Water In Washington

Keith Phillips
November 2005
A Water Awareness Test

Oldest statute in the water code?
A. 1851
B. 1879
C. 1899
D. 1905
E. 1917
A Water Awareness Test

Oldest statute in the water code?

A. 1851
B. 1879
C. 1899
D. 1905
E. 1917
A Water Awareness Test

Who can hold on to saved water?
A. farmer?
B. city?
C. hydropower plant?
D. aluminum smelter?
A Water Awareness Test

Who can hold on to saved water?
A. farmer?  NO
B. city?  YES
C. hydropower plant?  YES
D. aluminum smelter?  NO
A Water Awareness Test

The law says ...
Fish water in all streams.

Future users can be regulated.

Past users can be regulated.
A Water Awareness Test

The law says ...
Fish water in all streams.
  True
Future users can be regulated.
  True
Past users can be regulated.
  False
A Water Awareness Test

Value of water on the land?
A. 1/10
B. 1/4
C. 1/2
D. 3/4
E. 8/10
F. 19/20
A Water Awareness Test

Value of water on the land?

A. 1/10
B. 1/4
C. 1/2
D. 3/4
E. 8/10
F. 19/20
A Water Awareness Test

Yakima ground water study cost?

A. $ 180 K
B. $ 570 K
C. $ 930 K
D. $ 6 million
A Water Awareness Test

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A. $ 180 K
B. $ 570 K
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D. $ 6 million
A Water Awareness Test

True or false?

“A water right is a property right.”
A Water Awareness Test

True or false?

“A water right is a property right.”

True. Once the water has been put to use, the water right is a use-based (“usufructuary”), vested property right.
“A little inaccuracy saves tons of explanation.”

The numbers ~ population growth

- 1.5 M -- surface code adopted (1917)
- 3.5 M -- last time code updated (1971)
- 5.6 M -- today
- 7.0 M -- by 2010

Eastern ≠ Western Washington:
  - different economics, population, water supply
  - growth rates are similar
The numbers ~ endangered fish

- Over 20 listed salmon/trout/steelhead runs
- 16 over-appropriated basins: stream flows critical to recovery
- 7 salmon recovery areas – much of the state
Water law in time ...

1854 ~ tribal treaties/reserved rights
1863 ~ territorial law/riparian rights
1917 ~ state surface water code
1945 ~ state ground water code
1949 ~ wildlife code/streamflows
  must support fish at all times
1967 ~ minimum instream flows act
1971 ~ water resources policy act
Consumptive Water Use in WA

Irrigation
Industrial
Municipal

Billions of Gallons per Day

Eastern Washington   NW Washington   SW Washington
Water Rights Permits

Ecology must determine:

- use is beneficial
- water is available
- existing water uses not impaired
- not detrimental to public interest
Current Water Rights

- Certificates: 48,000
- Permits: 3,600
- Applications: 6,800
- Claims: 170,000
“I tell you gentlemen, you are piling up a heritage of conflict and litigation over water rights for there is not sufficient water to supply the land.”

JOHN WESLEY POWELL,
1834 - 1902
A matter of belief ~ water as

- Agriculture ~ a full property right beyond the purview of government
- Cities ~ a right needed to meet the duty to serve planned growth
- Environmental ~ belonging to the citizens to be held in public trust
- Business ~ an affordable/timely resource for economic growth
- Tribes ~ allocated by treaties and reserved for future uses
- Feds ~ owned by federal projects (irrigation/hydropower/reserved)
The water code ...

- A set of general principles to be applied to the facts
- 2/3 of the water code is not in statute -- it is common law (case law)
- A layer cake compiled over 120 years
- All uses are equal -- the only priority is “first in time is first in right”
- Overallocation by design -- junior rights give way when water is short
- Limited/no recognition of GMA, ESA, local watershed plans, public trust
Water management challenges

• Water for growing communities
Water management challenges

- Water for growing communities
- “Use it or lose it” – what is the incentive to save water?
Water management challenges

- Water for growing communities
- “Use it or lose it” – what is the incentive to save water?

