

# Understanding the Water Resources HCP Take Model

Linking Land with Aquatic Habitat

Joseph A. Daraio, Ph.D, A.M. ASCE

Center for the Management, Utilization, and Protection of Water Resources  
Tennessee Tech University  
Cookeville, TN 38505

June 30, 2010



# Outline

## 1 Take Modeling

## 2 Water

- Hydrologic Cycle
- Water on Land
- Land Use Change and Watershed Response



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# Take Modeling

- “Take” is defined in the Endangered Species Act (ESA) as:
  - ▶ to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species. Harm may include significant habitat modification where it actually kills or injures a listed species through impairment of essential behavior (e.g., nesting or reproduction).
- Purpose of take model:
  - ▶ Estimate, or forecast, how much take will occur over the 30 year period of HCP
  - ▶ Assess effectiveness of conservation measures and BMPs



# Take Modeling

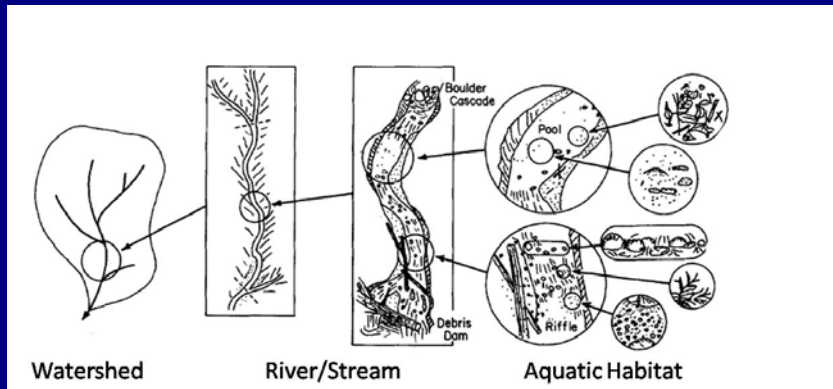
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# Take Model

- Quantifying take

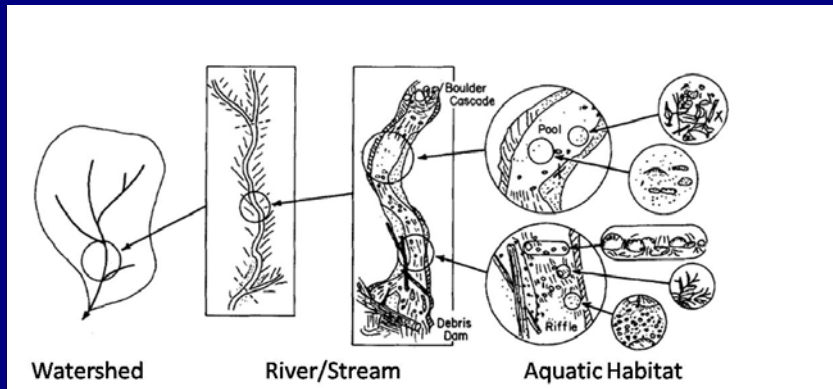
- ▶ Estimate direct take
- ▶ Estimate take from habitat loss and degradation
  - ★ Covered activities lead to changes in hydrology
  - ★ Hydrologic changes affect instream habitat (water quantity and water quality)



