

1962 catching
a crayfish



2012 no living
creatures in the same
Pennsylvania creek.



50 years of poor quality runoff
killed all aquatic life.

WARDS Model Outreach

Meteorology-Hydrology-Earth Science

By Mark Hoskins PE, CFM
Illinois Department of Natural Resources / Office of Water Resources

Presenting the WARDS MODEL

Classrooms

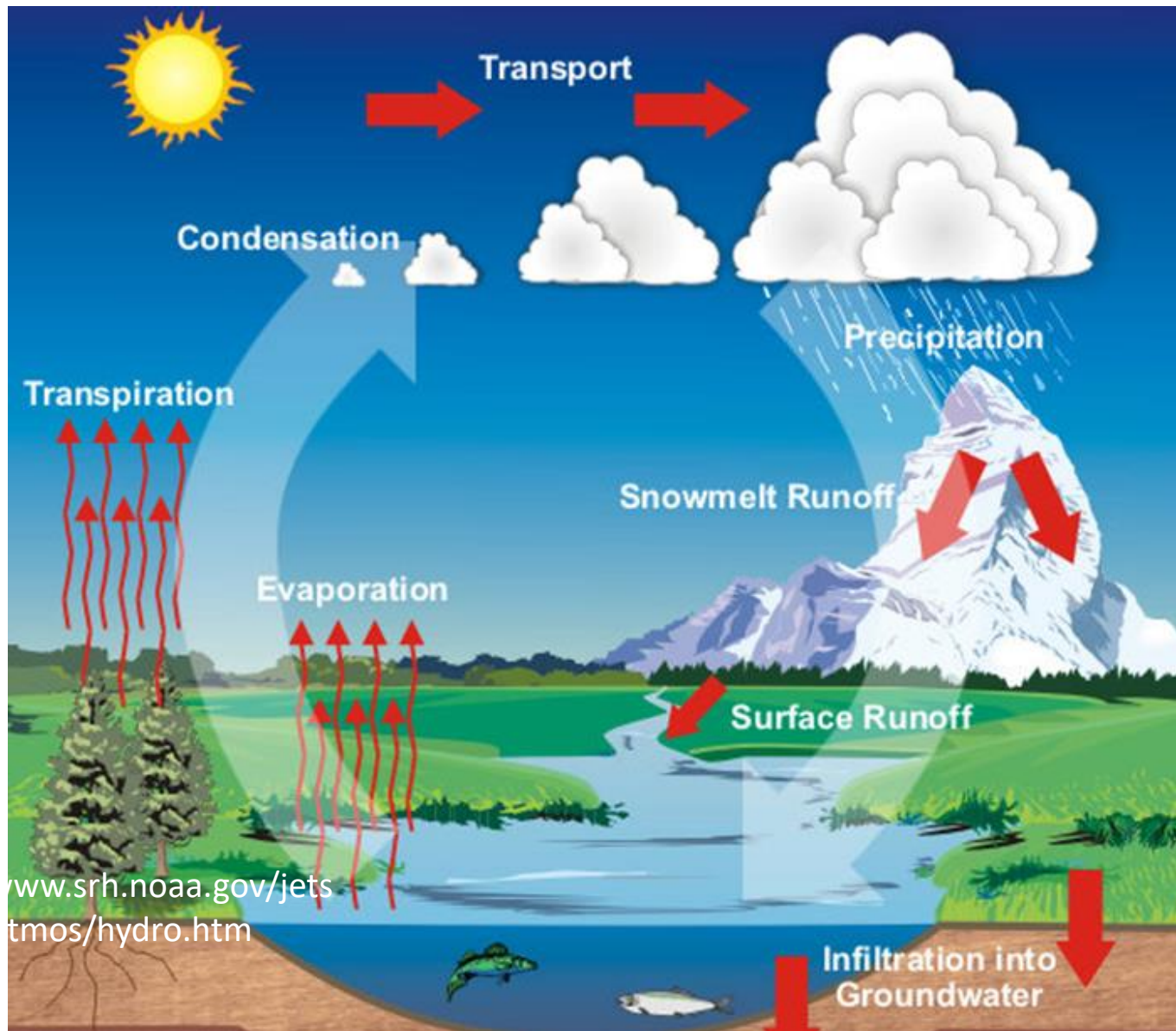


Outside tent events

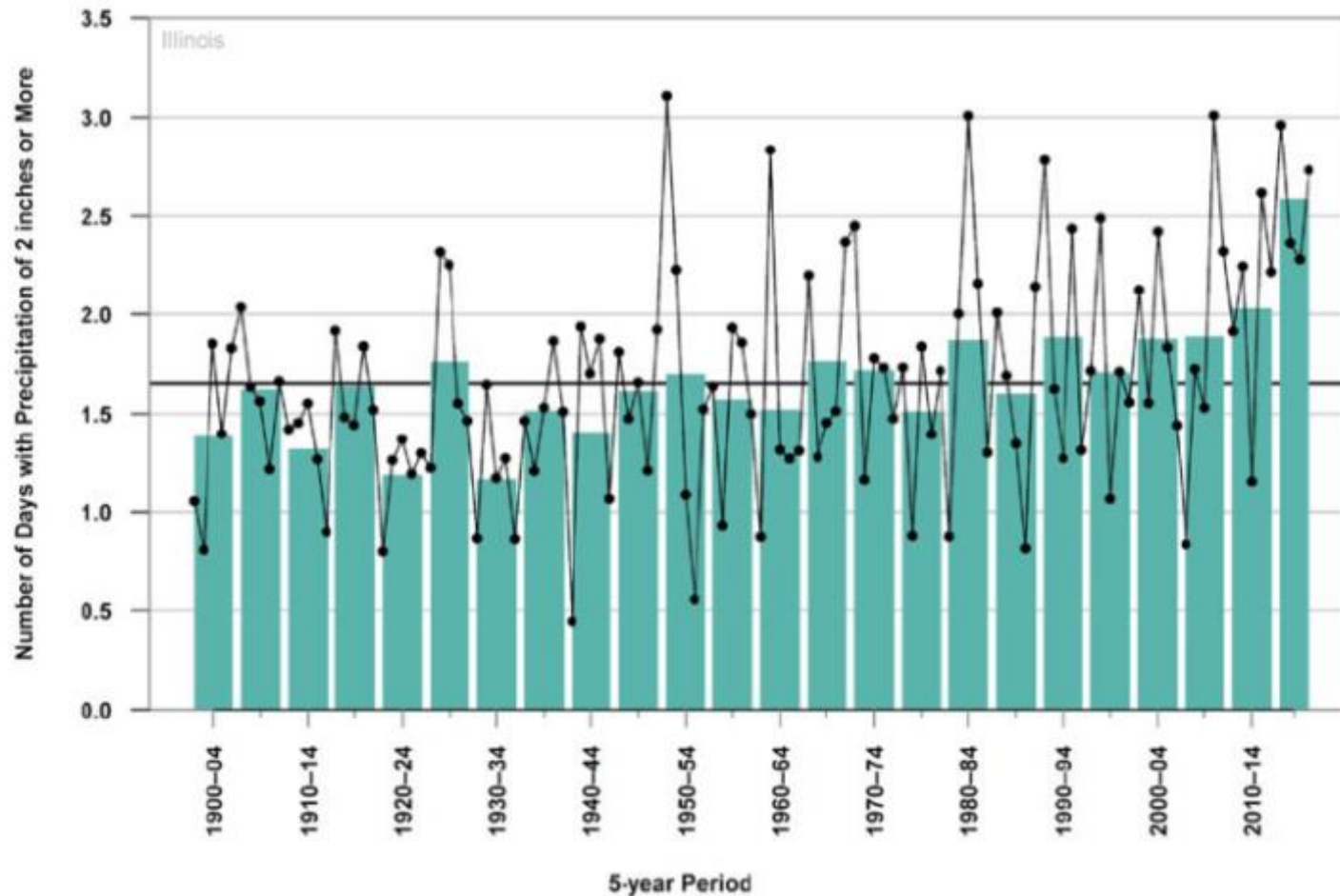


Classroom PowerPoint

Hydrology Basic Concepts



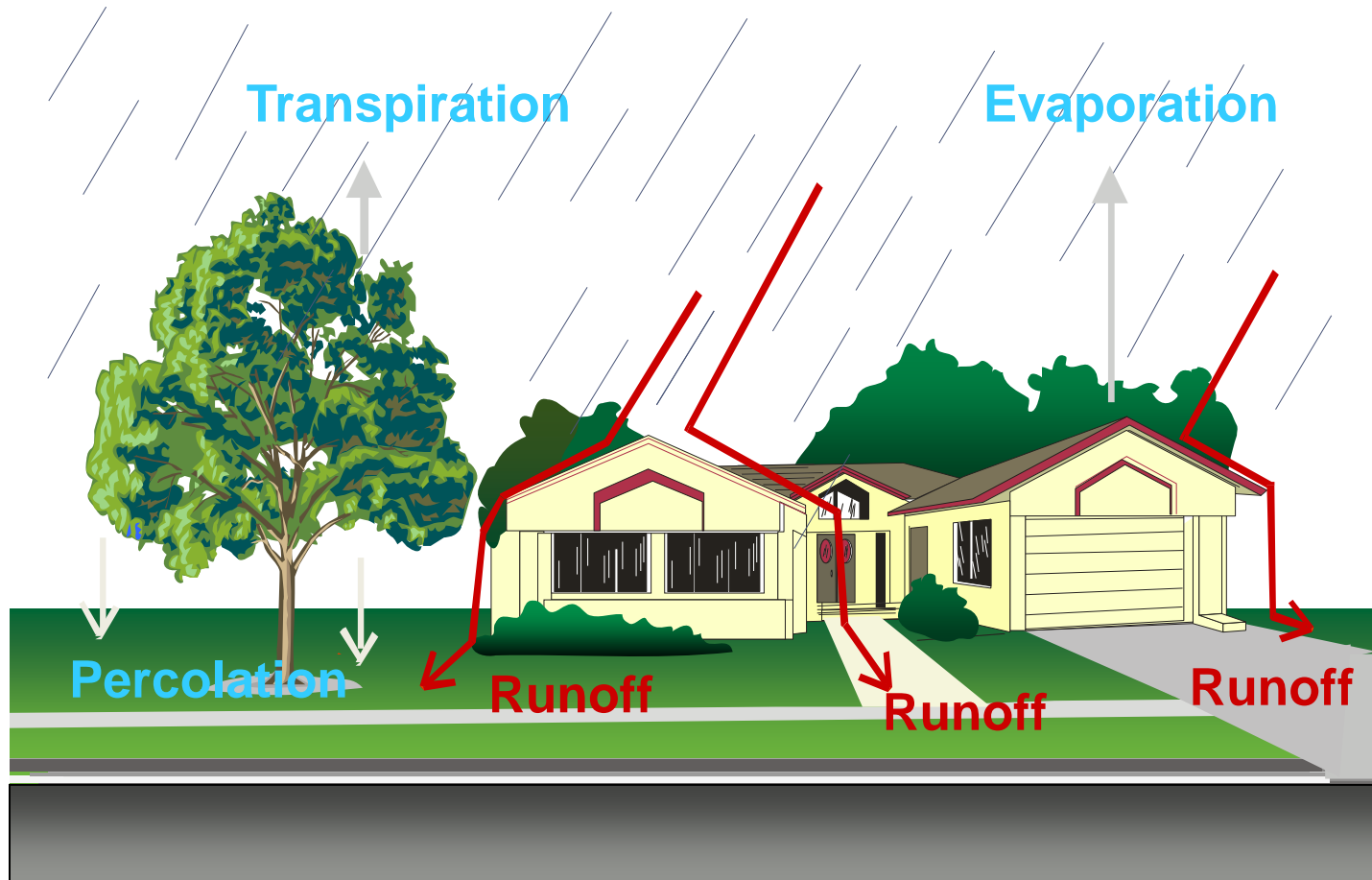
Observed Number of Extreme Precipitation Events (1900-2018)



