

# GREEN FUNDAMENTALS

└ “Water and energy are the two most fundamental ingredients of modern civilization.”

Michael E. Webber in  
*Scientific American October 2008*

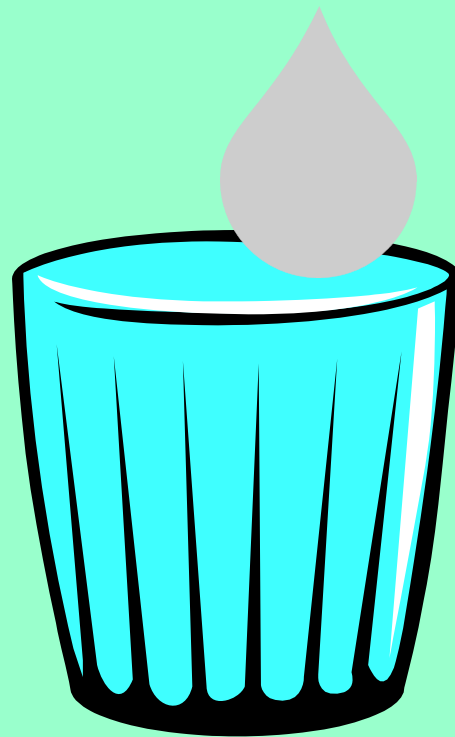
# **Water and Energy – Related!**

- ┌ Energy production requires water.**
- ┌ Water treatment and distribution require energy.**
  - ◆ Water treatment systems use about 3% of the nation's energy consumption.**
  - ◆ Water and wastewater treatment facilities account for more than 1/3 of municipal energy use.**

**Conserving water conserves energy.**

**Conserving energy conserves water.**

**From Raindrops  
to  
Your Drinking Glass:  
What I've Learned about Water**

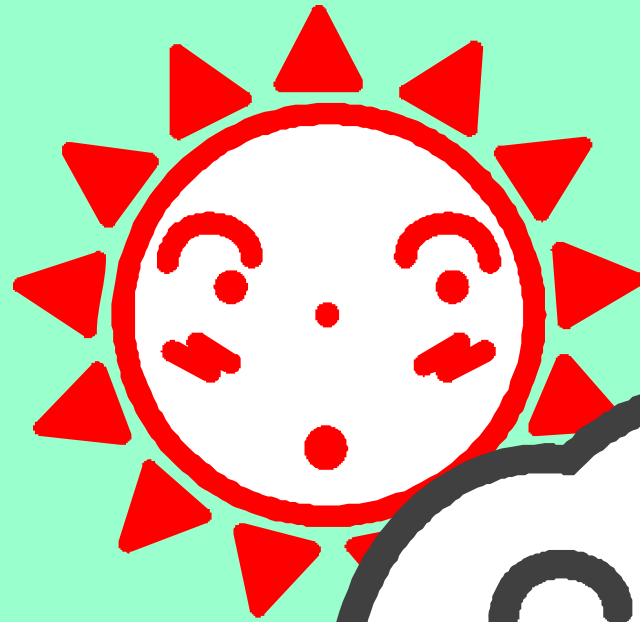


**Della Moen  
NRCS/SWCD  
Earth Team  
Volunteer  
5/28/09**



**In the beginning**

***WATER MOLECULES***



*POWERED  
BY THE SUN*



*EVAPORATION  
CONDENSATION  
PRECIPITATION*

**The ultimate in recycling**  
*THE HYDROLOGIC CYCLE*

# *THE REST OF THE STORY*

## **About Evaporation**

- **Moves water into the atmosphere from anywhere it can.**
- **Restores water to its pure form.**



# *THE REST OF THE STORY*

## **About Condensation**

- **Earth's atmosphere contains water vapor – water in its gaseous form.**
- **Water vapor becomes visible in the droplets of clouds and rainbows.**



