

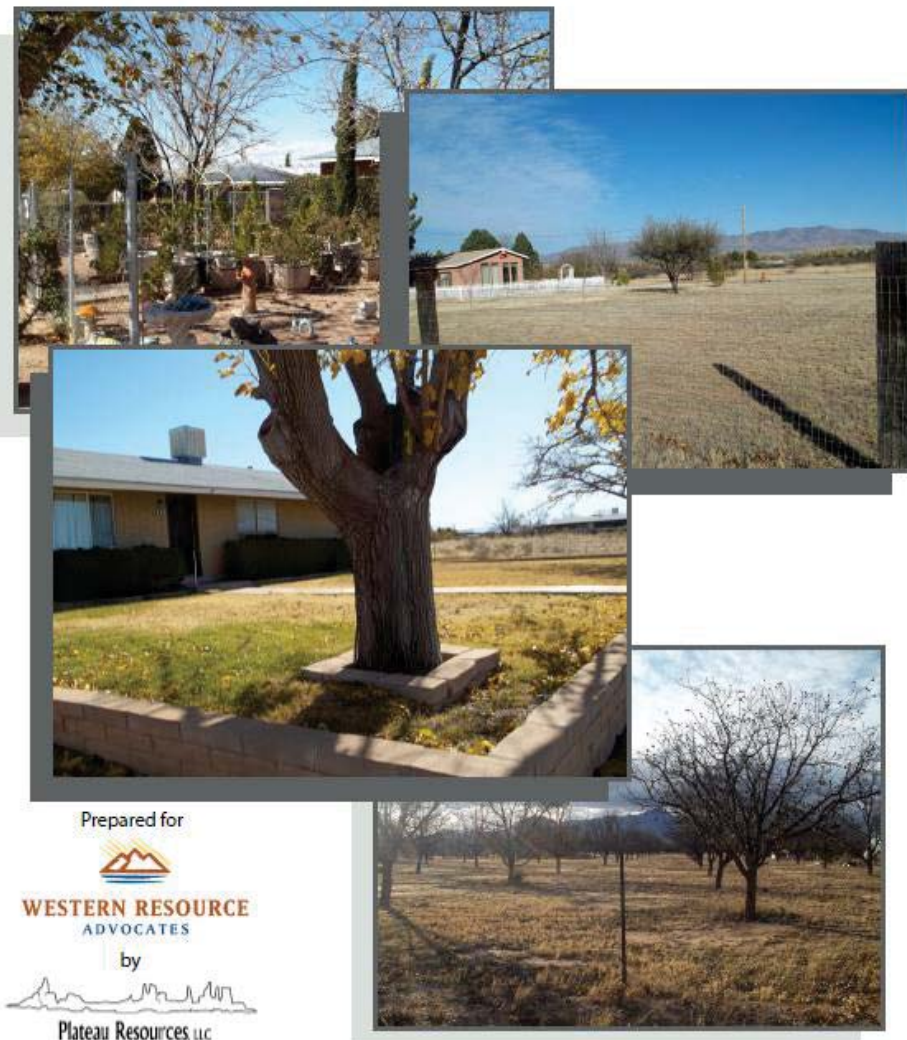
# Evaluating Rural Water Use: Why it Matters

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San Pedro River in the San Pedro Riparian Conservation Area (photo courtesy of The Nature Conservancy)

Estimated Water Demand and Conservation Potential of Domestic Wells in the Sierra Vista Subwatershed, Arizona



Find the study at: [www.westernresourceadvocates.org](http://www.westernresourceadvocates.org)

