

# WATCHING OVER TEXAS FROM SPACE

An Earth Observations education resource for grades 4 -12 in support of TEKS covering  
Earth Science and Environmental Science Standards

Developed by TexasView with support from Grant Number G14AP00002 from the  
Department of the Interior,  
United States Geological Survey to AmericaView

## Section 4. Texas as Art

Texas as Art is an exhibit modeled after the series of Earth as Art collections first published in 2002. Earth as Art 6 was released in 2019. TexasView chose to develop its exhibit as an educational Science, Technology, Engineering, ART, and Math(STEAM) outreach event. The first showing took place at the Sibley Nature Center in Midland, Texas in 2021. The second exhibit was at the Museum of the Big Bend at Sul Ross State University in Alpine, Texas. The art has been exhibited at several community-based art shows including the Celebration of the Arts and SeptemberFest in Midland, Texas, and in two juried art shows including the Midwestern State University's "Restore our Earth – Earth Day 2021" exhibit and at the Arts Council of Midland's "Open Show", where one of its pieces won second prize.

The art exhibit is designed to connect viewers with Texas landscapes, ecoregions, and state-managed lands – most of the images have an "anchor" that is a Texas State Park or other holding managed by the Texas Parks and Wildlife Department (TPWD).

For the Museum of the Big Bend exhibit a virtual version of the show has been created (4.1). It explains the ecoregions/landforms focus and provided QR codes that connect to TPWD resources that include videos, maps, imagery, and photographs. There are presenter notes viewable by selecting the notes icon in the upper right of each page.

A new "Which is Which" activity (Section 4.2) is included here, in the form of a slide show using the artwork imagery. Other educational resource materials are under development and will be made available soon.



4.1 Texas as  
Art Virtual  
Exhibit





# Texas as Art 2022

Texas as Art is a travelling art exhibit designed to engage the public with Landsat satellite imagery showing Texas landscapes, ecoregions, geology, and natural resources, as works of art. Imagery from the Landsat satellites – observing our world for almost 50 years - is enabling protection and management of our natural resources and serves as the basis for this artwork.

Two themes connect the scenes chosen for the 2022 exhibit. The first is Texas' natural ecoregions; scenes also show the human footprint on our natural landscapes. The second theme connects us to our State Parks, Historic Areas, Natural Areas, and Wildlife Management Areas that are scientifically managed, conserved, and restored by the Texas Parks and Wildlife Department.

The 2022 exhibit focuses on West Texas, the Panhandle, and the Edwards Plateau; future exhibits will expand to cover the entire State of Texas and all of its beautiful landscapes.

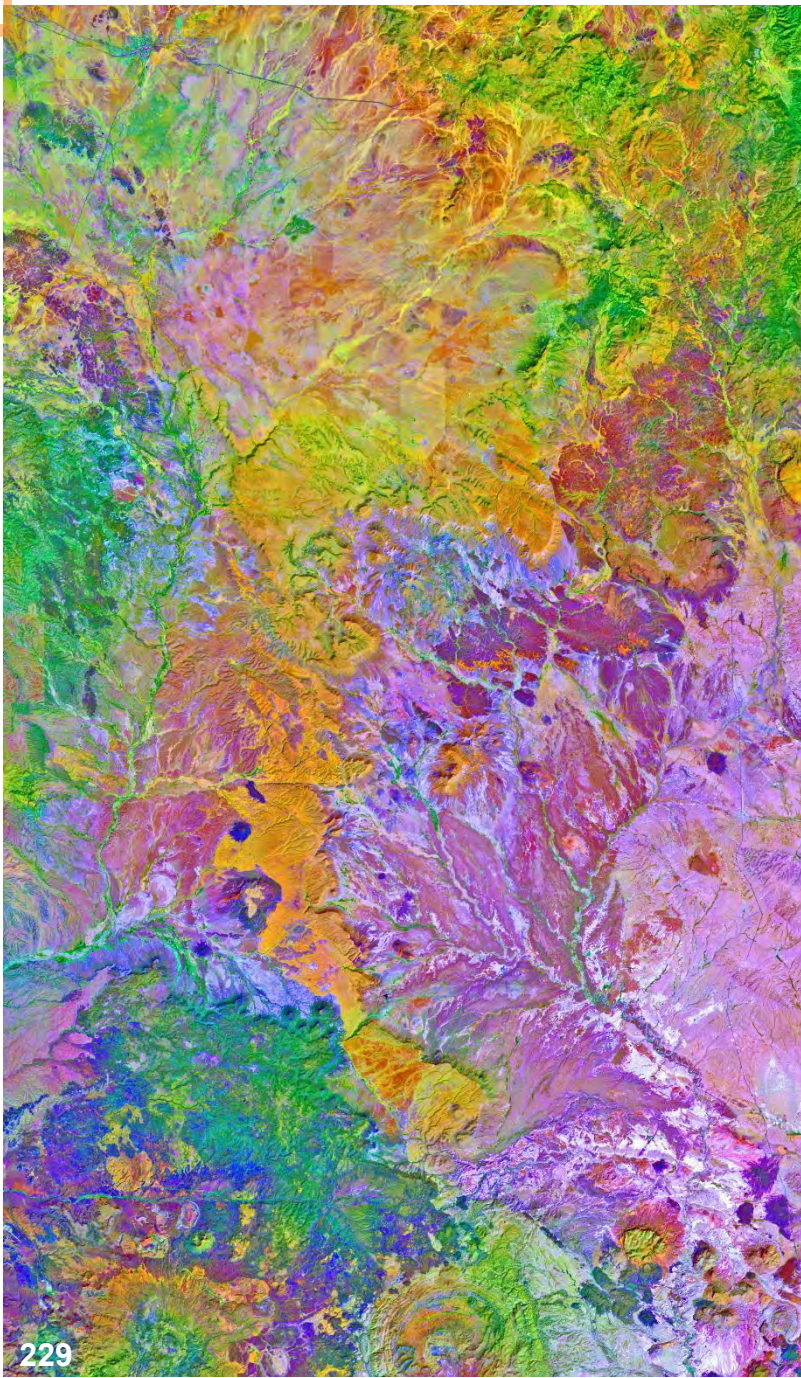
# Texas as Art 2022

Rebecca L. Dodge is an Emeritus Associate Professor of Geology and Environmental Science at Midwestern State University. She specializes in Earth Observations for natural resource management, and in K-12 Earth Science teacher training. Art is a new tool for educational outreach to teachers, students, and the public.

Liz Bartlett Culp spent 30 years as a petroleum geologist, with painting her creative outlet. She now paints full time, both in the studio and *en plein air*. Her landscapes of choice include the Big Bend area and the Davis Mountains. Her artwork includes botanicals, landscapes, and skyscapes.

Teresa Howard has worked at the University of Texas Center for Space Research for more than two decades. She has provided training for professionals and for undergraduate and K-12 educators and students, enabling access to satellite imagery for mapping, disaster response, and geoscience education'









- 1. Piney Woods
- 2. Gulf Prairies and Marshes
- 3. Post Oak Savannah
- 4. Blackland Prairie
- 5. Cross Timbers and Prairie
- 6. South Texas Plains
- 7. Edwards Plateau
- 8. Rolling Plains
- 9. High Plains
- 10. Trans-Pecos

Source: Gould, F.W., Hoffman, G.O., and Rechenhain, C.A. 1960. Vegetational areas of Texas, Texas A&M University. Texas Agricultural Experiment Station, Leaflet No. 492.

# Texas as Art 2022

## Ecoregions of Texas Panhandle and West Texas

Developed by TexasView with support from Grant Number G14AP00002 from the Department of the Interior, United States Geological Survey to AmericaView

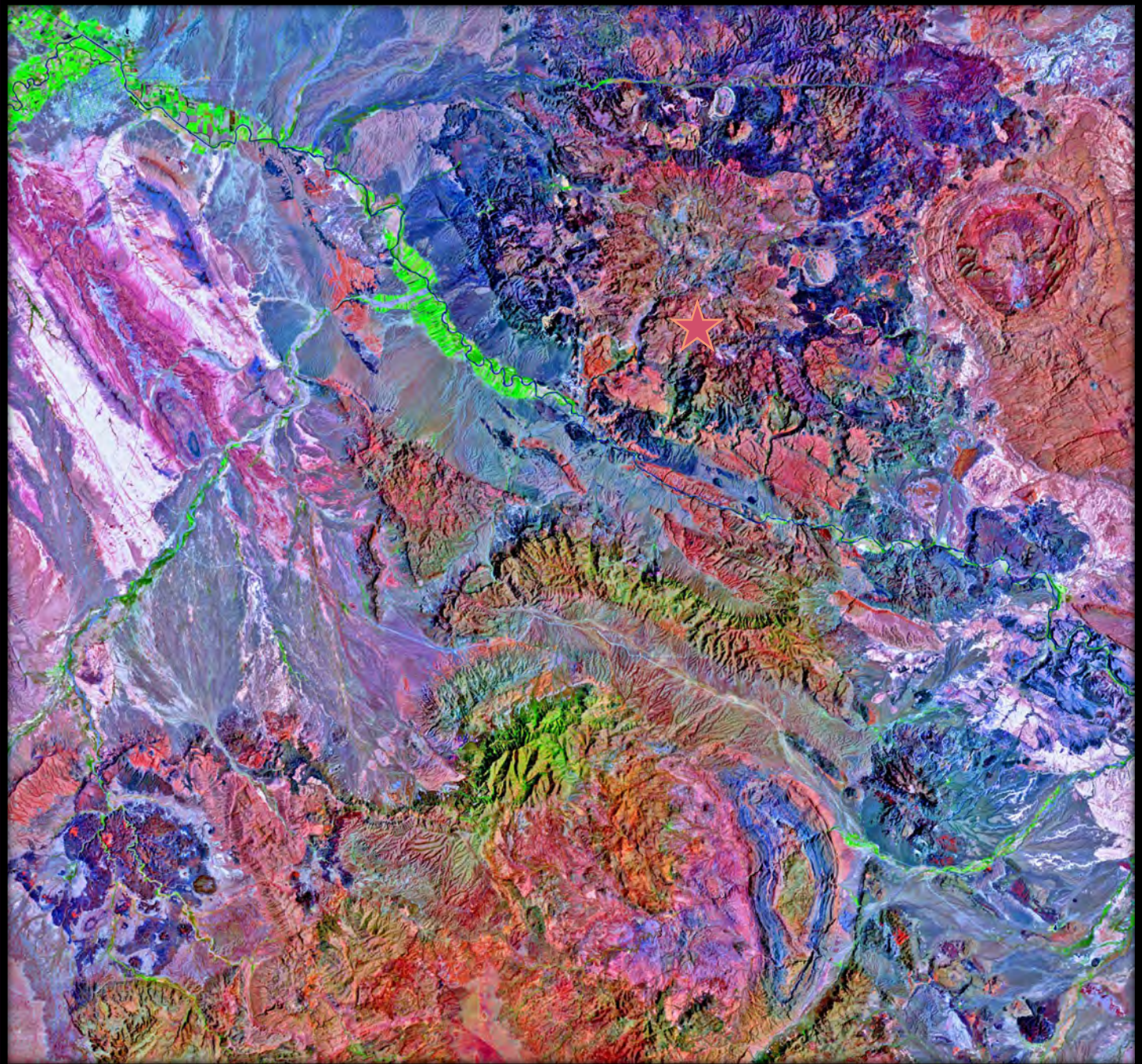




# Trans-Pecos Ecoregion

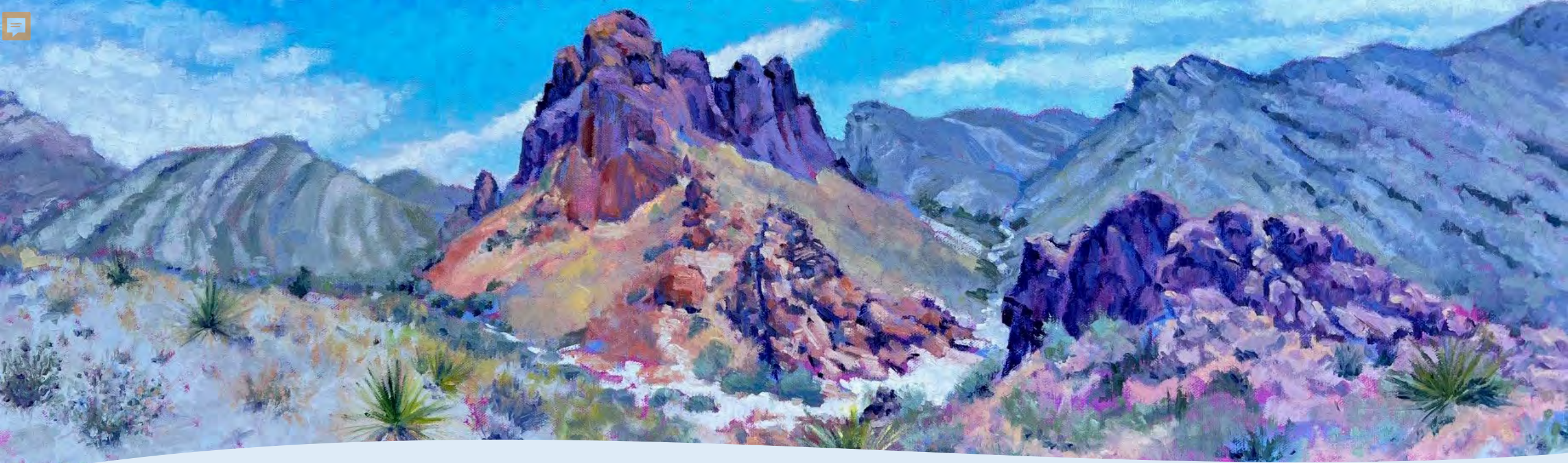
- Mountains, Plateaus, broad valleys
- Diverse geologic bedrock from sedimentary to volcanic
- Diverse soils vary by bedrock
- Subregions reflect diversity
- Rainfall below 12 inches avg.
  - Seasonal
    - July and August highest
    - Higher elevations receive more
- Vegetation Diverse
  - Creosote-tarbush desert scrub
  - Desert grassland
  - Yucca and juniper savannahs
  - Montane forests of pinon pine and oak
- Ranching predominates





**Big Bend Ranch State\* Park lies north of the Rio Grande, which crosses the scene diagonally from the upper left. The circular Solitario Dome, a large laccolith, dominates the scene on the upper right. Folded mountain ranges trend NW – SE south of the border. Vegetation, including linear agricultural fields, hugs the river in the Trans-Pecos ecoregion, which is also known as the Chihuahuan Desert.**





**Fellow geologist and artist Liz Culp generously agreed to include her artwork of the Trans-Pecos region in this exhibit. Here, her landscape of the Solitario Dome highlights the central peak and surrounding, sloping bedrock layers that define the circular geologic feature. Her artwork provides beautiful perspectives from the ground, to complement and inform the view of ecoregion topographic features and landcover from orbit.**





**ICONIC DESERT PLANTS SUCH AS YUCCA AND PRICKLY PEAR THRIVE IN THE ARID TRANS-PECOS ECOREGION.**





**OCATILLO**

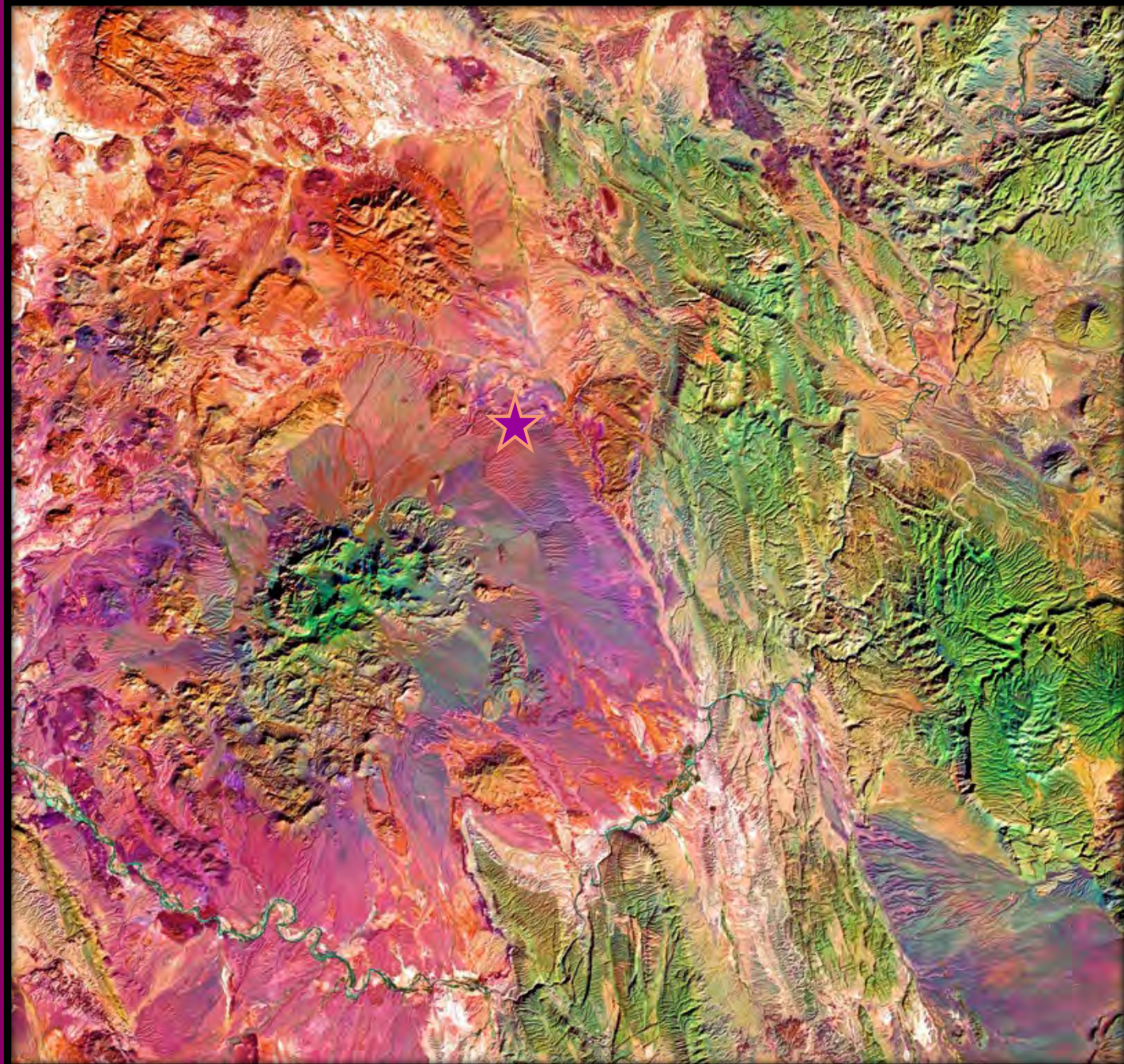


**CACTI**





**Big Bend National Park\* hosts the largest protected area of Trans-Pecos/Chihuahuan Desert Ecoregion in the United States. Of multiple deep canyons carved in limestone along the Rio Grande, Boquillas Canyon is the longest and deepest. Black Gap Wildlife Management Area hosts research and demonstration projects that inform natural resource management.**







**EMORY PEAK**



**MULE EARS AT SUNSET**

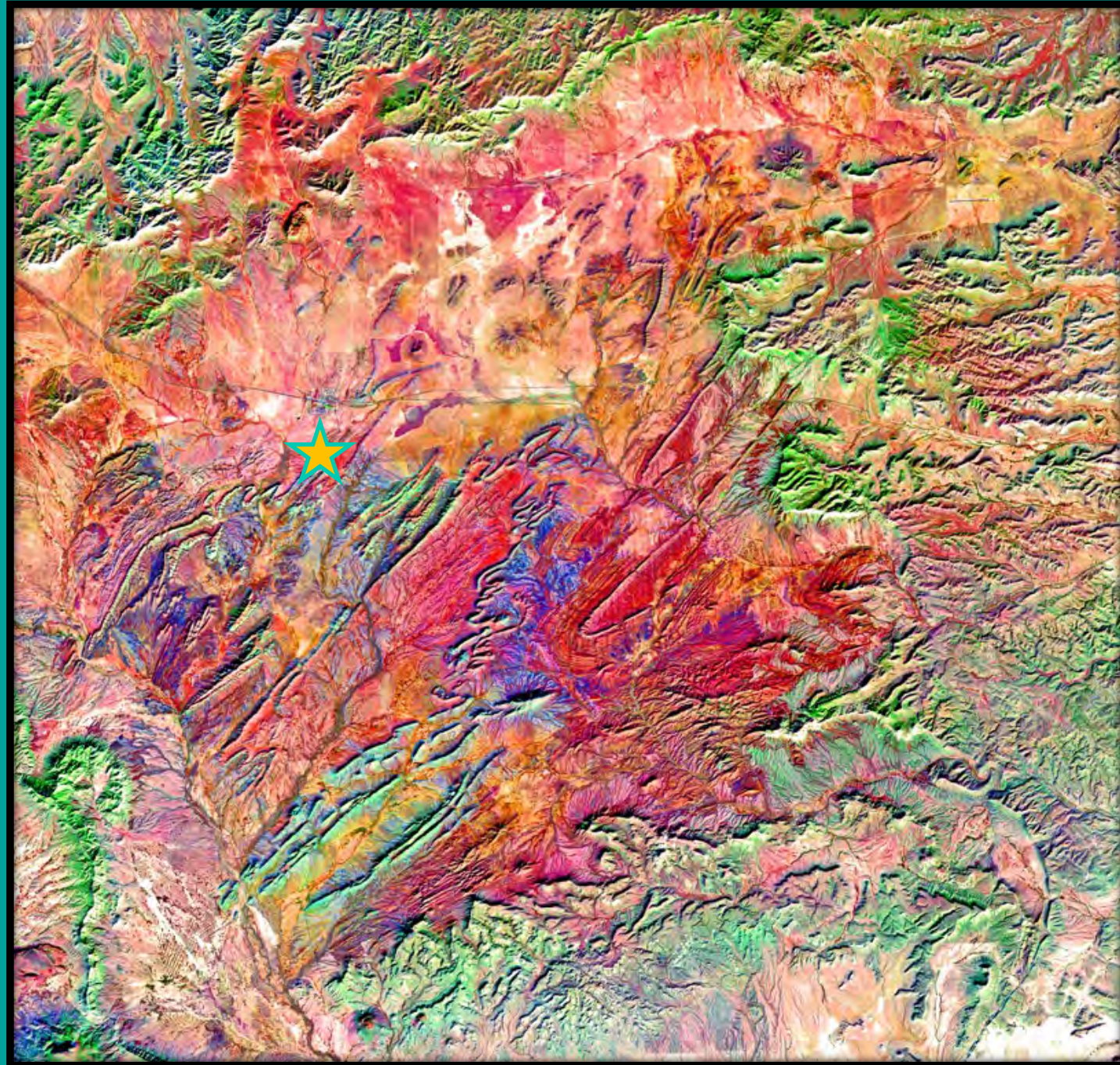


**THE WINDOW AT SUNSET**





Fort Pena Colorado Park\* was converted from the ruins of an old cavalry post garrisoned by Buffalo Soldiers of the Tenth Cavalry. Marathon, “where the Big Bend and the dark skies meet”, lies along highway 90 to the north and is home to the historic Gage Hotel. The Glass Mountains across the top of the scene are host to an exposure of largest fossil reef on the planet – the Permian Reef.





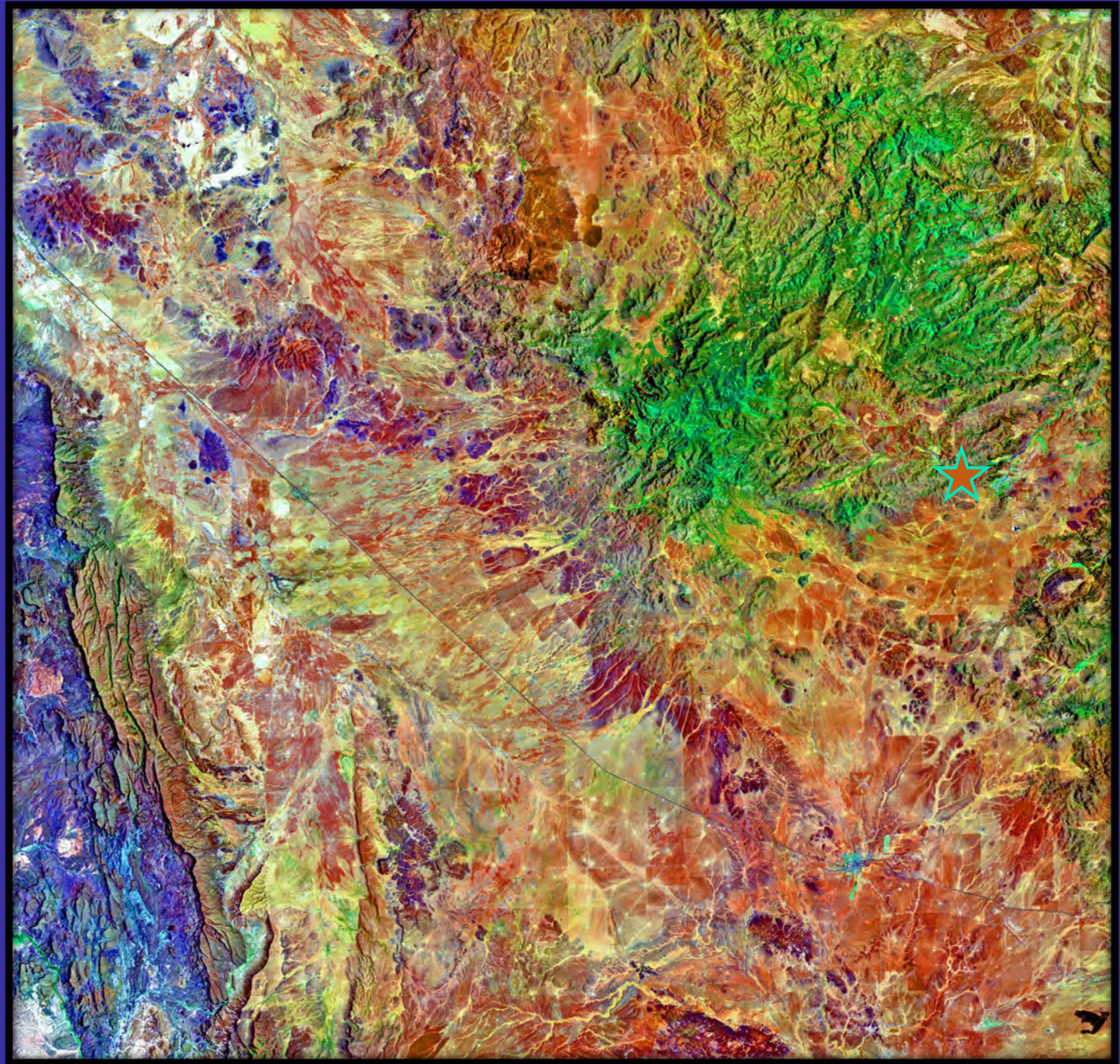


**CATHEDRAL MOUNTAIN**





**Davis Mountains State Park\*** is home to javelinas, mountain lions, feral donkeys, and over 250 species of birds. The Park is also famous for the infrastructure built by the Civilian Conservation Corp throughout the park in the 1930s. Northwest of the Park McDonald Observatory on Mount Locke is exploring our galaxy for planets around other stars.







