

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

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Section 3. Activities and Games

3.1 WHICH IS WHICH? IMAGERY KEY

The lessons and the activities in Which is Which are designed to introduce students to landforms, land cover, and human infrastructure as it appears on satellite imagery. I have used a scaffolded approach in this book, and Which is Which does not address scale or geographic grids. Later lessons will address these issues. I have used state-managed lands as the anchors for the lessons and activities labeled as TPWD images, including Texas' State Parks, Historic Areas, and Natural Areas. I have also included one National Seashore. For the lessons and activities labeled EO, I have used imagery of sites in Texas from the NASA Earth Observatory web site. This document provides links to the source of the images for all of the Which is Which lessons and activities. TPWD imagery was captured from the Texas Watershed Viewer or the Historical Imagery Viewer:

- <https://tpwd.maps.arcgis.com/apps/Viewer/index.html?appid=2b3604bf9ced441a98c500763b8b1048>
- [Historical Imagery Viewer \(arcgis.com\)](#)

All EO imagery was captured from the Earth Observatory web site

- [NASA Earth Observatory - Home](#)

Which is Which?

Imagery Key for Texas Parks and Wildlife (TPWD) Lessons and Activities



An oval mountain bare of vegetation rises above a sparsely vegetated landscape.

ENCHANTED ROCK STATE NATURAL AREA

[Enchanted Rock State Natural Area — Texas Parks & Wildlife Department](#)

“The massive pink granite dome rising above Central Texas has drawn people for thousands of years. But there’s more at Enchanted Rock State Natural Area than just the dome. The scenery, rock formations and legends are magical, too!”

Key Phrase correlations: **Identify changes to Earth’s surface features; Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps; a video under the “overview” tab provides a virtual field trip).

Key Word correlations: **Weathering; mass wasting; erosion; mountains; satellite and aerial imagery; topographic maps.**



Three rivers enter an east-west trending bay that joins a north-northeast trending bay behind a barrier island.

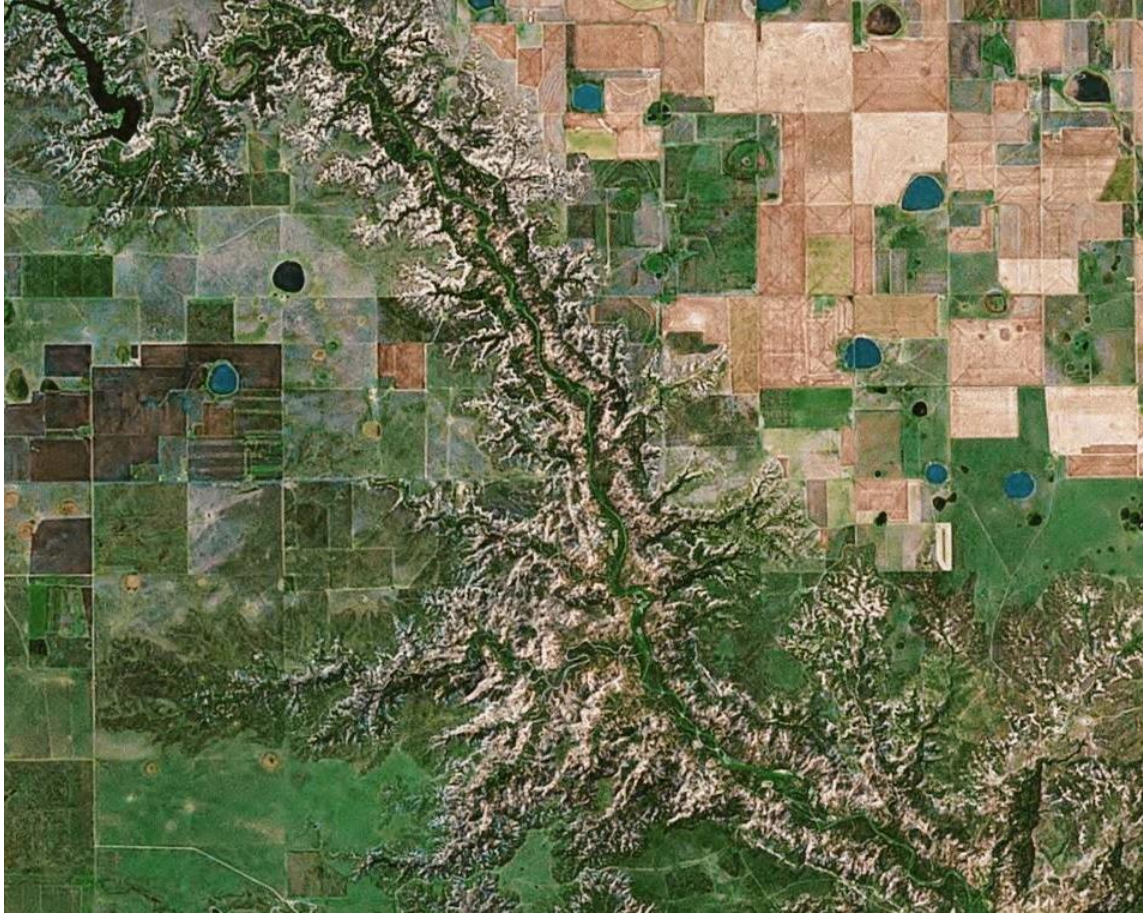
PADRE ISLAND NATIONAL SEA SHORE

[Padre Island National Seashore \(U.S. National Park Service\) \(nps.gov\)](https://www.nps.gov/pad)

“The longest stretch of undeveloped barrier island in the world.”

