



WATER RESOURCE MANAGEMENT

Dr. R.L. Soltz, with gratitude for grants from NSF, Pitt and CWU as well as the generous peoples of Northwest China and our many colleagues there.

WHY WATER

- Precipitation is the single most important factor that determines the type and quality of all biomes on earth
- Water is NOT distributed equitably... ETHICAL issues are ALWAYS present
- It is universally viewed to be a PUBLIC TRUST resource
 - Byzantine Emperor Justinian (330 AD)
 - Magna Carta (1215)
- DISTRIBUTION
 - QUALITY

OUR WATER RESOURCES

- $\frac{3}{4}$ of the earth's surface is covered by water, but 97% too salty
- 3% is fresh, but $\frac{2}{3}$ of that is ice
- 1% is available (easily) for people and we use only about $\frac{1}{2}$ of that, so what's the problem?

People do not live where water is particularly abundant...why?

TWO EXAMPLES: CALIFORNIA AND CHINA

NORTHERN AND SOUTHERN CALIF

- Pareto principle: 80/20
- Extensively plumbed
- Extensively adjudicated
- Statutory and case law would probably extend from San Francisco to New York

FIRST IN TIME, FIRST IN RIGHT
WATER FLOW TO MONEY

RURAL NORTHWEST CHINA

- ❖ Water deficient
- ❖ Fragile dryland ecosystems—Loess
- ❖ Massive infrastructure development
- ❖ Geographic, social and politically marginalized people
- ❖ *Sanjiangyuan NNR (Qinghai contains headwaters of Mekong, Yangtze and Yellow rivers)*

**ALL RESOURCES FLOW TO HAN AND
HAN ALLIES**





RURAL NORTHWEST CHINA

- Water deficient
- Fragile dryland ecosystems: Loess Plateau & Gobi Desert
- Massive infrastructure construction, economic modernization & poverty eradication programs
- Geographic, social and political marginalization
- *Sanjiangyuan NNR (Qinghai)* contains the headwaters of the Mekong, Yangtze and Yellow rivers

WATERSHED CHARACTERISTICS

River	Population (millions)	Proportion China	Proportion World	Area (sq. km)	Proportion world
Yellow	107	8.2%	1.7%	752,000	0.5%
Yangtze	420	32.2%	6.5%	1,809,000	1.2%
Mekong	60		0.9%	795,000	0.5%
Total	587	>40%	9.1%	3,356,000	2.2%



WHY THE YELLOW RIVER WATERSHED

- Loses 1.6 **billion** tons of soil/year (6X more than the Sahara)
- Average annual income < half national average
- The people living within the watershed are geographically, politically and economically marginalized

WHAT ARE THE ISSUES

California

- Action primarily historic
- Outcome primarily environmental
- Solution usually legal (litigation)

China

- Action(s) ongoing
- Outcome primarily social
- Solution is relocation to cities +/-

STUDENT QUESTIONS:

- Who makes the decisions?
 - CCP
- What is the vision/policy?
 - Building farmland
- How can China's issues be "ongoing?"
 - Sequential natural of China's water management philosophy
 - No freedom of press
 - No real legal system

SIMPLIFIED DAM SCHEMATIC

**Embankment
Dam Diagram**

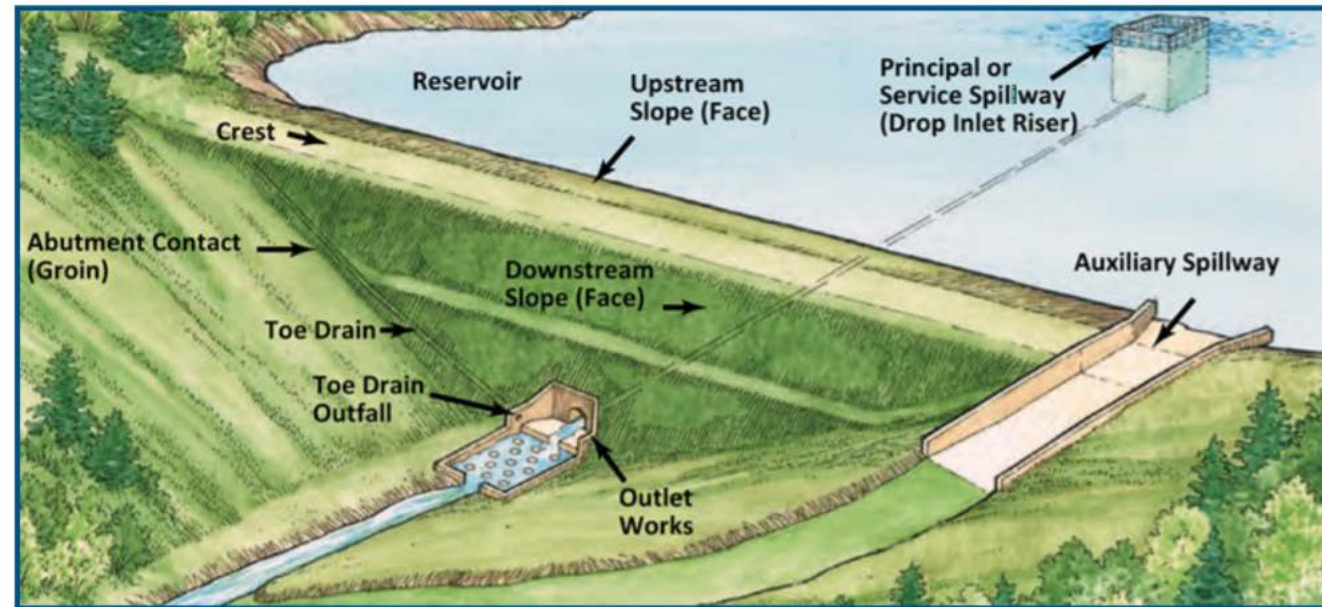


Figure 1 – Typical
dam diagram
showing common
terms.