

Spokane County Water Demand Forecast Model

Model 3.0 & 2013 Forecast Update

Presentation Overview

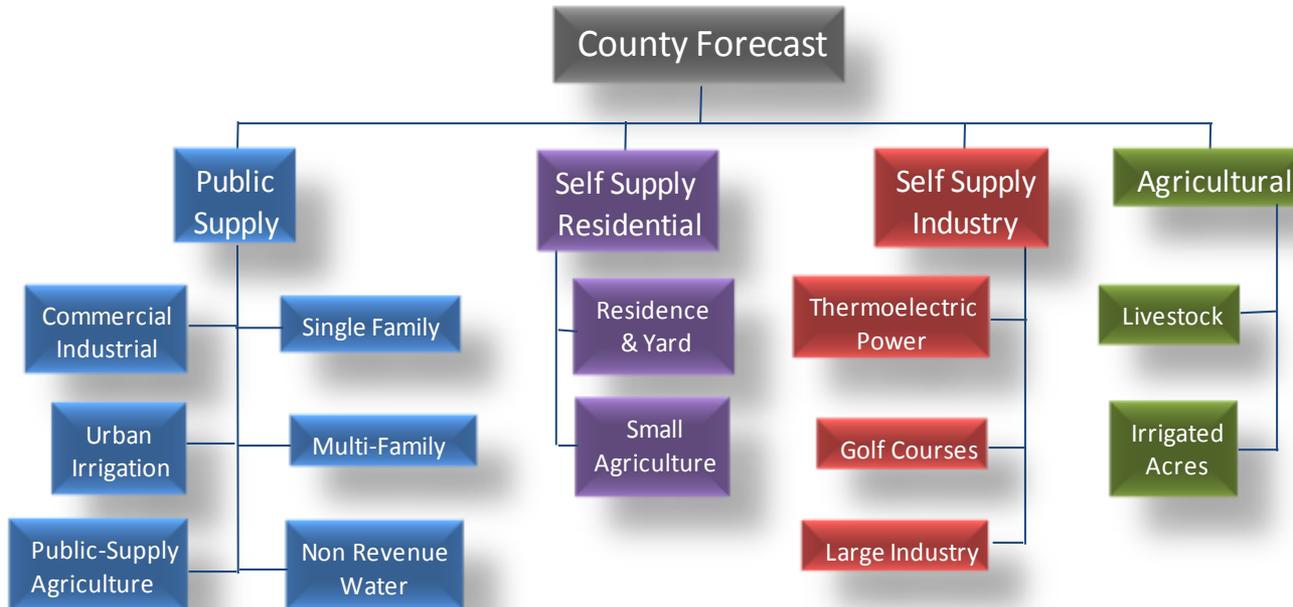
- Water Demand Model Overview
- Model Updates
- Forecast Updates
- Comparison to Idaho Future Water Demand Study

Water Demand Model Overview

- Spokane County Water Demand Model
 - Forecasts water demand based on:
 - Demographic forecast &
 - Housing and Employment projections from Spokane Regional Transportation Council
 - Water System Data
 - Monthly water use by sector from 15 water systems over a 20 year span for some systems
 - Agricultural census, aerial photo interpretation, park irrigation records, self supplied industrial (DMR, USGS), etc.
 - Forecasts water demand on a monthly basis
 - Forecasts water demand for subareas of the county

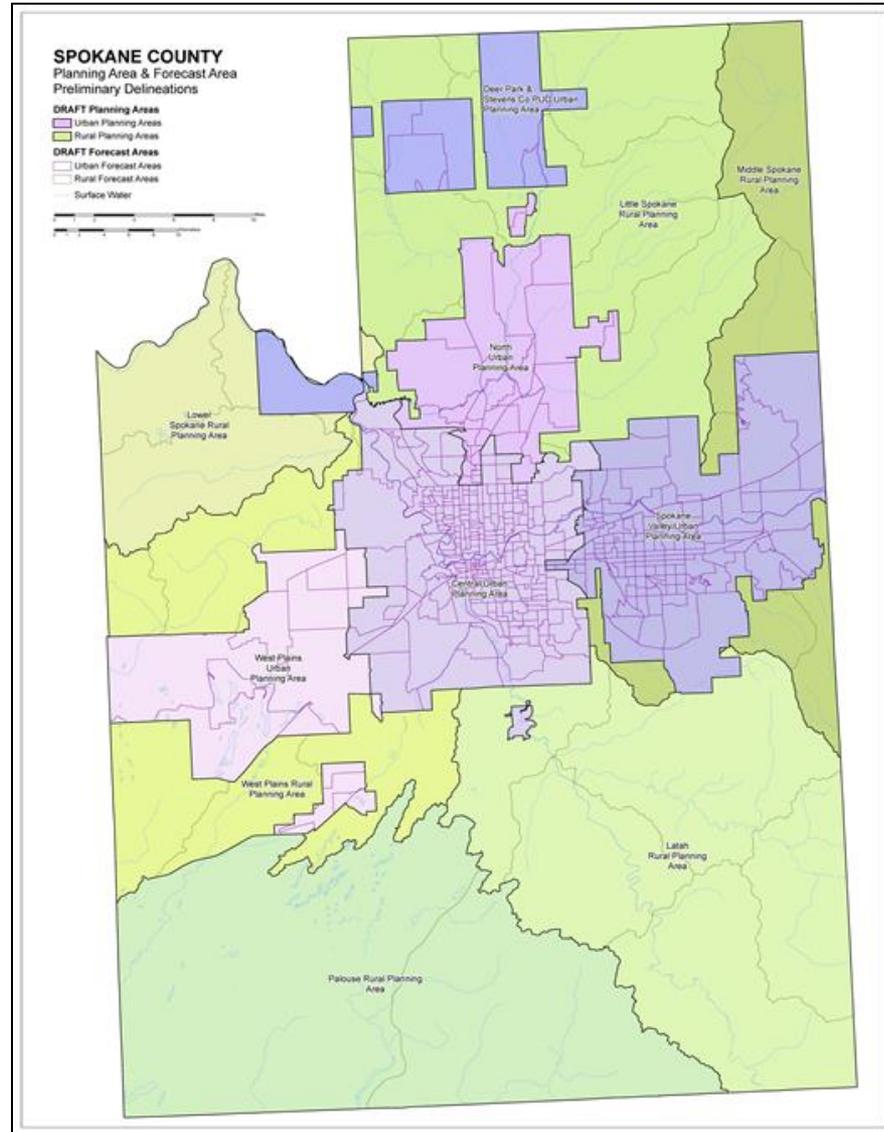
Water Demand Model Overview

- Segregated by Water Use Sector
 - Each subsector has a unique sub-model, or method of calculating water demand



