Ecology Of Grasslands

Grasslands/Savannas/Dry Woodlands

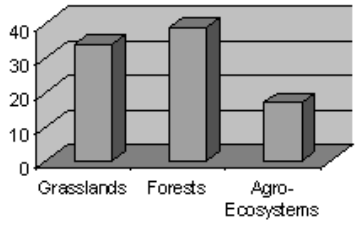
% of Global Total:

Terrestrial Area	40%
Biomass C	20%
Net primary productivity	40%
Soil organic C	30%

Ecosystem Functions And Services

1. Carbon Storage
2. Nutrient re-cycling
3. Habitat For Grazers
4. Buffer Between Deserts and Forests
5. Useful For Grain Crop Agriculture

Carbon Storage

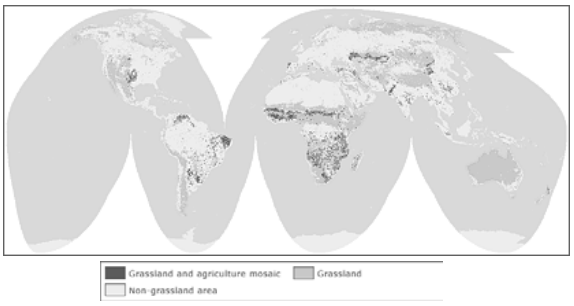


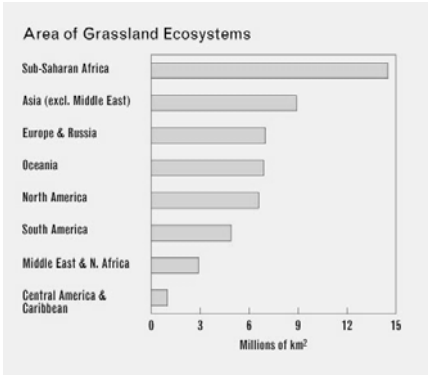
Carbon Storage

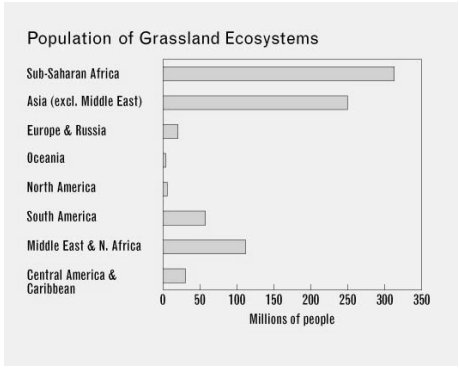
Estimated Range of Total Carbon Storage by Ecosystem

Ecosystem Type [a]	Total Land Area (10^6 km^2)	Global Carbon Stocks (GtC)			Carbon Stored/Area (t C /ha) (Low-High)
		Vegetation[b] (Low-High)	Soils [c] (Mean)	Total (Low-High)	
Forests					
High-latitude	10.3	46-115	266	312-380	303-370
Mid-latitude[d]	5.9	37-77	84	122-161	206-273
Low-latitude	12.8	48-265	131	180-396	140-310
Sub-total	**29.0**	**132-457**	**481**	**613-938**	**211-324**
Grasslands[e]					
High-latitude	10.9	14-48	281	295-329	271-303
Mid-latitude[d]	20.1	17-56	140	158-197	79-98
Low-latitude	21.7	40-126	158	197-284	91-131
Sub-total	**52.6**	**71-231**	**579**	**650-810**	**123-154**

Grasslands



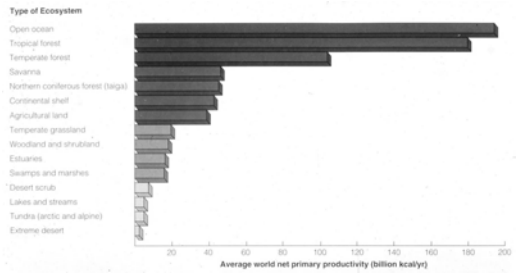




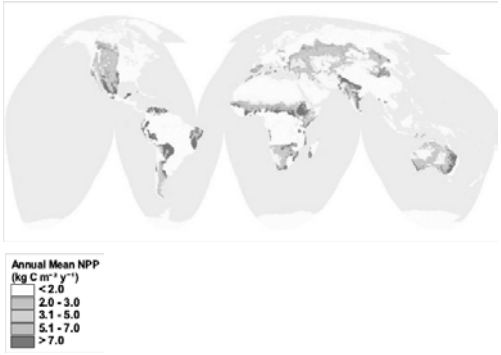
Top Countries for Percent of Grassland Area[a]

