



The Abdus Salam
International Centre for Theoretical Physics



2163-35

**College on Soil Physics: Soil Physical Properties and Processes under
Climate Change**

30 August - 10 September, 2010

Dust emissions and climate

Edward Skidmore
*United States Department of Agriculture
Manhattan
Kansas
USA*



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"Scientific thought is the common heritage of mankind" – Abdus Salam

College on Soil Physics

30 August – 10 September 2010

Miramare – Trieste, Italy.

Dust Emissions & Climate

**Research & Programs That lessen Likelihood of
Dust Emissions**

Edward Skidmore

United States Department of Agriculture, Agricultural Research Service

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Dust Emissions

Research

Programs & Practices

Dust storms in the Great Plains before Dust Bowl

Extracts from official weather records at Dodge City, Kansas:

April 8, 1890: "At 10 a.m. , the dust in the air was so dense that objects could not be distinguished 100 yards off. "

August 13, 1892: "The wind raised such a cloud of dust that it was impossible to see over 150 feet ahead."

April 6, 1893: "The dust was blinding and was deposited so thickly on office furniture that everything looked as though it were covered by a layer of dirt prepared for a hotbed."

May 15, 1894: "The dust caused by high wind was terrible."

The Dust Bowl

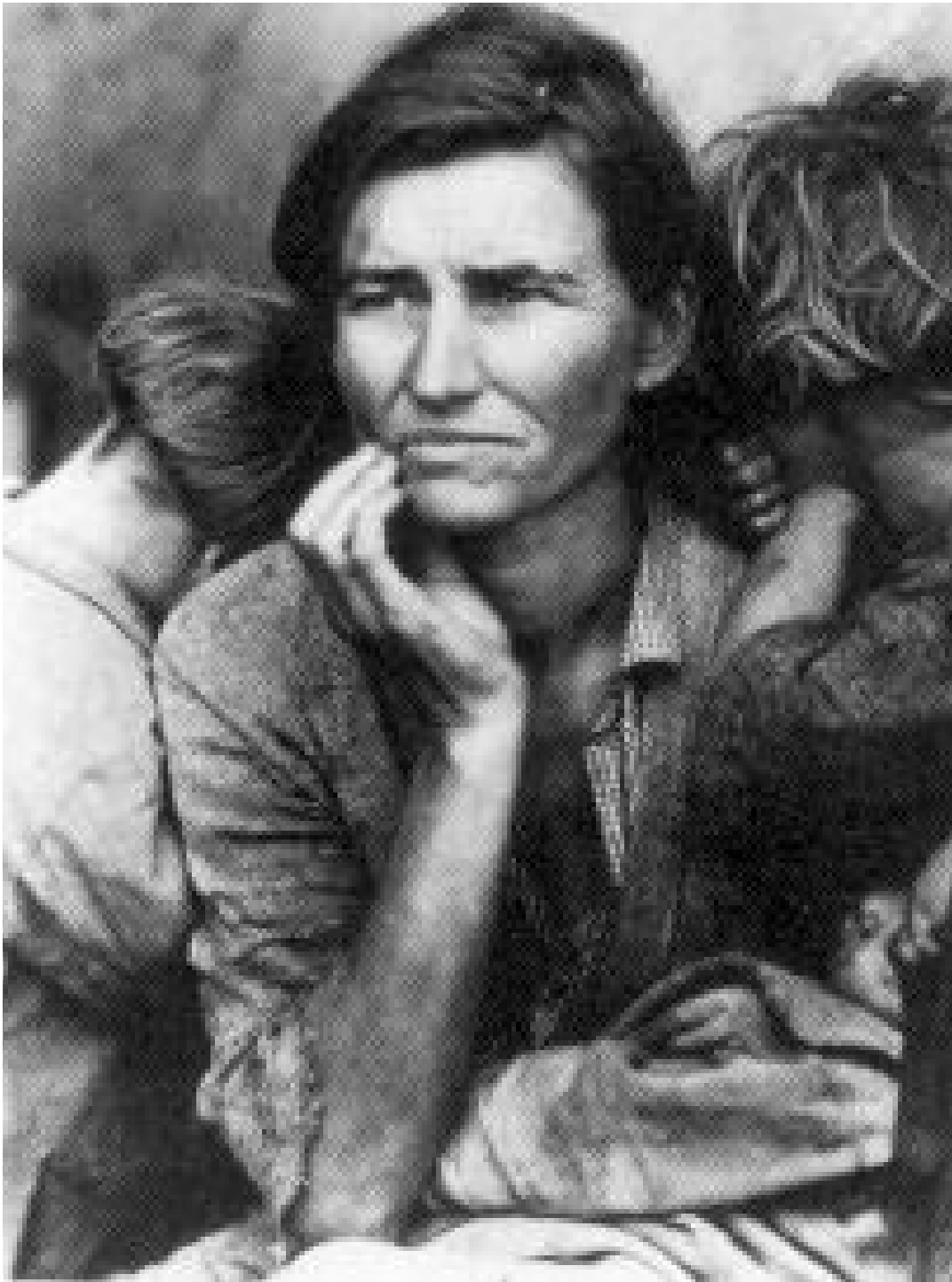


Scenes and comments









Comments of some who endured the dust bowl:

Wheat didn't germinate.

Couldn't grow garden.

You expected flowers to bloom and they didn't.

sun - copper colored, a dirty brown.

Red soil coming up from Oklahoma.