- grapes ➔ onions
- aluminum smelters
- past conservation
Water management challenges

- Water for growing communities
- “Use it or lose it” – what is the incentive to save water?
- Fish short of water
Lower Summer Flows = Fewer Fish

\[ Y = 3,102.67X + 1,373.14, \text{ Rsq } = 98.4\% \]
Lower Winter Flows = Fewer Fish

Coho Smolt Production & Flow (cfs)
Chehalis River, Brood Years 1980-1991

Minimum Spawning Flow (Nov – Dec)

\[ Y = 1,557.2719X + 1,118,617.7038, \]
\[ R^2 = 54.3\% \]

(WDFW Data)
Flood Flows = Fewer Fish

Y = -0.80043X + 98,357
Rsq = 49.1%
Rainfall and Snowmelt Affect Flows

Precipitation vs. Instream Flow
(Snoqualmie River near Snoqualmie)
Land Use Affects Flows
Urbanizing land use ~ changes hydrology

Annual Rainfall: 46 inches

Before
After

Runoff
Evapor.
Recharge
Baseflow = High Percent of August Streamflows
Withdrawals Affect Flows
Withdrawals -- a large effect in small streams
(Upper Crab Creek, Lincoln County)

Issued Water Rights vs 7 Day Low Flow
Cumulative Qa Issued vs Irby Low Flow

- **groundwater**
- **low flows**
- surface

- **SW Qa (WRLA 43)**
- **GW Qa (WRLA 43)**
- **Irby 7Day Low Flow**
Instream flows

- **Past approach** – allocate a portion of what’s left for fish
- **Recent approach** – ask for the amount of water that fish could use, when and if available
- **Future approach?** – identify the flows needed for a properly functioning, healthy watershed, and work to achieve that flow
Biologically defensible and hydrologically achievable

“Within the range of biologically defensible stream flows, the instream flow recommendation should be adjusted in consideration of the hydrological potential.”
Water management challenges

- Water for growing communities
- “Use it or lose it” – what is the incentive to save water?
- Fish short of water
- Water not where/when we need it
  - limited storage and conveyance
  - no reuse infrastructure
Watershed Plans ~ Phases

- Phase 1 – Organization/scoping
- Phase 2 – Assessment/studies
- Phase 3 – Plan development/approval
- Phase 4 – Implementation/review

Up to $1.2 M / watershed, over 9 years
If you don’t have enough water ...

... you have to “make water” ~

- Use water efficiently
  - water conservation
  - water reuse
- Store water -- for when needed
- Move water -- shared supplies, conveyance systems, markets
Water Operating Adds since 1997

$86 Million in Budget Adds
Columbia River Basin
Dams Affect Flows
Natural Flows Before Dams (Low Water Year (1931))

COLUMBIA RIVER AT THE DALLES, OREG.

[Graph showing mean daily discharge in cfs from 10/07 to 10/01, highlighting the low water year of 1931 with a discharge of 121,900 cfs.]
Flows After Dam Construction
(Low water years)

COLUMBIA RIVER AT THE DALLES, OREG.

Low Water Years:
- 1931 121900 cfs
- 1977 120400 cfs
Making power -- flows change hourly

Hydrograph and station description for 12472800

USGS

12472800 -- Columbia River bl Priest Rapids Dam

STREAMFLOW, in thousands of ft³/sec

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>23</td>
<td>200</td>
</tr>
<tr>
<td>24</td>
<td>180</td>
</tr>
<tr>
<td>25</td>
<td>160</td>
</tr>
<tr>
<td>26</td>
<td>140</td>
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<td>27</td>
<td>120</td>
</tr>
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<td>28</td>
<td>100</td>
</tr>
<tr>
<td>29</td>
<td>80</td>
</tr>
<tr>
<td>30</td>
<td>60</td>
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</table>

△ Mean daily streamflow, based on 79 years of record

9/29/99
Figure 4. Relationships among median travel time (days) and estimated survival from Lower Granite Dam to McNary Dam, and flow exposure index (kcfs) measured at Lower Monumental Dam, steelhead, 1995-1998.
Snake River Flow Augmentation

- Columbia River near mouth
- Snake River at Lower Granite Dam
- Outflow at Dworshak Reservoir
- Snake River Augmentation

Graph showing flow augmentation from 1995 to 1998.
Withdrawals -- a small effect in Columbia River?