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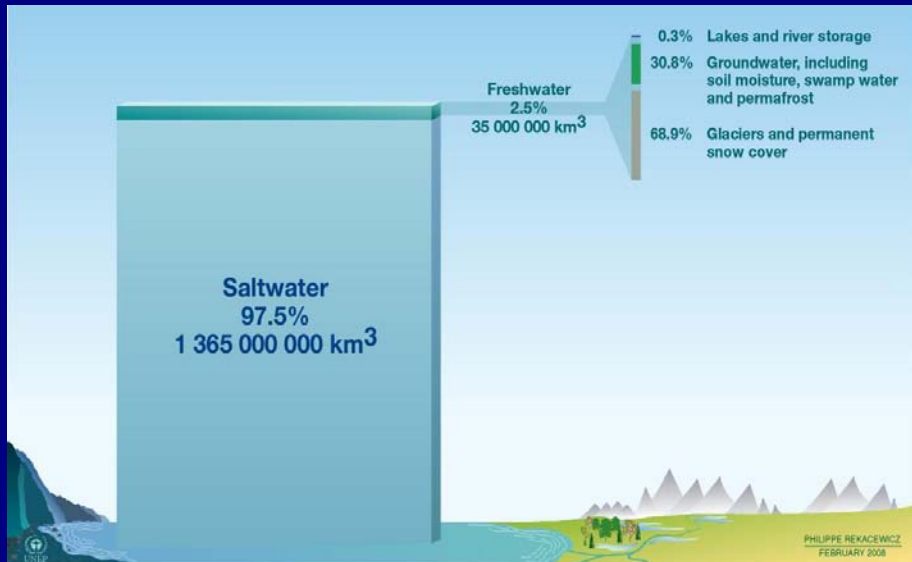
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# Water Quantity

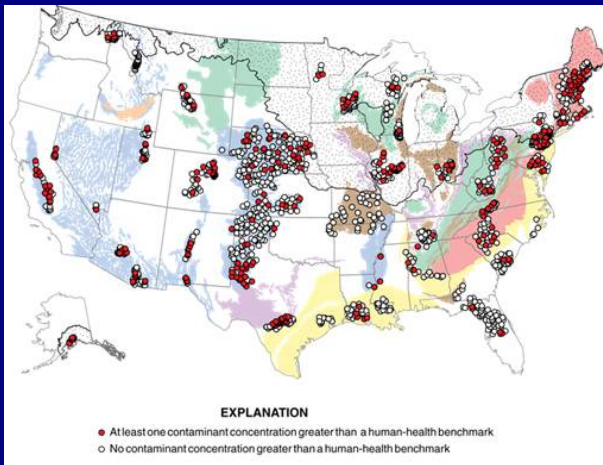
## Putting Water Resources in Perspective



Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational, Scientific and Cultural Organisation (UNESCO, Paris), 1999.

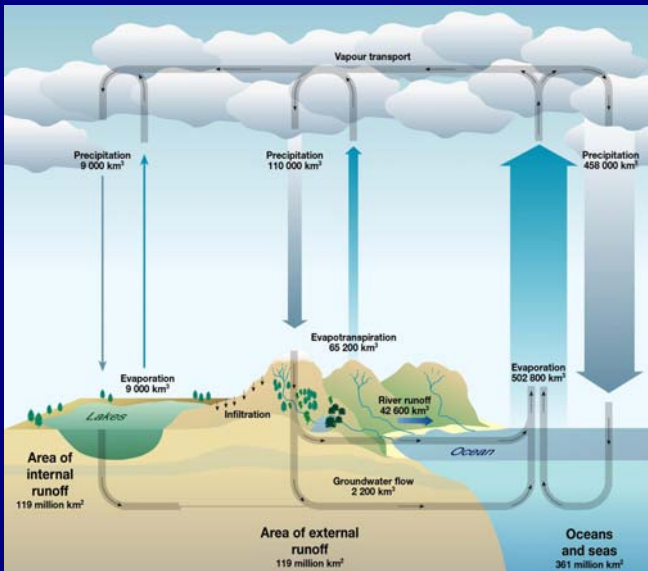
# Water Quality

## Putting Water Resources in Perspective



# Hydrologic Cycle

Water is a Renewable Resource



# What is a Watershed?

A.K.A. Catchment or Drainage basin

- “...that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community.” –John Wesley Powell



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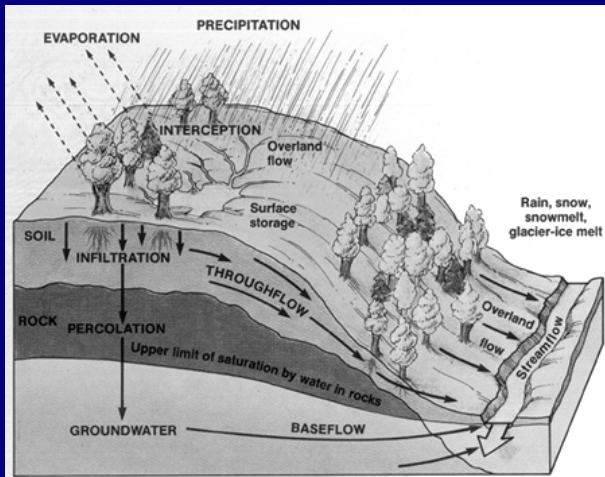
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# Hydrologic Processes