# *THE REST OF THE STORY*

## About Precipitation

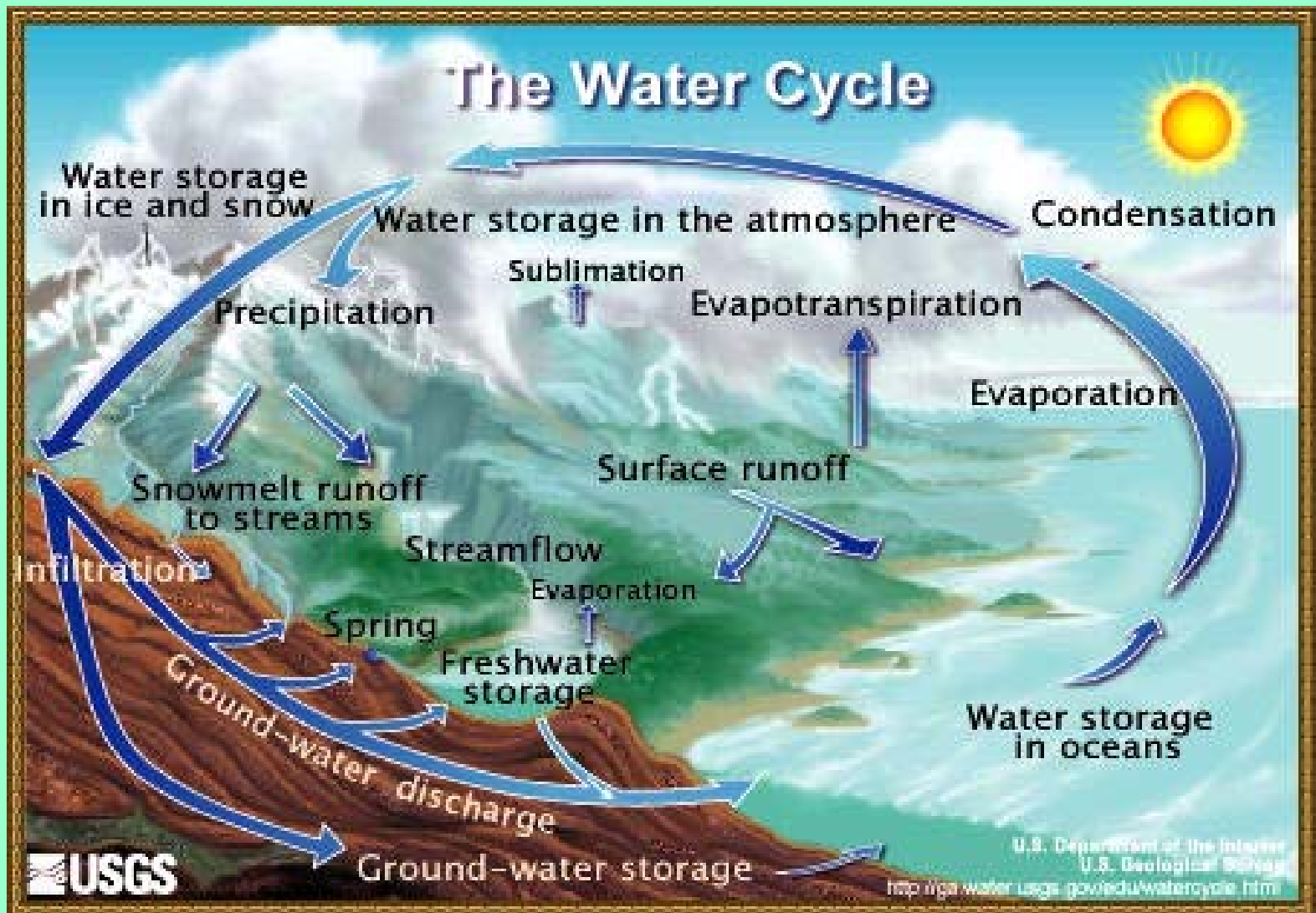
- Air masses carry water vapor and water droplets in clouds from place to place.
- Many variables influence precipitation and its forms.

