Water and Energy Tradeoffs in Western Irrigated Agriculture

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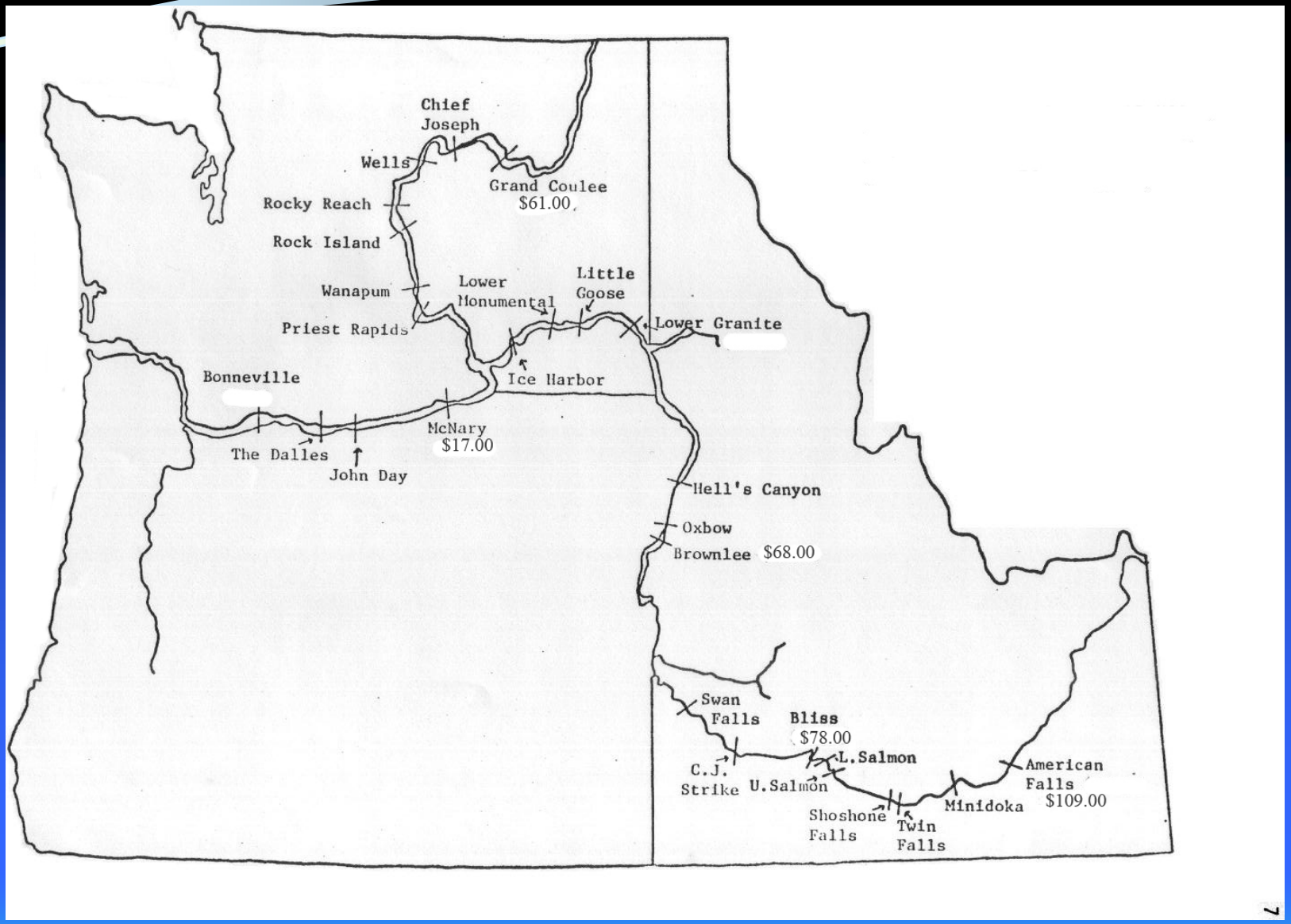
Introduction

- Water Scarcity in the West
  - Limiting factor for economic growth
  - No surplus water

Water Use by Agriculture
  - Up to 90% of consumption
  - Agriculture owns most allocable water

Irrigation and Energy Tradeoffs

- Water Diversions Impact Energy
  - Energy use (1.25 kwh/af/f)
  - Hydropower loss (.87 kwh/af/f)


Chief
Joseph
Wells
Grand Coulee
$61.00
Rocky Reach
Rock Island
Wanapum
Lower
Monumental
Little
Goose
Priest Rapids
Lower Granite
Bonneville
Ice Harbor
McNary
$17.00
The Dalles
John Day
Hell's Canyon
Oxbow
Brownlee $68.00
Swan
Falls
Bliss
$78.00
L.Salmon
C.J.
Strike
U.Salmon
American
Falls
$109.00
Shoshone
Falls
Twin
Falls
Minidoka

Energy use and hydropower loss for irrigation at 3.5 AF/A and 60 m/KWH

	Energy Foregone KWH/A	Energy Used KWH/A	Total Energy KWH/A	Energy Value $/A
Lower Columbia (WA/OR)	840	3,700	4,540	272
Upper Columbia (WA)	3,620	2,600	6,220	373
Upper Snake (ID)	2,200	2,100	4,300	258

Energy use for Irrigation

- Pump Lifts Often High
  - Ogalalla Aquifer (100-400 feet)
  - Snake River Aquifer (200-500 feet)
  - Columbia Basin Project/Grand Coulee Dam (500-1,000 feet)
  - California, Central Arizona Project, Pecos Basin, etc.

Irrigation Efficiency vs. Water Conservation

- Improving Irrigation Technology Affects:
  - Uniformity
  - Adequacy
  - Timeliness

  - Should reduce diversions
  - More water consumed by crops

Does Higher Irrigation Efficiency Conserve Water?

- Conservation Depends on Site Specific Conditions
  - New vs old technology
  - Return flow conditions
  - Water delivery efficiency
  - Groundwater mining

River Basin Effects of Raising Irrigation Efficiency

- Over Appropriated River Basins
  - Possibly more instream water in wet years
  - Less instream water in dry years
  - Evaluate streamflow over time for entire hydrologic river basin

Conclusions

- No Surplus Water in the West
- New Uses Require Reallocation
- Water Markets
  - Water rights are private property
  - Water markets not well developed
  - Non-market and third party uses affected
  - Reducing irrigated acreage is political minefield
- Contingent Water Markets are an Alternative