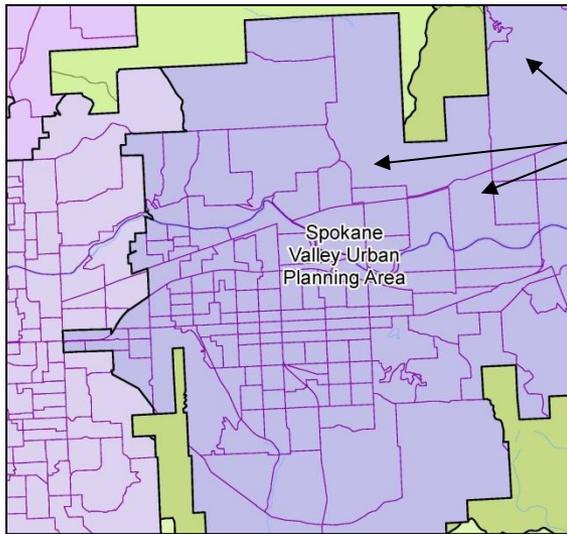
Water Demand Model Overview

- Segregated Spatially
 - 513 separate forecast units
 - A unique water demand calculation is done for each forecast unit

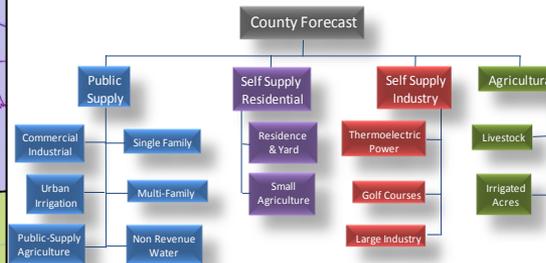


Water Demand Model Overview

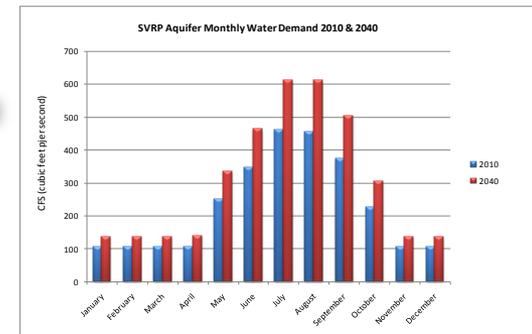
- Model is disaggregated which allows for many types of analysis, for example:
 - Water use from SVRP
 - Self supplied water use in Little Spokane River Basin



Each forecast unit can have different inputs into each sub model



Water demand calculation for each month



Model Update

- The Water Demand Model did not distinguish between consumptive and non-consumptive demand.
- Model update included separating water demand for each sector/subsector into consumptive use and non-consumptive use and routing the return flow of non-consumptive use.