**Blue Mountain Vistas**



**THE MONSOON SEASON BRINGS  
VITAL MOISTURE TO THE SKIES  
AND THE SOILS**





# Blue Mountain Vistas

TOWERING CLOUDS  
ACCOMPANY THE  
MONSOON SEASON





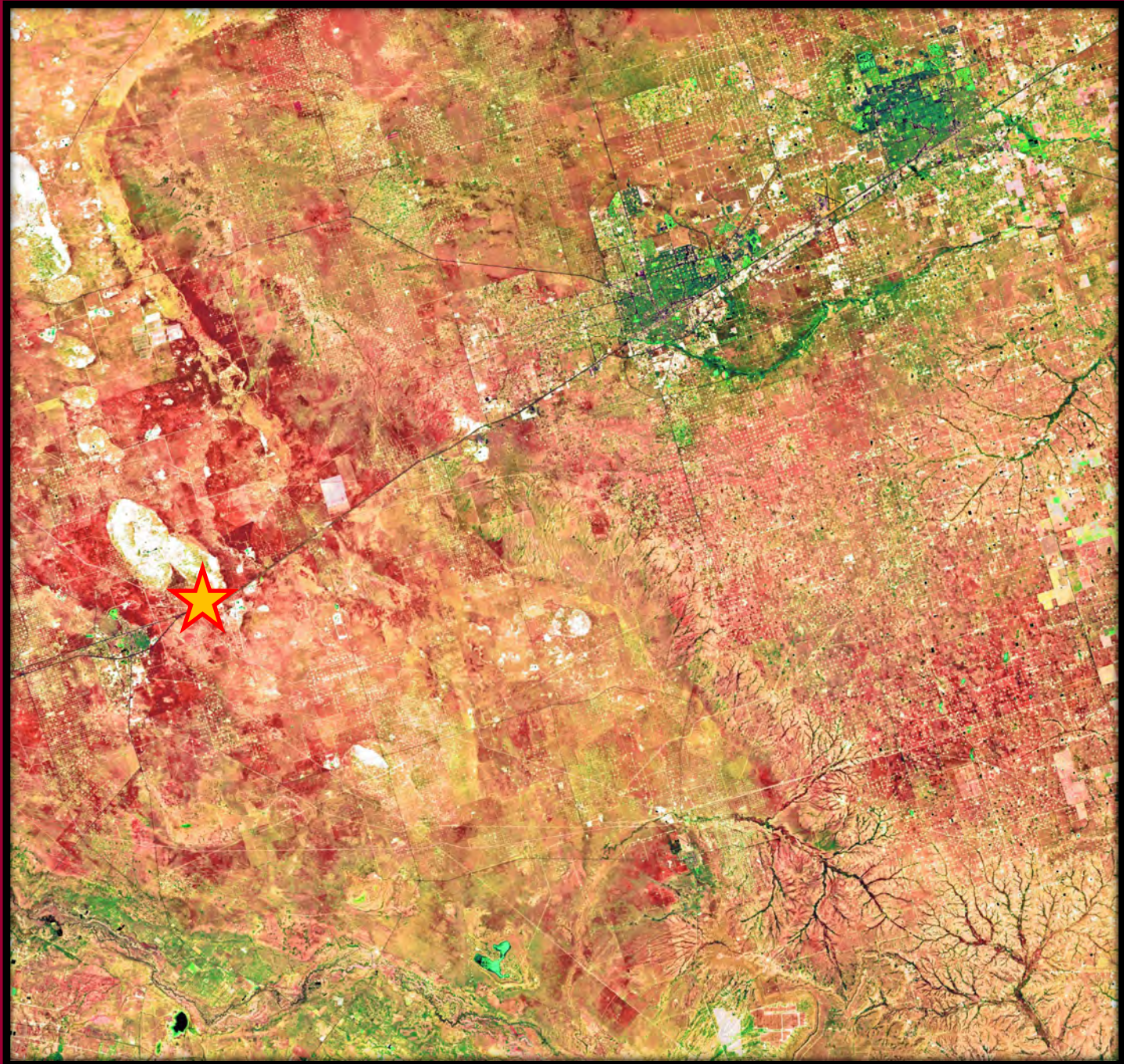
VISTA OF  
DAVIS  
MOUNTAINS  
WITH  
SPANISH  
DAGGER -  
YUCCA



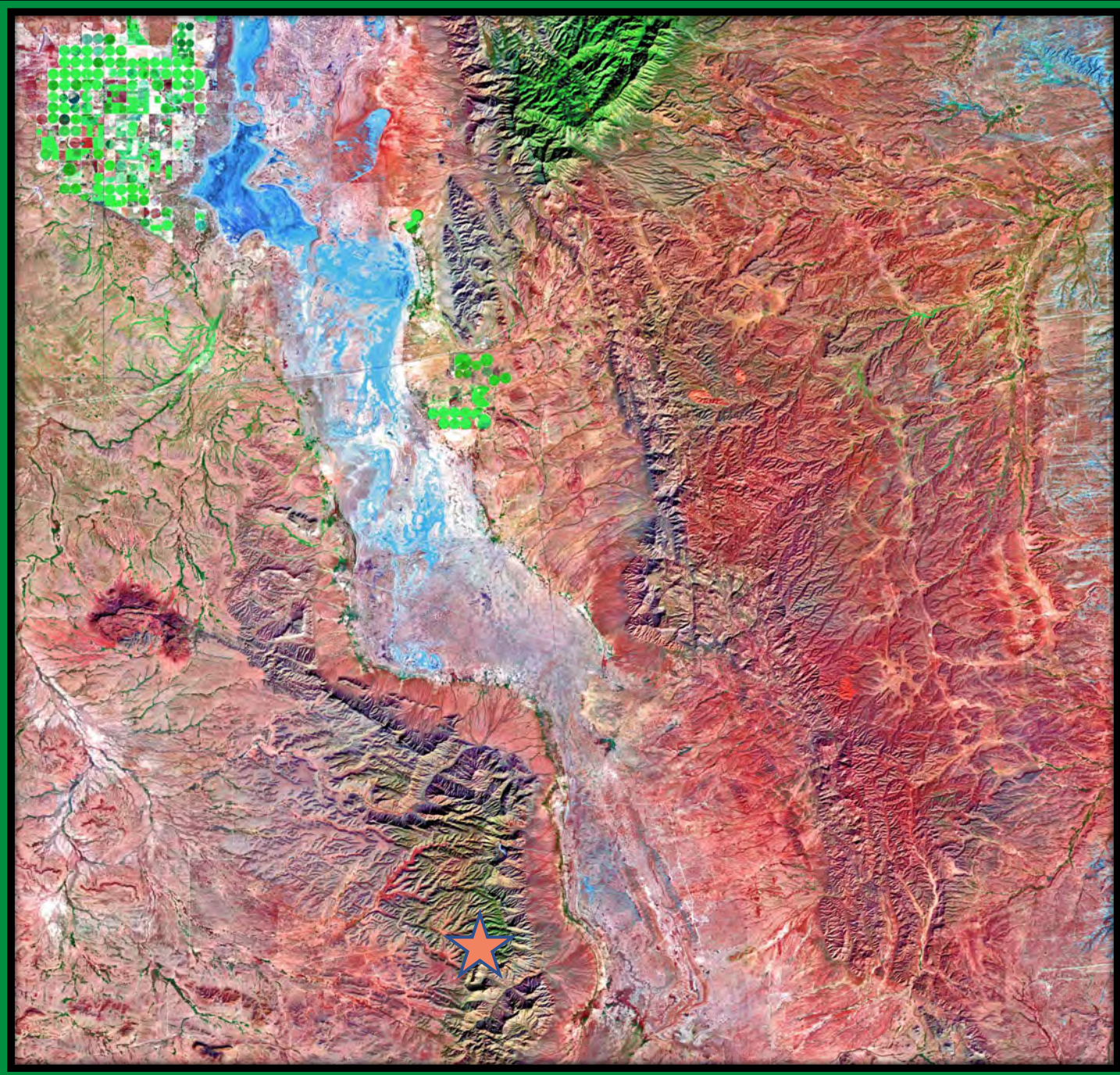




Monahans Sandhills State Park\* is home to sand dunes over 50 feet high; dune fields trend into New Mexico on the upper left. The Park hosts part of an extensive miniature Shinnery Oak forest. Odessa in the upper center is home to the University of Texas Permian Basin and the Odessa Meteor Crater. Midland in the upper right is home to Midland College, the Sibley Nature Center, and the Petroleum Museum.





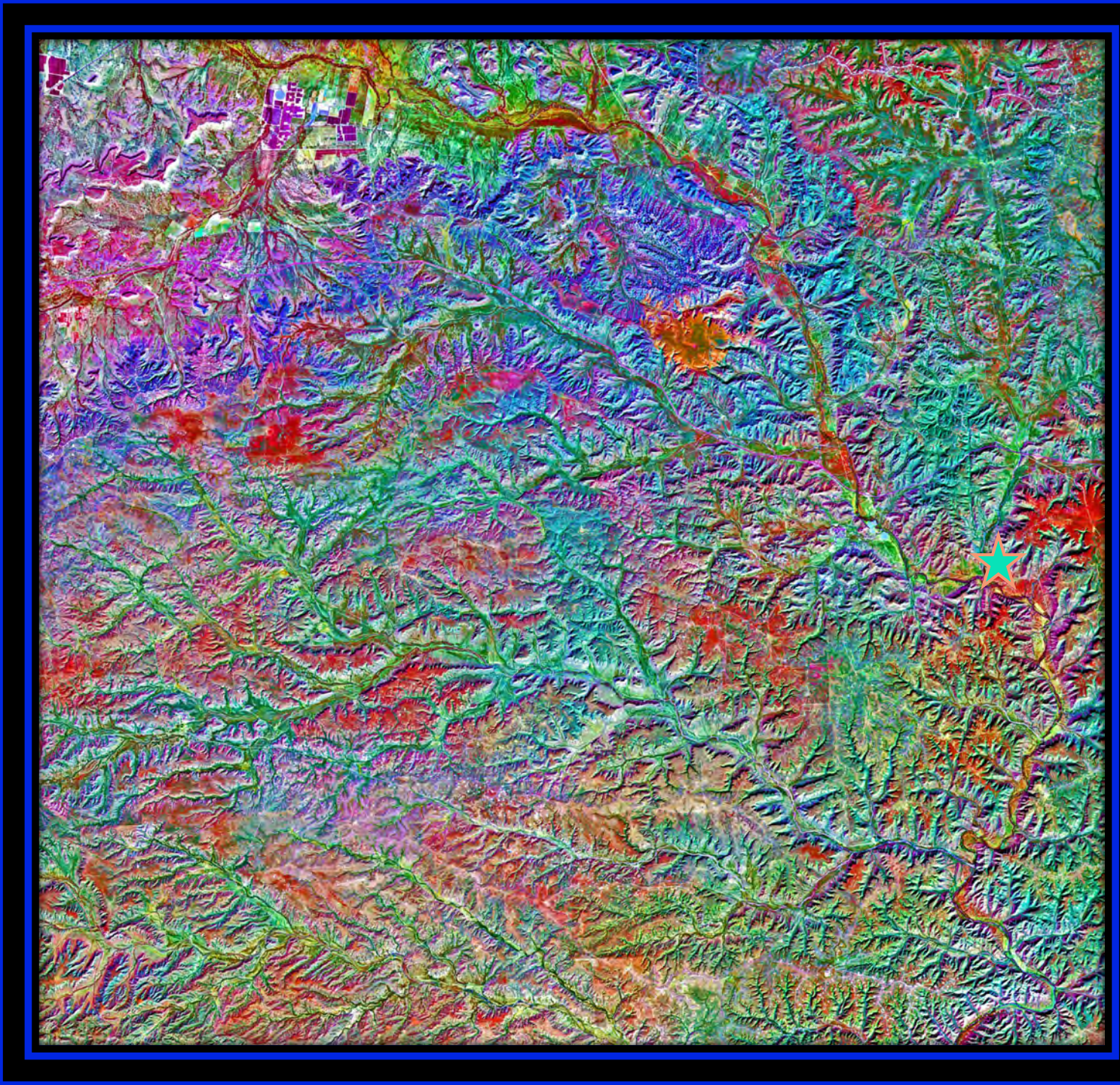


The Salt Basin runs through the center of the scene. During the last Ice Age, the entire basin hosted a lake over 80 feet deep. Now, summer rains form seasonal playa lakes. Sierra Diablo Wildlife Management Area\* was established in 1945 as a sanctuary for the last remaining desert bighorn sheep in Texas. The WMA is currently used for the restoration, conservation, and management of desert bighorn sheep.

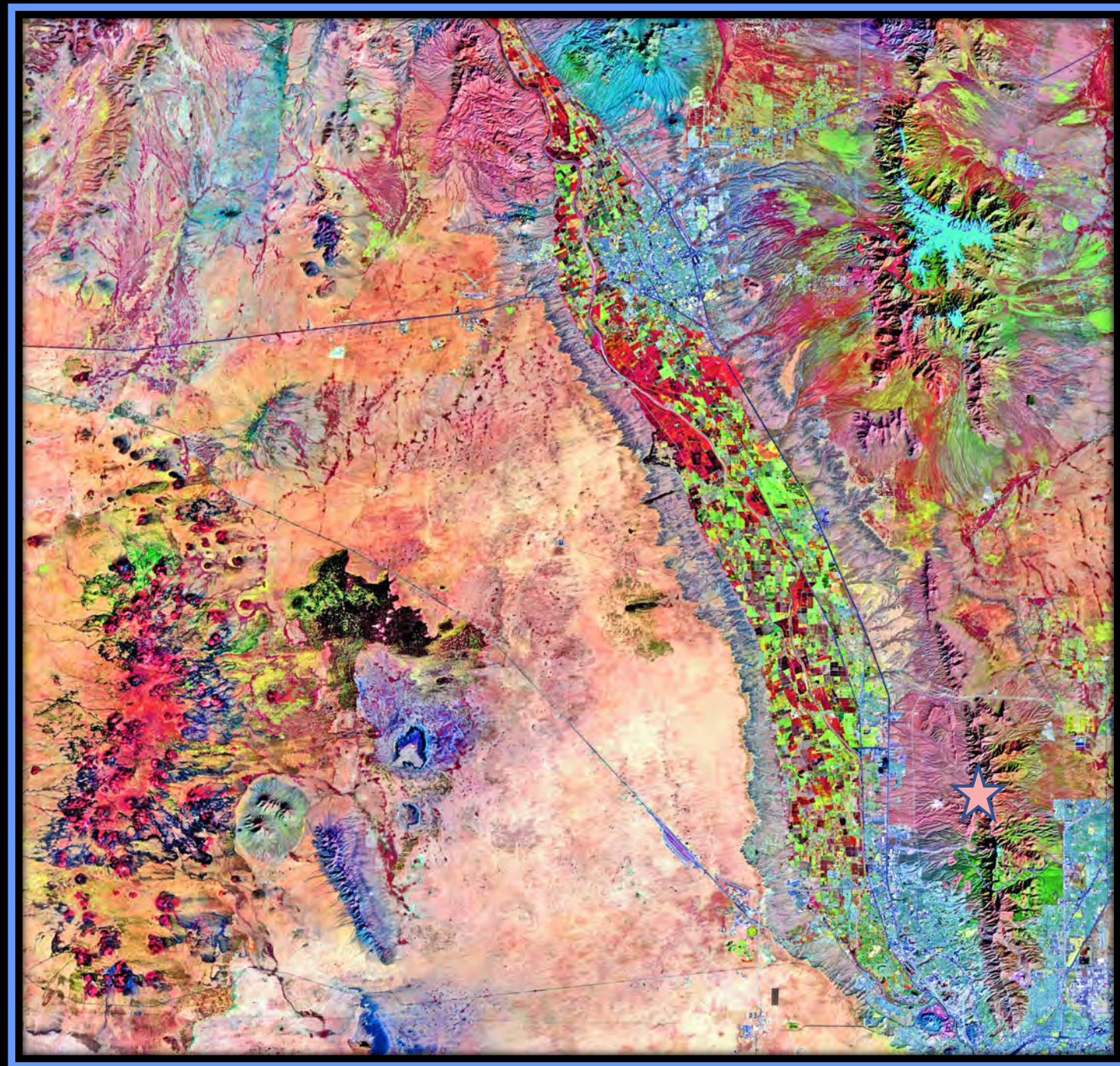




The Fort Lancaster State Historic Site\* hosts the ruins of a fort that protected the frontier from 1855 to the late 1870s, garrisoned by Buffalo Soldiers of the Ninth Cavalry. The Yates Oil Field, which started production in 1926, has produced over 2 billion barrels of oil. The town of Iraan along the Pecos River was established as a boomtown with the discovery of the Yates oilfield.







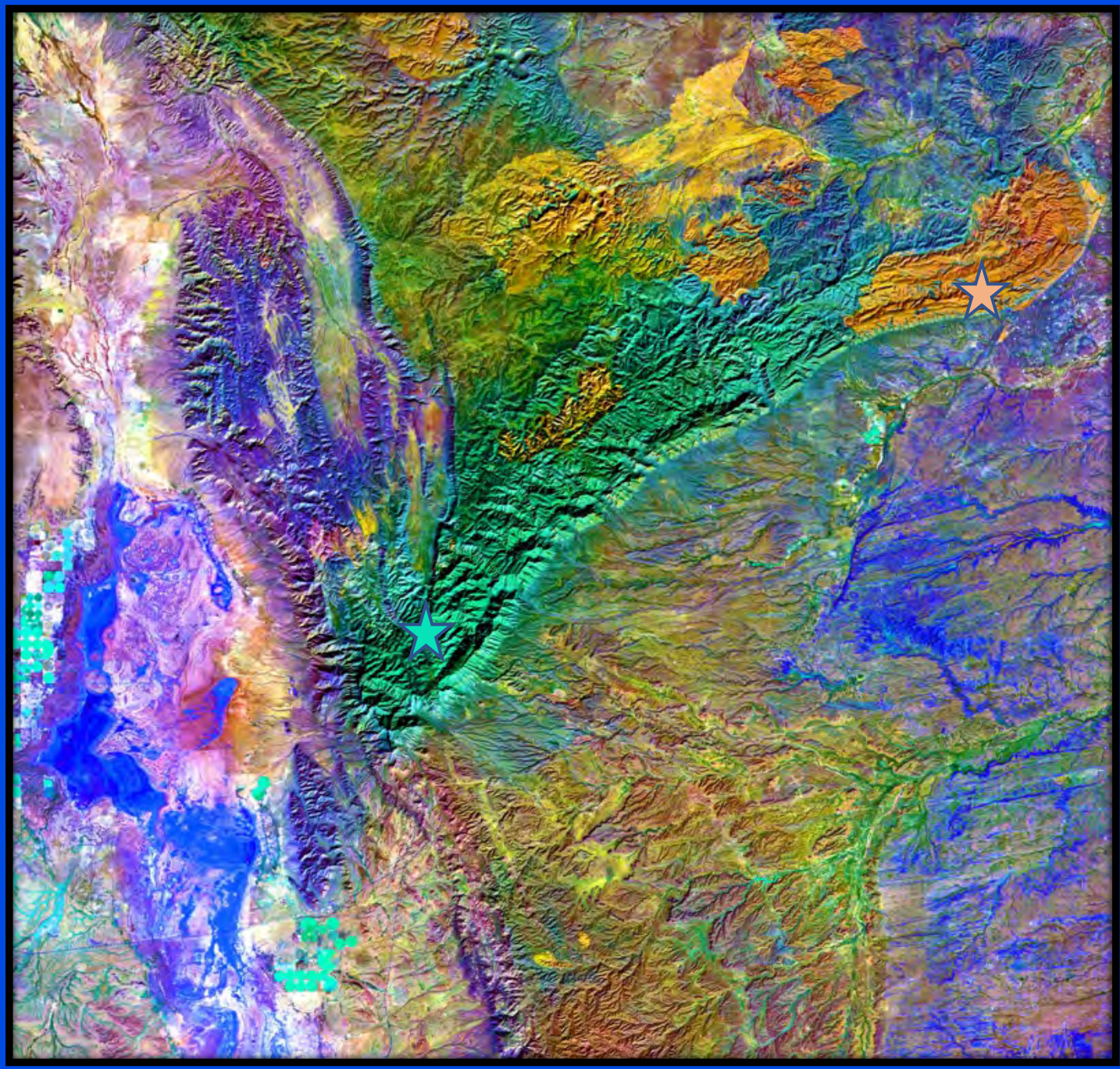
Agriculture is concentrated in the Rio Grande valley. The Franklin Mountains in the lower right divide the city of El Paso, where Franklin Mountains State Park\*, the largest urban wilderness park in the continental United States, preserves the Chihuahuan Desert /Trans-Pecos ecoregion of Texas. Multiple craters of the Potrillo volcanic field lie to the west. Apollo

247 astronauts trained here prior to moon landings.

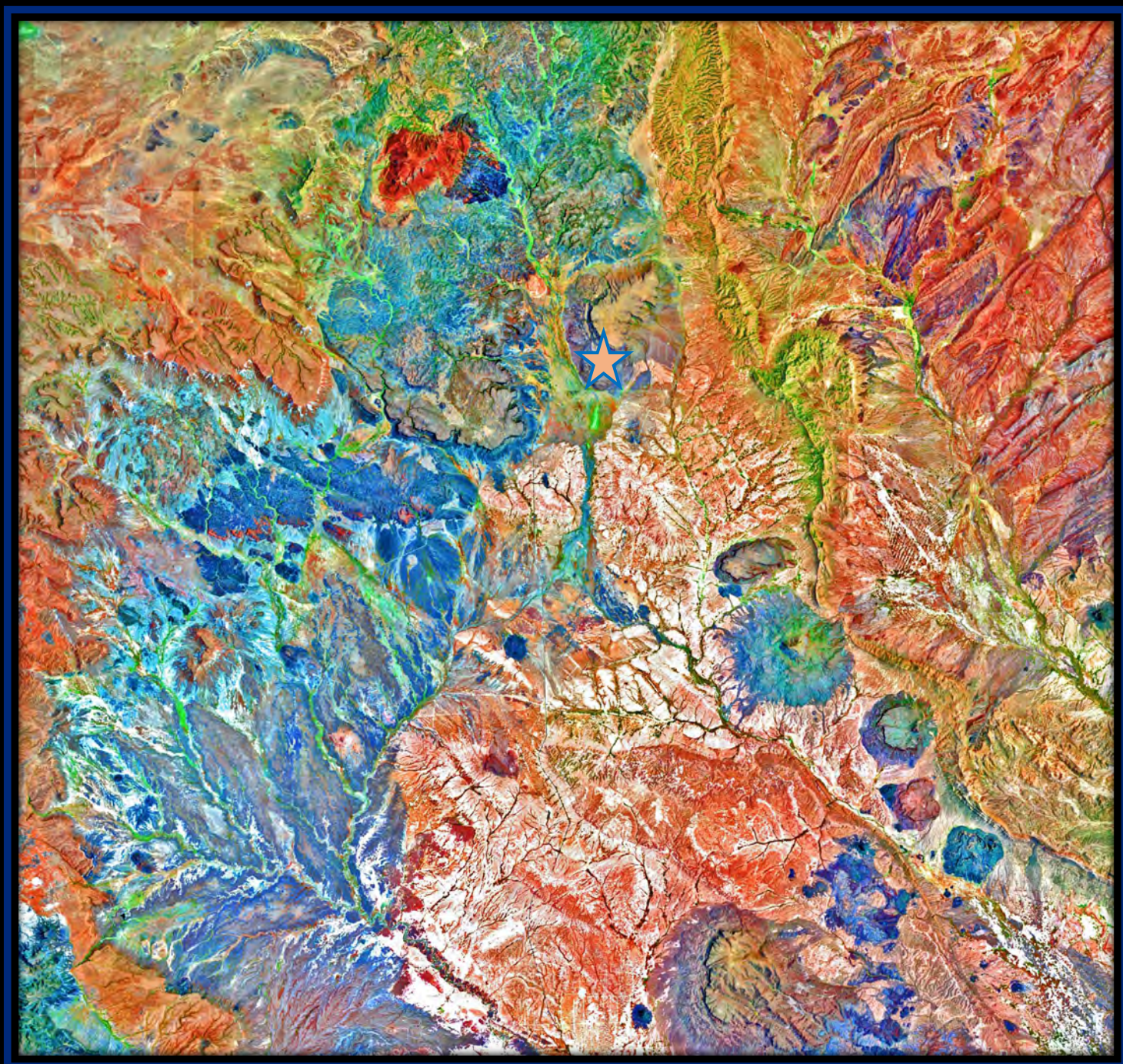




**Guadalupe Mountains National Park\* protects a massive exposure of the most extensive fossilized reef in the world – the Permian Reef. Carlsbad Caverns\* formed within the Permian Reef limestone. Linda Lake is recreational and fishing area in the Salt Basin that is a remnant of an Ice Age Lake that filled the Basin. Wildfire scars from 2011 mark the landscape in golden tones.**

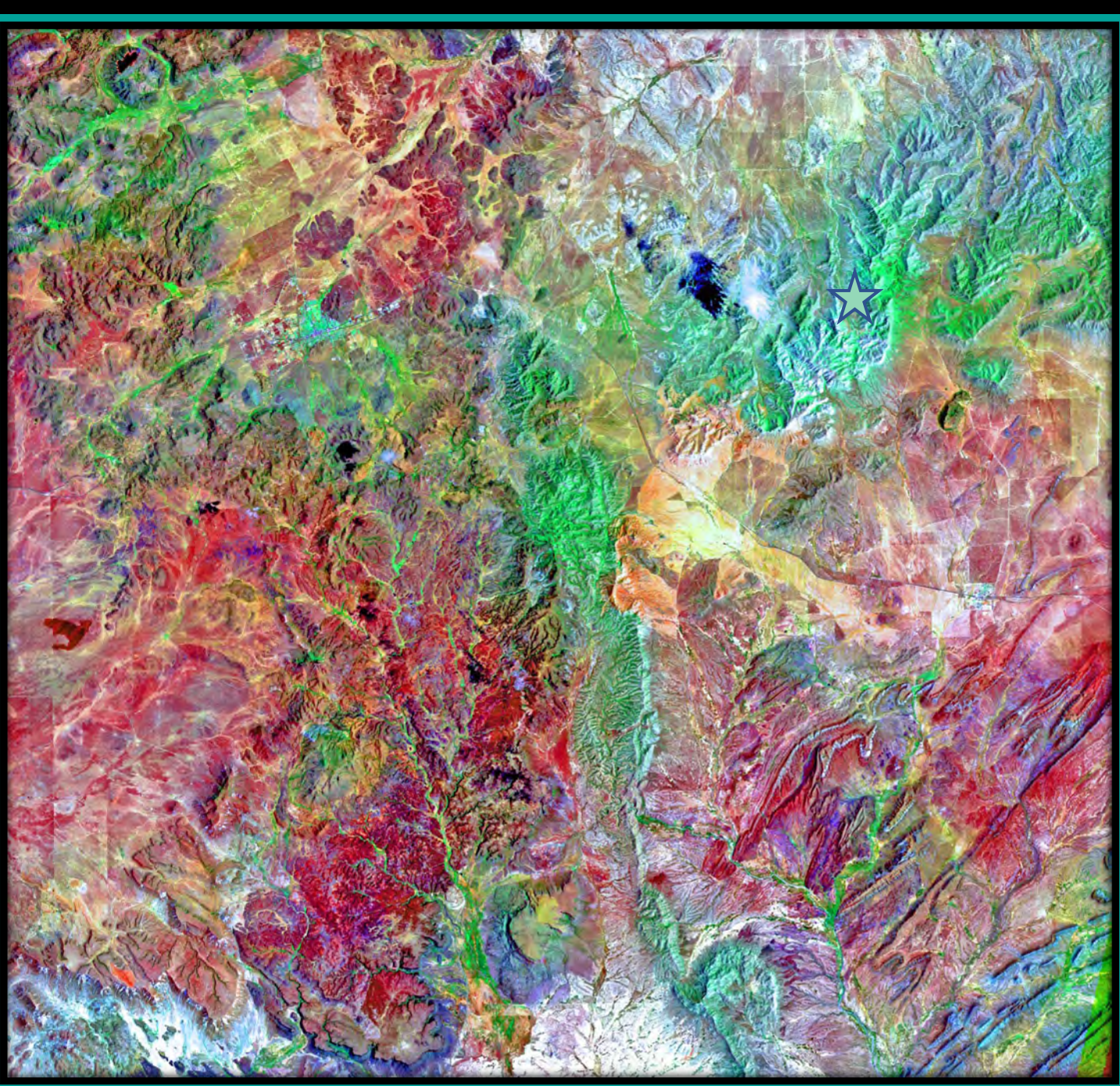






**Elephant Mountain Wildlife Management Area\*** was established to conserve the desert bighorn sheep and its habitat. In the upper right corner folded mountains trend into the scene towards the southwest; these were formed around 300 million years ago at the same time as the Appalachian Mountains and are now exposed by erosion.