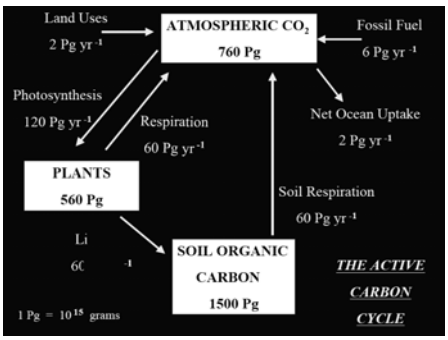
Country	Region[b]	Total Land Area (km²)	Grassland Area (percent)
Benin	Sub-Saharan Africa	116,689	93.1
Central African Republic	Sub-Saharan Africa	621,192	89.2
Botswana	Sub-Saharan Africa	579,948	87.8
Togo	Sub-Saharan Africa	57,386	87.2
Somalia	Sub-Saharan Africa	639,004	86.7
Australia	Oceania	7,704,716	85.4
Burkina Faso	Sub-Saharan Africa	273,320	84.7
Mongolia	Asia	1,558,853	83.9
Guinea	Sub-Saharan Africa	246,104	83.5
Mozambique	Sub-Saharan Africa	788,938	81.6
Namibia	Sub-Saharan Africa	825,606	80.6
Angola	Sub-Saharan Africa	1,252,365	79.9
Zimbabwe	Sub-Saharan Africa	391,052	76.8
Nigeria	Sub-Saharan Africa	912,351	76.7
Guinea-Bissau	Sub-Saharan Africa	34,117	73.9
Senegal	Sub-Saharan Africa	196,699	73.5
South Africa	Sub-Saharan Africa	1,223,084	73.5
Lesotho	Sub-Saharan Africa	30,533	73.5
Afghanistan	Middle East & N. Africa	642,146	73.4
Ethiopia	Sub-Saharan Africa	1,132,213	72.9
Zambia	Sub-Saharan Africa	754,676	69.8
Tanzania, United Republic	Sub-Saharan Africa	945,226	69.7
Madagascar	Sub-Saharan Africa	594,816	69.4
Kenya	Sub-Saharan Africa	584,453	68.6
Ghana	Sub-Saharan Africa	240,055	64.2
Cote d'Ivoire	Sub-Saharan Africa	322,693	62.3
Turkmenistan	Asia	471,216	62.1
Kazakhstan	Asia	2,715,317	61.5

