

INCREASING RELIANCE ON  
PRICING AND MARKETS TO  
ENCOURAGE CONSERVATION  
AND PROTECT OUR  
ENVIRONMENT



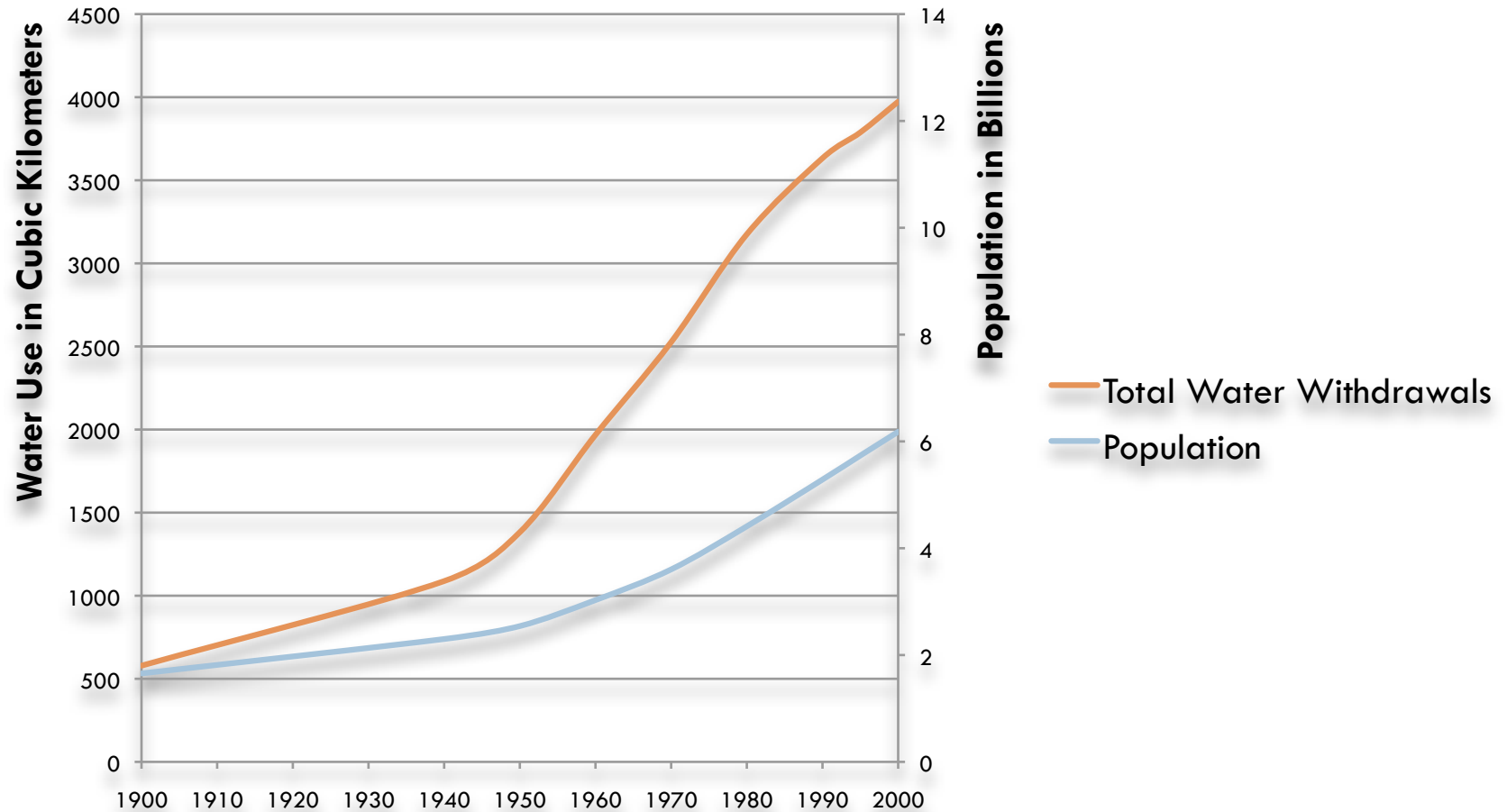
# Facts:

2

- Shortages of fresh water exist throughout the globe and they're getting worse
- Division of this scarce resource among competing interests is becoming an ever more contentious undertaking
- Traditional solutions – usually nothing more than tapping an unused source of supply -- are increasingly hard to find and expensive

# Since 1900 Growth in Global Water Use Almost Double Population Growth

3



# And Closer to Home ...

4

In Arizona, concerns over water shortages are likely to be exacerbated by some or all of the following:

- ▣ Growing population
- ▣ Competing demands for over-allocated Colorado River water by contiguous states and Mexico
- ▣ Settlement of Indian tribes' claims
- ▣ Possible worsening of droughts due to shifting precipitation patterns
- ▣ Environmental considerations requiring more water in natural courses

# Need to Allocate Scarce Water Resources Among Competing Uses

5

- Because fresh water resources are scarce and shortages are increasingly common, water must be allocated among competing uses
- Traditional allocation methods (Prior Appropriation & Beneficial Use) are not sustainable and environmentally destructive
- Choices for how to carry out this allocation are pretty simple – allocate by mandate, by moral suasion or by markets

# Allocation by Mandate, Moral Suasion or Markets?

6

- Allocation by government mandate
  - ▣ Bureaucrats establish and enforce allocations that they determine best meet the unique and changing needs and preferences of households and businesses
- Allocation by moral suasion
  - ▣ Households and businesses are encouraged to make changes that are not in their individual best interests but may be in society's best interests
- Allocation by markets
  - ▣ Reliance on the invisible hand of market forces to align self interest with conservation and to direct scarce resources to highest and best uses

# Limited Reliance on Market Forces in the Allocation of Water Resources

7

- Although market determined prices are used to allocate most scarce resources, the belief that water is a public resource has discouraged private ownership and trading of water resources, and it has precluded the use of market forces to conserve water and to achieve an economically efficient allocation of water among competing uses.
- Because water is vital for life, several outspoken critics claim it is morally wrong to treat it as a commodity and insist that no price be charged for its use.

# Currently, Most Water Prices are Set Based on Cost Recovery, Not Market Forces

8

- Recovery of operating and maintenance costs plus the cost of capital is the criterion used by most government owned utilities and state utilities commissions to establish water rates
- **The scarcity value of the most important input, raw water, is virtually always ignored**
- All too often, the result is overuse and/or misallocation of our precious and limited water resources



# In fact, Water Rates Typically Do Not Even Recover Costs

9

- Water provided to farmers by the Bureau of Reclamation (source of 50% of surface water withdrawn for irrigation) is heavily subsidized
- Direct federal spending and federally supported spending by states and municipalities have also subsidized the provision of water to the general public
- Consequently, rather than paying a premium to reflect its scarcity and encourage conservation, water is provided to customers at a price that doesn't even cover the costs of accessing and delivering it

# Different Subsidies for Different Water Uses Encourages Misallocations

10

- About 75% of Arizona's annual water use is for irrigation
- Arizona farmers use far more water per acre than farmers in any other state
- A farmer uses water for irrigation until pouring another acre foot of water on his fields increases the value of his harvest by less than the cost of obtaining that water
- While water prices for many municipal utilities are subsidized as well, those subsidies are much less
- Most Arizona farmers pay under \$50 for the last acre foot of water used and the marginal cost of water for much of the State's irrigated land is close to zero

# Illustrating the Problem with Cost-Based Pricing and Differential Subsidies

11

- 2004 study of water supplied in Colorado Counties on western slope of Rockies
- Marginal cost of water for irrigators ranged from zero to \$6.52 per a/f
- Municipalities in same counties charged between \$326 and \$1,026 per a/f
- The gains to society from transfers of water from irrigators to municipalities in these counties would range between \$320 and \$1,020 per a/f

