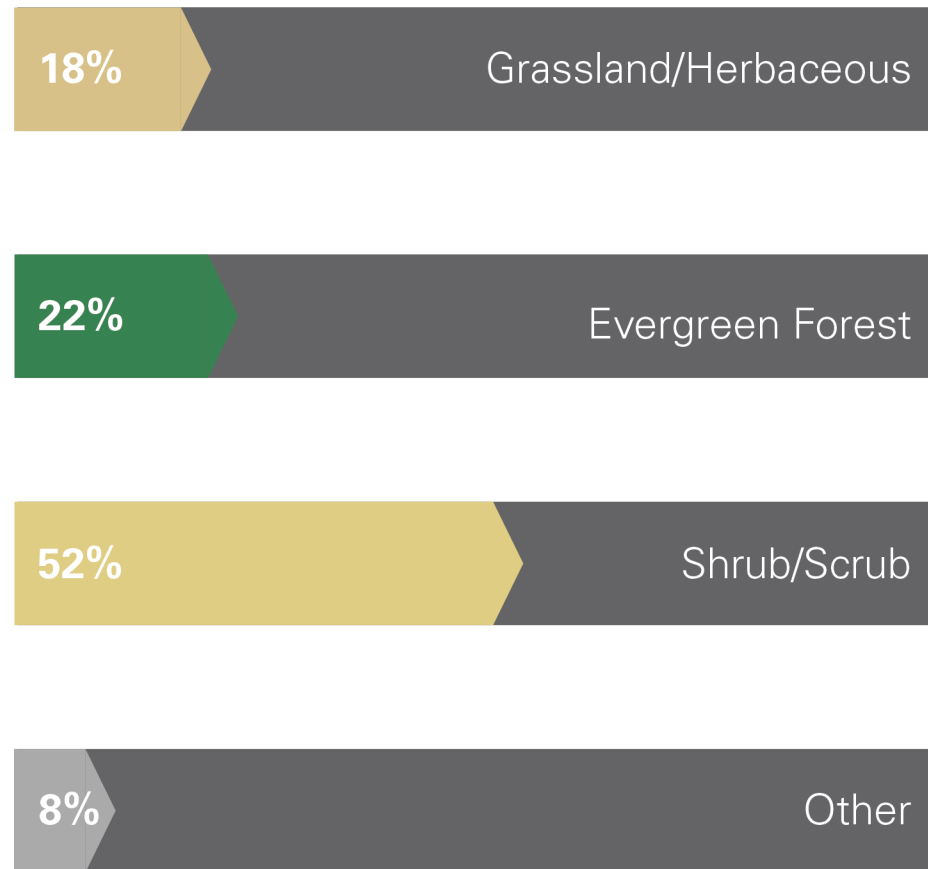
Post Oak Creek Geology Breakdown



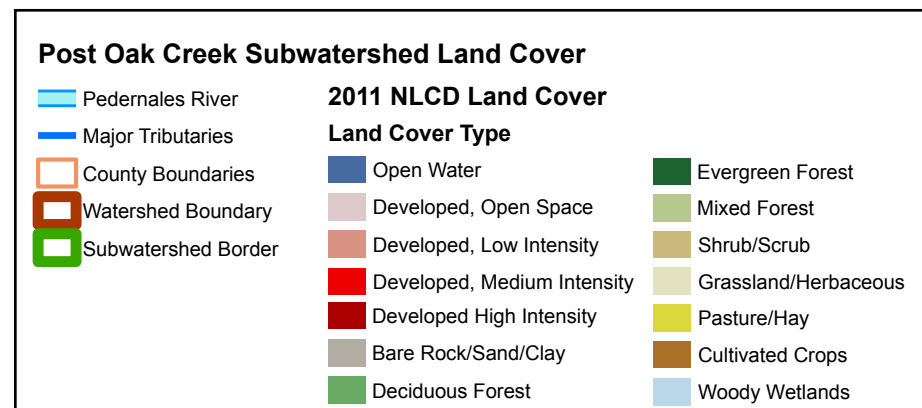


# Land Cover

## Post Oak Creek Land Cover

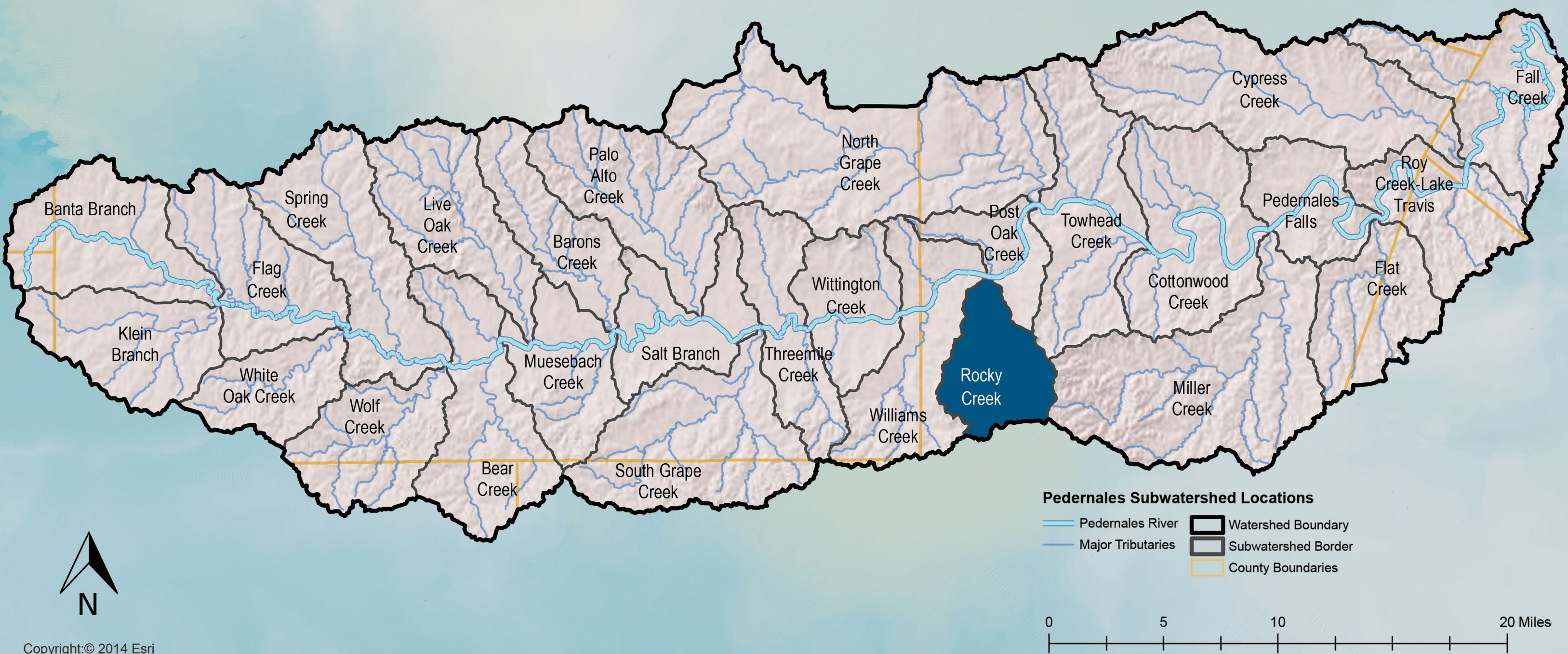


Minimal amounts of agricultural activity can be observed along Post Oak Creek and the Pedernales, especially in close proximity to USH 290. However, the vast majority of land cover within the subwatershed is scrubland interspersed with stands of Evergreen Forest and grasslands.



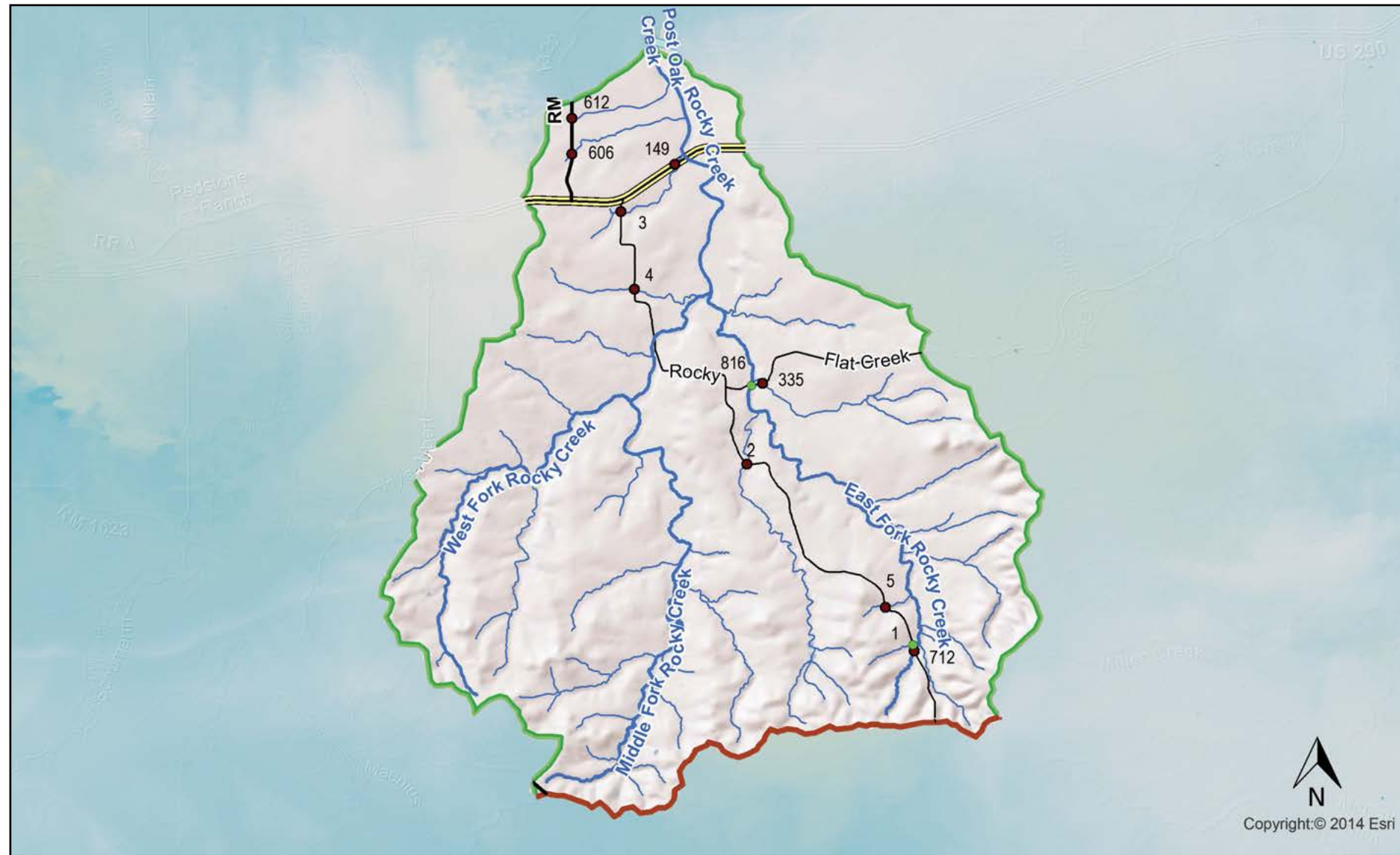


# ROCKY CREEK

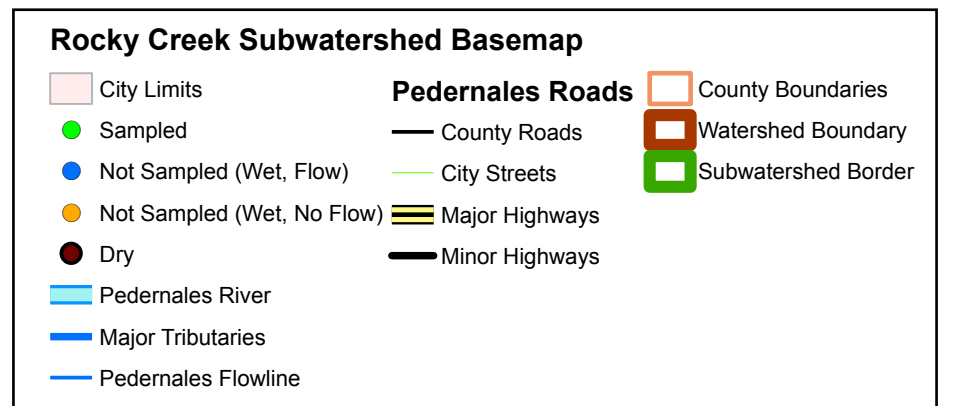


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Rocky Creek Subwatershed, Site 816



**T**HE ROCKY CREEK SUBWATERSHED contains 28.31 square miles and is located in Blanco County between the communities of Hye and Stonewall. RM 1320 runs in a north-south direction at the extreme northern edge of the subwatershed and meets with USH 290, which runs roughly west to east. All other roads within the subwatershed are county roads, including Rocky Road running roughly north-south and Flat Creek Road running west to east from Rocky Road. Rocky Creek is the only tributary within this watershed, although it is split into a West, Middle, and East fork further upstream from the Pedernales.

Flowing water was observed by The Meadows Center staff along the East Fork of Rocky Creek at Sites 1 and 816. The west and middle forks of Rocky Creek were not accessible by public road.

## ABOUT ROCKY CREEK SUBWATERSHED

*Size:* 28.31 square miles

*Counties:* Blanco

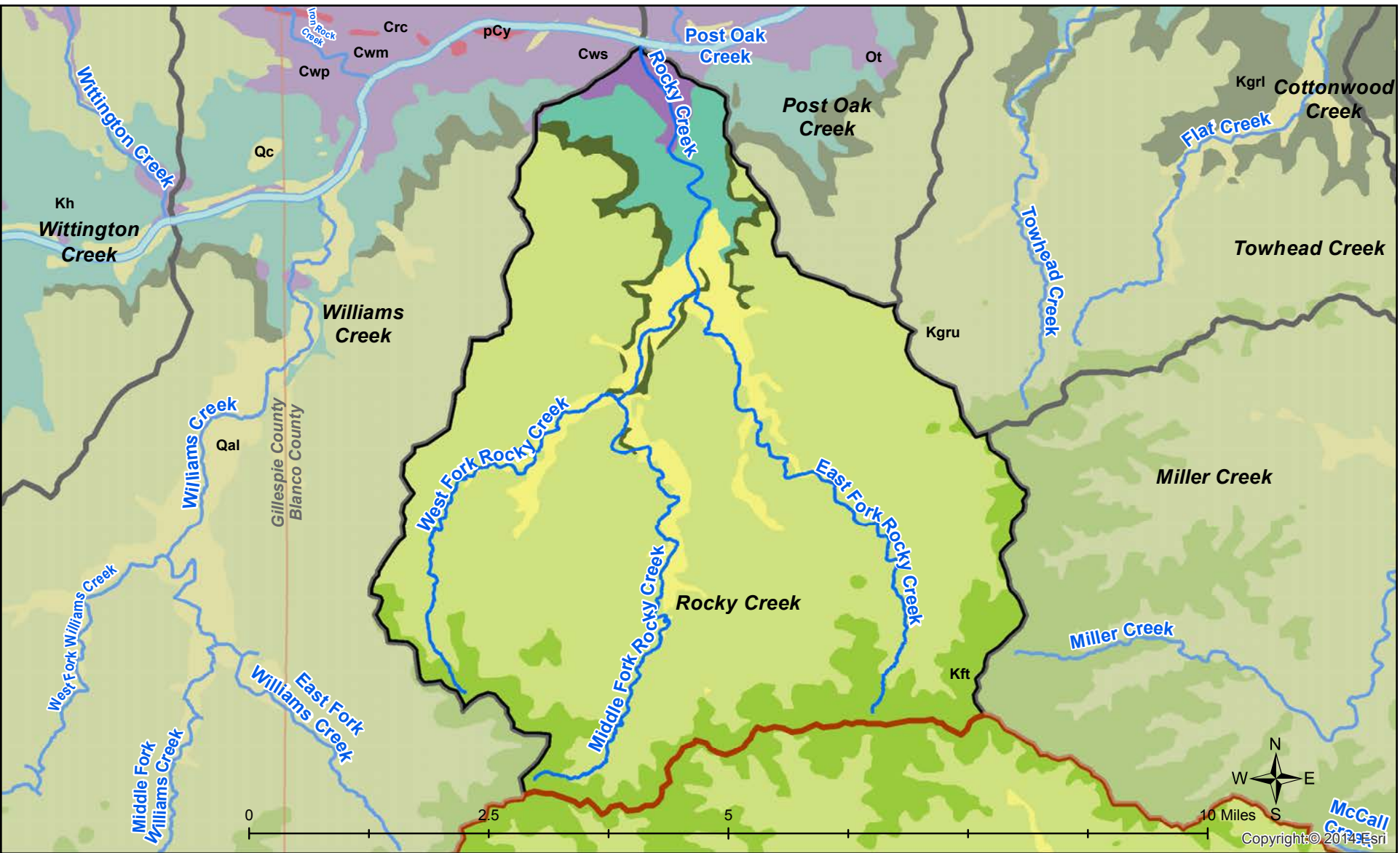
*Cities:* Hye and Stonewall

*Tributaries:* Rocky Creek, and West Fork, Middle Fork, East Fork

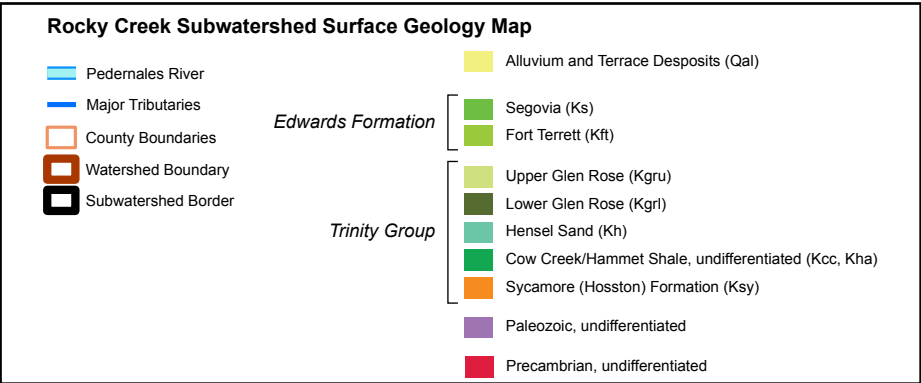
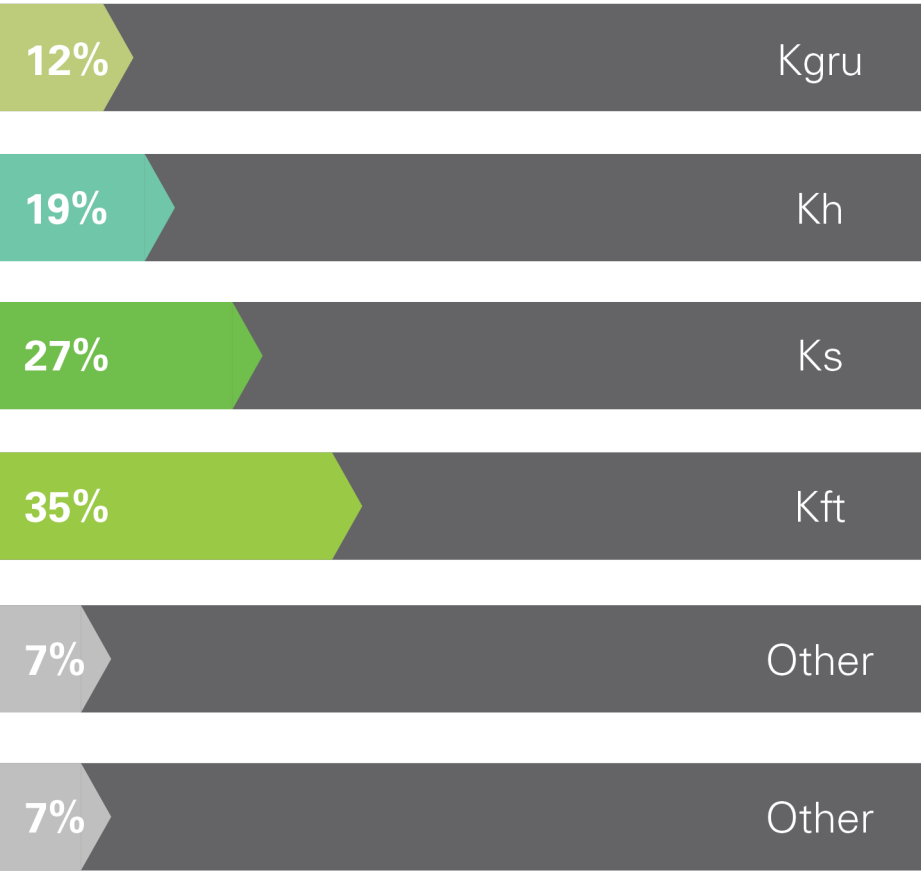


# Surface Geology

Surface rock deposits within this subwatershed follow a predictable pattern; Paleozoic rock formations (with small patches of alluvium and Precambrian deposits) close to the Pedernales transition to Hensel Sand (Kh), then Lower (Kgri) to Upper (Kgru) Glen Rose formations as one moves away from the river. Upper Glen Rose is the predominant formation within this watershed, although a small amount of Fort Terrett (Kft) deposits are located at the subwatershed’s southern edge.



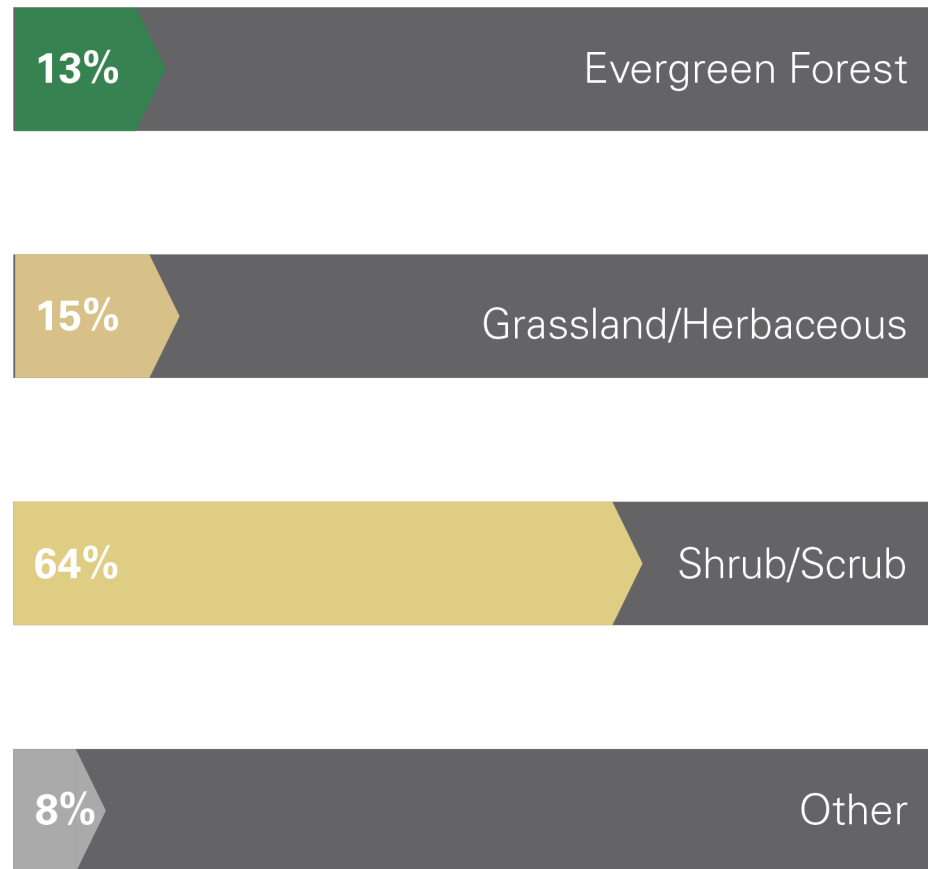
## Rocky Creek Geology Breakdown





# Land Cover

## Rocky Creek Land Cover



Minimal amounts of agricultural activity can be observed near the Pedernales, especially in close proximity to USH 290. However, the vast majority of land cover within the subwatershed is scrubland interspersed with stands of Evergreen Forest and grasslands.