## Watershed Response

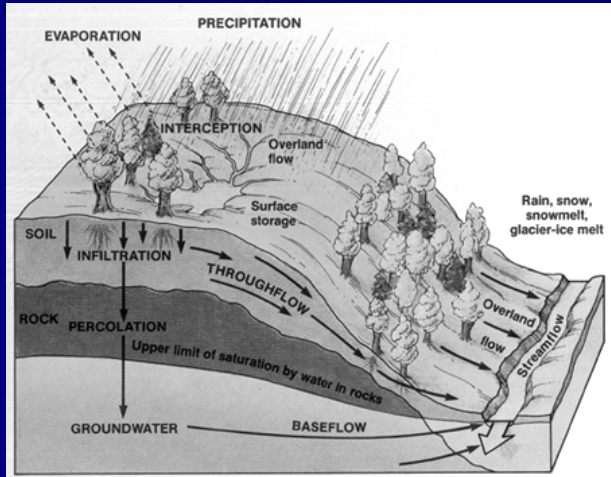
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- Groundwater
- Storage
- Runoff
- Streamflow



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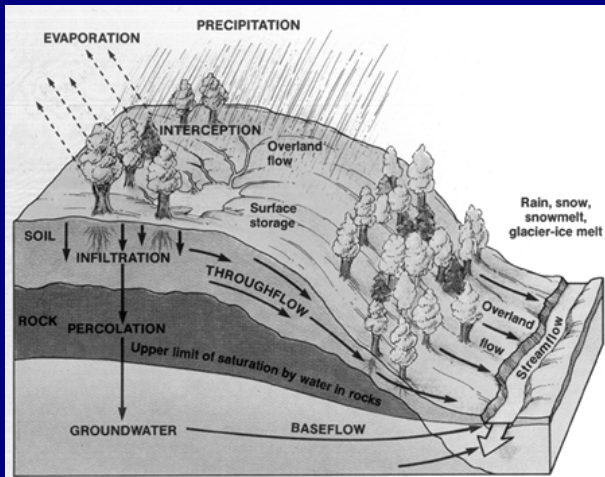
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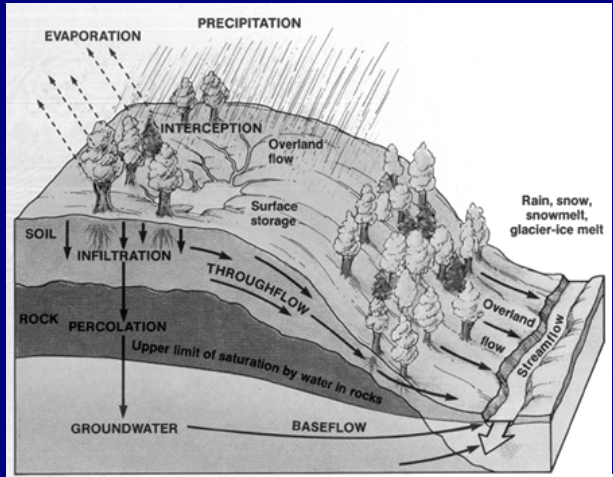
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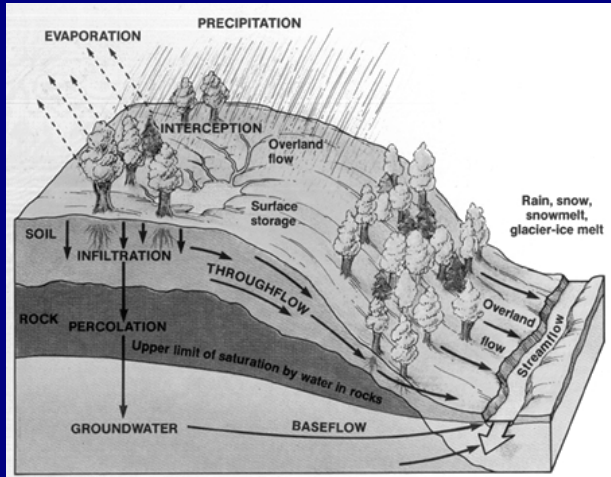