## Domestic well demand - the issue

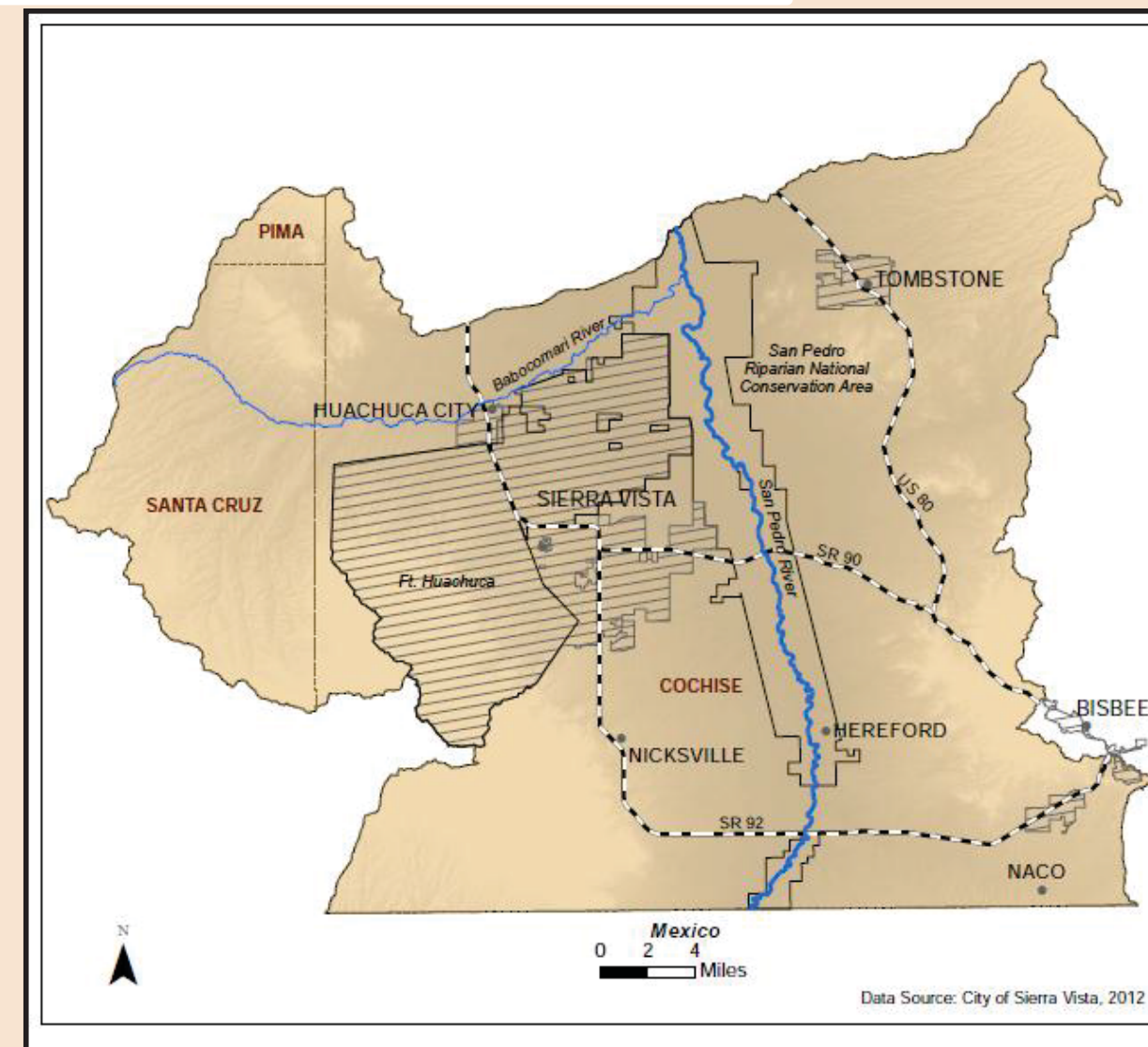
- ❖ Developing effective water resource plans and conservation programs requires accurate water supply and demand data
- ❖ Domestic well demand is not well known because use is not metered and reported.
- Domestic well demand can be large and located where groundwater pumping intercepts water that would otherwise support streamflow and maintain riparian ecosystems, including the San Pedro River in Southeast Arizona.



