

Spring 2007, Norm Brown

ESM 223



*Lecture 2 – Overview of Soil and
Groundwater Resource
Management*

Administrative Reminders:

Office Hours BH3408 – 11.50-13.30 MW or by appointment

Duplicate posting of lecture notes and other digital documents: waterresourcescience.com

Email: nnbrown@gmail.com

Library Reference Materials: Watts; Reader

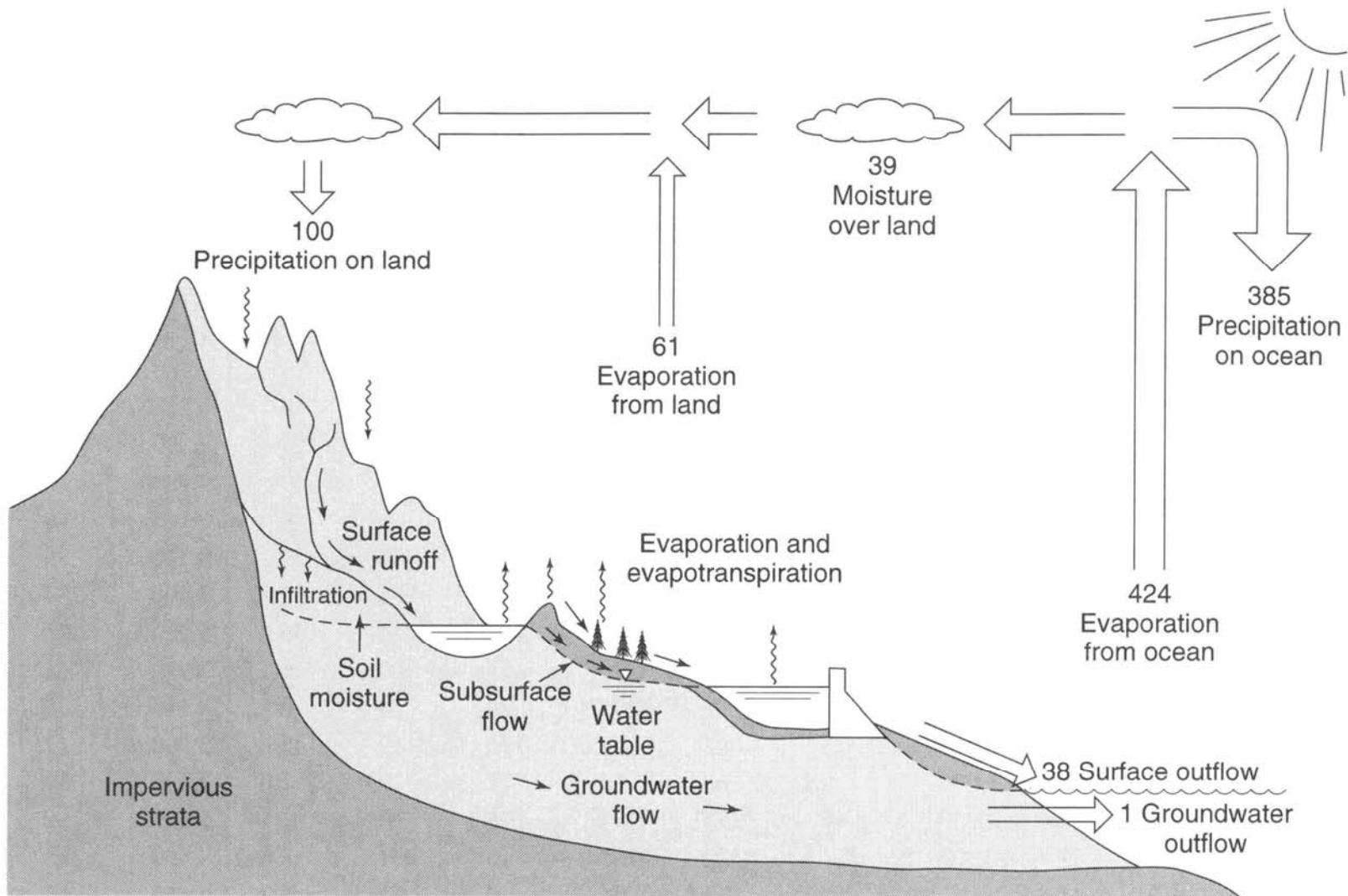


Figure 1.5.1. Hydrologic cycle with global annual average water balance given in units relative to a value of 100 for the rate of precipitation on land.²²

Summary

- Water Quality Constituents Managed
 - Chemistry
 - Operations and Management Strategies
 - Spatial Distribution & Migration
- Differences between soil, vadose and drinking water supply aquifer wrt management options
- Localized v. Distributed
- Risk and Cost Issues
 - Risk Assessment and Risk-based Action (intro)
- Examples

Summary *(continued)*

Management Goals

- Focus on end result: Monitoring, Prevention, Load Reduction, Waste Management, Remediation, Restoration
- Focus on supply: Monitoring, Supply utilization and efficiency, Reliability

Water Quality Management integrates defined contaminant and supply goals with financial, legal & institutional considerations. Adaptive management.

Timeframes, sustainability and energy implications

Summary *(continued)*

Getting it done: Who takes the lead?

- Different parties with different problems and goals
- Authorities and institutional mechanisms
- Technical considerations

Addressing uncertainty

Water Quality Standards

- Drinking water standards
- Maximum contaminant levels
- National recommended water quality criteria
- California Toxics Rule
- Goals v. Standards
- Testing requirements
 - Different classes of site or water use

Water Quality Constituents

Natural - Anthropogenic

- Major Classes
- Concentrations
 - TDS, Chloride, Manganese etc
 - Radiation, Arsenic, Nitrate etc
- VOCs
- Pharmaceuticals and Personal Care Products

Water Quality Constituents

Localized – Distributed

- Distribution
 - Areally
 - Relative to geology, infrastructure
 - Gradients
- Calculating migration times
 - Transport retardation, degradation
 - Tracers and Proxies
- What happens when there is interchange between surface and groundwater (hyporheic zone)?

Water Quality Constituents

- Soil, Vadose, Aquifer Zones
 - Interchange and cross-boundary flow
 - Tailoring water quality management to the hydrologic conditions
 - Risk-Cost comparisons
 - Risk Analysis (First of several parts)
 - Classes of Management Options
 - Operational; e.g., blending
 - Remedial
 - Substitution
 - Divisions in end users (and infrastructure requirements)
[cf recycled water]

Examples & Case Studies

- TDS
- Arsenic
- Nitrate
- TCE
- MTBE
- Estrogen

What are the *Risks, Costs and Benefits?*