Water Needs Subcommittee YRBWEP 2010 Basin Study

Meeting 1

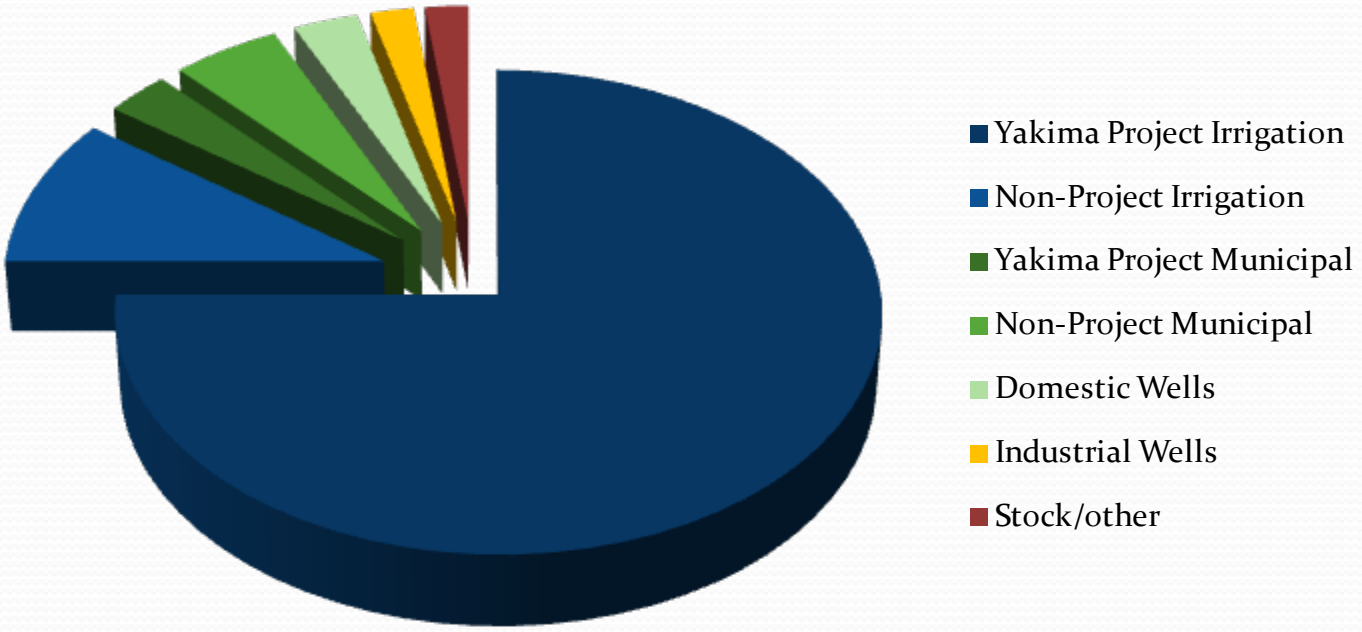
February 25, 2010

Project Considerations

- Objectives/intended use of results
- Forecasting time frame
- Range of uses considered
- Breakdown by user sub-categories
- Alternative Scenarios for Future Conditions
- Available data and methods for analysis

Water Use Categories - Yakima Basin

(Quantities are Conceptual Only)