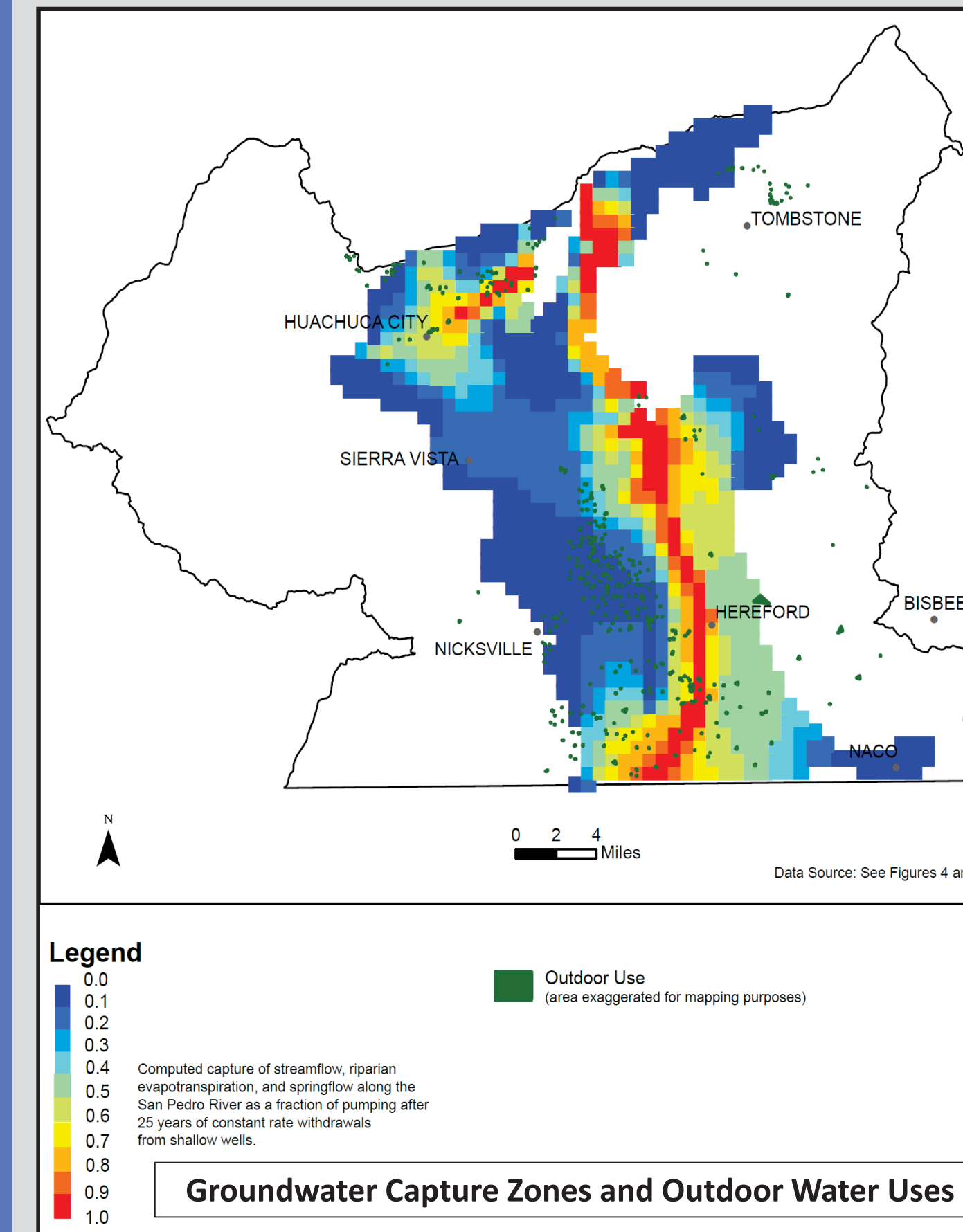
## Estimating Water Demand & Conservation Potential

The study uses proxies for metered water use:

- Housing age to estimate indoor demand
- Aerial imagery and field investigation to estimate exterior demand
- Information needed:
  - ✓ Population data
  - ✓ Parcel maps
  - ✓ Construction dates
  - ✓ Aerial imagery
  - ✓ Climate records