Black soil from western part of Kansas.

Comments continued:

Put dishes upside down on the table just before eating.

People died, birds died, cattle died ...suffocation or pneumonia.

Hardest thing ... what's coming next and will it ever rain?

My own humble opinion is that with the exception of a few favored localities the whole Great Plains region is already a desert that cannot be reclaimed through the plans and labors of man. From Empire of Dust by Lawrence Svbida

The dust, the dust, that awful dust ...

Black Sunday

14 April 1935



Reoccurrences

Dirty thirties

Filthy fifties

Severe seventies

Naughty Nineties

Future ???











Around the world

From Times News Services

Dust darkens Egypt

CAIRO, Egypt — Egypt was hit by a massive dust storm Friday that closed Cairo Airport, the port of Alexandria and major roads throughout the country.

Visibility in Cairo was sharply reduced as 30-mph winds spread choking dust over the city.

The storm also stalled traffic in the Suez Canal city of Ismailia and forced officials to close the desert road linking Alexandria and Salum, on the Mediterranean Sea.

Officials at Cairo Airport said that flights were being diverted to Larnaca, on Cyprus, the Saudi Arabian city of Jiddah, or the Luxor in Upper Egypt.

3 die, 40 hurt in 31-vehicle pileup on I-10

Swirling dust blinded drivers east of Bowie, authorities say

47 die in sandstorm

5/11/93

Associated Press

BEIJING — A sandstorm in Gansu province killed at least 47 people and injured 153, China's

in economic losses, the report said. Sandstorms commonly destroy crops by burying them.

The brief report did not say how the 47 people were killed.