Simple Forecasting Methods

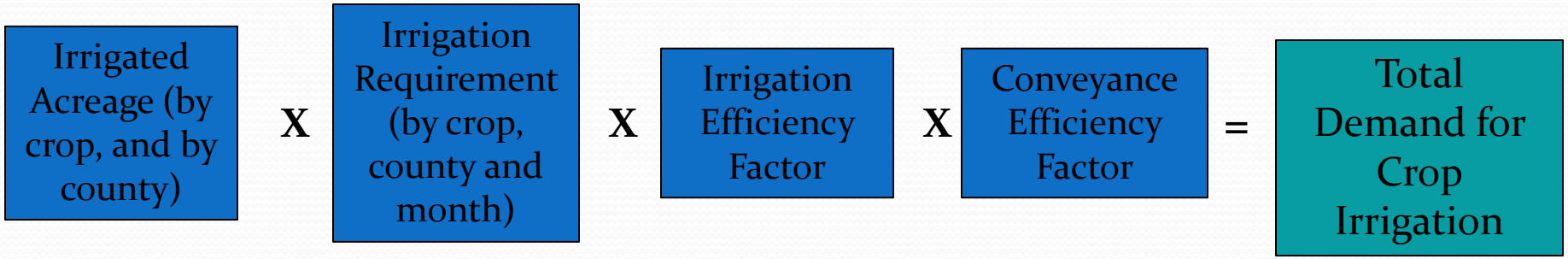
- Trend Analysis:
  - Statistical (simple or sophisticated) analysis of historical data
- Per Unit Demand:
  - Computes demand as product of demand per unit and number of units
  - Applies to different units and types of demand: e.g. population, employees, irrigated acres
  - Units may be further disaggregated by sub-group, location or land use
- End Use Models:
  - Determines demand from specific purpose (e.g. clothes washing, toilet flushing, irrigated acreage, etc.)
  - Similar to unit demand, but at a more fundamental description of use:
  - Computation involves requires data on technologies, intensity and users

Statistical Forecasting Methods

- Econometrics:
  - Statistically determines responsiveness of key drivers of demand (e.g. price, income, climate, etc.) on total demand
  - Demand forecasts are developed from forecasts of drivers and statistics results
  - Applies Monte Carlo simulation for forecast uncertainty
- Hybrid Method (Per Unit/Econometric):
  - Builds baseline level of demand from Per Unit Demand methods
  - Modifies Per Unit Demand with end use data and price/income effects
  - Applies Monte Carlo simulation to account for parameter and forecast uncertainty

Method	Strengths	Weaknesses
Trend Analysis	• Only historical demand data required	• Assumes past trend reflects future • Does not account for changes in demographics, weather, other factors
Per Unit Demand	• Simple analysis of key driver impact: population, employees, land, etc.	• Fixed influence on unit growth • Does not account for changes in demographics, weather, other factors
End Use Models	• Provides direct application of conservation program evaluation • Can be integrated with other methods	• Requires substantial amounts of data on intensity of use, technology design, and users • Requires calibration with existing data
Econometrics	• Applies statistics to estimate variability in water demand by site • Incorporates influences that may change over time	• Requires substantial amount of data on water use and drivers of use over time • Data deficiencies can limit statistical significance
Hybrid Model	• Less statistically intense • Adjusts forecasts from literature-based elasticities for price, conservation program and climate change • Incorporates uncertainty analysis	• Less precise forecast than econometrics because of application of literature based values

Crop Irrigation Needs Model (Oregon WRD Example)

