

4B. Water Conservation and Reuse

During development of this plan, the Region C Water Planning Group placed strong emphasis on water conservation and reuse as a means of meeting projected water needs. This section provides overviews of water conservation (Section 4B.1), reuse (Section 4B.2), drought management measures (Section 4B.3), and a summary of recommended water conservation and reuse strategies for Region C (Section 4B.4). Chapter 6 includes more detailed discussions of Region C water conservation (including reuse) and drought management strategies and recommendations. Appendix K includes an estimation of savings and costs for water conservation strategies.

4B.1 Water Conservation

The Texas Water Code §11.002(8) ⁽¹⁾ defines *conservation* as “the development of water resources; and those practices, techniques, and technologies that will reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.” By this definition, it is clear that reuse of treated wastewater effluent is a water conservation measure.

Although water conservation measures and drought or emergency water management measures both save water, water conservation measures are fundamentally different from drought or emergency management measures. *Drought/emergency management measures* are temporary measures that are implemented when certain criteria are met and are terminated when these criteria are no longer met, while water conservation measures are designed to provide permanent or long-term water savings.

Currently implemented water conservation strategies and water conservation assumptions implicit in the water demand projections (Chapter 2) are discussed below.

Currently Implemented Water Conservation Strategies in Region C

To provide a basis for assessment of potentially feasible water conservation strategies in Region C, it is necessary to identify currently implemented water conservation strategies in the region. To accomplish this, the Region C Water Planning Group surveyed water

suppliers, conducted telephone interviews with selected water suppliers, and obtained data from other sources including water conservation and drought contingency plans from water suppliers, TWDB historical use records, the TCEQ water rights data base and historical wastewater return flows, and by surveying reuse providers. Survey responses were received from 25 WWPs and 96 WUGs. Along with the returned surveys, many WWPs and WUGs included their current Water Conservation and Drought Contingency Plans. Information in these plans was used to supplement the survey responses. From among the 121 entities that returned completed surveys, 24 were selected to provide more comprehensive cost and public education information related to the implementation of the water conservation BMPs. This information was obtained through telephone interviews. Historical water use data was also collected from the TWDB for some entities. Water rights information and wastewater return flow information was obtained from the TCEQ. A full discussion of the findings of these studies is contained in Chapter 6. Appendix L provides model conservation plans.

Table 4B.1 shows the percentage of water retailers that have implemented certain water conservation strategies.

Significant efforts have been made by water providers and water users to conserve water in Region C. Regional coordination is one tool that has been utilized by wholesale water providers in the region. The North Texas Municipal Water District, Dallas Water Utilities and Tarrant Regional Water District jointly sponsor the North Texas Regional Water Conservation Symposium, now in its third year. Outdoor water conservation practices, such as time of day watering restrictions, have become part of local ordinances in Fort Worth, Dallas, and most of the larger cities in the area. Cities and water utilities have begun allocating conservation staff and budgeting dollars as part of their full time water management strategies. These individual conservation efforts are part of the ongoing Region C effort to promote conservation as a permanent, valuable water management strategy.

