



# Economic Effects Analysis of the Integrated Plan

Yakima River Basin Study Task 2.2

December 9, 2010

# Costs and Benefits

- The Integrated Plan will yield costs or benefits to the extent that it decreases or increases:
  - The value of goods and services derived from the basin's water and related resources
  - The value of capital stocks (financial, human-built, natural, human, social)

# Cost Categories Considered

- **Quantified Costs**
  - Capital costs of new facilities constructed
  - Operations and maintenance costs
- **Additional Costs (Not Quantified)**
  - Loss of land and habitat at new or expanded reservoir sites
  - Loss of recreational uses at those sites
  - Reduced earnings for competing farmers from crop price effects
  - Lost hydropower production from subordination

# Benefit Categories Considered

- **Quantified Benefits**
  - Value of improved Yakima Project agricultural output during severe droughts
  - Value of improved salmon and steelhead runs
  - Value of new municipal water supply

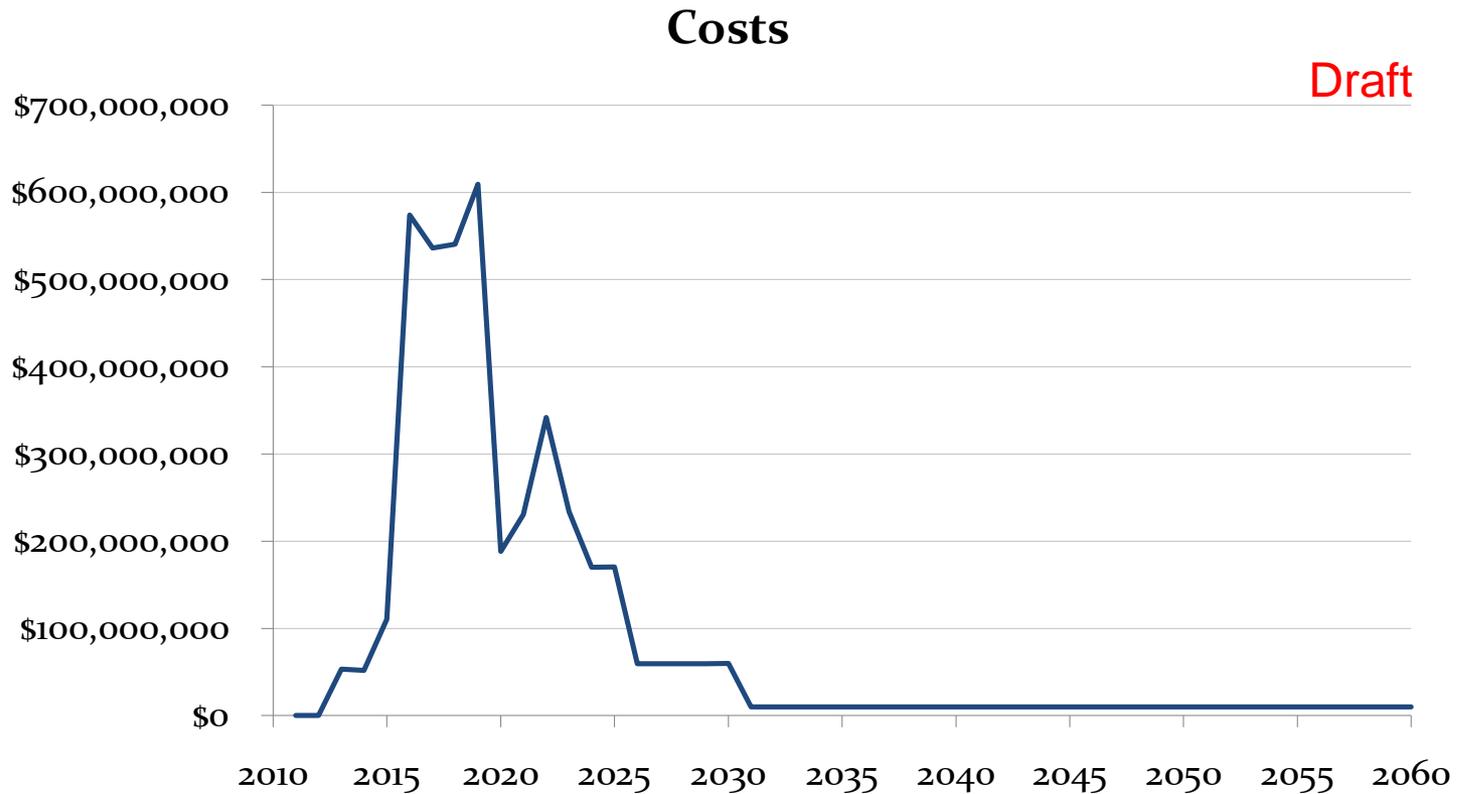
# Benefit Categories Considered

- **Additional Benefits (Not Quantified)**
  - Benefits to species besides salmon and steelhead
  - Improved agricultural output in less severe droughts
  - Additional agricultural output under climate change (increased frequency or intensity of droughts)
  - Improved agricultural output of KID under climate change scenario
  - Improved agricultural output of Non-Project Users
  - Reduced legal risk to ground water users and other junior water rights holders

# Measuring Costs and Benefits

- Dollars of 2010
- “Present value”
  - A single number equivalent to a stream of future values
  - Discount future values to reflect the cost of capital
  - Look forward 100 years, to 2110 (the graphs show only the first 50 years, to 2060)
  - Federal discount rate for water resources planning in 2010 = 4.375 % per year

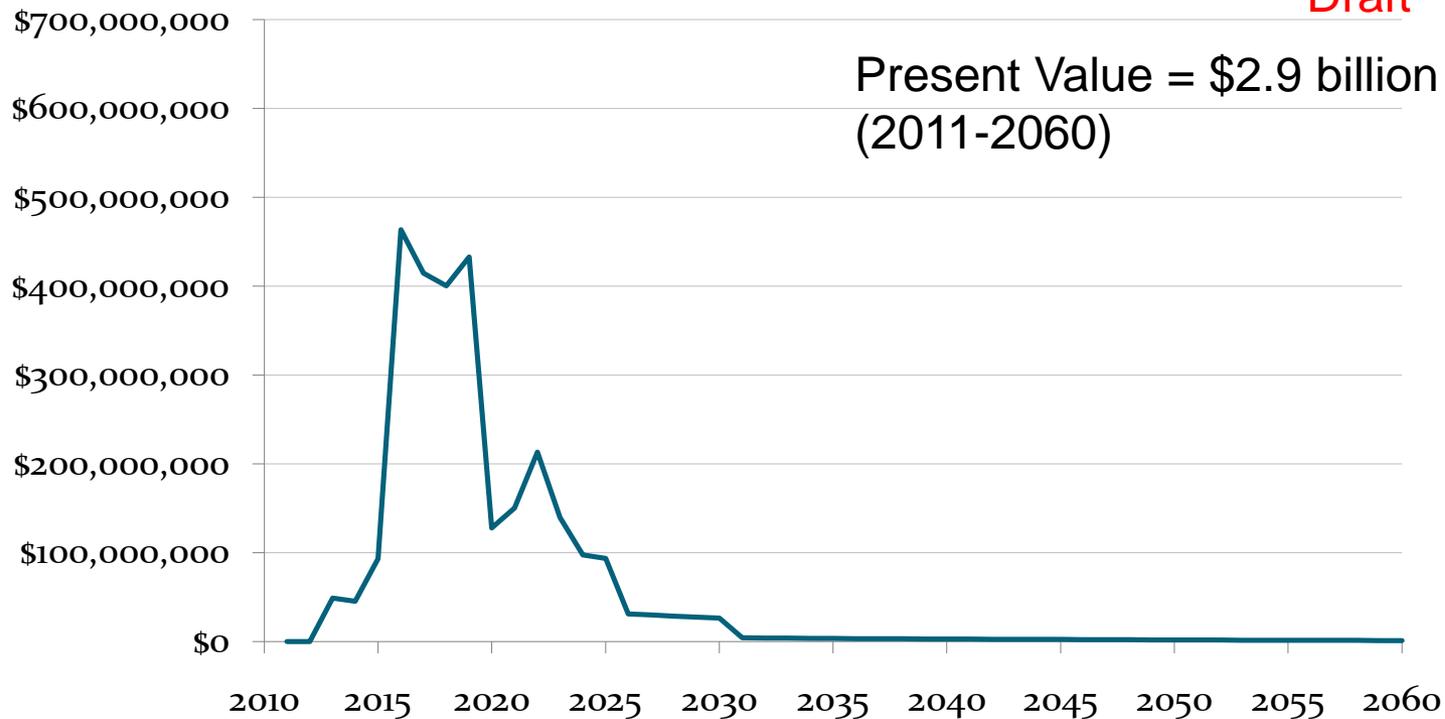
# Potential Capital and O&M Costs of the Integrated Plan