# ROY CREEK

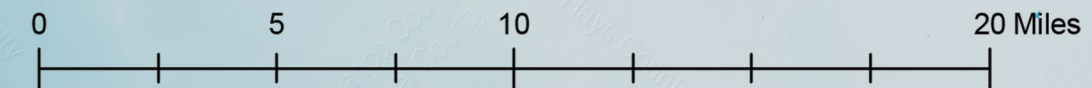


## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries



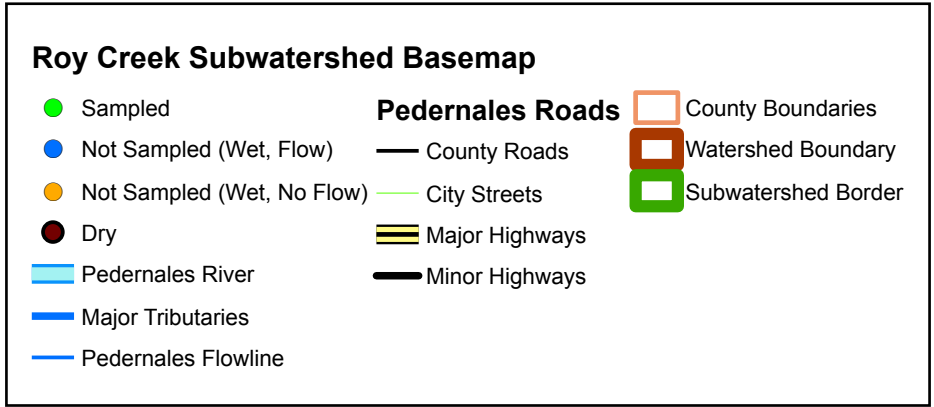
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Roy Creek Subwatershed at Lake Travis, Site 12



THE ROY CREEK SUBWATERSHED contains 37.24 square miles and is split between Hays, Blanco, and Travis counties. The main thoroughfare through this watershed is Hamilton Pool Road/RM 962, and the Hamilton Pool Swimming Hole is located on Hamilton Creek, one of two main tributaries to the Pedernales (Roy Creek being the other).

Flowing water was observed by The Meadows Center staff along Hamilton Creek at sites 904 and 632, as well as the Pedernales at site 12 (which was not accessible for sampling). Roy Creek was not accessible by road, but two nearby flowlines contributing to the creek were dry.

**ABOUT ROY CREEK SUBWATERSHED**

Size: 37.24 square miles

Counties: Hays, Blanco, and Travis

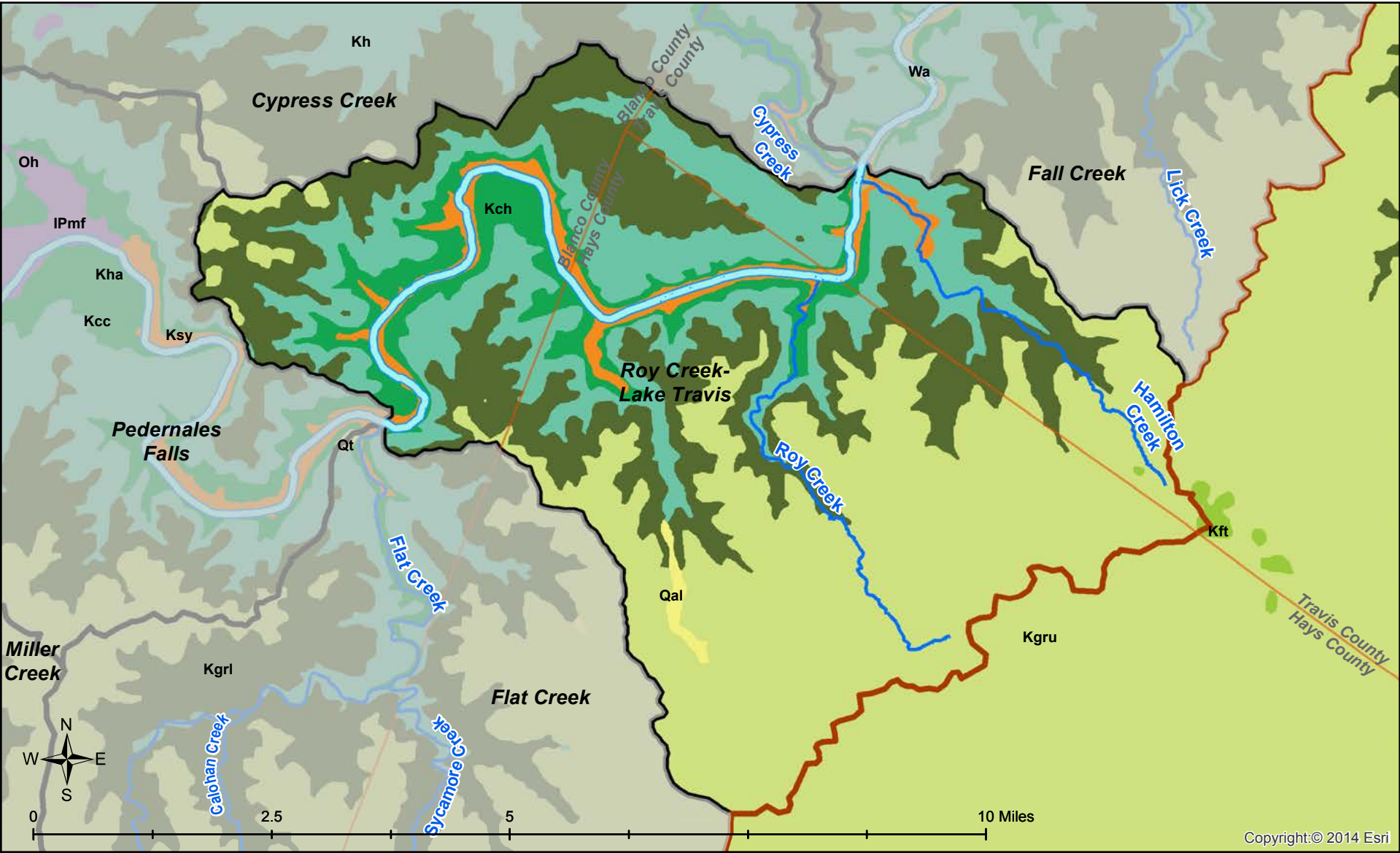
Cities: N/A

Tributaries: Hamilton Creek

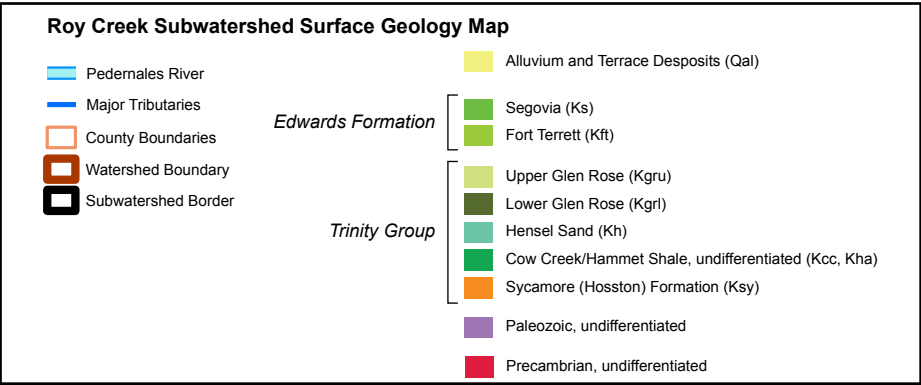
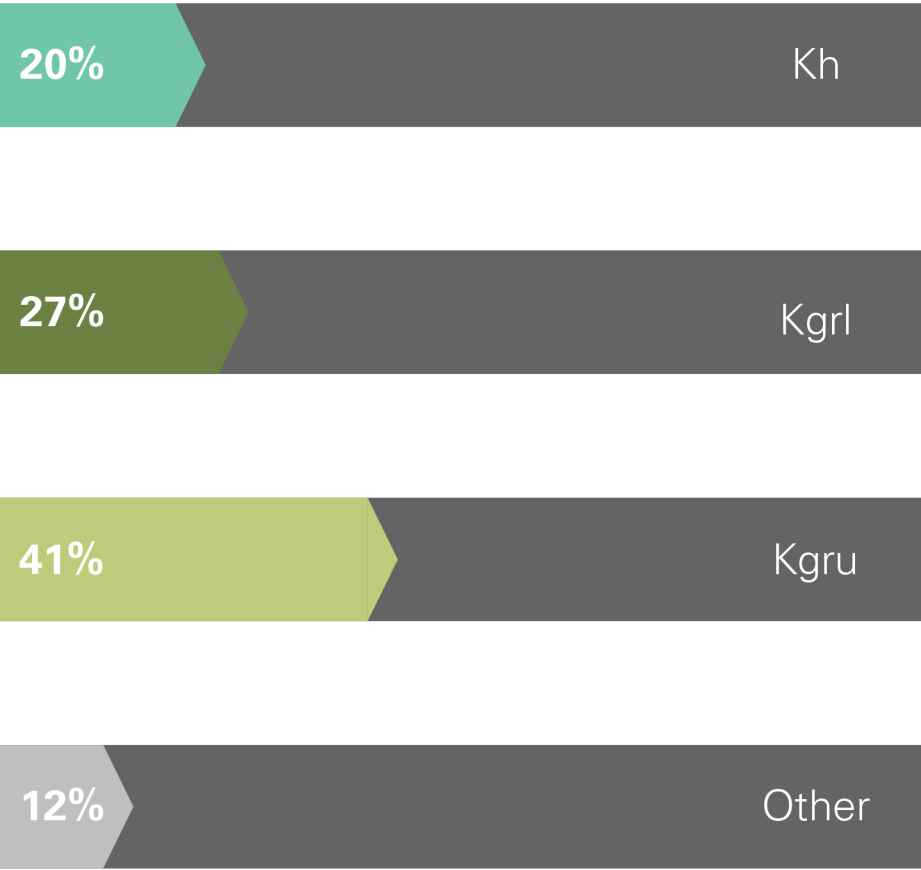


# Surface Geology

Surface rock deposits within this subwatershed follow a discernable pattern moving from the Pedernales River outward; Sycamore Formation (Ksy) deposits are located along the Pedernales river, which is surrounded by Cow Creek/Hammett Shale. Hensell Sand deposits surround the Cow Creek/Hammett Shale, and also follow river corridors for Hamilton and Roy Creeks as well as some flowlines spreading outward from the Pedernales. As one moves further away from the Pedernales, the predominant rock type then transitions into Lower (Kgrl) then Upper (Kgru) Glen Rose formations.



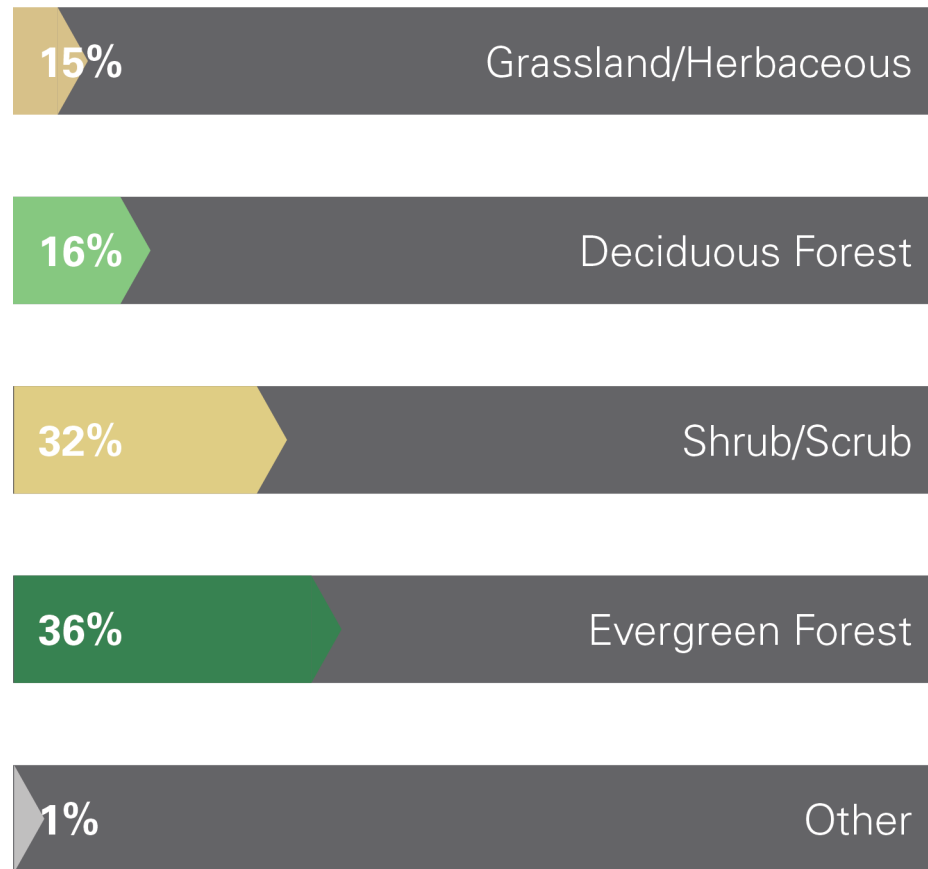
Roy Creek Geology Breakdown



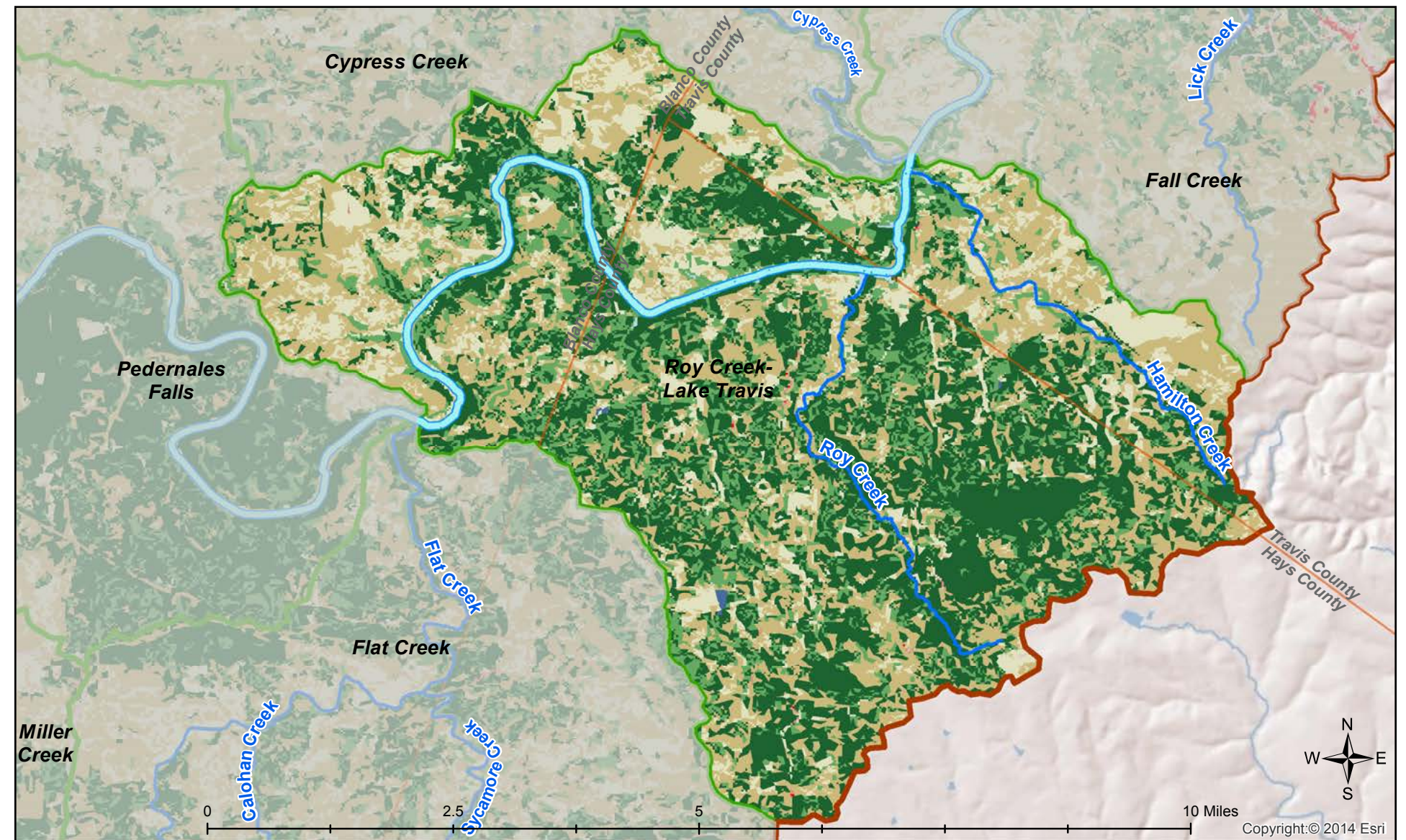
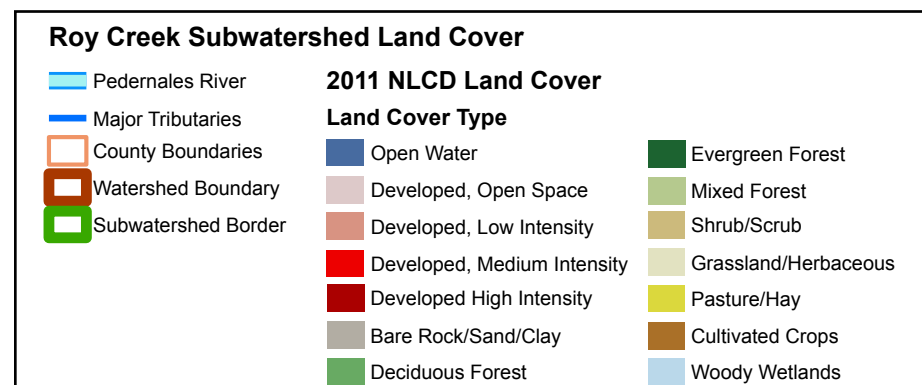


# Land Cover

## Roy Creek Land Cover



Land cover within this subwatershed is highly rural in nature, with forest cover being the predominant land type (52%) followed by scrublands (32%), and then grasslands (15%). Agricultural activity and land development are virtually absent.





# SALT BRANCH

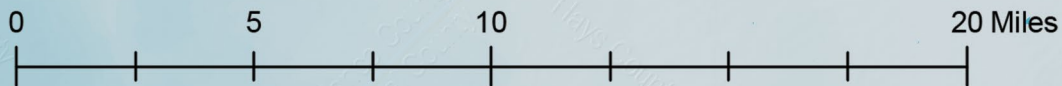


## Pedernales Subwatershed Locations

- Pedernales River
- Watershed Boundary
- Major Tributaries
- Subwatershed Border
- County Boundaries



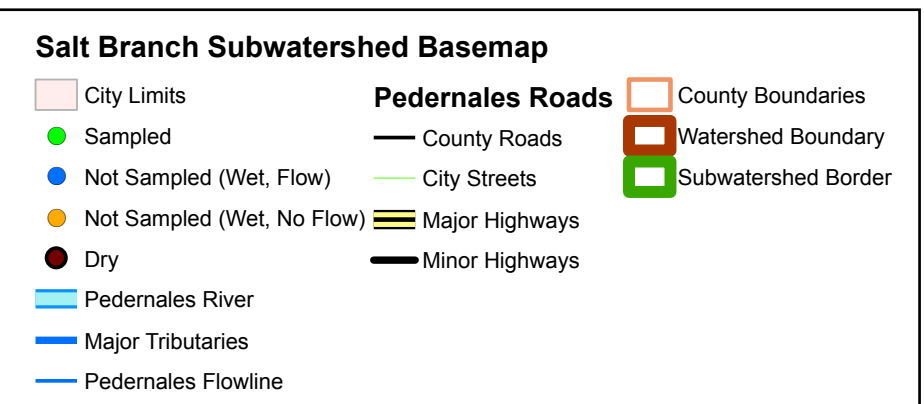
Copyright:© 2014 Esri







*Salt Branch Subwatershed at Pedernales River, Site 349*



**T**HE SALT BRANCH SUBWATERSHED contains 33.04 square miles and is located in Gillespie County just east of the city of Fredericksburg. USH 290 represents the main thoroughfare through the subwatershed, although RM 1376 meets USH 290 shortly after one crosses the Pedernales when traveling away from Fredericksburg. The Pedernales River runs right through the middle of the subwatershed, and Salt Branch is the only major tributary to the river.

Flowing water was observed by The Meadows Center staff along the Pedernales at sites 148 and 349, as well as water at flowlines close to the river at sites 159 and 683. Most notably, site 310 (less than a mile from 159) on the Pedernales was dry. Water was observed close to the headwaters of Salt Branch at site 820, but conditions were dry further downstream. Considering that Salt Branch is heavily situated within an agricultural zone dominated by Hensel Sand deposits, it's possible that loss of water may have been caused by either filtration into the ground, irrigation for agricultural activities, or both.

