Outdoor Water Conservation:

Options and Opportunities for "New" Water for the CRD

Water Advisory Committee Report prepared for the Regional Water Supply Commission[1]

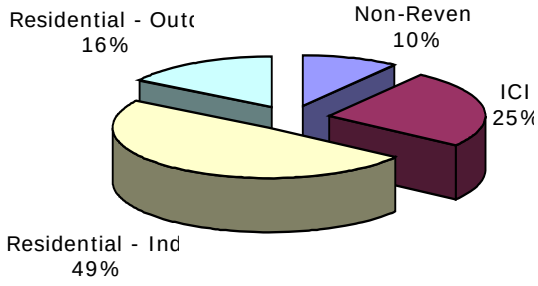
June 2007

This report summarizes and analyzes local water use patterns and trends, focusing on outdoor water use and its impacts on regional supplies. This report also offers solutions by presenting a motion to the Regional Water Supply Commission and by recommending specific complementary actions to be taken by the RWSC, WAC, CRD, and individual municipalities in the region.

Issue in a nutshell

Seasonal outdoor water use is a significant component of total regional water use. This is a result of the region's climate and rainfall pattern (long, dry summers) coupled with the fact that the most common local residential landscape – as in much of North America – is the lush green lawn, which requires substantial water to maintain throughout the summer. Seasonal outdoor water use impacts water demand and long-term regional water supply by putting pressure on infrastructure capacity and local watersheds.

Box 1: Total Current Water Demand in the CRD



CRD Water Services has developed a comprehensive water demand management effort, which includes toilet and washing machine rebate programs, a low-flush toilet bylaw, watering restrictions, drip irrigation installation training, an ICI program, and public education. Many of these programs have only recently begun to increase in size, and will take time to have an impact on long-term water consumption trends. This is consistent with evidence from other jurisdictions, which indicates that there is a "lag" and that it often takes 10 years before the combined effects of demand-side programs like these result in significantly reduced residential per capita water demand[2].

More aggressive municipal and residential outdoor water conservation programs are needed to address the ongoing challenge of balancing supply with demand; these programs would be a natural extension of the existing demand management program. To successfully reduce local outdoor use requires increased resources for the CRD Water Services Demand Management Program and specific actions by the CRD and local municipalities.

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[1] Prepared for the WAC by O. Brandes and B. Titus; all data courtesy of CRD Water Services

[2] Smartwash savings increase by ~26,000 m^3/yr; in 10 years this alone will reduce Residential use ~1%

Four conclusions regarding regional water use

Reviewing some of the basic statistics concerning local water use reveals the following four main conclusions:[3]

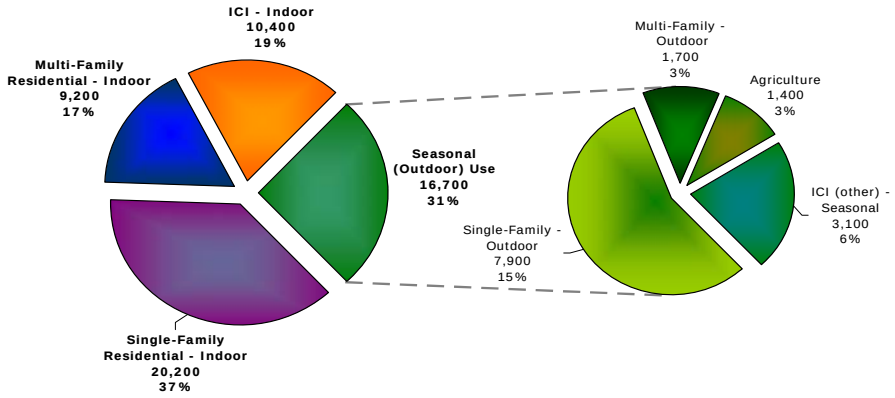
1. Total residential use is the greatest water demand, and is increasing

Population has increased by 7% between 1995 and 2005. **Total residential water use** – the largest use of water in the CRD – has also increased with population growth because daily per capita residential use has remained constant at approximately 309 L per person per day. **Total water use** (Residential, ICI and Non-Revenue), however, has remained constant because reductions in ICI demand have successfully offset increased residential use caused by population growth. Attaining constant **total water use** is a significant achievement, and is the result of a well-run Water Services department with successful demand management programs.