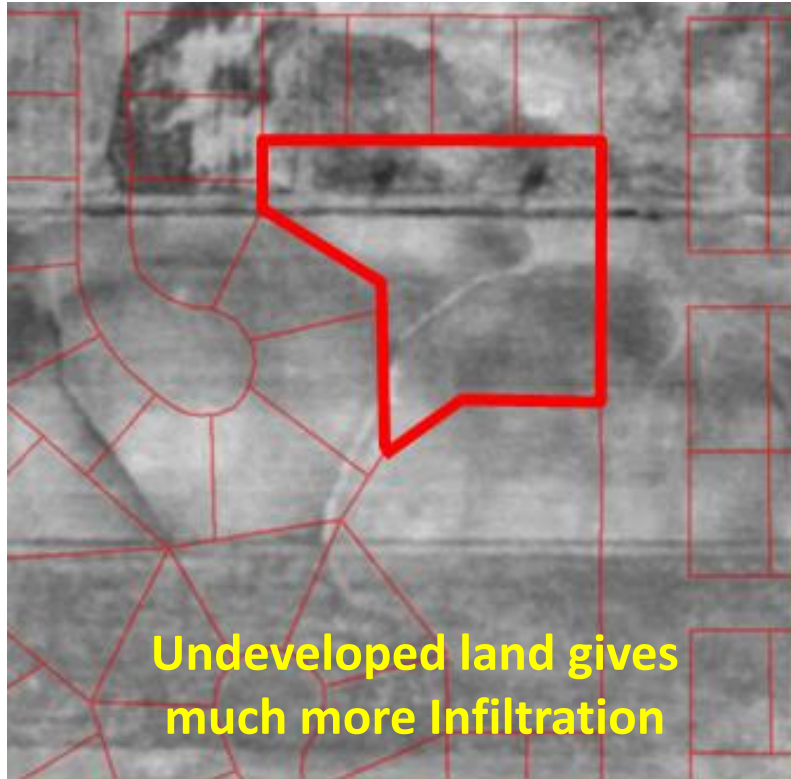
The number of days with precipitation of 2 inches or greater in Illinois between 1900 and 2018, averaged over 5-year periods. Dots show annual values, and the horizontal black line shows the long-term annual average of approximately 1.7 events per station between 1900 and 2018. Source: taken from Wuebbles et al. (2021).

Extreme Rainfall has increased... 1900-2018.
Carbon Dioxide is making our climate warmer.

Rain needs to filter into the ground.



Pavement + Rooftops can result in 600% more runoff!



Undeveloped land gives
much more Infiltration



More impervious = More runoff
Ponds too small for 100 year rain.

Discharge in a 2-yr storm

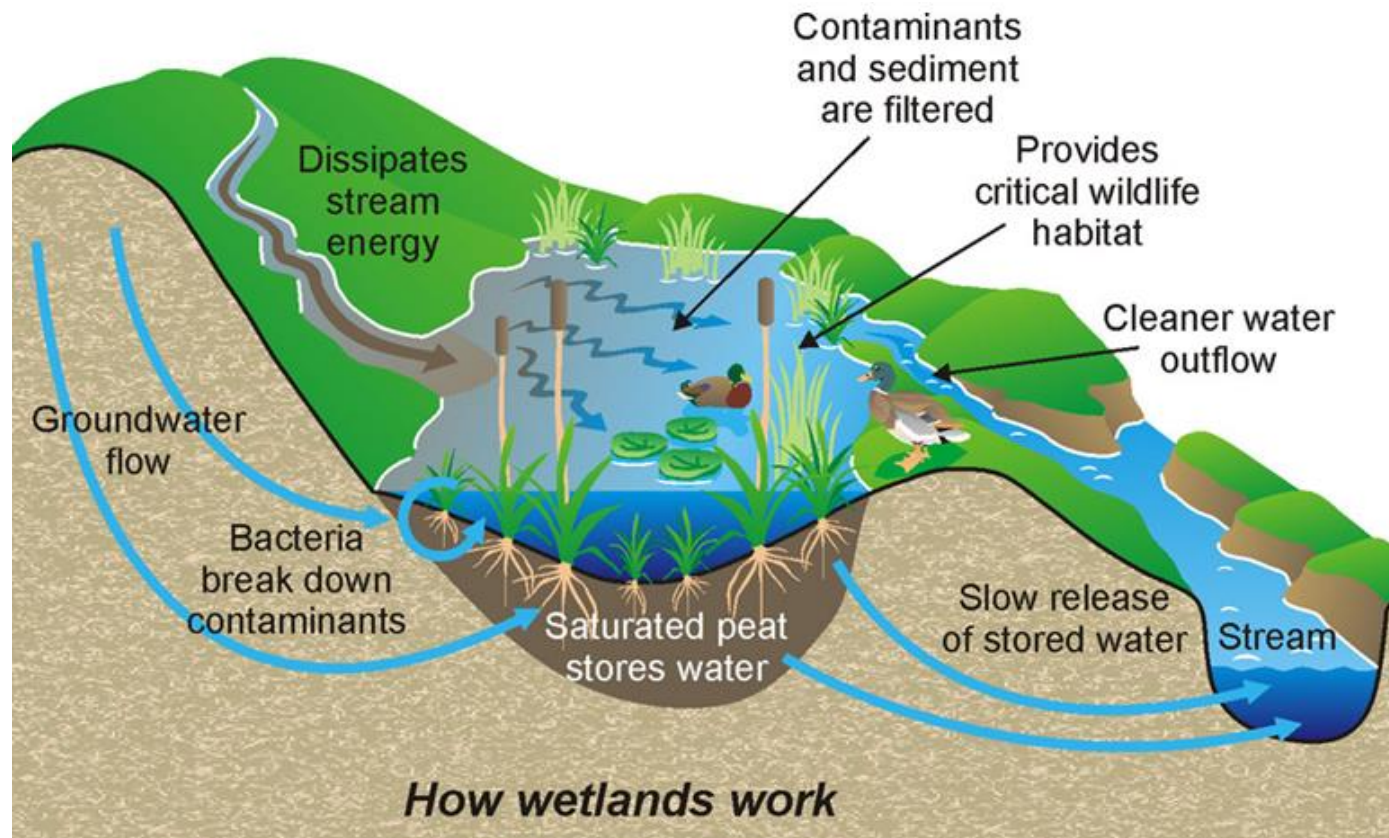
= 0.92 cfs

= 5.49 cfs

600% (6 times) more runoff, YIKES !!



Wetlands Capture Rain ...also a place for animals





We must protect, **natural wetland areas.**

In the movie THE LORAX, the vegetation was vital!



Universal Pictures March 2012

Creeks and Rivers need to be cleaned.

Debris and broken-pipes, hurt wildlife & cause flooding.