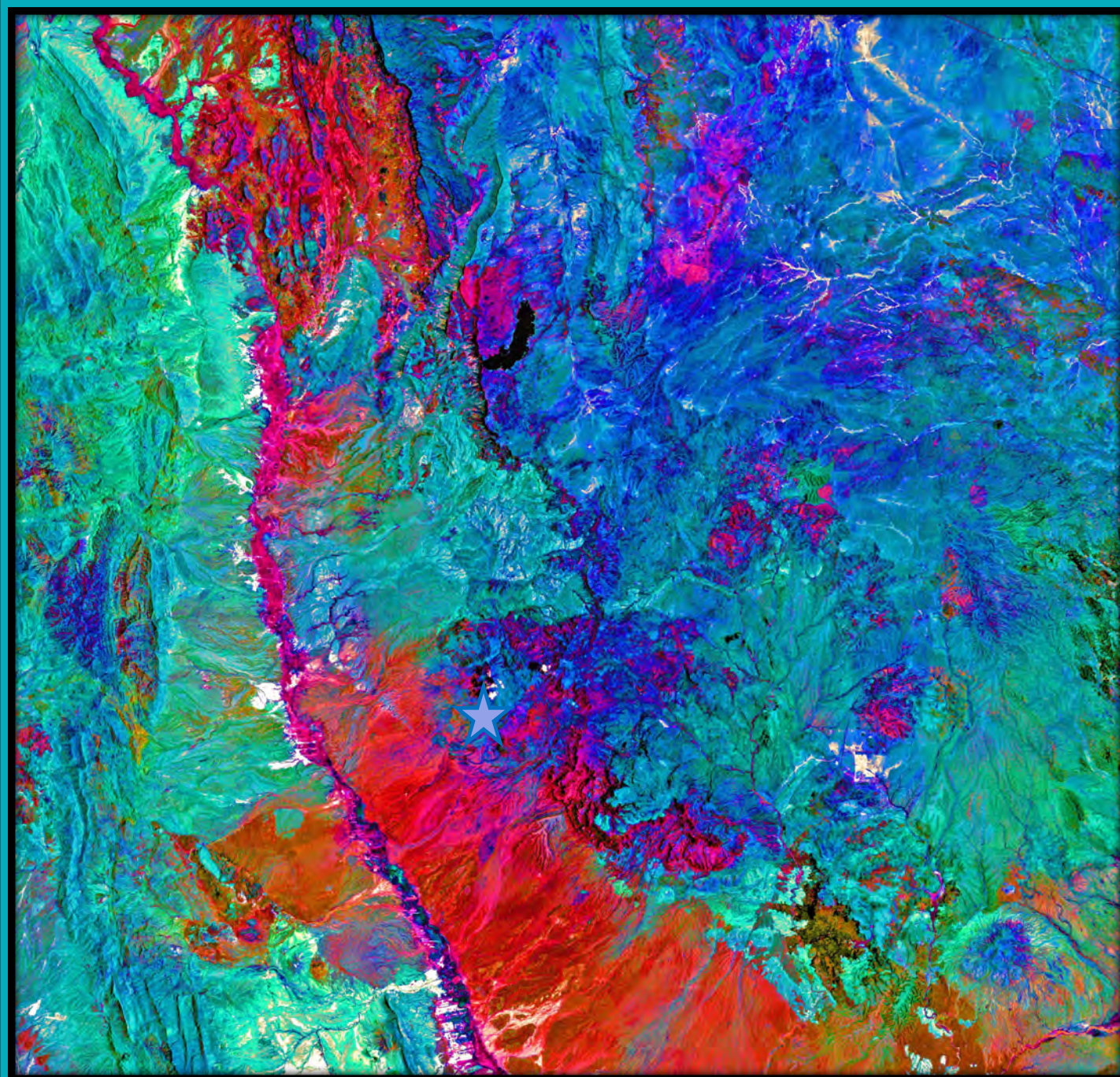


The town of Alpine hosts Sul Ross State University and the Museum of the Big Bend. The town of Marathon lies to the east along Highway 90. Ghostly checkerboard patterns in western part of the scene mark fence lines where different grazing practices affect landcover. The Glass Mountains\* in the upper right host fossils of 250-million-year-old reef-dwelling organisms that lived in an ancient ocean.





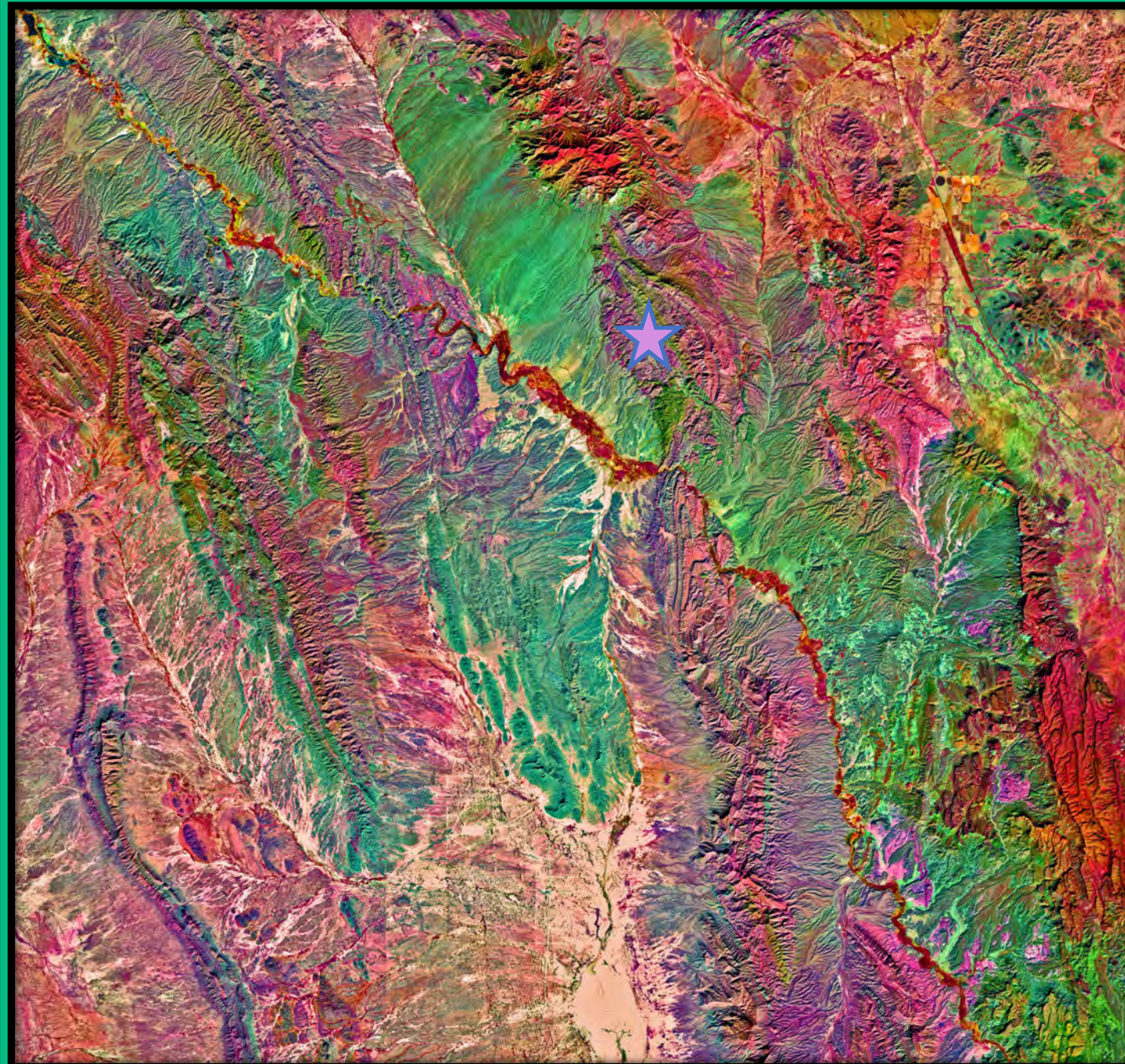
The Chinati Mountains State Natural Area is under development as a State Park preserving Trans-Pecos ecoregion plants and animals. Big Bend Ranch State Park, biggest state park in Texas and designated as an International Dark Sky Park, extends into scene in the lower right. Multi-hued alluvial fans converge on the Rio Grande, the border between Texas and Mexico that traverses the scene from the upper right.



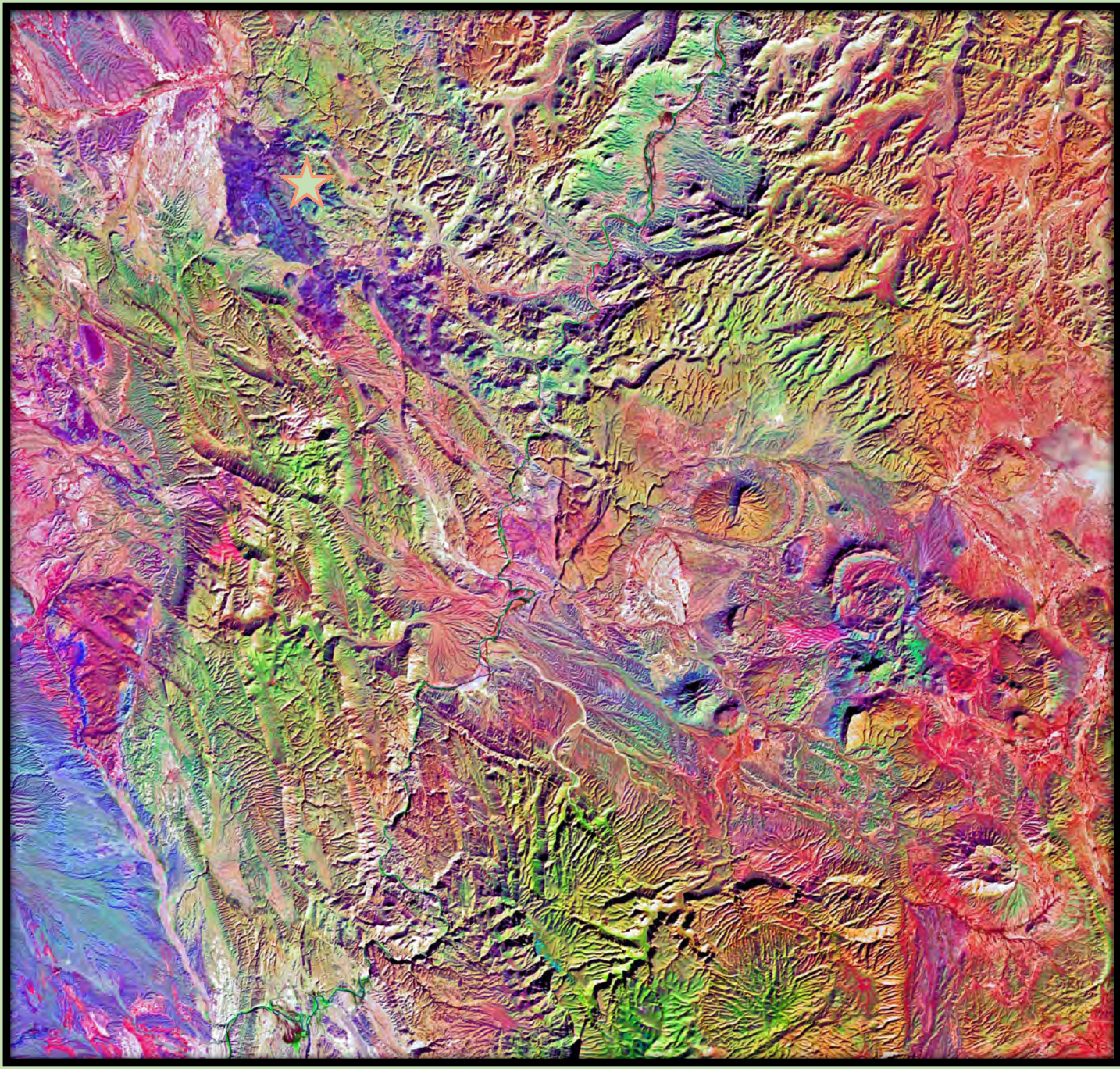




The Indio Mountains Research Station is in the southern extension of the Eagle Mountains. It is managed by the University of Texas at El Paso with an emphasis on research and instruction for the biological and geological sciences. The Rio Grande channel narrows as it cuts through folded mountains that traverse the border between Texas and Mexico.







The Black Gap Wildlife Management Area is where the Texas Department of Parks and Wildlife conducts demonstration and research projects including invasive species eradication and Bighorn Sheep reintroduction. The Rio Grande, the border between Texas and Mexico, marks the eastern extent of Big Bend National Park, a gold-tier Dark Sky Park.





100 miles

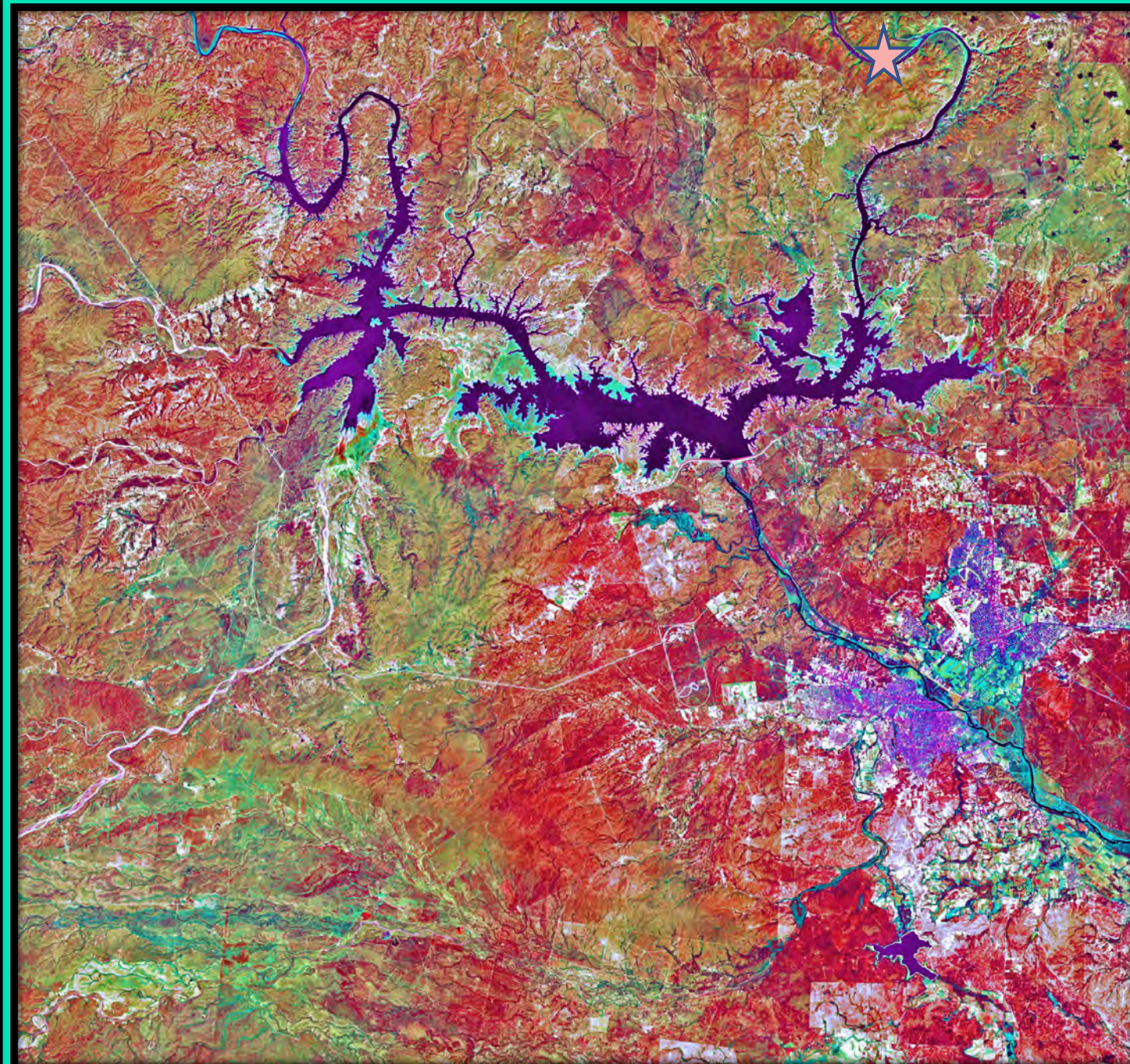
TEXAS



Source:  
U.S. Department of Interior  
U.S. Geological Survey

Image derived from  
Landsat 7 data and the  
National Elevation  
Dataset.

Period of acquisition  
July 1999 – September  
2002



**Amistad National Recreational Area on the Rio Grande conserves cultural and natural resources while providing recreational opportunities. Del Rio is home to the Rio Grande College of Sul Ross State University. Devils River State Natural Area\*, where the Trans-Pecos and Edwards Plateau ecoregions meet. The Devil’s River is one of the last ecologically intact river systems in Texas.**



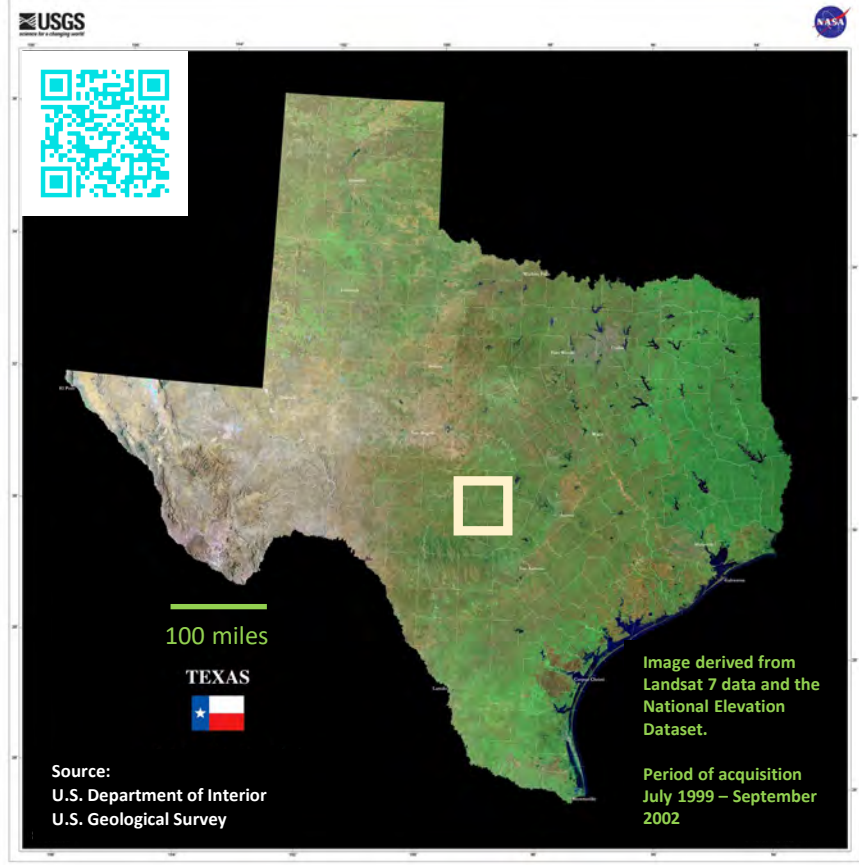
# Edwards Plateau Ecoregion



- AKA Texas Hill Country
- Springs, stony hills, and steep canyons
- Limestone bedrock
- Shallow soils
- Caverns common
- Edwards Aquifer =  
underground water flow
- Rainfall 15 – 34 inches avg.
  - Seasonal
  - May or June and  
September
- Vegetation
  - Grasslands
  - Live oak and mesquite  
savannah
  - Juniper/oak woodlands
  - Ranchland predominates





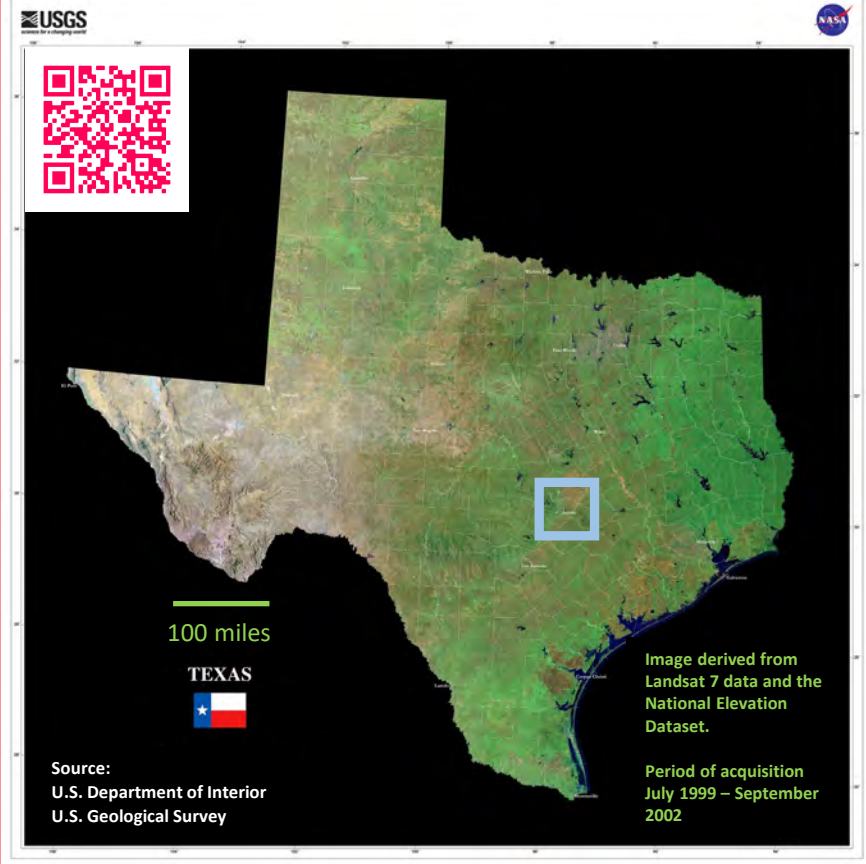


Enchanted Rock, a granite dome, began as a molten magma chamber that cooled underground and is now exposed by erosion.

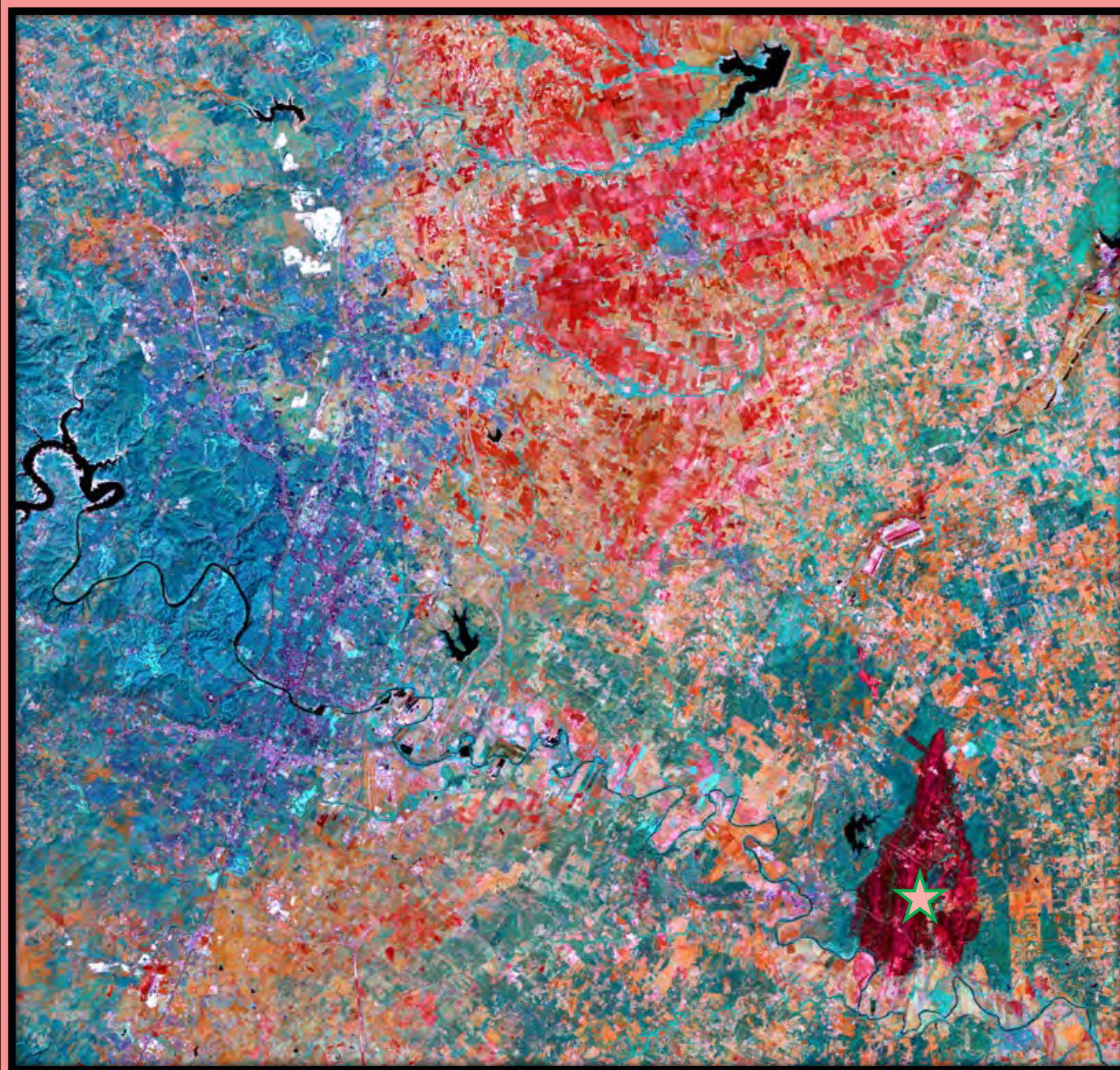
Weathering of the granite surface has produced pits that fill with seasonal vernal pools, which host unique species including freshwater shrimp. Food for birds, they provide an important link in the food chain.