Conclusion 1: *Unless per capita use of water by residents decreases, the needs of a growing residential population will outstrip gains in the ICI sector and may eventually surpass current water supply.*

2. Outdoor water use is a significant proportion of residential and total water use in the CRD

In 2004, single-family units consumed three times as much municipal water (28 million m^3) as multiple-family units (10 million m^3). Outdoor use in single-family units accounted for 15% of total water use and proportionately twice as much water for outdoor use (28%) as multiple-family units (16%). Of the municipalities for which data is available, Oak Bay used proportionately the most water outdoors (43%), followed by Metchosin (41%); Saanich, Sidney and Sooke used the least (at 23 to 25%) (see Figure 7 Appendix A for more details).



Box 2: Comparison between Indoor and Outdoor water demand
By sector (left) and proportion of Outdoor water demand by sector (right) in 2004, for Revenue water only.

Notes: (i) Non-Revenue water demand of 8,000 x 1000 m^3 = 13% of entire water demand but is not included because it is required for maintaining infrastructure (e.g., water mains cleaning).

Conclusion 2: *Outdoor water use by single-family units is a significant draw on water supply.*

[3] See Appendix A for more detailed analysis and summary tables and graphs.

3. Outdoor water use increases with both household income and value of property

Average municipal per capita outdoor water use (2004) increased with municipal household income and average dwelling value (single- plus multiple-family units; 2001 data). Lower income families are therefore less able, through conservation, to delay the time when expenditures are required for new sources of water; wealthier clients with a greater ability to pay for water may currently lack sufficient financial incentives to conserve outdoor water use.

Conclusion 3: *People with higher incomes and living in more valuable dwellings should be able to make proportionately greater outdoor water savings than lower income families in less expensive dwellings who use less water.*

4. Outdoor water conservation is a potentially significant "new" source of water for future development

The amount of water used outside by single-family units represents a source of water that, through conservation, could be accessed for **new housing** developments. For example, up to 100,000 L of water are required to irrigate a typical suburban lawn to keep it green over the summer months; encouraging owners of single-family units to refrain from irrigating lawns ("go golden") or to change to using drought-resistant plants would therefore result in considerable water savings, and increase the sustainability of our current water supply. Also a real opportunity to reduce long-term outdoor water use exists by "hard-wiring" new housing so that they have reduced outdoor water demands from the beginning by using drought-resistant landscaping, as discussed in the next section.

Conclusion 4: *Water conserved by reducing outdoor use by existing (and future) single-family units could be used by new housing developments.*

Using drought resistant landscaping to save water and money

Improving outdoor water-use efficiency through drip irrigation, watering restrictions and effective watering scheduling is a critical first step in water conservation, and is well underway in the CRD. However, moving toward long-term and durable solutions requires the next step: addressing outdoor water use "needs" by promoting outdoor spaces that are well-suited to our local (and seasonally dry) environment and do not require "surplus" water to maintain them. (See Appendix B for a summary of options (and expected savings) to reduce outdoor water use).

A water-reducing landscape provides many benefits, most importantly reduced water use, but other benefits include reduced maintenance effort and costs, and improved bio-diversity and habitat for local insects and wildlife. This reduced water use saves money all through the system, from the end-user (i.e., homeowners, businesses, municipalities) to the community by reducing infrastructure, treatment and distribution costs.[4] Establishing drought-resistant landscapes is most economical when new houses are built, as compared to "retrofitting" existing lawns and established gardens.

[4] Additional benefits include reduction in use of harmful chemicals for treatment and reduction of energy use (and fossil fuels an important climate change driver) as less water is pumped, treated and distributed throughout the water supply network.

Turning ideas into action

Motivated by a concern for the sustainability of our regional water resources, the Water Advisory Committee of the Regional Water Supply Commission recently passed a motion:

> **THAT the Water Advisory Committee recommends that the Regional Water Supply Commission expand the outdoor conservation program and request that municipalities and developers design and implement drought resistant landscapes that are less water-intensive than traditional designs.**

If the RWSC passed this motion and obtained the cooperation of the municipalities and development community, then it would mark an important step towards addressing outdoor water use in the region. Real impacts, however, require more than just motions – they require action, including leading by example, and development of appropriate bylaws and ordinances. WAC therefore recommends the following specific actions as complements to this motion:

- That the RWSC challenge municipalities and the CRD to lead by example by refraining from irrigating lawns and by using drought-resistant outdoor landscapes in all public spaces and around government buildings, and that the RWSC request municipalities to report back to the RWSC by outlining potential water savings and providing an action plan to begin implementation.
- That the RWSC support an expanded CRD water demand management plan for outdoor conservation programs.[5]
- That the RWSC encourage all municipalities to include information on drought-resistant design with all planning permits, and urge developers to establish drought-resistant landscapes in new developments. At a minimum, municipalities should require developers to estimate future water use and possible savings through drought-resistant options as part of the permit process, to identify opportunities for triple bottom line savings.
- That the CRD, in partnership with the 13 local municipalities, provide funding for outdoor water reduction audits (especially of high users) and incentives to replace current lawns with drought-resistant lawns and landscapes.
- That the RWSC urge municipalities to create financial incentives to reduce outdoor water use by creating an inclining block or seasonal water price system that increases costs with total consumption, based on outdoor use (i.e., prices per volume of water increase when homeowners exceed their usual indoor use so that water used outdoors becomes increasingly expensive, and the price increases step-wise with greater volumes of water used). This would provide homeowners with a financial incentive to use water wisely since the more consumed, the greater the cost per additional unit.
- That the RWSC request Water Services and WAC to work together over the coming year to develop models for bylaws to control outdoor water use.

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[5] An increased budget would enable staff to develop specific outdoor water conservation (and landscape design) resources for municipalities and developers, and enable active engagement through consultations, social marketing, workshops, demonstration sites, pilot projects, and resource and information distribution.

Appendix A: Summary water use tables for the region

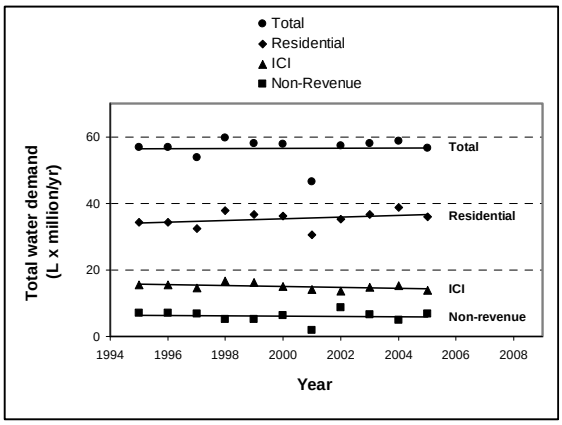

Fig. 1. Total water demand (L x million per year) in the CRD (1995-2005). *Notes:* (i) total water demand is constant because ICI use declined; (ii) residential use is increasing; (iii) drought in 2001; (iv) higher Residential in 2002 because of dam raising & reduced enforcement. (See Table 1 for data.)

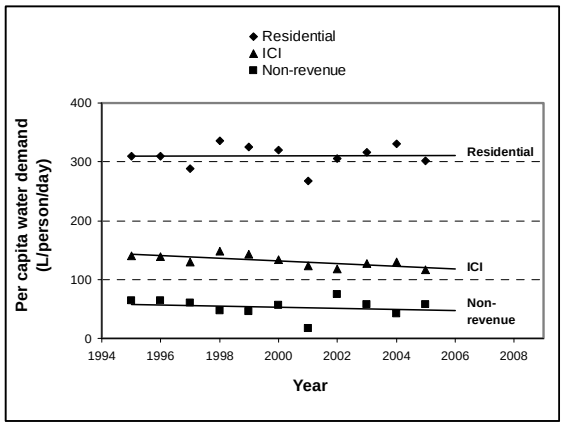

Fig. 2. Per capita water demand (L per person per year) in the CRD (1995-2005). *Note:* per capita Residential demand has not yet decreased and is ~309 L/person/day; the top line above that measures this is accurate to within about ±20 L/person/day. (See Table 2 for data.)