(We know this as weather – a good example of mathematical chaos theory)

- Precipitation may never make it to the ground; may stay on the surface to evaporate; may run off over the surface; may infiltrate and runoff under the surface as groundwater.



# A COMPLEX SYSTEM



**•EVERYONE LIVES IN A WATERSHED THAT COLLECTS RAIN FOR A WATERBODY; THAT WATERBODY FEEDS ANOTHER; ...AND SO ON.**

**• !!! Lakes and reservoirs GET WATER FROM A WATERSHED and are sources of drinking water.**

**• !!! Groundwater GETS WATER FROM A WATERSHED and is retrieved with wells as a source of drinking water.**



# ENTER POLLUTION

- Raindrops (any form of precipitation) dissolve or carry with them whatever is in the air.
- Raindrops that don't reach the ground will remain in the atmosphere and come down later somewhere else.
- Rain that reaches the ground runs off over the surface dissolving and/or carrying with it whatever is on the surface – rocks, soil particles, trash, chemicals, etc. – to a waterbody;
- OR rain infiltrates the soil dissolving and carrying with it pollutants as it flows through soil, sand, and permeable rock to a waterbody.

# WHAT NATURE PROVIDES

- **Plants that utilize carbon dioxide and return oxygen and water to the atmosphere**
- **Native plants with deep roots for infiltration.**
- **Freezing to break apart rocks to form the basis for new soil.**
- **Decomposition to add nutrients to the soil.**
- **Wetlands and flood plains to slow run off to remove sediment and purify water.**
- **Connection between surface water and groundwater to maintain flow, water table, and water storage.**

# PLANTING ROW CROPS AND GARDENS WHAT CAN I DO?

- Use grassed waterways to carry run off.
- Use buffers of grass around planted areas.
- Use buffers of trees or grasses along streams.



## **SOIL EXPOSED TO RAINDROPS AND WIND WHAT CAN I DO?**



- **Disturb soil as little as possible.**
- **Leave plant residue or use mulch on the ground. (Also reduces evaporation of moisture from the soil.)**



# APPLYING FERTILIZERS AND PESTICIDES

## WHAT CAN I DO?

- Investigate alternatives to pesticides.
- Learn to live and let live -- harmful or harmless?



- Test soil for nutrients; **AVOID APPLYING MORE THAN NECESSARY.**



- Apply chemicals strictly according to directions. Store chemicals in a safe place.
- Use filter strips of grass around treated areas.

# LIVESTOCK AND PET WASTE

## WHAT CAN I DO?



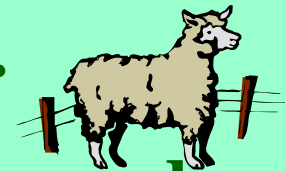
- Exclude animals from streams.



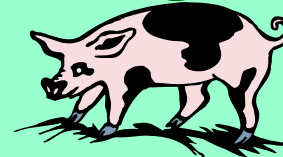
- Locate pastures and pet runs away from waterbodies.



- Protect stored waste from run off.



- Keep pet waste out of street gutters and ditches.



- Follow guidelines of the USDA and USEPA.

# **INFILTRATION**

## **WHAT CAN YOU DO?**



- **Minimize paved surfaces.**
- **Use border plantings with high water needs along driveways and parking areas.**
- **Consider using paving material with infiltration capability.**
- **Plant native grasses where possible – lawn grasses speed run off.**
- **Construct “rain gardens” in an area where water flows.**

# **SLOW DOWN WATER**

## **WHAT CAN I DO?**

- **Use a rain barrel.**
- **Construct a rain garden where water discharges from roof gutters.**
- **Protect ditches with barriers to slow water flow.**