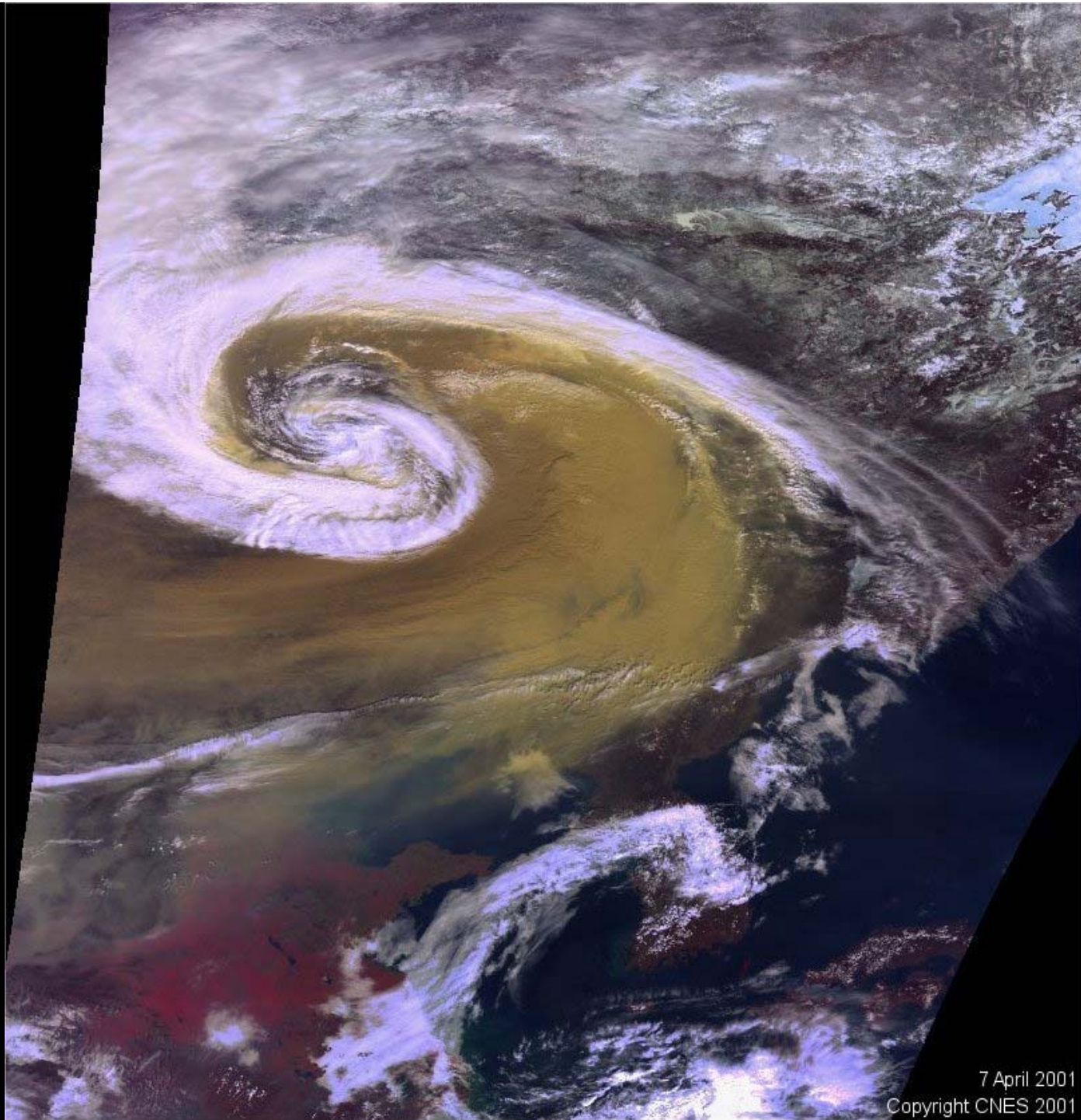
Seven are killed in 80-car pileup

BAKERSFIELD, Calif. (AP)— Seven persons were killed and 96 injured, some seriously, as some 80 vehicles slammed into each other in

Lt. Max D. Smith of the California Highway Patrol said the zero-visibility dust storms were caused by unexpected, 20-25-mile-per-hour

Southern California on the east as unstable winds from the northeast around a system centered around





7 April 2001
Copyright CNES 2001





Health hazards:

Silica – silicosis, dust pneumonia
And respiratory infections.

Soil-borne **spores** (fungus *Coccidioides immitis*)
- Valley Fever, coccidiomycosis

Soil-borne agricultural **chemicals** -???