## ABOUT SALT BRANCH SUBWATERSHED

*Size:* 33.04 square miles

*Counties:* Gillespie

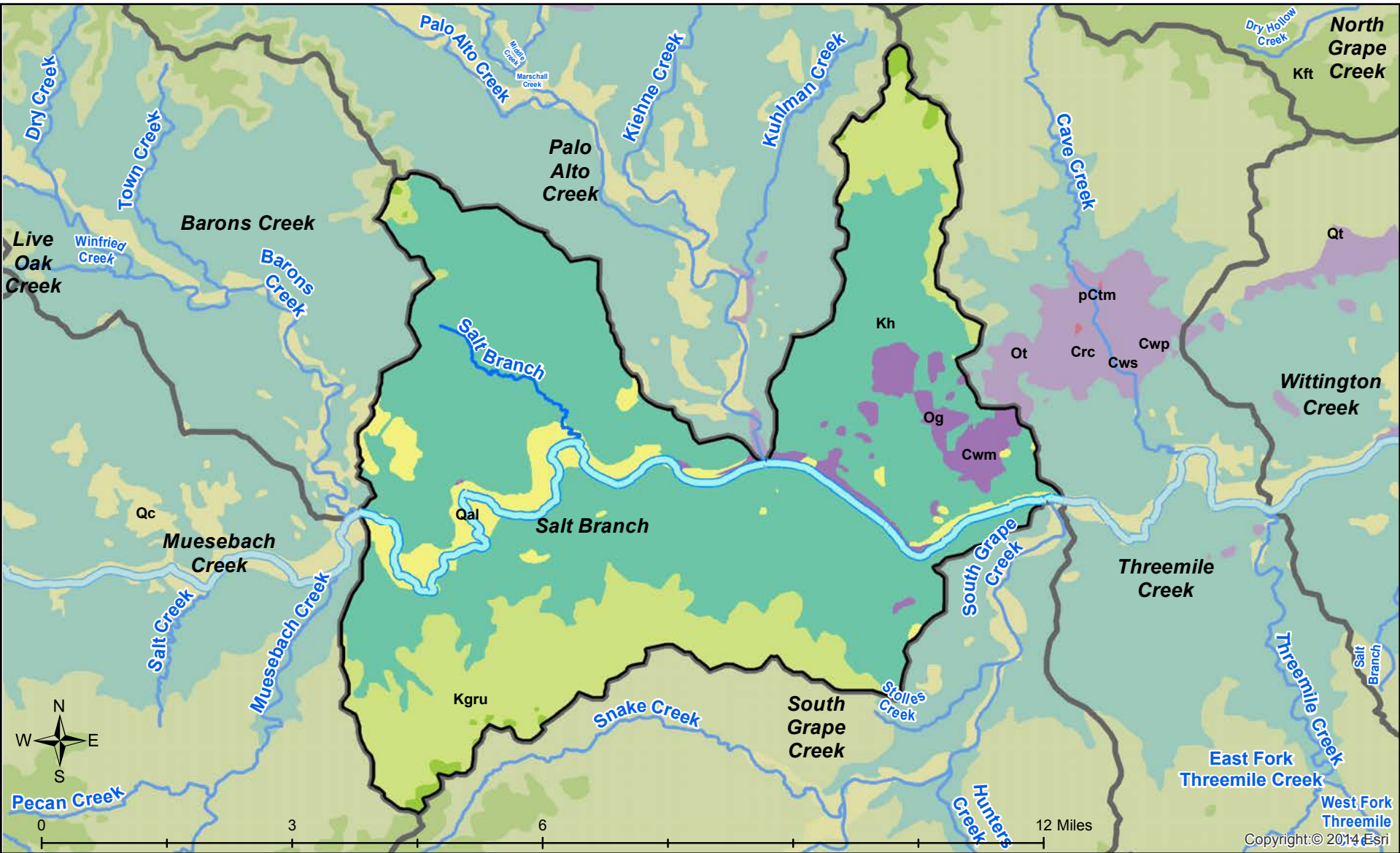
*Cities:* N/A

*Tributaries:* Salt Branch

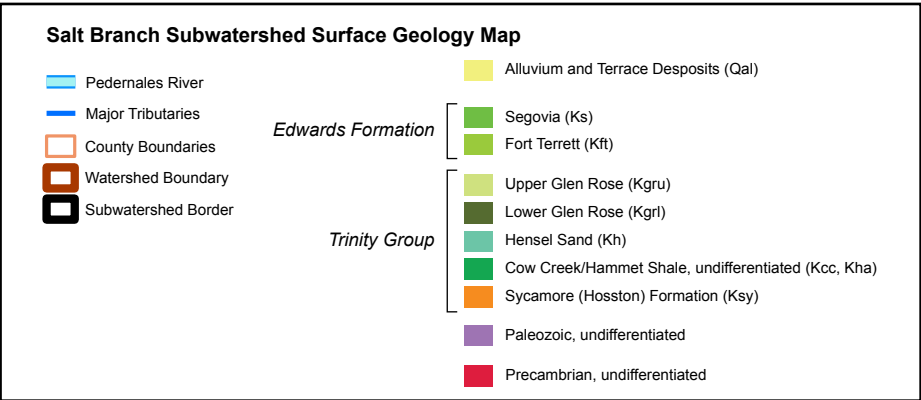
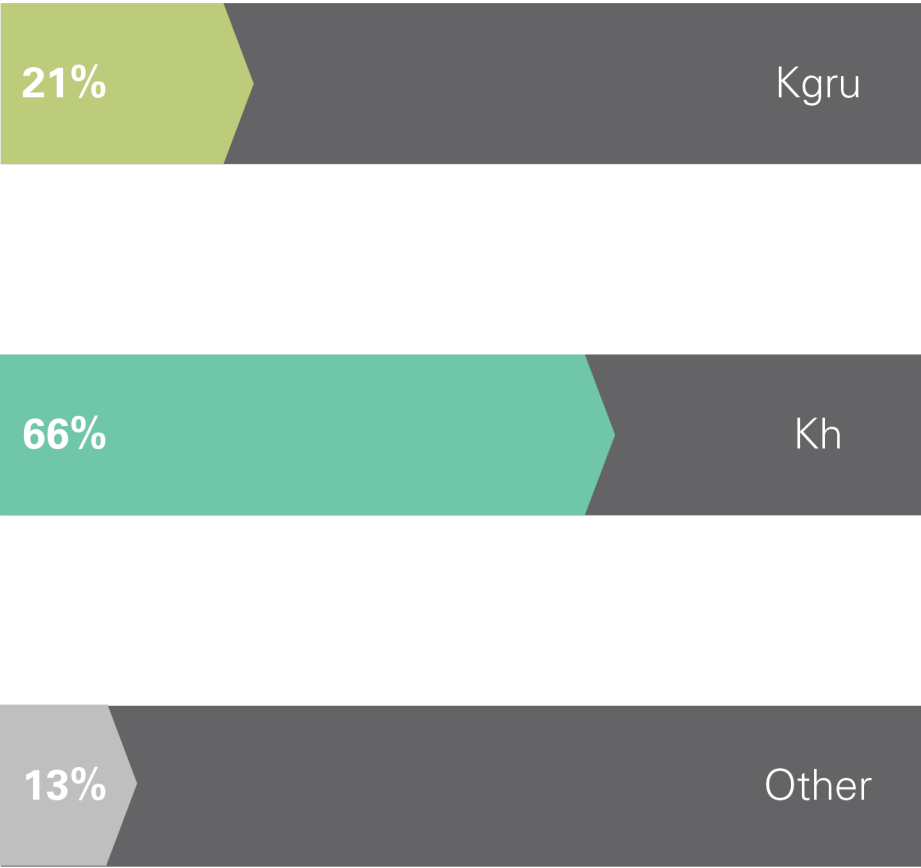


# Surface Geology

Large Hensel Sand (Kh) deposits can be found in this subwatershed in and around the Pedernales, although pockets of Alluvium and Paleozoic deposits can be found immediately along the river corridor as well. Upper Glen Rose (Kgru) units are found as one moves outward from the Pedernales and Hensel Sand deposits.



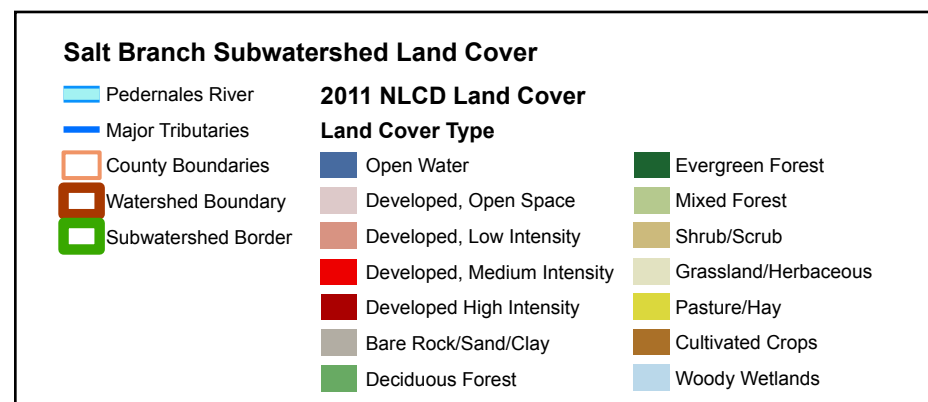
Salt Branch Geology Breakdown



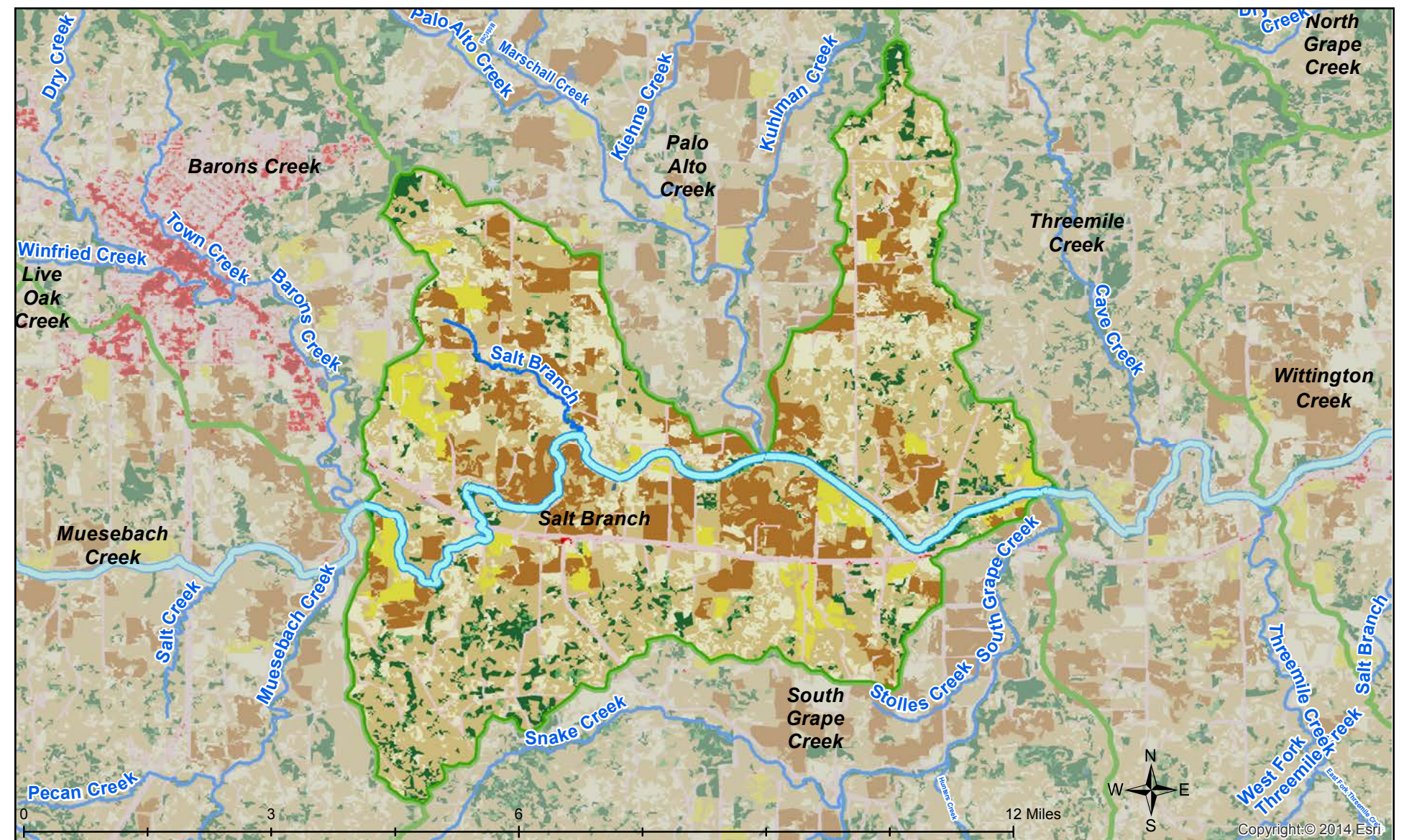


# Land Cover

## Salt Branch Land Cover



Perhaps because of the extensive Hensel Sand deposits in the area, agricultural activity is particularly pronounced within the Salt Branch subwatershed, with pasture and croplands being common throughout. Many of these agricultural areas are used for Fredericksburg's regionally famous peach and wine operations. Most of the land that is not used for agricultural purposes is scrubland (43%) and grasslands (19%). Forested areas are not common here.



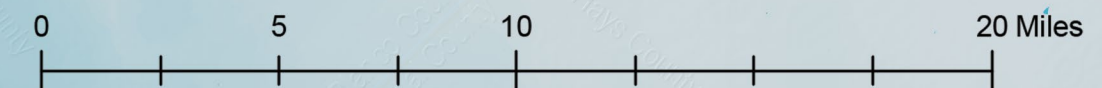


# SOUTH GRAPE CREEK



## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries

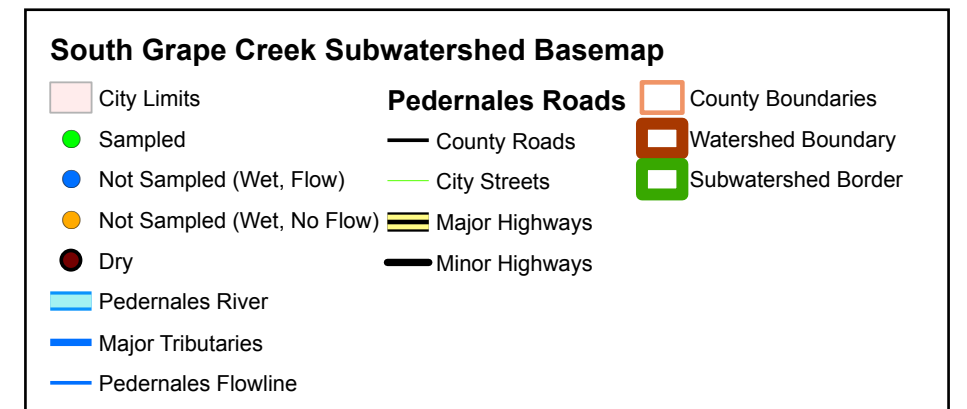


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South Grape Creek Subwatershed, Site 775



**T**HE SOUTH GRAPE SUBWATERSHED contains 63.07 square miles and is located in Gillespie and Kendall Counties in the south central region of the Pedernales River watershed. USH 290 grazes the subwatershed at its extreme northern edge, but the main thoroughfares through the area are RM 1376 and RM 1888. Numerous sub-tributaries flow into South Grape Creek within this subwatershed, including School Creek, Hopfs Creek, the West, Middle, and East Forks of Hunters Creek, Snake Creek, and Stollers Creek.

Flowing water was observed by The Meadows Center staff along South Grape Creek at sites 766, 61, 729, 835, and a flowline at site 382. Staff also observed flowing water at a flowline of the Middle Fork of Hunters Creek at sites 195, and a flowline to the east fork of Hunters Creek at Site 129, as well as site 756 at the confluence of the West, Middle, and East Forks of the creek. Stollers Creek, Snake Creek, and School Creek were dry, and Hopfs Creek was not accessible by public road.

## ABOUT SOUTH GRAPE CREEK SUBWATERSHED

*Size:* 63.07 square miles

*Counties:* Gillespie and Kendall

*Cities:* N/A

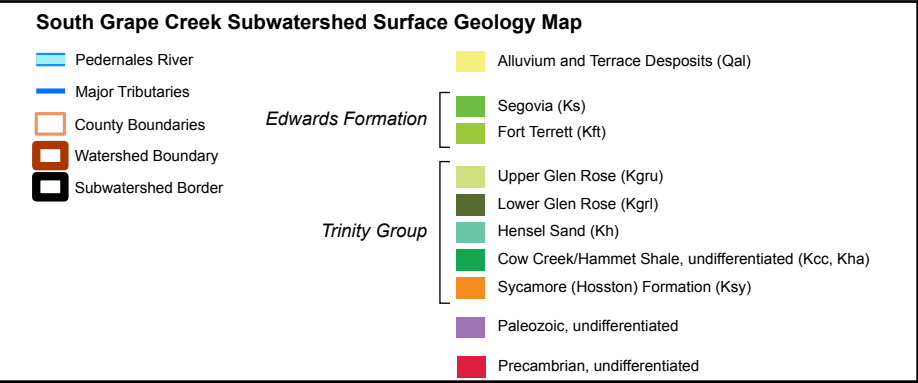
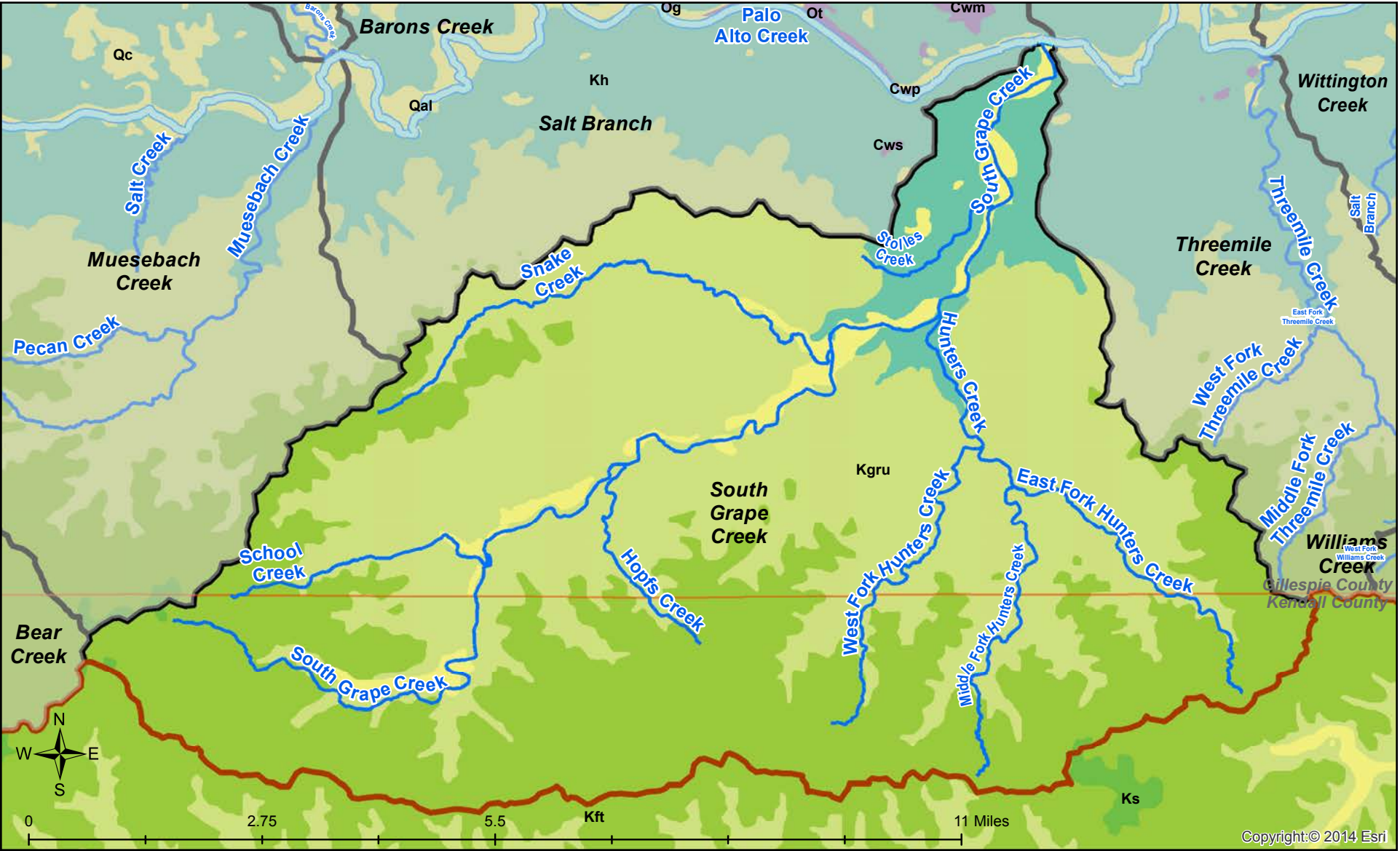
*Tributaries:* School Creek, Hopfs Creek, Hunters Creek (West, Middle and East), Snake Creek, Stollers Creek



# Surface Geology

Hensel Sand (Kh) deposits can be found in this subwatershed near the Pedernales along South Grape Creek. As one moves away from the Pedernales, surface rock deposits transition to Upper Glen Rose (Kg<sub>ru</sub>) units, then Fort Terrett (K<sub>ft</sub>) deposits in the southern end of the subwatershed.

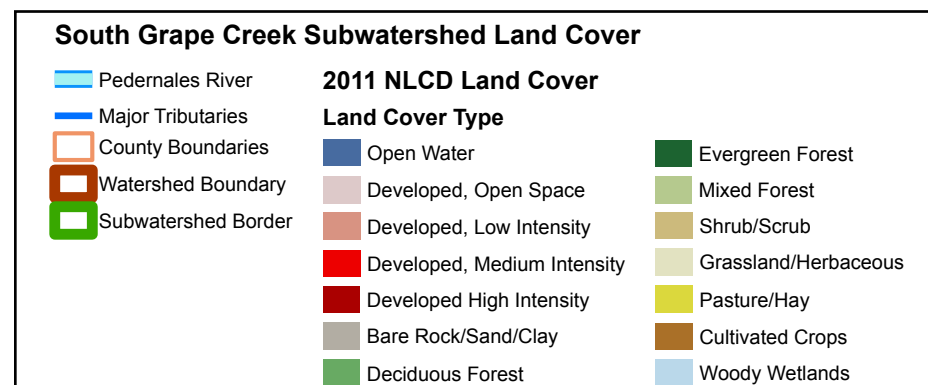
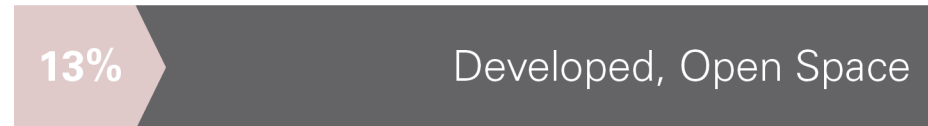
South Grape Creek Geology Breakdown



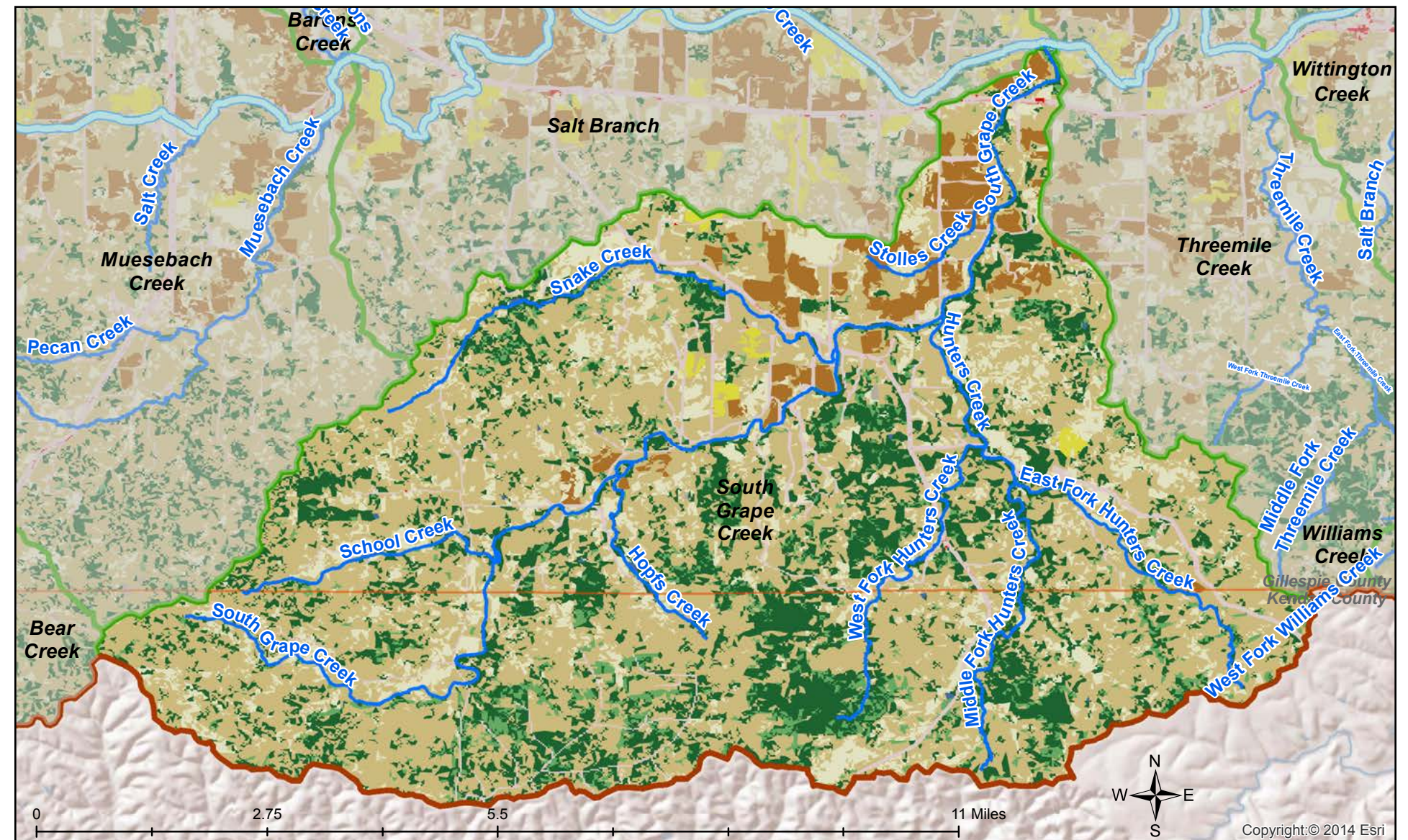


# Land Cover

## South Grape Creek Land Cover



Agricultural activities are prevalent close to the Pedernales River along South Grape Creek and Snake Creek on land roughly analogous with Hensel Sand deposits, but as one moves away from the corridor the land cover types become predominantly scrubland, grasslands, or forest stands close to creek and river corridors.