Primary Productivity

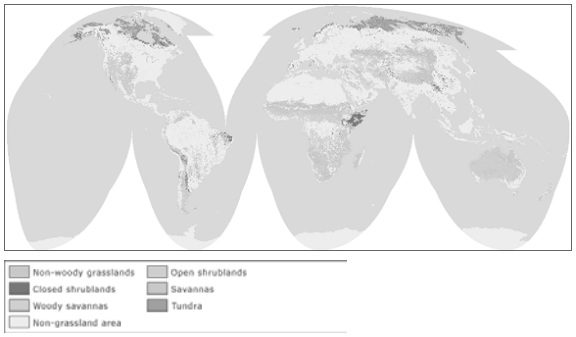


Drylands: Net Primary Productivity

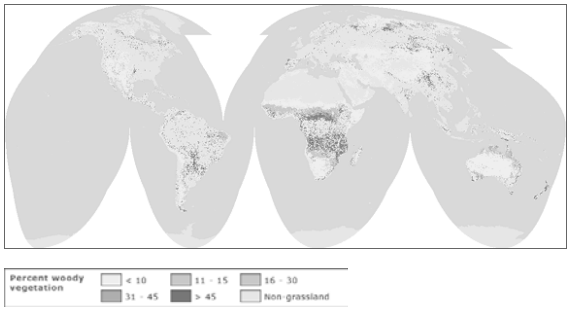


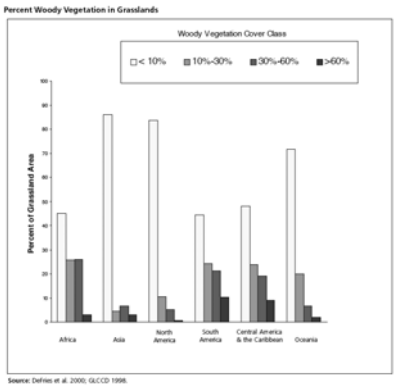


Grasslands



Woody Vegetation In Grasslands





Chaparral Adaptations to Fire

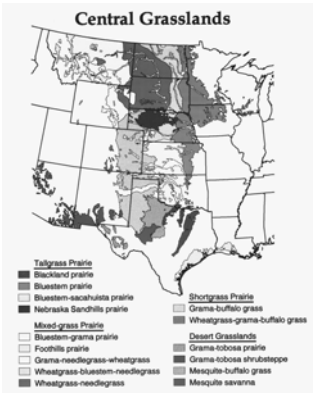
- Mediterranean climate - fire season from July to November
- Average fire cycle is 10-50 years (slope & aspect)
- Resinous foliage, woody stems, accumulated litter promote fire
- Fire needed for regeneration
  - Clears away litter and shrubby vegetation
  - Ground is generally left bare but with nutrient-rich ash
- Reproduce via seeds and vegetatively
  - Seed bank: seeds buried in the soil
  - Sprouting: from root crowns, basal crowns, rhizomes, and other other underground structures

FIRE ECOLOGY OR ADAPTATIONS:

In grassland ecosystems, fires may occur in any year, provided the grass is cured and ready to burn. In the plains grasslands, mean fire intervals likely range from 4 to 20 years depending on climates and ignition sources. Fire in grasslands can burn over large areas until a break in terrain or a change in weather stops the fire. In desert grasslands where blue grama may dominate, reductions in fire frequency result in shrub invasion and substantially less grass cover. Fire occurring during periods of drought combined with wind erosion may retard the process of succession.

Fire is an essential element in our ecosystem as natural management technique to control species dominance, noxious invasion, healthy plant production, and successful germination. Fires do not have a natural detrimental effect on grasslands.

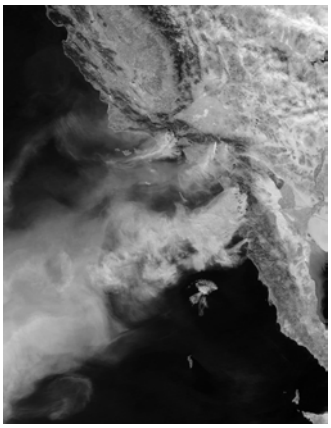
http://www.cnr.uidaho.edu/range456/hot-topics/fire-ecol.htm#nutrientcycling



Community or Ecosystem	Dominant Species	Fire Return Interval Range (years)
Nebraska sandhills prairie	*Andropogon gerardii*	< 10
bluestem-Sacahuista prairie	*Andropogon littoralis-Spartina spartinae*	< 10
sagebrush steppe	*Artemisia tridentata*	20-70
basin big sagebrush	*Artemisia tridentata* var. *tridentata*	12-43
mountain big sagebrush	*Artemisia tridentata* var. *vaseyana*	15-40
Wyoming big sagebrush	*Artemisia tridentata* var. *wyomingensis*	10-70
saltbush-greasewood	*Atriplex confertifolia*	< 35 to < 100
desert grasslands	*Bouteloua eriopoda*	5-100
plains grasslands	*Bouteloua* spp.	< 35

Human Impacts on Chaparral

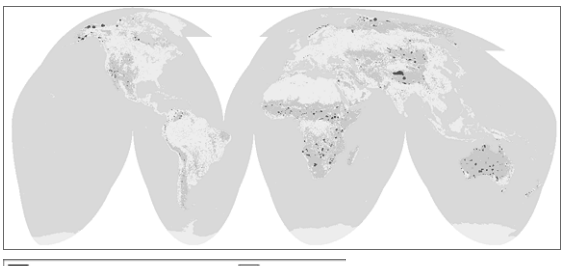
- Urbanization and development of chaparral areas – urban-wildland interface
- Fire suppression to protect these homes
- Dangerous Cycle:
  - No fire
  - no new vegetation
  - woody debris buildup increases fire hazard
  - huge, destructive conflagrations destroy homes
  - people rebuild
  - fire suppression continued
- Fire regime may now be as great as 155 years in Santa Cruz Mountains chaparral



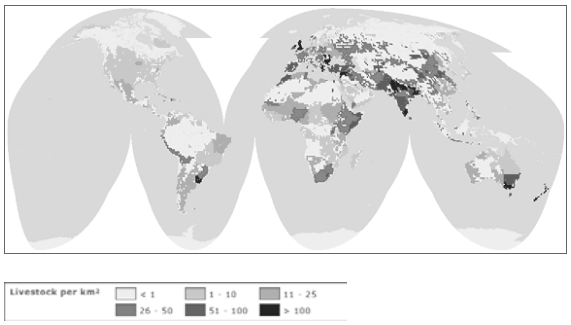
California Chaparral On Fire, 2003

Santa Anna Winds Are Visible

Protected Grasslands



Livestock Density



The world's grasslands have declined in their extent and condition, as well as their ability to support human, plant, and animal life.