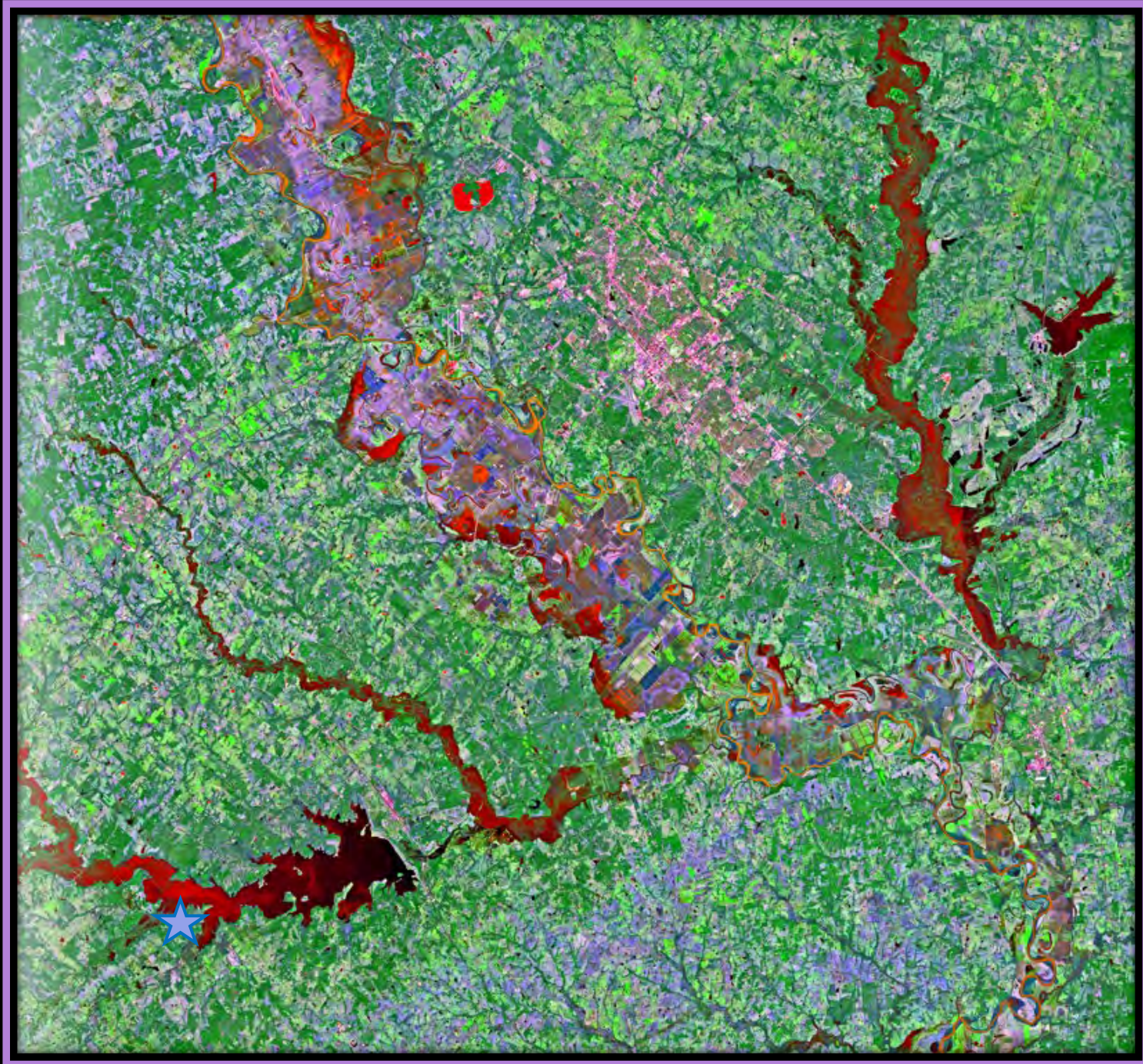
Bastrop State Park includes the westernmost stand of loblolly pines in the U.S. The 2011 Bastrop fire damaged 96% of the park and left a dramatic burn scar through this ecologically unique area. Recovery efforts are restoring the trees and the endangered Houston Toad and using controlled burns to prevent future wildfire disasters.







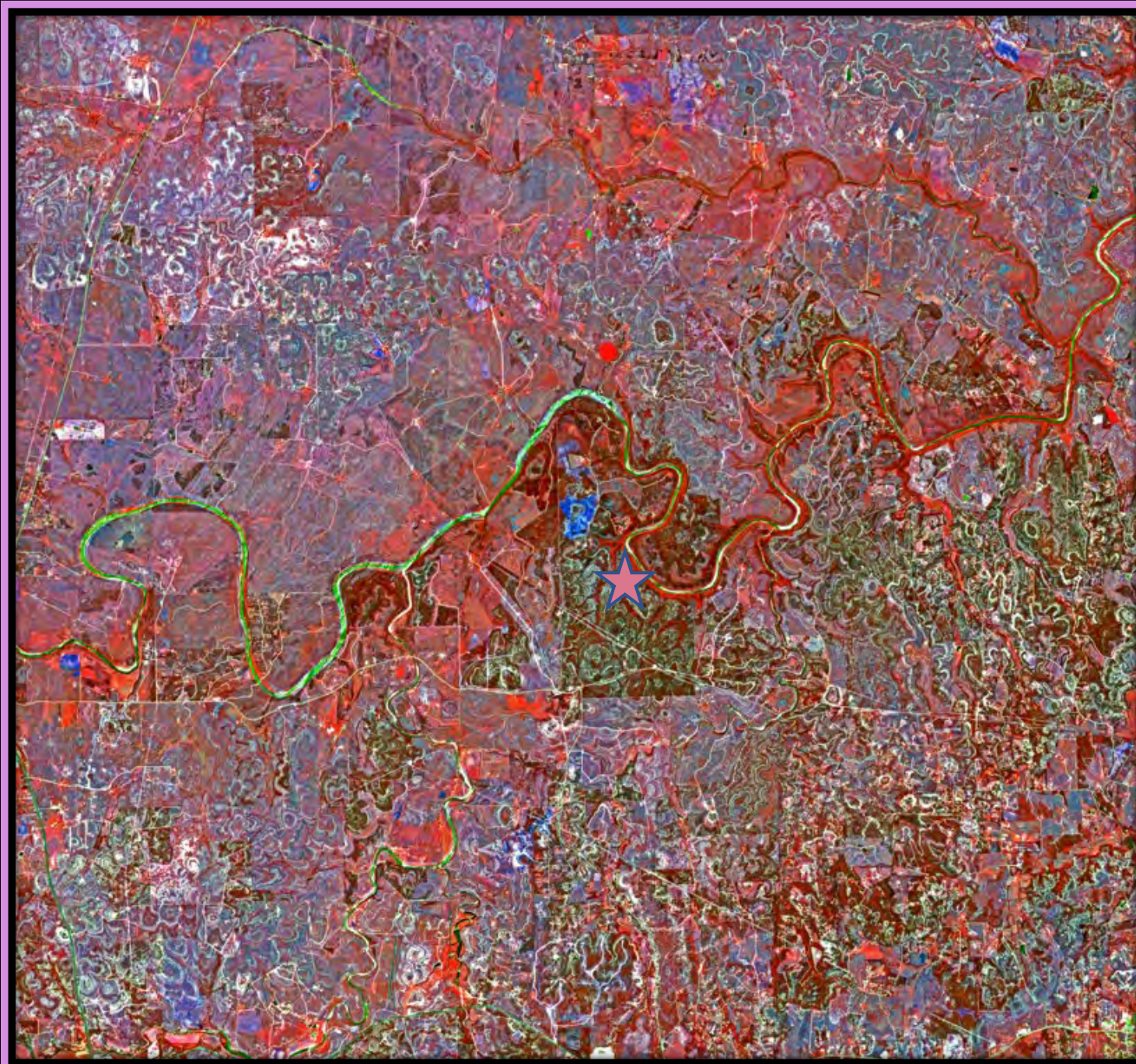
**Somerville State Park and Trailway hosts abundant wildlife including river otters, bobcats, and alligators; migrating birds find conserved wetland habitat. To the east, College Station is home to Texas A&M University's main campus, founded in 1876 as Texas' first public institution of higher education.**



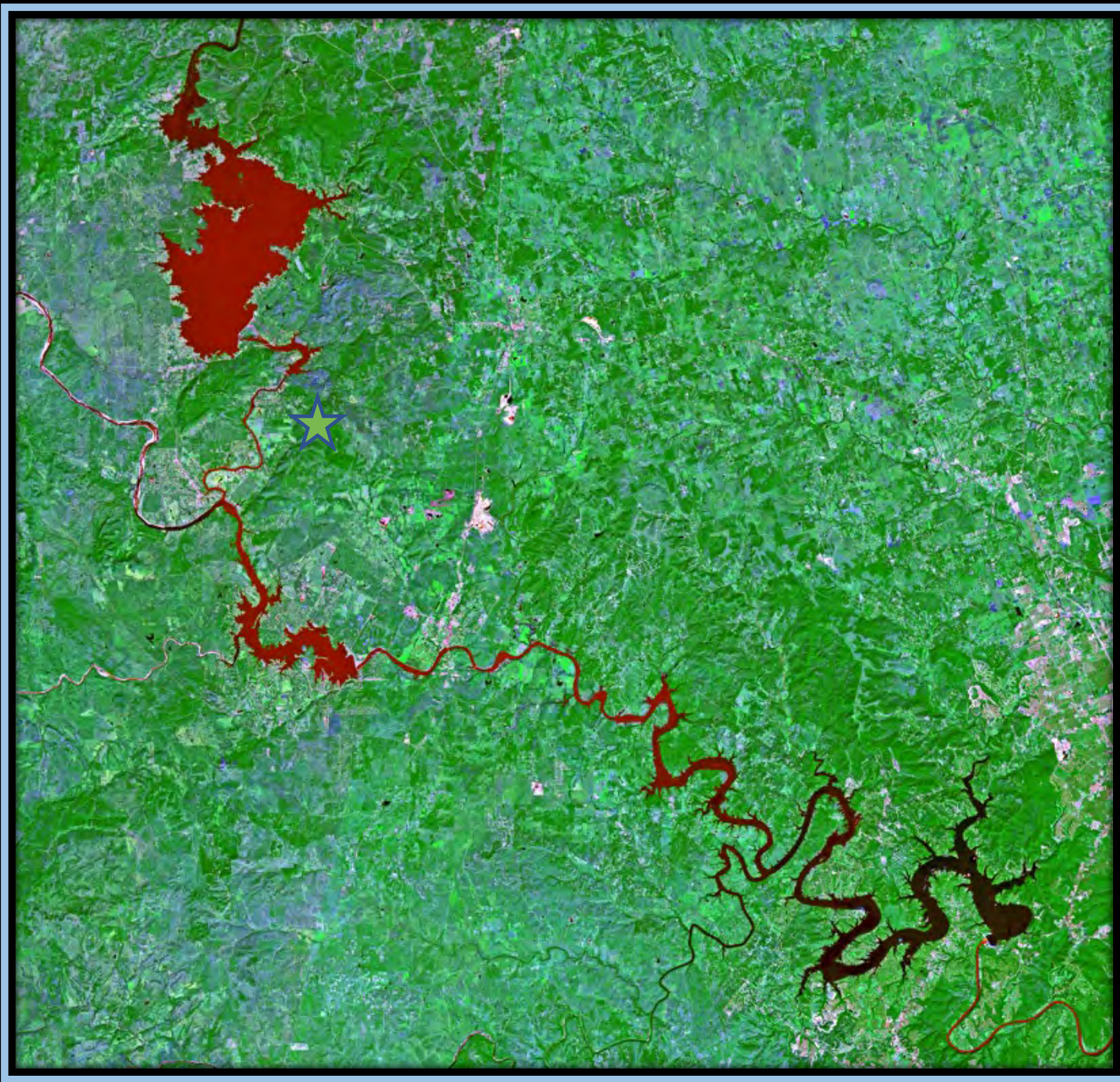




The Pedernales River flows over gently tilted limestone layers of the 300-million-year-old Marble Falls formation. Pedernales Falls State Park preserves both sides of a stretch where the river drops over 50 feet in elevation in just over one-half mile, creating step-like multiple falls and pools.

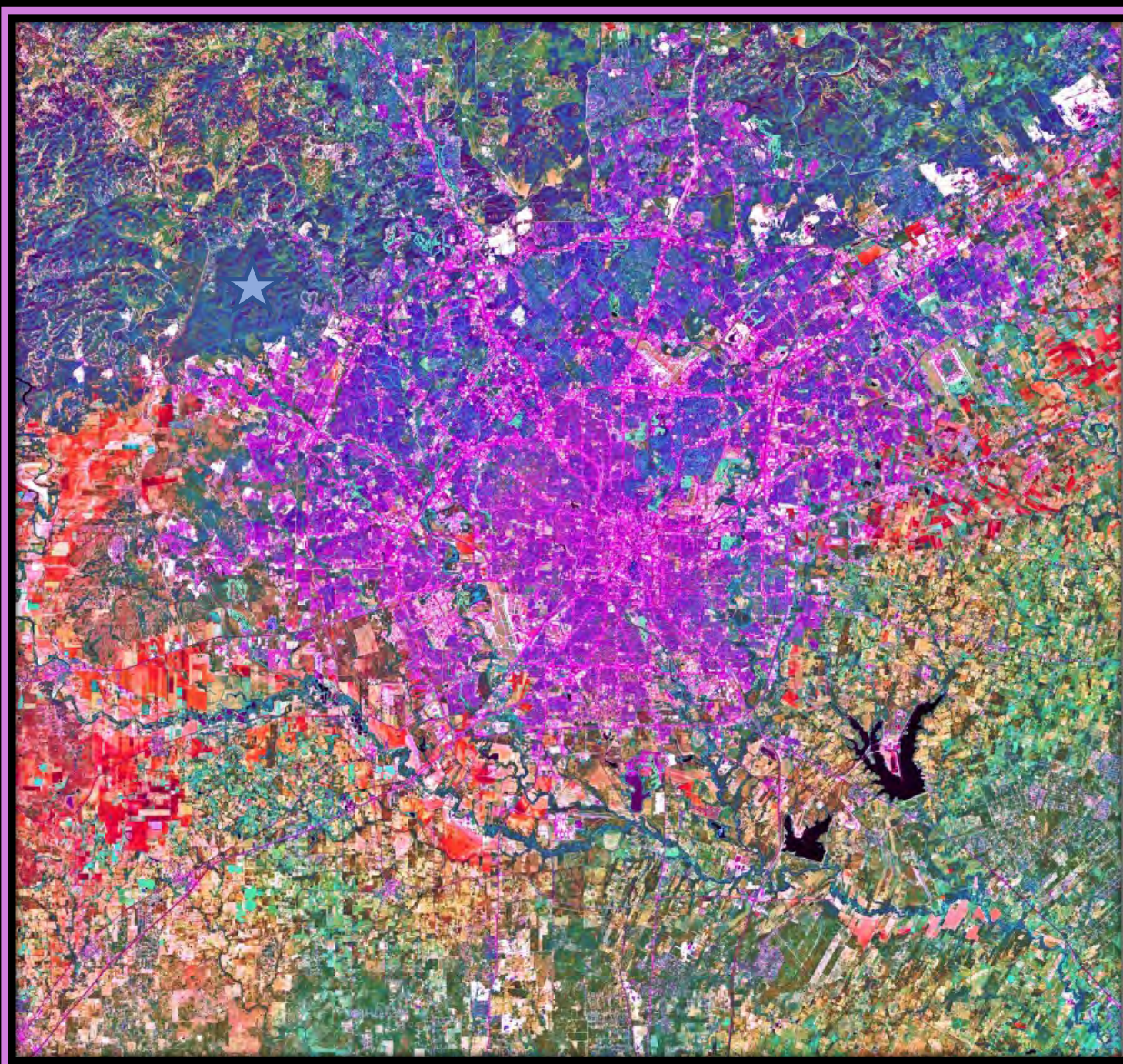






**Longhorn Caverns State Park sheltered prehistoric people and has had several incarnations, including as a bat guano mine and a dancehall. It has been a State Park since 1938. Several reservoirs line the Colorado River west of Austin; from the NW to the SE are Lake Buchanan, Inks Lake (State Park), Lake LBJ, and Lake Travis.**





**Government Canyon State Natural Area\*** protects the recharge zone of the Edwards Aquifer, which supplies San Antonio with fresh water. San Antonio, home to the University of Texas San Antonio, straddles the Balcones Escarpment and is the second-largest city in the Southern United States. Limestone quarries that dot the Balcones Escarpment 261 supply building stone and crushed rock.





100 miles

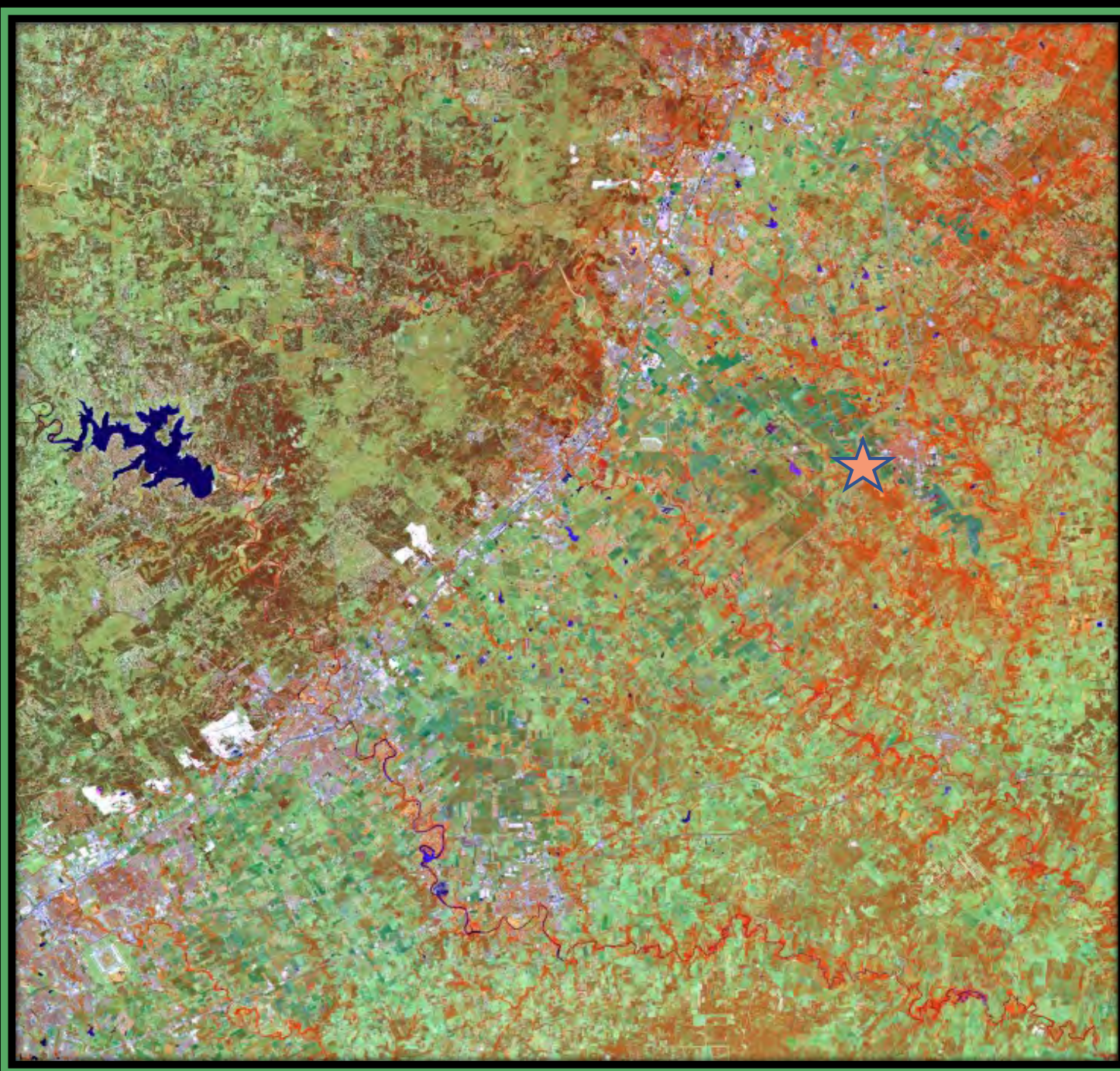
TEXAS



Image derived from Landsat 7 data and the National Elevation Dataset.

Period of acquisition July 1999 – September 2002

Source: U.S. Department of Interior U.S. Geological Survey

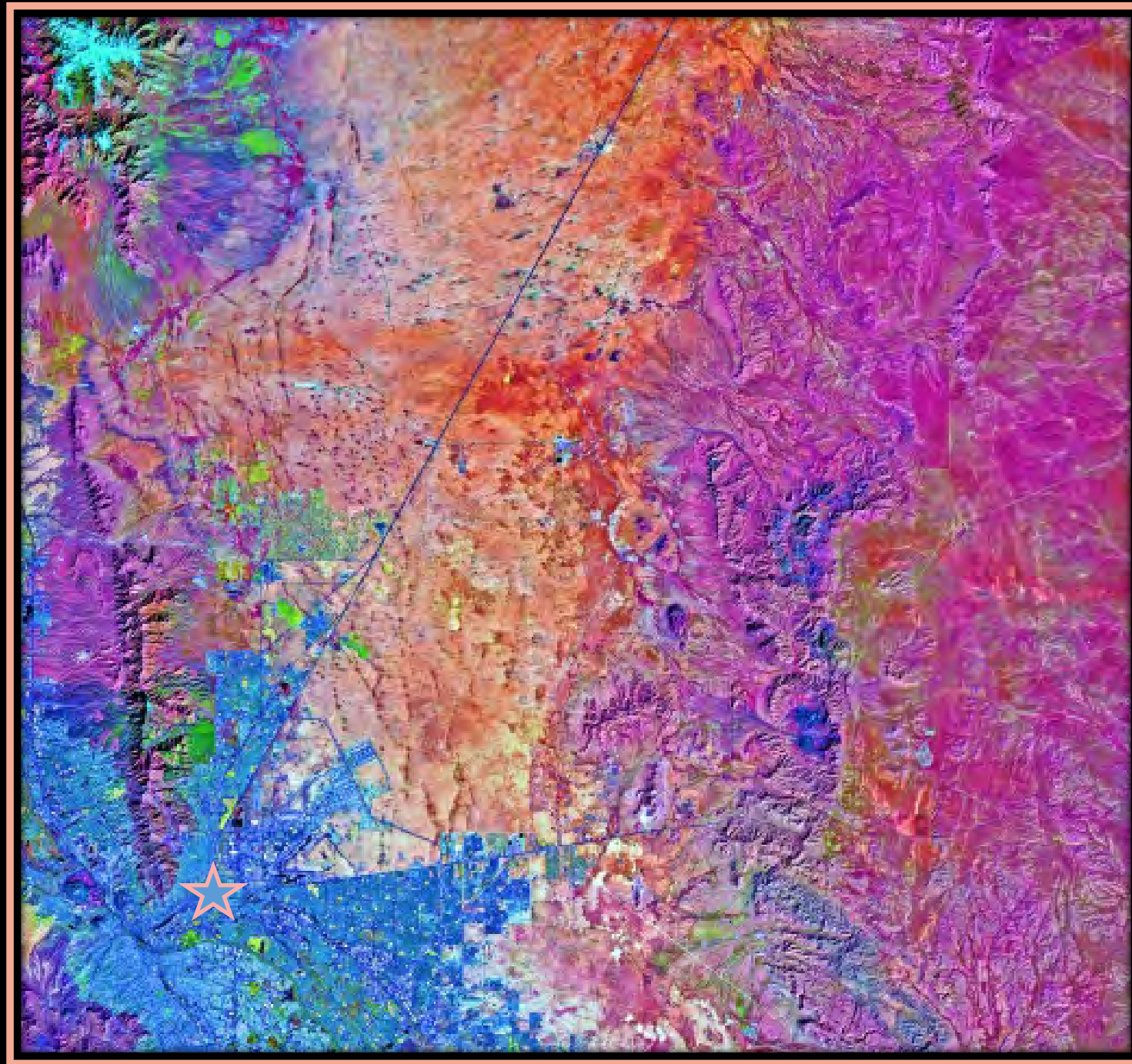


Lockhart State Park\* lies on the Clear Fork Plum Creek and preserves some of the state's most extensive recreational infrastructure constructed by the Civilian Conservation Corp. Canyon Lake Dam on the Guadalupe River supports a drinking water reservoir, provides flood control, and generates hydroelectric power. Limestone quarries in the Balcones Escarpment have provided building stones for central Texas since the 1830s.