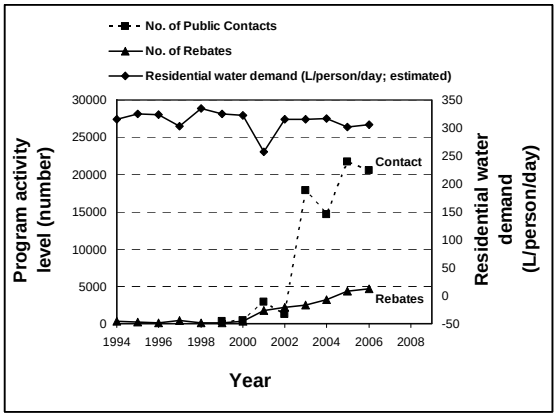

Fig. 3. Water conservation program activities (rebates, public contact at educational events) and daily per capita residential water demand (L per person per day). *Notes:* (i) 2001 was a drought year; (ii) Residential demand estimated from total water demand, population, and proportion of demand that is residential.

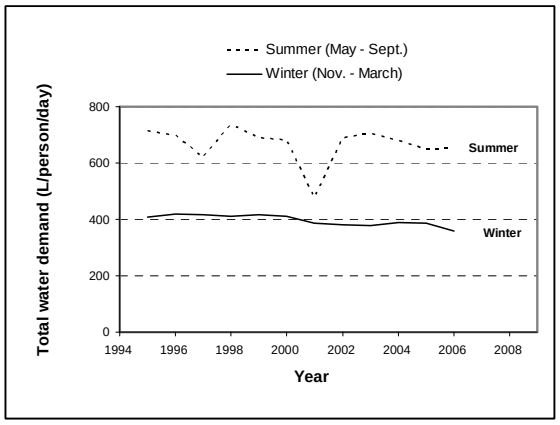

Fig. 4. Total (residential + ICI + non-revenue) daily per capita water demand (L per person per day) in the summer (May to Sept.) and winter (Nov. to March). *Note:* 2001 was a drought year.

Table 1. Total water demand (Mm^3 = million m^3) in the CRD and Residential, ICI and Non-Revenue demand as a proportion of total water demand (%) between 1995 and 2006. Note: Residential demand is currently 65% of total water demand.

Year	Water demand (Mm^3)				Proportion of total demand (%)		
	Revenue		Non-	Total	Revenue		Non-
	Residential[1]	ICI[1]	revenue	demand	Residential	ICI	revenue
1995[2]	n/a	n/a	n/a	56.8	n/a	n/a	n/a
1996[3]	34.3	15.4	7.2	56.9	60%	27%	13%
1997[2]	n/a	n/a	n/a	53.8	n/a	n/a	n/a
1998[2]	n/a	n/a	n/a	59.7	n/a	n/a	n/a
1999[4]	36.7	16.2	5.1	58.1	63%	28%	9%
2000	36.2	15.1	6.4	57.8	63%	26%	11%
2001[5]	30.6	14.1	1.9	46.6	66%	30%	4%
2002[6]	35.2	13.5	8.7	57.4	61%	24%	15%
2003	36.7	14.7	6.7	58.0	63%	25%	11%
2004	38.6	15.2	4.9	58.8	66%	26%	8%
2005	35.8	13.8	6.9	56.5	63%	24%	12%
2006[2]	n/a	n/a	n/a	57.8	n/a	n/a	n/a
Avge.	35.5	14.8	6.0	56.5	63%	26%	11%
3-yr avge.[7]	37.2	14.5	5.9	57.7	65%	25%	10%

1. Proportions of Residential and ICI demand for Sidney are estimated for 1999-2001, as only total retail demand was available.
2. Retail water demand data is not available for 1995, 1997, 1998, 2006.
3. Only bulk water demand of 1.30 Mm^3 available for Sidney in 1996, so demand values of 0.95 (Residential) and 0.35 (ICI) Mm^3 were added to 1996 totals.
4. No demand data available for Oak Bay in 1999, so typical demand values of 3.00 (Residential) and 0.40 (ICI) Mm^3 were added to 1999 totals.
5. 2001 was a drought year
6. 2002 had higher Residential use than normal because (i) Stage 1 restrictions delayed until June because of dam raising, and (ii) enforcement staff reduced from 7 to 2.
7. 3-yr average = 2004 to 2006.

Table 2. Per capita water demand (L per capita per day) in the CRD between 1995 and 2006. (See Fig. 2, which shows that Residential demand remained constant over this time period, but that ICI demand decreased.)