Best Management Practices -BMP

1) Restore our waterways, infiltrate rain with: Rain barrels, rain gardens, green roofs



Restore Waterways

Slow flow, stop erosion on banks



Rain gardens -Infiltrating Virginia



Rain barrels

-holding rainfall



Green Roofs

-hold rainfall on roofs

Low Impact Development (LID)

Pembroke Woods

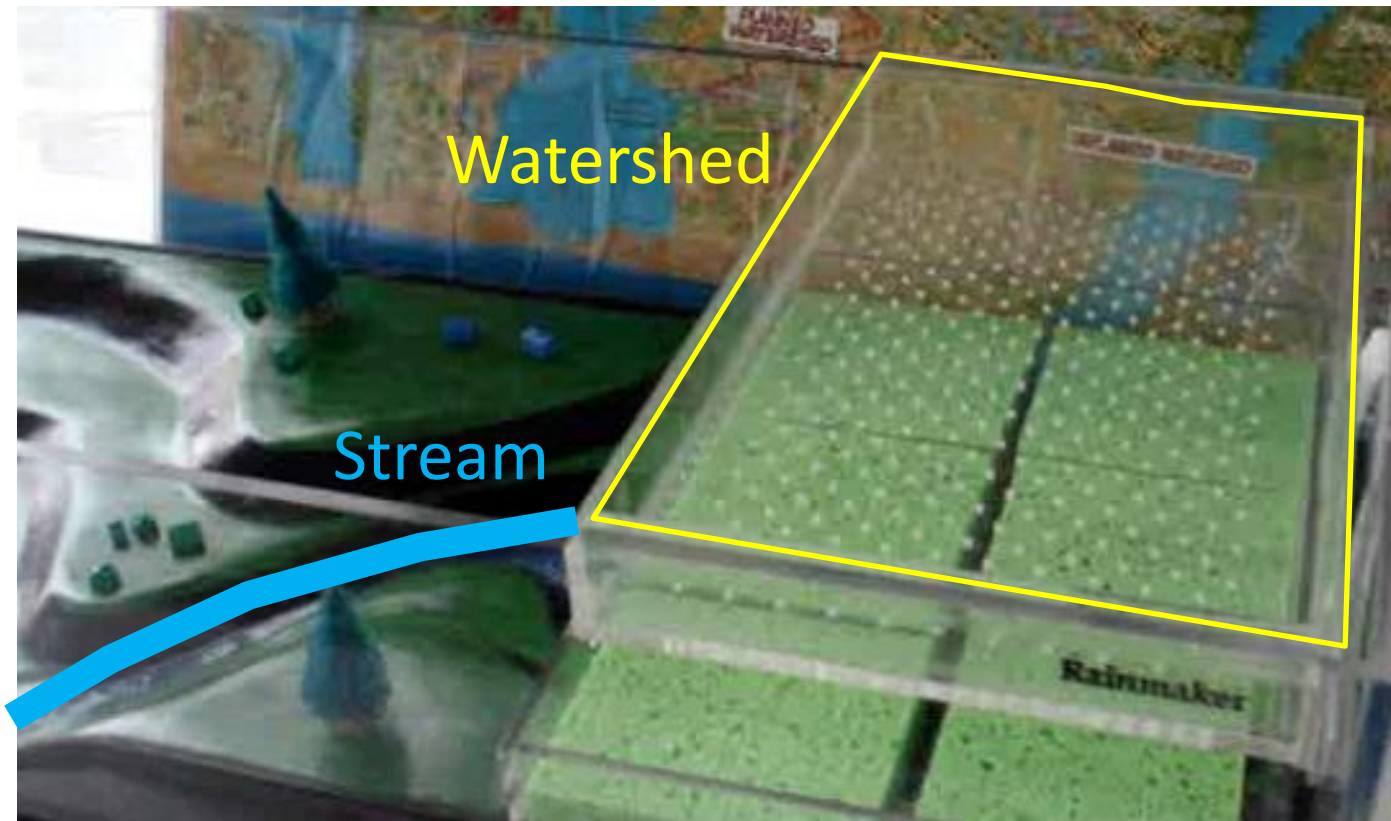
Designed by Dewberry in Frederick, Maryland.

The design lets runoff infiltrate back into the ground!



Classroom WARDS

- 1) Storms on: wetlands, impervious, detention
- 2) Student involvement
 - a) pour into rain tray (thundercup/strobe)
 - b) timekeeper
 - c) call out measurements – plot data
- 3) Levee building
 - a) place plastic houses protected by levee
 - b) build levee (can leak under the clay)
 - c) rainfall on impervious



WARDS HYDROLOGY

Rain on a Watershed

Pour water into a box-with-holes to make rain.
The sponges act like a wetlands, absorbing rain
Yet... what if the wetlands were removed ??



WARDS Hydrology

Run several simulations and record results

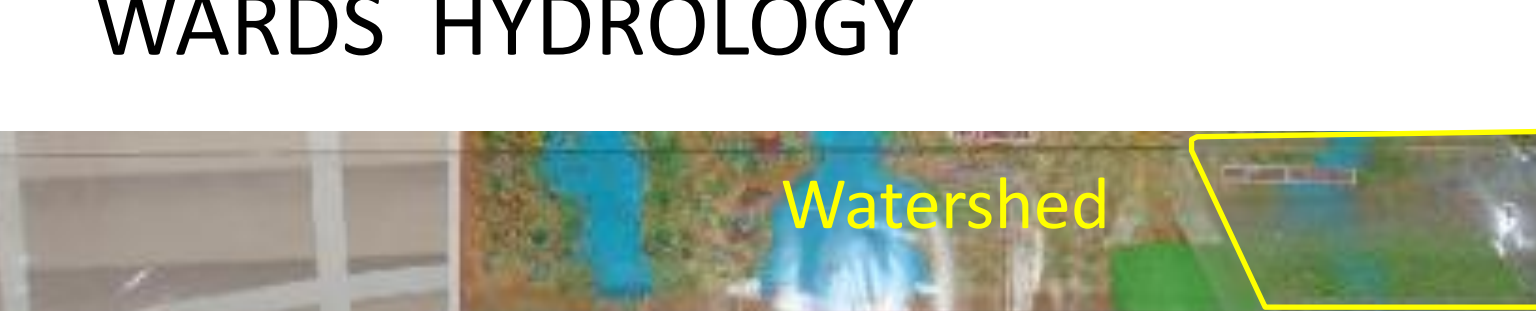
1) Rain falls on **wetlands** (sponges)

Rain falls on **pavement** (no sponges)

Rain falls on **pavement with detention pond**

2) Measure and **Plot Flow** from each “Storm”

WARDS HYDROLOGY



Watershed

Stream

- 1) Create individual rain events (Pour in “Rain”)
- 2) Measure the depth of Runoff in Creek (Recording Flow)
- 3) Plot the Water-graph (really a “hydrograph”)
 - a) With sponges, parking lot, and detention pond
(wetlands) (all impervious) (managed stormwater)



CLASS VOLUNTEERS NEEDED...