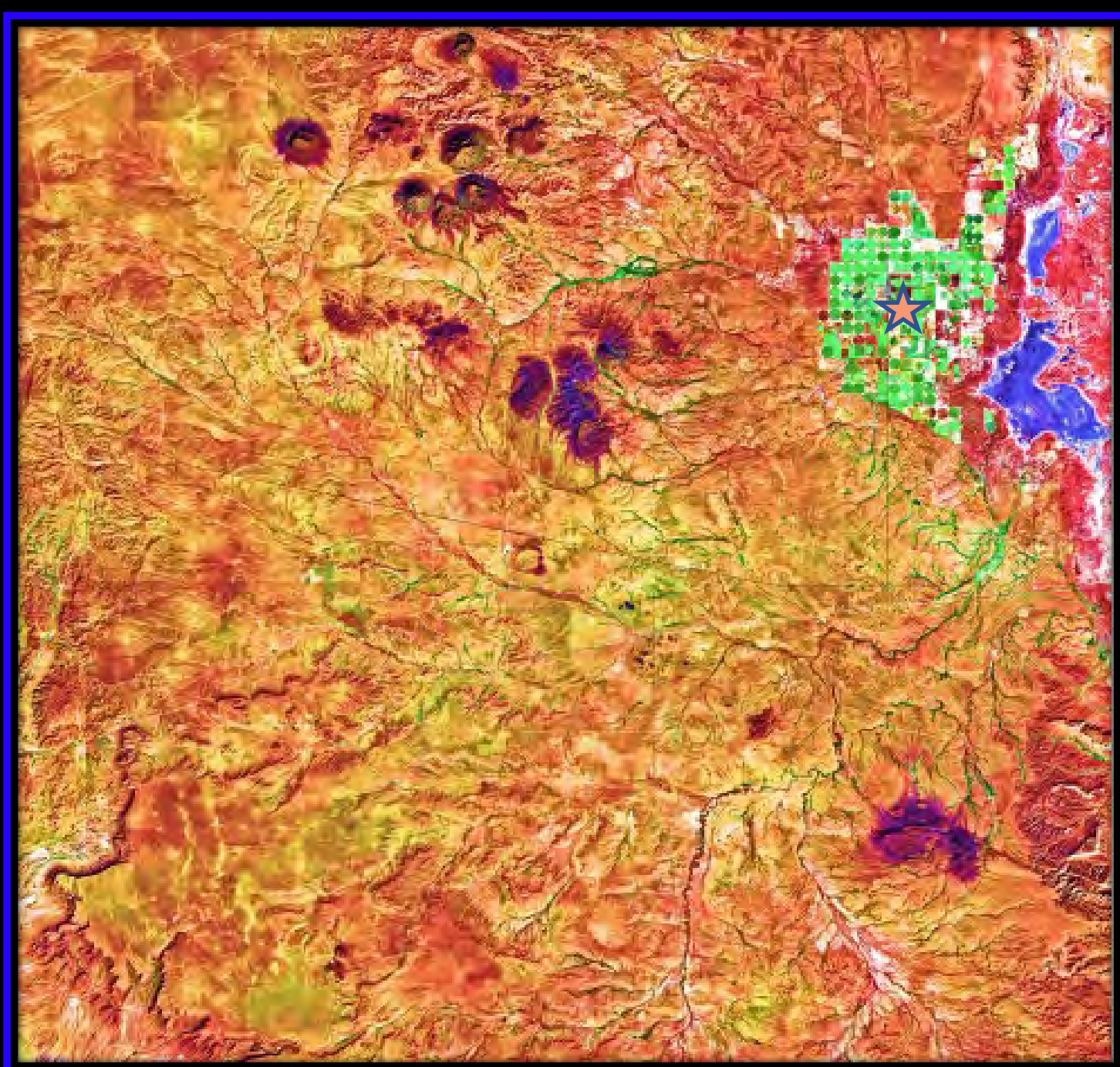
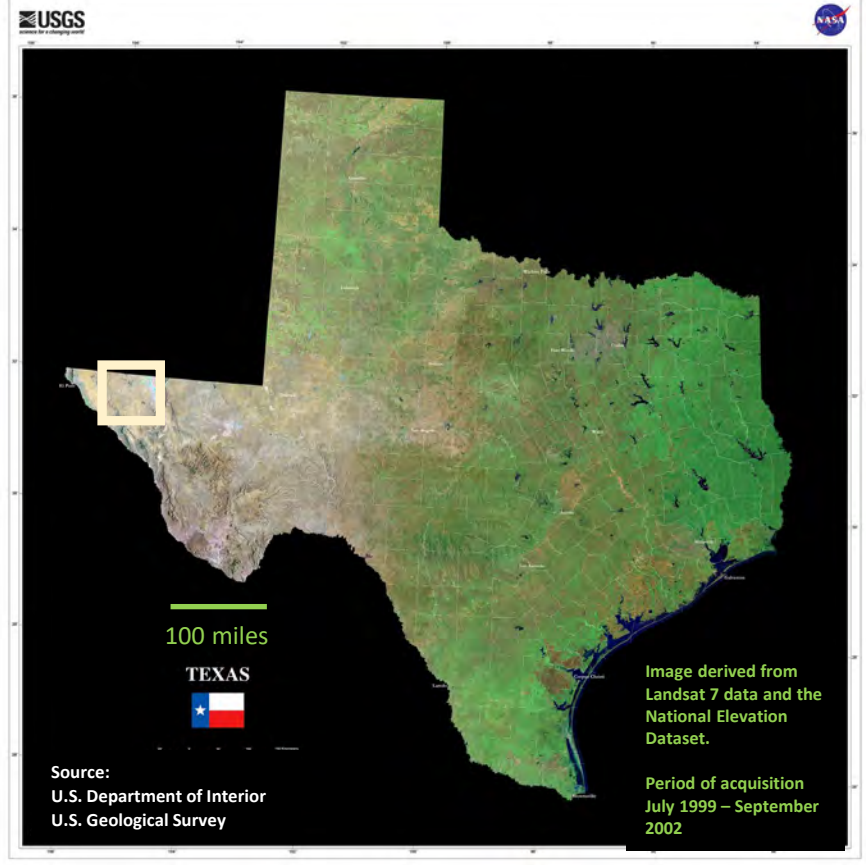




El Paso\*, population ~ 685,000, is home to the University of Texas at El Paso. The city surrounds the Franklin Mountains and meets the Rio Grande at the U.S-Mexico border. Juarez, Mexico has a population of over 1.5 million. Fort Bliss, established in 1849, is the second-largest U.S. Army base in the world – covering an area of 1,700 square miles .

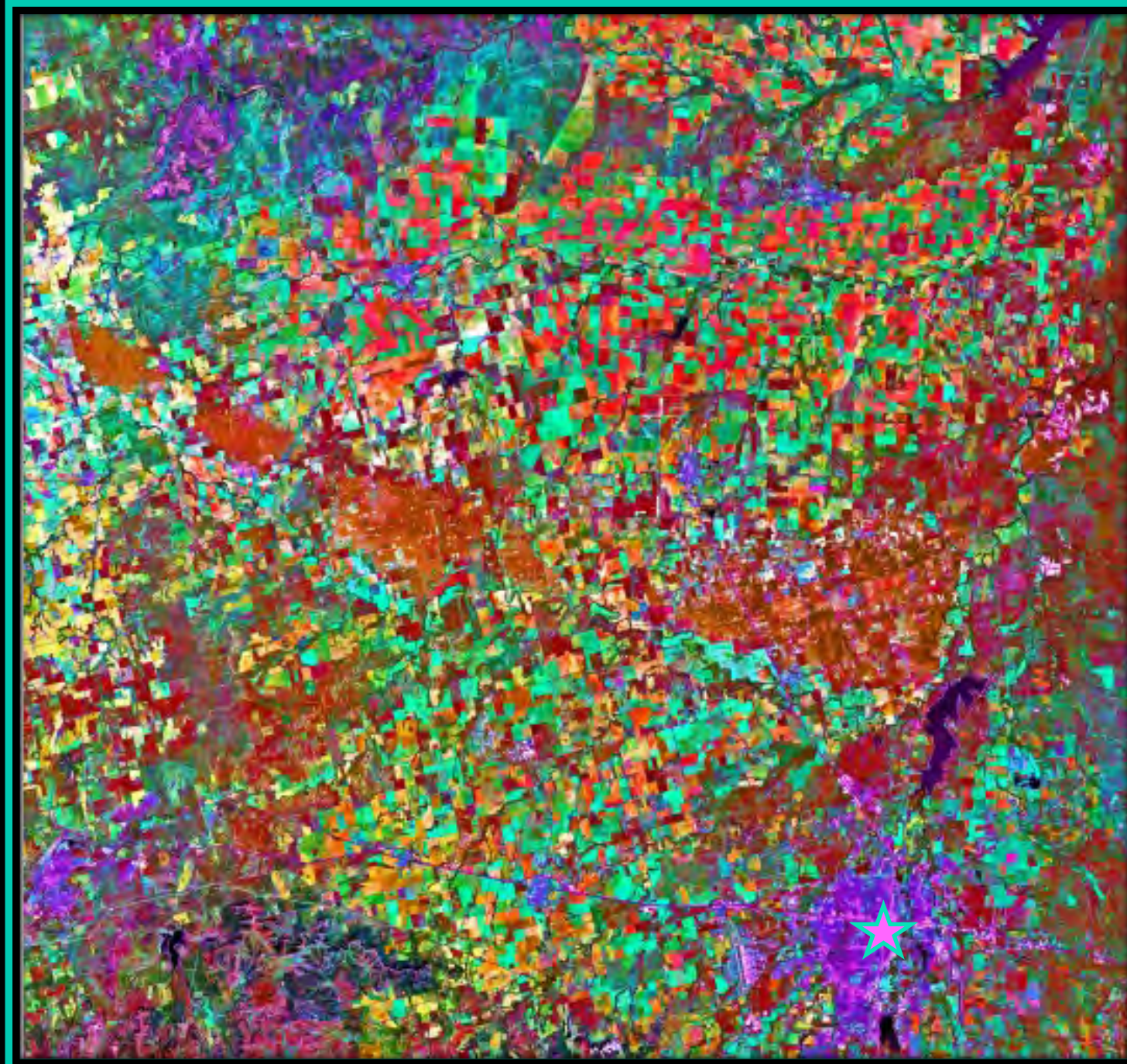
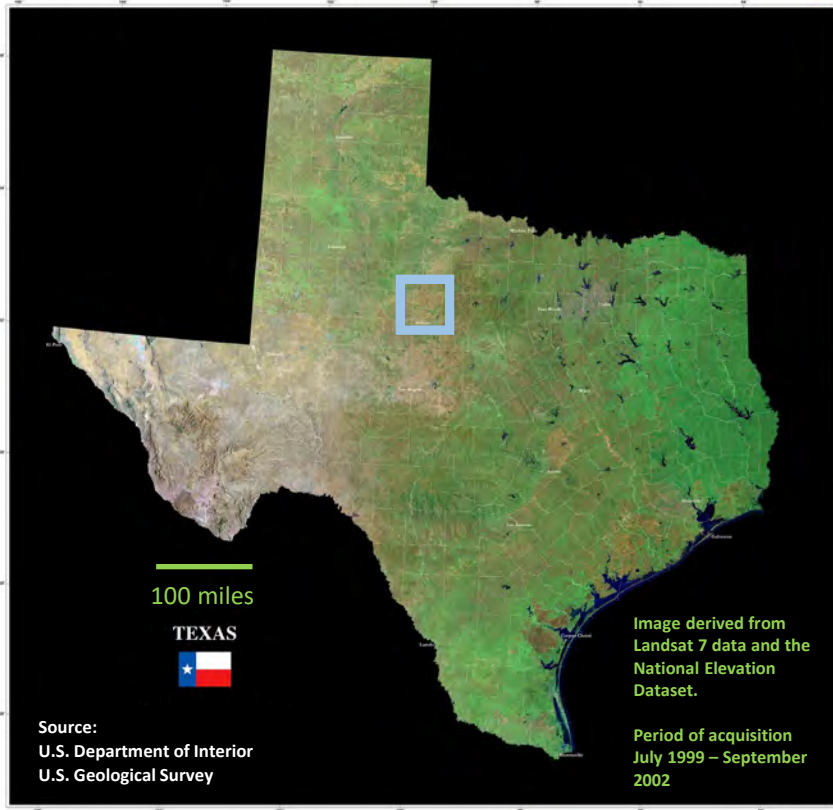






**Dell City is the “Gateway to the Guadalupe Mountains” to the east. Irrigated fields host a variety of crops including grapes, alfalfa, and corn. The arid Diablo Plateau is uplifted and incised by arroyos that recharge the Bone Springs aquifer, which provides irrigation ground water to Dell City. The Salt Basin was the site of a lake until ~10,000 years ago. Summer rains form shallow lakes; although the basin remains dry most of the year.**





Abilene\* is home to six colleges, Dyess Air Force Base, and the Abilene Zoo, which is involved in conservation projects worldwide. Wind farms on the edge of the Callahan Divide provide 114 MW of electricity to the Texas. The Alamo 7 solar farm is largest dual-axis solar farm in the United States. Scattered fields, bare in this season, are extending agricultural development into former Rolling Plains ecoregion rangeland.





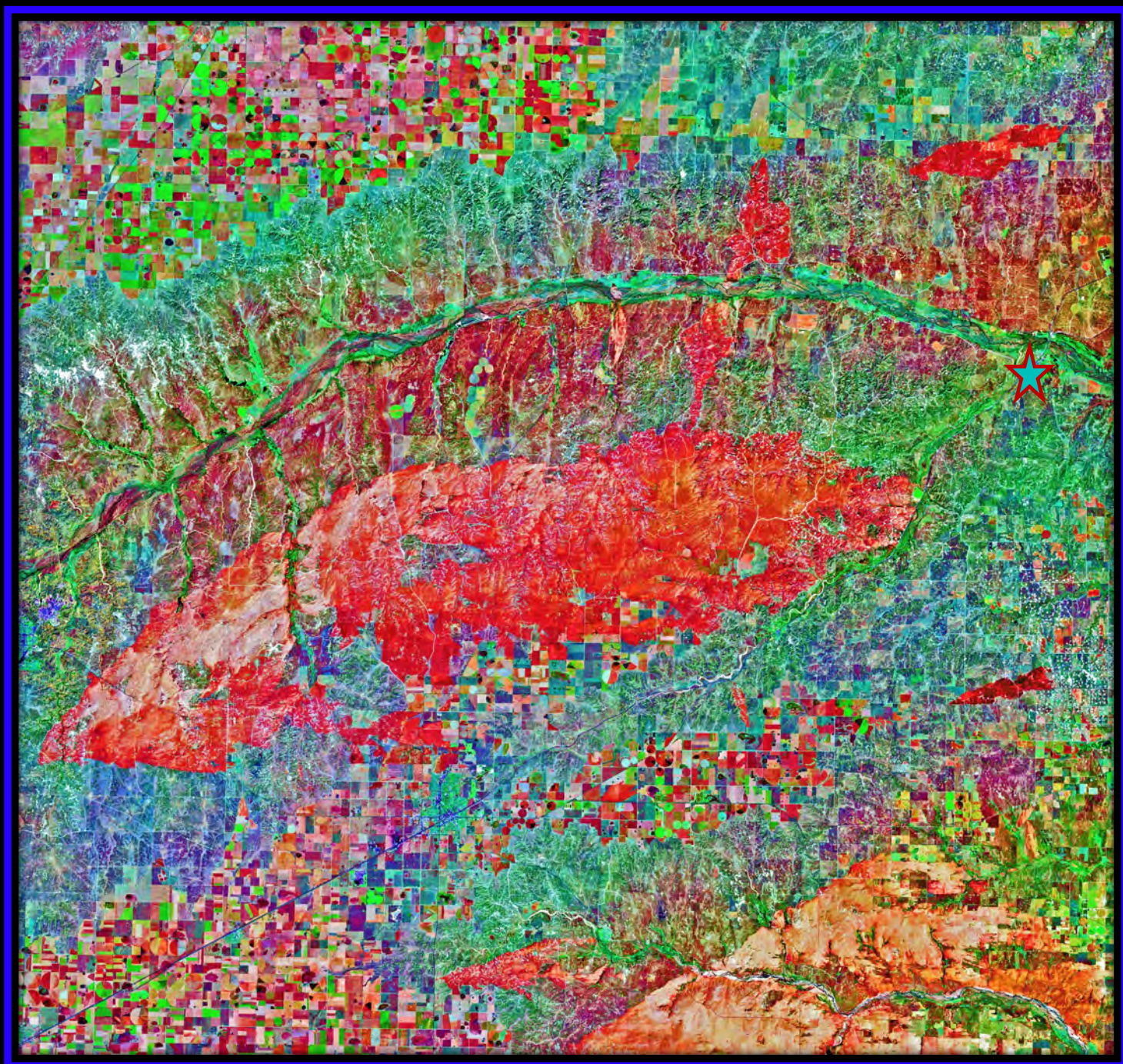
# High Plains Ecoregion



- Southern end of the Great Plains of the central U.S.
- Relatively level high plateau
- Playa lakes common
- Various sedimentary rock bedrock
- Soils vary by bedrock: sandy to clayey
- Rainfall 15-22 inches avg.
  - Seasonal
    - lowest in winter and mid-summer
    - highest in April or May and September or October
- Vegetation
  - Native shortgrasses
  - Shinnery oak on sandy lands
- Intensive irrigated agriculture predominates

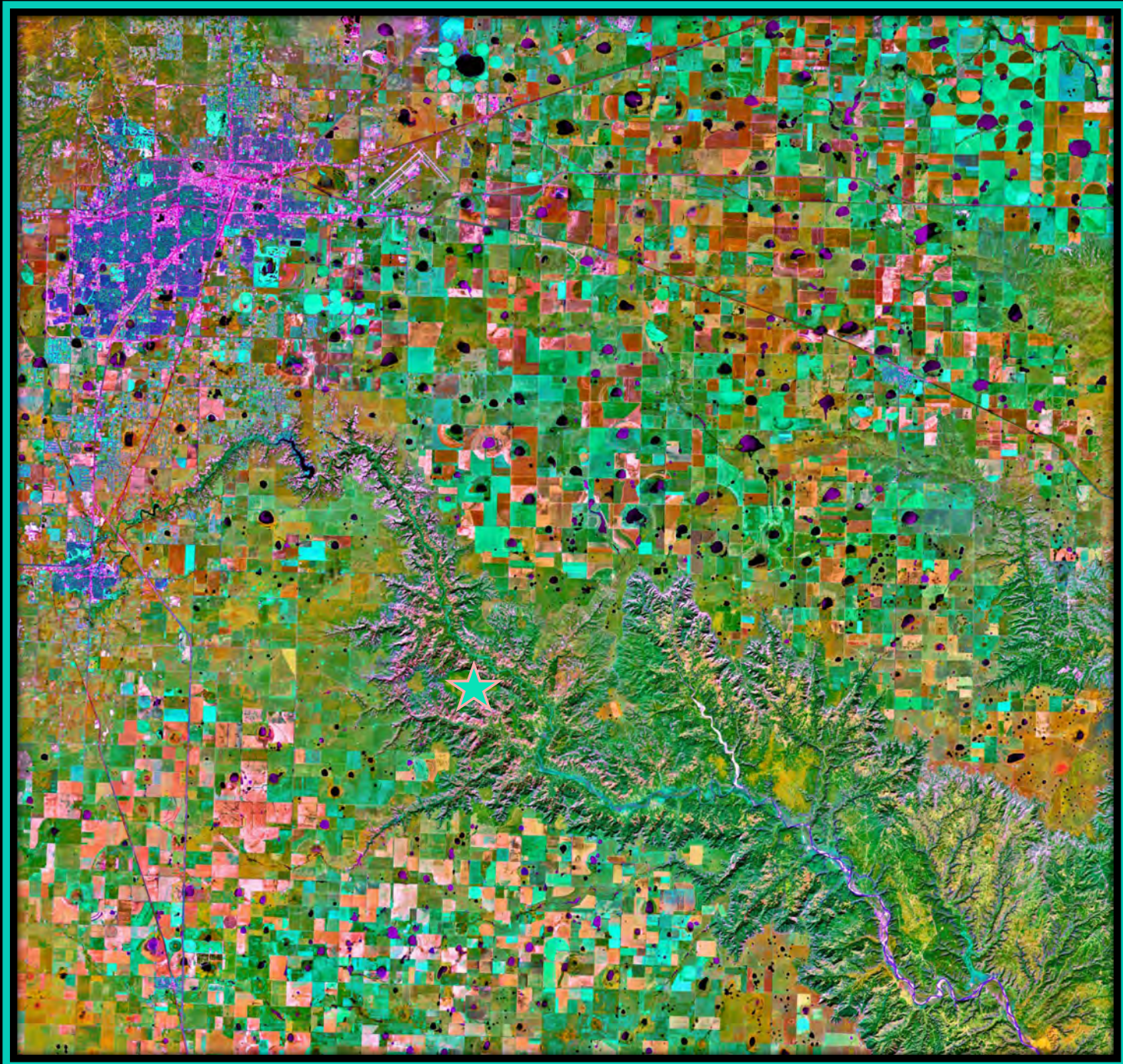






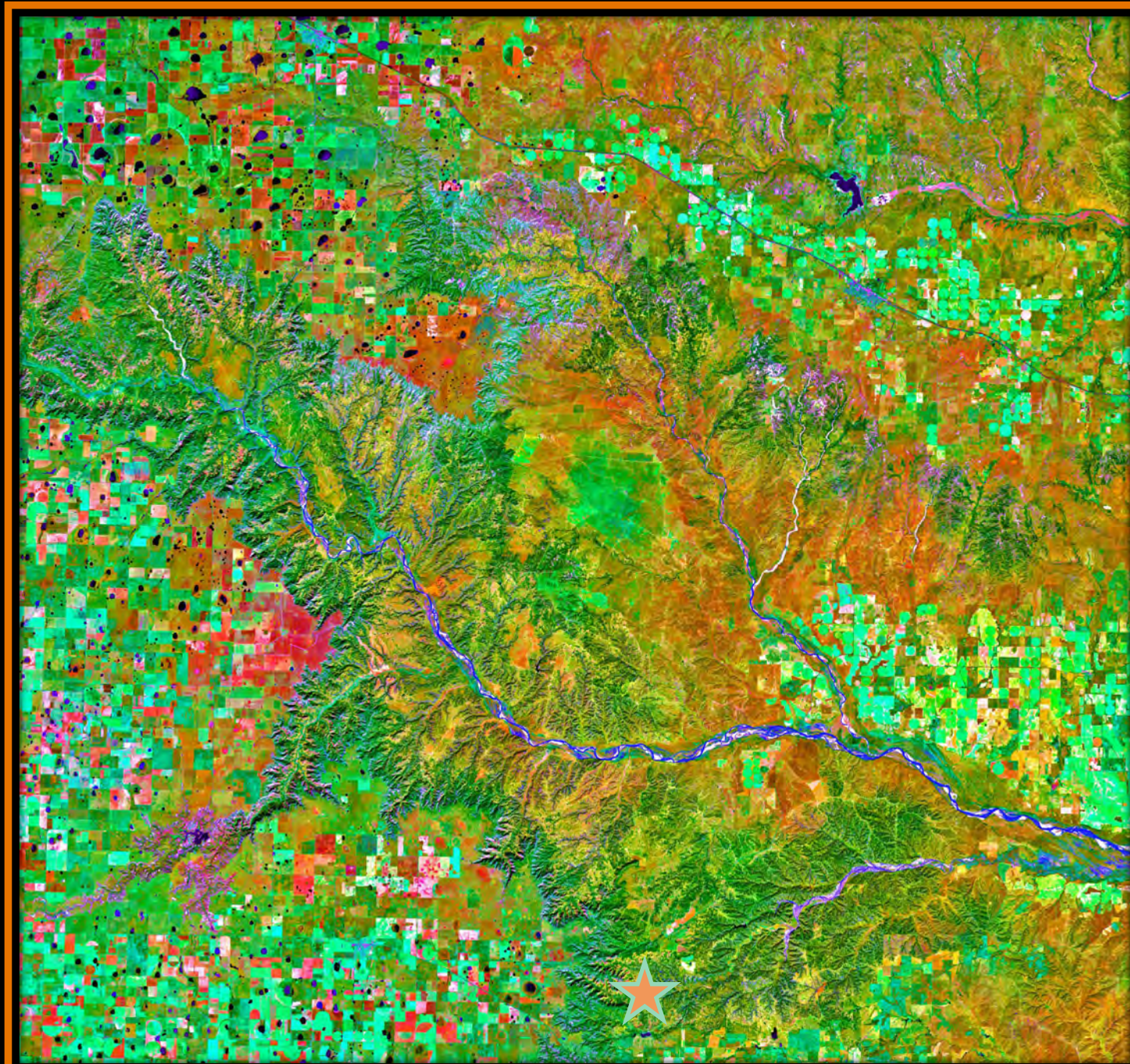
Canadian\* on the Canadian River was home to one of the first commercial rodeos in Texas (1888) and still hosts an annual Cowboy's Reunion. South of the river lies an extensive wildfire scar (red) from the March 2006 Borger Fire, which burned more than 450,000 acres of grassland. To the south lies the scar from March 2006 I-40 Fire (orange), which burned more than 350,000 acres of grassland. The fires killed 12 people and destroyed grazing land, livestock, and homes.





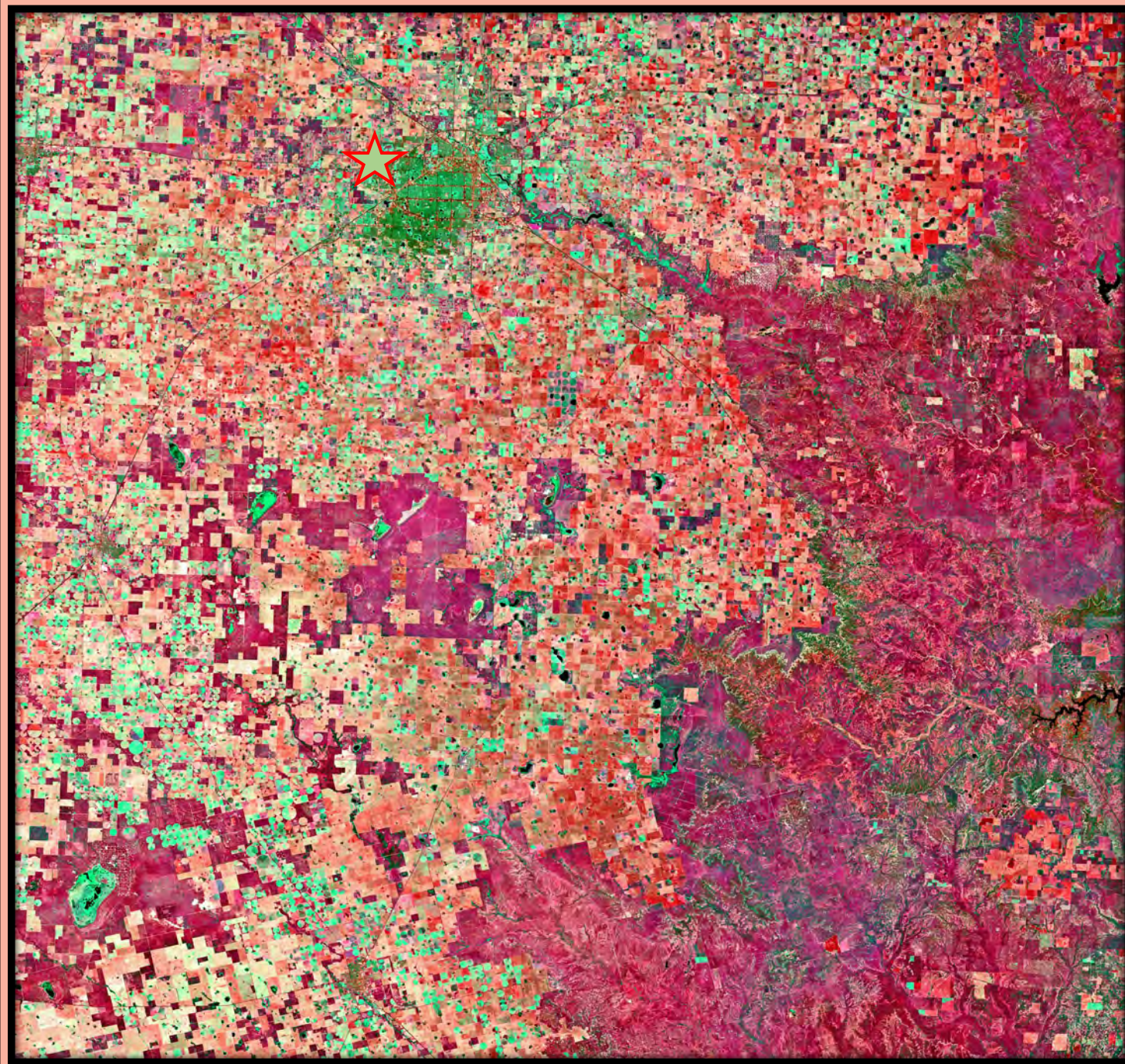
**Southeast of the city of Amarillo, Palo Duro Canyon State Park\* is in the second-largest canyon system in the United States; it includes areas in the high plateau and the valley of the Prairie Dog Town Fork of the Red River. The landscape on the plateau hosts irrigated farmland, dotted with small circular depressions that become shallow playa lakes during rainfall events. These recharge the Ogallala Aquifer, source of irrigation water.**





The Prairie Dog Town fork of the Red River cuts deeply into the landscape to host Caprock Canyon State Park\*. Surrounding flat, fertile plateau hosts broad swaths of irrigated farmland, dotted with small circular depressions that become shallow playa lakes following rainfall. The High Plains ecoregion merges into the Rolling Plains ecoregion in the Canyon and eastward.