Key Phrase correlations: **Identify changes to Earth’s surface features; Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps; videos under the “Learn about the Park/photos and multimedia/multimedia presentation” tab provide virtual field trips) ; **Impact of humans on Earth’s subsystems.**

Key Word correlations: **Erosion; bays: barrier islands; satellite and aerial imagery; topographic maps; agriculture.**



A southeast-trending river has eroded a wide, deep canyon into a flat-lying agricultural landscape, which is dotted with small seasonal lakes.

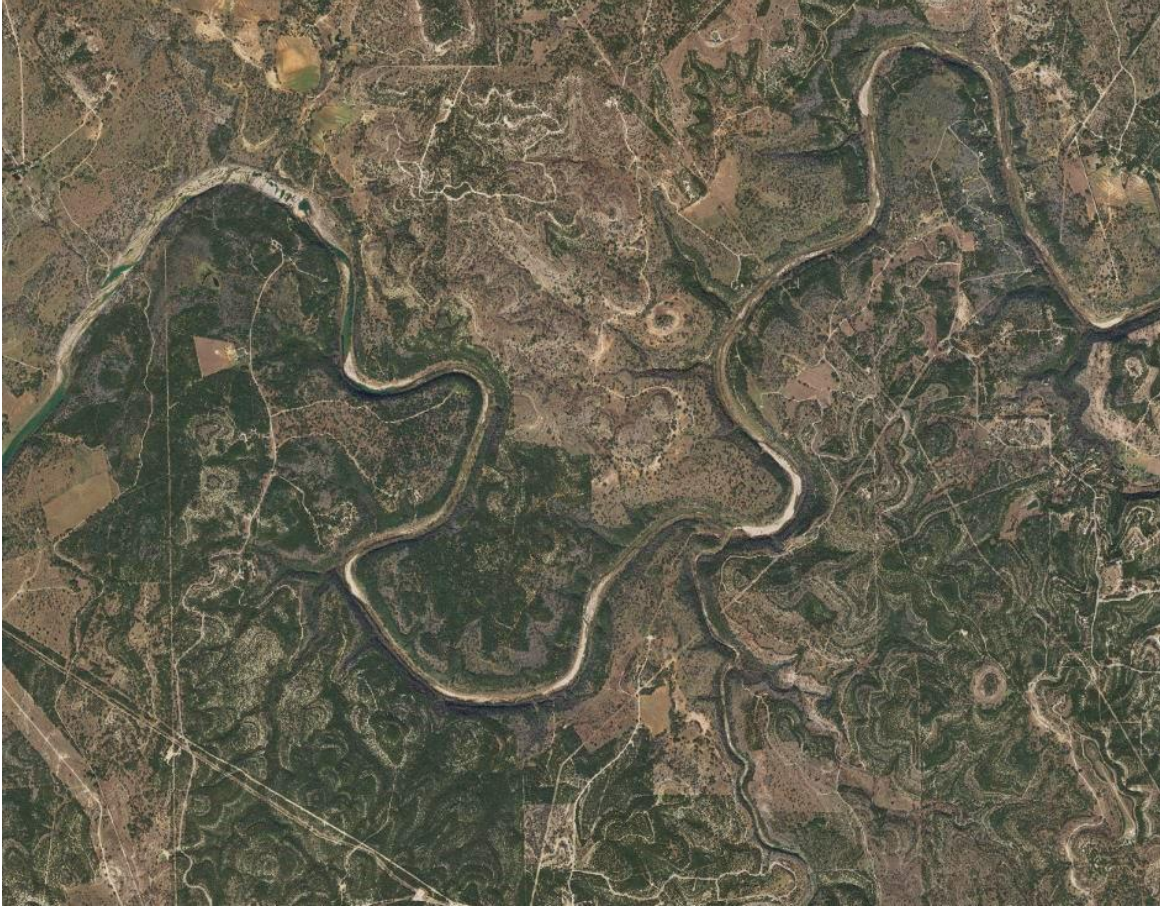
PALO DURO CANYON STATE PARK

[Palo Duro Canyon State Park — Texas Parks & Wildlife Department](#)

“The second largest canyon in the country lies in the heart of the Texas Panhandle.”

Key Phrase correlations: **Identify changes to Earth’s surface features; Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps; a video under the “overview” tab provides a virtual field trip). **Earth’s systems continuously change over a range of time scales; Impact of humans on Earth’s subsystems.**

Key Word correlations: **Erosion; Plateaus; canyons; satellite and aerial imagery; topographic maps; rate of change; agriculture.**



An east-west trending meandering river has eroded a narrow canyon into a hilly plateau.

PEDERNALES FALLS STATE PARK

[Pedernales Falls State Park — Texas Parks & Wildlife Department](#)

“Flowing over and around huge slabs of limestone, the Pedernales River can be turbulent. But most often it is tranquil, and a great place to relax and recharge.”

Key Phrase correlations: **Identify Changes to Earth’s surface features; Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps; a video under the “Learn about the Park/photos and multimedia/multimedia presentation” tab provides a virtual field trip); **Earth’s systems continuously change over a range of time scales.**

Key Word correlations: **Erosion; Plateaus; canyons; satellite and aerial imagery; topographic maps; rate of change.**



A barrier island trends northeast on the southeast side of the image. A large bay behind the barrier island is spanned by a bridge at its northwest end.