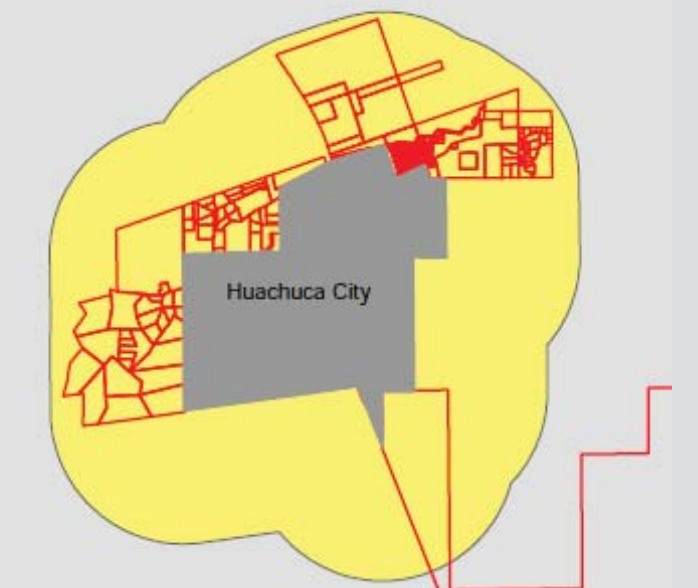
## Focus Programs to Maximize Environmental Benefit



- ❖ Uses in red, orange and yellow zones capture the greatest fraction of water that would otherwise flow to the river.
- Conservation efforts should first focus on older homes with high outdoor water use in areas of highest groundwater capture.

## Reuse and Recycle

- Extending existing sewer lines to nearby parcels with septic systems could be cost effective - wastewater could be used for irrigation or aquifer recharge



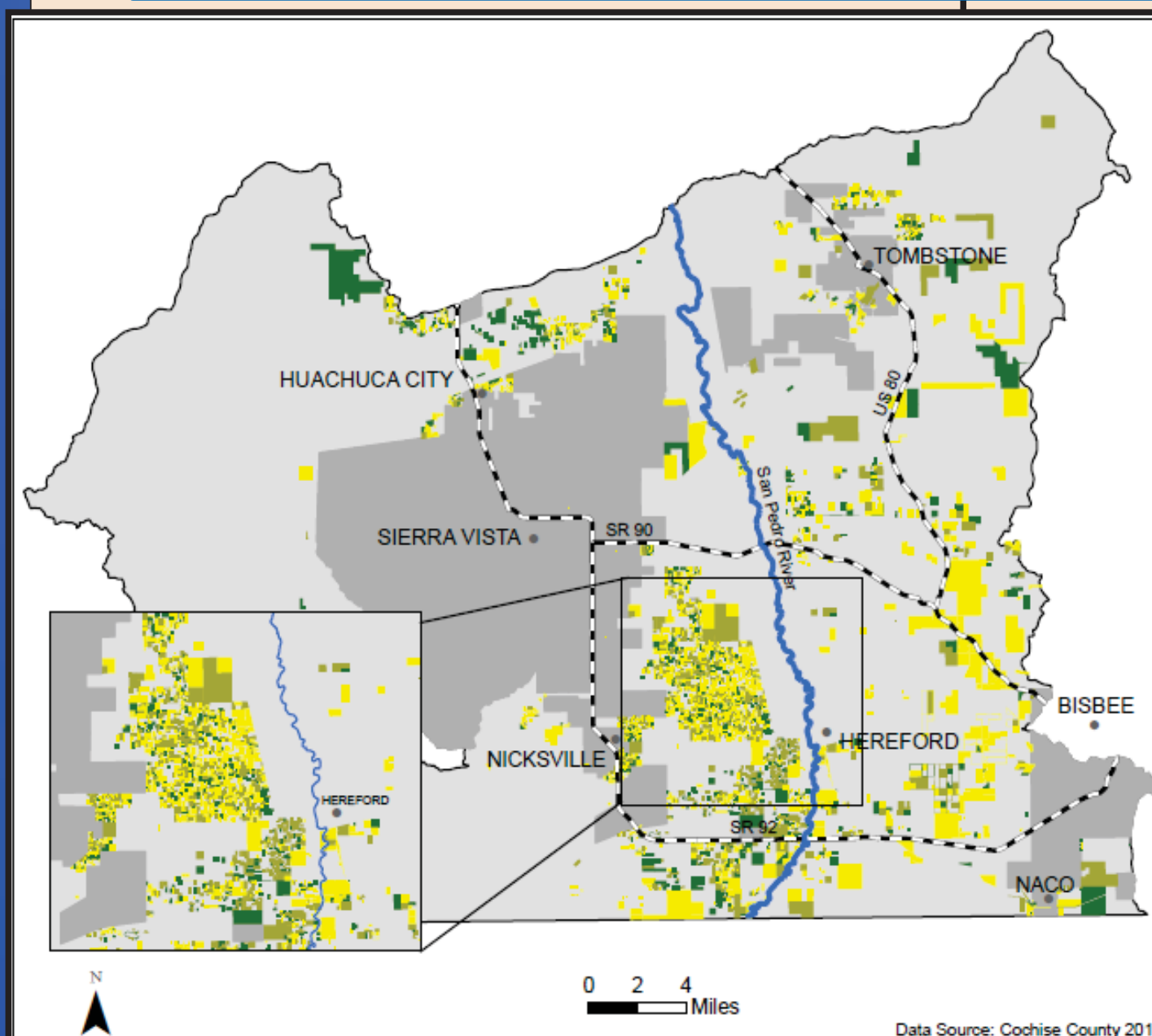
The study provides a first approximation of the relative demand and conservation potential of domestic wells.