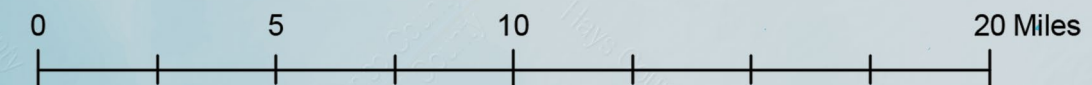


# SPRING CREEK



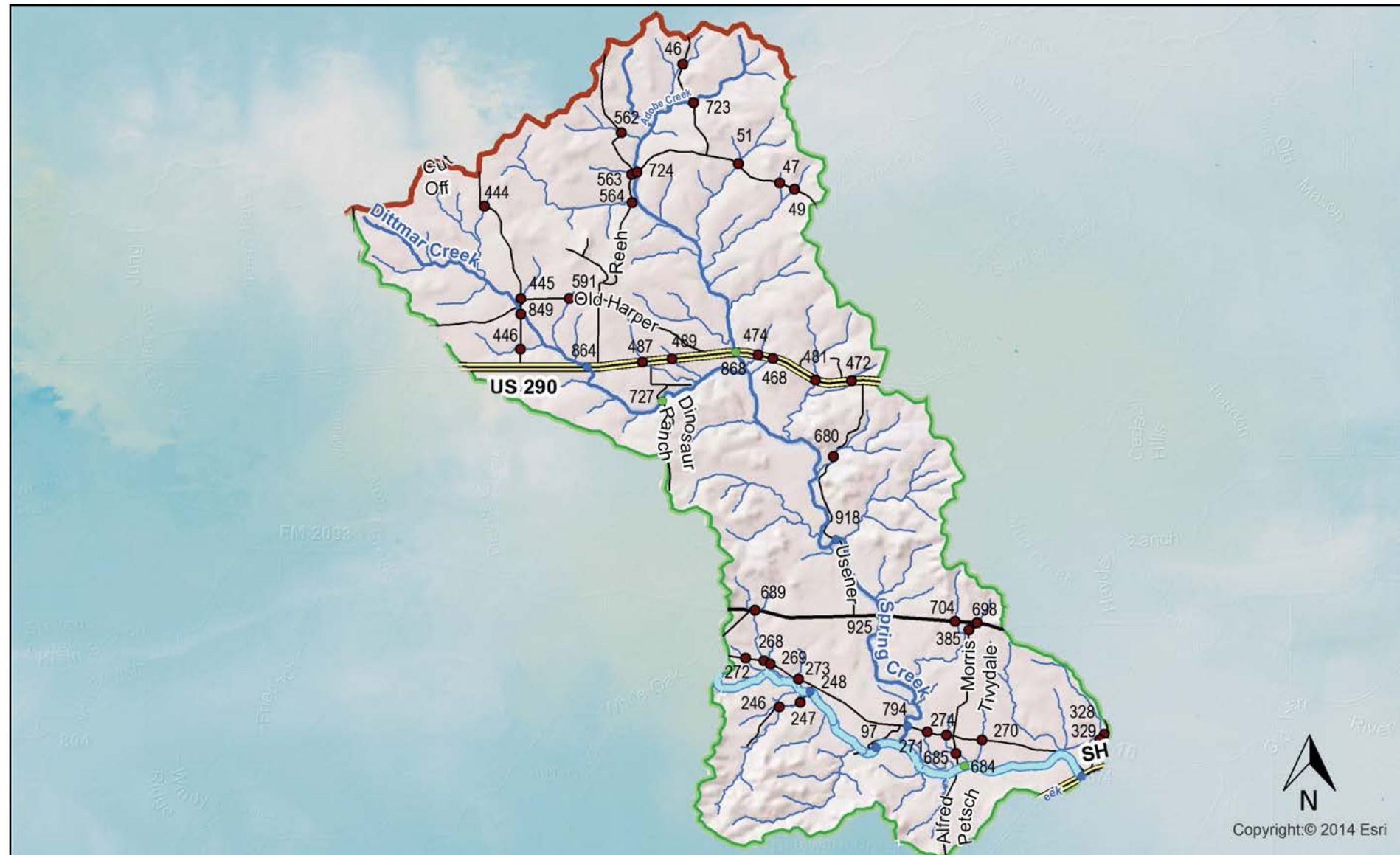
## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries



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Spring Creek Subwatershed at the Pedernales River, Site 868

**T**HE SPRING CREEK SUBWATERSHED contains 56.28 square miles and is located in Gillespie County west of the city of Fredericksburg. USH 290 runs through the north central portion of the subwatershed, as does FM 2093 in its southern area. Dittmar Creek and Adobe Creek flow from the north into Spring Creek, which eventually joins with the Pedernales River in the southern end of the subwatershed.

Flowing water was observed by The Meadows Center staff along the Pedernales at sites 97 and 684, Spring Creek at sites 794, 918, and 868, and Dittmar Creek at sites 727 and 864. However, Dittmar and Spring Creeks were dry in upstream locations north of USH 290. Adobe Creek was also dry.

## ABOUT SPRING CREEK SUBWATERSHED

*Size:* 56.28 square miles

*Counties:* Gillespie

*Cities:* N/A

*Tributaries:* Dittmar Creek, Adobe Creek

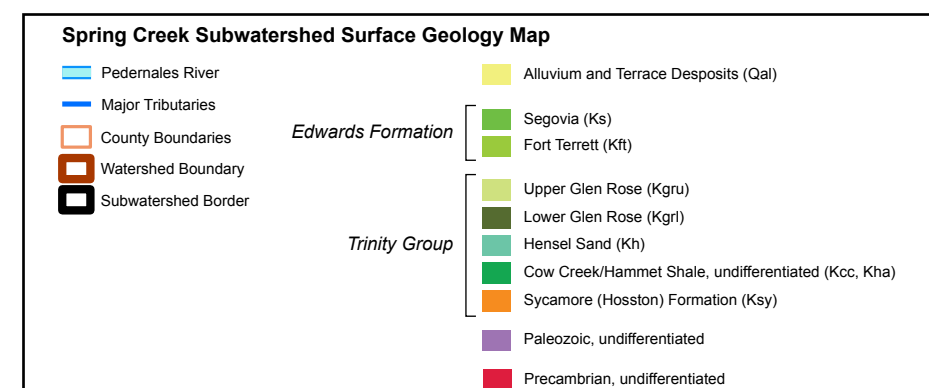


# Surface Geology

Hensel Sand (Kh) deposits can be found in this subwatershed near the Pedernales and slightly upstream into the Spring Creek corridor. As one moves away from the Pedernales, surface rock transitions into small deposits of Upper Glen Rose (Kgru) units, then larger deposits of Fort Terrett (Kft). Some Segovia (Ks) deposits can be found at the northern end of the subwatershed.



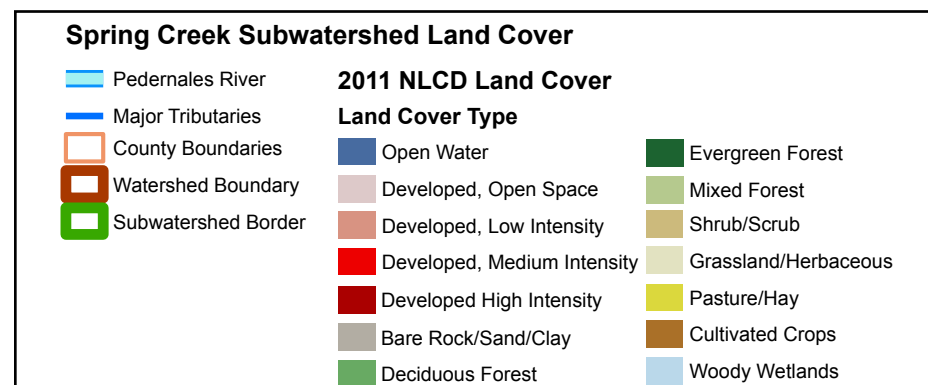
## Spring Creek Geology Breakdown



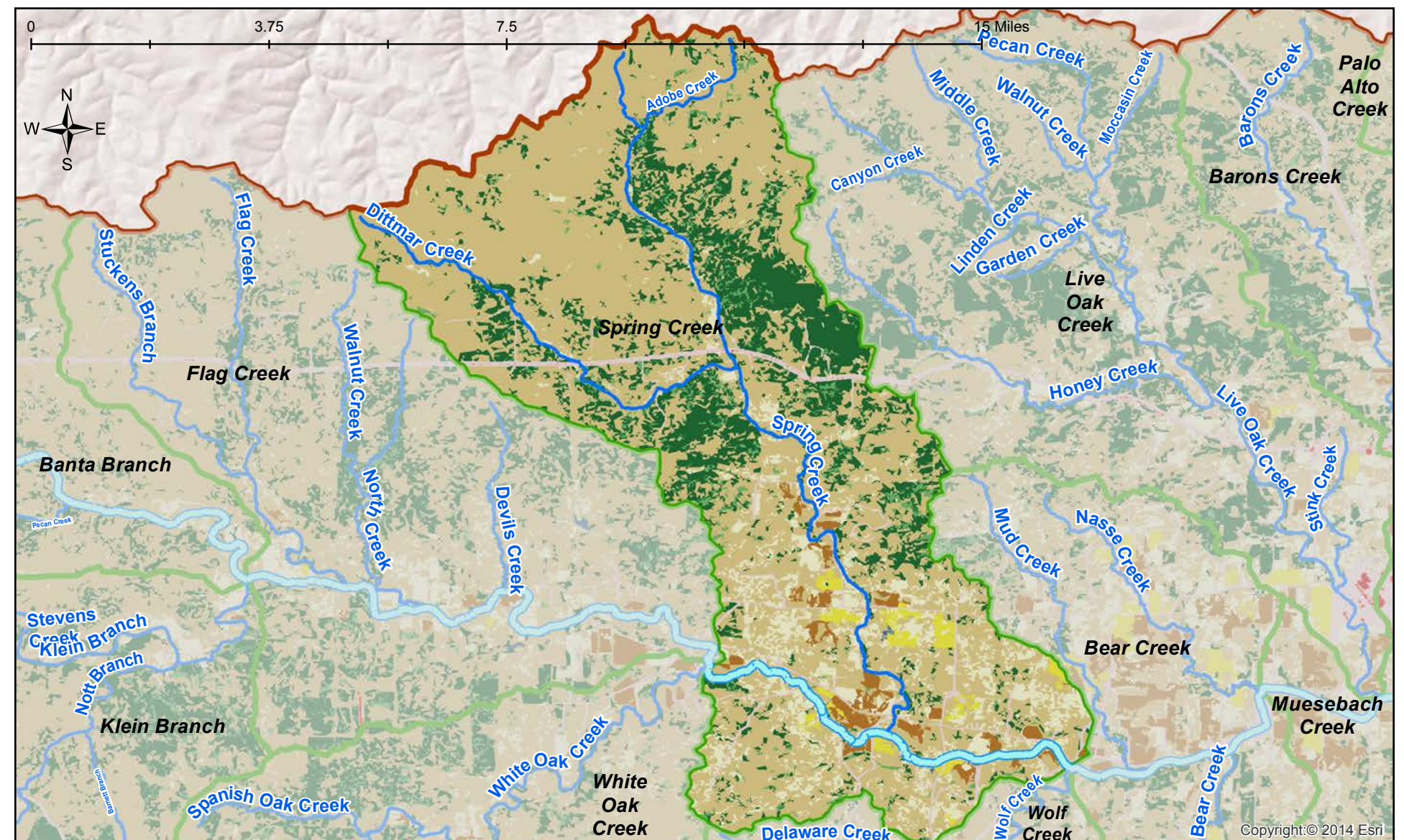


# Land Cover

## Spring Creek Land Cover



Some agricultural activities occur close to the Pedernales River and upstream into Spring Creek on land roughly analogous with Hensel Sand deposits, but as one moves away from the corridor the land cover types become predominantly scrubland, grasslands, or forest stands close to creek and river corridors.



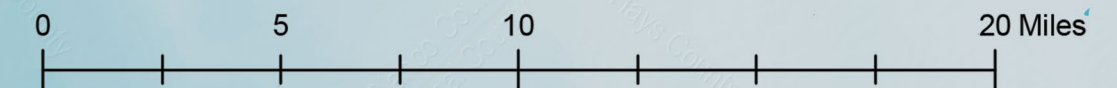


# THREEMILE CREEK



## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries

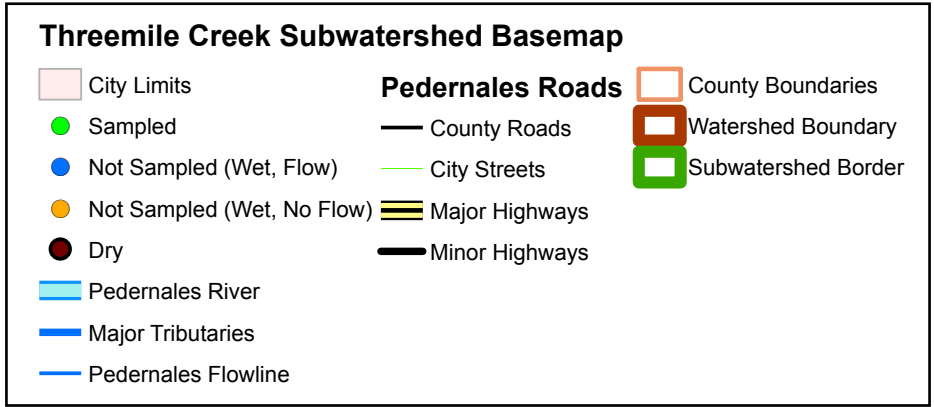


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Threemile Creek Subwatershed at the Pedernales River, Site 82



**T**HE **THREEMILE CREEK SUBWATERSHED** contains 34.28 square miles and is located in Gillespie County with its eastern edge grazing the village of Stonewall (pop. 469). USH 290 runs through the central portion of the subwatershed, as does RM 2721 in its northern area. Cave Creek runs its headwaters in the north down to the Pedernales River to the south, and Threemile Creek (along with its West and Middle Forks) runs from its headwaters in the south up to the Pedernales River to the north.

Flowing water was observed by The Meadows Center staff along the Pedernales at site 82. However, all sites along Cave Creek, Threemile Creek, and its forks were dry.

**ABOUT THREEMILE CREEK SUBWATERSHED**

Size: 34.28 square miles

Counties: Gillespie

Cities: Stonewall (pop. 469)

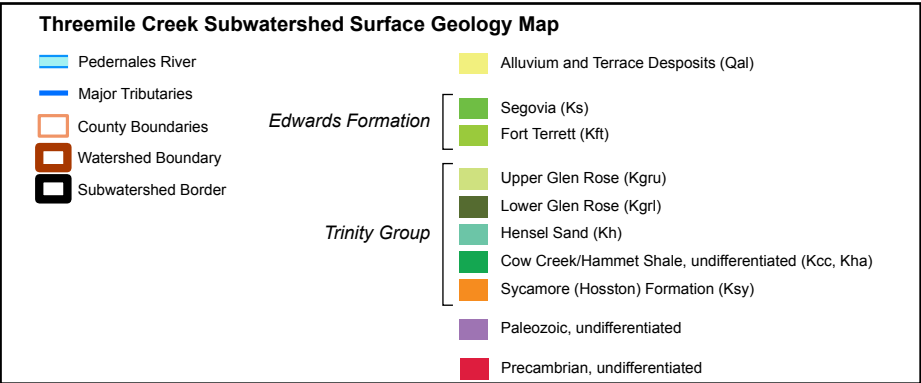
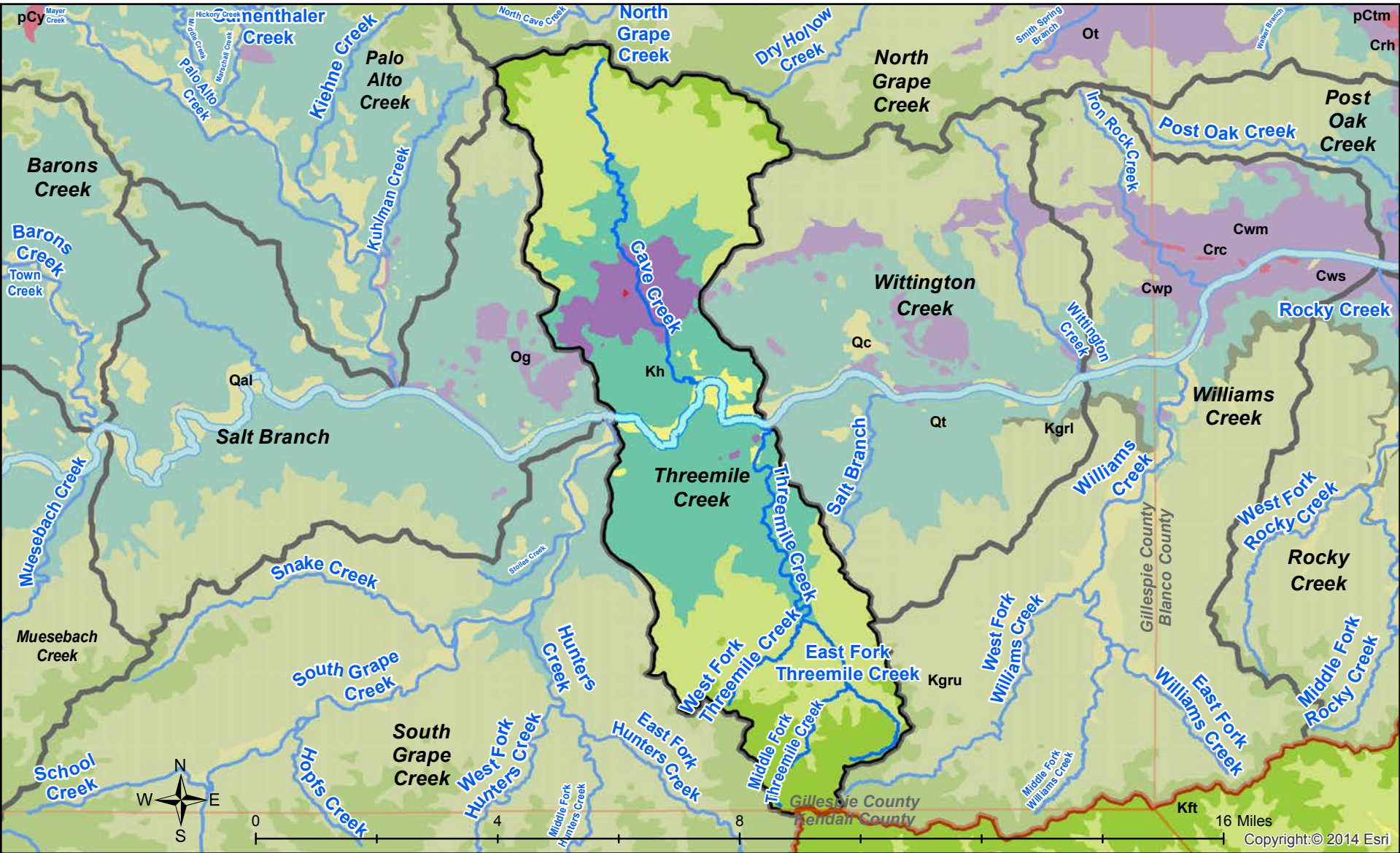
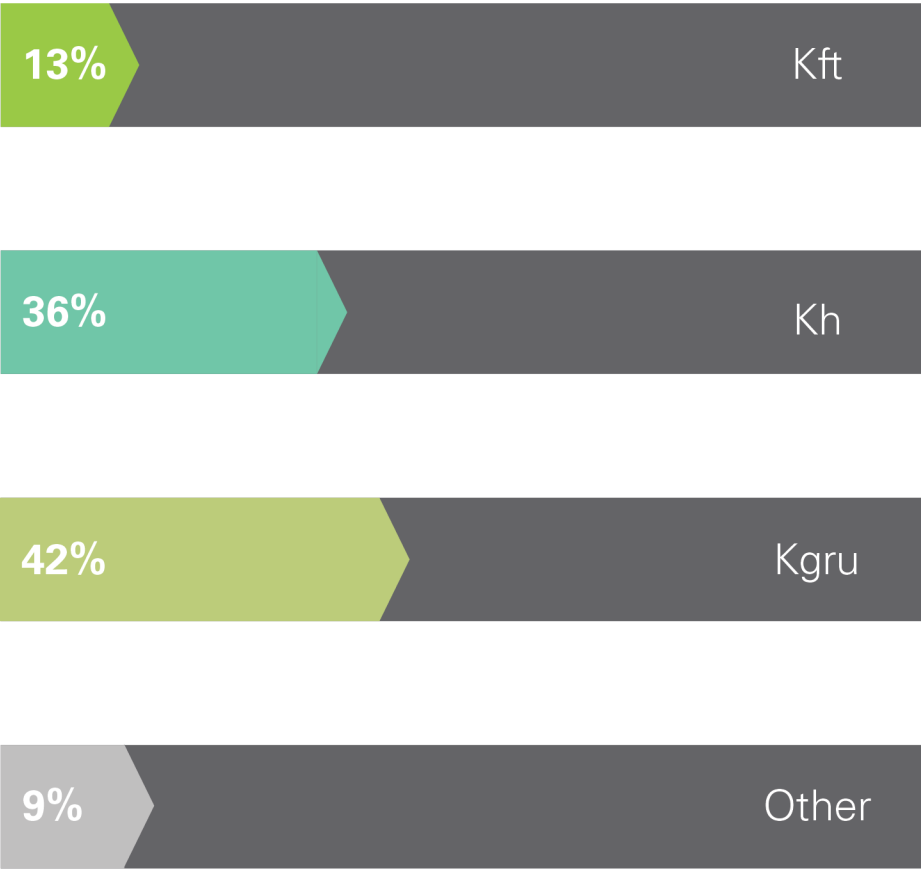
Tributaries: Cave Creek



# Surface Geology

Hensel Sand (Kh) deposits can be found in this subwatershed near the Pedernales and slightly upstream into the Cave Creek and Threemile Creek corridors. A large deposit of Paleozoic units is surrounded by these Hensel deposits within the north central portion of the subwatershed. As one moves away from the Pedernales, surface rock transitions into large deposits of Upper Glen Rose (Kgru) units, then smaller deposits of Fort Terrett (Kft).