MUSTANG ISLAND STATE PARK

[Mustang Island State Park — Texas Parks & Wildlife Department](#)

“With more than five miles of coastline, we have plenty of room for fun in the sun. Hang out on the beach, fish in the bay, add birds to your life list, and explore this unspoiled barrier island park.”

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps; a video under the “Learn about the Park/photos and multimedia/multimedia presentation” tab provides a virtual field trip); **Impact of humans on Earth’s subsystems.**

Key Word correlations: **Bays; barrier islands; satellite and aerial imagery; topographic maps; development.**



A broad sand dune field is bordered on its southwest side by an oil field.

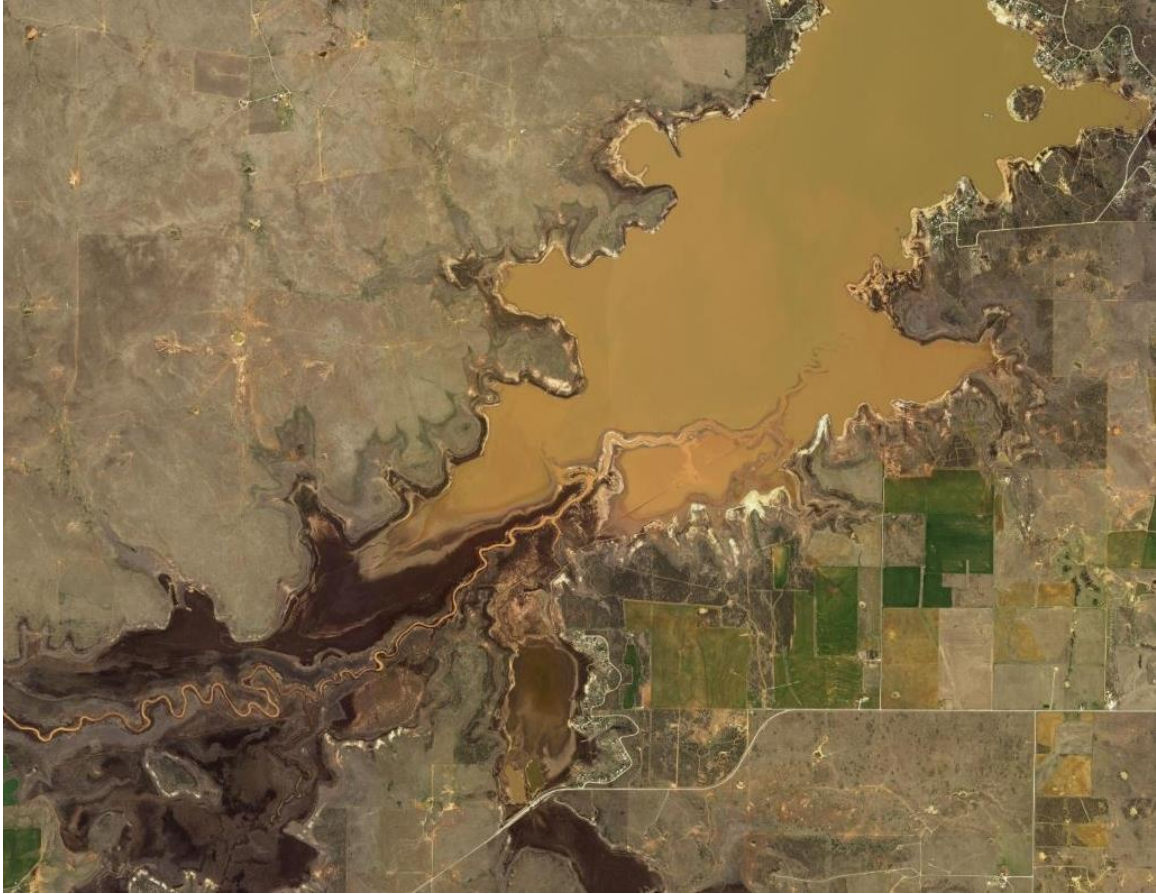
MONAHANS SANDHILLS STATE PARK

[Monahans Sandhills State Park — Texas Parks & Wildlife Department](#)

“Out west lies a mystical place where the wind sculpts sand dunes into peaks and valleys, sometimes overnight.”

Key Phrase correlations: **Identify changes to Earth’s surface features; Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps). A video under the “overview” tab provides a virtual field trip). **Impact of humans on Earth’s subsystems; Use of resources: impacts on Earth’s systems; Earths systems change continuously over time.**

Key Word correlations: **Wind; erosion; Dunes; satellite and aerial imagery; topographic maps; fossil fuel burning; energy production; environmental impacts; rate of change.**



A muddy stream flows across a lakebed exposed by drought, from the southwest corner of the image into a muddy lake. Agricultural fields occur on the southeast side of the lake.

LAKE ARROWHEAD STATE PARK

[Lake Arrowhead State Park — Texas Parks & Wildlife Department](#)

“Halfway between Dallas and Oklahoma City is Lake Arrowhead State Park, on the north shore of a 16,200-acre lake.”

Key Phrase correlations: **Identify changes to Earth’s surface features; Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps; a video under the “overview” tab provides a virtual field trip). **Impact of changes in Earth’s subsystems and natural hazards; Earth’s systems continuously change over a range of time scales; Impact of humans on Earth’s subsystems.**

Key Word correlations: **Erosion; lakes; rivers; barrier islands; satellite and aerial imagery; topographic maps; drought; rate of change; agriculture.**



A broad, northwest-trending channel in a heavily developed industrial landscape contains three large islands. Round storage tanks for petroleum abound. White boat wakes appear throughout the channel.