# Further, If Costs of Recovering, Treating and Delivering Water Don't Rise ...

12

- Cost-recovery based prices will remain fixed even as available supplies dwindle and as the value of water in alternative uses soars
- Demand for water resources will exceed available supply – aka shortages

# And When Demand for Water Exceeds Supply at Cost Based Prices ...

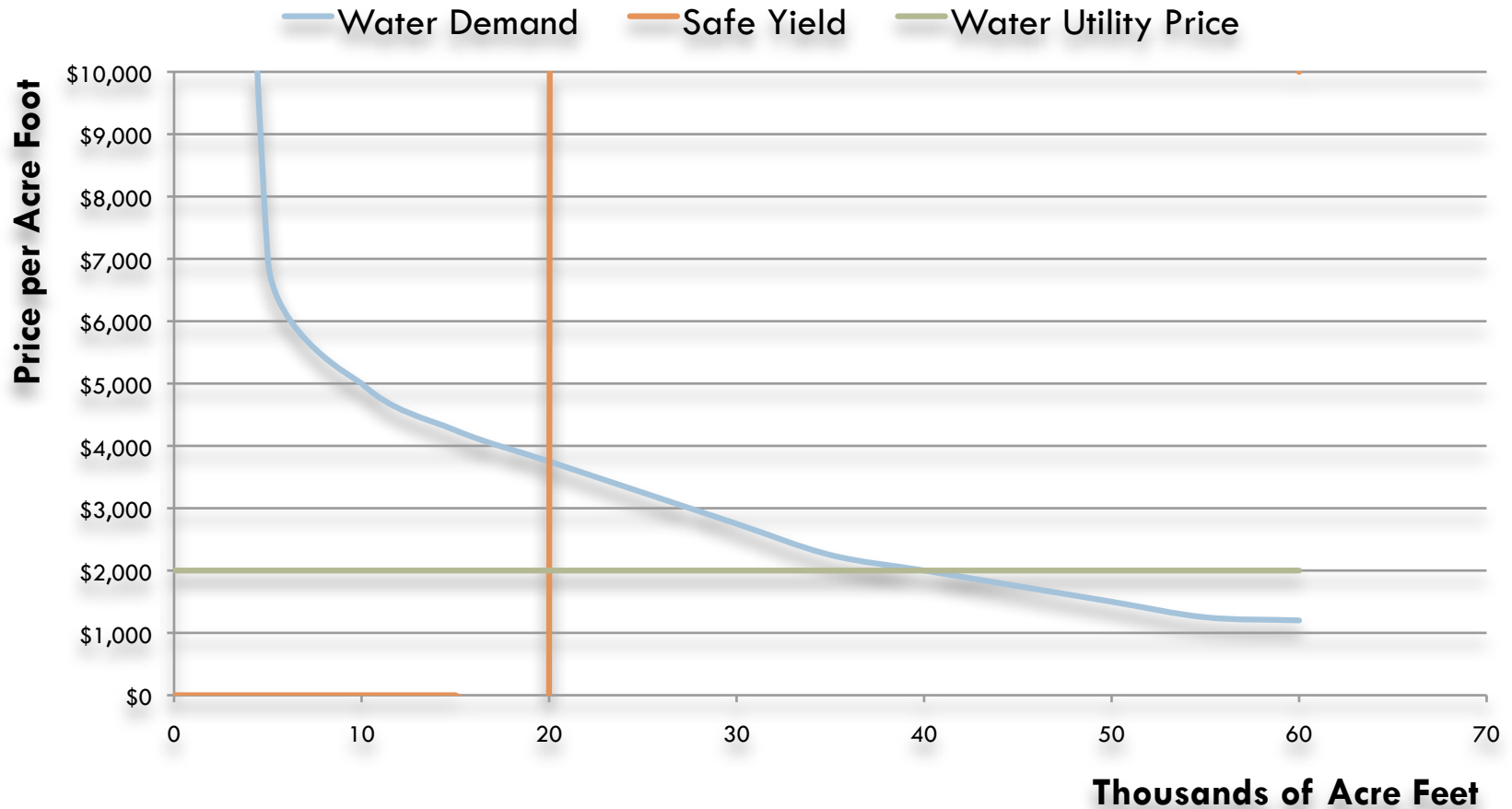
13

## Who gets water in Arizona:

- ▣ Groundwater rights dictated by “beneficial use doctrine” as modified by GMA, and if safe yield supply is insufficient to meet legal demand, we mine the aquifer
- ▣ Surface water rights dictated by “prior appropriation doctrine”, and if not enough water to satisfy demand junior rights holders must do without
- ▣ The environment has no groundwater rights. ADWR regulations do not permit environmental considerations in Adequate Water Supply evaluations for groundwater allocation.
- ▣ The environment can have instream flow rights.

# Illustrative Example: Price Reflecting Cost Recovery Encourages Water Mining

14



# Allocations Based on Seniority of Appropriation Unlikely to be Efficient

15

- Currently, surface water in the West is allocated by seniority of water rights
- Yet seniority of water rights is not closely correlated with water productivity
- Allocating water rights based on market prices delivers water to its most productive uses
- Recent study shows cost of reallocating water from ag to environment using price is less than a third the cost if allocation based on seniority of rights

# Typical Water Only Costs (approximate)

16

- Prescott municipal water: \$1165/af
- Domestic Well: \$70/af
- Water conservation: \$3000/af
- Macro-Rainwater Harvesting: 30,000/af
- Import water from BCA: \$25,000/af
- Effluent: \$23,000/af
- Imperial Valley irrigation water: \$15/af



# When Water Prices Reflect Scarcity, Users Conserve

17

- Water rates have significant impacts on water use
  - ▣ 2003 review of 300 residential water use studies found average price elasticity of -0.41 (10% increase in price results in 4.1% reduction in use)
  - ▣ Elasticity of demand for water by commercial enterprises is higher
- When the price of water is determined by markets rather than the cost accounting, price adjusts to reflect available supply and alternative demands