Table 4B.1⁽²⁾

Water Conservation Response Data from Water Retailers

	Basic Package							Expanded Package			
	Low flow plumbing fixture rules	Public and school education	Water use reduction due to increasing water prices	Water system audit, leak detection and repair, and pressure control	New efficient residential clothes washer standards	Water conservation pricing structure	Water waste prohibition	Coin-operated clothes washer rebate	Residential customer water audit	ICI water audit, water waste reduction, and site-specific conservation program	Reuse of treated wastewater effluent
BMP Implementation											
Implemented		49%	62%	58%		46%	29%	0%	13%	4%	10%
Target Res. ^(a)		78%	84%	68%		71%	73%	0%	47%	0%	18%
Target Ind. ^(b)		13%	43%	34%		37%	52%	0%	0%	40%	27%
Target Comm. ^(c)		29%	61%	48%		49%	64%	0%	0%	40%	45%
Target Inst. ^(d)		31%	48%	38%		43%	61%	0%	0%	60%	27%
Level of BMP Effectiveness											
Very Effective	20%	9%	25%	31%	10%	33%	27%	0%	20%	0%	45%
Somewhat Effective	61%	64%	45%	46%	60%	25%	45%	0%	60%	20%	36%
Not Effective	2%	9%	13%	3%	20%	10%	9%	0%	7%	0%	0%
No Response	16%	18%	16%	20%	10%	31%	18%	0%	13%	80%	18%
Plans to Maintain BMP											
Yes		87%	86%	80%		71%	94%	0%	67%	80%	73%
No		2%	0%	0%		0%	0%	0%	0%	0%	0%
No Response		11%	14%	20%		29%	6%	0%	33%	20%	27%
Would Consider Implementing BMP											
Yes		28%	30%	30%		33%	18%	17%	23%	25%	20%
No		11%	9%	9%		7%	15%	23%	15%	14%	20%
No Response		61%	60%	62%		61%	67%	60%	62%	61%	60%
Public Reaction											
Favorable	7%	53%	7%	28%	0%	14%	33%	0%	47%	20%	55%
Unfavorable	2%	0%	28%	0%	0%	18%	15%	0%	0%	0%	0%
No Reaction	36%	13%	19%	23%	50%	16%	6%	0%	0%	0%	0%
No Response	52%	33%	43%	48%	50%	49%	39%	0%	53%	80%	45%

- (a) Respondents indicated that BMP was targeted to residential customers
- (b) Respondents indicated that BMP was targeted to industrial customers
- (c) Respondents indicated that BMP was targeted to commercial customers
- (d) Respondents indicated that BMP was targeted to institutional customers

Information Developed Since the 2006 Region C Water Plan

The 80th Regular Session of the Texas Legislature (2007), via the passage of Senate Bill 3 and House Bill 4, directed the TWDB to appoint members to the newly created Water Conservation Advisory Council. The Water Conservation Advisory Council replaced the Water Conservation Implementation Task Force, which was created in 2003 and abolished on January 1, 2005. Duties of the Council include: monitoring trends in water conservation implementation and new technologies for possible inclusion as best management practices; monitoring the effectiveness of the statewide water conservation public awareness program; developing and implementing a state water management resource library; developing and implementing a public recognition program for water conservation; monitoring the implementation of water conservation strategies by water users included in regional water plans; monitoring target and goal guidelines for water conservation to be considered by the TWDB and TCEQ; and conducting a study to evaluate the desirability of requiring the TWDB to designate entities and programs that provide assistance to retail public utilities in developing water conservation plans as certified water conservation training facilities and to give preference to certified water conservation training facilities in making loans or grants for water conservation training and education activities.

In December 2008, the Advisory Council published *A Report on Progress of Water Conservation in Texas*⁽³⁾. The report included a number of recommendations regarding water conservation and regional water planning. These recommendations include the following:

- Develop methodology, metrics, and standards for water conservation implementation measurement and reporting.
- Develop specific guidelines for how gallons per capita per day should be determined and how it should be applied to population-dependent water use only.
- Develop reporting guidelines for improved data collection.
- Expand data collection efforts to include all water providers and water use categories.
- Develop a pilot project for water use data reporting.
- Develop a pilot project for determining population figures appropriate for certain water use metrics.

- Provide the Council with the necessary resources to sufficiently develop and implement tools to monitor implementation of water conservation strategies recommended in the regional water plans.
- Expand public awareness of water conservation statewide and coordinate campaigns at the state, regional, and local levels.
- Establish a statewide water conservation recognition program.
- Collaborate with national efforts to develop a clearinghouse of resources, tools, and best management practices.
- Direct the TWDB to develop a certification process for conservation training programs and provide preference for technical and financial assistance to these certified programs.