SAN JACINTO BATTLEGROUND STATE HISTORIC SITE

[San Jacinto Battleground State Historic Site | Texas Historical Commission](#)

“On a chilly April afternoon in 1836, General Sam Houston’s army of settlers, Tejanos and foreign volunteers won Texas’s independence.”

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “view larger map” tab to access multiple resolutions of imagery and topographic maps); **Impact of humans on Earth’s subsystems; Use of resources: impacts on Earth’s systems.**

Key word correlations: **Channels; islands; satellite and aerial imagery; topographic maps; development; fossil fuel burning; energy production.**



A north-south trending mountain range divides a city into the “east side” and the “west side”. An airport is visible on the southeast side of the image.

FRANKLIN MOUNTAINS STATE PARK

[Franklin Mountains State Park — Texas Parks & Wildlife Department](#)

“Come explore these high-desert mountains, just 15 minutes from El Paso.”

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “view larger map” tab to access multiple resolutions of imagery and topographic maps; a video under the “overview” tab provides a virtual field trip). **Impact of humans on Earth’s subsystems.**

Key Word correlations: **Rivers; mountains; satellite and aerial imagery; topographic maps; agriculture; development.**



Drought-induced lake-level drop has exposed lake-bottom sediments and stranded boat docks above water level.

POSSUM KINGDOM STATE PARK

[Possum Kingdom State Park — Texas Parks & Wildlife Department](#)

“Grab your family, fishing pole and “swimsuit and head for the clear blue water and striking scenery at Possum Kingdom State Park.”

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “maps” tab to access multiple resolutions of imagery and topographic maps; a video under the “overview” tab provides a virtual field trip); **Impact of changes in Earth’s subsystems and natural hazards; Earth’s systems continuously change over a range of time scales; Impact of Humans on Earth’s subsystems.**

Key Word correlations: **Lakes; satellite and aerial imagery; topographic maps; drought; rate of change; development.**



A southeast-trending river with a broad green floodplain runs through a heavily developed landscape. A large airport is present on the northwest corner of the image, and a large drinking water reservoir on the south-central part of the image.

CEDAR HILL STATE PARK

[Cedar Hill State Park — Texas Parks & Wildlife Department](#)

“Relax by the lake, tour an old Texas farm, or explore our rugged limestone hills and rare prairie pockets.”

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “view larger map” tab to access multiple resolutions of imagery and topographic maps; videos under the “overview” tab provide a virtual field trips). **Impact of humans on Earth’s systems; Use of resources: impacts on Earth’s systems.**

Key Word correlations: **Rivers; lakes; satellite and aerial imagery; topographic maps; dams; development; environmental costs.**



A muddy, meandering stream enters the landscape on the west side of the image and follows a circuitous route into a dark lake on the southeast side of the image.

CADDO LAKE STATE PARK

[Caddo Lake State Park — Texas Parks & Wildlife Department](#)

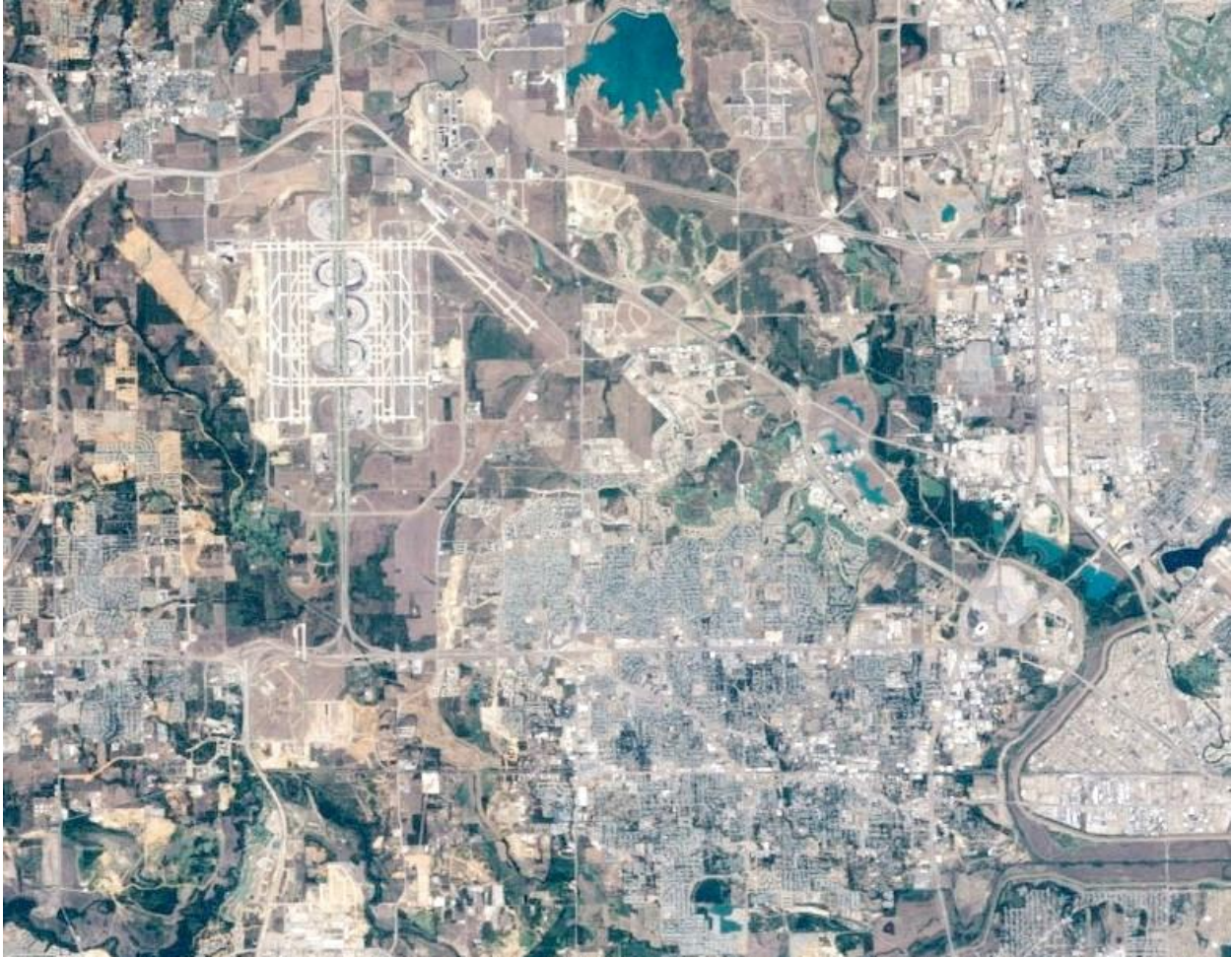
“Bald cypress trees draped with Spanish moss tower over the maze of bayous, sloughs and ponds of Caddo Lake.”