## Indoor Demand and Savings

- ❖ Assumed oldest houses have least efficient indoor plumbing fixtures and greatest demand
- ❖ Identify the location of different aged homes to target conservation programs
- Retrofitting homes with high efficiency fixtures can save 67 gpd in pre-1997 houses and 16 gpd in post-1997 houses

## Outdoor Demand and Savings

- ❖ Location, size and type of outdoor water use was identified using NAIP imagery
- ❖ Demand calculated using the plant watering requirement and irrigation method
- Improved irrigation efficiency and rainwater harvesting to reduce groundwater pumping



Legend  
 • City or Town  
 Water Provider Service Areas  
 Year Built  
 Before 1997 (~2,230 parcels)  
 1997 to 2004 (~1,330 parcels)  
 2005 to Present (~810 parcels)

Home Age	Number (Percent) of Households Not Served by Water Provider	Estimated Average Daily Indoor Water Use Per Household (gallons)									Estimated Total Annual Indoor Water Use (acre-feet)
		Toilets	Clothes Washer	Showers	Faucets	Leaks	Other	Bathtubs	Dish washer	Total	
Before 1997	2,190 (51%)	44.4	36.0	27.8	26.2	22.8	3.8	2.9	2.4	166.3 (0.19 AFA)	408
1997 to Present	2,140 (49%)	22.6	23.8	24.6	20.7	16.2	2.5	2.9	1.6	114.9 (0.13 AFA)	275
Retrofit Existing Homes with High Efficiency Fixtures	---	18.4	21.1	21.6	18.2	10.1	1.4	6.3	1.8	98.9 (0.11 AFA)	---

Note: Fixture rates taken from AWWA (1999) for pre-1997 homes; newer and retrofit homes from Aquacraft (2011)

## ESTIMATED OUTDOOR WATER USE IN THE STUDY AREA DURING 2010

Type	Number of Areas Mapped	Total Area (acres)	Annual Watering Requirement (feet)	Assumed Application Efficiency	Estimated Annual Outdoor Water Use (acre-feet)
Pasture	10	31.6	2.3 to 3.3	70 to 85%	86 to 149
Orchards	18	20.1	1.3 to 2.8	70 to 90%	29 to 80
Turf	165	12.4	0.0 to 2.6	40 to 75%	0 to 81
Landscape Plants	115	8.5	0.3 to 2.7	40 to 95%	3 to 57
Pools	64	0.5	4.2	Near 100%	2
<b>Total</b>	<b>372</b>	<b>73.1</b>	<b>---</b>	<b>---</b>	<b>120 to 369</b>

Note: Local data used as available. Some turf is non-irrigated natural grasses

## Demand Estimates

- Our demand analysis compares well to other studies that average 112 gpcd.

REPORTED DOMESTIC WELL USE				
Location	Year	Number of Homes	Average Annual Use	
			Per capita	Per Household (acre-feet)
<b>Metered</b>				
Sierra Vista Subwatershed	2005 - 2007	8	107	0.24
Sierra Vista, AZ (large lot metered provider)	2010	799	76	0.21
Near Santa Fe, NM	2009	250	---	0.30
<b>Estimated or Assumed Values</b>				
Sierra Vista Subwatershed			118	0.31
			312	0.84
Statewide ('standard' domestic use when filing to appropriate water)	Current	---	180	0.48