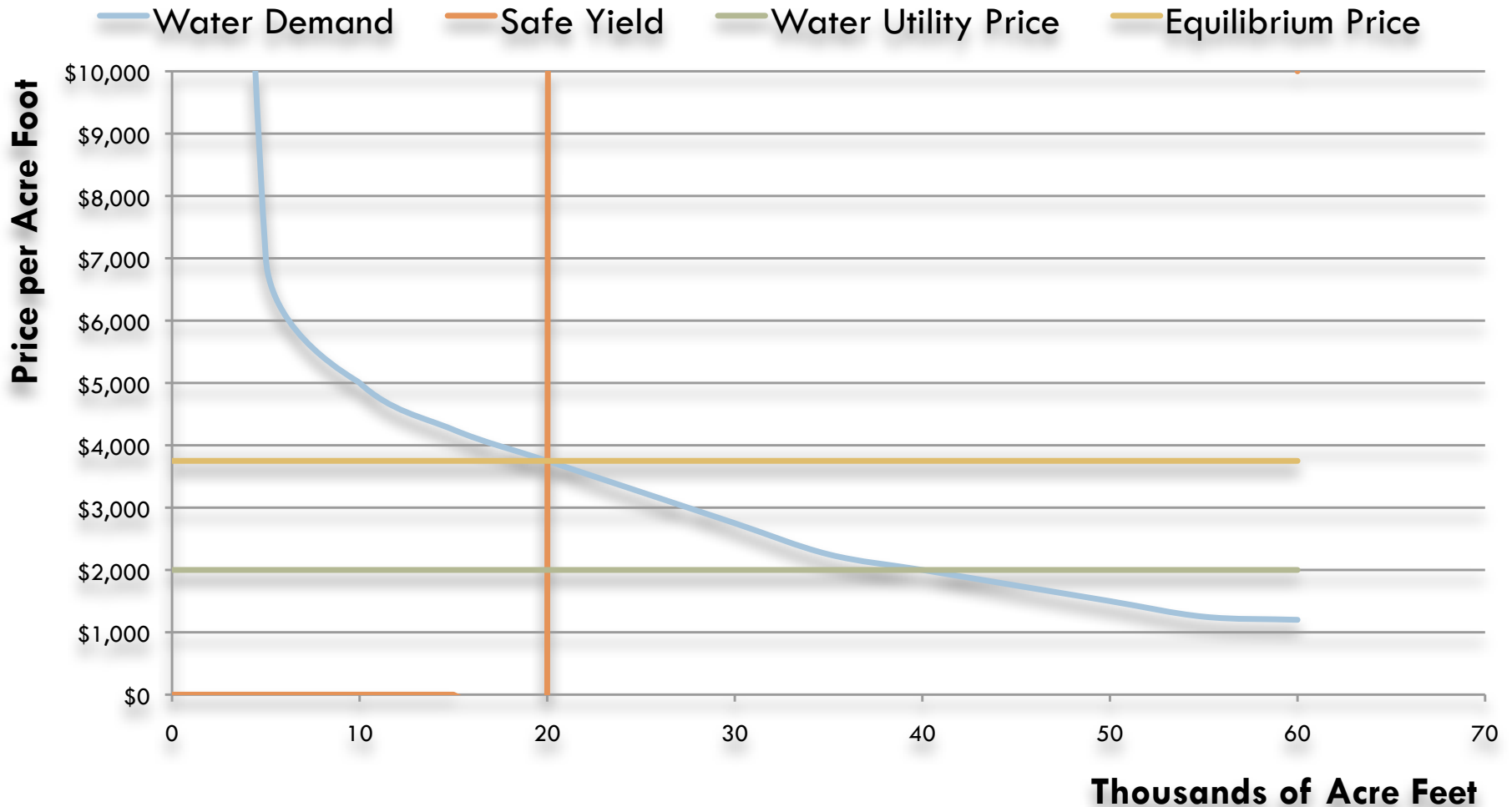
# Trading in Water Rights – A Hypothetical Example

18

- Distribute “rights” to use water drawn from the aquifer or “water credits” in an amount equal to natural recharge
- Require users to deliver one water right for every unit of water withdrawn, either directly from a well or indirectly from a municipal or private water system, in addition to paying price established by local utility
- Permit water rights or credits to be bought and sold on an open market
- The result would be a market price on water rights sufficiently high to equate demand for water from the aquifer with natural recharge

# Market Price for Water Rights Eliminates Shortage

19



# Important Consideration Re: Market for Privately Owned Water Rights

20

- Initial distribution of water rights will have little if any impact on equilibrium price, but will influence who benefits most from the change
- Because groundwater is a common good and because some quantity of fresh water is necessary to sustain life, even if water rights are not distributed equally to all residents, one would expect to see every resident receive at least a subsistence level of rights
- Important that amount of rights distributed not exceed reasonable use (e.g., natural recharge for groundwater or allocation from river in the case of surface water)

# Could Someone Corner the Market and Jack Up Prices?

21

- First, one would expect water rights to be broadly and periodically distributed making it difficult to corner the market
- Second, each individual could receive at least a subsistence level of water rights and could retain those for their own use
- Third, if the public wished, limits could be imposed on the percentage of water rights that could be owned or exercised by any individual or private party

# Experience with Marketable Private Water Rights

22

- Markets for water rights are fairly unusual, but they do exist in some parts of the U.S. and appear to have been quite successful
- Main impediments are legal and regulatory restrictions on buying and selling rights, not any problems with the way they have worked
- Although there have been concerns about some transactions involving water, the problematic deals have involved situations where water rights have exceeded prudently available water resources