*Grasslands, which cover 40 percent of the earth's surface, are home to almost a billion people, half of them living in susceptible drylands.

*Agriculture and urbanization are transforming grasslands. For some North American prairies, conversion is already nearly 100 percent. Road-building and human-induced fires also are changing the extent, composition, and structure of grasslands.

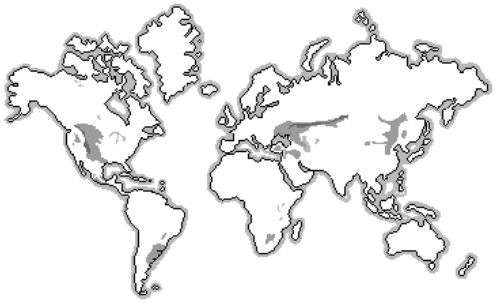
*All of the major foodgrains — corn, wheat, oats, rice, barley, millet, rye, and sorghum — originate in grasslands. Wild strains of grasses can provide genetic material to improve food crops and to help keep cultivated varieties resistant to disease.

•Grasslands attract tourists willing to travel long distances and pay safari fees to hunt and view
•grassland fauna. Grasslands boast some of the world's greatest natural phenomena: major
• migratory treks of large herds of wildebeest in Africa, caribou in North America, and Tibetan
• antelope in Asia.

•As habitat for biologically important flora and fauna, grasslands are found within 15 percent of the
• Centers of Plant Diversity, 11 percent of Endemic Bird Areas, and 29 percent of ecoregions
• considered outstanding for biological distinctiveness.

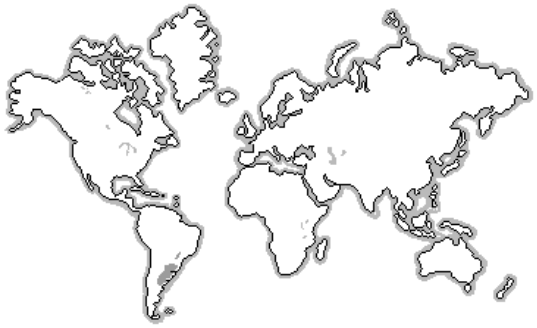
Source: *World Resources 2000-2001*

Grasslands

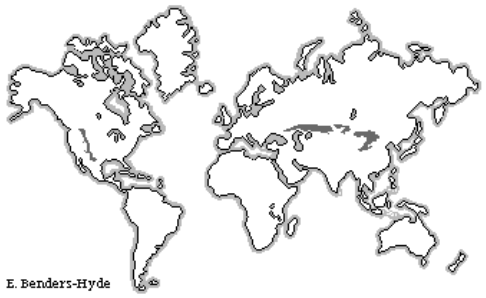


North American Prairie

Pampas of South America

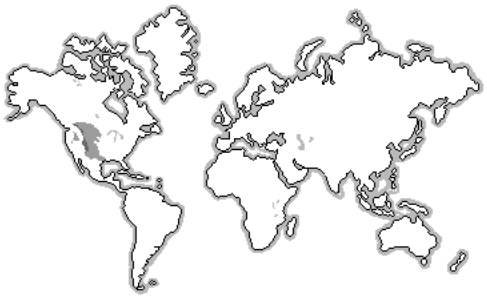


Steppes Of Eurasia



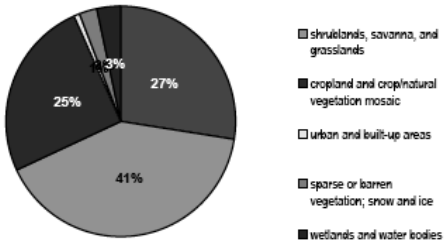
E. Benders-Hyde

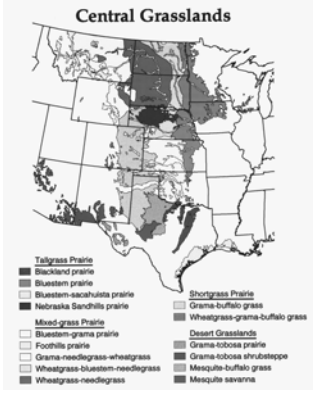
North American Prairie



North American Prairie
(Alberta, Saskatchewan, Manitoba North and South Dakota, Nebraska, Colorado. Minnesota, Montana)