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## Discounted costs

Draft



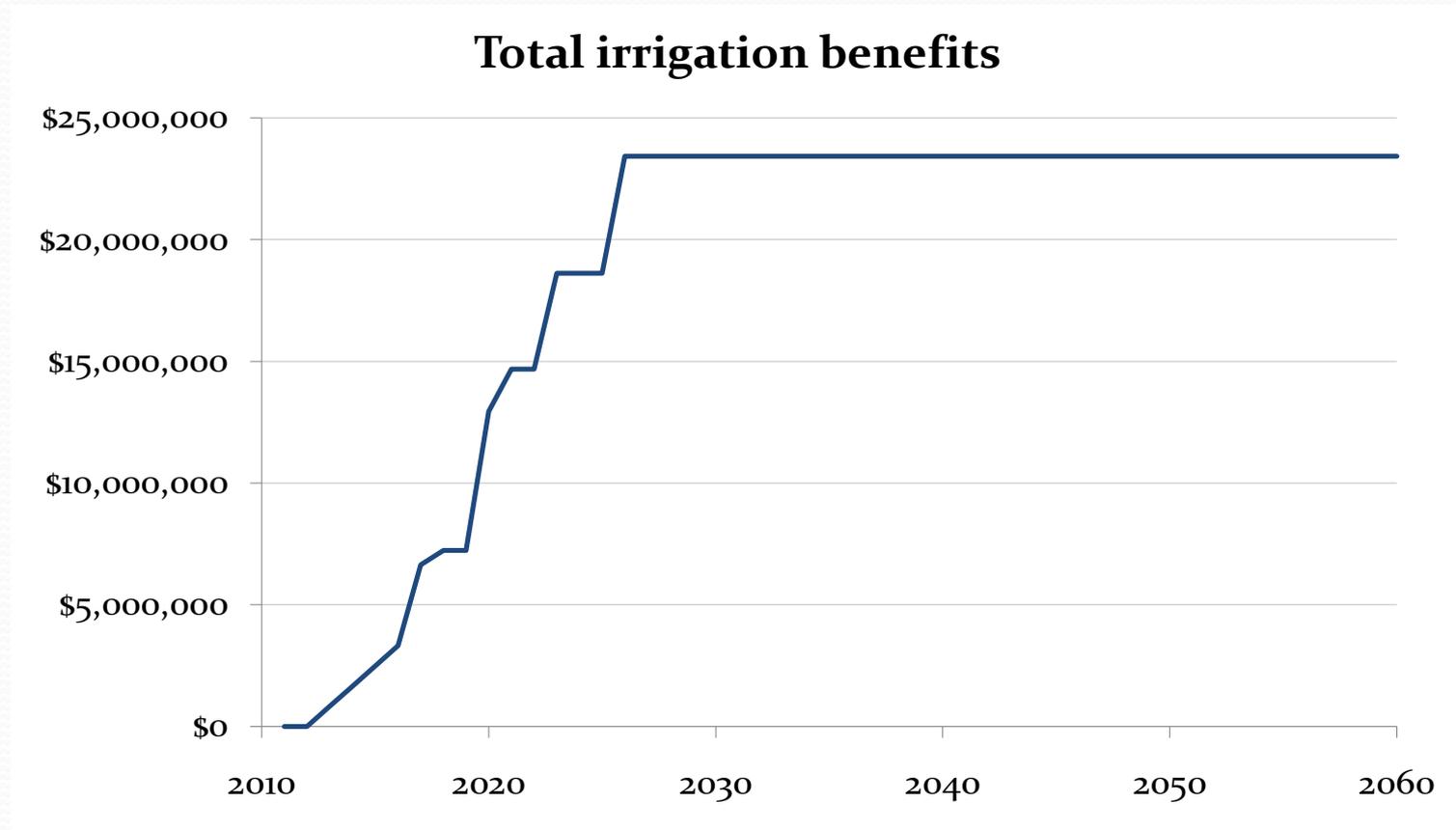
# Potential Irrigation-Related Benefits of the Integrated Plan

- Benefits = reduction in losses during severe drought
  - Roza, Kittitas, Sunnyside, Tieton, Wapato Districts
- Assume severe drought every 5 years; 3-year severe drought every 20 years
  - Annual expected probability of a drought = 0.30
- Severe drought = 30% proratable entitlement
- Full Integrated Plan = 70% proratable entitlement plus  $\frac{1}{2}$  the value of potential market-based reallocation