Model Before Update



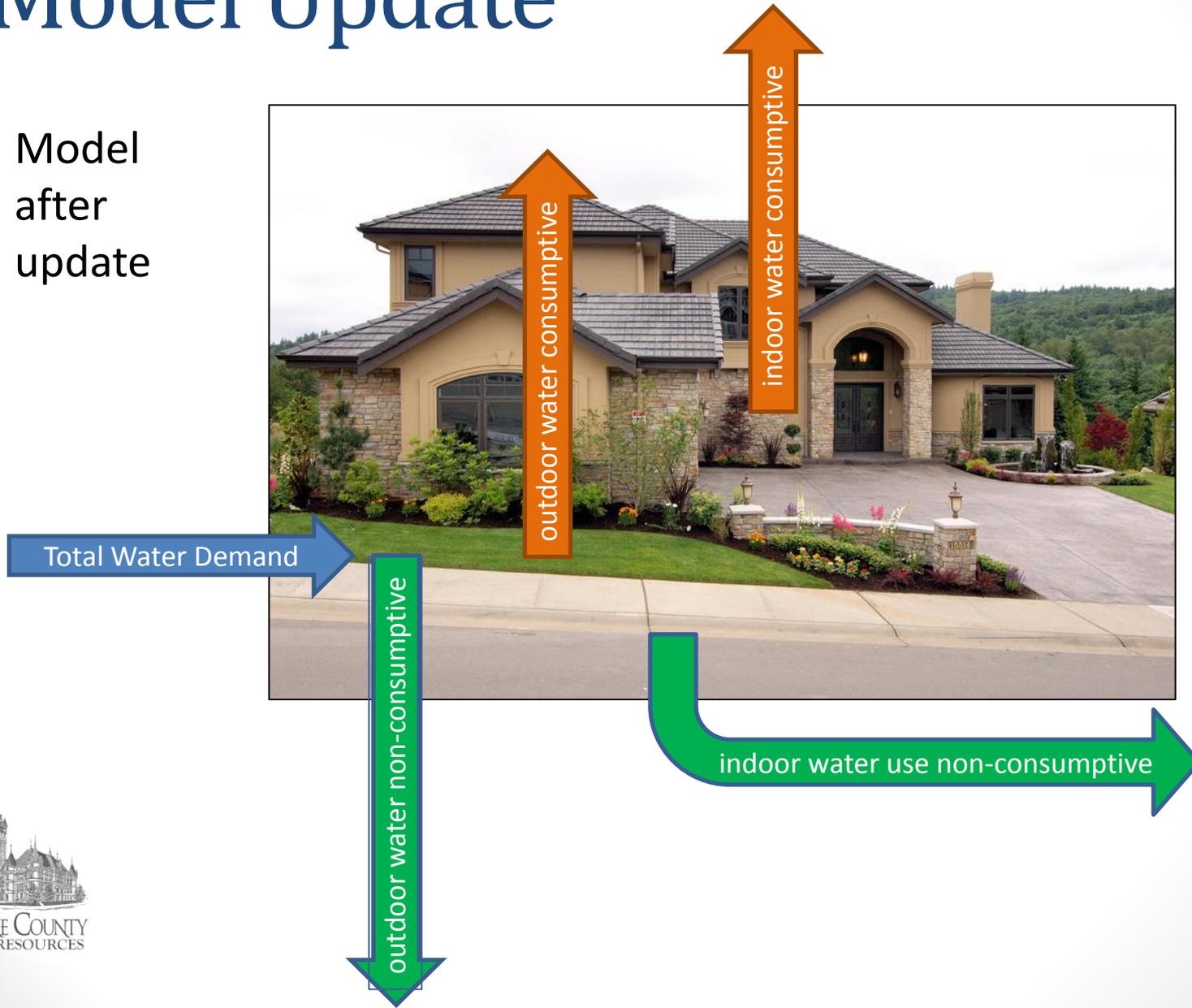
Total Water Demand



SPOKANE COUNTY
WATER RESOURCES

Model Update

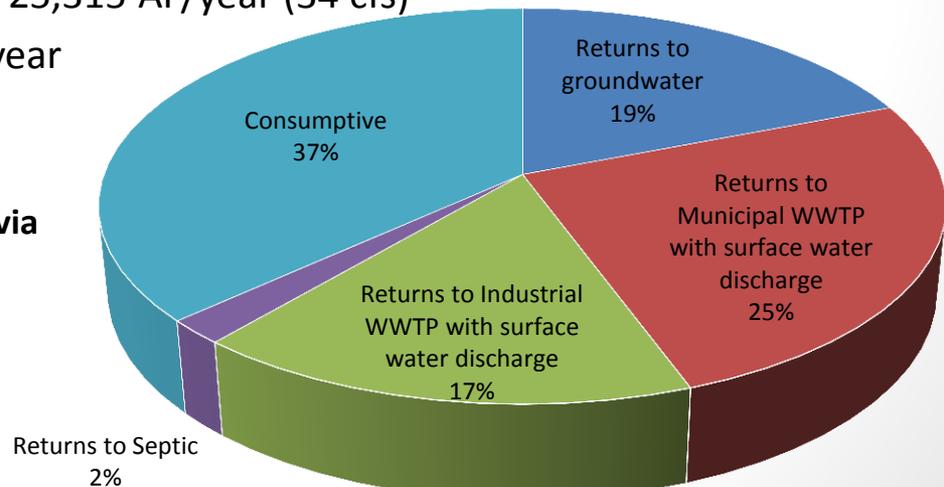
- Model after update



Model Update

- Before Update
 - Total 2010 Water Demand from SVRP = 151,586 AF/year
- After Update
 - Total Water Demand from SVRP = 151,586 AF/year
 - Consumptive Demand = 55,857 AF/year
 - Non-Consumptive Demand = 95,730 AF/year
 - Return to ground from outdoor irrigation = 28,838 AF/ year
 - Return to municipal WWTP = 38,554 AF/year (53 cfs)
 - Return to industrial WWTP = 25,315 AF/year (34 cfs)
 - Return to septic = 3,023 AF/year

42% of water withdrawn from the SVRP Aquifer is returned to the Spokane River via surface water discharge.



SVRP Aquifer Annual Water Demand & Return Flows

Forecast Update

- Updated model with new forecast developed by Spokane Regional Transportation Council
 - New forecast has a smaller baseline and slower growth rate.

Comparison of 2008 & 2010 Forecast of Single Family Dwelling Units

Year	2008 SRTC Forecast	2010 SRTC Forecast
2010	162,661	157,330
2020	179,812	174,074
2030	199,472	195,845
2040	219,132	207,270

- Reasons for difference –
 - 2010 Census data available
 - New forecast completed after economic downturn
- 2011 Water Demand Forecast based on 2008 SRTC Forecast
- 2013 Water Demand Forecast based on 2010 SRTC Forecast

Forecast Update

- Difference in water demand between 2011 & 2013 Water Demand Forecast:

**Table 4: Spokane County Total Water Demand
2011 & 2013 Forecast Comparison**

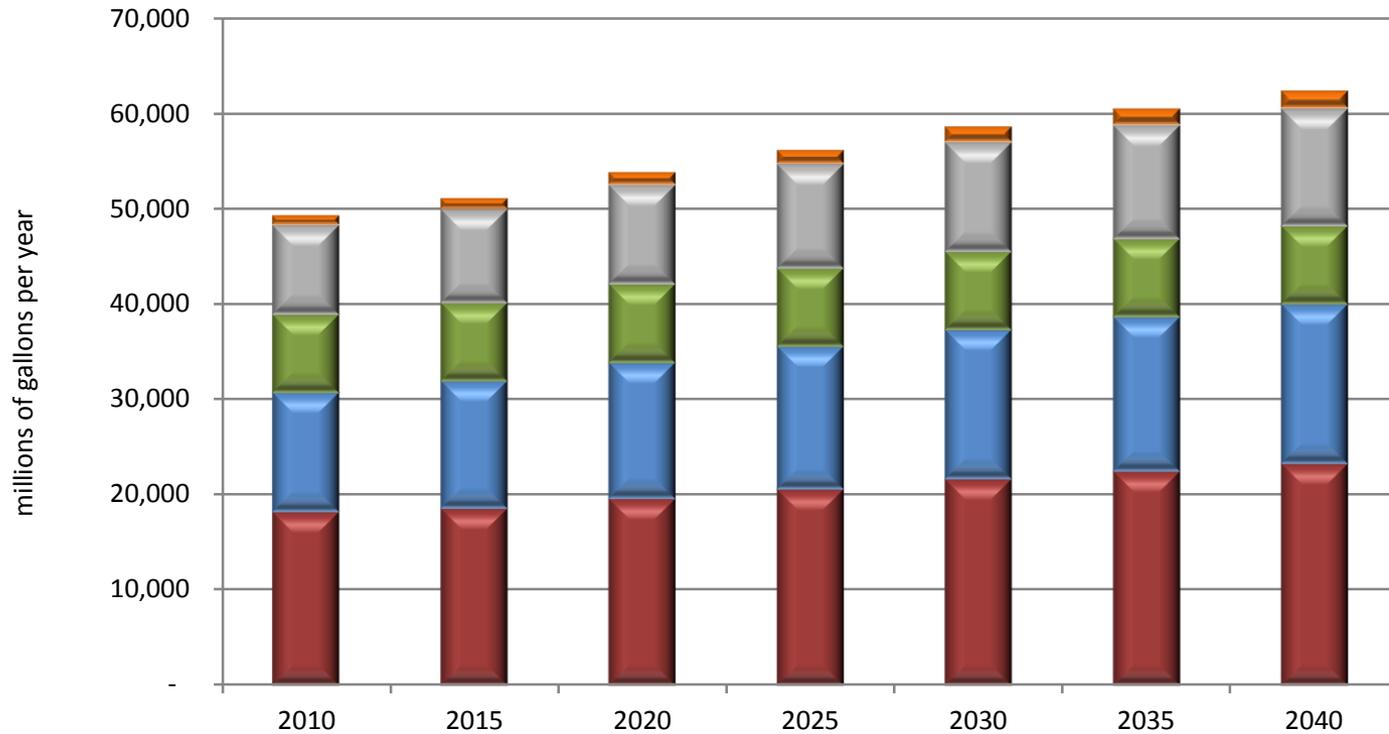
			Public Supply	Self Supply Residential	Industrial Self Supply	Agricultural	Total
2013 Forecast	2010		43.38	5.837	8.89	10.46	68.56
	2040		59.10	10.74	8.89	10.46	89.19
	% Change		36.3%	84.0%	0.0%	0.0%	30%
2011 Forecast	2010		52.27	5.46	7.17	10.53	75.83
	2040		73.59	8.00	7.17	10.53	99.30
	% Change		40.8%	46.5%	0.0%	0.0%	31%

values reported in billions of gallons per year

- Overall increase in water demand similar
- Significant difference in rate of growth of self supplied water demand
 - Change in the spatial distribution of housing units in SRTC Forecast