Key Phrase correlations: **Identify changes to Earth’s surface features; Recognize landforms/land features; Interpret Earth’s surface using a variety of methods** (select “view larger map” tab to access multiple resolutions of imagery and topographic maps; a video under the “overview” tab provides a virtual field trip). **Impact of humans on Earth’s systems; Earth’s systems continuously change over a range of time scales.**

Key Word correlations: **Erosion; deposition; rivers; lakes; satellite and aerial imagery; topographic maps; development; environmental costs.**

WHICH IS WHICH

Imagery Key for NASA Earth Observatory Lessons and Activities



An airport at the edge of a city. You can also see a lake and a meandering river.

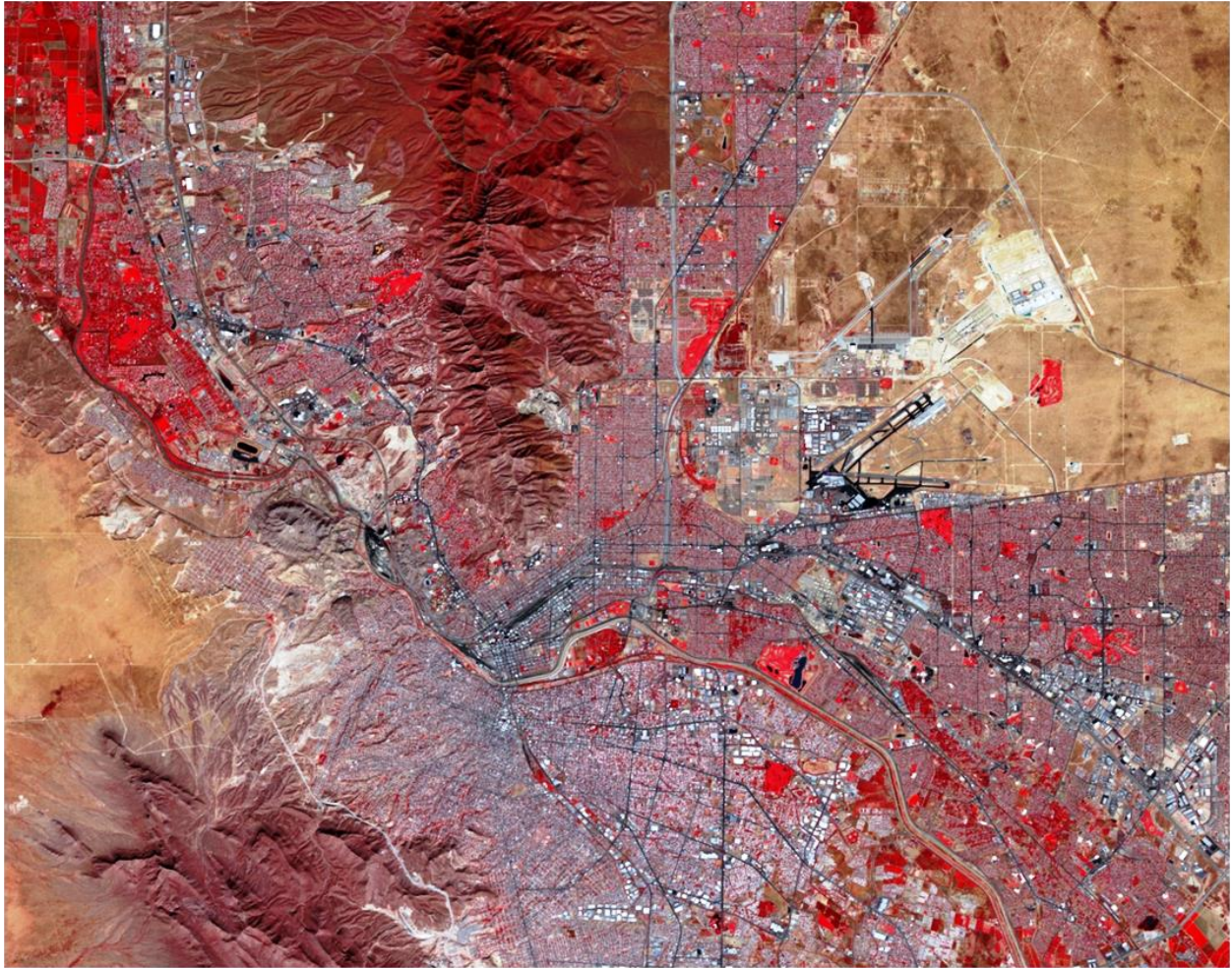
DALLAS TEXAS 1984 LANDSAT 5 IMAGE

<http://earthobservatory.nasa.gov/IOTD/view.php?id=42551>

View urban growth in the Dallas metroplex using Landsat imagery from 1984 and 2009.