Wind erosion (dust emission) threat To Sustainable Agriculture:

Removes most fertile soil

Modifies the landscape

Reduces seedling survival

Imperils human and animal health

Lowers marketability of crops

Irritates homemakers

STRATEGIES

- ▶ Determine the on-site and off-site consequences of wind erosion.
- ▶ Increase understanding of wind erosion and related processes.
- ▶ **Predict wind erosion, fugitive dust and their environmental impacts**
- ▶ Develop economically and environmentally viable control.
- ▶ Provide customer satisfaction Through technology transfer.

Wind Erosion Research



*Developing
Prediction tools*

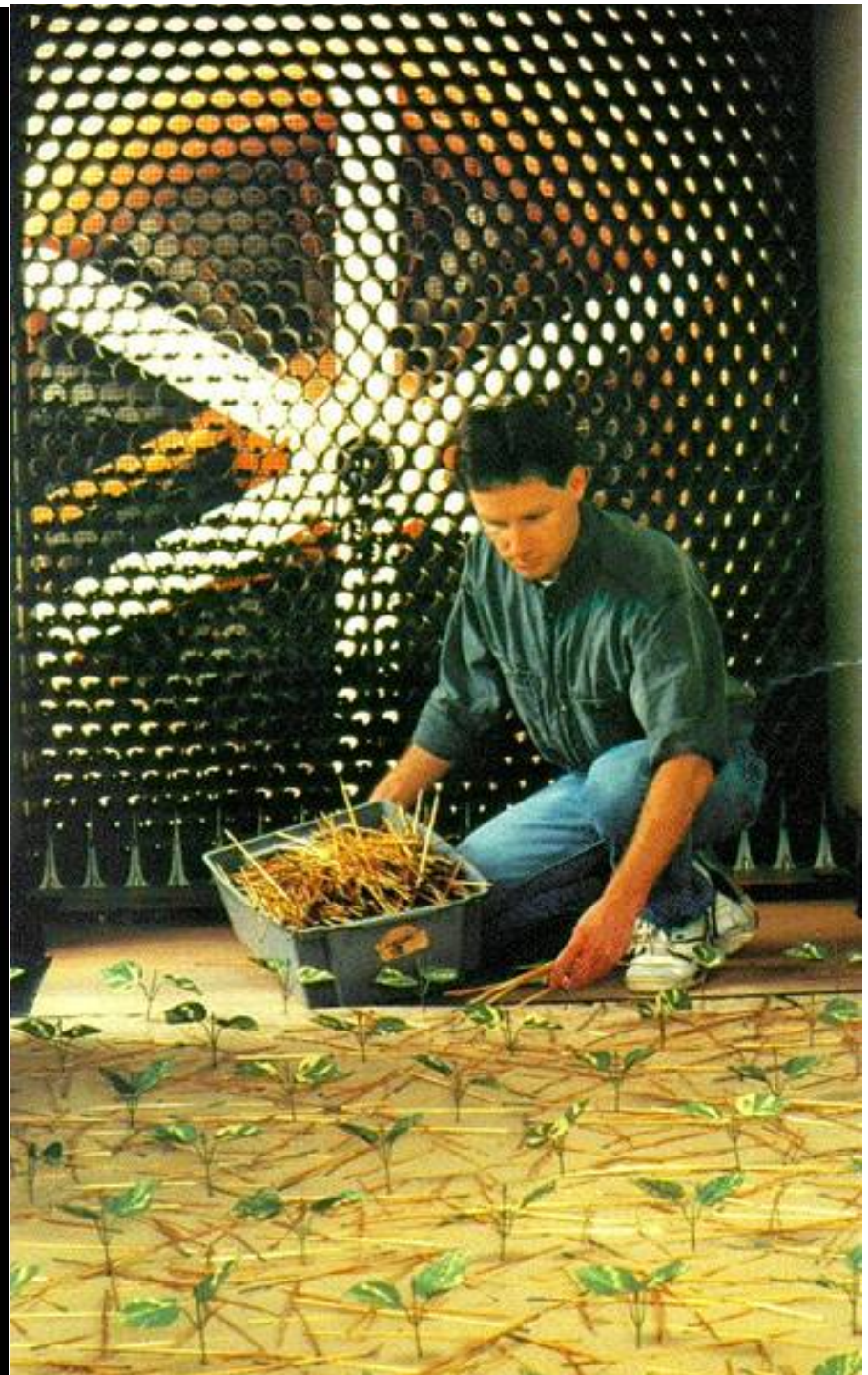


*Understanding
Processes*

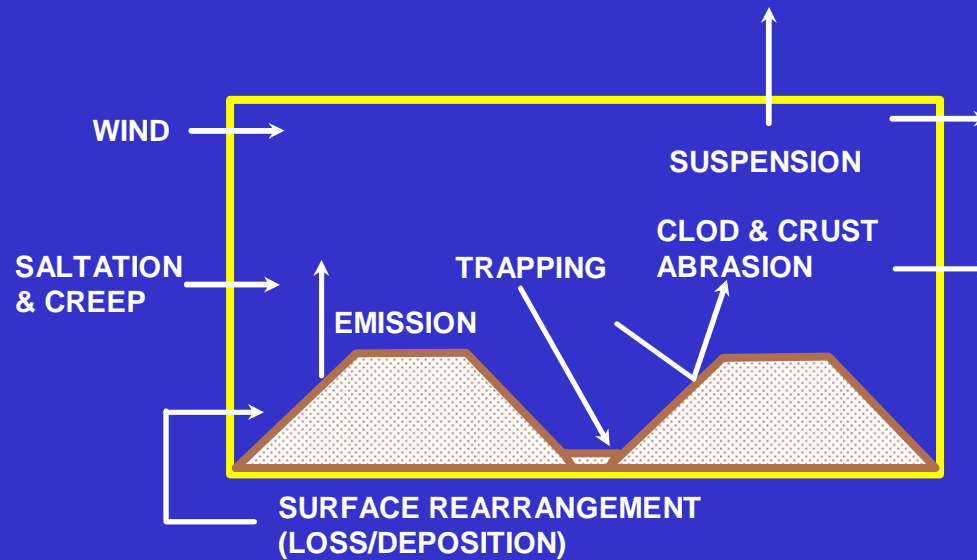


*Testing
Control strategies*

"...Developing innovative strategies for controlling wind erosion and protecting the environment"



What does WEPS Simulate?