Results & Analysis

SVRP Aquifer Water Demand & Return Flows

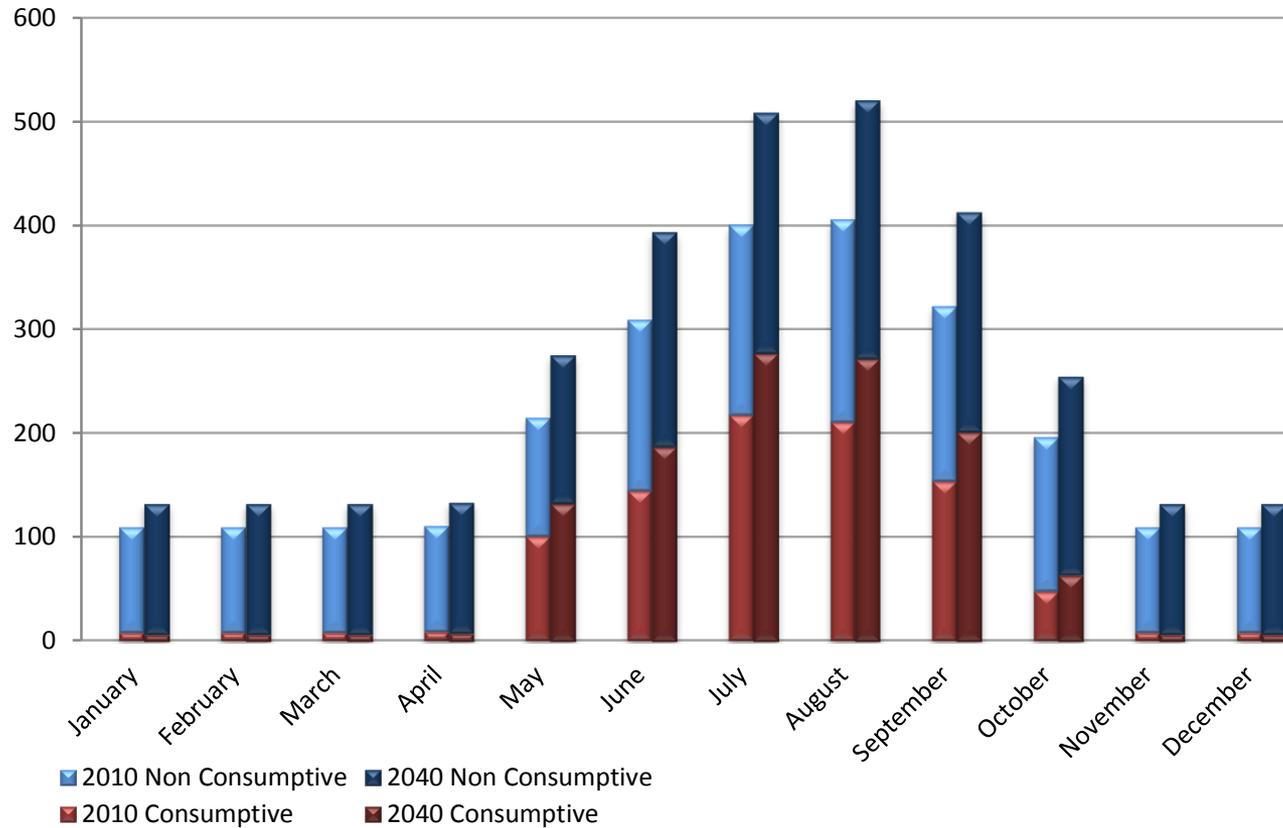


- Returns to Septic
- Returns to groundwater
- Returns to Industrial WWTP with surface water discharge
- Returns to Municipal WWTP with surface water discharge
- Consumptive

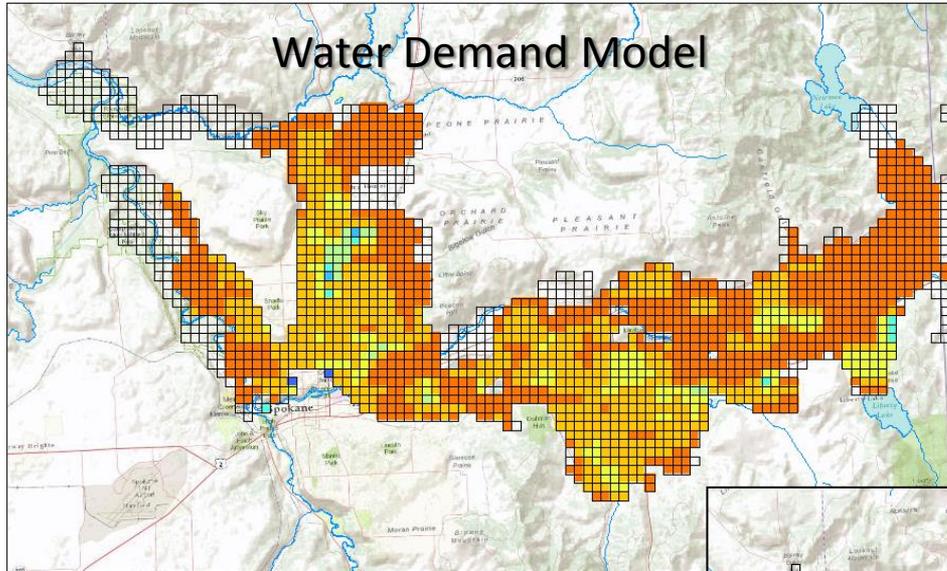
Note: Total demand is sum of all return flows