# Potential Irrigation-Related Benefits of the Integrated Plan

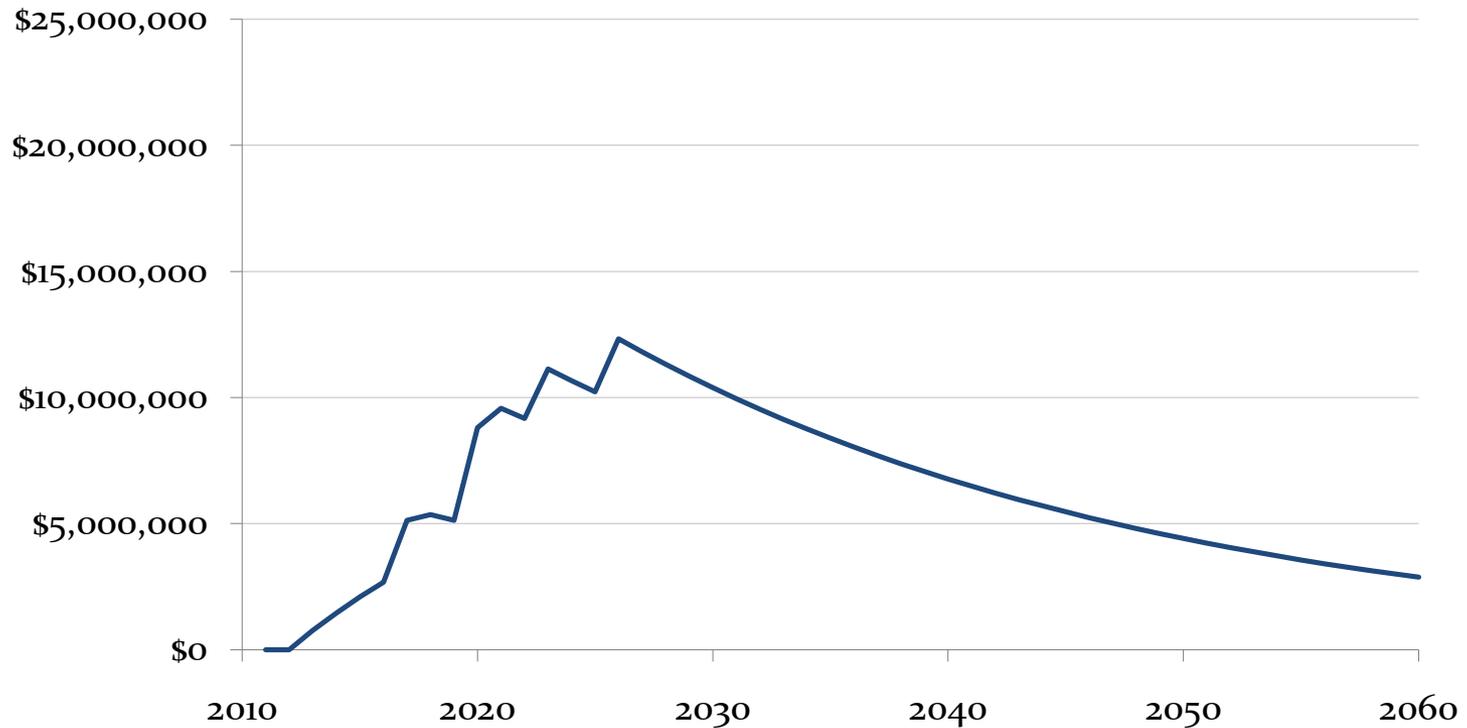
- 2011–2012: zero benefits
- Market-based reallocation benefits to irrigation
  - By 2016:  $\frac{1}{4}$  of full potential benefits
  - 2017–2060:  $\frac{1}{2}$  of full potential benefits
- Irrigation water-supply benefits
  - 2018–2025: ramp-up
  - Full benefits begin in 2026: \$78M per year