The High Plains on the left merge towards the east with the Rolling Plains, across the erosional Caprock Escarpment. The city of Lubbock\* lies in the top center and hosts Texas Tech University. Cedar Lake in the bottom left is a slightly saline lake that hosts migrating birds and diverse local wildlife. It has also served as a water source for travelers for thousands of years.



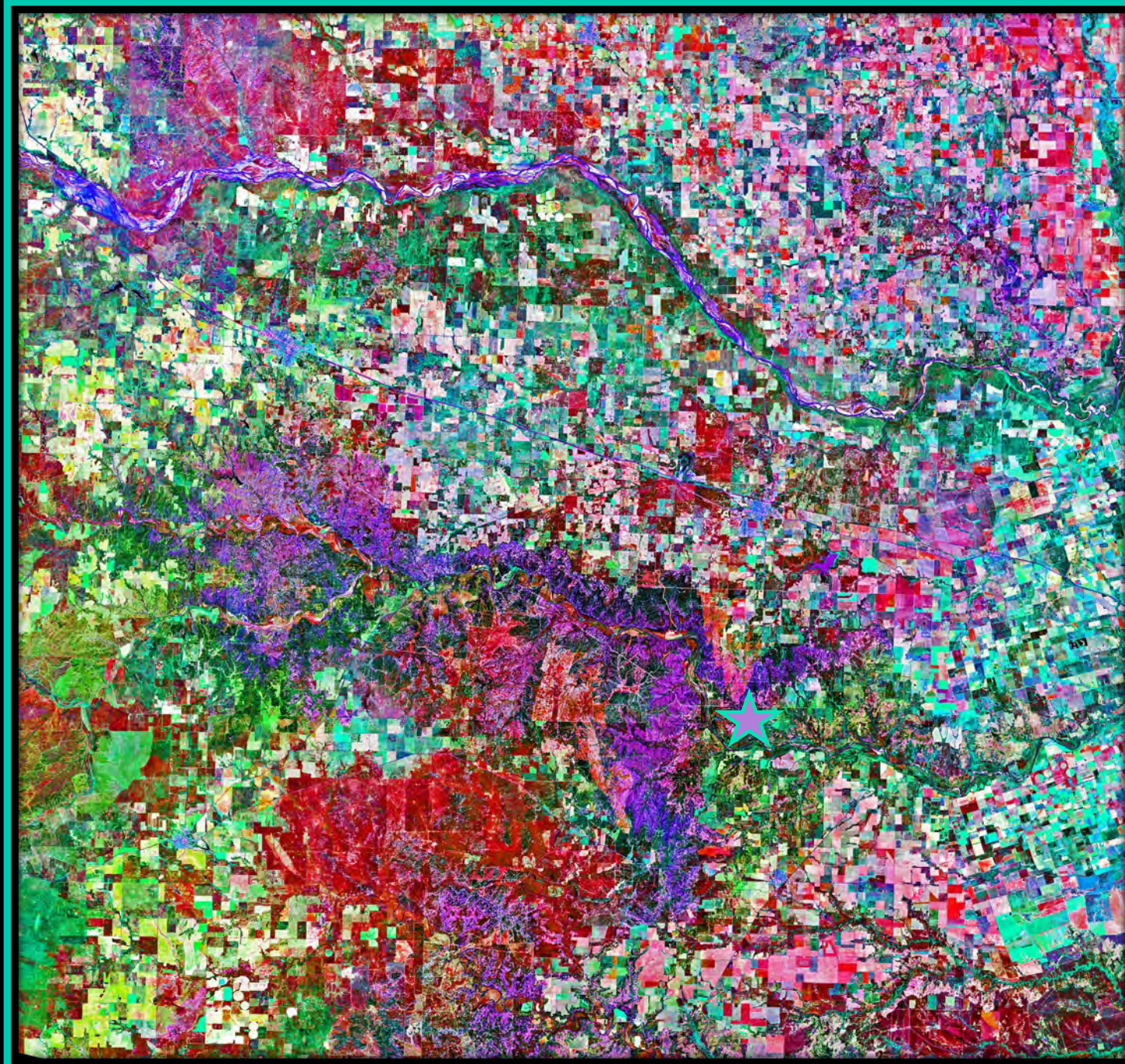
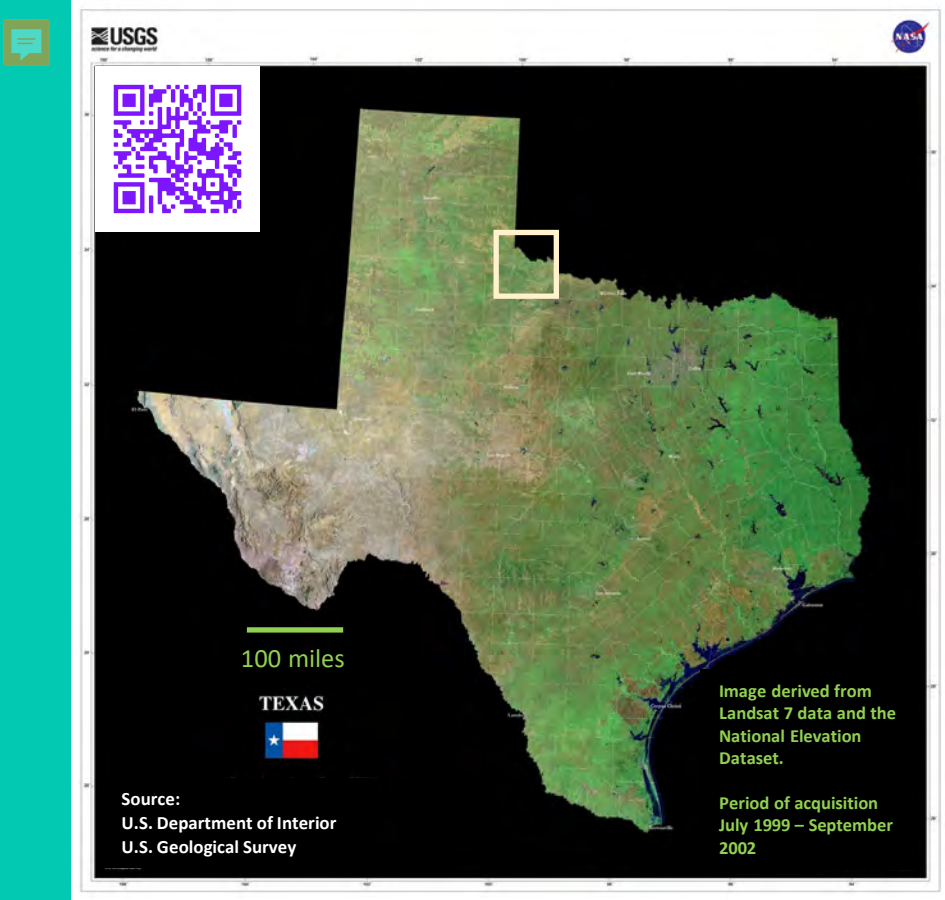


# Rolling Plains Ecoregion

- Rolling hills and flatlands
- Deep canyons
- Various sedimentary bedrock units
- Soils vary by bedrock: sandy to clayey
- Rainfall 20 – 28 inches avg.
- Dry summers
- Vegetation
  - Native tallgrasses
  - Short grasses and mesquite that invaded under uncontrolled grazing
- Currently a mesquite-shortgrass savannah
- Hardwoods in stream floodplains
- Juniper on steep slopes
- Crop and livestock production predominate





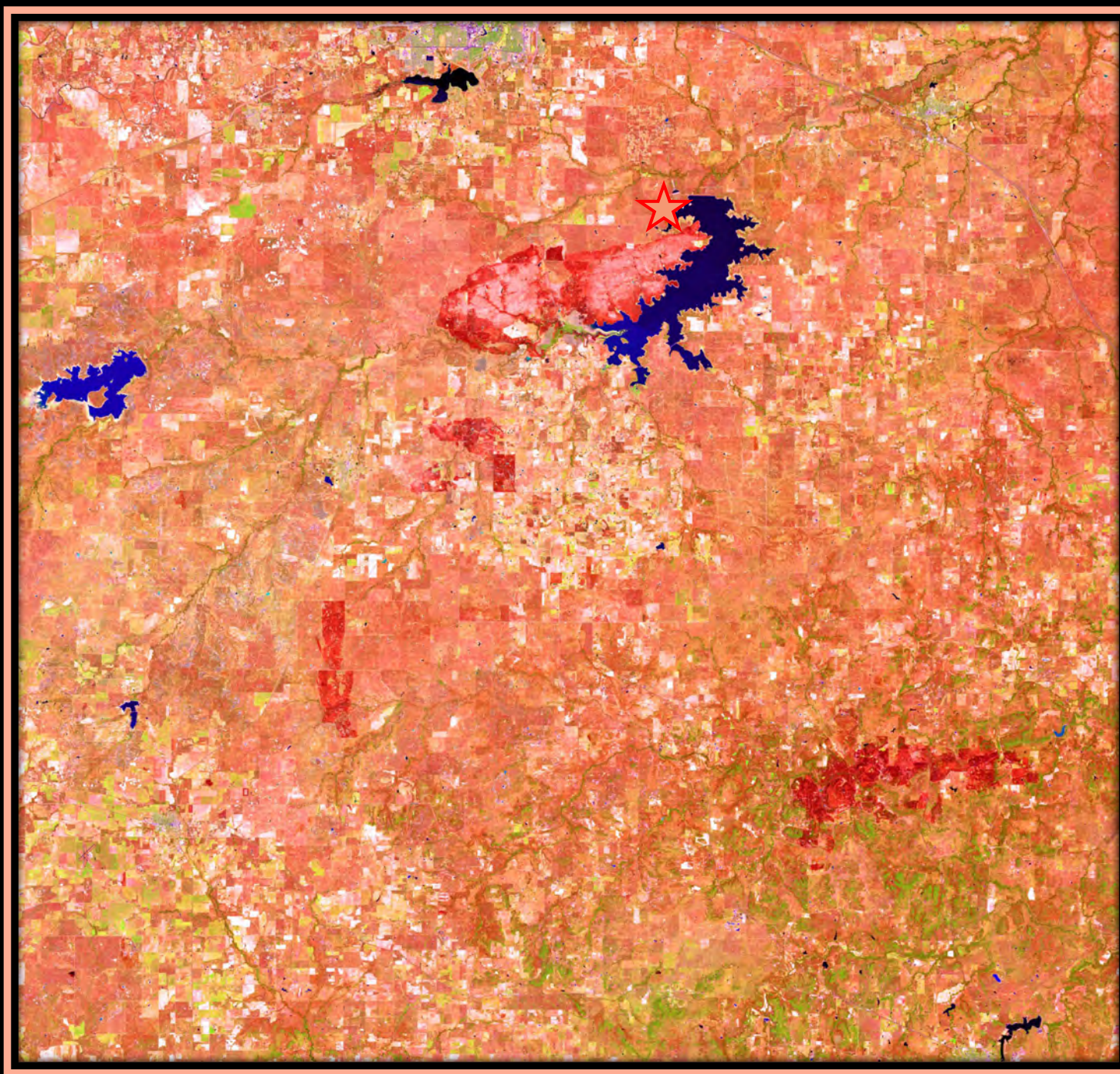


Copper Breaks State Park is an International Dark Sky Park; star parties are offered April through November, along with other night sky programs throughout the year. Northeast of the Park the Medicine Mounds comprise four prominent hills that served as a ceremonial and religious site for the Comanches. The Red River, border between Texas and Oklahoma, traverses the image in the upper quarter.



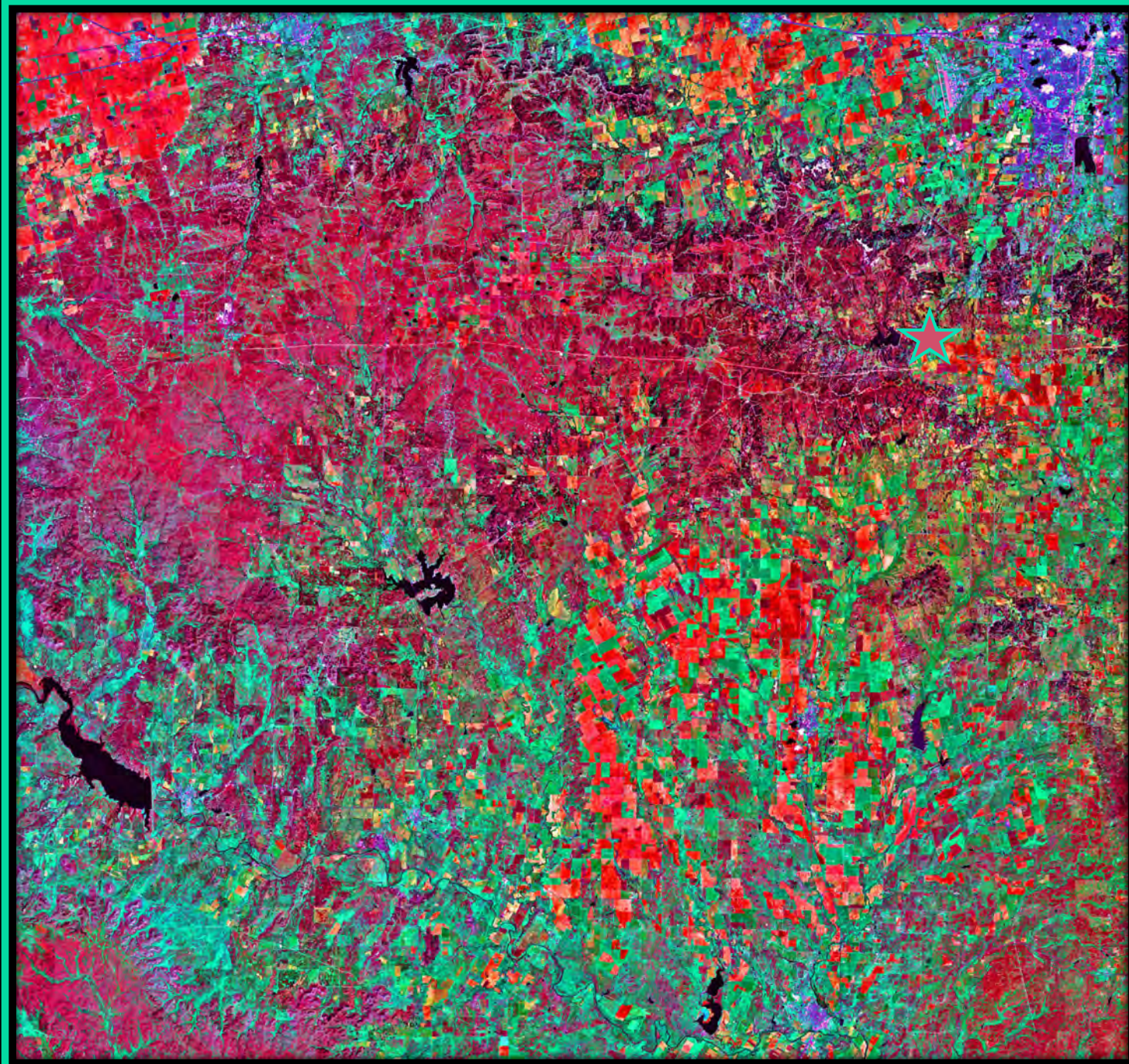
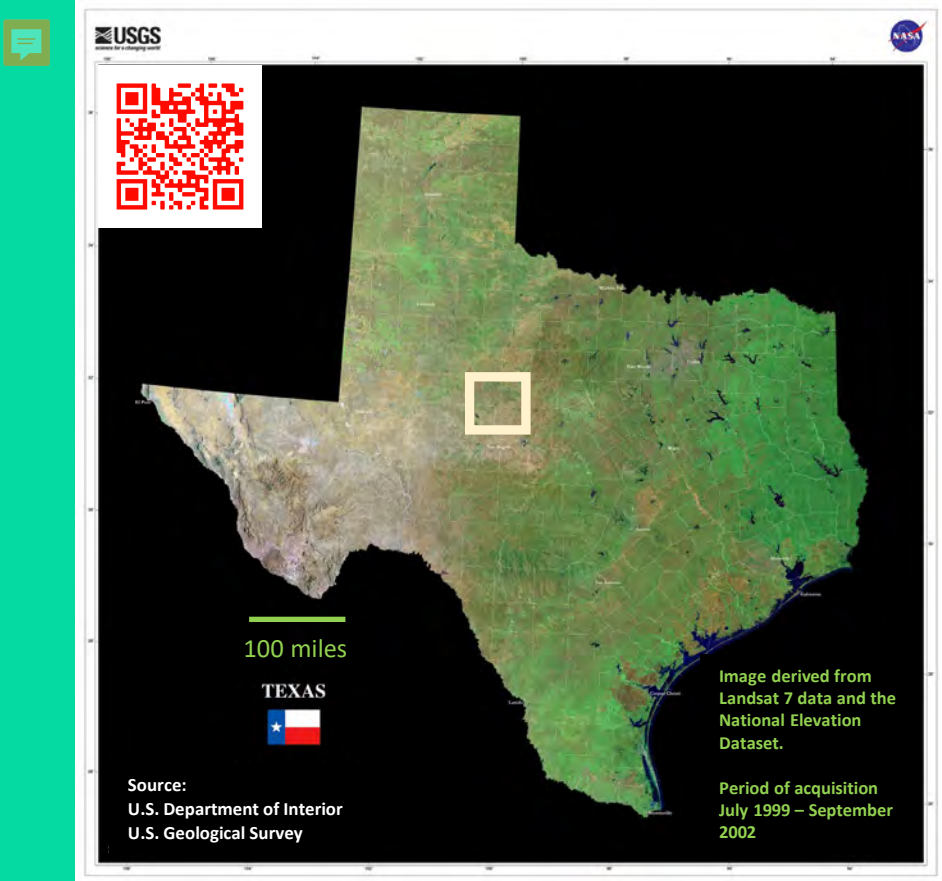


USGS



**Multiple burn scars from drought-related fires dominate this scene; the largest shows the burn that burned out at the edge of the Lake Arrowhead State Park\* reservoir. Within the Rolling Plains ecoregion, formerly predominant grasslands have converted to mesquite savannah due to heavy grazing. Restored grasslands within the park host both 273 migratory birds and Monarch butterflies.**



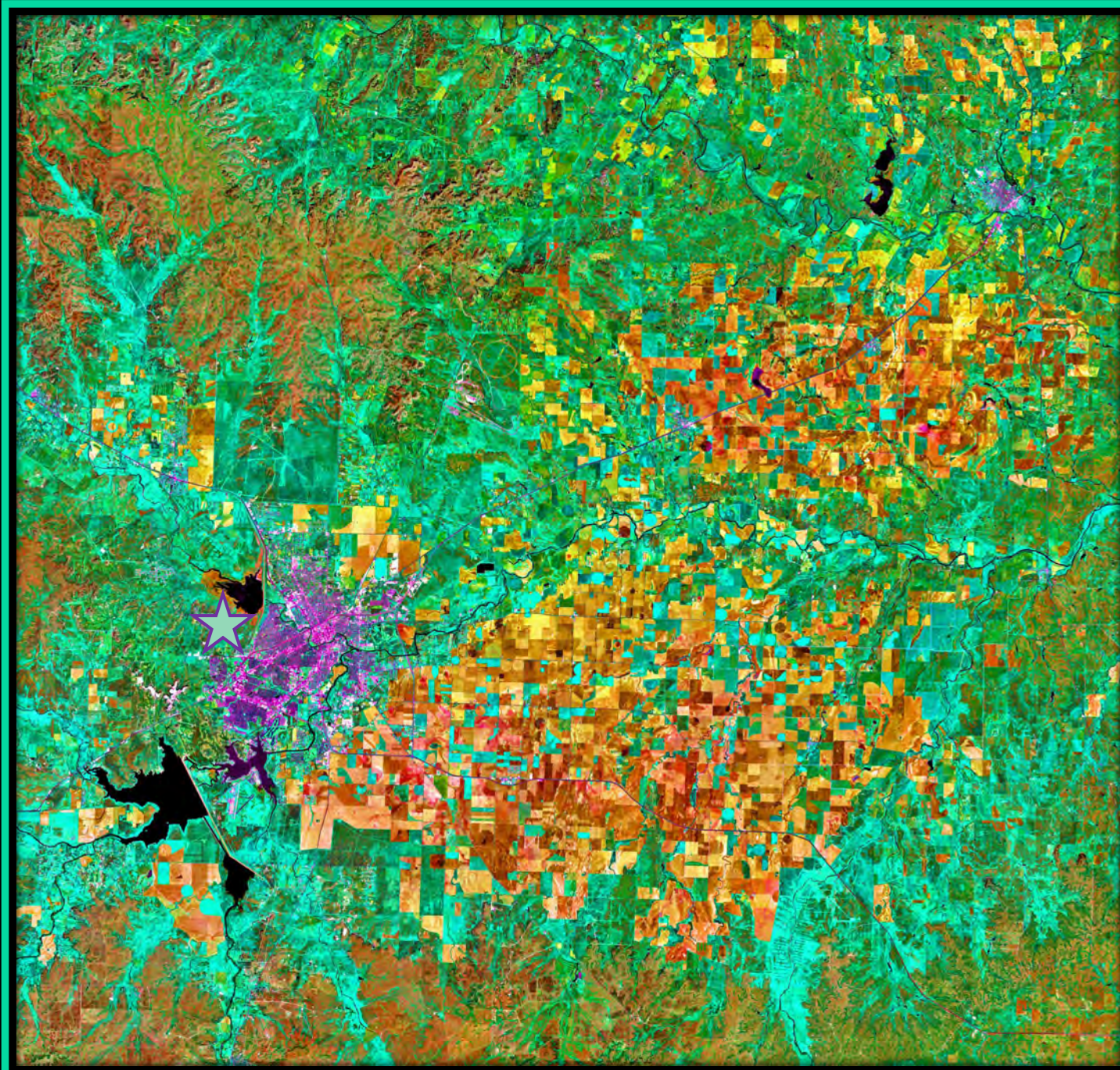


The Callahan Divide dominates the upper one-third of this scene, and now hosts numerous wind farms. Surrounding unplanted agricultural fields are red; those with cover crops are green. Abilene State Park\*, embraced by the Eastern arms of the Divide, was a seasonal campground for Comanche and Apache Native American tribes. The Rolling Plains and Edwards Plateau ecoregions converge here. Abilene lies in the upper right corner.