WATER POURING PERSON (MAKE IT RAIN):

TIMER (EVERY 5-SECONDS):

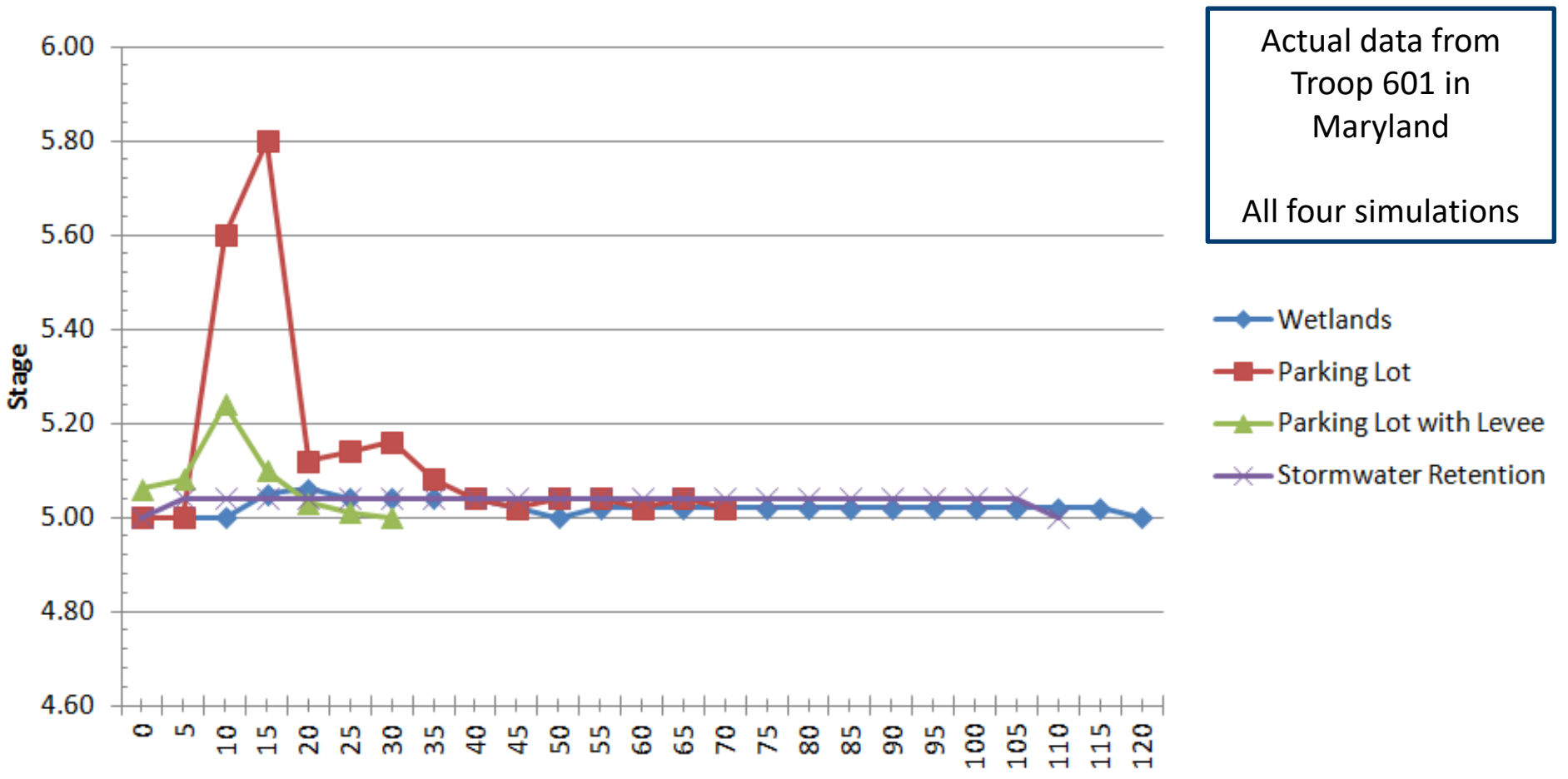
READER (WATER DEPTH):

RECORDER (WATER DEPTH):

DATA ENTRY (ENTER INTO COMPUTER):

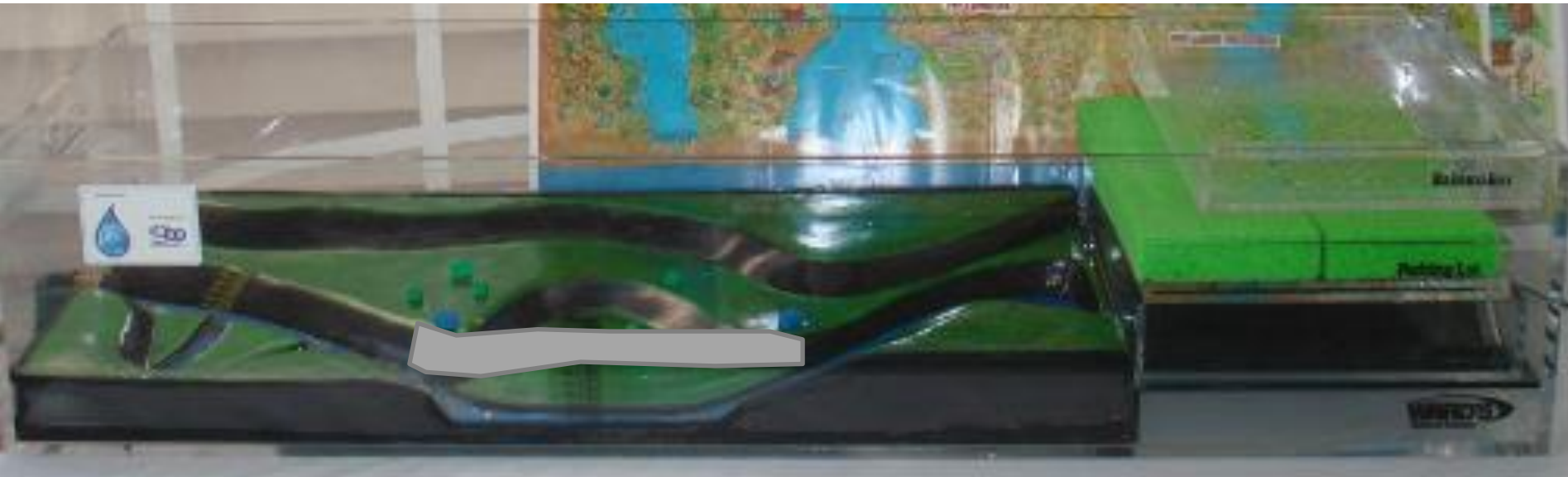
Wetlands =Blue line Pavement =Red line Pond =Green Line

Stormwater Floodplain Simulation System Hydrographs



Levees

A good alternative to protect homes?



- 1) Create and set clay levee as shown (Pour in “Rain”)
- 2) No need to measure as the water flows higher
- 3) The flow frequently goes under the levee (makes a boil)
- 4) Students identify with their house being flooded when they thought they were levee protected.

