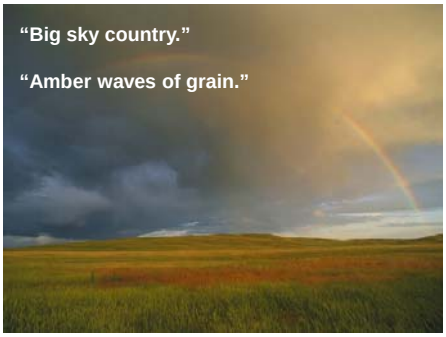
Regional Landscapes of the United States and Canada

The Great Plains and Prairies

Prof. Anthony Grande

Prairie-covered Plains



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OVERVIEW

- **Minimal topographic variation.**
- **Area of water deficiency.**
- **Noted for its violent weather.**
- **Area of negative misconceptions.**
- **Abundant food source:** from hunting to grazing to agriculture.
- **Farm management:** from sod busting to the Dust Bowl to center pivot irrigation and bread basket.
- **The Ogallala Aquifer as a lifeline:** groundwater.
- **Farm consolidation and depopulation trend.**

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Plains vs. Prairies: What's the difference?

- Usage commonly incorrectly interchanged.
- **Plains** is a topographic term signifying expansive and relatively flat land.
- **Prairie** is a vegetation that refers to a variety of grasses.
- Most of the Great Plains was originally covered by prairie, hence the association.

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The Great Plains and Prairies

- Situated between the Interior Lowlands and the Rocky Mts.
- Extends from the southern fringe of Canada's coniferous forest to the Mexican border.
- Flat to rolling landscape with some notable irregularities.
- Gently increases in elevation from 1600-5200 ft.
- Western section is called the "High Plains."

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Formation of the Great Plains

- The Great Plains were formed from the deposition of sediment eroded from the uplifting Rocky Mts. hundreds of millions of years ago.
- Sedimentary layers are extremely thick and slope toward the Mississippi River valley. Many layers are **porous** and contain great water supplies.
- The headwaters of parallel east-flowing rivers originate in the Rockies.
- The rivers are generally shallow and take on a "braided" appearance during low water periods.
- River erosion has exposed extensive fossil beds throughout the region.

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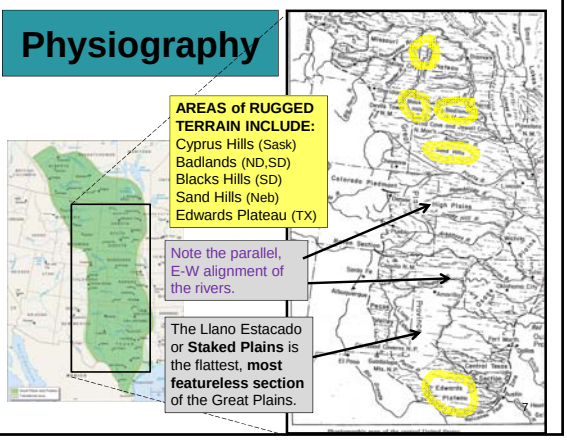
Physiography



AREAS of RUGGED TERRAIN INCLUDE:
Cyprus Hills (Sask)
Badlands (ND,SD)
Blacks Hills (SD)
Sand Hills (Neb)
Edwards Plateau (TX)

Note the parallel, E-W alignment of the rivers.

The Llano Estacado or **Staked Plains** is the flattest, **most featureless section** of the Great Plains.

Unusual Terrain Features


Badlands NP, SD


Braided section of the Platte River, Neb.


Black Hills, SD

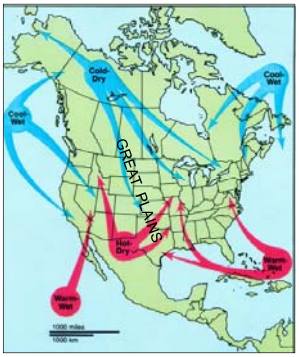

Sand Hills, Neb.

AIR MASSES

The Great Plains are in the zone of conflict between major air masses.

This is accentuated in spring and autumn when there is a greater difference in the temperature of the air masses.

Thunderstorms, blizzards, high winds and tornadoes are common occurrences.