# Potential Irrigation-Related Benefits of the Integrated Plan



# Potential Irrigation-Related Benefits of the Integrated Plan

**Discounted total irrigation benefits**



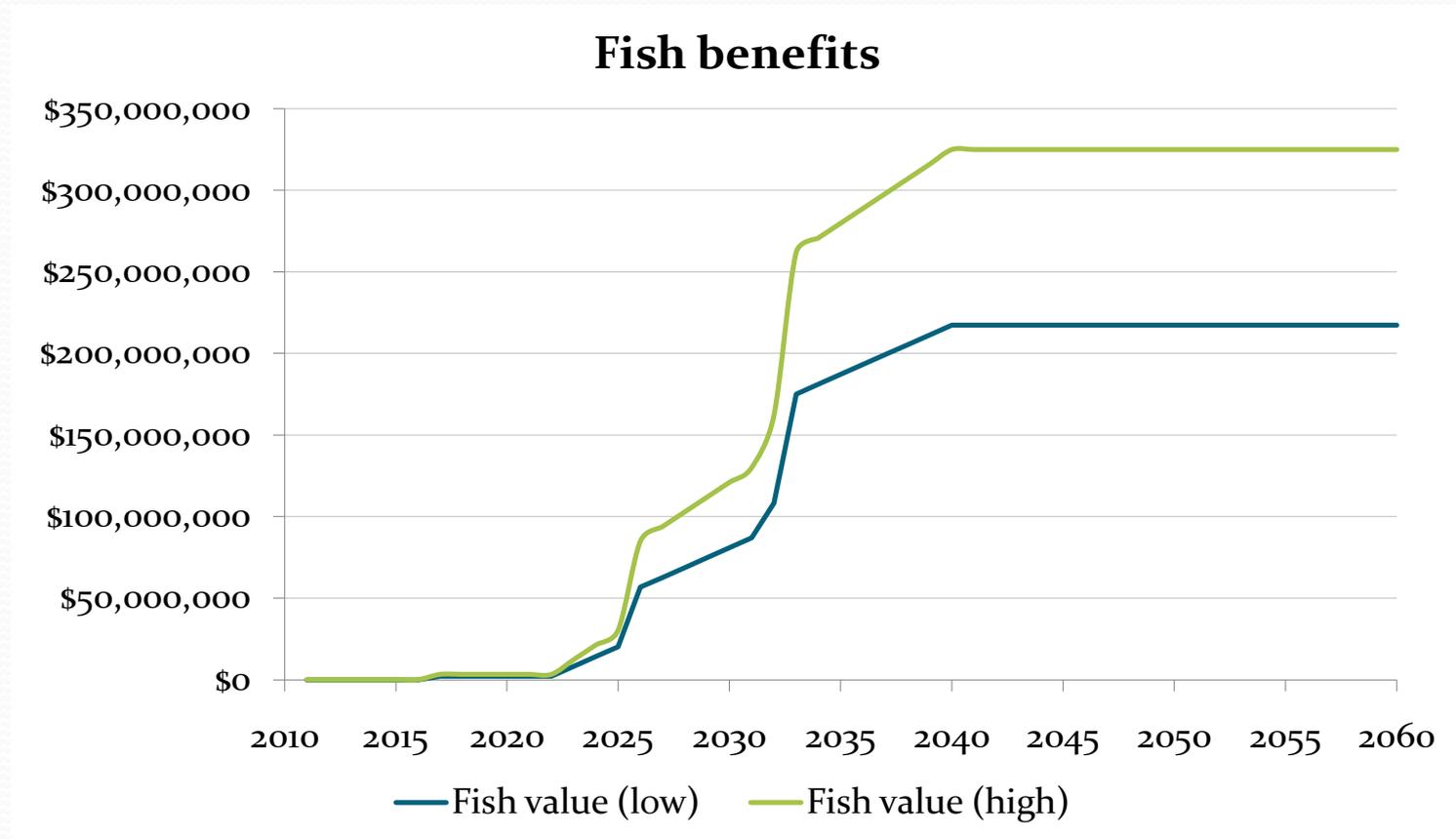
# Potential Fish-Related Benefits of the Integrated Plan

- Benefits = the willingness to pay for the potential increase in fish population
  - Use value (commercial fishing, recreation)
  - Quantifiable passive-use value (existence, altruism, bequest)
  - Unquantifiable value (existence, bequest, spiritual, cultural)