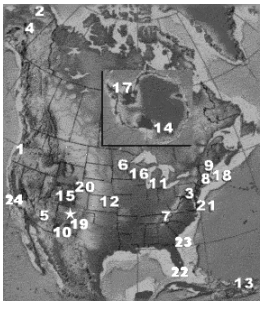
Ecosystem Areas by Type, United States, 1992-93

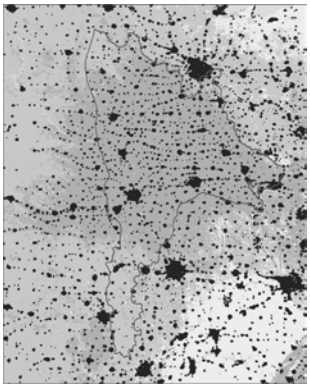




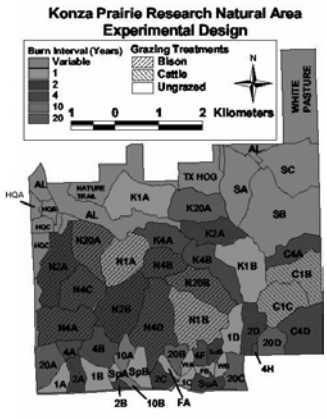
The US
Long Term Ecological Research
Network

LTER

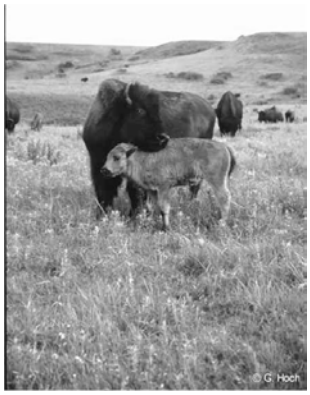




Tall Grass Prairie



Virgin Grasslands



*What Ever Happened To The "Dust Bowl"?**

*read: ***Grapes Of Wrath***

Dust Storm, Kansas 1930s

Abandoned Farms, Kansas, 1930s

Kansas, 2003

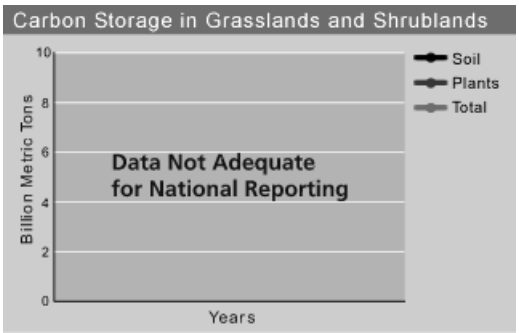
Fire & Rain With flames that soared 30 to 40 feet in the air, the wildfire burned a stand of sacaton grass to the ground, leaving behind bare soil and piles of ash. But sacaton will resprout quickly after a fire, especially following the summer rains.

Technical Note for Grasslands and Shrublands Indicator: Carbon Storage

The Indicator

This indicator seeks to track long-term changes in carbon sequestration in grasslands and shrublands. Measurements of this indicator through time can provide information on whether the ecosystem is a net source or a net sink of atmospheric carbon dioxide. An ecosystem accruing carbon is one contributing to a reduction in greenhouse gases. White et al. (2000) have estimated that grassland ecosystems worldwide store an amount of carbon that is about of that stored by the world's forests and roughly equivalent to that stored by agricultural systems.

http://www.heinzctr.org/ecosystems/grass_technotes/grass_crbn_strg.shtml



Biodiversity Of Birds Utilizing Prairie Habitats

Common Name	Scientific Name
Tallgrass Prairie	
Dickcissel (a)	*Spiza americana*
Henslow's Sparrow	*Ammodramus henslowii*
Le Conte's Sparrow (a)	*Ammodramus leconteii*
Bobolinka	*Dolichonyx oryzivorus*
Eastern Meadowlark (a)	*Calcarius pictus*
Smith's Longspur (winter)	*Calcarius pictus*
White-tailed Hawk (Texas coastal prairie)	*Buteo albicaudatus*
Mixed-grass Prairie	
Sprague's Pipit (a)	*Anthus spragueii*
Clay-colored Sparrow	*Spizella pallida*
Baird's Sparrow	*Ammodramus bairdii*
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*
McCown's Longspur	*Calcarius mccownii*
Shortgrass Prairie	
Ferruginous Hawk (a)	*Buteo regalis*
Mountain Plover (a)	*Charadrius montanus*
Long-billed Curlew (a)	*Numenius americanus*
Northern Shrike (winter)	*Lanius excubitor*
Lark Bunting (a)	*Calamospiza melanocorys*
Chestnut-collared Longspur	*Calcarius ornatus*
Lesser Prairie Chicken	*Tympanuchus pallidicinctus*