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CLIMATE and WEATHER

- It has a **semi-arid climate** with severe winters and snow (BSk) and subtropical conditions in southern Texas (BSh).
- It is located in the rain shadow of the Rocky Mts.
- **Precipitation decreases from east to west.**
- Area is subject to temperature extremes and violent weather.

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Precipitation

- Most **precipitation** occurs along the frontal zone of the air masses
- About 75% falls from April through August (growing season); snow in winter.
- **Not dependable**: wide variation from year to year (80% to 120% of "average") with periods of drought.

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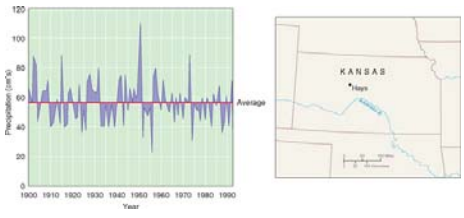
Drought

- Occurs about every 20 years.
- Optimism in good years followed by disaster in dry years (e.g., **Dust Bowl**)



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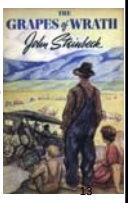
DUST BOWL – 1930s

The **Dust Bowl** was an area on the southern High Plains that during the 1930's, in the wake of a severe drought, suffered ruinous "dust storms" (actually, blown soil particles).

It was immortalized by John Steinbeck's novel, "The Grapes of Wrath," which told the story of poor Oklahoma farmers during the Great Depression.



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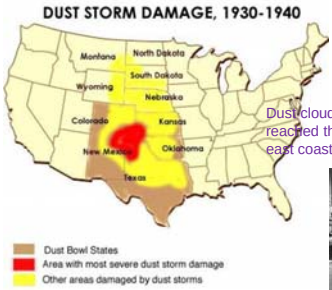
Dust Bowl Area



Dust clouds reached the east coast.

Dust Bowl

Caused by:

1. Inappropriate deep-plowing techniques
2. The false belief that "*rain follows the plow*"
3. Several droughty years that contributed to a drying of the exposed topsoil
4. High winds that picked up the dried soil and carried it away, creating "dust storms"

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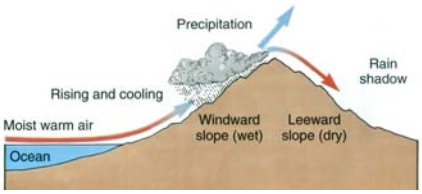
Rain Shadow Refresher



(wet) **ROCKY MOUNTAINS** **GREAT PLAINS** *(dry)*

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PHYSICAL CHARACTERISTICS

Precipitation

Natural Vegetation

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Vegetation

Grasses are the characteristic vegetation
- Taller and more dense in the east
- Shorter and relatively sparse in the west

Intricate root systems
- Add decayed organic matter to soil
- Very difficult to plow
- Can be cut into blocks; it was used as construction material (sod houses)

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SOILS

Mollisols: Soils that form *under grasses* rather than under forests.

They have a **thick surface layer** (up to 5 ft) and **high organic content** that comes from the grasses' dense root systems.

Excellent for grain production.

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Extreme Weather Events

- **Extremely windy environment.**
  - High rates of *evaporation* and *transpiration* (desiccating affect).
  - Late spring and summer wind speeds in central and northern plains among the highest in North America.
  - Can cause damage to crops and structures.
- **Great seasonal swings of temperature** (from below zero ^{0}F to over 100^{0}F)
- **Blizzards**
  - Storms of heavy snow, high wind and intense cold
  - Can last for several days
  - Cause "whiteouts" that limit visibility
  - May block livestock from food supplies

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Extreme Weather Events

Chinook (a regional wind)

Occurs in winter.

- Warm, dry air descending from Rocky Mts. (pushed over mountains by Pacific air flow).
- Relief from bitter cold and snow; "a snow-melter."

Thunderstorms

- Collision of contrasting air masses (esp. in spring & fall)
- May produce wind, rain, lightning, hail

Tornadoes

- Result of extreme thunderstorm causing conditions.
- Extremely destructive within small areas

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Tornado Alley

"Tornado Alley" A vernacular region that refers to parts of the United States where tornadoes are most frequent.