Key Phrase correlations: Recognize landforms/land features; Interpret Earth's surface using a variety of methods, Impact of humans on Earth's subsystems.

Key Word correlations: Rivers; lakes; satellite and aerial imagery; development.



A large city divided in half by a mountain range. You can also see an airport, and a river with a second city on the other side.

EL PASO TEXAS 2008 ASTER IMAGE

http://earthobservatory.nasa.gov/IOTD/view.php?id=37482&eocn=image&eoci=related_image

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems.**

Key Word correlations: **Rivers; mountains; satellite and aerial imagery; development.**



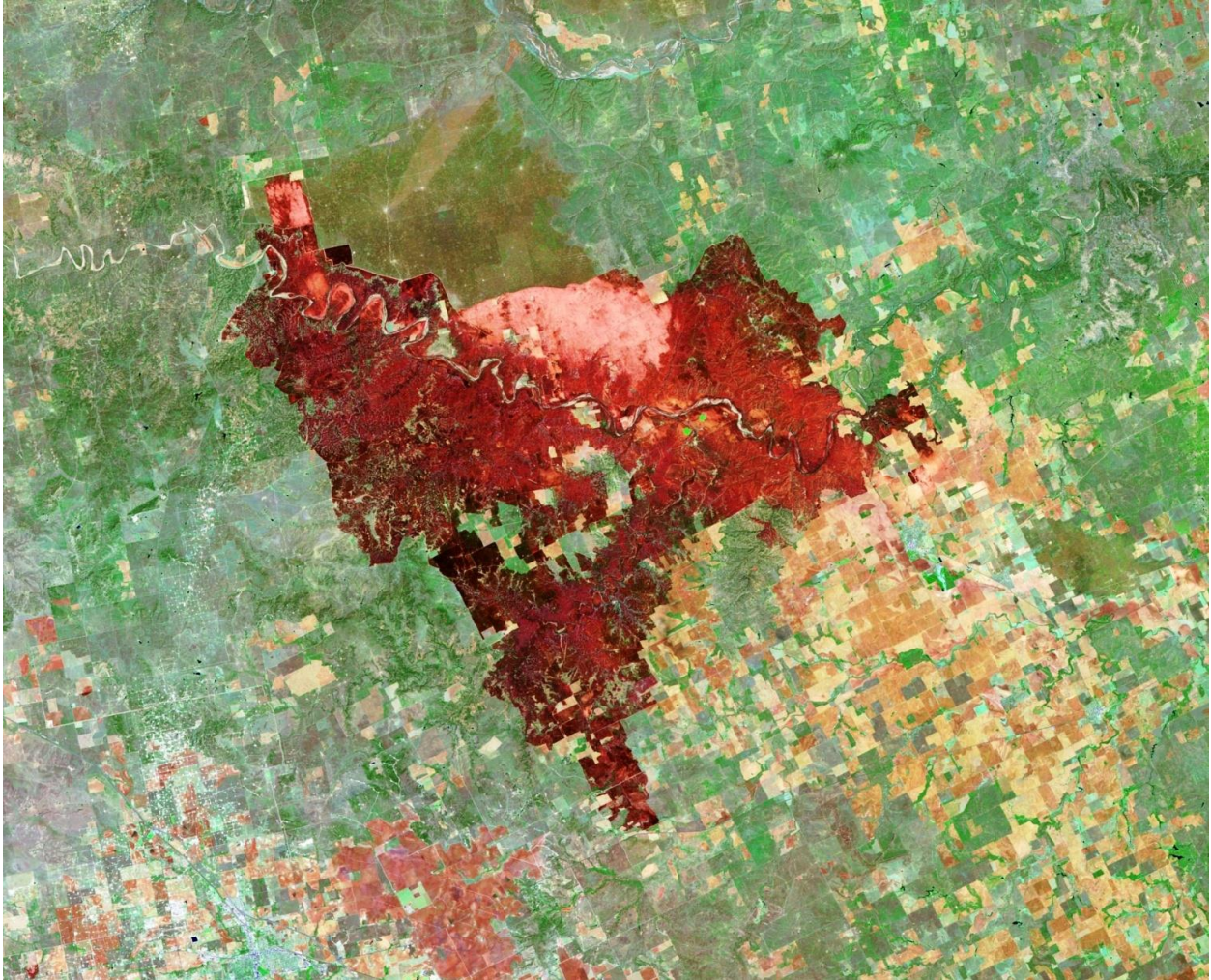
A city surrounded on all sides by an oil field. You can also see center-pivot irrigation agricultural fields.

DENVER CITY ISS PHOTOGRAPH 2002

<http://earthobservatory.nasa.gov/IOTD/view.php?id=2767>

Key Phrase correlations: **Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's systems; Use of resources: impacts on Earth's systems.**

Key Word correlations: **Satellite and aerial imagery; development; fossil fuel burning; energy production; agriculture; environmental impacts.**



Agricultural fields surrounded by the burn scar from a drought-related wildfire. You can also see a meandering river flowing through the burned area.