Tent Event... WARDS

Rain on sponges and rain on impervious

ASK QUESTIONS.....

What is the Shape of a Raindrop?

Teardrop or sphere? Use soap bubbles then ask again.

What is Meteorology?

How is our weather forecast (radiosondes)?

Climate Change?

Is the earth melting?

What is a Floodplain map?

Show them a FIRM

WARDS Earth Science Table Ideas

THUNDER CUP
MAKES A THUNDER
SOUND

**GLASS LIGHTENING
BALL**

SOAP BUBBLES
(ABOUT 10 CENTS EACH)

NOAA CLOUD CHARTS
PRINT ON 11X17 PAPER



ANIMAL POSTERS
ILLINOS DNR

WILDFLOWER SEEDS

**EVENT
LITERATURE**

RAINDROP TATOOS
(ABOUT 3 CENTS EACH)

CoCoRAS RAIN GAGE



Sept 2019 Waterpalooza at Maria Saucedo Scholastic Academy, in South Chicago
What shape is a raindrop?



The students enjoyed seeing and feeling the raindrops from the rain tray.
Thunder-cup in action.

SKY WATCHER CHART

<http://www.weather.gov/os/brochures/cloudchart.pdf>

Typical Types: Cirrus (Ci), Cirrostratus (Cs), Cirrocumulus (Cc)

High Clouds: cloud bases 16,000 - 50,000 ft (5-15 km)



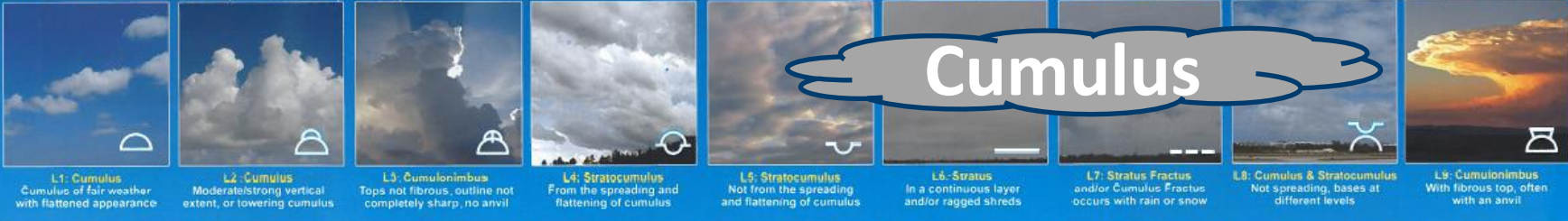
Middle Clouds: cloud bases 6,500 - 23,000 ft (2-7 km)

Typical Types: Altostratus (As), Altocumulus (Ac), Nimbostratus (Ns)



Low Clouds: cloud bases up to 6,500 ft (0-2 km)

Typical Types: Stratus (St), Stratocumulus (Sc), Cumulus (Cu), Cumulonimbus (Cb)



Special photo credit thanks to Jim W. Lee, Eric Kurth, Brian Kimowski, and Eric Heigeson

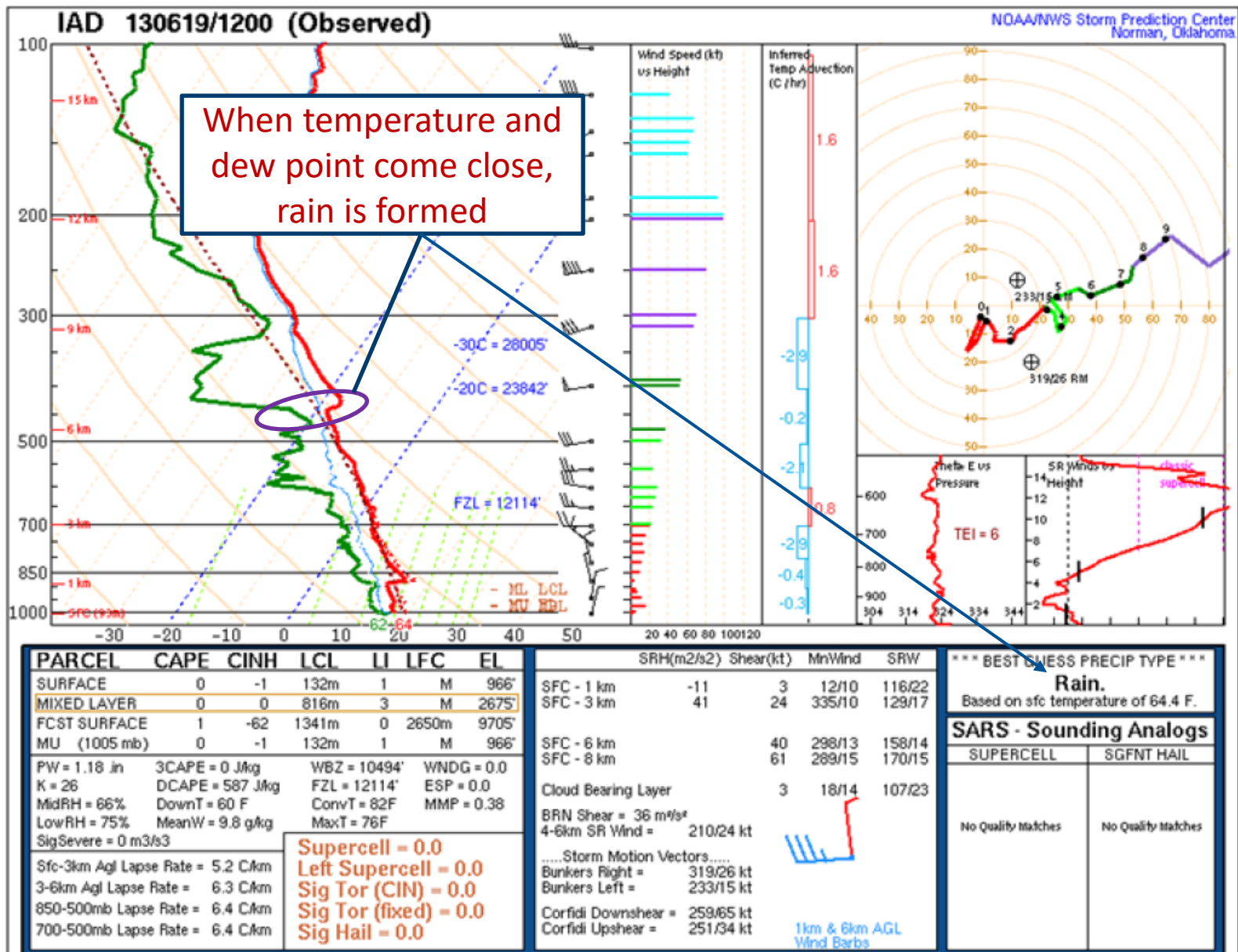
Three types of clouds.