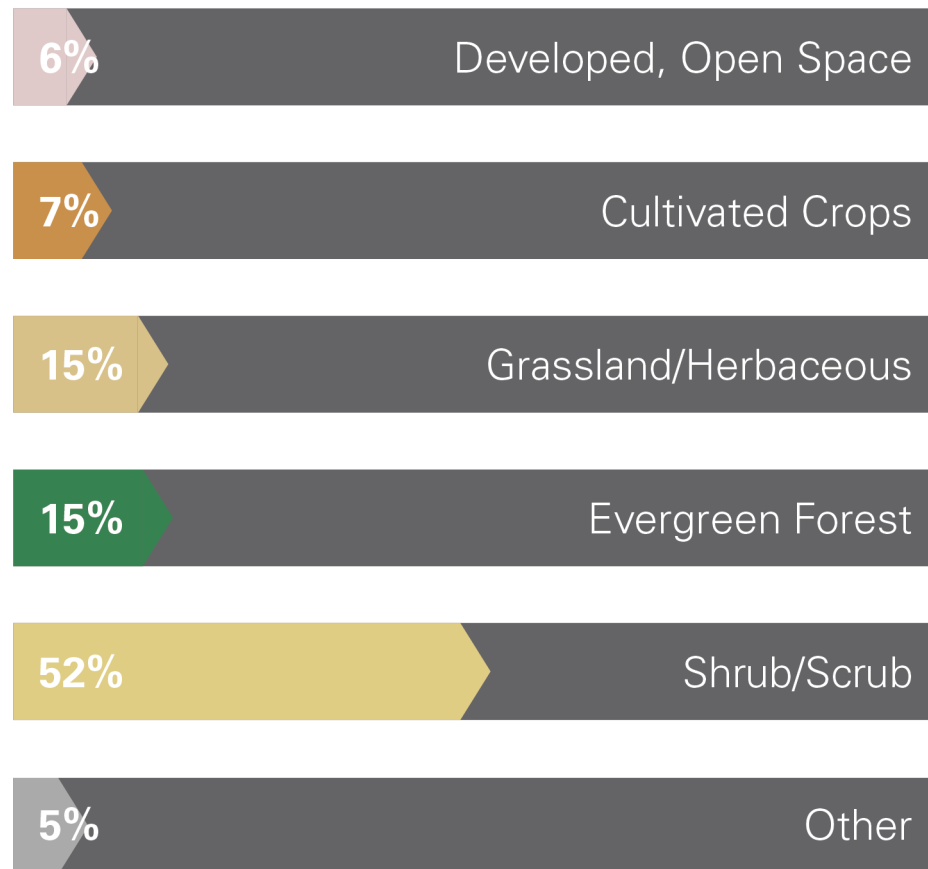
Threemile Creek Geology Breakdown



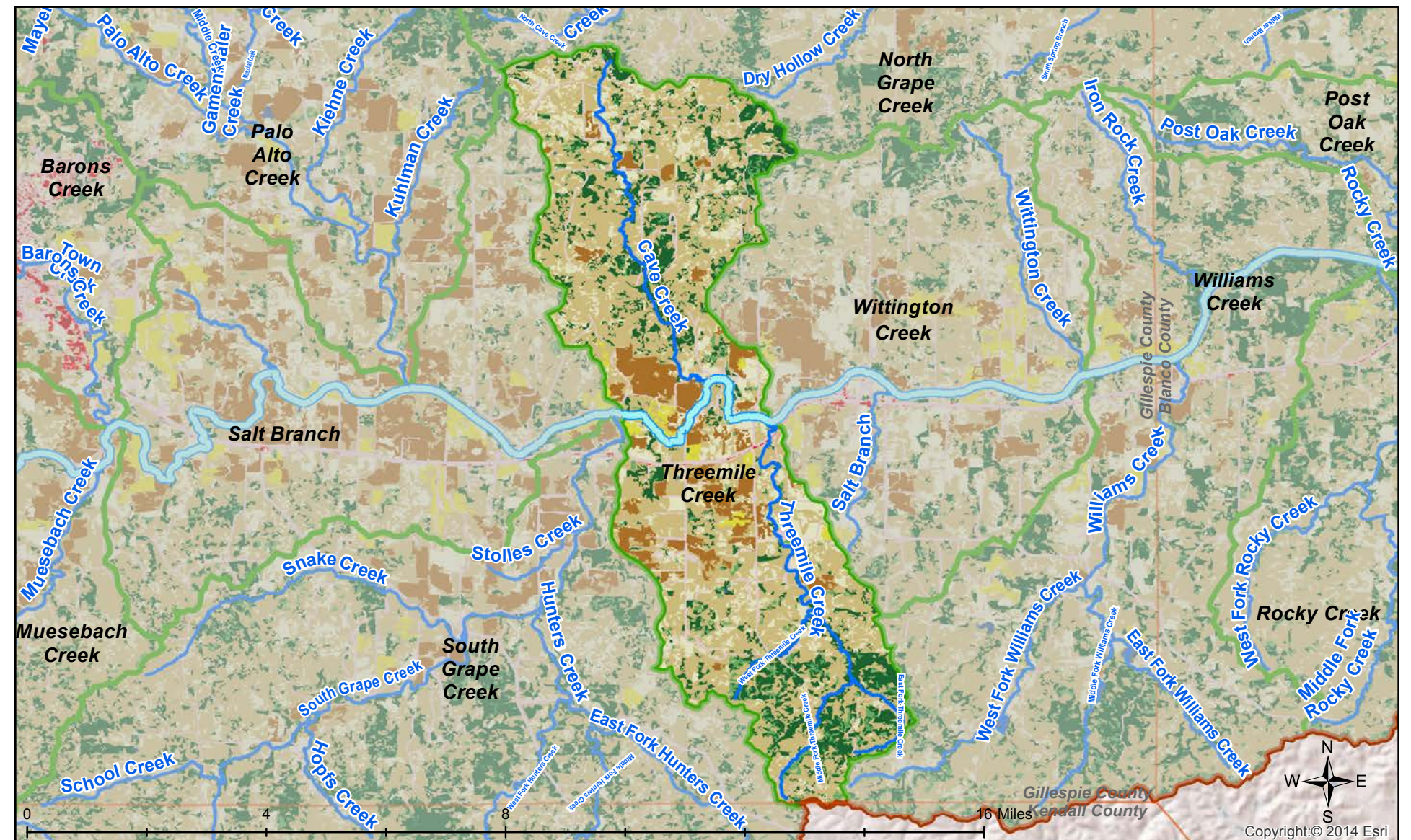


# Land Cover

## Threemile Creek Land Cover



Agricultural activities occur close to the Pedernales River and upstream into Threemile Creek on land roughly analogous with Hensel Sand deposits, but as one moves away from the corridor the land cover types become predominantly scrubland, grasslands, or forest stands close to creek and river corridors, particularly along Threemile Creek.



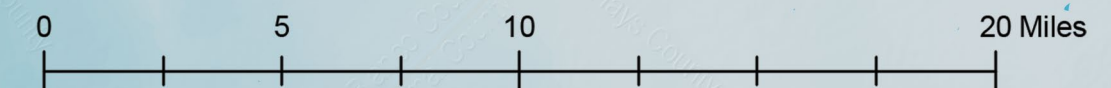


# TOWHEAD CREEK



## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries

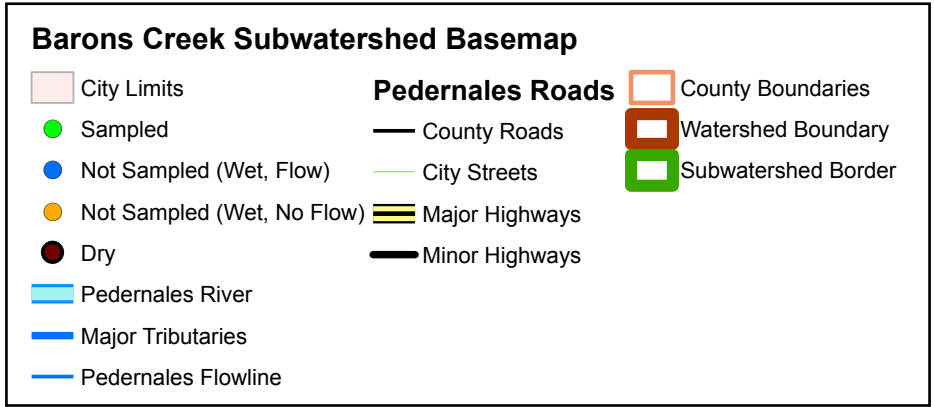


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Towhead Creek Subwatershed at the Pedernales River, Site 883



**T**HE TOWHEAD CREEK SUBWATERSHED is located in Blanco County with its eastern edge grazing the town of Johnson City (pop. 1,785). USH 290 runs through the southern portion of the subwatershed, as does RM 1323 in its central and northern areas. Hickory Creek runs from the northwest down to the Pedernales River in the southeast, Buffalo Creek runs from the northeast down to the Pedernales in the southwest, and Flat Creek and Towhead Creek combine with each other to flow from the southwest up to the Pedernales in the northeast.

Flowing water was observed by The Meadows Center staff along the Pedernales at site 232, as well as Towhead Creek at sites 815 near its headwaters and 883 near its confluence with the Pedernales. Flat Creek was dry upstream but had flowing water at site 764 as well as at a flowline at site 136. Hickory Creek had water at site 906, but access to a site further upstream was not possible. Buffalo Creek was dry at its only site accessible by road.

**ABOUT TOWHEAD CREEK SUBWATERSHED**

Size: 55.63 square miles

Counties: Gillespie and Blanco

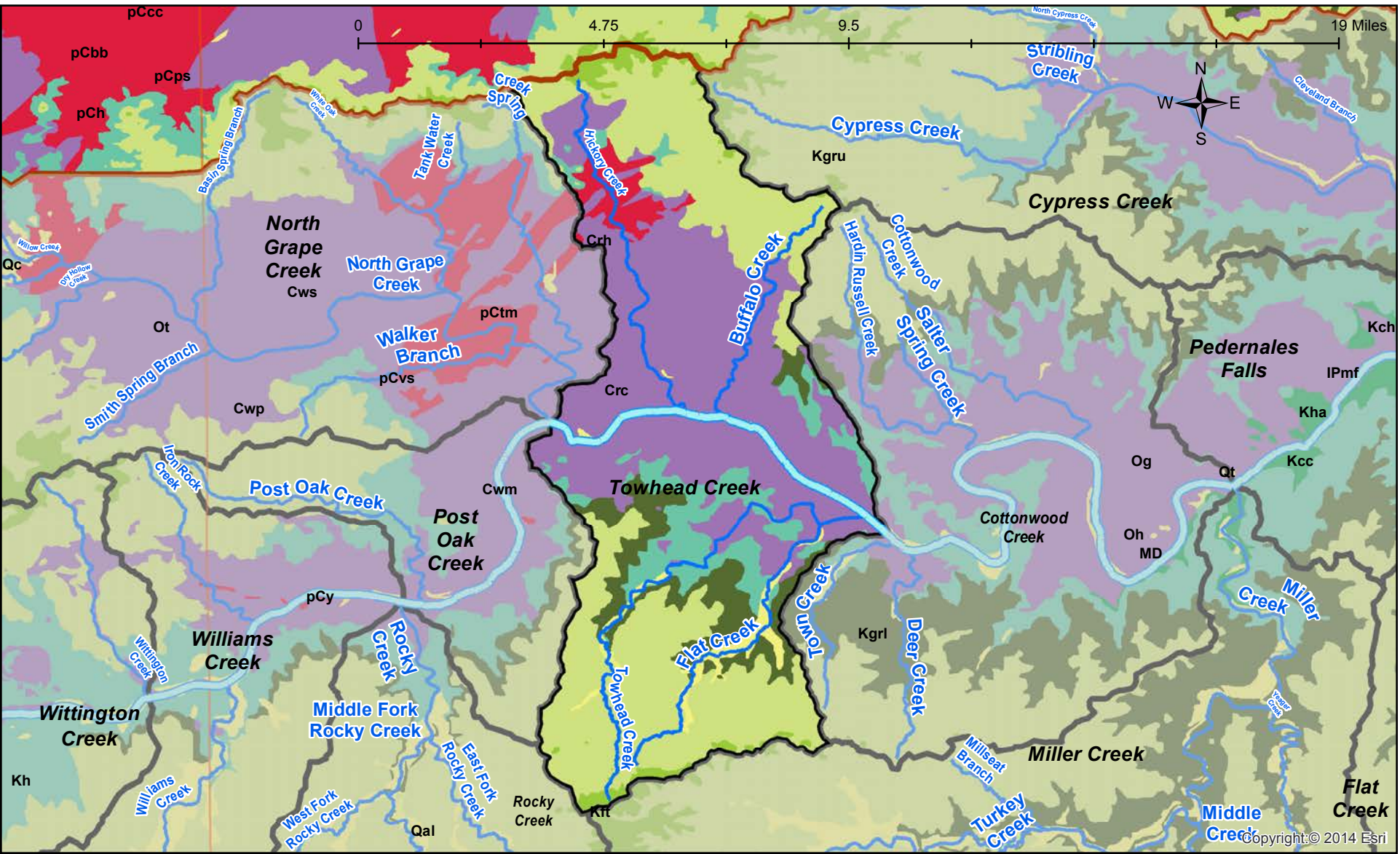
Cities: Johnson City (pop. 1,785)

Tributaries: Hickory Creek, Buffalo Creek, Flat Creek

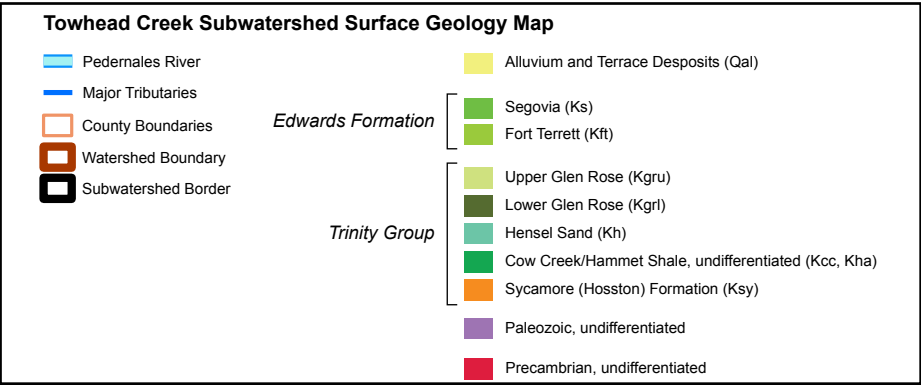
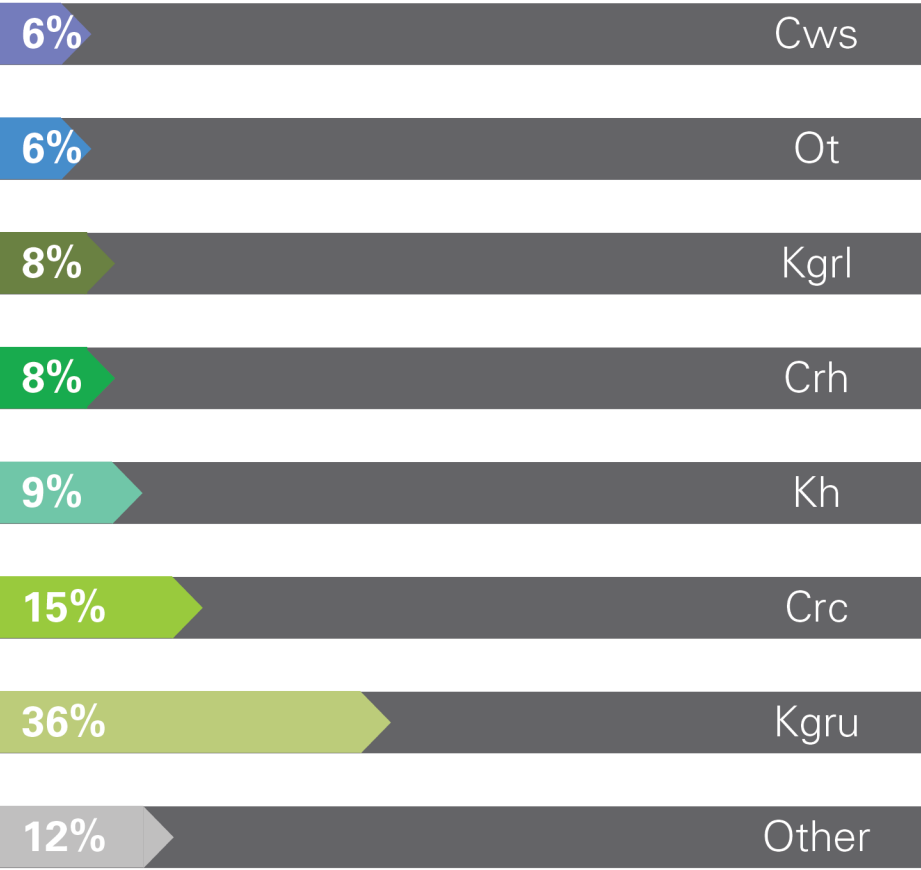


# Surface Geology

Paleozoic deposits are predominant along the Pedernales River and upstream into the Hickory Creek and Buffalo Creek corridors. A small amount of Precambrian deposits can be found just south of Hickory Creek’s headwaters. Very small amounts of Hensel Sand (Kh) deposits can be found south and east of the Paleozoic deposits as one moves away from the Pedernales, which then transitions to Lower Glen Rose (Kgri) deposits then Upper Glen Rose (Kgri) deposits when moving further south. However, as one moves into the northern edges of the subwatershed, lower Glen Rose deposits are absent and mostly Paleozoic deposits transition directly into Upper Glen Rose units rather than lower Glen Rose or Hensel Sand.



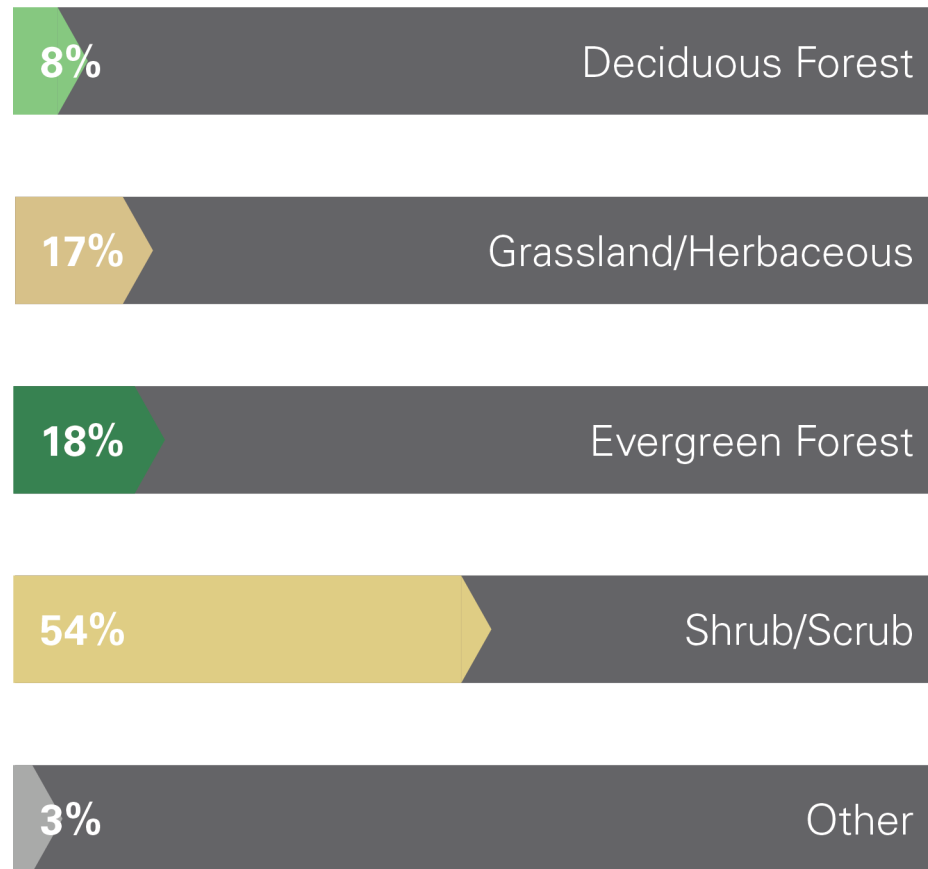
Towhead Creek Geology Breakdown



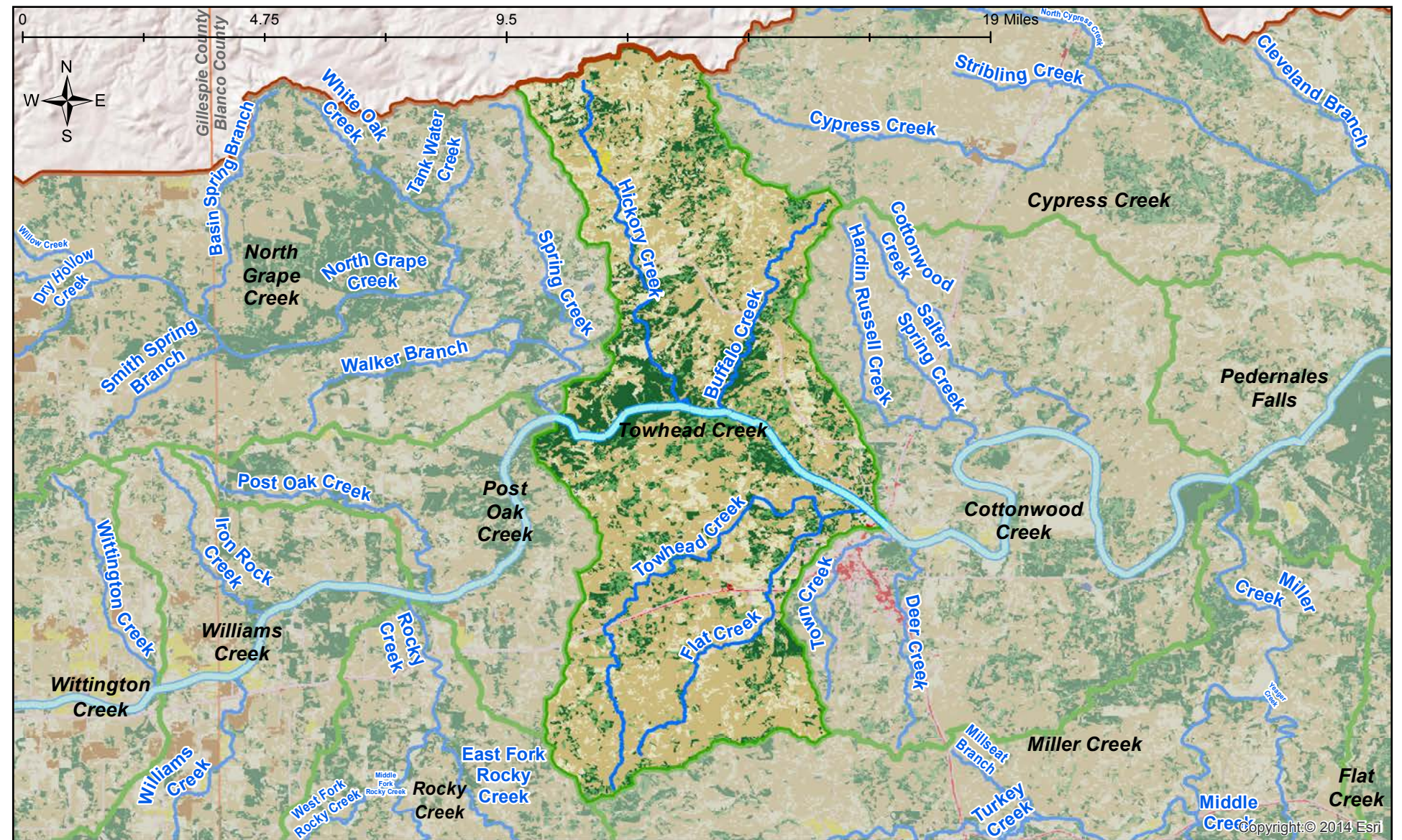
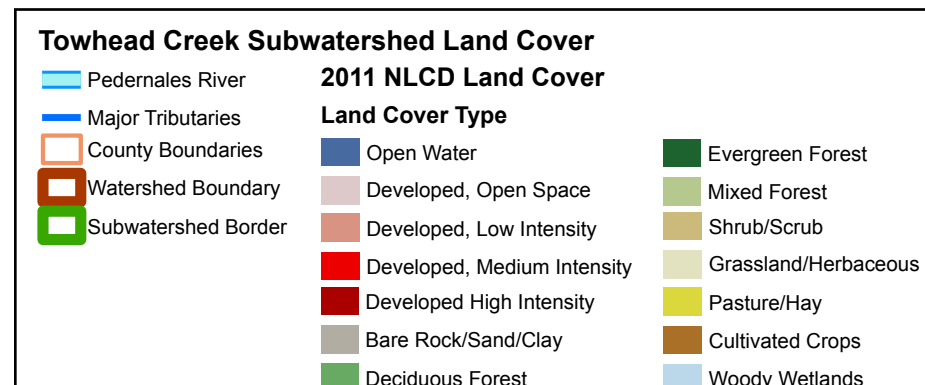


# Land Cover

## Towhead Creek Land Cover



Agricultural activities are mostly absent within this subwatershed, although a minimal amount of development can be found along USH 290 and at Johnson City's outskirts. Most of the subwatershed is comprised of scrubland, then stands of forest and grassland.