Year	Pop'n Served[1]	Water demand (L per capita per day)			
		Revenue		Non-revenue	Total demand
		Residential[2]	ICI[2]		
1995[3]	302,200	n/a	n/a	n/a	514
1996[4]	304,100	309	139	64	513
1997[3]	307,500	n/a	n/a	n/a	479
1998[3]	308,600	n/a	n/a	n/a	530
1999[5]	309,500	325	143	45	514
2000	310,200	320	134	56	510
2001[6]	312,600	268	123	17	408
2002[7]	314,800	306	118	75	499
2003	317,900	316	127	57	500
2004	320,700	330	130	42	502
2005	324,500	302	117	58	477
2006[3]	327,000	n/a	n/a	n/a	484
Avge.	313,300	309	129	52	494
3-yr avge.[8]	324,067	316	123	50	488

1. S Gudivicius, CRD Water Services.
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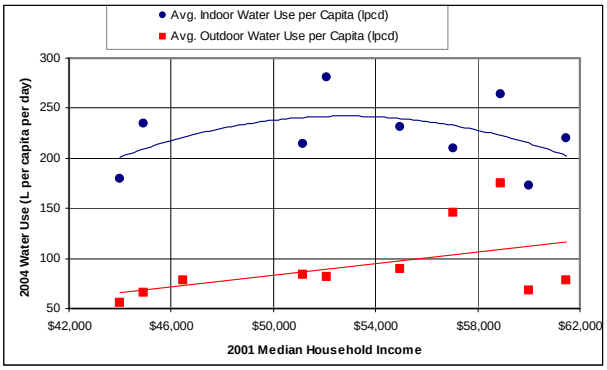

Fig. 5. Use by average municipal household income (Single-family + Multi-family units). *Note:* Outdoor water use increases with income.

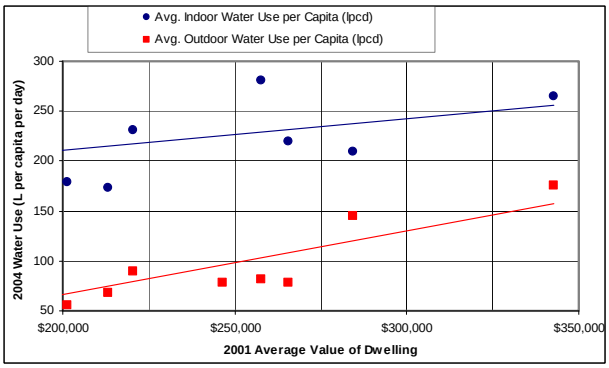

Fig. 6. Use by average municipal dwelling value (Single-family + Multi-family units). *Note:* Outdoor water use increases with value of house