Always look up
NOAA launches 138 Radiosondes per day.

Radiosondes Collect Upper Atmosphere Information

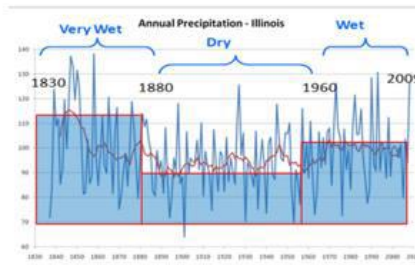
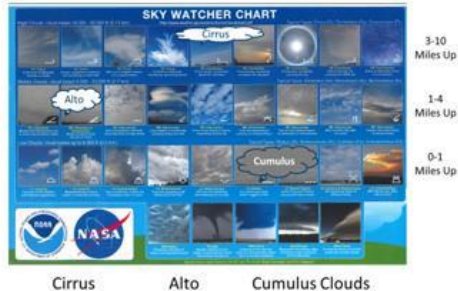
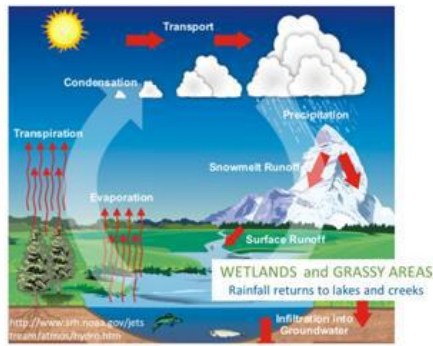


Note added to differentiate between spy balloons and radiosonde balloons.



Radiosonde data returned that shows rainfall is forming.
Pretty complex data and analysis.

CLIMATE and RAINFALL



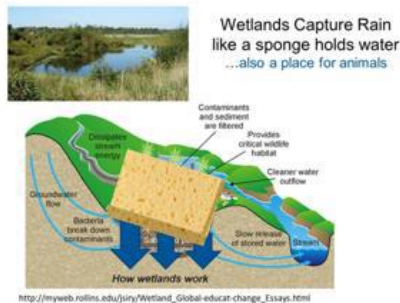
Rainfall has wet and dry times.
Carbon Dioxide is making our climate warmer.

Questions that the
WARDS model can
help answer

How do we study
climate and weather
patterns?



NATURAL RUNOFF



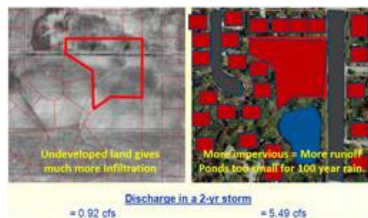
In the movie THE LORAX, the vegetation was vital!



How important are
wetlands?

PAVEMENT RUNOFF

Pavement + Rooftops can result in 600% more runoff!



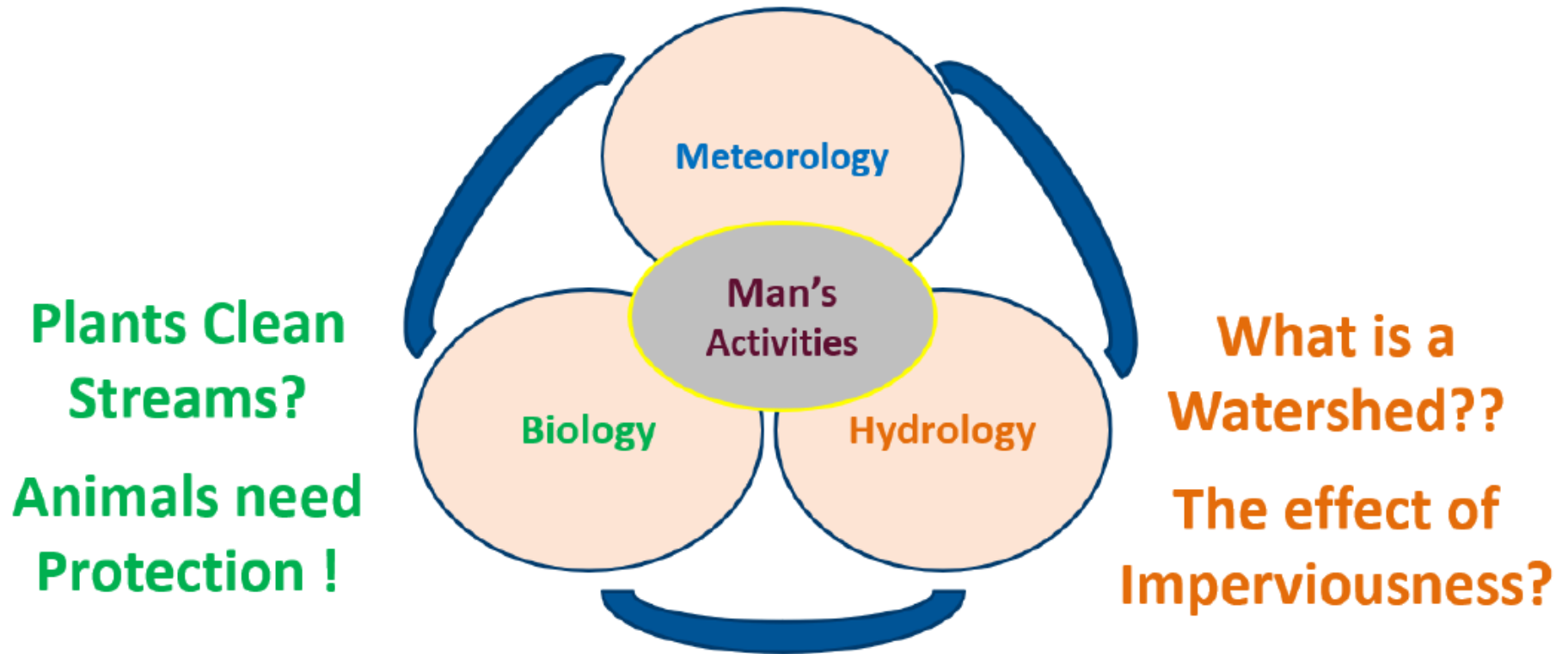
600% (6 times) more runoff, YIKES!!

Creeks and Rivers need to be cleaned.
Debris and broken-pipes, hurt wildlife & cause flooding.