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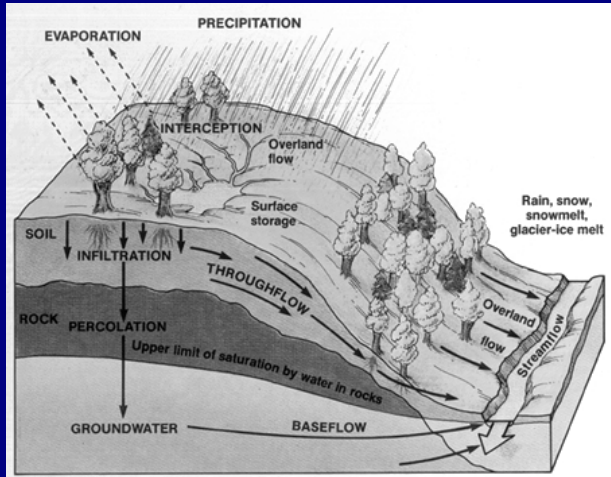
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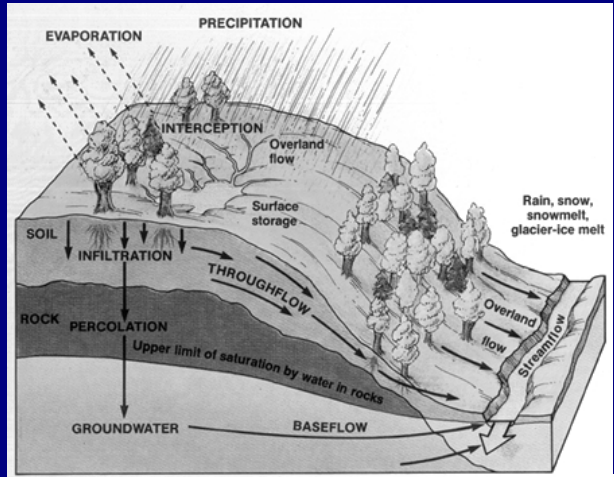
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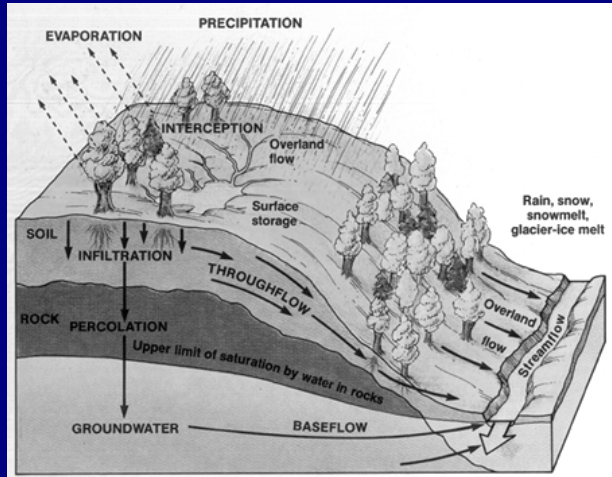
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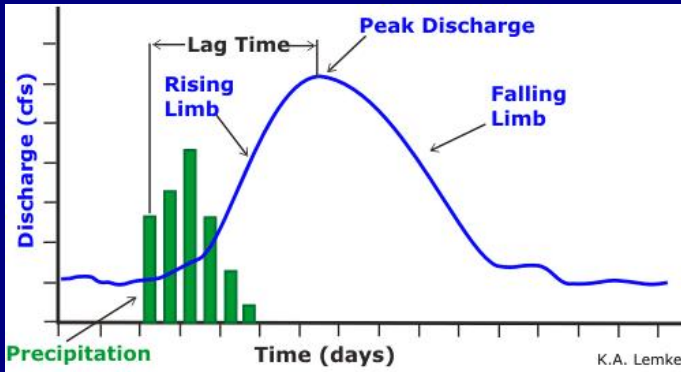
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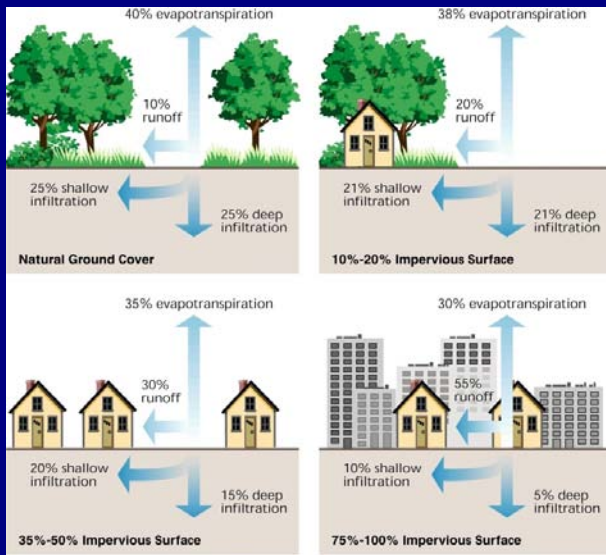