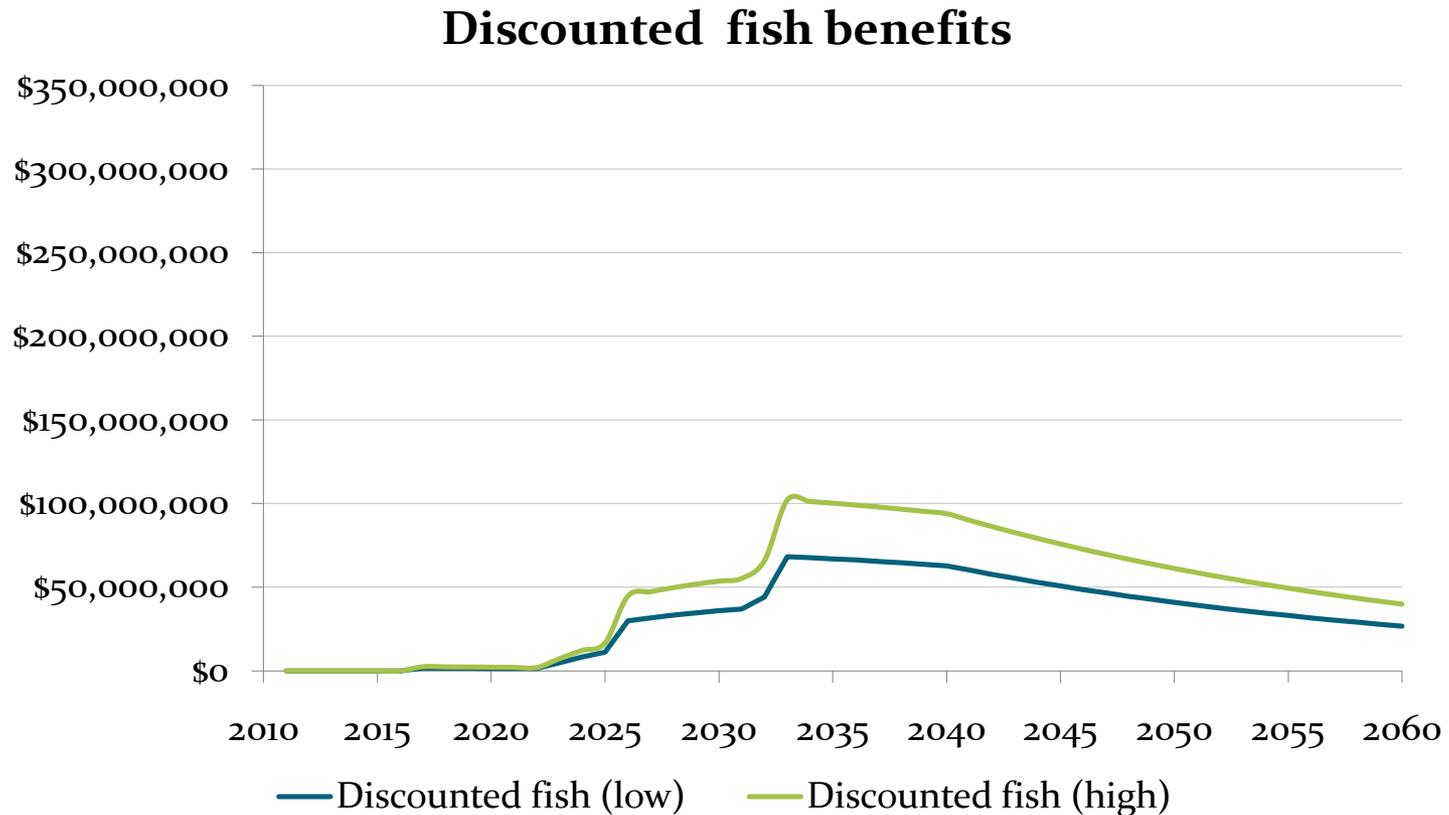
# Potential Fish-Related Benefits of the Integrated Plan

- Results from survey of Washingtonians about willingness to pay for higher salmon/steelhead populations in the Columbia River basin
  - Use value + quantifiable passive-use value
- Full potential increase in salmon/steelhead population = 221,000 – 725,000 fish per year
- Full potential quantifiable value (to Washingtonians) = \$217–\$325 million per year
- Benefits begin in 2017, ramp up to 100% in 2040