New Regional Planning Requirements

The TWDB has revised its planning guidelines since the last round of regional water planning. Based on updated legislation, TWDB now requires that:

- Retail public utilities with populations greater than 20,000 implement a landscape irrigation permitting, inspection and enforcement program under HB 1656
- Retail public utilities with more than 3,300 connections submit a water conservation plan under Texas Water Code §13.146
- The TWDB review each water conservation plan and annual report to determine compliance with minimum requirements and submission deadlines under Texas Water Code §16.402

In addition, new legislation (House Bill 2667) enacted in 2009 will require toilets purchased after January 1, 2014 to have a maximum flush volume of 1.28 gallons per flush. This will supplant the existing 1.6 gallons per flush maximum rate defined in the Water Saving Performance Standards for Plumbing Act (Chapter 372 of Texas Health and Safety Code, effective January 1992) and should be used as appropriate to estimate water savings. Further discussion of this Bill and estimated savings are included in Section 6.4.

4B.2 Reuse

Reuse is becoming an increasingly important source of water in Region C and across Texas. There are a number of water reuse projects in operation in Region C, and many others are currently in the planning and permitting process.

Direct reuse and indirect reuse have significantly different permitting requirements and potential applications. Direct reuse occurs when reclaimed water is delivered from a wastewater treatment plant to a water user, with no intervening discharge to waters of the state. Direct reuse requires a notification to the Texas Commission on Environmental Quality (TCEQ), which is routinely accepted so long as requirements to protect public health are met. Direct reuse is most commonly used to supply water for landscape irrigation (especially golf courses) and industrial uses (especially cooling for steam electric power plants).

In 2008, the TCEQ adopted rule language (§30 TAC Chapter 321) that applies specifically to permitted wastewater treatment facility owners who plan to produce reclaimed water at a site other than an existing permitted domestic wastewater treatment facility. The new rule, which streamlines the permitting of offsite reclaimed water production facilities that do not discharge to waters of the state, could potentially reduce costs associated with the transportation of raw wastewater to an existing facility and from the existing facility to reclaimed water users.

Indirect reuse occurs when reclaimed water is discharged to a stream or reservoir and is diverted downstream or out of the reservoir for reuse. The discharged water mixes with ambient water in the stream or reservoir as it travels to the point of diversion. Many of the water supplies within Region C have historically included return flows from treated wastewater as well as natural runoff. These return flows provide a supplement to supply that can be used as long as the return flows continue. An entity can ensure the ability to use its return flows through a water right permit from the TCEQ. A wastewater discharge permit from the TCEQ may also be required if the discharge location were to be changed as part of the reuse project.

Potential applications for water reuse in Region C include:

- Landscape irrigation (parks, school grounds, freeway medians, golf courses, cemeteries, residential)
- Agricultural irrigation (crops, commercial nurseries)
- Industrial and power generation reuse (cooling, boiler feed, process water, heavy construction, mining)

- Recreational/environmental uses (lakes and ponds, wetlands, stream flow augmentation)
- Supplementing potable water supplies.

There are a number of benefits associated with water reuse as a water management strategy, including:

- Water reuse represents an effective water conservation measure.
- Water reuse provides a reliable source that remains available in a drought.
- Water reuse quantities increase as population increases.
- Water demands that can be met by reuse are often near reuse sources.
- Water reuse is a viable way to defer and avoid construction of new surface water impoundments.

Reuse has been a source of water supply in Region C for a number of years. In 2010, Region C is expected to have nearly 204,000 acre-feet per year of wastewater return flows available for use as water supplies. Under current permits and infrastructure, this supply is expected to increase to nearly 336,000 acre-feet per year by 2060. There are also several reuse projects that have been permitted, but do not have infrastructure in place. Significant new reuse projects since the last plan include:

- The expansion of the City of Fort Worth's Village Creek Reclaimed Water Delivery System to serve the Cities of Arlington and Euless, Dallas-Fort Worth International Airport, and other potential retail customers within the City of Fort Worth is currently under construction and is anticipated to be online by the end of 2010.
- The TRWD Richland-Chambers Reservoir reuse project began operation in 2009 and diverts return flows into off-channel, wetland impoundments for water quality treatment purposes before delivery into the Richland-Chambers Reservoir for storage and diversion.
- The NTMWD is now authorized to divert up to an additional 35,941 acre-feet per year (for a total of 71,882 acre-feet per year) of return flows from the District's Wilson Creek Wastewater Treatment Plant in Lake Lavon.
- The NTMWD East Fork Raw Water Supply Project began operation in 2009 and can currently convey nearly 48,000 acre-feet per year of return flows to Lake Lavon for subsequent reuse. The NTMWD East Fork Raw Water Supply Project diverts return flows from the East Fork of the Trinity River to a constructed wetland for polishing treatment and ultimately returns this water to Lake Lavon. The water right for the project authorizes diversions up to 157,393 acre-feet per year, as return flows increase and become available.

- Dallas Water Utilities and NTMWD have entered into an agreement which would allow NTMWD to exchange return flows from its WWTPs discharging into Lake Ray Hubbard for Dallas return flows discharged to the main stem of the Trinity River. Under this agreement, Dallas will obtain the right to divert the NTMWD return flows from Lake Ray Hubbard and will pump an equal amount of flow from the main stem of the Trinity River to the NTMWD East Fork Water Supply Project wetland for use by NTMWD. In addition, once water rights for Elm Fork return flows (from NTMWD WWTPs discharging to Lake Lewisville) have been secured by NTMWD, NTMWD will support Dallas efforts to secure bed and banks transport, storage and diversion rights for the Elm Fork return flows. In exchange, Dallas will pump a quantity equal to NTMWD's discharge of its future Elm Fork return flows to the East Fork Water Supply Project wetland for use by NTMWD.

A number of other reuse projects have already been defined, and planning is in the early stages. These will be considered as potentially feasible strategies. A list of the current reuse projects in Region C is shown on Table 6.3 in Section 6 and discussed in detail in Appendix I.

In general, reuse strategies will require the use of multiple barriers (such as advanced wastewater treatment, blending, residence time, and/or advanced water treatment) to mitigate potential negative impacts to the environment, agricultural resources, and other resources. Sources of wastewater effluent needed for new reuse projects are generally limited to owners and operators of large wastewater treatment plants. These include the Trinity River Authority, which operates several wastewater treatment plants in the region, North Texas Municipal Water District, the cities of Fort Worth and Dallas, and several smaller cities.

The potential for additional reuse projects in Region C is dependent upon the amount of wastewater generated and the ability of the user to use treated effluent. Approximately 93 percent of the 1.76 million acre-feet of water expected to be used in the Trinity River Basin in Region C in 2010 is attributed to municipal and manufacturing use. Municipal and manufacturing use in Region C is expected to increase to 3.2 million acre-feet per year by 2060. Of the total amount of water projected for use in Region C, a considerable amount is expected to be returned to the Trinity River Basin through return flows.

Return flow is the term used to describe water that has been beneficially used and then is discharged to a receiving stream or reservoir. Existing streams and reservoirs have

historically relied on these return flows for water supplies and instream uses.

Recommending reuse projects that have a significant impact to the historical return flows can have an impact to the health of the river system. Discussions with the regional and local water providers identified several potential reuse projects that could be used to help meet the projected shortages in Region C. A list of the recommended reuse projects in Region C is shown in Table 4B.2.

The Region C plan proposes to reuse an additional 257,000 acre-feet of return flows in 2020 through both direct and indirect reuse projects, with most of this additional reuse occurring in the Trinity River Basin. By 2060, the proposed reuse in the region is expected to reach more than 300,000 acre-feet per year. The total 2060 reuse from proposed and existing projects will be nearly 636,000 acre-feet per year.