Has man increased
runoff ?

**Are storms more intense?
Weather Forecasting? Radiosondes**

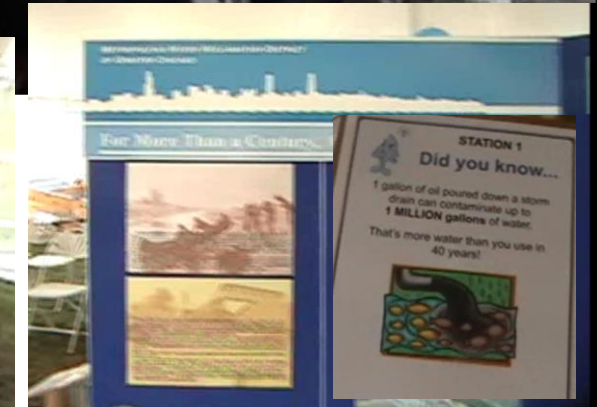
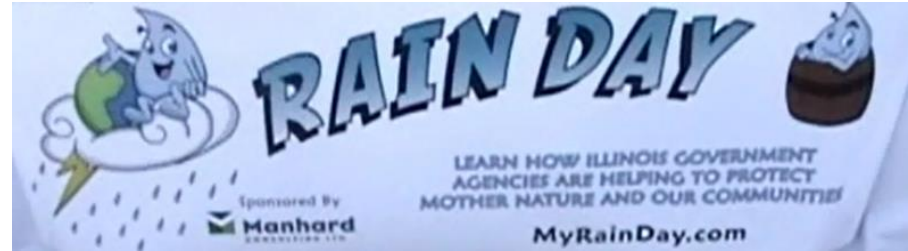


Teach these concepts in a big tent!
Invite NOAA - US Army Corps - EPA - FEMA

Call it a Rain Day tent !

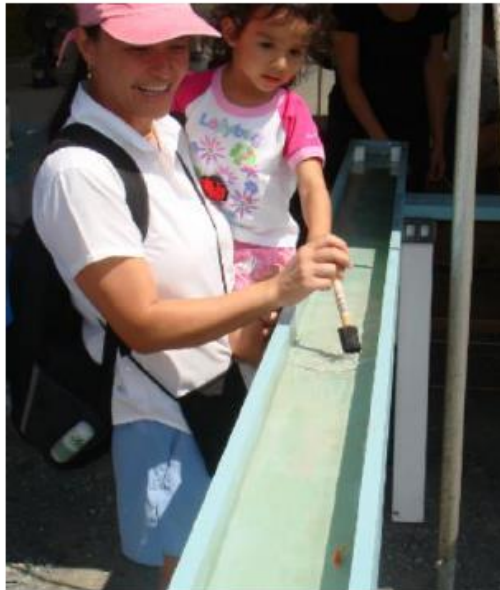
Rain Day 2007 at the Illinois State Fair

US Army Corps, MWRD, FEMA, ISWS, IEPA,



Rain Day 2013 at the Montgomery County (MD) Fair

NOAA, USGS, EPA, FEMA







Hurricane Foot-wash Exhibit



P.T. Barnum would appreciate this...
 “Feel the force of a hurricane on your feet.” Yet... the water splashes upwards, soaking everyone.

The kids say...
 “Again!”

Rain Day is Sponsored Many Great Agencies and by:

Dewberry

Dewberry is a leading professional services firm with a history of providing architecture, engineering, management and consulting services to a wide variety of public and private sector clients.

We offer a highly specialized subject matter expertise backed by the deep resources and stability of a national firm. We have four offices in Maryland including: Baltimore, Gaithersburg, Frederick and Lanham.

For Rain Day information check out www.Dewberry.com/news/events/rainday

MAFSM

Maryland Association for Floodplain and Stormwater Management

The MAFSM is a group of professionals that outreach floodplain and stormwater management issues.



www.mafsm.org

Where at the Fair?



Rain Day Tent

The Rain Day tent is located near the camel rides along Maple Avenue

Additional Information

Mark Hoskins

Dewberry

MHoskins@Dewberry.com

Call (703) 849 - 0216

Something to think about...

Whether the weather is fine
Or whether the weather is not.
Whether the weather is cold
Or whether the weather is hot.
We'll weather the weather
Whatever the weather
Whether we like it or not.



"Raining Cats, Dogs..." (George Cruikshank)

Drop-in to the Rain Day Tent!

at the Montgomery County Fair
August 10-18, 2012

Have Fun and Learn how
Government Agencies
protect Mother Nature
and Your Community.

When will it stop raining?
Will my home flood?
How can we keep the streams clean?



Sponsored by Dewberry and many dedicated agencies.

Rain Day Promotional Flyer

Learn about these Agencies at Rain Day

FEMA - How do you read floodplain map? Should you get flood insurance?

EPA - How can the program "Adopt Your Watershed" help Mother Nature?

USGS - How does water flow underground? How do we measure creek flow?

NOAA - Become a weather man under the CocoRAHS program in Maryland

Emergency Management - Ask about protecting your home

MAFSM - Maryland Association for Floodplain & Stormwater Management

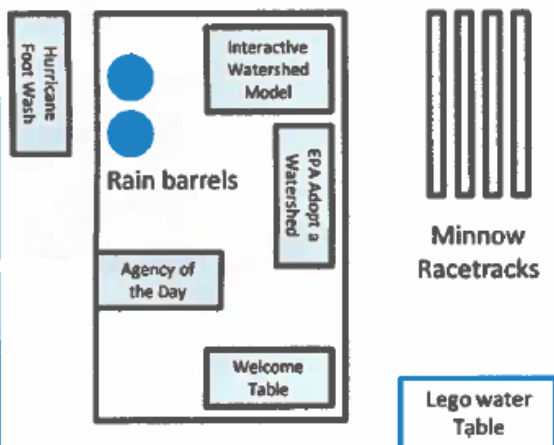
We support the efforts from so many government agencies that handle rainfall issues.

Too much rain can cause floods. Polluting runoff has hurt our environment.

Let's share ideas on how to better protect our fragile planet.

That's what Rain Day is all about!

Rain Day Tent Map



Fun at Rain Day

Race your minnow, only after you name it and learn about fish habitat

Learn about **Rain Barrels**, **Rain Gardens** and **Green Roofs**

Answer 10 stormwater questions at the Rain Day raffle for a Prize

Build stuff at the **Lego Water Table**

Feel the force of the **Hurricane Foot-Wash**

Make thunder and rumble the tent





Thanks !!
Mark.Hoskins@Illinois.gov