



Watersheds 101

Dr. Bruce Lesikar
Texas AgriLife Extension Service
Department of Biological and Agricultural Engineering



What is a Watershed?

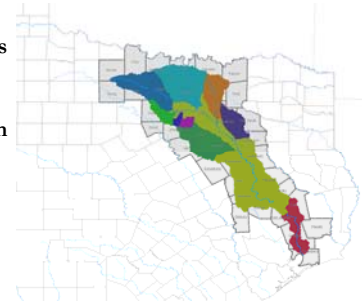
- Land area that drains into a common water body
- Surface water
- Ground water
- Soils
- Vegetation
- Wildlife and Livestock
- People



What is a Watershed?



Watersheds
are Part of
Larger
River Basin
Systems



Eagle Mountain Watershed

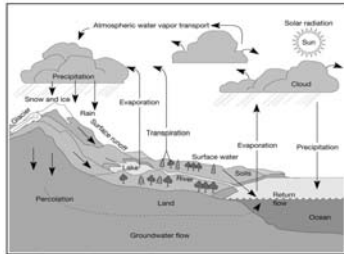


Watershed Functions

- Hydrological
 - Water Capture
 - Water Storage
 - Water Release
- Ecological
 - Providing diverse sites for biogeochemical reactions to take place
 - Providing habitat for plants and animals of various kinds

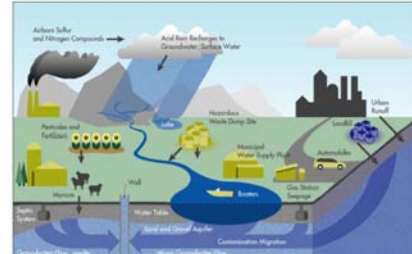
North Central Texas Water Quality Project

Hydrology: The Water Cycle



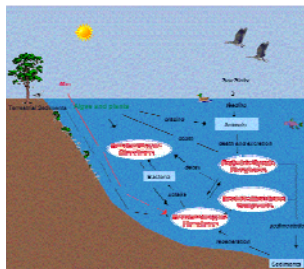
North Central Texas Water Quality Project

Human Impacts on the Hydrologic Cycle



North Central Texas Water Quality Project

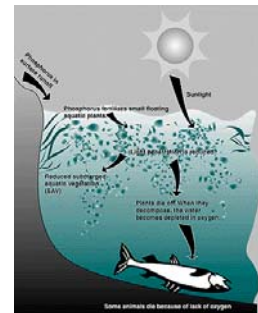
The Phosphorus Cycle



North Central Texas Water Quality Project

Eutrophication

- Increase in chemical nutrients - typically compounds containing nitrogen or phosphorus in an ecosystem
- Promotes excessive plant growth and decay and is likely to cause severe reductions in water quality



North Central Texas Water Quality Project

Water Quality Standards

- Used by TCEQ regulatory programs to establish reasonable limits on permitted dischargers
- Numeric Standards
 - Segment specific numbers
- Narrative Standards
 - Descriptive standards to protect aesthetics and designated uses
 - Screening limits non-segment specific numeric standard for nutrients

North Central Texas Water Quality Project

Water Quality Parameters

- Chemical
- Dissolved Oxygen (DO)
 - Electrical Conductivity
 - pH
 - Fecal Coliform
 - Nitrogen
 - Total Phosphorus

North Central Texas Water Quality Project

Water Quality Parameters

Physical

- Temperature
- Turbidity
- Total Suspended Solids
- Stream Flow (Discharge)

North Central Texas Water Quality Project

Pollutant

Any substance that, when present in a hydrologic system at sufficient concentration, degrades water quality in ways that are or could become harmful to human and/or ecological health or that impair the use of water for recreation, agriculture, industry, commerce, or domestic purposes.

North Central Texas Water Quality Project

Pollutants: Types and Impacts

POLLUTANT	NONPOINT SOURCE	IMPACTS
Bacteria	Livestock, pet waste, septic systems, and boat discharge.	Introduces disease-bearing organisms to surface water and ground water, resulting in shellfish bed closures, swimming restrictions, and contaminated drinking water.
Nutrients (phosphates & nitrates)	Fertilizers, livestock, pet waste, septic systems, suburban/urban development, and soil erosion.	Promotes algae blooms and aquatic weed growth which can deplete oxygen, increase turbidity, and alter habitat conditions.
Sediment (soil)	Construction, driveways, ditches, earth removal, dredging, mining, gravel operations, agriculture, road maintenance, and forest operations.	Increases surface water turbidity which in turn reduces plant growth and alters food supplies for aquatic organisms, decreases spawning habitat and cover for fish, interferes with navigation and increases flooding risk.
Toxics and Hazardous Substances	Landfills, junkyards, underground storage tanks, hazardous waste disposal, mining, pesticides/herbicides, auto maintenance, runoff from highways and parking lots, boats, and marinas.	Accumulates in sediment posing risks to bottom feeding organisms and their predators; contaminates ground and surface drinking water supplies; some contaminants may be carcinogenic, mutagenic and/or teratogenic and can bioaccumulate in tissues of fish and other organisms including humans.

North Central Texas Water Quality Project

Point Source Pollution

Pollution resulting from collection and discharge at a defined point

- Waste Water Treatment Plant Discharges
- Industrial Waste Discharge
- Confined Animal Feeding Operations

North Central Texas Water Quality Project

Nonpoint Source Pollution

Pollutant sources that are spread over a landscape

- Fertilizers, herbicides, and insecticides
- Oil, grease, and toxic chemicals
- Sediment
- Salt (irrigation)
- Acid (abandoned mines)
- Bacteria (livestock/ pet waste, septic systems)
- Atmospheric deposition
- Hydromodification (channel modification and dams)

North Central Texas Water Quality Project

Texas Surface Water Quality Standards

Each body of water is managed for one or more uses

- Contact/Noncontact Recreation
- Domestic Water Supply
- Industrial Water Supply
- Fish Consumption
- Aquatic life
- Navigation
- Livestock Watering and Wildlife
- Irrigation

North Central Texas 
Water Quality Project

Management Tools

- Education & Outreach
- Best Management Practices
- Permitting (NPDES)
- Regulations (TCEQ and EPA)