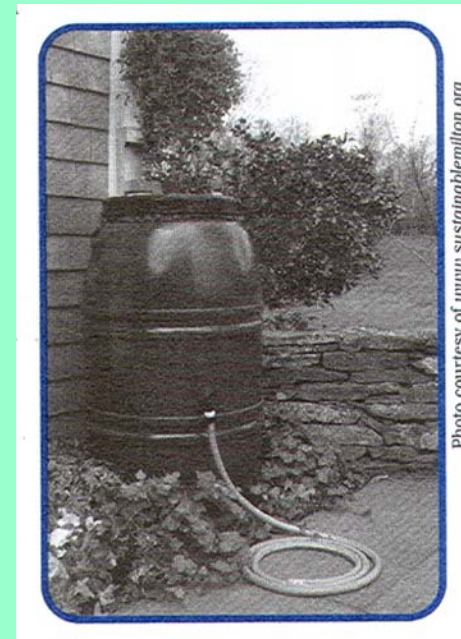


Photo courtesy of [www.sustainablemilton.org](http://www.sustainablemilton.org)

# **SEDIMENT AND POLLUTANTS IN RUNOFF**

## **WHAT CAN I DO?**



- **Use filter strips of native grasses along waterbodies.**
- **Provide wetlands at stormwater discharge points.**
- **Maintain natural areas in flood plains.**

# **TAKING CARE OF WASTEWATER**

## **WHAT CAN I DO?**

- **Dispose of already poured but unused clean water in a container for watering plants.**
- **Install low flow toilets and faucets.**
- **Compost vegetable waste instead of placing it in sink garbage disposal.**
- **Follow instructions for maintaining septic systems – use certified service technicians.**
- **New construction? Investigate gray water systems.**

# PROTECTING PRIVATE WELL WATER

## WHAT CAN I DO?

- Remember all groundwater is recharged by rain on the surface somewhere – water flows underground through soil and rock.
- Pumping water draws water from the surface nearby into the well – keep pollutants away from the wellhead.
- Test annually for coliform bacteria.
- Keep surfaces and containers clean where water is used.
- Prevent backflow from a filter or outside source.



# ABOUT COLIFORM BACTERIA

- **Organisms in soil or vegetation and in the intestinal tract of warm-blooded animals.**
- **Presence is considered an indicator that intestinal parasites and pathogens may be present.**
- **Sources: runoff from woodlands, pastures, and feedlots; septic tanks and sewage plants; animals and wild fowl; domestic animals; areas with high concentrations of animals or humans.**
- **Food handling and personal hygiene are more likely routes for contamination than water.**

**Cliff Treyens, National Groundwater Association, *On Tap, Winter 2009***

# **PROTECTING COMMUNITY WELLS**

## **WHAT CAN I DO?**

- **Manage sediment and pollutants in your watershed to keep them out of surface and groundwater.**
- **For major spills of chemicals or other pollutants in the area of the wells, report to proper authorities for cleanup.**
- **Reduce water use to save energy that is used to treat and distribute water.**



# **RESOURCES**

**An Internet Search for:**

**Backyard Conservation**

**Rain Gardens**

**Rain Barrels**

**Watersheds**

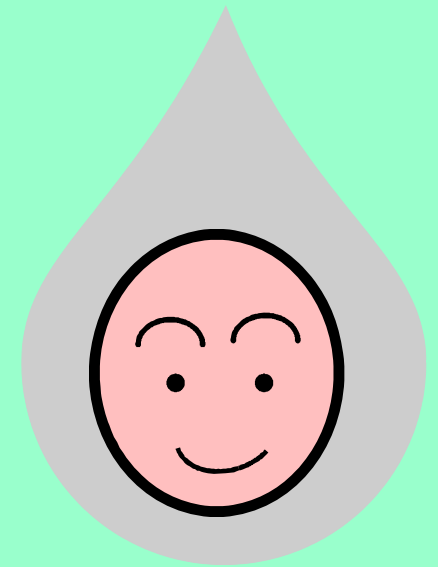
**Driftless Area Initiative**

**Natural Resources Conservation Service**

**Illinois EPA – Bureau of Water**

Take care of water  
as if your life  
depends on it...

It does!



**Thanks for  
coming!**