Results & Analysis

SVRP Aquifer Monthly Water Demand 2010 & 2040

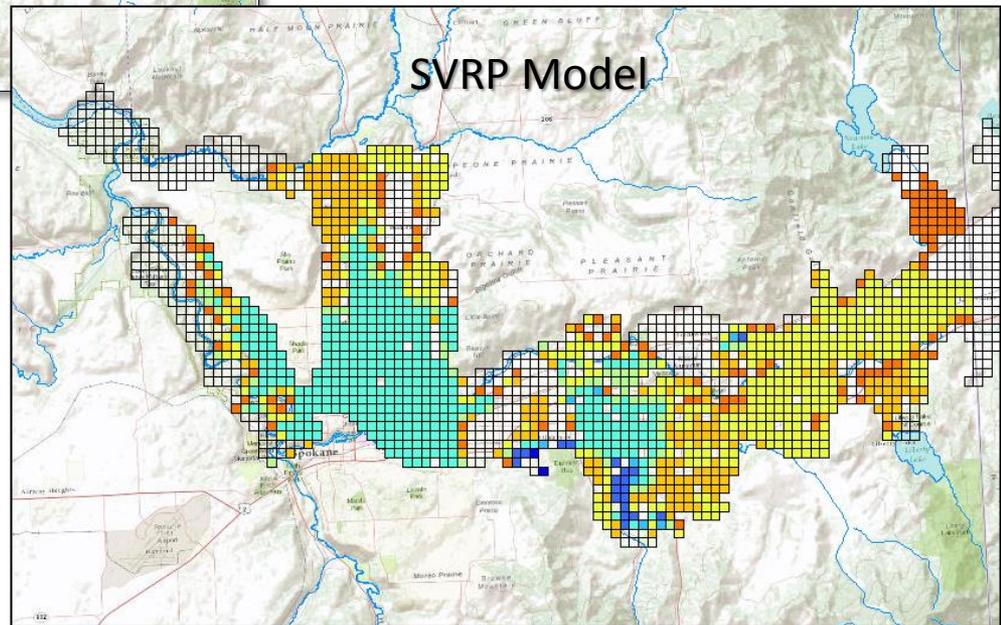
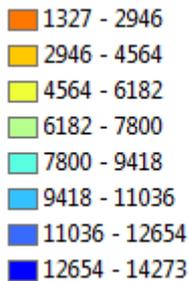


Results & Analysis



- Comparison of return flow from septic & irrigation in SVRP Model and Water Demand Model

cubic feet per day per model cell



ID & WA Model

- Spokane County Water Demand Model and Forecast now separates consumptive and non-consumptive water use

2010 Estimated SVRP Water Use

	Idaho	Washington
Consumptive	39,830	55,857
Non-consumptive	34,320	95,730
Total	74,150	151,587
% consumptive	54%	37%

ID & WA Model

- Comparison of water use sectors

2010 Estimated SVRP Water Use (acre feet per year)

	Idaho	Washington
Public Water Systems	34,430	118,752
Self Supplied Domestic	8,800	119
Self Supplied Commercial & Industrial	4,220	26,946
Agriculture	24,700	5,770



Single Family Residential

- Separating Single Family Residential into consumptive and non-consumptive use

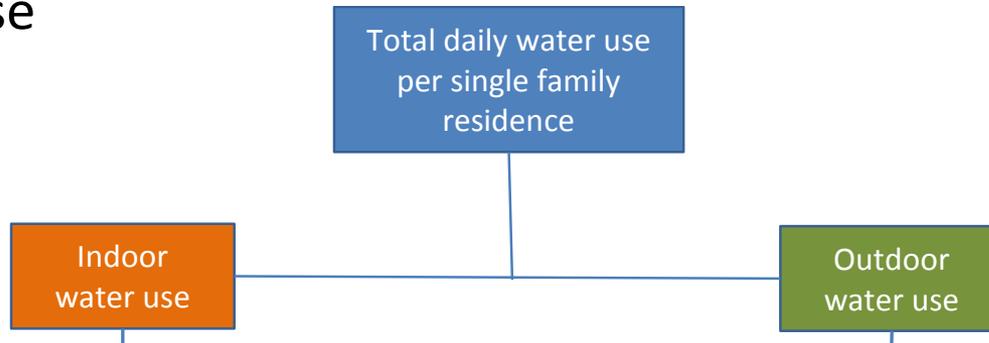
Total daily water use
per single family
residence

Econometric model estimated single family water use based on:

- Household Income
- Home Assessed Value
- Monthly Max Temp
- Monthly Precip.
- Lot Size

Single Family Residential

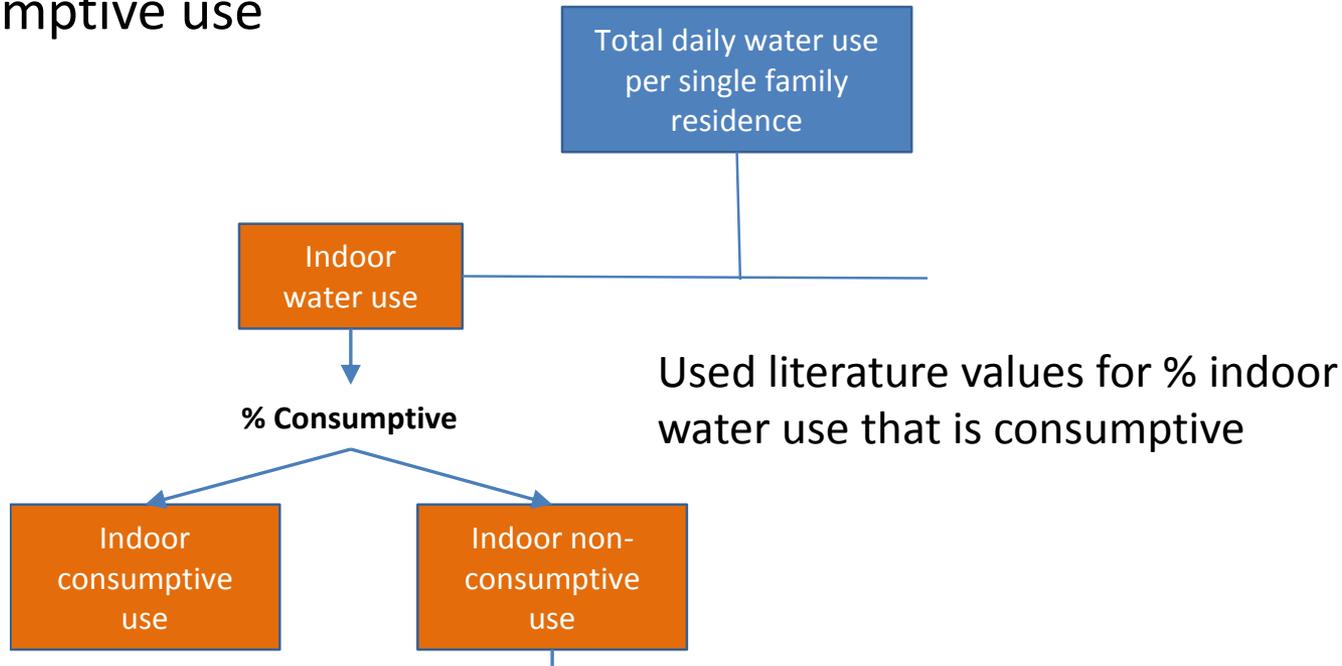
- Separating Single Family Residential into consumptive and non-consumptive use