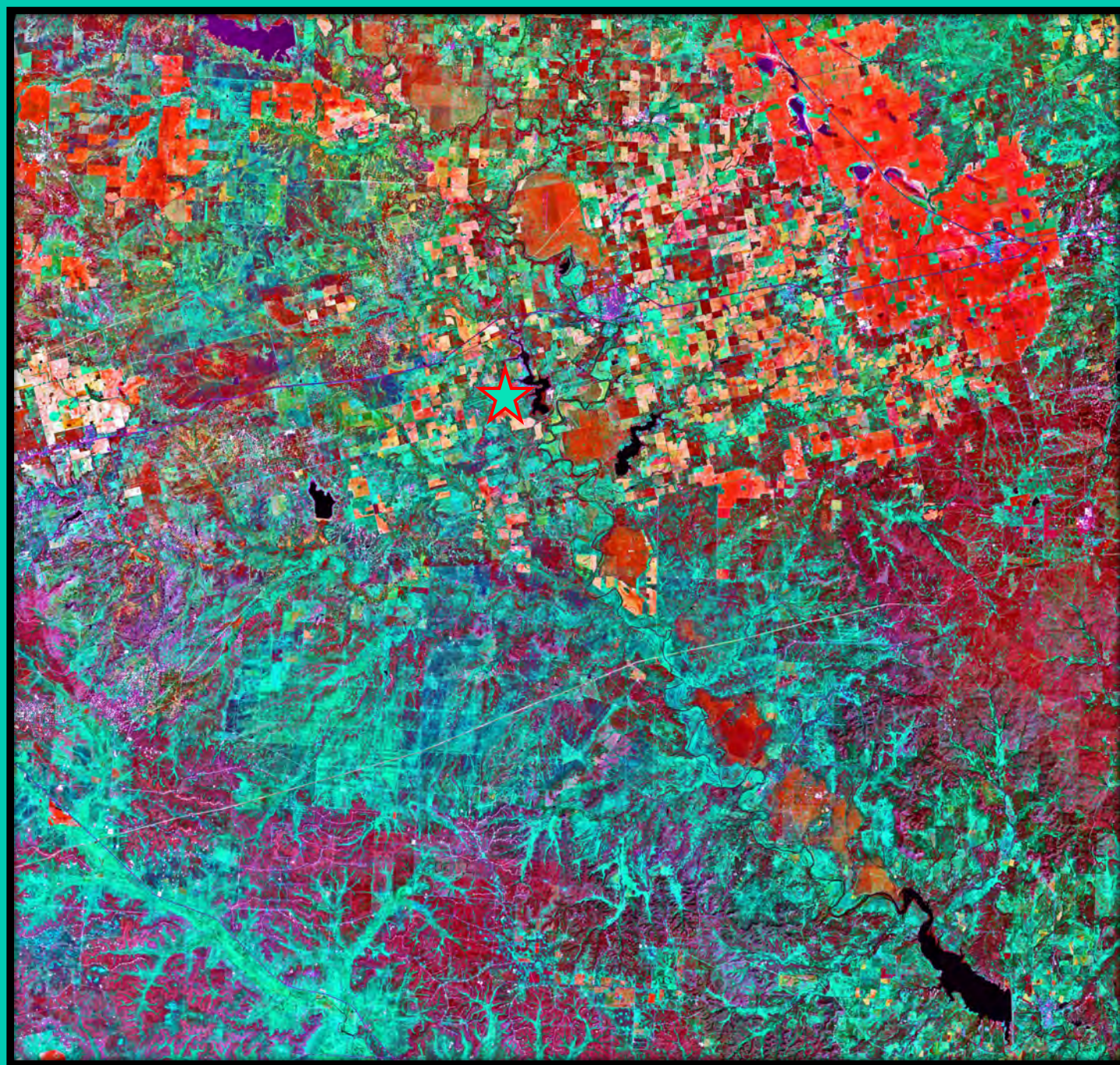
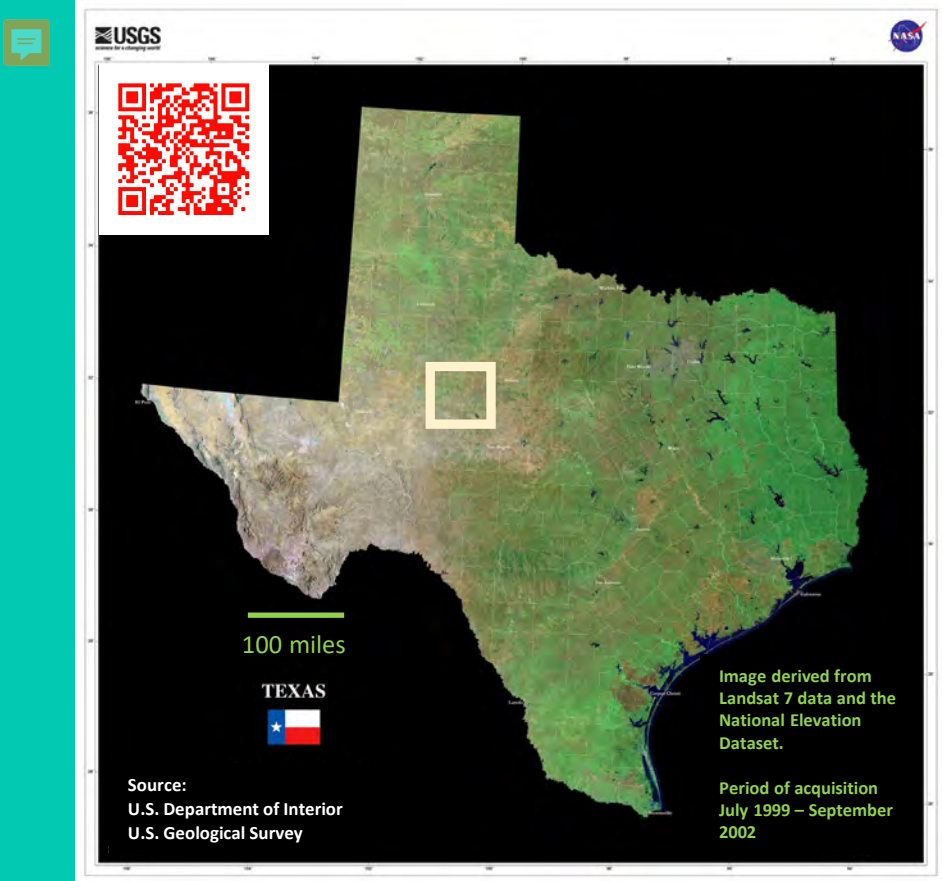




**San Angelo State Park\* lies at the convergence of the Edwards Plateau with the Trans-Pecos, High Plains, and Rolling Plains. Biodiversity is high with species from all four ecoregions. Fallow agricultural fields (shades of orange and red) are surrounded by converging wooded valleys (turquoise) eroded into flat-lying plains of the Edwards Plateau ecoregion.**

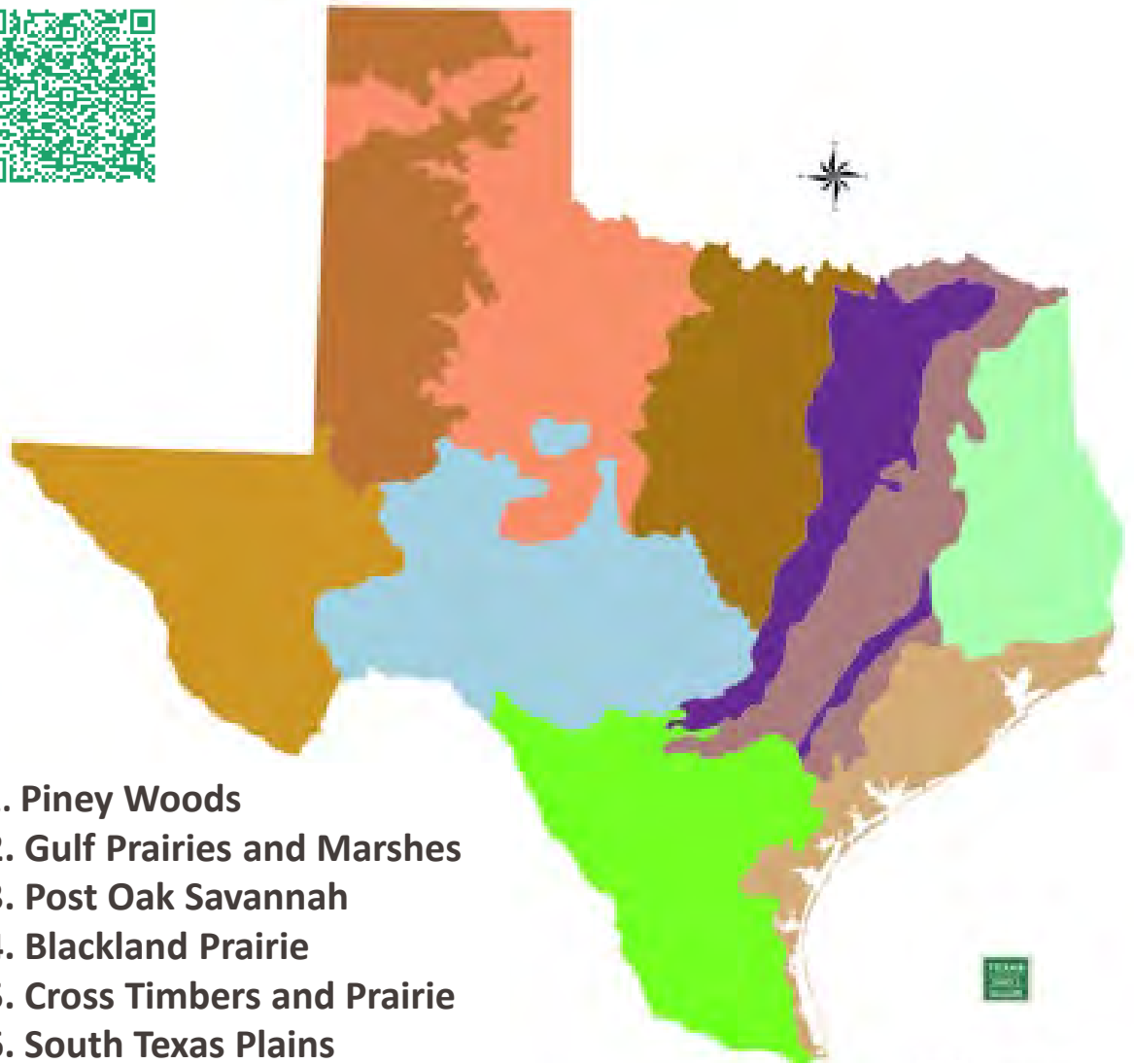






Lake Colorado City State Park's\* reservoir originally provided cooling for the local power plant; it serves recreational purposes now. The area was originally an open grassland, part of the Rolling Plains Ecoregion. Restoration efforts are under way within the Park to return the land to its original state, through the removal of mesquite trees.





1. Piney Woods
2. Gulf Prairies and Marshes
3. Post Oak Savannah
4. Blackland Prairie
5. Cross Timbers and Prairie
6. South Texas Plains
7. Edwards Plateau
8. Rolling Plains
9. High Plains
10. Trans-Pecos

Source: Gould, F.W., Hoffman, G.O., and Rechenthin, C.A. 1960. Vegetational areas of Texas, Texas A&M University. Texas Agricultural Experiment Station, Leaflet No. 492.

# Texas as Art 2022

## Ecoregions of Texas Panhandle and West Texas

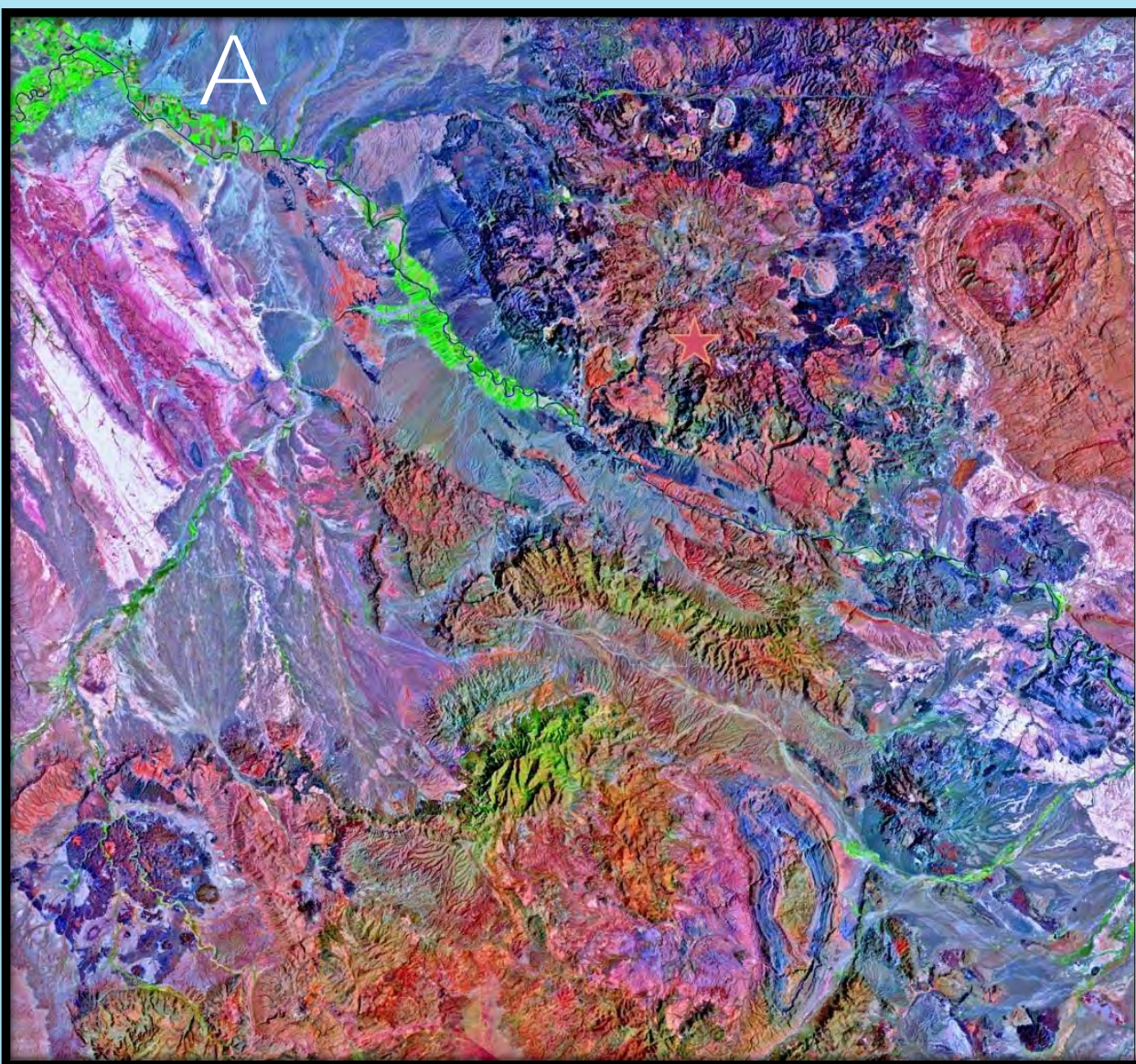
Developed by TexasView with support from Grant Number G14AP00002 from the Department of the Interior, United States Geological Survey to AmericaView



# Which is Which?

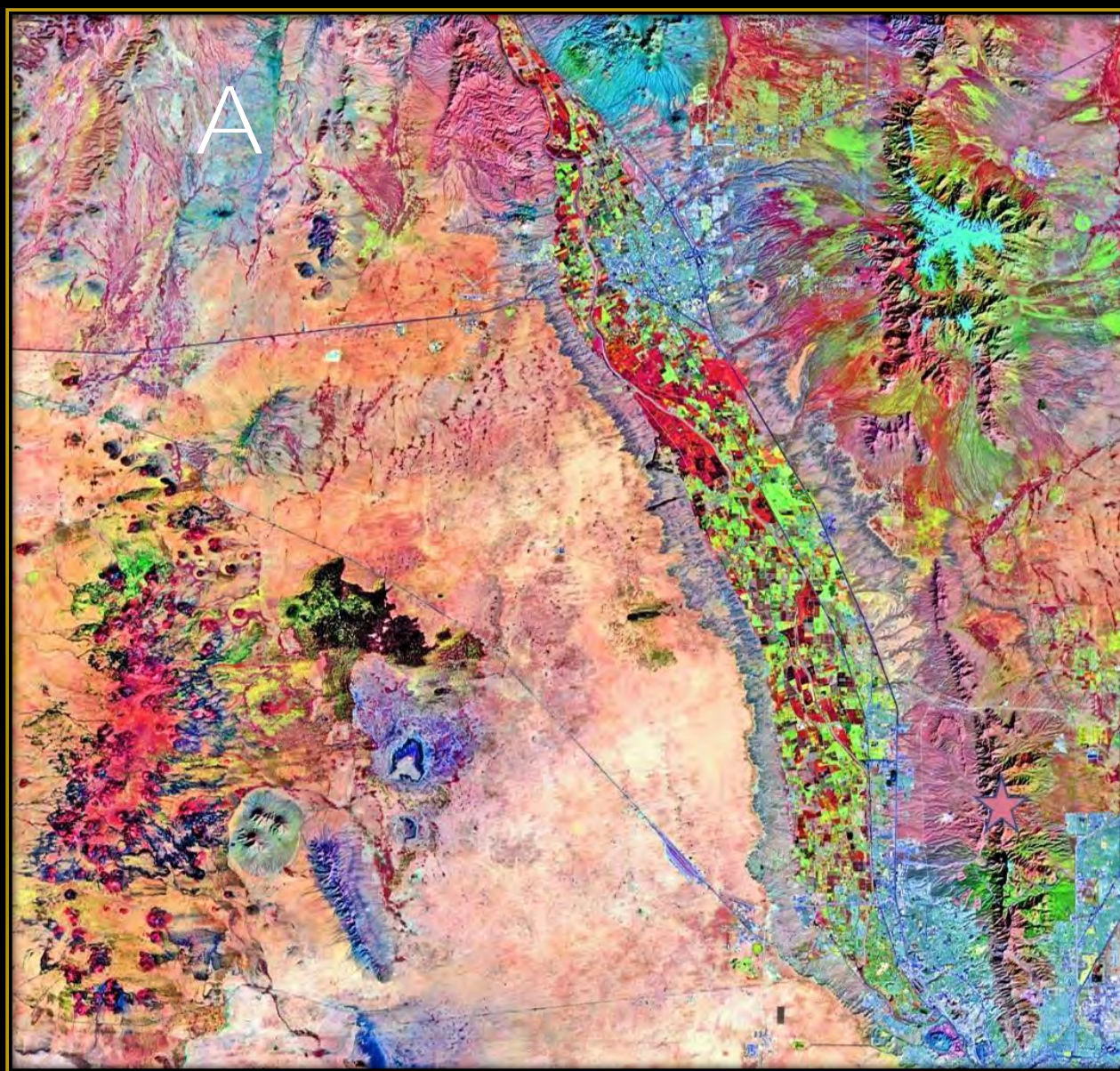
## SECTION 4.2





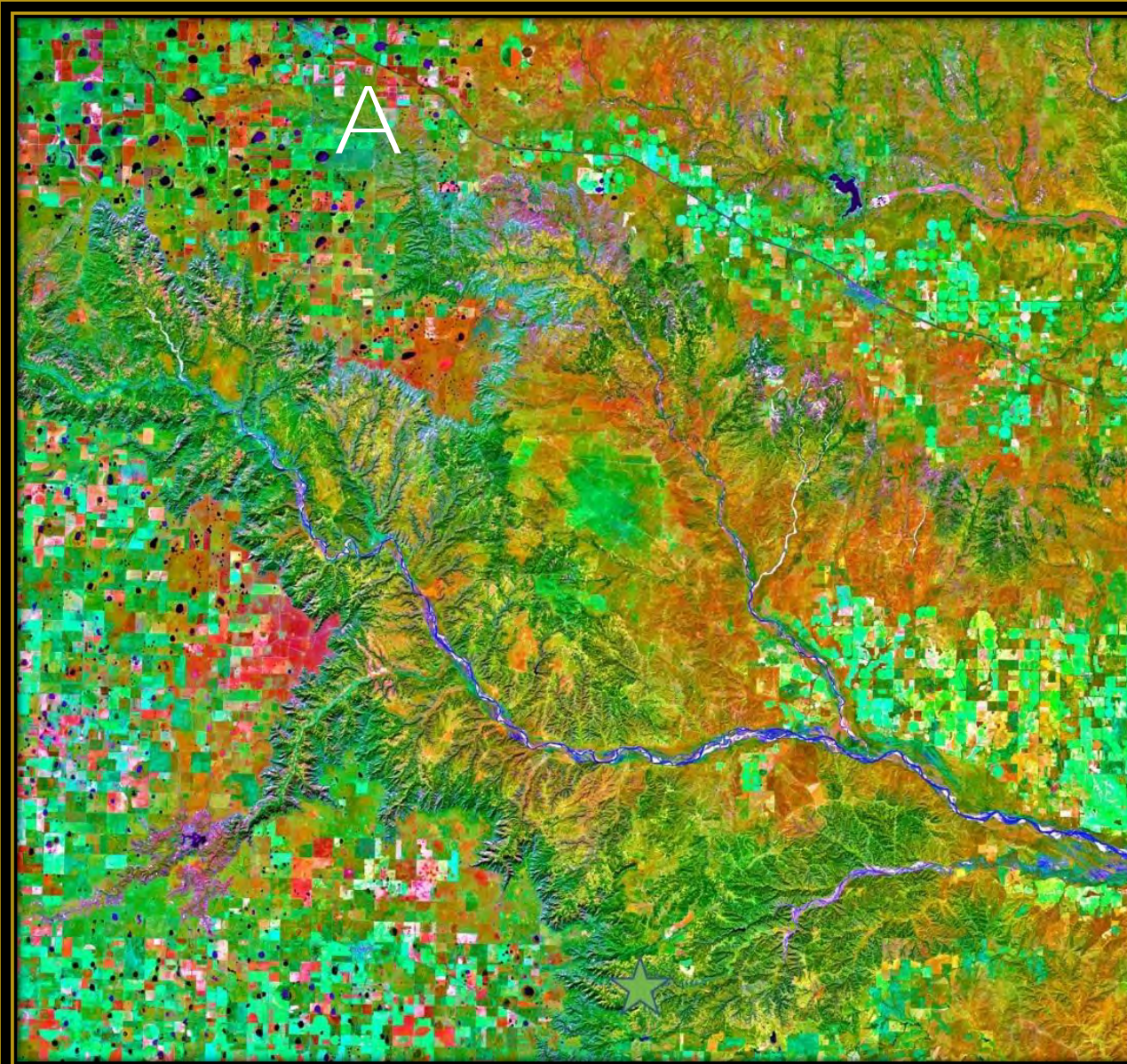
1. Which image shows scattered playa lakes filled with water, on a flat plateau dissected by a deep canyon?





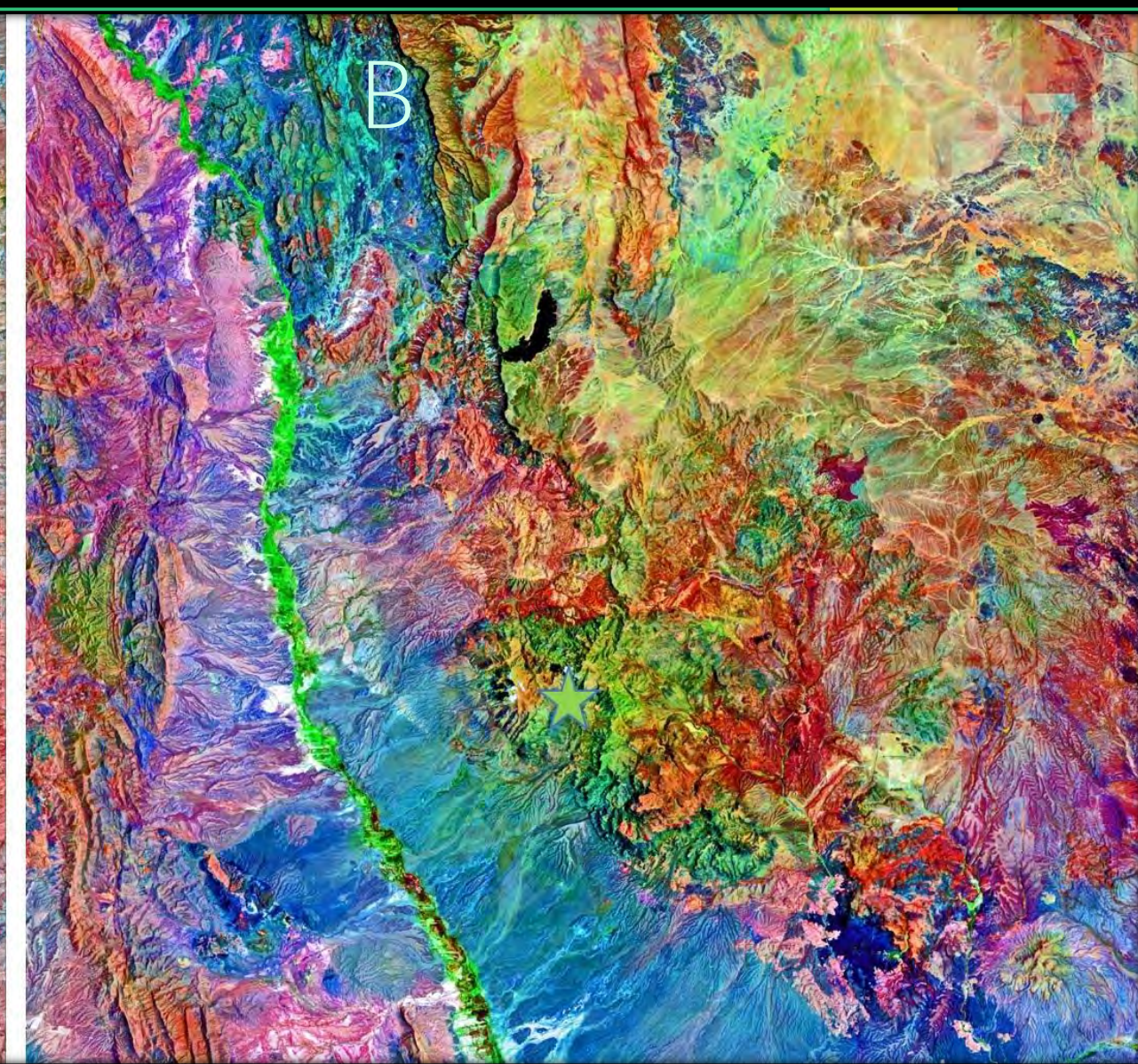
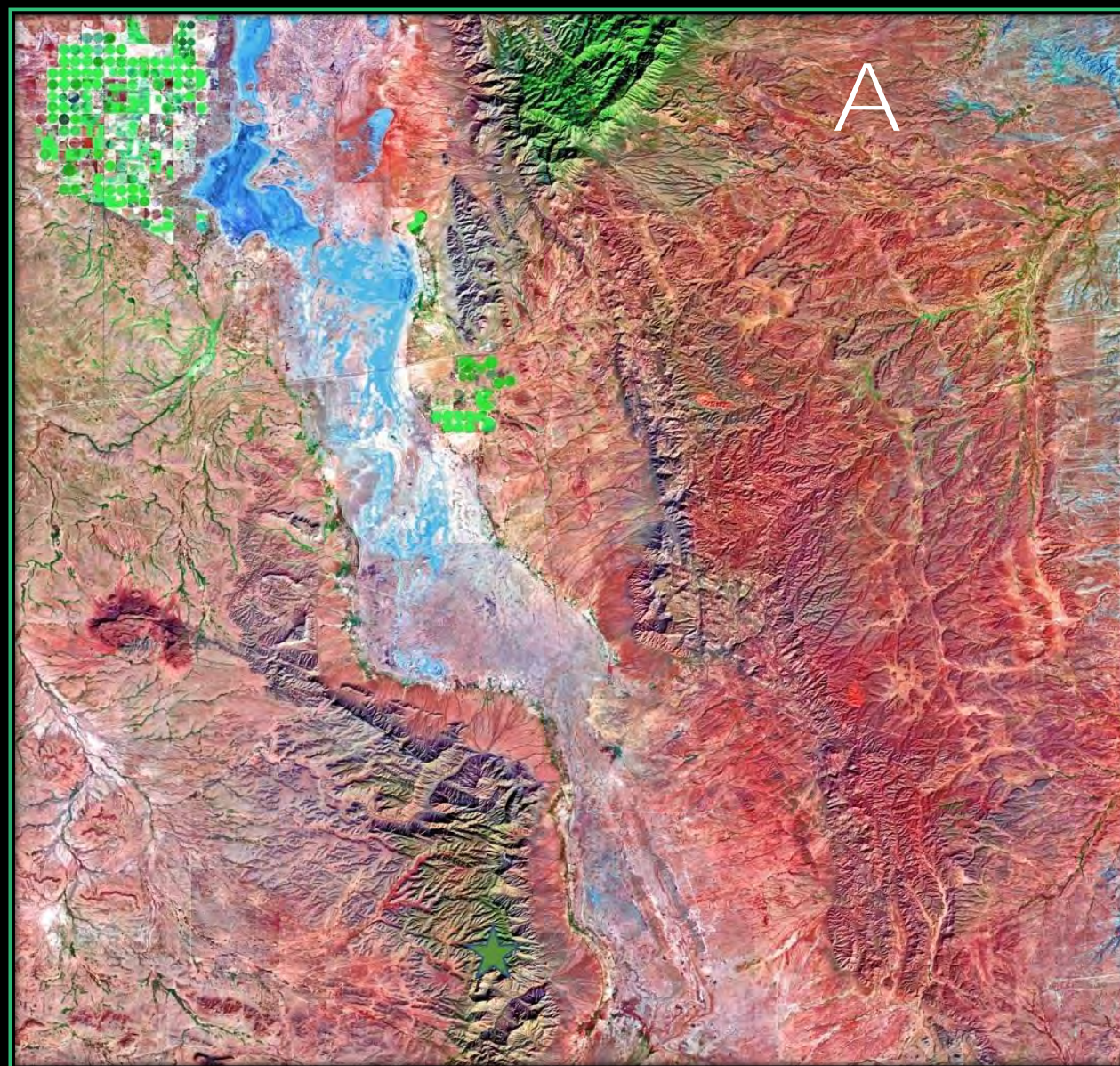
2. Which image shows multiple volcanic vents and an extensive lava flow?