# Potential Fish-Related Benefits of the Integrated Plan



# Potential Fish-Related Benefits of the Integrated Plan

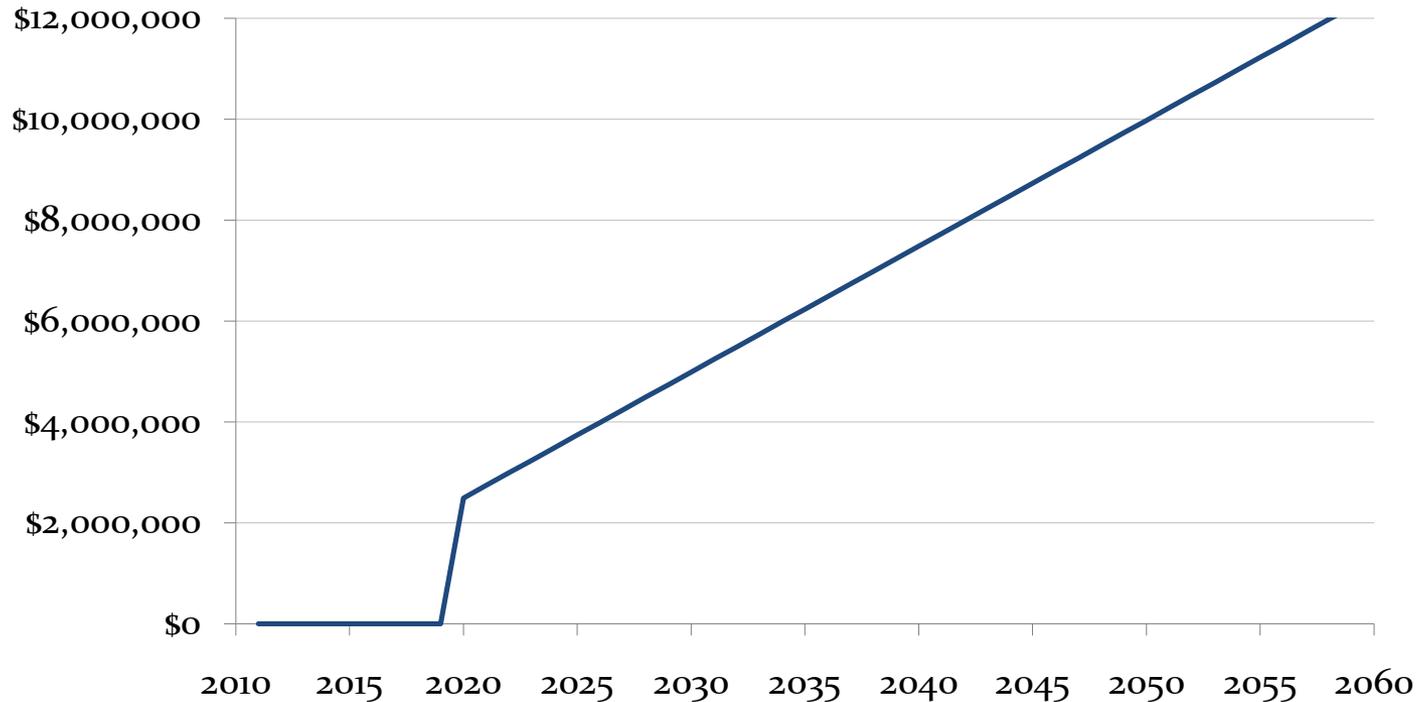


# Potential Municipal-Supply Benefits of the Integrated Plan

- Full potential increase in municipal supply = 50,000 acre-feet
- Full potential quantifiable value = \$12 million per year
- Benefits begin in 2020, ramp up to 100% in 2060