Econometric model separated water use between indoor and outdoor components

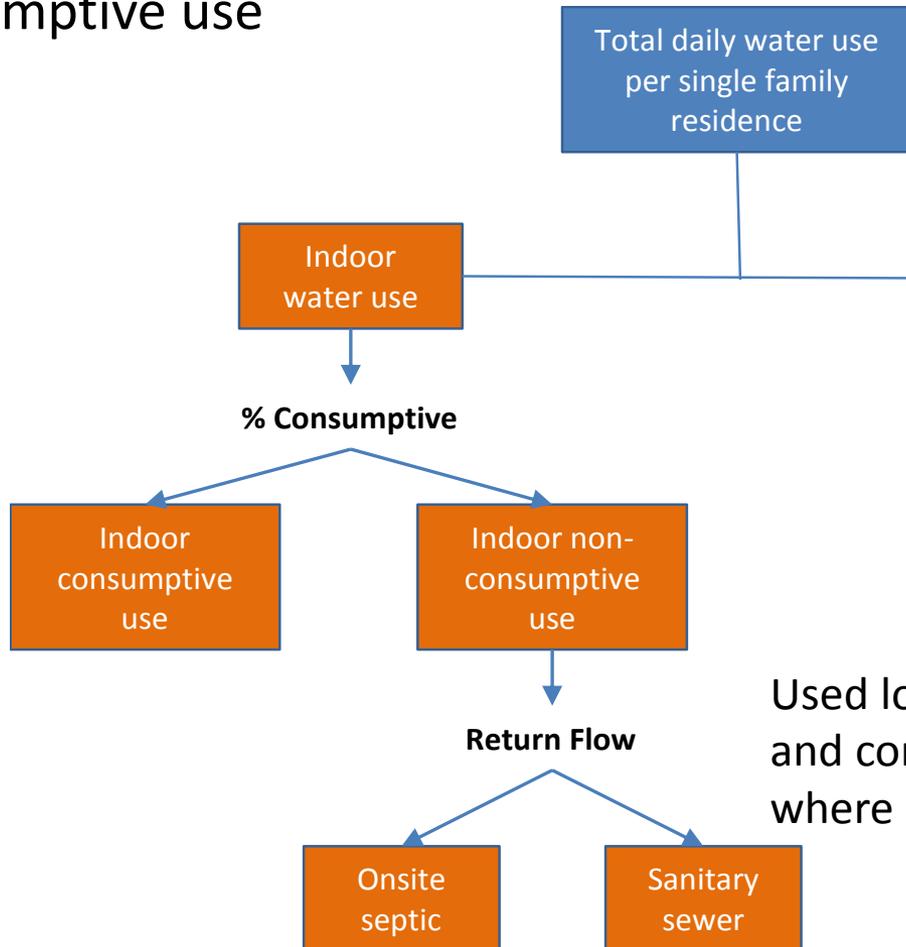
Single Family Residential

- Separating Single Family Residential into consumptive and non-consumptive use



Single Family Residential

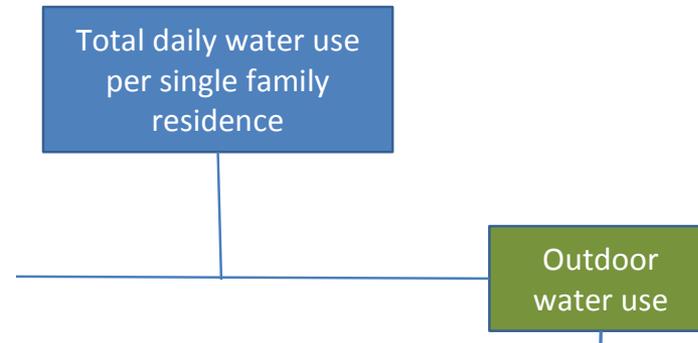
- Separating Single Family Residential into consumptive and non-consumptive use



Used location, sewer service areas and connection data to determine where return flow would go

Single Family Residential

- Separating Single Family Residential into consumptive and non-consumptive use



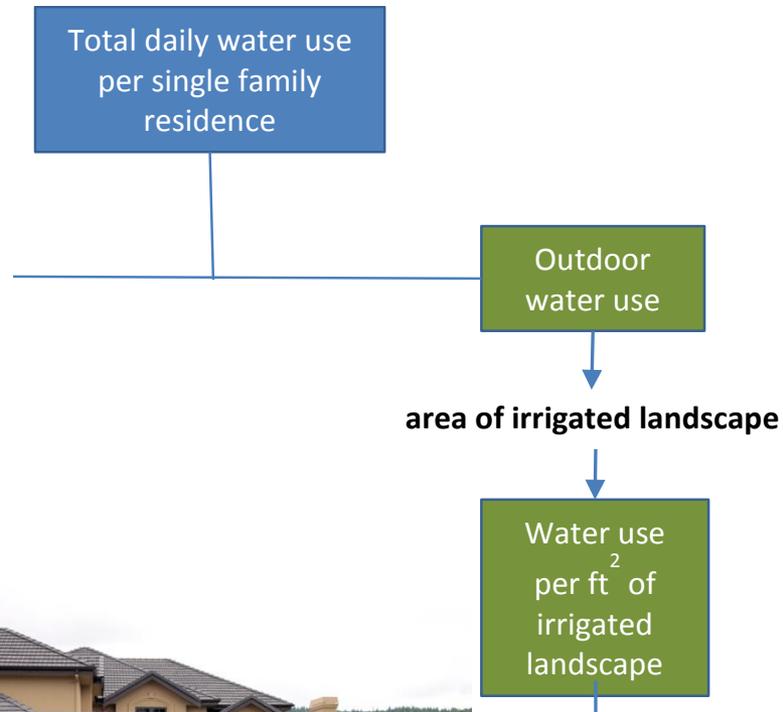
- Econometric model provide outdoor water use in gallons per day per residence

Single Family Residential

- To separate outdoor water use into consumptive and non-consumptive components it is necessary to know how much landscape is irrigated.