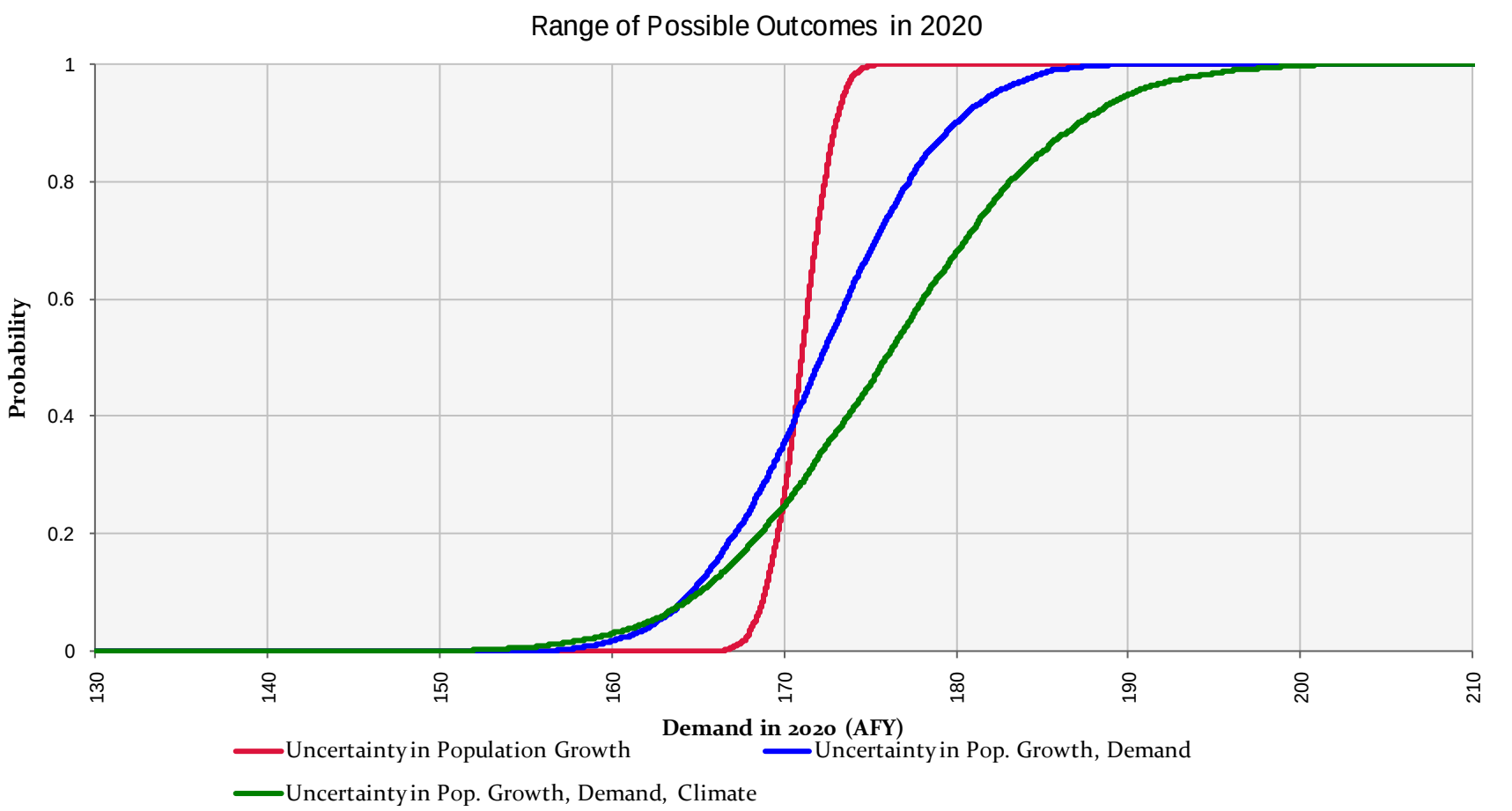


Note: Yakima Project acreage is fixed in Yakima Basin (except land conversion)
Method allows scenarios for Climate; Cropping; Irrigation Efficiency; Conveyance Efficiency