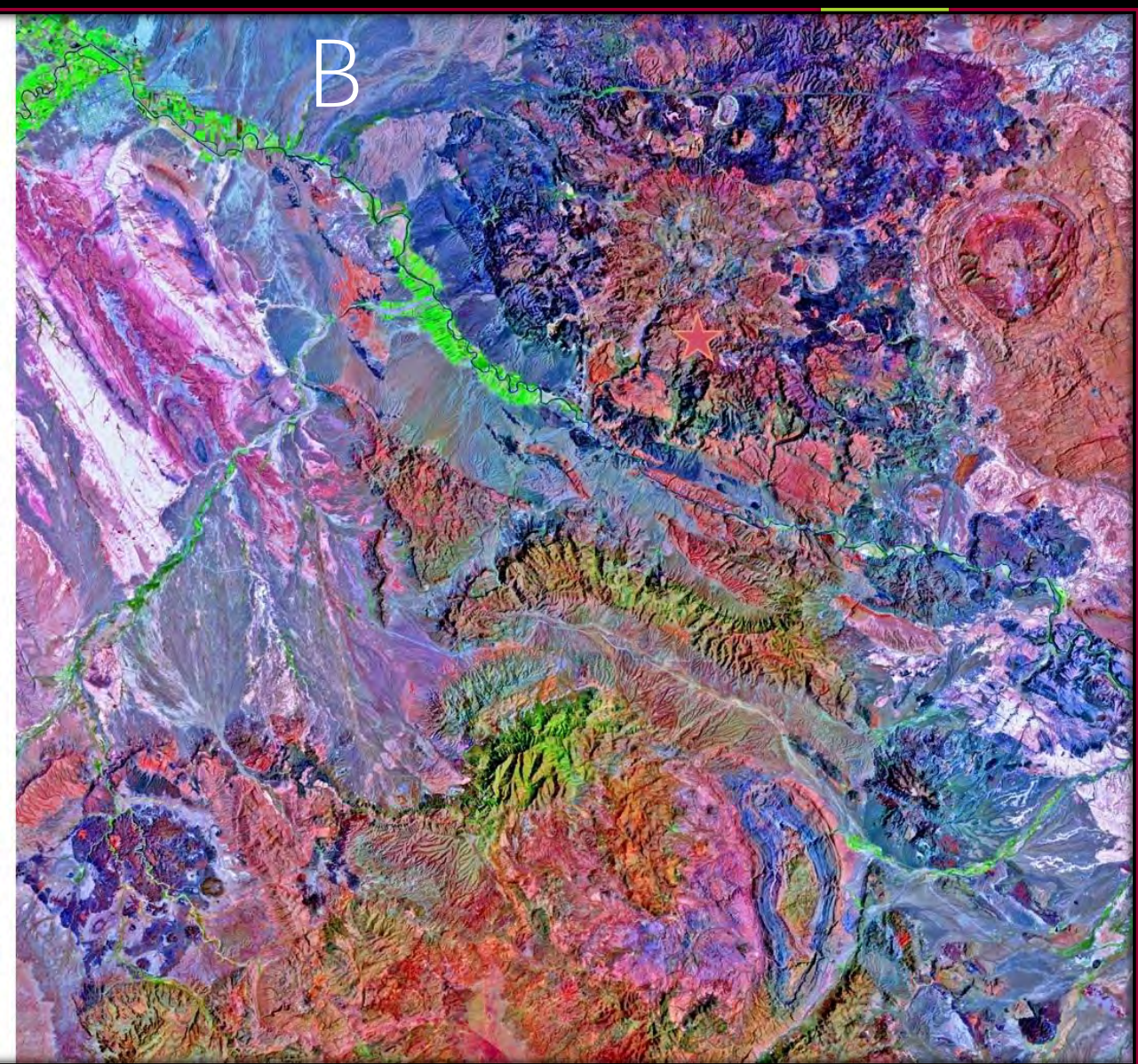
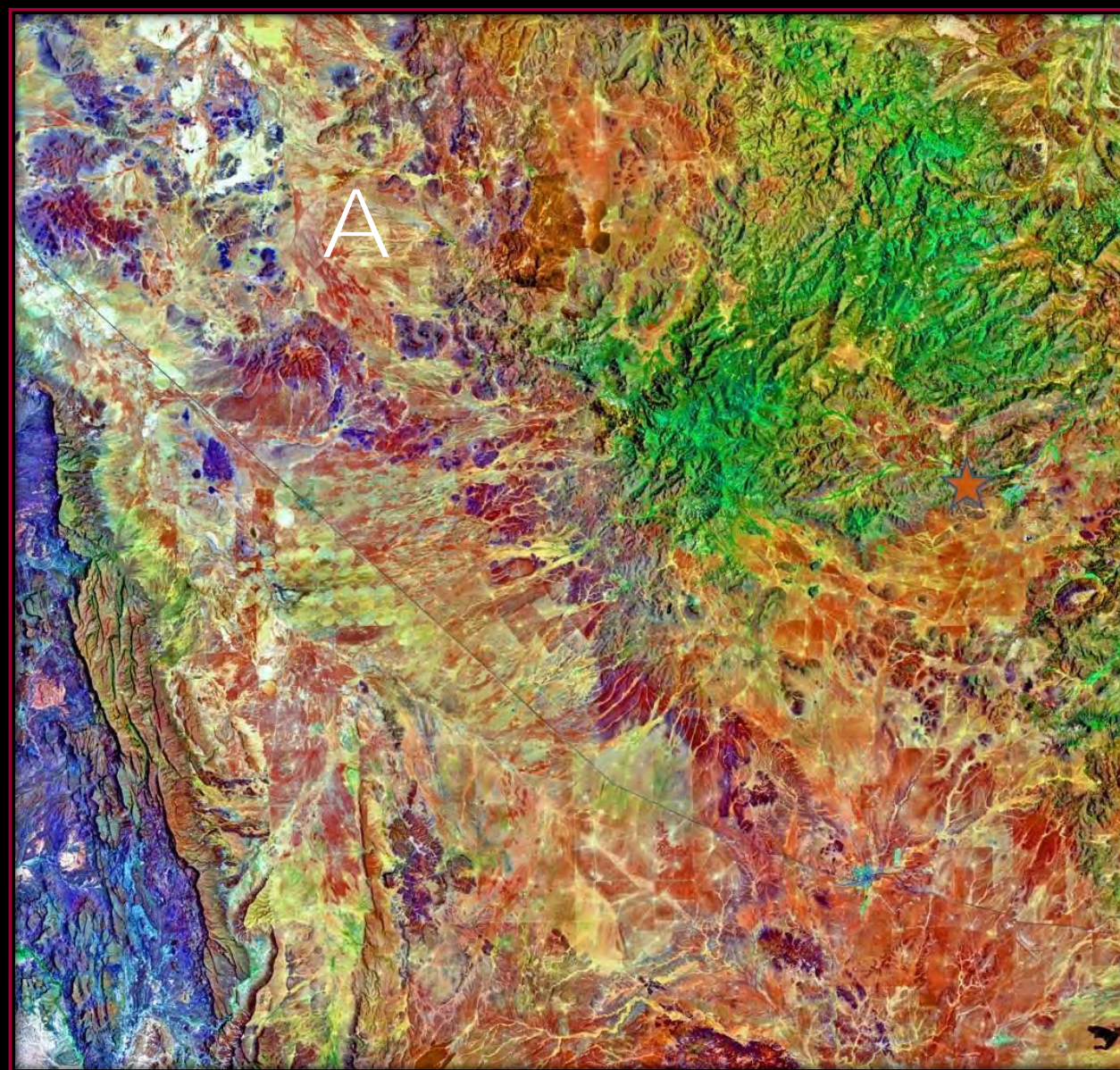
3. Which image shows extensive petroleum field development extending into two cities in an arid region?





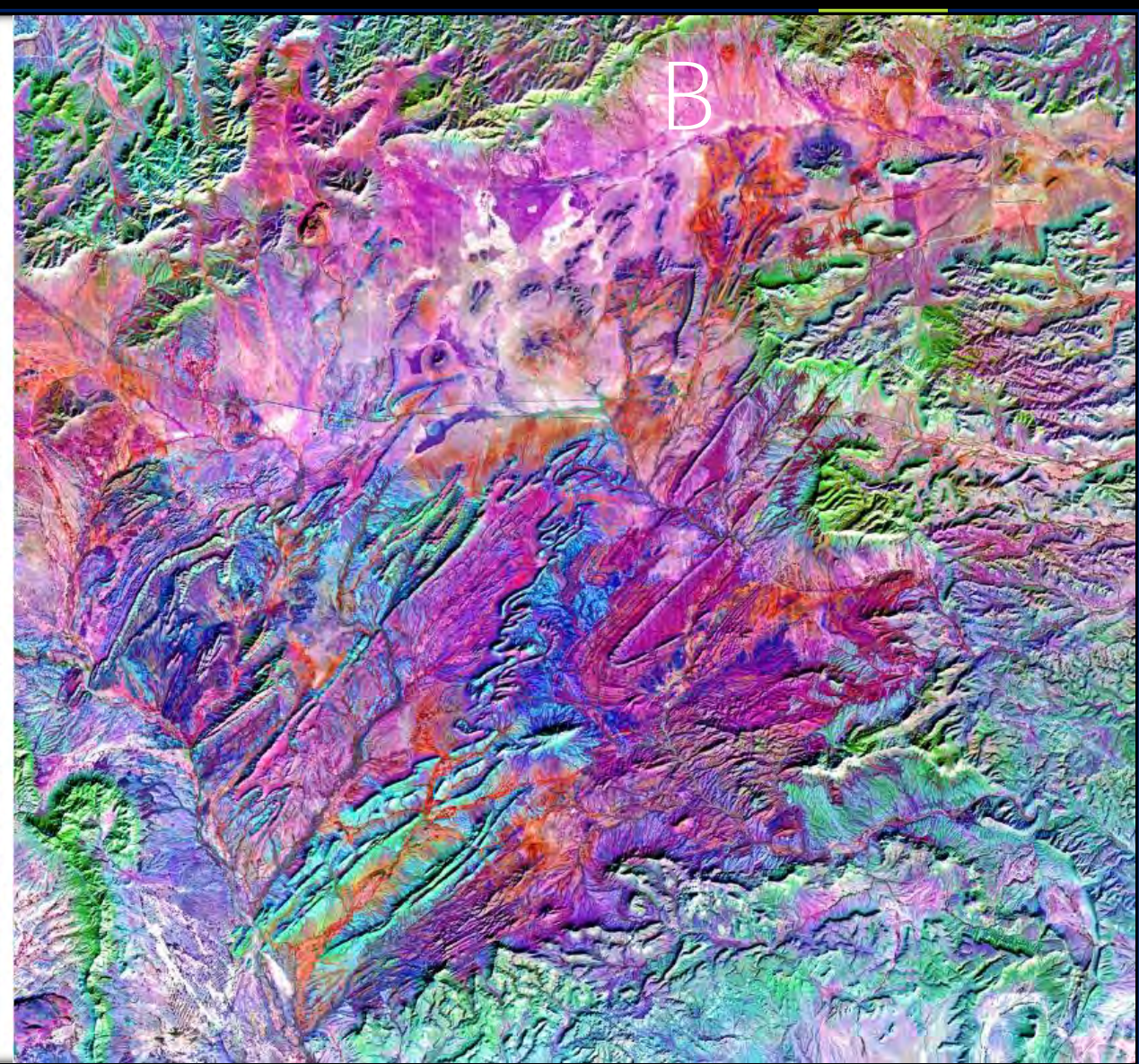
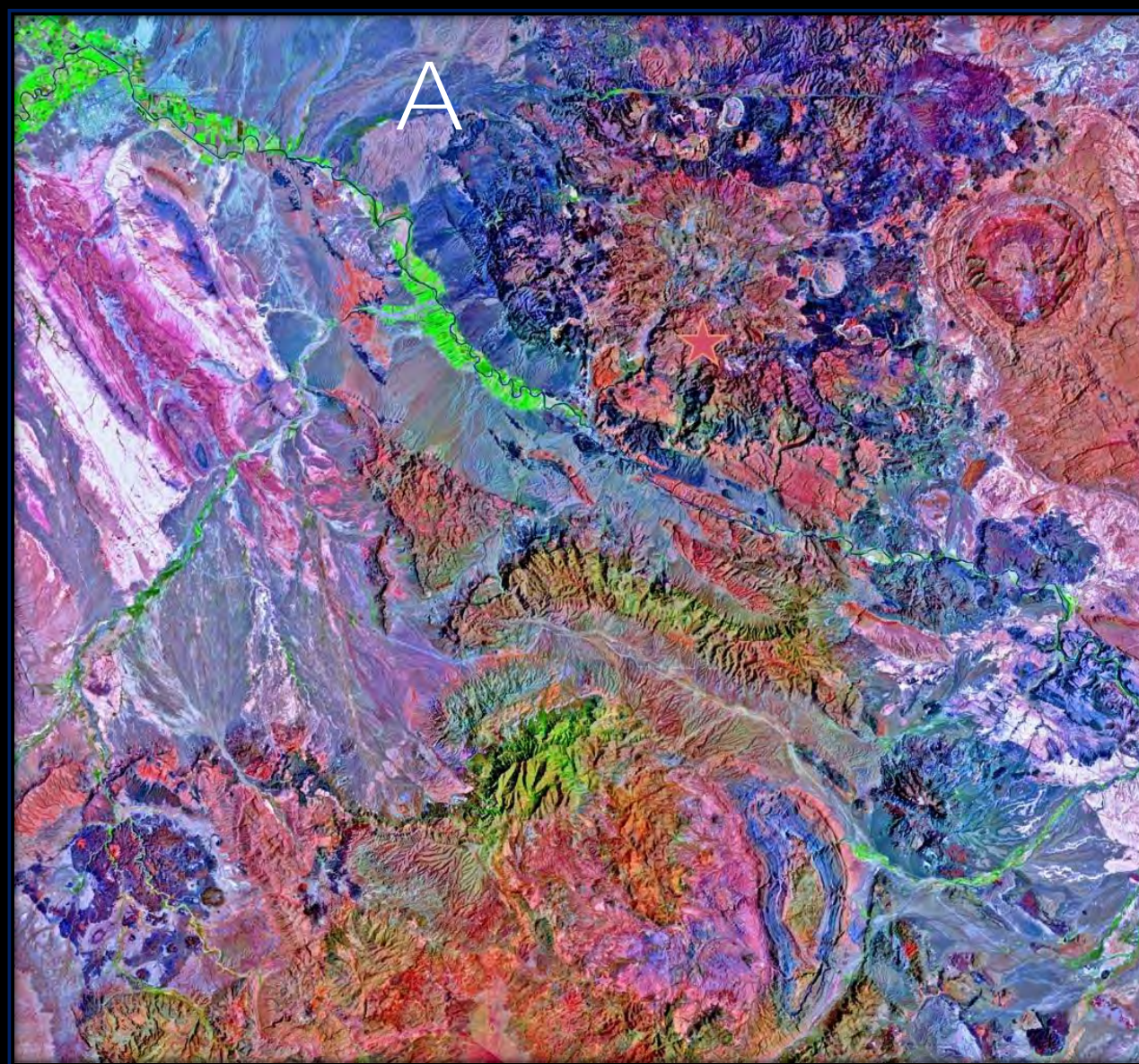
4. Which image shows multi-colored alluvial fans developing along mountains parallel to a river floodplain?





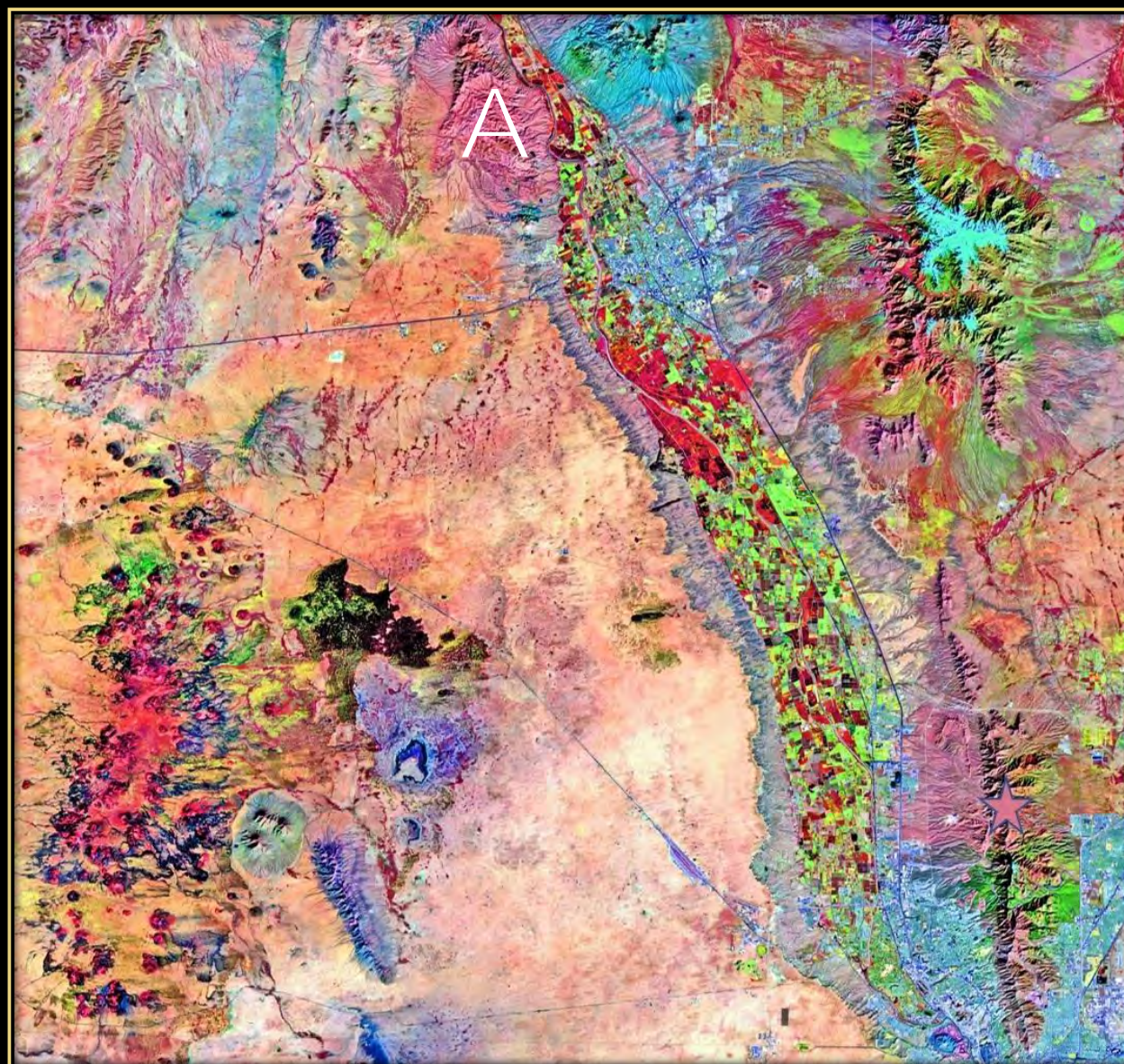
5. Which image shows an eroded batholith and multiple elongated folds?





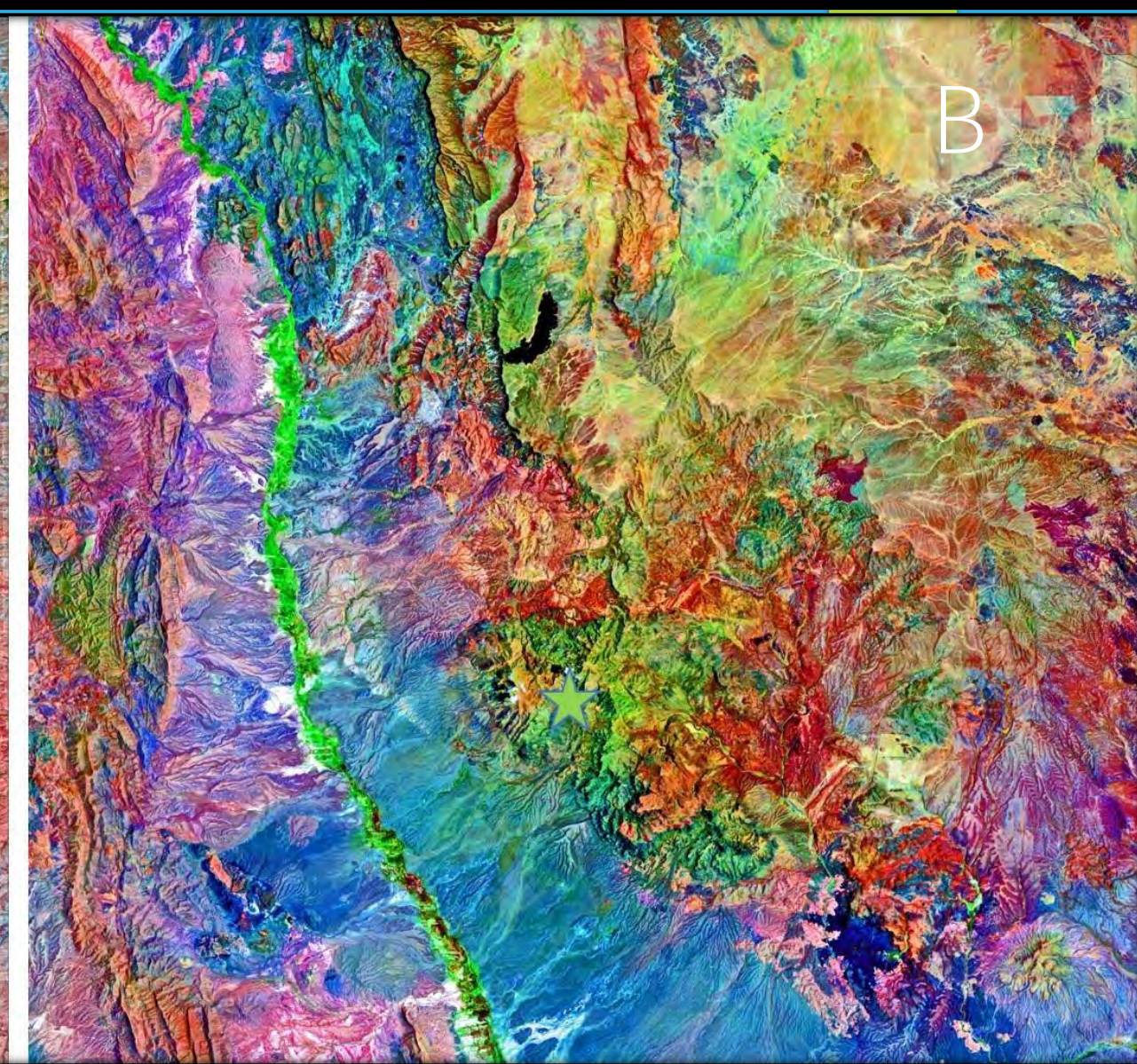
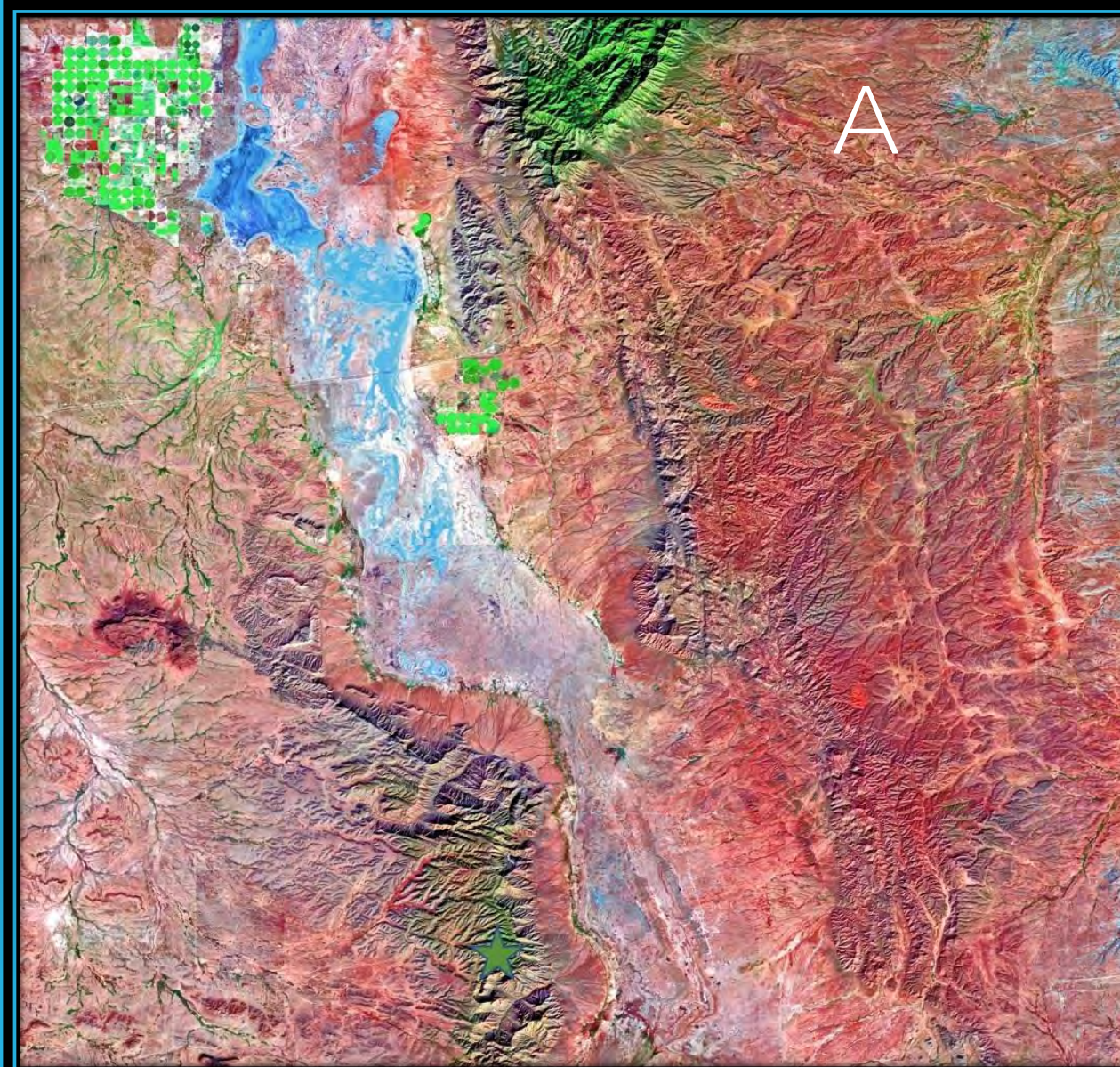
6. Which image shows an intensely-folded mountain belt bordered by flat-lying rock units?





7. Which image shows a deep canyon incised into a flat, intensively-farmed plateau?





**8.** Which image shows an angular structural depression partially filled with water, surrounded by block uplifted mountains?