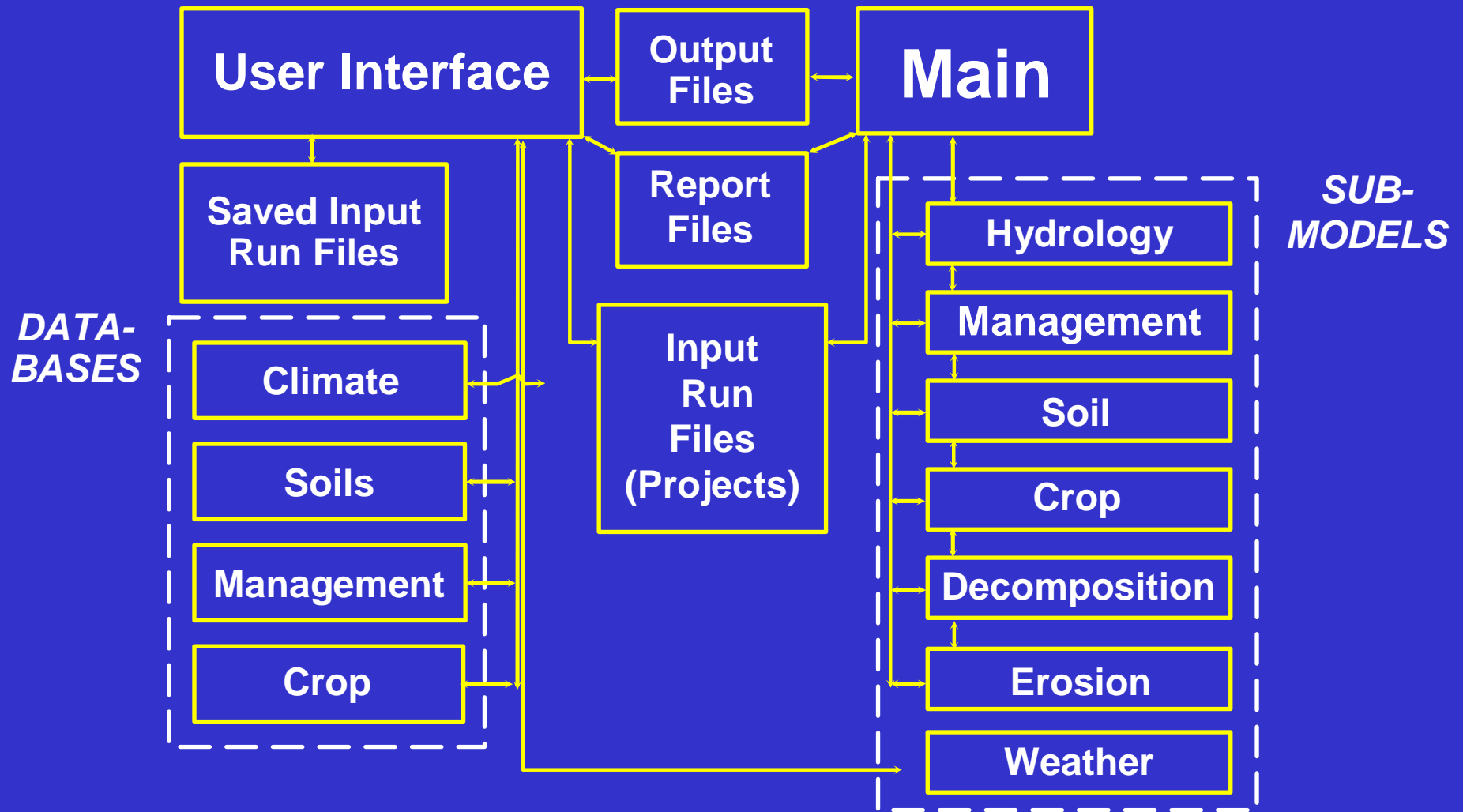


Detachment

Transport









Deposition

How is WEPS Implemented?



WEPS

example output
for Suspension and PM10

wheat fallow 20 Year Simulation								
Wind Erosion Soil Loss								
Mass Passing Field Boundary								
Suspension				PM10				
								
-----tons/1000ft-----				-----tons/1000ft-----				
Avg. Annual Rot. Year 1	128	33.4	422.1	34.6	2.1	0.6	6.3	0.5
Avg. Annual Rot. Year 2	0	0	0	0	0	0	0	0
Average Annual	64	16.7	211.0	17.3	1.1	0.3	3.1	0.3

USDA Programs i.e. CRP









No•till

On The Plains











Irrigation

“Real consoling to go there now and see the irrigation,
terrific corn crops, corn stalks in a circle, big irrigation sweeps.”