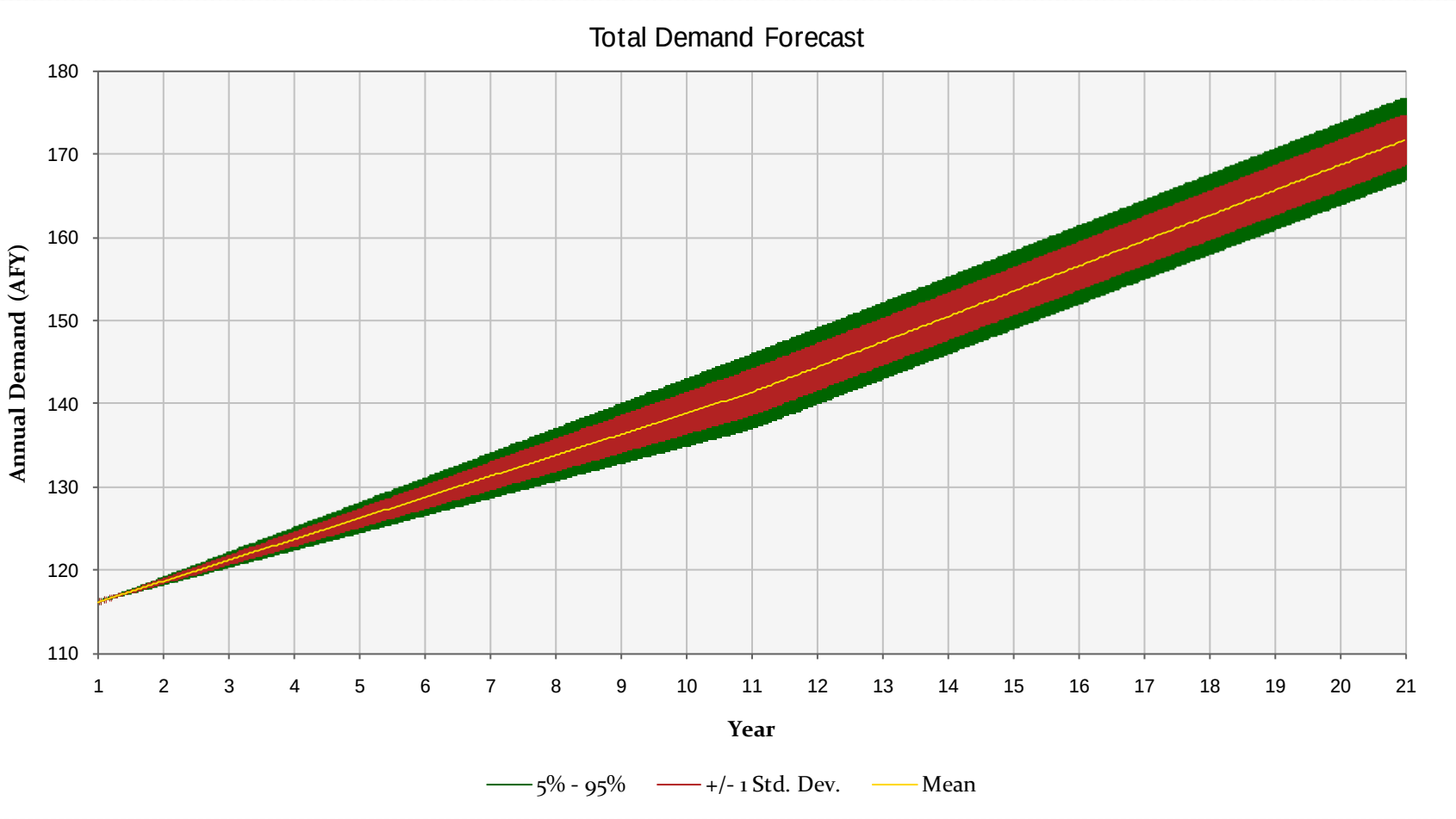
Data Needs (Municipal Category)

- Water Use Data:
  - Variables describing overall water use and users: monthly demand for water; type (e.g. residential, commercial, public, etc.) and number of water connections; system losses
- Price / Income Data:
  - Variables describing price influence of demand: water rates; average income
- Demographic Data:
  - Variables describing municipal demographics: local employment; population; population per household; housing density
- M&I Data:
  - Variables describing the municipality including: land area; sources of water; “type” of municipality (potential categorical variables would be imputed from other data to stratify the municipalities with respect to economic base, population size, region)
- Climate Data:
  - Variables describing climate influences including: cooling degree days, precipitation, air temperature
- End Use Data:
  - Variables describing water use: characteristics of conservation program timing, type, and performance