4B.3 Drought Management Measures

The Region C Water Planning Group decided not to recommend drought management measures as a water management strategy to provide additional supplies for Region C. The consensus of the planning group is that:

- Drought management and emergency response planning are intended to preserve water resources for the most essential uses when water supplies are threatened by an unexpected condition such as a multi-year drought, an unexpected increase in demands, or a water supply system component failure.
- Drought contingency and emergency response measures provide protection in the event of water supply shortages, but they are not a reliable source of additional supplies to meet growing demands. They provide a backup plan in case a supplier experiences a drought worse than the drought of record or if a water management strategy is incomplete when it is needed.

4B.4 Summary of Water Conservation and Reuse Recommendations

Despite the efforts that have been made by water providers and water users, the survey results indicate that there is more work to be done to fully implement the proposed water conservation strategies. Cities and utilities in Region C have made significant strides in the implementation of water conservation efforts in Region C. It is important that suppliers in the region build on this momentum with continued conservation efforts, and this plan suggests areas of emphasis for that effort.

Table 4B.2
Recommended Reuse Projects in Region C*
 - Values in Acre-Feet per Year -

Provider	Project Name	Type	County ^(a)	2010	2020	2030	2040	2050	2060
Athens	Athens Fish Hatchery	direct	Henderson	0	2,872	2,872	2,872	2,872	2,872
Cooke County	Direct Reuse	direct	Cooke	0	70	70	70	70	70
Cooke County Mining	Mining Reuse	direct	Cooke	0	99	67	71	74	77
DWU	Direct Reuse	direct	Dallas	0	20,458	20,458	20,458	20,458	20,458
DWU/NTMWD	NTWMD WWTP Discharges to the Lake Ray Hubbard Watershed	indirect	Dallas/Kaufman/ Collin/Rockwall	0	31,612	35,872	39,459	40,244	41,029
Ennis	Indirect Reuse	indirect	Ellis	0	0	0	333	2,521	3,696
Fort Worth	Village Creek Direct Reuse	direct	Tarrant	1,552	3,469	3,526	3,526	3,526	3,526
Fort Worth/TRA	Alliance Corridor Direct Reuse	direct	Tarrant	0	1,120	4,694	4,694	4,694	4,694
Fort Worth	Fort Worth Future Direct Reuse	direct	Tarrant	0	0	3,460	7,979	7,979	7,979
Frisco	Collin/Denton County Direct Reuse	direct	Collin/Denton	0	2,240	3,360	5,650	5,650	5,650
Jacksboro	Indirect Reuse (Jack County mining)	indirect	Jack	385	385	385	385	385	385
Irving/TRA	Irving Direct Reuse	direct	Dallas	0	6,000	8,000	8,000	8,000	8,000
NTMWD	Additional Supplies from Dallas for East Fork	indirect	Dallas/Kaufman/ Collin/Rockwall	0	34,900	15,100	0	0	0
Tarrant County SEP	Tarrant County SEP	direct	Tarrant	0	0	1,528	2,360	2,360	2,360
TRA	Tarrant County Indirect Reuse	indirect	Tarrant	0	7,500	7,500	7,500	7,500	7,500
TRA	Dallas County Direct Reuse	direct	Dallas	0	0	6,760	6,760	6,760	6,760
TRA	Joe Pool Lake Indirect Reuse (New WWTP)	indirect	Dallas	0	4,368	4,368	4,368	4,368	4,368
TRA	Ellis County Direct Reuse	direct	Ellis	0	0	0	0	0	2,200

* NOTE: Lists recommended reuse strategies for Region C and does not include existing reuse projects.

(a) County reflects location of reuse project.