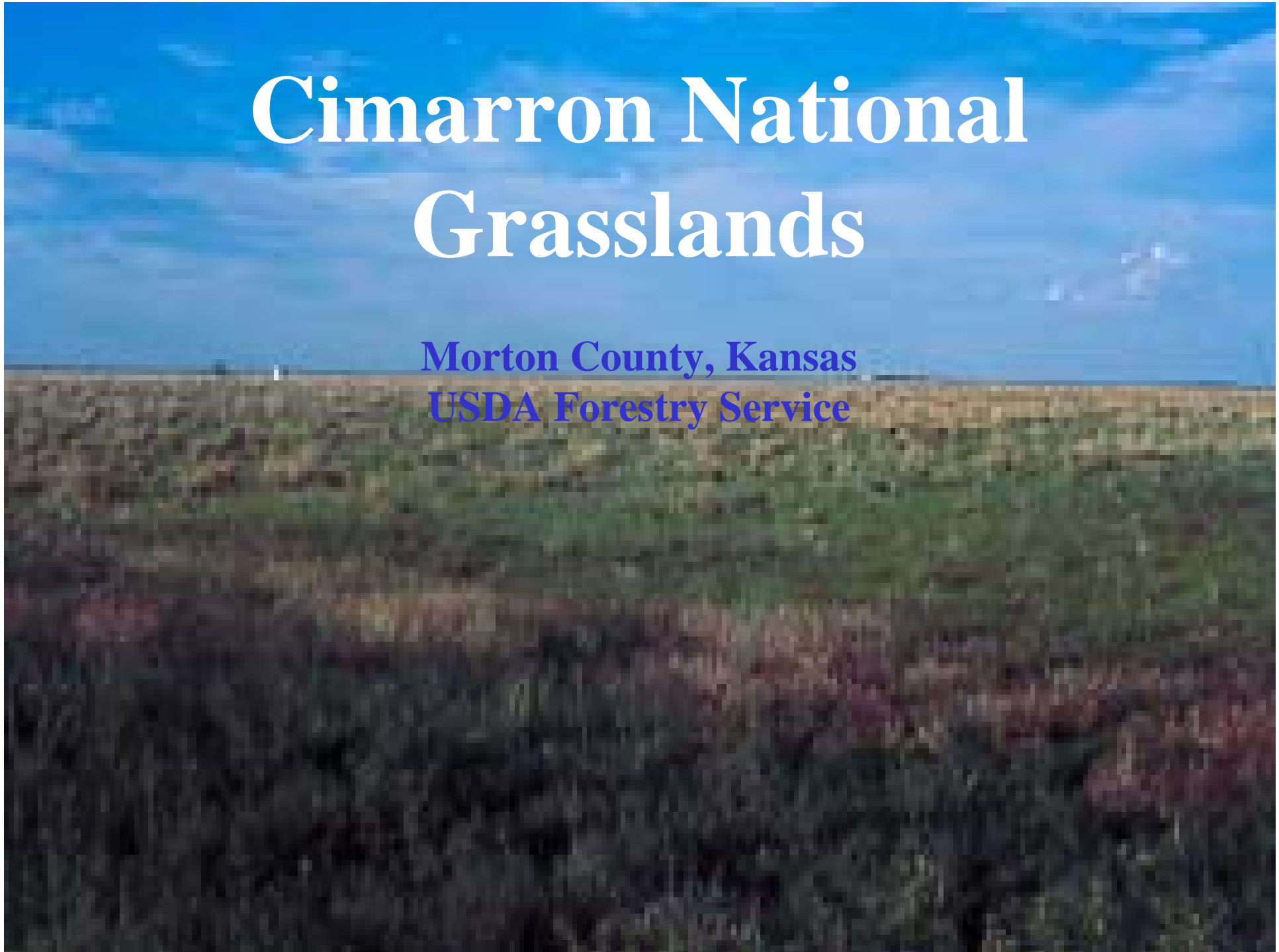






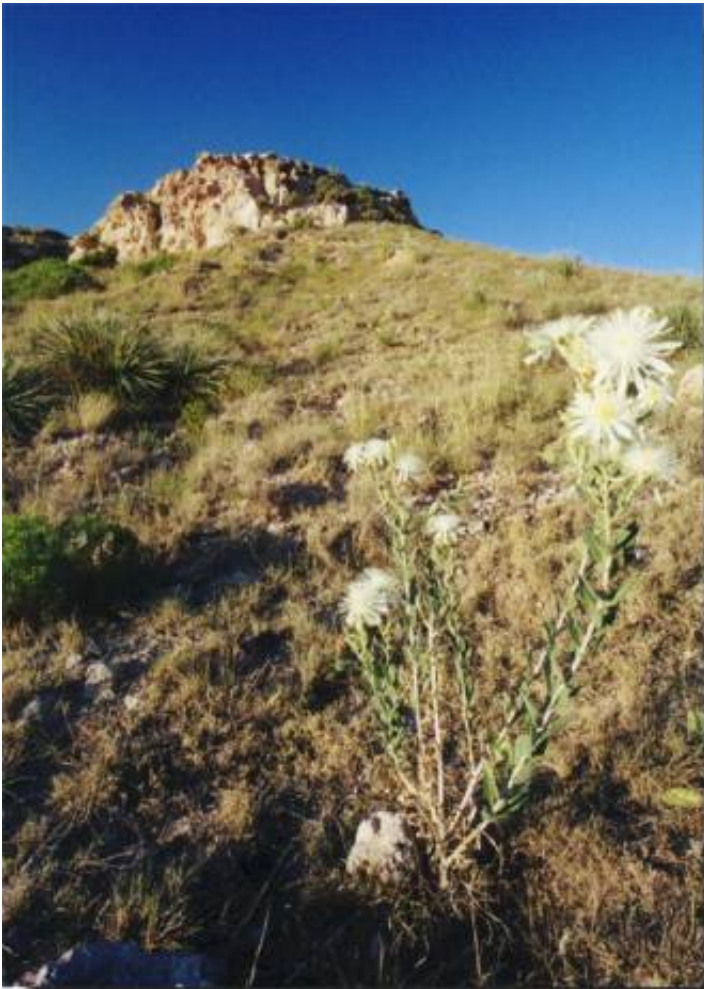
Cimarron National Grasslands

Morton County, Kansas
USDA Forestry Service



Sitting quietly in the

southwest corner of Kansas is one of the State's greatest treasures of public land: The Cimarron National Grasslands. This was farm ground once, until the drought and dust



storms of the 1930's put a halt to farming here. The US Government started buying farms from those who'd had enough. Through the direction of several government agencies and the labor of thousands of workers, the Grasslands were reclaimed. In the 1960's, they were placed under the control of the USDA Forest Service and the 108,175 acre area was named the Cimarron National Grasslands.

One of the most notable features of the Grasslands is known as the Point of Rocks. First noted by the Spanish explorer Coronado in the mid-1500's, it has been the landmark ever since.

The view from the top of Point of Rocks is great! It's the third highest point in Kansas. The trees in the distance are along the normally dry Cimarron River. Until the 1940's few trees grew there, but the growth of the trees has provided habitat for animals that would otherwise not be found here, such as Whitetail deer.



A few of the 5000 or so head of cattle that seasonally graze the Grasslands gather at a windmill and water tank.