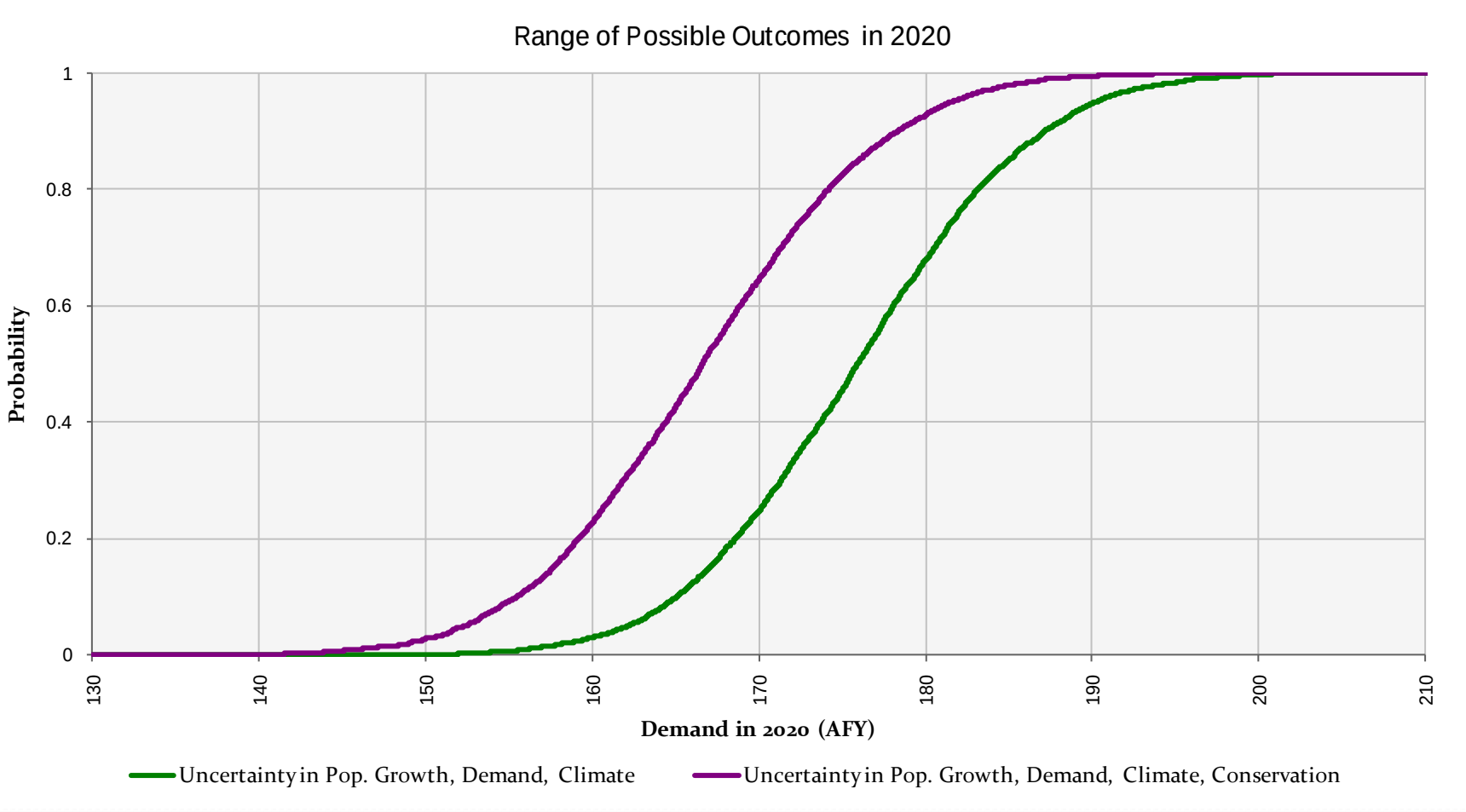
Sample Uncertainty in Specific Year



Sample Forecast with Uncertainty



Uncertainty With Conservation Included



Questions/Discussion