Alternative Approaches to Assessing and Forecasting Out-of-Stream Water Needs
2010 Yakima River Basin Study

	Approach	Pros	Cons
1. Yakima Project Irrigation Needs			
Current Needs			
C1	Use drought deficiencies, 1994-2005 as measure of water need.	Simple to apply. Transparent to multiple audiences. Directly addresses primary issue of dry-year supply deficiencies.	Provides little detail. Does not support documentation of efficiency characteristics.
C2	Water balance approach. Use Reclamation or I.D. records of diversions & return flows. Combine with acreage data to document aggregate water efficiency. Focus on non-drought conditions to define "full" need; then adjust for drought conditions.	Diversion data largely available. Provides more complete picture of use and location. Provides information on trends in use over time.	Return flows hard to quantify. No breakdown between conveyance and on-farm needs.
C3	Crop land calculations based on USDA records of acreage; WSDA crop irrigation requirements. Ground-truth results using Reclamation or I.D. records of diversions & return flows.	Supports modeling of future needs (see below).	Little data available for some necessary elements of calculation.
Future Needs			
F1	Used fixed quantities, based on Method C1 above (future needs same as current needs).	Simple, transparent.	Assumes static conditions and results.
F2	Make adjustments to current needs. Land conversion to urban uses. Fixed estimates of water conservation savings from planned projects.	Simple, transparent. Allows some adjustments for future changes.	Does not allow complete consideration of future changes (e.g. climate change effects on demand; potential changes in crop mix; etc.)
F3	Crop land calculations extending Method C3 above, to future years.	Provides breakdown of conveyance and on-farm needs. Supports modeling of alternative future scenarios (efficiency improvements; crop mix changes; climate change effects on crop irrigation requirements)	More complex to develop and communicate.

	Approach	Pros	Cons
Effects from Conservation Actions			
	Document total diversions per acre over past 20 years to characterize past changes from conservation.		
	Document actions from YRBWEP-funded Water Conservation Plans – actions that have been completed; and those that are currently planned for implementation. Add up projected changes in diversions and characterize effects on a.) stream flow and b.) irrigation supply.		
	For on-farm projects, gather information from Conservation Districts; Ref 38 (Ecology); and other sources as applicable.		
2. Non-Project Irrigation Needs			
Current Needs			
C1	Calculate from crop acreage estimates, combined with crop irrigation requirements.	Likely adequate as long as IWRMP is not designed to address supply issues in this category.	Low accuracy.
Future Needs			
F1	Used fixed quantities, based on Method C1 above (future needs same as current needs).	Simple, transparent.	Assumes static conditions and results.
F2	Adjust based on estimates of climate change effects or land use changes.		
Effects from Conservation Actions			
	Provide qualitative discussion of conservation activity in this sector, based on interviews with conservation districts.		
3. Municipal Needs*			
Current Needs			
C1	Review water system plans submitted to WSDOH. Where plans are unavailable, request current data from larger systems; and estimate all others using simple per-capita calculations.	Uses actual data. Achieves consistency with water systems' own information.	Time consuming to acquire. Data likely to be incomplete or inconsistent across water systems.

	Approach	Pros	Cons
C2	Review annual reports submitted to WSDOH in 2008 and 2009.	Central location (WSDOH) Uses actual data. Consistency with water systems' own information.	Data likely to be incomplete or inconsistent across water systems. Provides no information on supply limitations.
C3	Issue simple survey to municipal water systems; and contact largest systems directly.	Improves consistency of data and results. Use of standard time frame eliminates extrapolation.	Burdensome on water systems; low response rate.
C4	Combination of above (review plans and annual reports; issue survey partially completed and request only missing data).	Combines benefits of other methods; leads to most complete data.	More labor-intensive than other methods.
Future Needs			
	Note: The municipal forecast will distinguish needs between federal and non-federal water users.		
F1	Use projections from water system plans submitted to WSDOH.	Work is already done (by some systems). Consistency with water systems' own forecasts. Some plans may include data on future supply limitations.	Many systems will be unavailable or outdated. Inconsistent methods and assumptions. Inconsistent time frames. Inconsistent treatment of conservation. Projections go only 15 - 20 years out.
F2	Per-unit forecast applied across the Basin (e.g. per capita; per household; per employee; per acre).	Relatively simple to apply. Covers key drivers of demand. Permits a consistent approach across the Basin.	Results for local systems may not match local forecasts. Limited ability to predict how changes in key variables will affect needs in future.