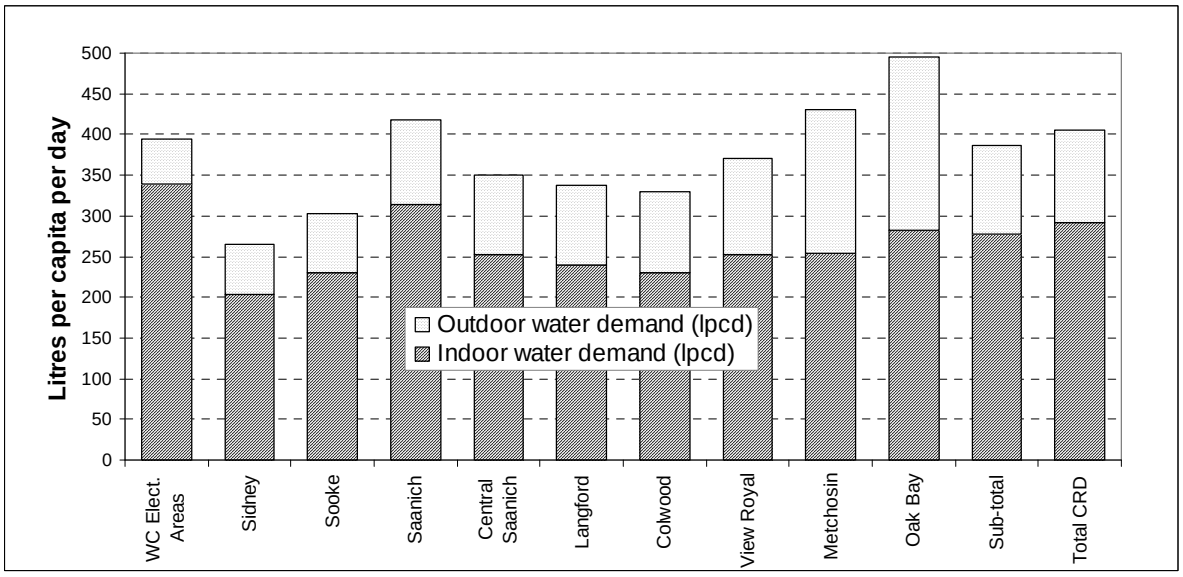

Fig. 7. Per capita indoor and outdoor water demand (L per capita per day) by municipality for 2004. *Notes:* (i) Data not available for all individual municipalities; (ii) WC Elect. Areas = Water Commission Electoral Areas; (iii) Sub-total = average of municipalities for which data is available.

Table 3. Indoor and outdoor water demand by municipality for 2004, sorted from highest to lowest proportion of outdoor use. *Notes:* (i) Data not available for all individual municipalities; (ii) WC Elect. Areas = Water Commission Electoral Areas; (iii) Sub-total = average of municipalities for which data is available.

	Population		Single family household size (2003)[5]	Demand per municipality (m^3/yr)			Outdoor Use (% of Total)	Change from CRD avge (%)	Demand per capita (L/person/day)		
Municipality	2001	2004		Indoor	Outdoor	Total			Indoor	Outdoor	Total
Oak Bay	18,573	18,357	2.6	268	203	471	43	54	282	213	495
Metchosin	5,070	5,272	2.7	251	174	425	41	46	254	176	430
View Royal	7,587	8,045	2.7	249	117	366	32	14	252	119	370
Colwood	14,345	14,825	2.9	245	105	350	30	7	231	99	330
Langford	19,660	20,901	2.8	246	100	346	29	4	240	98	338
Central Saanich	16,018	16,451	2.9	268	104	372	28	0	252	98	350
Saanich	108,179	109,639	2.7	310	103	413	25	-11	313	104	418
Sooke	9,116	9,730	2.7	227	72	299	24	-14	230	73	303
Sidney	11,404	11,495	2.5	186	56	242	23	-18	204	61	264
WC Elect. Areas	3,801	4,029	2.4	298	49	347	14	-50	340	55	395
Sub-total	148,518	218,744	2.8	286	111	397	28		278	108	386
Total CRD	312,600	320,700	2.55	272	106	378	28		292	113	405

Appendix B: Outdoor water saving opportunities

Method	Savings in outdoor irrigation water use
Improved irrigation technology: Automatic shutoff nozzle on hose Rainfall shutoff device on automatic irrigation systems Drip irrigation system	 5-10% 5-10% 25-75% (of non-lawn irrigation)
Water-wise landscape planning and design (e.g. Xeriscaping)	20-50% (potentially to 100%)
Reduced lawn area	15-50%
Use of native and low-water-use plants	20-30%
Comprehensive audit	10-15%
Source: Vickers, A. (2001). *Handbook of Water Use and Conservation: Homes, Landscapes, Businesses, Industries, Farms*. Amherst, Massachusetts: WaterPlow Press. pp. 152-200.	

Xeriscaping in Practice[6]

A study by the North Marin Water District in California found that water-conserving landscapes featuring about half as much turf as traditional yards required 54% less water, 25% less labour, 61% less fertilizer, 22% less herbicide, and 44% less fuel (for mowing) to maintain.

Between 1990 and 2003, a study by the US National Xeriscape Demonstration Program compared the financial costs and water demand of Xeriscaping to standard landscaping with the following results:

- Phoenix realized water saving of 53% on properties with Xeriscaping;
- southern Nevada maintained a 39% summer water savings compared to properties not converted to Xeriscape;
- homes in Austin used 31% less water than those with conventional landscapes; • cities along Colorado's Front Range used 18% to 63% less water than popular Kentucky bluegrass landscapes;
- in Colorado, surveys revealed that Xeriscape participants were generally satisfied with their new landscapes and would recommend them to others; and,
- Denver Water found an 11% increase in the number of Xeriscaped yards in Denver over the three-year study period.

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[6] Excerpt taken from Brandes, O.M., T. Maas and E. Reynolds. 2006. *Thinking Beyond Pumps and Pipes: Top 10 Ways Communities Can Save Water AND Money.* The POLIS Project on Ecological Governance, University of Victoria, Victoria, BC pp. 28-29. Available at www.waterdsm.org.