Sonoran/Chihuahuan Desert Grasslands

Cassin's Sparrow (a)	*Aimophila cassinii*
Aplomado Falcon	*Falco femoralis*
Botteri's Sparrow (a)	*Aimophila botterii*
Rufous-winged Sparrow (a)	*Aimophila carpalis*

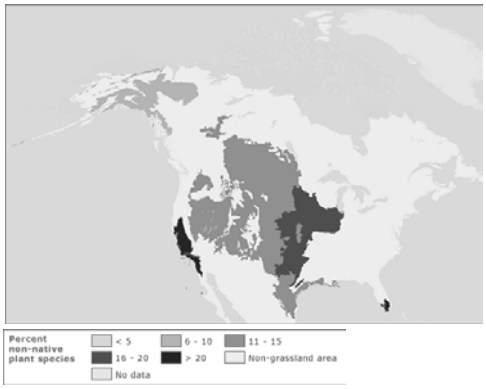
Grassland Generalists

Upland Sandpiper (a)	*Bartramia longicauda*
Northern Harrier (a)	*Circus cyaneus*
Swainson's Hawk (a)	*Buteo swainsoni*
Burrowing Owl (a)	*Athene cunicularia*
Short-eared Owl (a)	*Asio flammeus*
Common Nighthawk	*Chordeiles minor*
Loggerhead Shrike (a)	*Lanius ludovicianus*
Vesper Sparrow	*Pooecetes gramineus*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow (a)	*Ammodramus savannarum*
Lark Sparrow	*Chondestes grammacus*
Western Meadowlark (a)	*Sturnella neglecta*

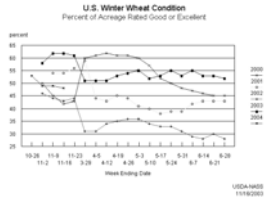
Grasslands are recognized by many as the most imperiled ecosystem worldwide.

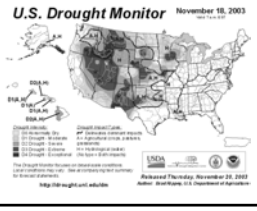
- The unique avian assemblages associated with grasslands are also in danger -- grassland bird populations have shown steeper, more consistent, and more geographically widespread declines than any other guild of North American bird species.
- Breeding Bird Survey (BBS) data from 1966-1993 indicate that almost 70% of the 29 grassland bird species adequately surveyed by the BBS had negative population trends.
- The need for information on abundance, productivity, habitat use, seasonal distribution, and effects of management practices is widely recognized among resource managers.
- Favorite grassland birds like the Eastern and Western Meadowlarks, Mountain Plover, Burrowing Owl, Dickcissel, Cassin's Sparrow, and Lark Sparrow are declining.

Non-native Plant Species

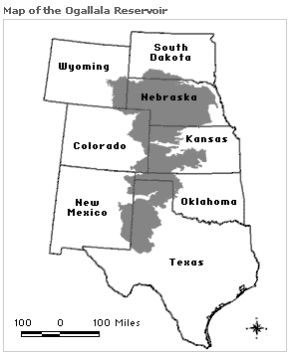


Kansas Wheat Production

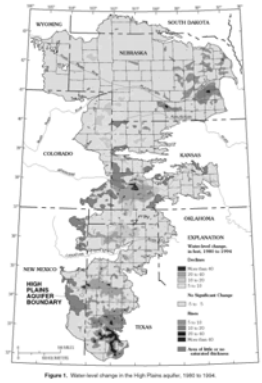




Ogallala Reservoir



Drawdown Of The Ogallala Reservoir



"Don't Mess With Texas"*

***"Til taught by pain, men really know not what good water is worth."* - Byron**

"The truth of the matter is that if the High Plains are to continue to be of any agricultural importance new water sources must be found. Potential water supplies could be the collection and storage of natural rainfall before it runs off or evaporates, increasing rainfall through seeding clouds (still being researched), and most importantly new sources of water will have to come from outside the High Plains region."

*Saying On Some Texas license plates. Too late, because: "We All Live Downstream"