	Approach	Pros	Cons
F3	Econometric forecast (statistical approach using regression analysis).	Most accurate in measuring influence of key variables. High predictive power for variables that will change over time. Permits a consistent approach across the Basin.	Requires detailed, system-specific data. Difficult to achieve sufficient participation by individual water systems. Results for local systems may not match local forecasts.
F4	Hybrid approach combining per-use calculations with econometric information from a few systems in the Basin and from published literature.	More robust than per-unit calculations alone. Moderate predictive power for variables that change over time.	Application of values from a small sample of systems and from published literature results in lower accuracy than system-specific econometric methods.
Effects from Conservation Actions			
	Review municipal conservation goals from water-use efficiency reports submitted to WSDOH in 2008 and 2009.	Central location (WSDOH). Consistent with local systems' goals.	Likely incomplete and inconsistent. Typically short time frames (1 – 5 years). Difficult to separate consumptive from non-consumptive water savings.
	Review conservation information in water system plans submitted to WSDOH.	May provide additional information on specific actions and implementation.	Time consuming to acquire and review. May be unavailable, incomplete or outdated. Inconsistent assumptions across water systems. Relatively short time frames covered.

	Approach	Pros	Cons
	Develop two to three alternative scenarios for long-term municipal conservation; and apply these scenarios consistently across the Basin. Use standardized assumptions on conservation actions, participation rates, water savings and implementation costs.	Allows comprehensive treatment of conservation potential and cost across the Basin. Allows separation of consumptive and non-consumptive water savings. Relatively simple to apply using standard assumptions from other areas of the West. No limitation on time frame examined.	Standardized assumptions may not reflect diversity of system plans. Local water systems may view results as a "top-down" imposition of expectations. Results sensitive to assumptions, especially customer participation rates.
4. Domestic Well Needs			
Current Needs			
C1	Subtract homes served by public water systems from homes in County. Use the difference as estimate of number of homes with domestic wells. Develop estimate of water use per home based on residential usage in public water systems, adjusted upward for additional outdoor use.	Consistency with County-level data on residential population.	Limited accuracy, due to inadequate data.
Future Needs			
F1	Extrapolate from current needs based on County and/or WSOFM projections of growth in unincorporated areas.	Consistency with County-level data on residential population.	Limited accuracy, due to inadequate data. Limited ability to predict how changes in key variables will affect needs in future.
F2	Apply hybrid approach similar to municipal systems, above.	Moderate predictive power for variables that change over time.	Use of trend estimates from municipal sector likely to underestimate or overestimate water usage.

	Approach	Pros	Cons
Effects from Conservation Actions			
	Develop assumptions for water conservation specific to homes with domestic wells. Determine estimation methodology after these assumptions are developed. May range from: effect of plumbing code only; to development and implementation of a specific Basin-wide or county-by-county conservation program to promote water conservation services by these residents.		Assumes conservation programs will be delivered to residents outside municipal systems.
5. Industrial Well Needs			
Current Needs			
C1	Estimate usage based on water rights held by industrial users.	Water rights data readily available from Ecology.	Water rights data does not accurately represent actual usage.
C2	Contact large industrial users directly.	Uses real information from users.	Some users may be unwilling to provide the information needed.
Future Needs			
F1	Same methods as above.	Same as above.	Same as above.
6. Stock/Other Needs			
Current Needs			
C1	Estimate usage based on water rights.	Water rights data readily available from Ecology.	Water rights data does not accurately represent actual usage.
C2	Develop per-unit approach based on number of stock or other factors.		
Future Needs			
F1	Same as above.	Same as above.	Same as above.
F2	Same as above.	Same as above.	Same as above.