# Hydrograph

A watershed responds to inputs in precipitation

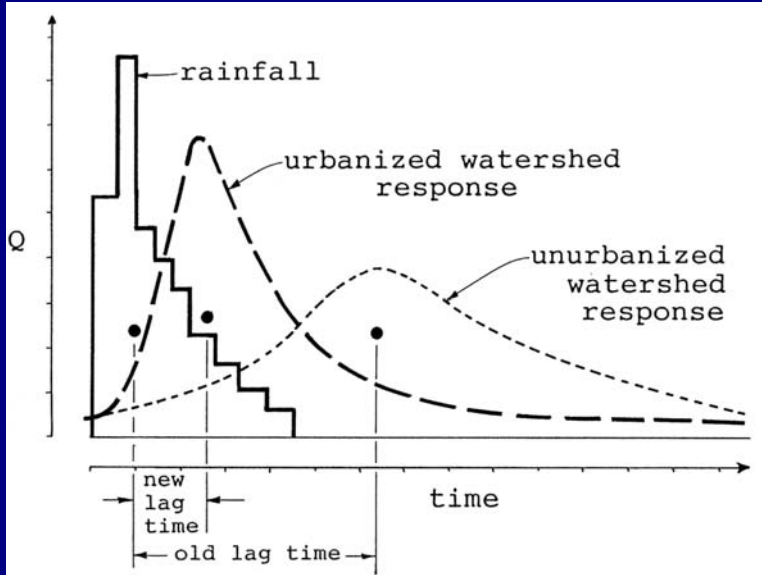


- Watershed Response to Land Use Change



# Hydrograph

Land use change alters the watershed response



# Water Quantity

Increases in Peak Flow lead to Larger More Frequent Floods



# Water Quality

Urban and Suburban Areas have Lower Water Quality



- Sediment
  - ▶ Siltation
  - ▶ Turbidity
- Nutrients
  - ▶ Nitrogen
  - ▶ Phosphorus
- Wastewater Discharge
  - ▶ Organic material
  - ▶ Oxygen demand
- Chemicals
  - ▶ Herbicides
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# Summary

## Potential Hydrologic Effects of Land Use Change

- Removal of trees and vegetation may lead to decreased interception and evapotranspiration, and increased stream sedimentation
- Urban land uses increase the amount of impervious land cover resulting in more runoff and negligible infiltration
  - ▶ Roofs, roads, sidewalks, and parking lots
- Discharge of runoff waters directly to watercourses may adversely affect the quality of the receiving water body
  - ▶ A range of organic and inorganic pollutants as well as heavy metals may be carried from road surfaces into rivers and streams



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# Take Home Message

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- Water quantity and quality are the primary components of habitat for aquatic organisms



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# Next Time

## Instream Aquatic Habitat