# Ensuring the Poor have Access to Water

23

- In the U.S. the price of water from the tap is extremely low, even in communities where water prices are the highest
- If water rights were tradable, rates in these high price communities would fall as highly subsidized, low cost water supplies were reallocated
- But if water is too expensive for some, the most efficient solution is to expand Earned Income Tax Credits to give the poor the money to buy what they need, not to disguise water's scarcity by capping its price

# Can We Risk Leaving the Allocation of a Unique and Vital Resource to Market Forces?

24

- Consider the Alternatives:
  - ▣ Allocation of scarce goods by government mandate has always produced shortages and inefficiency
  - ▣ Allocation solely by moral suasion have virtually always been ineffective
  - ▣ In contrast, market determined prices have proven to be the most effective mechanisms for the efficient allocation of scarce goods known to man
- How can we trust the allocation of a resource as precious as water solely or primarily to mechanisms that have performed so poorly and turn our backs on a mechanism that has worked so well?



# Water use responds to price

25

- Water is underpriced, causing misallocation and inefficient use
  
- Proven in municipal markets:
  - ▣ Increasing price cuts water use.
  - ▣ Increasing block rates must be substantial.
  - ▣ Base rates must be small or they will override the increasing block rates.

# Requirements for functional market

26

- A regulated and structured market is the most efficient method to allocate goods.
- Rights must be defined (Gila adjudication) and prioritized.
- Compliance: consumption must be measured
- True costs must be used - no externalities
- Subsidies must be rare and minor (eg to serve the poor) to avoid market distortions
- Statutory foundations: legal procedures for trading support a timely & orderly market.

# Market based methods

27

- Conservation easement
- Severance and transfer
- Leasing/purchasing water rights
- Conserved water rights
- Water banks.

# The Nature Conservancy

28

- Purchase/Resale to public agency
  - ▣ Shields Ranch to CNF
  - ▣ Rockin' River Ranch to Az State Parks
  - ▣ Upper Verde to AZGFD
  - ▣ Retained Upper Verde Preserve
- Conservation easements
  - ▣ San Pedro: retired irrigation on grazing land
  - ▣ Upper Verde: development rights to Rocky Mt Elk Fdn

# Walker Lake: NFWF

29



# Walker Lake: NFWF

30



**A yellow scum lines the shore of a dying Walker Lake, where Lahontan cutthroat trout once thrived. In the distance lie rocks with mineralization from the lake's high salt concentrations, exposed because of the ever-receding shoreline.**