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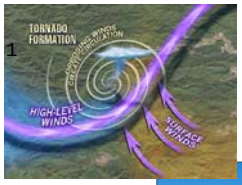
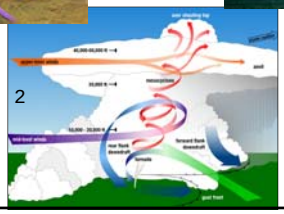
Tornado Formation





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Tornadoes on the Ground

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Aftermath of a Tornado

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Tornado Video Clips

- http://news.bbc.co.uk/2/hi/science/nature/7533941.stm
- http://efg-bnusfoodreserves.blogspot.com/2011/05/video-actual-footage-from-storm-chasers.html
- http://www.youtube.com/watch?v=dwMVfn7y8V8&feature=related
- http://www.youtube.com/watch?v=EfdK6H9d6J0

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Tornado Tourism

Perceptions of the Plains

- **Coronado** (raised in dry Spain in the early 1500s): "*This region is the best I've seen for producing the crops of Spain. [The land] is very flat and black [and] well watered by the rivulets and springs and river."*
- In the early 1800s, **East Coasters** and **Northern European immigrants** perceived it as wholly unfit for cultivation and habitation: ***No trees = No good for farming*.**
- **1850s-1930s:** Called the *Great American Desert*.
- **20th century perception was one shaped by literature and the movies**: *dry waste land inhabited by Indians, buffalo and cattlemen.*

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Plains Indians

- **Lived a nomadic lifestyle** (hunting and gathering)**.**
- **Buffalo** (bison) **hunting** main livelihood.
- Historically **mobility limited.**
- **Acquisition of horses in 1500s** (left by Spanish)
  - Allowed diffusion throughout the Great Plains.
  - Were able to follow the buffalo herds.
  - Teepees were traveling homes.
  - Excelled at horse-mounted activities.
- **Pushed out of the Great Plains by American westward expansion**
  - Loss of buffalo (food) to trophy hunting
  - Arrival of European immigrant farmers

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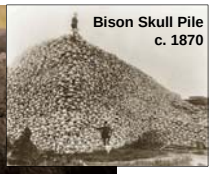
Bison (American Buffalo)



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Plains Indians in Painting

Head-Smashed-In Buffalo Jump

World Heritage Site, Fort MacLeod, Alberta

The buffalo jump was used for 5,500 years by the indigenous peoples to kill buffalo by driving them off the 35 ft high cliff.

First American Settlers

- **First arrivals** were hindered by a lack of trees for building, fencing, fuel and a lack of water.
- This area was **bypassed** by agriculturists in favor of Rocky Mt. and west coast tracts.

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Wagon Trains

- **Organized movement westward**. Started as supply lines for fur traders; later became a route for settlers heading to the Rocky Mountains and to California and Oregon.
- Wagon wheels created **ruts** in the prairie sod.
- Trail masters followed the ruts on their trips across the Great Plains.
- **Geologic landmarks were important guide posts and gauges of distance traveled.**

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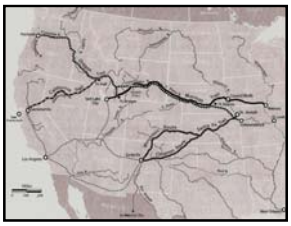
Overland Trails



Wagon train parties were outfitted in Missouri and crossed the plains by following rivers, ruts and landmarks.

Landmarks along the Oregon Trail

First American Settlers

- **First settlers**
  - Claimed best waterways
  - ***Riparian (Water) Rights***
    - *The rights, which belong to landowners through whose property a natural watercourse runs, to the benefit of such stream for all purposes to which it can be applied.*
    - *Individuals not owning land adjacent to the water course have no rights to use the water.*
  - Excluded later settlers.
  - Led to water wars.
- **Cattlemen at odds with land owners.** Need to graze and water the animals along the trek to market.

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Agricultural Settlement

- Agricultural settlement was delayed until the development of technologies to deal with the environment:
  - **Barbed wire** (for fencing)
  - **Sod houses** (until replaced by frame houses made from wood transported in by railroads)
  - **Deep-well drilling to get water** and **windmills to pump up the water.**
  - **Mechanization** of grain farming.