COOPER MOUNTAIN FIRE Landsat 5 2011

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=50406>

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems; Impact of changes in Earth's subsystems and natural hazards.**

Key Word correlations: **Rivers; satellite and aerial imagery; agriculture; wildfire**



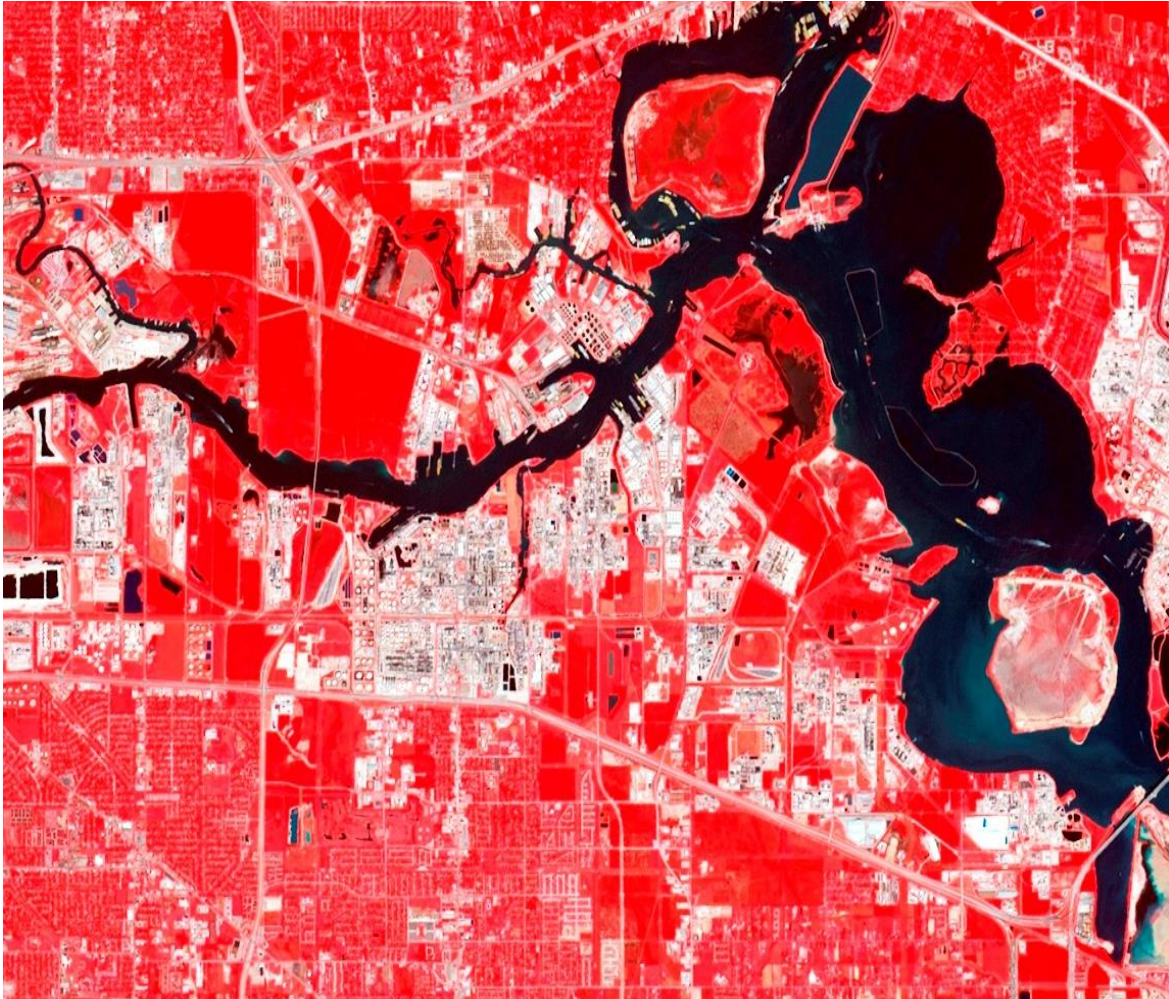
An industrial site on a channel; numerous round petroleum storage tanks mark the site of refinery facilities. You can also see ships (with wakes) moving in the channel.

HOUSTON SHIP CHANNEL AND BAYTOWN REFINERY ISS 2005

<http://earthobservatory.nasa.gov/IOTD/view.php?id=6142>

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems; Use of resources: impacts on Earth's systems.**

Key Word correlations: **Satellite and aerial imagery; development; fossil fuel burning; energy production; environmental impacts.**



Two rivers join and flow into a large channel that contains two large islands.

SAN JACINTO RIVER/HOUSTON SHIP CHANNEL ASTER DATE 2003

<http://earthobservatory.nasa.gov/IOTD/view.php?id=80673>

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems.**

Key Word correlations: **Rivers; islands; satellite and aerial imagery; development.**



A coastline with a barrier island and a peninsula enclosing a large bay. You can also see a large city and cloud formations over the ocean.

HOUSTON AND GULF OF MEXICO COASTLINE LANDSAT 7 TM 2000

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=14283>

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems.**

Key Word correlations: **Rivers; lakes; barrier islands; bays; satellite and aerial imagery; development.**



A large reservoir with exposed shoreline related to severe drought-induced drop in water levels. You can see a smaller reservoir where water levels do not appear to have dropped.