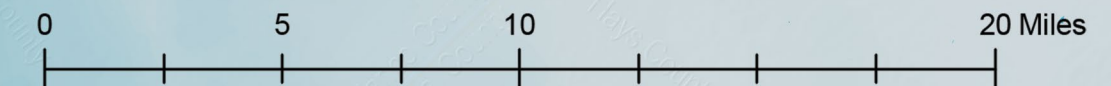


# WHITE OAK CREEK



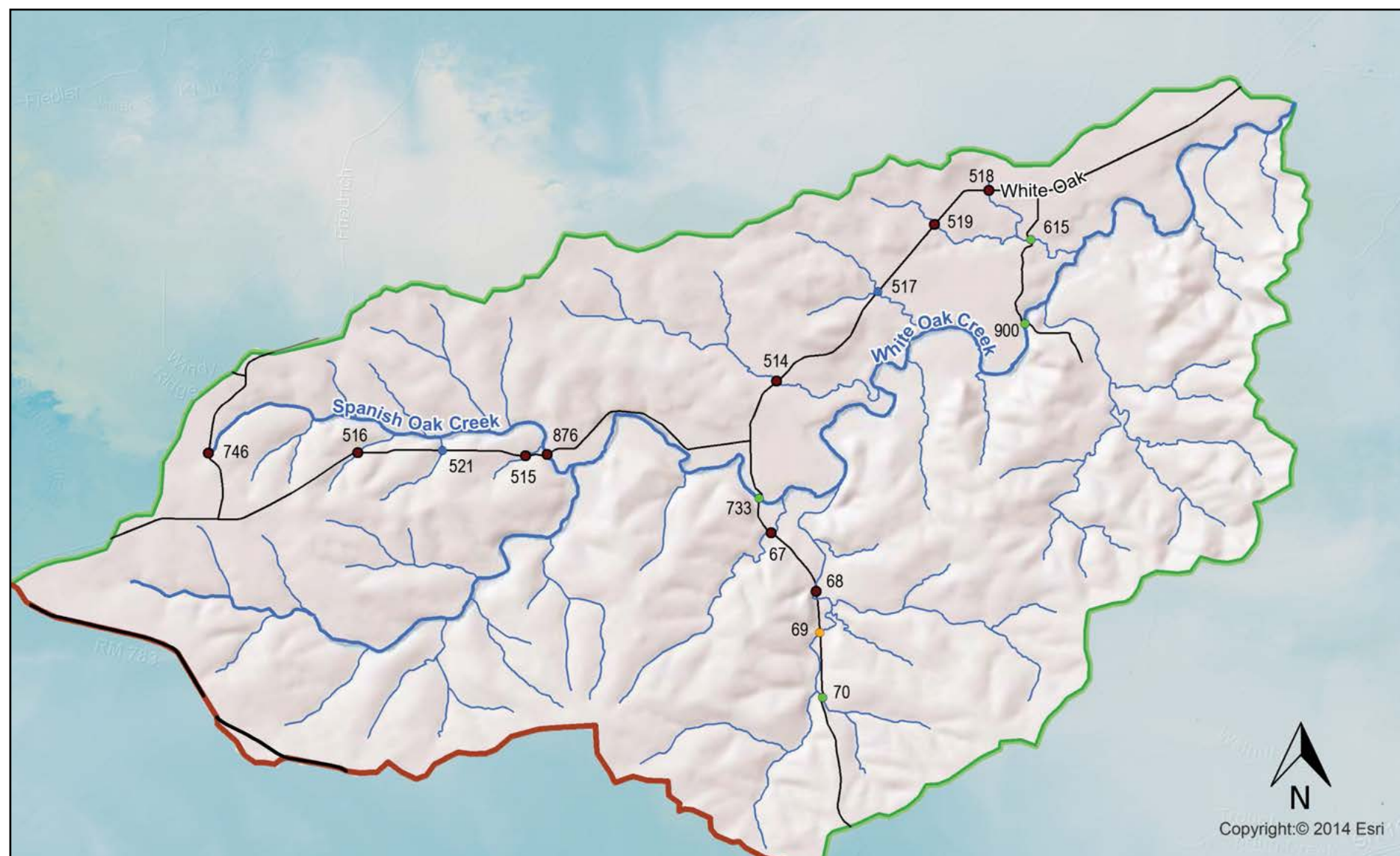
## Pedernales Subwatershed Locations

- Pedernales River
- Major Tributaries
- Watershed Boundary
- Subwatershed Border
- County Boundaries

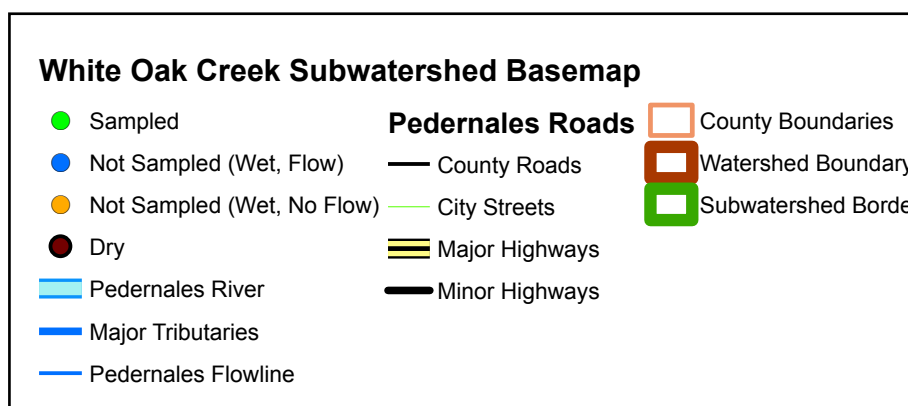


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White Oak Creek Subwatershed, Site 900



**T**HE WHITE OAK CREEK SUBWATERSHED is located at the southwest edge of the Pedernales River watershed to the west of SH 16 and south of FM 2093. The primary human landmark within the watershed is White Oak Road, which eventually connects to FM 2093. Portions of RM 783, which runs through the town of Harper, graze the southwestern end of the subwatershed.

The Meadows Center staff observed flowing water in White Oak Creek and three small flowlines on Zenner Ahrens, White Oak and Otto Staudl Roads, and in one small flowline contributing to Spanish Oak Creek on White Oak Road. However, no water was observed at the headwaters of Spanish Oak Creek or near its confluence with White Oak Creek.

## ABOUT WHITE OAK CREEK SUBWATERSHED

*Size:* 27.72 square miles

*Counties:* Gillespie

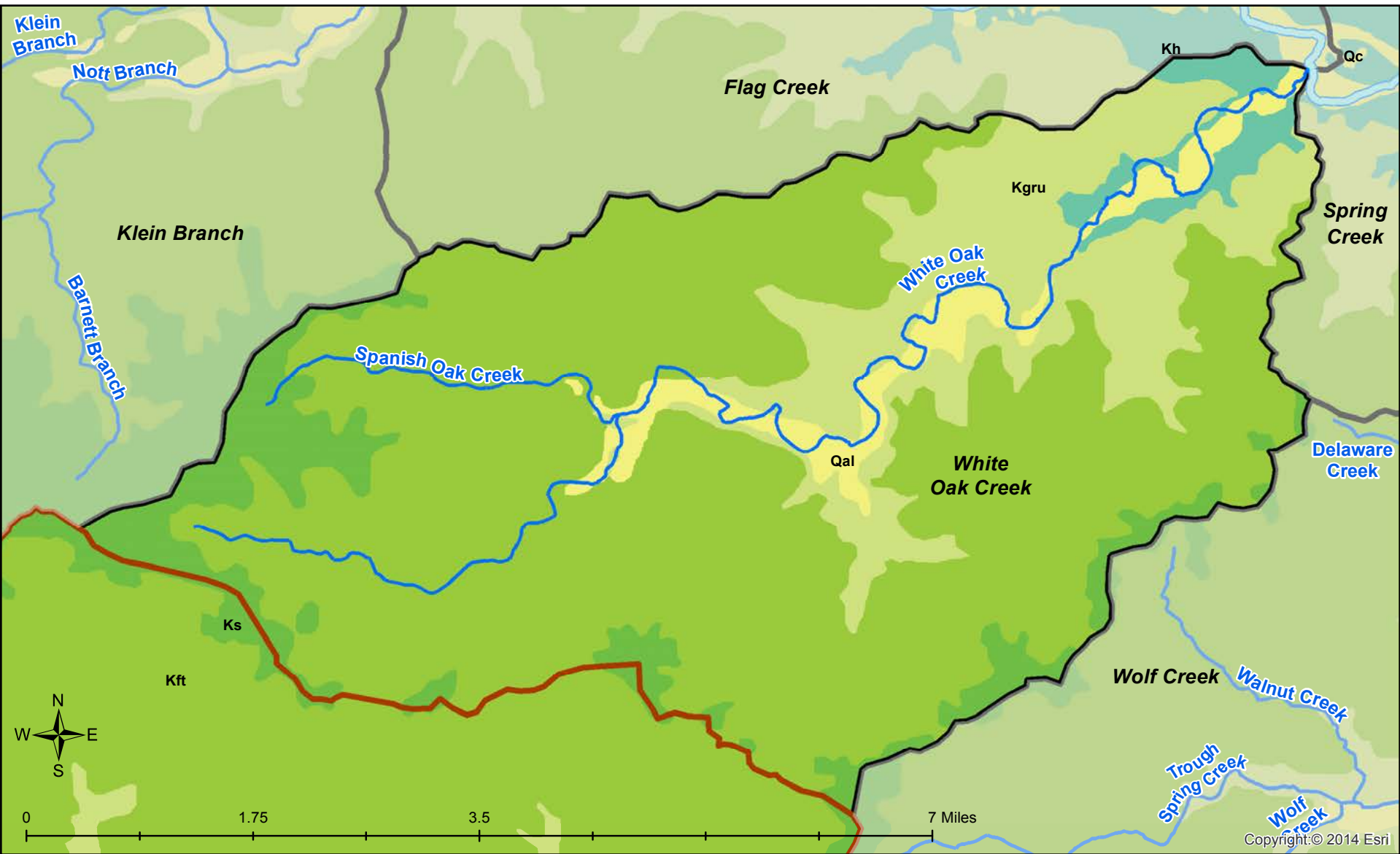
*Cities:* Harper (pop. 1,006)

*Tributaries:* Spanish Oak Creek

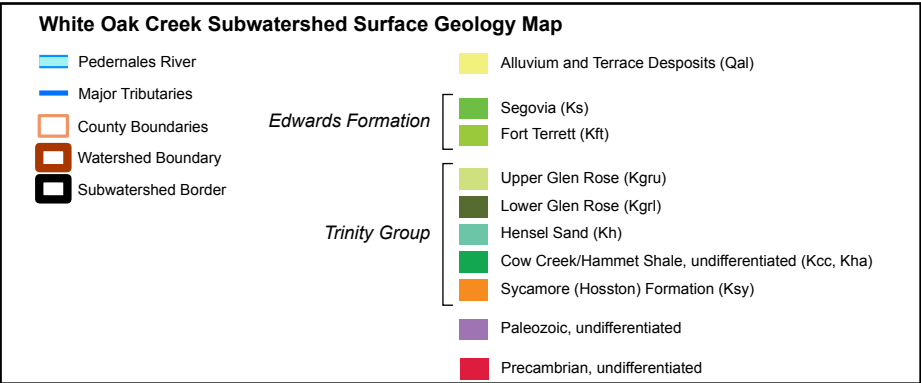


# Surface Geology

Rock types within the subwatershed range from Edwards formations in its south, west, and eastern portions to upper Glen Rose formations in the central and northeastern areas to small outcroppings of Hensell sand formations in the extreme northeast close to the confluence of White Oak Creek and the Pedernales. Most of the agricultural activity within the subwatershed takes place near or on top of these Hensell formations.

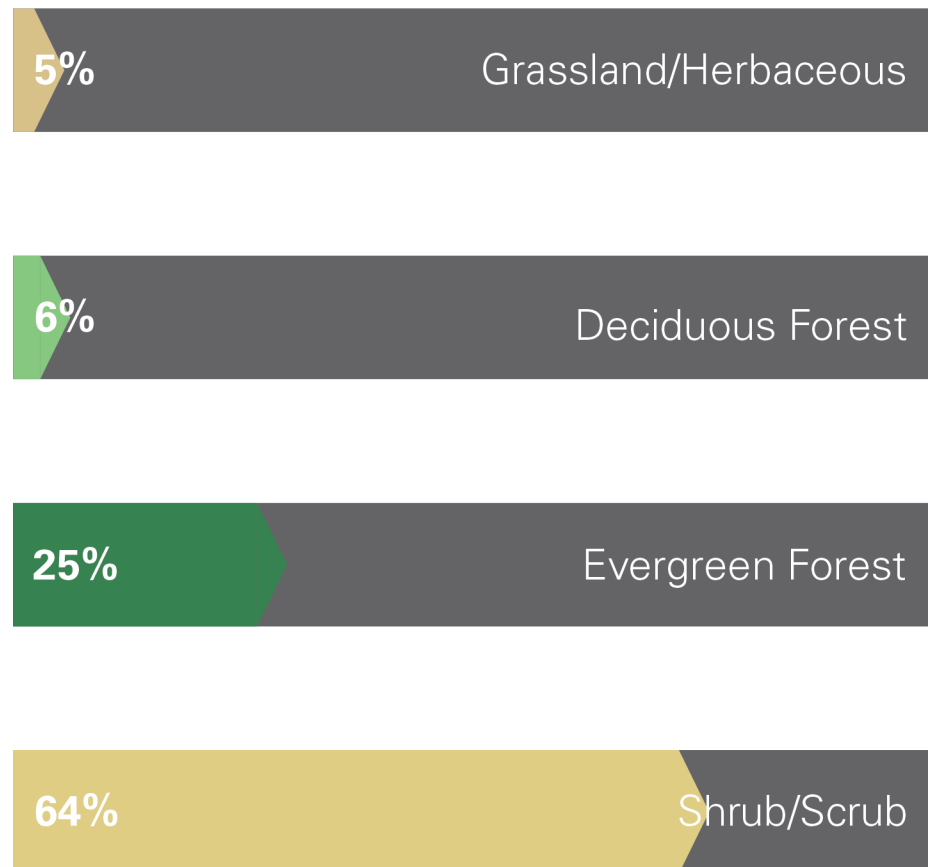


White Oak Creek Geology Breakdown

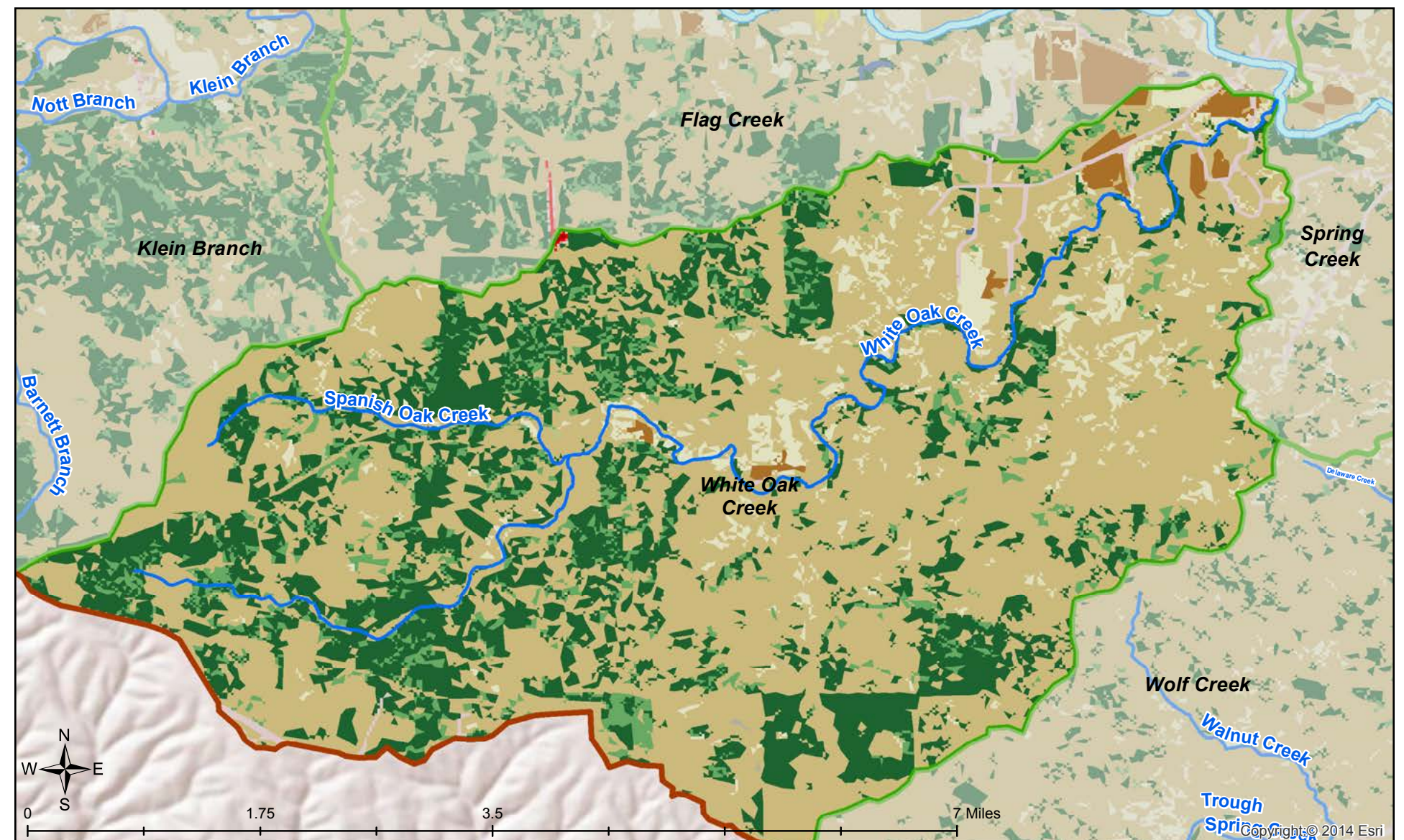




## White Oak Creek Land Cover

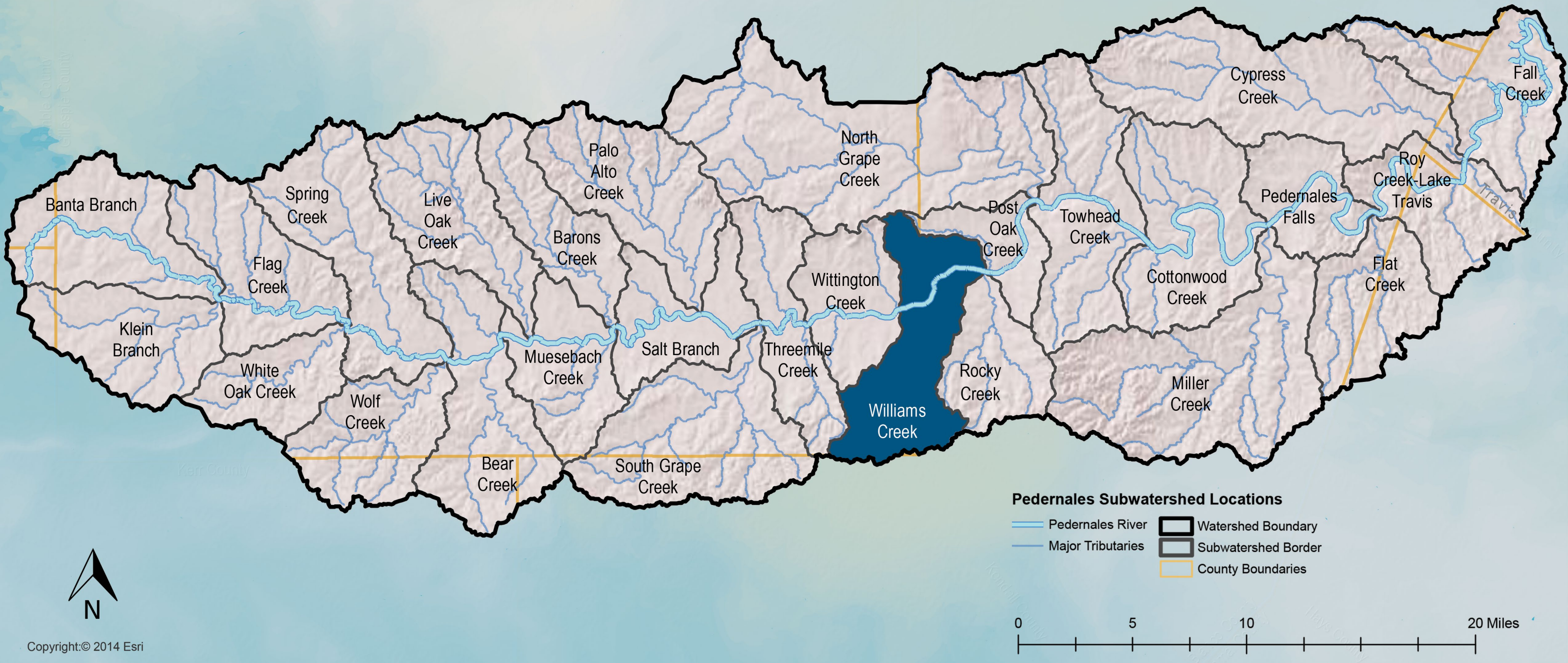


Land cover within the White Oak Creek subwatershed is primarily shrub/scrubland, with significant stands of forest interspersed throughout its western, southern, and southeastern areas and some grassland/herbaceous areas concentrated in its central and northeastern areas. The only significant human activity within the subwatershed is a small concentration of agricultural croplands on its extreme northeastern end adjacent to the Pedernales/White Oak Creek confluence.