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Pioneer Sod House

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Northern Plains
(Canadian Prairies)

- **Hudson's Bay Company**
  - Charter for **Rupert's Land** (1670) around Hudson Bay
  - Sole agent of British authority until 1870
  - Discouraged settlement as interfering with fur trade
- **Canadian Government**
  - Acquired Rupert's Land in 1870
  - Fostered settlement but the problems of Canadian Shield limited its use for farming.
  - Railroad was extended into the area (1885) but many settlers were from the U.S.
  - Leases, rather than land grants, controlled the land.
- **Prairie provinces** (Manitoba, Saskatchewan and Alberta) **are Canada's main wheat producers; most is exported to Europe.**

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Ranching in Southern Plains

- **Introduced into Texas by the Spanish.**
- **Cattle ranchers** were the first to use the land extensively; plentiful grasslands for cattle.
- **Rapid expansion** (1866-1886)
  - Unbranded cattle running loose during Civil War
  - Railroads pushing to West Coast
  - Cattle drives to rail heads in Kansas
- **Collapse** (late 1880s)
  - Overgrazing
  - New cattle-raising operations in Midwest
  - Slipping national economy
  - Disastrous blizzards of 1887-1888
  - Influx of farmers

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Ranching

- **Range Wars**
  - Cattlemen clashed with land owners and farmers.
  - Needed to move cattle overland to market (i.e., transcontinental railroad depots in Kansas.)
  - Needed water and grass for the herds
  - Conflict of land ownership precepts, water rights and open range concepts.
- **Sheep Wars*:* Battles fought between cattle and sheep ranchers in Southern Plains.** Revolved around disputes over land and water rights but mainly the cattlemen's disdain of sheep's overgrazing the range and polluting watering places used by cattle.

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Cattle Drive

- **The movement of cattle on hoof by cowboys on horseback.**
- A major economic activity in the West between 1866-1886, when about 20 head per year were "driven" from Texas north to rail-head "cow towns."
- Established the cowboy as an iconic American figure.

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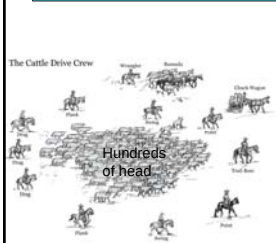
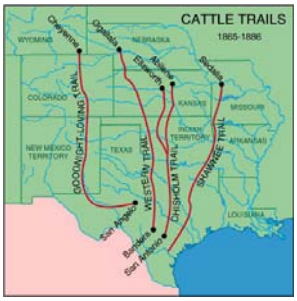
Cattle Drive Trails





Cattle drives moved herds to terminals along the east-west transcontinental railroads. Conflicts with land and water right owners ensued.

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Modern Cattle Feed Lots

Ranchers now ship cattle by truck and train to feed lots where they await being sold.

Agriculture Today

- Extensive (large area), large scale operation and machinery intensive.
- Wheat is the main crop.
  - Winter wheat
    - Planted in fall, established before winter.
    - Grows in spring, harvested May and June.
    - Mainly from northern Texas to southern Nebraska, but as far north as Montana.
  - Spring wheat
    - Central South Dakota to south-central Prairie Provinces of Canada.
    - Planted in early spring, harvested late summer-fall.

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Wheat Harvesting on the High Plains

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Harvest, Storage and Distribution

- **Harvesting**
  - Independent crews with large combines
  - Start with winter wheat harvest in Texas in June and work northward
  - Traditionally well paid
  - Gradually being replaced by farm-owned equipment
- **Storage** in small grain elevators or open-air bins
- **Distribution**
  - Canada
    - To Winnipeg, then to Thunder Bay for shipment on Great Lakes
    - North to Churchill on Hudson Bay and on to Europe
  - United States
    - To ports on the Great Lakes or Mississippi River

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Water

- Most important resource second to land
- Irrigation beneficial; irrigated land produces more than non-irrigated land
- **Ogallala aquifer**
  - Vast, natural underground reservoir (covers over 100,000 sq. mi.)
  - Contains "**fossil**" water from Rockies deposited over 1 million years ago and moving slowly east to the Mississippi.

