

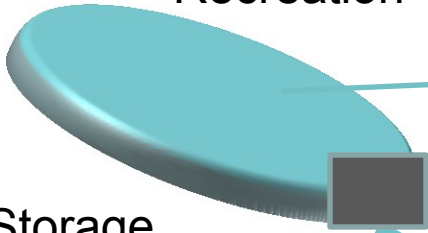
# **Measuring Drought Impacts in Integrated Water Resources Management**

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Ecosystems

Recreation



Water Supply

Drought affects multiple water uses

Flood Storage

Hydropower

Ecosystems

Municipal and Industrial Water Supply

Recreation

Thermal Electric Plant Cooling

Inland Navigation

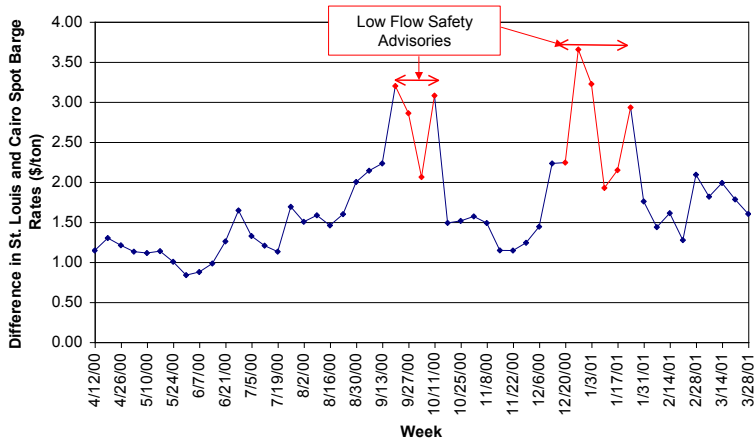
Ecosystems



# Drought Impacts by Sector

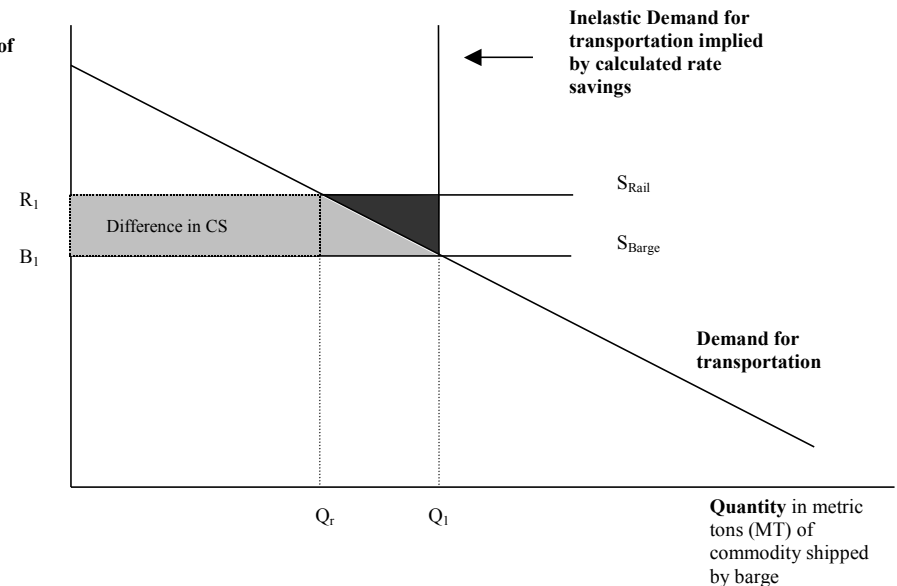
## ■ Inland Navigation

- ▶ Impact: Reduced channel depths cause reduced barge loading and increased shipping costs
- ▶ Impact: Channel closure causes shift to more expensive transportation mode
- ▶ Data: Barge shipments by product type and river reach



Calculation of economic losses due to low flows

Rates by mode of transportation



# Drought Impacts by Sector

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- Hydropower
  - ▶ Impact: Lower flows lead to less hydroelectric generation
  - ▶ Data: Monthly hydroelectric generation (KWHr) by project
- Municipal and Industrial water; thermal plant cooling
  - ▶ Impacts: Reservoir and river intakes may not be functional; thermal dilution for power plants can be a problem with low flows
  - ▶ Data and drought management by other entities



# Drought Impacts by Sector

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- Recreation
  - ▶ Impact: Reduced lake levels lead to reduced recreation visitors, reduced sales at associated businesses, lower property values
  - ▶ Data: Lake levels; lake recreation use
- Ecosystems
  - ▶ Lake Impacts: Fish kills more likely at lower pools and warmer temperatures
  - ▶ Downstream Impacts: Cold water fisheries at risk; fish spawns problematic
  - ▶ Ecosystem services: monetary and non-monetary losses
  - ▶ Data: USFWS, USGS, NMFS