# Walker Lake: NFWF

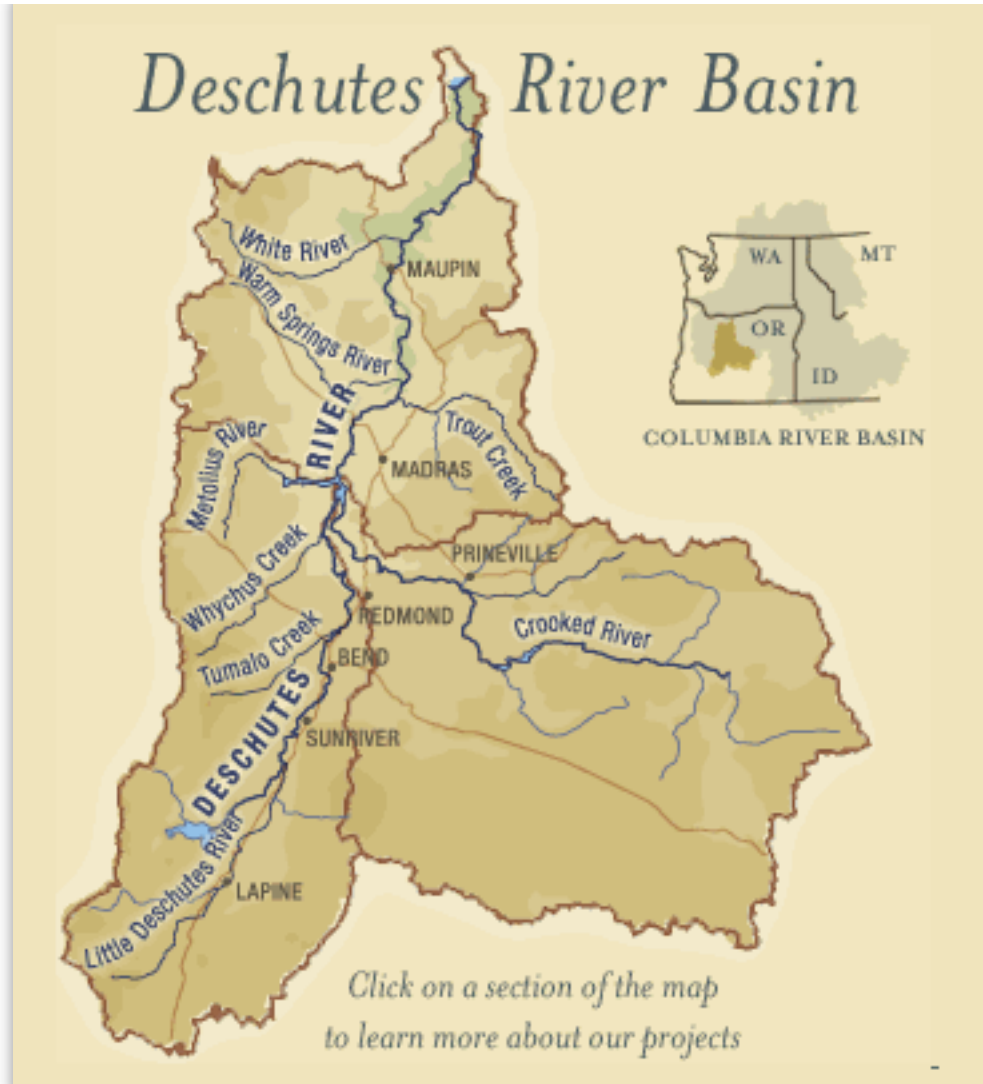
31

- Lahontan cutthroat trout: ESA issue
- Work with farmers
  - ▣ Takes time, patience, understanding
  - ▣ Dustbowl problem
- Purchase and/or lease irrigation water rights
- Transfer purchased rights to instream rights
- Need legal authority to retain instream flow in river
- Lake needs 26-53 Kaf/yr
- NFWF has acquired 6.5 Kaf/yr



# Deschutes River Conservancy

32





# Deschutes River Conservancy

33

- Driving issue: Salmon reproduction ESA threatened.
- Prior to 1987, Oregon did not consider water instream to be a beneficial use. “Today we realize that if fish and wildlife benefit, the public also benefits. Other benefits include recreation, water quality, navigation, and conservation of aquatic life.”
- Legal foundation:
  - ▣ All water is publicly owned. All users must obtain permit or water right to use water from any source.
  - ▣ Enabler: Oregon law supporting instream flow for fish
  - ▣ State law supplements WSRA: max 1 cfs change in WSR!

# Deschutes River Conservancy

34

- Purchased rights: high priority groundwater and surface water rights are permanently converted to instream flow rights, often in minor tributaries.
- Temporary leases: Rights transfer to instream diversion on monthly schedule
- Efficiency improvements: farmers are funded for ditch lining, pipelines, or converting from flood to drip or sprinkler irrigation. Farmer trades water credits (State gets 25%, farmer gets 75%), which are then converted conserved water to instream flow.

# Deschutes River Conservancy

35

- Deschutes Water Alliance Water Bank
  - ▣ Assists water users in transferring existing water rights between different uses.
- Groundwater Mitigation Bank
  - ▣ Restores streamflow and provides mitigation credits to new groundwater users.

# Deschutes River Conservancy

36