If 500 gallons per day is used on 100 sq. ft. much of it would be non consumptive

If 500 gallons per day is used on 1 acre most of it would be consumed



Single Family Residential

- Estimating area of irrigated landscape

Parcel size

Building footprint

- Need to know how to split remaining portion of lot into landscaped and non-landscaped
- Took a random sample of 284 parcels to estimate percentage



Single Family Residential

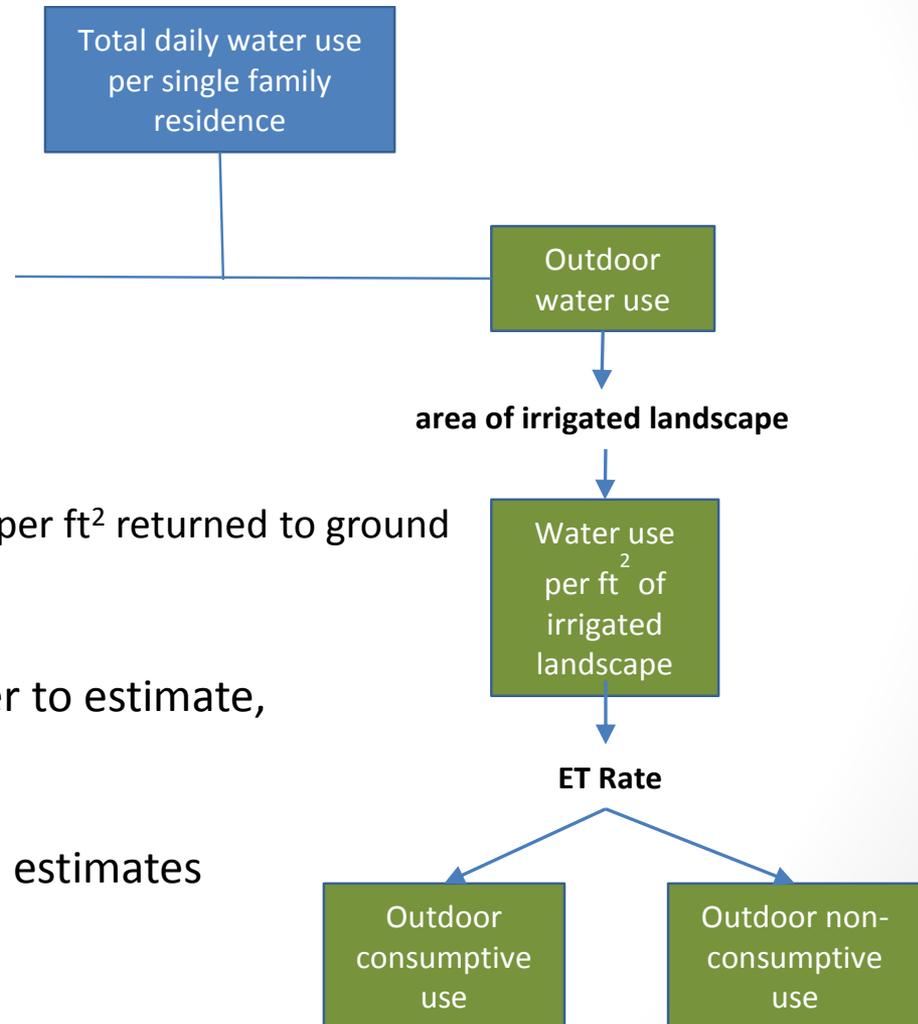
- Separating Single Family Residential into consumptive and non-consumptive use

ET rate in inches can be converted to gallons per square foot:

$(\text{Total GPD per ft}^2) - (\text{ET GPD per ft}^2) = \text{GPD per ft}^2 \text{ returned to ground}$

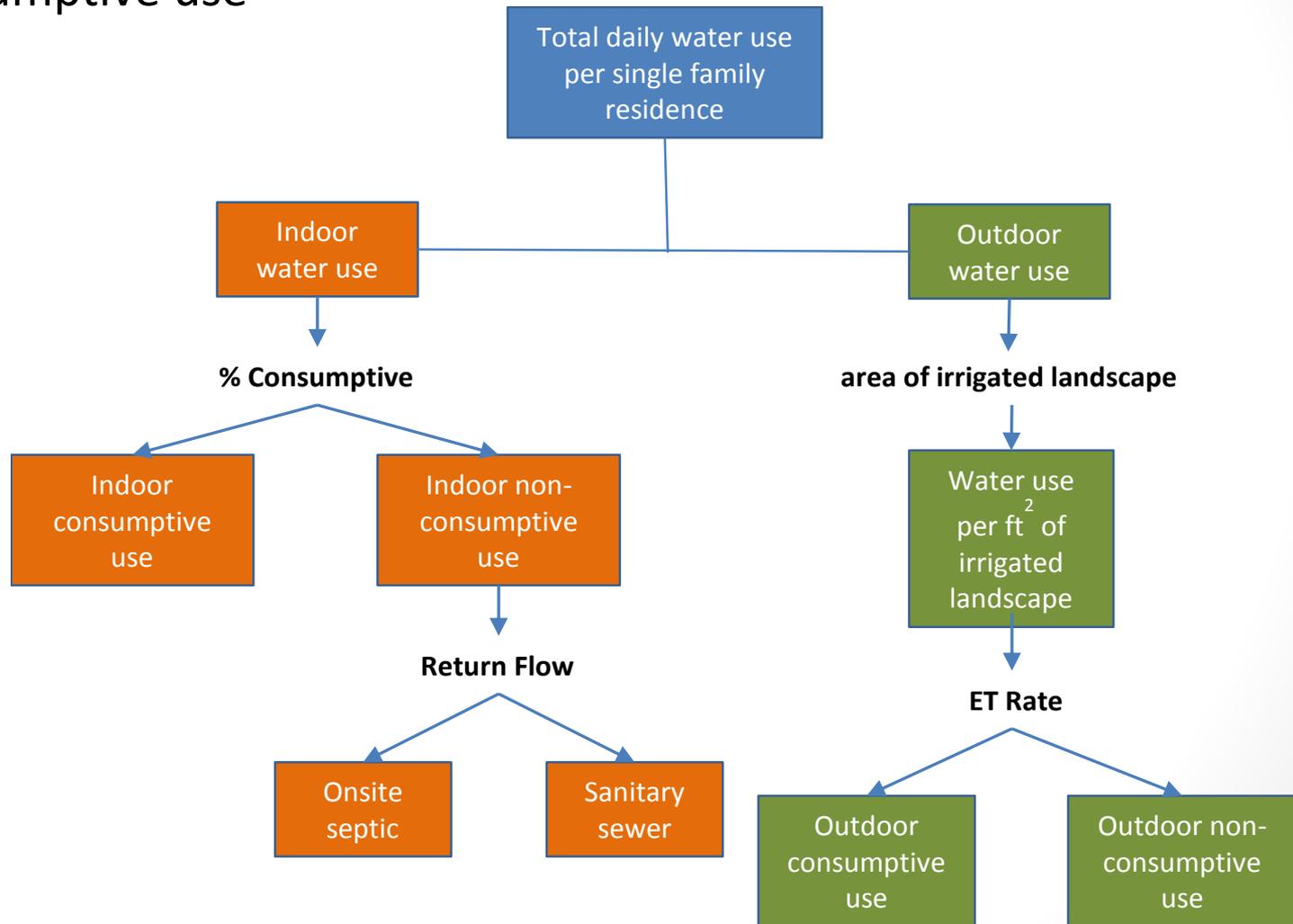
ET is a difficult parameter to estimate, and varies spatially.