# WILLIAMS CREEK

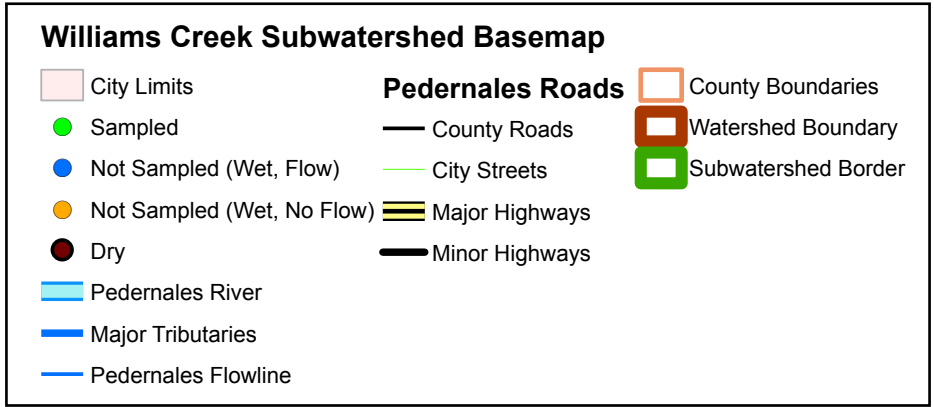


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Williams Creek Subwatershed at the Pedernales River, Site 888



**T**HE WILLIAMS CREEK SUBWATERSHED is split between Gillespie and Blanco Counties. It also contains the unincorporated town of Hye. USH 290 runs through the central portion of the subwatershed, as does RM 2721 at its northwestern edge and RM 1623 through its southern area. Iron Rock Creek runs from its headwaters in the northwest down to the Pedernales in the central portion of the subwatershed, and Williams Creek (along with its West, Middle and East Forks) runs from the south up to the Pedernales River.

The Pedernales was not accessible by public road within this subwatershed, but flowing water was observed by The Meadows Center staff on Williams Creek at site 762, as well as its West Fork at site 796. The Middle and East Forks were not accessible by public road, but flowing water was observed at sites 582 and 580 along flowlines contributing to the East Fork, suggesting possible spring activity close by.

**ABOUT WILLIAMS CREEK SUBWATERSHED**

*Size:* 46.56 square miles

*Counties:* Gillespie, Blanco

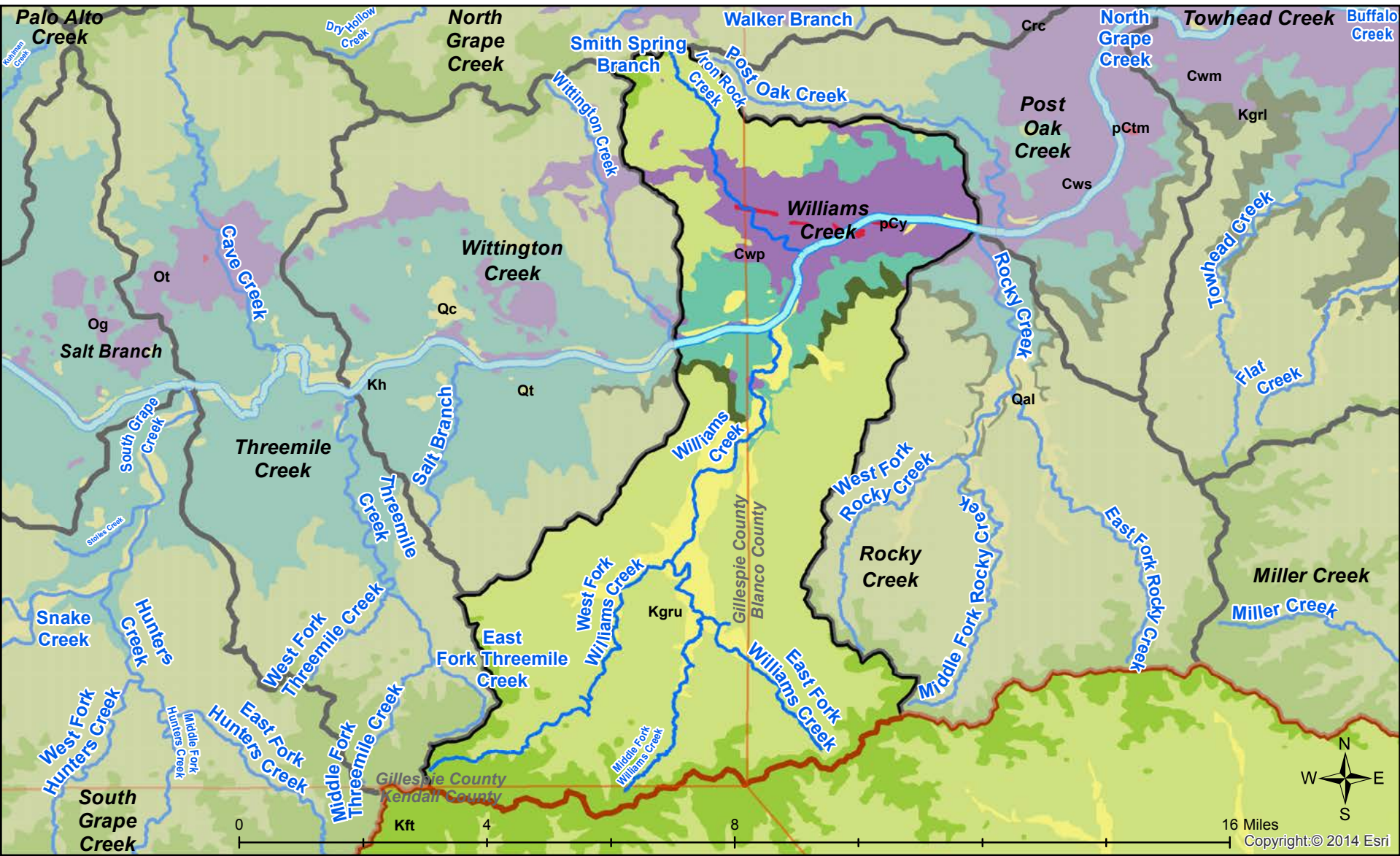
*Cities:* Hye

*Tributaries:* Williams Creek, and West Fork, Middle Fork, and East Fork

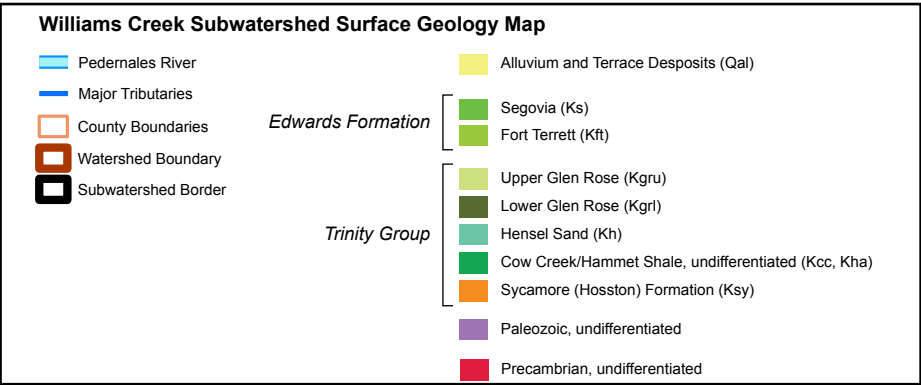


# Surface Geology

Surface rock types along the Pedernales include Paleozoic units with sparse pockets of Precambrian units as the river makes a major bend to the north and east, and Hensel Sand (Kh) deposits on the western edge of the subwatershed. As one moves away from the Pedernales, the predominant rock type transitions outward to Upper Glen Rose (Kg<sub>ru</sub>), with small amounts of Fort Terrett (K<sub>ft</sub>) deposits along the extreme edges of the subwatershed.



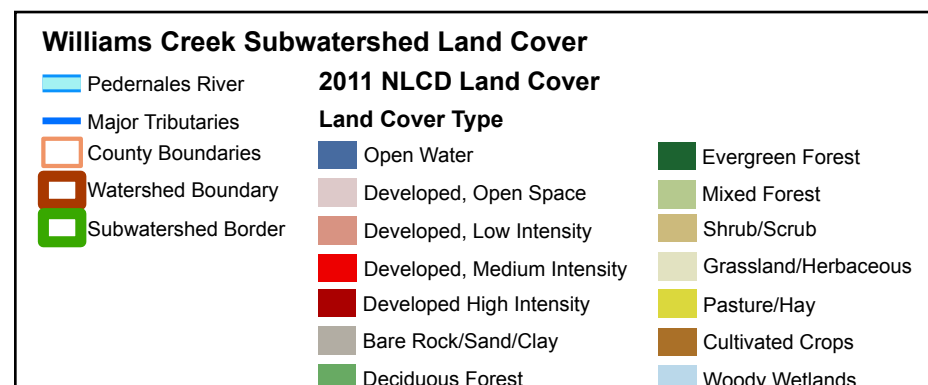
Williams Creek Geology Breakdown



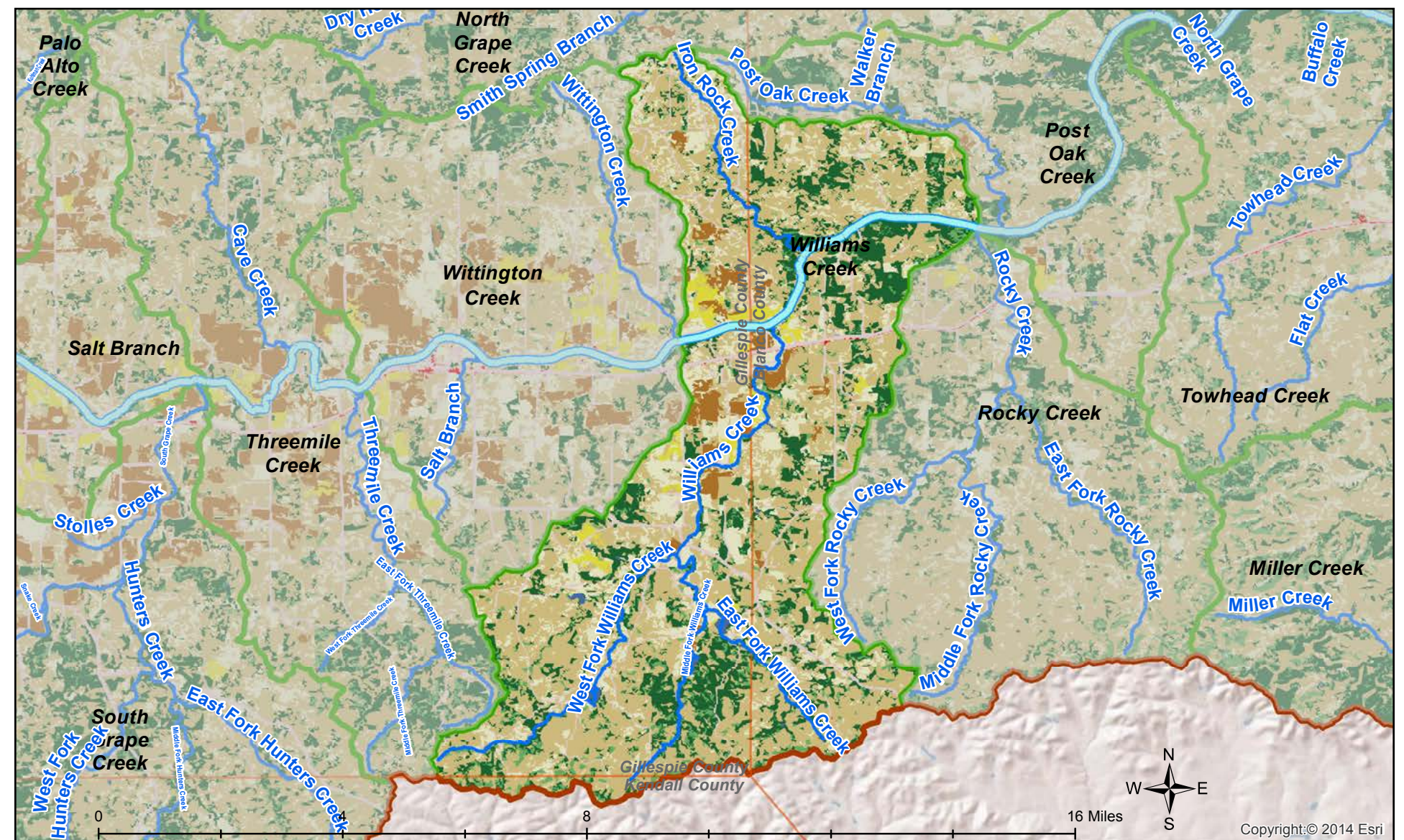


# Land Cover

## Williams Creek Land Cover

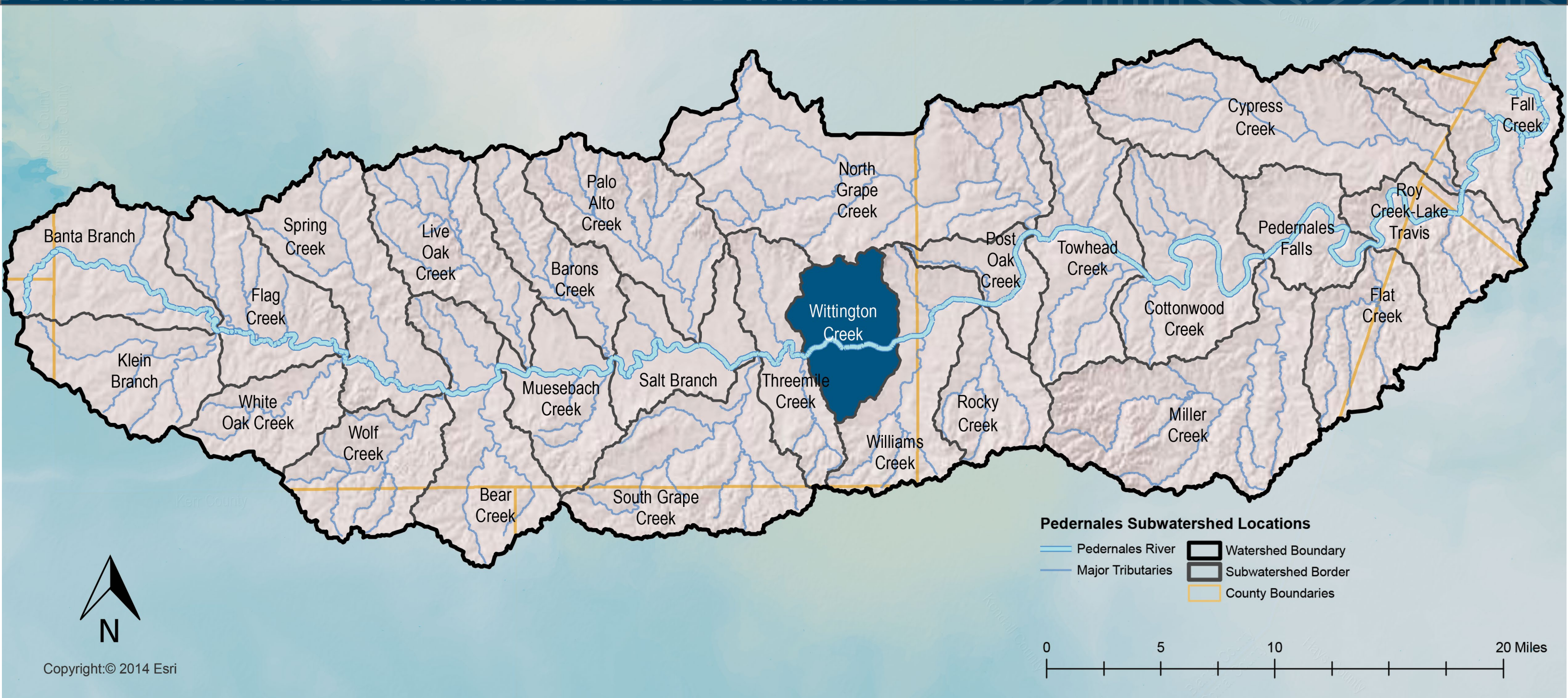


Agricultural activities are mostly limited to the Pedernales River corridor on lands roughly analogous to deposits of Hensel Sand. The rest of the subwatershed is a mix of scrubland, grasslands, and stands of forest in close proximity to river and stream corridors.





# WITTINGTON CREEK

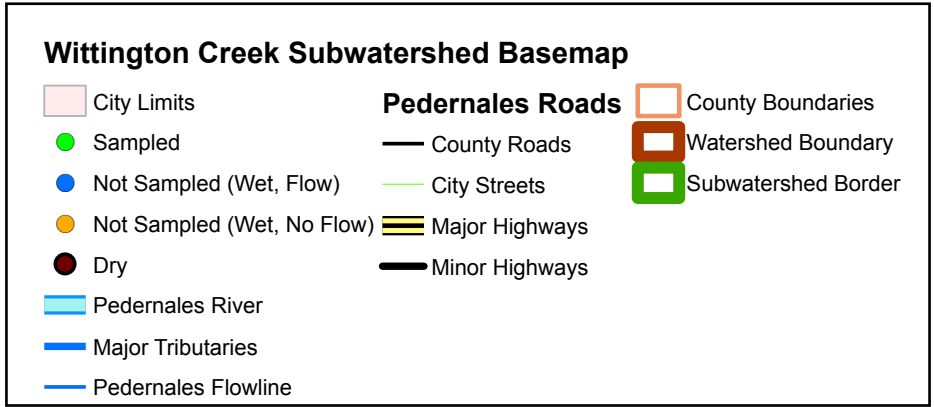


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Williams Creek Subwatershed at the Pedernales River, Site 776



**T**HE WITTINGTON CREEK SUBWATERSHED is located in Gillespie County. It contains the Lyndon B. Johnson State Park and National Historical Site. USH 290 runs next to the Pedernales in the south central portion of the subwatershed, and Ranch Road 1 runs directly adjacent to the river. RM 1623 splits off from USH 290 in Stonewall and runs north to south, and RM 1631 runs west to east as it meets RM 1623 in the northern portion of the subwatershed. Salt Branch runs south to north into the Pedernales, and Wittington Creek runs northwest to southeast into the Pedernales on the eastern edge of the subwatershed.

The Meadows Center staff observed flowing water along the Pedernales at multiple locations (Sites 257, 258, 298, 287, and 776), as well as in a flowline at site 285, but the river was dry at site 544 further downstream. Wittington Creek was mostly dry with one exception: Site 776 near its confluence with the Pedernales. Salt Branch was dry at both upstream and downstream locations.

**ABOUT WITTINGTON CREEK SUBWATERSHED**

Size: 31.40 square miles

Counties: Gillespie County

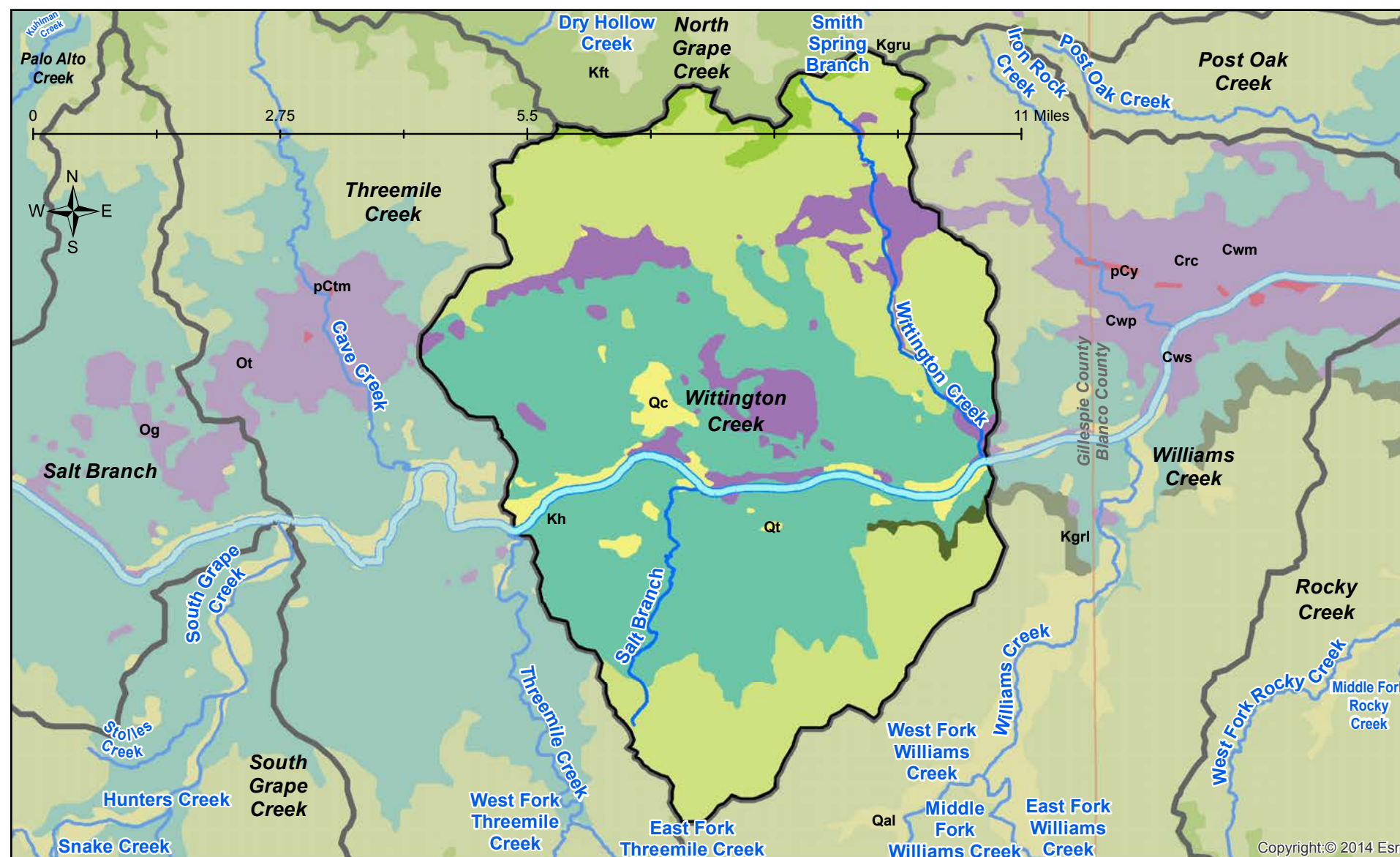
Cities: Stonewall (pop. 469)

Tributaries:

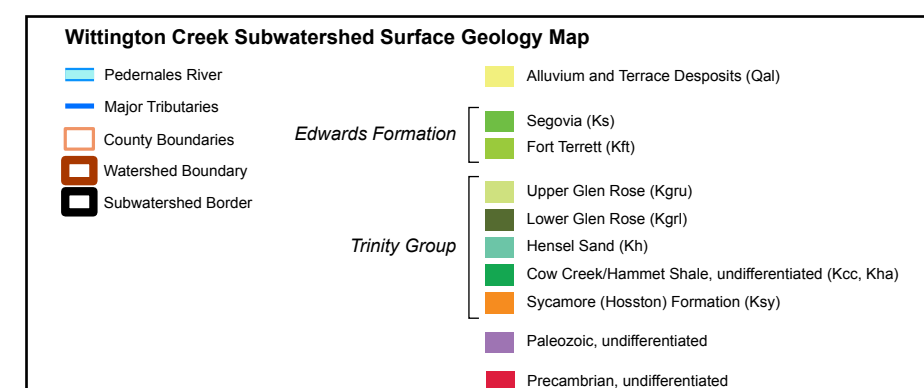


# Surface Geology

Surface rock types along the Pedernales include primarily Hensel Sand (Kh) deposits with pockets of Paleozoic outcrops. As one moves away from the Pedernales, the predominant rock type transitions outward to Upper Glen Rose (Kgru), with small amounts of Fort Terrett (Kft) deposits along the extreme northern edge of the subwatershed.