LAKE BUCHANAN LANDSAT 5 2011

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=76734>

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems; Impact of changes in Earth's subsystems and natural hazards.**

Key Word correlations: **Rivers; lakes; islands; satellite and aerial imagery; development; drought.**



A snow-covered agricultural landscape. You can also see a major highway and small city.

SNYDER EO-1 DATA CHRISTMAS 2009

<http://earthobservatory.nasa.gov/IOTD/view.php?id=42114>

Key Phrase correlations: **Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems; Impact of changes in Earth's subsystems and natural hazards.**

Key Word correlations: **Rivers; satellite imagery; development; agriculture; snow storm.**



A curved coastline showing several rivers delivering sediment into the ocean during a flood event.

GULF OF MEXICO TEXAS LOUISIANA MODIS 2004

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=14283>

Key Phrase correlations: **Identify changes to Earth's surface features; Recognize landforms/land features; Interpret Earth's surface features using a variety of methods; Impact of humans on Earth's subsystems; Impact of changes in Earth's subsystems and natural hazards.**

Key Word correlations: **Erosion; deposition; rivers; barrier islands; satellite imagery; development; flooding.**



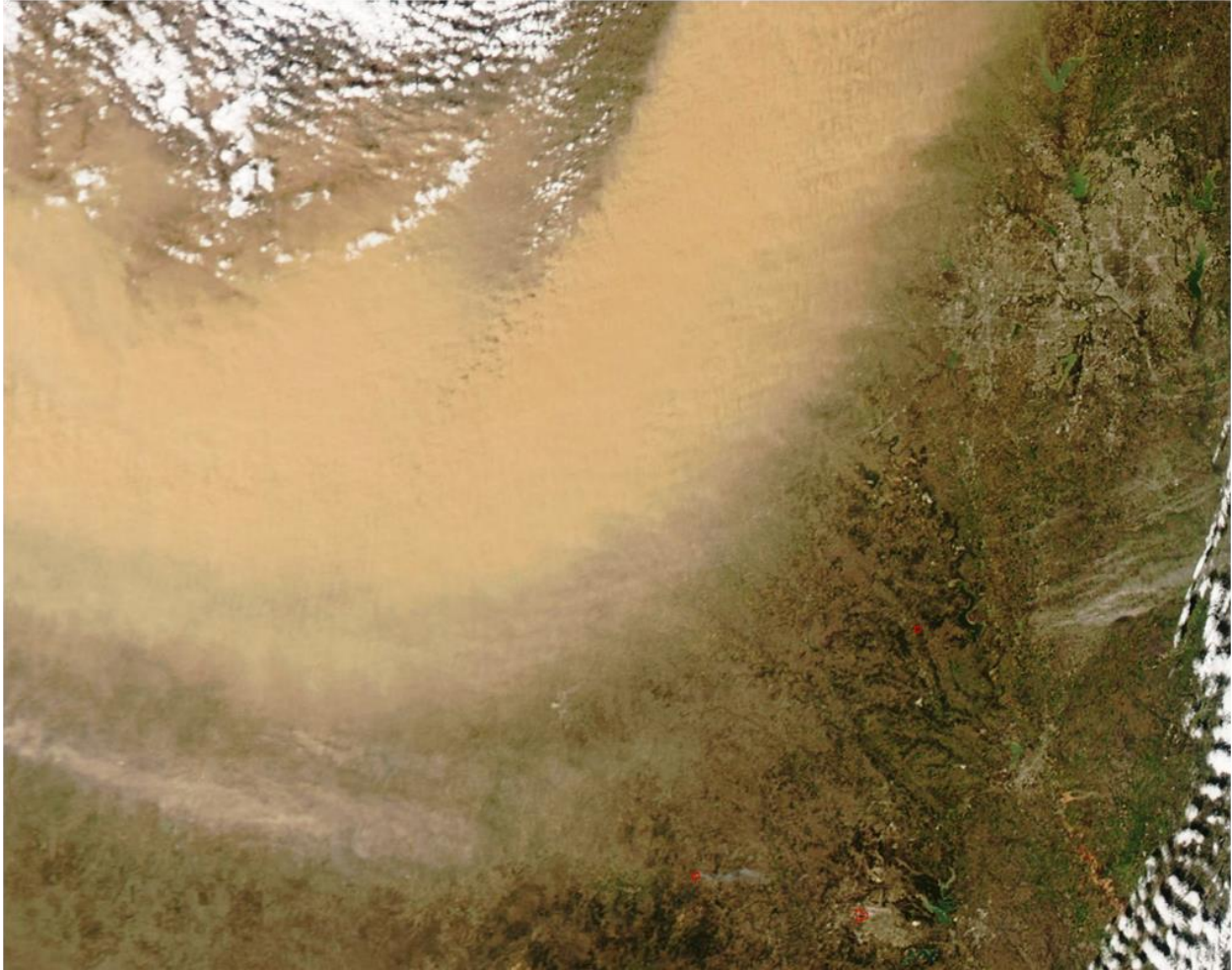
A large hurricane approaching a coastline.

HURRICANE IKE MODIS 2008

http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=9094&eocn=image&eoci=nh_vie-wall

Key Phrase correlations: **Impact of changes in Earth's subsystems and natural hazards.**

Key Word correlations: **Hurricane**



A large dust storm approaching a city. You can also see scattered puffy cloud formations.

DALLAS MODIS 2007

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=18046>

Key Phrase correlations: **Impact of changes in Earth's subsystems and natural hazards.**

Key Word correlations: **Dust storm**