Agrimet stations provide estimates



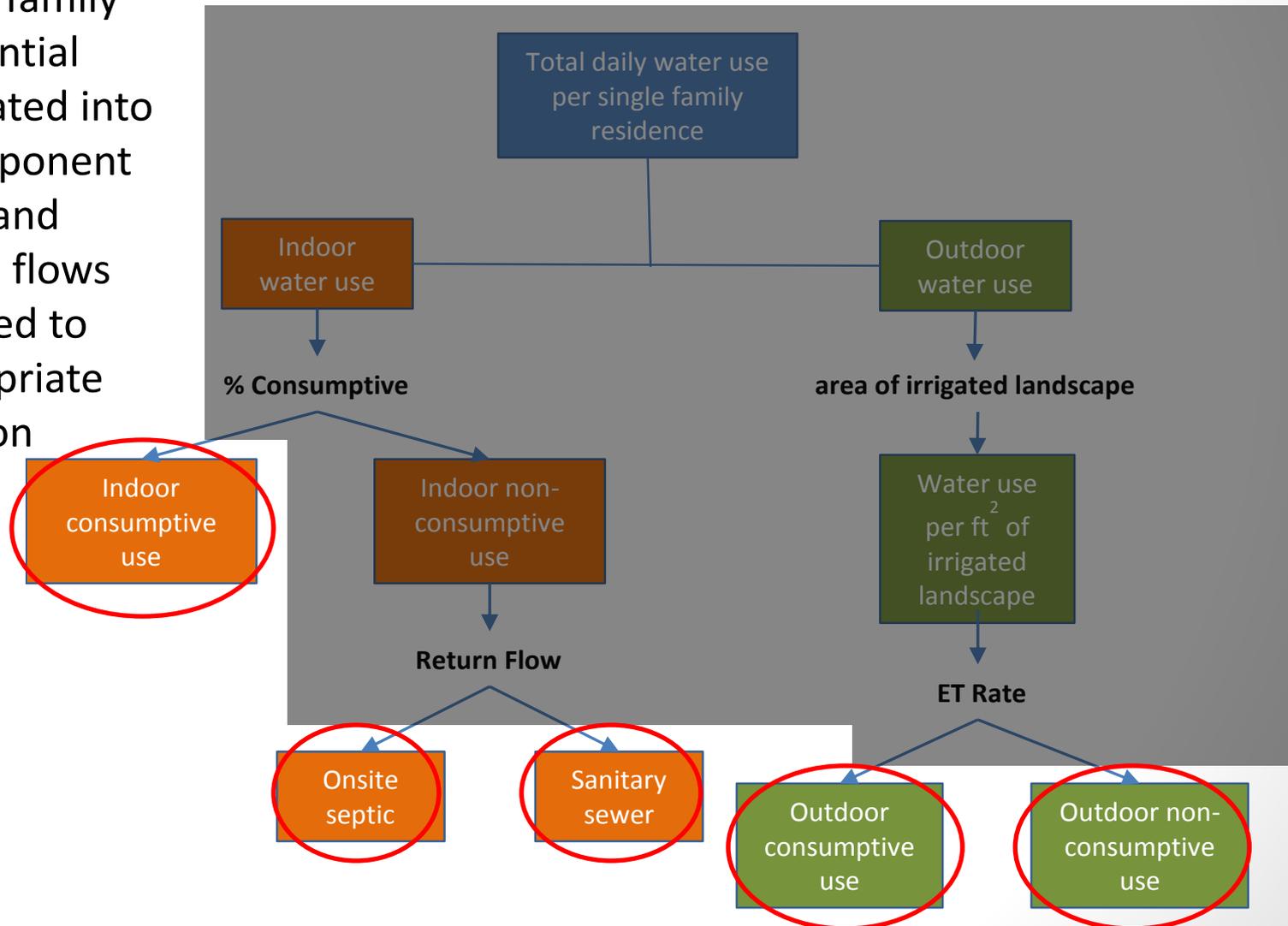
Single Family Residential

- Separating Single Family Residential into consumptive and non-consumptive use



Single Family Residential

- Single family residential separated into 4 component parts and return flows directed to appropriate location



Single Family Residential

Table 1—Sample Parcel Data Summary

	Parcel Area	Building Foot Print	Unbuilt Area	Landscape Area	% unbuilt landscaped
Average	13,494	1,816	11,677	5,782	58%
Median	10,031	1,733	8,146	4,571	60%
Max	217,454	5,535	213,549	42,381	100%
Min	4,568	686	3,111	0	0%

284 samples; values given in ft²

Table 12: Irrigated Area Comparison

Study City	Average Irrigated Area (ft ²)
Cambridge, ON	6,998
Waterloo, ON	5,951
Seattle, WA	6,058
Tampa, FL	12,361
Lompoc, CA	4,696
Eugene, OR	6,863
Boulder, CO	6,512
San Diego, CA	5,904
Tempe, AZ	7,341
Denver, CO	7,726
Walnut Valley, CA	10,282
Scottsdale, AZ	4,968
Phoenix, AZ	9,075
Las Virgenes, CA	16,306
Spokane, WA	6,190

**Table 13: Irrigation Application and
Return Flow Rates**

Month	Application Rate	Net ET	Return Flow Rate
May	0.75	0.86	-14%
June	1.09	0.94	14%
July	1.60	1.41	12%
August	1.60	1.31	19%
September	1.03	0.91	11%
October	0.50	0.00	100%

values in inches per week

Net ET is Lawn ET from the Rathdrum Prairie AgriMet
Station less rainfall

**Table 7: 2010 Total Public Supply Indoor Use Return
Flow Modeled vs. Reported**

System Name	Modeled	Reported
Total Flow to City of Spokane Facility	26.31	27.1
City of Spokane	24.41	-
Spokane County - North System	1.9	1.72
Spokane County - Valley	8.05	6.8
Liberty Lake Sewer & Water District	1.06	0.73
City of Cheney	0.86	1.17
City of Airway Heights	0.51	0.6
City of Deer Park	0.3	0.27
City of Medical Lake	0.43	0.4
Latah Creek WWTP	0.05	0.04
Septic	5	-
Self Supplied Septic	3.7	

values in million gallons per day