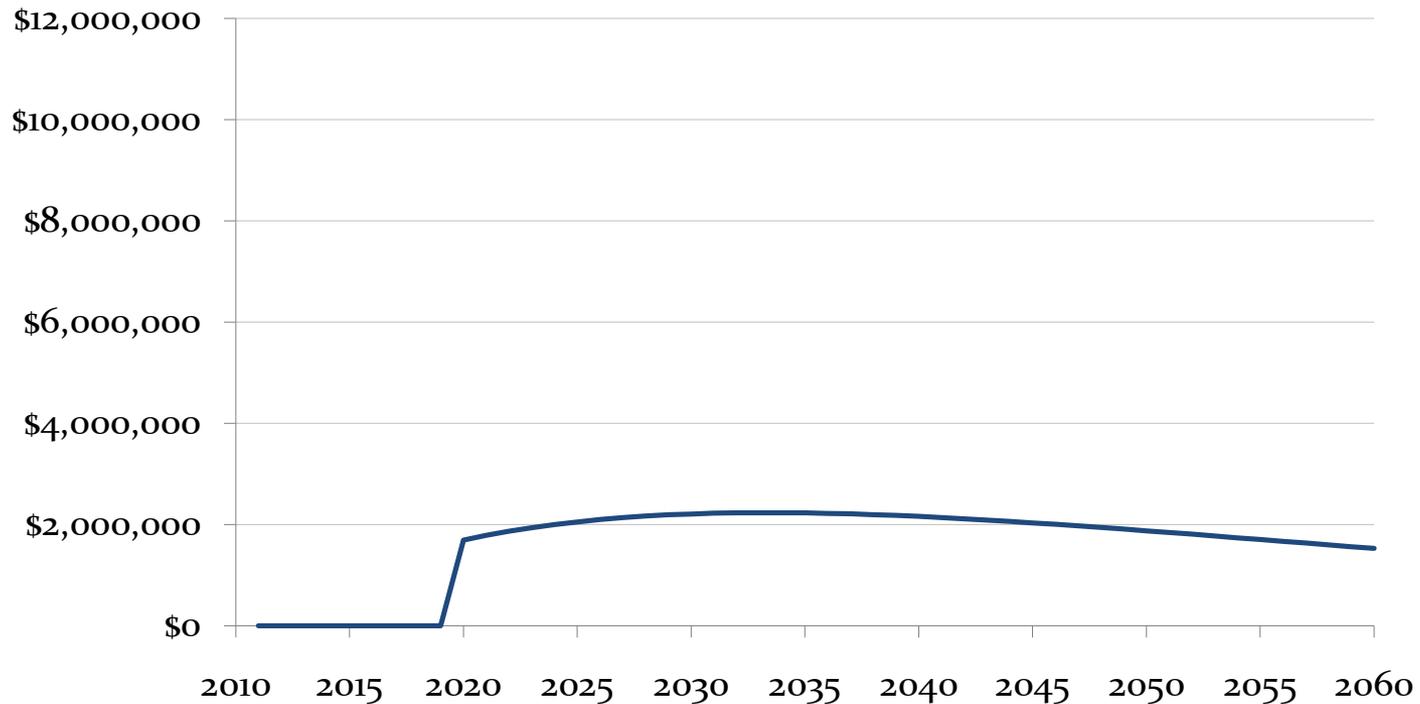
# Potential Municipal-Supply Benefits of the Integrated Plan

**Municipal-supply benefits**



# Potential Municipal-Supply Benefits of the Integrated Plan

**Discounted municipal-supply benefits**



# Sum of Quantified Potential Benefits of the Integrated Plan

Present value =

\$2.6 billion – \$3.7 billion

# Unquantified Potential Costs of the Integrated Plan

- Indirect decreases in net farm earnings for competing farmers
- Loss of ecosystem services from land/habitat inundated by reservoirs
- Decreases, if any, in net economic benefits of recreational opportunities

# Unquantified Potential Benefits of the Integrated Plan

- Increases in net farm earnings in years without severe drought
  - From increased water-supply reliability
  - From increased market-based water reallocation
- Unquantifiable benefits of higher fish populations
- Increases, if any, in net value of recreational opportunities, other than those associated with higher fish populations

Cont.

# Unquantified Potential Benefits of the Integrated Plan, cont.

- Increases in the populations of species other than salmon/steelhead
- Improved resiliency and adaptability of the water system
- Additional benefits under anticipated changes in climate
  - Irrigation
  - Fish
  - Other

# Other Potential Effects of the Integrated Plan

- Average, on-going effects of crop production statewide, per \$1 million gross farm revenue
  - Direct jobs ~ 23
  - Total jobs ~ 46
  - Total labor income ~ \$0.64 million
  - Total statewide output ~ \$2.3 million

Source: Washington Office of Financial Management

Cont.

# Other Potential Effects of the Integrated Plan, cont.

- Hypothetical, maximum effects, if the Integrated Plan were to increase gross farm earnings in the Yakima River basin by \$310 million/year
  - Direct jobs ~ 7,000
  - Total jobs ~ 14,000
  - Total labor income ~ \$200 million
  - Total statewide output ~ \$700 million

Cont.

# Other Potential Effects of the Integrated Plan, cont.

- The actual impacts from the Integrated Plan likely would be much different
  - Short-run smoothing
  - Offsetting impacts on competitors outside the Yakima River basin

# Next Steps

- Finish and distribute technical memorandum

# Disclaimer

- Modeling results represent the assumptions used.