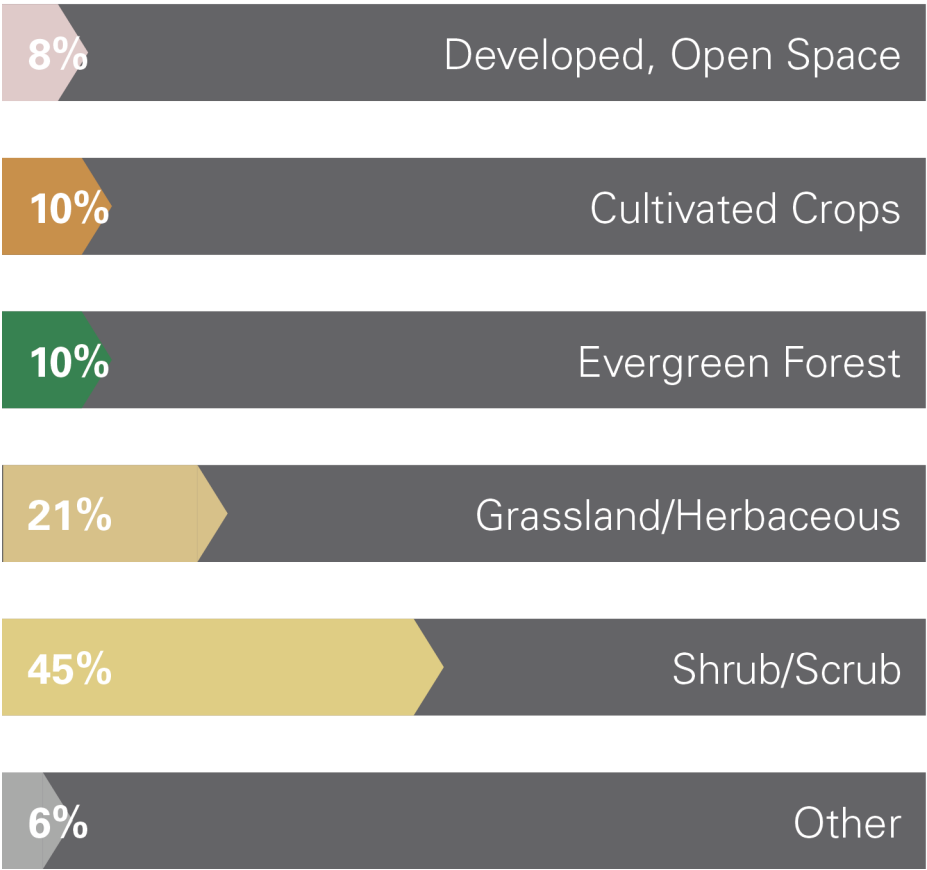


## Wittington Creek Geology Breakdown

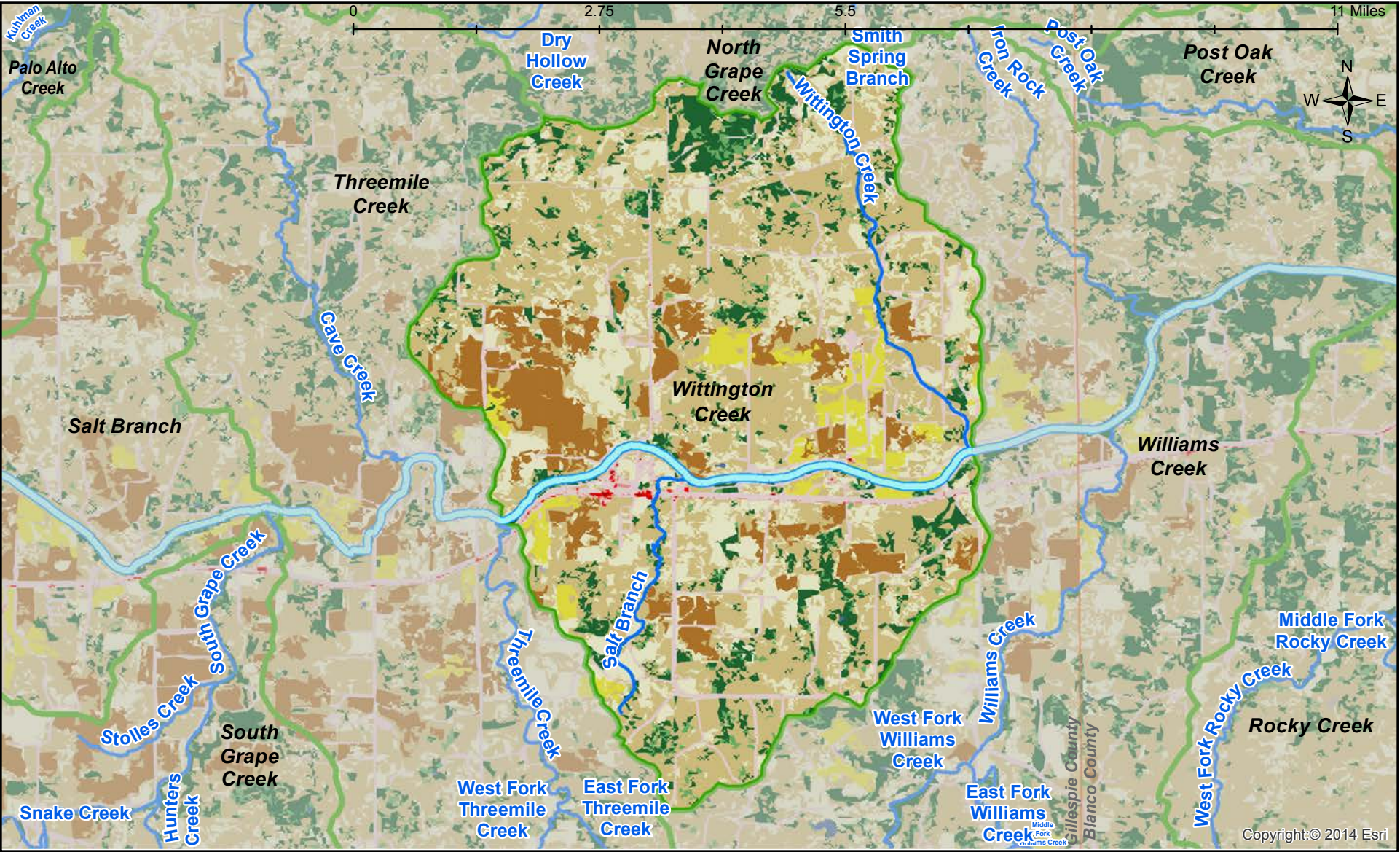
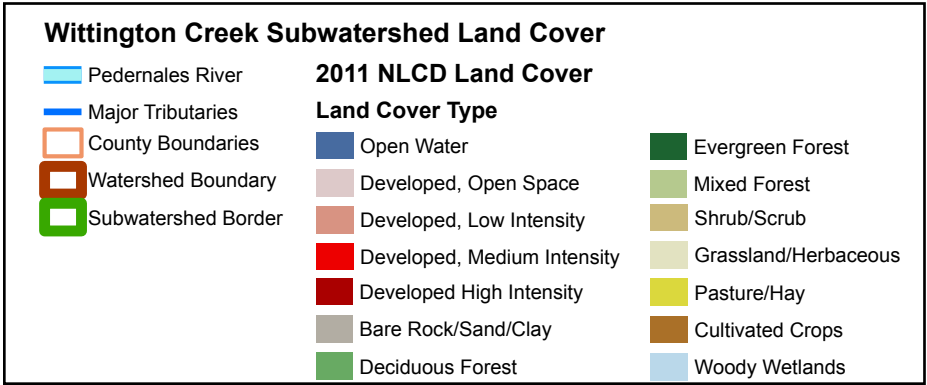




Wittington Creek Land Cover



Agricultural activities are mostly limited to the Pedernales River corridor on lands roughly analogous to deposits of Hensel Sand. A minor amount of open space development is also present in and around Stonewall. The rest of the subwatershed is a mix of scrubland and grasslands, with a small amount of forest located north of RM 2721.







# WOLF CREEK

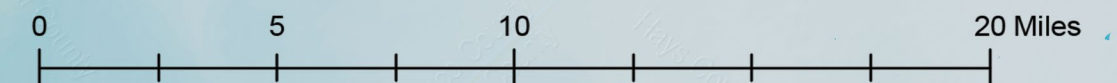
Subwatershed



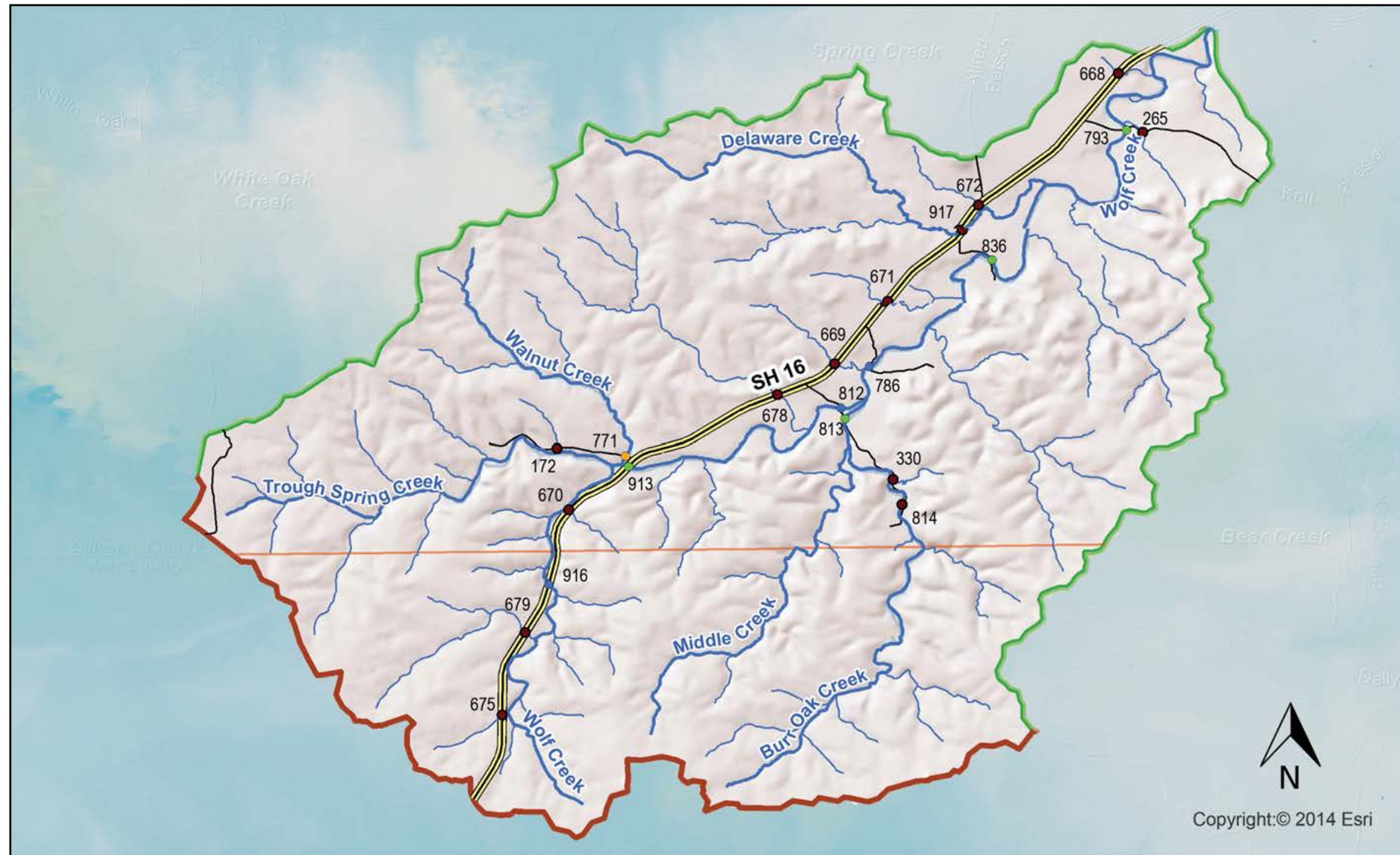
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## Pedernales Subwatershed Locations

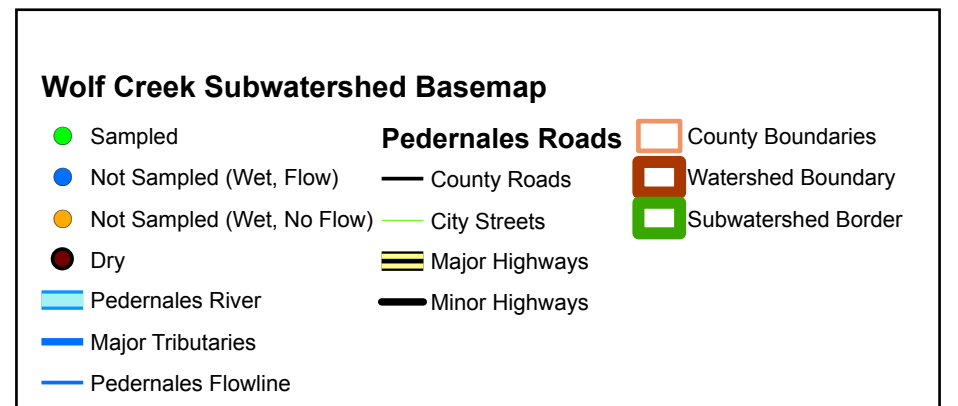
- Pedernales River
- Watershed Boundary
- Major Tributaries
- Subwatershed Border
- County Boundaries







Wolf Creek Subwatershed, Site 836



**T**HE WOLF CREEK SUBWATERSHED is located in the southwest portion of the Pedernales River watershed, and extends from the edge of the watershed to the confluence of Bear Creek and the Pedernales.

During the project's sampling regime, Wolf Creek, Middle Creek, and Delaware Creek had observed flows by The Meadows Center personnel and volunteers. Trough Spring Creek and Burr Oak Creek were all observed as dry, and Walnut Creek has a stagnant flow close to its confluence with Wolf Creek.

## ABOUT WOLF CREEK SUBWATERSHED

*Size:*

*Counties:* Gillespie County

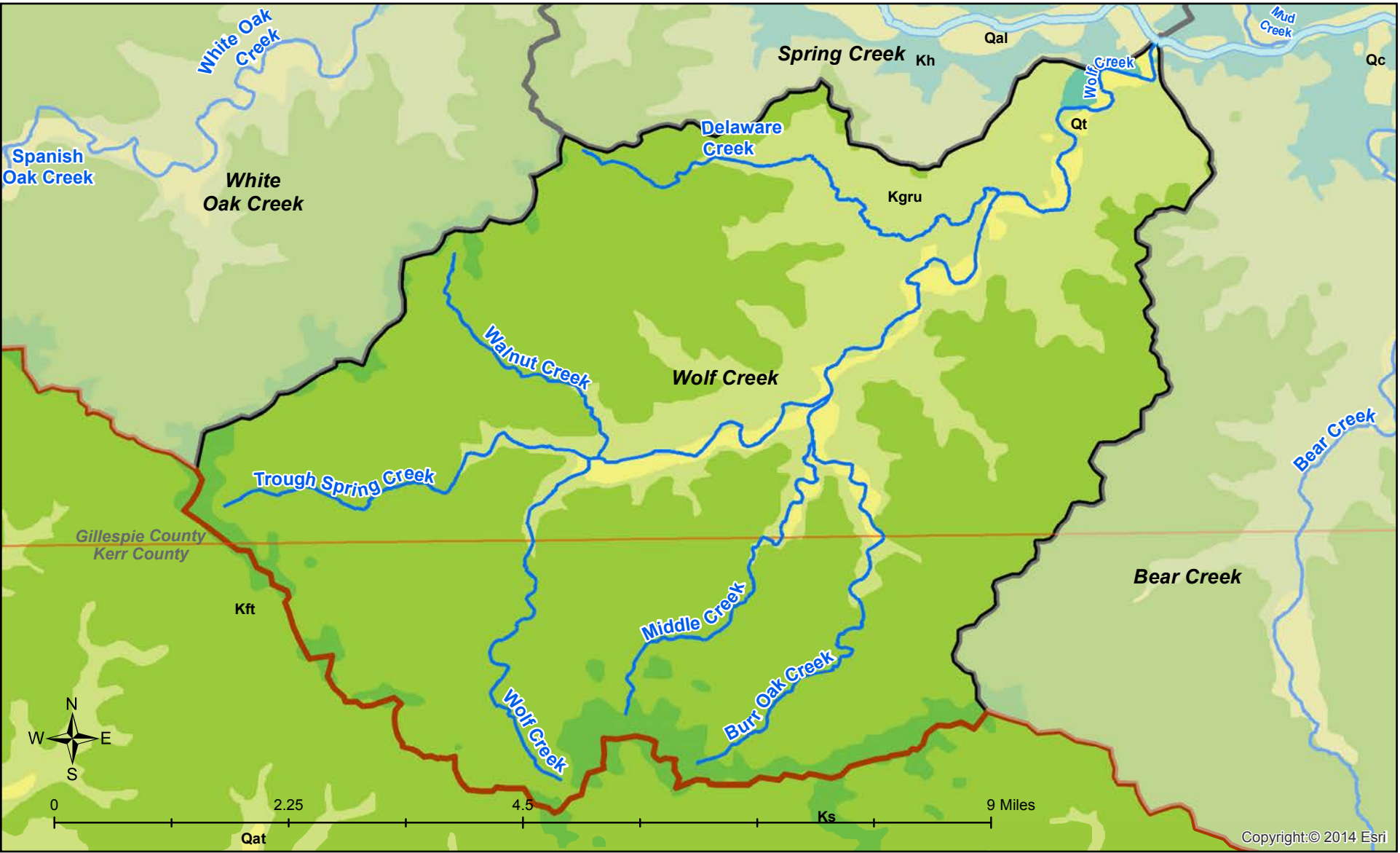
*Cities:*

*Tributaries:* Delaware Creek, Walnut Creek, Middle Creek, Burr Oak Creek and Trough Springs Creek

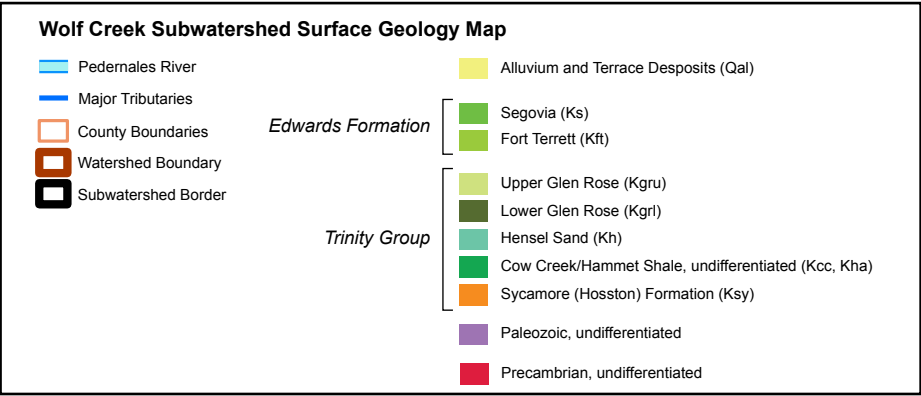


# Surface Geology

The major human landmark within this watershed is State Highway 16, a major road to and from Fredericksburg. Small neighborhoods including The Oaks directly north of SH16 and The Wilderness neighborhood on the extreme southern end of the subwatershed. The primary surface rock types range from Cretaceous-era Edwards formations in the south, east, and western portions of the subwatershed transitioning to Glen Rose formations as Wolf Creek decreases in elevation. A small amount of Hensell sand formations can be observed close to Wolf Creek’s confluence with the Pedernales River.

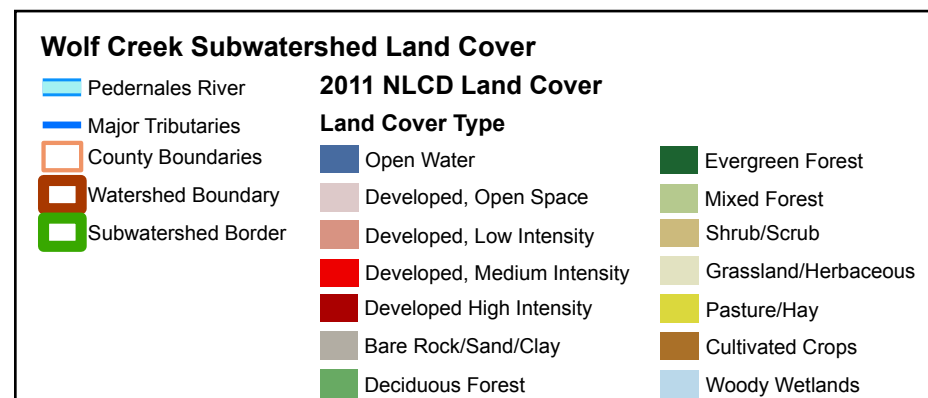
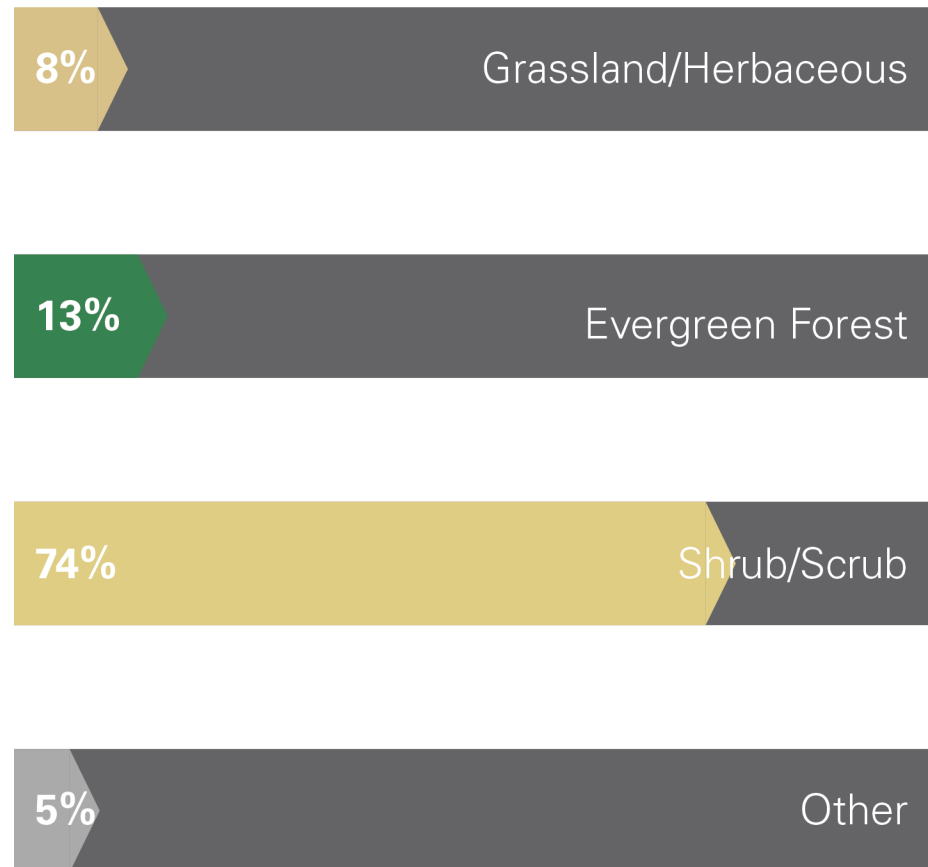


## Wolf Creek Geology Breakdown





## Wolf Creek Land Cover



Land cover within the subwatershed is dominated by scrublands with pockets of forests and grasslands interspersed throughout. Wolf Creek is the primary tributary that feeds into the Pedernales, with smaller minor tributaries including Delaware Creek in the northern part of the subwatershed and Walnut, Middle, Burr Oak, and Trough Spring Creeks also feeding into Wolf Creek in the central portion of the subwatershed from their respective headwaters to the south.

Although forested areas were more common along river corridors, there appeared to be few patterns between observed land cover and observed flow. However, the headwaters of most tributaries appeared to be within close proximity of transitional zones between Segovia rock formations (Ks) and Fort Terrett formations (Kft).





# PEDERNALES

## WATERSHED ATLAS



THE MEADOWS CENTER  
FOR WATER AND THE ENVIRONMENT

TEXAS STATE UNIVERSITY

201 San Marcos Springs Drive  
San Marcos, TX 78666  
[Pedernales.MeadowsWater.org](http://Pedernales.MeadowsWater.org)