COLUMBIA RIVER AT THE DALLES, OREG.
Flows With and Without SW Rights

The Total Sum Qa (from "Paper Rights") of all Surface Water Diversions from the Mainstem of the Columbia River for all of eastern WA averaged over an irrigation season is equal to 10,920 cfs

With diversions

Mean Daily Discharge in cfs

Without diversions

1888 - Pre Dam "Natural Flows"
1991 - Post Dam, Includes Diversions
1991 Flows with SW Diversions Off

<table>
<thead>
<tr>
<th>Water Year</th>
<th>Mean Annual Flow in cfs</th>
</tr>
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<tbody>
<tr>
<td>1888</td>
<td>201,431</td>
</tr>
<tr>
<td>1991</td>
<td>203,445</td>
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# The Columbia River’s Economic Significance

<table>
<thead>
<tr>
<th>Sector</th>
<th>Annual Value</th>
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<tbody>
<tr>
<td>Agriculture</td>
<td>$5 billion</td>
</tr>
<tr>
<td>Electricity</td>
<td>$2 billion</td>
</tr>
<tr>
<td>Transportation</td>
<td>$100’s of millions</td>
</tr>
<tr>
<td>Recreation</td>
<td>$10’s of millions</td>
</tr>
<tr>
<td>Fishing</td>
<td>$10’s of millions</td>
</tr>
</tbody>
</table>
Figure 5. Schematic Diagram of Columbia River Streamflow Management.

Unregulated streamflows
- precipitation
- snowpack melt

Streamflows

Consumptive Uses
- Irrigation
- Municipal
- Industrial

diversions
return flows
release
storage

Regulation for:
- Flood Control
- Fish Flows
- Navigation
- Recreation/Safety Maintenance

Istream Uses

Regulation for:
- Hydropower

Storage Reservoirs

Regulated Streamflows

Source: Constructed by author.
Salmon populations at < 10 %

Many variables affect salmon, including water temperature and velocity.

Water use affects temperature and velocity, and will likely increase.

Current water withdrawals have noticeable effects in July/August.

Increased water use during Jul/Aug could pose substantial risk to salmon.
Columbia River Initiative

- State acquires water for the mainstem during Apr-Aug: enough for out-of-stream needs and to improve stream flows ("3 for 2")
- Authorize new water permits that are mitigated
- Recover costs by annual mitigation payment and tax returns
- Water acquisition in the short term
- New water storage and conservation in long term
“Water, taken in moderation, cannot hurt anybody.”

Mark Twain
(1835-1910)
Preferred Future (Vision)

- Natural resource base
- Water market
- Information-based water management
- Shared governance
Establish a natural resource base

- Adequate quantity/quality for properly functioning, healthy watershed
- Sufficient to meet esthetic, recreational and other human needs for streamflows
- Base is defined, established and set aside in each watershed
Market water rights

- Markets replaces water allocation and permit system
- Efficiencies (conserve, reuse) are driven by market forces
- Simple market rules ensure fairness and address impairment
- Market generates funds to support market/natural base
- Basic family needs subsidized in the market
Ag jobs per water unit ... 

Jobs per 1000 AF

- Field crops: 2
- Vegetables: 20
- Fruits/nuts: 22
### Ag water use and value

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>Use</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field crops</td>
<td>66</td>
<td>28 %</td>
</tr>
<tr>
<td>Vegetables</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>Fruits/nuts</td>
<td>25</td>
<td>42</td>
</tr>
</tbody>
</table>
If Ag Covered Urban Needs ...
Information-based management

- Monitoring of surface and ground water conditions
- Measurement and reporting of all water use
- Market information is readily available to all parties
- Clearly defined water rights, fully adjudicated
Shared governance

- Water management responsibilities divided among governments
- State governance role with the natural resource base, and tribal/federal relationships
- Local governance role with the market, linked to land use decisions
Store more?

Volume in Millions of Acre-feet

- 113.6 Columbia River at The Dalles Dam, Oregon
- 55.3 Other Storage
- 18.2 Major Federal
- 16.6 Canadian Storage

Store more?
Comparison of Major U.S. Rivers
Length, Storage, Annual Runoff and Elevation Drop

It is the large volume of water passing given points along the Columbia-Snake Rivers that is so valuable to river planners and users. Although the Columbia River total storage compares favorably with other large U.S. rivers, its runoff is significantly larger than its storage capacity as compared to the Colorado or Missouri which have annual flows less than storage capacity.
Climate change = less snow

April 1
Columbia Basin
Snow Extent
The South Cascade glacier retreated dramatically in the 20th century

1928

2000

Courtesy of the USGS glacier group

USGS
Snake River at Ice Harbor

Reduced summer flows → less water for irrigation, fish, hydro
Increased winter flows → more hydropower production
Scientists expect temperatures will rise approximately 7°F over the next 100 years due to climate change.

Follow the red arrows south to discover what the climate of these major U.S. cities will be like in 2100.
Mission

Meet current and future water needs for people, farms and fish