Table 4B.2* (continued)

Provider	Project Name	Type	County ^(a)	2010	2020	2030	2040	2050	2060
TRA	Freestone County Direct Reuse	direct	Freestone	0	0	0	0	6,760	6,760
TRA	Kaufman County Direct Reuse	direct	Kaufman	0	1,000	1,000	1,000	1,000	1,000
TRA	Las Colinas Direct Reuse	direct	Dallas	0	7,000	7,000	7,000	7,000	7,000
TRA	Tarrant and Denton Counties Direct Reuse	direct	Tarrant/ Denton	0	7,500	7,500	7,500	7,500	7,500
TRWD	Trinity River Indirect Reuse - Richland Chambers	indirect	Navarro	0	53,000	53,000	53,000	53,000	53,000
TRWD	Trinity River Indirect Reuse - Cedar Creek	indirect	Henderson /Kaufman	0	52,500	52,500	52,500	52,500	52,500
UTRWD	Indirect Reuse of Lake Ralph Hall Water	indirect	Fannin	0	6,810	13,620	20,430	20,430	20,430
UTRWD	Direct Reuse	direct	Denton	0	0	560	1,121	2,240	2,240
Wise County Mining Reuse	Wise County Mining Reuse	direct	Wise	0	14,133	22,428	19,652	24,648	28,520
Total				1,937	257,036	275,628	276,688	292,539	300,574

* NOTE: Lists recommended reuse strategies for Region C and does not include existing reuse projects.

(a) County reflects location of reuse project.

Table 4B.3 shows a regional summary of estimated water savings from recommended water conservation and reuse strategies. By 2060, the projected water supplies and/or savings from water conservation are expected to be over one million acre-feet per year. Estimated costs for these strategies by entity are included in Appendix Q. The recommended water conservation for each water user group is shown in Appendix C.

Table 4B.3
Summary of Existing and Recommended Conservation (Including Reuse) for Region C
 - Values in Acre-Feet per Year –

Strategy	2010	2020	2030	2040	2050	2060
<i>Municipal Conservation</i>						
Low flow plumbing fixture rules ^(a)	22,029	69,122	86,663	105,067	151,981	211,201
Municipal Recommended Conservation	46,690	106,835	151,586	192,720	235,718	284,916
<i>Non-Municipal Conservation</i>						
Efficient new steam electric power plants	3,262	7,824	14,545	26,725	43,403	65,619
Non-Municipal conservation strategies ^(b)	57	1,069	3,334	4,518	5,147	5,737
<i>Reuse Strategies</i>						
Existing Reuse	203,974	246,510	289,995	312,992	321,405	336,082
Proposed Reuse Strategies	1,937	257,036	275,628	276,688	292,539	300,574
Total Conservation and Reuse	277,949	688,396	821,750	918,710	1,050,192	1,204,128
Total Region C Municipal Demands	1,546,970	1,833,671	2,087,597	2,344,115	2,612,176	2,924,157
Total Municipal Demand without Conservation	1,572,261	1,910,617	2,188,805	2,475,907	2,807,560	3,200,977

- a. The Total Region C Demands on the line above includes projected conservation savings from low flow plumbing fixtures and efficient new steam electric power plants. These savings were added to the Region C Demands to obtain "Total Demand without Conservation", a projection of Region C's demands if no conservation occurred.
- b. Non-municipal water conservation measures include estimated conservation savings from manufacturing and irrigation rebates.

SECTION 4B
LIST OF REFERENCES

- (1) Texas Water Code, Chapter 11 Water Rights, Austin, [Online], Available URL: <http://www.capitol.state.tx.us/statutes/wa.toc.htm>, May 2005.
- (2) Freese and Nichols, Inc., Alan Plummer Associates, Inc, CP&Y, Inc., *Region C Water Conservation and Reuse Study*, prepared for the Region C Water Planning Group, Fort Worth, April 2009.
- (3) GDS Associates, Inc., Chris Brown Consulting, Axiom-Blair Engineering, Inc., and Tony Gregg, P.E.: *Texas Water Development Board Report 362 Water Conservation Best Management Practices Guide*, prepared for the Water Conservation Implementation Task Force, Austin, [Online], Available URL: <http://www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITFBMPGuide.pdf>, November 2004.
- (4) Freese and Nichols, Inc., Alan Plummer Associates, Inc., Chiang, Patel & Yerby, Inc., and Cooksey Communications, Inc.: *2006 Region C Water Plan*, prepared for the Region C Water Planning Group, Fort Worth, January 2006.

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