During the days of the Santa Fe Trail, this area was the famous Middle Cimarron Springs. Travelers of the Dry or Cimarron Route depended on this for water as the Cimarron River seldom ran water. The spring is fed by the Ogallala Aquifer, which is now used heavily for irrigation on the High Plains.

As the sun sets on the Grasslands, less than 10 miles south on Highway US 56 travelers speed along on their way content in the belief that there is nothing out here but distance to be covered.

At a windmill on the Grasslands, I pause to view the sunset just to see what nothing is like. A sentinel guarding the prairie, the windmill lets out a slow pulse; thunk....thunk....thunk, which speeds up and slows down with the wind. A cow in the distance calls her calf to gather it to the herd before dark. Nearby a grasshopper fiddles it's late summer serenade among the grass.

There is peace on earth, or at least this small part of it. The travelers down on Highway 56 are both right and wrong at the same time.



Improved farming practices



























Research and programs that lessen the Likelihood of dust emissions from climate

Wind Erosion Prediction Technology

Conservation Reserve Programs

Conservation Security Programs

No-till on the Plains

Irrigation

Improved control practices

Web Site:
www.weru.ksu.edu

Publications

84 - 474-J

E. L. Skidmore

WIND EROSION CLIMATIC EROSION

Climate Change 9:195-208

Climatic Erosivity

SURVIVING THE
DUST BOWL



Thank You!