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Dealing with a Water Deficiency

- Costs
  - Groundwater being overdrawn
  - Conservation regulations by states
- Government programs
  - **National Reclamation Act** of 1902
  - **Big Thompson River project** (1938-1957)
  - **Missouri Valley Project** (Pick-Sloan Plan)

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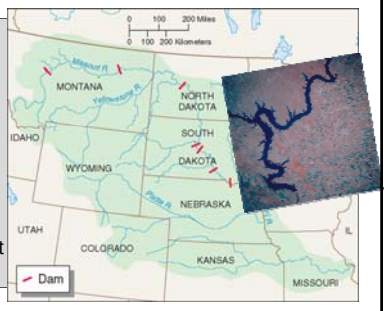
Missouri River Watershed

The Missouri River and its tributaries have been dammed to create an extensive reservoir system which provides farmers with water for irrigation.
Problem: flat terrain creates long, wide but shallow reservoirs.



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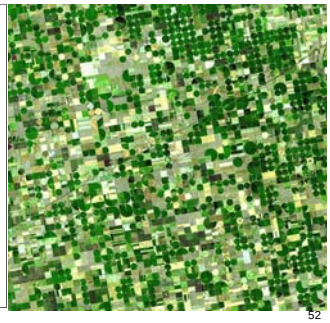
Plains Landscape Pattern

Pivot irrigation circles super-imposed on the Township and Range grid.

<u>There is a water well in the center of every circle.</u>

(Can you see the looming problem?)



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Pivot Irrigation System

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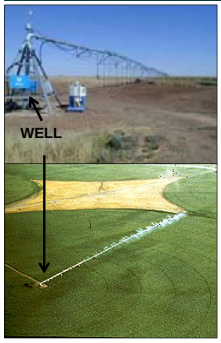
Pivot Irrigation Equipment



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Ogallala Aquifer

The Ogallala Aquifer is a deeply situated area of Dakota Sandstone, extending from South Dakota to Texas, containing water that originated in the eastern Rocky Mts.

Water pumped from the aquifer is used for irrigation, stock watering and domestic uses.

Aquifer: a water-bearing rock formation through which water slowly moves. 55

Aquifer Depletion

In some areas, the water table has dropped more than 100 feet as a result of pumping.

Shallow wells and natural springs are dry.

Other wells have to be drilled deeper.

Stronger pumps are needed to bring the water to the surface

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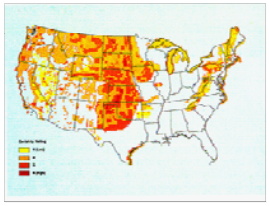
Energy Resources

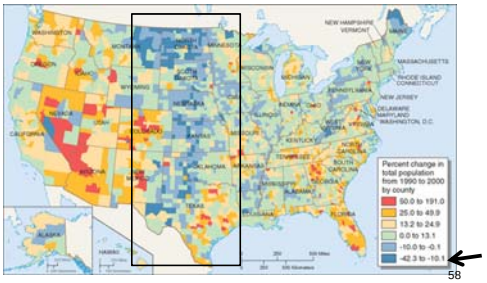
- **Natural gas**
  - Panhandle Field is (W Texas, Oklahoma, Kansas) world's largest field
- **Petroleum**
  - Panhandle Field
  - Wyoming, North Dakota (deep formations)
  - Alberta (Athabasca Tar Sands)
- **Coal**
  - Thick seams, easily mined
  - Low-sulfur (less polluting)
  - Expensive to ship
  - Wyoming now leading coal-producing state

- **Wind**
  - Inexpensive production
  - Excellent potential
  - Far from areas of need



Wind Power: Certainty Rating of the Wind Resources in the US. 57

Population Change



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Population Trends

- Out-migration to cities
  - To larger cities within region
  - To cities beyond Great Plains periphery
- Mechanized farms need less labor.
- Younger people leaving; older folks staying.
- Energy boom in Wyoming and North Dakota luring workers.

- Transportation routes
  - Do little to integrate the region
  - Perceptual orientation toward other places
  - Interstate highways speed people through the region.
- Historic and scenic sites draw tourists to the area.

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